Pod Rot of Lima Bean

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Pod rot of lima bean, caused by the oomycete *Phytophthora capsici*, is a relatively new and economically important disease affecting lima bean production in Delaware and the surrounding states. Total crop loss can occur if conditions are highly favorable for disease development. This publication will review pod rot identification, the disease cycle, and management options.

Disease Identification

Pods with off-white, granular, sandpaper-like appearance to them are indicative of *P. capsici* infection (Figure 1). The pathogen only infects maturing pods, and flat pods (fully elongated, but seed has yet to fill) are the most susceptible. Infection often starts on pods that are in contact with the soil or low on the plant but may spread to pods higher in the canopy under excessively wet conditions. Poorly drained areas of the field tend to be more severely affected. Infected pods typically turn black or brown and prematurely dry down, abort, or drop from the plant. Areas of heavy infection will often give off a distinct, algae-like odor.

Figure 1. Lima bean pods infected with *P. capsici*. Notice the granular appearance to the pods, a characteristic sign of the disease. Pods eventually turn dry and brown.

Disease Cycle

Phytophthora capsici is a soilborne pathogen that requires very wet, humid conditions to infect and cause disease. Infection starts late in the growing season when plants are setting pods, which is mid to late August through September for late spring planted beans. Excessive rainfall, high humidity, and warm temperatures (75-90°F) are required for infection. The appearance of sporulation following infection may take as little as 2-3 days under optimal conditions [1].

The thick walled resting spores of *P. capcisi*, called oospores, overwinter in soil. Oospores are recalcitrant, and can survive extremes in temperature, water stress, and UV radiation. As a result, the pathogen may persist in soils for many years in the absence of a suitable host (5-10 years) [2]. Oospores germinate under appropriate conditions on pods, which are in contact with the soil, or are splashed onto pods that are higher up in the canopy via rain or irrigation. Under favorable conditions, new sporangia are produced from infected pods. These sporangia further spread the disease short distances during the growing season.

Management

Successful management of pod rot of lima bean can be achieved through crop rotation, water management, sanitation, and fungicide application. Currently no commercial lima bean cultivars contain resistance to *P. capcisi.* Scouting for the disease should occur after flowering when pin pods start to form. Check low spots in the field where water pools and areas where water naturally flows in the field. Pull plant foliage back and inspect the lowest most pod set for signs of the pathogen and symptoms of the disease (Figure 2).

Figure 2. Signs and symptoms of pod rot on plants. Early stages of infection with white mycelia on green pods (left). Advanced stages of the disease with pods turning brown and prematurely drying down (right).

Crop Rotation

P. capsici has an extensive host range (see Table 1). It is not advised to follow any of the crops listed in table 1 with lima bean in fields that have a history of the pathogen. Corn, soybean, and small grains are good crops to plant in rotation with lima bean, as they are not hosts for the pathogen under field conditions.

Table 1. List of common crop and weed species host for *Phytophthora capsici* in Delaware.

Family	***Common Name***
Cucurbitaceae	Watermelon
	Cantaloupe (muskmelon)
	Squash
	Cucumber
	Zucchini
	Pumpkin
	Honeydew
Solanaceae	Pepper
	Tomato
	Eggplant
	Nightshade (weed)
Fabaceae	Lima bean
	Snap bean
Amaranthaceae	Beet
	Spinach
Geraniaceae	Carolina geranium, crane's-bill (weed)
Portulaceae	Purslane
Malvaceae	Velvetleaf (weed)

Some research has indicated that biofumigant green manure crops such as mustards and rapeseed may reduce *P. capsici* primary inoculum in the soil and thus reduce disease in a subsequent susceptible crop [3]. Mustards should be sown in early spring, flail chopped and incorporated into the soil two weeks prior to full bloom for maximum fumigation potential. Incorporate residue immediately after chopping, as 80% of the fumigation gasses are lost to the atmosphere after 20 minutes. Ideally, at least a half an inch of water should be applied after soil incorporation to seal the soil surface and to completely synthesize the fumigation gasses.

Water Management

Promote drainage when possible and avoid planting lima beans in compacted or poorly drained fields. Avoid irrigating from ponds or ditches that may harbor *P. capcisi* and avoid irrigating at night.

Sanitation

If possible, fields with a history of *P. capcisi* should be harvested last to limit potential disease spread on equipment. Wash and disinfest equipment following harvest or cultivation of diseased fields. Field work should be avoided in lima bean fields during wet conditions to limit the spread of the pathogen within the field or to new fields.

Fungicide Application

Currently, only mefenoxam (Ridomil Gold) and cyazofamid (Ranman) are labeled for use against pod rot of lima bean in Delaware. Fungicide applications for the management of pod rot are only necessary late in the growing season when plants are setting pods and weather conditions are favorable for infection.

References

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