Integrated Pest/ Disease Management

IPM 1

COMPARISON OF THE EFFICAEY OF DIFFERENT TRAPS AND ATTRACTANTS TO CONTROL CERATITIS CAPITATA IN SYRIA. M. Mofleh[1] and M. Ahmad[2]. (1) Agricultural Research Center in Lattakia, Lattakia, Syria; (2) Plant Protection Department, Faculty of Agriculture, University of Tishreen, Lattakia, Syria.

A comparison between different attractants, and traps of various color showed the followings: trimedlure products, if used separately, attract males only, but if accompanied with water or protein hydrolysate, it will attract females in addition to males; the proportion of females being very small. Traps containing protein hydrolysate attracted males and females, but the numbers was very low compared with those attracted by trimedlure traps; the proportion of attracted females was higher than that of males. The effect of trap color on the quantity caught did not indicate superiority of a definite color. However, within the same product, the yellow and dark green colors were slightly better.

IPM 2

EVALUATION OF DUAL CYCLE'S (BARLEY/BARLEY AND BARLEY/FALLOW) IMPACT ON BARLEY PRODUCTIVITY AND CONTROL OF MEALY BUG (GROUND PEARL) IN DRY REGIONS OF SYRIA. Yassin Swiedan, P.O. Box 113, Douma, Damascus, Syria.

Multiple-Location on-farm demonstrations were conducted over 1993-2002 to evaluate the effect of crop rotation on productivity of barley and control of mealy bug (Ground pearl) in the dry regions of Syria. The results indicated that barley yield was increased by 21-24% after fallow compared with yield after barley, and control of mealy bug dropped from an infestation level of 7-10 insect/plant to 1-2 insect/plant. These results indicated effectiveness of crop rotation as an option to control this serious insect which causes significant yield loss.

IPM 3

EFFECT OF PLANTING DATE AND EXTENSIVE USE OF PHEROMONE TRAPS ON REDUCING THE INFESTATION RATE WITH PINK BOLLWORM. Diaa Shebl, Plant Protection Research Institute, Pest Physiology Department, 7 Nadi Elsaid Street, Dokki, Giza, Egypt.

The experiments were carried out in Sharkia governorate during the cotton growing seasons of 1996 and 1997. Early planting was on March 7 in some fields, and late planting was carried out on April 10 in other fields. Mass trapping of pink bollworm *Pectinophora gossypiella* was done by pheromone traps at the beginning of June at a rate of 4 traps/feddan as compared with 1 trap/5 feddans in other fields.

The results obtained indicated that the early sowing of cotton seeds could reduce the infestation rate by pink bollworm and reduce insecticides treatment. Mass trapping with 4 traps/ feddan reduced infestation level better than using one trap/ 5 feddans. It could be concluded that early planting date together with intensive use of pheromone traps can protect the cotton green bolls from infestation with pink bollworm attack, with reduction in insecticides use.

IPM 4

INTEGRATED MANAGEMENT OF DATE PALM PESTS IN QATAR. Emad H. Al-Turaihi and Abdulla S. AL-Khunji. Agricultural Development Department, P.O. Box 1966, Doha, Qatar, E-mail: al-turaihi@hotmail.com

Date palm cultivation in Qatar is subject to attack by many fungal diseases and insects such as Black Scorch (*Thielaviopsis paradoxa*); Graphiola leaf spot (*Graphiola phoenicis*); Leaf spots (*Alternaria sp. & Cladosporium sp*.); Red Date Palm Weevil (*Rhynchophorus ferrugineus*); Fruit stalk borer (*Oryctes elegans*) and Stem borer (*Jebusaea hammershmidti*). These pests significantly reduce date yield and quality in several farms. Five components of Integrated Pest Management (IPM) were used to reduce yield loss. These components were: 1) Using chemical pesticides, 2) Agricultural practices, 3) Plant quarantine regulations, 4) Biological control and 5) Pheromone traps. Results revealed that the infestation level was highly reduced to below the economic threshold. Additionally, the effect of ecological and agricultural factors predisposing the palm trees to attack by those pests was also studied.

