Seven projects selected in the first C-IPM call

Thirteen different European countries are involved in the seven research projects selected for funding in the first C-IPM call. This folder describes the seven projects.

C-IPM Coordinated Integrated Pest Management in Europe

Foto: Janne Hansen

Funded by the European Union


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Foreword

The ERA-Net C-IPM would like to thank all actors who have contributed to the first call via the identification of topics, the funding commitment and the implementation of the joint transnational call. A particular thanks goes to the call secretariat, call group, national contact points, project evaluators, and applicants.

The development and implementation phases of the call were a demanding process which consisted of planning, definition of the procedure, pre- and full submission phases, evaluation procedure and funding decisions.

The development and funding of joint transnational calls were among the key objectives of the ERA-Net C-IPM to promote and/or strengethen scientific collabortion across borders in the sector of crop protection both in short to medium and long term. We believe that the first transnational call, which links scientists from 13 different European countries, is a good initiative to achieve those objectives.

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Doing battle against hairy root disease in horticultural crops

Integrated pest management strategies can be the approach to take against the increasingly prevalent problem of hairy root disease in minor crops.

The horticultural industry has seen an increasing prevalence of a particular, harmful bacteria which can cause certain crop types to develop excessively hairy roots. And why, you might ask, does it matter if a tomato or a cucumber has hairy roots? The condition is not merely cosmetic; it reduces the yield of the crop and causes substantial economic losses to the European horticultural industry.

Scientists from Belgium, France and Switzerland are therefore collaborating on a project that seeks to control hairy root disease in tomatoes, cucumbers and eggplants using integrated pest management strategies. The two-year project has seven partners and a total budget of € 347,015.

Hairy root disease is caused by the bacterium Rhizobium rhizogenes (formerly Agrobacterium rhizogenes). Control of the disease has hitherto relied on chemical means. However, hairy root disease is a hard nut to crack because the bacteria form a biofilm around the roots of the plant and in the irrigation system.

Biofilms are difficult to remove because they provide a niche in which the microbes are protected against disinfectants. High concentrations of chemicals are required to remove biofilm. In addition, some of these chemicals are converted to toxic by-products.

The main objective of the project is to develop long-term and sustainable integrated pest management solutions to reduce problems caused by hairy root disease. The scientists will approach the problem from several angles and will look at plant cultivation, biofilm in irrigation systems, and plant microflora.

More specifically, the project partners aim to develop a reliable monitoring tool for rapid detection of hairy root disease and will screen for new biocontrol organisms, evaluate novel anti-biofilm compounds and investigate new cultivation techniques to reduce disease symptoms.


Foto: Colourbox

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Uncovering the secret life of mites

Berry bushes and azalea are among the numerous crops targeted by mites. Scientists from four different European countries are collaborating to learn more about these tiny and elusive species.

What do azalaeas, strawberries and black currant have in common? The answer is that they are all at risk of becoming infected with small mites from the Eriophydiae, Tetranychidae and Tarsonemidae families. Mites from these families affect a wide range of plants, causing galls, tissue damage, necrosis or distortion of growing points. The problem is that these tiny creatures are often hidden and difficult to monitor until damage to the crop is conspicuous.

Scientists from Belgium, Switzerland, the Netherlands and Spain are collaborating on a project that seeks to increase our knowledge of these harmful mites in minor crops such as blackberry, currant, raspberry, strawberry and azalea. The two-year project has five partners and a total budget of € 510,443.

An efficient sustainable and integrated way to control these mites in-field is missing. Since the target crops are minor crops in most countries, cooperation between multiple European research organisations can boost this process markedly. The project partners will do just that by combining their experience to tackle the problems.

Elucidating interactions between mites and their targets

The goal is to develop in-field solutions by focusing on the interactions between the plant, pest and pest control. The project partners will characterise mites via experience, field surveys and literature. They will optimise sampling techniques to allow fast early detection and monitoring and seek to identify natural enemies of the mite – including predatory mites – for potential use as biological control agents.

