Under the Auspices of His Excellency Prof. Dr. Abdel Moneim El Banna,
Minister of Agriculture and Land Reclamation

Arab Journal of Plant Protection

Volume 35, Special Issue, November 2017

وزارة الزراعة واستصلاح الأراضي
Ministry of Agriculture and Land Reclamation
ARC
مركز البحوث الزراعية
Agricultural Research Center

Abstracts Book

12th Arab Congress of Plant Protection

Organized by
Arab Society for Plant Protection
&
Agricultural Research Center
Represented by
Plant Protection Research Institute & Plant Pathology Research Institute

Hurghada, Egypt

4-10 November 2017

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KEYNOTE ADDRESS

KN1

BUILDING BRIDGES BETWEEN PLANT PROTECTION DISCIPLINES FOR SUSTAINABLE MANAGEMENT OF CROP PESTS. R. Muniappan, IAPPS and Director, IPM Innovation Lab, Virginia Tech, 526 Prices Fork Road, Blacksburg, VA, USA, Email: rmuni@vt.edu

Plant protection is an interdisciplinary area that historically involved agronomy, plant breeding, entomology, plant pathology, statistics, and weed science. After World War II, pesticide development took precedence and chemistry, physics, and engineering were favored. This led to excessive use of synthetic pesticides, causing pest resistance to insecticides, contamination of ecosystems and undesirable health effects. As a result, the integrated pest management concept was developed in the 1960s. This expanded into new disciplines, such as mathematics, computer science, meteorology, and aeronautics to forecast pest occurrence and dispersal. It also included molecular biology and microbiology to produce biological control agents and GMOs and to manage pest resistance in them. IPM can contribute to sustainable agriculture both philosophically and functionally. IPM and sustainable development evolved during the last three decades of the 20th century. This process was supported by the integration of several basic and applied sciences in the development of plant protection components and dissemination of information. These include the social sciences such as economics, sociology, and gender studies. Also, public and private institutions are involved in the research and development of plant protection technologies, production and distribution, implementation, adoption, and evaluation in the field.

KN2

AN INNOVATIVE METHOD FOR THE TREATMENT OF PLANTS AND LANDS BY EXTREMELY LOW FREQUENCY ELECTROMAGNETIC PULSES TO CONTROL PLANT DISEASES. Fadel Mohamed Aly, Biophysics Department, Faculty of Science, Cairo University, Egypt, Email: fadelage@gmail.com

One of the main problems facing potato production is brown rot disease. Potato brown rot is caused by a bacterium which aggressively colonize the xylem vessels causing lethal wilting. Control of potato brown rot has proven to be a serious, very difficult and puzzling task. Consequently became one of the major obstacles in marketing Egyptian potato for export, since potato brown rot is declared a quarantine disease of concern in the EU. Similarly, white rot of onion and garlic is not easily controlled by chemicals, and farmers abstained planting these crops vin the infested area for 3-5 seasons. Nematodes are also a serious problem for most orchards, strawberries and vegetable crops cultivated in open fields or in greenhouses. All of the mentioned infestations are considered national problems facing these high value cash crops. Extremely low frequency electromagnetic waves at resonance frequency were evaluated for the control of potato brown rot, onion and garlic white rot and nematodes. Fast series specific detectors were manufactured to detect each of brown rot bacteria in both soil and tubers, white rot fungi and nematodes. Results confirmed the efficiency of R-Fast device for this purpose. Results showed that treating potato field by extremely low frequency electromagnetic pulses for one hour achieved 100% mortality of bacteria, *Ralstonia solanacearum* in soil and tubers. There was insignificant differences between treating potato fields for one or two hours. Chemical analysis of potato leaves showed significant increase of total protein, potassium and phosphorus. Chemical analysis of potato tubers confirmed the results obtained from leaves, suggesting that treating potato fields with very low waves of electromagnetic pulses improved the nutritional values of potato tubers as well as increased the crop yield by around 15%, compared to the control. Preliminary experiments on garlic white rot in the field at Beni-Suef and onion white rot in four fields at Fayoum, indicated successful control of these pathogens. This method was also promising for the control o0f nematodes. The efficacy of this method will be evaluated again in the next season to demonstrate its wide application.

SYMPOSIA

Symposium I. Implications of Disease and Insect Pest's Biology and Ecology on Designing Pest Management Strategies

S1

IPM AGAINST SOIL-BORNE PESTS AND SUSTAINABLE FOOD PRODUCTION. Abdelfattah A. Dababat[1], Gul E. Orakci[1], Hans-J. Braun[2], A. Morgounov[1], R.A. Sikora[3]. (1) International Maize and Wheat Improvement Center (CIMMYT), Ankara, Turkey; (2) International Maize and Wheat Improvement Center (CIMMYT), Mexico; (3) University of Bonn, Germany, Email: a.dababat@cgiar.org

Soil Borne Pathogens (SBPs) including the *Heterodera* species, cereal cyst nematode (CCN), *Pratylenchus* species, root lesion nematode and crown rot (CR) caused by Fusarium species, attack the roots of cereal crops resulting in a high yield loss and reduced grain quality and quantity. The damage caused by these diseases is accelerated in areas where water stress and monoculture practices dominate. Sustainable agriculture production of rain-fed crop exposed to drought, especially those growing under arid and semi-arid conditions, is being impacted by climate change due to hotter and drier soils. It is important to recognize that a plant's ability to secure adequate amounts of water is severely impacted by the destabilizing effects of nematodes and root rotting fungi on root architecture. Integrated crop health management approaches, using both modern cultivars with resistance/tolerance to these organisms, as well as, technologies that stimulate root health and growth coupled with modern nematode management strategies such as chemical, biological and cultural are needed for sustainable production in the ever drier environments that are now a

reality in many areas of the world. Resistance is environmentally friendly and biologically effective once identified. However, resistance has only been identified against one of the CCN species found in Turkey; *Heterodera filipjevi.* This resistance is not yet present in the varieties widely grown in the region. Therefore, alternative approaches to limit the damage caused by SBPs are needed. Extensive screening of wheat germplasm against SBPs has identified many moderately resistant germplasm in winter and spring wheat germplasm. However, CR remains a significant bottleneck in many wheat-growing areas around the world. Hundreds of wheat lines are screened annually for SBP at CIMMYT Turkey in collaboration with the Grains Research Development Corporation and many new moderately resistant to resistant lines have been identified. A number of these sources of resistance are new and previously unreported QTL's have been identified through association mapping. The new sources of resistance to the SBPs that may be useful for selecting parents and deploying resistance into elite germplasm adapted to regions where it is a problem. Nematologists, breeders and agronomists need to work together to find solution to the complex issues facing agricultural production and use multidisciplinary approaches to move forward in insuring food security for all. Recent research within the SBP program of the International Maize and Wheat Improvement Center (CIMMYT) has focused on germplasm screening, the potential of this germplasm as source of resistance, and how to incorporate the new sources of resistance into breeding programs. Breeding for resistance is particularly complicated and difficult when different species and pathotypes coexist in nature. Other current and future research will address the use of endophytic microorganisms and other cultural practices to the yield losses incurred by SBPs. There is currently insufficient breeding for resistance to SBPs due to a lack of expertise and recognition of SBPs as a factor limiting wheat production potential, inappropriate breeding strategies, slow screening processes, and increased research funding is required for a more holistic approach to plant health management.

S2

KNOWLEDGE OF WHITEFLY VECTOR-BEGOMOVIRUS DYNAMICS TO INFORM INTEGRATED DISEASE MANAGEMENT STRATEGIES: CASE STUDIES. Judith K. Brown, School of Plant Sciences, University of Arizona, Tucson, AZ 85721 USA, Email: jbrown@ag.arizona.edu

Whitefly-transmitted geminiviruses (*Begomovirus, Geminiviridae*) are responsible for millions in dollars of crop losses, spanning cotton, ornamentals, tropical fruit trees, and vegetables. The genus, *Begomovirus*, is a large group of rapidly diversifying ssDNA plant viruses undergoing population expansions in crop and/or uncultivated, ruderal plant hosts, in parallel with haplotypes of the whitefly vector *Bemisia tabaci* (Genn.) cryptic species group, comprising variants exhibiting a range of phenotypes and potentially, and different extents of gene flow (reproductive isolation). The propensity of certain *B. tabaci* haplotypes to upsurge locally and/or disperse trans-continentally in monoculture agro-ecosystems has greatly influenced begomoviral diversification. Genomic diversity studies of plant viruses that address 'within viral species' genetic structure, and its relationship to geographic distance or gene flow barriers, and/or to whitefly vector haplotype composition has provided unique insights into vector-virus-host interactions in time and space to inform short- and longer-term disease management practices. Molecular and genomic surveillance technologies have aided in identifying host-determinants such as genetic markers that inform ability to trace the 'origin of transmission' in space /temporally can guide prevention and/or arrest spread at or near the source, allows action to be taken at source, prior to extensive spread. Case studies are cotton leaf curl and cassava severe mosaic begomovirus-whitefly systems in Pakistan and sub-Saharan Africa, respectively, offer opportunities to apply diverse tools to better understand whitefly-mediated begomovirus epidemiology, and abate disease using knowledge-based approaches.

S3

RISK ANALYSIS AND ITS IMPACT ON PREVENTION AND CONTROL MEASURES OF ECONOMIC IMPORTANT PESTS. Martin Ward, EPPO, Paris, France, Email: martin.ward@eppo.int

Analysis of risks from plant pests has been an important role of the European and Mediterranean Plant Protection Organization since its foundation in 1951. Pest Risk Analysis, with capital initial letters, often shortened to PRA, is a more recent activity. The Sanitary and Phytosanitary Agreement of the World Trade Organisation in 1995 required technical justification of phytsosanitary measures on traded commodities. This necessitated the development of formal technical justification through Pest Risk Analysis. Three International Standards have been adopted describing how to conduct PRAs. EPPO Standards and computer tools provide more detailed guidance. There are currently two contrasting trends in the EPPO region with regard to pest risk analysis. On the one hand there are pressures to produce more quantitative PRAs making use of tools such as epidemiological spread models and climate matching. These can enable a more thorough comparison of costs and benefits of possible interventions. On the other hand there is also a need to respond rapidly to a wide range of emerging threats, using quick methods to screen large numbers of organisms. This can help plant health services to target regulation effectively against current risks and to give appropriate priority to each pest for phytosanitary inspections, surveys, contingency plans and awareness raising campaigns.

Symposium II. Advanced Technologies and Plant Protection

S4

USE OF GIS AND REMOTE SENSING FOR DEVELOPING IMPROVED IPM STRATEGIES. Burkhard Golla, Jörn Strassemeyer and Silke Dachbrodt-Saaydeh, Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Institute for Strategies and Technology Assessment Studies, Kleinmachnow, Germany, Email burkhard.golla@julius-kuehn.de

The widespread approach of IPM is becoming more and more popular in Europe. It can be considered as a response to the growing recognition that a strong dependence and non-sustainable use of chemical pesticides to control pests, weeds and crop diseases for food production is leading to adverse environmental and agronomic effects e.g. reduction of biodiversity and the evolution of resistances. Spatially explicit approaches in pest monitoring systems and environmental risk assessment tools using GIS and remote sensing technology and geodata play an important role for safeguarding and improve IPM strategies. GIS-based in-field monitoring systems help famers to identify, monitor and control weeds, pests and diseases; GIS-based pest warning services from extension services give spatially specific advice. The advice is generally based on individual professional working experience together with the interpretation of up-to-date and spatially explicit decision support tools (such as warning and alert systems) and monitoring results. GIS-based environmental risk assessment tools are inevitable instruments for farmers, advisors and authorities to encourage taking environmental risk from pesticide use into consideration while planning and improving IPM strategies. From field scale to an area-wide application these tools support the detection of pesticide hot-spots due to environmental conditions and pesticide use pattern. This talk provides a brief overview on the current status of GIS and remote sensing tools and approaches to foster the development of area-wide or regional sustainable pest management strategies.

S5

DEVELOPMENT OF INTEGRATED FINE SCALE SYSTEMS FOR INFORMED DECISION MAKING IN SUSTAINABLE CROP PROTECTION. Vittorio Rossi and Tito Caffi, Department of Sustainable Crop Production (DIPROVES), Università Cattolica del Sacro Cuore, Piacenza, Italy, Email: tito.caffi@unicatt.it

A key target in modern agricultural crop production is to develop less intensive and integrated farming systems with both low application of inputs (i.e. fertilizers, pesticides, etc.) and limited wastage of natural resources (i.e. water, soil, energy, etc.). The Integrated Pest Management (IPM) is a key component for reaching this goal together with a reduction of risks to human health and the environment. IPM relies on the use of all the information available to combine different agricultural practices and control methods in order to reduce the damages by the most economical means, and with the least possible hazard to people, property, and the environment. IPM is based on dynamic processes and requires careful and detailed organisation and management of farm activities at different levels (i.e. strategic, tactical, and operational). In this context, much more knowledge is required to make decisions and the decisions are more complex with IPM than with conventional agriculture. Decision-support systems (DSSs) are a specific class of computerized information system that support decision-making activities collecting, organizing, and integrating all types of information required for crop production. A new generation of DSSs was recently developed, implemented and provided to farmers for sustainable management of different crops. Those DSSs are characterized by two main components: (i) an integrated system for real-time monitoring of field components and (ii) a web-based tool that analyses these data and provides up-to-date information for managing the crop in the form of alerts and decision supports. The main goal of this new generation DSS is to provide real-time, holistic and detailed information on the many aspect of the crop status considering the development of the crop (e.g. phenological development), limiting factors (e.g. diseases, pests and weeds), natural resources (e.g. water) and technical inputs (e.g. plant protection products). The delivery of these DSSs via the Internet increases user accessibility, allows the DSSs to be updated easily and continuously (so that new knowledge can be rapidly and efficiently provided to farmers), and allows users to maintain close contact with providers. Examples of this new DSSs are vite.net® and grano.net® for the sustainable management of grapevine and durum wheat, respectively. In season 2016, 2,100 farmers used grano.net® in order to produce 140,000 tons of grain on 28,000 ha and 270 farmers used vite.net® on approximately 9,600 ha across Italy.

S6

OVERVIEW ON NOVEL TECHNIQUES FOR SUSTAINABLE PEST MANAGEMENT IN PROTECTED AND OPEN FIELD AGRICULTURE. J. Meyer, Bayer AG, Monheim, Germany, Email: Joachim.meyer@bayer.com

Examples of innovative approaches in three different fields of research and development for sustainable pest management are presented: new substances, integrated solutions and application technologies. The successful development of new active substances is illustrated by product innovations to manage weeds, diseases and pests via seed treatment, foliar or soil application. Integrated crop solutions combining biological control agents and small molecules have been elaborated to provide farmers with complete offers. Such programs will safeguard yield and quality of the produce. In the area of application technology considerable progress has been made during the past years in several areas. Digital Farming is about engaging into a discussion with the grower about his field and how to crop it best. Closed systems to further improve safe handling of products will be presented. Drip application offers a highly efficient method to carry the label-allowed pest control agents to the target areas in the soil for effective insect or disease control. All examples are considered to be valuable tools for growers to set up sustainable control programs in various important production segments.

S7

THE USE OF MOLECULAR TOOLS IN DEVELOPING PEST RESISTANT CROPS. Aladdin Hamwieh, International Center for Agricultural Research in the Dry Areas (ICARDA), P.O. Box 2416, Giza, Egypt, Email: a.hamwieh@cgiar.org

Molecular biology tools has changed our understanding to conventional breeding techniques during the last two decades, not only by shortening the duration of

breeding programs through marker assisted selection (MAS), but also by improving the accuracy of crosses, genes pyramiding, and tissue culture. The recent new technologies have led to remarkable advances in whole genome sequencing, which provides high-throughput sequences to revolutionize plant genotyping. Single nucleotide polymorphism (SNP) has been widely applied in plant breeding to enhance crop yield, quality, and tolerance to biotic or abiotic stresses. Molecular marker technologies achieved good results for both single-gene trait and polygene traits referred as quantitative trait loci (QTL). Molecular mapping and association mapping have been developed in most major crop plants to enhance pest crops resistance. Recent advance of genotyping-by-sequencing (GBS) offers an ultimate MAS tool to identify resistant genes for many diseases. Pyramiding two or more major genes in one cultivar through using MAS is the best option for increasing the longevity of resistance. Transgenic approach provides an opportunity for control of plant diseases. This paper will demonstrate few examples of these applications for enhancing pest resistance.

Symposium III. Management of Newly Emerging and Serious Pests: the Case of Olive Decline Caused by *Xylella fastidiosa,* a Threatening Disease to Olive Production in the Mediterranean Basin

S8

RESEARCH PROGRESS ON THE BIOLOGY, GENETICS, DIAGNOSIS AND CONTROL OF THE *XYLELLA FASTIDIOSA* STRAIN CAUSING THE QUICK DECLINE OF OLIVE IN SOUTHERN ITALY. Giovanni P. Martelli, Department of Soil, Plant and Food Sciences, University Aldo Moro, Bari, Italy, Email: giovanni.martelli@uniba.it

The olive quick decline syndrome (OQDS) is a devastating disease that occurs in the Salento peninsula of Apulia (south-east Italy). In autumn 2013, the xylem-limited Gram-negative bacterium *Xylella fastidiosa* was detected by laboratory assays in symptomatic plants, and studies for determining its epidemiology and involvement in the OQDS genesis were initiated. The bacterium was found in all diseased olive trees sampled in different and geographically separated infection foci, and culturing of 51 isolates, each from a distinct OQDS focus, was accomplished. A representative bacterial isolate, identified by multilocus sequence typing (MLST) as belonging to sequence type 53 (ST53) of *X. fastidiosa* subsp. *pauca*, was used for needle-inoculation of olive and other hosts, reproducing the field symptomatology. The spittlebug *Philaenus spumarious* was experimentally proven to be the vector of the olive-infecting bacterial strain. There is no cure for *Xylella* infections and effective methods for inoculum reduction in the field are few. Thus, combating *X. fastidiosa*-induced diseases relies primarily on the identification and use of resistant germplasm, as well as surveillance for restraining disease spreading through extensive field monitoring, uprooting infected and neighboring healthy plants in newly detected foci, and vector control. The latter is being attempted in Apulia through mechanical weeding in late winter-early spring to kill juveniles that thrive on weeds, followed by chemical treatments of olive trees in late spring-early summer to control the adults.

S9

EXPERIENCE GAINED FROM EFFORTS TO CONTAIN AN OLIVE DECLINE IN SOUTHERN ITALY AND RESEARCH NEEDS TO MANAGE IT IN THE MEDITERRANEAN REGION. Thaer Yaseen and Anna Maria D'Onghia, International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), MAI-Bari, Via Ceglie 9, Valenzano. Bari, Italy, Email: y.thaer@iamb.it

Xylella fastidiosa (Xf), a xylem-limited and vector-transmitted bacterium, has subspecies (*fastidiosa, multiplex, pauca*) which are known to induce several diseases in woody and herbaceous plants (more than 360), mainly in the American continent. In 2013 the subsp. pauca strain CoDiRO, vectored by *Philaenus spumarius*, was found in Apulia region (Italy), causing the quick decline of a million olive trees with severe economic, environmental and social consequences. The Italian government and the EU Commission soon declared a state of emergency strengthening phytosanitary measures. In the demarcated area, which includes the infected and buffer zones, intensive monitoring, eradication and containment measures, vector control, movement restrictions of plants, and planting prohibition of host plants are carried out. More than 200,000 plants were tested to assess the presence and spread of the infection, which currently affects approximately 16 per cent of the national olive growing area. Sampled and infected plants were mapped, management of monitoring data was fully computerized, and several initiatives were carried out for awareness campaigns and capacity development (www.emergenzaxylella.it). In this contest, an innovative model for the surveillance of Xf was developed and provided to the Plant Protection Service to support institutional decision making. This model is multidisciplinary, multifunctional and includes multiple actors. It allows the traceability, storage, management, and analysis of different types of data using a web-based software (XylWeb). The tool combines remote sensing data, obtained through the photointerpretation of high-resolution aerial images for rapid identification of suspected symptomatic trees, with field data acquired accurately with the application XylApp. The model includes on site methods for early detection of the pathogen (real time LAMP and DTBIA) in plant material and 'spy insects'. This model is under improvement through current research initiatives.

S10

THE STATUS OF *XYLELLA FASTIDIOSA* IN THE ARAB REGION AND THE EFFORTS UNDERWAY TO CONTAIN IT. Shoki Al-Dobai and Maged ElKahky, FAO- Regional Office for the Near East and North Africa (FAO-RNE), Cairo, Egypt, Email: Shoki.AlDobai@fao.org; Maged.ElKahky@fao.org

The rapid attack of Olive Quick Decline Syndrome (OQDS) caused by *Xylella fastidiosa* in Italian Apulia

region caused serious and significant losses in olive production sector estimated by €250 million since the first report of *X. fastidiosa* in 2013. Around 95% of olive cultivation is concentrated in the Mediterranean region, where the Near East and North Africa (NENA) countries placed in the second place in terms of global production of olives, after Southern European countries (Spain, Italy and Greece). In addition to the economic importance, olive trees have important historical, identical and cultural roots in the Arab countries, where Syria is known to be the first land to produce olive in the ancient world and the origin of olive growing. Olive production and olive oil sector considered one of the important sources of income of thousands of families and food security in the region. The host complexity of *X. fatidiosa* (around 360 host plants), and favourable climatic conditions for the epidemic spread of the disease increase the risk of introduction of the pathogenic bacterium into the countries of the NENA region through the movement and trade of potentially infected host plants. All these challenges pose an enormous threat to olive production in the all NENA region countries and raised the emerging threat to the entire Mediterranean Basin. These facts also, request the necessity for reviewing and strengthening the phytosanitary measures applied in the region and putting in place a harmonized surveillance programme in the NENA countries. FAO Regional Office for the Near East and North Africa (FAO-RNE) embarked on providing technical support programmes to support countries to raise the awareness about this disease and to strengthen their capacities for enforcement of appropriate phytosanitary regulations/ measures to prevent the introduction of the disease to the countries, as well as assisting countries to put in place effective surveillance and monitoring programmes. A Regional TCP Project has been launched in August 2016, and is being implemented in seven Arab countries in the Mediterranean Basin (Algeria, Egypt, Lebanon, Libya, Morocco, Palestine and Tunisia). The project aims to support the countries in their efforts to enforce preventive measures for the introduction and spread of *X. fastidiosa* and Olive Quick Decline Syndrome in their territories. The project has assisted the countries in devolving and implementing a contingency action plans to prevent the introduction and spread of the disease. The presentation will present the current status of *X. fastidiosa*, achievements of the FAO project and other activities and assistance provided by FAO to Arab countries.

Symposium IV. Impact of Climate Change on Plant Protection under Mediterranean and Oasis Conditions

S11

IMPACT OF CLIMATE CHANGE ON PLANT DISEASES AND IPM STRATEGIES. Sahar Zayan, Plant Pathology Research Institute, ARC, Egypt, Email: drsahar.abdo@gmail.com

A remarkable scientific output on the topic of how climate change is likely to affect plant diseases has been recognized enormously. Climate change is very likely to influence the occurrence, prevalence and severity of plant diseases, as well as other pests. Projected climate change and variability will thus affect the interaction between crops and pathogens in multiple ways. This will also affect disease management in terms of timing, preference and efficacy of chemical, physical and biological measures of control and their utilization within integrated pest management (IPM) strategies. Prediction and management of climate change effects on plant health are complicated by interactions between globalization, shifts in climate, pollution and increasing numbers of invasive plants, pests and pathogens. Disease management under future conditions is of great interest for agro-industries, extension services and practical farmers. A comprehensive analysis of potential climate-change effects on disease control is difficult because current knowledge is limited and fragmented and due to the complexity of future risks for plant disease management, as new cultivars will be introduced. Plant disease models that correlate climate parameters with disease development are still premature. All efforts and integrations will produce an effective crop protection strategies using novel technological appropriate tools to adapt to altered climatic conditions.

S12

IMPACT OF CLIMATE CHANGE INDUCED BY GLOBAL WEATHER ENGINEERING TECHNOLOGY OF "CHEMTRAILS" ON PLANT PROTECTION. Monir M.M. El Husseini, Faculty of Agriculture, Cairo University, Egypt, Email: monir.elhusseini@agr.cu.edu.eg

Weather engineering scientists developed a new chemtrail technology applied by jets in the stratosphere for decreasing the global warming. It is based on building synthetic chemical clouds of aluminum oxide as Welsbach particles to reflect the heat coming from the sun back in the upper atmosphere, and thus cooling the air on earth. The applied aerosol mixture contains also nanoparticles of barium monoxide which react with CO2 when reaching the troposphere turning into barium carbonate and bicarbonate leading to minimization of its content in the atmosphere on the long run. In 2000, the UN approved the first global weather engineering project in the history of mankind to combat the global warming by chemtrail technology for the period from 2000 to 2050. This project decreased the global warming but induced undesirable climate changes over many areas on the planet that affected the natural balance between pests and their natural enemies. Thus, it affects strategies of pest control and plant protection in agriculture as well as in forestry, human and veterinary pests as recorded in the last two decades. These effects could be summarized in the following: 1) Creation of completely new wind directions by induced new air depressions as in 2004 which changed swarm direction of the desert locust autumn generation to invade north Africa for the first time, thus changing its usual control strategy. 2) Dehydration of certain ecosystems through the aluminum oxide as appeared in Australia 2009 destroying range land cattle production and leading to absence of both plant pests and their natural enemies. 3) Charging giant air electric fields leading to more lighting that induced wild fires in dehydrated forests, field crops and range land which were recorded in many countries. Thereafter, forest pests outbreaks and needs to be controlled until resurgent of their natural enemies 4)

Increasing frequency and empowering the natural disasters by seeding air with precipitation nuclei causing floods that damaged many crops as recoded also in different countries. Such floods are followed by outbreaks of mosquitoes and transmitted diseases. 5) Cooling upper air layers over warm water areas causing hurricanes, tornadoes, and building heavy snow and hail, the latter has shilling or destructive effect on certain crops and animal production in arid and semi-arid zones as in 2008 in KSA and some Asian countries. 6) Decreasing air visibility due to suspended chemtrail particles in the air and creation of extreme heat waves when reflecting the heat back to earth by aluminum oxide affecting crops sensitive to high temperatures as well as killing the newly hatched lepidopterous larvae leading to save control measures as in case of the cotton leaf worm in Egypt.

S13

ROLE OF INFORMATION PACKAGES FOR POTENTIAL EFFECTS OF CLIMATE CHANGE ON CROP PEST DYNAMICS. Mahmoud Medany, Climate Change Information Center and Renewable Energy, Ministry of Agriculture & Land Reclamation, Egypt, Email: rumedany@yahoo.com.

Climate change is the most important, and the most complex, global environmental issue to-date. Such changes may have serious impacts on global crop productivity and agricultural production leading to famine and starvation. Climatic factors like temperature and precipitation in particular, have strong influence on the development, reproduction and survival of insect pests and pathogens. It is predicted that some extreme events will increase in frequency as a result of a change in natural climate variability. Such changes in climatic conditions could profoundly affect the population dynamics and the status of insect pests of the crops. Climate change related factors like rise in temperature, changes in precipitation patterns, milder and shorter winters, rise of sea levels and increased incidence of extreme weather events can directly influence insects by affecting their rate of development, reproduction, distribution, migration and adaptation. The impacts include changes in phenology, distribution and community composition of ecosystem that finally leads to extinction of species. There are many interactions and it is extremely difficult to predict the impact of climate change on insect pests in the future, but we may expect an increase of certain primary pests as well as secondary pests and invasive species. It has been assumed that global warming will increase the prevalence of insect pests in many agro-ecosystems, but just to identify the problem is not enough, we need to find some solutions. The general approach of needed information involves analyzing historical data from a certain region to reveal statistical associations between short term climatic patterns and outbreak regime characteristics such as frequency, duration, and extent. This type of approach also provides a consistent composite scenario of how pest outbreak regimes might react to climate change. An alternative approach models the climate (particularly temperature) dependence of key processes in the Iife-cycle of the insect species of interest. Typically process data on climatic influences on almost all other species in the insect's food web is lacking so it is implicitly assumed that the insect of interest responds to climate change while most of the rest of its food web does not.

ECONOMIC ENTOMOLOGY

EN1

EXTENT OF CHLOROPHYLL LOSS IN DATE CULTIVARS EXPOSED TO DIFFERENT DENSITY LEVELS OF *OMMATISSUS LYBICUS* (HOMOPTERA: TROPIDUCHIDAE). Arif Shah[1], Ata-ul-Mohsin[2] and Moheem Khan[1]. (1) Department of Entomology Balochistan Agriculture College Quetta, Pakistan; (2) Department of Entomology, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan, Email: arifshahkakar@gmail.com

Dubas bug, *Ommatissus lybicus* Bergevin causes direct and indirect damage to date palm. This study was aimed to measure the extent of chlorophyll loss of three date cultivars caused by dubas bug. Dubas bugs were confined in cylindrical cage on leaflets, following emergence and till the end of adult phase @ 0, 5, 10, 15, 20, 25 and 30 insects/cage. Mean chlorophyll content (SPAD value) measured on the uninfested leaflet was significant among evaluated cultivars and seasons. In all entries, chlorophyll loss was directly proportional to dubas bug density level, however chlorophyll loss caused by single dubas bug decreased with increasing dubas density levels. Mean chlorophyll loss index in control leaflet was 0.028 (1.78-3.86%) compared to 0.045 (4.41-4.68%) and 0. 150 (13.89-16.26%) confined with 5 and 30 dubas bug per leaflet for the same time, respectively. Among cultivars, higher chlorophyll loss was recorded on the infested leaflet of Jan sore (9.30%) followed by Kehraba (9.07%) and Mozavati (8.43%), but with no statistical differences between Jan Sore and Kehraba. The slope (x) of regression analysis using the summed data of net chlorophyll loss of Mozavati, Kehraba and Jan Sore cvs. estimated to be 1.86x, 2.00x and 2.43x, respectively. In contrast, the slope of percent chlorophyll loss (summed data) caused by single dubas bug of the respective cultivars was -2.90x, -1.25x and -1.48x, respectively.

EN2

DIAGNOSIS OF QUALITATIVE AND QUANTITATIVE DAMAGE CAUSED BY BRUCHIDS ON LEGUMES IN MOROCCO AND THEIR CONTROL USING BIO-INSECTICIDES. Inaam El-Miziani[1,2,3], S. Lhaloui[2,3], M. El-Bouhssini[3], A. Lamri[1] and S.G. Kumari[4]. (1) Laboratory of Applied Chemistry and Environment, Faculty of Sciences and Techniques, University Hassan I, 26000, Settat, Morocco, Email: I.El-Miziani@cgiar.org; (2) Laboratory of Entomology, National Institute of Agronomic Research, Regional Center of Settat, 26000, Settat, Morocco; (3) International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat, Morocco; (4) ICARDA, Terbol Station, Beqa'a valley, Lebanon.

Post-harvest losses remain the greatest concern of grain legume farmers in Morocco. The storage pests,

mainly *Bruchids* are one of the most destructive factors which affect legumes grain stocks. Commonly, their control is done using chemical pesticides which have a harmful effects on humans, animals and on the environment. In order to avoid this, and look for alternative methods, several studies have been carried out for identifying bio-insecticides. The objectives of the present work are: (i) identification of different pest species of stored legumes in Morocco; (ii) assessment of their damaging effects during larval development; and (iii) testing bio insecticidal activity by fumigation of essential oils extracted from selected aromatic plants (e. g. *Mentha pulegium, Mentha viridis, Rosmarinus officinalis, Lippia citriodora, Thymus saturoides, Origanum compactum, Eucalyptus camaldulencis, Eugenia caryophyllus, Cedrus atlantica, Artemisia herba alba*) against adults of *Bruchus rufimanus.* The results revealed that the most important insect pests of stored legume grains in Morocco were beetles of the *Bruchidae* family. More than 50% of the grains stored had Bruchids' emergence holes, particularly for faba bean major and minor. Weight losses and germination quality were also the most important for these two crops. The majority of the essential oils tested were highly toxic against the adults of *Bruchus rufimanu;* there was 100% mortality even with low concentration of 5 µl/l.

EN3

DATE PALM HOST PREFERENCE OF THE GREATER DATE MOTH, *ARENIPSES SABELLA* HMPSON (LEPIDOPTERA: PYRALIDAE). Salah, M. M. Gameel[1], Aly A. Abd-Ella[2] and Eman F. Tolba[3]. (1) Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: Salah_gameel@yahoo.com; (2) Plant Protection Department, Faculty of Agriculture, Assiut University, 71526 Assiut, Egypt; (3) Plant Protection Department, Faculty of Agriculture -New Valley, Assiut University, 71526 Assiut, Egypt.

The status of the infestation with the greater date moth, *Arenipses sabella* Hmpson on date palm bunch bases and fruits of three common date palms (Saidi, Tamr and Mantor) in four Districts (El-Kharga, Paris, Balat and Mut) at the New Valley were studied during 2015 and 2016 seasons. Overall during the two successive seasons, at least about 61% of the inspected date palms were infested with *A. sabella*, and sometimes reached 96%. Generally, date palm bunch bases of Saidi and Mantor were more infested than Tamr. The highest infestations (34.21 and 19.94%) were recorded on Saidi in Balat and Paris Districts during 2015 and 2016 seasons, respectively. Meanwhile, the lowest incidence (0.27 and 0.21%) was observed on Tamr in Mut District during the same periods. It was found that, the greater date moth induced an economic damage (cut bunch bases) with an average of 11.00% on Saidi in El-Kharga. This injury led to bunch bases breakage and causing loss in fruit yield. Low direct fruit infestation was obtained on different date palm cultivars in El-Kharga, Paris and Balat. In Mut District, the greater date moth tended to feed more on the Tamr (dry date) than on Saidi fruits (semi-dry date). The larvae seldom attacked bunch bases of Tamr cultivar. The average fruit yield losses of Saidi were 20.87 and 26.23% and Tamr 47.20 and 44.91%, during 2015 and 2016 seasons, respectively. Chemical analysis of the fruits and bunch bases of the two date palm cultivars indicated that Tamr fruit contained higher content of potassium and calcium than Saidi fruit. Meanwhile, total protein, total carbohydrate and relative humidity content were nearly equal.

EN4

EVALUATION OF LURES FOR THE CONTROL OF FRUIT FLIES IN MANGO ORCHARDS IN SHENDI AREA, SUDAN. Faiza Mohammed Abdel Magid[1] and Amani Mohamed Khair[2]. (1) Department of Pests and Plant Health, College of Agriculture, University of Bahri, Khartoum North, Sudan, Email: Faizamagid4@gmail.com; (2) Department of Zoology, Faculty of Science and Technology, Shendi University, Sudan.

Fruit flies of the family Tephritidae are major pests that attack horticultural crops and reduce their productivity. In Sudan, the problem with fruit flies increased to such an extent in 2007 that they were upgraded and were added to the list of notorious national pests. Three para pheromones, methyl eugenol, trimedlure, cue lure in addition to a food bait lure nulure (protein hydrolysate) were evaluated to be used in mass trapping (lure &kill) of fruit flies. Lynfield traps baited with the lure and Malathion 57% EC were used in mango orchard for 2 successive seasons May–August 2012 and May–August 2013 at River Nile State Shendi. The fruit flies species found in association with mango were the Asian fruit fly, *Bactrocera invadens* (Drew), mango fruit fly, *Ceratitis cosyra* (Walker) and Mediterranean fruit fly, *Ceratitis capitata* (Wiedmann). *Bactrocera invadens* was the most dominant species in the study area replacing the indigenous species. Among the different fruit flies attractants used, methyl eugenol proved to be an effective lure for trapping large numbers of *Bactrocera invadens*, whereas protein hydrolysate played an important role in capturing females of different fruit flies species. Trimedlure attracted the male *Ceratitis capitata*, whereas cue lure did not attract any of the species found. Monitoring of the fruit flies using pheromone traps is necessary for detecting the prevalent species and their population and also for fruit fly management.

EN5

THE EFFECT OF PLANT SPECIES AND DIRECTION AND CERTAIN ENVIRONMENTAL FACTORS ON POPLAR LEAF APHID, *CHAITOPHORUS EUPHRATICUS* H. (HOMOPTERA: APHIDIDAE). Shaheen A. Mustafa[1], Ismail N. Almaroof[2] and Samer H. Al-Shaby[2]. (1) Collage of Agriculture, University of Kirkuk, Iraq, Email: shahinkifre@yahoo.com; (2) Collage of Agriculture and Forestry, University of Mosul, Iraq.

The results of the field study in the Mosul forests during 2012 and 2013 seasons showed the effect of species and direction for some forest trees namely, *Populus euphratica, P. nigra, P. deltoides* and *Salix acmophylla, Rhobinia pseudoacacia* and *Eucalyptus camaldulensis* on population density of aphid, *Chaitophorus euphraticus* H. The appearance of adults on trees started in mid-April in

Mosul forest and extended to mid-November, whereas aphid nymphs were low in numbers during the first week of May at an average temperature of 21.2 and 19.2˚C and relative humidity of 63.5 and 62.0%, in the two seasons, respectively. Nymphs number then increased to reach a maximum during the first week of June, at average temperature of 32.70, 32.20 and relative humidity of 28.32, 28.0% for both seasons, respectively. Thereafter, nymph numbers began to decrease to reach a minimum at average temperature of 16.1, 15.0 and relative humidity of 65.7, 71.0% during the first week of November. These results showed that the higher average for the number of nymph and adults were on the trees *P. euphratica*, *P. nigra* and *P. deltoids*, and the lower average was obtained on *Salix acmophylla*, *Rhobinia pseudoacacia* and *Eucalyptus camaldulensis* for both seasons. The study has also shown a significant correlation between temperature and numbers of insect and non-significant with relative humidity. Generally, poplar species and direction had an effect on the aphid population density, and the insects preferred eastern and northern side's for feeding. Statistical analysis indicated superiority for the euphratic poplar species in the average number of the insects which have reached 14.82 and 16.04 insect/leaf however, the lower average number of insects was noticed on eucalyptus trees which reached 0.47 and 0.77 insects/leaf, respectively.

EN6

SENSITIVITY OF SOME ONION CULTIVARS TO INFESTATION BY THE ONION MAGGOT *DELIA ALLIARIA* FONSECA (DIPTERA: ANTHOMYIIDAE) IN NURSERY AND FIELD. Feryal B. Hermize and Hameed H. Mahmood, Plant Protection Department, Faculty of Agriculture, Baghdad University, Iraq, Email: feryalbahjat@yahoo.com; alkarbolihameed@yahoo.com

This study was conducted to test the sensitivity of four onion cultivars to infestation by the onion maggot in nurseries. The most sensitive to injury was cv. White Grano, followed by Texas Early Grano, and the infestation rates were 10.77% and 7.27%, respectively. Infestation for cvs. Giza and Khepos were 4.88% and 5.0%, respectively. The infestation rates in the field peaked during April and reached 30.00, 23.33, 25.19 and 21.11% in the cvs. White Grano, Texas Early Grano, Khepos and Giza, respectively. The highest number of larvae reached 4.95 and 4.5insects/45 plants on cvs. White Grano and Giza which were significantly different from numbers of larvae on the cultivars Texas Early Grano and Khepos, that reached 2.4 and 1.95 larvae/45 plants, respectively. The number of larvae increased in the field during April and reached 140.4/90 plants on the White Grano which significantly differed from the other cultivars, where the number of larvae reached 126.6, 111.00 and 100.2/90 plants on cvs. Texas Early Grano, Khepos and Giza, respectively. The highest pupa peak was was 9.48 observed on cv. White Grano, followed by 6.11 on cv. Texas Early Grano, and 4.65 on Khepos cv., whereas the lowest number was 4.83 on cv.Giza. The numbers of pupa increased to reach its peak at 108.6 on cv. White Grano and 90.52, 74.4, 73.8 on Texas Early Grano, Giza and Khepos, respectively. The results of testing the sensitivity of two small bulb types, red local and white local, to infestation by the onion maggot revealed that there were significant differences between them, in the rate of infestation with larvae and pupae. The highest infestation rate was 11.96% and 10.26% on cvs. white local and red local, respectively. The numbers of larvae reached 61.8 and 53.2/45 plants for the white local and red local cvs., respectively, whereas numbers of pupa reached 59.17 and 48.12/45 plants for the two cultivars, respectively.

EN7

PINE BARK BEETLES IN QASSIOUN FOREST IN DAMASCUS: SPECIES, POPULATION DYNAMIC, TESTING PEST MANAGEMENT METHODS. Wael Saleh Alamtni, Debbane & Co., Shakib Areslan Str., Abu Rommaneh, Damascus, Syria, Email: waelalmatni@gmail.com

Pine bark beetle appeared on pine trees: *Pinus brutia* and *P. halepensis* in Qassioun forest in Damascus in early 2016. The infection developed rapidly to cause quick death of large numbers of trees and became a threat to the 500-hectare forest that gives Mount Qassioun its beautiful view. Insect samples were collected from the infested trees and identified based on reliable identification keys. Three main species of pine beetles (Scolytidae: Coleoptera) were observed: the Mediterranean pine beetle/engraver (*Orthotomicus erosus*), which is the main insect that causes the most damage, and the double spined spruce engraver beetle *Ips duplicatus*. In addition, another smaller number and larger size insect, *Dendroctonus terebrans*, was also found. Specialized multi-funnel pheromone traps has been designed and used for insect monitoring, control timing, and mass trapping. It showed that these insects continued their activity throughout the year (with fluctuations in the number of flying insects), except winter months where adults enter quiescence due to cold. Adults resume its activity at the end of winter and continue flying until the beginning of the following winter. This insect has several generations per year. The results of the mass trapping is promising. *O. erosus* adults started to fly in the beginning of April. The peak of insect flying was in July and August, whereas the number caught was near zero in December, January and February. The annual catch in each trap was more than 5,000 insects/season. Deltamethrin (Desis) sprays were applied at peak flight for each generation. A number of specialized parasites of park beetles in Qassioun forest were identified: *Dendrosoter* spp. (Braconidae: Hymenoptera), *Metacolus unifasciatus* (Pteromalidae: Hymenoptera) and *Calosota victimis* (Hymenoptera, Chalcidoidea, Eupelmidae), *Roptrocerus xylophagorum* (Pteromalidae: Hymenoptera), in addition to a number of predators. Pine beetles monitoring, pest control operations and trials are continuing to arrive at the best methods of managing these pests while preserving the forest biodiversity and tree safety.

EN8

A NEW REPORT OF INFESTATION OF OLIVE TREES BY THE OLIVE PYRALID MOTH, *EUZOPHERA PINGUIS* (HAWORTH, 1811) (LEPIDOPTERA, PYRALIDAE) IN LEBANON. Zinette Moussa[1], Elia Choueiri[2], Amira Youssef[3] and Milad El Riachy[4]. (1) Laboratory of Entomology, Lebanese Agricultural Research Institute, Fanar, Lebanon, Email: zmousa@lari.gov.lb; (2) Department of Plant Protection, Lebanese Agricultural Research Institute, Tal Amara, Lebanon; (3) Hasbaya Station, Lebanese Agricultural Research Institute, Hasbaya, Lebanon; (4) Department of Olive and Olive Oil, Lebanese Agricultural Research Institute, Tal Amara, Lebanon.

The olive tree, *Olea europaea* L., is considered one of the oldest and the most important crop in Lebanon. Its cultivated area is estimated around 58,800 hectares and most of them are rainfed. Seventy percent of the production is destined for olive oil, whereas thirty percent for table olives. The economic olive pests and diseases that threaten the olive groves in Lebanon are: the olive fruit fly *Bactrocera oleae* (Gmelin) (Diptera, Tephritidae); the olive moth *Prays oleae* (Bernard) (Lepidoptera, Yponomeutidae); the peacock eye disease induced by ascomycetous fungus *Spilocaea oleagina* (Castagne) S. Hughes (Pleosporales, Venturiaceae) and verticillium wilt caused by *Verticillium dahliae* Kleb. (Hypocreales, Incertae sedis), a new larvae of *Euzophera pinguis* (Haworth) (Lepidoptera, Pyralidae) Known as olive pyralid moth, spotted for the first time in the country in September 2015 in the region of Hasbaya at Hasbaya District. Galls, swelling and cracking with extensive internal necrosis were observed on barks, branches and twigs. Later, same symptoms were reported in two olive groves in the village of Kherbet Kanafar in West Bekaa District situated at 30 km away from the first source of infestation. A survey conducted in these two regions in October of the same year indicated that this new invasive pest is well established in Hasbaya, whereas no other infestation was reported in West Bekaa. However, another survey done in May 2017 indicated a new attack in Kefraya region, West Bekaa situated at 2-3 km away from the second source of infestation. This study showed that *E. pinguis* is a new invasive pest on olive trees in Lebanon and the potential risk of its spread to other areas of olive production is very high.

EN9

ECOLOGICAL STUDY ON COTTON MEALYBUG, *PHENACOCCUS SOLENOPSIS* TINSLEY (HEMIPTERA: STERNORRHYNCHA: COCCOIDEA: PSEUDOCOCCIDAE) ON EGGPLANT AT SHARKIA GOVERNORATE, EGYPT. Hassan A. Nabil, Plant Protection Research Institute, ARC, Dokki, Giza, Egypt, Email: scalonabil@yahoo.com

Field experiment was conducted on cotton mealybug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Sternorrhyncha: Coccoidea: Pseudococcidae) which infested eggplant at Hihhya district, Sharkia Governorate during two successive seasons, 2015 and 2016. The population density, activity periods, the effects of some weather factors and preferable leaf surface of different stages of *P. solenopsis* were investigated. Number of insect generations was calculated. The results obtained revealed that the total number of a live stages had four peaks of activity during the first season, and those occurred during third week of June, third week of July, fourth week of August and second week of September. Whereas, during the second season, three peaks of activity were noticed in the last week of June, first week of August and second week of September. The total effects of some weather factors such as maximum and minimum air temperature (˚C) and relative humidity (R.H. %) showed positive significant relationship with the cotton mealybug population. *P. solenopsis* had three generations during the first and second seasons, the first generation lasted seven weeks. Whereas, the second and third generations took six weeks. The first generation was during the period which extended from the third week of May until the end of June, the second one took place from the first week of July until the second week of August and the third one was during the period which extended from the third week of August until the third week of September. The insect pest preferred the lower leaf surface more than the upper surface during the first and second seasons.

EN10

DISSEMINATION FACTORS OF NEW INVASIVE PEST *DACTYLOPIUS OPUNTIAE* (COCKERELL) (HEMIPTERA: DACTYLOPIIDAE) IN MOROCCO. R. Bouharroud[1], M. Sbaghi[1], M. Boujghagh[1], M. El-Bouhssini[2], S. Lhaloui[2], A. Sabraoui[2] and K. El Fakhouri[2]. (1) National Institute of Agronomic Research, Morocco, Email: bouharroud@yahoo.fr; (2) International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat, Morocco.

In Morocco, the prickly pear cactus *Opuntiaficus-indica* grows in arid and semi-arid areas where it plays an essential role in the ecological balance, preventing desertification and preserving biodiversity. The fruits are consumed as a food and cladodes as cattle feed. However, *O. f. indica* is subjected to several attacks by pests and diseases. Recently, the prickly pear cochineal *Dactylopius opuntiae* (Cockerell) (Hemiptera: Dactylopiidae) has been reported in Morocco and caused severe damage. As an emergency plan, the Ministry of Agriculture has developed an emergency and research plans for the control and eradication of this pest. The research program has three components: host plant resistance, biocontrol/bio-pesticides and bio-ecology of *D. opuntiae* under Moroccan conditions. As part of the emergency plan and in order to investigate the dissemination factors of this new invasive pest, a national survey was conducted and geolocalized mapping of infestation severity was carried out. The wind is cited in many studies as the main dissemination factor facilitated by the specific morphology of nymphs and winged males, which allowed this pest to be transported in a passive way in the wind direction. Our preliminary results indicated that at the regional level, *D. opuntiae* has been disseminated mainly by humans through trucks transporting animal feed from infested to uninfested areas. Within a region, the wind continues to be the main factor of spreading the insect.

EN11

A SURVEY OF *BACHYTYCHIUS HORDEI* (BRULLE) IN WHEAT AND BARLEY FIELDS IN NORTHERN SYRIA. Atie Arab, Salim Khoja, Khloud Hokan, Baha Kouro and Rima Kudsiyeh, General Commission for Scientific Agricultural Research, Agriculture Scientific Research Centre of Aleppo, Syria, Email: atiearab@hotmail.com

Cereal weevil *Bachytychius hordei* is an important pest affecting wheat and barley and causing economic damage in the Mediterranean region. Survey of cereals weevil was conducted to determine the distribution and damage of *B. hordei* over wheat and barley cultivated areas in Aleppo and Edlib governorates, northern Syria during the 2010/2011 growing seasons. Results showed prevalence of cereals weevil all over surveyed areas. The highest prevalence 100% recorded on wheat fields in Alraay area of Aleppo in 2010. The infestation rate on barley ranged 7-22% in Aleppo and 5-13% in Edlib, whereas they were 9-26% and 5-18% on wheat in both governorates, respectively. Infestation intensity on wheat at the milky maturity stage was 18, 13, and 7 larvae per 100 spikes at Alraay, Tel-Hadya and Azaz, respectively, in Aleppo governorate in 2011. The highest infestation intensity on barley was 11 larvae per 100 spikes in Edlib governorate (Sarakeb) in 2010.

EN12

ANNUAL OCCURRENCE AND POPULATION DYNAMICS OF COTTON APHIDS, *APHIS GOSSYPII* GLOVER ON SPECIFIC HOST PLANTS AT ZAGAZIG REGION, SHARKIA GOVERNORATE, EGYPT. M.M.A. Ibrahim and H. E. Megahed, Plant Protection Research Institute, ARC, Dokki, Giza, Egypt, Email: ganauny1962@yahoo.com

This study was conducted in Zagazig region, Sharkia Governorate on all plants or trees prevailed in the study area during the period from the end of November, 2013 till early December, 2015 to determine host plants of cotton Aphid, *Aphis gossypii* Glover, in addition to investigating its annual population dynamics on the important economic weeds and wild plant hosts to employ this information in developing an effective integrated aphids management program. The results obtainedr evealed that the cotton aphid colonized a wide range of 37 economic plant species and 23 weeds and wild plant species belonging to 22 plant families. The highest occurrence rate of 38.9% was recorded on the family Malvaceae, whereas the lowest rate of 0.069% recorded on the family liliaceae (garlic). The mean numbers of *A. gossypii* varied as host plant variation where the highest occurrence rate of 16.81% was recorded on cotton plants; *Gossypium barbadenc* L. followed by okra plants, *Hibiscus esculentus* L. at 11.456%; whereas the lowest rate of 0.043% was recorded on aellen-wild beet, *Beta vulgaris* Perennis. In weed/wild plants, the highest harboring rate of 5.023% was recorded on purslane, *Pertulaca oleracea* and the lowest rate of 0.079% was recorded on yellow weed sorrel, *Oxalis corniculata* plants. The cotton plants, *G. barbadenc* harbored *A. gossypii* for the longest periods extended from early April till early October during the 2014 season and from early-May till mid-October in 2015, with the highest peak of 320 individuals/leaf recorded on 15th August, 2014; followed by the peak of 270 individuals/leaf recorded on 30th July, 2015 on lantana plants. With respect to the general annual population dynamics, there were two critical activity periods, where the aphids occurred on limited number of plant hosts and with low numbers, the 1st period extended from 6th February, till 5th April, 2014 with 16 hosts only, with a population density ranged from one individual/leaf on scarlet pimpernel, *Anagallis avensis* to 47 individuals/leaf on little mallow, *Malva parriflora*. The 2nd activity period was from 2nd January till 20th February, 2015 with 14 hosts only and the population density ranged from one individual/leaf on shepherd purse, Capsella bursa-pastoris to 66 individuals/leaf on little mallow, *M. parriflora*. The study showed the aphid hosts played an important role in the annual dispersal and dynamic of *A. gossypii* which moved between its main and alternative hosts throughout the insect activity periods.

EN13

BIOLOGICAL STUDIES ON COTTON MEALYBUG *PHENACOCCUS SOLENOPSIS* TINSLEY UNDER LABORATORY CONDITIONS. Hassan Ahmed Nabil, Plant Protection Research Institute (PPRI), Agricultural Research Center, Egypt, Email: scalonabil@yahoo.com

Studies were carried out on the cotton mealybug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Sternorrhyncha: Coccoidea: Pseudococcidae) during the period July-October, 2015 to study the developmental stages periods of the insect under laboratory conditions of 25±1˚C and 65±5% RH, and a photoperiod of 12 hrs to use this useful information for mass rearing and designing a comprehensive pest management program and prediction models for the cotton mealybug. Three numphal instars were recorded for males and females, but males had an additional pupal stage. The results indicated that eggs incubation period was 1.06 days for males and females. The developmental periods for 1st, 2nd and 3rd nymphal instars, adult female longevity, life cycle and generation were 6.15, 7.16, 7.81, 18.91, 41.20 and 26.95 days, respectively. The developmental periods for 1st, 2nd and 3rd nymphal instars, pupal stage and adult male longevity were 5.91, 7.06, 6.68, 6.12 and 2.97 days, respectively. The sex ratio male:female was 1: 6.65.

E14

MOLECULAR IDENTIFICATION OF TOMATO LEAFMINER, *TUTA ABSOLUTA* (MEYRICK) BIOTYPE IN EGYPT. Saad Moussa and Salem Darbain, Insect Biotechnology and Molecular Biology Unit, Plant Protection Research Institute, Agricultural Research Center, Egypt, Email: saadmousa@insectbiotech.sci.eg; saadmousa@yahoo.com; Website: www.insectbiotech.sci.eg

Tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is considered one of the most important pests that attack tomato and other solanaceous crops. It causes severe damage to both canopy and fruits resulting in huge yield loss. The PCR amplifications of

cytochrome c oxidase subunit I gene (MT-COI) for *T. absoluta* population collected from tomato fields in different locations over Egypt *viz*., Aswan, Minya, El-Sharkia, Kafr El-Sheikh and Sinai were analyzed and sequenced. The sequences were reviewed, compiled and blasted then submitted into the GenBank database with the following accession numbers: KY129655, KY129656, KY129657, KY129658 and KY129659, respectively. The sequence analysis showed that only one biotype of *T. absoluta* pest present in Egypt. The dendrogram data analysis reflects the presence of high gene flow among the *T. absoluta* species over the Mediterranean basin and other regions of the world. The data analysis also showed that *T. absoluta* has the ability to adapt to various environmental conditions.

EN15

NOVEL MODELING APPROACHES TO UNDERSTAND THE SPREAD AND IMPACT OF *TUTA ABSOLUTA*. Abhijin Adega, Network Dynamics, and Simulation Science Laboratory, Biocomplexity Institute, Virginia Tech, http://staff.vbi.vt.edu/abhijin/index.html

Trade and transport of goods is widely accepted as a primary pathway for the introduction and dispersal of invasive species. However, mainstream approaches have focused more on the biological and ecological factors than on human-mediated pathways of spread. Modeling the latter remains a challenge owing to its complex nature, unavailability of quality data and lack of systematic modeling methods. Backed by recent advances in network science and computational epidemiology, we are developing robust network-based tools to model commodity flows and study their role in the invasive species spread. We will present our recent work on *T. absoluta* in Nepal: its spread, the role of tomato trade, effect of climate and economic impact.

EN16

INFLUENCE OF DATE FRUIT BIOCHEMICAL CHARACTERISTICS ON DAMAGE RATES CAUSED BY THE CAROB MOTH (*ECTOMYELOIS CERATONIAE*) IN SAHARAN OASES OF ALGERIA. Mohamed Azzedine Idder[1], Hakima Idder-Ighili[1], Bahia Doumandji-Mitiche[2] and Haroun Chenchouni[3]. (1) Univ Ouargla, Fac. des sciences de la nature et de la vie, Laboratoire de Recherche sur la Phoeniciculture, Ouargla 30000, Algeria, Email: azzou.idder@yahoo.fr; (2) Département de Zoologie Agricole et Forestière, Ecole Nationale Supérieure d'Agronomie, El-Harrach, 16200 Algiers, Algeria; (3) Department of Biological Sciences, Faculty of Exact Sciences and Natural and Life Sciences, University of Tebessa, Tebessa 12002, Algeria.

The carob moth (*Ectomyelois ceratoniae*) is the most important pest of date fruits and the main constraint in palm groves of the region of Ouargla (Sahara Desert of Algeria) for date exportation. In order to explain food preferences of this insect pest, this study aimed to relate the variation of date infestation rates caused by the carob moth to biochemical characteristics of fruits of 20 date palm (Phoenix dactylifera) cultivars. Biochemical analyses were performed on fruits of twenty cultivars sampled in seven palm groves of the region of Ouargla. Infestation levels caused by the carob moth were assessed at three phenological stages of fruit ripeness within each cultivar. Date infestation rates significantly varied among cultivars, fruit maturity stages and their interaction. The cultivar Takermoust was the most infested (43%), whereas Bent Khbala and Tati Wtnuh recorded the lowest infestation rates. Tati Wtnuh, Bayd Hmam and Tamsrit are cultivars that produce soft dates. Principal component analysis (PCA) indicated that food preferences of the carob moth were related to soft and semisoft dates (not based on moisture content, but on the ratio of total-sugars towater content), slightly acidic to neutral pH, with high sucrose levels, and low values of total and reducing sugars.

EN17

EFFECT OF FOLIC ACID AND ANTI FOLIC ACID ON HOUSE FLY LARVAE *MUSCA DOMESTICA* (L.) DIPTERA: MUSCIDAE. Nidaa Saud Abed and Hasan Fleah Hasan, Faculty of Agriculture, Department of Plant Protection, Baghdad University, Iraq, Email: neda_sood@yahoo.co.uk

This study was conducted to determine the effect of industrial anti folic acid (Methotrexate) on fly *Musca domestica* (second and third larva stage and adult fly) and its effect on ovulation and the ability of mating and infertility by affecting the enzyme Dihydrofolate reductase with the concentrations 1, 5, 10, 15, 20, 30, 40, 50, 60, 70, 100 ppm. The same concentrations of folic acid were also used to study the above mentioned effects. In addition, the effects of industrial anti folic acid (Methotrexate) and folic acid on ovarian protein and the enzyme dihydrofolate reductase which has a direct role in reproduction and ovulation. The results indicated little effect of this compound on the mortality 24 h after treatment. The larval mortality rate of second larval stage were increased when the concentrations were increased, with 5 ppm the mortality rate for the second stage larvae reached 0.40%, whereas it reached 18.08% with 100 ppm 48 h after treatment. The duration of larval stage was 5 days when the concentrations 1, 5, 10, 15, 20 and 30 ppm were used, whereas it was 5 days when 40, 50, 60, 70 and 100 ppm concentrations were used, compared to 5 days in the control treatment. Pupation rate was decreased when the concentrations were increased and it reached 79.90% with 1 ppm after 5 days, whereas with 100 ppm it reached 18.30% after 8 days. The adults emergence rate was decreased with increased concentration, and reached 66.10%. The same effect was obtained on the third larval stage, with a mortality rate of 63.50% when 100 ppm concentration was used. Mortality rate increased after 72 h and pupation rate reached 77.38% with 1 ppm. Adults mortality was 0.00% for concentrations 1, 5, 10, 15, 20, 30, 40, 50, and 60 ppm and reached 8.7 and 10.00% with 100 ppm for first and second day, respectively, and reached 33.46% with 40 ppm on the 10^{th} day and increased to 51.4% with 60 ppm and 71.7% with 100 ppm.

EN18

CONTRIBUTION TO THE STUDY OF THE ENTOMOLOGICAL DIVERSITY OF AN OLIVE GROVE IN THE REGION OF AIN TOUTA-BATNA, ALGERIA. Smail Chafaa, Ahlem Delenda and Randa Boumedjane, Department of Ecology and Environment, Faculty of Sciences and Natural and Life, University of Batna 2, 05078 Fesdis, Batna, Algeria, Email: chafaasmail@gmail.com; s.chafaa@univ-batna2.dz

The aim of this study is to identify the most important insects that target the olive tree *Olea europea*, where this tree is unique to the Mediterranean region. This study was conducted in an olives orchard in Ain al-Touta area, which includes 3 different cvs., Shamalal, Sequoise and Saifian, during the period from December 2015 to June 2016. In the study of animal communities, a number of fishing methods were used, including ground colored traps, outstanding yellow traps, optical inspection and Japanese canopy, allowing the collection of a total of 1161 individuals which belonged to 42 species divided into 9 classes and 39 families. Among the species that were classified in this work are the olive fly *Bactrocera oleae*, *Euphyllura olivine*, *Chrysoperla carnea*. The investigated groups were subjected to a biological and environmental study.

EN19

EFFECT OF TEMPERATURE AND PHOTOPERIOD ON DEVELOPMENT OF THE OLIVE LEAF MIDGE *DASINEURA OLEAE* (DIPTERA: CECIDOMYIIDAE). Ali M. Ramadhane[1], Randa Abou Tara[2] and Zahraa M. Baidaq[3]. Department of Plant Protection, Faculty of Agriculture, Tishreen University, Lattakia, Syria; (2) Faculty of Science, Damascus University, Syria, Email: randaaboutara@hotmail.com; (3) GCSAR, Damascus, Syria.

A laboratory study on the effect of different temperatures and photoperiods on development of the olive leaf midge *Dasineura oleoe* F. Löew was conducted. Results showed that temperatures of 15±1 to 20±1ºC are required for the development of *D. oleoe* larvae and adults emergence. In addition, adults began to emerge 23±1.24 days after incubation at 15±1ºC. There were no adults' emergence at 10±1ºC for 30-60 days at both short (8 L: 16 D) and long (16 L: 8 D) photoperiods. However, larvae at temperature 30±1ºC for 30-60 days were unable to grow and produce adults.

EN20

MOLECULAR STUDY OF PEAR PSYLLA *CACOPSYLLA* SPP. (PSYLLIDAE: HEMIPTERA) IN MIDDLE AND SOUTHERN REGIONS OF SYRIA. Bassam Oudeh[1], Wajih Kassis[2] and Randa Abu-Tara[3]. (1) GCSAR, Agricultural Scientific Research Center at Homs, Mokhtaria Research Station; (2) Department of Plant Protection, Faculty of Agriculture, Damascus University, Syria; (3) Faculty of Science, Damascus University, Syria, Email: randaaboutara@hotmail.com

Molecular study of pear psylla *Cacopsylla* spp. (Psyllidae: Hemiptera) was carried out in the Biotechnology laboratory, Faculty of Agriculture, Damascus University during the growing season 2013-2014. Samples were collected from four governorates located in middle and southern regions of Syria: Homs (Mokhtaria Research Station and Al-Rastan), Hama (Tezeen), Damascus rural (Al-Zabadany) and Al-Sweida (Al-Sweida Research Center). The results showed that genetic differences of pear psylla by using ISSR with 19 primers, only 12 primers succeeded in amplifying the male's DNA of pear psylla. The total number of bands was 70, only 64 bands were polymorphic, with 93.6% polymorphism between males, and the highest genetic relatedness was 86.12% between males of pear psylla of Damascus rural and Al-Sweida. Cluster analysis separated the males of Hama in an independent first group, and the second was separated into two sub clusters, males of Al-Rastan and Mokhtaria Research Station were the first sub clusters, males of Damascus rural and Al-Sweida were the second cluster. Only 15 primers succeeded in amplifying the female's DNA of pear psylla. The total number of bands was 70, only 61 bands were polymorphic. Polymorphism between females was 74.49%, females of Al-Rastan and Hama were the closest to each other (77.22%). Cluster analysis separated the females of Damascus rural in an independent first group, and the second group was separated into two sub clusters, females of Al-Sweida were only as a first sub cluster, and females of other regions were the second cluster. It was possible to separate males and females of pear psylla according to geographical distribution and species.

