



Late blight and early blight, caused by *Phytophthora infestans* and *Alternaria* spp., respectively, continually threaten the yield and quality of potato and tomato crops in Europe and worldwide. In 2022 and 2023, new aggressive and multi-virulent variants of *P. infestans* with resistance to important fungicides spread in Europe and are now found in eight European countries. Restrictions on pesticide use and approval, a lack of new, effective and eco-friendly solutions and the slow rate of introduction of alternatives to pesticides exacerbate concerns. A paradigm shift from a traditional approach of managing individual diseases to a holistic approach to crop health (from Integrated Pest Management (IPM) to Integrated Crop Management (ICM) is needed.

During this transition phase, which requires a collective stakeholder approach, EuroBlight provides a unique collaborative platform - to discuss and propose solutions to the challenges that early and late blight pose. EuroBlight's biennial workshops held since 2007 allow key research and extension priorities to be identified and formulated into collective statements that underpin joint actions and international collaborations for improved IPM/ICM strategies. The 20<sup>th</sup> EuroBlight Workshop, held in De Werelt (the Netherlands) 13-16 May 2024, brought together 110 participants from Europe, South America, USA, and Africa.

The overall objective of EuroBlight is “To identify, evaluate and combine the best possible tools to predict, manage and control late and early blight as part of a sustainable ICM strategy”. In line with this objective, and based on the evidence and discussions coming from the Workshop, this paper expresses five ‘recommendations for action’ aligned with the [EuroBlight vision and strategic plan](#).

#### Recommendation 1:

*Coordinate disease surveillance characterization of the pathogens and the dissemination of these results.*

**Resistance to both CAA and OSBPI fungicides was reported in 2023, a high blight risk season, and this resulted in severe disease outbreaks and crop losses. This resistance emerged in strains of the *P. infestans* clonal lineages EU43 and EU46 which have spread dramatically in Europe over the last two years. Information regarding the threat did not appear to reach all growers. The combination of fungicide resistance and unprecedented wet weather is driving further severe epidemics in important potato production areas in 2024. There is thus an urgent need for a rapid response from the EuroBlight community. To protect crops, we must be responsive, work together to generate good data and disseminate this in a coherent and systematic manner. As EuroBlight has no funding this collaboration must be based on coordination and obtaining synergies between ongoing projects and existing organizations and infrastructures.**

*EuroBlight will:*

- *Continue its long-term role in disease surveillance and population monitoring with additional aims of 1) contributing to the design of assays for rapid scoring of CAA and OSBPI SNPs alongside targeted genomic sequencing for new marker discovery 2) more rapid genotyping towards real-time reporting 3) Initiation of a Pan-European virulence monitoring program in collaboration with the IPMorama project and relevant public/private partners. 4) Organising a network of trap nurseries for structured isolate sampling, “Hunting the new” (breakdown of R-gene combinations) and indication of the annual disease pressure across Europe.*
- *Facilitate networking between labs, carry out alignment of methods and equipment, sharing of data and tools i.e. marker development, genotyping and phenotyping, use of data science tools, exchange and training of students and staff.*
- *Stimulate partners to make data and knowledge available in a timely manner and on-line for the collaborative development of new early warning tools and services such as a Vulnerability Mapping Tool combining host, pathogen and environmental data at the landscape level. The output will include maps and charts indicating the spread and evolution of new variants of *P. infestans* e.g. detected by SNP markers.*

#### Recommendation 2:

*Accelerate breeding efforts for resistance to new pathogen races.*

**Breeding of resistant cultivars is essential for future sustainable potato production - so is diversification of cultivar choices and the effective deployment of R-genes at a landscape level. For R-genes to remain effective for as long as possible, there is a need to coordinate the release of cultivars with single and multiple R-genes.**

