DISEASES AND PESTS OF GRASS SEED CROPS

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This paper will discuss the diseases and pests that affect grass seed production. In order to put the diseases and pests into perspective, the principlesof grass seed production will be considered.

The components of yield of any crop for which seed is the product are: number of plants per unit area; number of inflorescences per plant; number of seeds per inflorescence; seed weight,

Many factors can influence these components, for example:

(1) crop establishment (cultivation, seed quality, seeding rate, sowing time, soil moisture and fertility can all affect numbers of plants)

(2) crop growth (soil moisture, fertility, grazing and weeds can affect crop growth and influence numbers of inflorescences and numbers and weight of seeds).

Diseases (caused by pathogenic micro-organisms) and pests (mainly insects) are just two of the factors that can influence seed yield components. These two factors can operate throughout the life of a seed crop, from establishment to the time of harvest.

At establishment seedling diseases caused by soil-borne fungi (*Pythium* and *Fusarium* spp.) can affect plant numbers. During plant growth foliage diseases can affect tillering and seed head development, e.g., crown rust (*Puccinia coronata),* anthracnose (*Colletotrichum graminicola*), and leaf scald and leaf spots caused by many different fungi. Seed head diseases include stem rust *(Puccinia graminis* var. *graminis),* ergot *(Claviceps purpurea),* blind seed disease (*Gloetinia temulenta*), choke, bacterial wilt and head smut (*Ustilago bullata*),

Insect pests such as Argentine stem weevil *(Listronotus bonariensis),* grass grub (*Costelytra zealandica*) and Porina (*Wiseana* spp.) can affect numbers of plants at establishment. Argentine stem weevil and army worms (both the native army worm, *Persectania aversa*, and cosmopolitan army worm, *Pseudaletia separata,* can attack grass foliage and can harm tiller and inflorescence production. Seed head pests include Argentine stem weevil, cocksfoot midge (*Stenodiplosis geniculati*), cocksfoot stem borer (*Glyphiptery x achlyoessa),* cocksfoot thrips *(Chlorothrips pallidocornis*), hessian fly (*Mayetiola destructor)* and seed nematode *(Anguina* agrostis) of browntop and chewings fescue. Argentine stem weevil is clearly a very important pest of

grass seed crops as it is capable of causing damage at all stages of crop growth.

In recent years there has been a move away from the catch crop approach to grass seed production to a more intensive specialist seed crop approach. Specialist seed crops can create particular disease and pest problems. For example, specialist grass seed crops are sown at lower seeding rates than pasture - there is no built-in margin to allow for seedling death. Thus control of seedling diseases, and insects that kill seedlings (such as Argentine stem weevil and grass grub), may be necessary in order to obtain reasonable establishment. However, specialist seed crops produce much higher yields than catch crops and high returns can be obtained from expenditure on disease and pest control. Because of these two factors, routine disease and pest control will become part of grass seed crop management.

Some of the practices that can form part of a routine disease and pest control programme are as follows.

At establishment: Fungicide seed treatment (either applied by the farmer using a concrete mixer or produced by specialist seed firms) to control seedling diseases and to control soil-borne diseases. Insecticide soil treatment to control Argentine stem weevil, grass grub or porina.

During crop growth: Crop spraying with fungicides and/or insecticide, particularly at later stages of crop development, to control foliage diseases and insects, and to control seed head diseases and pests.

Post-harvest: Burning crop residues has been shown' to control several important diseases and pests, including ergot, blind seed disease, seed nematodes and cocksfoot stem borer.

Head smut of prairie grass deserves special consideration as it is the only disease that is a criterion, in the Ministry of Agriculture and Fisheries' Seed Certification Regulations for grass seed crops, Prairie grass crops that contain a trace of head smut are rejected from certification.

Seed heads infected with smut contain spores of the fungus *Ustilago bullata* and produce no seed. Thus in heavily smutted crops, seed yields can be drastically reduced. The disease also causes foliage symptoms on vegetatively growing tillers; severe reductions in forage productivity can occur in pastures due to reduced growth and mortality of infected plants. ,

Plant infection is from seed-borne spores which germinate with the new seedling and infect the seedling coleoptile. The fungus,remains systemic while the plant is vegetative, and causes reductions in forage productivity. When plants flower the fungus sporulates and infects nearby healthy seed.

The major strategy for disease control is to break the cycle at the seed stage using suitable seed treatments. Various forms of the latter have been used for very many years:

1910	copper sulphate
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1915	hot water
1935	organic mercury
1955	Thiram 12.0 g kg-'
1974	Benomyl 5.0 g kg"
1980	Carboxin 2.0 g kg-'
1986	EBI fungicides 0.15-0.35 g kg^{-1}

Seed treatments give good control of head smut and result in increased seed yields.

Shoot infection form air-borne spores (as opposed to seed-borne) poses problems for seed producers and is the major reason that prairie grass seed crops are grown and harvested for only one year (not the two for which certification is permissible), as previously healthy crops can be rejected from certification because of head smut appearing from shoot infection.

In summary, diseases and pests are just two of the factors that can affect the yield components of grass seed crops. They can operate throughout the life of a seed crop from establishment to harvest. With increasing specialisation and intensification on grass seed production, routine disease and pest control programmes are increasingly becoming part of grass seed crop management.