

Teaching Plant Pathology and Disease and Pest Management for University Students: Some Considerations After Thirty Years of Experience

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Abstract

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Specific courses in Plant Protection are in place in most Agricultural Universities around the world. They are generally given at the MS level, after the concepts of plant protection have been introduced to students in Plant Pathology and Agricultural Entomology courses offered at the BS level. Plant protection, with very few exceptions, is thought worldwide in integrated courses, which combine the expertise of plant pathologists, entomologists and, less frequently, weed scientists. Such fragmentation represents one of the problems encountered, mostly at the student level, because a split view of the different topics, that generally need a holistic approach, is often given. Plant Protection is also the topic of MS courses and Ph.D. programmes. The changing role and importance of courses on plant protection in agricultural *curricula*, the need of such course also in food technology and agricultural biotechnology *curricula* are critically discussed. The importance of a good balance between theory and practical activities as well as the need of life-long learning in such field is discussed, together with the possible innovations in teaching methodologies.

Keywords: Plant Protection courses, Agriculture curricula, innovative teaching

Introduction

This paper originates from an invited lecture given at the 10th Arab Congress of Plant Protection (Beirut, Lebanon, October 2009) and reflects my personal experience as plant pathologist, with almost thirty years of teaching in Italy. However, it also reflects the experience gained during several periods of research spent abroad in leading Universities in the Netherlands and in the United States of America, that provided me exposure to different teaching models.

Other papers dealt with innovation in teaching (1, 6), while others (4) provided a through analysis of the present status and challenges of teaching plant pathology in the United States of America. This paper focuses on the present teaching environment in a period of rapid change. My considerations are, of course, related to the experience developed in industrialized countries.

The current situation and the main constraints

Teaching plant pathology and plant disease management today is confronting with both negative and positive challenges. Despite an urgent need to feed an increasing population, there is a general decreasing role of agriculture, which is strictly connected with a poor understanding of agriculture and science amongst the general public. Most public think that food comes from the grocery store and there is a lack of literacy of the public and, even worse, of many policy-makers. Urban and suburban populations do not have the scientific background needed to participate, as citizens, in decisions related to their own health, land use, appropriate use of genetic resources, rational judgement of genetic engineering, risks linked to the use of pesticides (6).

In the mean time, the agricultural sector did change during the past few years: issues related to environment

protection and to food technology are becoming more relevant. Different needs of the stakeholders emerged and, unfortunately, many of our departments and colleges were not being able to keep pace with such rapidly changing world.

Smaller number of undergraduate students are attracted to sciences in general: as a consequence, an even smaller number of students are attracted to agricultural sciences. The decreased enrollment of students in agriculture is accompanied with declining student numbers as well as interest in plant pathology. As a consequence, the numbers of qualified applicants for graduate school are declining.

During the past 10 years, the number of specific courses in the field of plant pathology decreased worldwide. Special courses, with hands-on practice are disappearing, as well as upper-level specialty ones. Some topics, particularly in the field of applied agriculture, are becoming at-risk.

During the past years faculty members with field research interest in many Universities, retired without being replaced due to economic constraints. If replaced, this happens with new faculty more lab-oriented, who do not relate to growers and have no interest in applied or field research. This fact, in conjunction with fewer grants for applied research, does not permit to fully exploit the crucial topics in applied plant pathology.

Today, in our field, even in the most competitive systems, it is difficult to recruit and to retain the best teachers, who are attracted by other fields of research. Plant pathology as a discipline lost visibility, also due to the disappearance of many plant pathology departments. Our discipline is now included in larger multidisciplinary departments, often trying to find its own space and role. Such invisibility impacts our profession in many ways: students are not attracted, and public funds are not directed to plant pathology (2). Due to shrinking students

enrollments, we are bound to a loss in courses, degrees and faculty members. Actually, when a group like plant pathology becomes a minority in a larger department, it is difficult to significantly influence votes on questions related to policy, *curricula* development, or faculty positions.

Challenges

Student recruitment - We must cope with the fact that currently students are not interested in agriculture: thus, it is very difficult to attract to our field the best and brightest students. There is much to do in this respect, trying to make our discipline more attractive to young people. Brightest students should help in attracting new students, providing them with real-world examples. Topics such as forensics, food safety, food security, saving forests and wild plants, environment protection are very relevant and suitable for attracting young people to our profession.

Student education - There is a strong disconnection between what University teaches and what employers need. To remain relevant to the agro-food industry, teaching programme need to put more emphasis on management, interpersonal and technical skills. In this respect, industry could help Universities offering internships for students. Field and lab work could help attracting students. It will also be important to invest in summer outreach programmes for students. On-farm experience for students should be reintroduced. Students should be encouraged to attend local professional meetings in order to interact with potential employers. Moreover, more incentives are needed for Ph.D. students and post-docs in applied areas. An increased movement of international students (North-South and South-South) should help increasing enrollments: agricultural studies are still relevant in developing countries.

Student support - There is a need of funding for supporting experiential training as well as of grant programmes in applied sciences. Again, internships with industry and governmental agencies could help. Moreover, stronger ties with industry should influence and help colleges to maintain basic agricultural disciplines.

