Scouting and Management of

Ascochyta Blight in Chickpea

Introduction:

Chickpea production in Saskatchewan has been limited by a devastating disease called ascochyta blight. Ascochyta blight is caused by a fungus, *Ascochyta rabiei*, and can cause yield losses in excess of 70% if left uncontrolled. Although advancements in agronomic research and variety development have reduced the impact of ascochyta blight in recent years, it remains an important disease that requires careful scouting and management.

Foliar fungicides are a very effective tool used to manage ascochyta blight. However, resistance to fungicides may develop as a result of repetitive use of fungicides belonging to the same chemistry family.

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How to use this guide:

This field guide is designed to assist farmers and agronomists in scouting for ascochyta blight and making important decisions about disease control. Carry this guide into the field and use it throughout the growing season to help support your disease control decisions.

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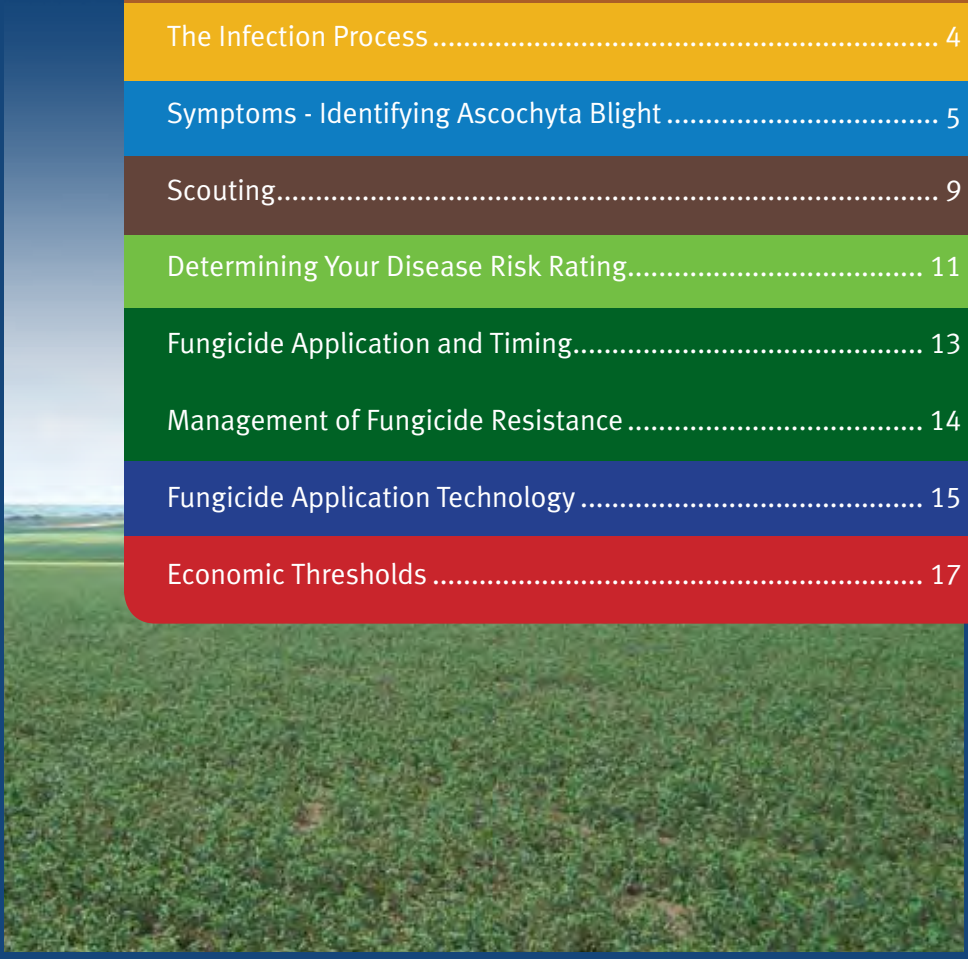
The guide is divided into the following chapters. Use the coloured tabs on the right to quickly find the reference you are looking for:



Integrated Pest Management (IPM):

Integrated Pest Management (IPM) requires a combination of agronomic and chemical practices to keep plant diseases below economically damaging levels. IPM practices reduce the overall dependency on pesticides and help reduce the impact of pesticides on the environment and non-target organisms. Prevention is the key principle in an integrated approach to disease management.

The following are some key elements to a good IPM program for chickpeas:

- Use disease-free seed – specifically seed that is at or below 0.3% *ascochyta rabei* infection.
- Use registered seed treatments when necessary.
- Plant chickpea only once every four years in the same field.
- When selecting a field, choose one that is at least 500 meters away from fields that had chickpea crops the previous season.
- Consider using types and varieties of chickpea that are less susceptible to the disease. Certain types and varieties of chickpea are less susceptible to ascochyta blight than others (see Figure 1). Desi types are less susceptible than kabuli types. Varieties with fern-like leaves (i.e. CDC Frontier, CDC Luna, Amit, CDC Chico) show consistently lower susceptibility than varieties with unifoliate leaves (i.e. CDC Diva, Sanford, CDC Xena) at all growth stages.
- Note that planting within the recommended ranges (kabuli – 38 to 44 plants per m^2 and desi – 44 to 50 plants per m^2) does not appear to have an association with the severity of ascochyta blight in less susceptible varieties.