EN21

INCIDENCE OF CADRA (*EPHESTIA* SPP.) DURING PRE- AND POST-HARVEST DATE PALM IN TWO OASES OF THE NEW VALLEY, EGYPT. Salah M.M. Gameel[1] and Badr El-Sabah A. Fetoh[1,2]. (1) Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt; (2) Department of Biology, College of Science, Imam Abdulrahman Bin Faisal University, Saudi Arabia, Email: bafetoh@uod.edu.sa; drabadrelsabah@hotmail.com

Cadra spp. (*C. cautella* and *C. calidella*) are considered a late season pest on date palm fruits in the different oases of the New Valley. The infestation of the two species start in the field and continue in storehouses. Generally, the fruits of the date palm under Paris oasis conditions harbored higher infestation rate of *Cadra* spp. compared with the date palm fruits cultivated in El-Kharga oasis during 2015 and 2016 seasons. The Mantor fruits (seed cultivar) was more preferred than Saidi fruits (economic cultivar). The average infestation rates of 22.43, 19.70 and 27.07, 34.57% were recorded on Saidi and Mantor fruits of El-Kharga oasis during 2015 and 2016 seasons, respectively. Meanwhile, the average infestation rate of 48.63, 31.63 and 63. 69 and 44.64% were observed on Saidi and Mantor fruits of Paris oasis during 2015 and 2016 seasons, respectively. In general, *Cadra* spp. larvae caused the maximum infestation rate during the first half of November. Also, the high rates of alive larvae was obtained during the same period. During the two successive seasons, the population of *C. cautella* was higher than *C. calidella* in the field, with approximately a ratio of 2: 1. Releasing the

egg parasitoid, *Trichogramma evanescens* West. for one time (beginning of May) induced a remarkable reduction in the infestation with *Cadra* spp.

EN22

CHAMELEON: A NEW TOOL FOR IRRIGATION SCHEDULING AND MANAGING PESTS IN GARLIC CROP. Arif Shah[1], R.J. Stirzaker[2], Abdul Nasir[3] and Sulman Jaffar[3]. (1) Department of Entomology Balochistan Agriculture College Quetta, Pakistan; (2) CSIRO Agriculture and Food, Canberra, Australia; (3) Department of Horticulture Balochistan Agriculture College Quetta, Pakistan, Email: arifshahkakar@gmail.com

Garlic (*Allium sativum* L.) is an important commercial vegetable crop in Pakistan. Insect pests and moisture stress are considered to be the most important factors limiting garlic yield. Cultural practices (irrigation) and host plant vigor are important management tools that can create unfavorable conditions for pests to establish a crop. This study aimed to quantify pests (thrips and weeds) infestation/damage and assess yield response of garlic by using a chameleon. The Chameleon consists of an array of three moisture sensors and one temperature (ID) sensor that are permanently installed at different depth in the soil. A portable hand held reader is connected to each sensor and display the soil moisture with a colored light. Each depth is represented by light color; blue (wet soil), green (moist soil) and red (dry soil). The lights gave a picture/pattern of soil water conditions from the top root zone to the bottom. Successive readings through the season gave color patterns that illustrate soil moisture tension. This study was carried out during the 2017 (3rd January-25th May 2017) at the Directorate of Floriculture, Rani Bagh, Quetta. Two irrigation regimes (treatments) in total were laid out in a randomized complete block design with three replications. In both treatments, soil moisture sensors were fixed at 10, 20 and 30 cm depth and all other variables were kept constant. Thrips population was counted using yellow sticky traps (YST) with actual count of entire plants. Results revealed that moisture tension significantly affected horticultural variables, in addition to thrips and weeds infestation. Except for root length, significantly higher bulb weight, neck length, levees length and number of leaves was recorded in garlic plot (T_2) with soil moisture summary of 40% blue; 57% green and 3% red colors, compared with garlic plot ($T_{1)}$ with soil moister summery of 23% blue; 57% green and 20% red. Thrips and weeds population was positively and negatively correlated with soil moisture tension, respectively. In conclusion, farmers can easily monitor soil moisture and avoid crop stress (biotic and abiotic) through proper irrigation scheduling based on soil moisture expressed by light colors pattern.

EN23

FILED AND LABORATORY STUDIES FOR THE LIFE CYCLE OF PACHTYCHIUS HORDIE (BRULLE) COLEOBTEREAE, CURCULIONIDAE IN EL MARGE REGION, LIBYA. J. Saleh, Resources and environmental Department, Faculty of Arts and Sciences, University of Benghazi. Libya, Email: jamilasaleh@yahoo.com

The objective of this study was to determine life cycle of wheat spike weevil Pachtychius hordie (Brulle) Coleobterea, Curculionidae in El-LMarje rejoin, east Libya during 2015-2016 on weed and grain crops fields (wheat and barley). Field visits and samples collection were made every two weeks from wheat and barley fields during the period from mid-February until end of May (harvest time), and to weeds in the neighbouring fields during summer and fall. Observations made indicated the insect was distributed in all El-Marje region on Graminea plants (weeds, barley, wheat), with adults feeding on leaves, laying one egg in the grain (milky stage), hatched larvae fed on the grain and then moved to the soil to pupate. Pupae emerge as adults early in next season. The insect had one generation each year, but some adults had summer dormancy, and start to lay eggs on weeds and wheat volunteer plants.

EN24

THE AGE–SPECIFIC FECUNDITY LIFE TABLES OF *SPODOPTERA LITTORALIS* (BOISD.) IN BAGHDAD. Jawad K. Al-Rubeae and Hind I.A. Al-Khazraji, Plant Protection Department, Faculty of Agriculture, University of Baghdad, Iraq, Email: hindaa2007@yahoo.com

The age–specific life tables of *Spodoptera littoralis* were studied in the Entomology Laboratory, College of Agriculture, Baghdad University at 25±2˚C and 60-70% R.H. Females survival began to decline on the 55th day, with an average age of 12 days. The average female age was 2 days at the first reproduction. Net reproduction rate (Ro) was 233.49 females/female/generation, suggesting that the population of *S. littoralis* was unstable. Intrinsic rate of increase (rm) was 0.0703 and the average generation period (T) was 34.30 days.

EN25

EFFECT OF EXPOSURE TIME AND MATERIAL THICKNESS ON THE EFFICACY OF MICROWAVE ENERGY ON DIFFERENT STAGES OF STORAGE INSECTS. Falah H. Naher, Mohammed Z. Khalaf, Hussain F. Alrubeai, Bushra H. Abdulhamza, Rajaa A. Sami and Hazim E. Alshamari, Integrated Pest Control Research Center, Directorate of Agricultural Research, Ministry of Science & Technology, P.O. Box 765, Baghdad, Iraq, Email: mkhalaf34@yahoo.co.uk

The effects of 1000W microwave radiation at different exposure time (0, 20, 25, 30, 35, 40 and 45 second) on eggs and larvae of *Ephestia cautella* and *Sitotroga cerealella*, have been studied to evaluate this technique as an alternative method to replace methyl bromide to control pests of stored dates cv. Zahdy. Results obtained indicated that microwave radiation has a high efficacy in killing eggs and larvae of *E. cautella* and *S. cerealella*, and this effect increased by increasing exposure time. Eggs mortality reached 92.95±0.73% and 100±0.0% at 40 and 45 sec exposure time, respectively, compared to 23.1±2.55 and 38.49±0.55% for exposure time of 20 and 25 seconds, respectively. Results also showed that there was no significant differences in mortality rates when date fruits were arranged in one or two layers, when exposed to microwave radiation. Mortality rate of larvae reached

92.56±0.62% and 97.21±1.16% at 40 and 45 sec exposure time, respectively, as compared to 20% and 35% at 20 and 25 sec exposure time. In corn seeds, mortality of *S. cerealella* larvae was 97% at 45 sec exposure as compared to 34-36% at 20 seconds exposure time, with no effect on germination of corn seeds. Results indicated that the efficacy of microwave radition to control fig moth in stored date fruits and corn seeds can be considered as an effective alternative method to methyl bromide.

EN26

FUNCTIONAL ROLE OF NEUROPEPTIDE LEUCOKININ II IN GROWTH INHIBITION OF RED PALM WEEVIL RHYNCHOPHORUS FERRUGINEUS. Mona Mohammed Saleh Al Dawsary, College Science and Humanities, Biology Department, Prince Sattam Bin Abdel Aziz University, Saudi Arabia, Email: wisdom1425@yahoo.com

Peptides are known to inhibit the growth of insects. This study aimed to evaluate the biological and physiological effects of leucokinin II on the growth of red palm weevil. Adult insects were fed on sugar cane treated with different concentrations (0.05, 0.1, 0.25 and 0.4%) of leucokinin II and the following biological parameters were evaluated: number of eggs, hatching rate, generation period and deformation rate. Results showed that there was a significant reduction in the number of eggs laid, which reached 75.7, 63.5, 59.4, 55.1 eggs/female for the different four concentrations, respectively, compared with an average of 140. 2 eggs/female in the control group. Hatching rate reached 71.4, 64.6, 70 and 71.5%, for the four concentrations, respectively, compared with 79.3% for the control group. Deformation rate in egg densities as compared to the control group reached 44.4, 15.4, 22.6, 27.8%. The results also showed that there was significant deformation in the resulting larvae for different treatments. Results of this study confirmed that leucokinin II prevents the insect from completing its life cycle, and its future potential in reducing red palm weevil population deserves further studies.

ENTOMOLOGY

E1

THE POTENTIAL OF ELECTRONIC NOSE TECHNOLOGY FOR EARLY DETECTION OF GRAIN INFESTATION CAUSED BY THE GRANARY WEEVIL *SITOPHILUS GRANARIUS* (L.). N. Abuelnnor[1], N. Ratcliffe[2] and B. de Costello[2]. (1) Plant Protection Department, Faculty of Agriculture, University of Tripoli, Tripoli, Libya, Email: najatali12@yahoo.co.uk; (2) Center for Research in Analytical, Material and Sensor Sciences, University of the West of England, Bristol, UK.

Preliminary work has been undertaken to show the possibility of using an electronic nose instrument to discriminate between infested and non-infested wheat grain. The results proved that the electronic nose can successfully distinguish between grain samples with different levels of infestation. In the first study there was very clear separation between non-infested and infested grain samples with different levels of infestation in week four, five and six, and in the second study the results showed that it was possible to detect 10 weevils incubated in 1 kg of grain simply by taking a random sample of the grain, three weeks after the beginning of the experiment.

E2

STUDY OF GENETIC VARIABILITY OF CHICKPEA LEAF MINER (*LIRIOMYZA CICERINA* R) IN MOROCCO. Abdelhadi Sabraoui[1], Mustapha El Bouhssini[1], Saadia Lhaloui[1], Karim El Fakhouri[1] and Aziz Bouchelta[2]. (1) International Center for Agricultural Research in the Dry Areas (ICARDA), P.O. Box 6299, Rabat Institutes, Rabat, Morocco, Email: m.bohssini@cgiar.org; a.sabraoui@cgiar.org; (2) Plant Protection and Environment Laboratory, Moulay Ismail University, B. P. 1120, Zitoune, Meknes, Morocco.

The chickpea leaf miner, *Liriomyza cicerina* (Rondani 1875) is the most damaging insect pest of chickpea in Morocco. During the 2014 and 2015 surveys, more than 73% of the surveyed fields were highly infested. The grain yield losses caused by this pest were 20% on average for winter planting and 42% for spring-sown crop. To study the genetic variability of this pest, 7 different chickpea resistant lines and 4 local varieties were planted in spring using alpha design with 3 replications, in 6 chickpea growing areas of Morocco. Visual damage was recorded on a scale from 1 to 9. Furthermore, 20 larvae were collected from 20 fields in each of the 6 regions of the study. In addition, 10 single sequence repeats were selected to determine the population structure, genes distance and population genetic variability. The results of the screening of the 7 chickpea lines for resistance to leaf miner in the field showed that there was a difference in terms of susceptibility of this germplasm to the different populations of chickpea leaf miner. To confirm this geographical differentiation, the assessment of *L. cicerina* populations DNA using SSR markers is in progress.

E3

MOLECULAR AND QUANTITATIVE GENETIC VARIATION OF SHAPE AND SIZE OF WINGS FOR POPULATIONS OF *CHRYSOMYA MEGACEPHALA* BY USING OUTLINE–BASED GEOMETRIC MORPHOMETRIC TECHNIQUE. Riyad Ali Okaily[1], A.A. Alqeragouly[2], A.I. Kadhim[3] and S.M. Hilal[3]. (1) Genetic Department, IPM Center, Agricultural Research Directorate, Ministry of Science & Technology, Baghdad, Iraq; (2) Biology Department, College of Education for Pure Science, Diyala University, Iraq; (3) Biology Department, College of Science Women, Babylon University, Iraq, Email: riyadkaily@yahoo.com

There are several different methods for classifying insects. One of these methods that were used is Geometric Morphometry of wings technique to study the impact of imipramine tablets on shape variation and wings size of *Chrysomya megacephala population.* The results showed that the average centroid size of the left wing of treated and untreated populations were 1077.3 and 1055.8 µM, respectively, and there was no significant differences in the average of the centriod size for the left front wing for two

colonies of *Ch. Megacephala*n populations. When classification was repeated using discriminate analysis, the results showed that the all populations were completely identical, suggesting that the populations tested represent the same species. Furthermore, results of the statistical analysis by using ANOVA test showed that there were no significant differences in the average of the centriod size for the left wing for two colonies of *Ch. Megacephala population.*

E4

MOLECULAR, MORPHOLOGICAL AND HISTOLOGICAL DIFFERENTIATION BETWEEN THE LESSER PUMPKIN FLY, *DACUS CILIATUS* (LOEW) AND THE GREATER PUMPKIN FLY, *DACUS FRONTALIS* BECKER. Badr El-Sabah A. Fetoh[1,2], (1) Plant Protection Research Institute (PPRI), ARC, Dokki, Giza, Egypt; (2) Department of Biology, College of Science, Imam Abdulrahman Bin Faisal University, Saudi Arabia, Email: drabadrelsabah@hotmail.com

In Egypt, the lesser pumpkin fly, *Dacus ciliatus* (Loew) and the greater pumpkin fly, *Dacus frontalis* Becker, which belong to the genus *Dacus* family Tephritidae order Diptera were found infesting some cucurbitaceous and solanaceous vegetable plants. Both flies resemble each other in infestation symptoms and all immature insect stages; furthermore adults have the same shape, size and color, and adults and larvae of both species were constricted. In this study, keys morphological characters of the two species appeared in the thorax and mid femur leg of the adults. The cross sections in the 3rd larval instar also showed little differences. Electrophoresis of total protein (SDS-PAGE) in all stages of both species indicated the presence of 13 protein bands in *D. ciliatus* and 12 protein bands in *D. frontalis* ranging between 200.00 kDa and 14.30 kDa. Similarity rate was 67.10%, similarity coefficient was 0.60, and commonality coefficient was 44.00. Esterase isoenzyme pattern after electrophoresis showed the presence of 7 bands in both specie, with similarity rate of 59.80%, similarity coefficient was 0.71 and commonality coefficient was 28.60. This could provide a new tool for the identification of any stage (egg, larva, pupa and adult) in an easy and quick manner, thus helps in quarantine inspection of both insects.

E5

THE RELATIONSHIP BETWEEN *BEMISIA TABACI* AND *APHIS GOSSPYII* INFESTATIONS WITH CERTAIN PLANT DISEASES, PLANT ENZYME ACTIVITIES, ANATOMICAL STRUCTURES AND NATURAL ENEMIES ON SQUASH PLANT. Gamal M. Hassan, F.H. Faragalla and Aziza M.M. Abou-Zaid, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt, Email: dr.jimy.hassan@gmail.com

The whitefly *Bemisia tabaci* and cotton aphid *Aphis gosspyii* are the most harmful insect pests for squash, *Cucurbita pepo* L. crop. Beside the direct damages, both insects transmit pathogenic viruses and induces plant physiological disorders, such as the silver leaf disorder. In this study, the development of leaf silvering and a mosaic virus in squash in relation to *B. tabaci* and *A. gosspyii infestation*, respectively, were evaluated. An experiment was conducted under field conditions, in Mansheyet Saqqara village, Giza, Egypt, during the summer seasons, 2016 and 2017. The activity of some plant enzymes, such as alpha esterase, peroxidase and phenoloxidase and chlorophyll contents were associated with *B. tabaci* and *A. gosspyii* infestations. The associated predators, mirid bug *Nesidiocoris tenuis* and ladybird *Coccinella undecimpunctata* were collected and their relation was also investigated. The leaf silvering levels were also determined during this study. Results obtained suggested that the induced silver leaf in squash cultivar is similar to a systemic phytotoxemia, and in case of mild infestation silvering symptoms appear between along the main and secondary veins of the upper leaf surface. Whereas in sever infestation, complete silvering of the upper leaf surface occurs and the lower surface appeared normal.

E6

CLASSIFICATION AND EVALUATION OF MALE DATE PALM TREES BASED ON ITS FERTILITY AND IDENTIFYICATION OF ITS PESTS. Saud A. Al Fadda[1] and Ramzy A. Abo Aiana[2]. (1) General Manager of the Agriculture Management, Saleh Al Rajhi Endowment Management, Saudi Arabia; (2) Plant Protection Research Institute, Agricultural Research Centre, Egypt, Email: ramzy200@hotmail.com.

Due to lack of scientific studies conducted on the male date palm trees, especially in terms of classification based on their fertility, and since the agricultural management of the Endowments Administration have three date palm projects with more than 250,000 palm trees, including of 17,000 male date palm trees, and because of the importance of classification of the male palm trees according to their fertility, a study was conducted (2015-2016) on random samples of male palm trees in order to classify those according their fertility, in addition to studying the characteristics of the male bunches and their pests. The results showed that 99% of male date palm trees produce pollen powder, whereas 0.6% of them doesn't produce any pollen powder, and only 0.4% were hermaphrodite trees. Results also showed that the average yield of bunches per tree was 20 bunches which produced 600 gm of pollen powder, enough to pollinate fifteen palm trees. The pollen fertility ranged from 89 to 98% depending on the period between pollen collection and use and methods of storage. Results also revealed that the male bunches can be attacked by four insect pests, in addition to Khamedj disease (*Meuginiella scaettae*). Moreover, frost is an additional stress in very cold seasons.

E7

DRY CONE SYNDROME IN STONE PINE (*PINUS PINEA)* FORESTS AND PESTS ASSOCIATED WITH IT. Efat Abou-Fakhr Hammad[1], Mohammad Abbass[1] and Nabil Nemer[2]. (1) Faculty of Agriculture & Veterinary Sciences, Lebanese University, Beirut, Lebanon; (2) Faculty of Agricultural & Food Sciences, Holy Spirit University of Kaslik, Jounieh, Lebanon, Email: abbass1994_mohamad@hotmail.com

The stone pine, *Pinus pinea* L. forms the densest forests in the lower mountains around Beirut and Jezzine in Lebanon. Lately, the decrease in the Lebanese stone pine yield has been correlated to infestation of cone and seed with pests and other biotic factors. Cone and seed insects have played a key role in the decline of stone pine nut production in main producing countries worldwide, and this decline was attributed to "dry cone syndrome". The objective of this study is to determine the pest species and their abundance in the eco-habitat of stone pine trees existing in 2 locations in Jezzine district. The sampling method included direct observation of first, second and third-year pine cones in 9 accessible trees distributed over an area of 500 m^2, as well as the seeds produced, were examined to assess viability. Pitfall traps were also distributed at a rate of one trap per 10 m among pine trees in the two locations. Preliminary results indicated that there were two scolytid pest species belonging to the genera *Tomicus* and *Orthotomicus* with high abundance of about 60% in comparison to other collected *Scotlytid* sp. Cones attacked by anobiid beetles and *Dioryctria* spp. were observed, as well as asymptomatic dead cones and cones with resin drops and patches that could not be easily related to one damaging agent were also studied. Adult anobiid beetles also emerged from cones in laboratory rearing. The presence of resin could not be definitely related to one specific damaging agent, although the feeding activity of the hemipterous seed bug *Leptoglossus occidentalis* could be one of the reasons; knowing that the latter species was not encountered in our study till end of May 2017. Thus, the "dry cone syndrome" could be attributed to several biotic factors as the above mentioned pests that need to be investigated further.

E8

***RHYNCHOPHORUS FERRUGINEUS OLIVER* AND ITS ECONOMIC NEGATIVE IMPACT ON DATE PALM AND PRODUCTION IN QASSIM.** Faeka Huseen Belal, Saly El-Awady and Hoda Ahmed Ebrahim, Faculty of Economic and Management, El Qaseem University, El Qaseem, Saudia Arabia, Email: faygahussein@gmail.com.

The Kingdom of Saudi Arabia is second in the world in dates production, after the United Arab Emirates, which strengthens the position of the Gulf Cooperation Council countries as the largest countries in date production, with Iraq being third, representing 25% of the world production. The Government of the Kingdom has recognized the importance of dates as a national strategic crop with its nutritional value and economic importance and its role in achieving national food security. There are many programs that support investment in the production and processing of dates in the Kingdom. The most important of these are the granting of medium-term loans to farmers to purchase machinery, pumps, irrigation systems and agricultural equipment, subsidize agricultural equipment and irrigation equipment and grant agricultural licenses for palm projects. The agricultural sector is a productive sector and contributes effectively to the GDP with a capital of about 54 billion riyals and an area of about 700 thousand hectares in 2016. The Qassim region is considered one of the agricultural areas in Saudi Arabia which is characterized by abundant ground water and arable land. The Qassim region is the second largest in the Kingdom, producing more than 6 million palm trees. Therefore, the Ministry of Agriculture and the competent authorities and farmers are seeking to protect date palms from the diseases that afflict it, especially insect pests that kill it and make the farmers lose many palm trees annually. Date palm weevil attack significantly reduced date production in the Qassim region during the period 2010-2016. The main objective of this study is to shed light on the negative economic effects of date palm red weevil (*Rhynchophorus Ferrugineus oliver)* on production. Preliminary data were obtained through the use of a questionnaire in a survey of a random sample (30 farms) and interviews of date farmers in the region, as well as other available information. The study uncovered that a large number of palm tree farms were destroyed and date production was reduced. The study also indicated that the cost of *Rhynchophorus Ferrugineus oliver* eradication amounted to SR 127, 800 million per season. The study recommended the need to control the *Rhynchophorus Ferrugineus oliver* and to reduce their spread by raising farmers' awareness of the importance of *Rhynchophorus Ferrugineus oliver* control when preparing for the agricultural season.

E9

INFESTATION OF THREE DATE VARIETIES WITH HIGH MARKET VALUE BY *ECTOMYELOIS CERATONIAE* (ZELLER) (LEPIDOPTERA: PYRALIDAE) IN OUED RIGH REGION, ALGERIA. Ismahane Lebbouz[1], Brahim Merabti[2], Mohamed Seghir Mehaoua[1] and Mohamed Laid Ouakid[3]. (1) Department of Biological Sciences, Faculty of Science of Nature and Life, Mohamed Kheider University, Biskra, Algérie, Email: smahanlebbouz@yahoo.fr; (2) Department of Nature and Life Sciences, Faculty of Exact Sciences and Sciences of Nature and Life, Amar Tlidji University Laghouat, Algeria; (3) Department of Nature and Life Sciences, Faculty of Exact Sciences and Sciences of Nature and Life, Badji Mokhtar University Annaba, Algeria, Algeria, Email: smahanlebbouz@yahoo.fr

The date moth *Ectomyelois ceratoniaes* (Zeller) is currently considred as the most dangerous pest of date palm. The contaminated fruits are inedible because of the damage caused by this pest. This study aimed to monitor the infestation rate of three varieties; Deglet Nour, Degla Beida and Ghars throughout phenological stages; fruits growth, ealy maturation and date maturity. Sampling was carried out in two private farms in El Meghaier region during the years 2011, 2012 and 2013. Three samples from each variety were collected weekly, at 100 date fruits per sample, and examinated in the laboratory. The results showed that infestation occurred across the phenologicals stages for Deglet nour and Degla Beida, whereas for cv. Ghars, the fruit growth stage was more infested than early maturation stage. The results also showed that regardless of phenological stage, Deglet Nour was the most infested variety and whatever the variety, mature date fruits were the most infested phenological stage. The factors influencing infestation variability have been established.

E10

A COMPARATIVE STUDY ON THE ABUNDANCE AND DIVERSITY OF BUTTERFLIES IN DISTURBED AND UNDISTURBED HABITATS IN CENTRAL NIGERIA. A. Ombugadu[1], A.R. Ugwu[1], O.C. Oke[2], P.N. Okoi[1], E.M. El-Nabaw[3], H.L. Njila[4], M.J. Mafuyai[5] and H.O. Ahmed[1]. **(**1) Department of Zoology, Faculty of Science, P.M.B. 146, Federal University Lafia, Nasarawa State, Nigeria;(2) Department of Animal and Environmental Biology, Faculty of Life Sciences, University of Benin, Edo State, Nigeria; (3) Entomological Laboratory, Faculty of Agriculture, The United Graduate School of Agricultural Sciences, Kagoshima University, 1-21-24 Korimoto, Kagoshima 890-0065, Japan; (4) Department of Science Laboratory Technology, University of Jos, P. M. B. 2084, Jos, Plateau State, Nigeria; (5) Department of Pest Management Technology, Forestry Research Institute of Nigeria, Federal College of Forestry, Jos, Plateau State, Nigeria, Email: akwash24@gmail com

Butterflies have a wide spread distribution, and are comparatively easy to sample and recognize both as individuals and as species. They are extremely sensitive to changes in vegetation composition and environment structure. To this end, butterfly abundance and diversity in Central Nigeria was investigated in April, 2016 using sweep nets along four line transects in disturbed and undisturbed habitats of Federal University Lafia. Transects were visited in the morning and evening sessions. An overall total of three hundred and one butterflies were seen. However, only 160 were caught which spread across 5 families, 21 genera and 25 species. The most abundant family of butterflies caught was Pierdae 49 (30. 63%), followed by Lycaenidae 42 (26.25%), Nymphalidae 34 (21.25%), Papilionidae 34 (21.25%), while Hesperidae 1 (0.63%) was the least and scarce in the study area. The abundant genera of butterflies recorded in the study were *Eurema* 29 (18.13%), *Papilio* 27 (16.88%) and *Hypokopelates* 23 (14.38%). The mean abundance of butterflies seen in relation to disturbed and undisturbed habitats showed a very high significant difference (t = -4. 1952, df = 94. 682, P = 0. 00006143). Time of day showed a very high significant difference (t = 6.2208, df = 82.469, P < 0. 0001) in the mean abundance of butterflies. The undisturbed habitat was more diversified (H´ = 2. 6) in butterfly species than the disturbed habitat (H´ = 2. 5). This study clearly showed that the ongoing building construction in the Permanent Site of the University may have some impact on the abundance and diversity of butterflies, most especially *Papilio demodocus* (citrus swallow tail) that has been categorized threatened by IUCN. Therefore, this study recommend that the Management of the Institution should quickly swing into action of making sure the area designated for Zoological Garden is well safe guarded for wildlife.

E11

BIOLOGY AND HOST PREFERENCE OF MELON WORM *DIAPHANIA HYALINATA* L. (LEPIDOPTERA: PYRALIDAE) ON CUCURBITS IN GEZIRA STATE, SUDAN. Mohaned M.A. Mohammed[1], Faiza E.E. Salah[2] and Mohammed H. Zein Elabdeen[2]. (1) Ministry of Agriculture, Sudan; (2) University of Gezira, Sudan, Email: faizaruba@yahoo.com

Melon worm *Diaphania hyalinata* is considered an insect pest on cucurbits, but did not receive adequate study. This swork was conducted at the experimental farm of the University of Gezira in two winter seasons, to evaluate damage on leaves and fruits of six types of cucurbits namely, snake cucumber, squash, pumpkin, sweet melon, water melon and tibish by the melon worm. Results obtained revealed that leaves of snake cucumber were the most damaged by the insect (24.92%), whereas pumpkin leaves were the least damaged (9.16%). On the other hand, fruits of sweet melon showed the most damage (46.6%) in the second season when tibish fruits were the least damaged (4.5%), and no damage was observed on water melon. Snake cucumber harbored the highest number of larvae and pumpkin was the least. The average duration of the developmental stages i.e. egg, larva and pupa were 2.5±0.25, 11.4±0.13 and 7±0.15 days, respectively. The fecundity and fertility were 90.4±7.60 and 73.6±3.63 per female, respectively. The whole life cycle was completed in 20-23 days with a mean of 21.37±0.22 when the insect fed on snake cucumber. The sex ratio was 1:0.8 male: female. The morphological features of the different developmental stages were described. Results obtained revealed effect of food type on larval and pupal periods and total life cycle. Insect life cycle when fed on leaves of snake cucumber, squash, pumpkin, sweet melon, water melon and tibish was 20.38, 20.84, 21.54, 21.42, 22.33 and 22.87 days respectively, compared to 23.25, 23.5, 23.6, 23.9, 24.5, and 24.25 days, respectively, when fed on fruits of the same cucurbits. The study also revealed that snake cucumber and sweet melon were the most preferred by the insect females compared with other cucurbits.

E12

DISTRIBUTION, SEASONAL PHENOLOGY AND INFESTATION DISPERSAL OF THE CHICKPEA LEAFMINER *LIRIOMYZA CICERINA* (*DIPTERA: AGROMIZIDAE*) ON TWO WINTER AND SPRING CHICKPEA VARIETIES. Abir Soltani[1,2], Moez Amri[3] and Jouda Mediouni Ben Jemâa[2]. (1) Faculté des Sciences de Bizerte, Zarzouna Bizert, Université de Carthage, Tunisie, Email: soltani.abir@live.fr; oudamediouni@lycos.com; (2) Laboratoire de Biotechnologie Appliquée à l'Agriculture, Institut National de la Recherche Agronomique de Tunisie (INRAT), Rue Hedi Karray 2049 Ariana, Tunis, Université de Carthage; (3) Centre Régional de Recherche en Grandes Cultures de Béja, Route de Tunis, Km 5, 9000 Béja Laboratoire des Grandes Cultures, Université de Carthage, Tunisie.

In North Africa, the chickpea leafminer *Liriomyza cicerina* (Rondani) (Diptera: *Agromizidae*) is one of the major damaging pests affecting both spring and winter-planted chickpea. Damage is caused by the larvae which feed in the leaf mesophyll tissue, resulting in desiccation and premature leaf fall that can cause severe yield losses. In the present work, distribution and seasonal phenology of *L. cicerina* were studied on two chickpea varieties; a winter variety Beja 1 which is the most cultivated variety in Tunisia and a spring-sown variety Amdoun 1. The

experiment was conducted during cropping season 2015-2016, in the experimental research station Oued Beja, in Beja region (36°44'N; 9°13'E). To determine the distribution and seasonal phenology of *L. cicerina* in both studied varieties Beja 1 and Amdoun 1, 100 leaf samples (50 from the top and 50 from the base) were collected from 10 chickpea plants randomly chosen from each field. Sampling was done during three development stages (i) 20-25 days before flowering (BFL), (ii) at flowering (FL) and (iii) at pod setting stage (PS). For each plant, leaves were checked from the base till the upper ones for the insect infestation progress into the plant in correlation with chickpea growth stages. Adult population were monitored using 8 yellow sticky traps together with weekly leaves sampling in each field. The traps were placed 70 cm above ground. Traps were collected once a week over the cropping season period. Results showed that *L. cicerina* distribution varied among both studied chickpea varieties and crop development stage, all with seasonal phenology. For the winter chickpea variety Beja 1, infestation levels of 2%, 10.3% and 20.3% were recorded on the base plant part for BFL, FL and PS stages, respectively against 0%, 8.1% and 45.8% recorded for the upper plant part leaves for the same stages, respectively. For the spring-sown variety Amdoun 1, the infestation level reached 71. 5% during flowering stage. Population dynamic study revealed that for Beja 1 variety, *L. cicerina* accomplished three annual generations over the cropping season period with the third one being the most important with a capture level of 85 adults/trap by mid-May against a capture level of 139 adults/trap at the end of May recorded for cv. Amdoun 1. Results also showed that *L. cicerina* field infestation dispersal depended on the field part and on the crop growth stage. The border areas plants were more infested than the plants placed inside the plots. For cv. Beja 1, border areas infestations were 11%, 28% and 91.2% for BFL, FL and PS stages respectively, against 2%, 10.73% and 69.2% recorded on the inside plot plants during the same growth stages, respectively. For the cv. Amdoun 1 infestation level of 90% was observed on the border plants at FL and PS stages against an infestation level of less than 65% recorded inside the plot.

E13

HIGHLIGHTS ON CERTAIN OLIVE PESTS AND THEIR CONTROL IN EGYPT. Mohamed Abdel-Rahman Mohamed Amro, Plant Protection Research Institute Agricultural Research Center, Dokki, Giza, Egypt, Email: moamro1953@yahoo.com.

This work aimed to identify the olive insect pests and their associated natural enemies recorded in Egypt by using the available literatures. Mites associated with olive groves were also determined. The collected articles exhibited the presence of 15 hexapod species belonging to 14 genera, 9 families and 4 orders in association with olive groves. Three predatory Acarid species were also recorded. The data obtained made it clear that Order Homoptera harbored 60% of the recorded arthropod pests. However, orders Lepidoptera, *Diptera* and *Coleoptera* harbored 20%, 13.33% and 6.67% of the total recovered species, respectively. Fifty five parasitoid species belonging to 9 Hymenopteran families were recorded in association with arthropods infesting olive trees. The data obtained showed that family Aphilinidae ranked first because it harbored 30.90% of the total determined parasitoids, followed by family Encyrtidae (27.27%). The remaining families can be arranged in descending order as follows: Pteromalidae (10.91%), Braconidae (9.10%), both Euritomidae and Trichogrammatidae (7.27%), Eupelmidae (3.64%), and both Bethylidae and Chalcididae (1.82%). The role of biological and chemical control procedures used to manage olive pests was determined. Parasitism of certain parasitoid species on the main olive arthropod pests was investigated. The impact of chemical and safe alternative compounds to reduce olive pests and their associated natural enemies will be discussed in more details.

E14

SEASONAL ABUNDANCE OF CERTAIN PIERCING SUCKING PESTS ON CUCUMBER PLANTS IN EGYPT. A.A.A. Saleh[1], H.M. El-Sharkawy[2], F.S. El-Santel[2] and Rehab A. Abd El-Salam[2]. (1) Plant Production Department, Faculty of Technology & Development, Zagazig University, Egypt, Email: amin_ahmed4u@yahoo.com; (2) Plant Protection Research Institute, Agricultural Research Center (ARC), Dokki, Giza, Egypt.

Experiments were carried out at Diarb Negim district, Sharkia Governorate to study certain piercing sucking pests infestation and their associated predators on cucumber plants during two successive seasons 2014-2015 and 2015-2016. The dominant insect pests were cotton aphid, *Aphis gossypii* Glover, tobacco whitefly, *Bemisia tabaci* (Genn.), *Thrips tabaci* (Lindquist) and a few jassids as well as *Nezara viridula* F. Whereas, the prevailing associated predators were *Orius* spp., *Metasyrphus corollae* F., *Chrysoperla carnea* (Steph.), *Coccinella undecimpunctata* L. and a few number of *Paederus alfierii* (Koch) and true spiders. Infestation with *A. gossypii* and *B. tabaci* were much higher in autumn plantations than in summer plantations in both study seasons, whereas, *T. tabaci* was detected in few numbers on cucumber plants during autumn plantation in both seasons. In autumn plantation, *Orius* spp. had two peaks of activity in both years. The two peaks were recorded on the 1st and the 3rd November (17 and 23 individuals/30 leaves respectively) in 2014 season and 9 and 12 individuals/30 leaves in 2015 season. Similarly, during summer plantation, *Orius* spp. had two peaks of activity on the 2nd of May and the 1st of June (48 and 31 individuals/30 leaves) in 2015 season. Also, *Metasyrphus corollae* had two peaks of activity on 4th of April and 1st of May (3 and 17 individuals/30 leaves. *Chrysoperla carnea* had two peaks of activity on 2nd and 4th of May (3 and 15 individuals/30 leaves). Statistical analysis showed that temperature and relative humidity were significant factors with some insects and insignificant with others.

E15

POPULATION DENSITY OF MEDITERRANEAN FRUIT FLY (*CERATITIS CAPITATA*) (WIEDEMANN) DIPTERA: TEPHRITIDAE, ON MIXED FRUIT ORCHARDS IN BAGHDAD. Abdulrazak A. Salman,

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In recent years, the Mediterranean fruit fly, *Ceratitis capitata* (wiedemann) has been distributed in the orchards of central Iraq and caused high economic losses. This study was conducted in an orchard (25 donums) north-east of Baghdad during the consequtive growing seasons of 2014, 2015 and 2016. A Field survey for that pest was conducted in three orchards with mixed fruits types (citrus, apricot and figs), and for this purpose Delta and McPhail traps were supplied by Russel IPM together with their selective pheromones. The present preliminary study has shown that the Mediterranean fruit fly *C. capitata* has a year round presence in fruit orchards in central Iraq and reached its highest numerical density of the pest in the targeted orchards during the beginning of December 2014 till June 2015. The number of insects trapped was 2909/trap/week when maximum temperature reached 44 ˚C and minimum temperature 32˚C with relative humidity of 29%. The pest population density constantly increased during the same period of that season. During the 2015 growing season, the pest population density reached 2090/trap/week with maximium temperature of 43 ˚C and minimum temperature of 30^0C and relative humidity of 31%. In the 2016 growing season, the pest population density reached 861/trap/week at maximum temperature of 43 ˚C and minimum of 30˚C, and relative humidity was 28%. It was noted that number of traped insects was reduced due to the use of pheromone traps with consequent reduction of fruits infestation, and the highest number of trapped insects was mid-March because of the continued presence of the host plant and the availability of optimal environmental conditions.

E16

LABORATORY STUDY FOR THE LIFE CYCLE OF MEDITERRANEAN FRUIT FLY *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHITIDAE) AT DIFFERENT TEMPERATURES. Samira A. Khlaywi[1], Hamza K. AL-Zubaidy[2] and Hussain F. Alrubeai[1]. (1) Directorate of Agricultural Research, Ministry of Science and Technology, Iraq, Email: samira_odaa@yahoo.com; (2) Plant Protection, College of Agriculture, University of Baghdad, Iraq.

The biology of *Ceratitis capitata* at different temperatures under laboratory conditions was conducted, and the results obtained revealed that the highest duration of egg development was ten days at 10±1°C, whereas it was 1.25 day at 35±1°C. Larvae development stage duration was 27 days at 15±1°C and 6 days at 35±1°C. The longest pupa duration was 33 days at 15±1°C. The duration of pre-oviposition period was 21 days at 20±1°C, and 4.5 days at 35±1°C. The complete life cycle was 118 days at 20±1°C, and 36 days at 35±1 °C. The lower development threshold for eggs and larvae were 7.8 and 11.2°C, respectively, whereas it was 12.2°C and 15.19°C for pupae and pre-oviposition periods, respectively. Thermal combined requirements for the development of eggs, larvae and pupae were 49.5, 151.5 and 147 day-degrees, respectively, whereas it was 92.5 day-degrees for the pre-oviposition period.

E17

EFFECTS OF SOWING DATE AND SEED TREATMENT ON SITONA WEEVIL (*SITONA LINEATUS* L.) ON FABA BEAN (*VICIA FABA* L.) CROP. M. El-Bouhssini, K. El-Fakhouri, A. Sabraoui and S. Lhaloui, International Center for Agricultural Research in the Dry Areas (ICARDA), P.O. Box 6299, Rabat Institutes, Rabat, Morocco, Email: m.bohssini@cgiar.org; K.El-Fakhouri@cgiar.org

Sitona weevil (*Sitona lineatus* L.) (Coleoptera: *Curculionidae*) also called pea leaf weevil is one of the most important insect pests of faba bean in Morocco. Adults of this weevil feed on leaf tips, consisting of U-shaped notches on the leaf margins and limit the photosynthetic capacity of plants, whereas larvae cause extensive damage by feeding on the roots and nodules causing a delay of vegetative growth. Therefore, seed treatments with systemic insecticides are becoming an important component of crop protection. This study examined the efficacy of a liquid formulation of the seed dressing insecticide Celest ®Top (a. i. Difenoconazole + Fludioxonil + Thiamethoxam) with three doses (1.5, 2 and 2.5 cc), and 2 planting dates for the control of Sitona weevil larvae and adults under field conditions in Douyet (*Saïs* region) and Marchouch (Zemmour-Zaër region) experimental domains during the 2014-2015 and 2016-2017 cropping seasons. Visual damage was assessed by determining the severity of the infestation of Sitona adults according to the scale of defoliation rate (1 to 9), and then examine the root to determine the larvae damage at flowering stage. The results of the first season showed that foliage damage caused by Sitona weevil was reduced by thiamethoxam with the highest dose (2.5 cc) compared to the untreated one, reaching a visual damage score of 3 (1-25%) of the leaflet damage for the first date and reduced nodules infestation in about 10.75% for the second planting date. The results of the first-year study showed that seed treatments with neonicotinoid (thiamethoxam) provided protection to faba bean plants and can be used as a component in the IPM of Sitona weevil.

E18

INCIDENCE OF ANOBIID BORING BEETLES ATTACKING SEASONED WOOD IN EGYPT AND TRIALS FOR THEIR CONTROL. Ahmed Merghem and Nahed Abd El-Ghany, Department of Agronomy and Termite Research, Plant Protection Research Institute (PPRI), Agricultural Research Center, Dokki, Giza, Egypt, Email: ahmedmerghem@yahoo.com

Family Anobiidae is a coleopteran wood-injurious important family, belongs to superfamily Bostrichoidae whose members known to attack wooden articles and furniture and are commonly called powder-post beetles. Through this study, a survey for these wood boring pests was undertaken in 7 Egyptian governorates; Damietta, Fayoum, Giza, Ismailia, Matrouh, Port Said and Sohag representing the different geographical regions of Egypt and 29 locations in those governorates were investigated.

Anobiid boring beetles were recognized in 7 surveying localities and the damage and infestation levels were determined. Laboratory screening experiments were provided with tested prepared crude extracts of neem seeds, commercial Nemazal and Cidial pesticide. Extracts were generated mainly from three organic solvents apart in addition to water extracted one, then mortality and repellency rated were determined. Laboratory tests were confirmed by field application trials at the naturally attacked localities and a statistical comparison between all these treatments was done to determine the most effective treatments.

E19

DIVERSITY OF GROUND BEETLES (CARABIDAE: COLEOPTERA) IN SOME JORDANIAN HABITATS. Ahmad Katbeh Bader[1] and Wafa Naser[2]. (1) Department of Plant Protection, School of Agriculture, University of Jordan, Amman, Jordan, Email: Ahmadk@ju.edu.jo; (2) Department of Plant Protection, School of Agriculture, University of Jordan, Amman, Jordan.

Ground beetles of the family Carabidae are considered important predators in the different ecosystems which are frequently used in ecological studies. Pitfall traps containing vinegar were placed from March 2015 to April 2016 in a pine forest and a stone fruits field, and from November 2015 to April 2016 in an Olive field. The soil in the pine forest was ploughed once, 3 times in the stone fruits field and the olive field was not ploughed. The number of collected specimens and species were different in the different habitats. The total number of specimens was 1242 which belonged to 16 species. Number of species in the stone fruits field was the highest (13 species), followed by the pine forest (11 species) and then the olive field (5 species). Six species were found in all habitats [*Microlestes discoidalis* (Fairmaire), *Microlestes maurus* (Sturm), *Philorhizus melanocephalus* (Dejean), *Pterostichus* (Pseudomaseus) fuscicornis (Reiche and Saulcy), Calathus (Neocalathus) melanocephalus Linne, Amara (Amara) aenea (DeGeer)]. Five species were found in the stone fruits field [*Microlestes corticalis* (L. Dufour), Bembidion (Chlorodium) *splendidum Sturm*, Bembidion (Philochthus) biguttatum (Fabricius), Poecilus (Poecilus) cursorius Dejean, Harpalus (Harpalus) affinis (Schrank)]. Three species were found only in the pine forest [*Syntomus fuscomaculatus* (Motschulsky), *Microdaccus pulchellus* Schaum, *Trechus labruleriei* Jeannel]. Two species were found in the pine and stone fruit field [*Dixus eremita* Dejean, *Notiophilus danieli* Reitter]. Available biological and ecological data were given for all species. All species were preserved in the University of Jordan Insect Museum. The differences in number of specimens and species among the habitats may be due to the different number of host species and their densities in the habitats rather than the number of ploughing times. Future studies are needed to verify such assumption.

E20

EFFECT OF SOME MORPHOLOGICAL AND PHYSIOLOGICAL CHARCTERISTICS OF SOME POPLAR SPECIES ON INFESTATION BY THE THE POPLAR LEAF WORM *EPINOTIA ABBREVIANA* F. (TORTICIDAE: LEPIDOPETRA). Shaheen Abbas Mustafa[1], Ismael Najim Al-Maroof[2] and Sahar Tahir Al-Mulla[2]. (1) College of Agriculture, Department of Forestry, Kirkuk University, Kirkuk, Iraq, Email: shahinkifre@yahoo.com; (2) College of Agriculture and forestry, Department of Forestry, Mosul University, Mosul, Iraq.

Lab and field studies was conducted at the college of Agriculture, University of Mosul to evaluate the effects of some morphological and physiological characteristics of some poplar species on infestation by the poplar leaf cutter, *Epinotia abbreviana* F. Results showed significant differences between means of leaf area, leaf thickness, chlorophyll content, water content and number of hairs (leaf) of the poplar species on the mean number larva. The increase in the mean leaf area lead to an increase in the number of larva on the leaf. Mean leaf area of euphratica poplar, *Populus euphratica*, black poplar, *Populus nigra*, Americana poplar and *Populus deltoids* reached 45, 91, 44, 25, 53 and 14 cm^2 with larva number 1, 6, 2, 3, 2 and 90 larva/leaf, respectively. The study showed that the mean leaf thickness with the same number of larva reached 0.179, 1.6, 0.161, 2.03, 2.90 and 0.178 mm, respectively. The increase of chlorophyll content in poplar leaf lead to larval increase. Mean of chlorophyll content with the same number of larva for the six poplar species reached 1.370, 1.6, 1.380, 2.03, 1.391 and 2.90%, respectively. The results of present study showed variation of mean water coutent in the leaves of the six poplar species reached 39.88, 38.84, 42.51, 32.10, 42.64 and 35.36%, respectively. Results indicated that the euphratic poplar showed higher susceptibility to infestation and larvae number reached 4.02 larva/leaf, followed by black poplar, *Populus nigra* 2.75 larva/leaf, whereas the American poplar, *Populus deltoides* was the least susceptible with larvae number reached 1.72 larva/leaf.

E21

LEAFHOPPER *JACOBIASCA LYBICA* (BERGEVIN AND ZANON) (HEMIPTERA: CICADELLIDAE) ON OKRA PLANTS AND ASSOCIATED PARASITOIDS. A.S. Hendawy[1], S. K. El-Fakharany[1] and F.H. Hegazy[2]. (1) Plant Protection Research Institute, Agricultural Research Center, Egypt, Email: ashendwy@gmail.com; (2) Plant Protection Department, Faculty of Agriculture, Tanta University, Egypt.

The current study was conducted in 2016 at two locations; Sakha and El-Riad, Kafr El-Sheikh Governorate. Okra plants were sown at rice borders, canals and dikes at Sakha Agricultural Research Station, and at El-Riad as a solid crop in an area of 1000 m^2. At both locations, okra plants were naturally infested by the leafhopper *Jacobiasca lybica* (Bergevin and Zanon). To determine the parasitoids associated with the leafhopper, okra leaves having the eggs and nymphs of the leafhopper were collected. The eggs and nymphs were collected and incubated in petri dishes to be monitored for the possible emergence of parasitoids. One leafhopper nymph, collected from okra in rice fields, was found to be parasitized by *Aphelopus* sp. (Dryinidae: Hymenoptera). The leafhopper eggs collected from either

okra in rice fields or solid okra, hatched with four egg parasitoids emerged. Three species; *Anagrus* spp., *Anagrus atomus* L., *Stethynium* sp. belong to Mymaridae and one parasitoid *Oligosita* sp. belong to Tricogrammatidae. *Anagrus* parasitoids were the most abundant, whereas other parasitoids were found in low numbers. To study the population fluctuations of the leafhopper adults and the associated parasitoid *Anagrus* spp., yellow sticky traps were fixed close to okra plants at both locations. *J. lybica* exhibited three peaks of occurrence at each location, and the parasitoid exhibited three peaks on okra surrounding rice fields, and two peaks on solid okra. Collected data suggest that okra plants in rice fields received higher numbers of parasitoids than solid okra.

E22

SURVEY AND POPULATION FLUCTUATIONS OF ARTHROPOD PESTS AND NATURAL ENEMIES IN OKRA PLANTATIONS AT KAFR EL-SHEIKH GOVERNORATE, EGYPT. Sanaa Kotb El-Fakharany, Ahmed Samir Hendawy and Mahmoud Abd El-Mageed Samy, Plant Protection Research Institute, ARC, Dokki, Giza, Egypt, Email: mahmoudsamy@gmail.com.

Survey and population fluctuations of arthropod pests and natural enemies associated with okra, *Abelmoschus esculentus L.* were conducted during 2015 and 2016 seasons at El-Riad district, Kafr El-Sheikh governorate. The investigation revealed the presence of 20 arthropod species belonging to 17 families and 8 orders. Spiders were the most dominant predators and the population densities of spiders peaked in June, July, August, September and October. The survey of spiders on okra achieved by pitfall traps and hand catch revealed the occurrence of 12 families; Araneidae, Clubionidae, Dyctinidae, Dysderidae, Eutichuridae, Gnaphosidae, Linyphiidae, Lycosidae, Philodromidae, Salticidae, Tetragnathidae and Theridiidae, with lycosids being the the most abundant, followed by Araneidae and Philodromidae. The remaining families were slightly represented; Dysderidae, Clubionidae and Eutichuridae. The spider population was collected more by pitfall traps and then by hand catch. Fifteen parasitoid species were detected as belonging to 13 families using pitfall traps. Water pan traps captured 25 parasitoid species belonging to 13 families with *Trichopria* spp. being the most abundant parasitoid.

E23

EFFECT OF POWDERS OF CLOVE, GINGER, BABUL, AND GALANGAL ON SORGHUM SEEDS INFESTATION WITH KHAPRA BEETLE. Ahlam Mohammed Ahamed Abdalla Bkhet, Calamine, Agriculture Office, Aljazeera, Sudan, Email: ahlamzr15@gmail.com

Sorghum is the most important cereal crops in the Sudan, used for both human and animal diet. Khapra beetle (*Trogoderma grnarium)* is the major storage pest of Sorghum grains. This study was conducted to reveal the efficacy of powders of clove *Syzygium aromaticum*, ginger *Zingiber officinale*, babul *Acacia nilotica* and galangal *Alppina officinarum* on Khapra beetle larva. The experiment was carried out in the laboratory to rear Khapra beetle larvae on Sorghum grains treated with powder of the above plant botanicals. Ten Khapra beetle larvae were added to each treatment. Five treatments were replicated five times and arranged in a complete randomized design. The treatments were: sorghum treated with powder of clove, ginger, babul and galangal, and untreated sorghum grains as a control. Five parameters (weight losses of sorghum grains, larvae mortality, adults emerged, seed germination and seed damage) were used to show the effect of these botanicals on Khapra beetle larvae mortality and weight losses were assessed weekly; adults counted after their emergence (after ten weeks), seed damage and seed viability were done at the end of the experiment. The results indicated that these botanical crops significantly ($p < 0.05$) reduced the damage of Khapra beetle larvae on Sorghum grains by 6.00, 13.20, 14.80 and 20.40%, for clove, ginger, babul and galangal, respectively, compared to 21.60% for the untreated sorghum grains. Least weight lossesof 1.64, 2.40, 2.50 and 2.69% for clove, ginger, babul and galangal powders, respectively, compared with 3.31% for the untreated sorghum grains. Highest larval mortality rate of 11.6, 2.64, 2.50 and 2.42% for clove, ginger, babul and galangal powders, respectively, compared to 1.47% mortality in the untreated control. Highest seed germination rate of 90, 78, 68 and 51% was obtained for clove, ginger, babul and galangal powders, respectively, compared to 44% seed germination in the untreated control. The lowest rate of adults emergence of 1.40, 5.60, 6.80 and 7.20% was obtained for clove, ginger, babul and galangal powders, respectively, compared to 7.8% for the untreated control. From this study it was concluded that clove powder was the most effective in controlling Khapra beetle larvae and can be used in controlling stored grains insect pests.

E24

SUITABILITY OF TWO SAMPLING METHODS FOR DETERMINING THE POPULATION TRENDS OF CERTAIN SAP-SUCKING ARTHROPOD SPECIES INHABITING TOMATO AND CUCUMBER PLANTATIONS. Mohamed A. Amro, Abd El-Raheem A. Abd El-Raheem and Alaa El-Deen A.A. Salem, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: moamro1953@yahoo.com

Faunistic composition and seasonal abundance of certain sap-sucking arthropod species inhabiting tomato and cucumber plantations were determined by using sweep net and direct count methods, during summer seasons of 2015 and 2016 in Assiut Governorate, northern upper Egypt. Twelve species belonging to 7 families and 3 orders in addition to the acarid mite were recorded. Heteropteran species were found to be constituted 69.24% of the gathered species. However, Homopteran species were found to constitute 15.38%. Thysanoptera and Tetranichidae were presented by 7.69% for each. Concerning the sampling method, 76.92% of the collected species were captured by the sweep net method, whereas 23.08% were gathered by the direct count method. The recovered species were classified as predominantly predaceous, predominantly phytophagous, predaceous in some and phytophagous in other species. Seasonal abundance of the recorded species were determined. The distinct predators *Coranus aegyptius* (Fabricius) and *Orius* spp. showed moderate abundance

rates. The predatory-phytophagous mirid species [*Campylomma impicta* Wagner; *Cyrtopeltis tenuis* (Reuter); *Creontiades pallidus* Ramb. and *Deraeocoris serenus* (D & S), showed different abundance rates. Amongst these taxa, *C. tenuis* revealed the highest abundance rate in tomato plantations with an average of 63.00 and 75.00% during 2015 and 2016 seasons, respectively. The distinct phytophagous species *Thrips tabaci* Linnaeus, *Bemisia tabaci* (Gennadius) and *Tetranychus urtica*e Koch presented the most abundance rates on cucumber when collected by the direct count method. This work reflect the importance of sweep net as a suitable sampling method to determine the faunistic composition of the flying predatory insects inhabiting tomato and cucumber. However, direct count can be considered the most suitable method for determining the population trends of stable and/or mobile arthropods inhabiting the same crops. In addition, the use of more than one sampling method could be successful to clarify the relation between useful and harmful arthropod species.

E25

THE USE OF MICROWAVE TO CONTROL THE GREATER WAX MOTH *ALLERIA MELLONELLA* (L.) (LEPIDOPTERA: PYRALIDAE). Sindab S. J. Al-Dahwi and Ahmed H. Hadi, Plant Protection Department, College of Agriculture, Baghdad University, Iraq, Email: sindab_aldahwi@yahoo.com

Laboratory study was undertaken to investigate the microwave radiation effect on different stages of the greater wax moth: egg, larva, pupa, and adults. Energy levels of 200, 400, 600, 800 and 1000 watts and exposure duration of 10, 20, 30 and 40 seconds were used. The results showed that the death rate increased with increasing energy level and duration of exposure to all pest stages, and the exposure to 600 watts for 30 seconds caused 100% death to all pest stages. The study also showed that pupa was the most affected stage by microwave radiation, and the larvae were the least affected, with death rates of 80 and 77%, respectively.

E26

EFFECT OF TEMPERATURE AND RELATIVE HUMIDITY ON SEASONAL OCCURRENCE OF EGG PARASITOIDS OF SUNN PEST *EURYGASTER TESTUDENARIA* GEOFFROY (HEMIPTERA: SCUTELLERIDAE). Jasim K. Mohammed and Tamkin I. Tarad, Ministry of Agriculture, Plant Protection Directorate, Abu-Ghraib, Baghdad, Iraq, Email: jasim_aljanabi1968@yahoo.com

A field study was carried out to evaluate the effect of temperature and relative humidity on the seasonal occurrence of egg parasitoids of *Eurygaster testudenaria* Geoffroy in the al-Najaf province/Kufa during the period 2012-2015. Results showed difference in the prevalence of parasitoids according to the parasitoid type. *Ooencyrtus telenomicida* (Vassiliev) was the most abundant parasitoid which occurred in the field during the study years. The results also showed that egg parasitoids activity begin in the early spring. The time of presence of parasitoid in the field varied from one year to another, depending on the prevailing weather conditions of temperatures and relative humidity.

E27

THE ECONOMIC IMPORTANCE OF THE GREATER DATE MOTH *ARENIPSES SABELLA* HMPSON ON DATE PALM IN THE NEW VALLEY, EGYPT. S.M.M Gameel, Plant Protection Research Institute, Agricultural Research Center, MOA, Egypt, Email: Salah_gameel@yahoo.com

Since the end of the twentieth century, the greater date moth, *Arenipses sabella* Hmpson has become a major pest which attacks date palm trees, especially Saidi cultivar, in the New Valley. Around 80% of the inspected date palm in El-Kharga Oasis was infested with *A. sabella*. Different larvae instars were observed in full activity in the frond bases during mid January. Unopened spadix of the date palm males showed the earliest infestation during the last week of January. Meanwhile, slight infestation was observed on spathes of the females during the end of March. Bunch bases infestation with *A. sabella* larvae ranged between surface and/or cut damage. The cut bunch bases (CBB) is considered as an economic injury where, it led to breakage of bunch bases and caused damage to the fruits and reduced its quality. This usually happens during August when bunches are heavy enough and then these infested bunches are unable to bear their weight. After examining 25 date palm groves during 2015 and 2016 seasons, it was observed that, the highest CBB per one date palm tree was 62.50%. During the two seasons, the general average of the total and surface bunch bases damage were 22.10, 12.95, 18.32, and 8.27%, respectively. Throughout the first season, the cut bunch bases due to the greater date moth infestation ranged between 0.00 and 21.62% with an average of 9.12%. These rates ranged between 3.78 and 17.45% with an average of 10.05% during the second season.

MITES

M1

THE EFFECT OF MAGNETIC FORCE AND MAGNETIC WATER ON BEHAVIOR AND POPULATION OF *TETRANYCHUS URTICAE* AND *AMBLYSEIUS GOSSIPI* ON SOYBEAN IN THE LABORATORY AND FIELD. H.A. Abd El-Rahman, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt, Email: eseedy.1234567@yahoo.com

The phytophagous mite *Tetranychus urticae* is the main pest infesting soybean plants causing a great damage and loss in yield. The continued use of acaricides to control this pest has caused environmental pollution. Therefore, it has become necessary to search for safe compounds to control mites. Accordingly, two experiments were carried out to study the effects of magnetic force and magnetic water on two spotted spider mites *Tetranychus urticae* (Koch) (Acari: Tetranychidae) and *Amblyseius gossipi.* In the first experiment leaflets of infested soybean with *T. urticae* and *A. gossipi* were passed through different concentrations of magnetic force and magnetic water at

different time intervals and concentrations of magnetic force and magnetic water in the laboratory were 100, 200, 300, 400 and500 Gausses, respectively, while Magnetic force and magnetic water in the field were 1000, 2000, 3000, 4000 and 5000 Gausses, respectively. The second experiment was conducted by spraying infested leaflets with *T. urticae* and *A. gossipi* at three time intervals. The results of both experiments revealed that the numbers of the two tested mites were reduced after treatment with magnetic force or magnetic water. The data obtained also indicated that magnetic force was the most effective on adults and the eggs stage of *T. urticae,* but was the least toxic on *A. gossipi,* whereas magnetic water had moderate effect on eggs and adults of the two tested mites. Under field conditions, the magnetic force was the most effective on behavior and population of *T. urticae* and *A. gossipi*, whereas magnetic water had moderate effect on the population and behavior of eggs and mobile stages of *T. urticae* and adults of *A. gossipi.*

M2

EFFICIENCY COMPARISON OF SOME COMPOUNDS AND THEIR NANOPARTICLES AGAINST THE TWO-SPOTTED MITE AND ITS PREDATOR IN THE LABORATORY AND FIELD. H.A. Abd El-Rahman, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt, Email: eseedy.1234567@yahoo.com

The two-spotted spider mite, *Tetranychus urticae* (Koch) is one of the major pests attacking different field crops, vegetables and fruits, whereas predatory mite *Phytoseiulus persimili*s (Athias-Henriot) is a well-known predator specialized on Tetranychidae mites. Nanotechnology is a science of manipulating materials at nano-scale. Nanotechnology and solutions of some common compounds occupied a central position for the control of pests. The present investigation was carried out to evaluate some compounds (Cyhalothrin, Abamectin Benzoate, Chlorpyrifos and Methomyl 95) and their nanoparticles against *T. urticae* and *P. persimili*s in the laboratory and under field conductions on cotton plants. The LC_{50} of these chemicals on the mite and predator were evaluated. The results obtained revealed that abamectin benzoate nanoparticles had high toxic effect and high toxicity index. On the other hand, methomyl 95 nanoparticles was least toxic to adult female of *T. urticae* and *P. persimili*s than the other tested compounds in common solution. Moreover, cyhalothrin nanoparticles was the most effective compound against *T. urticae* egg deposition and egg hatchability. *Furthermore,* cyhalothrin nanoparticles had moderate effect on mite eggs and adults of *T. urticae* and *P. persimili*s. Under field conditions, all compounds nanoparticles achieved good effect against *T. urticae* and *P. persimili*s in cotton plants. The current investigation suggest that this approach can be a component in the integrated management of *T. urticae* and *P. persimili*s in the field.

M3

THE EFFECT OF DIFFERENT COTTON VARITIES ON THE TWO-SPOTTED SPIDER MITE *TETRANYCHUS URTICAE* (KOCH) AND ITS PREDATORS POPULATION UNDER LABORATORY AND FILED CONDITIONS. H.A. Abd El-Rahman and Laila E.M. Seliman, Plant Protection Research Institute, Agricultural Research Center, Giza, Egypt, Email: eseedy.1234567@yahoo.com.

The phytophagous two-spotted spider mite *Tetranychus urticae* Koch, 1836 is one of the most important agricultural pests, not only because of the damage it causes, but also because it has a wide host range, infesting many commercial crops such as leafy greens, cotton, beans, and soybeans. Field experiment was carried out at Sakha Agriculture Research Station, Kafr El-Sheikh, Egypt, in the summer seasons of 2015 and 2016, to study the effect of genetic structure of different cotton varieties on the populations of *Tetranychus urticae, Amblyseius gossipi* and *Stethorus gilvifrons mites*. Six genotypes of cotton were used in this study, namely Giza 96, Giza 95, Giza 94, Giza 92, Giza 88 and Giza 86 at three planting dates. The results obtained showed that genotypes mean squares were highly significant for *T. urticae, A. gossipi* and *S. gilvifrons* in the two seasons (2015/2016), at three planting dates. The results also indicated that there was significant differences between the tested varieties and the population density of *T. urticae, A. gossipi* and *S. gilvifrons* in the two tested seasons (2015, 2016). Giza 92 had the lowest population density of *T. urticae, S. gilvifrons and A. gossipi* in the two seasons, whereas the highest number of *T. urticae* and its two mentioned predators were observed on Giza 96 and Giza 88 varieties. Population of the predatory mites *A. gossipi* and *S. gilvifrons* were positively correlated with *T. urticae* and also was positively correlated with Chlorophyll a and b content, leaves moisture, nitrogen and potassium content in the cotton varieties. Toxicity index of the five tested compounds (Ortus, Derosel, Lambada, Challenger and Lint) induced an average reduction of 100, 76.43, 51.66, 44.52 and 32.75%, respectively, in the population of spider mite on three planting dates. The results also showed that ortus was the most toxic compound, followed by challenger and lambada to mobile stages of *T. urticae* and *S. gilvifrons and A. gossipi*, whereas lint was the least toxic to the mite and their predators. Field results indicated that ortus and challenger caused the highest reduction (84. 10 and 82.25%), derosel and lambada caused a moderate reduction (50.45 and 45.77% reduction), and lint caused the least reduction (35.64% reduction) to mobile stages of *T. urticae, S. gilvifrons* and *A. gossipi* on three planting dates for two seasons (2015 & 2016).