IPM 5

TOWARDS DEVELOPMENT OF INTEGRATED MANAGEMENT OF COTTON PESTS IN IRAQ. Mohamed N. Al-Salty[1], Nazar N. Hama[2] and Laith Adel Mohamid[2]. (1) Arab Organization for Agricultural Development, Arab League Countries, Baghdad, Iraq; Present address: Faculty of Agriculture, Aleppo University, Syria (2) State Board for Agricultural Research, Ministry of Agriculture, Iraq.

Several laboratory and field studies were conducted since fall 2001, such as optimum planting date, suitable cotton variety as well as monitoring insect pests population and its natural enemies with a main objective to minimize insecticides use and conserve local natural enemies. Ecological similarity between Iraq and Syria encouraged the introduction of important egg and larvae parasitoids of spinny boll worm *Earias insulana* Boised from Syria to Iraq. Egg parasitoid *Trichogramma principium* Westwood was first introduced in October 2001and was successfully adapted, while the larval parasitoid was introduced in August 2002. Following introduction, adaptation, and laboratory mass rearing, the parasitoids

were field released at different locations in Iraq with proper monitoring. Total area of biologically controlled cotton fields was 20 ha during 2001 cropping season, and increased to 222.5 ha during 2002 cropping season. Cotton yield was increased in all fields covered by biological control, with no insecticide residues and black molds. High densities of natural enemies was recorded in all biologically controlled cotton fields at the end of 2002 season.

IPM 6

INTEGRATED CONTROL OF THE KEY INSECT PESTS OF DATE PALM FRUITS IN THE NEW VALLEY GOVERNORATE, EGYPT. Samy Hussein Mohamed, Department of plant protection, Faculty of Agriculture, Assiut University, Assiut, Egypt. E-mail: samy_hussein@Yaho.com

Cultivation of palm trees (*Phoenix dactylifera*) in Egypt goes back thousands of years.The earliest evidence of its presence is testified by the drawing on the ancient Egyptian tombs, though it is believed that it existed long before that time. The date palm represents the most important cash crop in New Valley. Around one million date palm trees are grown in the New Valley and the total annual production of date fruits reached about 20 000 tons. *Cadra* (=*Ephestia*) spp. (*Cadra cautella* Walker, *Cadra calidella* (Guen)), *Batrachedra amydraula* Meyer and *Virachola livia* Klug. are considered as major insect pests infesting date fruits in the field and the *Cadra* spp. are later transmitted to the storehouse and consequently infestation was repeated and increased. Integrated pest control (IPC), by using biological agents and minimizing the use of chemical pesticides, could prove effective in reducing pest losses and infestations. The present study was conducted to (i) evaluate the biological, chemical and mechanical control methods for controlling the key insect pests of date palm fruits, (ii) study the relationship between the existence of shishlan and acacia trees and the incidence of date fruits infestation with pomegranate butterfly and (iii) using the sex pheromone and gamma irradiation to control *Ephestia cautella*.

IPM 7

POSSIBLE SYNERGISTIC EFFECT AGAINST THE DESERT LOCUST OF A MIXTURE OF DECIS WITH WATER EXTRACTS OF *MUCUNA PRURIENS* (FABACAE). Abdalla M. Abdalla [1], Michel Lecoq[2], M. H. Luong-Skovmand[2] and S. El Bashir[3]. (1) University of Kordofan, PO Box 160 El-Obeid, Sudan; (2) Centre de coopération internationale en recherche agronomique pour le développement, Prifas, TA 40/D, 34398 Montpellier Cedex 5, France, E-mail: lecoq@cirad.fr; (3) Department of Plant Protection, Faculty of Agriculture, University of Khartoum, Shambat, Sudan.