Chickpea types and varieties: impact of *Ascochyta rabei*

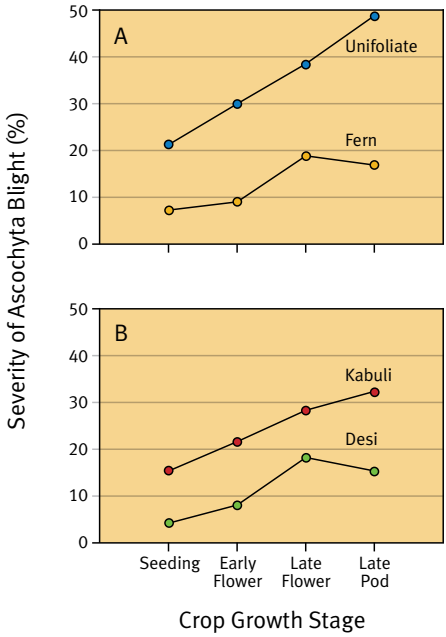


Figure 1.
Severity of ascochyta blight in relation to (A) leaf type (pinnate vs. unifoliate), and (B) variety type (kabuli vs. desi). Data shown are averaged across 3 years and 2 sites. Source: Agriculture and Agri-Food Canada.

For more detailed information on varieties, refer to the most recent version of the Saskatchewan Agriculture publication "Varieties of Grain Crops".

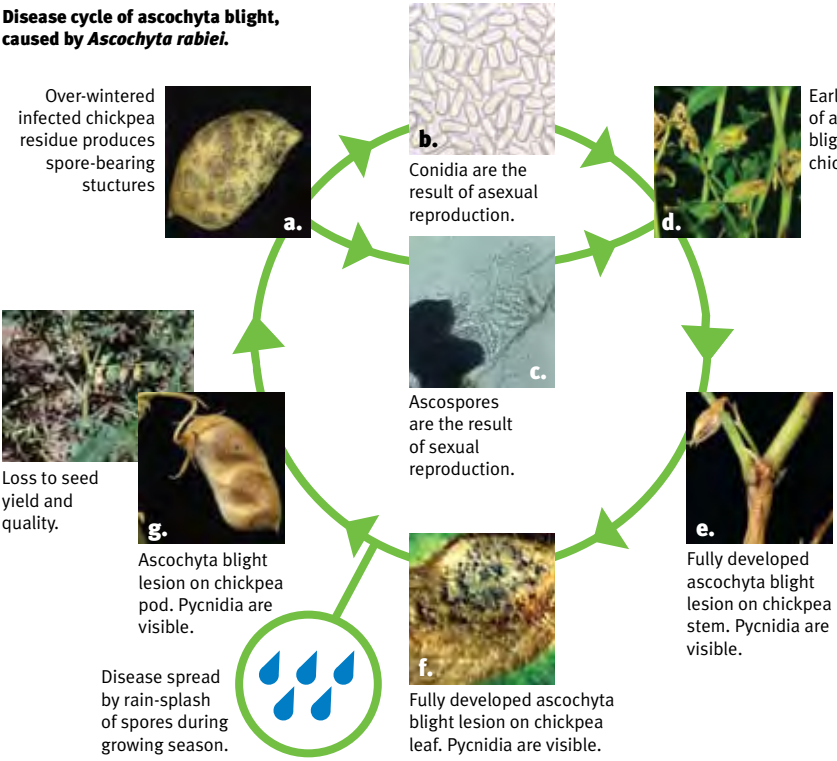
The Disease Cycle of Ascochyta Blight

The pathogen over-winters on infested chickpea residue or in infected seed (a). The pathogen can produce two different spore stages on over-wintered chickpea residue. One spore stage is known as the asexual spore stage and results in the production of **conidia** (b). The other spore stage is the sexual spore stage and results in the production of **ascospores** (c). Ascospores are airborne and can spread in the wind for several miles from infested residue to new fields. This spore type is believed to be responsible for many of the early season lesions. Since ascospores are produced by genetic recombination, the pathogen population can become more genetically diverse. This makes breeding for resistant chickpea varieties a challenge, as well as increases the likelihood of fungicide-resistant strains developing.

Symptoms begin to develop within 4-6 days after the spores have infected the plant (d, e). Disease lesions can occur on leaflets, stems or pods. Conidia are exuded from pycnidia in a sticky spore mass and are spread to surrounding plants during rain-splash (f). Pycnidia and conidia develop readily under humid conditions and are responsible for most of the symptoms observed during the growing season.

Yield and seed quality loss occur as a result of reduced photosynthesis and seed production (g).

Disease cycle of ascochyta blight, caused by *Ascochyta rabiei*.



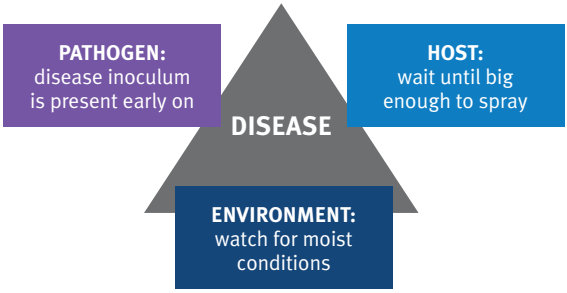
Early Disease Management:

Remember.....ascochyta blight infections from previous years (1) leave disease on the residue the following years (2), which translates to inoculum potential and early infection in the next chickpea crop (3).

The first fungicide application of the season is critical for early ascochyta blight prevention and management.

Research has shown that disease inoculum is present in the crop environment as early as the beginning of May, most likely in the form of ascospores released from previous chickpea crop residue.