M4

RESPONSE OF SOME COTTON VARIETIES TO INFESTATION WITH TWO SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH (ACARI: TETRANYCHIDAE) AND THE PREDATOR, *AMBLYSEIUS GOSSIPI* EL-BADRY (ACARI: PHYTOSEIIDAE), AND ITS RELATION WITH ITS CHEMICAL COMPOSITION. H.M. Mead[1], H.M.H. Al-Shannaf[1], M.A. Khedr[1], O.M.O. Mohamed[1] and A.E.I. Darwesh[2]. (1) Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: hshannaf@yahoo.com; (2) Cotton Research Institute, ARC, Egypt.

Field studies were carried out to evaluate seven cotton varieties i. e. Giza 86, Giza 87, Giza 88, Giza 92, Giza 93, Giza 94 and Giza 96 for their liability to the two-spotted red mite, *Tetranychus urticae* Koch infestation and its associated predacious phytoseiidae mite, *Amblyseius gossipi* during 2014 and 2015 cotton growing seasons at two different Governorates, Sharkia and Kafr El Sheikh. Giza 86 was the most susceptible variety in Kafr El Sheikh during the two successive seasons, whereas in Sharkia Governorate, Giza 92 and Giza 96 were the most affected by *T. urticae* infestation during 2014 and 2015 seasons. Results showed that the population of phytoseiidae, *A. gossipi* varied according to the tested varieties and growing seasons. G. 94 gave highest significant yield in Kafr El Sheikh during the two successive seasons, of 7.57±0.47 and 13.07±1.20 kintars during 2014 and 2015 seasons, respectively. Whereas in Sharkia, the yield obtained was 7.86±0.25 and 11.60±0.20 kintars in both 2014 and 2015 seasons, respectively. Moreover, temperature and humidity played a key role in the infestation abundance of *T. urticae* in tested cotton varieties. A positive relationship was found between mite infestation and both nitrogen and protein contents in tested cotton leaves. The varieties Giza 96 and Giza 86 gave the highest significant amounts of both total protein and nitrogen which led to the highest significant mites infestation in both Sharkia and Kafr El Sheikh governorates.

M5

A NEW MITE SPECIES IN THE GENUS *EPITRIMERUS* NALEPA (ACARI: ERIOPHYIDAE) FROM *LANTANA CAMARA* L. IN EGYPT. Ashraf S. Elhalawany, Fruit Trees Mites Department, Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt, Email: dr_ashraf_said@yahoo.com

A new mite species in the genus *Epitrimerus* Nalepa from Egypt was described and illustrated, namely *Epitrimerus lantanae* sp. nov. on *Lantana camara* L. (*Verbenaceae*). The new species was observed as vagrant on the leaf surface without damage to the host plant. A key to identify the new species of *Epitrimerus* in Egypt was established.

FUNGAL DISEASES

F1

ANTIFUNGAL ACTIVITY OF *BACILLUS* SPECIES IN BIOCONTROL OF *FUSARIUM OXYSPORUM* AND THEIR ROLE IN PLANT GROWTH PROMOTION OF CHICKPEA. Hannane Abed and Noureddine Rouag, Department of Microbiology, Faculty of Nature and Life Sciences, University of Ferhat Abbas Sétif-1, Algeria, Email: n.rouag@univ-setif.dz

The aim of this study was to determine the potential of plant growth-promoting rhizobacteria (PGPR) and evaluate their antifungal activity against *Fusarium oxysporum* f. sp. *ciceris.* Eight *Bacillus* species were isolated from chickpea, *Cicer arietnum* cultivated in Algeria. Four bacterial isolates showed a good production of enzyme chitinase with an area size of 17-24 mm and 4 isolates exhibited an interesting cellulase production zone. All isolates tested had a good production of IAA ranged between 28, 35, 40 and 50 µg/ml. In the case of volatile compounds, *B. licheniformis* proved to be the most productive with a maximum concentration of HCN equal to 0.29 µg/ml. Four of the eight bacterial isolates were able to grow on Pikovskaya solid and liquid media and two solubilized phosphorus, but *B. firmus* showed a maximum P solubility of 125.00 µg/ml. Six out of eight isolates were able to produce siderophore and 5 out of 8 produced NH_3. *In planta* experimentation, results showed that each tested variety was linked to the Foc isolate. Thus Flip 93-93 was more sensitive to Foc1 with 58.75% plants mortality and Flip 05-156 sensitive to Foc2 with 57.5% mortality. Foc2 was more virulent than Foc1, with mortality rates of 63.75% and 53.75%, respectively. With respect to PGPR effect of bacterial strains on the plant growth parameters, results showed that Flip 93-93 variety responded better to bacteria, which is resulted in an improvement of the number of branching, stem length, root length, fresh root weight and on foliage weight.

F2

A STUDY OF DATE PALM LEAF BLIGHT CAUSED BY *SERENOMYCES PHOENICIS* IN BASRAH. Mohammed A. Fayyadh, Yehya S. Ashor and Dhergham J. Lefta, Plant protection Department, College of Agriculture, University of Basrah, Iraq; Email: muamer2010@yahoo.com

This study was carried out at the plant protection department, college of agriculture, university of Basrah, during September 2014 and September 2015 to isolate fungi associated with date palm leaf blight and to evaluate efficacy of some fungicides in reducing the disease severity. The disease was prevalent in all orchards surveyed, especially north of Basrah. Disease symptoms occured as small oval pustules on rachis which contained perithecia of *Serenomyces phoenicis*. In the presence of moisture, pustules swelled and exploded and many spores were released from it. Many fungi isolated from leaflets such as *Diplodia phonicum*, *Chalaropsis radicicola*, *Bipolaris australis*, *Phoma glomerata* and *Alternaria alternata*, were usually associated with yellowish spots symptoms on the leaflets. Laboratory experiment revealed that *S. phoenicis* did not grow on all media tested. It's also found that the best media for the growth of *D. phonicum* was rachis extract agar as radial growth reached 7.1 cm compared to 3.3 cm on PCA medium. Results also revealed that fungicides Dazim and Revos Top completely inhibited the growth of *D. phonicum* as inhibition rate reached 100%, compared with 84.3 and 54.2% for Hunter and Dithane -45. On the other hand, *Trichoderma harzianum* and *Psedomonas fluorescens* completely inhibited the growth of *D. phonicum*. Field experiment revealed that *P. fluorescens* was the most effective in reducing disease severity compared with other chemical and biological agents tested.

F3

NATURAL CONTAMINATION OF DRIED GRAPES WITH OCHRATOXIN A AND THEIR ASSOCIATED FUNGI. Samir K. Abdullah[1] and Asia A.M. Saadullah[2]. (1)

Biology Department, Faculty of Science, University of Zakho, Iraq, Email: samir.abdullah1947@gmail.com; (2) Biology Department, Faculty of Science, University of Duhok, Iraq.

The natural contamination of dried vine fruits with ochratoxin A and associated fungi from Iraq was studied. The associated fungi were determined both before and after surface disinfection with sodium hypochlorite on DRBC and DG18 media. All samples (disinfected and non-disinfected) proved to be contaminated with fungi at various degrees. A total of 19 filamentous fungal genera in addition to yeasts and non-sporulating mycelia were detected. Predominant genera detected on both media were *Aspergillus, Penicillium* and *Eurotium*. Natural contamination with ochratoxin A was detected by LC/MS-MS technique. Detected values of ochratoxn A in juices obtained from dried grapes was between 0.37 ng/ml to 1.85 ng/ml. Samples contaminated with ochratoxin A were associated with *Aspergillus carbonarius, A. niger, A. sclerotium, A. tubingensis, A. ochraceus, A. ostinum* and *Penicillum verrucosum*.

F4

PRELIMINARY STUDY ON DIEBACK OF THUJA TREE LIMBS. Huda Hazim Wafi Al-Taee and Ali Kareem Mohammed Al-Taee, Plant Protection Department, College of Agriculture & Forestry, Mosul University, Iraq, Email: dr.hudataae@yahoo.com

The isolation of the infected branches and transplants of Thuja trees was conducted in the Horticulture Station of Nineveh, gardens and roads of Mosul University during 2013. The findings of this research revealed the presence of three fungi, identified as *Phoma herbarum*, *Pesttalotiopsis funereal* and *Nigrospora oryzae*. This is the first record of the latter two fungi on Thuja trees in Iraq. The pathogenicity test results showed the ability of the fungi to cause yellowing and browning of plant leaves starting from the crown area to the plant tip causing plant death 3 months after inoculation. Tests showed total wilting after treatment with *Phoma herbarum* culture filtrate as compared to *Pestalotiopsis* sp., and *Nigrospora oryzae* culture filtrate of the three fungi increased water loss in Thuja branches. The amount of water loss was significantly correlated with culture filtrate concentration and period of treatment.

F5

FIRST DETECTION OF THE FUNGUS *LEPTOGRAPHIUM* SPP., THE CAUSE OF PINE DECLINE IN SYRIA. Basima Barhoum and Qusay Al-Rahyeh, General commission for Scientific agricultural research, Latakia Center, plant protection, Latakia, Syria, Email: d.basimabarhom@gmail.com

Pine Decline caused by *Leptographium* spp. is considered one of the most dangerous diseases that threaten pine forests. Field survey revealed a general weakness in the growth of pine trees with occasional sudden death of the whole tree. This was noticed in different forestry sites (Sanawbar Jableh, Al-Hannadi Plantation, Al-Haffa, Balloran, KastalMa'af, Al-Shabatlieh) in Lattakia province, Syria, during the years 2014-2015. In order to study and determine the causal agent of this disease, plant samples including branches, stems, and roots from infected trees (43 trees) were collected. The isolates from the infected tissues were cultured on PDA medium and were incubated at 25° C for 7 days. The results revealed frequent association of *Leptographium* spp isolates in the infected samples of Sanawbar Jableh, Balloran and Kastal Ma'af with infection rates of 75.0, 33.3, 80.0, and 100.0%, respectively. The isolates of *Leptographium* spp. fungus were characterized by light-colored mycelium that immediately changes into dark grey. Erect conidiophores had dark-brown, thick-walled, 125.6 µm long; ramified heads up to 84.1 µm across, made up of repeatedly branching metulae, conidia were hyaline, aseptate obovate 5.19 x 2.81 µm. The symptoms of infected trees along with the characteristics of the isolates corresponded to the characteristics of the black stain root disease in pines caused by the *L.wageneri* fungus. This study is considered the first detection of the *Leptographium* spp. fungus as the main cause for the death of pine trees in Syria.

F6

FIRST REPORT OF *RHIZOCTONIA SOLANI* AG-4 ON TOMATO IN POTHWAR REGION OF PAKISTAN. Amjad Shahzad Gondal, Ch. Abdul Rauf, Gulshan Irshad and Farah Naz, Department of Plant Pathology, PMAS Arid Agriculture University, Rawalpindi, Pakistan, Email: amjadsahzad@live.com

Rhizoctonia solani Kühn (teleomorph = *Thanatephorus cucumeris* (Frank) Donk) is the most important soil-borne fungal pathogen, widely established with typical symptoms of collar rot, seedling death, stunted growth and root rot in tomato. Fungus isolated from diseased tomato plants from Pothwar region was identified as *Rhizoctonia solani* by comparing its morphological characters. Isolates were further confirmed as AG-4 by the hyphal fusion test with tester isolates and DNA analysis. Present study is the first report of *R. solani* AG-4 affecting tomato in Pothwar region, Pakistan.

F7

ISOLATION, DETERMINATION AND IDENTIFICATION OF FUNGI IN SEEDS OF SUMMER LEGUMES AND THEIR MYCOTOXINS. Nadeem A. Ramadan and Jasim M. Al-Harky, Department of Biology, College of Science, Mosul University, Iraq, Email: nadeem.ramadan53@yahoo.com

Fungi from the seeds of summer legumes collected from local markets and displayed for the purpose of human consumption in the city of Mosul (beans, peanuts, soybean and cowpea) were isolated. Nineteen different genera of fungi *Rhizoctonia* sp. were isolated from the seeds of the four summer legumes, at the rate of 3, 1, 1 and 4%, respectively. *Trichoderma* was isolated from 14% of the bean seeds. Thirteen isolates of *Aspergillus* were obtained from summer legumes, and 7 isolates belonging to *A. niger*, *A. flavus*, *A. ustus* and *A. parasiticus* were obtained, in addition to three isolates of the fungus *Penicillium*, two isolates of *P. expansum* and one isolate of *P. chrysogenum.* were obtained from nine isolates of *Fusarium* were distributed among five types and *F. dimerum*, *F. moniliforme*, *F. semitectum*, *F. sporotric*hoides and *F.*

solani was prepared 1, 3, 3, 1 and 1, respectively. The peanut contained the highest proportion of toxins IFLA reached 1.7 ppb followed by the seeds of beans and cowpeas and soybeans (0.4 and 0.8 and 0.1 respectively) and contained soybean seeds to 0.4 ppb, beans, peanuts 0.2 field ppm and the amount of toxins, Fumonisin in the seeds of beans, 0.4 ppb and 0 in the rest of the seed.

F8

NEW VARIETIES OF DATE PALM TO ALLEVIATE THE PROGRESS OF THE BAYOUD DISEASE OF DATE PALM. S. Boudeffeur, H. Khelafi and M. Khersi, National Institute of Agronomy research of Algeria, Experimental Station of Adrar, Algeria, Email: hkhelafi@hotmail.com

The Algerian heritage of date palm is facing a regression of genetic diversity with a huge loss of genes and disrupting the fragile balance of the oasis. In Algeria, the date palm is in a hyper-arid area where exploitable water resources are scarce. Several constraints are imposed on genetic diversity, among them bayoud disease whose causal agent is *Fusarium oxysporum* f. sp. *albedinis*. This disease has killed 3 million trees of date palm in Algeria. With the assistance of PNUD/FAO/RAB/84/018 and PNUD/FAO/RAB/88/021 programs, controlled crosses (hybridization) were made in INRAA in order to obtain new clones of date palm resistant to bayoud disease, between females of quality and males resistant to bayoud disease. For this purpose, 19 American males have been obtained by these regional projects from California, whereas females were selected among the best varieties in North Africa: Deglet Nour, Medjhoul, Feggous and Taqerbucht. At the 2-leaf stage, seedling's roots were subjected to artificial inoculation with a concentration of 10^6 conidia/ml of bayoud pathogen. Seedling mortality started from the fourth week. Before this stage, no symptoms of bayoud were observed. Variability in sensitivity was observed from different crosses during 28 years of artificial inoculation and rigorous monitoring. This selection technique has proved effective and has eliminated 55. 6% of hybrid seedlings. Crossing of American males with Deglet nour, Medjhoul and Feggous showed a mortality rate of around 70%, whereas, Americans males crossed with the bayoud-resistant variety 'Taqerbucht' produced a mortality rate of only 16-20%.

F9

OCCURRENCE OF SPOT AND NET FORMS OF NET BLOTCH DISEASE OF BARLEY IN ALGERIA. H.I. Lammari, Z.A Fellahi, A. Benbelkacem and H. Benslimane, National High College of Agriculture (E.N.S.A), Algiers, Algeria, Email: imenelamari@gmail.com

In Algeria, cereal products are very important in the food system as well as for the national economy. Barley (*Hordeum vulgare*), is the second most cultivated cereals after wheat; but unfortunately, this crop is facing several foliar diseases. Net blotch is one of the most common diseases of barley in Algeria; it's caused by the fungus *Pyrenophora teres* Drechsler, which occurs in two forms, *P. teres* f. *teres* (*Ptt*) causing the net form (NFNB) and producing longitudinal or transversal necrotic bands and *P. teres* f. *maculata* (*Ptm*), causing the spot form (SFNB) which produce dark brown circular or elliptical lesions. Since the two forms are morphologically similar but genetically distinct, many PCR primer sets have been developed to allow their differentiation, without symptom or morphological analysis. In this context, and since the right identification of pathogens is highly significant for disease management and epidemiological studies, this study aimed to explore the occurrence of *Ptt* and *Ptm* populations in Algeria, using two specific primer pairs. The results have shown that *Ptt* is the more prevalent in all the prospected provinces. Because there is no data about the existence and the occurrence of the two forms of the net blotch in Algeria, this approach will help to characterize the causal agent populations and to carry more epidemiological research, in order to adopt a better management strategy of the barley net blotch disease in this country.

F10

THE INTERACTIVE EFFECTS OF SOIL SALINITY AND *FUSARIUM GRAMIN* INFECTION ON MYCORRHIZA POPULATION ASSOCIATED WITH THE WHEAT CROP. Wafaa H. Hasssoun, Naeem Saeed Dheyab, Baraa Hassan Hamza, Doaa Abaas Hadi, Mehdi Aboud and Mustafa Mzbaan Mohammed, Ministry of Science and Technology, Directorate of Agricultural Research, Iraq, Email: wafaahasoon@yahoo.com

A field experiment was conducted to determine the effect of soil salinity and *Fusarium germanium* on population of arbuscular mycorrhiza fungi (AMF) within wheat roots as manifested by the fungal spores number, the percentage and density of mycorrhizal root and infection density. The results showed that the percentage and density of mycorrhizal roots as compared to control treatment. The results also showed significant increase in the wheat seed germination rate, chlorophyll concentration and plant height in plants subjected to salinity stress with mycorrhizal fungi, whereas no significant effect in the tested parameters was observed in wheat plants exposed to salinity combined with *Fusarium Germanium* infection.

F11

THE COMBINED EFFECT *OF MELOIDOGYNE JAVANICA* AND *RHIZOCTONIA SOLANI* ON EGGPLANT (*SOLANUM MELONGENA* L.) SEEDLINGS. Khalifa H. Dabaj, Plant Protection Department, Faculty of Agriculture, University of Tripoli, Tripoli, Libya, Email: dabajhk@yahoo.com

An experiment was conducted to test the effect of *Meloidogyne javanica* and *Rhizoctonia solani* on eggplant (*Solanum melongena* L.) seedlings under protected cultivation conditions in various treatments including: nematodes only, fungus only, nematode + fungus, either inoculated at the same time or one week before the other, in addition to the control treatment (without inoculation). The results showed that infection with nematodes and fungi affected the growth of eggplant seedlings. The effect was more severe in the combined infection of nematodes and fungi. The highest infection rate was recorded on the roots

of eggplant seedlings in both "nematode infection alone" and simultaneous "nematodes and fungi" treatments, whereas the rate of nematodes infection decreased and the rate of root rot and death increased in the treatment of fungus infection followed by nematode infection one week later. The symptoms of root rot were less in the treatment of nematodes infection followed by fungal infection, one week later. There were no root rot symptoms in the treatment of infection with nematodes only or when fungus infection preceded nematodes infection by one week compared to the control treatment.

F12

BIOACTIVE CONSTITUENT FROM *CANNABIS SATIVA* L. HAVING ANTIFUNGAL ACTIVITY AGAINST ROOT ROT DISEASE OF *ABELMOSCHUS ESCULENTUS* (L.) MOENCH. Muhammad Akbar[1], Tayyaba Khalil[1], Arshad Javaid[2], Muhammad Sajjad Iqbal[1], Salik Nawaz Khan[2] and Muhammad Ishfaq[3]. (1) Department of Botany, University of Gujrat, Gujrat, 50700, Pakistan, Email: makbarpu@gmail.com; (2) Institute of Agricultural Sciences, University of the Punjab, Lahore, 54000, Pakistan; (3) Department of Botany, University of the Punjab, Lahore, 54000, Pakistan.

Root rot of Okra (*Abelmoschus esculentus* (L.) Moench is an important disease. This disease reduces the crop growth by killing/rotting of roots. Commercial antifungal chemicals are available to control this disease, but all these chemicals have environmental and health problems. Thus, in recent years there have been tremendous efforts to use nature friendly alternatives such as exploitation of natural antifungal alternatives from plants. In the present investigation, dried biomass of root and shoot of *Cannabis sativa* L. were exploited as antifungal agents against the root rot fungus, *Fusarium oxysporum*. These plant extracts were first evaluated in soil amendment bioassays conducted in pots, where root rot disease of okra was significantly suppressed by root dried powder of *C. sativa*. Root dried powder of *C. sativa* significantly suppressed the disease in okra, there by increasing the morphological and physiological growth parameters of okra; shoot length up by 22%, root length up by 55%, shoot fresh weight up by 66%, shoot dry weight up by 62%, root fresh weight up by 75%, root dry weight up by 92% and chlorophyll a up by 85%, chlorophyll b up by 80% and carotenoid up by 67%. For the isolation of antifungal compound, *C. sativa* roots were extracted with methanol. This extract was further partitioned with acetonitrile and subjected to column chromatography (CC) that yielded 3 components, which were further purified with the help of reversed phase high performance liquid chromatography (RP-HPLC). Of these, one compound exhibited strong antifungal activity against *F. oxysporum*. Mass Spectral (MS) investigations showed that this compound has molecular weight of 289.2 exhibiting bioactivity at minimum concentration of 0.5 mg/ml. Present study showed the occurrence of natural antifungal compound in *C. sativa* that can be exploited as natural antifungal compound.

F13

EFFECT OF WHEAT STRIPE RUST RESISTANCE GENES AND VIRULENCE OF *PUCCINIA STRIIFORMIS* F. SP. *TRITICI ON WHEAT PRODUCTION* IN EGYPT. Atef Shahin, W. Youssief, M. Hasan and Doaa EL-Naggar, Wheat Diseases Research Department, Plant Pathology Research Institute, ARC, Egypt, Email: a.a.shahin@hotmail.com

Stripe rust of wheat, *Triticum aestivum* L., caused by *Puccinia striiformis* f. sp. *tritici*, is a serious problem of wheat production in many parts of the world. The first stripe rust epidemic in Egypt was recorded in 1967; however, the most important severe stripe rust epidemic occurred in 1995, particularly in the northern and southern Delta regions. Virulence patterns of wheat stripe rust were studied under field conditions across four growing seasons during 2012 to 2016 at Sakha Agriculture Research Station by planting tester lines and local Egyptian varieties inoculated with a mixture of races were used to evaluate the collective effect of stripe rust on wheat. The results revealed that resistance genes *Yr5*, *Yr10*, and *Yr15*, exhibited high levels of resistance, whereas *Yr18* showed moderate susceptibility in all years. Genes *Yr1*, *Yr2*, *Yr6*, *Yr7*, *Yr8*, *Yr9*, *Yr17*, *Yr27*, *Yr32*, and gene combinations Opata (*Yr27+Yr18*) became susceptible during the 2014/2015 growing season. The resistance genes found effective against stripe rust under natural conditions may be deployed singly or in combination to develop high yielding resistant wheat varieties in Egypt.

F14

CURRENT KNOWLEDGE OF WHEAT TAN SPOT DISEASES IN NORTH AFRICA AND MIDDLE EAST. H. Benslimane[1], A. Yahyaoui[2], S. Ait-Ouhamou[3], Y. Benamrouche[3], H. Ouradi[1], N. Ferradji[1], A. Benbelkacem[4], Z. Bouzned[1] and M. Baum[5]. (1) Ecole Nationale Supérieure d'Agronomie, Département de Botanique, laboratoire de phytopathologie et biologie moléculaire, El-Harrach, Alger, Algérie, Email: h.benslimane@ensa.dz; (2) International Maize and Wheat Improvement Center, Apdo. Postal 6-641, 06600, Mexico DF, Mexico; (3) Université M'hamed Bougara, Faculté des Sciences, Département de Biologie. 16, Avenue de l'indépendance, Boumerdès, Algérie; (4) Institut National de la Recherche Agronomique d'Algérie, Unité de Recherche de Constantine, Station ITGC, Elkhroub, Algérie ; (5) International Center for Agricultural Research in Dry Areas, Morocco.

Tan spot, caused by *Pyrenophora tritici-repentis*, is a serious disease of wheat, in North Africa and Middle East for a long time. These areas have a special interest because they are close to the wheat center of origin. A collection of isolates sampled from several wheat growing areas in Algeria and Syria as a models for North Africa and Middle East, respectively, have been studied. Isolates from Algerian fields, showed a wide morphologically variation. When 55 isolates from 15 departments, were studied to determine which races are present, using a differential host set, included both bread and durum wheat plants. Races 1, 4, 5, 6, 7 and 8 were found and a new virulence pattern was identified. Amplification of ToxA and ToxB virulence genes showed that the genome of isolates sampled from

Algeria and Syria harbored both virulence genes, and their distribution, through several growing wheat areas have been studied. Fluorescent amplified fragment length polymorphism (AFLP), revealed high genetic diversity in both Algerian and Syrian isolates populations. Cluster analysis of molecular data showed that clustering of the isolates was independent of their race classification, geographic origin, or host plant. However, one isolate from Algeria that showed a new virulence pattern was clearly distinguished from the rest of the population studied. Using resistant varieties still is the best way to overcoming this disease. Until now no resistant sources were found in Syria. Whereas few varieties of durum wheat showed an appreciable level of résistance in Algeria. The current knowledge about the causal agent of tan spot in these two areas displayed the high variablity of the pathogen.

F15

FIRST REPORT OF FUSARIUM PROLIFERATUM ISOLATE KILLS YOUNG TREES OF POMEGRANATE IN JORDAN. Gharam Abu Jaleel, Nida Salem and Luma Al Banna, Department of Plant Protection, School of Agriculture, The University of Jordan, Amman, 11942 Jordan, Email: gharamabujaleel@yahoo.com.

Fusarium proliferatum attack several vegetables, fruit trees, and ornamentals and exhibit leaf spots, rotting and wilting on these hosts. The infected plants may eventually die and the production will be significantly reduced. During the growing season of 2014, young trees of pomegranates (*Punica granatum*) showing wilting, brown leaves, dying branches, and complete death were observed in a farm located in the southern desert phytogeographical region of Jordan. Roots and crown area of dying trees were sampled, sectioned, and plated on potato dextrose agar and incubated at 25±5°C for one week. White mycelium and conidia were observed. Morphological features and the molecular analyses of sequences of the translation elongation factor 1 alpha (TEF-1α) gene and the partial 18S ribosomal RNA gene, complete internal transcribed spacer (ITS) 1, 5. 8S ribosomal RNA gene, ITS 2, and partial 28S ribosomal RNA gene revealed that this fungus is *F. proliferatum.* Pathogenicity test was performed by inserting fungal discs into branches of young pomegranate seedlings. Seedlings were maintained on the greenhouse bench at 25 ± 5°C. Disease symptoms were monitored for three months. The fungus was reisolated from roots and stems of inoculated plants confirming Koch's postulates. This is the first report of F. *proliferatum* that causes the death of young trees of pomegranates in Jordan. More attention should be paid for the spread of this pathogenic fungus with wide host range, since it is impossible to eradicate once it is introduced. Thus, it is of a great necessity to keep young, disease-free seedlings healthy. Furthermore, epidemiology of this pathogen must be fully understood to permit the employment of the best management strategy.

F16

IDENTIFICATIONOF SEED-BORNE FUNGAL PATHOGENS ASSOCITED WITH CEREALS AND FOOD LEGUEME SEEDS AT ICARDA'S SEED HEALTH LABORATORY IN MOROCCO PLATFORM. Inaam El-Miziani[1,2], S.G. Kumari[2], S.A. Kemal[1], A. Amri[1], M. El-Bouhssini[1] and S. Lhaloui[3]. (1) International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat, Morocco, Email: I.El-Miziani@cgiar.org; (2) ICARDA, Terbol Station, Beqa'a valley, Zahle, Lebanon; (3) Laboratory of Entomology, National Institute of Agronomic Research, Regional Center of Settat, 26000, Settat, Morocco.

Seed-borne fungal pathogens are transmitted by seeds as spores or resting structures within or on seed surfaces and a pathogen can be introduced into an area from which it was originally absent, therefore they are important in plant germplasm movement for research and other purposes. The seed health laboratory of ICARDA-Morocco Platform is responsible to test the seed health status of all incoming and outgoing seed samples of cereals and food legumes breeding lines and accession from the genebank. During 2016-2017, the laboratory received 41 shipments of cereals (12,184) germplasm (3540 barley, 7514 bread wheat, 600 durum wheat, 50 oat) and 480 lentil seed accessions from 12 countries. In addition, 39 shipments were distributed from research Platform to many countries, 11,613 germplasm samples containing 7327 barley, 1478 bread wheat, 2381 durum wheat, 246 lentil, 161 chickpea and 20 grass pea breeding lines. Test results of incoming seeds showed that 1.3% of barley shipments were infected with *Fusarium* spp., 2.3% of wheat were infected with common bunt (*Tilletia tritici* and *T. laevis*). Oat accessions were infected with *Fusarium* spp. (38%) and *Pyrenophora* spp. (4%). Lentil seeds were infected with *Stemphylium* spp. (2.5%), *Fusarium* spp. (0.6%), and *Ascochyta* spp. (0.2%). The percentage of seed-borne fungal pathogens intercepted fungal pathogens from seeds produced in Morocco were *Fusarium* spp. (13.9%), *Bipolaris* spp. (0.04%) and *Pyrenophora* spp. (0.1%) on barley. In addition, wheat accessions were found infected with common bunt (8.13%). Seed health laboratory at ICARDA is playing a critical role in managing quarantine diseases so that collaborating countries will safely use germplasm developed by cereal and legume breeders. Moreover, it facilitates safe exchange of germplasm among breeders and other researchers in the world.

F17

PREVALENCE AND CHARACTERIZATION OF FOLIAR FUNGAL PATHOGENS OF LENTILS IN PAKISTAN. Muhammad Shahid, Farah Naz, Gulshan Irshad, Ch Abdul Rauf and Kausar Nawaz Shah, Department of Plant Pathology, PMAS Arid Agriculture University Rawalpindi, Pakistan, Email: janmarree@gmail.com

In Punjab, Pakistan, about ten thousand tones reduction in the lentil (*Lens culinaris*) yield may be attributed to various biotic and abiotic factors. Among biotic factors, symptoms of Anthracnose caused by *Colletotrichum truncatum*, Ascochyta blight caused by *Ascochyta lentis* and Stemphylium blight caused by *Stemphylium botryosum* are common. They are cosmopolitan in occurrence and are highly destructive diseases. Comprehensive survey regarding the incidence,

prevalence and characterization of foliar fungal pathogens of lentil in Pothwar region has not been done yet. Therefore, the study has been planned to document the incidence and prevalence of the pathogens or diseases on lentil crop in Rawalpindi. Foliar samples infected with fungi were collected from infected fields and cultured on artificial media. The purified isolates will be cultured on suitable media including potato dextrose agar (PDA), malt extract agar (MEA) and Czapekdox agar (CDA). Those purified cultures will be characterized morphologically to determine their species. The pathogenic behavior of isolated fungal agents will be determined on healthy detached leaves of lentil crop. The positive or pathogenic fungal isolates will be further characterized. Incidence of the pathogenic isolates in lentil crop fields will also be recorded. The present study will depict the true picture of highly destructive foliar fungal pathogens on lentil crop which is prerequisite for the development of diseased management strategies for this crop.

F18

OCCURRENCE AND CHARACTERIZATION OF FUNGAL SPECIES ASSOCIATED WITH OLIVE AND FIG DECLINE IN MARSA MATROUH REGION, EGYPT. Y. Ahmed[1], Ivan Virtuosi[2] A. Hussien[3] and T. Yaseen[2]. (1) Plant Pathology Research Institute, Agriculture Research Centre, 9 Gamaa Street, Giza, Egypt, Email: yosra.ahmed@arc.sci.eg; (2) CIHEAM/Mediterranean Agronomic Institute - Bari, Via Ceglie 9 - Valenzano(BA), Italy; (3) Central Administration of Plant Quarantine, Dokki, Giza, Egypt.

Olive (*Olea europea*) and fig (*Ficus carica)* are common crops cultivated in many Mediterranean countries as well as in Egypt. They could be attacked by various fungal pathogens, causing great quantitative and qualitative yield losses. Severe decline symptoms have been observed recently in several orchards of Marsa Matrouh governorate, however, the identity of the causal pathogens has not been investigated. During 2014 and 2015, a survey was carried out in five locations representing the main olive and fig production areas in Marsa Matrouh (Ras-Elhekma, Reteem, El-Kaser, Sidi Barrani, and Wadi Kharouba). The study aimed to evaluate the phytosanitary status of the olive and fig trees; to assess the occurrence of fungal diseases; and to characterize their associated causal agents. Typical symptoms of root rot, branches canker and malformation, leaf rust, dieback and severe decline were reported in all the investigated olive and fig orchards. Samples were collected from symptomatic plant tissues and isolation was made on different growth media. Different fungal species were accordingly isolated from the margin between symptomatic and healthy tissues. *Fusarium solani, F. oxyposrum, F. equiseti, Rhizoctonia solani, Macrophomina phaseolina, Pythium irregulare, Lasiodiplodia theobromae, Eutypa lata, Acremonium curvulum, Alternaria alternate, Trichothecium roseum, Cladosporium cladosporioides, C. herbarum, Stemphyllium* sp., *Rosellinia limonispora, Eucasphaeria capensis, Geosmithia flava,* and *Epicoccum nigrum* were identified based on morphology, culture characteristics and DNA sequence analysis of ITS region. *L. theobromae* was the most predominant species associated with dieback symptoms followed by *T. roseum. Eutypa lata* was reported only in Sidi Barrani region. According to the available literature and based on our knowledge; this is the first finding of Eutypa dieback caused by *E. lata* on olive in Egypt. The current study provides basis for understanding phytosanitary issues of olive and fig in Marsa Matrouh, and provide essential data for development of integrated disease management strategy and improve crops production.

F19

ANTIFUNGAL AND ENZYMATIC EFFICACY OF SOME PLANTS IN MOROCCO. F. Benkhalti[1], M. Bichra[2], C. El Modafar[2] and H. Bouamama[1]. (1) Laboratory of Bioorganic and Macromolecular Chemistry; (2) Laboratory of Biotechnology of the Valorization and Protection of Agro-resources, Faculty of Sciences and Technology of Cadi Ayyad University of Marrakech, P.O. Box 549, Av. Khattabi, 40000, Morocco, Email: benkhalti.f@gmail.com

The use of natural preservatives has become a major challenge, especially for sensitive fruits with high damage after harvesting or during the food manufacturing process. This study is based on the evaluation of antioxidant and anti-microbial substances extracted from six plants widely used in traditional Moroccan medicine. The use of organic and water extracts of those plants especially *Mentha suaveolens*, in the prevention of the enzymatic browning, catalysed by polyphenol oxidases (PPO) and peroxidases (POD), showed a high effect on PPO. Whereas, all extracts of *M. suaveolens* presented only a minor effect on POD of apple. This inhibition exceeded the effect of potassium sorbate, while all plants have a simple effect on the enzymes. This effect is associated with the chemical composition of those plants. The study also proved that the evaluated species are rich in phenolic compounds and essential oils. The antifungal activity of the extracts was estimated by the method of the minimum inhibitory concentration (MIC) on *Penicilium digitatum* and *Alternaria* sp. The results obtained showed that all tested plants, except *Salvia officinalis*, had an effect on *P. digitatum* at an effective mean (EC_{50}) of 0.5-5 mg/ml. *Alternaria sp.* showed much less sensitivity. On the basis of the results obtained, the medicinal herbs studied represent a potential source of bio-preservatives due to their richness in antioxidant and antimicrobial compounds.

F20

SURVEY OF FUNGAL DISEASES OF BANANA IN THE JORDAN VALLEY. Ahmad Mohamad Almomany, Nida Salem and Monther Tahat, Department of Plant Protection, Faculty of Agriculture, University of Jordan, Amman, Jordan, Email: momanyah@ju.edu.jo

Field survey was conducted in all banana cultivation areas in the Jordan Valley, which includes North Shounah, Deir Alla, Ghor Assafi and Southern Shounah. Seventeen field trips were conducted through the preliminary survey and 367 samples were collected from 30 different farms selected arbitrarily from Albagorah in North Jordan Valley to Ghor Assafi in the South. Samples were taken from the soil at different depths and from irrigation water in every farm as well as from Banana pseudo stem,

leaves, and roots. Samples included also Banana seedlings from private nurseries in the Jordan Valley. Fungal propagules were calculated per gram oven dry soil. Every sample was tested on PDA in the laboratory by direct plating and making different dilutions. Fungi isolated from Banana plant parts were identified morphologically and confirmed by using molecular tests. To evaluate disease incidence and disease severity, 50 different Banana plants from each farm were arbitrarily chosen and visually tested. The development of the disease symptoms was rated using the scale of Kempe and Sequeira (1983). In the survey, the following diseases were isolated and recorded from banana plants and soil as well as from irrigation water samples: Fusarium wilt called Panama disease caused by *Fusarium oxysporum* f.sp. *cubense* was found in all Banana farms and it was the most destructive disease in Jordan Valley, *Rhizoctonia solani, Pythium* and *Cladosporium musae*. Five Fusarium species were isolated from different banana farms in Jordan and four of them were reported for the first time and confirmed by polymerase chain reaction (PCR) using specific primers, followed by cloning and sequencing. Nurseries played partially an important role in disease distribution and transmission. Old age Banana farms cultivated for long time were highly infected with Panama disease in comparison with young farms that were planted every two years in a banana free land.

F21

PRODUCTION OF TRANSGENIC PLANTS FROM SOME APPLE CULTIVARS AND ROOTSTOCKS.

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The aim of the present study was to develop an efficient and practical reproducible approach of *Agrobacterium*-mediated transformation which harbour *g2ps1* gene for apple cultivars Golden Delicious, Royal Gala and rootstocks MM111 and M26 for improving their fungal resistance. Adventitious shoot formation from leaf pieces of apples studied was achieved using middle leaf segments taken from the youngest leaves from *in vitro*-grown plants. Optimum conditions for 'direct' shoot organogenesis resulted in high regeneration efficiency of 90, 95, 92 and 94% producing one or more shoot per explant with high regeneration rates of 4.5, 5.6, 4.0 and 4.1 new shoots in the studied apples, respectively, on Murashige and Skoog (MS) medium to which 2.0 mg/l TDZ (Thidiazuron (N-phenyl-N-1,2,3-thiadiazol-5-yl urea)) with 0.2 mg/l NAA (a-naphthalene acetic acid) were added. Middle leaf segments were more responsive than the upper or lower part of the leaf. Therefore, middle leaf parts were used afterwards for organogenesis using leaf tissues of the studied apples. Genetic transformation of the studied apples were then obtained using g_2ps_1 gene from *Gerbera hybrida* which contributes fungal and insect resistance was used. Putative transgenic shoots could be obtained on MS media with 5.0 mg l^{-1} BAP, or 2.0 mg l^{-1} TDZ with 0.2 mg l^{-1} NAA in the presence of the selection agent "PPT" (Glufosinate-amonnium Pestanal ® (Riedel-de Haen)) at 3.0 mgl^{-1}. Shoot multiplication of transgenic shoots was achieved on: MS +1.0 mg l^{-1} BAP (N6-benzylamino-purine) + 0.3 mg l^{-1} IBA (Indole-3-butyric acid), 0.2 mg l^{-1} GA3 (Gibberelic acid), with the selection agent PPT at 3 mg l^{-1} and were sub-cultured every 4 weeks. Transgenic clones of the studied apples were obtained and confirmed by selection on the media containing the selection agent "PPT" and by PCR analysis using the suitable primers in all clones obtained for the presence of the “selection” bar gene (447bp) and the gene-of- interest *"g2PS1"* (1244 bp), with transformation efficiency of 0.4%,0.6%,0.1% and 0.3%, respectively. Results of DNA sequence analysis of the transgenic plants also proved the successful transformation and had sequence homology with the gerbera syntheses *g2ps1* gene, these transgenic clones were multiplied further and rooted *in vitro* by transferring 2-3 cm long shoot tips to rooting ½ MS basal medium supplemented with 1.0 mg/l IBA, in the presence of the selection agent 'PPT'. Rooted transgenic plantlets were successfully acclimatized and are being kept under-containment conditions according to the bio safety by-law in Syria to evaluate their performance for fungal resistance.

F22

GENETICS OF RESISTANCE TO STRIPE RUST CAUSED BY *PUCCINIA STRIIFORMIS* F. SP. *TRITICI* IN THREE BREAD WHEAT CULTIVARS.

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Yellow rust of wheat (*Triticum aestivum*) caused by *Puccinia striiformis* f. sp. *tritici*) is a devastating disease in temperate regions when susceptible varieties are grown. With frequent and severe outbreaks, disease resistance is a key tool for controlling stripe rust on wheat. This research aimed to determine the number of genes controlling adult plant resistance (APR) to yellow rust in three elite spring bread wheat cultivars (Babaga-3, Hammam-4 and Khadir-1). The inheritance of yellow rust resistance was studied in the field in 2011-2012 at ICARDA, Aleppo, Syria. Crosses were made between the susceptible parent spring bread wheat (Avocet“S”) with each of the three resistant cultivars. The F1 progenies of the crosses were resistant, indicating that the resistance in these cultivars is governed by dominant genes. Parents, F2, F3, BC1F1, and BC1F2 populations were evaluated for reaction to isolate 70E214 of yellow rust. The results showed that resistance in Babaga-3 is controlled by three dominant genes with epistasis interaction, whereas two dominant genes controlled the resistance in Hammam-4 and Khadir-1. The results also showed that the evaluation of F3 or BC1F2 families were highly relevant to support the results achieved by F2 or BC1F1 plants.

F23

MORPHOLOGICAL AND HISTOPATHOLOGICAL STUDY OF *XANTHORIA PARIETINA* AND *DIPLOICIA CANESCENS* LICHENS INFECTING CITRUS TREES IN SHARKIA GOVERNORATE, EGYPT. Ali M. Kortiem, Faculty of Technology and Development, Zagazig University, Egypt, Email: Ali. koreim@yahoo.com

In Egypt, lichen studies as one of plant pathogens are very important to create more attention for studying their effect on fruit trees than they have so far received. In recent years, the harmful effect of the epiphytic lichens upon higher plants especially fruit trees has been established. It was noticed that many citrus orchards in Sharkia Governorate, especially the neglected ones, were heavely infected with lichens. Investigation of the collected lichen samples, and by using identification keys, indicated that the more abundant lichen species were *Xanthoria parietina* and *Diploicia canescens*. Freezing microtome and light microscope were used to study the anatomy of each lichen thallus and fruiting bodies. The histopathological characters as well as the physical attachment between lichen thallus and citrus tree bark tissues were studied. The anatomy of *X. parietina* thallus showed a typical foliose lichen layers i. e. upper cortex, algal layer, medulla, lower cortex and rhizines. The rhizines were spreading over the cork-tissue forming foot-like structure. No penetration was noticed except the loosely cork layer in the contact center point. The anatomy of *D. canescens* thallus showed a typical crutose lichen layers which lack the presence of lower cortex and rhizines. Superficial penetration by the lichen hyphae was also noticed through the cork tissue which caused disruption and separation of the cork layer.

F24

STUDIES ON DISTRIBUTION OF SOME SOIL-BORNE FUNGAL DISEASES IN MAJOR STRAWBERRY PRODUCING GOVERNORATES IN EGYPT. M.E. Ragab[1], Reda E. Ahmed[2], E. Embaby[3], Amany Attia[2] and Heba H. Mohamed[2]. (1) Hort. Department, Faculty of Agriculture, Ain Shams University, Egypt, Email: mohamedragab99@hotmail.com; (2) Hort. Res. Institute, Agric. Res. Center, Egypt; (3) Plant Disease Department, National Res. Center, Egypt.

These experiments were carried out at Ismaelia, Beheira and Kalubia governorates on basic and foundation strawberry plants. The aim of the work was to collect strawberry samples from roots and runners showing disease symptoms such as stunting, root rots, wilt and death, in order to isolate and identify the causal organisms and their effects on growth and yield. Infected plants with the above mentioned symptoms of Tamar and Yael cultivars were observed in the open field and on foundation plants in the greenhouse. Higher incidence of root diseases was recorded in cv. Tamar compared with Yael, in both greenhouse and open field plants. The incidence of naturally diseased cv. Tamar were 3.6% and 1.6% in open field and greenhouse (foundation plants), respectively. Whereas, disease incidence in Yael cultivar reached 0.8% and zero in the open field and greenhouse (foundation plants), respectively. The causal agents were *Fusarium solani, Fusarium oxysporum, Macrophomina phaseolina* and *Rhizoctonia solani*. Results showed also that fungi belonging to Fusarium genus were the most frequent (41. 2%) followed by Macrophomina (35.3%), and Rhizoctonia was the least frequent (11.8%). Strawberry seedlings roots were more infected than crowns, with infection rates of 44.7% and 33.3%, respectively. Results also indicated that the highest infection rate was found in Kalubia followed by Ismailia and the lowest was in Behira governorate. There was clear reduction in yield and fruit quality due to the different root rot diseases.

F25

EFFECT OF INCUBATION TEMPERATURE ON LESION DIAMETER OF *PENICILLIUM EXPANSUM* ON APPLE FRUIT VARIETIES. Abdul Sattar[1], Abid Riaz[1], Zobia Jabeen[2] and Syed Zulfiqar Ali[2], (1) Department of Plant Pathology, PMAS Arid Agriculture University Rawalpindi, Pakistan, Email; abdulsattarkoli@yahoo.com; (2) Department of Plant Pathology, Balochistan Agriculture College Quetta, Pakistan.

Fungal infections are the major cause of postharvest rots of fruits and vegetables in storage. Infections caused during postharvest conditions mitigate the shelf life and shape the market value of fruits negatively. Apple being a delicate product is prone to qualitative and quantitative losses after harvest. *Penicillium expansum* Link. (blue mold) is one of the most important causes of postharvest losses in apple production and its spread is directly influenced by storage temperature and fruit variety. This study was carried out under laboratory conditions to check the effect of temperature on lesion diameter of fungal growth in most prominent apple fruit varieties grown in Pakistan. Four temperature (5, 15, 25 and 35°C) treatments were provided to fruits of each variety after inoculation with spore suspension adjusted at 10^6 spores/ml and growth of *P. expansum* was measured regularly for a 12 days period at 3 days intervals. Pathogen showed maximum growth (23mm) at 25°C and minimum growth (11mm) at 5°C in all varieties, whereas moderate growth was observed at 15°C and 35°C. Golden Delicious apple which have thin cuticle and prone to injuries more frequently as compared to other varieties was found most susceptible at all temperatures, whereas Red Delicious proved to be the most resistant against pathogen growth at all temperatures tested.

F26

STUDY ON ALTERNARIA LEAF SPOT DISEASE ON LEAVES OF MASTIC SHRUBS *PISTACIA LENTISCUS* L. IN MID REGION OF AL-GABaL AL-KHDAR, LIBYA. O.M. El-Sanousi, H.A. Kalifa and Z.I. El-Gali, Department Plant protection, Fac. of Agriculture, University of Omar Al-Mukhtar, Libya, Email: Omarelsanousi2@yahoo.com

In a disease survey in the muid-region of Al-Gabal Al-Akhdar, brown spots were observed on leaves of mastic shrubs *Pistacia lentiscus* L. This study was conducted to determine the fungi that caused these symptoms on *P. lentiscus*. The study included disease incidence and prevalence in three areas of different altitudes (Al hamama,

Alwsita and Algariga). The vegetation density and its diversity in specific sectors was also included. The results recorded that the highest density of vegetation was in Al-hamama and the lowest was in Al-gariga. The results indicated that the density of pistacia shrubs was 32, 30, and 27 plants per sector in Al hamama, Algariga and Alwsita, respectively. There was an association between the leaf spot symptoms and the presence of *Alternaria alternate* fungus. The presence of mycelia and conidia of the fungus in plant tissues was associated with white leaves. The highest disease incidence was recorded in Al hamama, followed by Algariga and Alwsita. The host range stydy showed the ability of the isolated fungus to infect pistachio *(Pistacia. vera*), *Pistacia atlantica, Ceratonia siliqua* and *Olea erupia*. The best medium for the fungus growth was potato sucrose agar (PSA) followed by potato and pistacia leaf extract agar (PLA). The range of temperature for fungus growth on nutrient media was 20-30^{0}C). The density of mycelial growth was reduced under continued light, whereas the alternation between light and darkness resulted in the formation of concentric rings. The best fungal growth was shown under the dark. *A. alternata was* able to grow well at humidity levels of 35-100% and a wide range of pH (4.5–9).

F27

EFFECTIVENESS OF SOME OILS IN CONTROLLING FUNGI ISOLATED AND IDENTIFIED FROM TULIP BULBS FLOWERS. Saba Baqer Al–Guboori, Mohamed Meshaan and Yehiya Sadeeq, Plant Protection Department, College of Agriculture, University of Baghdad, Iraq, Email: s_aljuboory@yahoo.com

A survey of fungi associated with imported tulip flower bulbs available in the local markets of Baghdad and from infected plants bulbs were planted in a green house. Four fungi were isolated *Rhizopus* sp., *Aspergillus niger*, *Penicillium* sp. and *Fusarium oxysporium.* The frequency rates of these fungi reached 16.66, 16.66, 23.80 and 50.00%, respectively. The efficiency of cummin (*Cuminum cyminum)* oil and rosemary (*Rosmarinus officinalis)* oil were tested against *F. oxysporium* with three concentration 1000, 1500 and 2000 ppm on PDA medium. The results showed that the effectiveness of oils in inhibiting the growth of fungus reached 20.44, 40.47 and 60.30% for the cumin oil and 30.5, 47.2 and 51.3% for the rosemary oil, for the three concentrations, respectively, compared with 0.0% in the control treatment.

F28

FREQUENCY OF YELLOW RUST (*PUCCINIA STRIIFORMIS* F. SP *TRITICI*) RACES ON WHEAT IN NORTHEASTERN SYRIA DURING 2001-2013 PERIOD. Omran Youssef, Helim Youssef, Alan Ramo, Mahmoud Hasan, Sultan Shekhmous, Afrem Issa, Nawzad Suleman and Abdul-Ruhman Issa, The General commission for Scientific Agricultural Research (GCSAR), Al-Qamishli Agricultural Research Center, Al-Qamishli, Syria, Email: om_youssef@yahoo.com

A study for monitoring yellow rust disease of wheat in northeastern Syria was conducted during 2001-2013. Differential cultivars of yellow rust were planted in two locations: the first in Al-Qamishli Agriculture Research Center during 2001-2013 and the second in Al-Yanbouh station in Al-Malekya during 2007-2013. Results obtained showed the frequency of some yr-genes to *Puccinia striiformis* f. sp *tritici* which varied from one year to another according to rainfall and temperature during the growing season. 28 yr-genes were recorded during the study period: (S; Yr7), (W; Yr7+?), Yr7, Yr8, (S; Yr8), Yr9, (W), (W; YrND), (W; Yr32), Yr A, YrA+ Yr18, Yr18+, Yr17, (W; Yr10), Yr27, Yr2, Yr6, (S; Yr6+1), Yr18, Yr21, Yr25, Yr28, Yr29,, Yr27+?, Yr31, Yr6+ Yr20, Yr27+ Yr18, Yr31+APR. Infection with two yr-genes: Yr8 and W; Yr32 were found only in Al Qamishli in 2001. Whereas, infection with the following eight yr-genes was found in Yanboh Station in Al Malekya: (S; Yr8), (W), Yr27+?, Yr31, Yr6+ Yr20, Yr27+ Yr18, Yr31+APR, Yr27(Ciano 79). Infection with 19 yr-genes was found in two locations in more than one year: (S; Yr7), (W; Yr7+?), Yr A, YrA+ Yr18, Yr18+, Yr17, (W; Yr10), Yr27, Yr2, Yr6, (S; Yr6+1), Yr18, Yr21, Yr25, Yr28, Yr29, Yr7, Yr9, (W; Yr ND). Infection with one yr-gene was found in six years, 3 yr-genes in 5 years, 5 yr-genes in 4 years, 8 yr-genes in 3 years and 10 yr-genes in 2 years. Based on rainfall and temperature during the wheat growing season showed a clear effect of ecologic conditions on the occurrence of yr-genes in some years on the same differential cultivars sensitive to infection with yellow rust. The year 2010 was distinct for the appearance of a new Yr gene (Yr27), induced by the heavy inoculum pressure imposed on the wheat crop because of optimal weather conditions and the availability of susceptible cultivars in large areas.

F29

MUTAGENESIS AND *IN VITRO* SELECTION FOR IMPROVEMENT OF DATE PALM CV DEGLET NOUR AGAINST BAYOUD DISEASE. H. Khelafi[1], M.H. Sedra[2], F. Abed[1], D. Yatta[1], L. Djellal[1] and M.S. Yakhou[1]. (1) INRAA Biotechnology and Plant Breeding Division. CRP Mehdi boualem BP37, Route de Baraki 16210, Algeria, Email: hkhelafi@hotmail.com; (2) INRA Laboratory of Phytopathology, Genetic and Integrated Control, Centre régional de Marrakech, BP 533, 40000 Marrakech, Morocco.

In Algeria, Deglet Nour variety of date palm is one of the best in quality but very sensitive to Bayoud disease. This vascular fusariosis is caused by *Fusarium oxysporum* f. sp. *albedinis (Foa).* The best way to control this disease is through the development of resistant varieties. Induction of resistance in a sensitive variety is possible by radio mutagenesis techniques. For this purpose, embryogenic callus of date palm cultivar Deglet Nour were irradiated at 20 Gy from a Cobalt^{60} source. Leaves detached from 20 *in vitro* plants regenerated from irradiated embryogenic callus were used to evaluate their resistance to *Fusarium* wilt. Two concentrations, 25 µg/ml and 50 µg/ml of the fraction FII toxin were used. Mutants previously tested using the toxin were inoculated with 100 ml of the conidia suspension of *Foa* at a concentration of 10^6 sp/ml. 11 in vitro plants which showed resistance to the pathogen were transferred to a field infested with the pathogen to confirm their

resistance to the bayoud disease and evaluate agronomic traits.

F30

EFFECTIVENESS OF BIOCHARCOAL AMENDMENT IN LEAD (PB) AFFECTED SOILS IN RELATION TO SUPPRESSION OF TOMATO EARLY BLIGHT (*ALTERNARIA SOLANI*) DISEASE. Abdul Rehman[1], Muhammad Sajid Mehmood[1], Muhammad Waqar Alam[1], Hafiz Naeem Asghar[2] and Saira Mehboob[3]. (1) Department of Plant Pathology, University of Agriculture Faisalabad, Email: rehman.abdul@uaf.edu.pk; (2) Institute of Soil and Environmental Sciences, University of Agriculture Faisalabad; (3) Plant Pathology Research Institute, AARI, Faisalabad, Pakistan.

Tomato is an important horticultural crop and is cultivated around the globe. Tomato early blight caused by *A. solani* is a common disease and is found in all tomato growing areas. *A. solani* produces dark brown necrotic lesions containing concentric rings on leaves, stem and fruits. In the present study, biocharcoal was used for the management of (a) lead phytotoxicity, and (b) tomato early blight. Lead (Pb) is a heavy metal present in the soil, underground water and in the atmosphere. The adopted experimental design was the completely randomized design (CRD) with three replications for each treatment. Disease severity, percent disease index (PDI), plant height, number of fruits and total phenolic contents were monitored. It was observed that disease severity and PDI increased with the increasing concentration of Pb in soil, whereas disease severity and PDI were significantly reduced in biocharcoal amended soil. Biocharcoal amendment significantly increased plant height, number of fruits, total phenolic contents and suppressed the disease in Pb polluted soil as well as in non-polluted soil. Effectiveness of biocharcoal to suppress disease in Pb polluted soil was reduced as compared to non-polluted soil. Significant increase in plant height, number of fruits and total phenolic contents were more observed in biocharcoal amended soil not contaminated with $Pb(NO_3)_2$ than in contaminated soil, suggesting that soil pollution reduced the effectiveness of biocharcoal. Increased plant's total phenolic contents in Pb polluted and biocharcoal amended soil may be involved in detoxification of Pb phytotoxicity and in disease suppression.

F31

VIRULENCE PATTERNS AND MOLECULAR DIVERSITY OF OLD AND RECENTLY EMERGED POPULATIONS OF *PUCCINIA STRIIFORMIS* F. SP. *TRITICI* ON WHEAT IN EGYPT. Ibrahim Sobhy Draz, Wheat Diseases Research Department, Plant Pathology Research Institute, Agricultural Research Center, Giza, Egypt; Email: dr.ibrahim_draz@yahoo.com

Pathotypic evolution of *Puccinia striiformis* f. sp. *tritici* (Pst), the causal fungus of wheat stripe rust, has increased dramatically during the recent years and many wheat cultivars have been affected by the disease. The susceptibility of these cultivars was mainly due to the dynamic nature of the causal organism population which produced new virulent races able to breakdown cultivars resistance to the disease. Old and recently emerged Pst populations were differentiated based on virulence and molecular variations. Virulence patterns of Pst populations were identified based on the reaction of the 17 World/European differential set (*Yr* genes), indicated the presence of four new pathotypes i. e. *0E16* (*Yr8* virulence), *4E130* (*Yr2, Yr6* and *Yr7* virulences), *64E0* (*YrSU* virulence) and *66E0* (*Yr7* and *YrSU* virulences). Simple sequence repeat (SSR) markers were used to detect the molecular polymorphism of Pst pathotypes, and no similarity was detected. The contemporary populations of Pst obtained during recent seasons were very distinct from old populations based on virulence and SSR markers, since the old pathotypes may have been replaced by contemporary pathotypes. The new virulences appear to be genetically distinct and may represent an exotic introduction rather than a mutation in isolates of the old pathotypes. Further studies on the potential resistance genes to the detected Pst virulences are needed.

F32

PARTIAL RESIATANCE TO STEM RUST IN EGYPTIAN WHEAT VARIETIES. M.A. Hasan, A.A. Shahin and M. Abou-Zeid, Wheat Diseases Res. Department, Plant Pathology Research Institute, ARC, Giza, Egypt, Email:abdelkaderhasan@yahoo.com

Stem rust has been one of the most destructive diseases of wheat in Egypt and worldwide, and can cause complete annihilation of wheat crops over wide areas during epidemic years and late sowings. The locally produced wheat cultivars have been developed as field resistant to stem rust regardless of the reactions in term of infection types. Partially resistant cultivars were characterized by their high potential to slow down the incidence and development of stem rust infection, under favorable field conditions at rust hot spots, in contrast to the highly susceptible cultivars. Therefore, this study was carried out to characterize partial resistance (PR), as a more durable form of resistance in 8 Egyptian wheat cultivars to stem rust. Rust incidence as a final rust severity (FRS%), area under disease progress curve (AUDPC), and rate of disease increase (r-value) were found to be lower in magnitude in PR cultivars than in the highly susceptible ones under the same field conditions in the two years under study (2014/2015 and 2015/ 2016). Among the tested cultivars, only three Sakha 94, Gemmiza 9 and Giza 168 proved to have an adequate level of PR, compared to the highly susceptible cvs. Misr 1, Sids 12, Gemmiza 11, Shandwil 1 and Misr 2, which showed the lowest values of the previous parameters. Thus partial resistance to stem rust in wheat genotypes could be accurately measured, characterized, screened and selected equally well under field conditions by using the most convenient epidemiological parameters, FRS%, AUDPC and r- value.

F33

EVALUATION OF CHICKPEA GENOTYPES FOR RESISTANCE TO ASCOCHYTA BLIGHT. A.K. Al-Taae[1], H.H. Al-Taae[1], A.H. Thanoon[1] and S.S. Murad[2]. (1) Plant Protection Department College of Agric. & Forestry, Mosul University, Iraq, Email: htaae@yahoo.com; (2)

Ninevah Agriculture Directorate, Ministry of Agriculture, Iraq.

A survey was carried out in three regions in Ninevah province during the season of 2011. Results showed that disease incidence and chickpea Ascochyta blight score were different from one region to another. High average disease incidence and score was 70% and 5.8 in Fyda, respectively. Results of isolation and diagnosis showed that the disease is caused by *Ascochyta rabiei* (Pass.) Labr. Results of screening twenty genotypes of chickpea for susceptibility to the disease indicated that five genotypes were resistant (FLIP05-85C, FLIP 05-113, FLIP 06-156, FLIP o6-93 and FLIP 06-102C), six were moderately resistance (FLIP03-72C, FLIP05-57C, FLIP05 -74C, FLIP05-90C and FLIP05-154C and Dijla), six were susceptible (FLIP97-220, FLIP04-22C, FLIP05-18C, FLIP05-44C, FLIP05- 17C and Rafidane), and three were highly susceptible to Ascochyta blight (FLIP05-50C, ILC 263 and local).

F34

EVALUATION OF DIFFERENT TREATMENTS FOR THE MANAGEMENT OF CHICKPEA BLIGHT (*ASCOCHYTA RABIEI*) UNDER FIELD CONDITIONS. Salman Ahmad[1], Muhammad Aslam Khan[2], Irfan Ahmad[3], Ejaz Ashraf[1], Zafar Iqbal[1], Hafiz Mohammad Aatif[4] and Sharma Mamta[5]. (1) College of Agriculture, University of Sargodha, Sargodha, Pakistan. Email: salmanahamd@uos.edu.pk; (2) Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan; (3) Department of Forestry and Range Management, University of Agriculture, Faisalabad, Pakistan; (4) Bahadur Campus Layyah, Bahauddin Zakariya University, Multan, Pakistan; (5) International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad, Telangana, India.

Two fungicides, Aliette and Thiovit$_{Jet}$ @ 0.15%, containing aluminum tris (O-ethyl phosphonate) and sulphur compounds, respectively; two plant extracts, *Melia azedarach* and *Azadirachta indica* @ 8% and a one antagonist, *Trichoderma harzianum* @ 10^7 conidia ml^{-1} were investigated for their effectiveness against chickpea ascochyta blight under field conditions. Treatments were evaluated on three chickpea varieties susceptible to chickpea blight during 2011 and 2012. Field trials revealed that Aliette and Thiovit$_{Jet}$ significantly decreased disease severity to 17 and 23%, respectively, followed by *M. azedarach* and *A. indica* extracts which decreased severity to 50 and 56%, respectively, compared to control with 75% disease severity. *T. harzianum*, with a severity of 63%, was significantly less effective than fungicides and plant extracts in controlling the blight disease. The current research revealed that systemic and sulphur containing fungicides, plant extracts and the antagonist have good potential to control chickpea ascochyta blight.

F35

MORPHOLOGICAL CHARACTERIZATION OF *FUSARIUM* ISOLATES ASSOCIATED WITH LENTIL WILT. Rubab Altaf, Chaudhary A. Rauf, Farah Naz and Ghulam Shabbir, Department of Plant Pathology, PMAS-Arid Agriculture University, Rawalpindi, Pakistan and Department of Plant Breeding and Genetics, PMAS-Arid Agriculture, University Rawalpindi, Pakistan, Email: aridpmas@gmail.com

Lentil *(Lens culinaris* Medikus) is an important dietary source of protein in many parts of the world, especially in South Asia including Pakistan. The crop is vulnerable to wilt, a serious soil-borne threat incited by the fungus *Fusarium oxysporum* f. sp. *lentis.* In view of the potential threat *Fusarium* wilt can pose to lentils, these studies were considered essential, and consequently this project was initiated for the disease assessment, morphological characterization of recovered isolates the pathogen and determination of their pathogenicity. Nine districts with 28 locations were surveyed during the crop season of year 2012-13, out of which 21 showed 100% disease prevalence. In total, 15 isolates of *F. oxysporum* f. sp. *lentis* were recovered. The length and width of micro-conidia of these isolates ranged from 4.38 to 6.65 µm and 2.31 to 3.2 µm, respectively. Micro-conidia were oval shaped for all the isolates except for isolate FOL-6 (2 celled oval) and FOL-10 (oval pyriform). The length and width of macro-conidia ranged from 9.90 to 29.73 µm and 3.02 to 5.06 µm, respectively. The shape of macro-conidia was straight for all the isolates except FOL-6 and FOL-12, which were slightly curved. The mean diameter of chlamydospores ranged from 7.0 to 15.8 µm. During pathogenicity testing of 15 isolates on cv. Masoor-93, the mean disease severity index ranged from 0 (FOL-1, FOL-8 and FOL-11) to 0. 72% (FOL-3) and on line ILL 4605 ranged from 0 (FOL-1, FOL-3, FOL-5, FOL-8, FOL-10 and FOL-13) to 0. 66% (FOL-2). This line proved to be more resistant than Masoor-93.