*EuroBlight will facilitate collaboration between breeding and pathology, and:*

- *Establish a framework to test breeding material against new emerging variants of pathogens under controlled conditions.*
- *Work together to operate a Pan-European virulence monitoring network (see also Rec. 1).*
- *Stimulate sharing of data and results from trap nurseries, field nurseries and data from the official variety testing in the EU (VCU).*
- *Stimulate actions to increase and coordinate research on host pathogen interactions at the molecular level to understand and prevent breakdown of resistance by pathogens.*
- *Establish a EuroBlight subgroup dealing with novel breeding approaches targeting late blight resistance, to stimulate collaboration and coordination of R-gene stewardship among public/private partners.*

#### Recommendation 3:

*Coordinate assessment of the epidemic potential of new emerging variants of the pathogen.*

**EuroBlight recognizes that there is a need to monitor the stability of resistances and virulence in time and space - in the field, in the lab and via modelling. In addition, to understand the evolution of genotypes and phenotypic variants, and apply this information to future IPM/ICM strategies, more emphasis should be put on phenotyping of both *P. infestans* and *Alternaria* spp.**

*EuroBlight will:*

- *Initiate a formal collaboration between labs with expertise and ongoing activities in phenotyping of *P. infestans* and *Alternaria* spp.*
- *Develop and share common protocols for phenotypic assessments under field, greenhouse and lab conditions.*
- *Support development and co-ordination of improved genome-based markers (e.g. effectors) for phenotypic traits.*
- *Setup a FAIR data management infrastructure and contribute to the development of a Vulnerability Mapping Tool (refer to Rec. 1).*

#### Recommendation 4:

*Develop and test IPM/ICM based control strategies in diverse agroecological environments and combine with landscape-based risk and dispersal modelling tools and services.*

**EuroBlight recognizes the need for a shift from IPM to ICM. The ICM approach is considered an expansion of the IPM approach to include the prevention and control of other pests and pathogens, other aspects of wider crop health management, spatial and temporal aspects of pathogen virulence evolution at a landscape scale and the combination of prior single disease DSSs into a single crop management package. Introducing this approach is a huge task that needs collaboration among all stakeholders and acknowledgement that growers are not the only actors with decision making power. For example, processors and retailers make the decisions on which cultivars are grown on a European scale but may not be considering late blight resistance.**

*EuroBlight will:*

- *Contribute to the design of ICM frameworks based on the combination of landscape level monitoring tools and crop specific DSSs using both traditional fungicides and biocontrol methods.*
- *Establish a EuroBlight subgroup on biologicals to prioritise R&D activities aimed at identifying new biologicals, their effective application technologies and incorporation into ICM strategies.*

#### Recommendation 5:

*Rethink fungicide application strategies and disseminate information on fungicide efficacy aimed towards decision making.*

#### Contact

- *Recommend establishing a Pan-European network of living labs (10-15-year horizon) and associated regional stakeholder-driven working groups, to test and demonstrate innovative ICM strategies.*

**The widespread, multiple occurrences of resistance in diverse populations of *P. infestans* and *Alternaria solani* is generating increasing uncertainty among users on the sustainable performance of individual active ingredients and, also of fungicide programs. The development of fungicide resistance and progressive loss of multisite active ingredients to prevent resistance occurring when used in mixing strategies is forcing practitioners to reconsider control programs.**

*EuroBlight recommends:*

- *Avoidance of block applications of products with the same mode of action, but to favour instead alternations and mixed applications to limit selection pressure.*
- *Annual revision of the type of products to be included in the programmes and the number of applications according to disease severity and local pathogen populations identified from field monitoring. Such adjustments may even be needed during the season.*
- *Maintaining as large a portfolio of modes of actions as possible as a prerequisite for these adjusted strategies to deliver sufficient performance over time.*
- *Raising awareness of the fungicide resistance issues experienced by the growers and documented at the EuroBlight workshop. Explaining to the growers about genotype and phenotype to aid decision making on fungicide resistance avoidance strategies.*
- *Updating and amending the EuroBlight fungicide tables to provide the best information for decision making.*

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