This means that the "pathogen" side of the disease triangle is fulfilled even before the "host" crop has emerged.



As long as environmental conditions are conducive for disease development, an early preventative foliar fungicide may be applied as soon as the crop is at the 7-10 node stage, but you may hold off a bit longer if the weather is dry.

It is important to protect chickpea flowers in order to conserve the yield; therefore the first application should occur before flowering.

Scout crops for early signs of disease and follow-up after spraying to gauge the effectiveness of your first fungicide.

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Chickpeas at the 7-10 node stage will be ready for their first fungicide application.

All fungicides will protect against spores entering the plant (protectant activity).

Curative fungicides will also protect against early stages of the incubation period.

No fungicides will protect against disease already established in the plant or once lesions form.

1. Spore Germination

Spores require a minimal amount of moisture from rainfall or dew to germinate. Germination can occur within 4-12 hours depending on temperature. Short periods of dryness (up to 24 hours) will not kill spores and germination will resume once moisture becomes available.

2. Penetration into plant

The germinated spore will grow along the plant surface, then forms an appressorium (e.g. anchor) from which it penetrates the plant. This occurs within 12 to 24 hours.

3. Invasion of Plant Tissue

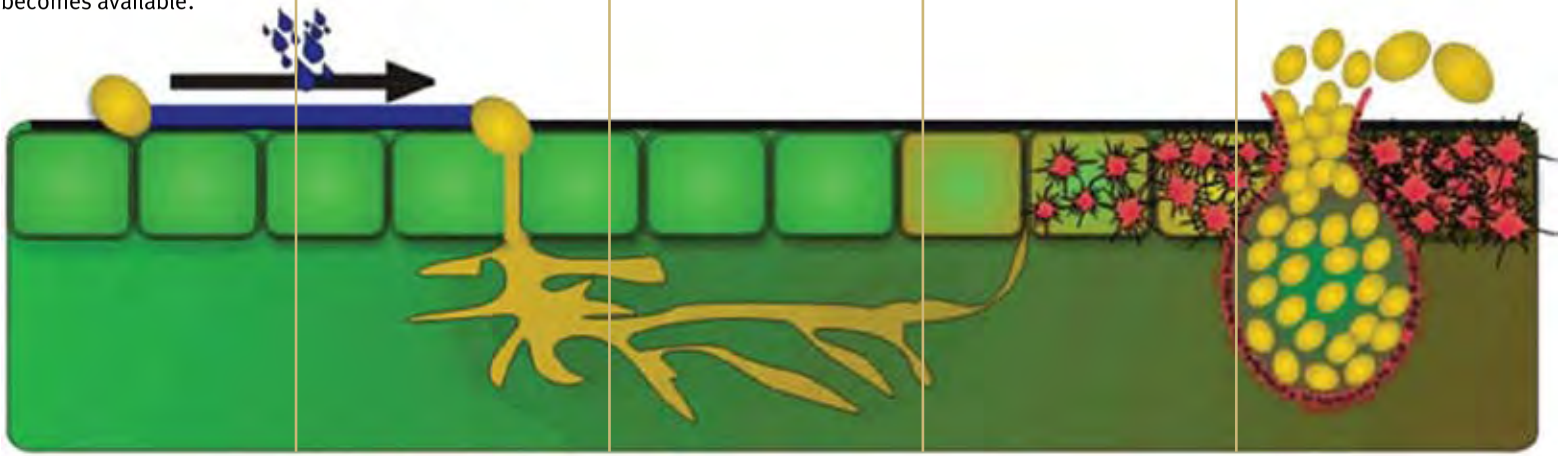
Once inside the plant, the fungus is protected from dry conditions and the effects of most fungicides. This is known as the incubation period (infection has occurred but symptoms are not yet visible).

4. Lesion Development

Once the fungus has successfully invaded the plant, it starts to kill plant tissues, resulting in disease lesions. Symptoms can become visible as early as 4-6 days after spore germination.

5. Release of new spores

Pycnidia form in lesions. Spores "ooze" from pycnidia under humid conditions. Rain-splash is required to transport spores to surrounding leaves and plants. Even small rain showers are sufficient to spread spores.



The Infection Process of Ascochyta Blight

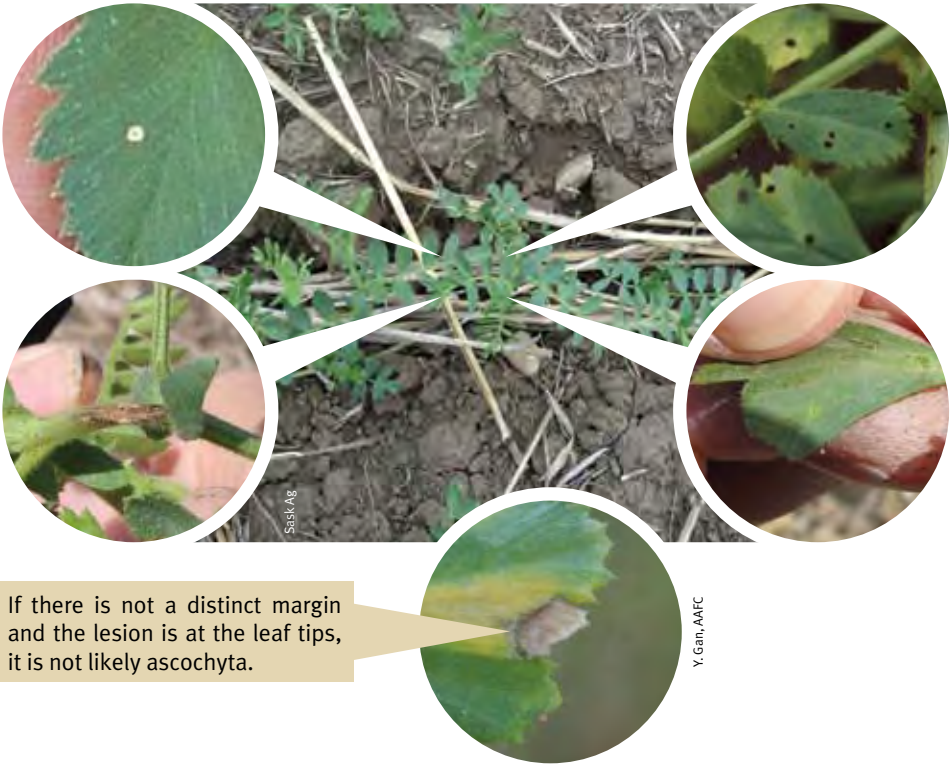
Above is a close-up illustration of a chickpea leaf in cross-section being infected by a spore (from left to right).

