

# The cream of the crop

Professor Zbigniew T Dąbrowski presents an overview of a collaborative initiative enhancing plant health expertise in Poland to respond to EU regulations and meet the growing social demand for healthy fresh produce



## Could you outline the context from which the Warsaw Plant Health Initiative (WPHI) emerged?

WPHI is the result of discussion among scientists at the Faculty of Horticulture, Biotechnology and Landscape Architecture at Warsaw University of Life Sciences (WULS) who are aware of new challenges posed by the recent European development in the area of plant health. Strengths, weaknesses, opportunities and threats (SWOT) analysis demonstrated that the leading role of WULS academics in plant health initiatives in Poland may be at risk due to constraints such as poor funding for advanced equipment, decreased international cooperation and a 'generation gap' in other departments.

The analysis also confirmed the increased need for interdepartmental and interinstitutional cooperation in developing holistic research and

strategies to respond to the Europe 2020 strategy – in particular the Innovation Union and Youth on the Move initiatives – and enhance the Warsaw Plant Health Cluster (WPHC) collaborative capacity and visibility within the European Research Area (ERA) and European Higher Education Area (EHEA).

## What are the main objectives of the Initiative?

The presently recommended principles of sustainable agriculture are mainly based on growing healthy crop plants – tolerant or resistant to abiotic and biotic factors – using new bioactive compounds safe for the environment and humans, and strengthening the impact of antagonistic organisms for pathogens and pests.

Through its recommendation for the obligatory implementation of integrated pest management (IPM) by farmers from 1 January 2014, the Directive 2009/128/EC has challenged government agencies and the scientific community to meet the demand by farmers and consumers for environmentally safe plant protection methods. The project was therefore designed to enhance both the research and networking capacity of WPHC and the mobility of its staff. This complies with the overarching objectives of European research policy aimed at enhancing the mobility of researchers and the dissemination of knowledge and technology within the single EU market for research and innovation.

## What is WPHC and how does it relate to the Initiative?

WPHC at WULS embraces a number of traditional academic disciplines, such as entomology, plant pathology, plant genetics, plant ecology and crop production. Although substantial advances in these disciplines have been made and some IPM methods for growing healthy, fresh produce have been developed, the scale of their application in Poland as well as in some other European countries is still unsatisfactory. Intense use of pesticides, fungicides,

herbicides and synthetic fertilisers on vegetable and fruit crops is still widespread.

As an interdisciplinary group of researchers – some with a long international experience in research on plant health and implementation of IPM programmes – WPHC will provide both the impulse and means to create an innovation-friendly institutional environment, fill competence gaps, absorb new methodologies and approaches, foster internal cooperation, and publicise accomplishments and existing competition, advantages and strengths. WPHI, generously supported by the EC, provides a vehicle for these changes and will stimulate not only interdepartmental but also cross-faculty and interinstitutional cooperation in research and development on plant health in Poland and Europe.

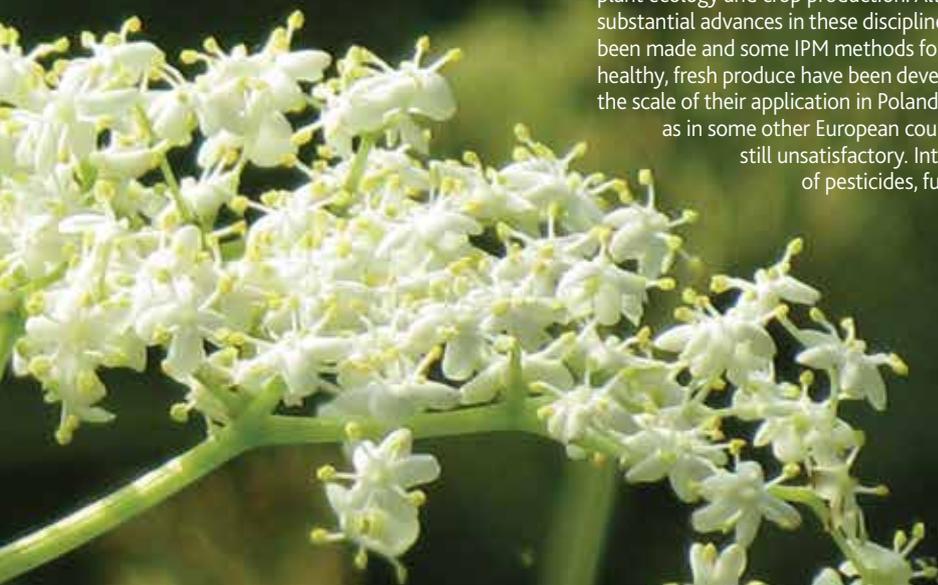
## Could you summarise some of the most significant issues affecting the field of plant health?

