EuroBlight

A potato late blight network for Europe

Monte Verità, Ascona, Switzerland
Venue 2022 EuroBlight physical workshop

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EuroBlight technical meetings:

30 April: Fungicides and biologicals
Responsible: Bert Evenhuis et al.

13 April: Alternaria subgroup meeting
Responsible: Hans Hausladen et al-

23 March: New control strategies in the context of the EU Green deal - Farm to Fork strategy
Responsible: Geert Kessel et al.

16 March: European *P. infestans* monitoring initiative
Responsible: David Cooke et al.

EuroBlight plenum - reporting

11 May
- Welcome
- Continental networks
- Pathogen group
- DSS and control strategies

12 May
- Alternaria
- Fungicides and Biologicals
- EuroBlight statement

EuroBlight
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The potato blights network – the people

EuroBlight Coordinators

Alison Lees, The James Hutton Institute (UK)

Jens G. Hansen, Aarhus University (DK)

Geert Kessel, Wageningen University (NL)

EuroBlight Statements

Limassol, 2013

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14th EuroBlight Workshop
Limassol, Cyprus, 12-15 May 2013
'Towards sustainable management of early and late blight in potato'

www.euroblight.net — Coordinators: Jens G. Hansen, Alison Lees & Huub Schepers

Potato is a major staple food and cash crop in Europe and worldwide. It is however vulnerable to many pests and diseases, among which early and late blight are of utmost economic importance in most, or all, growing regions. These diseases, caused by *Alternaria* spp. and *Phytophthora infestans* respectively, are damaging both to the foliage and the tubers of the plant.

Despite active research and recent breakthroughs, some important aspects of the biology and epidemiology of these pathogens are still unknown: how do they persist after harvest? what triggers an epidemic? why does epidemic intensity vary greatly between years? why are these diseases so difficult to control sustainably? Recently developed powerful genetic markers show that the pathogen populations are constantly evolving and are subject to repeated biological invasions by novel genotypes. Such genetic changes may jeopardize the ability to develop durably resistant cultivars and the sustainability of other control measures. It is essential to understand the mechanisms behind the changes and their relation to human intervention (e.g. pathogen transportation with plant material or cropping practice) and to the changing climate.

This was the rationale for establishing 'EuroBlight', a network of European scientists, initially supported by the European Union. EuroBlight is now a vibrant consortium of scientists and industry representatives and has met regularly since 1996 with a simple overall objective: to identify, evaluate and combine the best possible tools to predict, manage and control the pathogen populations in the field. This multidisciplinary approach to the acquisition of knowledge and its timely transfer to farmers through the extension chain is the raison d'être of EuroBlight.

The 14th EuroBlight Workshop brought together 90 participants from all parts of Europe, South America, Israel, China and India. EuroBlight is a unique collaborative platform dedicated to tackling the challenges that early and late blight pose in Europe and worldwide. Major past achievements, such as a comprehensive web-based resource hosting harmonized research protocols and extensive databases allowing the compilation and sharing of data on pathogen populations, host resistance and agrochemical characteristics, constitute some of the tools that the network develops and extends to the whole community of blight researchers and extension specialists

Statements:

Euroblight wishes to draw attention to major issues of relevance to policy making in Europe:

Rapid changes in *P. infestans* populations causing late blight in Europe, America and Asia, including the emergence of strains with altered pathogenicity or reduced fungicide sensitivity have been observed. Constant monitoring of populations and characterization of invasive genotypes in order to understand and predict changes is a prerequisite for the deployment of IPM strategies, as required by Directive 2009/128/EC on the sustainable use of plant protection products. It directly influences the development and deployment of resistant cultivars, the performance of disease warning systems and the efficacy of plant protection products. A coordinated and continuous monitoring effort would be best supported through National Action Plans relating to IPM implementation in EU member states.

Brasov, 2015

EuroBlight
A potato late blight network for Europe

Statements from the 15th EuroBlight Workshop
Brasov, Romania 10-13 May 2015
'Designing sustainable management strategies for early and late blight in potato'

Coordinators: Jens G. Hansen, Alison Lees and Huub Schepers — 25 June 2015

Potato late blight (*Phytophthora infestans*) and Early blight (*Alternaria* spp.) continue to severely damage both the foliage and tubers of potato crops, and also to cause severe losses in other important food crops, such as tomato.

