

Important Seedborne Diseases of Pulse Crops

Below are seedborne diseases of pulse crops, their causal agents and economic importance. Planting disease-free seeds is a smart way to minimize the possibility of the diseases and losses associated with them. The Regional Pulse Crop Diagnostic Laboratory (RPCDL) test your seed lots for the presence of these pathogens.

Bacterial Diseases

Aster Yellows Phytoplasma

Aster yellows is caused by one or more strains of a bacterium with no cell wall and it is difficult to culture. It is aster leafhopper transmitted during feeding. It can also be seedborne and seed transmitted. Aster yellows causes severe reductions in yield and quality. The most common symptoms include general yellowing, stunting, and rosetting. This bacterium can infect many plants including field crops.

Our laboratory uses PCR to detect Aster yellows phytoplasma

Bacterial blight

Bacterial blight is a serious disease of field peas that is caused by the bacterial pathogens: *Pseudomonas syringae* pv. *pisi* and *Pseudomonas syringae* pv. *syringae*. *Xanthomonas campestris* pv. *Cassie* is responsible for bacterial blight in chickpea. The disease first appears on leaf as small, dark-green, water-soaked spots (lesions), which coalesce and later turn yellowish to brown. Both pre-emergence and post emergence damping-off may occur. Heavily infected seed may be discolored, resulting in poor seed grade. Severe epidemics can occur which can lead to crop failure.

The pathogens are seedborne. Infected and contaminated seeds are the most important sources of inoculum for field epidemics. The pathogens also survive on stubble and in the soil.

Bacterial blight disease management options are planting disease-free seeds, crop rotation, varietal selection, and avoiding early sowing.

Our laboratory uses seed wash-dilution-plating out technique for detection of agents of bacterial blight.

Fungal/Fungal-like diseases

For all fungal screening, our laboratory uses morphological characteristics on growth media to identify fungi and fungi-like agents.

Anthracnose

Anthracnose of lentil and chickpea is caused by the fungus *Colletotrichum truncatum*. It has been reported in Canada, and United States in North Dakota and Montana. The

fungus infecting field pea is caused by *C. pisi*. Anthracnose of lentil is an economically important disease, where it occurs. Anthracnose is an emerging problem of pea. The disease symptoms include tan lesions which can lead to defoliation and girdling, causing plants to wilt and lodge. Seeds from infected plants may be discolored and shriveled, resulting in significant dockage. Also, low infection levels can cause significant yield losses and provide additional inoculum for re-infection. In pea, anthracnose reduces productivity and germination ability of seeds. The best way to prevent the disease is by not introducing the pathogen through planting of disease-free seeds.

Alternaria

Alternaria blight is caused by a fungus, *Alternaria alternata*. It infects chickpea, lentil, and field pea. The pathogen is seedborne and it can be spread by planting infected seeds. It causes lesions on leaf margins and tips; petioles, flowers and pods, similar to those caused by *Ascochyta*. Affected leaflets drop off the plant. Alternaria can cause germination loss, and severe losses later in the growing season.

Ascochyta

Ascochyta blight is a disease complex caused by *Ascochyta* species (fungi), and other pathogens in field pea. The species of *Ascochyta* are host-specific: *Ascochyta rabiei* only infects chickpea and *Ascochyta lentis* only infects lentil. In field pea *Ascochyta* blight is caused by a complex of three pathogens: *Ascochyta pisi*, *Mycosphaerella pinodes* (asexual stage: *Ascochyta pinodes*), and *Phoma pinodella*. The pathogens cause lesions (diseased spots) on every parts of the pulse crop they infect and can easily spread on the field. These lesions coalesce to form blight. The disease can reduce seed yield and seed quality. This pathogen can be seedborne at high levels. Growers are advised to test their seed lots and only plant those below the following thresholds: 0%, 5%, and 5% in chickpea, pea, and lentil, respectively.

Botrytis

Gray mold (*Botrytis*) is caused by *Botrytis cinerea* in chickpea and lentil. The pathogen causes symptoms, which at onset appears as water-soaked lesions on stems, branches, leaves, flowers, and pods, then progress to gray/brown lesions, and are often covered with a gray mass of fungal hyphae and spores. The pathogen prefers blossoms and pods but can also attacks other aerial parts of the plant. The disease causes flowers to drop, resulting in significant seed yield losses. Seedling soft-rot of chickpea can arise from infected seeds. The fungus can survive on infected seed for up to five years. A test that determines the amount of seed borne botrytis that is present in the seed is available in our lab.

Fusarium wilt

This disease, caused by *Fusarium oxysporum*, was responsible for the decline of the pea industry in many regions of the U.S. including Montana's Gallatin valley during the middle 1900s.

Fusarium wilt is caused by subspecies of *Fusarium oxysporum* specific to crop. For example, *F. oxysporum* f. sp. *psii* infects pea, *F. oxysporum* f. sp. *lentis* infects lentil, and *F. oxysporum* f. sp. *ciceris* infects chickpea. Existence of several different races within each subspecies makes breeding for resistance challenging. However, there is resistance to races 1 & 2 of Fusarium wilt in many pea varieties. The pathogen is very long-lived in the soil (as chlamydospores) and can increase in a field each time you replant the susceptible crop.