The spotlight will also be aimed at the plants that the mites target. The plants' defences, including the jasmonic acid and salicylic acid pathways, will be studied. Jasmonic acid plays a role in regulating plant responses to abiotic and biotic stresses as well as plant growth and development, while salicylic acid is a plant hormone that plays a role in mediating plant defences against pathogens.

The project partners will also characterise the response of the mites to these defence mechanisms with the aim of integrating natural defences into biological control-based integrated pest management. In addition, the project will study potential applications of plant volatiles.

Using natural enemies

Mites attack not only plants; some mites attack other mites. These are the so-called predatory mites. This state of affairs can be exploited by including them into integrated pest management (IPM) programmes. The project partners will therefore evaluate commercial and possible newly found mites with the aim of using them in IPM with regard to the pests' life cycle, the dose and timing of the release of the predatory mites. Furthermore methods to support the predatory mite population build-up with alternative foods (e.g. pollen, artemia) or mulch layers will also be investigated.

The results from the studies will be summarised in a tool containing practical advice for growers on how to identify, monitor and control the most important mites in the target crops.

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Scientists aim to improve integrated pest management in greenhouses

The multiple and complex interactions between pests, beneficials and crops in greenhouse agroecosystems need to be fully understood in order to develop robust and reliable integrated pest management strategies.

Although the greenhouse environment is a controlled environment it nevertheless comprises a complex set of interactions between crops, pests and beneficials. Consequently, integrated pest management strategies have difficulty taking hold without an in-depth knowledge of these interactions.

A new European project involving scientists from four different research institutions in France, Spain and Germany will help solve this problem. The 2.5-year project has a total budget of € 487.600. The aim of the project is to develop, optimise and validate decision support system tools in a real greenhouse cropping system context.

Pest control in greenhouses is challenged

Consumers place high demands on horticultural crops, including greenhouse crops, and demand products that look good. Back in the greenhouse, the crops are subject to very high levels of pest risks. Farmers' ambitions to meet the demands for high visual quality and low pest levels have led to an intensive use of pesticides and high indexes of frequency of treatment worldwide.

This chemical path is becoming unsustainable due to limits on the number of available active ingredients, an increase in pest resistance and concerns about health risks. For these reasons integrated pest management strategies, that tackle pest management using a wide variety of tools and techniques, should be the answer. However, a fundamental understanding of the functions of the agroecosystem at the local farm level appear to be more challenging than expected even in the controlled greenhouse environment.

Building an optimal decision support system
The project partners intend to develop a robust integrated pest management strategy by designing accurate tools that enable monitoring and management of the spatiotemporal dynamics of all the key biotic components in a greenhouse environment. To this aim they will carry out the following tasks:

- Develop tools to assess the health status of crops via sampling and information analysis of the main biotic factors obtained from the monitoring of crops throughout European network of experimental stations and farms
- Promote the acquisition and implementation of the knowledge that is necessary for decision-making adapted to local specificities and constraints
- Build or optimise predictive models to anticipate pest and natural enemy dynamics in real cropping situations via systemic trials
- Develop decision support systems and tools relying on the re-definition of local, regional and European decision rules that also consider socio-economic aspects of farms

The system will be based on a decision support system already developed for ornamentals in France and Italy.


Foto: Lars Kruse

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Intelligent weed control can reduce herbicide use

Scientists from three different European countries are collaborating to develop an improved decision support system to help farmers control weeds in maize and winter wheat, taking local conditions into regard.

Weeds cost money. However, controlling weeds using herbicides also costs money, in addition to time, labour and risks to the environment.

Decision support systems (DSS) that can assist farmers and farm advisors in treating weeds in crops at precisely the right times with the most efficient products and in the right amounts can contribute to reducing herbicide consumption markedly. Therefore, a new DSS will provide both economic and significant environmental benefits.

Scientists from Germany, Denmark and Spain are therefore collaborating on a project that seeks to design and customise an innovative online decision support system for weed control in maize and winter wheat. The system's longevity will be guaranteed by long-term support. The three-year project has four partners and a total budget of € 414,891.