Despite active research and recent breakthroughs, further investigations are still needed to fully achieve integrated pest management (IPM) strategies. Remaining questions include: what are the genotypic (DNA) and phenotypic (behavioural) diversity and the mechanisms of evolution of the European meta-population of *P. infestans*? how can we use this information to develop new innovative and more effective IPM strategies (IPM2.0)? why are these diseases so difficult to control sustainably? how can we sustain the use of both efficient fungicide active ingredients and host resistance genes whilst simultaneously minimising the risk that the pathogen overcomes the efficacy of these important control measures? These, and other, questions were the rationale for establishing 'EuroBlight', a network of European scientists, with initial funding by the European Union.

What is Euroblight?

EuroBlight is a very active consortium of scientists and industry representatives, which has met regularly since 2006 with a simple overall objective: to identify, evaluate and combine the best possible tools to predict, manage and control blight diseases in the field. EuroBlight is a unique collaborative platform to tackle the challenges that early and late blights pose in Europe and worldwide. Its biennial workshops allow key research and extension priorities to be identified and formulated into collective Statements that can serve as the core principles of joint actions and international collaborations to improve IPM strategies.

The 15th EuroBlight Workshop, held in Brasov, Romania in May 2015, brought together over 100 participants from all parts of Europe, South America, USA, Israel and China to achieve this aim.

Major achievements and breakthroughs on past EuroBlight statements

The European-wide monitoring initiative of *P. infestans* populations carried out by EuroBlight partners in 2013 and 2014 (> 2200 isolates collected and genotyped using SSR markers) confirmed that the populations are constantly evolving and that some of them are subject to repeated biological invasions by novel genotypes (read news story about this). Such genetic changes may jeopardize the ability to develop durably resistant cultivars and the sustainability of other control measures. It is thus essential to understand the mechanisms behind the changes and also to their relation to human intervention (e.g. pathogen transportation with plant material or cropping practice) and to the changing climate.

Together with the comprehensive web-based resource developed within EuroBlight i.e. hosting harmonized research protocols and extensive databases allowing the compilation and sharing of data on pathogen populations, host resistance and fungicide characteristics, the research and extension efforts carried out within the network pave the way for the set-up and adoption of 'smart control', IPM strategies for early and late blight in Europe.

Major issues of relevance to policy making in Europe

The recent Europe-wide late blight monitoring initiative demonstrated the value and necessity of constant monitoring of populations and characterization of invasive genotypes in order to understand and predict changes. It directly influences the development and deployment of resistant cultivars, the performance of disease warning systems and the efficacy of plant protection products. A coordinated and continuous monitoring effort would be best supported through National Action Plans relating to IPM implementation in EU member states.

Aarhus, 2017

EuroBlight
A potato late blight network for Europe

16th EuroBlight Workshop
Aarhus, Denmark 14-17 May 2017
'Fostering the sustainable management of early and late blight in potato'

EuroBlight Workshop, Aarhus 2017

Late and early blight, caused by *Phytophthora infestans* and *Alternaria* spp. respectively, severely threaten the foliage and tubers of potato crops and cause losses in other important food crops such as tomato. In Europe, the cost of late blight alone, including control and losses, is estimated at about 900 M€ a year. Despite recent breakthroughs, continued research and extension efforts are needed fully to achieve integrated pest management (IPM) strategies, as required by EU Directive 2009/128/EC.

What are the drivers for pathogen changes and adaptation? How can we work together in Europe and beyond via an effective data management and communication infrastructure? How can we improve existing decision support systems to maximize the effect of host resistance and fungicides whilst mitigating the risk of reduced efficacy of these important control measures due to pathogen change?

What is EuroBlight?

These and many other questions remain the rationale for 'EuroBlight', an ongoing network of approximately 200 scientists and industry representatives, launched with initial funding from the EU. This network has met regularly since 2006 at EuroBlight Workshops with a clear overall objective: to identify, evaluate and combine the best possible tools to predict, manage and control late and early blight epidemics. The EuroBlight network and the associated information system (euroblight.net and databases) is a unique collaborative platform from which the challenges that early and late blight pose can be tackled. Its biennial workshops allow key research and extension priorities to be identified and formulated into collective statements that underpin joint actions and international collaborations for improved IPM strategies. The 16th EuroBlight Workshop, held in Aarhus, Denmark in May 2017, brought together 110 participants from Europe, South America, USA, Africa, Israel and China to share research results and identify current challenges and opportunities.