Identifying Ascochyta Blight

Ascochyta blight symptoms can be observed in the field as early as the seedling stage and continue to develop into the podding stage. The disease causes lesions (spots of damaged tissue) on any above-ground plant and can lead to leaf death and stem breakage.

Early Symptoms

- Early symptoms are the most difficult to identify but are also the most important. Intervention with fungicides at the seedling stage is necessary to limit disease development for the entire season.
- Early lesions are often only the size of a pinhead and can occur on leaflets or stems.
- Use a magnifying glass to help identify the tiny early lesions.
- Pull plants from the soil in order to get a closer look at leaflets and stems.
- Rub the spots with your thumb to remove any debris. Lesions are imbedded in the leaflet and will not rub off.
- Early lesions may range in colour from light tan to dark brown and will have a distinct margin.



If there is not a distinct margin and the lesion is at the leaf tips, it is not likely ascochyta.

Advanced Symptoms:

Lesions *expand rapidly under humid conditions.*

- **Lesions on leaflets** are usually tan in colour and have a dark brown margin. Pycnidia form inside the developing lesions. A yellow halo usually surrounds the lesion, which indicates the fungus is expanding to attack healthy cells.

G. Chongo, U of S

T. Wolf, AAFC

- **Stem lesions** are more elongated compared to the circular leaflet lesions but are similar in colour and will also contain pycnidia. Stem lesions may be devastating to the plant if they girdle the stem, leading to stem breakage and plant death.

G. Chongo, U of S

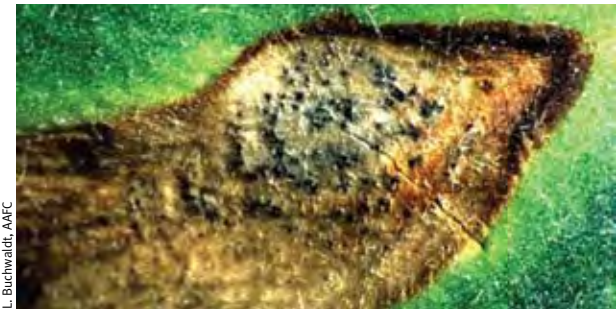
G. Chongo, U of S

- **Pod infections** limit pod development and can lead to discoloured and infected seed, resulting in a loss in grade. Pycnidia may form in concentric rings, giving a bull's-eye appearance to pod lesions.

C. Armstrong-Cho, U of S

G. Chongo, U of S

Pycnidia *(fruiting bodies of the fungus) develop within lesions. Pycnidia are dark brown, round and small, about the size of a ballpoint pen tip. It is within these pycnidia that spores are formed and 'ooze' out under dew or humid conditions.*



L. Buchwaldt, AAFC

Symptoms that are not Ascochyta Blight:

Chickpea is susceptible to other diseases and damage caused by extreme weather conditions, mechanical injury, herbicide injury or insects. It is important to accurately identify the cause of a symptom to make sure that the necessary corrective action is taken. Once chickpea plants are injured, they are more likely to have delayed maturity and be more susceptible to further stresses, including infection by ascochyta blight.

Following are some of the symptoms that may be present when you are scouting the field and could be confused with ascochyta blight.

R. Morrall, U of S

R. Morrall, U of S

Sclerotinia stem and pod rot. Early symptoms (above) vs. advanced rot (right).

B. Briggs, Syngenta

Leaf miner insects feed between the layers of leaves (lentil in this photo) and create frass trails that may be mistaken for ascochyta blight.

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Frost and hail damage. Symptoms include white marks on pods and leaflets, but will not have dark margins or pycnidia. Hail predisposes the plants to ascochyta blight.

G. Chongo, U of S

G. Chongo, U of S

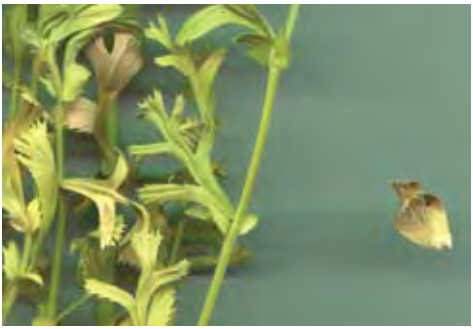
Seed rots and seedling blights. Blights cause yellowing of the seedling and reduced root development.