BACTERIAL DISEASES

B1

EFFECTS OF POTASSIUM MONO-PHOSPHATE, POTASSIUM SILICATE AND CHITOSAN APPLICATIONS TO INDUCE RESISTANCE IN TOMATO PLANTS AGAINST TOMATO BACTERIAL CANKER AND WILTING DISEASE. Hussien Belal[1] and Hüseyin Basim[2]. (1) Botany Department, Faculty of Agriculture, Fayoum University, Egypt, Email: hes00@fayoum.edu.eg; (2) Plant Protection Department, Faculty of Agriculture, Akdeniz University, Turkey.

Effects of different concentrations of potassium mono-phosphate (PMF) at 10, 15, 20, 25 and 30 mM, potassium silicate (PS) at 2, 4, 6, 8, and 10 mL-1 and chitosan (CHI) at 0.05, 0.10, 0.15, 0.2 and 0.25 mM, which are alternative inducers to agrochemicals, were studied for their resistance induction ability against *Clavibacter michiganensis* subsp. *michiganensis*, the causal agent of tomato bacterial wilt and canker of tomato. Resistance induction after applications of different concentrations on the tomato variety "Ömür" was determined by the analyses of peroxidase, catalase, total protein, nitrogen content, total soluble sugar, leaf chlorophyll and carotenoids, ascorbic acid (vitamin C), leaf proline, leaf membrane stability index (%) and relative water content (%). Potassium mono-

phosphate at 10 mM concentration showed the highest resistance induction, and the disease incidence in the applied plants was 0.7% compared to 41.4% in control plants. Peroxidase and catalase activity and membrane stability index were determined to be 76.44% to 85.92% higher; from 4.2 mg protein^{-1} to 6.2 mg^{-1}; and from 4.0 mg protein^{-1} to 6.2 mg^{-1}, respectively. Such increased activities may explain increased resistance induction that prevented increase in disease incidence of infected tomato plants. The total chlorophyll content was found to be increased by the PMF 30 and PS treatments of tomato plants from 8.48 mg/g to 9.70 mg/g fresh weight compared to the control plants. The ratio of carotenoids in the PS treated tomato plants was increased from 2.40 mg/g to 2.8 mg/g fresh weight compared to the control plants. The total soluble sugar ratio of the Ki 0.05 applied tomato plants was the highest and changed from 31. 4 mg/g to 114.8 mg/g fresh weight compared to the control plants. The vitamin C content in the PMF 10 treated tomato leaves produced the highest increase of 23.0% compared to the control plants, which had 13.9% vitamin C. The nitrogen content was the highest in the PS 10 treated plants with 5.39% N compared to the control plants with 3.64% N. The protein level increased to 33.6% in the PS treated plants, whereas the control plants had 22.7% protein.

B2

VALIDATION OF REAL TIME LOOP- MEDIATED ISOTHERMAL AMPLIFICATION ASSAY (LAMP) FOR THE DETECTION OF *RALSTONIA SOLANACEARUM* IN NATURAL SAMPLES. Iman Amer[1,2], Thaer Yaseen[2], Naglaa Balabel[3,4], Ahmed Hussien[4,5] and Mohamed Soliman[3,4]. (1) Plant Pathology Department, Faculty of Agriculture, Cairo University, Egypt, Email: eman.amer@agr.cu.edu.eg; (2) C.I.H.E.A.M. International Center for Advanced Mediterranean Agronomic Studies IAM-Bari, Italy, Email: thaer@iamb.it; (3) Bacterial Disease Research Department, Plant Pathology Research Institute, Agricultural Research Centre, Egypt; (4) Potato Brown Rot Project, Ministry of Agriculture, Egypt; (5) Central Administration of Plant Quarantine, Egypt.

Ralstonia solanacearum is the causal agent of bacterial brown rot disease that affects more than 200 plant species. The bacterium is a soil borne, Gram negative, aerobic bacteria, and considered one of the most economic destructive plant pathogenic bacteria. *R. solanacearum* is enlisted on almost all quarantine lists worldwide, so rapid and accurate detection methods are a significant factor to prevent the entrance and reduce the spread of the bacteria in pathogen-free regions. Several detection methods have been developed for *R. solanacearum* including serological (IFAS) and conventional molecular methods such as PCR and real time PCR. Innovative molecular detection methods used for other pathogens like Real time LAMP for *Xylella fastidiosa* looks very interesting, due to their rapid and reliable ability to detect the pathogen. The objectives of this study aimed to evaluate the sensitivity and specificity of real time LAMP method in comparison to serological (IFAS) and other molecular methods (conventional PCR and real time PCR), and to evaluate several DNA extraction protocols from different sources (potato extract, soil extract and irrigation water). The results showed higher analytical sensitivity of real time LAMP method as compared with IFAS, PCR and real time PCR. Real time LAMP method seems to be more tolerant against inhibitors present in natural matrix, with detection limit 10-fold more sensitive than real time PCR. Primary results, showed that real time LAMP method is a promising technique for rapid and high sensitivity detection of *R. solanacearum*.

B3

CONTROL OF PEAR FIRE BLIGHT DISEASE CAUSED BY *ERWINIA AMYLOVORA* IN ERBIL PROVINCE, KURDISTAN REGION, IRAQ. Tahsein A.M. Amein[1], Ramadan Y. Mohamed[1] and Aram N. Hussein[2]. (1) Plant Protection Department, College of Agriculture, Salahaddin University, Erbil, Iraq, Email: ramadan.mohamed@su.edu.krd; (2) Plant Protection Department, Technical Institute of Khabat, Erbil Polytechnic University, Iraq.

Pseudomonas fluorescens strain L18, *Bacillus subtilis* strain K3 and five plant extracts (*Allium sativum*, *Syzygium aromaticum*, *Nigella sativa*, *Thymus vulgaris* and *Punica granatum*) were tested for their efficacy against the fire blight disease of pear caused by *Erwinia amylovora*. The results showed that both antagonistic bacterial strains had good effect on infected shoots, but *Pseudomonas* strain had much better significant effect than *Bacillus* strain. The *Pseudomonas* strain protected the shoots by 40% and reduced the disease severity index by 48% compared to *Bacillus* strain which protected the shoots by 20% and reduced the disease severity index by 32%. The pathogen was sensitive to all plant extracts, but the garlic (*Allium sativum*) extract showed the best effect. It can be concluded that the investigation of different bacterial strains as biological control agents and herbal extracts can be concidered as control components for the management of fire blight disease in the future.

B4

FIRST REPORT OF *XANTHOMONAS AXONOPODIS* PV. *CITRI* CAUSING CITRUS CANKER DISEASE IN IRAQ. Firas T.R. Al-Dulaimi, Asmaa A. Al-Kaisse, Laith A. Al-Rubaye and Mahal Amer Abdulwadood, Ministry of Agriculture, Department of Plant Protection, Iraq, Email: firas_aldulaimy@yahoo.com

Leaves, with blister-like eruption lesions and a water-soaked margin of Tangerine (*Citrus reticulate* Blance), Mexican lemon (*Citrus limon*), and Sweet orange (*Citrus sinensis* Osbec) were collected from different orchards in Diyala, Baghdad and Hilla Governorates of Iraq. Isolation and identification was carried out and virulence test of different isolates was confirmed along with symptoms produced under laboratory conditions on detached leaves using pin prick method. Results revealed that 21 (60%) isolates of *Xanthomans axanopodis* pv. *citri* was highly virulent to initiate water soaked lesion with fully developed symptoms within 10 to 15 days. 14 (40%) isolates of Xac. were slightly virulent. The results of morphological and biochemical characteristic viz., shape, colony, color, Gram reaction, starch hydrolysis, gelatin liquefaction, KOH test, indole production, oxidase reaction, acid and gas production

from different carbon sources, catalase reaction, fluorescent pigmentation test, NaCl tolerance and molecular test by conventional PCR using specific primer *pth1/ pth2* which produces an amplicon 198 bp in size, suggested the occurrence of citrus bacterial canker (CBC) in Iraq, and all 35 isolates (100%) harbored *pth A* gene. This represent the first report of CBC in Iraq.

B5

ABSENCE OF POTATO BROWN ROT AND RING ROT IN LEBANON. Elia Choueiri[1], Fouad Jreijiri[1], Samer Wakim[1], Michel Issa El Khoury[2], Franco Valentini[3], Nino Dubla[3], Daniele Galli[3], Rosine Habchy[4], Khalil Akl[5], Georges Saad[6], Emilio Stefani[7]. (1) [1]Department of Plant Protection, Lebanese Agricultural Research Institute, Tal Amara, P.O. Box 287, Zahlé, Lebanon, Email: echoueiri@lari.gov.lb; (2) Lebanese Agricultural Research Institute, Abde Station, P.O. Box 752, Tripoli, Lebanon; (3) CIHEAM - Istituto Agronomico Mediterraneo, Via Ceglie 9, 70010 Valenzano (BA), Italy; (4) Plant Protection Department, Lebanese Ministry of Agriculture, Beirut, Lebanon; (5) Agriculture Service of Bekaa, Lebanese Ministry of Agriculture, Bekaa, Lebanon; (6) Plant Quarantine Department, Beirut Port, Lebanese Ministry of Agriculture, Lebanon; (7) Department of Life Sciences, University of Modena and Reggio Emilia, via Amendola 2, 42122 Reggio Emilia, Italy.

Potato is a strategic crop for Lebanese agriculture, covering about 11,000 ha and with production of approx. 300,000 T per year and is the highest field crop tonnage in this country. Despite its importance, potato production in Lebanon has not achieved full export potential because of a number of production constraints among them consistent field surveys and laboratory analyses for the possible detection of bacterial quarantine diseases. Accordingly, extensive surveys were carried out during three consecutive potato growing seasons (2013–2015) in the main potato growing areas of Lebanon, to assess the occurrence of potato brown rot caused by *Ralstonia solanacearum (Rsol)* and potato ring rot caused by *Clavibacter michiganensis* subsp. *sepedonicus (Cms)*. A total of 232 potato samples were collected from Bekaa valley and 145 samples from Akkar plain, which are the major potato cultivation regions in Lebanon. Composite samples consisting of 200 tubers were collected at random from each field in the survey following the official EU methods for detection and diagnosis of *Rsol* and *Cms* in potatoes. In addition, 12 potato demonstration fields established in Akkar plain and designed for potato export to European markets were also surveyed using the same strategy. Furthermore, surveys of surface water used for crop irrigation were carried out at potato-growing sites in the traditional potato growing regions and a total of 40 sampling sites in Bekaa and 19 sites in Akkar were established to collect surface water. GPS coordinates of potato fields and water sampling sites were recorded to map specific sampling points using Geographic Information System. Laboratory analyses gave negative results for the presence of *Rsol* and *Cms* in potatoes and *Rsol* in water samples. Additionally, a total of 1686 potato seed samples and 815 Egyptian potato samples, imported from abroad and Egypt, respectively, over three growing seasons (2013–2015), were also tested for the presence of the potato brown and ring rot bacteria, in the framework of official checks planned to avoid the entry and spread of *Rsol* and *Cms* from areas where they are present. All samples referring to imported potato lots were free from *Rsol* and *Cms*. An official monitoring system for *Rsol* and *Cms* has been established in Lebanon. This will enhance the phytosanitary quality of potatoes and provide their access to broader international markets.

B6

EVALUATION EXTREMELY LOW FREQUENCY ELECTROMAGNETIC WAVES AT RESONANCE FREQUENCY FOR CONTROLLING POTATO BROWN ROT CAUSED BY *RALSTONIA SOLANACEARUM*. F.M.Aly[1], Naglaa M. Balabel[2], Kh.Gh. Elmalki[3], A. Almaghraby[4] and A. Amin[4]. (1) Biophysics Department, Faculty of Science, Cairo University, Egypt; (2) Plant Pathology Research Institute, ARC, Egypt; (3) Plant Protection Res. Institute, ARC, Egypt; Email:khilloelmalky@yahoo.com; (4) Eng. Authority of the Armed Forces, Egypt.

One of the main problems facing potato production is brown rot. Potato brown rot is a systemic bacterial wilt disease caused by aggressively colonize the xylem vessels causing a lethal wilting. Control of potato brown rot has proven to be a serious, very difficult and puzzling task. As a result it became one of the major obstacles in the total value of Egyptian potato exports. As potato brown rot was declared a quarantine disease of concern in the EU. This work aimed to assess the efficiency of very low waves of to detect infestation of land and potatoes' tuber by brown potato rot as well as control that aggressive bacteria. R-Fast device had been manufactured as specific detector of brown potato rot bacteria in both land and tubers. Results confirmed on efficiency of R-Fast device for that purpose. Results showed that, treating potato field by electromagnetic resonance for one hour achieved 100% mortality of bacteria, *Ralstonia solanacearum* in soil and tubers. There was insignificant differences between treating potato fields for one and two hours. Chemical analysis of certain potato leaves contents showed that, significant increase of total protein, potassium and phosphorus of treating leaves. Chemical control of potato tubers confirmed the results of leaves. It means that, treating potato fields by very low waves of electromagnetic resonance improved the nutritional values of potato tubers well as increased the crop yield by about 15% of control.

VIRAL DISEASES

V1

SURVEY FOR LEGUME AND CEREAL VIRUSES IN LIBYA. Hatem Abukraa[1], Safaa G. Kumari[2] and Fawzi Bshia[1]. (1) Plant Protection Department, Agriculture Research Center, Tripoli, Libya, Email: hatemabukraa@gmail.com; (2) International Center for Agricultural Research in the Dry Areas (ICARDA), Terbol Station, Beqa'a valley, Zahla, Lebanon, Email: s.kumari@cgiar.org

A field survey was conducted during March and April 2010, to identify viral diseases affecting cereals and legumes in different regions of Libya. A total of 3706 barley and wheat samples were collected randomly in addition to 198 symptomatic samples from 22 barley and 20 wheat fields. Moreover, 34 symptomatic legume samples were collected from two faba bean fields and one field of lentil, chickpea, *Vicia sativa*, *Vicia ervillia* and *Vicia narbonesis.* All samples were tested at ICARDA Virology laboratory by tissue blot immunoassay (TBIA) using specific antibodies. Results of random cereal samples showed that *Barley yellow dwarf virus-PAV* (BYDV-PAV) was more common (12.6%) in wheat and barley samples, followed by *Wheat dwarf virus* (WDV) (1.08%). In symptomatic samples, BYDV-PAV was also the most common (45 out of 187 samples tested were infected: 45/187), followed by WDV (23/187), *Barley yellow striate mosaic virus* (BYSMV) (17/187) and *Maize streak virus* (MSV) (7/187). In the legume fields, *Soybean dwarf virus* (SbDV) (13 out of 34 samples tested were infected: 13/34) was more common, followed by *Bean leafroll virus* (BLRV) (12/34), *Chickpea chlorotic stunt virus* (CpCSV) (5/34) and *Beet western yellows virus* (BWYV) (4/34). This is the first report of WDV, MSV and BYSMV on cereal crops, and BLRV, BWYV, SbDV and CpCSV on legume crops in Libya.

V2

OCCURRENCE OF TOMATO LEAF CURL NEW DELHI VIRUS INFECTION ON CUCURBITS AND TOMATO IN TUNISIA. S. Zammouri, J. Eddouzi, M. Sadok Belkhadhi, M.R. Hajlaoui and M. Mnari-Hattab. (1) Laboratoire de Biotechnologie Appliquée à l'Agriculture, INRA Tunisie, Université de Carthage, El Menzah, 1004, Tunis, Tunisia Email: semiazamm@gmail.com; (2) Centre technique pour les cultures géothermiques cité el Manara 6011 Gabes, Tunisia.

Tunisia enjoys a Mediterranean climate favourable to the cultivation of tomatoes and cucurbits throughout the year in open fields as well as in unheated and geothermal heated plastic tunnels. In January 2015, abnormal yellowing and leaf curling symptoms were observed on the cucurbits melon, cucumber and zucchini under geothermal heated plastic tunnels in Kébili region (south-eastern Tunisia). Symptoms consisted of severe yellowing and mosaic in young leaves included curling, vein swelling, plant stunting, and fruit skin roughness sometimes associated with fruits dehiscence (fissuring). Genomic DNA was purified, PCR was performed using degenerated primers designed for the coat protein gene of Begomoviruses. A product of approximately 560 bp was obtained from all the tested symptom-bearing samples and was absent in sample collected from symptomless plants. Three amplified products were cloned and sequenced. The nucleotide sequences were deposited in GenBank (Accession numbers KP979713, KP979714 and KP979715) with more than 99% homology among them. DNA obtained from all newly collected samples from cucurbit and tomato crops and from weeds collected from around the production unit were tested by PCR using DNA B specific primer pairs. Results demonstrated that Tomato leaf curl New Delhi virus (ToLCNDV) occurred on cucurbit and tomato crops and some weeds in Tunisia.

V3

INFECTION OF ALFALFA, OTHER CULTIVATED PLANTS AND WEEDS GROWING ADJACENT TO ALFALFA BY *BEAN LEAF ROLL VIRUS* IN DIFFERENT REGIONS OF SAUDI ARABIA. I.M. Al-Shahwan, O.A. Abdalla, M.A. Al-Saleh and M.A. Amer, Plant Protection Department, College of Food and Agricultual Sciences, King Saud University, Riyadh, Kingdom of Saudi Arabia, Email: ishahwan@ ksu.edu.sa

In a two years survey, 1368 plant samples were collected from alfalfa, cultivated plants and weeds found growing close to alfalfa fields in main alfalfa-producing regions of Saudi Arabia. *Bean leaf roll virus* (BLRV) was detected in alfalfa, other cultivated crops and weeds using DAS-ELISA. The virus was detected in alfalfa in all surveyed regions. The percentages of detection of BLRV varied between 2 and 26% in the surveyed regions with an average infection rate of 12.5% in the alfalfa samples. BLRV was more spread in alfalfa in Jouf (26%) and Hail (17%) in comparison with other regions. DAS-ELISA results were confirmed by RT-PCR. The size of the major product from BLRV-infected alfalfa tissues following analysis of the amplified fragment in 1% agarose gel by electrophoresis was identical to that of the 390 bp from the CP gene of BLRV in the samples collected from the different surveyed regions. Phylogenetic relationship between eight representative Saudi isolates of BLRV and 11 isolates from the GenBank was determined. The cultivated plant species in which BLRV was detected were faba bean and potato and the weeds in which it was detected were *Sonchus oleraceus*, and two other weed plant species all growing adjacent to alfalfa fields in Jouf and Hail regions. These findings suggest that these plant species may play a role in BLRV epidemiology in alfalfa crop in these regions.

V4

THE EFFICIENCY OF DXN-REISHI AND DXN-SPIRULINA ORGANIC FOOD SUPPLEMENT IN REDUCTION OF TOMATO MOSAIC VIRUS ON THREE VARIETIES OF COLD PEPPER UNDER GREEN HOUSE CONDITIONS. Maadh Abdul Wahab Al–Fahad and Basma Thabab Al-Ajily, Department of Plant Protection, Faculty of Agriculture, Ministry of Higher Education and Scientific Research, University of Tikrit, Iraq, Email: Maadhdft@gmail.com

This study was carried out in laboratory of virus research and greenhouse unit of the Faculty of Agriculture, University of Tikrit to calculate the effect of *Ganoderma lucidum* powder and *Spirulina* sp**.** candy on incidence and severity of ToMV on some local and hybrid varieties of sweet pepper. Results obtained showed that fungal powder reduced virus infection by 63.4% while algal candy reduced virus infection by 26.7% as compared with control plants. In addition algal candy increased pepper leaf area to 31.2 cm^2 whereas control leaf area was 26.3 cm^2. Double treatment with fungal powder and algal candy increased

plant yield to 4 kg/plant, as compared to 2.2 kg/plant in the untreated control.

V5

MONITORING OF NEW EMERGING EGGPLANT VIRAL DISEASE IN JORDAN VALLEY. Abeer Abu Shirbi, National Center for Agricultural Research and Extension (NCARE), P.O. Box 639 Baqa 19381, Jordan, Email: abeer@ncare.gov.jo

Over the last two decades, intensive agriculture has been developed rapidly in the Jordan Valley. Some viruses were recorded for the first time in Jordan. Early detection and identification of newly emerging viruses is critical for implementation of prper control methods. The aim of this study was to do identify and characterize the causal agent of a newly viral disease of eggplant (*Solanum melongena*) in Jordan. The virus disease was first observed in the field during 2012. The disease was transmitted mechanically from infected source plants to healthy eggplant. It has different host range. Transmission electron microscopy (TEM) of purified virus preparations indicated the presence of flexible filamentous particles (approximately 720 nm long). Moreover, TEM of ultrathin sections of infected tissue revealed the presence of pinwheel cytoplasmic inclusion bodies and crystalline structures, typical of potyviral infection. The *Tomato mild mottle Ipomovirus* (TomMMoV) was identified by RT-PCR with two sets of primers (amplicon sizes 1200 bp and 700 bp). The viral particles reacted positively in ELISA using antisera against TomMMoV. The virus was transmitted by the aphid vector *Myzus persicae*. The current study also revealed some biological properties of *Eggplant mild leaf mottle Ipomovirus* (EMLMV), which is transmitted by the whitefly *Bemisia tabaci*, but not by three aphid species.

V6

EVALUATION OF TWO APPLICATION METHODS OF FOUR STRAINS OF PLANT GROWTH PROMOTING RHIZOBACTER TO INDUCE SYSTEMIC RESISTANCE AGAINST *CUCUMBER MOSAIC* VIRUS IN TOMATO PLANTS IN THE GREENHOUSE. Hanan Qawas[1] Omar Hamoudi[2], Ahmed Ahmed[3] and Emad Daoud Ismail[1]. (1) Department of Plant Protection, Faculty of Agriculture, Tishreen University, Lattakia, Syria, Email: Hanankawas1@gmail.com; (2) Agricultural Research Center, Lattakia, Syria; (3) Agricultural Research Center, Tartous, Syria.

The study was conducted to evaluate two application methods of four strains of plant growth promoting rhizobacter: *Pseudomonas chlororaphis* MA342, *Serratia plymuthica* HRO-C48, *Bacillus subtillis* B2g, and *B. subtillis* FZB27 to induce systemic resistance in tomato plants against *cucumber mosaic virus* (CMV) under greenhouse conditions. In the "treated seed" application, tomato seeds were submerged in a suspension of *Pseudomonas chlororaphis* MA342, *Serratia plymuthica* HRO-C48, *Bacillus subtillis* B2g or *B. subtillis* FZB27 (10^{10} cfu/ml), and in "treated seed + irrigation" application, seeds were treated in the same way, 10 days after transplanting, every transplant was irrigated with 10 ml of each suspension (10^9/ml), and 19 days after transplanting were inoculated with CMV. The time required for initial symptoms development was recorded. In addition, disease incidence, disease severity and peroxidase enzyme activity were also determined. Results of this study showed that treatment with the four strains delayed the time of symptoms appearance compared with the infected control. The delay was more in the "treated seed + irrigation" application than in the "treated seed" application. The treatment with four bacterial strains decreased disease incidence in treated plants which ranged between 36.11%-46.65% and 45%-63.33% 14 and 30 days after inoculation, respectively. Consequently, the highest reduction in infection rate was with the strain B27 (treated seed + irrigation). The treatment with bacterial strains reduced infection severity 14 and 30 days after inoculation, and the reduction was higher in the "treated seed + irrigation" application than in the "treated seed" for all the evaluated bacterial strains. The B27 strain with "treated seed + irrigation" application gave the best effect compared with the other three strains, with reduction in infection rate of 57.14% and 60.36%, 14 and 30 days after inoculation, respectively. The treatment with bacteria improved the peroxidase enzyme activity in the inoculated treated plants with recorded activity of 0.039- 0.097 n mol and 0.106-0.271 n mol compared with the infected control (0.021 n mol) and the healthy control (0.022 n mol) 14 and 30 days after inoculation, respectively. The B27 strain in the "treated seed + irrigation" application gave the best result.

V7

SURVEY OF THE SANITARY STATUS OF ANCIENT NATIVE GRAPEVINE CULTIVARS FROM APULIA (ITALY) BY REALTIME-RT-PCR. Raied Abou Kubaa[1], Massimiliano Morelli[1], Angelantonio Minafra[1], Giovanna Bottalico[2], Antonietta Campanale[1] and Pasquale Saldarelli[1]. (1) Istituto di Virologia Vegetale del CNR, UOS Bari, Via Amendola 165/A, 70126, Bari, Italy, Email: raied.aboukubaa@ipsp.cnr.it; (2) Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti (Di. S. S. P. A.), Università degli Studi di Bari Aldo Moro, 70126 Bari, Italy.

A study of the sanitary status of ancient native grapevine cultivars and biotypes of Apulia (Italy) was performed in the framework of the project Re. Ge. Vi. P. ("Recovery of Apulian grape germplasm"). A total of 80 native table and wine grapes (the majority of which described in historical pre-philloxera reports) were recovered throughout the Apulian territory and their dormant canes used for virus screening by ELISA for the presence of *Grapevine virus A* (GVA), *Grapevine virus* B (GVB), *Grapevine leafroll-associated virus-1, -2* and *-3* (GLRaV-1, -2 and -3), Grapevine *fanleaf virus* (GFLV), *Grapevine fleck virus* (GFkV) and *Arabis mosaic virus* (ArMV), using commercial kits (Agritest s. r. l., Italy). Certified plant propagation material of grapevine should be free of these viruses according to the Italian Law. Selected accessions were propagated and those positive for single or multiple virus infections were submitted to sanitation. Overall, at least three plantlets deriving from distinct apex excisions (totally 242) were transferred to the greenhouse after acclimatization and were tested after 60 days by

REALTIME-RT-PCR for all the viruses above indicated, in 242 apexes tested, that GFLV and GFKV were the most frequently detected viruses showing 9.5% and 8.2% infection rate, respectively, followed by GVA (4.9%), GRLaV3 (2.9%) and GVB (1.6%). Furthermore, all plants reacted negatively to GLRaV-1, GLRaV-2 as well as ArMV which is known to be rare in the Mediterranean area, mainly because of the low occurrence of its vector, *Xyphinema diversicaudatum.* Mixed infections by more than one virus were found in some plants assuming the failure of sanitation procedure to eliminate these viruses. The persistence of infection by GVA, GVB, GLRaV3 and GFkV in some apexes, which was not detected by the preliminary ELISA screening of source plants, underlines the higher sensitivity of Realtime-RT-PCR in detecting these viruses

V8

DISTRIBUTION AND MANAGEMENT OF *BEET WESTERN YELLOWS* AND *CHICKPEA CHLOROTIC STUNT VIRUSES* IN TUNISIA. Samia Mghandef[1,2], Safaa G. Kumari[2], Joop van Leur[3] and Asma Najar[4]. (1) Faculté des Sciences de Bizerte, Bizerte, Tunisia, Email: mghandefsamia91@gmail.com; (2) International Center for Agricultural Research in the Dry Areas, Terbol Station, Zahla, Lebanon, Email: s.kumari@cgiar.org; (3) NSW Department of Primary Industries, Tamworth Agricultural Institute, New South Wales, Australia, Email: joop.vanleur@dpi.nsw.gov.au; (4) National Agricultural Research Institute of Tunisia (INRAT), Ariana, Tunisia, Email: asmanajara@yahoo.fr

A field survey to determine the extent of the spread of *Beet western yellows virus* (BWYV) and *Chickpea chlorotic stunt virus* (CpCSV) (genus *Polerovirus*, family *Luteoviridae*) on faba bean and chickpea in five main regions in Tunisia (Béja, Bizerte, Cap Bon, Jendouba and Kef) was conducted during 2014/2015 growing season. A total of 599 faba bean and 843 chickpea samples with yellowing, reddening and/or stunting symptoms were collected from 49 faba bean and 48 chickpea fields. Tissue blot immunoassay (TBIA) test detected BWYV and CpCSV in all surveyed regions. Around 45% of chickpea and 8% faba bean samples tested were infected with CpCSV, whereas BWYV was only detected in 12% of faba bean and 7% of chickpea samples. The usefulness of seed-dressing with two pesticides to reduce spread of the aphid vectored BWYV and CpCSV was investigated in a field experiment, using artificial virus inoculation. Seeds of three Tunisian chickpea cultivars (Beja 1, Chetoui and Bouchra) were treated with Celest top (25g/L difenoconazole + 25 g/L fludioxonil + 262.5 g/L thiamethoxam) at the rate of 0.7, 1.5 and 3.0 cc/kg of seeds and with Apron Star 45 WS (200 g/kg thiamethoxam, 200 g/kg mefenoxam, 20 g/kg difenoconazole) at the rate of 1.25, 2.5 and 5.0 g/kg compared with untreated seeds (control). Seven weeks after sowing, all plants were artificially inoculated with BWYV and CpCSV using viruliferous *Myzus persicae* (Sulzer) and *Aphis craccivora* Koch, respectively. Results obtained showed that the spread of BWYV and CpCSV and yield loss caused by them were significantly reduced in treated plots compared with untreated plots. Around 182 chickpea and 72 lentil germplasm accessions from ICARDA's Gene Bank were selected to represent a wide range of geographical origins were evaluated for their reaction to local Tunisian isolates of BWYV and CpCSV under field conditions during 2015/2016 growing season. Resistance screening for each virus was done in separate field trials. All tested plants were inoculated with BWYV and CpCSV using viruliferous *M. persica* and *A. craccivora*, respectively. Reaction of the different genotypes to virus infection were monitored by evaluating (i) disease severity (DS) (score 0-3), (ii) virus existing and distribution (using TBIA test), and (iii) yield. Few lentil genotypes were found tolerant to CpCSV (IG 343) and BWYV (IG 5384); and few chickpea genotypes were tolerant to CpCSV (IG 69719) and BWYV (IG 9406).

V9

PRELIMINARY SCREENING OF FABA BEAN GENOTYPES FOR RESISTANCE TO *BEET WESTERN YELLOWS VIRUS*. Safaa G. Kumari[1,2], Joop van Leur[3], Marwa Ben Omrane[2] and Samia Mghandef[2]. (1) International Center for Agricultural Research in the Dry Areas (ICARDA), Terbol Station, Beqa'a Valley, Zahla, Lebanon, Email: s.kumari@cgiar.org; (2) ICARDA, Tunis, Tunisia; (3) NSW Department of Primary Industries, Tamworth Agricultural Institute, New South Wales, Australia, Email: joop.vanleur@dpi.nsw.gov.au

Beet western yellows virus (BWYV, genus *Polerovirus*, family *Luteoviridae*) causes a serious disease to several crop and weed species, especially these belonging to *Brassicaceae*, *Compositae* and *Fabaceae* families. The main symptoms in response to BWYV infection are leaf yellowing, plant stunting, reddening and thickening of the leaves and reduction in pod setting of legume crops**.** BWYV is persistently transmitted by aphids only, mainly *Myzus persicae.* BWYV have been reported in many countries of Central and West Asia and North Africa (CWANA) region. Host resistance is the most acceptable component to control viral diseases because it is environment friendly, practical, and economically acceptable to farmers. In this study, populations of 27 single faba bean plants selected from the previous seasons with a high yield and tolerance to *Faba bean necrotic yellows virus* (FBNYV, genus *Nanovirus*, family *Nanoviridae*) infection (Syrian and Tunisian isolates), and registered at ICARDA's GeneBank under accession numbers from IG159162 to IG159188, were evaluated during the 2015/2016 and 2016/2017 growing seasons for their reaction to a local Tunisian isolate of BWYV under bee-proof screenhouse at Mornag station, Tunisia. All evaluated plants (15 plants/accession) were artificially inoculated with the BWYV using viruliferous *Myzus persicae* (10-15 aphids per plant). Reaction of the different accessions to virus infection was monitored by evaluating (i) incidence and severity of infection, (ii) virus distribution and concentration (using TBIA test), and (iii) plant yield. Plants characterized by mild or no symptoms, no or little virus content and good yield were identified during the 1st growing season (2015/2016). The selected best performing individual plants (40 plants represented 22 accessions) were harvested and re-evaluated during the 2nd growing season (2016/2017) using the same virus inoculation methodology.

Results should that populations of 14 single plants represented 8 accessions (IG159168, -159170, -159171, -159173, -159174, -159179, -159180 and -159181) were highly resistant to BWYV with no virus detected in their leaves by TBIA and high yield. In addition, 2 populations (IG159163 and IG159178) were resistant with only 10-20% infection and high yield. Moreover, populations of 5 single plants represented 4 accessions (IG159172, IG159175, IG159182 and IG159183) were highly susceptible to BWYV (100% infection with severe symptoms and high yield loss).

V10

THE NATURAL HOSTS FOR PRUNUS NECROTIC RING SPOT VIRUS (PNRSV) IN IRAQ. Khalid M. Ahmed[1], Nadeem A. Ramadan[2] and Nabeel A. Qasem[3]. (1) Plant Protection Department, Agriculture College, Salahaddin University, Iraq, Email: khalid.ahmed@su.edu.krd; (2) Biology Department, Science College, Mosul University, Iraq; (3) Plant Protection Department, Mosul University, Iraq.

A survey was conducted during 2011 and 2012 in different locations in Erbil and Dohuk governorates. The survey included 46 orchards of stone fruit trees in Erbil and 10 orchards in Dohuk governorate. During 2011-2012, orchards size ranged between one to fifty donums. In order to detect the virus distribution in orchards, leave samples with visible viral symptoms were collected in which infections with *Prunus necrotic ring spot virus* (PNRSV) on peach, apricot and plum trees and infection by *Plum pox virus* (PPV) of peach trees were detected in both Erbil and Dohuk governorates. The survey results indicated that the surveyed regions included natural hosts for PNRSV such as *Trifolium* sp., *Chenopodium amaranticolor*, *Rosa hybridia* and *Elaeagnus* sp. and the latter represent the first record as a host plant for the virus. In the host range study, several plant families were also found as other hosts for the viruses. The most important were *Phaseolus vulgaris* and *Petunia hybrid* which are recorded for the first time as a host plant for PNRSV.

V11

CATEGORIZATION OF RESISTANCE/ TOLERANCE LEVELS IN *VIGNA MUNGO* (L) HEPPER DIVERGENT TO *MUNGBEAN YELLOW MOASAIC VIRUS* (*MYMV*) UNDER DIFFERENT CLIMATE CONDITIONS. Nadeem Shad[1], Bareera Siddiqi[1], Arshad Javaid[1] and Muhammad Siddique Sadiq[2]. (1) Institute of Agricultural Sciences (IAGS), Quaid-i-Azam campus; University of the Punjab, Lahore 54590 Pakistan; (2) Nuclear Institute for Agriculture and Biology (NIAB), P. O. Box 128 Jhang Road, Faisalabad, Pakistan, E-mail: nadeem.iags@pu.edu.pk

Germplasm of 48 *Vigna mungo* (L.) Hepper (commonly known as greengram/mashbean/urdbean) accessions were evaluated for their reaction to Mungbean yellow mosaic virus (MYMV) under different climate conditions during summer and spring seasons. Out of these *V. mungo* accessions, none of them showed any sign of resistance to *Mungbean Yellow Mosaic Begomovirus* (MYMV) during summertime. In the spring season, thirty test lines showed varied levels of resistance. Yield production ranged between 5. 31 and 54 grams per plant. Among 48 tested entries, 6, 2 and 4 entries demonstrated susceptible, moderately susceptible and extremely susceptible reaction. Resistance response was observed in 16, 12 and 8 entries as extremely resistant, resistant and moderately resistant, respectively.

V12

ADDITIONAL ECONOMIC PROFITABILITY OF THE NEW BARLEY "IMEN" VARIETY SELECTED FOR ITS RESISTANCE TO BYDV. Asma Najar, Hager Ben Ghanem and Saida Mlouhi, Institut National of Agriculture Research of Tunisia, Street Hedi Karray, 1002 El Menzeh, Tunisia, Email: asmanajara@yahoo.com

Barley is the second widely cultivated cereal crop in Tunisia. It covers around 500 000 ha/year. The national mean yield is estimated to 14 qx/ha. However, recent studies in Tunisia have shown that Barley yellow dwarf virus (BYDV) is the most important virus on barley. In fact, virus incidence can exceed, in some areas, 35% in barley crops. The selection of resistant genotypes is the most effective method against BYDV. A screening program for resistance to BYDV was initiated during 2002-2003 cropping season. Selected barley resistant advanced lines (23) were assessed for agronomic related traits under semi-arid climatic conditions from 2007 to 2013 growing seasons using Manel and Rihane, the most commonly grown barley varieties in Tunisia, as controls. Within these lines, a new resistant variety “Imen” carrying Yd2 gene was released because of its high yield and biomass. Imen is well adapted to semi-arid areas. The superiority of Imen was significantly estimated (Fpr < 001) at 40-55% and 48-54% in terms of grain yield and biomass compared to controls, respectively. To determine the economic impact of the new resistant variety “Imen”, we calculate the related annual gross margin (GM) compared to Manel and Rihane using General Algebric Modeling System (GAMS) based on mathematical programming. GM generated by these 3 varieties fluctuates according to climatic conditions. The highest GM was generated by the Imen (1100 TD/ha), followed by Manel and Rihane (around 900 TD/ha). Virus infection with BYDV decreased GM of 39, 82 and 97%, respectively for Imen, Manel and Rihane compared to the uninoculated control.

V13

WILD GRAPEVINES (*VITIS VINIFERA* SPP. *SYLVESTRIS*) AS NATURAL RESERVOIR OF GRAPEVINE VIRUSES IN TUNISIA. Naima Mahfoudhi[1], Ilhem Selmi[1], Amal Najahi[1], Mounira Ben Slimane Harbi[1] and Francesco Carimi[2]. (1) Laboratoire de Protection des Végétaux, Institut National de la Recherche Agronomique de Tunisie, Rue Hedi Karray, 1004 ElMenzah, Tunis, Tunisie, Email: nmahfoudhi@yahoo.fr; (2) Istituto di Bioscienze e BioRisorse (IBBR), Consiglio Nazionale delle Ricerche CNR Corso Calatafimi 414, I-90129 Palermo, Italy.

In Tunisia, grapevine has proven flexibility in adapting to different conditions. Although the greatest diversity of native varieties is found in the southern regions,

wild grapevines (*Vitis vinifera* spp. *sylvestris*), exists in natural populations located mainly in the northwest and northeast. The preservation of wild grapevine populations is considered essential for the maintenance of the genetic resources of local grapevines and conservation of biological diversity in natural environments. Wild grapevines might be considered as natural reservoirs of pathogens including viruses. No data are currently available on the presence of viruses in Tunisian wild grapevines, which can play a role in the dissemination of viruses to the cultivated grapevines. To this aim, a survey was conducted and dormant canes from 63 plants (male and female specimens) were collected from five naturally occurring wild grapevine populations. All samples were tested by RT-PCR for the presence of *Grapevine rupestris stem pitting associated virus* (GRSPaV), *Grapevine virus A* (GVA), *Grapevine virus B* (GVB) and *Grapevine leafroll associated virus-3* (GLRaV-3), using specific primers which amplify a 329 bp, 236 bp, 459 bp and 546 pb for GRSPaV, GVA, GVB and GLRaV-3, respectively. Results showed that wild grapevines are infected by GRSPaV, GVA and GLRaV-3. The presence of these viruses is confirmed by sequencing.

V14

IMPACT OF NEW CITRUS ROOTSTOCKS AND VIROID INFECTION ON MALTESE HALF-BLOOD PRODUCTION AND THE GROSS MARGIN GENERATED. Asma Najar[1], Saida Mlaouhi[2], and Ahmed Jemali[1]. (1) Laboratory of Plant Protection; (2) Laboratory of Rural Economy, National Institute of Agronomic Research of Tunisia, Email: saidamlouhi@gmail.com

Tunisian citrus orchards are exclusively based on the use of the single rootstock, sour orange, which is mainly threatened by *Citrus tristeza virus* (CTV). The aim of this study was to evaluate the possible substitution of this sensitive rootstock by other CTV tolerant ones. Such measure may provide yield increase and economic profit without omitting the viroid incidence. Because the Tunisian Maltese is the most important variety in Tunisia, a rootstock trial started since 2005 at the station of Tunisian National Institute of Agriculture Research (INRAT) following two conconmittant approaches. The first was to evaluate Maltese production grafted on seven healthy rootstocks that are: *Poncirus trifoliate* (PT**)**, *Citrus volkameriana* (CV), *Rangpur lime* (LR**)**, Citrange carrizo (CC), Citrumelo swingle (Citru) Mandarin Cleopatra (MCL) and Sour orange (SO). The second approach takes into account of the four important viroids in single or mixed infection state: *Citrus bent leaf viroid* (CBLVd), *Hop stunt viroid* (HSVd), *Citrus dwarfing viroid* (CDVd) and *Citrus barck cracking viroid* (CBCVd). Results obtained showed that: i) when grafted on healthy rootstocks, Maltese variety gave better cumulative yields in almost all new introduced rootstocks compared to Sour orange. CV and LR provided the highest cumulated yields with respectively 78 T/ha and 74 T/ha, followed by Citru (55 T/ha). CC comes in fourth position with 52 T/ha. MCL and SO gave similar yields evaluated at around 44 T/ha. ii). Under viroid infections, only the combination of four viroids resulted in yield decrease nearly 50% in the case of Citru and PT. CV, LR and CC showed a slight yield decrease compared to un-inoculated trees. These rootstocks seem most tolerant to mixed viroid infection. The same trend was observed for *Citrus dwarfing viroid* infection (CDVd) with high yield decrease nearly 31% and 38%, respectively for Citru and PT. Based on the 2015 production data, gross margin (GM) provided to healthy Maltese by new rootstocks, was higher than provided by SO. Indeed, CV and LR rootstocks were the most productive and consequently gave the higher GM (around 10.000 TD/ha). The combination of four virods showed that GM was decreased for all rootstocks compared to the control. CV, LR and CC showed a GM close to the un-inoculated control.

V15

PRESENT STATUS OF VIRUS AND VIRUS-LIKE DISEASES OF CITRUS IN THE EAST MEDITERRANEAN REGION OF TURKEY. Orhan Bozan and Nüket Önelge, Department of Plant Protection, Faculty of Agriculture, Cukurova University, Balcali, Adana, Turkey, Email: gborhan@hotmail.com

Citrus fruits are one of the important agricultural products for Turkey. 80% of the citrus production of Turkey is obtained from the Eastern Mediterranean region of Turkey and virus and virus like diseases have a major impact on citrus production in this area. Citrus of this region is known to be infected by many virus and virus-like diseases including viroids. Most of old citrus trees are infected with at least one virus or virus-like disease. In the scientific studies carried out since 1980 in the region, many viruses and virus-like diseases have been detected. The major citrus diseases of the region are Stubborn caused by *Spiroplasma citri*, *Citrus psorosis virus*, *Citrus chlorotic dwarf associated virus*, *Citrus yellow vein clearing virus*, Citrus cachexia viroid. *Citrus tristeza* virus represent a potential danger because of the use of the CTV-susceptible sour orange (*Citrus aurantium*) as a rootstock in 99% of the region.

V16

MOLECULAR CHARACTERIZATION OF CITRUS PSOROSIS VIRUS AT EAST MEDITERRANEAN REGION of TURKEY. Nüket Önelge1, Büşra Fidancı1, Orhan Bozan1 and Pakize Gök-Güler2 (1) Department of Plant Protection, Faculty of Agriculture, Cukurova University, Balcali, Turkey, Email: nuketonelge@hotmail.com; (2) Biological Control Research Institute, Adana, Turkey.

Citrus psorosis is a serious disease caused by *Citrus psorosis virus* (CPsV). Two different psorosis syndromes have been described called Psorosis A (PsA) and Psorosis B (PsB). The virus was previously reported in almost all old citrus plantations of our country. The widespread PsA affects only the trunk and main branches showing bark scaling and gum accumulation and PsB, the most aggressive one shows severe lesions in the bark causing its detachment and gum accumulation and pustules on young branches. In this study we selected 50 citrus trees showing severe bark lesions and different leaf symptoms with vein clearing, leaf flecking and oak leaf pattern. All collected leaf samples were analyzed by RT–PCR. The primer pairs BC76 5’-

ATGTCGATYCCWATYAAGTSTCAC-3', BC77 5'-TTAC ATAGTYGMWGCYACCCCAAAG-3', BC78 5'-TGCTCCAACAAAGAAATTC CC-3' and BC79 5'-TTCTGCCATCTGGAGTGAGGC-3', Ps62 5'-AAAGATGTTTTCATG TTCTCT-3', Ps63 5'-TATTTAAAGCGAAACATGAT-3' and CPV-1 5'-GCTTCCTG GAAAAGCTGATG-3' and CPV-1 5'-GCTTCCTG GAAAAGCTGATG-3'were used to amplify of CPsV coat protein gene. The infected plants showed the expected size of CPsV coat protein fragments (350, 514, 600 bp) which was absent in the healthy plants. For biological indexing, 10 samples were inoculated on Pineapple orange seedlings to see the leaf symptoms of the virus. The first growth flushes of infected indicator trees showed vein banding and shock reaction of CPsV. Blast analysis showed that nucleotide sequences had greater than 98% nucleotide identity with corresponding region of CPsV reference genomes.

V17

APPLICATION OF HIGH-THROUGHPUT SEQUENCING APPROACH TO DEFINE THE SANITARY STATUS OF CERTIFIED AUTHOCTHONOUS GRAPEVINE CULTIVARS. Michela Chiumenti[1], Massimiliano Morelli[1], Raied Abou Kubaa[1], Vito Nicola Savino[2], Pierfederico La Notte[1], Angelantonio Minafra[1] and Pasquale Saldarelli[1]. (1) Istituto di Virologia Vegetale del CNR, UOS Bari, Via Amendola 165/A, 70126, Bari, Italy, Email: raied.aboukubaa@ipsp.cnr.it; (2) Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti (Di. S. S. P. A.), Università degli Studi di Bari Aldo Moro, 70126 Bari, Italy.

In Italy, grapevine certification system requires the status of "virus controlled" for multiplication and commercialization. This system entails free plant propagation material from *Grapevine virus A* (GVA), *Grapevine virus B* (GVB), *Grapevine leafroll-associated virus 1, 2, 3* (GLRaV-1, -2, -3), *Grapevine fanleaf virus* (GFLV), *Grapevine fleck virus* (GFkV) and *Arabis mosaic virus* (ArMV)]. Routinely applied bio- and molecular assays for the detection of systemic plant pathogens, such as wood indexing, serological and (RT-) PCR molecular tests, are time-consuming and always require *a priori* knowledge of the target. On the other hand, the availability of High-Throughput Sequencing (HTS) techniques, which are free from the abovementioned constraints, allows the characterization of the "virome" of the analysed plants. Indeed, data originating from HTS give an unbiased picture of the virus/viroid content of a plant. In this frame, a task of the Apulian Regional Project Re. Ge. Vi. P (Recovery of Apulian grape germplasm) aims to assess the sanitary status of 20 certified autochthonous grapevine clones, table and wine cultivars, by HTS. In 2016, small RNAs (sRNAs) libraries were synthesized from 20 grape accessions and subjected to Illumina sequencing. The downstream data were processed using a custom-developed bioinformatics pipeline including the quality control of the libraries, the *de novo* assembly of the reads using Velvet assembler and the Blast annotation of the obtained contigs. Annotated contigs confirmed the absence of the above-regulated viruses. Also, this approach showed the presence of two viruses and two viroids not targeted in routinely performed assays, i. e. Grapevine rupestris stem pitting-associated virus (GRSPaV), Grapevine rupestris vein feathering virus (GRVFV), Hop stunt viroid (HSVd) and Grapevine yellow speckle viroid 1 (GYSVd-1). These results, confirmed by RT-PCR assays, strengthen the potentiality of HTS approach in plant "virome" definition and its application in grapevine certification schemes.

NEMATODES

N1

DISTRIBUTION AND IDENTIFICATION OF POTATO CYST NEMATODES FROM AIN DEFLA REGION, ALGERIA. N. Tirchi[1], A. Mokabli[1], A. Troccoli[2], F. De Luca[2] and E. Fanelli[2]. (1) University Djilali Bounaama of Khemis Miliana, Ain Defla, Algeria, Email: tirchin1977@yahoo.fr; mokaissa@yahoo.fr; (2) Istituto per la Protezione Sostenibile delle Piante-CNR di Bari, Italy, Email: francesca.deluca@ipsp.cnr.it; a.troccoli@ba.ipp.cnr.it; elena.fanelli@ipsp.cnr.it

Potato cyst nematodes (PCNs) are the most economically damaging pests of potato crop worldwide. During 2013, a survey was carried out in Ain Defla region of Algeria. 81 soil samples collected from potato fields of 14 locations were submitted to nematological analysis which indicated the presence of these nematodes in 22.22% of the surveyed fields. Sixteen PCN populations from five locations were characterized by combination of features the perineal regions of cysts and those of second stage juveniles. The morphological identification has been confirmed by the analysis of the ITS-RFLP profiles, sequencing and phylogenetic analysis of the ITS region. The results revealed that the two species *Globodera rostochiensis* and *G. pallida* were present in this region, occurring separately or in mixed populations. However, dominance of *G. pallida was noted*, since only 12.25% of the populations were identified such as *G. rostochiensis*, whereas 31.5% were *G. pallida* and 56.25% of the populations consisted of a mixture of the two species, and among these mixed populations, 77.77% showed a dominance of *G. pallida.* The predominance of *G. pallida* has been noted in the sites of Ain Defla, El Amra, Mekhatria and Arib. *G. rostochiensis* was dominant in Rouina. Intraspecific variation was noted between populations of *G. rostochiensis* and *G. pallida*. Because of the high divergence among Algerian populations of *G. pallida* and *G. rostochiensis*, it can be assumed that they were multi-introduced in Algeria. The most divergent population of *G. pallida*, that formed a well separated group with some populations from Chile and Peru, suggests a later or independent introduction of this population in Algeria.

N2

***IN VITRO* NEMATICIDAL ACTIVITIES OF SOME MEDICINAL PLANT EXTRACTS ON EGGS AND SECOND-STAGE JUVENILES OF ROOT-KNOT NEMATODE *(MELOIDOGYNE INCOGNITA*) IN MALETE, KWARA STATE, NIGERIA.** O.S. Osunlola and T.H. Gbadeyan, Department of Crop Production,

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The nematicidal activities of aqueous extracts of leaves of *Mormodica chardiata*, *Morinda lucida*; and leaves and bark of *Azadirachta indica* at 12,500, 25,000 and 50,000 mg/L each on eggs and J2 of *Meloidogyne incognita* were investigated *in vitro*. Qualitative tests were also conducted to determine the presence of phytochemicals using standard procedures. Egg inhibition and juvenile mortality data were analysed using ANOVA (P<0. 05). Egg hatch at 25,000 mg/L and 50,000 mg/L in *M. chardiata* were 37 and 35% respectively compared with control (75%). Juvenile mortality at 50,000mg/L was 42.5%, 42.5% and 48% for *Morinda lucida*, *Azadirachta indica* and *Mormodica chardiata* respectively compared with control (0%). All plant parts contain saponins, tannins, flavonoids, alkaloids and glycosides. Similarly, all the test plants contain phenols with the exception of *A. indica* leaves. The extracts of the medicinal plants are nematicidal and hold promise as alternative to synthetic nematicdes which are expensive and cause environmental pollution.

N3

THE POTENCY OF DIFFERENT *TRICHODERMA* SPECIES AS BICONTROL AGENTS AGAINST *MELOIDOGYNE JAVANICA* ON TOMATO. Ahmed A.M. Dawabah[1,2], Ahmad S. Al-Hazmi[2], Fahad A. Al-Yahya[2], Hamzeh A. Lafi[2], Muhammad TariqJaveed[2] and Saleh N. Al-Nadhari[2]. (1) Nematode Diseases Research Department, Plant Pathology Research Institute, Agricultural Research Center, 9 Gamaet El-Qahera Street, Giza 12619, Egypt, Email: dawabah@hotmail.com; dawabah@yahoo.com; (2) Plant Protection Department, College of Food and Agricultural Sciences, King Saud University. P.O. Box 2460, Riyadh 11451, Saudi Arabia.

Three Saudi isolates of *Trichoderma* sp. were assessed for their biological control potential against *Meloidogyne javanica in vitro* and under greenhouse conditions on tomato plants. The fungal isolates were morphologically and molecularly identified as: *H. harzianum*, *H. hamatum* and *H. atroviride*. The granular nematicide, fenamiphos 10G was used for comparison. Results of the *in vitro* test showed that the mortality of second-stage juveniles (J_2s) increased ($P \leq 0.05$) proportionally to both time increase (2 to 4 to 6 days after exposure) and the concentration of fungal filtrates (25 to 50 to 75%). In the greenhouse (two tests), tomato plants were treated with three dosages of fungal-colonized wheat grains of each fungus (5, 10 and 15 g/pot) before inoculation with *M. javanica*. Fenamiphos was used also for comparison. Sixty days after nematode inoculation, fenamiphos was the most potent treatment, where it reduced the root damage by up to 99.5% and the nematode reproduction by up to 99.0%. The most efficient fungal treatment was *T. atroviride* @ 15 g/pot which provided about 74% reduction in root damage and 71% reduction of nematode reproduction. All fungal treatments enhanced tomato growth parameters, but fenamiphos was also the most potent treatment in this respect. These Saudi local isolates of *Trichoderma* might rise as reasonable options of biological control agents in the integrated management programs of *M. javanica* on tomato.

N4

RELATIONSHIP BETWEEN ROOT KNOT NEMATODE INFESTATION AND YIELD OF SUGARBEET GROWN AT DIFFERENT DATES OF PLANTING. A.M. Korayem and M.M.M. Mohamed, Plant Pathology & Nematology Department, National Research Centre, Dokki, Cairo, Egypt, Email: kar_asm@yahoo.com

Relationship between the root-knot nematode, *Meloidogyne javanica* infestation and yield of sugarbeet grown in three different planting dates (early, middle and late planting) was studied in sandy fields naturally infested with the nematodes in north Egypt. The nematode damage (root–galling index) was assayed at plants harvest stage. At all three dates of planting, no significant differences (P=0. 05) between the yield of infected sugarbeet and that of healthy plants (not infected), at all levels of nematode infection (root galling). Relation between nematode damage and sugarbeet yield was positive in case of early planting, whereas it was negative in case of middle and late planting; however no correlation between them (nematode – yield) was obtained, as correlation coefficient (r) was 0.03, 0.3, 0.28 for early, middle and late planting, respectively. TSS% was also not influenced by nematode damage for plants of early and late planting, whereas damaged roots of sugarbeet increased with middle planting.

N5

DEVELOPMENT OF POTATO CYST NEMATODES IN RELATION TO TEMPERATURE. Mahmoud E.M. Ehwaeti[1] and Vivian Blok[2]. (1) Omar Al Mokhtar University, Elbedi, Libya, Email: goody3cot@gmail.com; (2) The James Hutton Institute, Invergowire, Dundee, DD2 5DA, Scotland, UK.

The potato cyst nematodes (PCN) *Globodera rostochiensis* (Stone) and *Globodera pallida* (Woll) are major parasite of potatoes and other members of Solanaceae family and they are the largest constraint as pest on potato production in the UK. The life cycle of PCN is faster as soil temperature increase and there is danger of appearance of second generation in the same growing season. The first description of the relationship between environment temperature (*Te*) and rate of development and the second cycle of the duration of development for (*Te*) between (*To*) and (*Tb*). Rate = (Te – *Tb*)/*DD* (1) Duration = *DD*/ (*Te* –*Tb*) (2). The development of potato cyst nematodes (*Globodera rostochiensis* and *G. pallida*) is dependent on many environmental factors. The aim of this work is to determine how soil temprature affects nematode development. Soil temperatures differ in different regions and with tendency for more change in the future. In this experiment an apparatus that establishes atemperature gradient was used to examine the rate of emergence of females of *G. rostochiensis.* A temperature range from 10-22ºC was used and 2 different hosts, Desiree and Maris Piper. This assay was done in closed plastic canisters placed on a metal plate over which a temperature gradient was formed from 10 to 22ºC. Tubers of the 2 cultivars were placed into moist compost and inoculated with (1000) eggs of *G. rostochiensis*. Females were scored as they emerged on the root surface at the interface with the canister wall and the

temperature was recorded weekly. Digital temperature recorders were placed in canisters containing soil only to monitor the temperature. Results showed that females were first observed at the highest temperature 22ºC at week 4 on Desiree. The following week females were observed at 20º C. More females were observed at 18ºC than at 22 and 20ºC even when they emerged later. Development at 10, 12 and 14º C was relatively delayed with reduced numbers compared to the higher temperatures. A few females were observed on the resistant cultivar Maris Piper in this experiment at the 16-22ºC temperature range.

N6

NEMATODE (*MELOIDOGYNE JAVANICA*)-MYCORRHIZA (*GLOMUS* SP.) INTERACTIONS AS AFFECTED BY HOST-STATUS (TOMATO). E.A. Edongali and Abdulhakim A. Sumaydah, Plant Protection Department, Faculty of Agriculture, University of Tripoli, Tripoli Libya, Email edongali48@hotmail.com

This study was conducted to investigate the interaction between the fungus *Glomus* sp. and root-knot nematode *Meloidogyne javanica* on growth of two tomato (*Solanum lycopersicum*) cultivars. Nematodes inoculum was collected from tomato, while *Glomus* sp. (Mycorrhiza) was from onion (*Allium cepa*). Experiments were carried out in a plastic house. Results indicated that inoculation with *Glomus* sp. before root-knot nematode (*M. javanica*) alone or in combination, improved plant growth of both cultivars Myies (S) and 4040 ®, and improved phosphorus up-take, whereas inoculation with root-knot nematode alone or in combination with *Glomus* sp. reduced root-knot nematode gall index in conparison with nematode alone. In presence of the fungus, phosphorus up-take and plant growth were improved with less gall-index and disease severity. The presence of *Glomus* sp. in soils could be utilized as protection measure and as a biofertilizer.

N7

SENSITIVITY OF SOME THE RECOMMENDED WHEAT VARIETIES TO THE INFESTATION OF WHEAT-GALL NEMATODES *ANGUINA TRITICI* IN LABORATORY AND FIELD IN IRAQ. Basima G. Antoon, Muthana A. Ekaidy, Hadil B. Dawood and Saif A. Razak, State Board For Agricultural Research, Abu-Ghraib Iraq, Email: basimanematod@yahoo.com

A total of 12 wheat Varieties were tested against wheat-gall nematode *Anguina tritici* in the laboratory and field for 2 seasons starting from 2013 to 2015. Results indicated that the wheat variety Saber Beg was immune 100% against this nematode in the laboratory and field tests. Wheat varieties Furat and Ibaa-99 were found slightly infected, especially the variety Ibaa-99. Quality studies of both varieties, such as number of larvae/gall and weight of 10 galls/gm showed the contrary and were sensitive to the nematode. In the sensitive varieties for this nematode, the number of larvae per one gall reached 26280 larvae for the variety of Abu-Ghraib. The results of this experiment indicated that the resistance gene in Saber Beg can be transferred to the sensitive varieties by breeding to improve the quality of the sensitive wheat varieties and their production.

N8

EFFICIENCY OF A BIO-FERTILIZER (NEMATOX) IN CONTROLLING ROOT KNOT NEMATODE. Mohammed Saud AlQasem, National Center for Agricultural Research and Extension, Jordan, Email: mohdqasim@ncare.gov.jo

A bio-fertilizer product (NEMATOX), contains two nematophagous fungal species (*Pacillomyces lilacinus* and *P. variotii*) and formulated using Potassium Humate fertilizer was used to control the root knot nematode (*Meloidogyne javanica*) by artificial inoculation (5,000 second stage juveniles (J2)/plant) on stone fruit rootstocks transplants inside a plastic house using a pot experiment protocol. Data indicated significant decrease in galling indices and in the average number of root knots which decreased by 75% compared to the control treatment. Moreover, a decrease in nematode reproduction ratio (Pf/Pi) about 70–90% was noticed at the end of the experiment. Results showed 77-83% significant increase of plant height 150 days after treatment with the bio-fertilizer NEMATOX compared to the control; this might be due to the presence of the endophyte fungus *P. variotii*. Transplants treated using NEMATOX performed better than those of control and chemical treatments with no significant differences between these treatments at the end of season. Result indicated that NEMATOX reduced root knot nematodes disease severity and J2 counts in soil of rootstocks' transplants. The study demonstrated success of biological treatment using *P. lilacinus* and *P. veriotii* if added at early stages of nematode infection. In addition, combining rootstock with relative tolerance to root knot nematode with nematode biological treatment was able to reduce galling indices by 80% compared to using susceptible transplants infected with root knot nematodes without biological treatment.

N9

ESTIMATION OF POSSIBLE YIELD LOSS OF BROAD BEAN DUE TO ROOT-KNOT NEMATODE, *MELOIDOGYNE ARENARIA*, IN SANDY SOIL. M. Korayem and M.M.M. Mohamed, Plant Pathology & Nematology Department, National Research Centre, Dokki, Egypt, Email: moawad_bondok@yahoo.com

Loss in broad bean grown in sandy soil naturally infested with root-knot nematode, *Meloidogyne arenaria*, was estimated during two successive seasons. Severity of nematode infection (root gall indices, GI) was assayed at harvest based on a 1-6 scale (1=no infection, and 6= 100% root galling). In the first season (2014-2015), relation between nematode damage and yield of broad bean was negative, however no significant loss (P=0.05) in growth and yield was found at all nematode root-gall indices (damage). Correlation coefficient (r) between nematode damage and yield was low, 0. 38 in case of pod yield, and 0.40 in case of dry seeds. In the second season (2015-2016), a significant reduction in pods weight of 10.6% was obtained at severe nematode infection (GI= 6), whereas dry seed weight was significantly reduced by 10.7% and 12.5% at 5 and 6 GI, respectively. Both shoot weight and number of pods were not significantly affected.

N10

A SURVEY OF PLANT PARASITIC NEMATODES ASSOCIATED WITH GREEN LAWNS IN THE TRIPOLI RGION. E.A. Edongali and Moahmed Adel Mistafa, Plant Protection Department, Faculty of Agriculture, University of Tripoli, Libya, Email: edongali48@hotmail.com

Asurvey was conducted to determine palnt parasitic nematodes associated with turf grass in the Tripoli region, during two seasons, namely winter and summer months, of two types of common lawn grasses Bermuda (*Cynodon dactylon*) and creeping grass (St. augustine). This study was caried out in 31 locations in the city, which was directed to determine the population dynamics and types of nematodes. Results indicated the presence of 14 different genera, with higher population during summer and lower during winter. The identified nematodes genera were: *Pratylenchus*, *Paratylenchus*, *Rotylenchus*, *Xiphinema*, *Longidorus*, *Meloidogyne*, *Tylenchorhynchus*, *Trichodorus*, *Criconema*, *Criconemoides*, *Hoplolaimus*, *Aphelenchus* and *Tylenchus.* A study was conducted on the pathogenicity of the most frequently encountred nematodes *Trichodorus* spp. and *Criconemoides* spp. on Bermuda grass and St. agustine turf. Results indicated that creeping grass was more affected compared with Bermuda, which showed more vigorous growth compared to St. augestine.