Major achievements and breakthroughs from past EuroBlight statements

Europe-wide monitoring of *P. infestans* populations, carried out yearly by EuroBlight partners since 2013 (> 5300 isolates collected and genotyped using SSR markers), confirmed that these populations are constantly evolving and can be subject to periodic invasions by novel genotypes. In 2016, several new clonal lineages (notably 36_A2 and 37_A2) suddenly emerged, and early phenotyping suggests that they might be highly aggressive to potato crops. Similarly, surveys of *Alternaria* populations show the progressive expansion of genotypes less sensitive to fungicides. EuroBlight has thus proved its value as a fast-reaction, coordinated infrastructure able to rapidly detect ongoing changes in blight pathogen populations that require a response from all stakeholders including potato breeders, the agrochemical industry, extension services and growers.

A major step towards linking phenotypic and genotypic traits was the successful launch of IPMBlight2.0, a 3-year ERANET C-IPM project, in 2016. Preliminary results, presented during the Aarhus workshop, include the detection and characterisation of new, aggressive clones which may endanger host resistance and the sustainability of other control measures. In view of these recent advances, but also of the current knowledge gaps and urgent issues, EuroBlight members present in Aarhus unanimously support the following recommendations:

Recommendation 1: Monitor populations of blight pathogens

Continue to monitor populations of blight pathogens, as this information is crucial for the optimal deployment of sustainable control strategies.

EuroBlight wishes to continue its involvement in pathogen monitoring in Europe and beyond. However, it recommends that a coordinated and continuous long-term monitoring effort would be best supported through National Action Plans for IPM implemented in EU member states. EuroBlight stresses that such a coordinated scheme which can be easily transposed to other major crop pathogens, should: 1) consolidate an EU (global) network of reference laboratories for pathogen characterisation; 2) improve, harmonise and distribute protocols for sampling, storing and phenotyping isolates, including the development of 'fast phenotyping' methods; and 3) manage and exploit a database and communication infrastructure, so that geo-referenced data on pathogen composition, host resistance and fungicide performance can be evaluated in a European context and additionally, can be integrated with national and regional information systems and DSSs where growers regularly seek information and support.

EuroBlight statement from York

1. **New aggressive genotypes are causing concern – continue global monitoring / global early warning**
2. **New innovative tools, CRISPR, alternatives, GIS, Satellites, in-field sensors, machine learning etc. (IPM3.0)**
3. **Developing participatory, multi-actor, open-science IPM strategies is key for sustainable control of potato and tomato blights**

EuroBlight

17th EuroBlight Workshop
York, United Kingdom, 12-15 May 2019
'Fostering the sustainable management of early and late blight in potato'

EuroBlight Workshop, York 2019

The 17th EuroBlight workshop held in York in May 2019 was attended by 110 scientists and industry stakeholders from 22 countries. The delegates included representatives of similar networks in North America, Latin America, Asia and Africa, thus offering a unique global forum for the review of late blight and early blight. These devastating diseases are adapted to conventional and organic potato and tomato production, crops grown under commercial or subsistence practices and in both developed and developing countries. Under discussion were the striking scientific advances made since the previous workshop in Aarhus (May 2017), and the current challenges and opportunities for improved control and management strategies. Participants of the 17th EuroBlight workshop unanimously adopted the following statements:

Optimal disease management is dependent on understanding the pathogens and their evolution

The emergence of new clonal lineages of the late blight pathogen *Phytophthora infestans* in Europe was presented. Genotypes EU_36_A2 and EU-37_A2 are spreading in north-west regions and replacing genotypes such as EU_13_A2 and EU_6_A1 and over the past 3 years, genotype EU_41_A2 has become established in previously sexual Nordic populations. Progress in genetic characterisation, including typing with SSR markers and genotyping by sequencing of selected effector genes, provide new opportunities to track emergences. The recent spread of older European *P. infestans* genotypes worldwide has also been tracked, including for example the recent discovery of genotype EU-2_A1 in Latin America, eastern Asia and eastern sub-Saharan Africa, with potentially major consequences for disease control.

