Chocolate Spot Disease in Faba Bean

By Donna Fleury, P.Ag

One of the few diseases of potential concern for faba bean growers in Western Canada is chocolate spot. Known as gray mold or botrytis in most other crops, chocolate spot is caused by *Botrytis cinerea* and *Botrytis fabae*, of which the second is more virulent. The prevalence of the two and the epidemiology has not been confirmed yet in Western Canada. The rapid expansion in acreage over the past couple of years has outpaced research efforts, so there are still many questions to be answered as the research progresses.

Chocolate spot is a concern in most cool-temperate faba bean growing regions around the world. In Australia, where faba beans are well established as a winter crop, chocolate spot is one of the major disease problems and is most aggressive under moderately warm temperatures (10 to 20°C) and humid conditions, particularly at flowering time. Europe is another large faba bean growing area where chocolate spot is also a concern. In Europe the crop is often predisposed to disease because of insect pests that luckily are not a problem in Canada. However, research on connections between lygus bug and pea leaf weevil insect damage on predisposition to chocolate spot infection in faba beans is just starting in Western Canada, led by Dr. Hector Carcamo, Research Scientist with Agriculture and Agri-Food Canada at Lethbridge.

Robyne Bowness, Pulse Research Scientist with Alberta Agriculture and Forestry in Lacombe has been monitoring the disease and is involved in the research projects in Alberta. Bowness notes that in Western Canada, the disease has been mostly at low levels, and even during the mostly wet season of 2014 it was not considered a major economic concern in most areas. By mid-June 2016, disease levels in most areas were still very low in Alberta. In areas where pea leaf weevil is a problem, and the insects are feeding on faba beans, the damage caused by the pea leaf weevil is predisposing the crop to the disease, and it is moving in quicker in these fields. Botrytis is a very opportunistic disease and severity is assumed to be favoured by moderate temperatures (10 to 20°C) and higher moisture conditions.

As for pea leaf weevil in Saskatchewan, the predominate area for the weevil is southwest Saskatchewan, which is not the prime faba bean growing region. Faba beans are better suited to wetter areas of the province, such as the Black soil zone, and therefore the pea leaf weevil is not thought to have much impact on chocolate spot in Saskatchewan. However, Dale Risula, Provincial Specialist, Special Crops, Crops and Irrigation Branch, Saskatchewan Ministry of Agriculture, suggests lygus bug is an insect that can be found in faba bean areas and may predispose the faba beans to chocolate spot infection.

In Saskatchewan by mid-June 2016, chocolate spot disease was not noticed to any great extent, explains Risula. However, Dr. Sabine Banniza with Crop Development Centre at the University of Saskatchewan adds that in 2015 there was also little chocolate spot in June but the disease developed quickly in areas in northeast Saskatchewan after July rains. In the heavily infected areas we did see the benefit of fungicide applications during flowering in Saskatchewan.

Weather does play a major role in both Alberta and Saskatchewan. Moisture and moderate temperatures may make conditions more conducive to the disease, so growers should be monitoring closely as the disease can move in very quickly.
Disease Cycle
Botrytis can overwinter as sclerotia in the soil, in crop debris, and on seed. Spores produced are spread by wind and rain splash within and between crops. Moisture on the plant surface is important for spore germination and infection. The disease builds up rapidly under moderately warm, moist conditions. Once the disease becomes established, it spreads rapidly in the crop and within 4-5 days of infection spores can be produced on infected tissue which initiates secondary infection and further spread of the disease.

Symptoms and Scouting
The symptoms of the disease reflect the name with small chocolate spots on the leaves appearing first. Bowness explains that when symptoms first appear it looks like someone took a paintbrush and splattered paint on the leaves, giving the lower leaves a peppered appearance. The chocolate colored lesions start small, but can start to expand if moisture is available under warmer temperatures, eventually merging so that the whole leaf turns brown. After two or three weeks, the larger lesions will turn gray, looking more similar to botrytis or gray mold in other crops. The disease does produce small sclerotia bodies similar to Sclerotinia sclerotium (white mold). These sclerotia bodies can be found inside the stems of badly diseased plants.