Imazethapyr herbicide damage. Results in delayed maturity and injured tissue (right); often leads to subsequent blight infection (insert).

Glyphosate drift from neighbouring field causing complete plant death.

Metribuzin herbicide damage; applied past recommended growth stage. Causes white curled leaflets and may lead to ascochyta blight.

Purpling pods and leaves from heat stress.



Drought damage causes leaves to become dry and brittle without characteristic blight lesions.

Wireworm damage causes shredding, wilting, stem lesions, and may burrow into seeds.

Get a second opinion: *If you are unsure about the cause of damage to your crop, ask an agronomist to walk the field with you. Review the field history, herbicide applications, and recent weather events. A plant sample can also be sent to the provincial lab for further analysis.*

Scouting for Ascochyta Blight

Why should I scout for disease?

Scouting for ascochyta blight in your chickpea crop can take time and effort, but is well worth it in the long run. Identifying ascochyta blight early allows time to make a decision regarding foliar fungicide application before the disease can get a foothold in your crop and cause economic loss. Also remember that every crop will be unique because of field history, current agronomics, and exposure to disease inoculum. Therefore, it is very important to scout each of your crops so that they can be managed as needed based on these factors.

Scouting guidelines:

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Early intervention with fungicides is key to managing blight for the entire season.

- Begin scouting your crop at the seedling stage. This is approximately 2 to 3 weeks after seeding and when the plants have emerged and seedling rows are becoming evident (a). Scout every 3 to 7 days during this critical time period.

- Since ascochyta blight is favoured by frequent rain showers and humid conditions, it is important to increase scouting frequency if moist conditions prevail.

- For varieties rated as "fair" resistance, be diligent about scouting during the seedling and vegetative stages. Once the disease is in check and no new symptoms are appearing on new growth, the scouting interval can be increased to 7-10 days.

- For varieties rated as "poor" or "very poor" resistance, you must remain diligent in scouting for new symptoms throughout the growing season.

- Continue scouting until the pod filling stage (b). A fungicide application at the pod stage may not impact yield but could improve seed quality by reducing staining and seed-borne infections if humid conditions occur later in the season. However, once the crop has started to change colour and dry down, there is no benefit to protecting it from disease (Refer to Page 17; Economic Thresholds).

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What if I do not have the time or experience to scout for ascochyta blight? *Crop scouting and disease identification takes time and experience. If you are unsure or want a second opinion, ask an agronomist to walk the field with you.*

How to Scout for Disease:

- Scout field in a W-shaped or large circular pattern, stopping to inspect 5 to 10 sites.
  - Keep your eyes open for discoloured plants and/or small discoloured spots on the leaves.
  - Stop at each site and look down within the crop canopy, remove some plants from the soil, and closely inspect each leaflet and the roots.

- Be most diligent scouting fields at greater risk to disease, such as:
  - Fields that were planted to infected or poor quality seed;
  - Fields that have a short crop rotation or are adjacent to infested crop residue from the previous season;
  - Fields that were planted to a susceptible crop variety; and/or,
  - Fields that suffered from other stresses (poor emergence, herbicide injury, hail damage, etc).

- Also check for areas in the field that are potential "hot spots" for disease, such as:
  - Areas of the crop that may be heavier seeded or have increased fertility (e.g. headlands);
  - Areas where moisture may have accumulated (e.g. hollows or near fence lines); and/or,
  - Areas where plants received damage from frost, wind-blasting, drought, herbicide injury, hail, or other stresses.

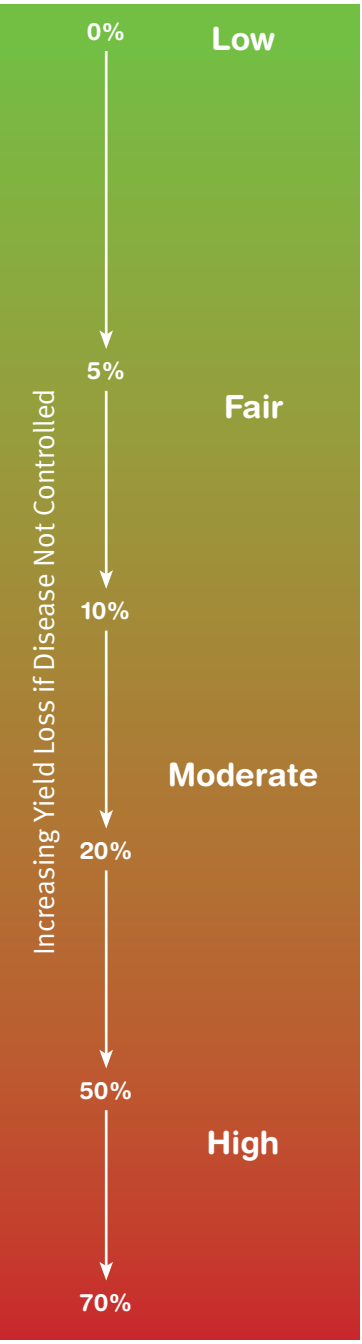
- Use flags or stakes to mark specific areas for regular monitoring during the growing season. This allows you to return to a specific site to look for lesions developing on new plant growth and to determine the effectiveness of your fungicide program.