Population surveys have also been instrumental in understanding the composition of the early blight species complex dominated by *Alternaria solani* and *A. alternata*, and its epidemic dynamics. *A. alternata* is often associated with early attacks, whilst *A. solani* occurs later but has more severe impacts on yield. The use of specific molecular markers to target genes involved in the mode of action of active ingredients such as the strobilurin and SDHI fungicides, which are important for the control of early blight, has enabled a better understanding of the distribution of insensitive isolates in European potato-growing areas. Populations with resistance to more than one mode of action, which are particularly difficult to control, have been identified.

Despite these advances, and new quantitative data on the geographic distribution of major phenotypic traits, critical information which would allow population data to be used for predictive management of pathogen emergence and disease outbreaks is lacking. In particular, the connection between genotypic and phenotypic variation in *P. infestans* remains elusive. Reasons for the rapid changes in population structure are untested, in part due to the absence of accurate curated data on the distribution of fungicide use and cultivar deployment, which would allow quantification of selection in the pathogen population to these drivers.

Recommendation 1: Develop the global genetic landscape

EuroBlight recommends that global efforts to monitor pathogen population changes are continued. Where possible, new markers closely predictive of specific phenotype should be developed. The global data should be compiled and collated into an integrated database along with information on fungicide use and cultivar deployment.

EuroBlight is willing to collaborate with AsiaBlight, Tizon Latino, USABlight and AfricaBlight to build capacity to establish regional infrastructures for continuous population monitoring.

Addition of innovative tools to the blight control toolbox

As pathogen populations are evolving quickly, the arsenal of sustainable control methods is also expanding and this was reflected in an increasing number of presentations in this area. For example, targeted breeding of resistant potato cultivars and the development of biocontrol options either through plant defence stimulation or microbial biological control. Decision Support Systems and risk assessment methods have been improved thanks to cutting-edge technologies including machine learning, in-field sensors and pathogen detection, GIS and satellite data. These innovations are at various stages of development and their use in practice, in some cases, will require changes to production systems.

Recommendation 2: Adopt innovative IPM technologies

Faced with increasingly stringent regulations on pesticide approval and use and a desire to meet Integrated Pest Management targets, EuroBlight strongly recommends that efforts to develop, assess and implement innovative technologies are strengthened.

ECOSOL

Era-Net project

2021-2024

EuroBlight statement from Zoom, 2021

Recommendation 1: *Continue and renew efforts to monitor populations of blight pathogens, their evolution and spread*
Recommendation 2*: Assess, develop and integrate control methods into efficient, tailor-made local strategies through collaborative and participatory research*
Recommendation 3: *Developing a transnational, distributed European research- and e-infrastructure*
Recommendation 4: *Fostering global outreach, cooperation and harmonisation*

EuroBlight
A potato late blight network for Europe

18th EuroBlight Workshop
Held online, 11-12 May 2021
'Fostering the sustainable management of early and late blight in potato'

Coordinators: Jens G. Hansen, Alison Lees and Geert Kessel

Late and early blights, caused by *Phytophthora infestans* and *Alternaria* spp. respectively, severely threaten both the foliage and harvested products (tubers/fruits) of potato and tomato crops in Europe and worldwide. In Europe, the cost of late blight alone, including control and losses, is estimated at about 900 M€ a year. This annual cost exceeds 5 B€ globally.

Despite continuous breakthroughs, further research and extension efforts are needed to fully achieve integrated pest management (IPM) strategies, as required by EU Directive 2009/128/EC and by the priorities of the new Green Deal and Farm to Fork initiatives launched by the EU as part of the Horizon Europe strategic framework programme. This context imposes a set of expectations that can be grouped under three major themes:

- **understand the composition of pathogen population, their genetic evolutions and the biological, climatic and anthropic drivers behind their invasive success;**
- **develop new innovative, effective and sustainable Integrated Pest Management strategies**, consolidating and exploiting population information, improved climate prediction, available control means (conventional pesticides, resistant cultivars, biocontrol options, early detection and warning) and cutting-edge information technologies;
- **provide optimal husbandry of efficient control means** to maximize their benefits whilst mitigating the risk of reduced efficacy of these important control measures due to pathogen change.