Public relations and communication - There is a need for a new brand image: the public should understand that farmers are not the enemies of the earth, but, on the contrary, that life on earth depends on plants. There is a need to collect and share data related to the percent of graduates employed, salaries, placement,...etc. Such data should reach people who have influence.

Teaching - New teaching methods and tools should be adopted more extensively. The Internet permits rapid access to information and images for both students and instructors. Internet is also very useful for life-long programme used for extension services (7). Instructional technology provides new tools for classroom presentations, communications with students, reaching new audiences, and distance learning (6). In order to improve teaching, an

exchange of faculty and industry and extension service professionals would be very useful. Introducing new skills and abilities, such as communication, critical thinking, writing, international experience are very useful. Students need to be adaptable to future changes. We need to avoid clonal propagation of ourselves.

A strategic approach for the future

Plant pathology is connected with relevant social and economic issues: environmental protection and conservation, food safety and security, climate change. Yet, it is continuously challenged to maintain its identity and reaffirm an existence based on the needs of those who grow food and fiber.

As the ever-increasing world population demands more to consume: we must respond with improved methods of disease control that are less destructive to the environment.

As stated by J.C. Walker many years ago, it is therefore important that we keep and help our students keeping "one foot in the furrow" (5).

It will be important to get plant protection and social role of diseases into early *curriculum*, also bringing plant pathology teaching into Sciences and Environment Colleges.

Reaching new audiences should be a priority. Bringing plant pathology into biology and microbiology courses can enrich the education of these students, by introducing new and fascinating topics, which are closely related to food quality and safety and environment protection. The undergraduate course "Plants, pathogens, and People" taught at the University of Illinois represents a very good example. This course is followed by students coming from six to eight different colleges or schools, with very different backgrounds in biology (1).

It will be very useful to bring more industry perspective into teaching, as well as contributions from research institutes, government, industry, and botanical gardens. Gisi (3) exemplified very well the need to integrate, in teaching plant pathology, the knowledge on molecular biology, genetics, biochemistry, physiology, epidemiology of the most important pathogens with applied aspects derived from agronomic questions. Investing in life-long courses should be another priority, together with investments in critical infrastructures (farms, labs,...). Strong teams of excellence around crops or problems and more attention to those scientists, capable to work across disciplines should be developed.

Conclusions

Plant pathology remains a critical topic, and teaching plant pathology, because of its complexity, remains a major challenge for both teachers and students (3). The student population is now very different from that of the past, with an increasing number of students with little biology background. Sometimes we are teaching students with different commodity interest or completely new audiences.

New technologies are now available for teaching. Students have now easy access to images, simulation and all type of information. Teachers also have now new possibilities of communicating among them, sharing teaching material and exchanging experiences.

More links with Scientific Societies are needed. The International Society for Plant Pathology has a Subject Matter Committee on teaching and the topic of teaching has been well covered during its International Congresses. The American Phytopathological Society, has in place very successful programmes, with its APSnet Education Center (6) and established an *ad hoc* Committee dealing with

education of plant pathologists, which prepared a very complete analysis of the present situation in the United States (4).

A new generation of students adaptable to future changes, capable of critical thinking, flexible and able to communicate and work as a team, must be trained. And, finally, we should put in teaching the same passion and enthusiasm that we put in research.

Eventually, the world will probably (re) discover that there is a need for agriculture and the general picture will become more positive.

الملخص

غولينو، ماريا لودوفيكيا. 2009. تعليم أمراض النبات وإدارة الآفات النباتية لطلاب الجامعات: إعتبرات بعد ثلاثين سنة من الخبرة. مجلة وقاية النبات العربية، 27: 233-235.

يوجد في معظم الجامعات الزراعية حول العالم مقررات محددة في وقاية النبات. تُعطى هذه المقررات عامة على مستوى الماجستير، بعد عرض مفاهيم وقاية النبات في مقررات أمراض النبات والحشرات الزراعية في المرحلة الجامعية الأولى. يتم تدريس وقاية النبات على المستوى العالمي، مع استثناءات قليلة، في مقررات متكاملة تجمع خبرات إحصائي أمراض النبات، الحشرات وعلى نحو أقل تردداً إحصائي الأعشاب. ويمثل هذا التجزئى إحدى المشكلات المصادفة، على مستوى الطلبة غالباً، بسبب الرؤية المنقسمة للموضوعات المختلفة، والتي تحتاج غالباً إلى اتجاه شمولي في وقاية النبات، وهي أيضاً موضوعات في برامج الماجستير والدكتوراة. تناقش الورقة الدور المتغير وأهمية المقررات الدراسية في مجال وقاية النبات في المنهاج الزراعي. كما سنتم مناقشة أهمية التوازن الجيد ما بين الأنشطة النظرية والعملية، بالإضافة للتعليم مدى الحياة في هذه المجالات مع بعض الابتكارات في منهجيات التدريس. كلمات مفتاحية: مواد وقاية النبات، برامج التعليم الزراعي، التعليم المبتكر.

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