A series of concentrations of Decis (3.125, 1.56, 0.78, 0.39 and 0.195g/l) were tested in the lab on the Desert Locust, *Schistocerca gregaria*, alone and with a fixed concentration (25g/l) of water extracts of roots of *Mucuna pruriens*. A set of ten 2nd instar nymphs were treated with each respective concentration using hand sprayer (400 ml). Nymphs sprayed only with water served as control. The treatments were replicated 4-8 times. Knockdown effect was recorded one hour after treatment, while mortality was recorded on hourly basis for the first six hours after treatment and then on subsequent days until complete mortality or transformation into 3rd instars. At the end, the total mortality was calculated for each treatment. Data was analyzed using Mstat-c statistical package applying one way variance analysis. Results revealed significant differences between treatments with Decis, *Mucuna* and *Mucuna*/Decis when compared with the untreated control. There were also significant differences between treatments with *Mucuna*/Decis mixtures and Decis alone. Results show a dramatic increase in the effect of Decis when mixed with *Mucuna* water extracts (both knockdown and mortality were enhanced). The resulting effect of the two toxic components exceeded the total sum of the effect of the two components used separately, indicating a possible synergistic effect. Thus a low dose of Decis may cause pronounced kill of locust when mixed with an extract of *Mucuna*. This is beneficial to the environment especially since at such low doses of Decis a less harmful effect would be expected to occur.

IPM 8

MODELING APPROACH FOR *BEMISIA TABACI* GENN. AND ITS PARASITOIDS *ERETMOCERUS MUNDUS* MERCET AND *ENCARSIA* SP. IN JORDAN VALLEY. Hazem Sharef Hasan[1] and Naim Sharaf[2]. (1) Department of Agricultural sciences, Al-Shobak University Collage, Al-Balqa Applied University, Al Shobak, P.O. Box 5, Jordan, E-mail: Hazem@ju.edu.jo; (2) Department of Horticulture and Plant Protection, Faculty of Agriculture, University of Jordan, Amman, Jordan, E-mail: Sharaf@ju.edu.jo

A high parasitization rate was achieved when either *E. mundus* or *Encarsia* sp. were released at the ratio of 2:1 (Adults Whitefly:Adult parasitoids). Parasitization ranged from 58.4-81.3% with a grand mean of 72.2% for *E. mundus*, whereas it was between 38.1 and 81.5% for *Encarsia* sp. with a grand mean of 75.8% for *Encarsia* sp. The net reproductive rate (R_o) of whitefly females was drastically affected by the level of parasitoids released. At high release ratio of 2:1 as well as at an equal release ratio of 1:1, R_o –values were very low as compared to the control. But at release ratios of 1:1.5 and 1:3, R_o –values were relatively high exceeding sometimes R_o 's of the control. The output of this study was proposed in a model for biological control of *B. tabaci* based on adult counts of whiteflies and on an inundative release of parasitoids, *E. mundus* or *Encarsia* sp. Whitefly parasitoids interaction in such a simple model represents parasitism rate close to those obtained in the field, since this model coincides with 83% of the data (R^2=0.83) in the case of *E. mundus* and 80% (R^2=0.80) of the data in the case of *Encasia* sp.

IPM 9

GENETICALLY MODIFIED CROPS FOR PEST CONTROL: ARE THEY ESSENTIAL COMPONENTS FOR IPM. Khaled M. Makkouk, Al-Manar University, P.O. Box 676, Tripoli, Lebanon, E-mail: kmakkouk@almanar-university.com

The use of biotechnology in plant protection is a very old practice, which include the use of disease-free planting material, microbiological pesticides and a variety of diagnostic techniques proved to be very useful for improved identification and monitoring of pest populations and pesticide residues. The most recent, but controversial biotechnological tool, is the use of genetically engineered plants with increased plant resistance to pests. Such new approach brought forward new varieties transformed with genes which confer insect resistance, tolerance to herbicides or resistance to virus multiplication. It is evident that there are risks and benefits associated with this new approach, and a summary of those will be presented and discussed. Recent findings suggest that unilateral control strategies, including GMOs, are unlikely to provide sustainable solutions to pest problems.

However, GMOs can selectively be components, and only when necessary, in IPM options applied by farmers.