Determining your Risk Rating:

- Review the following six considerations and assign a risk value to each
- Add up the risk values to create a total risk value
- Use the total value to compare to the risk rating scale on the following page

	Risk Value
1. Field History and Crop Rotation	
a. Crop is being grown in a region that has never had chickpea production	☐ 0
b. Crop is planted on land that has not had chickpea for at least 3 years	☐ 5
c. Crop is planted on land that has had chickpea in the last 2 years; OR is located adjacent to chickpea stubble from the year before	☐ 10
2. Chickpea Variety	
a. Desi variety OR kabuli variety rated as "fair" resistance to ascochyta blight (e.g. B-90 or Amit, CDC Frontier)	☐ 5
b. Kabuli variety that is rated as "poor"	☐ 10
c. Kabuli variety that is rated as "very poor"	☐ 20
3. Level of Seed-borne Disease and Use of Seed Treatment	
a. Seed test indicated no seed-borne ascochyta AND used a registered seed treatment for ascochyta blight control	☐ 0
b. Seed test indicated low levels of ascochyta (< 1%) AND used a registered seed treatment for ascochyta blight control	☐ 5
c. Seed test indicated significant levels of ascochyta blight (5-10%) AND used a registered seed treatment for ascochyta blight control	☐ 10
d. The seed quality is unknown, OR I am not using a seed treatment	☐ 20
4. Presence of Disease Symptoms since last Fungicide Application	
a. No new disease lesions have developed since last fungicide application	☐ 0
b. Disease lesions have developed on new crop growth since last fungicide application	☐ 10
c. Leaf and/or stem lesions have developed and no fungicide has been applied this season	☐ 20
5. Weather Conditions	
a. No rainfall in the past week and short-term forecast is for continued dry weather	☐ 5
b. Weather conditions are unknown	☐ 10
c. Rainfall or heavy dew has occurred during past week	☐ 20
d. Weather is unsettled; thunderstorms are likely	☐ 20
6. Other Crop Health Considerations	
a. Crop emerged well in the spring and there has been no significant weather/injury to crop	☐ 0
b. Crop was seeded very early and was slow to emerge	☐ 5
c. Crop was damaged by early herbicide application or soil-residue	☐ 10
d. The crop has received a light to moderate hail shower in the past 24 hours	☐ 10
TOTAL RISK VALUE (1 + 2 + 3 + 4 + 5 + 6) =	

Disease Risk Categories



Total Risk Value (< 15):

Your risk is low and ascochyta blight should not have a negative impact on your crop if you remain diligent about scouting and applying fungicides when necessary.

Consider the following recommendations:

- Apply fungicide if the crop is at the seedling stage and a fungicide has not yet been applied.
- Delay fungicide application if there has been no new lesion development and there is no rain in the forecast.

Total Risk Value (20 – 45):

Your risk is fair to moderate. Continue to scout for new lesion development as your crop matures.

Consider the following recommendations:

- Apply fungicide if it has been close to 14 days since the last application.
- Delay fungicide if less than 14 days since last application and there is no rain in the forecast.

Total Risk Value (50 – 75):

Your risk is moderate and disease is either increasing in your crop due to favourable weather conditions or because ascochyta blight was established before a fungicide was applied. Some yield loss due to disease will occur.

Consider the following recommendations:

- Apply fungicide if it has been close to 14 days since the last application.

Total Risk Value (> 80):

Your risk is high and ascochyta blight will impact your yield and seed quality.

Consider the following recommendations:

- Apply fungicide if crop is in the flowering to early-pod stages and there is a potential for suitable yield.
- Do not apply fungicide if disease is severe and there is little chance for economic return. Refer to Page 17; Economic Thresholds.

Fungicide Application and Timing:

Research and grower experience have shown that it isn't the choice of fungicide that is important in controlling ascochyta blight, but rather the timing and quality of the fungicide application.

Proper timing of a fungicide application prior to rainfall events is the most esssential practice for effective ascochyta blight control.

Importance of Rainfall:

Rain is important for ascochyta blight in two ways:

- Rain-splashed droplets physically spread the disease within the crop canopy by transferring spores from diseased plant tissue to healthy plant tissue.

- Rain provides the moisture required for spore germination and penetration of the fungus into the plant. The high humidity common in chickpea crops, even in the absence of rain, is also sufficient for spore germination and penetration but will not transport spores from one plant to another as will rain-splash.

How spores infect the chickpea plant:

Refer to Page 4; The Infection Process. An important part of the infection process is known as the incubation period or latent period. It is the period of time between penetration of the fungus into the plant and the first visible disease symptoms. The incubation period for ascochyta blight in chickpea is only 4 to 6 days. This means that symptoms that appear within a few days of a fungicide application were likely the result of a spore that had already successfully invaded the plant.

How fungicides work:

Fungicides work to control disease by creating a barrier on the plant's surface to prevent the spores from germinating and infecting the tissue. All the fungicides registered for control of ascochyta blight in chickpea have this **protectant activity** and are most efficacious if they are applied preventatively, or before the fungus penetrates the plant.

In addition to protectant activity, some of the fungicides registered for control of ascochyta blight have a slight **curative activity**. The curative activity is limited to the early part of the incubation period, only for the first 24 to 36 hours after spore germination and infection. These fungicides have limited systemic movement within the plant tissue and will not be translocated throughout the plant or into new growth. Application must be made within the first 36 hours after a rainfall to provide curative effects. These curative products do not repair tissue that has already been damaged or killed by the fungus.

Longevity of fungicides:

None of the available fungicides will provide protection against disease for longer than 2 weeks. This protection period is shorter when a highly susceptible chickpea variety is grown, when frequent rainfall is received, and/or when the plant has developed new growth. Refer to the product labels for the spray interval recommended for these products. When nearing the end of this time period, watch the weather forecast and be prepared to spray again before a rain event.

