

Study on Seed treatment for plant disease control

Seed treatment

Seed treatments are physical, chemical or biological treatments applied to seeds or vegetative propagation materials to control disease organisms, insects or other pests.

Objects of seed treatment:

- To prevent germination failure and infection of seedling
- To destroy external and internal seed borne pathogens
- To develop a protective zone around the seed which protects the germinating seed/seedling from the attack of certain soil inhabiting pathogens.

Characteristics of the seed treating materials:

- Consistently effective
- Safe to operators
- Low phytotoxicity
- Environmentally safe
- Compatible with other treatments
- Desirable application and retention qualities
- Low cost

Advantages of seed treatment

- Protects germinating seeds and seedlings against soil and seed borne pathogens/insects.
- Seed germination enhancement.
- Early and uniform establishment and growth
- Enhances nodulation in legume crop.
- Better than soil and foliar application.
- Uniform crop stand, even in adverse conditions (less/high moisture)
- Reduced risk of pathogen resistance
- Economical and Convenient

Disadvantages of Seed Treatments

- Accidental poisoning
- Cropping restrictions
- Limited dose capacity
- Limited duration of protection
- Limited shelf life of treated seed
- Phytotoxicity affects

Methods of seed treatment

- A. Physical methods
- B. Chemical methods
- C. Biological method

A. Physical methods or procedures

1. Hot water treatment

Hot water seed treatment can be an important step in ensuring that seed is not a source of pathogens. The temperature of water for treating seed varies from 118 to 125°F (48-52°C), depending on the crop, and the treatment period varies from 10 to 20 minutes. It is important to use the appropriate protocol for each crop to control pathogens without damaging the seed. While hot-water seed treatment can be done effectively on a stove top, it is much better to use a precision water bath and an accurate thermometer. If properly used, hot-water soaks will kill most seed-borne fungi and bacteria without killing the seed. Seed lots of poor quality or lots more than one year old may not germinate well after hot-water treatment. Therefore, a small sample of each seed lot should be treated and tested for germination before the entire lot is treated. The water temperature must be carefully controlled, since a slight reduction in temperature may result in a failure to kill the fungi or bacteria, and a slight increase may result in severe seed injury.

2. Cold water treatment

Steps to be followed-

- i. Seeds should be kept in a loose bag and loosely tied at the top of the bags.
- ii. Seeds should be soaked for 30 minutes in normal water then stored in an air tight container for 80 hours at 68°F/70 hours at 70°F/60 hours at 75°F /40 hours at 80°F.
- iv. Then water should be drained out and seeds dried on clean light floor and finally stored with normal moisture content (10-18%).

3. Anaerobic water treatment

The seeds are soaked in water and held under anaerobic conditions for a definite period of time e.g. loose smut of barley was effectively controlled by soaking seeds in water at 24°C and at 28°C for 6 hours and then drained and stored in air-tight container for 42 hours. The procedure reduces the hazard of injury to seed germination from overheating.

4. Dry air treatment

This has been little used although different combination of temperature have given promising results against certain pathogens while attempts against some other fungal pathogens gave negative results. e.g. *Colletotrichum gossypii* in cotton positive results was reported. Dry air treatment of tomato seed at 70°C for 3-4 days is partly effective against tobacco mosaic virus (TMV) and lettuce seed infected with lettuce mosaic virus can be inactivated by treating seeds at 55°C for 80-120 days.

5. Solar heat treatment (Solar energy method):

Grain is presoaked in normal water for 4-5 hours at room or in the shade and then drained the water and dried the seeds on ground under sun for 4-6/8 hours. In our country drying of Aus paddy on concrete road or pucca floor under the sun is a sort of seed treatment by solar heat. The procedure has proved effective against loose smut of barley and wheat.

6. Aerated steam treatment

The principle is to treat dry seed in moving vapour by pressure flow. e.g. Cabbage seed reported to be treated at 56°C for 30 minutes to eliminate *Alternaria brassicae*.

B. Chemical methods of seed treatment

1. Steep treatment: The seed is soaked in fungicidal solution/suspension for a definite period and then drained and dried.

2. Sprinkle treatment: The seed is sprinkled with a fungicidal liquid solution or suspension, left damp with this for a definite period of time and then dried.

3. Dust treatment: Place the seed and fungicide (2 g/kg seed) in a closed container (Mason jar or drum) and agitate vigorously for several minutes until the seed is uniformly coated with dust.

4. Slurry treatment: Add enough water to a wettable powdery formulation of the selected fungicide to make a sloppy paste. Place the seed in the slurry and stir or swirl until the seeds are thoroughly coated. Dry the seed before planting.

5. Wet treatment: The seed is mixed with a relatively small amount of concentrated liquid (about 100-300 ml/kg seed). There is no recovery of liquid after treatment, but drying is necessary.

6. Fumigation: The seed is treated in an air-tight container, for a definite period of time by use of volatile material (a fungicide or a nematicide).

7. Pelleting: Application of sticker prior to mixing the seed with a dust fungicide. Tween-20 may be used as sticker. The seed is coated, first with the sticker in dilute solution in such a way that each seed becomes a pellet containing an outer zone of protectant.

Some seed treating chemicals and their doses:

- Thiram 75WP/ Captan 75 WP @ 0.25% (2.5 g/kg seed)
- Provax-200WP @ 0.25% (2.5g/kg seed)
- Bavistin 50WP - 0.25% (2.5g/kg seed)
- Panocrine liquid to control internally seed-borne diseases 0.1%= 1 drop in 10 g of seeds
0.4% = 4 drop in 10g; of seeds
- Benomyl and Homai @ 0.3% (3g/kg seed)

C. Biological method

Biological agents consist of dormant microorganisms that are applied to seeds. Under favorable conditions, these microorganisms grow and colonize the exterior of the developing seed or seedling. Biocontrol agents may reduce seed decay, seedling diseases, or root rot either by competing with pathogens or by producing antibiotics. Biocontrol organisms include the bacteria *Bacillus subtilis* (trade name Kodiak) and *Streptomyces griseoviridis* (trade names Mycostop, Subtilex, System 3), and the fungus *Trichoderma harzianum* (trade names T-22, Bio-Trek).

General dosage: Seed treatment: 2.5-3.0% of seed weight, Soil drenching: 2% in water, Foliar spray: 2% in water.

Precautions:

- The treated seed should not be used for consumption purpose.
- Seed treatment must be done in well ventilated room.
- Hand gloves and face mask should be used during seed treatment.