IPM 10

THE EFFECT OF SEED DRESSING AND TIME OF FUNGICIDE APPLICATION ON ASCOCHYTA BLIGHT SEVERITY AND GRAIN YIELD OF CHICKPEA CULTIVARS. Mohammad Nazir Mouseli, W. Kaddoh and H. Yusef, GCSAR, Doma, P.O.Box 113 Damascus, Syria.

Chickpea is one of the traditional crops in Syria for a very long time. Ascochyta blight (*Aschochyta rabie*) is the most serious disease which reduce chickpea yield. A complete crop failure is expected if conditions conducive to disease development prevail. The present experiment aimed to control the disease by Integrated Disease Management (IDM) approach. Several treatments were carried out during three consecutive years starting from 1996 in three locations (Ghab, Tel Hadya, Hymo), where fungicide sprays and seed dressing were studied in a split plot experiments, with three replications. The main plot included four winter chickpea cultivars with different susceptibility to Aschochyta blight, while the sub plots included four fungicide treatments: (1) seed dressing + fungicide spray at seedlings stage, (2) seed dressing + fungicide spray at foliar growth stage, (3) seed dressing + fungicide spray at flowering stage, (4) seed dressing + fungicide spray at pod forming stage, (5) Control (without seed dressing or fungicide spraying). The seed dressing fungicide used was “Thiobendazole”, and the fungicide used for foliar spray was “Chlorothalonil”. The environmental conditions during the period of the experiment allowed the disease to spread widely, causing complete death of the control. Results showed that the infection was less on plots sprayed with fungicide at seedling stage, and produced the highest yield, followed by spraying at foliar stage then at flowering stage and finally at the pod forming stage. The control treatment was severely damaged and the yield was the least. It was concluded that spraying a fungicide at the seedling stage will reduce infection rate of Ascochyta blight, leading to an increase in yield, and can be considered an important component in integrated management of the disease.

IPM 11

INTEGRATED MANAGEMENT OF *ROTYLENCULUS RENIFORMIS* INFECTING SUNFLOWER BY USING CHICKEN MANURE, *HIRSUTELLA RHOSSILIENSIS* AND OXAMYL. A.J. Al-Sharif, F.A. Moustafa and A. Al-Said Khalil. Nematology Unit, Faculty of Agriculture, Mansoura University, Egypt, E-mail: elsherifmohammed@yahoo.com

The effect of poultry manure singly or integrated with the fungus *Hirsutella rhossiliensis* and/or Oxamyl nematicide on sunflower plant infected with *Rotylenculus reniformis* was evaluated under greenhouse conditions. Results indicated that most treatments tested caused an increase in plant growth. The application of poultry manure singly or mixed with one or two other components showed significant increase in shoot length and fresh weight of sunflower plant. Poultry manure plus Oxamyl treatment gave the highest increase in whole plant fresh weight as compared to poultry manure plus *H. rhossiliensis* only. Highest reduction in the renifrom nematode population density on sunflower plant was achieved by the application of poultry manure plus Oxamyl (71.24%) followed by poultry manure mixed with *H. rhossiliensis* plus Oxamyl (70.84%) and poultry manure alone (62.14%). Moreover, a significant reduction in egg-mass numbers was evident between all treatments in relation to either nematode or wheat grains.

IPM 12

INTEGRATED MANAGEMENT OF COTTON DAMPING OFF UNDER INTERCROPPING WITH SOME WINTER CROPS. A.E.A Ismail, Plant Pathology Research Institute, Agricultural Research Center, Giza, Egypt.

This study indicated that in all states, intercropping cotton with wheat increases the rate of infection with damping off followed by intercropping cotton with faba bean, while intercropping cotton with onion and garlic gave the lowest incidence of cotton damping off. The rate of infection with cotton damping off was less on the West side than on the East side of the ridge. Using seed dressing decreased the rate of pre– and post–emergence damping off, while the Homia 80 and Benlate 50 gave the highest rate of plants survival followed by Vitavex, Captan and Rizolex T50. Using two isolates of *T. harzianum* and two isolates of *Trichoderma viride* decreased the rate of infection with cotton seedlings damping off. *T. harzianum* was most effective in controlling damping off compared with *T. viride*.

