Direct Seeding

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Controlling Field Pea Diseases in Direct Seeding Systems

Introduction

Of all the crops seeded on the prairies, field peas are often said to be the most easily adapted to direct seeding. For this reason, a large percentage of the pea acreage is direct seeded. Whether in a direct or conventional seeding system, the field pea crop requires close observation for disease throughout the growing season. Several economically important diseases can affect field peas.

Field Pea Diseases

Diseases of major concern in field pea crops are as follows:

- ascochyta blight (leaf and pod spot)
- mycosphaerella blight and foot rot
- powdery mildew
- root rot
- seed decay and seedling blight
- sclerotinia stem and pod rot

Other diseases of less significance and/or for which practical control measures are not available include downy mildew, bacterial blight and septoria leaf blotch. Downy mildew and bacterial blight are rare on the prairies, but may appear under prolonged wet, cool growing conditions. Septoria leaf blotch may be present under similar conditions but usually does not cause losses of economic importance.

Ascochyta blight (leaf and pod spot)
This disease is caused by the fungus called *Ascochyta pisi*. Infested seed and previously infected crop debris are sources for this organism. The fungus does not overwinter in soil.

Symptoms start with a brown speckling of the lower leaves, eventually spreading upwards to the newer leaves and pods. These lesions are often dotted with small fruiting bodies called pycnidia. Cool, wet conditions favour disease development.

Mycosphaerella blight and foot rot
Two different fungi are responsible for this disease: *Mycosphaerella pinodes* and *Ascochyta pinodella*. These organisms may be found on seed, on crop residue and in the soil.

Mycosphaerella blight may be found on the leaves and stems as purple spots. Foot rot symptoms usually appear on the stem near the soil surface as bluish-black discolorations. Both fungi thrive in wet environments. *Mycosphaerella pinodes* is an aggressive pathogen (disease-causing organism) causing yield losses of up to 75 per cent.

Powdery mildew
The disease is caused by the fungus *Erysiphe polygoni*, which develops just before or at harvest. As the name implies, a white powdery coating covers the leaves. Eventually, the speckles turn into spots and the plant turns purple, bluish-green and, lastly, brown.

Warm, dry days and cool nights are critical to this organism's development. Late-seeded fields are typically at higher risk. Frequent heavy dews in the absence of rain accelerate the disease's progression.

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Root rot

Root rot is caused by several fungi: *Fusarium solani* f sp. *pisi*, *Pythium* species and *Rhizoctonia solani*. Affected plants are stunted and yellow, lose lower leaves and die prematurely. The lower stem turns black or brown. Roots are pinched off and rotted. *Fusarium solani* f sp. *pisi* infections may be distinguished from the others by the reddish brown external colour of the roots. High moisture and warm soil temperatures (18 to 25°C) favour root rot development of all these fungi.

Seed decay and seedling blight

This disease is characterized by poor or no emergence, and those plants that do emerge typically collapse before the first true leaves unfold. *Pythium* species are the most common fungal cause of seedling blight in field peas. Infected seeds become soft and watery, with fungal hyphae, or strands, emanating from the seed. Cool soil temperatures and wet soils favour the development of this disease.

Sclerotinia stem and pod rot

A serious pathogen of canola, *Sclerotinia sclerotiorum* is less of a problem in field peas. Symptoms of this disease are soft stems and pods with a cottony white mould and hard, charcoal-like resting bodies, called sclerotia, on the inside or outside of the stems. During periods of high soil moisture, the sclerotia grow golf tee-like structures that disperse spores into the air and onto the plant.

Disease Levels in Direct Versus Conventional Seeding Systems

Research on whether disease levels increase or decrease under direct seeding has produced seemingly contradictory results. This result is likely because pathogens react differently to weather conditions, micro-environments and crop rotations. Favourable conditions for one disease may not be favourable for another.

The move to direct seeding affects the micro-environment in which the organisms live by influencing such factors as soil temperature, moisture, porosity, pH and compaction. Soil temperature and moisture are the factors most often considered by researchers; other micro-environment factors are rarely discussed.

