



# Direct Seeding

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## Controlling Barley Diseases in Direct Seeding Systems

Disease control in barley requires proper management and sound agronomic practices no matter which tillage system is used. Weather conditions and crop rotations are usually much more influential than the tillage system in determining disease intensity in barley.

### Barley Diseases

Yield- and quality-influencing infectious diseases of barley on the prairies can be divided into the categories shown in the table below.

Disease Source	Disease	Control
Seed-borne*	true loose smut	systemic seed-treatment fungicides
	false loose smut	seed-treatment fungicides, resistant varieties
	covered smut	seed-treatment fungicides, resistant varieties
	fungal leaf stripe	seed-treatment fungicides, resistant varieties
Residue-borne	net blotch	foliar fungicides, crop rotation, resistant varieties
	scald	foliar fungicides, resistant varieties, crop rotation
	speckled leaf blotch (septoria)	resistant varieties, crop rotation
	powdery mildew	foliar fungicides, crop rotation
	ergot	increase soil copper availability, tillage
	fusarium damaged kernels**	seed treatment fungicides, crop rotation (avoid cereal and corn crops)
	halo spot	crop rotation
	sharp eyespot	crop rotation
Soil-borne	common root rot (seedling blight)	seed-treatment fungicides, crop rotation, resistant varieties, balanced fertility
	spot blotch*** (smudge, black point)	crop rotation, resistant varieties
	take-all	crop rotation (avoid planting barley after take-all infested wheats)
Off-site	rusts	resistant varieties, foliar fungicides; stem and leaf rusts of barley are not normally problems in Alberta
	viruses (spread by aphids, leaf hoppers, pollen and soil-borne fungi)	no control available for many viral diseases, such as barley yellow dwarf; for seed-borne barley stripe mosaic virus, use pedigreed (certified) seed, which is normally free of this disease; flame chlorosis is present only in Manitoba and the United States

\* Recommended seed treatment fungicides do not harm emergence or establishment of hulled or hullless barley.

\*\* Malting barley has zero tolerance for fusarium damaged kernels, and anything approaching 1% infection of fusarium damaged kernels makes barley unsuitable for hogs and other monogastrics.

\*\*\* The same fungus that causes common root rot.



Sporadic or poorly understood diseases of barley include: aster yellows, bacterial blight, blue dwarf virus, browning root rot, cephalosporium stripe and grey speck (manganese deficiency). (Grey speck is a common problem on dryland barley in southern Alberta, particularly in dry summers.)

Important non-infectious diseases of barley are as follows:

- frost banding when temperatures drop below  $-3^{\circ}\text{C}$  overnight, and heat banding from hot or very bright sunlight
- prolonged waterlogging
- herbicide injury
- nutrient deficiencies

Herbicide injury may resemble infectious diseases, predispose the crop to lodging (similar to sharp eyespot) or result in poor crop vigour and yield. Herbicide injury can result from herbicides applied to the crop or from herbicide residues. Severe crop injury from herbicides can result from an interaction of several factors including drought, cold temperatures, high crop residue levels, livestock manure applications, soil-borne herbicide residues and soil copper deficiency.

Copper deficiency in barley can induce many symptoms that resemble other problems, such as lodging, delayed maturity and significantly reduced yields and quality. See *Copper Deficiencies in Cereal Crops* (Agdex FS532-2), *Micronutrient Requirements of Crops in Alberta* (Agdex FS531-1) and *Minerals for Plants, Animals and Man* (Agdex FS531-3) for more information.

## Influence of Tillage Systems on Barley Disease

### Seed-borne and off-site disease sources

Tillage systems have no known effect on the incidence or degree of seed-borne diseases, rusts

and viral infections. All barley seed should be treated with fungicide to avoid introducing destructive seed-borne diseases or to control their build-up.

### Residue-borne diseases

Several major factors contribute to the increased extent and occurrence of residue-borne diseases on barley:

- occurrence of wet or humid weather
- presence of overwintering disease organisms
- lack of crop rotation
- copper deficiency causing delayed maturity.

Direct seeding and other reduced tillage systems can be a secondary influence because the crop residue cover may allow a more rapid build-up of diseases such as net blotch, scald, speckled leaf blotch (septoria) and sharp eyespot under weather conditions favourable for disease build-up.

No matter what tillage system is used, a three- to four-year crop rotation provides good control of residue-borne diseases because the disease organisms in the residues usually break down before barley is grown again. Under wet or humid weather conditions, timely foliar fungicide applications may make the difference between feed and malting quality grain. In addition to improved quality, yield response following fungicide application can range from 5 to 30 per cent or more in high-input crops.

