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Paper XX (C)

Microbiology and Disease Management

Unit-2

Disease management:

2. Control methods

a. Seed treatment:

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SEED TREATMENT

Many pests during the absence of dormancy of the host perpetuate in the seed or propagative organs till a new host is found. Hence the treatment of seeds to get rid of infection and to secure healthy plant materials constitutes one of the major measures of plant protection. The application of fungicides to seeds has two fold effects: a) control of diseases caused by seed borne infection, b) protection of germinating seeds or seedlings from the attack of soil-borne pathogens. Appropriate treatment of seeds can get rid of the seed borne pathogens and can control to a large extent diseases. Incorporation of a protective chemicals on the surface of the seed can reduce the chances of infection consequently harmful effects of many soil borne pathogens.

The introduction of systemic fungicides for seed treatment has added further possibilities: a) control of pathogens located deep inside the seeds, which are inaccessible to other seed treating chemicals and b) control of air borne infection at a later stage of growth of crop, the toxicant being systemically translocated to aerial parts. There is no single method or material which can be universally recommended for treatment of seeds. These methods have to be chosen in accordance with the modes of perpetuation of pests. Broadly speaking, they may be divided in to three categories: a) mechanical, b) chemical and c) physical.

Mechanical Method:

In many cases due to infection there may be an alteration in size, shape and weight of seeds by which it is possible to detect the infected seeds and separate them from the healthy ones. In ergot disease, infecting sclerotia are large in size and lighter than grains. They may be separated out by sieving or floatation. In tendu disease of wheat caused by *Anguina tritici*, galls due to infection in grains can be separated by floatation. In many seed borne infections, infected seeds are usually smaller in size and lighter in weight. They may be separated out by gravity grading, floatation or sifting through sieves as may be convenient. Such mechanical separation eliminates infected materials to a large extent and in some cases (ergot and tendu diseases) this is the only method.

Chemical Method:

Disinfection of seeds by chemicals was common for a long time. In 1809, Prevost carried out his classical work on the use of copper sulphate for the treatment of cereal seeds infested with spores of bunt fungi. Chemical treatment also afford protection to the seeds and young seedlings in the early stages of growth from soil borne fungi by sterilizing the small amount of soil around the seed and keeping it free from organisms during germination and early stages of seed establishment.

Very recently attempts have been made to control deep seated infections by the use of systemic fungicides for the control of: a) pathogens situated within the seed and previously inaccessible to chemicals, and b) air borne diseases using the dressing as a reservoir of fungicide during the growth of the crop at least in the early stages. Success of the use of systemic fungicides as seed dressing is now clearly established. Eoxathin and Carboxin are widely used for the control of deep seated infections of loose smut (*Ustilago nuda*). By use of pyrimidine ethirimol as seed treatment control of powdery mildew has been effected.

Treatment of seeds by chemicals may be affected by: a) steeping in liquid, b) dry seed treatment, or c) slurry treatment. Steeping in liquid may be done in buckets. Dry seed treatment usually carried out in rotary or gravity fed seed dressers. In dry seed dressing, powder which is applied in very fine from adheres to the surface of seeds. Slurry treatment in which the chemical is applied in the form of a thick soup, so that during the process of treatment slurry get deposited on the surface of the seeds in the form of a thin paste which dries up. Seeds treated with dry dust may be stored for a long period so also slurry treated seeds. But seeds treated by steeping in liquid can not be stored. Seeds treated with chemicals must be stored in dry and treatment should be done one week before sowing. In case of treatment with liquids, treatment has to be done immediately before sowing. Liquid treatment is usually followed for vegetative propagating stocks. Storing under damp conditions after treatment has been reported to damage the viability of seeds. Hence proper storage of treated seeds has to be ensured.

Organomercuric chemicals are called broad spectrum seed treating fungicides. They have shown effectiveness against a number of diseases in a m\number of different crops. Alternative chemicals include Chlorobenzene, Benzimidazole compounds like Captan, Carboxin. Many chemicals used for the seed treatment are poisonous and toxic to men and animals and they should be used with caution. Chemical treated seeds should not be used for consumption by men and animals. Sacks, bags or other containers used for storing treated seeds should not be used for other purposes before thorough cleaning. Inhalation of fumes or dust during the process of treatment should be avoided. Extreme care should be taken to avoid the skin coming into contact with these chemicals. Seed treatment should always be carried out in the open. Instructions given by the manufacturers regarding safety, dosage, and handling should be strictly followed.

Physical Method:

Seeds and planting materials can be subjected to heat treatment in order to eliminate certain internally borne pests including nematodes. Temperature and period of treatment will vary with the infection or pest concerned. The use of heat as an agent of disinfection was first made by Jensen who attempted to control the internal infection of diseased tubers of potato affected with late blight (*Phytophthora infestans*). It was noted that internal mycelium could be killed by a four hour treatment at 40^0C.

Jensen's method of hot water treatment (1897) is more widely known and accepted for the control of loose slut of wheat, barley and oats. In this practice, seeds are to presoaked for four hours at 20-30^0C, during which period, dormant mycelium develops actively and becomes more vulnerable to exposure in hot water at 50-52^0C for a few minutes. Seeds then dried very carefully before they can be used for sowing.

In India, solar energy has been utilized as a means of disinfection of seeds attacked with loose smut. In this process, seeds are to be presoaked for four to five hours in shallow vat conataining water during night. During this period the seeds remain immersed in water.

Then they should be taken out, the excess water drained off and the seeds spread to dry in the sun on a clean floor. At the end of the day the seeds are expected to be dry. They should be stored in clean airtight containers. This process is simple and suitable for bulk treatment, but can only be adopted in summer.

The practicability of use of hot air treatment for the control of virus in the propagating stocks was first suggested by Kunkel in peach yellows. It was claimed that peach can be cured of yellows by warm water treatment. It was also noted that plants or planting materials kept at 35^0C for a fortnight can be cured of infection. Attempts were made to control virus diseases of sugarcane and strawberry runners by hot air treatment. In the 1950s, hot air treatment was used by Dr. Kassanis to eliminate potato leaf roll virus.

Seed treatment particularly by chemicals has become popular. It is advocated to have disease-free seeds and planting materials. The cost of treatment is very low in terms of potential benefits and methods of treatment are simple. At present, treatment of seeds is adopted as routine measure by the organizations dealing with seeds.

Thank You