IPM 13

EFFICACY OF CULTURAL PRACTICES ADAPTED BY FARMERS IN THE MANAGEMENT OF WITCHES' BROOM DISEASE OF LIME. A. M. AL-Sa'di, M.L. Deadman and I. Khan, College of Agricultural and Marine Sciences, Sultan Qaboos University, P.O. Box 34, AlKhod 123, Sultanate of Oman, E-Mail: Saad2000@squ.edu.om

Since the first report of symptoms in the early 1970s, and the identification of the causal agent as a phytoplasma in the late 1980s, no control measures have been able to suppress witches' broom disease of lime in Oman. The disease, which is characterized by symptoms that appear as very dense branching, small, light green to yellow leaves, and no or very small juice-less fruits, has affected the economy of the country by destroying more than 90% of lime production. Moreover, the disease has been reported in the UAE, Iran and India, and is becoming a worldwide problem. Management approaches such as the use of antibiotics, destruction of the severely affected trees, and ongoing research on protoplast fusion, haven't yet managed to control the problem. A survey was initiated in the northern part of Oman to identify and assess the cultural practices employed by farmers to manage the disease. Lime trees were found to start producing fruits when they were 2.5-3 years old. Witches' broom disease symptoms were found to appear after the third year and to increase steadily. The severity of the disease can reach as high as 90% in 10 years. Maximum production was found when limes are 5-6 years old, after which the production started to decline and had a significant negative correlation with the severity of the disease. To avoid any gap in production, farmers have an average of three tree growth stages under cultivation at any one time. The use of cow manure was found to have a significant relationship with the yield and growth density, while the growth density had a significant negative correlation with the disease incidence and severity. Salinity of the irrigation water was found to promote the disease.

IPM 14

APPLICATIONS OF SOIL SOLARIZATION UNDER GREENHOUSE CULTIVATION IN LIBYA. Khalifa H. Dabaj, Plant Protection Department Faculty of Agriculture, El-Fateh University, Tripoli, Libya.

Experiments on soil solarization under green house conditions were carried at different locations in the western region of Libya in four growing seasons (1999/2000–2002//2003). The results indicated that this new technique was effective control measure against agriculture pests under green house cultivations and constitute an effective replacement of methyl bromide. Application of different polyethylene plastic sheets; one and two layers of transparent plastic, and one layer of black plastic were highly effective for controlling plant parasitic nematodes,

particularly root knot nematode *Meloidogyne* spp. and annual and perennial weeds including Bermuda grass *Cynodon dactylon*, in addition to its effect on fungal population in the soil. By applying soil solarization, there was a significant increase in growth, flowering and yield of cucumber, tomato, eggplant, cantaloupe and pepper as compared to methyl bromide treatment.

IPM 15

EFFECT OF SOIL SOLARIZATION WITH DIFFERENT PLASTIC SHEETS ON GROWTH AND PRODUCTION OF CUCUMBER PLANTS UNDER GREENHOUSE CONDITIONS. Mahmoud A.Mesbah and Khalifa H.Dabaj, Plant Protection, Department Faculty of Agriculture, El-Fateh University, Tripoli, Libya.

Soil solarization with different plastic sheets; one and two layers of transparent plastic, one layer of black plastic and other control treatments were carried out under greenhouse conditions. Results showed that soil solarization with plastic sheets reduced root knot nematode (*Meloidogyne* spp.) population and annual and perennial weeds, especially Bermuda grass *Cynodon dactylon*, in addition to reduction of fungal population in the soil, including *Aspergillus* spp. and *Penicillium* ssp. These effects significantly increased plant growth, flowering and yield of cucumber.