Improved decision support system

The project partners aim to develop the online system so that it can support reliable decisions based on local conditions. The system will consider thresholds for weed densities and include economic calculations of treatment costs.

Spraying with herbicides is not the only solution to combating weeds. The system will also be able to offer mechanical options wherever possible in keeping with the principles of integrated pest management. With the aid of integrated pest management, including intelligent use of herbicides, the decision support system will facilitate management of herbicide resistance.

The scientists will not be starting from scratch, as there are already decision support systems in Europe. However, there are knowledge gaps, and the project aims to address some of these. Dose-response functions need to be validated under field conditions in maize and winter wheat. Specific tools, such as resistance management and economic calculations, will be added to the decision support system. The project partners will also select and improve the best test version or strategy for practical applications.

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Making wireworm behaviour easier to predict

Wireworms are masters at disappearing deeper into the dark depths of the soil when conditions call for it, making it difficult to control them. A new European project aims to learn more about wireworms in order to successfully predict when they can best be controlled.

Wireworms – the abundant, soil-dwelling larvae of click beetles – are big trouble for a range of agricultural crops, including potatoes, maize and vegetables. Typically, wireworms damage crops when they forage in the upper soil layers and munch at the crops' below-ground parts.

Unfortunately, this behaviour does not necessarily make wireworms easily accessible to pest control because they burrow downwards into the depths of the soil when upper soil conditions are unfavourable or when they need to moult or hibernate.

Predicting wireworms' vertical movements between soil layers and identifying when the wireworms actually dwell in the upper layers is crucial for the decision and timing of control measures against these pests.

A new European project involving scientists from 14 different research and other institutions in Austria, Belgium, France, Germany, Italy and Switzerland will shed light on wireworm behaviour and biology. The three-year project has a total budget of € 874.149.

The aim of the project is to fill in the gaps of knowledge about wireworm activity in order to significantly improve the current predictive models and, based on the knowledge generated from the project, to develop a decision support system which is applicable across European arable land.

Wireworms are tricky

Wireworms are one of the most difficult pests to control for mainly two reasons. In the first place, wireworms show considerable vertical movement in the soil. These vertical migrations make it difficult to estimate potential yield loss, define damage thresholds based on wireworms caught in bait traps and implement effective control measures.

In the second place, there are several different species occurring in European agriculture. Although their differences are difficult if not impossible to spot with the naked eye, they nevertheless have different behaviours, biology and ecology. This calls for species-specific control measures.

Adding value to existing systems

A decision support system that can forecast wireworm activity in the upper soil layers already exists. It is based on soil moisture, temperature and soil type and works well in Germany, where it was developed. However, when applied in Austria, it performed poorly, probably because there are additional factors that need to be taken into consideration, such as species-specific movement behaviour, larval age, root availability and plant volatiles.

Coordinated field studies in the project countries will help identify the main pestiferous wireworm species in the different regions and examine their species-specific migration behaviour, which are important prerequisites for a widely applicable integrated pest management strategy against wireworms.


Foto: Katharina Wechselberger:

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Expanding the fight against potato blight

The pathogen causing potato blight is highly variable and evolves quickly, making it a serious challenge to control. Aarhus University is participating in a new international project that will tackle the problem by analysing potato blight's genotypic and phenotypic variations and evolution, while designing better decision support systems.

The battle between potato growers and potato blight is an arms race in which both sides continue to develop new attack and defence mechanisms. The potato blight pathogen is highly variable and evolves very quickly, so potato growers need to be on top of it constantly.

A new project involving scientists from Aarhus University as one of eight different research institutions in Denmark, France, Norway, Estonia and Great Britain aims to tackle the problem by analysing the pathogen's genotypic and phenotypic variations and evolution. The three-year project has a total budget of € 1.229.210.

Late blight in potatoes is caused by Phytophthora infestans. The disease is the major threat to potato crops in Europe and a main reason for pesticide use. In severe blight years farmers in some regions spray their potato fields up to 25 times in a season. In Europe, potato blight costs an estimated average of one billion euros per year.


