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Management of Chocolate Spot (*Botrytis fabae*/*Botrytis cinerea*) in broad beans



Figure 1. Chocolate Spot on broad beans

Action points

- Identification – look for small, chocolate coloured spots, coalescing lesions and aggressive brown patches on leaves. Stem streaking may be present when disease pressure is high.
- Impact – yield losses of up to 50% may be seen in years of high disease pressure and losses of 25% are not uncommon.
- Cultural methods of control and best practice for disease reduction – broad beans should be planted at a maximum of one year in five to avoid build-up of disease.
- Plant crops well away from previous year's bean sites and isolate winter-sown broad beans from spring-sown broad beans. Ensure an adequate supply of soil phosphate and avoid high density plantings.
- Chemical control and best timing – use approved products in tables 1 and 2 and apply as soon as the first chocolate spot lesions are present. A two-spray programme may be necessary when disease pressure is high, particularly in winter-sown broad beans and first pod timing can be particularly important for chocolate spot control.

Background

Broad beans for processing and for fresh market are produced in several areas of the country including Kent, Worcestershire, Norfolk, Lincolnshire, Yorkshire, the Borders and Eastern Scotland. In 2015, around 1,000 hectares were grown for the fresh market and 1,700 hectares for freezing. Harvesting schedules demand a spread of drilling times, some crops for the fresh market are drilled in the autumn, although the majority of the crop for both market and processing range from early March to late May.

Following reports of poor control of chocolate spot in broad beans in 2008 with associated yield losses, Processors and Growers Research Organisation (PGRO) carried out an investigation of approved products to determine best treatment options for growers (AHDB Horticulture FV 355). Work has subsequently been undertaken in field beans to determine the best timing for chocolate spot control (Innovate UK 101082).

Introduction

Chocolate spot affects both broad and field beans as *Botrytis* spores on the leaf germinate and penetrate the leaf surface. Autumn-sown crops can be infected from early spring, particularly following periods of frost damage and during prolonged wet and overcast weather. Spring-sown crops can be affected later in the growing season.

In summers of prolonged wet weather, chocolate spot can cause premature defoliation and severe yield loss in broad beans, due to reduction in the photosynthetic area.

In beans for the fresh market, pod blemishing can result in downgrading of quality and may make the beans unmarketable. Yield losses of around 25% are not uncommon (up to one ton per hectare). Data from trials carried out between 2010 and 2015 have shown that in untreated areas and under high disease pressure, yield can be reduced by up to 50% when compared to a two or three-spray programme.

Because chocolate spot is encouraged by overcast and wet conditions, there is always a proportion of the crop in the UK at risk from infection. Control of chocolate spot is dependent on the application of fungicides as protectant treatments, because once the disease is established, there is little curative control possible. Timing of fungicides should be related to growth stage and disease risk.



Figure 2. Crop effects



Figure 3. Crop effects

Description and life cycle

Both *B. cinerea* and *B. fabae* can be seed-borne but the primary source of infection is from airborne spores that settle on the leaves and germinate to penetrate the leaf surface. Both fungi are very common, especially in areas where beans are grown regularly. Crop debris and volunteers from previous crops provide material for overwinter survival of the disease. The fungus overwinters as sclerotia in the soil, which sporulate and produce conidia in wet conditions. The conidia contaminate the plant organs, causing lesions on the leaves, flowers and stems. Optimum conditions for the development of the fungus are when temperatures are between 15°C and 20°C, and relative humidity greater than 80% is required for conidial sporulation. In dry weather, the fungus does not develop as quickly on the plants.

Early symptoms appear as small, discrete chocolate-coloured spots on the surface of the leaves and, as the disease develops, these spots coalesce to form larger patches on the leaves. These eventually reach the aggressive phase, with lesions sometimes having the appearance of concentric rings in the centre, particularly when conditions of alternating humid and dry weather have occurred. Brown stem streaking may develop and pod surface may be finely speckled or bronzed. Leaves may drop off and plants may lodge.

