

Onion Smut

Urocystis cepulae Frost



Photo 7 – young onion plants with symptoms of onion smut

Description:

The first signs of the disease are the distortion and thickening of onion seedlings in the first and second leaf stage. Symptoms continue to appear in successive leaves, particularly if the infection is near the meristematic zone from which they form. Lesions appear as dark, thickened streaks on the outer surfaces of the leaves, leaf sheaths and young bulbs. The streaks are caused by masses of dark-brown to black spores (teliospores) that form in the tissues immediately under the epidermis. Mature lesions become silver in appearance as the epidermis thins. Subsequently the epidermis splits open and releases the spores into the soil. Many infected seedlings die within 3-5 weeks of germinating leaving gaps in rows. Some infected plants can grow on and express symptoms on the necks and enlarging bulbs.

Disease cycle:

Infection occurs when teliospores germinate and mycelial threads penetrate, through the cuticle of the young cotyledon (first leaf). Plants are susceptible to infection 2-3 days after germination and remain so through the development of the first leaf, a period of 10-21 days. The optimum temperature for smut spore germination and infection is between 16-22°C, although temperatures between 10°C and 25°C are tolerated. No infection occurs in seedlings if the mean soil temperature is greater than 28°C. Soil moisture has no direct effect on spore germination or disease. Spores can remain dormant in the soil for up to 15 years in the absence of a crop. Maximum soil infestation occurs in the arable layers at the depth of 0-7 cm. Spores are readily carried from one area to another in soil on machinery, wheels of vehicles and bins. The disease is not normally carried in seed. Infection only occurs during and soon after germination and the disease does not spread from plant to plant in a growing crop.

Hosts:

Onion and numerous *Allium* spp. Garlic appears to be immune.

Geographic distribution:

Americas, North, East and South Africa, West, South, and East Asia, Europe, Australia, and New Zealand. This fungus is present where temperatures are cool.

Control Strategies:**Crop monitoring:**

The best way to manage the disease in New Zealand is on a preventative basis. Crops in suspect areas should be examined within the first 3-5 weeks of germination to check for any visible disease symptoms. Although control of the disease is not possible at that stage, knowledge of its presence in an area is vital to future management of the disease.

Non-pesticide strategies:**Choice of growing area**

If possible, avoid areas known to be contaminated with smut. Ensure there is good surface drainage as smut spores can be carried by water.

Irrigation

Cool, damp conditions can slow plant growth, thus increasing the susceptible period of the seedling.

Nutrition

No research has been undertaken in New Zealand on this aspect of disease control. However, in Poland, research indicated that adding mineral fertiliser reduced the incidence of onion smut.

Sanitation

Preventing the movement of soil and crop debris is the single most important factors in minimising the spread of the disease. Spores can be spread any time soil is moved, not just during onion growing operations. Ensure that all tools used in an infested, or potentially infested site, are thoroughly cleaned. As spores can remain dormant for up to 15 years in the absence of a crop, good sanitation procedures should always be implemented. Mycelium produced when spores germinate in the absence of an onion crop can survive on organic matter in the soil.

Rotation

A three-year or longer rotation to crops such as cereals in areas with a low incidence of infection is recommended. Given the survival capacity of the spores, rotations of this duration are unlikely to reduce infection in heavily infested areas. Anecdotal evidence suggest that taking land out of onion production for up to 15 years and replanting only with carbendazim treated seed has been effective in overcoming the disease in some areas.

Pesticide control:

In New Zealand control of smut has predominantly been based on the benzimidazole fungicides benomyl and carbendazim. Due to the removal of benomyl, the industry is now reliant on carbendazim. The standard treatment is carbendazim (as MBC 50WP) applied at 125 g/kg or 250 g/kg onion seed. The lower rate of 12.5% is used as a precautionary measure in areas where the disease has been noted at a low incidence, or in areas where there is risk from contaminations from adjacent infested areas. Because carbendazim is relatively ineffective against other soil-borne fungi, it is always applied in combination with either captan or thiram to provide protection from common damping off fungi. Neither captan nor thiram alone will provide protection from smut.

In the past, methyl bromide was used as a soil fumigant to treat affected areas. Metam sodium may be a suitable alternative.

Further information:

Experimental work in Canada suggests that fungicides of the triazole group have a role in the control of smut. However, some fungicides of this group are phytotoxic when applied to onion seed.

Pink Root Rot

Phoma terrestris E.M. Hans., also known as:
Pyrenochaeta terrestris (Hansen) Gorenz, Walker & Larson



Photo 8 – pink root diseased roots on an onion bulb (left), close-up right.

Description:

As the name of this disease indicates, the most striking symptom of pink root is *pink roots*. Roots infected by the pink root fungus are initially pink in colour, and occasionally yellow to yellowish-brown. As the disease progresses, roots become semi-transparent and water-soaked, then shrivel and die, persisting as red-purple or dark brown remnants. As new roots grow, they also become infected, turn pink and eventually die. Although pink root can kill seedlings, the disease is most commonly seen in almost-mature plants, which usually do not die. If infection is severe, plants may develop leaf tip dieback – symptoms similar to drought or nutrient deficiency. Severely infected plants remain stunted, producing small poor quality, unmarketable bulbs. Infection is confined to roots and the bulb basal plate - living bulb tissue is not affected. Weak plants are more susceptible to pink root than vigorous plants.

Disease cycle:

Pink root is strictly a soil-borne disease. *Phoma terrestris* survives in the soil as thick-walled resting spores (chlamydo spores), fungal fruiting structures (pycnidia), spores (pycniospores), and as mycelium in colonised roots or infected plant debris. The fungus penetrates onion roots directly; wounds are not necessary for infection. The fungus is spread in water and by movement of infected soil. Pink root is more prevalent in hot growing conditions - temperatures of 24° to 28°C are optimum for pathogen growth and disease development, whereas little disease occurs below 16°C. The disease is greatly enhanced by stresses imposed on plants such as heat, cold, drought, flooding and nutrient toxicities/deficiencies. Onions infected with the pink root fungus have also shown a higher incidence of Fusarium basal rot.