One of the major issues is identification of emerging plant health risks due to climate warming and globalisation. As a consequence, new crop pests and diseases have become the major factors reaching economic importance. They are responsible not only for causing injury to plants but also for financial losses on crops.

Another concern is the consequence of intensive plant and animal production characterised by large monoculture fields, high external inputs and reduced vegetation biodiversity. In some EU countries this is leading to the loss of many plant and animal species and in some cases irreparable damage to the land.

## How do you work to foster international collaboration and what challenges are associated with this?

Strengthening present cooperation of some senior WPHI staff and providing the opportunity for others to establish international collaboration is one of the major objectives of the WPHI. This is realised through organising mini-symposia and workshops; offering potential international research collaboration opportunities by presenting actual scientific achievements of WPHI staff at international conferences; short visits of senior WPHI staff to European research centres to joint project writing; and hiring internationally recognised scientists to maintain and expand their previous links with advanced research teams and active participation in international networks.



# Growing knowledge in **plant health**

Over 100 researchers and students in the **Warsaw Plant Health Cluster** are working together to improve their research and networking capacity in an effort to foster innovation within the plant health domain and contribute to future economic and social development

**IN ORDER TO** ensure the crops we rely on are healthy and consistently produce a supply that meets growing market demands, scientific advances must be made. At present one of the most widely used methods for promoting plant health and protecting against harmful influences is pesticides. These are substances that kill, repel or control pests, influence the life processes of plants and destroy weeds or prevent their growth. However, their use must be closely regulated to avoid unwanted side effects, such as causing harm to human health and the environment.

In part because of the risk of these negative effects from pesticides, there has been a push in recent years by governments and the public to develop 'greener' methods of growing healthy crop plants. To do this, greater research into plant health within the EU is needed. One research unit in particular, the Warsaw Plant Health Cluster (WPHC), based at the Faculty of Horticulture, Biotechnology and Landscape Architecture within the Warsaw University of Life Sciences (WULS) in Poland, is investigating various aspects of the plant health domain. The group's research is being conducted with an eye towards responding to new challenges posed by EU plant health regulations and public demand for reducing the unjustified use of pesticides, while at the same time improving the expertise and resources within WULS.

## **OBJECTIVES AND ORGANISATION**

The project comprises 60 researchers and over 40 PhD students within WPHC who are collaborating to achieve five main objectives: update research policy and enhance internal organisation at WULS; fill competence gaps through knowledge exchange and training; increase the number and expertise of the faculty by hiring researchers; upgrade resources through the purchase of new equipment; and enhance WPHC's visibility, networking and cooperation within the European Research Area (ERA).

In order to achieve these diverse goals and organise the large number of participating members, the project has been divided into six goal-orientated Work Packages (WPs). Each WP focuses on a particular aspect of plant health research with five key areas being covered, including: entomology, pathology, genetics, ecology and crop production.

## **CUTTING-EDGE TECHNOLOGY**

The starting point for the project – and the objective of the WP – was to identify and address barriers that are preventing the WPHC from offering a sustainable institutional environment. The first issue was a lack of available funding for purchasing the latest equipment for WPHC's researchers. Steps have already been taken to secure financial support for new equipment, as can be seen in the establishment of two new laboratories. The first, the micro- and nano-encapsulation laboratory, was the result of the acquisition of new equipment for WP2, which is designed to enhance the research and networking capacity of



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entomology research teams. As a result of this new facility, the researchers are now well positioned to investigate possible environmentally safe synthetic pheromones, attractants or repellents that present a greener option than current pesticides.