In a three-year study comparing zero, minimum and conventional tillage at Indian Head, Saskatchewan, Agriculture and Agri-Food Canada researchers found that tillage method had no effect on the severity of foot rot or bacterial leaf spot of field pea. Conditions were dry during the study, with growing season precipitation ranging from 164 to 233 mm (6.5 to 9 inches).

For root rot, in a four-year study (1993-1996) in Fort Vermilion, Alberta, researchers from Agriculture and Agri-Food Canada found the severity of root rot in peas was significantly lower in the zero tillage system.

In a study on sclerotinia, researchers found that tillage or the burying of residue decreased the survival rate of the organism causing sclerotinia stem rot by 6 to 32 per cent.

Other than weather, crop rotation is one of the most important factors in disease expression, under a direct or conventional seeding system. Crop researchers across Western Canada and the Northern Great Plains of the United States agree that rotation with a diversity of crops ensures lower disease levels. Inoculum (disease source) levels decline when crops are rotated because pathogens cannot survive without a suitable host.

Consequently, it is recommended that cereal crops should make up no more than 50 per cent of the rotation with other crops like field pea, flax, canola and forages. Growers should not include field peas more than once in a four- to five-year rotation. Avoid growing field peas and canola back-to-back as they are both affected by *Sclerotinia sclerotiorum*.

Disease Control

There are a number of factors to consider for controlling diseases in field peas under a direct seeding system. Crop rotation, using a diversity of broad-leaved and cereal crops, will ensure lower levels of all diseases. Avoid growing canola, beans, fababeans and sunflower before or following field peas to lower the chances of attack by *Sclerotinia sclerotiorum*.

To avoid encountering powdery mildew disease, it is important to select a resistant pea variety. Powdery mildew resistance has been bred into all new field pea varieties, and these varieties have been commercially available since 2004. Genetic resistance to other diseases may be incorporated into new varieties in the future.

For diseases such as ascochyta blight, mycosphaerella blight and foot rot, chemical treatments like Bravo 500, Headline EC, Lance or Quadris are available. Testing seed for ascochyta blight and mycosphaerella blight is another preventive measure farmers may use. Seed decay, seedling blight and some forms of root rot can be controlled by chemical means such as treating the seed with Apron FL, Apron Maxx RTA, Captan Flowable, Thiram 75WP or Vitaflo 280.

Using field pea varieties with an open canopy structure, like the semi-leafless types, will allow better air flow and should reduce disease levels.

The control measures for the major field pea diseases are summarized in the following table.

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Factsheets in the Direct Seeding Series are also available through Alberta Agriculture's Internet site at www.agriculture.alberta.ca/publications

Summary of Control Measures for Six Major Pea Diseases			
Disease	**Resistance**	**Chemical**	**Cultural**
Ascochyta blight	Multiple genes are involved in attaining resistance. Development of a truly resistant variety will be a long time coming.	Apply seed treatment Apron Maxx RTA or foliar fungicides Bravo 500, Headline EC, Lance or Quadris.	Use good quality, disease-free seed produced in dry areas. Test seed for the disease before planting. Maintain a rotation of one pea crop every four or five years.
Mycosphaerella blight and foot rot	None available.	Apply Bravo 500, Headline EC, Lance or Quadris.	Same as for ascochyta blight.
Powdery mildew	Since 2004, all newly registered varieties are required to have resistance.	Apply Headline EC, Kumulus DF or Quadris.	Use resistant varieties.
Root rot	Genetic resistance is known, but current varieties do not have it incorporated.	Apply Captan Flowable.	Use high quality seed and maintain a rotation of one pea crop every four or five years. Avoid other legumes in rotations with peas.
Seed decay and seedling blight	Genetic resistance is known, but current varieties do not have it incorporated.	Apply Apron FL, Apron Maxx RTA, Captan Flowable, Thiram 75 WP or Vitaflo 280.	Same as for root rot.
Sclerotinia stem and pod rot	None available.	None available.	Maintain a rotation of one pea crop every four or five years. Avoid planting field peas after canola or any other host of sclerotinia such as beans, fababeans, sunflower or mustard. Use semi-leafless varieties to keep as open a canopy as possible.