What is Euroblight?

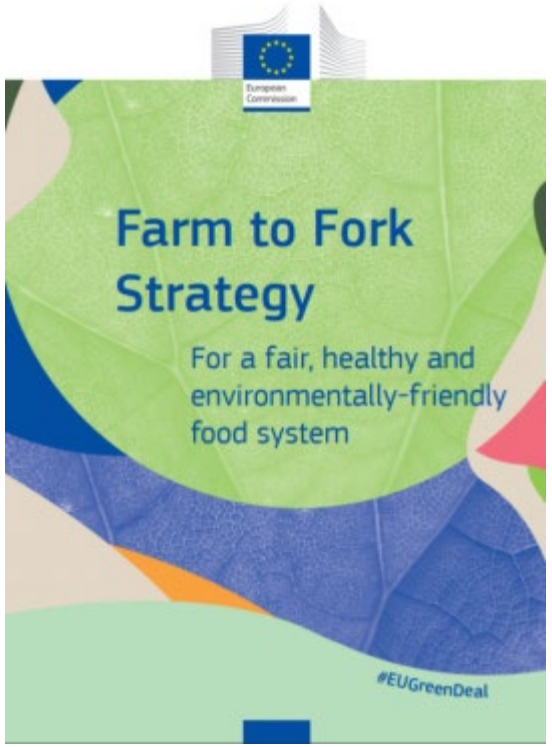
These themes remain the rationale for 'EuroBlight', a very active multi-disciplinary, multi-actor consortium launched with initial funding from the EU and which has met regularly since 1996 with a clear overall objective: to identify, evaluate and combine the best possible tools to predict, manage and control late and early blights. EuroBlight has developed into a unique collaborative platform from which the challenges that early and late blights pose in Europe and worldwide can be identified and tackled. Its biennial workshops allow key research and extension priorities to be identified and formulated into collective Statements that underpin joint actions and international collaborations for improved IPM strategies. The 18th EuroBlight Workshop, held online in May 2021 due to the CoVid19 pandemic, brought together 120 participants from Europe, South America, USA, Africa, and India to share research and identify current challenges and opportunities.

Major achievements and breakthroughs on past EuroBlight statements

Since the EuroBlight workshop in York (May 2019), research and development on late and early blights have remained strong in Europe, and generated both new findings and new initiatives.
Among the **new findings**, let us cite:

- the detection, typing and mapping of new emerging clones, both within as yet clonal populations (EU_36_A2 and EU_37 A2 being the most notable) but also within as yet sexual populations (EU_41_A2, EU_43_A2). The latter emergences are driven by a change in early inoculum sources, with volunteers and dump piles playing a strong role;
- The confirmation of the expanding occurrence of resistance or multi-resistance to some key fungicides in both *P. infestans* (EU_37_A2/fluazinam) and *Alternaria* spp (multiple mutations responsible for resistance to e.g. QoIs) ;
- an increasing interest for resistant cultivars, both in Europe and elsewhere in the world. Most of these resistant cultivars rely on major genes, alone or as pyramids, which raise the question of resistance durability;
- many on-going trials with new and/or integrated control solutions.

Regarding **new initiatives**, EuroBlight members have started several new projects dealing with biocontrol (ECOSOL, SC, DK, FI, ES, DE), management of primary inoculum and dissemination of early infections (SYNAPTIC, F), integrated management of early and late blights (H2020 Organic +), and new technologies for scouting and monitoring infections with drones and sensors. EuroBlight also maintained its efforts for population surveillance, fungicide assessment against tuber and foliage blight, and launched similar trials and protocols for early blight control and for biocontrol solutions.



From Farm to Fork

Our food, our health, our planet, our future

European Commission

A healthier and more sustainable EU food system is a cornerstone of the European Green Deal

Make sure Europeans have access to healthy, affordable and sustainable food

Tackle climate change

Protect the environment and preserve biodiversity

Ensure a fair economic return in the supply chain

Increase organic farming

"The coronavirus crisis has shown how vulnerable we all are, and how important it is to restore the balance between human activity and nature. At the heart of the Green Deal the Biodiversity and Farm to Fork strategies point to a new and better balance of nature, food systems and biodiversity; to protect our people's health and well-being, and at the same time to increase the EU's competitiveness and resilience. These strategies are a crucial part of the great transition we are embarking upon."