Management of Fungicide Resistance:

Some of the products registered for ascochyta blight control belong to the group of fungicides called strobilurins. The risk of developing resistance is high for these products as they have a single mode of action to control the fungus. Resistance developing in fungal pathogen populations to strobilurins is of great concern, as these are valuable, broad-spectrum fungicides. If a pathogen develops resistance to one fungicide in the strobilurin group, it will be resistant to other fungicides in that group.

Multiple applications of strobilurins — regardless of which product — puts increased selection pressure on the ascochyta pathogen population to select for strains of the pathogen that are resistant to all fungicides in this group. If a strobilurin is used repeatedly, the resistance selection is faster.

Analysis of fungal isolates collected from commercial chickpea fields in Saskatchewan found that many isolates developed resistance to strobilurin fungicides.

Loss of effective fungicides due to resistance is very costly to growers as the disease may go uncontrolled and fungicide product options become limited. We are all responsible to ensure judicious use of fungicides and to rotate between fungicide groups.

Consult the current Saskatchewan Agriculture publication "Guide to Crop Protection" for a listing of fungicide products registered on chickpea.

Recommendations for preventing the increase of fungicide resistant fungi:

Adopted from guidelines developed by the North American Fungicide Resistance Action Committee (NAFRAC). For more information on fungicide groups and managing resistance, go to: http://www.frac.info/frac/index.htm

- Rotate the use of a strobilurin product with a non-strobilurin product; OR, use a tank mix of products from different fungicide groups.
- To reduce the portion of resistant isolates in the over-wintering fungal population do not use a strobilurin product as the last application of the season.

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Fungicide Application Technology:


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Research conducted by Agriculture and Agri-Food Canada and the University of Saskatchewan to find ways to improve fungicide application technology is continuing. Here are some results to date:

Water Volumes:

Higher water volumes are critical because water is necessary to ensure thorough coverage of the fungicide over the entire plant canopy. Since fungicides are not fully systemic (e.g. do not have the ability to move within the plant to non-treated tissues), good coverage equals good control. It was found that 80 L/acre (20 gal/acre) provided better disease control than 40 L/acre (10 gal/acre), but similar control as 120 L/acre (30 gal/acre). This effect was more pronounced for fern-leaf varieties compared to unifoliate-leaf varieties.

The recommended water volumes on fungicide labels range from 40-90 L/acre (10-25 gal/acre) for ground application and 16-20 L/acre (4-5 gal/acre) for aerial application. Use the highest water volume if the crop canopy is dense and disease risk is high. A lower water volume can be used when applying fungicide at the seedling stage.

Nozzle Type / Pressure:

Research has shown that nozzle type (e.g. double, flat fan, or air-induced nozzles) does not have a significant effect on ascochyta blight control in chickpea. For fungicides, fine sprays are usually recommended, however fine sprays are more likely to evaporate and drift before they reach their target (especially at high travel speeds). Coarse sprays can provide just as much coverage as long as high water volumes are used.

Use the nozzle type and pressure that will enable the best penetration and coverage of the chickpea canopy. If unsure, you can test your coverage using water sensitive spray papers (available at farm machinery stores that sell nozzles). Place the spray papers down in the canopy. Make sure the droplet distribution looks consistent and satisfactory.

Air vs. Ground Application:

Research has shown that both application methods have advantages and disadvantages, but overall provide similar yields. Ground applications use higher water volumes and provide greater overall coverage, but wheel tracks may reduce yield and can spread disease. Conversely, aerial applications use lower water volumes but do not damage the crop and can cover more area in a timely fashion.


T. Wolf, AAFC

Ground Application.


T. Wolf, AAFC

Sprayer marks from ground application.


T. Wolf, AAFC

Air Application.

Consider paired-row seeding as an alternative planting configuration:

Research conducted by Agriculture and Agri-Food Canada in Swift Current, SK has shown that changing planting patterns from solid rows (i.e., spaced at 20-25 cm between rows) to a paired-row planting (i.e., 25-cm intra-row, and 75-cm between the paired-rows) can decrease ascochyta blight severity in the crop by an average of 16%, reduce use of fungicides by up to 30%, while maintaining or increasing yield by as much as 30% in highly-susceptible varieties.

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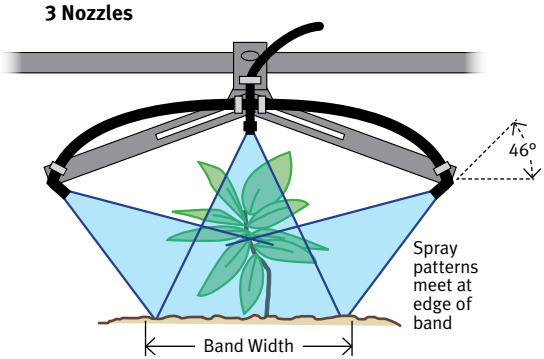
For paired row plantings, results were achieved by using a modified sprayer system equipped with 2 arms and 3 angled nozzles, one on the top and one other nozzle on each side of the plant canopy. The 3-nozzle sprayer provides a uniform coverage and delivers fungicide droplets directly into the lower part of the crop canopy where it is needed most. In conventional solid row planting, about 30-50% of the fungicide droplets are wasted on the bare ground when canopy is open early in the season, and later, when the canopy is closed, fungicide droplets are mainly trapped on the top of the canopy. Some modifications on the drill and sprayer are required in order to implement the paired-row planting.