The second new laboratory – the bioinformatics research laboratory for WP6 – will allow the analysis of high-throughput biological data. The goal of this facility is to uncover new genes that will help to promote plant health. To this end, the laboratory will host experiments that enable a more complete understanding of plant and pathogen genome assembly and annotation, transcriptome analysis and data visualisation.

Another prime example of how WPHC is working to improve the resources available to its researchers is demonstrated through the purchase of the newest type of flow cytometer for WP5, which has a focus on upgrading pathology research teams. The tool will enable analysis of microbes and their host cell cycle, which will prove useful for further understanding plant pathogens including fungi, bacteria and viruses.

### A GLOBAL OUTLOOK

Improving international cooperation was identified as a second area for improvement within WPHC. Acknowledging the importance of drawing on global expertise, WPHC set out to address decreasing international cooperation within the Cluster. One way of encouraging a global outlook for WPHC members is by facilitating exchanges for researchers – encouraging scientists to work at the WPHC as well as sending their researchers to work at partner institutions. All WPs exchanged staff with other institutions and a total of five young staff and nine senior staff carried out international consultations for an average of three months at a time.

A further means of achieving international partnerships is through workshops and mini-symposia organised by each of the WPs. One such mini-symposium was organised by WP4, which is focused on improving the micro-ecology research teams within WPHC. Held in February 2013, the event on resistance to acetolactate synthase inhibiting herbicides was attended by more than 50 leading European experts and students. Lectures provided insights into the increasing problem of weed resistance to herbicides within Europe, which poses problems not only for farmers but also researchers and industry. To work towards a solution, the presentations considered weed resistance across the molecular, genetic and biochemical levels.



The Warsaw University of Life Sciences is the largest, oldest and highest-rated agricultural academic institution in Poland.

The most recent example of very successful international cooperation and enlargement of institution visibility was organising the 11<sup>th</sup> International Conference on Reactive Oxygen and Nitrogen Species in Plants by members of the consortium. The project supported three Plant Health special sessions, 20 excellent speakers from world-class laboratories and over 350 international participants.

### FILLING KNOWLEDGE GAPS

The final component of the project concerns bringing in young scientists and students to study and pursue a career in the field of plant health. Whilst WPHC has many well-established researchers taking part in their work, a number of WPs have identified a generation gap that results from a lack of young scientists. For instance, WP3, which is dedicated to enhancing the capacity of the Vegetable and Medicinal Plants Department, is looking to improve young scientists' knowledge of analytical methods through three new collaborative initiatives which will expose them to methods that are not available within WULS.

Likewise, WP5 – the upgrade of plant pathology research teams – found that although at present it is benefiting from highly experienced members, it does not have any young staff, which could lead to a generation gap in the future. Therefore, young researchers must be recruited and trained up. To achieve this, WP1 plans to establish a new MSc programme in plant medicine with the hope that it will result in new job opportunities for young scientists at WULS.

### FUTURE DEVELOPMENT

The Cluster has already made great strides in encouraging innovation and collaborative thinking, and is in a position to build on these strengths into the future. By improving the capacity of the WPHC it is hoped that the researchers will be able to make even greater contributions to the field of plant health in the coming years, especially on a Europe-wide scale.

## INTELLIGENCE

### WARSAW PLANT HEALTH INITIATIVE

#### OBJECTIVES

- To fill competence gaps and opening new collaborative avenues through knowledge exchange and training
- Upgrading material capacity through organising new laboratories and acquiring additional equipment for existing laboratories
- Upgrading human capacity through hiring an experienced researchers and skilled technicians
- Improving visibility, mobility and cooperation within the European Research Area (ERA) through promotion of WPHC accomplishments and competitive advantages

#### KEY COLLABORATORS

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#### FUNDING

The Warsaw Plant Health Initiative project is co-funded by the EU Seventh Framework Programme (FP7) under Grant Agreement number 286093 (FP7-REGPOT-2011-1-286093)

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