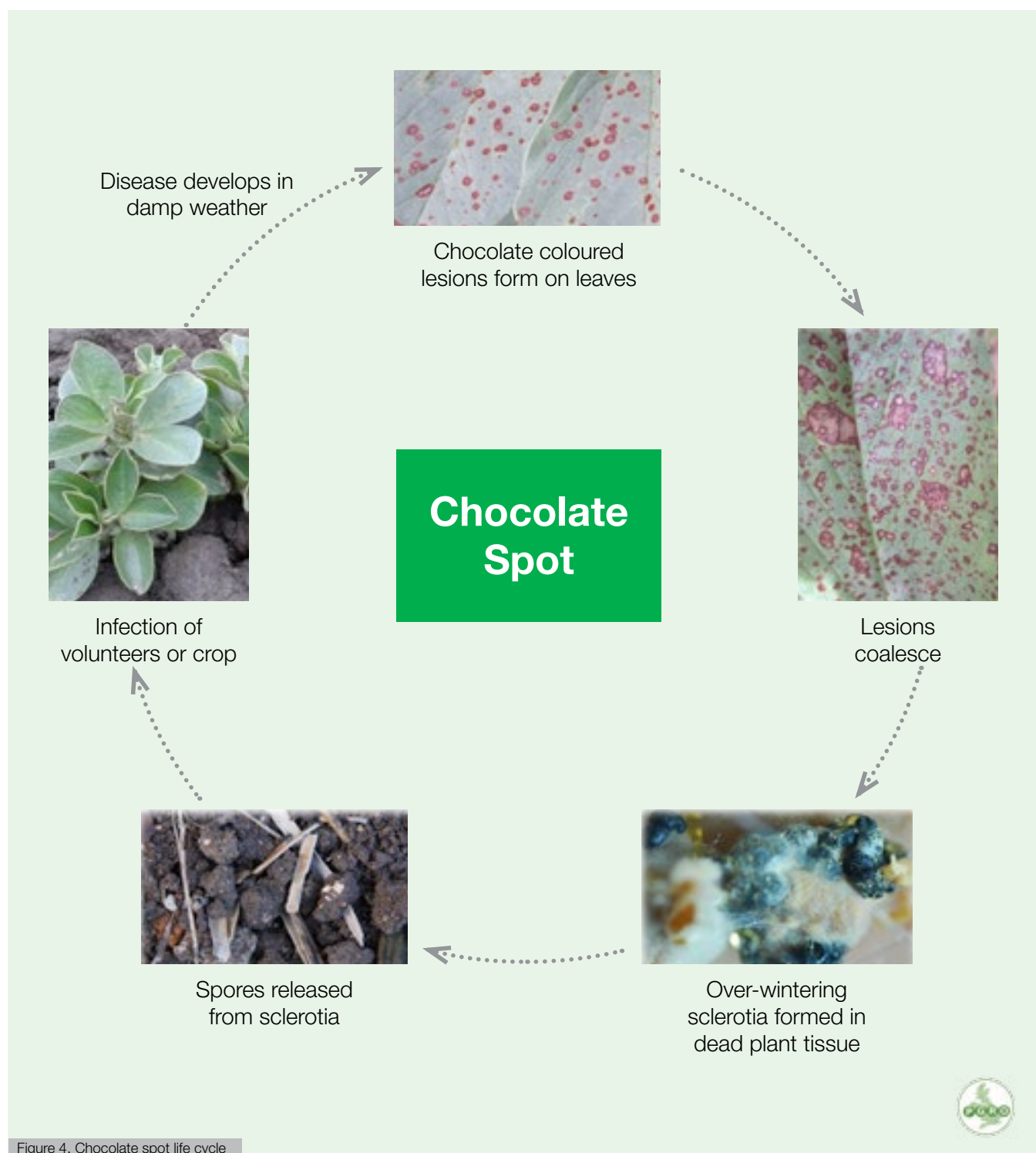


Figure 4. Chocolate spot life cycle





Figure 5. Early chocolate spot lesions



Figure 6. Coalescing chocolate spot lesions



Figure 7. Aggressive chocolate spot

Management and control

Cultural and rotational measures

Winter-sown broad beans are more likely to be susceptible to chocolate spot, particularly when plant population is high, as the disease can be present at low levels for most of the winter before developing in wet spring conditions. Adequate rotation to allow a four year gap between susceptible crops will help to reduce levels of inoculum, as will ensuring that crops are planted well away from sites of previous years' beans and isolating spring-sown broad beans from winter-sown broad beans.

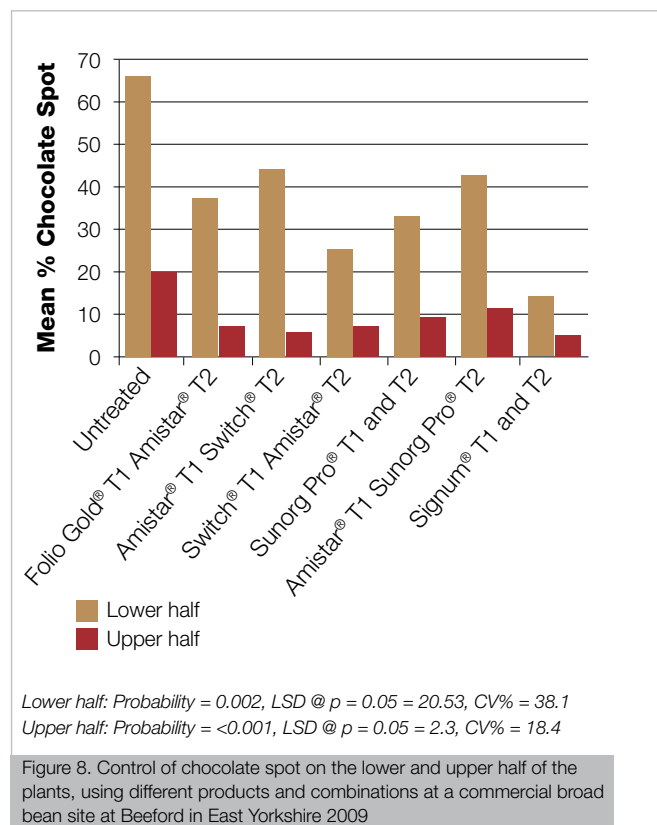
Deficiencies in phosphate in the soil can lead to increased susceptibility of broad beans to chocolate spot, and high density planting will create a more humid microclimate that is suitable for disease development and infection. Avoidance of these conditions will help to prevent disease infection.

Chemical measures

Prompt treatment of chocolate spot is important to achieve sufficient control, as the products that are currently available for broad beans are preventative not curative. Fungicides should be applied as soon as the first chocolate spot lesions are seen on the foliage.

In a project funded by AHDB Horticulture in 2009 (FV 355), three trials were established in commercial broad beans to evaluate fungicides for control of chocolate spot. Crop growth stage and disease progression were monitored at each site and sprays were applied at the current recommended growth stages. The first application (T1) was at early flower or when disease levels had reached 10% and the second (T2) was applied between two and three weeks later. Disease levels were assessed at

three timings during the season and plots were hand harvested to evaluate disease effects on yield. Of the products tested, Signum® (boscalid + pyraclostrobin) applied early or as a two-spray programme, showed effective control of chocolate spot and in some cases gave a statistically significant yield benefit. An alternative programme that gave good chocolate spot control was Amistar® (azoxystrobin) and Switch® (cyprodinil + fludioxonil) in a two-spray programme.



Subsequent work in field beans (Innovate UK project 101082) using the product Signum® has shown that optimum timing for control of chocolate spot in winter-sown beans was at the first pod growth stage. Signum® was applied at full rate (1kg/ha) either as a single application or at a combination of timings, starting at first flower and extending to the pod fill growth stage. In any combination, when the first pod (T2) growth stage application was made, there was a significant reduction in chocolate spot infection and in some cases a subsequent yield increase.