3 Nozzles



Advice on Calendar Spraying:

Some farmers may feel that disease scouting and watching the weather forecast is very time consuming and would not be as effective as applying fungicide every two weeks from seedling emergence to pod development. However, the importance of scouting prior to a fungicide application cannot be overlooked. Applying fungicides at the wrong time (i.e. just after a rainstorm) or for the wrong problem will greatly reduce economic returns and can limit your control options for later in the season (e.g. rotation of fungicide groups to prevent fungicide-resistance).

That being said, it is still necessary to use the calendar to book custom applicators and to preorder fungicide products for the growing season. But the final decision for each application must be made near the time of the intended application. Disease risk can change daily depending on weather conditions, development of new symptoms, varietal resistance and yield potential.

After the first routine fungicide application at the 7-10 node stage, it is important to watch the crop and the weather forecast to determine the next fungicide application. If disease risk is high and moist weather conditions are occurring, the spray interval may need to be decreased to 5-7 days. Alternatively, as the crop advances and weather conditions become hot and dry, the spray interval may be increased to three or more weeks

Economic Thresholds

When to stop applying fungicides? (Consider the following three factors)

1. Stage of the crop:

- Experience has shown that it is not beneficial to apply fungicides after the first week of August in commercial crops. This is because it takes about 1 month for a flower to develop into a full-sized seed. For example, if the average first fall frost for your region is the 2nd week of September, new flowers produced in mid-August are NOT likely to form viable seed.
- Applying foliar fungicides later in the season to protect new growth may in fact delay crop maturity and increase green seed count, without improving yield.
- For those varieties rated as having "very poor" resistance, it is likely that the crop will have some pod lesions, even with an intensive fungicide program during the season.
- Exception: Pedigreed seed growers may consider applying fungicides later in the season to reduce the risk of seed-borne disease.

2. Disease severity or other damage to the crop:

- Disease severity: If disease has not been effectively controlled during the season and pod lesions are already widespread, it is usually too late to apply a fungicide.
- Other damage: Although chickpeas are resilient and can recover from severe ascochyta blight infection or other damage such as hail, you have to consider the additional risk of frost injury due to delayed crop maturity (see photo at right).
  - If the damage is not too severe and occurred at the seedling or vegetative stage, it is usually worthwhile to protect the crop.
  - However, if significant damage occurred during the pod development stage, then it is likely too late to protect against further disease.

3. Value of the crop:

- It is best to salvage some yield rather than lose it all. However, this decision will depend on the input costs already spent, the severity of disease or damage, and the potential yield. Refer to Page 1• ; Calculations for Determining Economic Threshold.

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Once the crop starts to senesce and lose moisture, additional fungicides won't be beneficial.

B. Rapp, Heartland Agro

Hail damage to chickpea two weeks prior to photo being taken. Note the new growth above the damaged pods. The new growth is not worth protecting due to risk of frost.

Calculations for Determining Economic Threshold:

It is beneficial to protect your crop if yield potential is good and the crop is actively growing; otherwise uncontrolled ascochyta blight can greatly reduce seed yield and quality. However, the decision about whether or not to continue spraying becomes very difficult if you have already made a number of applications and disease is still causing damage.

Below are some calculations to assess the economic threshold or your "break even" point:

% Potential Yield Loss x Estimated Yield (lb/acre) x Price ($ per lb) = Yield Loss/ acre ($)

Use your own experience from previous years to estimate a yield loss value. Or, refer to Pages 11-12; Determining Your Risk Rating.

If this value is lower than the cost of a fungicide application
⇨ Do not apply a fungicide.

If this value is higher than the cost of a fungicide application
⇨ A fungicide application is likely warranted

Consider the following examples:

Example 1. Consider a kabuli crop with an expected yield of 1000 lb/acre, a market price of $0.32/lb, and a fungicide application cost of $22/acre. Assume a yield loss of 15% (e.g. the variety rating is "poor" and lesions were observed on new crop growth).

Yield loss/acre = 0.15 yield loss X 1000 lb/acre X $0.32/lb
Yield loss/acre = $44 per acre

In this case, it would be economical to apply fungicide as the potential yield loss is much greater than the cost of a fungicide.

Example 2. Consider a desi crop with an expected yield of 1200 lb/acre and a market price of $0.20/lb. Assume a yield loss of 5% (e.g. disease risk is low).

Yield loss/acre = 0.05 yield loss X 1200 lb/acre X $0.20/lb
Yield loss/acre = $12 per acre

In this case, it is not economical to spray at this time, but keep monitoring the crop and weather forecast for increasing disease risk.

REMINDER TO CONSIDER CROP INSURANCE:
If you are considering taking your loss, talk to your local Saskatchewan Crop Insurance Corporation (SCIC) Customer Service Office regarding your decision not to spray. Choosing not to follow disease control strategies may impact your claim.

Additional Resources:

Saskatchewan Ministry of Agriculture

- Agriculture Knowledge Centre: 1 (866) 457-2377
- Website: http://www.agriculture.gov.sk.ca/ (Search for "Ascochyta Blight of Chickpea")
- CD Rom on Management of Ascochyta Blight in Chickpea in Saskatchewan (available from the Ag Knowledge Centre).

Saskatchewan Pulse Growers:
http://www.saskpulse.com/

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This publication is only a guide. Use additional resources to obtain more information and refer to fungicide labels for details and precautions. Decisions regarding disease management and fungicide use are at the discretion of the grower.

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