

Managing the risk of early blight (*Alternaria* species)

Alternaria species

Two species of *Alternaria* can cause early blight in potato crops in GB – *Alternaria solani* and *Alternaria alternata*. These species cannot be differentiated in the field. *Alternaria solani* is more easily controlled with a range of fungicides than *Alternaria alternata*.

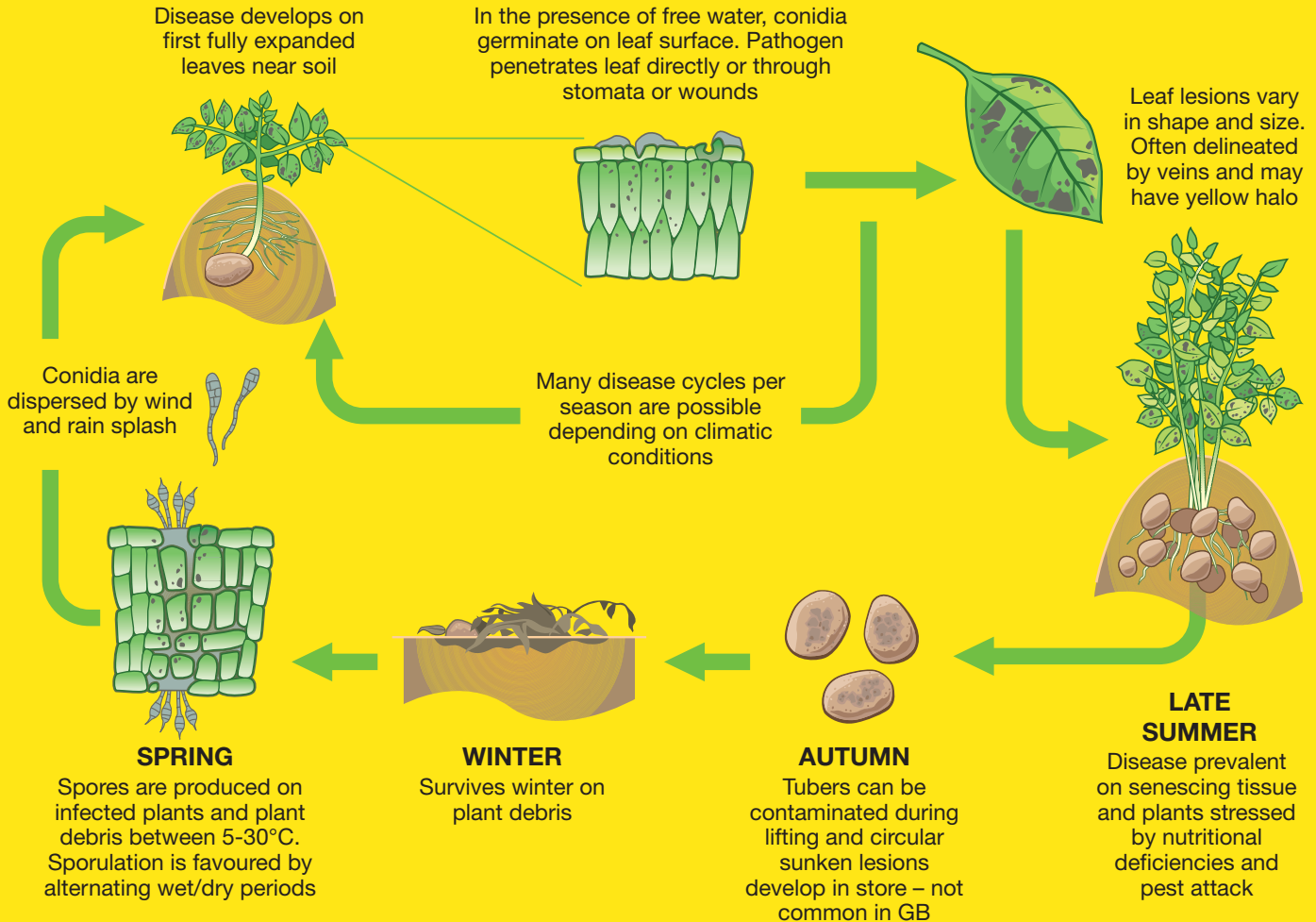


Image courtesy of John Keir



Image courtesy of John Keir

Life cycle of *Alternaria* spp.





RISK FACTOR

Potato variety

Weather conditions

Crop stress

Use of late blight fungicides with no activity against *Alternaria* spp.

Early blight, caused by *Alternaria* species (spp.), was previously considered to be a risk only to potatoes grown under a warmer, continental climate. Indeed, early blight is the most significant foliar disease of potatoes in the USA, Asia and Africa. Recently, early blight has become far more widespread in mainland Europe, Scandinavia and, increasingly, in GB.