N11

DAGGER NEMATODE ATTACKING ALEPPO PINE IN JORDAN. Leena A. Irshaid[1], Monther Sadder [2] and Luma S. Al Banna[1]. (1) Department of Plant Protection, School of Agriculture, University of Jordan, 11942 Amman, Jordan, Email: Leena_irshaid@yahoo.com; (2) Department of Biotechnology, Faculty of Agricultural technology, Al-Balqa Applied University,19117 Al-Salt, Jordan.

A dagger nematode was recovered from rhizosoil of declining Aleppo pine trees, *Pinus halepensis*, grown in AL-Jubiha area in the Northern Mediterranean phytogeographical region of Jordan. The morphological characters and the analyses of the D2-D3 expansion fragment of the 28S rDNA revealed that the recovered nematode belongs to the dagger nematode *Xiphinema vuittenezi*. However, variations exists between the Jordanian isolate and other populations of *X. vuittenezi* described worldwide. The temporal distribution of this nematode was studied for almost two years. The results of this study showed that the number of recovered individuals fluctuates from as low as two individuals/100 ml of soil recorded in October, to 88 individuals/100 ml of soil recorded in December. Furthermore, the number of recovered nematodes in the same month in two consecutive years also varied. The reason for this fluctuation may be due to both temperature and soil moisture. The effect of storage of soil samples at 8˚C on the dagger nematode population was also investigated. Soil samples that were collected in January, February, March, and April 2015 were stored at 8C for 5 months. Monthly processing of stored soil samples was performed and numbers of recovered nematodes were documented. Interestingly, this investigation revealed that the number of recovered nematodes fluctuates and a remarkable increase occurred after two months of storage and this might be due to egg hatching.

N12

CONTROL OF ROOT LESION NEMATODE *PRATYLENCHUS* SPP. INFESTING POTATO CV. SPUNTA UNDER FIELD CONDITIONS THROUGH BIOTIC PRODUCTS. Hoda Hussein Amin Mohammed and Usamy Samy Fathy Elkelany, Plant Pathology Department, Nematology Lab., National Research Centre Buhouth st. Dokki, Giza, Egypt, Email: usamasamy_nrc@yahoo.com

In Egypt, potato is the most popular solanaceous vegetables either for local consumption or exportation. Previous investigations showed that potato have been attacked by many plant parasitic nematodes. The root-lesion nematodes (*Pratylenchus* spp.) is economically the most important potato plant pathogens after root knot nematodes. They cause an average growth inhibition of 59.6% of infected potato seedlings with losses in tuber yields of 20-50% and in total plant weight of 50%. Producers have relied mainly on nematicides and chemical fertilizers to control plant parasitic nematodes and improved soil fertility, but their applications are associated with myriads of problems on human health and environment. Due to the consumer demand for chemicals-free food the main goal of this work is to evaluate the potentialities of some commercial bioproducts in controlling root lesion nematodes *Pratylenchus* spp. infecting potato cv. Spunta and improving yield production, under field conditions. The bioagents that have been assessed and their commercial name are: Microbien containing the N2 fixing bacteria *Pseudomonas* spp. and *Bacillus megatherium*, Potassiumag containing the potassium solubilizing bacterium *Bacillus circulanes* and Phosphorine contain the phosphorus solubilizing bacterium *Bacillus megatherium*, Nemafree containing *Serratia* spp., the Stanes Symbion VAM Plus containing the vascular arbiscular miccorhiza *Glomus fasciculatum* and the Stanes Sting containing the rhizobacteria *Bacillus subtilis*. A field experiment was conducted at Kafr-kandeel village, Helwan governorate, Egypt to investigate the integration effects between these products to control *Pratylenchus* spp. and improve potato yield production of potato cv. Spunta. The combined treatments were: 1) Biofertilizers (Microbien, Phosphorine, Potassiumag); 2) Biofertilizers plus stanes Symbion; 3) Biofertilizers plus Nemafree; 4) Biofertilizers, plus Stanes Sting: 5) untreated plant as control. Results obtained after three months showed that all the tested combinations reduced *Pratylenchus* spp. both in soil and roots by different rates, as well as increased potato yield production as compared to untreated control treatment. The highest increase in potato yield production of 30% over control resulted from the application of the bionematicides Stanes Sting containing *Bacillus subtilis* in combination with the biofertilizers Microbien, Phosphorine and Potassiumag.

WEEDS

W1

EFFECTS OF INTERCROPPING PEARL MILLET WITH SOME LEGUMES ON *STRIGA HERMONTHICA* (MILLET STRAIN) EMERGENCE.

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Striga hermonthica, (Del.) Benth, an obligate root parasitic plant, constitutes a major constraint to cereals production and a threat to agriculture and food security in sub-Saharan Africa. Maize, sorghum, millet, rice and sugar cane are the traditional hosts; however, recently wheat was reported susceptible to the parasite. Many potential control methods were developed against the parasite including physical, cultural, chemical, and biological methods. However, so far these methods have only a limited impact on controlling *Striga* and today there is no single control method that can effectively solve this problem. The roots of several legumes are known to induce suicidal germination of *Striga* seeds. The present investigation was undertaken at the College of Agricultural Studies (CAS), Sudan University of Science and Technology (SUST) at Shambat in 2015–2016 to determine the effects of intercropping pearl millet (cvs. Sudan Brawn and Wad-Elbashir) with cowpea, green gram, and cluster bean on *Striga* millet strain incidence and pearl millet growth. Treatments were arranged in Complete Randomized Block Design with three replicates. The results showed that sole millet displayed highest *Striga* number while *Striga* number was generally lower in the intercrops. Cowpea intercropped with millet cultivars (Wad–Elbashir and Sudan Brown) at seed bank size of 32 and 64 mg/pot, reduced *Striga* emergence by 57.1-100%. Intercropping cluster bean with millet cultivars at *Striga* seed bank size of 32 mg/pot completely suppressed *Striga emergence* throughout the experiment. However, at *Striga* seed bank size of 64 mg/pot, intercropping cluster bean with millet decreased *Striga* number by 28.3-70.9%. Green gram intercropped with millet cultivars, irrespective of seed bank size caused considerable reduction of *Striga* number (14.8-76.7%). All intercrops reduced *Striga* dry weight, in comparison to the sole millet. Cereal-legume intercropping and rotation could be used to combat *S. hermonthica* in cereals through induction of suicidal germination.

W2

STUDY OF WEED DIVERSITY ASSOCIATED WITH BARLEY (*HORDUEM VULGARE* L.) FIELDS IN THE ALGERIAN STEPPE.

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During the three last decades, the Algerian steppe has undergone a deep mutation from pastoral to agropastoral system. The extension of cereal farming is one of the main factors characterizing such a transformation. It has been widely discussed, from a socio-economic viewpoint, in numerous previous studies. Nevertheless, further aspects related to cereal farming are still unrecognizable. This is the case, for example, of weeds flora of cereal fields. In this context, the objective of our research was to contribute to understanding the dynamic evolution of weed flora of barley (*Hordeum vulgare* L.) in Aïn Ghrab area (M'sila province) situated in the central steppe of Algeria. The study was based on the comparison of regular floristic surveys during three consecutive months: February, March and April. Based on the data obtained, 23 weed species, belonging to 17 genera and 8 families, were identified. The floristic composition varied greatly according to the sampling month and, therefore, depending on climatic conditions. By order of importance, the botanical weed families of barley in the studied area were: *Fabaceae* (6 species in 2 genera), *Asteraceae* (5 species in 5 genera), *Brassicaceae* and *Poaceae* (3 species in 3 genera for each family), *Papaveraceae* (2 species in 1 genus), and finally *Malvaceae*, *Ranunculacea et Convolvulusaceae* (1 species in 1 genus for each family). The majority of found species had marked an abundance-dominance coefficient, using the classical Braun-Blanquet scale, ranked as: +, 1 and 2. The generic diversity index (GDI) varied from 1.62 to 2, whereas the specific diversity index (SDI) has reached a value greater than 2 in all three sampling dates. On the other hand, the Shannon-Weaver diversity index (H) has indicated a high difference in the diversity of species (1.28 to 2.19 bits) controlled by the sampling date.

CHEMICALS PESTICIDES

P1

CONTROL OF LEOPARD MOTH *ZEUZERA PYRINA* (L.) (LEPIDOPTERA: COSSIDAE), BY IMIDACLORPRID IN OLIVE TREES.

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Olive tree is subjected to attack by many insect pest species that affect yield quality and quantity. Among the most common pest species surveyed in Egypt is the leopard moth *Zeuzera pyrina* (L.) (Lepidoptera: Cossidae), a serious pest in olive orchards causing serious damage and loss in olive yield. Imidacloprid is one of the natural insecticides which decrease the infestation with many insect pests. The effect of Imidacloprid were tested under laboratory and field conditions. Results showed that the LC_{50} of Imidacloprid was 120 ppm when *Z. pyrina* was treated with different concentrations of Imidaclorprid. When the product nano imidaclorprid applied on the target pests the LC_{50} was 47 ppm. Under field conditions, the infestations were significantly decreased to 23±8.9 and13±2.1 individuals following treatment with Imidacloprid at Ebn Malek and Ismailia, respectively. In the same locations, the nano Imidacloprid application showed a significant decrease in the pests infestations reached to 15±5.1 and 6±6.6 individuals/plant as compared to 95±1.9 and 96±3.4 individuals/plant in the control. The yields

weight in both locations were significantly increased after the nano imidacloprid treatment.

P2

PREPARATION AND CHARACTERIZATION OF BIOPOLYMER CHITOSAN-BASED MEMBRANES AS EDIBLE COATINGS IN POSTHARVEST APPLICATIONS. Mohamed E.I. Badawy[1] and Entsar I. Rabea[2]. (1) Department of Pesticide Chemistry and Technology, Faculty of Agriculture, Alexandria University, Alexandria, Egypt, Email: m_eltaher@yahoo.com; (2) Department of Plant Protection, Faculty of Agriculture, Damanhour University, Damanhour, Egypt, Email: entsar_ibrahim@yahoo.com

Chitosan is a reactive functional biopolymer, which gives possibilities for chemical modifications to generate new properties and functions. Biocompatibility, biodegradability, non-toxicity, and potential biological activities make this polymer with its advantageous derivatives useful for many applications in different fields. Chitosan has the ability to form thin membranous films because of its high hydrophilicity and good film-forming characters (homogeneous matrix, stable structure, good permeable, good water barrier, and mechanical properties). Therefore, the current study investigates the possible development of some active biodegradable coatings based on chitosan, gelatin, starch, and sorbitol with or without monoterpenes (geraniol and thymol) and their application on fresh grapes as postharvest treatments. The coated fruits were inoculated with fungal spores of *Botrytis cinerea* and stored at 4°C for 21 days. Decay incidence, weight loss, total soluble solids (TSS), total soluble phenolics (TSP), polygalacturonase (PGase), pectin-lyase (PLase), antioxidant activity, guaiacol peroxidase (G-POD), polyphenol oxidase (PPO), and catalase (CAT) were determined in the fruits of experimental sets and compared with the appropriate controls. The results obtained suggested that the incorporation of gelatin or starch by blending with sorbitol as a plasticizer into chitosan film-forming formulations showed good antimicrobial activity and greatest effect on other biochemical parameters. In addition, these formulations can be recommended as useful coating agents for extending the shelf life and maintaining quality of grapes following harvest.

P3

COMPARATIVE STUDY EFFECT OF TILT, ARTEA AND AMISTARXTRA FUNGICIDES ON GROWTH OF DURUM AND BREAD WHEAT AND THEIR IMPACT ON GRAIN YIELD AND ITS COMPONENTS IN THE SEMI-ARID ZONE OF SETIF, ALGERIA. Khlissa Cheniti, Laboratory of Improvement and Development of Plant and Anima Production, Faculty of Nature Science and Life, University of Setif, Algeria, Email: khalissacheniti@gmail.com

Several fungal diseases may infect hard and soft wheat, which directly affect the yield and thus the economy of the country. Fungicides treatment is one disease control measure commonly used. In this study, two wheat varieties, Waha for soft wheat and Hidhab for hard wheat, were studied, at the Technical Institute of Crops (ITGC) in the wilaya of Setif under semi-arid conditions. This study consisted of a successive application of three fungicides (Tilt, Artea, and Armistarxtra) according to three treatments (T1, T2, and T3) in addition to the control (T0) at different stages of plant development (tillering, heading, and maturity). The purpose was to determine the effectiveness of these fungicides used sequentially. The study showed good efficacy when the sum of these pesticides were used. The comparison between these different treatments indicated that T3 treatment reduced yield loss significantly; and that was evident in the main yield components such as fertility, grain yield and weight of 1000 grains. In general, the fungal treatment was an effective way of improving profitability and timing interventions was critical in improving efficiency.

P4

CHITOSAN AS AN ALTERNATIVE FOR CONTROLLING FUSARIUM WILT AND FUSARIUM DRY ROT IN POTATO. Boutheina Mejdoub-Trabelsi[1,2], Soumeya Touihri[1] and Mejda Daami-Remadi[2]. (1) Higher School of Agriculture of Kef, University of Jendouba, 7119, Tunisia, Email: boutheinam2002@yahoo.fr; (2) UR13AGR09, Integrated Horticultural Production in the Tunisian Centre-East, Regional Center of Research on Horticulture and Organic Agriculture, University of Sousse, 4042, Chott-Mariem, Tunisia.

Fusarium disease is one of the most damaging soil-borne pathogens of potato in Tunisia. The activation of defensive responses of plants is a promising tool for controlling pests in agriculture. In the present study, chitosan, aresistance inducer, was evaluated for its *in vitro* antifungal potential against *Fusarium sambucinum*, *F. oxysporum* and *F. graminearum* the main causal agents of dry rot disease on potato in Tunisia. Their impact on Fusarium wilt severity and on potato cv. Spunta growth parameters were also investigated. Chitosan (1 and 4 mg/ml), inhibited mycelial growth of all *Fusarium* spp. in potato dextrose agar (PDA) medium, with the highest inhibition achieved was by using the highest concentration of resistance inducer. Treatments with chitosan (4 mg/ml), through incorporation in the soil, resulted in varied degrees of protection against wilt disease as compared to Fusarium-inoculated and untreated controls. Using chitosan, plant height, roots, tubers and aerial part fresh weights were enhanced compared to pathogen-inoculated controls. Results from this investigation showed that chitosan can provide sustainable management of Fusarium dry rot as well as Fusarium wilt on potato plants and tubers.

P5

FIELD EFFICACY OF BIO-RATIONAL PESTICIDE FYTOMAX N AGAINST DUBAS BUG *OMMATISSUS LYBICUS* DE BERG. (HOMOPTERA: TROPIDUCHIDAE) IN AUTUMN AND SPRING GENERATION. Salem Mohammed Bashomaila[1], Ibrahim Jadou Al-Jboory[2] and Abdulla Omer Madi[3]. (1) Department of Public Authority for Agricultural Research and Extension, East Coast Region, Mukalla, Yemen, Email: smbashomaila@gmail.com; (2) Faculty of Agriculture,

University of Baghdad, Iraq; (3) Agriculture and Irrigation Office, Hadhramaut Coast, Yemen.

Dubas bug *Ommatissus lybicus* represent the most economically important pest on date palm in Yemen, especially in the eastern coastal area (Hadramout, Shabwa and Al-Mahra coast). National campaigns carried out annually by using ground application of conventional chemical pesticides include pyrethriod and organophosphate. Many of which are effective but simultaneously kill beneficial insects such as parasites, predators and bees. Even though Dubas bug can be adequately controlled with chemical insecticides, the cost availability, health and environmental risks impose serious limitations on the use of conventional chemicals. Recently, Dubas bug has acquired resistance to insecticides. Therefore, an alternative approach is urgently needed for controlling this devastating pest. One possible solution is the use of natural bio-rational plant extract that could be safe, sustainable, eco-friendly and effective control measure. For this purpose Fytomax N (Azadirachtin 1%) has been selected for Dubas bug control in organic date palm cultivation in 2012-2013. Fytomax N was applied at a rate of 3ml/litre of water in the spring using HV sprayer in the area of Ghaidat Albhich in May 11, 2013 and in autumn-generation in Valley Asd Aljabel at Hadramout coast on October22, 2013 where palms were severely infested and no pesticides have been used for several years. The dominant insect stages at the experimental site were fourth nymphal instar and adult stages. Comparisons have been made with Dimethoate 40 EC in the autumn generation and Desirin 250EC (Deltamethrin) in spring generation at a rate of 1ml/litre water, in addition to untreated control. The results were statistically analyzed and revealed good control of nymphs and adults by Fytomax N in the spring generation of 86 and 87%, 89.8 and 87%, and 89.8 and 86.5%, after one day, one week and two weeks, respectively. Whereas Decirin 250 EC efficacy was at an average of 98.5%. In autumn generation the dubas population was less in treated area compared with the untreated control plots. The efficacy of Fytomax N on nymphs and adult stages was 92.42 and 94.0%, 94.7 and 93.74%, one and two weeks after treatment, respectively. Moreover, no significant difference was observed on Dubas bug population decline when Dimethoate was applied in the treated area. This outstanding performance encouraged us to recommend the inclusion of Fytomax N in Dubas bug control in Yemen as a green bio-rational solution. Future work will focus on biological aspects of Fytomax N on eggs laying, eggs hatching of Dubas bug and its impact on the egg parasitoid *Pseudoligosita babylonica.*

P6

DETERMINATION OF SOME PESTICIDE RESIDUES IN VEGETABLES AND FRUITS IN DERNA MARKET IN EASTERN LIBYA. Ifdeel Omer El-Awami, S.M. Hussein and A.F. Soliman, Plant Protection Department, Faculty of Agriculture, Omar Al-Mukhtar University, Libya, Email: ifdial_1956@yahoo.com

In this study, the residues of commonly used carbamate and pyrethroid pesticides in Libya (oxamyl, bendiocarb, carbofuran, carbaryl, methomyl, thiocarb, permethrin, deltamethrin, fenvalerate, esfenvalerate, and cypermethrin**)** in vegetables (tomatoes, cucumber, green pepper, scald, cabbage, lettuce and squash) and fruits (grape, peach, apple and plume) from different markets in Derna area was determined during different seasons (summer 2013, autumn 2013, winter 2014 and spring 2014). HPLC with UV detector was used for quantification. Quick, easy, cheap, effective, rugged and safe (QUECERS) extraction and purification method was used to identify the pesticides found in vegetable and fruit samples. The limit of detection was in the range of 0.0033 to 0.0017 mg/kg^{-1}. The mean recovery ranged between 75-95% with relative standard deviations in the range of 15-25%. Results indicated that pesticide residues were found in some monitored fruits and vegetable samples. In 93.71% of fruit and vegetable samples analyzed contained no detectable level of the monitored pesticides, 2.81% of the samples gave results with levels of pesticide residues above the MRL, whereas 4.11% of the samples showed results below the MRL. Carbofuran and oxamyl appear to have health risk associated with them, while the rest of the tested pesticides were found to be under safe limit. The results suggested that the consumers of the eastern area of Libya are exposed to concentration of pesticides that may cause chronic diseases correlated with carbofuran and oxamyl. Based on the results of this study, programs for monitoring pesticide residues in all food commodities is needed in order to protect the end user health.

P7

BIOCHEMICAL PARAMETERS, TOXICITY, DEVELOPMENT AND REPRODUCTIVE EFFECTS OF TWO NOVEL INSECTICIDES ON *SPODOPTERA LITTORALIS* (LEPIDOPTERA: NOCTUIDAE). A.E. Hatem, H.A. Sorour and A.T. Hassan, Plant Protection Research Institute, Agriculture Research Center, Giza, Egypt, Email: a_hattem@yahoo.com; hamsor98@hotmail.com

The response of the cotton leafworm, *Spodoptera littoralis* (Boisduval) (Lepidoptera: Noctuidae), to lethal, sublethal and biochemical parameters effects of clothianidin and metaflumizone were determined by a leaf dipping bioassays. Mortality of newly molted 4th instar larvae increased with increased concentration of the insecticides and the resulting LC_{50} values were 70.24 ppm and 20.41 ppm, for clothiandin and metaflumizone, respectively. Sublethal effects were studied by treatment of 4th instar larvae with a concentration equivalent to LC_{50}. The larval development time, from treatment until pupation, of the survivors were significantly increased in both insecticides, the pupation period shorted significantly for both sexes but shorted insignificantly in male pupa treated with clothianidin, and the weight of pupa was reduced significantly with both insecticides. However, no significant differences were found in the oviposition period and oviposition period of fertilized eggs but significant differences were found in the pre-oviposition period when larvae were treated with metaflumizone, fecundity rate decreased with both insecticides and adult longevity was shorted in both sexes when both insecticides were used. Biochemical analysis indicated that while treatment of 4th

instar larvae with LC50 with both pesticides had no significant effect on acetylcholine esterase activity (AChE) in larval homogenate, it significantly decreased larval contents of total protein and total carbohydrates, reduced alkaline phosphatase (ALP) and esterase (EST) activities, and increased glutathione-s-transferase (GST) activity.

P8

FIELD EVALUATION DATE PALM DUST MITE *OLIGONYCHUS AFRASIATICUS* (MCGREGOR) CONTROL ON DATE PALM TREES IN NEW VALLEY GOVERNORATE OF EGYPT. Ashraf S. Elhalawany, Ahmed S. Sanad and Mohammed A. Rakha, Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt, Email: dr_ashraf_said@yahoo.com

The old world date mite (dust mite) *Oligonychus afrasiaticus* (McGregor) is one of the major pests of date fruit in the New Valley Governorate of Egypt. This research has been carried out in Sharq El-Owainat province for evaluating the effects of biochemical acaricides (Vertimec 1.8% EC), four chemical acaricides (Abroch 5% SC, Challenger Super 24% SC, Envidor 24% SC and Ortus Super 5% EC), one insecticide (Tafaban 48% EC), a mineral oil (K.Z. oil 95% EC), sulfur (Micronite 80% WP) and a water check for the control of *O. afrasiaticus* in two date palm cultivars Barhi (soft) and Bartmoda (dry). Results indicated that on the date palm cultivar Barhi, Challenger super and Vertimec were the most effective compounds in reducing date palm mite population followed by Ortus Super, Envidor, Abroch, Tafaban and Mironite which gave good reduction (80.0%), whereas Kz oil and water gave the lowest mortality (76.47 and 69.41%, respectively). On the date palm cultivar Bartmoda, Challenger Super was the most effective acaricide on dust mite followed by Vertimec, Ortus Super, Envidor and Abroch. No differences between Tafaban, K. Z oil and Mironite gave a reduction in mites numbers by 76.56, 76.47 and 75.87%, respectively, as compared to water check (59.2%) three weeks after application.

P9

COMPATIBILITY OF PESTICIDES AND FERTILIZERS USED IN SORGHUM WITH TWO FUSARIUM ISOLATES IN CONTROLLING WITCH WEED (STRIGA HERMONTHICA (DEL.) BENTH.) UNDER SUDAN FIELD CONDITIONS. E.B. Zahran[1], E.Y Saad[2], A.A. Abbasher[2] and M.S. Zaroug[2]. (1) Al Zaeim Al Azhari University, Sudan; Email: edurzahran@gmail.com; (2) University of El-Gazira, Sudan

Sorghum is the second most important cereal crop after maize in sub-Saharan Africa and it is the main staple food for about 300 million people. In the Sudan, the area under sorghum is estimated at 6 million ha, with an average production of 4.2 million ton per year. In the Sudan, sorghum is heavily infected with Striga, which results in significant yield losses of 70-100%. The main objective of this study was to find compatibility of *F. abuharaz* and *F. nygamai* with sorghum insecticides [Sevein (N-Methyl carbamate) and Furadan (Carbofuran)], herbicides [2,4-D and Goal (Oxyfluorfen)], fungicides [Theram and Apron (Metalaxyl)] and Urea. Experiments were conducted in the laboratory, pots and in the field at Abu Haraz, Faculty of Agriculture and Natural Resources, University of Gezira, Wad Medani, Sudan. In the laboratory experiments, the combination of *Fusarium* sp. *abuharaz* isolate (FA) and *Fusarium nygamai* (FN) with Furadan and Goal, irrespective of rates, increased fungal growth by 4-25% and 4–53%, respectively. The combination of FA and FN with urea, irrespective of rates, produced comparable fungal growth in comparison to that obtained by the fungi alone. Sevein, irrespective of rates, inhibited fungal growth by 4-50%. The two fungicides Theram and Apron significantly reduced FA and FN growth. In pot and field experiments, the combination of FA and FN with Furadan, irrespective of rates, completely inhibited Striga parasitism and improved sorghum yield.

P10

VALIDATION OF A METHOD TO DETERMINE N-METHYLCARBAMATE PESTICIDE RESIDUE IN DATES AND OTHER COMMODITY CROPS BY USING LIQUID CHROMATOGRAPHY-TANDEM MASS SPECTROMETRY. Ali A.S. Al-Maliki, Pesticide Residues Analysis, Plant Protection Department, Ministry of Agriculture, Baghdad, Iraq, Email: ali77.2013@yahoo.com

A multiresidue technique (QuEChERS method) which is quick, easy, cheap, effective, rugged and safe has been validated by selecting 4 N-methylcarbamate insecticides from dates fruit. The four pesticides were chosen at different purity included aldicarb, carbaryl, oxamyl and propoxur. An organic dates fruit were spiked by the mixture of the 4 NMC pesticides and BDMC (IS) internal standard at 3 different concentrations. The determination of these components were made by using 2 diverse instruments: high performance liquid chromatography (HPLC) with post column and tandem mass spectrometry (LC Mas/Mas). Additionally, for spiking recovery, three different concentration were prepared for different pesticides, 0.05, 0.5 and 1 mg/kg for aldicarb and propoxur; 0.1, 1 and 2 mg/kg for carbaryl and oxamyl, a total of 28 replicates including the blank samples. In general, average recovery ranged between 97 to 115%. The precision of this method was measured by using the relative standard division (RSD%) which was 9%. This method was linear as shown by linearity calibration which was ≥ 0.99. With the high selectivity and sensitivity, a QuEChERS method was the most appropriate approach for analyzing N-methylcarbamate insecticides residues in dates. Development a method for determining NMC pesticides can be employed to analysis NMC pesticides on other commodity crops. Three organic crops were elected for this purpose: tomato, lettuce and orange and the same procedure was used for analyzing pesticide residues. These matrices were also spiked with the same pesticides and IS (BDMC). The linearity calibartion for the three crops was ≥ 0.99 and average recovery was almost 100% except for orange which was higher than 150% with RSD of 11% for tomato, 5% for lettuce and 15% for orange. Results obtained showed that orange crop represent a high recovery, suggesting that this method may not fit for this crop or more research is needed.

P11

BIOCHEMICAL MARKERS FOR ACETAMIPRID AND IMIDACLOPRID NEONICOTINOID INSECTICIDES SELECTIVITY IN THE COTTON WHITE FLY *BEMISIA TABACI*, THE COTTON LEAF WORM *SPODOPTERA LITTORALIS* AND HONEY BEE *APIS MELLIFERA*. Shimaa Gh.M. Marzouk[1], Ali A. El-Sheakh[1], Mostafa A. El-Tantawy[2] and Mohamed-Bassem A. Ashour[2]. (1) Plant Protection Research Institute, Agricultural Research Center, Dokki, Egypt, Email: shimaa.ghareeb@gmail.com; (2) Department of Plant Protection, Faculty of Agriculture, Zagazig University, Zagazig, Egypt.

Selective toxicity of acetamiprid (Mospilan 20% SP) and imidacloprid (Imaxi 35% SC) neonicotinoid insecticides to *Bemisia tabaci*, *Spodoptera littoralis* and *Apis mellifera* was studied. Assessment of biochemical alterations (total proteins, total carbohydrates and total lipids content; acetylcholine esterase EC3.1.1.7(AChE) activity; cytochrome P450 monooxygenases EC1.14.14.1 (CP450) activity; glutathione-S-transferases EC2.5.1.18 (GST) activity; alanine aminotransferase EC2.6.1. 2 (ALT) activity; aspartate aminotransferase EC2.6.1.1 (AST) alkaline phosphatase EC3.1.3.1 (ALP) activity) were recorded and discussed as biomarkers for acetamiprid and imidacloprid selective toxicity in the exposed insects. Conclusively, the selective toxicity of the cyanoguanidine neonicotinoid acetamiprid and the nitroguanidine neonicotinoid imidacloprid was based on their chemical structure and metabolic pathways and seemed to represent a species-specific feature. This was indicated by alterations of the values of total proteins, carbohydrates, lipid contents and specific activity of key enzymes in the exposed target and non-target insects.

P12

COMPOSITION AND INSECTICIDAL ACTIVITY OF ESSENTIAL OIL FROM *EUCALYPTUS OCCIDENTALIS* AND *EUCALYPTUS CAMALDULENSIS* AGAINST *ECTOMYELOIS CERATONIAE* ZELLER (LEPIDOPTERA: PYRALIDAE). Samah Ben-Chaaban[1], Ikbal Chaieb[2] and Kamel Mahjoubi[1]. (1) Regional Research Center of Oasis Agriculture, Degache, Tunisia, Email: samah_bchaaban@yahoo.fr; (2) Regional Research Centre in Horticulture and Organic farming, Chott-Mariem, Tunisia.

The aim of this research was to investigate the chemical composition and evaluate the fumigant toxicity of *Eucalyptus occidentalis* and *Eucalyptus camaldulensis* essential oil from Tunisia against larvae of the carob moth Ectomyelois ceratoniae. GC-MS analyses showed that *E. occidentalis* essential oil presented α-pinene (7.6%), Viridiflorol (14.20%) and 1,8-cinéole (44.31%) as major compounds, whereas, *E. camaldulensis* essential oil had α-pinene (1.79%), 1,8-cineole (28.1%), aromadendrene (3.93%) and Viridiflorol (21.89%) as major compounds. Results showed that fumigant toxicity depends on oil species, concentrations and exposure time. Aged larvae (L4 and L5) were more susceptible than young larvae (L2 and L3). Mortality rate of Larvae (L4) reached 80% and 72%, respectively for *E. camaldulensis* and *E. occidentalus* at the concentration of 75 µl/l of air after 24 hours exposure. The corresponding LC_{50} values were respectively 13.4 and 1.5 µl/l of air for *E. occidentalus* and *E. camaldulensis*. Results suggested that *E. camaldulensis* and *E. occidentalus* essential oils could be used as an alternative to the synthetic fumigants in postharvest treatment program for the control of *E. ceratoniae.*

P13

ULTRA-SONIC EMULSIFICATION AND CHARACTERIZATION OF BIO-BASED NANOEMULSION FORMULATIONS CONTAINING CITRAL WITH THEIR ANTIMICROBIAL ACTIVITY. Gehan I.Kh. Marei[1], Entsar I. Rabea[1] and Mohamed E.I. Badawy[2]. (1) Department of Plant Protection, Faculty of Agriculture, Damanhour University, Damanhour 22516, Egypt, (2) Department of Pesticide Chemistry and Technology, Faculty of Agriculture, Alexandria University, El-Shatby, Alexandria 21545, Egypt, Email: entsar_ibrahim@yahoo.com

There is general interest in natural antimicrobial agents, particularly essential oils with broad-spectrum antimicrobial activity, unique mechanisms of action and low tendency to induce resistance. However, their potential as a viable antimicrobial alternative greatly compromised due to their hydrophobic and volatile nature. The current study aimed to formulate and characterize bio-based oil in water (O/W) nanoemulsions for their potential antimicrobial activity against some plant pathogens. Nanoemulsion was prepared using citral as the oil phase, chitosan as a biopolymer carrier (with different ratios, 0.1:1, 0.2:1, 0.4:1 and 0.8:1, respectively), tween 80 as a surfactant, and sodium tripolyphosphate (TPP) as a polyanion crosslinker by ultrasonication method. The nanoemulsions were formed spontaneously by adding dropwise citral oil into an aqueous solution containing chitosan and surfactant with continuous stirring and then formed by ultrasonication. The success of formulation was confirmed by dynamic light scattering (DLS) and scanning electron microscopy (SEM) techniques. Physical stability and viscosity were investigated in details. The antibacterial activity of formulations were evaluated against *Erwinia carotovora* by measuring the minimum inhibitory concentration (MIC) using ELISA technique. The results of DLS and SEM measurements showed that the nanoemulsions had a nearly polydispersity index (PDI) ranged from 0.508 to 0.614 and these values decreased when the concentration of the citral increased. Particle size analysis showed that the mean particle size of these formulations ranged from 27 to 1283 nm. Stability studies showed that the formulations were stable under centrifugation test at 5000 rpm for 30 min. Stability under different storage temperatures showed that the five formulations were stable with no phase separation for the duration of 1 month at 25°C and 4°C. The antibacterial activity of the essential oil against *E. carotovora* was enhanced considerably when it was converted into a nanoemulsion, which was attributed to easier access of the essential oils to the bacterial cells. The highest antibacterial

activity (MIC= 23 mg/L) was observed with the low concentration of citral, which had the lowest particle size (27 nm).

P14

EFFICIENCY OF FLUCARBAZONE-SODIUM AND SELECTED ACETYL COENZYME, A CARBOXYLASE-INHIBITOR HERBICIDES AGAINST CERTAIN GRASS WEEDS IN CANOLA FIELDS. Ibrahim A. Mohamed, Plant Protection Department, Faculty of Agriculture, Assiut University, Assiut, Egypt, Email: ibrahimkorium@gmail.com

This study was conducted to evaluated the efficacy of five ACCase-inhbitors (fenoxaprop-p-ethyl, quizalofop-ethyl, clethodim, clodinafop+pinoxaden and tralkoxydim), an ALS-inhibitor (flucarbazone-sodium) herbicides and hand hoeing against two noxious grass weeds, *Avena fatua* L. and *Phalaris minor* Retz. in canola fields at Assiut Governorate, Egypt during winter seasons of 2014/2015 and 2015/2016. Results showed that all selected ACCase- and ALS-inhibitor herbicides and hand hoeing treatments were effective against *A. fatua* and *P. minor* and achieved a significant high fresh weight reduction of the individual and total grass weeds versus weedy check 30 days after treatments. However, flucarbazone-sodium killed all canola plants after 30 days of the application, thus it should not be utilized to control grass weeds in canola fields. Clethodim and clodinafop+pinoxaden exhibited a slight phytotoxic effect on some canola plants but they did not cause any reduction in canola seed yield. Other tested herbicides, fenoxaprop-p-ethyl, quizalofop-p-ethyl and tralkoxydim did not cause any adverse effects on canola plants after treatments. Concerning canola seed yield, all tested ACCase-inhibitors (Particularly tralkoxydim) and hand hoeing treatments increased seed yield of canola compared with weedy check that had the lowest yield in both seasons. According to this study, tralkoxydim could be used to control the grass weeds as it showed a high performance than other ACCase-inhibitor herbicides and hand hoeing versus weedy check as well as increased final yield.

P15

ASSOCIATION OF TRIAZOLE FUNGICIDES PERFORMANCE WITH *CYP51* GENE ALTERATIONS IN *MYCOSPHAERELLA GRAMINICOLA*, THE CAUSE OF LEAF BLOTCH OF WHEAT. Qasim Abdulla Marzani[1] and Stephen Rossall[2]. (1) Department of Plant Protection, Faculty of Agriculture, Salahaddin University, Erbil, Southern Region of Kurdistan, Iraq, Email: qasim.marzani@su.edu.krd; (2) School of Biosciences, University of Nottingham, Sutton Bonington Campus, Loughborough, LE12 5RD, UK, Email: qasim.marzani@gmail.com

Wheat leaf blotch caused by *Mycosphaerella graminicola* (synonym *Zymoseptoria tritici*), is a worldwide destructive cereal disease on wheat. Due to the lack of highly resistant cultivars, the disease is widely controlled using fungicides. Systemic, site-specific modern fungicides have played an essential role in disease management in cereals. Triazole-based fungicides, which inhibit the C14 demethylation step in fungal ergosterol biosynthesis, known as demethylation inhibitors (DMIs) are major site-specific systemic group of fungicides, currently used to control cereal diseases. Multiple, consecutive and extensive use of these fungicides has led to the emergence of pathogen resistance fungicide strains of wheat blotch. Sequence of *CYP51* gene fragment results indicated existence of more than 15 alterations in recent isolates of *M. graminicola*. Some of these mutations, such as Y137F, were found to be rare whilst the I381V mutation was found to be increasing with time. Based on bioassay studies, six categories within *M. graminicola* isolates were detected, showing different sensitivities to azole fungicides. In general, fungal genotypes of the type S, R3+ and R4 were sensitive to most azole fungicides. The R3+ variant, however, showed less sensitivity to tebuconazole and prochloraz. Whereas *in vitro* studies, the R5 variants, exhibited sensitivity to many DMIs but were less sensitive to prochloraz. This supported the results obtained from *in planta* assays, where this genotype was found to be sensitive to tebuconazole but less sensitive to prochloraz. On the other hand, genotypes of the type R6a, R7 and R8, containing I381V mutation, were resistant to tebuconazole but sensitive to prochloraz. The latter variant, however, was more sensitive to prochloraz. It can be concluded from this study that *CYP51* alterations were differentially selected by different members of the azole class of fungicides.

P16

EFFICACY OF CERTAIN CHEMICAL AND BIO-INSECTICIDES AGAINST PIERCING-SUCKING PESTS, COTTON LEAF WORM AND ASSOCIATED PREDATORS IN COTTON FIELDS AT SHARKIA GOVERNORATE, EGYPT. M.M.A. Ibrahim and H.M.H. Al-Shannaf, Plant Protection Research Institute, Agriculture Research Center, Dokki, Giza, Egypt, Email: hshannaf@yahoo.com

Two experiments were conducted in cotton fields, *Gossypium barbadense* L. variety Giza 86 at Zagazig District, Sharkia Governorate, Egypt during 2013 and 2014 seasons to evaluate the efficacy of some chemical and bio-compounds against some cotton pests and its side effects on associated predators. In the first experiment, each of parathion-methyl, spinosad, azadirachtin 4. 5% and dinotefuran compounds were tested in the field against the piercing-sucking pests (aphids, whitefly, leafhoppers, stink green bug and spider mites), associated predators, in addition to Diple DF (*Bacillus thuringiensis* var *kurstaki* (**B**TK)) against cotton leaf worm. In the second experiment, each of parathion-methyl, spinosad, dinotefuran and Diple DF compounds were tested using a field-laboratory technique to evaluate the biological effects of tested compounds on the second instar larvae of cotton leaf worm. The results of the 1st experiment revealed that the efficacy of tested compounds varied with the pests, seasons and time after application. The highest general mean effect of 81.85, 72.26 and 59.46% reduction were recorded for dinotefuran on aphids during the 1st season, on stink green bug during the 2nd season and on spider mite during the 1st season, respectively. On the other hand, the highest general mean effect of 80.01 and 74.82% reduction were recorded for parathion-methyl on whitefly and leafhoppers during the 1st

season, respectively. In case of cotton leaf worm, the highest general mean effect of 75. 91% reduction was recorded for parathion-methyl insecticide during 2014 season. With respect to side effects of tested compounds on predators associated with cotton pests, the dinotefuran insecticide recorded highest general mean effect of 68.05 and 88.46% reduction on lady bird beetles and true spider mites during the 2nd season, respectively. On the other hand, the parathion-methyl insecticide produced highest general mean effect of 70.03, 71.88 and 65.43% reduction of green lacewing, scmynus, heave beetle during the 2nd season, respectively, and 68.11% on orius bug during the 1st season. The results of biological effects of the compounds tested using the field-laboratory technique on the 2nd instar larvae of cotton leaf worm revealed that the highest mean of mortality of 86.67%, longest larval duration of 12.25 days and lowest pupation rate of 13.33% were recorded for larvae fed in the laboratory on cotton leaves sprayed in the field with parathion-methyl insecticide at zero time. The BTK compound decreased the pupal duration period and shortened emerging female longevity compared with the control and other tested compounds. Furthermore, the lowest pupal weight of 0.2976 g/pupa and emergence rate of 62.50% were obtained when the BTK compound was used. The lowest eggs number of 581.67 eggs/female was recorded for females emerged from parathion-methyl insecticide treatment at zero time. It can be concluded that the BTK compound produced a useful effect on cotton leaf worm biology followed by parathion-methyl insecticide.

P17

EVALUATING THE EFFICIENCY OF TWO LOCAL TRAPS BY USING SOME ATTRACTIVE FOODS TO CONTROL CUCURBITS FLY *DACUS CILIATUS* (DIPTERA: TEPHRITIDAE) ON THE CUCUMBER CROP. Awad Jasim Mohammad and Safaa Zakaria Baker, Faculty of Agriculture, Tikrit University, Iraq, Email: awad_jasim@yahoo.com

A field study was conducted to evaluate the efficiency of two local attractive traps in attracting and killing adults of cucurbits fly *Dacus Ciliatus* by using some attractive foods mixed with two biopesticides Spintor and Proclaim on three cucumber cultivars. Results showed that local trap (type A) with a mixture of date molasses + yeast + sodium urate + Spintor was superior in trapping adults which reached 14.17 adults⁄ trap/ week, followed by the trap (type A) with a mixture of date molasses + yeast + sodium urate + proclaim, which trapped 17 adults⁄ trap/week,, followed by the trap type B with the mixture of date molasses + yeast + sodium borate + Spintor, which caught 7.16 adults⁄ trap/ week. Results of interference trap type with cucumber cultivar showed that the local trap (type A) in cucumber cultivar Amer was superior in trapping adults which reached 7.25 adults⁄ trap/ week.

P18

HORMONAL EFFECT OF SUB-LETHAL DOSE OF SOME INSECT GROWTH INHIBITORS ON CUTICLE OF *PERIPLANETA AMERICANA* (L.). Muhammad S. Mansour[1] and N.M. Al-Mallah[2]. (1) Plant Protection Department, Faculty of Agriculture, Tikrit University, Iraq, Emial: mshmansor@tu.edu.Iq; (2) Plant Protection Department, Faculty of Agriculture and Forestry, Mosul University, Iraq.

The results of studying the hormonal effect of sub-lethal dose of azadirechtin, lufenuron and methoxyfenozide on wings cuticle of *P. americana* (L.) showed a malformation in treated wings and an increase in wing lipids reached 3.10, 18.10 and 4.69% for azadirechtin, lufenuron and methoxyfenozide, respectively, compared with 2.5% for the control. The results also revealed a significant decrease in protein content, with an increase in chitin content which reached 83.90, 88.22 and 85.30% for azadirechtin, lufenuron and methoxyfenozide, respectively, compared with 53.42% for the control. The previous treatments showed also reduction in phenols concentration in the wings cuticle which reached 17.75, 33.70, and 36.14 ppm for azadirechtin, lufenuron and methoxyfenozide, respectively compared with 42.06 ppm for the control.

P19

DOW AGROSCIENCES VISION FOR AGRICULTURAL YIELD AND QUALITY ENHANCEMENT IN LIGHT OF CROP PROTECTION PERSPECTIVE. Amr Moussa Abdulatlif, R&D Manager for North East Africa and Middle East, Email: Amoussa2@dow.com

The world is presently facing many challenges such as population growth, land scarcity and climatic changes which calls for increased plants productivity, quality and yield. Dow AgroSciences is heavily involved in developing new molecules that have high efficiency in order to produce crops with high quality and yield, and to contribute to closing the global food gap. These products are highly effective and safe on environment and user which lead to increased crop productivity. Among the latest molecules produced by are the following: 1) “Isoclast" new product with unique mode of action providing best control performance on Sap-feeding insects, break resistant population including neonicotinoid resistance, good fit in IPM programs, with low environmental impact for wide range crops; 2) "Arylex" new base molecule for new products to control grasses and broad leaf weeds in wheat with no carry over issues offering the best cross spectrum solution for weeds control; 3) "Rinskor" unique base molecule for new products with excellent broad spectrum control for major rice sedges, broad leaf weeds and grasses with less number of sprays to produce healthy crop, higher yield with higher income.

P20

EFFECT OF HERBICIDE MIXTURES ON WILD BARLEY AND ACCOMPANIED WEEDS OF WHEAT AND THEIR IMPACT ON GRAIN YIELD. Reasan K. Shati and S.H.A. Al-Ziadee, Department of Field Crops Science, Faculty of Agriculture, University of Baghdad, Iraq, Email: reasan1949iraq@yahoo.com

Field experiments were carried out at Wasat Governorate during the winter season 2013-2014 to evaluate the performance of wheat to weed control by using some herbicides and their mixtures (Traxous+Granstar, Traxous+Hormony, Cronus+Granstar, Cronus+Hormony,

Pallas+Traxous and Pallas+Cronus). The experimental design used was the randomized complete block design (RCBD) with three replicates. The treatment Cronus+Granstar gave the lowest number and dry weight of wild barley, with 98% reduction, compared to weedy treatment, whereas the treatments Traxous+Granstar or Pallas+Traxous gave 100% control of weeds (broad and narrow). Consequently wheat growth was improved with increased number spikes per square meter and grain yield, similarly the treatment Pallas+Traxous gave high number of spikes.m^{-2} and grain yield of 1691 gm.m^{-2} as compared to the weedy control treatment which gave the lowest grain yield of 698 gm.m^{-2}. Weed control in this study resulted an increase in grain yield of 58.7% compared to the control treatment.

P21

TOXIC EFFECT OF ESSENTIAL OILS OF *ELATTARIA CARDAMOMUM* L. AND LAMBDA – CYHALOTHRIN ON *TROGODERMA GRANARIUM* EVERT. Sahil K. Al-Jamil, Plant Protection Department, Faculty of Agriculture & Forestry, Mosul University, Iraq, Email: sahilaljameel@yahoo.com

Toxic effect of lambda-cyhalothrin and essential oils of cardamom seeds of *Elettaria cardamomum* L., individually or in combination, on the larva, pupa and adult stages of khabra beetle, *Trogoderma granarium* Evert. through the topical application were studied. The mortality rate of the larval stage exposed to lambda–cyhalothrin, at concentrations of 0.25, 0.35, 0.50 and 0.75 ppm reached 11.33, 22.00, 34.67 and 44.67%, respectively. Whereas, the mortality rate of pupa exposed to the same chemical at concentrations of 0.25, 0.35, 0.50 and 0.75 ppm reached 12.33, 15.67, 24.67 and 44.33%, respectively. For adults, exposed to Lambda concentrations of 0.25, 0.35, 0.50, and 0.75 ppm mortality rates reached 10.0, 12.33, 24.33 and 42.0%, respectively. The mortality rate of larvae exposed to cardamom oil at concentrations of 0.1, 0.3, 0.5 and 1 ppm reached 62.0, 74.67, 92.0 and 94.67%, respectively, whereas the mortality rate of pupa exposed to cardamom oil at concentrations of 0.1, 0.3, 0.5 and 1 ppm reached 46.67, 63.33, 83.33 and 90.0%, respectively. The mortality rate of adults exposed to cardamom oil at concentrations of 0.1, 0.3, 0. 5 and 1 ppm reached 41.33, 62.0, 74.67 and 82.33%, respectively. The synergistic ratios for larva, pupa and adults exposed to mixture number 1 (0.03 ppm insect cardamom oil and different concentrations of pesticide), were 2.08, 1.50 and 1.40, respectively, whereas the synergistic ratios of larva, pupa and adults exposed to mixture number 2 (0.07 ppm insect cardamom oil and different concentrations of pesticide) were 2.66, 2.44 and 3.40, respectively. These results suggest that a combination of cardamom seeds oil with different concentrations of the insecticide lambda can produce synergistic effects.

P22

THE INSECTICIDAL EFFECT OF THE SECONDARY METABOLITES OF AROMATIC PLANT *THYMUS ALGERIENSIS* AGAINST BLACK BEAN APHID (*APHIS FABAE*, APHIDIDAE: HEMIPTERA). Rayane Saifi[1], Mohamed Belhamera[1], Messaouda Benabelkader[2] and H. Saifi[1]. (1) Laboratory of research diversity of the ecosystems and dynamic and production of agricultural systems in arid regions, Department of Agronomic sciences, Mohamed Khiider University, Biskra, Algeria; (2) Laboratory of Applied Mycrobology, Faculty of Sciences, Ferhat Abbes University, Department of Environment and Agronomy, Faculty of Nature and Life Sciences, Jijel University, Algeria, Email: rayanesaifi2015@gmail.com

This study aimed to evaluate the bio-insecticide activity of essential oil belonging to the vegetable species *Thymus algeriensis*. We carried out tests on one of the most dangerous insects of broad bean *Aphis fabae*; that causes direct and indirect damage in Algeria and other countries. Concentrations of 1, 2, 4 ul/ml of this oil, by contact or inhalation, proved to be insecticidal. The results obtained showed that this oil was effective, with a low DL50 compared to oils of some other plants. However the studied oil produced morphological disturbances observed on broad bean leaves. In the light of these results we were encouraged to evaluate essential oils as alternative control measures important for the development of bio agriculture to minimize the effect of toxic pesticides.

P23

EFFECT OF SOME CHEMICAL INSECTICIDES AND INORGANIC SALTS AGAINST SUBTERRANEAN TERMITES *ANACANTHOTERMES OCHRACEUS* UNDER FIELD CONDITIONS. Eman E.H. El Rehewy, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: emanelrhewy@yahoo.com

The present investigation was carried out in order to estimate the effect of some chemical insecticides, inorganic salts, and molasses on the subterranean termites *Anacanthotermes ochraceus*, under field conditions. Tested compounds were as follows: two IGRs; neubenzeron, and lufeneuron, two inorganic salts; sodium bicarbonate and copper sulphate, in addition to Fipronil, Chloropyrofos and Tempo. Results obtained showed that chloropyrofos was the most effective followed by Tempo. The results also showed that sodium bicarbonate and molasses were the most attractive materials to the subterranean termites. This can be used as a new strategy for pest management of the subterranean termites.

P24

PHOTOCATALYTIC DEGRADATION OF CARBAMATE PESTICIDES (METHOMYL) USING SYNTHESIZED TIO_2 NANOPARTICLE. A.M. Shaker[1], A.H. Zaki[2], Elham F. Abdel-Rahim[1] and M.H. Khedr[2]. (1) Sids Agricultural Research Station, Plant Protection Research Institute, ARC, Giza, Egypt; (2) Faculty of Postgraduate Studies for Advanced Sciences, Beni-Suef University, Egypt, Email: amshaker2003@gmail.com

An estimated 1 to 2.5 million tons of active pesticide ingredients are used annually in agriculture causing environmental pollution, and is of serious concern. Photo-degradation and mineralization of pesticide contaminants has become the key concern of scientific community. The main cause of pesticide pollution is the excessive use of

pesticides. Nanotechnology plays an important role for solving this problem using TiO_2 nanoparticles which could successfully eliminate the harmful pesticide toxicity under sunlight radiation within a very short time. In this study, three treatments of the 2nd and 4th instars of a laboratory strain of *Spodoptera littoralis* larvae were investigated. Larvae were fed on three groups of cotton leaves; the first group was sprayed with a solution mixture of methomyl and TiO_2 nanoparticles, the second group was sprayed with methomyl alone, and the third group was sprayed with distilled water as control. The experiment was evaluated at 0, 3, 5, 7, 9 and 12 days after treatment. It is noticed that insects fed on methomyl alone had higher mortality rate than the insects treated with the solution mixture, as compared to zero mortality for the insects treated with distilled water. The mortality rate varied according to the larval instar and the toxic residual period. The study also evaluated the effect of the treatments on the biological activities of the insect such as fecundity, hatchability, morphogenic abnormality and pupal weight.

P25

INSECTICIDES APPLICATION AND THE EGYPTIAN COTTON LEAFWORM, *SPODOPTERA LITTORALIS* (BOISD.) SUSTAINED LARVAE. Hassan F. Dahi[1], Abdel-Rahman G. Abdel-Rahman[2], Mahmoud M. El-Bamby[3], Walaa E. Gamil[1] and Doaa S. Rasheed[2]. (1) Plant Protection Research Institute, Agricultural Research Center, Doki, Giza, Egypt, Email: hassandahi@yahoo.com; (2) Plant Protection Department, Desert Research Center, Mataria, Cairo, Egypt; (3) Environment and Bio-Agriculture Department, Faculty of Agriculture, Al Azhar University, Cairo, Egypt.

Sustained larva phenomenon is the elongation of the duration of the larval stage. This phenomenon occurs as a result of imbalance in insect hormones after treating the larvae with some insecticides such as insect growth regulators (IGR). This work aimed to explain this phenomenon as a result of treating *S. littoralis* 4th instar larvae with Spinetoram, Lambda-cyhalothrin, Chlorpyrifos and Emamectin Benzoate. Highly significant increase in larval duration was recorded in treated larva. Significant changes in total carbohydrates, total protein and total lipid contents as well as the main enzymes activities were detected in the sustained larvae. Genetic differences between normal untreated *S. littoralis* and sustained larvae were also studied.

P26

MOLECULAR CHANGES IN THE EGYPTIAN COTTON LEAF WORM, *SPODOPTERA LITTORALIS* (BOISD.) STRAINS RESISTANT TO SPINETORAM AND LAMBDA-CYHALOTHRIN. A.G. Abdel-Rahman[1], M.M. El-Bamby[2], H.F. Dahi[3], Walaa E. Gamil[3] and Doaa S. Rasheed[1]. (1) Plant Protection Department, Desert Research Center, Mataria, Cairo, Egypt, (2) Environment and Bio-Agriculture Department, Faculty of Agriculture, Al Azhar University, Cairo, Egypt; (3) Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: walaagamil@yahoo.com

Four primers (OP-A3, OP-A5, OP-A6 and OP-A8) out of five gave clear differences among the untreated, resistant and field strain of *S. littoralis* on the basis of the amplified products pattern. The results showed seven unique bands (absent and present), where three primers (OPA-03, OPA-05 and OPA-06) produced unique bands, whereas OPA-08 did not produce any unique polymorphic bands. The dendrogram based on RAPD analysis separated three main clusters of the tested strains. The first one included untreated (susceptible Lab. strain) 4th larval instar, S/G4 and S/P, the second group included S/G2, S/G6 and FS1, whereas the third group included K/G2, FS3, K/P and FS2.

PLANT EXTRACTS

EX1

EFFICACY OF DIFFERENT INDIGENOUS PLANT EXTRACTS AND A CHEMICAL INSECTICIDE AGAINST WHITEFLY, *BEMISIA TABACI* (GENNADIUS) ASSOCIATD WITH SUNFLOWER, *HELIANTHUS ANNUUS* L. IN PESHAWAR VALLEY, PAKISTAN. Fazal Said[1] and Mian Inayatullah[2]. (1) Department of Agriculture, Abdul Wali Khan University, Mardan Pakistan; (2) Department of Entomology, The University of Agriculture, Peshawar, Pakistan, Email: dr.fazal@awkumedu.pk

Susceptibility to a large number of different insect pests is one of the most important concerns towards the prosperous production of sunflower across Pakistan. Among these insect pests, the whitefly, *Bemisia tabaci* (Gennadius) is the most important pest which contributes to the yield losses in sunflower production. The current research project was conducted at New Developmental Farm (NDF), The University of Agriculture Peshawar, Pakistan during the years 2012 and 2013 in order to study the effectiveness of different indigenous botanicals and a new chemical insecticide emamectin benzoate 1.9 E. C against whitefly associated with sunflower cv. Hysun-33 in Peshawar Valley of Khyber Pakhtnkhwa. Population density of the whitefly was recorded one day before and then 1 day, 2 days, 3 days and one week after application of each spray on the crop. Results obtained revealed that chemical insecticide caused highest reduction in whitefly population, whereas among the plant extract treatments, *D. alba* extract was the most effective treatment in reducing whitefly population, followed by *Azadirachta indica* oil and *A. indica* seed extracts. Maximum population density of the pest was observed in the control plot, where no pesticide material was applied. Plant extracts of *D. alba* and *A. indica* have the potential to be used for the positive control of whitefly on sunflower.

EX2

FIRST RECORD OF PESTICIDAL PROPERTIES OF AMERICAN AGAVE PLANT ON SOME SCALE INSECTS AND APHIDS IN SYRIA. Mohammad Omran[1], Ghassan Ibrahim[2], Anwar Al-Miamar[2], Amjed Al-Yousef[2] and Mayadah Haj Ali[1]. (1) National Commission for Biotechnology (NCBT), Damascus, Syria, Email:

mayyada.hajali@gmail.com; (2) Plant Protection Department, Faculty of Agriculture, Damascus University, Syria

The aqueous and alcoholic extracts of leaves of American agave *Agave americana* (Agavaceae) were tested for their ability to control some scale insects and aphids by using three concentrations (50, 75, 100%), and two application methods: (i) leaf extract was applied against some species of scale insects on bay laurel plant *Laurus nobilis* (Lauraceae) and umbrella plant *Schefflera arboricola* (Araliaceae) (in the laboratory), (ii) leaf extract was applied against peach black bark aphids *Pterochloroides persicae* (Aphidae: Homoptera) on peach plant *Persica* spp. (Rosaceae) (in the field). In the laboratory, all three concentrations (50, 75, 100%) of the aqueous extracts applied on bay laurel had shown the highest mortality rate of olive scale insects *Parlatoria oleae* (Diaspididae: Homoptera) without significant differences among them compared with the alcoholic extracts concentrations. Whereas, the highest mortality rate of brown soft scale insects *Coccus hesperidum* (Coccidae: Homoptera) was obtained on umbrella plant by using the 100% concentration of aqueous extract with significant differences among all the concentrations, except the 100% concentration of alcoholic extract. In the field, the 100% concentration of alcoholic extract has achieved 50.9% mortality of peach black bark aphids *P. persicae,* whereas 80.6% mortality was achieved by using the 100% concentration of the aqueous extract. Thus, the American agave plant *A. americana extract* has some insecticidal characteristics, and the aqueous extract was more effective than the alcoholic extract.

EX3

EFFECT OF MIXTURES FROM PLANT EXTRACTS (OLEANDER, MUGWORTS AND BETONY) IN CONTROLLING WHITE FLY INSECTS. Sadek Kadhem, Omer Khaleel and Abed Al-Rezaq Jassem, Ibn Al-beter Research Center, Baghdad, Iraq, Email: a19000a@yahoo.com

Experiments to evaluate biological effects of oleander, mugworts and betony plant extracts at a concentration of 1 g/L to control white flies, using a direct spray method were conducted. Insect mortality rate was determined at four times 1, 3, 5 and 10 days after spraying. The tests indicated that there were significant differences in the effect of the extracts on the insect at the nymphal stage. Highest mortality reached on the tenth day following spray treatment. The mortality rate obtained for each of the extracts of the three plant species reached 87.9, 78.4 and 66.5%, respectively.

EX4

PHYTOCHEMICAL AND BIOINSECTICIDAL SCREENING OF THE ALGERIAN PLANT: *THAPSIA GARGANICA* L. (APIACEAE). Fatma Acheuk[1], Khemais Abdellaoui[2], Nora Chahbar[1], Lamia Yalaoui[1], Hadjer Boukahal[1], Wassima Lakhdari[3] and Abderramene Dahliz[3]. (1) Laboratoire Valorisation et Conservation des Ressources Biologiques, Département de Biologie, Faculté des Sciences, Université de Boumerdes, Boumerdes, 35000, Algeria, Email: fatma.acheuk@yahoo.fr; (2) Département des Sciences Biologiques et de la Protection des Végétaux, Institut Supérieur Agronomique de Chott-Mariem, Université de Sousse, Tunisia; (3) Institut National de Recherches Agronomiques, Station de Sidi Mehdi, Touggourt, Algeria.

A phytochemical screening of the crude ethanolic extracts of the aerial part (AP) and the underground part (UP) of the plant *Thapsia garganica* L. was carried out by TLC and GC/MS. The results of these phytochemical characterizations showed that the two parts (AP and UP) of the plant contained flavonoids, tannins, saponins and alkaloids in trace amounts. The study showed that the plant did not contain anthocyanins and leucoanthocyanins. AP and UP were poor in coumarins and iridoids. Gallic tannins were highly present in both parts of the plant. Phytochemical tests showed the presence of glucosides. GC-MS gave an idea of the composition of the crude extracts of this plant. 8 compounds were identified in the crude extract of AP and 5 compounds in the crude extract of UP. The major constituents for these extracts were: phytole, hexadecanoic acid, octadecanoic acid, hexadecanoic acid, erucylamide and 13-docosenoic acid amide erucamide. In order to demonstrate the bioinsecticidal potential of the extracts of this plant, toxicity tests were carried out on larvae of the 5th instar of the migratory locust *Locusta migratoria* by testing 5 doses for UP, ranging from 100 to 3000 µg/larvae and 4 doses for AP ranging from 300 to 3000 µg/larvae. The results of the toxicity tests revealed that the ethanolic extracts tested exhibited good insecticidal activity with a dose-response relationship. The 100% mortality was obtained 4 h after treatment for UP and after 24 h for the AP at the highest doses tested.

EX5

MOLECULAR CHARACTERIZATION OF *PYRICULARIA ORYZAE* AND ITS MANAGEMENT BY STEM EXTRACT OF *TRIBULUS TERRESTRIS.* Arshad Javaid, Freeha Anjum and Naureen Akhtar, Department of Plant Pathology, Institute of Agricultural Sciences, University of the Punjab Lahore, Pakistan, Email: arshadjpk@yahoo.com; arshad.iags@pu.edu.pk

Rice blast disease caused by *Pyricluaria oryzae* Cavar is one of the most destructive diseases of rice responsible for high yield losses all around the world. In the present study, morphological and molecular characterization of *P. oryzae* and its management by stem extracts of *Tribulus terrestris* L. (Land caltrops) was carried out. In a laboratory bioassay, methanolic stem extract of 1, 2, 3, 4 and 5% concentrations significantly reduced biomass of *P. oryzae* by 35-43%. Methanolic extract was successively fractionated using *n*-hexane, chloroform, ethyl acetate and *n*-butanol. Bioassays with different concentrations of these fractions (1.562, 3.125, 6.25……., 200 mg mL^{-1}) showed that chloroform and ethyl acetate fractions were highly antifungal resulting in 54-82% and 16-85% suppression in biomass of *P.oryzae*, respectively. Chloroform fraction was subjected to GC-MS analysis that revealed 18 compounds. Among these were: 1,3-benzenedicarboxylic acid, bis(2-ethylhexyl) ester (20.69%), octacosane (11.20%), heptacosane (9.67%), octadecane, 6-

methyl- (5.40%), *n*-hexadecanoic acid (4.82%), pentadecanoic acid methyl ester (3.80%) and Apiol (3.71%). Such compounds might be responsible for antifungal activity of methanolic stem extract against *P. oryzae*.

EX6

USING OF THYMOL FOR EXPORT FRUITS PRESERVATION FROM SPOILAGE UNTIL IT REACH THE CONSUMER. Maha A. Al-Rijabo, Department of Biology, Faculty of Science, Mosul University, Iraq, Email: mahaalrejaboo@gmail.com

Isolates of *Fusarium graminearum* and *Penicillium nalgiovense* were collected from imported and spoiled grapes as well as orange and grapefruits purchased from local markets. The growth of the two species was checked on thymol. Complete growth inhibition was achieved at concentration of 0.5 mg/ml of growth medium for *Fusarium graminearum* and 1.5 mg/ml of growth medium for *Penicillium nalgiovense*. Because thymol becomes mutagenic and toxic at high concentration, safety is recommended when this product is used to preserve fruits and crops whose outer peel, such inskin like citrus, is kept to protect the fruits from spoilage during packaging, storage and transportation.

