

Using Cultivar Resistance to Reduce Fungicide Inputs Against Late Blight

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Food Quality and Safety
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Using Cultivar Resistance to Reduce Fungicide Inputs Against Late Blight

The late blight resistance of a cultivar offers the greatest potential for reducing fungicide use in integrated control strategies

Where there is strong demand from consumers, retailers or governments for less fungicide input or even no input at all (organic agriculture), the late blight resistance of a cultivar provides an important tool to achieving it. Indeed, this element of the integrated control strategy offers the largest potential for reducing fungicide input. Both partial resistance (lower susceptibility) and fungicides can slow down the development of late blight, and many reports show that partial resistance in the foliage can be used to complement fungicide applications, cutting fungicide use through reduced application rates or extended intervals between sprays.

Resistance for widely grown varieties

In Western Europe, resistant cultivars are not grown on a large scale because commercially important characteristics such as quality, yield and earliness are usually not combined with late blight resistance in the same cultivar. From the grower's perspective, savings in fungicide input using resistant cultivars are no compensation for the higher (perceived) risk from blight. In countries where fungicides are not available or very expensive, the use of resistant cultivars is one of the most important ways to reduce blight damage. In Poland, resistance to viruses is being utilised, though resistance to late blight is not sufficient in the widely grown potato cultivars.

Modern breeding offers potential

Breeders are constantly trying to produce cultivars that combine commercially important characteristics with late blight resistance: either by conventional breeding using crossing and selection or using GMO techniques. It is a method that may be more acceptable to the public than transgenesis. Cisgenesis is the genetic

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EUCABLIGHT
Potato Late Blight Network For Europe

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EUCABLIGHT - 'A Late Blight Network for Europe'

The European Concerted Action on Blight, or, 'EUCABLIGHT' (A Late Blight Network for Europe) as it will be known, will be co-ordinated by The Scottish Crop Research Institute in Dundee, Scotland and will run for 3 years. The Eucabligh consortium consists of a group of 24 European partners from 14 European countries with varied expertise in both host and pathogen research.

The European Union's Concerted Actions are intended to support the co-ordination of RTD tasks already financed at national level where the pooling of data would facilitate common interpretation of facts and contribute to the development of harmonised standards, procedures, methodologies, processes or common research instruments.

The project will be organised in three geographic regions: Western Europe, which will be administered by Didier Andrivon at INRA, Central Europe (Ewa Zimnoch-Guzowska, IJAR) and Nordic Europe (Arne Hermansen NCR1). There are two themes that run across these regions. The first, 'Characterising host resistance' will be led by Leontine Colon at PRI in The Netherlands and the second 'Characterising pathogen variation' by David Cooke at SCRI. The databases and website will be implemented by Jens Hansen at DIAS in Denmark.

The Host

The implementation of integrated control of late blight with reduced inputs of fungicides would benefit if durable blight resistance was more common in commercial potato cultivars. Many sources of resistance exist in wild, primitive and developed cultivars but the nature of that resistance is often poorly understood. This project will use collective expertise, compare existing practices and hence suggest new and standardised screening procedures to allow such rational and objective comparisons of genetic resources.

The available European data on host resistance is fragmented and often the methods used to collect this data are not well documented. We aim to collate the available data into a harmonised and readily accessible database so as to allow breeders and geneticists to compare or exploit sources of resistance in their breeding programmes.

The Pathogen

In an industry striving towards reduced or even zero inputs of agrochemicals the ongoing monitoring of blight populations is an essential tool in the effective deployment of host resistance. The effective deployment of resistant commercial cultivars creates a "moving target" for *P. infestans*, but such a strategy can only be effective if we understand the existing pathogen population structure and can predict its ongoing evolution. Studies to date have focussed on national isolate collections and a comprehensive pan-European assessment of blight populations is lacking; e.g. there has been no estimate of metapopulation size of *P. infestans* across Europe. In the U.S.A., a standardised naming system for strains on the basis of molecular (RGS7 and mtDNA) and phenotypic data was adopted. This has proved useful in following the distribution of strains and hence monitoring of the US blight population structure. Sexual reproduction is blurring the boundaries between such well-defined strains and a raft of new co-dominant markers need to be applied to meet this challenge. Ideally, such markers will be appropriate for the analysis of isolates of diverse origin. There is clear need for European standardisation and a dissemination process that will foster international collaboration firstly

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EUCABLIGHT site contains information on resistant cultivars and the pathogen population (harmonised protocols and results)

modification of a recipient plant with a natural gene from a crossable - sexually compatible - plant. Besides the technique of inserting the desired gene, it does not contain antibiotic resistance marker genes or strong promoters originating from unrelated organisms.

Testing for resistance

Another barrier to the use of resistant cultivars is the risk that resistance is not durable. Especially with the sexually reproducing population of *P. infestans*, the risk for breaking the resistance could be increased. The stability of resistance is very important. In many European countries cultivars are tested for resistance to late blight and it is important to know how frequently these tests are updated. It is recommended that the harmonised protocols developed in EUCABLIGHT are used to test resistance and stability of resistance. The resistance genes used in cultivars are not known. It is also difficult to find information on the use and distribution of resistant cultivars.