It has always been possible to find *Alternaria* spp. lesions on GB potato crops, although the disease did not develop early or severely enough to affect crop yield or quality. However, in the warmer summers of 2010 and 2011, earlier and more severe effects of early blight were observed on several crops of susceptible potato varieties.

Several factors may have led to increased incidence of early blight in GB potato crops:

- Climate change, resulting in warmer summers
- Growing of more susceptible potato varieties
- Decreased use of broad-spectrum fungicides for the control of late blight (*Phytophthora infestans*)

This technical note summarises the limited knowledge available for the control of *Alternaria* spp. in GB. Data derived from GB trials has been used in preference to other work because fungicide active ingredients, potato varieties and species of early blight occurring in these trials are particularly relevant to the GB situation.

To avoid confusion with late blight, 'early blight' will be called *Alternaria* spp. in this publication.

Managing the risk of early blight

There are no varieties with proven resistance to the disease, as plant breeders have not considered *Alternaria* spp. as an important factor for breeding GB varieties. However, there are varieties which consistently show increased susceptibility to *Alternaria* spp.

Apart from the known highly susceptible varieties there is only limited data for other GB varieties. Highly susceptible varieties include: Markies, Vivaldi, Melody and King Edward. Varieties exhibiting less damaging symptoms include: Ramos, Fontane, Saturna, Orchestra, Hermes, Sassy, Lady Rosetta, Estima, Saxon, Victoria and Shepody.

A combination of hot (>25°C), dry weather and periods of leaf wetness favour *Alternaria* spp. – see disease life cycle overleaf. European models based on leaf wetness and air temperature are being evaluated in GB to assist with fungicide timing and spray intervals.

Crops under **nutrient stress** are particularly at risk of *Alternaria* spp. infection.

- Nitrogen is especially important – ensure crops receive sufficient nitrogen.

Crops under **moisture stress** are also more susceptible to *Alternaria* spp.

- Accurate irrigation scheduling based on soil type, evapotranspiration and rainfall is required.
- Attention to soil structure for all crops is essential and especially for unirrigated crops where extensive root systems will mitigate against stress during a dry period. Low spots in a field where drainage is impeded or areas of compaction often show greater levels of *Alternaria* spp. compared with adjacent areas where growth is unrestricted.

Many of the most effective, modern late blight fungicides, which contain the following active ingredients, have no measurable activity against *Alternaria* spp.:

- Cyazofamid
- Fluopicolide
- Mandipropamid
- Propamocarb hydrochloride

Late blight is a far more devastating disease than *Alternaria* spp. in most seasons and the use of these products remains essential during high disease pressure. However, fungicides having activity against both *Alternaria* spp. and late blight should be considered when constructing a late blight programme. These products can be tank-mixed or used in programme with specific late blight fungicides.

Products with dual activity against both *Alternaria* spp. and late blight are as follows:

- Famoxadone
- Fenamidone
- Fluazinam
- Mancozeb

Inclusion of these active ingredients into a late blight control programme will improve control of *Alternaria solani*.

The best levels of *Alternaria* spp. control are obtained from azoxystrobin + chlorothalonil or pyraclostrobin + boscalid. Activity is largely restricted to *Alternaria solani*. It must be noted that these fungicides have very low levels of activity on late blight and should be used in addition to a full late blight control programme. At this early stage in our understanding of *Alternaria* spp. control, the specific fungicides are probably best reserved for the more highly susceptible potato varieties, while the regular introduction of fluazinam and mancozeb into a late blight programme will often provide sufficient protection for less susceptible varieties.

Optimal timing and frequency of fungicide application for *Alternaria* spp. control are still being evaluated. However, because *Alternaria* spp. have many reproductive cycles during a growing season, a one-off spray will not suffice and multiple applications of fungicide will be required. The number of reproductive cycles and therefore the number of fungicide applications will depend on climatic conditions. Hot temperatures will shorten the life cycle, although leaf wetness is still needed for spore germination and leaf penetration. Fungicides active on *Alternaria* spp. perform largely as protectants and prophylactic applications are necessary. Many similarities exist between the way both late and *Alternaria* spp. fungicide programmes need to be constructed.

Blight (*Alternaria* spp.)

Alternaria alternata on Markies



Image courtesy of John Keer

Alternaria solani on King Edward



Image courtesy of John Keer

Pest pressure, particularly potato cyst nematode (PCN) damage, results in a greater incidence of *Alternaria* spp. infection.

Reduce the impact of PCN using cultural and chemical controls (www.potato.org.uk/pcn).