EX7

INSECTICIDAL ACTIVITY OF *ALCEA SETOSA* ON BLACK BEAN APHID (*APHIS FABAE* SCOPOLI) AND RED SPIDER MITE (*TETRANYCHUS URTICAE* KOCH) UNDER LABORATORY CONDITIONS. Hazem S. Hasan[1] and Khaldoun J. Al-Hadid[2]. (1) Department of Plant Production and Protection, Faculty of Agricultural Technology, Al-Balqa' Applied University. Al-Salt 19117, Jordan, Email: Hazem@bau.edu.jo; (2) Department of Biological Sciences, Faculty of Science. University of Jordan, Amman, Jordan, Email: kalhadid@ju.edu.jo

The effect of *Alcea setosa* (bristly hollyhock) aqueous extract was tested against the two spotted spider mite, *Tetranychus urticae* Koch (Arachinda: Acai: Tetranychidae) and *Aphis fabi* Scopoli (Hemiptera: Aphididae). Different concentrations of 1, 0.75, 0.5 and 0 (control) gm/ml (wt/v) resulted in 40, 37, 27, 0 and 90, 80, 40, 0% mortality of the target population, respectively. The LD_{50} was 0.385 ppm on *Tetranychus* and 0.620 ppm on *Aphids*. The *Alcea setosa* plant extract proved to have positive impact on reducing the spider mites and aphids population. This product can be included as a component of integrated management and organic farming programs. This plant is available in large scale and is safe to humans and environment. Aqueous extract can be prepared easily by farmers them selves with low cost.

EX8

EFFECT OF LEAVES POWDER OF SOME PLANTS AGAINST THE CONFUSED FLOUR BEETLE *TRIBOLIUM CONFUSUM* (COLEOPTERA: TENEBRIONIDAE). Halluma Kerra and Marwa Abetrad, University of Tripoli, Libya, Email: Kerra50@hotmail.com

Tribolium Confusum is one of the most dangerous secondary insect pests which attacks stored grains and their products world wide. This study aimed to investigate the effects of different ground materials as pesticides or repellents obtained from carnation, fenugreek seeds, and olive leaves. These products were tested at different concentrations on *Tribolium Confusum.* Biology, mortality, response index and reduction in F1 progeny were investigated. Results indicated no significant differences were found between the different powders and their concentrations. The response index reached 13.3% for carnation, and 8.3% for fenugreek seeds and olive leaves, compared with 0% for the control. Repellent effects were highest for carnation at 13.3%, followed by fenugreek seeds at 28.85% and olives leaves at 82.2%, compared with 0% for the untreated control. Results showed that carnation powder gave a significant kill 100% of all first generation adults compared with all other treatments.

EX9

IMPACT OF NEEM EXTRACTS, *AZADIRACHTA INDICA* A. JUSS INDUCED AGAINST RED PALM WEEVIL, *RHYNCHOPHORUS FERRUGINEUS* (OLIVIER) ATTACKING DATE PALM ORCHARDS IN EGYPT. Ahmed Merghem[1] and Abd Al-Rahman Mohamed[2]. (1) Department of Wood Borers and Termites, Plant Protection Research Institute, Egypt, Email: ahmedmerghem@yahoo.com; (2) Central Laboratory for Date Palm Research and Development, Agricultural Research Centre, Giza, Egypt.

Red palm weevil (RPW), *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae) is considered to be the most devastating boring pest attacking date palm trees, *Phoenix dactylifera* L. (Arecales: Arecaceae). In this study, date palm orchards were investigated at Ismailia governorate, Egypt, were investigated during 2015-2016. Results obtained revealed the wide distribution of RPW with high infestation rates at the visited locations. Rates and severity of infestation were recorded in the surveyed sites, with highest infestation rate of 91.6% and a maximum severity of 3.4 holes/tree and least average infestation rate of 14.9% and severity of 1.19 holes/tree. Extracts of neem seeds, *Azadirachta indica* A. Juss (Sapindales: Meliaceae) were tested in the laboratory against the RPW stages using organic solvents in addition to the commercial Nemazal brand as a comparison treatment. Laboratory experiments revealed a potential effect of the used titers against both adult and larvae of *R. ferrugineus* stages resulting in high mortality rates which reached 85.4 and 79.5% on average for larval and adult stages, respectively. Field trials with such agents were conducted on both remedial and protective scales revealing a considerable infestation reduction of 60.8% and 53.1% repellency for all applied treatments. Field trials confirmed the potential of using such treatments for the control of RPW in Egypt.

EX10

***TUTA ABSOLUTA* AND PLANT EXTRACTS AS ALTERNATIVE BIORATIONAL MEASURE FOR ITS CONTROL.** Efat Abou-Fakhr Hammad[1,2,3], Amani

Abbass[1], Mohammad Abbass[1], Elissa Daher[1] and Youssef Abou Jawdeh[2]. (1) Faculty of Agriculture & Veterinary Sciences, Lebanese University, Beirut, Lebanon, Email: ima27@mail.aub.edu; (2) Faculty of Agricultural & Food Sciences, American university of Beirut, Lebanon.

Bioassays with plant extracts of fruits of the Chinaberry tree, *Melia azedarach* L., and extracts of vegetative micro-algae were performed against adults and eggs of *Tuta absoluta* (Meyriek). The plant material was extracted in different solvents: water, methanol, ethyl acetate, ethanol, chloroform and hexane at a ratio of 1:5 (w/v) in 24 h. The extracts with and without mineral oil (2%) were applied on tomato plants before release of adult *Tuta* sp. and were applied directly on *T. absoluta* eggs infesting tomato plants to determine their direct effect on the insect egg instar and consequent development instars in comparison with the biorational products: neem oil, mineral oil, sulfur and distilled water as control. Results obtained showed that three *M. azedarach* and one microalgae sp. extracts caused significant repellency against the adult moths of *T. absoluta* in a choice test and have significantly decreased the oviposition rate of the insect without affecting the new adult moth emergence in comparison with the control. Results also showed that extracts of *M. azedarach* fruits caused significant direct toxicity effect on eggs of the leafminer and have significantly decreased the larval and pupal survival rate of the insect in comparison with the control. These results suggest to employ the potential effect of *M. azedarach* fruit and microalgae extracts on two stages of *T. absoluta* development, eggs and adults, as a component in management of this cosmopolitan pest.

EX11

EFFICIENCY OF SOME PLANT OIL EXTRACTS AGAINST THE TWO-SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH AND THE TWO PREDATORY MITES *PHYTOSEIULUS PERSIMILIS)* A. -H.), AND *NEOSEIULUS CALIFORNICUS* (MCGREGOR). Ashraf S. Elhalawany[1] and Ahmed A. Dewidar[2]. (1) Fruit Trees Mites Department, Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt, Email: dr_ashraf_said@yahoo.com; (2) Medicinal and Aromatic Plants Department, Horticultural Research Institute, Dokki, Agricultural Research Centre, Giza, Egypt, Email: Dewidar1@yahoo.com

Seven plant essential oils were tested for their toxicity against eggs and adults of *Tetranychus urticae* Koch as well as adults of the two predatory mites *Phytoseiulus persimilis* Athias-Henriot, Neoseiulus californicus (McGregor) under laboratory conditions. Essential oils were extracted with water from leaves of lemon grass, spearmint, rosemary, fennel, chamomile flower, marjoram and coriander seeds. Five concentrations 4, 3, 2, 1 and 0.5% were used for each essential oil. LC_{50} values for the adult females of *T. urticae* after 72 h were 1.28, 0.85, 0.53, 1.61, 0.44, 3.11 and 0.46%, respectively. For these oils, LC_{50} values for eggs of *T. urticae* were 1.54, 6.44, 0.96, 1.72, 1.30, 14.67 and 0.95%, respectively. Chamomile, coriander and rosemary proved to be the most efficient agent against eggs and adults of *T. urticae*. Results indicated that the mean number of laid eggs highly decreased as concentration increased, with the highest decrease observed with *T. urticae* females treated with 4% of coriander oil extract, which gave 4.7 eggs/female compared with 44.3 eggs/female in the untreated females. On the other hand, there were no significant differences between seven essential oils against *P. persimilis* and *N. californicus* after 48 h of treatment. The LC_{50} values of the seven oils ranged from 7.09 to 9.63% for *P. persimilis*, whereas it ranged from 4.94 to 9.63 for *N. californicus*. The toxicity of all essential oils was least to females of predacious mites than to *T. urticae.* The data may suggest that essential oils of all seven plants have potential to be used for management of *T. urticae* with little effect on the two predacious mites *P. persimilis* and *N. californicus*. The chemical composition of the essential oils was characterized by GC-MS.

EX12

ANTIFUNGAL PROPERTIES OF ESSENTIAL OILS EXTRACTED FROM CITRUS PEELS. Mayadah Haj Ali, Rudwan Badr Al-Deen and Bassam Al-Oklah, National Commission for Biotechnology (NCBT), Damascus, Syria, Email: mayyada.hajali@gmail.com

Essential oils from the peels of six citrus species, *Citrus limon*, *C. sinensis*, *C. paradise*, *C. maxima*, *C. reticulata* and *C. aurantium*, were extracted using a water distillation method. The chemical composition of these essential oils were determined by means of gas chromatography-mass spectroscopy (GC-MS). The essential oils were applied against four fungal genera, namely *Penicillum*, *Alternaria*, *Fusarium* and *Aspergillus*. The total number of identified compounds was 45. The components and their percentage varied according to the kind of essential oil. The most common component with the highest percentage was limonene. Moreover, antifungal activity varied among the essential oils based on concentration and citrus species source.

EX13

ANTIFUNGAL ACTIVITIES OF ESSENTIAL OILS EXTRACTED FROM TWO EUCALYPTUS SPECIES (*EUCALYPTUS SIDEROXYLON* AND *EUCALYPTUS GOMPHOCEPHALA*). Mimoun El Kaoua[1], Soukaina Zarrouk[2] and Hafida Bouamama[2]. (1) Laboratoire de Biotechnologie et Bioingégniorie moléculaire, Email: elkaoua@gmail.com; (2) Laboratoire de Chimie Biomoléculaire et Macromoléculaire (LCBM). Université Cadi Ayyad Faculté des Sciences et Techniques Guéliz. BP: 549, Boulevard Abdekrim El Khattabi. Marrakech, Maroc.

In this study, average yields of essential oils were determined for two eucalyptus species, with significant difference between the two sources. Yield from *Eucalyptus Sideroxylon* was 7 times more than that obtained from *Eucalyptus gomphocephala*. This high oil content of essential oil in *E. sideroxylon* has been correlated to the large oil pockets founded on both sides of the mesophyll layer in the leaf, whereas examination of the histological sections by photonic microscopy in *E. gomphocephala* indicated that no oil pockets were visible in this species, thus the low essential oil yield. The chromatographic

analysis of the essential oil has made it possible to separate 102 compounds of which five have been identified and and represent 94.58% of the total. Among these compounds, cineole was the major compound with a content of 79%. Other metabolites have been found at relatively high levels, namely myrcene, α-terpineol, terpinolene and spathulenol. The quantitative and qualitative difference in essential oils between the two Eucalyptus species studied was confirmed by the sensitivity of the different phytopathogenic fungi to the essential oils of Eucalyptus which varied from one species to another. Indeed, the essential oil from *E. Sideroxylon* exhibited very strong inhibitory activity on *Fusarium* spp. and *Penicillium* spp. Furthermore, essential oils extracted from *E. Gomphocephala* had no effect on the strains of phytopathogenic fungi tested in this study.

EX14

INVESTIGATION OF ANTIFUNGAL ACTIVITY IN THREE TYPES OF MARINE ALGAE. Hasnaa Sammama, Abdelali Benaliat, Ibrahim Amine Farouk, Driss Hssisou, Allal Douira and Mimoun El Kaoua, Faculty of Science and Technology, University of Cadi Ayyad, Marrakech, Morocco, E-mail: hasna.sammama@edu.uca.ac.ma

Presently, marine organisms are a very important source of new bioactive molecules. In this study, the antifungal activity of three species of marine algae, *Cystoseira* spp., *Bifurcaria bifurcata* (Phaeophyceae) and *Corallina elongata* (Rhodophyceae), collected along the Moroccan Atlantic coast were evaluated. Extraction was carried out using soxhlet with a decreasing polarity solvent: methanol, ethanol, ethyl acetate, dichloromethane and hexane. These extracts were tested against three fungal species: *Botrytis cinerea*, *Alternaria alternate* and *Rizoctonia solani*. After defining the efficiency of different extracts, the evaluation of antifungal activity was performed by using the disk diffusion method, followed by determining the minimum inhibitory concentration (MIC) and the effect on spore germination. This study showed that methanol and ethanol extracts gave the highest recovery of 13.9% in *Cystoseira* spp. Hexane extract was the most effective on *B. cinerea* with an inhibition zone of 24.3 mm and with 10% spore germination. This effect was observed at a MIC of 100 µg/ml. However, inhibition of 70-80% of the spores and better inhibition of mycelial growth of the test species was observed in the methanolic extracts and ethyl acetate of Phaeophyceae species. It was concluded that methanol and ethyl acetate extracts of *Cystoseira* spp. and *Bifurcaria bifurcate* demonstrated high antifungal activity.

EX15

EFFECTS OF MELIA AZEDARACH L. EXTRACTS ON THE SAW-TOOTHED GRAIN BEETLES *ORYZAEPHILUS SURINEMENSIS* (COLEOPTERA: SILVANIDAE). Mohamed Izzat Al Ghannoum and Batool Abdullah Karso, Plant Protection Department, Faculty of Agriculture, University of Duhok, Iraq, Email: mighannoum@yahoo.com

Methanolic and aqueous extracts of dry seeds from the chinaberry tree, Melia azedarach L. (Meliaceae) were performed against adults and larvae of *Oryzaephilus surinemensis* (Coleoptera: Silvanidae) under laboratory conditions. Seed extracts showed high bioactivity at all doses. Results obtained showed that the seed extracts suppressed adults and larvae activity of *Oryzaephilus surinemensis* even at low dose. In general, larvae were more susceptible to seed extracts than the adults. The methanolic extract showed strong impact on larvae and adults, with clear effect on mortality rate which increased with increasing concentration of the extract. The highest concentration of 50% showed 90% mortality of adults, and 100% mortality of of larvae. The aqueous extract effect on mortality rate was less, 76.7% on adults and 90% on larvae, in response to the same concentration. The low cost and naturally occurring biopesticides may represent a safe alternative to synthetic pesticides.

EX16

USE OF ACTIVE COMPOUNDS PRESENT IN *ULVA RIGIDA* AND *FUCUS SPIRALIS* WITH ANTIFUNGAL PROPERTIES TO PLANT PATHOGENS. Ibrahim Amin Farouk, Abdelali Benaliat, Hasnaa Sammama and Mimoun El Kaoua, Faculty of Science and Technology, Kadi Ayad University, Marrakesh, Morocco, Email: farouk.uca@gmail.com

Aquatic algae, especially marine algae, are considered a good source for biologically active molecules, but without extensive studies until present. This study aimed to discover compounds with antifungal activities which can be extracted from the marine algae *Ulva rigida and Fucus spiralis* collected from the Moroccan Atlantic coast. In this study the Soxhlet instrument and solutions with different polarities were used to extract the active molecules. The ectracted compounds were evaluated for their ability to inhibit growth of fungal pathogens of agricultural and economic importance.

EX17

USE OF SOME PLANT EXTRACTS TO CONTROL POWDERY MILDEW DISEASE CAUSED BY ERISYPHE CICHORACEARUM ON ZUCCHINI PLANT. Ibraheem A. Ibraheem, Firas T. Rasheed, Abdulkader K. Abbas and Emad A. Slebi, Department of Plant Protection, Iraq, Email: abdulkader_abbas@yahoo.com

Aqueous extract of four plant species *Allium sativum* (bulb), *Urtica* sp. (leaves), *Citrullus colocynthus* (fruit) and *Mirabilis jalapa* (roots) were tested to evaluate their effect on reducing disease severity of powdery mildew caused by *Erisyphe cichoracearum* on Zucchini plant *in vitro* and *in vivo*. Results obtained showed that among the four plant extracts, bulb extract of *A. sativum* and leaf extract of *Urtica* sp. were found to have inhibitory effect on conidia germination at all concentrations. The most effective treatment was *A. sativum* extract (100%) at concentration of 30 mL/L, compared with the control treatment, folowed by *Urtica* sp. leaf extract (85%) at the same concentration. The extracts of *Citrullus colocynthus* (fruit) and *Mirabilis jalapa* (roots) were found to have no effect on conidia germination at all concentration used. In green house experiment, the results obtained showed the high efficiency of *A. sativum*

and *Urtica* sp. extracts to reduce disease severity compared with the control treatment. *A. sativum* extract was the most efficient in reducing disease severity (8%) at the concentration of 30 mL/L, with significant differences compared to all other treatments.

EX18

ANTIFUNGAL ACTIVITY OF THE ESSENTIAL OILS OF TWO MEDICINAL PLANTS AGAINST THE FUNGUS *PHYTOPHTHORA CAPSICI*. Messaouda Benabelkader[1], Rayane Saifi[2] and Hadjer Saifi[3]. (1) Laboratory of Applied Mycrobology, Faculty of Sciences, Ferhat Abbes University, Department of Environment and Agronomy, Faculty of Nature and Life Sciences, Jijel University, Algeria, Email: yamina_messaouda@yahoo.fr; (2) Department of Agronomical Sciences, Mohamed Khider University, Biskra, Algeria; (3) Department of Biological Sciences, Tunis El Manar University, Tunisia.

Algeria has an important diverse flora which is useful to explore and valorize. Bioactive substances such as essential oils from medicinal plants are known for their ability to fight plant diseases.In this study, two plant species well known in folk medicine in Algeria and mainly used in our region of Jijel: *Eucalyptus globulus* and *Lavandula angustufolia* were selected to extract their essential oils and study their antifungal activity against *Phytophthora capsici*. The essential oil extraction yield was 0.33% for *E. globulus* and 1.63% for *L. angustufolia*. These crude oils were effective against P. capsici, as they formed an inhibition zone of 57 mm in diameter with *E. globulus* oil and 49 mm in diameter with *L. angustufolia* oil. Application of these bio fungicides to control plant diseases in the field will be further investigated.

EX19

EFFECTIVENESS OF CARDAMOM AND CLOVE POWDERED SEEDS TO CONTROL *RHYNCHOPHORUS FERRUGINEUS*. Mona Mohammed Al-Dawsari, College of Science and Humanities, Price Sattam bin Abdel Aziz, Saudi Arabia, Email: wisdom1425@yahoo.com

Effectiveness of powdered seeds of cardamom (0.8, 1, 3 and 5 mg) and clove (1, 3, 5 and 7 gm) to control *Rhynchophorus ferrugineus* were evaluated. For each concentration a total of 15 adult weevils in 3 replicates were used and fed on pieces of sugarcane covered with each concentration. Data showed that cardamom seeds powder at 5 gm concentration gave 93% mortality after one day and 100% mortality after two days. Whereas, others concentration (0.8, 1 and 3 mg) after two days gave 26, 40 and 46%, mortality, respectively. Similar results were obtained from clove seeds powder at 7 mg concentration gave a 53% mortality after one day and 100% mortality after three days. Other concentrations (1, 3 and55 5 mg) after three days gave 33, 73 and 80% mortality, respectively. In addition, extracts of both plants using petroleum ether and chloroform were tested, by mixing 1 ml of each extract with 10 ml distilled water. Mortality rates were observed after 24, 48 and 72 h and after spraying each extract with different concentrations (0.2, 0.4, 0.5, 0.6, 0.7 and 0.8 mg) on 15 adult weevils in 3 replicates. A 100% mortality was obtained after three days to all concentrations of cardamom and clove. More investigations are in progress.

EX20

INHIBITION EFFECT OF ALCOHOLIC LEAF EXTRACT FOR SOME PLANTS ON *RHIZOCTONIA SOLANI* GROWTH. Maha A. Al-Rijabo[1] and Nadia Q. Mahmood[2]. (1) Department of Biologym Faculty of Sciencem University of Mosul, Iraq, Email: mahaalrejaboo@gmail.com; (2) Department of Nursing, Technical Institute, Mosul, Iraq.

Rhizoctonia solani isolated from rice, causes damage damage to several crop plants. To control this fungal pathogen by a safe method without causing damage to the environment, animals and humans, this study aimed to evaluate the alcoholic leaf extract of some plants to inhibit the growth of *R. solani*. The fungal inhibitory effect of alcoholic extract of *Cassia* spp., *Salvia officinalis* and *Achillea millefolium* leaves was evaluated by using four concentrations for each 5, 10, 15, 20 mg/ml and the results obtained were compared with the antifungal effect of *Trichoderma harzianum* and *Trichoderma viride*. It was noticed that these extracts had high inhibitory effect against this fungus. The inhibition rate reached 100% for all extracts and all concentrations tested except 5 mg/ml of alcoholic leaf extract of *Cassia* spp., where inhibition rate reached 90.3%. The results indicated that the alcoholic extract of tested leaves had high inhibition ability similar to other used biocontrol agents.

EX21

EVALUATION OF THE ATTRACTIVE POTENTIAL OF SOME EXTRACTED SUBSTANCES FROM DATE PALM TISSUES TO THE RED PALM WEEVIL, *RHYNCHOPHORUS FERRUGINEUS* (OLIVIER), FEMALES. Eman E.H. El-Rehawy, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: emanelrhewy@yahoo.com

The red palm weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) (Oliv.) is the most serious and destructive insect pest for date palm trees. The relative potential of the extracted substances from date palm tissues to trap the red palm weevil, *R. ferrugineus* Olivier, was evaluated in date plantations of El-Mansoria village, Giza Governorate, Egypt. Results of this study indicated that the amino acids and indols attracted more red palm weevils adults than phenols. Moreover, results showed that sugars attracted the least number of adults compared to other substances.

EX22

EVALUATION OF THE EFFICIENCY OF SOME PLANT EXTRACTS TO CONTROL *BEMISIA TABACI* AND *MYZUS PERSICA* ON EGGPLANTS. Ammar K. Jasman, Ali K. Slomy and Asmaa Abd Ali. (1) Faculty of Agriculture, University of Green Qaseem, Iraq, Email: ammarjasmann@yahoo.com; (2) Technical Institute, Musayyib, Iraq.

The aim of this study was to use safe and easily biogegradble natural water extracts from the leaves and

stems of *Mirabilis jalapa* plant and *Conocarpus erectus* L. tree to control the white fly *Bemisia tabaci* and green peach aphid *Myzus persica* on eggplants. The extract of *M. jalapa* plant resulted in killing all developmental stages of *B. tabaci* and *M. persica* at a concentration of 1.5 g/L during the study period, in the laboratory and field. The results of the biochemical evaluation of the plant water extracts showed 100% mortality of the whitefly nymphs and adults, followed by the *C. erectus extract*, with mortality rates of 62.33% and 39.33% for *B. tabaci* nymphs and adults, respectively, and mortality rate of 36.65% and 34.95% of nymphs and adults of *M. persica*, respectively. Results of field experiments also showed that the mortality rate of *B. tabaci* and *M. persica* 6 days after treatment reached 100% and 61.65%, respectively, when the water extract of *M. jalapa* plant was used at a concentration of 1.5 g/l.

EX23

EFFECT FUNGICIDAL ACTIVITY OF SOME PLANTS AND PROPOLIS EXTRACTS ON *ASPERGILLUS FLAVUS*. Ibrahim S. Ibrahim[1], Gomaa F. Abo Laban[2] and Ahmad E. Mostafa[3]. (1) Plant Protection (Pesticide) Department, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt; (2) Plant Protection (Entomology) Department, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt; (3) Pharmacognosy Department, Faculty of Pharmacym Al-Azhar University, Cairo, Egypt, Email: abonaem2015@yahoo.com

The fungicidal effect of ethanolic and acetone extracts of fresh guava (*Psidium guajava* L.) leaves, ginger (*Zingiber officinale*) rhizomes and propolis against *Aspergillus flavus* was investigated under laboratory conditions using poisoned food techniques. The effect of six different concentrations (500, 1000, 2000, 3000, 5000 and 7000 ppm) of each extract in potato dextrose agar medium (PDA) were evaluated. The results revealed that both ethanolic and acetone extracts of guava leaves, ginger rhizomes and propolis significantly inhibited *A. flavus*. It was also observed that the inhibitory effect of ethanolic extracts of both guava and propolis were higher than acetone extracts. The inhibition rate of *A. flavus* mycelia growths for the ethanolic extract of *P. guajava* were 40.77 and 58.55% at concentrations of 2000 and 3000 ppm, respectively, whereas the inhibition rate for acetone extracts were 32.22 and 50% at the same concentrations, respectively. On the contrary, the antifungal effect of acetone extract of *Z. officinale* was higher than its ethanolic extract. Inhibition rates were 55.55 and 62.22% at concentrations of 2000 and 3000ppm, respectively. However, inhibition rates for the ethanolic ginger extract were 32.22 and 41.88%, at the same concentrations, respectively. The results indicated that the lowest inhibitory effect against *A. flavus* was 10% at 500 ppm for acetone extract of propolis. However, the strongest activity against *A. flavus* was 88.88% at concentration 7000 ppm for ginger acetone extract. In general, the inhibitory effects of the extracts significantly increased with increasing concentrations. The results indicated that tested extracts possessed antifungal activity, and it has potential to use as a component for the control of *A. flavus*.

EX24

POTENTIAL OF NEEM AND USHER EXTRACTS IN CONTROLLING SORGHUM COVERED SMUT. Naiema E. Gorashi, Hoyam M. Idriss and Rehab E. Idriss, Environment, Natural Resources and Desertification Research Institute, National Centre for Research, Khartoum, Sudan, Email: negorashi@yahoo.com

Dura *Sorghum bicolor* is an important crop in Sudan as staple food and as cash crop. The covered smut is a destructive fungus which affects the quantity and quality of sorghum grains. It is commonly s controlled by chemical pesticides as seed dressing which creates high risk of animal and human poisoning. Healthe and environmental concerns increased the efforts towards safer alternatives. The objective of this research is to evaluate the efficiency of aqueous and ethanolic extracts of neem and usher in controlling the covered smut in sorghum, cv. Tabat. Infected seeds were collected and brought to the Laboratory. The spores of the fungus were treated with different concentration of aqueous and ethanolic extracts prepared from the two plants and with water only as control. The spores were observed under the microscope for two days spore germination rate was determined. Significant reduction in spore germination was achieved by extracts from the two plants. However, ethanolic extracts were more effective and the inhibition rate was increased with increased concentration of the extract. The spores germination was reduced to 7.2, 11.4, 1.8 and 0.2% for aqueous extract of neem seed, neem leaves; Usher leaves aqueous and ethanol extracts, respectively, compared to 86.4% in the control. Sorghum seeds germination was not affected by those extracts, although the length of the radicle was reduced. This study should be continued in the nursery to demonstrate the efficiency of the extracts of the two plants, as seed dressing, on reducing disease severity before transferring to the field.

EX25

FIELD EVALUATION OF DIFFERENT EGGPLANT CULTIVARS AGAINST INFESTATION OF BRINJAL SHOOT AND FRUIT BORER (*LEUCINODES ORBONALIS* GUENEE). Ajmal Khan Kassi, Humayun Javed and Muhammad Asif Aziz, Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan, Email: a_k_kasi@yahoomail.com

Response of different eggplant cultivars against Brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee.) was evaluated at the research farm of PMAS, Arid Agriculture University, Rawalpindi, during 2013. Field trials were conducted in randomized complete block design with four replications for the screening of five cultivars of Brinjal (*Solanum melongena* L.) (Short Purpal, Singhnath 666, Brinjal long 6275, Round Brinjal 86602, Round Egg Plant White). Cultivar Round White Brinjal showed maximum fruit infestation (54.44%) followed by Singhnath 666 (53.19%), while minimum fruit infestation was observed in Round Brinjal 86602 (42.39%). Cultivar Short Purpal showed maximum larval population (0.43) followed

by Round White Brinjal (0.39), while the minimum larval population was observed in Round Brinjal 86602 with (0.27). It was observed that Round Brinjal 86602 cultivar showed comparatively minimum (*L. orbonalis*) larval population per leaf. The correlation of Brinjal fruit infestation and larval population of *L. orbonalis* with the different environmental factors showed that the average relative humidity was positively and significantly correlated with fruit infestation of cultivars. Average precipitation showed positive but non- significant correlation on all the cultivars except Singhnath 666 with the value of (0.79), which was positive and significant. The average temperature showed non-significant and negative correlation with Brinjal long 6275, Round Brinjal 86602 and Singhnath 666, but significant negative correlation with Short Purpal and Round White Brinjal. Maximum temperature also showed the significant and negative correlation on all the five Brinjal cultivars which were significant or highly significant. Minimum temperature showed negative correlation but not significant correlation with all the cultivars. Consequently, based on the *L. orbonalis* larval density and Brinjal fruit infestation, the Round Brinjal 86602 proved least susceptible and Short Purpal highly susceptible cultivars.

EX26

QUANTITATIVE CHEMICAL ANALYSIS OF TWO EXTRACTS OF MEDICINAL PLANTS AND THEIR ANTIFUNGAL ACTIVITY AGAINST *PHYTOPHTHORA CAPSICI.* Messaouda Benabelkader[1], Rayane Saifi[2] and Hadjer Saifi[2]. (1) Laboratory of Applied Microbiology, Faculty of Sciences, Ferhat Abbes University, Department of Environment and Agronomy, Faculty of Nature and Life Sciences, Jijel University, Algeria, Email: yamina_messaouda@yahoo.fr; (2) Department of Agronomical Sciences, Mohamed Khider University, Biskra, Algeria; (3) Department of Biological Sciences, Tunis El Manar University, Tunisia.

The pathogen *Phytophthora capsici* is a pathogen of sweet pepper (*Capsicum annuum*), causing serious damage every year in Algeria, especially during long rain periods. Two plant species well known in folk medicine in Algeria *Nerium oleander* and *Myrtus communis* were selected in order to study the chemical and antifungal properties of their extracts. The results obtained demonstrated an important antifungal activity of the two extracts against *P. capsici* by producing inhibition zones of different sizes in growth cultures: 2.9 cm with the crude aqueous extract of *N. oleander*, 1.9 cm with the crude aqueous extract of *M. communis*, 4.1 cm with the dry crude extract after its hydrolysis of *N. oleander* and 3.3 cm with the dry crude extract after hydrolysis of *M. communis.* Quantitative chemical analysis of these extracts showed their richness in phenolic compounds (*N. oleander* 26.75 and *M. communis* 22.71 mg EAG/gE), flavonoids (*N. oleander* 7.9 and *M. communis* 11.56 mg EQ/gE) and tannins (*N. oleander* 41.63 and *M. communis* 22.96 mg EAT/gE), which explains their efficacy and toxicity to the studied fungus, suggesting its potential use in agriculture as a biofungicide.

EX27

ANTIFUNGAL ACTIVITY OF MOROCCAN CISTUS ESSENTIAL OILS. H. Bouamama[1], F. Benkhalti[1], A. Benharref[2] and A. Gonzales-Coloma[3]. (1) Laboratoire de Chimie Bioorganique et Macromoléculaire, FST, UCA, BP: 549, Av. Khattabi, 40000, Marrakech, Maroc, Email: bouamamahafida@gmail.com; (2) Laboratoire de Chimie Biomoléculaire, Substances Naturelles et Réactivité, Faculté des Sciences Semlalia, UCA, BP: 2390, Marrakech, Maroc; (3) Centro de Ciensias Medioambiantales, CSIC, C/Serrano, 115-bis, Madrid, 28006, España.

The antifungal activity of essential oils of two *Cistus* species were tested against three *Fusarium* species: *F. moniliforme* (Sheldon), *F. oxysporum* and *F. solani* (Mart). Evaluation was made through the mycelial growth inhibition method. The *Fusarium* sp. are Ascomycetes ubiquitous fungi. They are abundant in natural and cultivated soils and are often phytopathogenic. *Fusarium* species can also cause various infections in humans; they are known to produce potent mycotoxins, and affected crops become unfit for human and or animal consumption. The species most frequently encountered in human pathology is *F. solani*, in addition to *F. oxysporum* and *F. moniliforme*. According to the results obtained on essential oils of the species Cistus incanus and Cistus monspeliensis, the most important antifungal effect was observed in the essential oil of *C. monspeliensis* (HE. M) with EC_{50} = 0.081 mg/ml (0.034-0.19) against *F. oxysporum* and EC_{50} = 0.098 mg/ml (0.012-0.78) against *F. moniliform.*

EX28

EFFECT OF POWDER PREPARATION OF CLOVE, GINGER, GARAD AND GALANGAL ON THE INFESTATION OF CHICK-PEA GRAINS CAUSED BY ADULTS COWPEA WEEVIL *CALLOSOBRUCHUS MACULATUS*. Afaf Abdel Hameed[1], Faiza E.E. Salah[2] and Ahamed Adam Eisa[2]. (1) Plant protection, Ministery of Agriculture, Sudan; (2) Crop Protection Department, Universty of Gezira, Sudan, Email: faizaruba@yahoo.com

Chickpea, *Cicer arietinum* L. (Fabaceae) is the most important legume crop in Sudan. Cowpea weevil, *Callosobruchus maculatus* (Coleoptera: bruchidae) is the major store pest of chickpea grains. This study was conducted to investigate the efficacy of flower buds powder of clove, *Syzygium aromaticum* Cl, rhizomes powder of ginger, *Zingiber officinale* Rose, galangal, *Alpinia officinarum* Hance, and fruits powder of garad, *Acacia nilotica*, on the level of cowpea weevil adult infestation. The experiments were carried out in the laboratory to rear cowpea weevil adults on chickpea grains treated with the powder of the above mentioned natural products. Ten cowpea weevil adults were introduced to each treatment. Chickpea grains were treated with powder of clove, ginger, galangal, garad, and untreated chick-pea grains as control, replicated five times and arranged in a complete randomized design. Parameters studied were weight loss, adult mortality, seed damage and seed germination. Weight loss and adult mortality were determined weekly, whereas seed damage and seed germination were assessed at the end of the experiment. Results obtained indicated that these

natural products significantly (p<0. 05) reduced the damage rate caused by the cowpea weevil adult on chickpea grains, which reached 8.40, 19.60, 32.00, 33.20 and 66.00% in response to treatment with the powder of clove, ginger, galangal, garad, and the control, respectively. Weight loss (%) reached 1.81, 3.31, 4.03, 4.35 and 5.31% following treatment with the powder of clove, ginger, galangal, garad, and the control respectively. Adult mortality reached 93.33, 61.99, 54.66, 41.40 and 30.06% following the treatment with powder of clove, ginger, galangal, garad and the control respectively. Seed germination rate of 83.20, 74.00, 68.00, 64.40 and 41.60% was obtained in response to using the same powders, respectively. Apparently clove powder was the most effective, followed by that of ginger, galangal and garad compared to the control. It can be concluded that clove powder was the most effective in reducing cowpea weevil adult infestation on chickpea grains, and thus recommended for chickpea grains protection against cowpea weevil in grain stores.

EX29

COMPARATIVE EFFECTS OF DIFFERENT PLANT EXTRACTS ON OKRA PESTS. J.M. Mari and S.N. Mari, Sindh Agriculture University, Tandojam, Sindh, Pakistan. Email: janmarree@gmail.com

Okra is a major fruit vegetable, cultivated all over the tropics of the world and used as a vegetable. Different factors caused reduction in fruit yield, among them insect pests are considered the major ones. The experimental research work was laid out in the agricultural fields of Department of Plant Protection, Sindh Agriculture University, Tando Jam, during the 2016 spring season. Data obtained indicated that tobacco extract was found the most effective, followed by neem, hing and Eucalyptus extracts. 48 h after treatment of different plant extracts, pest population started to decline, except with neem extract, where decline started 24 hrs after treatment, and it was significantly higher than that of the control. Data showed that maximum effect of tobacco, hing extracts and Eucalyptus on whitefly, jassid and aphid was found after 48 hrs followed by 24, 72 and week respectively. Afterwards, they showed gradual decrease against the test insects. The tobacco extract showed a greater effect over the other and Eucalyptus exhibited a negligible effect to decline pest numbers. In conclusion, an attempt has been made to evaluate the role of plant extracts in pest activity. The results reported here open the possibility of further investigations on the efficacy of natural product extracts.

EX30

INHIBITION EFFECT OF ETHANOLIC EXTRACTS OF *NERIUM OLEANDER* LEAVES, *SILYBUM MARIANUM* SEEDS AND *GLYCRHIZA GLABRAL* ROOTS AGAINST *RHIZOCTONIA SOLANI* AND *MACROPHOMINA PHASEOLINA* IN VITRO. Neran S. Aljarah and Rasha M. Abidallh, Agriculture College, Baghdad University, Iraq, Email: neranaljarah@yahoo.com

This research was conducted during the growing season 2015-2016. The research aimed to investigate the effectiveness of ethanol extracts of *Nerium oleander* leaves *(*Oleander*)*, *Silybum marianum* (Milk thistle) seeds and *Glycrhiza glabral* (Liquorice) roots against plant pathogens *Macrophomina phaseolina* and *Rhizoctonia solani in vitro*. The results obtained showed significant inhibition activity of the three tested extracts on the radial mycelial growth of *M. phaseolina* and *R. solani* on PDA medium. The most effective extract was 1% concentration of liquorice extract, which produced 73.4 and 72.2% inhibition of the vtwo fungal pathogens, respectively. The dry biomass of *R. solani* was significantly reduced with 1% concentration of the three extracts after 4 days of growth on PDB medium, whereas both of oleander and milk thistle extracts were effective in reducing the dry biomass of *M. phaseolina* only. No significant effect on the germination of *M. phaseolina* sclerotia was obtained after 24 hours of soaking in three stock solutions of plant extracts.

EX31

EFFECT OF SOME SECONDARY METABOLITES ON BIOLOGY AND BEHAVIOR OF BLACK BEAN APHID (*APHIS FABAE* SCOPOLI) ON FIVE LOCAL FABA BEAN (*VICIA FABA* L.) CULTIVARS. Fouad Meradsi[1] and Malik Laamari[1,2]. (1) Laboratory of Improvement of the Phytosanitary Protection Techniques in Mountainous Agrosystems, Region of the Aureses, Algeria; (2) Agronomy Department, Institute of Veterinary and Agricultural Sciences, University of Batna, Algeria, Email: fouadmeradsi@gmail.com

Understanding how host-plant characteristics affect behavioral responses and biological parameters of insect herbivor is of considerable importance in the development of resistant crop cultivars for use in integrated pest management. Tests for antixenotic and antibiotic resistance of apterous *Aphis fabae* Scopoli (Homoptera: Aphididae) were investigated among five local faba bean, *Vicia faba* L. (Fabales: Fabaceae) cultivars. Differences between cultivars for parameters of antibiosis were significant only for the total fecundity ($F_{3.18}$ = 3.42; P= 0.040). However, the total number of nymphs was almost four times higher on susceptible control compared to the cultivar 14. The most attractive host plant to the insect was the cultivar 4 in both tests (light and dark), whereas the cultivars 12 and 1 were the least preferred in the dark test. The chemical analysis showed that cultivar 12 had the lowest level of flavonoids (43.15 µg g^{-1} dry matter) ($F_{3.48}$= 6.77; P= 0.007) than the other cultivars. However, the content of total phenols among the five cultivars did not differ significantly ($F_{3.48}$ = 0.53; P= 0.716). Cultivars 12 and 1 had a high level of antixenosis and a moderate level of antibiosis. Cultivar 14 had a high level of antibiosis and a moderate level of antixenosis.

INTEGRATED PEST MANAGEMENT

IPM1

USE OF BIORATIONAL INSECTICIDES COMBINATION OF AZADIRACHTIN AND *BACILLUS THURINGIENSIS* ASSOCIATED WITH *DICYPHUS MAROCCANUS* RELEASING IN *TUTA ABSOLUTA* IPM PROGRAM UNDER SEMIFIELD CONDITIONS. S. Abbas[1], M. Pérez-Hedo[2], A. Tena[2], S. Colazza[1] and A. Urbaneja[2]. (1) Department of Agricultural and Forest Sciences, University of Palermo, Palermo, Italy, Email: sdekabbassorganic@gmail.com; Stefano.collaza@unipa.it; (2) Unidad de Entomologı´a UJI-IVIA, Centro Proteccio´n Vegetal y Biotecnologı´a, Instituto Valenciano de Investigaciones Agrarias, Ctra. Moncada-Na´quera, Km. 4. 5, 46113 Moncada (Valencia), Spain, Email: aurbaneja@ivia.es; atena@ivia.es

Generalist predators representing an important component of biological and IPM strategies. Previous studies stressed the importance of Mirid bugs in controlling leafminers. This study, conducted in IVIA in Valencia province of Spain during 2013, aimed to evaluate (i) the use of biorational insecticides combination of Azadirachtin plus *Bacillus thuringiensis* associated with *Dicyphus maroccanus* released in *Tuta absoluta* IPM program, and (ii) to explore *D. maroccanus* potential role under semifield conditions. The study consisted of 5 treatments, 4 replications each, and seven tomato plants in each replication. The treatments included *D. maroccanus* alone in 2 different releasing rates (high and low), *D. maroccanus* with the biorational insecticides combination of Azadiractine plus *Bacillus thuringiensis*, the combination of Azadiractine plus *B. thuringiensis* alone, and the control treatment. Azadirachtin was tested as Neem at 3cc/1L/plant and *B. thuringiensis* var. kurstaki was used at 0.333 g/1 and one liter per plant. The results obtained showed that there was no side effects of the combination of Azadiractine plus *B. thuringiensis* on *D. maroccanus* existence; moreover, the treatment of *D. maroccanus* (high released rate) with the combination of Azadiractine plus *B. thuringiensis* demonstrated the lowest number of tomato infested leaflets among the treatments. The same treatment showed the highest efficacy of *T. absoluta* infestation rate reduction among the treatments. Finally, this study supported the use of the combination of Azadirachtin with *B. thuringiensis* associated with *D. maroccanus* released in IPM program to control *T. absoluta*. More studies are still required for tomato pests management in protected agriculture and in the open field, in order to explore further the potential use of *D. maroccanus* in IPM programs.

IPM2

INTEGRATED PEST MANAGEMENT OF TOMATO LEAFMINER *TUTA ABSOLUTA* (LEPIDOPTERA: GELECHIIDAE) IN MOROCCO. Rachid Bouharroud, Institut National de la Recherche Agronomique, CRRA-Agadir, Avenue des FAR B.P. 124 Inezgane, Agadir, Morocco, Email: bouharroud@yahoo.fr

After the introduction of the tomato leafminer *Tuta absoluta* to Morocco in 2008, farmers faced a serious challenge to control this pest without losing their potential market, especially EU. To meet the customer requirements and to achieve the objectives of Moroccan Green Plan, farmers have adopted IPM. This strategy reduced pesticide use by monitoring both pests and beneficial organisms, and employ crop loss prediction as the basis for management decisions. The exclusion of pests by insect-proof nets is a key IPM component. Greenhouses in general offer this opportunity by preventing entry of pests. Greenhouses were first introduced to Morocco in 1970s, but the objective at that time was to improve off-season production regardless of plant protection. Currently the area of protected crops, in the Souss region (Southwest of Morocco) has increased exponentially and tomato occupies more than 78% of total area in Morocco. Even the main tomato production in Morocco is under greenhouse conditions, chemical control of *T. absoluta* was adopted as a last choice. The survey done in 2009-2010 season showed that the cost of pesticides was increased by 22% compared to seasons before the introduction of *T. absoluta*. The invasion of *T. absoluta* has resulted in the use of natural enemies especially *Nesidiocoris tenuis*. The IPM components adopted by the farmers are: sanitation before planting, tillage, use of certified seedlings free of diseases and pests, mulching, pheromone traps, weeding around greenhouses, removal of infested leaves, management of indoor climate, management of fertilization and irrigation. From 2009 to 2015, the status of *T. absoluta* in Morocco was under control by generalizing the use of zoophytophagous bug *N. tenuis*. Accordingly, the population of *T. absoluta* population was significantly reduced during these seasons and the pest became a secondary pest in tomato greenhouses. However, the resurgence of *T. absoluta* did occurr during late 2016 and 2017, as the farmers started to reduce the use of *N. tenuis*, because this bug caused damage to solanaceous crops, when its preferred prey is absent.

IPM3

INTEGRATED MANAGEMENT OF ORANGE FRUITs TO POSTHARVEST AND STORAGE DISEASES. Abdul Rhman Youssef Khafteh[1] and Sanaa M. Fares Sari[2]. (1) Department of Plant Protection, Faculty of Agriculture, Tishreen University, Lataki, Syria, Email: dr.khafateh54@yahoo.com; (2) Ministry of Agriculture, Syria, Email: sanaa_sari57@hotmail.com

Citrus growing area around the world increased, and citrus production exceeded 123 million tons in 2013. In Syria, citrus production reached 1.5 million tons in 2015 in Lattakia and Tartous regions. Experiments were conducted in 2016-2017 during storage period on Valencia late fruit in chilled storage houses. Results of a survey for causal organisms of orange decays showed that green and blue molds caused by *P. digitatum* and *P. italicum* were the most damaging postharvest diseases of orange fruits, and their incidence reached 41% and 26%, respectively. The other identified fungi associated with citrus fruits were: *Guingnardis citricarpa, Colletotrichum, Botrytis cinerea, Cercospora angolense* and *Phytophthora citrophtora*. Applying the integrated orange fruit diseases management (IDM) in the field and in storage could reduce blue and

green molds incidence to 0.39% and 0.17%, respectively, after cold storage for 90 days.

IPM4

USE OF FOCUSED IDENTIFICATION OF GERMPLASM STRATEGY (FIGS) IN GENE MINING FOR RESISTANCE TO PESTS AND DISEASES: SUCCESSES AND LIMITATIONS. M. El-Bouhssin, K. Street, A. Amri, S. Ahmed, Z. Kehel, K. El-Fakhouri and A. Sabraoui, International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat, Morocco, Email: m.bohssini@cgiar.org

Insects and diseases are important biotic stresses that impact negatively the production of cereal and food legume crops in North Africa, West and Central Asia. Host plant resistance is the most economical and practical means for controlling pests and diseases. The Focused Identification of Germplasm Strategy (FIGS) has been used at ICARDA to select best-bet subsets for sought trait using the relationship between the environmental conditions of the collection site and the trait. FIGS has the potential to efficiently mine genetic resources ensuring a continuum between the conservation and utilization of genetic resources. For pests and diseases, the FIGS approach is based on co-evolution, selection pressure and adaptation. This approach favors selection of germplasm to test for resistance to pests and diseases from centers of origins and diversity where co-evolution between the host and the parasite (pests and diseases) has occurred. Using FIGS approach, we were able to identify resistance to sunn pest, Russian wheat aphid, rusts and powdery mildew in wheat and leaf minor in chickpea. However, we are not yet successful in finding resistance to chickpea pod borer, the barley stem gall midge and Ascochyta blight on chickpea. Our findings suggested that the FIGS approach may not be effective in finding resistance under the following circumstances: insects with multiple host plants (polyphagous), case of chickpea pod borer and pathogens/insects with highly virulent races/biotypes, case of Hessian fly Syrian biotype and virulent pathotypes in *Ascochyta rabiei* affecting chickpea.

IPM5

TOWARDS AN ECONOMIC AND SUSTAINABLE STRATEGY OF INTEGRATED CROPS PROTECTION (ICP) IN SMALL SCALE FARMS (SSFS) IN THE SOUTH MEDITERRANEAN. Khaled Alrouechdi, FAO, Egypt, Email Kh.alrouechdi@gmail.com

This presentation is based on the author's observations and data collected through a high number of technical missions/projects in the different South Mediterranean countries (SMCs). Agriculture in the SMCs, is dominated by small scale farms (SSFs), generally 2-5 hectares, which account for more than 70% of the food production, with important pre- and post-harvest losses due to various insect pests, diseases, weeds and vertebrate pests. There is a need to establish an integrated plant production/protection strategy including biological control, good agricultural practices (GAPs) and phytosanitary measures, including nurseries production. It is necessary first to understand well the SSFs system, the multiple obstacles and challenges faced in particular the critical shortage of financial and technical resources as well as the weak local/external markets and marketing. Areas required are the following: a simplified field training and extension program for farmers through farmer field schools (FFS), the preparation and use of local botanical pesticides, such as neem, by farmers, the management of natural enemies, as well as natural fertilizers (integrated fertility management (IFM). The phytosanitary control of the local production of seeds and seedlings, in order to have a healthy planting material but, as much as possible, by farmers themselves and preferably collectively in collaboration with the concerned official and private bodies.

IPM6

EFFECTS OF *GLOMUS* SP., AN ARBUSCULAR MYCORRHIZAL FUNGUS (AMF), AND THE HERBICIDE CHLORSULFURON ON *STRIGA HERMONTHICA* MANAGEMENT. Suha Hassan Ahmed[1], Migdam Elsheikh Abdelgani[1], Rashida Abusin[2] and Abdel Gabar El Tayeb Babiker[1]. (1) Environment and Natural Resources Research Institute, Khartoum, Sudan; (2) National Centre for Research, University of Bahri, Khartoum, Sudan, Email: hashimsuha@yahoo.com

Striga hermonthica, presents a major constraint to cereals production and a threat to food security in sub-Saharan Africa. In nature plant parasite seeds, only germinate on exposure to a stimulant, strigolactone, exuded by hosts roots. Strigolactones enhance mycorrhization which in turn improves phosphorus uptake and down regulates strigolactones production by plants. The present investigation, was designed in a screen house at the College of Agricultural Studies, Sudan University of Science and Technology to evaluate the efficacy of an arbuscular mycorrhizal (AM) fungus (*Glomus* sp.) and chlorsulfuron, a potent herbicide on *S. hermonthica*, each alone and in combinations, on *S. hermonthica* on sorghum. *Striga* displayed early emergence with 15.75-62.25 plants/pot at 30-120 days after sowing (DAS). Chlorsulfuron at 1.79-2.98 g ha^{-1}, reduced *Striga* emergence by 42-78.2%, at 30-120 DAS and biomass at harvest by 54.87-73.64%. *Glomus* sp. reduced *Striga* emergence by 70-100% and biomass by 74%. The corresponding reductions affected by the herbicide application in combination with *Glomus* on *S. hermonthica* emergence and biomass were 76.9 - 84.6% and 67.5-100%, respectively. Unrestricted *Striga* parasitism reduced sorghum height, leaf area, and number of leaves, chlorophyll content and biomass by 19.67, 13.80, 26.87, 31.6 and 59.64%, respectively. Chlorsulfuron, alone, increased sorghum height, leaf area, number of leaves, relative chlorophyll content, sorghum shoot and sorghum root biomass by 19.67-23.2, 9.89-22.6, 19.1-25.3, 18.3-55.91, 110.59-177.57 and 175.89-251.07%, respectively. The corresponding increments affected by application of *Glomus* sp. were 42.58-92.3, 27.5-51.2, 66.6-151.5, 61.4-205.7, 207.7 and 277.7%. The analogous increments affected by chlorsulfuron and *Glomus* sp. combinations were 48.8-103.4, 57.45-85.6, 36.05-38.46, 76.22-219.7, 233.08-272.4 and 250.7-292.02%. Among all treatments, chlorsulfuron at its lowest rate (1.78. g ai ha^{-1}) in combination with *Glomus* sp., produced the highest

increments in sorghum growth attributes and the lowest reduction (6.6%) in mycorrhization.

IPM7

THE EFFECT OF AGRICULTURAL PRACTICES ON ABUNDANCE AND BIODIVERSITY OF SOIL FAUNA: A REVIEW. Marguerite A. Rizk[1], Wafai Z.A. Mikhail[2], Mona M. Ghallab[1], Ayman Y. Zaki[2], Nadia H. Habashi[1] and Ayda K.H. Askander[1]. (1) Plant Protection Research Institute, (ARC), Egypt; (2) Department of Natural Resources, Institute of African Research & Studies, Cairo University, Egypt, Email: reta19492001@yahoo.com

Recent research on the effects of agricultural practices on the biodiversity of arthropod soil fauna with special reference to spiders is summarized. This article examines the detrimental effects of practices intensification and considers agriculture practices which aim to protect soil fauna from decline. Modern agricultural practices, including tillage and intensive use of conventional insecticides, have been broadly linked to the declines in biodiversity in agro-ecosystems. Organic farming, soil solarization, intercropping, poly-culture, mono-culture, crop rotation and use of fertilizers, were also discussed. Biodiversity refers to diversity of genes, species and ecosystems. In addition, the best way to apply sustainable agriculture which increase population density of soil fauna and conserve biodiversity will be discussed.

IPM8

CULTURAL AND CHEMICAL MANAGEMENT FOR THE ROOT PARASITIC WEED *STRIGA HERMONTHICA* ON SORGHUM. Rashida M. Abusin[1], A. Ahmed[2] and A.G.T. Babiker[3]. (1) University of Bahri, Pests and Plant Health, College of Agriculture, Khartoum, Sudan, Email: rashidaabusin333@gmail.com; (2) Agricultural Research Corporation (ARC), Sudan; (3) Sudan University of Science and Technology, College of Agricultural Studies, Sudan.

Striga hermonthica, an important root parasitic plant on cereals, is a difficult weed to control. The present investigation was undertaken to study the effects of nitrogen, the herbicide tricolpyr and their combinations on *Striga* incidence and sorghum growth and grain yield. *Striga* count, in the untreated control, was 10 and 34 plants m^{-2} early and late in the season, respectively. Nitrogen at 43.8 and 87.6 kg ha^{-1} displayed excellent (>80%) suppression of the parasite early in the season. Nitrogen at 43.8 and 87.6 kg ha^{-1} reduced peduncle length by 10 and 44%, respectively. Triclopyr, alone and when applied subsequent to nitrogen reduced peduncle length by 44-61%. *Striga* parasitism resulted in the lowest head weight (32.5 g). Nitrogen had inconsistent effects. Triclopyr, at all rates, when applied subsequent to nitrogen increased head weight by 12-42%. Unrestricted *Striga* parasitism reduced sorghum grain yield significantly. Nitrogen at 43.8 and 87.6 kg ha^{-1} increased grain yield by 32 and 46%. Tricolpyr, at 0.68, 1.0 and 1.4 kg a. i. ha^{-1}, alone, increased grain yield by 12, 121 and 44%, respectively. Tricolpyr, at all rates, when applied subsequent to nitrogen, at the lower rate, increased grain yield by 68-110%. Increasing nitrogen to 87.6 kg ha^{-1} increased grain yield by 129-134%. The data obtained indicated that triclopyr at 1.0 and 1.4 kg a. e. ha^{-1}, when supplemented with nitrogen, had the most consistent performance and resulted in the highest suppression of the parasite and the highest sorghum grain yield.

IPM9

LEOPARD MOTH, *ZEUZERA PYRINA* (L.) (LEPIDOPTERA: COSSIDAE) THREAT TO OLIVE TREES, *OLEA EUROPAEA* L. (LAMIALES: OLEACEAE) IN FAYOUM GOVERNORATE AND ITS SUPPRESSION TRIALS USING IPM TACTICS. Ahmed Merghem and Abd Al-Aziz Ahmed, Plant Protection Research Institute. Agriculture Research Center Egypt, Email: ahmedmerghem@yahoo.com

Olive tree, *Olea europaea* L. (Lamiales: Oleaceae) is an economically important and strategic crop which widely spreads throughout the Mediterranean basin countries including Egypt. It suffers from several serious insect pest attacks especially those arising from wood boring pests infestations such as leopard moth, *Zeuzera pyrina* (Lepidoptera: Cossidae). Present study concerns with the dispersion power of this cossid borer attacking olive groves at several locations in Fayoum Governorate. Additionally, incidence, population fluctuation, infestation rates and severity were investigated. Trials to suppress these attacks using IPM tactics were applied with agricultural practices such as pruning and mechanical control were conducted. Biological control tools such as predators release, in addition to application of chemical pesticides were investigated.

IPM10

EFFECT OF SOME BIOLOGICAL CONTROL AGENTS AND PLANT EXTRACTS AND DATE PALM ORGANIC FERTILIZER ON *RHIZOCTONIA SOLANI* KÜHN CAUSING ROOT ROT DISEASE ON EGGPLANT. Ahed A.H. Matloob, Biological Control Techniques Department, Al-Musaib Technical College, Al-Furat Alawsat Technical University, Iraq, Email: ahad_20071980@yahoo.com

This study aimed to evaluate the effect of some plant extracts, *Trichoderma harzianium* and plant growth promoting rhizobacteria *Azotobacter chroococcum*, and addition of organic fertilizer made of date palm leaves to control eggplant root rot disease caused by *Rhizoctonia solani* fungus. Results of the field survey confirmed the presence of eggplant root rot disease in all the surveyed districts: Baghdad, Babylon and Karbalaa provinces with disease incidence of 33.3-83.0% and severity of 16-60%. Results of isolation and identification showed the presence of 8 isolates of *R. solani* fungus associated with infected plants. The biocontrol agent *T. harzianium* fungus and *A. chroococcum* bacterium had highly antagonistic ability against pathogenic isolates of *R. solani* under laboratory conditions. The plant extracts used in this study (Cinnamon, ginger, milk thistle, crack willow) had an inhibition effect against the growth of the pathogen on PDA. Cinnamon extract was superior in preventing growth of the pathogen. Under lath house conditions, all treatments caused significant decrease in disease incidence and severity of eggplant root rot disease. *T. harzianum* + Cinnamon

aqueous extract and *A. chroococcum* + Cinnamon aqueous extract treatments, were superior to other treatments to control the pathogen and reduce disease incidence and severity compared to the control. All treatments indicated significant increase for all tested plant growth parameters. The results of the field experiment indicated that integrated treatment with *T. harzianium* and *A. chroococcum* caused significant reduction in disease severity to 33.33% and caused significantly enhanced eggplant growth parameters. The organic fertilizer of date palm leaves increased the efficiency of biological control agents. The integrated treatment between *T. harzianium* and *A. chroococcum* and organic fertilizer of date palm leaves showed decrease in disease severity to 20.00% and increase in plant growth parameters to 17.33 cm, 18.33 and 2.77 g, respectively. On the other hand, the additions of treatments individually or mixed with organic fertilizer enhanced eggplant growth. These results suggest for the first time in Iraq that *T. harzianium*, *A. chroococcum* and organic fertilizer of date palm leaves showed high antagonistic effect on *R. solani* and decreased severity of eggplant root rot disease.

IPM11

CURRENT RESEARCH ACHIEVEMENTS ON *BEMISIA TABACI* IN TUNISIA: SPECIES STATUS AND ALTERNATIVES FOR SUSTAINABLE MANAGEMENT OF A MAJOR *B. TABACI*-TRANSMITTED PHYTOVIRUS DISEASE.

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Bemisia tabaci Genn. (Hemiptera: Aleyrodidae) was described in 1889 as a tobacco pest in Greece and has since become one of the most important pests for vegetable and horticultural crops both in the field and protected systems worldwide. The whitefly *B. tabaci* is a complex species including at least 35 morphologically indistinguishable species. Several species [Mediterranean (Med) and Middle East-Asia Minor I (MEAMI), Sub-Saharan Africa 2 (SSA2) and Italy species] of the complex have been reported in the Mediterranean basin to date. Results indicated that Med and MEAMI, the most invasive and destructive species of the complex, as well as rare SSA2 *B. tabaci* were present in the main Tunisian crops producing regions. Unlike in many Mediterranean countries, where MEAM1 have been displaced by Med, it was demonstrated that Med and MEAMI species co-occured with similar frequency (51% vs. 48.9%, respectively). Based on fine population genetics and field spatial distribution analyses, it was found that the co-existence of these two interacting species was based on habitat partitioning including spatial and host-plant partitioning. Although they co-occurred at larger spatial scale, they excluded one another at sample scale and Med species were closely associated with ornamentals and MEAM1 with vegetables. In this study screening for resistance to *Tomato yellow leaf curl virus* (TYLCV), which is one of the most damaging begomovirus on tomato worldwide, in tomtoes was initiated. Using several *Ty* gene combinations, it was possible to identify the most effective *Ty* gene to provide resistance to TYLCV in tomatoes grown in the field under Tunisian conditions, *i. e. Ty1/Ty-3+ty-2*. Tomato accessions harboring relevant *Ty* genes are currently included in breeding program. In addition, to control *B. tabaci* adult populations using plant bioressources *in vivo* and under greenhouse conditions, the fumigant activity of the *Citrus aurantium* (Sapindales: Rutaceae) essential oils was evaluated as an alternative to control *B. tabaci*. Significant pesticidal effect was obtained *in vivo* and under greenhouse conditions to control whiteflies on eggplants with mortality rates of 100% and 81%, respectively. Results obtained defined more environment-friendly methods to manage whitefly species and the TYLCV.

IPM12

NEW IPM TECHNIQUE FOR CONTROLLING MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIEDDRMANN1) DIPTERA: TEPHRITIDAE, IN CITRUS ORCHARDS IN IRAQ.

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Ceratitis capitata, the Mediterranean fruit fly, is a fruit fly species capable of causing extensive damage to a wide range of fruit crops. It is native to the Mediterranean area, but has spread invasively to many parts of the world, including Australasia and North and South America and other Arab countries, including Iraq. IPM program was conducted in three citrus orchards in order to control that fly in Alhafrea, Wasit province in the middle of Iraq, during the 2015 season. There were many fruit crops grown in the three orchards. Two of the three orchards were used for experimental purposes by distributing Ceranock traps (50 traps/donum), and the third orchard was left as a control. Delta and Macfeild traps with proper pheromones (Ceranock) were used to accurately assess the number of the captured flies. The active ingredients of the attractive pheromones were: Femilure 90 PH–180–FM (as a female attractive agent), Trimidlure PH–180–ISR (as a male attractive agent). Meanwhile the fatal active ingredient was trapping strips from Russell IPM. More over, Ceranock drops were distributed around the treated orchards to prevent the flies from escaping. The results showed that the fly regular activities and its population density increased since the first week of October when the average temperature was in the range 9.5-25°C, and the relative humidity 70%, that is during the maturing phase of the different fruits of the treated orchards. The captured flies increased gradually along with increased maturity of the different fruits and the changing of their colors to

yellowish. The infestation ratio reached 24% and 15% in the Ceranock traps treated orchards, meanwhile it was 80% in the control. The results clearly showed that there is a good potential for using Ceranock traps for controlling Mediterranean fruit fly in Iraq.

IPM13

IMPROVEMENT OF SOIL PROPERTIES, GROWTH AND PROTECTION AGAINST *FUSARIUM*-WILT OF CUCUMBER BY *PIRIFORMOSPORA INDICA* AND TWO ORGANIC WASTES. Moustafa H.A. Moharam[1], Mazhar D.A. Mohamed[2] and Osama O. Negim[3]. (1) Plant Pathology Department; (2) Microbiology Department; (3) Soil Sciences Department, Faculty of Agriculture, Sohag University, Sohag, Egypt, Email: moustafa.moharam@agr.sohag.edu.eg

Disease resistance and non-chemical treatment strategies against seed- and soil-borne plant pathogens are powerful approaches to sustainable agriculture which can reduce chemical input into the environment. The current work started to identify non-chemical seed and soil treatments that are effective against *Fusarium*-wilt (FW) of cucumber caused by the formae specials *cucumerinum* of the soil-inhabiting fungus *F. oxysporum* Schlecht. Fr. (Fo) in a reclaimed soil. The potential of *Piriformospora indica* (Pi), a plant-root-colonizing fungus as seed and soil treatment, for protecting cucumber plants against FW in greenhouse trials was evaluated. Moreover, the role of some organic wastes as soil amendments for improving soil properties, and their relation to colonization of cucumber roots by Pi was also investigated. Results revealed that both applications of Pi into the soil infested with Fo and supplemented with 2.5 and 5.0% (w: w) of bagasse ash (BA) and pressmud (PM), respectively, improved soil proprieties, the growth and protection of cucumber plants against FW. Using light microscopy, spores of Pi were seen in roots of the protected plants (28-days-old). In the same tissues the presence of Pi was also confirmed in the roots by PCR. DNA of Pi was extracted from mycelium grown *in vitro* or from plant roots using the DNeasy® Plant mini Kit. Amplification of an annotated sequence of the β-tubulin gene of the designed specific primers yielded a band of 751 base pairs in length that was also present when the colonization of roots by Pi was assayed. Beneficial effects of Pi on the defense status of colonized plants protected from the harmful effect of Fo were observed. Lack of the antagonistic effect of Pi against Fo performed *in vitro* test, demonstrating that an induction of resistance by Pi could have occurred. Moreover, colonization rate of cucumber roots by Pi was improved (up to 70%) in treated plants against FW, which was determined by microscopy and/or PCR with DNA extracted from roots (random 10 samples of each treatment). Colonization rate also increased with addition rates of BA and PM in the soil, demonstrating an enriching of Pi could have occurred by these materials. In shake culture in potato dextrose broth medium, addition of 2.5% water extract of these organic wastes increased growth of Pi as compared with the medium alone. When total counts of Pi and Fo in the rhizosphere of cucumber plants were determined *in vitro*, population of Pi highly increased, whereas Fo decreased with increasing rates of BA and PM up to 5.0%. Finally, based on the results obtained, it can be concluded that application of the endophytic fungus Pi with BA and BM could improve soil properties. It could also increase FW disease resistance and promote growth of cucumber plants. Further field experiments are needed to evaluate if the identified treatments can manage the disease.