IPM 16

APPILICATION OF BLACK MULCHS FOR SOIL SOLARIZATION AND SOIL MULCHING FOR MUSCMELON PRODUCTION UNDER GREEN HOUSE CONDITIONS. Khalifa H. Dabaj[1], Ali A. Kafu[2] and Ali Kharraz[3]. (1) Plant Protection Department Faculty of Agriculture, El-Fateh University, Tripoli, P.O. Box 30940, Libya, E-mail: Dabajhk@yahoo.com; (2) Agricultural Research Center, P.O. Box 2933, Tripoli, Libya; (3) Former Researcher at Agricultural Research Centre, (Present) Private sector Tripoli , Libya.

Black plastic mulches for two months soil solarization were used, and the same plastic was also used for soil muchling during planting of muscmelon plants for commercial production in a plastic green house for two succissive seasons 01/02 and 02/03. Results indicated that there were significant differences in plant growth (plant heights), fruit muturity, yield production, weed control and soil borne pathogen infections, between mulched and non-mulched cultivated plants.

IPM 17

EFFICACY OF SOME INSECT GROWTH REGULATORS (IGR) AGAINST CITRUS WHITEFLY *ALEUROCLAVA JASIMINI*. H.A. Taha, L. Adel and M.S. Hassan, Ministry of Agriculture, State-Board of Agriculture Research, Baghdad, Iraq.

Five insect growth regulators (IGRs) were tested for their efficacy to control the citrus whitefly. Results revealed that five IGRs were effective against the whitefly *Aleuroclava jasmini* nymphs during summer 2001, folowing 4 weeks of spraying. Precent mortalities were 43.7, 33.9, 23.7, 20.8 and 12.3 for Admiral 10 EC 1ml/L (Pyriporxefen), Nomolt 15 EC 1ml/L (Teflubenzaron), Match 050 EC (Lufenuron), Cascade 10 EC 0.9ml/L (Flufenoxuron) and Dimiline 10 EC 1ml/L (Diflubenzuron), respectively. The Admiral, Nomolt IGRs were highly effective against whiteflies and can be considered in IPM programs to control this insect.

IPM 18

APPLICATION OF CORN SEED TREATMENT WITH INSECTICIDES AGAINST STEM BORER *SESAMIA CRETICA* LED. Abdul-Sattar A.Al-Khafaji and Tadhamun Eskander, Ministry of Agriculture, State-Board of Agriculture Research, Baghdad, Iraq.

Several field experiments were conducted at Abou-Ghraib Experimental station during 1999-2001 to study the efficacy of different doses of the insecticides Cruiser, Marshal, Lesak as seed treatment, as well as insect growth regulators (IGRs) and biological insecticides against corn stem borer *Sesamia cretica* Led. Results indicated that both Cruiser and Marshal gave better protection from infestation by the borer and this was reflected on good growth and increased yield. Although other insecticides were also effective in controlling this pest but they were less effective than seed treatment insecticides.

IPM 19

INTEGRATED PEST MANAGEMENT OF APHIDS IN WHEAT CROP. Abdul Hamid Hafez, Department of Plant Protection, Faculty of Agriculture, University of Aleppo, Aleppo, Syria, E-mail: hafez2224@hotmail.com

Several studies were carried out to reduce the population density of aphids (Homoptera: Aphididea) on wheat, grown at the Research Center, Faculty of Agriculture, University of Aleppo, Syria. The results showed that there were significant difference in the population density of aphids when different fertilizer ratios and varieties of wheat were used. Parasites and predators gave good results in regulating aphids density especially in the absence of pesticides. In addition, the results indicated that the treatment with the bacterium *Bacillus subtilis* Her.

significantly decreased aphids density in comparison with the control treatment. Finally, phids population was rapidly reduced by insecticides' application.

IPM 20

INTEGRATED CONTROL OF *VERTICILLIUM* WILT OF OLIVE WITH CRYPTONOL IN COMBINATION WITH SOLAR CHAMBER AND FERTILIZER. M. Abu-Qamar[1] and A. Al-Raddad[2]. (1) National Center of Agricultural Research and Technology Transfer, Jordan, E-mail: abuqamar74@yahoo.com; (2) Department of Plant Protection, Faculty of Agriculture, Jordan University, Amman, Jordan.