Foto: Colourbox

Monitoring pathogen variability

Integrated pest management (IPM), in which the use of pesticides is only one of a wide range of tools, is the desired route to take in crop protection for a number of reasons. One IPM tool is the use of resistant cultivars. However, integrated management of late potato blight still relies heavily on the use of fungicides, despite the release of resistant cultivars and the implementation of modern decision support systems (DSS) operated from web platforms or mobile apps.

The genetic instability of the pathogen population is one reason why it is so hard to control. Its marked genetic adaptability jeopardizes the deployment of durably resistant cultivars and sustainable fungicide management. The main objective of the project is therefore to characterize and understand the mechanisms driving population changes in P. infestans across Europe.

Sustainable IPM strategies require that the pathogen populations be monitored for both genotypes and phenotypes, including virulence, aggressiveness and fungicide sensitivity. The project partners will therefore analyse the genotypic and phenotypic variation of P. infestans in reference collections of the pathogen sampled from sexual and clonal populations collected in partner countries.

Monitoring population variation is only useful if it can help prediction of future outbreaks and target appropriate control strategies. The project will therefore develop new DSS models while adjusting existing ones in order to offer disease risk assessment based on both epidemiological, weather-driven infection likelihood and pathogen phenotypes. The new DSS modules will thus be able to address farmers' questions about which resistant cultivars to use, when to spray, how to adjust the spraying schedule according to local populations and so on, and therefore to improve their late blight control.

The project builds on the monitoring activities carried out within EuroBlight, and complements them by providing critical, but currently unavailable phenotypic data.

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Drastic reduction of insecticide use against pollen beetles is possible

A new European project aims to develop alternatives to pesticides for the control of pollen beetles in oilseed rape, thus paving the way for a drastically reduced use of insecticides.

The pollen beetle is a major pest in European oilseed rape. The pesky beetle has evolved resistance throughout Europe to the only class of insecticides that is widely available, namely pyrethroids. New paths must therefore be blazed to find alternative solutions to controlling the pest.

Scientists from four universities in Finland, Belgium, Denmark and Estonia aim to do just that in a new, European three-year project with a total budget of € 597.231. The aim of the project is to go beyond traditional resistance management programmes, which rely on the continuous discovery and registration of new insecticides and new modes of action.

The project partners will develop novel, safe, sustainable and economically feasible strategies in which insecticide spraying is only necessary as a last resort. This will ease the selection pressure on the pest and prolong the efficacy of the available insecticides.

Preventing resistance development

Oilseed rape is an important crop and provides us with food, feed and energy in the form of vegetable oil, protein feed and biodiesel. In order to prevent the development of insecticide resistance, insecticides with different modes of action can be used.

This strategy is difficult to implement with regard to the pollen beetle. In most regions in Europe only pyrethroids are available and with the current ban on neonicotinoid insecticides this situation is not likely to improve. On the contrary, resistance problems in the pollen beetle may rapidly increase, threatening food, feed and bioenergy security throughout Europe.

The new project will combine the best tools from integrated pest management (IPM) and develop novel approaches to overcome the mounting problems with pesticide resistance in pollen beetles in Europe by providing a set of cascading alternatives for pollen beetle control.

Novel IPM approaches

The basic new tool is simple: changing tillage regimes. The project partners predict that in combination with revised and dynamic thresholds and improved forecasting and monitoring tools, farmers will be able to reduce their use of insecticides drastically.

The key components of the project include:

- Cropping system buffering against pest outbreaks via innovative biological control
- Development of forecasting and monitoring methods and revised treatment thresholds
- Targeted precision biocontrol for delivery of novel biocontrol products
- Development of RNA interference methods for pollen beetle control

These novel approaches are effective, non-toxic and selective biocontrol measures that can control the pest and avoid problems with pesticide resistance. The control tools can even help farmers manage occasional pest population peaks without the use of insecticides.

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Foto: Janne Hansen

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You can read more about C-IPM on the website at www.c-ipm.org

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