Figure 1. Chocolate spot on leaves of faba bean

Chocolate spot lesions on lower leaves can sometimes be confused with localized herbicide burn. Under warm temperatures herbicide applications can cause small burn marks on the leaves which mimic chocolate spot speckling. Recent lab examinations of these leaves confirmed the absence of any pathogens and it is suggested that adjuvant or contact herbicide burn is likely causing the speckling. With herbicide speckling the lower leaves are affected but the lesions do not spread upward in the plant, nor do the lesions grow together. The speckling from herbicide burn can also be found on other tolerant plants or weeds in the same field.
Control Options
Control options for disease include choosing more resistant varieties, fungicide applications, and planting good quality seed with low infection levels. Varieties available in Western Canada are not currently rated for susceptibility to chocolate spot and are all considered equal in susceptibility. Testing seed for disease levels prior to planting can help reduce the risk of infection at the seedling stage and early disease onset in a field, and should be considered when doing germination tests. Based on lentil recommendations growers should use different seed if levels of botrytis are above 10 per cent on seed.

So far, economic thresholds for fungicide applications have not been established for chocolate spot in faba bean. There are several research trials underway in Saskatchewan and Alberta comparing fungicide options, timing, and economic returns. Once researchers confirm the botrytis species causing chocolate spot in faba beans and gain more information about the disease, timing, and economic returns, an economic threshold can be established to help growers make fungicide decisions.

There are several fungicides registered for use on faba beans, however few actually list control of botrytis or chocolate spot on the label. It is a relatively new disease and the research has not been done for all products as acreage is still relatively small. Bowness explains that sclerotinia and botrytis are similar diseases, so products registered for control of sclerotinia on faba beans may control chocolate spot as well but growers are advised to check with individual companies for product effectiveness. Products registered for botrytis are for control of common gray mold or B. cinerea, so far no products are registered specifically for control of B. fabae.

Examples of products registered for control of sclerotinia on faba beans include Acapela® and Lance®. Priaxor® and Vertisan® are also registered for use in faba beans but for both sclerotinia and botrytis control. However, Headline®, which is registered for faba beans, is not registered for control of sclerotinia or botrytis. Check labels carefully and make sure products are registered for use in faba beans (or broad beans) and are registered for control of sclerotinia and/or botrytis (gray mold) to control chocolate spot disease.
Timing and Application of Fungicide

In most pulse crops, fungicide applications are recommended early- to mid-flower and before the canopy closes. In peas, application is usually recommended at 10-30 per cent flower, which is similar for lentils and chickpeas. However, faba beans are different from other pulses with a much more open and less dense canopy. Faba beans have a more erect growth habit and therefore a more open canopy, so growers can afford to delay spray applications a bit further into flowering to assess their risk and determine whether or not a fungicide application is necessary.

Chocolate spot in faba beans also tend to move in later in the season, and typically is not a concern until later in July or August. If conditions later in the season are dry, disease levels tend to remain low. However, faba beans grown under irrigation or in higher moisture areas should be scouted often as there have been localized early infections when conditions are favorable and the disease can spread rapidly. Chocolate spot can cause flower abortion and pod set if early infection occurs.

Late infections may not affect yield as much as earlier infections but can have a dramatic effect on seed staining and loss in quality. If growers are concerned that the disease may move onto pods later in the season and cause quality losses, then a fungicide application is definitely recommended because growers are paid for faba bean based on quality. Seeds without disease staining and insect marks are considered high quality and may capture higher premiums, especially with types targeted for human consumption.

The majority of faba bean yield comes from pods of the middle flowering nodes followed by pods from lower and upper flowering nodes. It is suggested that the first five flowering nodes (or thereabout) are the ones to protect if early disease infection is expected or evident. Faba bean is considered at full flower when there are flowers open on the first five flowering nodes or racemes. As with any disease, if the disease is present (symptoms of disease on leaves), conditions favour development (moisture and moderate temperatures in the forecast), and the crop is at susceptible stages (flowering and beyond), fungicide application may be beneficial. Timing of fungicide application is still being evaluated in Saskatchewan but is suggested at mid-flowering stages, such as when flowers are open on 2-4 flowering nodes or racemes (Figure 4) to protect yield, when disease is present on the leaves, and if mild humid conditions are forecast. If no disease is present and conditions are hot and dry, then no benefits will be gained from fungicide applications.

Figure 3. Flowers ready to open on fourth flowering node
Chocolate spot can result in flower abortion or poor seed set so monitoring your fields closely and being able to act quickly when symptoms appear is important for protecting healthy tissue. Once tissues become infected there is no way of curing it. As with all fungicide applications, make sure to use higher water volumes and spray pressure to ensure the application gets all the way down to the bottom of the plants. Faba beans are an especially tall and robust crop and chocolate spot may start at the bottom or further up in the lower canopy.

Growers are reminded that faba beans do need some stress for pod formation, so having some level of chocolate spot disease later in the season, which is only attacking and drying down the leaves, can be a good thing. Too much biomass without any stress can result in poor pod formation. Faba beans are a long season crop, so late season disease can help dry down the crop and bring in maturity.