This study was conducted after two applications of treatments during 1998 and1999, to determine the effects of different control measures on the development of *Verticillium* wilt caused by *Verticillium dahliae* Kleb. on olives cv. Nabali cultivar at Al-Hallabat location. Treating diseased trees with Cryptonol through soil drenching was effective in suppressing the disease development during the active phase of the pathogen compared to the control. Disease development was decreased on trees covered with solar chamber for 15 days compared to the control trees during the active period of the fungus. The fertilizer treatment (N-P-K 15-15 - 30) decreased disease severity and percentage of infection compared to the control during the active phase of the pathogen. The treatments did not differ significantly from each other, but was less than the control.

IPM 21

MECHANICAL CONTROL OF SNAILS AT THE EASTERN COASTAL AREA OF LIBYA. Fauzi Arifi Bisheya, Ali Ben Kafu, Monsif M. Zantuti and Abdallah M. Daas, Agricultural Research Center, P.O. Box 2480, Tripoli, Libya. E-mail: Bisheya@yahoo.com

Snails are considered invertebrate animals mostly distributed along the coastal area from Misurata up to Al-Nigat Al-khoms in the eastern part of the country. White snails (*Theba pisna*) are the most common snails causing severe damage on different agricultural crops. Infestation severity varied among the infested areas, and ranged from high at Misurata, Zawia, Subrata, Surman, moderate at Al-Jafara, and low at Tripoli. Mechanical control measures by hand picking were applied in the target areas and the total quantity of snails collected was estimated around 14622 kg from all areas; Zawia (3854 kg), Al-Nigat al-khoms (3627 kg), Subrata and Surman (3425 kg), Misurata (2486 kg), and Al-Jafara (1230 kg) and nothing was collected from Tripoli and Al-khomis. Collected snails were destroyed by burning in each area at a place prepared for this purpose. Thus hand picking is a successful and easy measure to apply for environmental safety.

IPM 22

EVALUATION OF TESTED IPM ELEMENTS OF SOME LAND SNAILS IN EGYPT. S.M. Abd–El-All[1] and H. I. El-Deeb[2]. (1) Faculty of Agriculture, Al-Azhar University, Assiut, Egypt; (2) Plant protection Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.

Several laboratory and field experiments were conducted to study the role of certain mechanical, cultural, biological and chemical control components in integrated pest management. Data revealed that lettuce plants were more attractive to snails compared to the other plant traps (i.e. cabbage, broad bean and sweet potato). All plants tested abated the snail population of both species to half. On the other hand, tillage and hand collection as cultural control methods of snails were found useful to control land snails. These approaches were found more effective in reducing *M. obstructa* than *E. vermiculata* population. The use of some microbial pesticides and plant extracts, i.e. *Bacillus thuringiensis* var. *kurstaki, Bacillus thuringiensis* var. *isroelensis* & vertimec 1.8% (*Streptomyces thuringernsis*) and Neem, spotted-gum and Oshar ethanolic extract, in laboratory tests for biological control of three-land snails *E. vermiculata, M. obstructa* and *T. pisana* revealed that the residue film technique was more effective than leaf-dipping, with B.t.k. giving the highest efficacy. On the other hand, *M. obstructa* snail was the most susceptible, whereas *E. vermiculata* snail was the least susceptible. *M. obstructa* was the most sensitive for vertimec, applied either as residue film or as leaf dip. Laboratory tests for the molluscicidal effect of some plant extracts against *E. vermiculata, M. obstructa* and *T. pisana* in laboratory, showed that neem and spotted-gum ethanol produced the best bioactivity, followed by Oshar. In addition, the residue film technique showed more toxicity than leaf dipping. The effect of some pesticides for chemical control of the adult stage of three land snail species; *E. vermiculata, M. obstructa* and *T. pisana* using residue film and leaf dipping techniques, were evaluated in the laboratory. Copper sulfate proved to be the most effective, while fenitrothion, sethoydim and thiophanate-methy1 were the least effective as residue film or leaf dip. *M. obstructa* snail was relatively more sensitive for metaldehyde and thiodicarb compounds than *T. pisana* and *E. vermiculata* snails.