Fusarium Dry Rot and Seed Piece Decay in the Maritimes

Fusarium spp. are important pathogens of potato that cause yield losses at planting and in storage following harvest. Seed potatoes infected with *Fusarium* can rot after planting (seed piece decay) causing “misses” in the field. Even if plants grown from infected seed do emerge, they often have reduced vigour and yield. The fungus can spread from infected to healthy seed during the cutting and handling process. After harvest, *Fusarium* spp. cause a dry rot in storage which reduces crop quality.

Spores of the fungus are found in all soils where potatoes are grown and can survive for many years. Agriculture and Agri-Food Canada scientists at the Crops and Livestock Research Centre in Charlottetown, Prince Edward Island are studying this devastating disease and are developing effective disease management options. Preliminary results of their research are presented here.

Fusarium Dry Rot

Potatoes infected with *Fusarium* spp. develop a spreading external decay that usually becomes shrunken and wrinkled in appearance. When diseased tubers are cut open, the brown decay can be seen spreading into the internal tissues of the tuber. The internal decay is usually marked by open cavities which contain the white mycelium of the fungus. *Fusarium* spp. can only infect potatoes through wounds. Thus, infection can occur when inoculum is spread from diseased to healthy seed

during seed cutting and handling. As well, inoculum in soil attached to the surface of tubers can infect potatoes through wounds made during harvest and handling operations prior to storage.

Although spores of *Fusarium* spp. can be found in all soils where potatoes are grown, research at the Centre in Charlottetown has shown that diseased seed is the most important source of inoculum to infect daughter tubers. High levels of seed infection do not always translate into high levels of dry rot in storage, because the amount of tuber wounding at harvest is normally the biggest factor determining post-harvest dry rot. However, high levels of seed infection can lead to significant seed piece decay with resulting yield impacts.

Fusarium species in the Maritimes

Research has shown that the predominant *Fusarium* species found on seed pieces provide inoculum for infection of daughter tubers and therefore, these species are also the predominant ones found in storage. Surveys from 2001 - 2006 in the Maritimes indicate that three *Fusarium* spp. are the most important as causal agents of seed piece decay and dry rot. Results from the survey showed that *Fusarium sambucinum* was predominant in 40-70% of tuberlots, *Fusarium coeruleum* in 20-40% of tuberlots and *Fusarium avenaceum* in 10-20% of tuberlots. Although mixed infections of several *Fusarium* spp. did commonly occur, one species was usually clearly predominant in a particular sample of tubers (either seed tubers or samples taken from storage). Some minor *Fusarium* spp. that were pathogenic to tubers were also recovered in the surveys including *Fusarium crookwellense*, *Fusarium sporotrichioides* and *Fusarium oxysporum*.

Potatoes in the Maritimes are commonly grown in rotation with cereal and forage crops. To test the potential of these crops to harbour *Fusarium* spp. that are pathogenic to potato, a study was initiated where isolates of *Fusarium* spp. obtained from cereal and forage crops were inoculated into wounded potato tubers which were subsequently stored for 5 weeks to allow disease symptoms to develop. Studies have found that some species of *Fusarium* from cereal and forage crops could indeed cause disease in potatoes. In particular, *Fusarium avenaceum* and *Fusarium oxysporum,* isolated from forage crops, and *Fusarium sporotrichioides* and *Fusarium graminearum,* isolated from cereal crops, could cause disease in potato tubers. Of particular concern, was the finding that *Fusarium graminearum*, the causal agent of head blight in wheat could cause severe disease in potato tubers. Thus, crops grown in rotation with potato may harbour *Fusarium* spp. that cause disease in potato tubers, although the importance of this inoculum source in a production system is unknown. Potato tubers naturally infected with *Fusarium graminearum* have never been found in the Maritimes.

Resistance to control products

Isolates of the various *Fusarium* spp. collected during surveys in the Maritimes have also been tested for their sensitivity to thiophanate methyl (a common potato seed piece treatment) and thiabendazole (a common post-harvest treatment). In all cases, isolates of *Fusarium sambucinum*, the major dry rot pathogen, were resistant to both products. By contrast, all other *Fusarium* spp. were sensitive to both products. In several field trials conducted at the Centre's research farm in Harrington, PEI, potato seed treatments with thiophanate methyl were unable to adequately control seed piece decay caused by thiophanate methyl - resistant *Fusarium sambucinum*, leading to reduced crop vigour and yield loss. By contrast, potato seed treatments with thiophanate methyl were able to control seed piece decay caused by thiophanate methyl - sensitive *Fusarium coeruleum*. Therefore, pesticide resistance can play an important role in the successful control of disease in a particular region.

Disease management

Knowing the predominant *Fusarium* spp. in a particular seedlot could provide growers with important information to use to make disease management decisions. Thus diagnostic testing of samples of tubers from seedlots could be a useful tool in the management of this important disease. *Fusarium* spp. grow relatively rapidly in artificial culture, so isolations from diseased tubers could yield cultures in 7-10 days that could be examined morphologically for identification. Alternatively, more sophisticated molecular, DNA-based methods could be employed for faster, more accurate results.

Ultimately, the management of Fusarium dry rot and seed piece decay depends upon an integrated approach that takes advantage of a number of control options and information generated by research studies. A summary of some of these control options would include:

At planting

1. Use clean seed; store seed in a facility that has been properly disinfected
2. Warm seed tubers prior to cutting to promote rapid healing
3. Remove any diseased seed tubers prior to cutting
4. Disinfect seed cutting and handling equipment often and ensure that cutters are sharp to make a clean cut that heals quickly
5. Don't store cut seed for more than 10 days before planting
6. Determine the *Fusarium* spp. present by having seed tested by a diagnostic clinic if available
7. Use a registered fungicide seed treatment and access any available local information on pesticide resistance
8. Plant when soil and temperature conditions promote rapid sprout growth and emergence

At harvest and in storage

1. Reduce tuber injury during harvest and handling operations
2. Provide conditions for rapid wound healing early in storage, then drop temperatures
3. Monitor storage conditions
4. Post-harvest treatments with thiabendazole will control most *Fusarium* spp., but not thiabendazole-resistant *Fusarium sambucinum*, therefore, access any available local information on pesticide resistance
5. New post-harvest treatments to manage dry rot in storage are in development and should be available in the next few years

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