Sources of information

Information regarding the late blight population, the present status of cultivar resistance and the fungicide strategies to make optimal use of existing resistance in commercially interesting cultivars can be transferred to other European potato growing areas. The EUCABLIGHT (www.eucablight.org) website contains a lot of this information. In France resistance is monitored during the season so information can be applied in Integrated Pest Management (IPM) control strategies during the same season. In most Decision Support Systems, resistance is taken into account. To make better use of resistance it is recommended that the influence of resistance on the epidemic is described in a better way, so the IPM control can be adapted accordingly.

Areas and blight resistance of the most grown ware potato cultivars

Note: The first number between brackets refers to the foliar resistance level to late blight according to the National Variety List, the second number to the level of tuber resistance.

	Netherlands (2006)	France (2006)	Denmark (2007)	Poland (2004)	Italy
1	Bintje (3 4.5) >7000 ha	Bintje (3, 3)	Sava (4.5, 8) 4500 ha	Vineta (2, 4)	Junior, Konsul, Carrera, Imola, Kuroda, Cosmos, Escort - Region: Emilia Romagna, 7018 ha
2	Agria (5.5, 7.5) 5000-6000 ha	Charlotte (6, 6)	Saturna (4.5, 6.5) 3000 ha	Satina (3, 5)	Alcmaria, Arielle, Berber, Inova, Konsul - Region: Campania
3	Fontane (4.5, 6.5) 4000-5000 ha	Monalisa (6, 5)	Ditta (5.5, 7) 1500 ha	Denar (3, 4)	
4	Innovator (8, 7) 3500 ha	Agata (4, 8)	Folva (3.5, 4) 1500 ha	Lord (3, 4)	
5	Lady Olympia (3, 5) 3000-3750 ha	Amandine (4, 4)	Bintje (2.5, 2.5) 1000 ha	Irga (2, 4)	
6	Premiere (2.5, 5) 2500-3000 ha	Caesar (5, 8)		Velox (2, 3)	
7	Ramos (3.5, 7) 2900 ha	Marabel		Bryza (4, 4)	
8	Asterix (5, 8.5) 2300 ha	Nicola (4, 6)		Sante (4, 4)	
9		Saturna (5, 7)			

Inzet rasresistentie ter vermindering van fungicidengebruik tegen aardappelziekte

Samenvatting

Resistentie van een ras tegen aardappelziekte maakt het mogelijk minder fungiciden in te zetten. Gedeeltelijke resistentie (waardoor geringere vatbaarheid) en fungiciden kunnen allebei de ontwikkeling van aardappelziekte vertragen. Uit veel rapporten blijkt dat gedeeltelijke resistentie in het loof kan worden benut ter ondersteuning van fungicidetoepassingen. Dit resulteert in een lager fungicidenverbruik door lagere doseringen of door langere intervallen tussen bespuitingen. Het gebruik van resistente rassen in Europa is verschillend. In West-Europa worden resistente rassen niet op grote schaal geteeld omdat commercieel belangrijke eigenschappen zoals kwaliteit, opbrengst en vroegheid meestal niet samen met resistentie tegen aardappelziekte in één ras verenigd zijn. Maar in landen waar fungiciden niet beschikbaar of erg duur zijn, is de inzet van resistente rassen één van de belangrijkste manieren om schade door aardappelziekte te beperken. Veredelaars proberen voortdurend rassen te produceren die commercieel belangrijke eigenschappen combineren met resistentie tegen aardappelziekte via conventionele veredeling of via genetische modificatie. Het gebruik van cisgenese - genetische modificatie met gebruikmaking van een natuurlijk gen van een kruisbare plant - wordt mogelijk gemakkelijker maatschappelijk geaccepteerd. De duurzaamheid van de resistentie blijft echter een belangrijke barrière, die moet worden getest volgens de EUCABLIGHT's geharmoniseerde protocollen. Deze folder onderzoekt de huidige situatie in Europa, de vooruitzichten voor verdere vooruitgang en informatiebronnen voor adviseurs en telers.

Voor nadere informatie kunt u contact opnemen met:

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Over ENDURE

ENDURE is het Europees Netwerk voor de Duurzame Toepassing van Gewasbeschermingsstrategieën. ENDURE is een 'Network of Excellence' (NoE) met twee hoofddoelstellingen: herstructurering van Europees onderzoek en ontwikkeling op het gebied van gewasbeschermingsmiddelen en het ontwikkelen van ENDURE tot wereldleider in de ontwikkeling en toepassing van duurzame bestrijdingsstrategieën door middel van:

- > Opbouw van een blijvende onderzoeksgemeenschap op het gebied van gewasbescherming
- > Eindgebruikers voorzien van een bredere reeks korte-termijn oplossingen
- > Ontwikkeling van een holistische benadering van duurzame gewasbescherming
- > Volgen van en informeren over veranderingen in het gewasbeschermingsbeleid.

Achttien organisaties in 10 Europese landen hebben zich voor vier jaar verbonden aan ENDURE (2007-2010), met financiële steun van het Zesde Kaderprogramma, prioriteit 5: Voedselkwaliteit en Veiligheid, van de Europese Commissie.

Website and ENDURE Information Centre:

www.endure-network.eu

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