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Management options for fusarium wilt of snow peas

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Fusarium wilt of snow peas (Figures 1 and 2) is a devastating disease that has appeared in all snow pea growing regions in the eastern states of Australia. The causal organism of the disease is *Fusarium oxysporum* f.sp. *pisi* (Fop). All pea types are affected by the disease.

It is a soil-borne pathogen that can rapidly build up in soil and can survive for many years. Symptoms caused by the disease include wilting and death of plants either early or after picking has commenced. When the stems of plants are cut longitudinally a reddish discoloration is often observed (Figure 3).

The disease can attack snow pea plants at any stage, but in Queensland growing regions it appears to be worse during hotter periods of the growing season, especially after harvesting has started. In Victoria it has been observed attacking plants at a very young stage.

Early infections may cause plant death; late infections reduce the number of harvests. One plant may be affected next to a plant that is not affected.

The fusarium wilt fungus

Fusarium oxysporum is a soil-borne pathogen that is commonly found in soil and plants. In relation to wilt diseases caused by this fungus only specific types of *Fusarium oxysporum* affect certain crops. Fop only affects peas. Other wilt fungi are also specific, for example fusarium wilt of cucumber is caused by *F. oxysporum* f.sp. *cucumerinum* and *F. oxysporum* f.sp. *cubense* causes fusarium wilt of cantaloupe.

Fusarium wilt invades roots of healthy pea plants and then gradually colonises the vascular tissue. The infection of the roots may be associated with damage to the roots by other fungi or by nematodes.

The growth of the fungus in the water conducting tissue contributes to the wilting of the plant. The plant is then readily invaded by the fungus and sporulates profusely on plant material.

Figure 1. Plant in foreground exhibiting wilt symptoms.

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Figure 2. Close-up of infected plant.

Figure 3. Brown discoloration exhibited in affected plants.

Different races of *Fusarium oxysporum* f.sp. *pisi* also exist that may show different reactions on different cultivars. The expression of disease may be different from one cultivar to the next.

Races of Fop

During a survey of snow pea growing regions, 4 races of Fop have been identified in Australia – races 1, 2, 5 and 6. The level of the races found in Australia from isolates of the fungus collected from infected snow peas are shown in Figure 4.

Races 2 and 5 are more common in Queensland, whereas races 1 and 5 are more common in NSW and Victoria. Races of the fungus and the population types present in the environment need to be evaluated for disease control management.

Specifically this information assists when examining newly bred cultivars and for the development of new resistant cultivars.

Management options

Control of fusarium wilt is difficult once established in a field. The first stage of any disease control program involves the examination of the disease and host interaction.

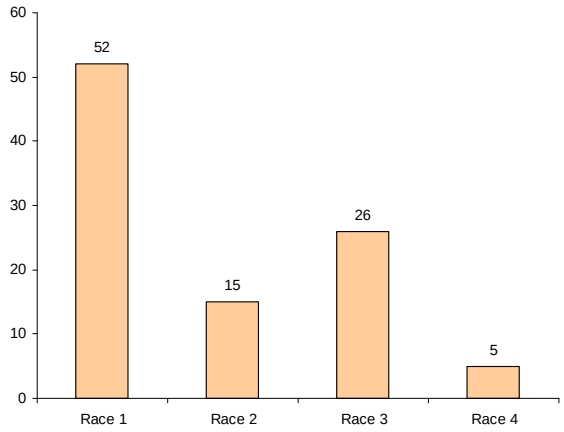

Figure 4. Races of Fop and their frequency of isolation from growing regions surveyed.

Fusarium wilt must be detected in an infected crop especially when disease symptoms are not widespread. An infected crop with minimal symptoms will provide inoculum for rapid build-up of disease in subsequent crops and decisions must be made on moving from an infected block to new ground.

If any symptoms are noticed that include yellowing of leaves, loss of plant vigour and reduced survival of plants when pods have developed, then correct identification of the cause of these symptoms is critical. They could be related to water or nutritional stresses but they could be the first signs of Fusarium wilt. Check for vascular discoloration by slicing the stem of an infected plant longitudinally at ground level and examine for a reddening inside the stem. Send plants with symptoms to a plant disease diagnostic laboratory for confirmation.

The best control option for this disease is resistant cultivars, but these are currently not available. The main control options for growers in Australia include soil fumigation, avoidance of infected fields, planting in cooler months of the year, adopting a strict farm hygiene plan and growing non-susceptible crops.

Fumigation has been found to be successful but may not be economically viable in some situations. Fumigation is currently carried out by some growers where the main products used include metham or chloropicrin. Fumigation will also control weeds, insects and nematodes. However, fumigation may only be effective for short-term benefits. Fumigation kills many beneficial antagonistic organisms in the soil and if fusarium wilt is re-introduced into that soil it can colonise the substrate rapidly with limited competition from other soil-borne organisms.

If beds only are treated with fumigants, infected soil from nearby can reintroduce Fop.

Although seed is suspected of carrying fusarium wilt, it is not considered likely. Fop infects the lower parts of the plant and not parts near flowers; however, infected plant residue in with the seed may carry the disease.

Seed is selected by seed companies from crops grown in areas free of disease and monitored for disease during the crop's growth. Seed quality is therefore assured. Seed transmission if possible, will only occur if growers keep seed from known infected plants.

Management options for growers must include maintaining a farm hygiene policy, especially when moving from infected ground to a clean property or block. Key points of this plan would include restricting soil movement by any means from one property to the next. The fungus is easily transferred in soil.

Restrict the movement of machinery such as tractors and wash them before going from an infected block to a clean block. Snow peas are hand picked so even pickers will need to clean boots and wash them in a disinfectant before moving to a clean block.

Snow peas require a great deal of infrastructure for trellising such as posts and wires. This trellising is moved from block to block, but would be capable of moving the fusarium wilt pathogen with it. Soil on posts, plant material and *Fusarium* spores on wires, all would provide inoculum when moved from an infected to uninfected block. Reducing this source of fusarium wilt inoculum would be very difficult. The only method to 'clean' this material would be to clean off soil and plant debris and/or dip in disinfectant type products which are available for such purposes. This however would be a huge task.

Valuable information is available to growers for assistance with planning farm hygiene with the publication *Farm hygiene for vegetable blocks* which is published by Queensland Department of Employment, Economic Development and Innovation and is available at http://www2.dpi.qld.gov.au/horticulture/4753.html

Fusarium wilt of snow peas is specific to a host crop; therefore the disease will not occur on a crop not belonging to the pea family. However, the fungus will survive in the soil and if peas are reintroduced then wilt infection may occur. Growers that have fusarium wilt may need to change to a different crop to break the disease build-up. Reducing the frequency of snow peas grown in the same block will reduce disease levels.

Cases have been reported of rapid build-up of fusarium wilt in snow peas grown in land that had previously not recorded the disease. The disease can build up rapidly as inoculum is spread by the movement of infected soil. Plants with symptoms may not be noticeable when the inoculum level is at low levels. However, with the movement of soil, vehicles, machinery and people through an infected block the level fusarium wilt in the soil increases to a level that results in increased infection especially in subsequent crops on the same land.

Information in this Primefact has been collected from a project, VG05029. VG05029 was a collaborative project that included four agencies; NSW Industry and Investment, the University of Sydney, Botanic Gardens Trust and Queensland Department of Employment, Economic Development and Innovation.

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