IPM14

MODELING THE EFFECTS OF CLIMATE ON DATE PALM SCALE (*PARLATORIA BLANCHARDI*) (HOMOPTERA: DIASPIDIDAE) POPULATION DYNAMICS DURING DIFFERENT PHENOLOGICAL STAGES OF LIFE CYCLE UNDER HOT ARID CONDITIONS. Hakima Idder-Ighili[1], Mohamed Azzedine Idder[1], Bahia Doumandji-Mitiche[2] and Haroun Chenchouni[3]. (1) Univ Ouargla, Fac. des sciences de la nature et de la vie, Laboratoire de Recherche sur la Phoeniciculture, Ouargla 30000, Algeria, Email: idder.ighili@yahoo.fr; (2) Département de Zoologie Agricole et Forestière, Ecole Nationale Supérieure d'Agronomie, El-Harrach, 16200 Algiers, Algeria; (3) Department of Biological Sciences, Faculty of Exact Sciences and Natural and Life Sciences, University of Tebessa, Tebessa 12002, Algeria.

The date palm scale (DPS) *Parlatoria blanchardi* (Homoptera: Diaspididae) is a serious pest due to the damage it inflicts on date palm tree (*Phoenix dactylifera*). To develop an effective control against DPS in arid regions, it is essential to know its bio-ecology including population dynamics and climatic factors influencing the duration and timing of life history and also the densities of different developmental stages (crawlers, first and second instars nymphs, adult males, and adult females) of the insect. Monitoring of biological cycle and population dynamics of the pest were achieved through weekly counts of DPS densities on leaflets sampled at different positions of date palm trees in an oasis of Ouargla region (Algerian Sahara Desert). Within this hyperarid region, DPS established four generations per year; the most important was the spring generation. Two overlapping generations occurred in spring–early summer and two in autumn– early winter; these two pairs of generations were interspersed by two phases of high-mortality rates. The first corresponds to winter cold and the second refers to the extreme heat of summer. Statistical analysis of the effects of the studied climatic conditions (minimum, maximum and mean temperatures, precipitation, humidity, wind, rain days, and climatic indices) on the DPS densities at different developmental stages showed great variability from one stage to another. Among these, adult females were the most affected by climate factors. For the total DPS population, high values of minimum temperatures negatively affected population density, whereas high Maximum temperatures, hygrometry, and De Martonne aridity index showed a positive influence.

BIOLOGICAL CONTROL

BC1

BIOLOGICAL CONTROL OF *OROBANCHE CRENATA* USING HOST-SPECIFIC MYCOHERBICIDES. Yasser Shabana[1], M. El-Hawary[2] and M. Eid[1]. (1) Department of Plant Pathology, Faculty of Agriculture, Mansoura University, El-Mansoura, Egypt, Email: yassershabana2@yahoo.com; (2) Agronomy Research Institute, Agricultural Research Center, Giza, Egypt.

The parasitic weed, *Orobanche crenata* is causing a substantial damage to faba bean plants (*Vicia faba*) in Egypt and many parts of the world. Although a considerable number of herbicides have been tested as means for its control, none of them effectively controlled it. In addition, high cost and toxicity of chemical herbicides also limited their application. Indigenous, weed-specific fungal pathogens as granular bioherbicides were developed for safe and effective control of *O. crenata*. As an alternative or adjunct to conventional weed control technology of chemical and mechanical controls, the bioherbicides offered excellent means of ecologically sound weed management. Two strains of *Fusarium oxysporum* in addition to one strain of both *F. semitectum* and *F. camptoceras* have been shown to be effective bioherbicide candidates for *O. crenata*. Results from laboratory and greenhouse trials have confirmed the high feasibility of using these fungal strains to control broomrape of broad bean. Effect of various environmental factors including temperature, cultural media, pH, light regime, and aeration on these biocontrol agents will also be discussed.

BC2

MANAGEMENT OF LENTILWILT DISEASE OF LENTIL (*LENS ESCULENTA* MOENCH) FOR SUSTAINABLE PULSE PRODUCTION IN WEST BENGAL, INDIA. M.K. Biswas, Department of Plant Protection, Institute of Agriculture, Visva-Bharati, Sriniketan, Email: mohankumar.biswas@visva-bharati.ac.in

Lentil wilt caused by *Fusarium oxysporum* f. sp. *lentis* is one of the serious diseases of West Bengal. To manage the disease under field condition, various management approaches were employed during the winter seasons of 2012-13 at the agricultural farm of Palli-Siksha Bhavana, Visva-Bharati, Sriniketan, Bengal. Out of different biocontrol agents evaluated in vitro against the growth of *F. oxysporum* f. sp. *lentis*, the antagonists *T. harzianum* + *P. fluorescens* inhibited 80.68% growth and found most effective. *In vivo* study revealed the supremacy of *T. harzianum* in terms of incidence of Fusarium wilt, plant growth and yield. Spent mushroom substrate + Earth worm compost + soil (1: 1: 1) was found most effective in inhibiting the disease 73.33% and gave maximum plant height (51.2 cm) at 80 days after sowing (DAS), root length (26.1 cm), and 1000 seed weight (27.6 g). Among the different systemic, combi products and non systemic fungicides evaluated against *F. oxysporum* f. sp. *lentis* in vitro, Carbendazim showed maximum efficacy and completely reduced mycelia growth (100%) followed by Propiconazole (94.45%). Carbendazim (0.1%) was found to be very effective in inhibiting the disease (95%) and gave maximum plant height (48.5 cm) at 80 DAS, root length (23.8 cm), and 1000 seed weight (23.5 g) under *in vivo* conditions. The above findings will help farmers to minimize lentil wilt effects under field conditions, and maximize their profit.

BC3

EFFICACY OF FOUR COMPATIBLE *TRICHODERMA* SPP. INOCULANT PREPARATIONS TO CONTROL FIVE PHYTOPATHOGENIC FUNGI WHICH INFECT RICE UNDER GREENHOUSE CONDITIONS. Hamdia Z. Ali, Abdul Rahman Abdul Qader Abdul Rahman, Ali A. Abdullah, Hutham M. Saood, Ameera S. Mohammed, Salam D. Salman and Thamer F. Abed, Agriculture Research Directorate, Integrated Pest Management Center, Ministry of Science and Technology, Baghdad, Iraq, Email: hamdiazali3@gmail.com

The current research included greenhouse studies to evaluate efficacy of four compatible *Trichoderma* spp. (T4, T6, T7 and T9), in combination with each other in controlling five phytopathogenic fungi; (*Fusarium oxysporum* R6, *F. solani* R11, *Curvularia lunata* R7, *Alternaria tenuissima* R23 and *Thanatephorus cucumeris* R12) by using local rice variety cv. AL-Baraka. Four Trichoderma isolates combinations (T4+T7, T4+T.9, T6+T7 and T 4679), were selected based on pre-screening with pathogens via the dual culture technique to determine its compatible activity against pathogens under laboratory conditions. The experiment was carried out under uncontrolled condition in a greenhouse with non-sterilized field soil, and thirteen parameters were evaluated. The results showed that rice plants inoculated with *Trichoderma* spp. triggered the highest level of chitinase, peroxidase, Pal (Phenyl alanine-ammonialyase) and chlorophyll content in plants, two months after planting. Significant differences were observed in all treatments compared to untreated control. In addition, the results showed significant interaction between compatible *Trichoderma* spp. on growth parameters of rice plant; fresh weight of shoot and root, dry weight of shoot, root and panicle, shoot and root length. *Trichoderma T.* 4679 exhibited most compatible and greater efficiency of reducing disease severity when treated with *A. tenuissima* R23 and *T. cucumeris* R12 (8.883, and 11.553%, respectively), as compared with control (pathogens alone) which gave significant increase (P=0. 05) of 70 and 88.867%, respectively) 120 days after transplanting. As a consequence of dual inoculation, the greenhouse experiment determined *Trichoderma* T 4679 as an effective component in an integrated pest/pathogen management (IPM) program to control rice diseases.

BC4

BIOCONTROL OF THE CLADOSPORIC SPOT DISEASE OF EGGPLANT CAUSED BY *CLADOSPORIUM CLADOSPORIOIDES.* Abdelnapi Abd Alnaseer, Faculty of Agriculture, Basra University, Iraq, Email: abdu198875@yahoo.com

The aim of this study was to control the cladosporium leaf spot disease of eggplants caused by *C. cladosporioides* by using *Aspergillus carbonarius***,** *Trichoderma harzianum* and *T. koningii*. To confirm the effectiveness of these organisms, teats were conducted in the laboratory and in the field. Three isolates of *C. cladosporioides* were isolated from different eggplant grqwing areas in Basrah. When testing the pathogenic capacity of the three isolates, isolate number 1 obtained from Shatt al-Arab area was found to produce the highest severity of 68.7 %. The results of the experiment showed that all three concentrations of fungal filtrates (10, 20, 30 ml/liter) affected the growth of the pathogenic fungus, with an inhibition rate of 36.59, 29.61 and 40.69%, respectively. In addition, the sterilized filtrates decreased the sporulation of the pathogenic fungi. The average number of *C. cladosporioides* spores following treatment with the three filtrates of antagonistic fungi reached 22.73, 19.96 and 16.95 x 10^3 spores for the concentrations 10, 20 and 30 ml/liter, respectively, compared with 40.11 x 3^{10} spores for the control. When the chemical fungicide carbadazim was used to inhibit the growth of the pathogenic fungus in PDA medium, the rate of inhibition reached 33.95, 68.26, 82.99 and 100% for the concentrations of 25, 50, 75 and 100 ml/liter, respectively. The filtrates of the antagonistic fungi *A. niger, T. harzianum* and *T. koningii* at concentrations of 20 and 30 ml/L were effective in reducing the incidence of the pathogenic fungus *C. cladospoirides,* and increased fresh and dry weights of eggplants, as well as peroxidase activity.

BC5

EFFECT OF SOME BIOLOGICAL AGENTS ON PATHOGENICITY OF SOME ROOT PATHOGENIC FUNGI ON TWO STRAWBERRY (*FRAGARIA ANANASSA* DUCH.) VARIETIES HAPIL AND FESTIVAL. Hadeel Ahmed Al-Ameri, University of Mosul, Faculty of Science, Biology Department. Mosul, Iraq, Email: hadeelahmed.mu@gmail.com

Results of pathogenicity tests showed that the three fungi *F. culmorum*, *Cylindrocarpon* spp. and *Bipolaris* spp. produced severe disease symptoms on both strawberry varieties Hapil and Festival. Hapil was more sensitive than Festival to infection with the three fungal pathogens. Results obtained indicated that the addition of biological agents *T. harzianum* and *P. aerogenosa* and fungicides Azadirachtin to the three fungi *F. culmorum*, *Cylindrocarpon* spp. and *Bipolaris* spp. caused a significant reduction in pathogenicity compared with fungi alone. The biological agents had high antagonistic ability against the three fungi *F. culmorum*, *Cylindrocarpon* spp. and *Bipolaris* spp.

BC6

EVALUATION OF THE BIOFUNGICIDE BIO ARC 6% WP (*BACILLUS MEGATERIUM*) FOR THE CONTROL OF POWDERY MILDEW (*LEVILLULA TAURICA*) AND EARLY BLIGHT (*ALTERNARIA SOLANI*) DISEASES IN TOMATO. Suad A. Gamiel Mohamed, Sudan, Email: saudgamiel_5@gmail.com

Powdery mildew caused by *Levillula taurica* and early blight caused by the fungus *Alternaria solani* are common diseases of snake tomato in Sudan. The diseases are usually controlled by synthetic fungicides. The use of microorganisms currently offer an alternative to synthetic fungicides for management of plant diseases without the negative effect of chemical control. The effect of the biofungicide Bio Arc 6% WP (*Bacillus megaterium* 25 x 10^6 CFU) was evaluated to control powdery mildew and early blight diseases in tomato. Field experiments were carried out at Gezira Research Station for two seasons, 2013/2014 and 2015/2016. The biofungicide was sprayed three times at the rates of 187.5, 250 and 312.5 g/100L water and compared to the conventional fungicide Aleenazole 25% EC at the rate of 30 ml/100L water. The biofungicide suppressed powdery mildew disease incidence by 41–53% and 50–67% in 2013/2014 and 2015/2016 seasons, respectively. Disease severity was satisfactorily reduced by 52–55% and 31-67% compared to the untreated control in the first and second seasons, respectively, however, the bio fungicide was effective as the synthetic fungicide Aleenazole. Bio Arc 6% at the rate of 250g/100L was more effective in reducing disease severity and incidence than the other two rates tested. A significant increase in yield was obtained in all dosage rates of the biofungicide compared with the synthetic fungicide and the untreated control.

BC7

PLANT GROWTH-PROMOTING RHIZOBACTERIUM *PSEUDOMONAS* AS BIOFERTILIZERS AND PRESERVATION OF ECOSYSTEMS BIODIVERSITY. Amina Meliani[1], A. Bensoltane[2], L. Benidire[3] and K. Oufdou[3]. (1) Department of Biology, University of Mustapha Stambouli, Mascara, Algeria, Email: ameliani2003@yahoo.fr; (2) Laboratoire de Biotoxicologie Expérimentale, de Biodépollution et de Phytoremédiation, Université d'Oran (Essenia), Oran, Algérie; (3) Laboratoire de Biologie et Biotechnologie des Microorganismes, Université Cadi Ayyad, Faculté des Sciences, Semlalia, Marrakech, Marocco.

Plant growth-promoting rhizobacteria (PGPR) play a crucial role in maintaining soil fertility and upgrading plant growth and eco-development. These PGPR may be a viable alternative to organic fertilizers and could decrease the environmental problems associated with conventional chemical fertilizers, which also helps in reducing the pollution and preserving flora and fauna growth. Thus, the use of PGPR bio-fertilizer such as N_2 (nitrogen) fixing and phosphate solubilizing bacteria (PSB) can reduce chemical fertilizer applications and consequently preserve ecosystems biodiversity. Furtheremore, the *Pseudomonas* inoculants have provided an alternative biotechnological solution in sustainable agriculture to meet the P demands of plants. The present study was carried out to isolate the PSB from the rhizosphere, to characterize indol acetic acid (IAA) productivity, 1-aminocyclopropane-1-carboxylate (ACC) deaminase activity and enhancement of plant growth.

BC8

INDUCING SYSTEMIC RESISTANCE IN STRAWBERRY PLANTS AGAINST *MACROPHOMINA PHASEOLINA* USING SOME BIO-INDUCERS. Hurria H. Al-Juboory[1], Alaa Khudair Hassan[1] and Yaser N. Al-Hamiri[2]. (1) Department of Plant Protection, Faculty of Agriculture, University of Baghdad, Iraq, Email: hhaljboory@yahoo.co.nz; (2) Department of Plant Protection, Faculty of Agriculture, University of Karbala, Iraq.

This study was conducted to isolate and characterize the pathogenic fungus causing charcoal root and basal stem rot on strawberry plants. The pathogenicity of fungal isolates obtained from symptomatic strawberry plants collected from two locations of Baghdad province, and seven locations at Kerbala province were tested. The activity of bacteria, *Bacillus subtilis*, *B. thurgensis* and *Pseudomonas fluorescens* and the fungus *Trichoderma viride* to induce systemic resistance in the strawberry plants against *Macrophomina phaseolina* under laboratory and greenhouse conditions was evaluated. Nine isolates, showing capacity to infect strawberry at infection rates of 17.5-85.0%, were identified. The highest infection rate was obtained with the isolate MK3. It was found that all bioagents used in this study possess the capacity to reduce the growth of *M. phaseolina*, MK3 isolate, on PDA medium. The highest reduction in MK3 growth was obtained with *P. fluorescens*, with an inhibition zone of 1.17 cm, compared to 3.67 and 3.35 cm for *B. subtilis* and *B. thurgensis*, respectively. Highest degree of antagonism was induced by *T. viride* against MK3 isolate reached 1.0 according to Bell`s scale was observed. The addition of Beltanol fungicide into PDA medium at 500, 750 and 1000 mg/L caused reduction in MK3 isolate growth, with inhibition zones of 7.42**,** 4.72 and 0.00 cm, respectively. All bioagents used reduced significantly the infection rate and disease severity of MK3 on strawberry plants, which reached 5.00% and 2.50% with *T. viride*, 10% and 7.50% with *P. fluorescens,* compared with 77.50% and 70.00% in the control, respectively. The reduction in infection rate and disease severity was found associated with increase in plant growth parameters, such as root length and root and shoot dry weight. The highest increase was observed in infected plants treated with *T. viride,* where three evaluated traits reached 23.500 cm, 10.968 gm and 3.388 gm, respectively, compared with the treated control 11.20 cm, 4.825 gm and 1.168 gm, respectively. It has been found that all bioagents used significantly increased the efficiency of the peroxidase enzyme in strawberry plants. The highest peroxidase activity reached 67.48 unit/ml with *T. viride* treatment as compared to 23.97 unit/ml for the control treatment.

BC9

EVALUATION OF THE ANTAGONISTIC ACTIVITY OF TRICHODERMA ATROVIRIDE (TA. 13) AND ITS SECONDARY METABOLITES AGAINST SOME PHYTOPATHOGENIC FUNGI *IN VITRO* AND *IN VIVO*. Houda Boureghda, Ouerdia Ameur, Abelaziz Kedad, Meriem Louanchi and Zouaoui Bouznad, Laboratoire de Phytopathologie et de Biologie moléculaire, Département de Botanique, Ecole Nationale Supérieure Agronomique (ENSA), El Harrach, Algiers, Algeria, Email: hou.boureghda@gmail.com

The antagonistic activity of *Trichoderma atroviride* (Ta.13) against some phytopathogenic fungi affecting strategic crops, *Fusarium culmorum*, *Alternaria solani*, *Rhizocotnia solani*, and *Botrytis cinerea* were evaluated first *in vitro* by direct and indirect confrontation techniques. For direct confrontation, the growth inhibition rate varied between 41.59 and 60.97%, compared to the control. The highest inhibition rate was obtained against *R. solani*. In case of indirect confrontation, inhibition rates between 20.18 and 100%, were obtained, with the highest rate recorded against *A. solani* (100%). In a second step, the secondary metabolites were obtained by growing the *T. atroviride* (Ta.13) isolate on PDB medium in stationary culture for 30 days. Extraction of the secondary metabolites was carried out with ethyl acetate and followed by a rotavapor concentration at 35°C under vacuum. The antagonistic activity of the concentrated crude extract containing the secondary metabolites obtained was tested on the phytopathogenic fungi prior to its fractionation by chromatogrphy. Four concentrations of the crude extract (1000, 100, 10 and 1 µg) were tested on mycelial pathogens plugs taken from 7 days old culture. The levels of growth inhibition obtained varied between 15 and 100%, with the highest inhibition rate obtained against *A. solani* (100%) with 1000 µg. The effect of the crude extract decreased with dilution. In a third step, concentrated crude extract was fractionated by column chromatography (silica gel SiO_2) by an eluent of petroleum ether/EtOAc gradient (9:1 to 2:8) and purification by thin layer chromatography (TLC). The fractionation resulted in 6 fractions (fraction 2= metabolite A, fraction 4= 6PP). Purification of fractions 1, 3, 5 and 6 resulted in 14 metabolites of which 5 had a high molecular weight. Two of the purified metabolites (6PP and metabolite A) were evaluated. The study of the effect of the two metabolites on wheat protection against root and crown rot caused by *F. culmorum* was carried out by applying 10 µl of the two metabolites 6PP and A at concentration of 5 mg/L and 10mg/L at the crown of wheat, 3 hours before inoculation with a spore suspension of *F. culmorum* (10 µl of a solution of 2.10^5 spore/ml). This treatment resulted in a reduction in disease index evaluated on a scale ranging from 0 to 3, and showed an inhibition rate conferred by 6PP of 55.67% and 50% for 10 mg/L and 5 mg/L, respectively, and 29.67 and 32.67% for the metabolite A, respectively.

BC10

EFFECT OF INTERACTION BETWEEN VESICULAR-ARBUSCULAR MYCORRHIZA AND *PYTHIUM ULTIMUM* ON MITIGATING THE TOMATO DAMPING-OFF DISEASE IN THE SYRIAN COAST. Mohammad Imad Khrieba[1], Ibtissam Ghazal[2], M. Fawaz Azmeh[1] and Wafaa Choumane[3]. (1) NCBT, Damascus, Syria, Email: imadkhrieba@gmail.com; (2) Plant Protection Department, Faculty of Agriculture, Tishreen University, Latakia, Syria; (3) Biotechnology Center at Tishreen University, Lattakia, Syria.

The effect of vesicular-arbuscular mycorrhiza (VAM) on limiting the infection with *Pythium ultimum*, causing tomato damping-off, was studied in a pot

experiment during the 2013 growing season. The experiment included five treatments with soil infested as follows: (1) soil was infected only with Pythium (Py), (2) with mycorrhiza only (My), (3) with *Pythium* and Mycorrhiza at seed planting time (My+Py), (4) with Pythium and two weeks after seed planting with mycorrhiza (Py-My), and (5) with mycorrhiza and two weeks after seed planting with Pythium (My-Py). Infection severity rates varied significantly between treatments and control (C). They were 97.91%, 81.25%, 64.58% and 31.25% for Py, Py-My, Py+My, My-Py, respectively. The impact of treatments on growth parameters showed a significant increase in My and My-Py treatments for plant height (28% and 35.35%), leaf number (18% for both treatments), and the fresh shoot weight (31.44% and 26.44%), respectively. Py-My and My+Py affected the dry weight of the canopy causing a decrease of 89.05% and 35.09%, respectively. PY-MY and PY reduced the root fresh and the dry weight (85.26 and 98.94% for fresh weight and 94.11 and 99.7% for dry weight, respectively). My+Py and My increased significantly the root volume by 18.6% and 45.56%, respectively. Stem diameter was higher in all treatments over Py and Py-My treatments. Root mycorrhization was estimated and the highest value was detected in the My, followed by My-Py (70%) treatment. The interaction between My and Py was very efficient in protecting tomato seedlings from infection. My-Py showed the highest rate of protection based on most parameters studied.

BC11

IDENTIFICATION OF FUNGAL SPECIES ASSOCIATED WITH CROWN ROT AND FUSARIUM HEAD BLIGHT OF WHEAT IN ALGERIA AND BIOLOGICAL CONTROL BY *TRICHODERMA ATROVIRID.*

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Fusarium head blight (FHB) and crown rot (foot and root rot) are two worldwide diseases of wheat. Both diseases induce yield reduction and seed contamination with mycotoxins. The identification of main species associated with crown rot and head blight in the main regions of wheat production in Algeria was carried out. Surveys were conducted over two years, 2014 and 2015 in the main grain provinces of the eastern, central and western regions of Algeria. Both symptoms were observed in the surveyed fields (Fusarium head blight and crown rot). Identification of the isolates obtained based on morphological characteristics and confirmed by molecular identification has shown that the main species associated with FHB and crown rot were *F. culmorum* followed by *Microdochium nivale* and *M. majus* then *F. pseoudograminearum*. The pathogenic tests of *F. culmorum* collection and *Microdochium* spp. were carried out under greenhouse conditions on the basal part of the wheat plant through soil infestation and by inoculation of the ears in the field during flowering stage. The results showed variability in the aggressiveness of the *F. culmorum* isolates, where disease index range was between 0.5 and 1.8 on a scale of 0 to 3 noted on the crown. Similarly, variability of aggressiveness was recorded on spikes with a disease index range between 2.25 and 7.88 on a scale of 0 to 9. Disease index of *M. nivale* and *M. majus* isolates on the crown varied between 0.72 and 2.07, and on the spike from 4.33 to 5.66. The pathogenic isolates obtained from the ear were able to induce symptoms on the crown and those obtained from the crown infected the ear. It has been agreed that no single control strategy is effective against FHB and crown rot and a combination of more than one strategy should be more effective. Testing *T. atroviride* on crown protection against the most aggressive isolate of *F. culmorum* allowed a reduction of disease index of 65.52%. Accordingly, the effect of *T. atroviride* Ta.13 against the main species associated with FHB and crown rot (*F. culmorum*) were evaluated to justify their use as a component of an integrated control management system.

BC12

EVALUATION OF *ACREMONIUM STRICTUM* AS ANTIFUNGAL AND ANTIBACTERIAL AGENT *IN VITRO.*

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Acremonium strictum is a cosmopolitan fungus found in soil, water, and plant debris and has different relationships with plants. The objective of the current study aimed to evaluate the ability of *A. strictum* to inhibit mycelium growth of four fungal species: *Fusarium oxysporum, Macrophamina phaseolina, Aspergillus flavus,* and *A. niger* as spore suspension and antagonistic effect. Four bacterial strains also used: *Escherichia coli*, *Staphylococcus cohnii*, *Enterobacter colaceae*, *Stenotrophomonas maltophilia*, and *Bacillus cereus* as spore suspension and supernatant. Moreover, *A. strictum* was tested on wheat grains inoculated with *M. phaseolina* and *F. oxysporum in vitro* and many measurements for wheat grains were conducted. The growth rate varied significantly among the different fungal species studied in the two methods used, and for the interaction between the fungus species and the method used. Similarly, bacterial growth inhibition varied significantly among tested bacteria in the two methods, and for the interaction between bacteria and the method used. Testing *A. strictum* on *M. phaseolina* and *F. oxysporum* on wheat grains *in vitro* generally showed that *A. strictum* improved the coleoptile development and the seminal root growth and in some treatments improved radical length. *A. strictum* would be an interesting biological agent, but more investigations are needed under greenhouse and open field conditions on different plant hosts and against many plant fungal pathogens.

BC13

EFFICACY AND SAFETY OF *SPODOPTERA LITTORALIS* (BOISD) NUCLEOPOLYHEDRO VIRUS AS A BIO-INSECTICIDE FOR PEST CONTROL. El-Sayed A. El-Sheikh, Plant Protection Department, Faculty of Agriculture, Zagazig University, Zagazig 44511, Al-Sharkia, Egypt, Email: eaelsheikh@zu.edu.eg

Due to public concern about the risks associated with chemical pesticides, searching for environmentally safe and effective alternative methods for insect pest control has led to increased interest in microbial pest control agents. Baculoviruses-based bioinsticides are host specific, infecting only one or a few closely-related species, helping to make them good candidates for management of crop and forest insect pests with minimal off-target impacts. Baculoviruses play an important role in integrated pest management programs as they showed to be safe for the environment. Results showed that *Spodoptera littoralis* nucleopolyhedrovirus (SpliNPV) was effective on Spodopteran insects such as *S. littoralis*, *S. frgiperda* and *S. exigua* with LC_{50} of $1.8x10^3$, $1.7x10^5$ and $6.2x10^4$ PIB/ml, respectively, with no significant differences in time required for 50% mortality among the 3 Spodopteran species. This virus showed not to infect the cut worm larvae, even when viral particles concentration used was as high as $1x10^8$ PIB/ml. SpliNPV had a significant effect on insect development and significantly increased larval duration (alive larvae after infection) which was correlated with marked decrease in juvenile hormone esterase activity. It can be concluded that baculoviruses are important insect pathogens that might be used effectively side by side with other control strategies for effective and safe pest control.

BC14

BIOLOGICAL CONTROL OF THE DATE PALM TREE BORERS, *ORYCTES* SPP. (CLEOPTERA: SCARABAIDAE: DYNASTINAE). Mohammed Z. Khalaf[1], Hussain F. Alrubeai[1], Falah H. Naher[1], Mustafa Dh. Jumaa[1] and Ayser A. Abdulhusein[2]. (1) Integrated Pest Control Research Center, Directorate of Agricultural Research, Ministry of Science & Technology, Baghdad, Iraq, Email: mkhalaf34@yahoo.co.uk; (2) Al-Madain Agriculture, Directorate of Baghdad Agriculture, Ministry of Agriculture, Baghdad, Iraq.

The efficacies of the entomopatogenic nematodes (EPN), *Rhabdits blumi*, and the entomopatogenic fungi (EPF), *Beauveria bassiana* as a biocontrol agents were determined for the date palm tree borers, *Oryctes* spp. (Coleoptera: Scarabaidae: Dynastinae) in laboratory and field trials, during 2015 season. Laboratory results demonstrated that direct spray of 1000 infective juveniles (IJs) per ml of *R. blumi* on Arabian Rhinoceros Beetle, *Oryctes agamemnon arabicus* (ARB) caused 71.67% and 15% mortality in the larvae and adults, respectively. Treating the food source of the larvae (pieces of fresh tissue of the frond bases) with the same dose and period resulted in 48.33% mortality in larvae and 10% in adults. Laboratory results also showed that using concentration of 1×10^9 conidia/ml^{-1} of *B. bassiana* as direct spray of the ARB larvae or treatment of the food medium, led to 66.7% and 60% mortality for the two methods, respectively. Field experiments results showed that injection of 50 ml per palm tree with a concentration of 1000 IJs/ml of *R. blumi* caused around 42% mortality in ARB larvae which infested the tree. Meanwhile, injection of 50 ml of 1×10^9 conidia/ml^{-1} of *B. bassiana* imposed 50% mortality on larvae. Results of this investigation suggested the possibility of using *R. blumi* and, *B. bassiana* as a bicontrol agents against palm borers in IPM programs.

BC15

FIRST RECORD OF HYMENOPTEROUS PARASITOIDS IN EGYPT. Ahmed Samir Hndawy. Biological Control Research Department, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: ashendwy@gmail.com

Two parasitoids were recorded for the first time in Egypt. The first one, *Dryinus canariensis* Ceballos (Dryinidae: Chrysidoidea) was collected from Sant Catherine (Sinai) region. The second one, *Dicopus* sp. (Mymaridae: Chalcidoidea) was collected from Sakha (Nile Delta) region.

BC16

A SURVEY OF THE MOST IMPORTANT NATURAL ENEMIES OF THE TOMATO MOTH *TUTA ABSOLUTA* (MEYRICK) (LEPIDOPTERA: GELECHIIDAE) IN SYRIA. Randa Abou Tara[1], Majida Mofleh[2], Rafik Abbod[2], Hanan Habak[2], Nael Abdallah[2], Amal Sydaoui[2], Feras Azame[2], Ahmad Sa'ddine[2] and Ghassan Rustom[1]. (1) Faculty of Sciense, Damascus University, Syria, Email: randaaboutara@hotmail.com; (2) GCSAR, Damascus, Syria.

Tomato moth is one of the most serious pests on tomatoes in Syria. Chemical control has failed to combat it. Therefore, it was necessary to search for natural enemies in the local environment for use in the integrated control of this serious pest. Surveys were conducted in Lattakia, Tartous, Daraa, Damascus Country Side, and Quneitra governorates which are the spread areas of the tomato moth, in order to collect and identify the biological enemies of this pest in their natural habitat. Natural enemies were limited to several types of parasites, predators, and phytopathogens, which attack the tomato moth and are as follows: Parasites: *Bracon (Habrobracon) hebetor*, *Bracon (Habrobracon) nigricans*, *Diadegma* sp., *Elasmus* sp., Predators: *Nesidiocoris tenuis*, Phytopathogens: *Aspergillus* sp., *Alternaria* sp., *Cladosporium* sp. and *Verticillium* sp.

BC17

INSECTICIDAL ACTIVITIES OF SOME ACTINOMYCETE STRAINS ISOLATED FROM THE EGYPTIAN SINAI SOILS. A.G. Abdel-Rahman[1], B.M. Refaat[2], M. Helal[2,3] and A. A. Kobisi[1]. (1) Plant Protection Department, Desert Research Center, Mataria, Cairo, Egypt, Email: kobisinaser@gmail.com;(2) Botany and Microbiology Department, Faculty of Science (Boys), Al-Azhar University, Cairo, Egypt.

Seventy three pure actinomycete colonies were isolated from 48 rhizospheric soil samples collected from different locations in Sinai. These isolates were subjected

for measurement of their insecticidal activities against the greater wax moth *Galleria mellonella* L. Among them, seven isolates (S6, S13, S16, S23, S27, S35 and S36) were found as the most potent and were chosen for detailed toxicological studies. Their LC_{50} values were 25.23, 36.80, 55.96, 52.02, 54.19, 54.52 and 32.88 mg/ml, respectively. The most potent isolate (S6) was isolated from the rhizosphere of *Tamarix nilatie* plants grown in a sandy soil at El-Tor area and was identified as *Streptomyces lavendulae*.

BC18

SUSCEPTIBILITY OF DIFFERENT STAGES OF THE COTTON LEAF WORM *SPODOPTERA LITTORALIS* (BOISD.) TO THE FUNGUS *BEAUVERIA BASSIANA* (BALS.) VUIL. IN THE LABORATORY. Mohamad Ahmad, Ibtisam Gazal and Lobna Rajab, Department of Plant Protection, Faculty of Agriculture, Tishreen University, Latakia, Syria, Email: lobnarajabbassiana@gmail.com

This study was conducted to detect the most susceptibile stage of the cotton leafworm *Spodoptera littoralis* to the entomopathogenic fungus *Beauveria bassiana*. Conidial suspension from a fungal isolate of *B. bassiana* was prepared at concentration of 10^6 spore/ml. The suspension was sprayed separately on each of pupae, adults, and larvae (1st, 3rd, and 6th instar). Whereas, egg patches were dipped in the suspension. Results showed that the fungus *B. bassiana* was able to infect all tested stages of cotton leaf worm. Both the first and third instar larvae showed high susceptibility to infection with 100% mortality at the third and fifth day following inoculation. Also, egg and pupal stages showed susceptibility against a suspension of the fungus with mortality of 83 and 58%, four and fifteen days after inoculation, respectively. Mortality of adults was 32% on the fifth day, whereas the sixth instar larvae showed less susceptibility to fungal infection with mortality of 18%. It was notable that values of LT_{50} increased with increasing age of larvae.

BC19

EFFECT OF DIFFERENT STRAINS OF SUDANESE BACILLUS SPECIES TO THE ASIAN FRUIT FLY *BACTROCERA INVADENSE* DREW AND WHITE (DIPTERA: TEPHRITIDAE). Ebisam Mohammed Bashir, Asia abdeen and Naiema Eltayp Gorashi, Environment, Natural Resources and Desertification Research Institute, Khartoum North, Sudan, Email: ebtisammb@hotmail.com

This study was carried out under laboratory conditions (temperature 25 ± 10 C˚ and relative humidity 50±10 %. Larvae of *Bactrocera invadens* in slices of banana were treated with 100 µl of suspension of different isolates of *Bacillus* invadens (Po-1) (JX 841102), Om-5 Bt. (JX 66071) and st-2 Bt (KC201677)} at rate of $2x10^3$, $1x10^3$, $3x10^3$ spore/ml, and were observed daily, and the mortality rate was recorded. The suspension of st-2, om-5 and Po-1 caused 33, 44 and 100% mortality, respectively. Po.1 caused highest mortality after 72 hr and there was no significant difference between st. 2 and the control. Treated adult's food medium (yeast and sugar) by po-1, om-5 and st-2, caused 0, 10 and 30% mortality, respectively, compare with the control (16%). po-1 produced the highest mortality, followed by om-5 and st-2 but, there was no significant differences between them and the control. In case of adult attraction to supernatant of LB media compare with water control, po-42 gave the highest mortality of 70% after three and six days, whereas po-5 gave 43% mortality 5 days after the treatment, as compared to 46% for the control.

BC20

IMPACT OF BACILLUS THURINGIENSIS ON HEMOLYMPH OF *LOCUSTA MIGRATORIA*. M. Saidi-Touati, O. Sihali-Beloui, Farida Nateche, Zahia Djenane, Tassadit Baghdadi and Aldjia Bourass, Biodiversity Laboratory, Faculty of Biological Sciences, USTHB, Algeria, Email: mahdia_saidi@hotmail.com

The aim of this work was to demonstrate the effect of some strains of *Bacillus thuringiensis* (FAR4, HANA1 and TIM24) provided by Biodiversity Laboratory, Faculty of Biological Sciences (USTHB), on the hemolymph of *Locusta migratoria*. Results of producing blood smears showed an activated immune response in these locusts. Quantitative and qualitative changes were noted in the hemolymph after carrying out the blood smear examination of *Locusta migratoria* controls and those treated with the strains FAR4 and HANA1 and Tim24 of *Bacillus thuringiensis*. Changes in the blood of this locust were noted such as hemocyte proliferation, cell accumulation and clustering, increased plasmatocytes and granulocytes with decreased prohemocytes. This study demonstrated that the bacterium *Bacillus thuringiensis* stimulates the immune system of *Locusta migratoria*.

BC21

INNOVATIVE METHOD TO CONTROL DUBAS BUG, *OMMATISSUS LYBICUS* (DEBERG) (HOMOPTERA: TROPIDUCHIDAE) BY USING ENDOPHYTIC *BEAUVERIA BASSIANA* ISOLATES IN DATE PALM ORCHARDS. Hussain F. Alrubeai, Mohammad W. Khudhair, Mohammad Z. Khalaf and Mustafa Dhari, Integrated Pest Control Research Center, Agricultural Research Directorate, Ministry of Science and Technology, Baghdad, Iraq, Email: halrubeai@yahoo.com.

Two entomopathogenic *Beauveria bassiana* isolates were identified to have endophytic property were isolated from date palm, *Phoenix dactylifera* L. leaves, in addition to one isolate originally isolated from soil. Concentration of 1×10^9 conidia/ml was used in field experiments targeting Dubas bug, *Ommatissus lybicus* nymphs via injection, produced high mortality rate of 92, 96, and 100% of the three endophytic isolates, respectively, 15 days after treatment. The successful establishment in the date palm tissue was determined using *B. bassiana*-specific primers for the first time via using conventional PCR amplification technique before and after injection. The presence of B. Bassiana was confirmed when the expected amplicons appeared in the agorose gel after electrophoresis. The present study confirmed for the first time the presence of natural endophytic *B. bassiana* isolates within date palm

tissues using a molecular technique and their field efficacy in controlling dubas bug, *Ommatissus lybicus* (Deberg).

BC22

MICROBIAL CONTROL ON *SESAMIA CRETICA*INSECTS BY *BEAUVERIA BASSIANA* AT SHARKIA GOVERNORATE, EGYPT. E.A.H. Sherief [1], M.F. Ghaly[2], A.A.A. El Mougith[2] and M.A. Abd EL Kader[1]. (1) Plant Protection Research Institute, Sharkia, Egypt, Email: elsayed_sherief2000@yahoo.com; (2) Department of Botany, Faculty of Science, Zagazig University, Egypt.

This research was performed in Sharkia Governorate during 2014 and 2015 seasons under laboratory conditions. *Beauveria bassiana* (Blas.) is an imperfect entomopathogenic fungus that attacks a wide range of agriculture pests causing disease named as white muscardine and currently used as biocontrol substitute to the harmful chemical insecticides. *Beauveria bassiana,* isolate Cairo MIRCEN, was evaluated as a biocontrol agent against *Sesamia cretica* Led. under laboratory conditions. *B. bassiana* caused 100% mortality to *S. cretica,* 5 days after treatment. *B. bassiana* was screened for lytic enzyme production as it had the ability to produce chitinase and protease enzymes, but no lipase production. Environmental and nutritional conditions were studied to detect the optimum conditions for *B. Bassiana* growth and protease production. Fungal isolate was identified by microscopic examination. Culture filtrate of *B. bassiana* 1572 was concentrated (partially purified active compounds by chloroform) and tested on *Sesamia cretica* larvae at different ages in comparison with diluted (original filtrate). Insect's body became deeper in color, with the appearance of white mycelial growth of the fungus *B. bassiana* 1572 on the treated dead insect body in both treatments and the insect cadaver was solidified with some black lesions and malformation. Symptoms were more pronounced with the concentrated treatment than with the diluted treatment. Beauvericin toxin production was also investigated by SDS-protein electrophoresis. The test confirmed the presence of beauvericin toxin in both concentrated and diluted filtrates. When conidia of *B. bassiana* 1572 became in contact with the insect cuticle surface under suitable ecological condition, it germinated and initiated infection, followed by hyphae penetration of the insect body cavity, hyphae growth, division, beauvericin toxin production and production of spores which spread in the hemolymph. The beauvericin toxin in the body led to function disorder and death. The fungus grew outside the cadaver until the availability of suitable conditions to resume life cycle.

BC23

LABORATORY EVALUATION OF AN ENTOMOPATHOGENIC FUNGUS, *ISARIA FUMOSOROSEA* WIZE AGAINST THE TWO-SPOTTED SPIDER MITE, *TETRANYCHUS CUCURBITACEARUM* (SAYED). Hany Mohamed Jalal Al-Kawas, Hassan Ahmed Nabil, Fatima Shehata Qalamoush and Rana Hussein Mohamed Hussein, Plant Protection Research Institute (PPRI), Agricultural Research Center, Egypt, Email: hmg733@yahoo.com

Studies were carried out in Plant Protection Research Institute, Sharkia branch, during 2015–2016 to evaluate the effectiveness of the entomopathogenic fungus, *Isaria fumosorosea* Wize as a biological control agent of the two-spotted spider mite, *Tetranychus cucurbitacearum* (Sayed) under laboratory conditions. Two different application methods were used, spray and dipping techniques of fungal spores suspension at two temperatures 25 and 30±1˚C and 60±5% R.H. Mortality rate increased with increase in spore concentration, exposure time and temperature. LC_{50} values were 2.14×10^6 and 1.70×10^4 spores/ml after four and seven days of spray application at 30˚C, respectively. On the other hand, LC_{50} values were 8.95×10^6 and 2.77×10^6 spores/ml after four and seven days of dipping at 30˚C, respectively.

BC24

FIRST RECORD OF *AENASIUS ARIZONENSIS* (GIRAULT) (HYMENOPTERA, ENCYRTIDAE), A PARASITOID OF *PHENACOCCUS SOLENOPSIS* TINSLY (HEMIPTERA, PSEUDOCOCCIDAE) IN BAGHDAD, IRAQ. M.S. Abdul-Rassoul, Iraq Natural History Museum, Baghdad, Iraq, Email: msabr_1942@yahoo.com

This study represent the first record of *Aenasius* arizonensis (Girault) (Hymenoptera, Encyrtidae) parasitizing the recently introduced species of cotton mealybug, *Phenacoccus solenopsis* Tinsly (Hemiptera, Psedococcidae) infesting *Lantana camara* L. (Verbeneceae) as well as other ornamental plants in Baghdad province, Iraq. A short morphological description will be presented.

BC25

REARING OF PARASITOID *COTESIA GLOMERATA* ON DIFFERENT HOSTS AND RESPONSE OF PROGENY TO THESE HOSTS. Amani Shllalo, Wageh Kses and Slam Loend, Faculty of Agriculture, University of Damascus, Damascus, Syria, Email: msabr_1942@yahoo.com

The biological control of insects is the safest and less polluting to the environment control method. One approach depends on mass rearing and releasing of parasitoids, but the ability of parasitoid to survive becomes weaker after several generations of laboratory rearing. The aim of the present investigation was to determine the efficiency of *Cotesia glomerata* in the biological control when it's rearing on alternative hosts in laboratory such as *Aporia crataegi*, *Pieris brassicae* and *Galleria mellonella*. The fertilized females showed a preference for host larvae they were reared on, followed by the larvae of *Pieris brassicae*, consequently, the olfactory memory in *C. glomerata* acquired during the larval stage, continue until the emergence of adults and lay their eggs on the host where it was reared with high efficiency.

BC26

SOME BIOLOGICAL ASPECTS OF THE EGG PARASITOID *PSEUDOLIGOSITA BABYLONICA* VIGGIANI (HYMENOPTERA: TRICHOGRAMMATIDAE) ON DUBAS BUG *OMMATISSUS LYBICUS* DE BERG. (HEMIPTERA: TROPIDUCHIDAE) UNDER LABORATORY

CONDITIONS. H.F. Alrubeai[1], BH. Hassan[1] and J.K. Alrubeai[2]. (1) Ministry of Science and Technology, Directorate of Agricultural Resaerches, Integrated Pest Control Research Center, Baghdad, Iraq, Email: bassim67@yahoo.com; (2) Ministry of Higher Education and Scientific Research, University of Baghdad, Department of Plant Protection, Iraq.

Some biological aspects of the egg parasitoid *Pseudoligosita babylonica* Viggiani (Hymenoptera: Trichogrammatidae), which attack eggs of both generations of dubas bug *Ommatissus lybicus* De berg. (Hemiptera:Tropiduchidae) in Iraq, were investigated under two constant temperatures, 25±1 C˚ and 30±1 C˚ and relative humidity of 70±5% to determine the best temperature for rearing this parasitoid under laboratory conditions. Results showed that temperature has a significant effect on immature stages developmental time and longevity of parasitoid adults. Results also showed that 30°C was the best and the average developmental time of the immature stages at this temperature was 40.94 days. Whereas, adults longevity was 6.88±0.18 and 8.12±0.29 days for males and females, respectively. Results also showed significant differences between males and females longevity under the two temperatures tested and between the two sexes within the same temperature, with female's longevity longer than that of males. Temperature had a significant effect on the parasitism rate of normal females (mated females), whereas the highest parasitism rate was 46.2±2.32% at 30°C, with no significant differences in the sex ratio of the progeny produced at 25°C and 30°C and it was 1♂: 1.07♀ and 1.13♂: 1♀, for the two temperatures, respectively. The results revealed that females had arrhenotokous parthenogenesis, and temperature had a significant effect on the longevity of unmated females, and was longest (5.38±0.22 days) at 30°C. Temperature also had significant effect on developmental period of the immature stages that reproduced parthenogenetically and reached 41.62±0.29 days at 30°C.

BC27

FIRST RECORD OF *AENASIUS ARIZONENSIS* (HYMENOPTERA: ENCYRTIDAE) AS A SOLITARY, ENDOPARASITOID OF COTTON MEALYBUG, *PHENACOCCUS SOLENOPSIS* TINSLEY (HEMIPTERA: PSEUDOCOCCIDAE) INFESTING DIFFERENT HOST PLANTS IN THE GIZA REGION, EGYPT. Angel R. Attia[1], Kamal T. Awadallah[2] and John Noyes[3]. (1) Plant Protection Research Institute, ARC, Dokki, Giza, Egypt, Email: angelroshday@yahoo.com; (2) Biological Control Lab., Faculty of Agriculture, Cairo University, Giza, Egypt; (3) Department of Life Sciences, Natural History Museum, London, UK.

The primary parasitoid *Aenasius arizonensis* (Girault) (= *Aenasius bambawalei* Hayat) is a solitary, endoparasitoid which emerges from *Phenacoccus solenopsis* adult stage. It was recorded for the first time on two host plants, *Lantana camara* (Verbenaceae) and *Hibiscus rosa–sinensis* (Malvaceae) with a population density of 9.8 and 5.1 individuals/branch for the two hosts, respectively, during June 2016 in the Giza region. One month later (July), *A. arizonensis* was reported on five host plants: *Solanum nigrum* (Solanaceae), *L. camara* (Verbenaceae), *Bidens bipimata* (Compositae), *Withania somnifera* (Solanaceae) and *H. rosa-sinensis* (Malvaceae). Average numbers on the five surveyed host plants ranged from 9.0 to 13.6 individuals/branch. The occurrence rate of *A. arizonensis* females varied with different host plants. The highest rates of 65.45% and 63.33% were reported on the two host plants *B. bipimata* and *H. rosa- sinensis*, respectively, whereas the least females occurrence rate (42.39%) was associated with the host plant *W. somnifera* during July. The corresponding values on the host plants *S. nigrum* and *L. camara*, were 47.79% and 47.46%, respectively. Most of *A. arizonensis* females (87.5%) emerged from mummies of mealybug gravid females (85%), whereas most of *A. arizonensis* males emerged from mummies of mealybug adult females. Three hyperparasitoids: *Chartocerus subaeneus* (Forster) (Signiphoridae), *Prochiloneurus aegyptiacus* (Mercet) (Encyrtidae) and *Pachyneuron* sp. were recorded associated with this primary parasitoid. The common hyperparasitois, *C. subaeneus* reduced the population of *A. arizonensis* by 18%. Its mean population number ranged from 8.9 to 21.7 individuals/branch, with highest count obtained on *L. camara* and the lowest on *H. rosa-sinensis*.

BC28

RELATIONSHIP BETWEEN DEVELOPMENTAL STAGES OF THE PREDATOR *NEPHUS INCLUDENS* (KISCH) (COLEOPTERA: COCCINELLIDAE) REARED ON CERTAIN MEALY BUG SPECIES AND THERMAL UNITS REQUIREMENTS. A.A.A Saleh[1], A.A. Ghanim[2], Nadia E. Mohamed[1] and Sh.A. Mohamed[1]. (1) Plant Protection Research Institute, Agricultural Research Center, Dokki, Egypt, Email: amin_ahmed4u@yahoo.com; (2) Economic Entomology Department, Faculty of Agriculture, Mansoura University, Egypt.

The present work was conducted to study the relationship between the developmental stages of the predator *Nephus includens* (Kisch) (Coleoptera: Coccinellidae) and the required thermal units at three constant temperatures (20, 25 and 30ºC) on certain mealy bug species (*Planococcus citri* Risso, *Icerya seychellarum* (Westwood) and *Maconellicoccus hirsutus* (Green). The results obtained indicated that, the duration of the predator was longer at 20ºC. As temperature increased from 20 to 30ºC, the longevity decreased. The lower thermal threshold for the development of the predator *N. includens* were 10.9, 10.6 and 11.1ºC for eggs, 6.4, 2.1 and 0.7 ºC for larvae, 8.4, 5.6 and 11.9 ºC for pupae, whereas it were 0.1, 3.2 and 1.9ºC for the total duration from egg to adult, on the three mealy bug species, respectively. The heat units requirement for the development of eggs were 90.1, 92.4 and 91.5 day degrees (DD's), for larvae were 387.7, 328.1 and 382.5 DD's, for the pupae 325.8, 308.1 and 390.1 DD's, while they were 713.8, 674.2 and 765. 3 DD's for the development period of *P. citri, I. seychellarum* and *M. hirtsutus*, respectively. The lower thermal threshold for longevity of *N. includens* females were 12.8, 18.4, 10.9, and for the males were 13.2, 22.8, 48.7, meanwhile, the heat

units requirement for female longevity were 2779.8, 2513.7, 2709.9 and for the male longevity were 2380.7, 2432.4, 4206.2 on the same three mealy bug species, respectively. The average total consumption per predator larva was the highest at 25±1ºC, when the predator fed on the larval stage of the mealy bug *P. citri*. The results revealed that the longevity of the predator adult stage decreased with temperature increase. The highest consumption rate per female was at 30± 1ºC, as compared with the other temperatures. The number of deposited eggs per female was the highest (185.74±1.92 eggs) when the female was reared on *P. citri* at 25±1ºC. Results obtained provided essential information for predicting the field population of the predator *N. includens* and optimal release time on certain mealy bug species. The study supports the option of using this predator as a component in integrated pest management programs of certain mealy bugs in Egypt.

BC29

THE ROLE OF PREDATOR INSECTS IN REGULATING POPULATION DENSITIES OF CERTAIN PIERCING-SUCKING PESTS ON SQUASH PLANTS IN EGYPT. A.A.A. Saleh[1], H.M. El-Sharkawy[2], F.S. El-Santel[2] and Rehab A. Abd El-Salam[2]. (1) Plant Protection Research Institute, Agricultural Research Center (ARC), Dokki, Giza, Egypt, Email: amin_ahmed4u@yahoo.com; (2) Plant Production Department, Faculty of Technology and Development, Zagazig University, Egypt.

Studies were carried out at Diarb Negim, Sharkia governorate during two successive seasons 2014-2015 and 2015-2016. Results obtained showed that in the fall plantation, there were two peaks of *Aphis gossypii* (Glover) on squash plants, one peak during the last week of November and the other during the third week of December in the 2014-2015 season. On the other hand, *Bemisia tabci* (Genn.) had three peaks, during second week of November, first week of December and third week of December in the 2014-2015 season and two peaks of infestation during the fourth week of November and December in the 2015-2016 season. Whereas, three peaks during summer plantation were obtained; during the fourth week of April, the fourth week of May and second week of June, in the 2015-2016 season, respectively. The study revealed that squash plants were infested with few numbers of thrips during fall plantation throughout the two seasons. Statistical analysis of the data obtained suggest a high negative correlation between aphids and whiteflies population and temperature during fall plantation in both seasons. A positive significant correlation between population density of *A. gossypii* and mean RH was found in the fall plantation of the second season 2015-2016. During summer plantation, there was a negative correlation between minimum RH and *Orius* spp. population density and a positive significant correlation between minimum RH with *C. carnea* population density in the first season 2014-2015. The predaceous insects found associated with pericing-sucking pests were *Orius* spp., *Coccinella undecimpuncta* L., *Chrysoperla carnea* Steph., *Metasyrphus corolla* F. and few numbers of *Paederus alferii* (Koch) and true spider. The results revealed that *Orius* spp. had three peaks in the two seasons during fall plantation, during the first and third week of November, and third week of December, in both seasons, respectively. Meanwhile, in the summer plantation of the 2015-2016 season, there was two peaks, during the first week of May and third week of June. *Chrysoperla carnea* had two peaks in the fall plantation during the two seasons; third week of November, second week in December in 2014 and fourth week of November, third week of December in 2015. In addition, two peaks were observed in the summer plantation of the 2015-2016 season; during the first week of April and second week of June.

BC30

ANTIMICROBIAL ACTIVITIES OF SOME ACTINOMYCETE ISOLATES FROM THE EGYPTIAN SINAI SOILS. A.G. Abdel-Rahman[1], B.M. Refaat[2], M. Helal[2] and A.A. Kobisi[1]. (1) Plant Protection Department, Desert Research Center, Mataria, Cairo, Egypt, Email: ag_rahman@outlook.com; (2) Botany and Microbiology Department, Faculty of Science (Boys), Al-Azhar University, Cairo, Egypt.

Seventy three pure actinomycete colonies were isolated from 48 rhizospheric soil samples collected from different locations in Sinai. These isolates were tested for their antimicrobial activities against *Bacillus subtilis* and *Staphylococcus aureus* as gram-positive bacteria, *Escherichia coli* and *Pseudomonas aeruginosa* as gram-negative bacteria, *Candida albicans* as an unicellular fungus and *Aspergillus niger*, *Aspergillus flavus*, *Rhizoctonia solani* and *Fusarium oxysporum* as filamentous fungi. Isolates S6, S13 and S35 were the most effective against the tested bacteria and fungi. They had the lowest minimum inhibitory concentration (MIC) values and showed the highest and widest spectrum of antibacterial and antifungal activities. Factors controlling actinomycetes active metabolite(s) productivity were studied.

BC31

SEASONAL OCCURRENCE OF APHID NATURAL ENEMIES AND EFFECT OF THE FUNGUS *LECANICILLIUM LECANII*, THE INSECT GROWTH REGULATOR MULIGAN AND THE PESTICIDE CONFIDOR ON LADYBIRD *COCCINELLA SEPTUMPUNCTATA* PREDATOR. Zahraa A.A. Alghadbaan and Shima A.R. Omra, Plant Protection Department, Faculty of Agriculture, University of Baghdad, Iraq, Email: s_aljuboory@yahoo.com

A study of seasonal occurrence and relative effectiveness of the fungus *Lecanicillium lecanii* (Zimmerman), insect growth regulator Muligan and chemical pesticide Confidor on the aphids natural enemies that infest the wheat crop (Ebaa 99 Variety) in the field during 2015-2016. The results obtained showed the presence of two species of ladybird *Coccinella septumpunctata*, *C. undecimpunctata* and one species of flowers flies of the Syrphidea and four Hymenoptera parasitoids, three of them Braconidae and the other Aphelinidae. Entomopathogenic fungi such as *Uocladium* sp. and *Fusarium* sp. were also identified. Both species of beetles appeared at the beginning of January and increased to reach its peak at mid-February and then began to decline

until disappeared in mid-April. Flowers flies and parasitoids started to appear in December and reached its peak in mid-February then started to decline until disappeared in April. Aphid's natural enemies did not move to the area cultivated with wheat, because wheat plants were dry and aphids were absent. The impact of the fungus *L. lecanii* at the concentration of 1.5×10^7 spores/ml on *C. septempunctata* adults was less than the effect of the insect growth regulator (Muligan) and the pesticide Confidor. The relative effectiveness of the fungus was 6.67%, 14 days after treatment, whereas, it was 26.67% and 66.67% for the insect growth regulator Muligan and the pesticide Confidor, respectively, and the differences were significant.

BC32

ORIENTATION AND BEHAVIORAL RESPONSES OF *APANTELES GLOMERATUS* (HYMENOPTERA: BRACONIDAE) TO HOST PLANTS (ALMOND) AND HOST LARVAL BODY (*APORIA CRATAEGI*) EXTRACTS. Amani Shllalo, Wageh Kses and Slam Loend, Faculty of Agriculture, University of Damascus, Damascus, Syria, Email: amannishllalo@yahoo.com

The foraging activity of a parasitoid is highly influenced by the chemical signals released from the host plants and their potential hosts in a cropping system. In this present study using *Apanteles glomeratus* (L.) as a model, we examined the capacity of native *Apanteles glomeratus* (L.) virgin and gravid females to learn and orient themselves towards the odour of almond host plant extract, and to larval body extract of *Aporia crataegi* (L.). The gravid females were most attracted to a mixture of host plant and larval body extracts, followed by the mixture of uninfested host plant and larval body extracts, which was equal to the attraction of the larval body extract, followed by attraction towards infested host plant extract, and the least attraction was towards uninfested host plant extract. The virgin females were equally attracted towards uninfested and infested host plant extracts, and the least attraction was towards larval body extract.

BC33

STUDIES ON SOME PARASITOIDS OF THE APHID *APHIS GOSSYPII* GLOVER, (HOMOPTERA: APHIDIDAE) ON CUCUMBER PLANTS IN EGYPT. A.A.A. Saleh[1], H.M. El-Sharkawy[2], F.S. El-Santel[2] and Rehab A. Abd El-Salam[2]. (1) Plant Protection Research Institute, Agricultural Research Center (ARC), Dokki, Giza, Egypt, Email: amin_ahmed4u@yahoo.com; (2) Plant Production Dept., Faculty of Technology & Development, Zagazig University, Egypt.

The present study was conducted to survey and assess population density of aphid *Aphis gossypii* Glover (Homoptera: Aphididae) infesting cucumber plants and its parasitoids at Diarb Nigem district during two seasons, 2015 and 2016. Three primary parasitoids *Lysiphlebus fabarum* (Marshall), *Diaeretiella rapae* (M Intosh) and *Binodoxys angelica* (Haliday) and a hyperparasitoid, *Pachyneuron* sp. (Hymenoptera: Aphidiidae) were collected and identified. Primary parasitoid *Lysiphlebus fabarum* was a highly dominant species at relative density of 53.76 and 52.24%, followed by *D. rapae* at 22.58 and 27.73%, *Binodoxys angelica* at 15.06 and 12.14%, and the hyperparasitoid, *Pachyneuron* sp., occurred at 8.60 and 7.89%, during 2015 and 2016 seasons, respectively. The parasitism rate ranged from 3.14% to 21.0% in 2015, whereas in 2016 it started at 2.66% and reached a maximum of 42.66%. The total developmental period of the parasitoid *Lysiphlebus fabarum* was 14.67±1.16 days at 18.30±1°C and RH of 64±2 %. Investigations of the behaviour of the same parasitoid *Lysiphlebus fabarum* at varying host densities showed increased number of stings and number of mummies with the increase of host density. The results obtained showed that the longevity of the parasitoid *Lysiphlebus fabarum* was affected by temperature and food supply.

BC34

ECOLOGICAL STUDIES ON *AULACASPIS TUBERCULARIS* (HEMIPTERA: DIASPIDIADE) AND THEIR ASSOCIATED NATURAL ENEMIES ON MANGO TREES AT QALIOBIYA GOVERNORATE, EGYPT. Marwa E.S. Amer[1], M.A. Salem[2], M.E.H. Hanafy[2] and N. Ahmed[1]. (1) Scale Insects and Mealybugs Research Department, (P.P.R.I), A.R.C), Dokki, Giza, Egypt, Email: dr.marwasanad@gmail.com; (2) Plant Protection Department, Faculty of Agriculture, Ain shams University, Egypt.

Studies on some ecological aspects of *Aulacaspis tubercularis* Newstead (Hemiptera: Diaspidiade) and their associated parasitoids and predators on mango trees were carried out at Benha district, Qaliobiya Governorate, Egypt, during two successive seasons 2014-2015 and 2015-2016. The results obtained showed that *A. tubercularis* had four peaks of activity yearly in both seasons. The peaks were in April, June, September and January during the two seasons. *A. tubercularis* had four overlapping generations during the two seasons. Three predator species were associated with *A. tubercularis* on mango leaves: *Chrysoperlla carnae* (Stephens), *Hemisarcoptes coccophagus* (Meyer) and *Chilocorus bipustulatus* (Linnaeus) and three parasitoids species: *Habrolepis sp*, *Encarsia sp*. and *Aphytis* sp. The highest total population was observed in the fall and summer and lowest population in winter. The heaviest infestation of *A. tubercularis* were detected in south and east directions, and the upper leaf surface was preferable compared with the lower surface.

BC35

FATTY ACIDS COMPOSITION OF EIGHT ISOLATES OF ENTOMOPATHOGENIC NEMATODES FROM FIVE EGYPTIAN GOVERNORATES. A.A. Meligy, A.M. Azazy, H.A. Sorur and M.A. Monzer, Pest Physiology Department, Plant Protection Research Institute (PPRI), Agricultural Research Center, Egypt, Email: amal2004s2000@yahoo.com

The fatty acids composition of infective juveniles (IJs) related to five isolates of *Heterorhabditis indica* (EGAZ1, EGAZ2, EGAZ3, EGAZ4, and EGAZ5) and three isolates of *Steinernema carpocapsae* (EGAZ9, EGAZ10 and SA) collected from five Egyptian Governorates was assessed. In addition, fatty acids composition of IJs from two commercially relevant strains of *H. bacteriophora*

(HP88) and *S. carpocapsae* (All), were examined for comparison. Newly emerged IJs of all isolates had fatty acid number and pattern similar to that of the corresponding commercial species. Of the ten fatty acids identified, oleic, was the main fatty acid in all species and isolates. Unsaturated fatty acids were dominant and total amount of saturated fatty acids of *H. indica* isolates was significantly higher than that of *S. carpocapsae* isolates. Palmitic was the second most abundant fatty acid in IJs of *H. indica* isolates, whereas linoleic was the second most abundant fatty acid in IJs of *S. carpocapsae* isolates. Of the tested Egyptian isolates, IJs of EGAZ3 and EGAZ5 of *H. indica* had the highest amounts of fatty acids and their contents of saturated fatty acids/gram body weight were comparable to that of the commercial strain. It is suggested that isolates EGAZ3 and EGAZ5 of *H. indica* are the candidates for developing practical Egyptian bio-control product based on nematode formulation.

BC36

SURVEY AND POPULATION FLUCTUATIONS OF ARTHROPOD PESTS AND PREDATORS IN SWEET POTATO AT NILE DELTA, EGYPT. A.S. Hendawy[1], S.K. El-Fakharany[1] and F.H. Hegazy[2]. (1) Plant Protection Research Institute, Agric. Res. Center, Egypt, Email: ashendwy@gmail.com; (2) Plant Protection Department, Faculty of Agriculture, Tanta University, Egypt.