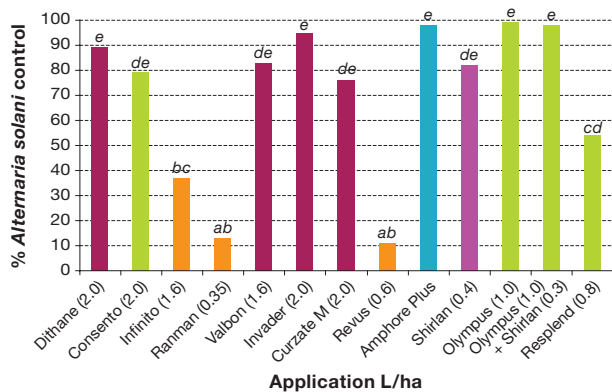
Alternaria solani



Image courtesy of John Keer

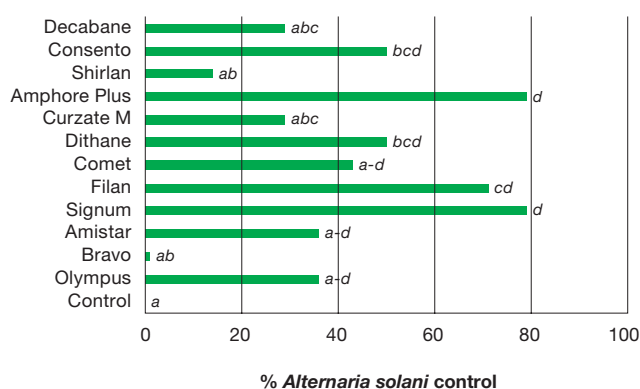
Late blight fungicides for *Alternaria solani* control – 10 applications at 7-14 day intervals

a, b, c, d – any products with matching letters show no statistical difference
Data courtesy of Syngenta UK



The relative efficacy of a range of fungicides for the control of *Alternaria solani* – 2012

a, b, c, d – any products with matching letters show no statistical difference
Data courtesy of Syngenta UK



Product	Efficacy ¹
Azoxystrobin	+++
Fluazinam	(+)
Mancozeb ²	++
Chlorothalonil	+(+)
Famoxadone+cymoxanil	++
Fenamidon+propamocarb	++
Zoxamide+mancozeb	++(+)
Pyraclostrobin+boscalid	++

Euroblight classification of fungicides for the control of *Alternaria* spp. in potatoes

1 Key to ratings:

0 = no effect ++ = reasonable effect
+ = some effect +++ = good effect

2 This rating applies to mancozeb containing products when used at highest dose rates (>1500g/ha). Where less than this rate of mancozeb is used, this rating may not be appropriate, particularly where the second active substance is not effective against *Alternaria* spp.

Symptoms of *Alternaria* spp. infection on potatoes

The two species of *Alternaria* (*Alternaria solani* and *Alternaria alternata*) form lesions of very similar appearance on potato leaves. Diagnosis to species level is only possible by microscopic assessment of the spores, after a short period of incubation in the laboratory.

Alternaria spp. can infect potato foliage from early emergence, through to late senescence. Therefore, symptoms can be found throughout the growing season. During the early season, developing lesions are more likely to occur on the oldest leaves, especially those leaves in contact with the soil surface or parts of a leaflet where free water collects, for example, on cupped leaf margins. Very often, *Alternaria* spp. will only be present at low levels until the onset of senescence. Once senescence has begun, lesions of *Alternaria* spp. can become far more numerous.

Lesions can range from 1-15mm diameter, vary in colour from light brown to a dark grey/brown (with or without a yellow halo) and typically contain a pattern of concentric rings on the uppermost leaf surface. Lesions are almost always randomly scattered over the compound leaf, although the first lesions are often seen where the leaf has been slow to dry. In contrast to late blight (*Phytophthora infestans*), lesions of *Alternaria* spp. are usually limited in their spread by leaf veins.

Alternaria spp. symptoms can be easily confused with nutrient deficiencies and partially controlled lesions of late blight (*Phytophthora infestans*). However, nutrient deficiencies usually show as regular, repeating

Magnesium deficiency



Image courtesy of Scottish Agronomy

Manganese deficiency



Image courtesy of Blackthorn Arable

Late blight



Image courtesy of John Keer

Alternaria solani

Showing lesion development where water has accumulated

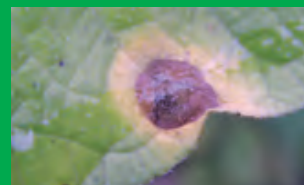


Image courtesy of John Keer

symptoms, whereas *Alternaria* spp. are randomly distributed across a compound leaf.

Although the two species of *Alternaria* are generally indistinguishable in the field, *Alternaria alternata* is considered to be the weaker pathogen and usually requires leaf senescence or a crop stress factor, such as a nutrient deficiency, drought or pest attack before high levels of disease can occur. *Alternaria solani* may affect new, healthy leaf tissue and progress quickly through the haulm of a healthy, vigorous crop.

Tuber infections are very rare and show as necrotic depressions close to the surface. This can be confused with gangrene or late blight.

Alternaria solani spores



Image courtesy of NIAB

Alternaria alternata spores



Image courtesy of Fera crown copyright 2013

Tuber symptoms of *Alternaria solani* infection



Image courtesy of Fera crown copyright 2013



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