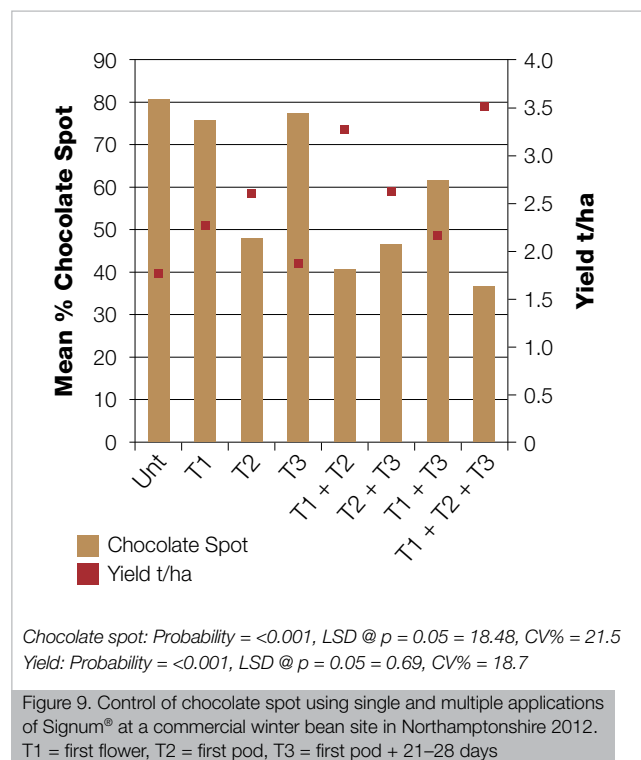


Table 1. Fungicides approved for broad beans that will control chocolate spot

Active ingredient	Product	Harvest interval
Azoxystrobin	Amistar® (*EAMU 2311/03) Life Scientific Azoxystrobin (*EAMU 1407/11)	14 days
Boscalid/pyraclostrobin	Signum® (*EAMU 1009/12)	14 days
Chlorothalonil/metalaxyl-M	Broadsheet Folio Gold®	14 days
Cyprodinil/fludioxonil	Button; Clayton Gear; Reversal; Switch®	14 days (28 days for dry harvest)
Metconazole	Caramba (EAMU 1835/11) Sunorg Pro® (*EAMU 1928/11)	14 days
Tebuconazole	Various with Extensions of Authorisation for Minor Use (*EAMU)	7 days

This factsheet includes information available on the Health and Safety Executive (HSE) website (pesticides.gov.uk), on product labels and in supplier technical leaflets. Please check the HSE website or with an appropriate adviser before using the information as regulations may have changed.

EAMU – Extension of Authorisation for Minor Use.

Growers must hold a paper or electronic copy of an EAMU before using any product under the EAMU arrangements. Anyone using a plant protection product with an EAMU should follow EAMU (or label) recommendations. Use is carried out at the grower's own risk. If specific crop safety information is not available, consider undertaking small-scale tests and/or obtain professional advice before widespread commercial use.

If in doubt about which products are permissible, or how to use them correctly, seek advice from a BASIS-qualified consultant.

*Details of compatibility of plant protection products with biological control agents are available from biological control suppliers or IPM consultants.

Table 2. Biocontrol agents approved for use to control chocolate spot in broad beans

Organism	Product	Harvest interval
<i>Gliocladium catenulatum</i> strain J1446	Prestop (*EAMU 0564/12)	Not stated (latest time of application is pre-emergence or pre-sowing).
<i>Bacillus subtilis</i>	Serenade ASO (*EAMU 0706/13)	0 days

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Further information

AHDB Horticulture Project FV 355 'Broad beans: fungicide programme for chocolate spot control'.

Want to know more?

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