Experiments were carried out at El-Riad district, Kafr El-Sheikh Governorate during two successive growing seasons (2015 and 2016) to survey and assess population fluctuations of arthropod pests, insect predators and spiders in sweet potato, *Ipomoea batatas* (L.) (Apis Cultivar). The investigation revealed the presence of 26 Arthropods, 16 as pests and 10 as predators. *Bemisia tabaci* Genn. was the most occurring (41.51 and 45.37%) followed by *Tetranychus* sp. (18.74 and 15.39%), *Empoasca* spp. (13.24 and 14.15%), *Agrius convolvuli* (L.) (7.12 and 6.18%), *Nezara viridula* (L) (6.90 and 6.09%) and *Eysarcoris ventralis* (Westwood) (6.27 and 5.66%), in 2015 and 2016 seasons, respectively. The insect pests *Scantius aegyptius* (L.), *Gryllus domesticus* L. and *Aiolopus strepens* (Latreille) exhibited the least population densities. Spiders were the most occurring predators (49.30 and 43.27%), followed by coccinellids (34.43 and 32.66%) and *Chrysoperla carnea* Steph. (11.36 and 11.80%), in 2015 and 2016 seasons, respectively. The lowest predatory densities were those of *Eupeodes corollae* (F) (0.95 and 0.81%) in 2015 and 2016 season, respectively. The collected spiders by different sampling techniques were found belonging to 13 families: Araneidae, Clubionidae, Dictynidae, Dysderidae, Eutichuridae, Gnaphosidae, Linyphiidae, Lycosidae, Philodromidae, Salticidae, Tetragnathidae, Theridiidae and Thomisidae, with araneids and lycosids being the most abundant. Pitfall traps proved to be the most efficient in collecting spiders, followed by sweep net, and hand cach. Predators were detected on sweet potato plants by mid or late June. The population density of *Stethorus gilvifrons* (Mulsant) was quite low early in the season and then increased gradually to exhibit its peak by the first week of August, whereas, *Chrysoperla carnea* adults peaked during the first week of September. The peak of *Coccinella undecimpunctata* L. adult occurred on June 23 rd. Spiders peaks were by late June in 2015 and late July in 2016.

BC37

ANTI-FUSARIAL ACTIVITY OF BACTERIA ISOLATED FROM POTATO FIELDS. Samia Mezaache-Aichour, Nadia Sayah, Nora Haichour and Mohamed Mihoub Zerroug, Laboratoire de Microbiologie Appliquee, Faculte des Sciences de la Nature et de la vie, Universite Ferhat Abbas Setif 1, 19000, Setif, Algerie, Email: mezaache@univ-setif.dz; mezaic2002@yahoo.fr

The overuse of chemicals in crop protection had led to emergence of resistant plant pathogens. The enhancement of disease suppressive properties of soils will limit disease development, thus, will be of great importance for application in sustainable agriculture as well as in organic farming systems. The aim of this research is to test the effect of some indigenous bacterial strains with suppressive properties on the growth of *Fusarium* causing mould and wilt diseases, using the confrontation test. The results showed that among 50 bacterial strains isolated from potato fields, only 12 showed antifusarial activity. A strain from the first field inhibited *Fusarium oxysporum* f. sp. *albedinis* (FOA) with 67. 44% and had no effect against *Fusarium solani* var. *coeruleum (FSC)*, whereas a strain from the second field inhibited *FSC* with 85% and had a very low inhibitory effect against *FOA* of 1.25%.

BC38

OCCURRENCE AND BIOLOGICAL CONTROL OF CUCUMBER DAMPING OFF DISEASE UNDER PROTECTED CULTIVATION IN SULAIMANIA, IRAQ. Emad M. Al-Maaroof and Nermin M. Saber, Faculty of Agricultural Sciences, Sulaimani University, Sulaimania, Iraq, Email: ealmaaroof@yahoo.com; emad.ghalib@univsul.edu.iq

Survey of cucumber damping-off disease incidence in Sulaimania plastic houses in 2014 revealed an overall disease incidence of 6.82%. The highest incidence and severity reached 23.7% and 5.0 respectively in Kharajian. The lowest incidence and severity were detected in Arabit (0.2% and 0.6, respectively). Disease symptoms included pre- and post-emergency damping-off of cucumber seedlings. Twelve fungal pathogens were isolated from roots and crown of infected seedlings of plants with typical damping-off and root rot symptoms. *Rhizoctonia solani* was the most frequently isolated fungus, followed by *Pythium aphanidermatum*, *Fusarium solani* and *Pythium sp.* Morphology and characteristics of *R. solani* and *P. aphanidermatum* matched with the originally described characters of these fungi. The optimum growth temperature for *P. aphanidermatum* was 30°C and for *R. solani* was 25-30°C. Pathogenicity test revealed that *R. solani* significantly surpassed all other treatments except *P. aphanidermatum* by inciting 53.3% pre- and 66.4% post-emergence damping-off, followed by *P. aphanidermatum* that incited 43.6% and 56.3% pre- and post emergence damping-off, respectively. *Trichoderma harzianum* showed high antagonistic ability against both pathogens. Antagonistic ability of *T. harzianum* reached 37.02% against *P.*

aphanidermatum and 32.00% against *R. solani*. The bio-control bacterial agents *Bacillus subtilis, Rhizobacteria, Streptomyces coelicolor* showed high efficiency in controlling the disease. *Rhizobacteria* and *S. coelicolor* completely inhibited *R. solani* growth at 10^{-1} bacterial dilution and significantly surpassed all other treatments. Dilution of 10^{-1} from all the used bacteria were significantly more efficient against *P. aphanidermatum.* This dilution contained 21.4×10^7 cell forming units in each milliliter (CFU/ml) in *B. subtilis*, 28×10^7 CFU/ml in *Rhizobacteria*, 29.5×10^7 CFU/ml in *S. coelicolor*, 32.2×10^7 CFU/ml in *Pseudomonas flouresence* and 22.6×10^7 CFU/ml in *Azotobacter chroococcus*.

BC39

EVALUATION OF ANTAGONISTIC ACTIVITY OF SELECTED RHIZOBACTERIAL ISOLATES AS A COMPONENT IN INTEGRATED POTATO SOFT ROT MANAGEMENT. Nasir Mehmood, M. Inam-ul-Haq and Gulshan Irshad, Department of Plant Pathology, PMAS Arid Agriculture University Rawalpindi, Pakistan, Email: nasirm20@gmail.com

Potato soft rot caused by *Erwinia carotovora* has been reported to be most destructive and widely distributed disease in Pakistan. Rotted samples were collected on the basis of symptoms from different areas of Rawalpindi, Islamabad, Taxila and Gujranwala and the pathogen was isolated. Rhizobacteria were isolated from the rhizosphere of potato plants and evaluated for their ability to antagonize the isolated rot causing pathogen, *in vitro*, using zone inhibition technique and by using whole potato assay along with pot experiment. By using the inhibition zone technique, it was observed that out of 20 isolates, 3 isolates (Rb-5, Rb-12 and Rb-18) were efficient and had considerable antagonistic effect on the pathogen with an inhibition zones radius of 15 mm, 12 mm and 9 mm, respectively. The isolate Rb-18 showed more inhibition than Rb-5 and Rb-12 as they produced inhibition zones radii of 15 mm, 12 mm and 9 mm, respectively. Antagonistic rhizobacterial isolates were applied on potato tubers kept in humid boxes and placed in laboratory for testing. Results obtained revealed that treatments were variable. Best results were observed in the treatment where isolates were applied as a mixture and produced 87.15% inhibition.

BC40

DEVELOPMENT AND EVALUATION OF A BIO PESTICIDE AGAINST ROOT PATHOGENIC FUNGI OF CHICKPEA. Raees Ahmed, Shazia Shahzaman and M. Inam-ul-Haq, Department of Plant Pathology, PMAS-Arid Agriculture University Rawalpindi, Pakistan, Email: rahmed1770@gmail.com

Chickpea occupies significant place among other pulse crops as it provides protein for human diet and play vital role in replenishing soil fertility. Yield potential is drastically affected by a number of soil- borne fungal pathogens that lead to quality and quantity reduction. Plant growth promoting rhizobacteria (PGPR) colonizing the chickpea roots resulted into disease control and also enhanced plant growth. In the present study, a survey was conducted in major chickpea growing areas of Rawalpindi and adjoining districts; three locations in Attock District (Fateh Jangh, Hasan Abdal and Pindi Gheb), one location in Chakwal District (Chakwal) and four major locations in Rawalpindi District (Doltala, Tarnol, Taxila and Kahuta). Maximum disease incidence, prevalence and severity was recorded from Chakwal district. Rhizobacteria were isolated from soil by serial dilution method and were purified by picking single colony from composite culture. Isolated rhizobacteria were screened for antagonism and antagonists were subjected to biochemical tests and were identified as *Pseudomonas fluorescens* and *Bacillus subtilis* based on molecular analysis. Dual culture tests were performed to test the antagonistic potential against *Fusarium oxysporum.* PS3 rhizobacteria was found highly effective against all the seven tested *Fusarium oxysporum* strains (FOS1, FOS2, FOS3, FOS4, FOS5, FOS6 and FOS7) as compared to the control treatment. Rhizobacteria in a suspension form (10^6 cells/ml) at 5 ml/pot were also tested under greenhouse conditions, in pot trials. Data related to disease incidence, prevalence and severity, recorded 45 days after treatment, indicated that among all the tested treatments, T5 produced the best effect in reducing disease incidence and enhancing plant growth as compared to untreated control plants, where only pathogenic fungal inoculum was applied. Most effective rhizobacteria such as *Pseudomonas fluorescens* and *Bacillus subtilis* were mass multiplied on different carrier materials (e. g. vermi compost and organic matter) for their efficient application. Shelf life of the prepared formulations was studied by measuring cfu at two temperatures, 5 and 28ºC at different time intervals. Maximum cfu was observed at 28ºC, 60 days after sowing and decreased 90 days after sowing.

BC41

ADDITION OF NITROGEN SOURCES TO LIQUID AND SOLID FORMULATIONS OF *TRICHODERMA HARZIANUM* AND EVALUATION OF ITS EFFICACY TO BIOLOGICALLY CONTROL FUSARIUM WILT DISEASE ON CHICKPEA. Hanan I. Mudawi[1], Rasheda Aduseen[2] and Rowa Malik[2]. (1) Department of Biopesticides and Biofertilizers, The Environmental Natural Resources and Desertification Research Institute, National Centre for Research, Khartoum, Sudan, Email: hananmodawi@gmail.com; (2) Department of Pest and Plant Health, Collage of Agriculture, Bahri University, Khartoum, Sudan.

Locally, non expensive and available agricultural residues were evaluated as natural substrates for the formulation of *T. harzianum* as carbon sources, supplemented with nitrogen sources. Chickpea (*Cicer arietinum* L.) plants were used as a model plant to evaluate the efficacy *T. harzianum*, as a biopesticide in liquid and solid formulations to control Fusarium wilt disease on chickpea. Soil inoculated with Fusarium wilt pathogen was used in a green house assay. The liquid formulation contained an aqueous suspension of *T. harzianum* and the solid formulation consisted of fine ground particles of solid substrates of wheat, rice and sorghum as carbon sources inoculated with *T. harzianum*. Both formulations were supplemented with 1% (w/w) peptone or yeast extract as

nitrogen sources. Solid formulations supplemented with nitrogen sources were significantly more effective than liquid formulations in enhancing plant growth, and decreasing disease development. Addition of peptone to wheat plants increased the plant height and root weight which reached 23.58 cm and 0.61 g compared to 13.08 cm and. 0.24 g, for the control treatment, respectively. When rice substrate was supplemented with peptone, it significantly increased the number of plant branches by 13.07 and with the addition of yeast it increased shoot dry weight by 0.5 g compared to 7.91 and 0.06 g, for the control uninfected plants, respectively. A pronounced increase in chlorophyll content was recorded when yeast was added to liquid and rice substrate (24.05 and 23.51%, respectively) compared to infected plants (1.65%). All the formulations of *T. harzianum* decreased the wilt disease intensity index (DII) of chickpea plants within a range of 0.33-0.50, compared to the control treated plants (0.76). Hence, the addition of nitrogen sources when formulating *T. harzianum* as biopesticides is important for potential enhancement of plant protection.

BC42

INVOLVEMENT OF LYTIC ENZYMES PRODUCED BY *SERRATIA MARCESCENS* IN INHIBITING *RHIZOCTONIA SOLANI*, THE CAUSAL AGENT OF BLACK SCURF AND STEM CANKER IN POTATO.

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A bacterial strain of *Serratia marcescens* isolated from date palm compost was tested for its antagonistic effect of *Rhizoctonia solani*, the causal agent of black scurf and stem canker in potato. Dual cultural assays on potato dextrose agar (PDA) showed a significant inhibition of mycelial growth of the pathogen which reached to approximately 30%, compared with that in the absence of the bacterium. Production of chitinase and β-1,3-glucanase was evaluated. The mode of action has been shown to be chitinolytic. Determination of some chitinolytic enzymes revealed the involvement of N-acetyl glucosaminidase (Nagase) and endochitinase in degrading the mycelium of *R. solani.*

BC43

ANTAGONISTIC EFFECT OF *TRICHODERMA* SP. AGAINST *PESTALOTIOPSIS* SP. IN TUNISIA.

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Fungi inflict damage to forest trees, and fungal dieback symptoms include leaf drop and yellowing, drying and necrosis of branches, cankers, deformations, blackish fluid flow in the the trunks. The forest of Henchir Kort, (northeast of the Tunisia) has suffered heavy infection since 2012. Symptoms of wilting were noted on the pine (Pinus pinea) and several other species such as white heather (Erica arborea). In October 2016, attacked samples with symptoms of necrosis and dryness have been collected shrubs of white heather. Isolations from the margins of these cankers revealed the presence f the fungus *Pestalotiopsis* sp. and Koch's postulates were verified. The antagonistic effect was assessed in vitro. Tests of direct or remote confrontation, on PDA medium, between *Pestalotiopsis* sp. and *Trichoderma* sp., revealed that the latest inhibited mycelial growth of the pathogen compared to the control.

BC44

PLANT GROWTH AND BIOCONTROL PROPERTIES OF ALGERIAN STEPPIC STRAINS OF *STREPTOMYCES* SPP. AGAINST *FUSARIUM CULMORUM* ON WHEAT.

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The main objective of this study is the taxonomy of some *Streptomyces* strains (*Actinobacteria*) active against *Fusarium culmorum*, evaluate their antagonistic properties and their potential use in the biocontrol of wheat damping-off and seedling blight and wheat growth promotion. Eighty four isolates of actinobacteria were collected from 8 soil samples from Zaafrane steppic area in Algeria and were tested for antifungal properties. Five active isolates named S1, S5, S15, S22 and S54, were selected for further investigations. The taxonomic study using a polyphasic approach (morphology, chemotaxonomy, physiology, DNAr 16S sequencing, and phylogeny) permitted to include these strains in the *Streptomyces* genus. Isolates S1, S5, S22 and S54 formed one group related to *S. cyaneofuscatus* (similarity of 100%). The isolate S15 was heterogeneous and belonged to the species *S. lavendofoliae* with 99.9% similarity. The evaluation of the biocontrol ability of each selected isolate against *F. culmorum* on common wheat permitted an effective disease reduction. The *in vitro* inoculation by the actinobacteria isolates, as agents of biocontrol against damping-off, showed their effective action on reducing disease symptoms when compared with the chemical fungicide ACIL 060FS® (Tebuconazole). Among the evaluated isolates, S15 and S54 were the most effective in reducing disease incidence (85.5 and 70%) and severity (89 and 83%), respectively. Results of the "*in vivo*" control of seedling blight also showed that the isolates S15 and S54 induced the highest reduction in disease incidence (73.7% and 72.9%) and severity (73.3% and 72.6%), respectively. Furthermore, the principal mechanisms involved in the biocontrol and plant growth promotion were studied for the five isolates. The results showed that the

majority of the isolates are equipped with antagonistic and lytic potential, and able to secrete siderophores. Thus, these mechanisms are supposed to be implied in their antagonistic activities. The tested actinobacteria proved their abilities to solubilize complex phosphate. The *Streptomyces* spp. isolates S15 and S54 were distinguished by the highest production rates of phytohormones GA3 and IAA. Finally, this study demonstrated the potential ability of the *Streptomyces* sp. Isolates S15 and S54 as biopesticides agents; however, other complementary studies are required to achieve the efficient formulation for field application.

BC45

INDUCED SYSTEMIC RESISTANCE IN TOMATO TO ROOT KNOT NEMATODES BY APPLYING A COMBINATION OF CHEMICAL AND BIOLOGICAL INDUCERS. Dhulfiqar Layth Al-Sandooq and Farkad A. Raheem A. Fattah, Plant Protection Department, Collage of Agriculture, University of Baghdad, Iraq, Email: dhulfiqar_laith@yahoo.com

This study was conducted to estimate the efficiency of combination of chemical inducers (β-aminobutyric acid (BABA) and acibenzolar-S-methyl (BION)) and biological inducers (*Beauveria bassiana* and a mixture of mycorrhizal fungi) for induction of systemic resistance in tomato against root knot nematodes, *Meloidogyne* spp. using various application methods. Results showed that all these inducers were efficient in the induction of resistance in tomato plants to *Meloidogyne* spp. The resistance was manifested by reduced root penetration of second stage juveniles (j2) and lowered root knot gall index of treated plants. Treatment with mycorrhiza and BABA were the best combination among the tested treatments, and led to significantly low (80 j2) number which penetrated plant roots compared with a high number (450 j2) in the control and significantly lower gall index (2.67) as compared to the control (10). This treatment caused the highest root fresh weight of 1.870 g compared with 1.117 g in the control. The dry root weight in the treatment of *B. bassiana* and BABA was 0. 216 g compared with 0. 054 g in the control treatment. In addition, this treatment caused significantly the highest shoot fresh and dry weights of 5. 38 and 0. 663 g, compared with 1.66 and 0.126 g in the control treatment, respectively.

BC46

EFFECT OF FUNGAL ISOLATES ON *S. HERMONTHICA* SEEDS GERMINATION IN RESPONSE TO GR24. Magdoline Mustafa Ahmed[1], Mohammed Mahgoub Hassan[1], Ahmed ME Rugheim[2], Awad Galal Osman[1], Migdam Elsheikh Abdelgani[1] and Abdel Gabar Eltayeb Babiker[3]. (1) Environment and Natural Resources Research Institute, National Centre for Research, Khartoum, Sudan, Email: magdoline.mustafa@yahoo.com; (2) Omdurman Islamic University; (3) College of Agricultural Studies, Department of Crop Sciences, Sudan University of Science and Technology, Khartoum, Sudan.

Laboratory experiments were conducted to study the effects of some fungal isolates on pre-conditioned *Striga* seeds, simultaneously prior to GR24 application at 0.01 or 0.1 ppm on germination of witchweed seeds. Soil borne fungi were isolated from *Striga*-infested or non-infested sorghum fields in Sudan. Twenty three fungal isolates were selected on the basis of their ability to enhanced *Striga* germination in response to GR24. The results revealed that fungal isolates showed different effects on *Striga* germination. The results revealed that application of Si34, Si23 and Ai 41 isolates on pre-conditioned witchweed seeds significantly suppressed germination in response to GR24. They reduced germination by 28.6, 52 and 70%, for the three isolates, respectively, as compared to the control. However, isolates Ai 50, SF18 and AF4 increased germination by 37.3, 43.5 and 52.5, for the three isolates, as compared to the corresponding control in response to GR24, respectively. Seeds conditioned in water or uninoculated displayed high germination.

BC47

EFFECT OF SUCROSE-ACTIVATED BREAD YEAST (*SACCHAROMYCES CEREVISIAE*) ON THE POPULATION DENSITY OF ROOT KNOT NEMATODE, *MELOIDOGYNE INCOGNITA* ON EGGPLANT AND ITS GROWTH VIGOR AS. M.M.A. Youssef and W.M.A. El–Nagdi, Plant Pathology Department, Nematology Laboratory, National Research Centre, Dokki, P. O. Code 12622, Cairo, Egypt, Email: myoussef_2003yahoo.com

Dry active bread yeast, *Saccharomyces cerevisiae*, was used as a bioagent for controlling root knot nematode, *Meloidogyne incognita* on eggplant (*Solanum melongena*) under screenhouse conditions. Addition of increased sucrose amounts (10, 15 and 20 g) as a biofermentor to a fixed yeast amount (10 g) were compared to various amounts of yeast (5, 10 and 15 g) added to a fixed amount of sugar (10 g) in 500ml of warm water were evaluated. All treatments significantly reduced number of *M. incognita* as indicated by the numbers of the second stage juveniles in soil and numbers of galls and eggmasses on roots. There was a positive correlation between average rate of nematode reduction and the tested amounts of yeast or sugar. As for plant growth criteria, 10 g of bread yeast + 10 g sucrose were the best treatment in improving plant growth index which reached 15.4, followed by adding 5 g of bread yeast + 10 g sucrose which led to a plant growth index of 15. The highest yeast amount (15 g yeast+10 g sucrose) or sugar amount (20 g sucrose+10 g yeast) caused a decrease in plant growth, as their growth indices were 13.9 and 13.7, respectively, compared to the untreated check.

BC48

ATTRACTION OF *RHYZOBIUS LOPHANTHAE* BLAISDELL (COLEOPTERA: COCCINELLIDAE) TOWARDS ESSENTIAL OILS IN CITRUS INFESTED WITH *AONIDIELLA AURANTII* MASKELL (HEMIPTERA: DIASPIDIDAE). Ahmed Alsabte, Ali Kayahan and İsmail Karaca, Süleyman Demirel University, Faculty of Agriculture, Department of Plant Protection, Isparta, Turkey, Email: ahmedhassan.s2005@gmail.com; aalikayahan@gmail.com; ismailkaraca@sdu.edu.tr

Citrus is one of the most important crops in the world. Because of the significant increase in citrus growing

area, abundance of indigenous pest populations and introduction of exotic pests increased dramatically. The most important pest is California red scale *Aonidiella aurantii*. Large populations of scale can build up unnoticed before plants begin to show visible symptoms. The presence of CRS economically impacts on production and trade of citrus internationally. There are numerous predators present as natural enemies, associated with *A. aurantii*. The predator *Rhyzobius lophanthae* is the most abundantly prevalent predator and has the ability to effectively suppress its host. Citrus plants produce volatile organic compounds (VOCs) in response to *A. aurantii* attack, and these VOCs can be used by the predator to direct them to host locations. This study focused on identifying a robust technique to identify the volatile organic compounds emitted by healthy and infested citrus trees with California red scale insect *A. aurantii* using headspace solid-phase micro extractions (HS-SPME) combined with gas chromatography (GC). The study also focused on identifying the compounds responsible for the attraction of *R. lophanthae* to the infested citrus and study their effectiveness in increasing the attraction of *R. lophanthae.* In this research we identified the chemical stimuli emanating from uninfested and infested citrus plants. More than 80 VOCs were identified, eight of these were increased by *A. aurantii* infestation and five were decreased. Innate positive chemotaxis of predator *R. lophanthae* female and male towards these VOCs was then tested in olfactometer, and assays showed that females and males were attracted to VOCs produced by infested citrus plants.

BC49

STUDY OF TROPHIC RELATIONSHIPS BETWEEN DIASPIDIDAE FAMILY SPECIES -HOST PLANTS– PREDATORS AND PARASITOIDS IN ALGERIA. R. Belguendouz[1], M. Biche[2] and L. Bendifallah[3]. (1) Laboratory of Aromatic and Medicinal Plants, Biotechnology Department, Faculty SNV, University of Blida I., Alergia, E-mail: belguendouzr@yahoo.com; (2) National Superior School of Agricultural sciences (E. N. S. A), Algiers, El-Harrach, Algeria; (3) Laboratory of Soft Technology, Valorization, Physical-chemistry of Biological Materials and Biodiversity, Faculty of Sciences, University of Mohamed Bougara, Boumerdes, Algeria.

The use of parasitoids and predators in biocontrol contribute to the development of sustainable agriculture, which respects environment and human health. In this context, the identification of natural Diaspididae enemies present on the Algerian territory were investigated. Results obtained highlighted three predatory families: Coccinellidae, Nitidulidae and Coniopterygidae. Tthe first family was represented by the most voracious species such as *Rhyzobius lophantae* living on 19 Diaspines observed on 121 plants, from the northern, and two parasitoid families lived on 39 Diaspididae species affecting 125 plants and were represented by four genera and 23 species such as *Aphytis* and *Encarcia* (Aphelinidae) lived on 31 diaspididae species found on 125 host plants. The most voracious and polyphagous species identified can be an essential component for integrated pest management (IPM) programs of important crops.

BENEFICIAL INSECTS

BI1

HONEY BEE COLONIES ACTIVITY UNDER DIFFERENT ENVIRONMENTAL ECOLOGY AT SIDS REGION, BENI SWEIF GOVERNORATE. EGYPT. E.W. Zidan and A.M.M. Ghania, Department of Apiculture, Plant Protection Research Institute, Agriculture Research Center**,** Dokki, Giza, Egypt, Email: ehabzedan@gmail.com

Environmental ecology has an important role in honey bee activity. This study at apiary of the Sids Agriculture Research Station, Beni Sweif governorate, middle Egypt, during the 2016 season. The faba bean *Vicia faba*, citrus *Citrus* spp., clover *Trifolium alexandrinum* and maize *Zea mays* trapped pollen pellets were collected from the bee hives. The average values of the recorded temperatures ranged from 8.9 to 28.1°C and the averages of the recorded relative humidity values ranged from 48.9 to 79.70% during the year of study. There was a significant correlation between temperature or relative humidity and collected pollen amounts. Correlation coefficients were -0.16 and -0.18 in faba bean pollen, -0.07 and 0.07 in citrus pollen, 0.36 and -0.25 in clover pollen and -0.76 and -0.07 in maize pollen, for temperature and relative humidity, respectively. On the other hand the amount of pollen gathered fluctuated and was affected by plant source and date of collection. There was a significant effect of pollen trapping on the brood rearing activity which amounted to 67.08% reduction in faba bean pollen season, 45.03% in citrus pollen season, 43.30% in clover pollen season and 17.68% in maize pollen season. It can be concluded that environmental ecology is an important factor in the different activities of honeybee colonies.

BI2

THE ROLE OF DIFFERENT POLLINATION TREATMENTS ON FRUIT SET AND FRUIT CHARACTERISTICS IN SOME PLUM VARIETIES. M.A. Abd Al-Fattah[1], I.E. Elshenawy[2], E.E. Tharwat[3] and Sarah H. El-Dereny[3]. (1) Department of Economic Entomology & Pesticides, Faculty of Agriculture, Cairo University, Giza, Egypt; (2) Department of Pomology, Faculty of Agriculture, Cairo University, Giza, Egypt; (3) Department of Beekeeping, Plant Protection Institute, Agriculture Research Center, Ministry of Agriculture, Giza, Egypt, Email: Sarah1981_6@hotmail.com

The present study was carried out on three plum cultivars; Golden Japanese, Hollywood and Santarosa during two successive seasons 2012 and 2013 to study the influence of different pollination treatments on fruit set and fruit characteristics of the studied cultivars. Several sequential treatments were applied from one bee visit/flower up to ten bee visits/flower compared to zero visit (self-pollination control) and open pollination treatments. The relationship between the foraging activity of honeybees in cross-pollinated flowers of plum cultivars and both fruit set and main fruit characteristics were investigated. Bee foragers expressed significant benefit to

plum cultivars on final fruit set as well as on fruit characteristics; length, diameter, T.S.S.%, fruit weight and volume and improved fruit quality through decreasing fruit firmness. Results of the present study showed direct improvements as a result of increased bee visits/flower which were reflected on significant increase in fruit set when compared with self-pollination and open pollination. Results obtained were 18.7, 86.7; 27.5, 95.7; 28.6, 91.3% fruit set for season 2012 and 19.7, 87.5; 26.9, 96.0; 26.1, 94.7% fruit set for season 2013, for the three studied cvs., respectively. Moreover, fruit characteristics showed positive effects of increasing bee visits/flower were expressed as significant improvement in fruit weight which was increased by 4.0, 3.3 and 3.1% for Golden Japanese, Hollywood and Santarosa cultivars, respectively. Consequently, significant improvements in fruit volume, fruit length, diameter, T.S.S.% and firmness were recorded and presented. Thus, based on the results obtained, it can be recommended to maintain sufficient honey bee colonies in plum orchards that can offer at least ten bee visits/flower to increase fruit set and to achieve satisfactory improvement in yield and fruit characteristics.

BI3

EFFECT OF FEEDING SOME DIETS AS A POLLEN SUPPLEMENT DURING SPRING SEASON ON THE BUILD-UP OF HONEY BEE COLONIES. M.E. El-Sherif [1], Naglaa E. Ghazala[2], L.A. Youssef[1] and Sobhia S. Sayed[2]. (1) Plant protection Department, Faculty of Agriculture, Ain shams university, Egypt; (2) Plant Protection Research Institute, Agriculture Research Center, Ministry of Agriculture, Cairo, Egypt, Email: sobhiasaid@yahoo.com

This work was conducted in the apiary of Plant Protection Research Institute at El-Quanater, Qaluobia Governorate to study the effect of some diets on build-up of honeybee colonies during spring season of 2016. Seven food factors on Carniolan hybrid bee colonies were compared. Those were: Brewer's yeast–chick pea cake fortified with 4.2% pollen as a protein supplement plus sugar syrup (1:1 or 2:1) addend with 1% Camphor oil (10 ml/litter), sugar syrup (1:1) amended with pollen grains or vitamin (Royal star), El-Quanater fresh pollen cake plus sugar syrup (1:1) and pollen substitute cake 1 plus sugar syrup (2:1), by counting the daily workers brood rearing rate, the stored honey weight, the stored pollen weight and the longevity of newly emerging workers. Results revealed that the best diet was Brewer's yeast–chick pea cake fortified with 4.2% pollen in addition to sugar syrup (2: 1) at 3 day intervals and for two months. This diet was the best and produced a higher brood rearing rate of 968.84 workers brood/day with increased rate of 127.28% when compared to the corresponding average in the colonies before feeding. The average weight of stored honey was 3502.92 grams/colony with an increased rate of 433.78% when compared to that before feeding. No significant differences were observed among the diets in the weight of stored pollen but Brewer's yeast–chick pea cake fortified with 4.2% pollen in addition to sugar syrup (2:1) produced a higher weight of stored pollen and reached 249.03 grams/colony with increased rate of 315.54% when compared to that before feeding. The average longevity of caged newly emerged workers was 26.17 days. This diet was packaged and offered in the market to the beekeepers all over the country.

BI4

THE ROLE OF HYGIENIC BEHAVIOR AS A DEFENSE MECHANISM OF HONEY BEE AGAINST THE PARASITIC MITES AND DISEASES. Mohamed A.M. Amro and Abdulraouf M.A. Amro, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: moamro1953@yaho.com

Hygienic behavior in honey bee (*Apis mellifera* L.) is measured by determining the rate at which the bee uncap and remove dead sealed brood. This review describe the hygienic mechanism against the parasitic mite (*Varroa destructor*), as well as brood diseases (chalk brood and American foul brood). Breeding hygienic disease resistant bees as an important option was determined by some investigators. However, heritability of hygienic behavior against *Varroa* was argued by other investigators. The performance of commercially bred honey bee queens sold as resistant to the parasitic mite, *V. destructor* was assessed by some workers. Physiological susceptibility and hygienic behavior affected chalk brood disease incidence in worker and drone larvae in honey bees (*A. mellifera*) was evaluated by others. Control of American foul brood disease in commercial apiaries through the use of queens selected for hygienic behavior was discussed reported earlier. A comparison of the hygienic response of African and European (*A. mellifera carnica*) honey bees to *Varroa*-infested brood in tropical areas was also investigated. An annotated list which contains the scope of study, authors and the studied area will be presented.

BI5

ACTIVITY OF HONEY BEE FORAGERS IN NECTAR AND POLLEN COLLECTION FROM PLUM (*PRUNUS* SP.) CULTIVARS FLOWERS. M.A. Abd Al-Fattah[1], I.E. Elshenawy[2], E.E. Tharwat[3] and Sarah H. El-Dereny[3]. (1) Department of Economic Entomology & Pesticides, Faculty of Agriculture, Cairo University, Giza, Egypt; (2) Department of Pomology, Faculty of Agriculture, Cairo University, Giza, Egypt; (3) Department of Beekeeping, Plant Protection Institute, Agriculture Research Center, Ministry of Agriculture, Giza, Egypt; Email: Sarah1981_6@hotmail.com

The activity of honey bee foragers in collecting pollen, nectar or both from flowers of three plum, (*prunus* sp.) cvs. was investigated during the flowering season of two successive years (2012 and 2013) in plum orchard at El-Kalubia Governorate, Egypt. In general, Hollywood plum cv. was significantly more attractant to bee foragers than Santarosa and Golden Japanese cvs., during the two seasons. For all studied cultivars, honeybee workers worked on flowers throughout the day time with highest activity at 2 pm. highest proportion of pollen gatherers was recorded on flowers of Hollywood cv. 37.7 and 35.4%, followed by Golden Japanese 29.9 and 28.2%, then Santarosa flowers 26.1 and 27.4% during the two seasons, respectively. Activity of pollen collection was concentrated in the early

time of day for all cultivars with the highest peak at 11 am (mean of 40.9%), whereas the lowest value was 20.4%. On the other hand, Golden Japanese flowers significantly attracted the nectar foragers (37.3 and 36.4%) more than Santarosa (34.8 and 33.1%) and Hollywood (28.0 and 27.6%) flowers through the two seasons, respectively. Nectar gathering activity by honeybee from all plum cultivars was strongly concentrated in the second half of day and highest (43.0%) at 2 p. m. The collection of both nectar and pollen in the same trip by one forager was also observed on the three studied plum cultivars during the two seasons. Santarosa flowers were the best in attracting honeybee workers to gather both types of food (39.3%), followed by Hollywood (35.6%) and Golden Japanese (mean of two seasons). The most favorable time for this activity was early morning (44.3%) or late afternoon (41.8%), with no significant difference between them as a mean of two successive seasons.

BI6

ASSESSMENT OF DIFFERENT IMPORTED HYBRIDS OF MULBERRY SILKWORM, *BOMBYX MORI* L. IN EGYPT. Rehab H. Taha, Eman M. Hassan and Marwa N. Moustafa, Plant Protection Research Institute, Agriculture Research Center, Egypt, Email: marwanabil78@hotmail.com

Two different Thai hybrids (1 and 2) of mulberry silkworm, *Bombyx mori* L., were assessed under the Egyptian climatic conditions. Fitness parameters of imported hybrids was compared with Egyptian hybrid (as a control). Biological parameters, such as egg hatching rate, larval weight, effective rate of rearing (ERR), cocooning and pupation rates, pupal weight and egg fertility were assessed. Economical parameters, such as cocoon and cocoon shell weights and cocoon shell ratio, as well as technological parameters such as filament length, filament breaks and silk content of the cocoon were evaluated. Mature larval haemolymph total proteins, free amino acids, protease and transaminases (GOT and GPT) enzymes were measured colorimetrically. Imported hybrids were significantly higher than local hybrid in most of tested parameters. Hybrid 1 recorded a significant increase in larval, cocoon and cocoon shell weights (2.89±0.39 gm, 1.75±0.09 gm, 0.24±0.03 gm, respectively) and filament length (781±13 m). Whereas, Hybrid 2 was significantly higher in hatching and pupation rates (99.33±10.15 and 99±1.15%, respectively). Haemolymph total protein and free amino acids contents were significantly high in both hybrids 1 and 2 compared with the local one (129.66±30, 126.33±32.52 and 95±0.87 mg/ml) and (9.07±2.63, 9.03±2.82 and 2.73±0.21 mg/ml), respectively. The same trend was observed for tested protease and transaminases enzyme activities. It may be recommended to use these imported hybrids in the breeding programs as parents for the production of superior local hybrids.

BI7

NUTRITIONAL EFFECT OF USING LIQUORICE ROOT EXTRACT ON SOME BIOLOGICAL ASPECTS OF BEES *APIS MELLIFERA*. A.J Al-Shammary and A.S. Sajit, Integrated Pest Control Center, Directorate of Agricultural Research, Ministry of Science & Technology, P.O. Box 765, Baghdad, Iraq, Email: ahmedalshammary90@yahoo.com

This study aimed to determine the effect of liquorice root extract at different concentration on some biological aspects of honey bees. Results showed that the use of licuorice root extract, especially when using 20% concentration (mixture 3) which contains 150 ml of this concentration in one litre of water mixed 1:1 (vol:vol) with mixture 1 which contains 750 gm of sugar, 250 ml of honey, 500 gm of soya, one capsule of B-plex, one capsule of tetracycline and one litre of water. There was an increase in the nutrition acceptance index of 100, 100 and 100%. Significant increase in the total area of honey which reached 3626.7, 7182.5 and 2462.1 square inch, in the total area of brood 4359, 12130.4 and 4927.7 square inch, in the total area of collected pollen which reached 1445.4, 10092.0 and 4997.3 square inch during first, second and third periods, respectively. In addition, an increase in the resistance of honey bees to European foul brood disease and varroa mite was observed.

BI8

DETECTION AND EVALUATION OF ANTIBIOTIC OXYTETRACYCLINE RESIDUES IN EXTRACTED HONEY FROM COLONIES FED ON SUGER SOLUTION CONTAINING THE ANTIBIOTIC. Kameela Ward Shaher and Mohammed Marwan Hameed. Faculty of Agriculture, Baghdad University, Iraq, Email: kamilashahir@gmail.com

Experiments of estimating activities of honey bee colonies, which have been fed on sugar solution containing the antibiotic oxytetracycline, such as collecting pollen, nectar and speed in building wax foundation were achieved in the apiary of College of Agriculture, University of Baghdad. Estimation of this antibiotic residues was done by using HPLC Technique in the Laboratory of Pharmaceutical Preparations, Ministry of Science and Technology. No significant differences appeared among the treatments with regard to pollen gathering, whereas the rate of foraging reached 170, 166.1, 185.8 workers/hour for 1st, 2nd and 3rd treatments, respectively. No significant difference was observed in nectar gathering among the treatments, and the best rate of nectar gathering was at 1:00 pm with 758.79 workers/hour. Tests showed the presence of antibiotic residues in honey samples fed on sugar solution with tetracycline or with sugar solution only, at concentrations of 0.4 and 0.02 ppm, respectively.

BI9

EFFICIENCY OF SOME THERAPEUTIC ESSENTIAL OILS AS ANTIBACTERIAL AND ANTIOXIDANTS ON SOME BIOCHEMICAL PARAMETERS OF INFECTED SILKWORM *BOMBYX MORI* L. Marwa N. Moustafa and Eman M. Hassan, Plant Protection Research Institute, Agricultural Research Center, Egypt, Email: marwanabil78@hotmail.com

Silkworm was infected with *Bacillus thuringiensis* then treated with three concentrations (0.5, 0.75 and 1%) of three specific oils (citrus specific orange, chamomile and

lavander) to determine their ability as antioxidants and antibacterial for recovering the damage occurred in silkworm haemolymph through evaluating some biochemical changes in lipid peroxidation (MDA), protein carbonyl contents (PCC) as a biomarker of damage happened in lipids and proteins, also alanin transaminases (ALT), aspartate transaminases (AST) and antioxidant capacity. The results showed that 0.5 and 0.75% of citrus oil was the most effective oil, followed by 1% and 0.75% chamomile oil which showed the least damage for PCC and MDA with high antioxidant capacity. However, 0.5 and 0.75% citrus oil recoded the least value in ALT and AST for the two concentrations, compared with other oils and control.

SCIENTIFIC PUBLISHING

SP1

NEW INDEX FOR QUANTIFYING AN INDIVIDUAL'S SCIENTIFIC RESEARCH OUTPUT AND RESEARCH JOURNALS QUALITY. Mahmoud Abdel-Aty, Zewail City of Science and Technology, Giza, Egypt, Email: mabdelaty@zewailcity.edu.eg

In this work, different classifications of researchers according to the quality of their published work rather than the quantity, which is a curtail issue, will be discussed. A new formula of the percentage range to be used for evaluating qualitatively the researchers' production will be introduced. The suggested equation depends on the number of the single-author published papers and their citations to be added as a new factor to the known h-index. These factors give an advantage and make a clear evidence of innovative authors and reduce the known h-index for authors who are gaining citations by adding their names to multi-author papers. It is shown that various dimensions of ethical integrity and originality will be effective in this new index. An important scenario arising from the analysis is shown in terms of examples. It refers to larger differences between the h- and the new index which comes from the whole work and the one comes from the single-author papers only, will be shown. Finally, we introduce a new index, called Arab Impact Factor, to classify Arabic journals, those who publish research articles in the Arabic language.

SP2

THE ARAB IMPACT FACTOR IS AN ENTRY TO EXCELLENCE IN THE EVALUATION AND CLASSIFICATION OF SCIENTIFIC PRODUCTION PUBLISHED IN THE ARABIC LANGUAGE. Gamal Ali Khalil Al-Dahshan, Faculty of Education, Monofiya University, Egypt, Email: g_eldahshan@yahoo.com

The paper seeks to emphasize the importance and need of having a scientific body responsible for the classification and setting criteria for assessing scientific production published in Arabic, similar to the scientific impact factor which is limited at present to journals published in English, by establishing a unit or center whose responsibility is to develop a number of statistical indicators to assess quality of published research results, as well as studies of reference citations analysis for scientific journals issued in the Arabic language, similar to their foreign counterparts, in addition to the publication of annual reports that can be adopted to reward researchers and evaluate the scientific, educational and research institutions according to the productivity of their employees and the quality of the research published at the national, regional and global levels, known as the Arab impact factor. This will be an important and necessary achievement, which will play an important role in improving the quality of research publications in the Arabic language.

SP3

THE ARAB JOURNAL OF PLANT PROTECTION AND THE ARAB AND NEAR EAST PLANT PROTECTION NEWSLETTER: PROGRESS MADE AND SHORTCOMINGS. Khaled Makkouk[1], Bassam Bayaa[2], Ibrahim Jboory[3] and Safaa Kumari[4]. Arab Society of Plant Protection, P.O. Box 113-6057, Beirut, Lebanon, Email: aspp@terra.net.lb; website: <http://www.asplantprotection.org>. Work addresses: (1) National Council for Scientific Research (CNRS), Beirut, Lebanon; (2) Faculty of Agriculture, University of Aleppo, Syria; (3) Faculty of Agriculture, Baghdad University, Iraq; (4) International Center for Agricultural Research in the Dry Areas (ICARDA), Terbol Station, Beqa'a Valley, Lebanon.

Since the establishment of the Arab Society of Plant protection (ASPP) in 1981, the Society gave a priority to publishing the Arab Journal of Plant Protection (AJPP) in the Arabic language, and the first issue was published in 1983, and it has been published regularly since then. Shortly after, and to enhance communication among society members in particular, and plant protection scientists at large, ASPP in collaboration with the Near East Regional Office of FAO, published in 1984 the Arab and Near East Plant Protection Newsletter (ANEPPNEL), and it has also been regularly published since then. The Journal and the Newsletter made significant progress over the past three decades, with increased interest in them and they are now published three times per year instead of two. Since 2013, both the Journal and the Newsletter are only published electronically, and the Journal became an open access journal, which permitted all readers free access to the published articles. The AJPP is now available in several data bases such as CABI, AGRIS and Google Scholar, and soon will be available in the Directory of Open Access Journals and SCOPUS. AJPP now receives an impact factor from the Scientific Indexing Services (USA), Global Impact Factor (Australia) and the Arab Impact Factor (Egypt), where the AJPP received the highest IF in its 2015 report. For sure there are still some shortcomings which need to be attended at to bring the AJPP to the level desired by the scientific community in the Arab region.

MISCELLENOUS

MI1

PLANT QUARANTINE AS A MEASURE AGAINST INVASIVE ALIEN RED PALM WEEVIL (*RHYNCHOPHORUS FERRUGIENUS*) AND TOMATO BORER (*TUTA ABSOLUTA*). Emad Hussain Al-Turaihi, Agricultural Affairs Department, Ministry of Municipality and Environment. P.O. Box 1966, Doha, Qatar, Email: emadhussain30@yahoo.com

The introduction of several plant pests into Qatar with disastrous consequences called for the development of plant quarantine measures to prevent the introduction and spread of exotic pests. With the purpose of harmonizing and promoting appropriate measures for pest control, Qatar ratified the agreement of the International Plant Protection Convention (IPPC). Two examples of invasive alien species are given in this article: the red palm weevil (*Rhynchophorus ferrugienus*) and the tomato borer (*Tuta absoluta*). These two pests were introduced into the country and caused extensive damage. In 1989 red palm weevil was introduced in Qatar through imported date palm trees whilst tomato borer was introduced in 2011 by tomato fruits imported from outside the country. The enforcement of the plant quarantine law and its executive regulations are to prevent the introduction and spread of plant pests to protect the agriculture and plant resources, and facilitate the international trade exchange with foreign countries.

MI2

ECONOMIC DAMAGE THRESHOLD AND INJURY LEVELS OF GLASSY CLOVER SNAIL, MONACHA CARTUSIANA (MULLER) INFESTING STRAWBERRY PLANTS AT ISMAILIA GOVERNORATE, EGYPT. M.M.A. Ibrahim, M.H.E. Lokma and M.A. Issa, Plant Protection Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: Mh_lokma@yahoo.com

This study was carried out at Al Mahssama village, El Qassaseen district, Ismailia governorate during 2015 strawberry growing season to assess the economic damage threshold and economic injury levels of glassy clover snail, *Monacha cartusiana* (Muller) infesting strawberry plants, *Fragaria ananassa* Duchesne cv. Festival using natural infestation (marking plants) and poison baits techniques. Laboratory experiment was conducted to study food preference of *Monacha cartusiana* fed on three strawberry cultivars (Festival, Camarosa and Proprietary). Results obtained with the natural infestation method revealed that the peak of snail numbers correlated negatively with strawberry fruit yield; the calculated economic damage threshold and economic injury levels varied with infestation periods. Differences in poison baits number had an effect on snail numbers, which had a negative effect on strawberry fruit yield. Laboratory tests showed that the y clover snail preferred to feed on Proprietary cultivar (consumed 40.55% of total consumed quantity of the three cultivars) followed by cv. Camarosa (34.27%) and cv. Festival (25.17%).

MI3

ALLEVIATION OF SALT STRESS BY SEAWEED LIQUID EXTRACT COMPOUNDS IN BEAN AND WHEAT PLANTS. Salma Latique[1], Elouaer Mohamed Aymen[2] and Mimoun El-Kaoaua[1]. (1) Department of Biology, Laboratory of Biotechnology, Valorization and Protection of Agro-Resources, Faculty of Sciences and Technology, Cadi Ayyad University of Marrakech, Morocco, Email: l.salma86@gmail.com; (2) Department of Horticulture and Landscape, High Institute of Agriculture, Chott- Mariem, Sousse, Tunisia.

Salinity is one of the most important environmental factors limiting the productivity of crop plants and can have a devastating effect on plant metabolism and induces oxidative damage by reactive oxygen species (ROS) production in plant cell. Seaweed of marine macro algae are a potential renewable resource in marine environment and are often used as amendments in crops production systems, develop tolerance to environment stress and enhance antioxidants proprieties of plant. In our study, we evaluate the impact of the foliar applications of seaweed liquid extract (SWE) obtained from *Ulva rigida, Fucus spiralis, Sargassum vulagre* species on salt stress tolerance in wheat (*Triticum durum* L.) and bean (*Phaseolus vulgaris*) plants. Some physiological and biochemical parameters such as, growth parameters, chlorophyll content, malondialdehyde (MDA) content, total phenolic content and antioxidant enzyme activity: superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX) of wheat and bean plants were studied under salt stress condition. The result showed that the application of SWE enhanced vegetative growth and improved leaf pigment (chlorophyll) in plants under salt stress condition as compared to control plant. The lipid peroxydation was less pronounced in salt-stressed plant treated with SWE, indicating a lower accumulation of ROS. There was a significant enhancement in SOD, CAT and APX activities. These enzymatic activities increased considerably when plants were sprayed with seaweed extract under salt stress. In conclusion, the SWE application can contribute to protection of plant against oxidative deterioration and improve salt stress tolerance.

MI4

INTERNET OF THINGS (IOT) TO CONTROL THE TWO-SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* KOCH IN GREENHOUSES. Rania Ahmed Abd El-Wahab, Plant Protection Research Institute, Agricultural Research Center, Egypt, Email: rania-proline@hotmail.com

Internet of things (IOT) technology declared its effects in agriculture generally and for pests' control specifically. IoT is able to do many tasks in greenhouses which were infested with the two-spotted spider mite, *Tetranychus urticae*. The full automated system depended on the wireless protocol that used sensors, Arduino, geographic information system (GIS), global system for mobile communication (GSM), etc., for data collection and processing. It could be effective for pest monitoring, data transfer and finally formulate decisions related to automatic activation of distinctive procedures. Such technology can direct even light or sound or both to let particular predator

come and find its prey with little effort as compared with the control. Drone with light emitting diodes (LEDs) caused more than 90% reduction of infestation with most used colors by attracting specific predators to both exposed types, green and red, of *T. urticae*. Recorded voices of adult females of *T. urticae* in the case of high infestations showed their effectiveness to attract predators to cause reduction of around 80%. In other words, precision agricultural systems is so close to being applied successfully to control mites through IoT as an advanced technology in both open fields and greenhouses.

MI5

MOST IMPORTANT DISEASES AND PESTS MOVEMENT THROUGH SEED SHIPMENTS OF CEREAL AND FOOD LEGUME CROPS. Abdul Rahman Moukahel and Safaa G. Kumari, Seed Health Laboratory, International Center for Agricultural Research in the Dry Areas (ICARDA), Terbol Station, Beqa'a Valley, Zahle, Lebanon, Email: a.moukahel@cgiar.org; s.kumari@cgiar.org

The International Center for Agricultural Research in the Dry Areas (ICARDA) follows international registered methods and rules for seed health testing for seeds of different crops (wheat, barley, chickpea, Faba bean, lentil and grasspea) that are commonly exchanged with the national programs and other research centers. Generally, these methods are carried out for incoming and outgoing seed dispatches which include: (i) application of fumigation process by phosphine or stored at -20˚C for a week to terminate all pest stages; (ii) direct/visual inspection with the naked eye or binocular to detect the storage pests, weed seeds, bunt balls, fruiting bodies produced by some fungi and galls caused by some nematode species; (iii) detect the fungal spores carried on the seeds by centrifuge washing test; (iv) agar plate test on general or semi selective media to detect the seed-borne fungi and bacteria; (v) serological tests to detect seed-borne viruses and bacteria; and (vi) extraction test for nematode. During 2014, 2015 and 2016, a total of 34,253 seed samples (bread and durum wheat, barley, chickpea, lentil, faba bean and grasspea) were tested as incoming seeds to ICARDA from different regions of the world, in addition to 98,769 seed samples of the same crops dispatched to the national programs in Central and West Asia and North Africa (CWANA). Laboratory testing results showed that the common bunt of wheat (*Tilletia tritici* and *T. laevis*) was the most frequent disease (7.9%), followed by wheat weevil *Sitophilus granaries* (2.0%), in addition the dwarf bunt of wheat (*Tilletia controversa*) (0.15%) and the flag smut (*Urocystis agropyri*) (0.05%) were detected in single incoming bread wheat sample dispatch. Whereas, spike blight caused by the genus *Fusarium* sp. (8.0%), and the blotch diseases caused by the genus *Drechslera* sp. (1.0%) and the stored grain borer *Rhizopertha dominica* (0.6%) were the most frequent in barley seeds. For the legume crops, the laboratory tests revealed that the most frequent diseases were (i) *Ascochyta rabiei* (0.04%) and *Fusarium oxysporum* f.sp. *ciceris* (1.1%) on chickpea seeds; (ii) *Ascochyta lentis* (0.1%), *Fusarium oxysporum* f.sp. *lentis* (0.3%), a seed-borne virus (0.7%) and weevils in the family *Bruchide* (0.4%) on lentil seeds; (iii) *Ascochyta fabae* (0.05%), *Fusarium* spp. (0.5%), and a seed-borne virus (1.8%), in addition to Botrytis grey mold (*Botrytis* spp.) (0.2%) detected in single incoming shipment, on Faba bean seeds; (iv) *Fusarium* spp. were detected only (1.7%) on grasspea seeds. Subsequently, all infected samples with seed-borne diseases and pests were discarded, and the termination for the contaminated dispatches with dwarf bunt and flag smut. Furthermore, all incoming seeds were inspected after planting in post-entry quarantine area (PEQA) to insure that it is free from seed-borne pests.

MI6

ALLEVIATION OF SALT STRESS IN WINTER WHEAT BY *PANTOEA* SPP. ENDOPHYTES ISOLATED FROM SPONTANEOUS DESERT PLANTS. Hadj Ahmed Belaouni[1,2], H. Benattia[1], M. Madouh[1], K. Berini[1], S. Ben Ahmed[1], N. Sabaou[2] and A. Zitouni[2]. (1) Faculty of Sciences Natural and Life, University of Zeaian Achour, Djelfa, Algeria; (2) Laboratory Microbiology of Microbiological Systems, Graduate School of Teachers, Al-Qubba, Algeria, Email: shoober5@yahoo.fr

With the aim of developing bio-fertilizer solutions for salt stress mitigation in winter wheat, 5 selected endophytic *Pantoea* spp. strains isolated from spontaneous plants in Algerian Sahara were characterized for their ability to promote plant growth under saline conditions. These isolates were subsequently subjected to a taxonomic study on the basis of phenotypic (macromorphology and micromorphology, physiological characters on API 20E) and molecular characteristics (sequence analysis of 16S rDNA). Results confirmed that the 5 isolates belong to the genus *Pantoea*. Characterization of the mechanisms involved in the promotion of plant growth has been conducted, including direct and indirect mechanisms. Finally, an in pot test under greenhouse conditions in non-sterile substrate has been conducted for the evaluation of the effectiveness of the selected isolates in promoting the growth of winter wheat (cv. Gold Korn) under normal and saline conditions (100 and 200 mM) for three weeks, using a bacterial seed treatment by immersion for 2h30. The results suggest the strains *Pantoea* sp. ME3, *Pantoea* sp. OT37 and *Pantoea* sp. OT18 as interesting bacterial inocula for a potential use as bio-fertilizers to improve winter wheat yields in saline soils.

MI7

RESIDUES OF ORGANIC CHOLRINE PESTICIDES IN SHEEP AND COW MEAT IN CENTRAL SUDAN. Rawda Yaakoub El-Habib, Agriculture Research Authority, Center for Integrated Pest Management Research, Wad Medani, Sudan, Email: omymahiaw@gmail.com

Sixty samples of sheep and cow meat were collected from the central meat market in Wad Medani, central Sudan. Samples were analyzed for the presence organic chlorine residues that are environmentally stable. The method of De Fober Mondar et al (1964) was used to extract clean samples. Extracts were analyzed by gas chromatography with an electronic detector. 17% of cow meat samples contained lindane pesticide in the range of

0.04-0.0969 ppm and 20% of cow meat samples contained heptachlor hypoxide in the range 0.100 to 0.153 ppm. The pesticide DDE was found in two cow meat samples at 0.060 and 0.078 ppm. In sheep meat samples, 20% contained lindane in the range of 0.0053-0.0488 ppm, and the pesticide DDE was found in 13% of the samples in the range of 0.024-0.096 ppm. Two sheep meat samples contained the pesticide Dildrin at the concentration of 0.024 and 0.096 ppm.

MI8

RESPONSE OF SATIVUM WHEAT TO THE RESIDUES OF SILVERLEAF NIGHTSHADE (*SOLANUM ELAEAGNIFOLUM* CAV.). Nada Mohammad Ied Albarni[1], Anwar Al-Mouemar[2], Ghassan Ibrahim[2] and Abdul Rahman Alrashed[1]. (1) General Commission for Scientific Agricultural Research (GCSAR), Administration of Natural Resources Research, Alhalboni, Damascus, Syria, Email: albarninada@hotmail.com; (2) Plant Protection Department, Faculty of Agriculture, Damascus University, P.O. Box 30621, Damascus, Syria.

Silverleaf Nightshade (*Solanum elaeagnifolum* Cav.) is the most important serious invasive weed threat to many crops in Syria. In laboratory, the effect of the residues of this weed on the growth of wheat was investigated in two ways: (1) chemical study which included detection of some sub-chemicals in soil and plant parts extracts by using depositing reagents (Mayer and Tannic acid reagents), (2) bio-testing of the effect of heated aqueous extracts of plant parts (foliage, root) at flowering stage and mature fruits at four concentrations on germination and seedling growth of sativum wheat variety Bouhoth 10 during 2015 and 2016 seasons. The chemical study indicated that the extracts of silverleaf nightshade plant parts and soil which residues of this plant contained saponines and alkaloids. Alkaloids were found in all plant parts. The results also showed that silverleaf nightshade extracts have negative significant role on the studied properties. They reduced germination of wheat grains, increased the average germination time and decreased radicle and coleoptile length of wheat seedlings with obvious phytotoxicity symptoms. Similarly, they decreased chlorophyll content in leaves of 21 days old wheat plants. This effect increased with increasing concentration and differed according to plant part. Results `indicated that root and fruit extracts had more significant effect on germination and seedling growth of wheat compared with foliage extracts. Whereas fruit extracts had more significant effect on seedling growth compared with root extracts. In conclusion, the inhibition effect of silverleaf nightshade residues on germination and growth of wheat is mainly due to the presence of some sub-chemicals such as saponines and alkaloids which have toxic effect that may contribute to its invasiveness and extreme competitiveness.

MI9

DEVELOPMENT OF DROUGHT RESISTANT BARLEY VARIETY "KOUNOUZ" IN TUNISIA. Hajer Ben Ghanem and Mouldi Elfelah, Institut National de la Recherche Agronomique de Tunisie, 1004 El Menzah, Tunisie, Email: Hajeur_bg@yahoo.com

Kounouz, is a spring barley six-rowed variety, developed by the National Agricultural Research Institute of Tunisia (INRAT) and was officially registered in 2010 in the Tunisian catalog of plant varieties for commercial use by farmers. 'Kounouz' was selected by INRAT in collaboration with ICARDA following the decentralization strategy for germplasm development for the region. It was initially selected from the barley segregating populations for North-Africa (BSP-NA) grown in Béja and subsequently evaluated in a series of on-station and on-farm trials over the years at different locations before the variety was released for general cultivation across semi-dry and dry areas of Tunisia. Kounouz is a cross of Alanda/5/Aths/4/Pro/Toll//Cer*2/Toll/3/5106/6/24569 (Pedigree: ICB95-0508-0AP-1BJ-2BJ-0BJ**).** Kounouz is semi-compact with bent ears at maturity, yellowish-white kernels and greyish albumen, hollow straw, medium early (103 days) with medium height (95 cm) adapted to semi dry location and lodging resistant. Kounouz is moderately resistant to net blotch and powdery mildew compared to Manel and has good resistance to scald under natural inoculation compared to Rihane. Kounouz gave during three consecutive crop-seasons (2004-2007) in Kef (semi-arid), an average grain yield of 51.89 qx/ha, compared to Rihane (47.52 qx/ha) and Manel (51.64 qx/ha). At Beja (sub-humid), Kounouz gave during six consecutive crop-seasons (2001-2007) an average grain yield of 40.39 qx/ha, compared to Rihane (37.77 qx/ha) and Manel (42.20 qx/ha). The specific weight is 0.6 to 0.7 (t/hl) in high-input environment (Béja) and 0.63 in low input environment (Kef). Total protein content is 9 to12% (Béja) and 11.5 to 14.9 (Kef). It is advisable to grow Kounouz in semi-arid areas (250-350 mm of rain annually). For breeding and research use, small quantities of Kounouz seed can be obtained from the corresponding author

MI10

DROUGHT STRESS RESPONSE IN ARGAN TREE: PHYSIOLOGICAL AND BIOCHEMICAL TOLERANCE MECHANISMS. A. Chakhchar[1], M. Lamaoui[1], S. Aissam[1], A. Ferradous[2], S. Wahbi[3], A. El Mousadik[4], S. Ibnsouda-Koraichi[5], A. Filali-Maltouf[6] and C. El-Modafar[1]**.** (1) Laboratoire de Biotechnologie et Bio-ingénierie Moléculaire, Faculté des Sciences et Techniques Guéliz, Université Cadi Ayyad, Marrakech, Maroc; (2) Centre Régional de la Recherche Forestière Marrakech, Ain Itti Ennakhil, Marrakech, Maroc; (3) Laboratoire de Biotechnologie et Physiologie Végétale, Faculté des Sciences Semlalia, Université Cadi Ayyad, Marrakech, Maroc; (4|) Laboratoire de Biotechnologie et Valorisation des Ressources Naturelles, Faculté des Sciences, Université Ibn Zohr, Agadir, Maroc; (5) Laboratoire de Biotechnologie Microbienne, Faculté des Sciences et Techniques, Université Sidi Mohamed Ben Abdellah, Fès, Maroc; (6) Laboratoire de Microbiologie et Biologie Moléculaire, Faculté des Sciences. Université Mohammed V Agdal, Rabat, Maroc, Email: chakhchar.ckr@gmail.com

The argan tree (*Argania spinosa*) plays a crucial socio-economic and ecological role in southwestern Morocco's arid and semi-arid zones. A pot-study was undertaken to understand and characterize the physiological and

biochemical tolerance mechanisms of this endemic species to drought stress. A multifactorial approach was adopted to study the change of leaf water status, ionic status, chlorophyll fluorescence, oxidative damage, enzymatic and non-enzymatic defense systems, osmoregulation, carbohydrate metabolism, secondary metabolism, proteins and certain enzymes and pigments of photosynthesis in four contrasting argan tree ecotypes. *A. spinosa* plants were subjected to different levels of drought stress on one hand, and to dehydration + rehydration process, on the other hand, in order to determine the ability to recover after a prolonged edaphic drought. Results obtained revealed significant differences between the four contrasting ecotypes for the set of physiological and biochemical traits involved in tolerance to drought stress in *A. spinosa*. Significant correlations have been established between the traits that interact between them as well as the different potential interactions between the fixed factors (ecotype, treatment and time). The canonical discriminant analysis has facilitated the distinction between the four ecotypes in terms of their tolerance to drought stress *via* the traits having the most significant discriminating power. Our experimental-statistical approach also has contributed to conducting a "screening" of adaptive traits in order to select the most tolerant ecotypes that appear to be very promising for the regeneration of the Moroccan argan tree.

MI11

NUTRITIONAL PREFERENCE OF EGYPTIAN FRUIT BAT *ROUSETTUS AEGYPTIACUS* (GEOFFROY) IN RELATION TO ITS CONTROL UNDER LABORATORY AND FIELD CONDITIONS.

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Food preference and daily consumption of 17 materials by the Egyptian fruit bat *Rousettus aegyptiacus* (Geoffroy) were investigated under laboratory conditions using free and non-choice feeding methods**.** The results obtained revealed that the acceptance of these materials to fruit bat relatively differed according to the type of materials and applied feeding method**.** Using none choice feeding method among fruits, white mulberry fruits were the most preferred ones to bats, whereas, black berry fruits were the least preferred. On the other hand, strawberry fruits ranked first among vegetables materials, whereas kidney bean was the least preferred fruit by bats. At the same time, a tomato fruit was highly accepted by fruit bats as an introduced food**.** The ratio of consumed diet and body weight considerably differed according to type of diet and reached the maximum in case of strawberry fruits to the ratio 90.6% from bat body weight using free choice method**.** When zinc phosphide was used in different concentrations mixed with Agwa fruits as bait, the results obtained indicated that the 1.5% concentration led to 100% death of the fruit bat community.