Tillage or burial of ergot bodies prevents them from germinating. However, the main factor contributing to the occurrence of ergots in wheat, barley and oats is soil copper deficiency (see *Copper Deficiencies in Cereal Crops*, Agdex FS532-2). Recent research also shows that low boron levels may increase ergot build-up in Quebec and Western Europe. Ergots usually originate from infected wild grasses in the field headlands. Wind and insects spread the ergot spores from germinated ergots in the headlands to nearby crops.



Diseases such as powdery mildew and halo spot are minor problems in the prairies at present. Only time will tell if direct seeding affects the occurrence or level of these diseases.

### Soil-borne diseases

Agriculture and Agri-Food Canada research at Saskatoon has shown that common root rot decreases under reduced tillage. Common root rot is the only consistently destructive soil-borne disease of barley on the Canadian prairies. In Alberta, it is estimated to cause average annual yield losses of about 10 per cent. Losses in an individual field can be much higher.

Research by Agriculture and Agri-Food Canada at Lethbridge has found that common root rot of wheat is not highly infectious to barley and common root rot of barley is not highly infectious to wheat.

Common root rot has several phases including seedling blight, root rot and foliar spot blotch. Spot blotch (also called smudge) occurs when the root rot fungus attacks the leaves, stems and heads of barley. The incidence of spot blotch will likely increase if there is a heavy crop residue cover, especially if barley follows barley.

Spot blotch is destructive in eastern Canada, particularly in lodged crops. In recent years, it has been a concern in Manitoba and eastern Saskatchewan. Spot blotch can be as destructive as any foliar disease with the added disadvantage of being one of the causes of black point and the consequent downgrading of barley quality.

Agriculture and Agri-Food Canada research in Saskatchewan has shown that take-all levels decrease under reduced tillage, while research in the United States Pacific Northwest has found increased take-all levels. While highly destructive on wheat, take-all is not often as destructive on barley. However, it is not recommended to plant barley after wheat that was heavily infested with take-all.

## Direct Seeding Tips for Disease Control

### Crop rotation

Crop rotation plays a major role in effective disease control in barley, whether direct seeding or conventional tillage is used. Growing barley in a three- to four-year rotation will eliminate or effectively control most soil-borne and residue-borne diseases, including major diseases such as scald, net blotch and root rot.

Producers continuously growing barley or using short rotations will need to pay special attention to soil fertility, resistant barley varieties and fungicidal disease control. Growing barley continuously generally results in significantly reduced yields and lower quality grain, especially in the wetter, higher yielding areas of Alberta. Since many root, foliar and head diseases are involved, yield losses in the order of 20 to 30 per cent are not uncommon.

### Crop residue effects

- The crop residue cover on direct seeded fields conserves soil moisture and traps snow. Thus, seeding depths can be shallower in direct seeded fields. Shallow seeding may result in earlier emergence, leaving more energy for healthier seedlings better able to withstand disease.
- Direct seeding avoids the marked temporary nitrogen deficiency in conventional tillage fields caused by incorporating large amounts of straw into the soil immediately before seeding. Thus, direct seeding can give barley seedlings a better start for a healthier stand.
- A crop residue cover may result in cooler spring soil temperatures. Thus, in cool, wet springs, direct seeding may result in a greater delay in crop emergence (see *Soil Temperature and Direct Seeding*, Agdex 590-2).



## More Information

For more information on barley diseases, please refer to the following publications:

*Diseases of Barley* (Agdex FS632-2)

*Scald and Net Blotch of Barley* (Agdex FS114/630-1)

*Practical Crop Protection* (Agdex 606-3)

*Copper Deficiencies in Cereal Crops* (Agdex FS532-2)

*Seed Treatment of Cereal, Oilseed and Pulse Crops* (Agdex FS100/632)

*Micronutrient Requirements of Crops in Alberta* (Agdex FS531-1)

*Minerals for Plants, Animals and Man* (Agdex FS531-3)

*Fusarium Head Blight of Barley and Wheat* (Agdex 110/632-1)

These resources are available from your local office of Alberta Agriculture, Food and Rural Development. Another useful reference is a symposium paper by K.L. Bailey and L.J. Duczek entitled "Managing Cereal Diseases under Reduced Tillage" (*Canadian Journal of Plant Pathology*, 1996, volume 18, pages 159-167).

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*Factsheets in the Direct Seeding Series are also available through Alberta Agriculture's Internet site at <http://www.agric.gov.ab.ca/agdex/500/index.html>.*