Frans Timmermans, Executive Vice-President of the European Commission

2030 targets

Pesticides in agriculture contributes to pollution of soil, water and air.
The Commission will take action to **reduce the use and risk of chemical and more hazardous pesticides by 50%**

The **excess of nutrients** in the environment is a major source of air, soil and water pollution, negatively impacting biodiversity and climate. The Commission will act to

- **reduce nutrient losses by at least 50%**, while ensuring no deterioration on soil fertility
- **reduce fertilizer use by at least 20%**

Organic farming is an environmentally-friendly practice that needs to be further developed.
The Commission will help the EU's organic farming sector to grow, with the goal of **25 % of total farmland being used for organic farming by 2030.**

Structure of the day – 11 May - and agenda

13.00-13.30: Reporting from EuroBlight

- Welcome / Jens, Alison and Geert / 15 minutes
- EuroBlight physical workshop in 2022 / Karen and Tomke / 10 minutes
- Presentation of the program and Zoom rules / Jens / 5 minutes

13.30-14.30: Reporting from USABlight, Tizon Latino Blight and AsiaBlight, Chair: Jens G. Hansen. Moderator Alison Lees

- Report from USABlight / Jean Ristaino /10 Minutes
- Report from Tizon Latino Blight / Ivette and Florenzia / 10 minutes
- Report from AsiaBlight / Jorge Andrade / 10 Minutes
- Discussion about regional and global issues / all / 30 minutes

Coffee break

15.00-15.45: Report from subgroup: European *P. infestans* monitoring initiative - Results from 2020 and campaign in 2021: Chair: David Cooke, JHI. Moderator: Geert Kessel, WUR

- Report from subgroup meeting 16 March / David Cooke /10 Minutes
- Insights from EuroBlight 2013-2020 *P. infestans* populations / David Cooke / 15 Minutes
- EuroBlight monitoring 2021 sampling strategy and use of the Blightracker App and associated dashboard / David Cooke and Jens G. Hansen / 10 minutes
- Discussion / 20 minutes

15.45-16.30: Report from subgroup: New control strategies in the context of the EU Green deal - Farm to Fork strategy: Chair: Geert Kessel, WUR. Moderator: David Cooke, JHI.

- Report from subgroup meeting 23 March / Geert Kessel /10 Minutes
- *P. infestans* in resistant potato cultivars, genotyping and phenotyping / Geert Kessel / 15 Minutes
- Introduction to ECOSOL / Alison Lees / 10 minutes
- Discussion / 20 minutes

Questions via the Chat – Close microphone when not speaking – Close video when meeting starts

Structure of the day – 12 May - and agenda

13.00-13.45: Reporting from subgroup: Alternaria subgroup meeting

Chair: Hans Hausladen, TUM. Moderator: Pieter Vanhaverbeke, PCA

- Report from subgroup meeting 13 April / Hans Hausladen /10 Minutes
- Challenges in controlling Early blight / Nicole Metz / 10 Minutes
- Future activities / Hans Hausladen / 10 minutes
- Discussion / all / 15 minutes

13.45-14.30: Report from subgroup: Fungicides and biologicals

Chair: Bert Evenhuis, WUR. Moderator: Karen Sullam, Agroscope

- Report from subgroup meeting 30 April / Bert Evenhuis / 20 Minutes
- Protocol for Bio EuroBlight in an ICM context / Bert Evenhuis / 15 minutes
- Discussion / 20 minutes

Coffee break

15.00-15.45: EuroBlight statement and future prospects

Chair: Jens G. Hansen, AU. Moderator: Didier Andrivon, INRAE

- Presentation of the draft EuroBlight statement 2021 / Didier Andrivon / 20 Minutes
- Discussion / 25 minutes
- Wrap up / major conclusions / agreements / initiatives / what is next / Jens, Alison and Geert / 20 minutes

Questions via the Chat – Close microphone when not speaking – Close video when meeting starts