Resistance breakdown is a reoccurring phenomenon; thus, seeds need to be tested for Fusarium wilt agents.

Sclerotinia (white mold)

White mold is caused by any of these fungi: *Sclerotinia sclerotiorum*, *S. trifoliorum*, or *S. minor*. The pathogens infect a broad host range, including pulse crops and is often introduced into field through planting of infected seed lots or equipment. They survive as a mass of fungal hyphae enclosed in protective cases known as sclerotia. The fungi will kill tissue and fill the stem with white hyphae and sclerotia, which then survive in the soil for many years. Yield loss due to this disease has been as high as 50%. It lowers seed quality if any of the fungi form sclerotia on seeds.

Stemphylium blight

Stemphylium blight (chickpea, lentil) is caused by *Stemphylium botryosum*. It is a disease of increasing importance of lentil in Canada. It occurs in Montana and North Dakota. The fungus also infects field pea. It causes leaf spots which coalesce causing defoliation of the plant. The pathogen can be seed-borne and infected seeds have low germination rate. There are no fungicides registered for control of this disease. Seed testing is a smart and cost-effective way to measure, detect this disease, and avoid losses due to the pathogen.

Viruses

Our laboratory test for viruses by ELISA.

Alfalfa mosaic virus

Alfalfa mosaic virus (AMV) survives in infected seed or plant hosts. It typically induces a bright yellow mottle or mosaic symptom. In field pea and chickpea, it causes chlorosis and necrosis of the new shoots. Pods may be malformed and fail to develop peas. Lentils may develop necrotic tip growth, twisting and deformation of leaves and stunting when infected with the virus. The virus is seedborne.

Bean yellow mosaic virus

Bean yellow mosaic virus (BYMV) is distributed worldwide with a wide host range which includes the temperate pulses. The virus is spread by a number of aphid species non-

persistently as well as being seed and mechanically transmitted. Symptoms on field peas are variable. The virus may be symptomless or may induce bright mosaic, mottling of leaves and clearance of veins. Necrosis may occur on tips, in stems and veins. Desi and Kabuli chickpeas develop apical necrosis, reddening or yellowing, plant stunting and premature senescence. Lentils develop mild mosaic, light green or yellow leaves. A reduction in leaf size and stunting may occur. Infected plants produce very little seed.

Cucumber mosaic virus

Cucumber mosaic virus (CMV) causes severe disease in lentils, chickpeas and lupins. It also infects field pea. In areas where large aphid populations occur, crop losses can be high due to reduced herbage production and grain yield. The virus is transmitted by a number of aphid species, and it is seed-transmitted in many pulse species. CMV has the widest host range of any known plant virus and is distributed worldwide. The host range includes a large number of agricultural and horticultural crops including temperate pulses.

Pea seed-borne mosaic virus

Pea seed-borne mosaic virus (PSbMV) is distributed worldwide. The virus may be symptomless, or show as mild mosaic symptoms on field peas and other legumes. Early infections may cause considerable yield losses. PSbMV also affects seed quality by causing brown ring patterns and spots on the seeds of field pea, faba bean, lentil, chickpea, lathyrus and other legumes. The virus is believed to have spread worldwide through the exchange of infected seed.

Pea enation mosaic virus

Pea enation mosaic disease is caused by two symbiotic viruses: Pea enation mosaic virus-1 (PEMV-1; an Enamovirus) and Pea enation mosaic virus-2 (PEMV-2; an Umbravirus). Symptoms in peas typically include, in sequence, vein-clearing, mosaics, plant growth malformations, stunting, and enations (outgrowths) on the veins of the underside of the leaves. Infected pods are usually malformed, look warty, and contain few, if they have seeds. Symptoms in lentils include stunting, rolling of leaves, mottling, and tip wilting or necrosis. They can infect also infect chickpea. PEMV is seed-borne and could be seed transmissible.

Nematodes

We use seed-wash and microscopy to extract and identify the nematode respectively.

Stem and bulb Nematode

Stem Nematode (*Ditylenchus dipsaci*) is one of the most devastating plant parasitic nematodes and is widely distributed mainly in temperate areas. It is of great economic significance worldwide and on the list of quarantine organisms of many countries. *D. dipsaci* is an endoparasite that feeds in parenchymatous tissues in stems and bulbs. It is

a recognized pest of a wide range of root crops, ornamental and nursery plants, oat, pulse and some pasture crops. Avoiding spread of stem nematode by infested seed.

NOTE: The seed test does not guarantee a disease-free crop! It only helps to identify healthy seeds so that you can start healthy. Our test result is only representative of the sample you send for testing! So, send us seed samples that accurately represent your seed lots.

References

- [Diseases of Cool Season Legumes](#) (Pulse Crops: Dry Pea, Lentil & Chickpea) (USA)
- [Seed Health Testing in Pulse Crops](#) (Australia)
- [Guidelines for Seedborne Diseases of Pulse Crops](#) (Canada)