SEED TREATMENT

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Seed Treatment

Seed treatment refers to the application of fungicide, insecticide, or a combination of both, to seeds so as to disinfect and disinfect them from seed-borne or soil-borne pathogenic organisms and storage insects. It also refers to the subjecting of seeds to solar energy exposure, immersion in conditioned water, etc. The seed treatment is done to achieve the following benefits.

Benefits of Seed Treatment:
1. Prevents spread of plant diseases
2. Protects seed from seed rot and seedling blights
3. Improves germination
4. Provides protection from storage insects
5. Controls soil insects
Types of Seed Treatment

A. Pre sowing seed treatments
B. Pre storage treatments
C. Mid storage treatments

A. Pre sowing seed treatments

Pre sowing seed treatments includes the following

1. Chemical treatments to improve germination and vigour potential.
2. Insecticidal and fungicidal treatment.
3. Special treatments
1. Chemical treatments to improve germination and vigour potential:

Soaking / treating the seeds with nutrients vitamins and micronutrients etc.

**Paddy:** Seeds can be soaked in 1 % KCl solution for 12 hours.

**Sorghum:** Seeds could be soaked in NaCl₂ (1 %) or KH₂PO₄ (1%) for 12 hours

**Pulses:** Seeds can be soaked in ZnSO₄, MgSO₄ and MnSO₄ 100 ppm solution for 4 hours
2. Insecticidal and Fungicidal treatments

Seed health:
Seed lot that meets high standards of germination, vigour and purity if it is contaminated with seed borne pathogens and insect pests, may be useless to farmers because it may result in severe yield loss or even crop loss in an entire area.

Benefits of the insecticidal and fungicidal treatments:
- Prevents the spread of plant diseases
- It protects the seed from seed rot and seedling blights.
- It improves the seed germination
- It provides protection from storage insects.
- It controls the soil insects.
Seed Treatment Fungicides

• Fungicides are applied to seed prior to planting to provide effective protection against many seed and soil-borne plant pathogens.

• Chemical (fungicide) treatment guards against the various seed rots and seedling blights that occur during storage or after planting.

• It is not usually a "cure-all" and will not provide disease protection throughout the growing season after the plants become self-sufficient. (An exception to this would be the control of loose smut by seed disinfection).
Seed Treatment Fungicides

Fungicidal seed treatment may be divided into three categories, depending on the nature and purpose of the treatment.

1. **Seed disinfection** - Disinfection is the elimination of a pathogen which has penetrated into living cells of the seed, infected it and become established—for example, loose smut of barley and wheat.

2. **Seed disinfestations** - Disinfestations is the control of spores and other forms of pathogenic organisms found on the surface of the seed.

3. **Seed protection** - Seed protection is chemical treatment to protect the seed and young seedling from pathogenic organisms in the soil.
Seed Treatment Insecticides

Insecticides are often applied to seed to control or reduce insect damage to seed during storage and, to a lesser degree, to prevent damage from such insects as wireworms and seed corn maggots in the soil.

Combinations

Since some pesticides are selective in their control of pests, many times two or more compounds are combined in the treater tank, or an extra tank may be used, to give the spectrum of control needed.
Formulation of fungicides /insecticides

Fungicides / insecticides are available in the form of dusts, wettable powders and liquids

1. Dusts: It is usually applied @ 200-250 gms / quintal of seed. Main disadvantage is dusty condition will prevail during the seed treatment and after handling.

2. Slurry: This type of fungicide is applied to the seed along with soap like water suspension which can be mixed with seed by using special slurry treater.

3. Liquids: The use of liquid solution is known as the "quick wet ' method. Here a volatile fungicide is applied to the seed and it thoroughly mixed with them. e.g. Chemicals like panogen, mercuran, etc. can be applied by this method.
Precautions in Seed Treatment:

- Most products used in the treatment of seeds are harmful to humans, but they can also be harmful to seeds.
- Extreme care is required to ensure that treated seed is never used as human or animal food.
- To minimise this possibility, treated seed should be clearly labelled as being dangerous, if consumed.
- The temptation to use unsold treated seed for human or animal feed can be avoided if care is taken to treat only the quantity for which sales are assured.
- Care must also be taken to treat seed at the correct dosage rate; applying too much or too little material can be as damaging as never treating at all.
Precautions in Seed Treatment:

• Seed with a very high moisture content is very susceptible to injury when treated with some of the concentrated liquid products.

• If the seeds are to be treated with bacterial cultures also, the order in which seed treatments should be done shall be as follows

1. Chemical treatments
2. Insecticide and fungicide treatments
3. Special treatments
3. Special treatments

A: Seed hardening treatment
Seeds can be hardened for 2 purposes
- Drought tolerance
- Cold tolerance
The treatments are imposed to the seeds mainly to tolerate initial drought and cold. Cold tolerance treatment is given to germinated seeds, such treatments are given only to temperate crop and tree seeds.

B: Seed fortification
Main aim is to supply nutrients to seeds. The main objective is to achieve the high vigour to overcome unfavourable soil reactions. eg.) seed fortification with Mn$\text{SO}_4$ @ 0.5 to 1 %. will improve oxidation - reduction potential of seeds, which ultimately leads to higher germination.
C: Moist sand conditioning
It is a need based treatment the concentration can be increased upto 2-4 %. Amount of solution should be 1:1 ratio or slightly excess amount of water can be used. Protinaceous seeds should not be soaked in water (e.g) soybean, etc. for these seeds, mix the seeds with moist sand @ 5 to 10% MC. It should be kept for specified period of time. The method is known as moist sand hydration.

D: Seed infusion
Infusion of nutrients and growth promoting substances with organic solvents like acetone and dichlormethane.
E: Seed pelleting

Here the nutrients are coated on the seeds. This technique is very much adopted in forest tree seeds.

Importance

• Normally in small seeds this technique is adopted.
• By pelleting we can increase the size of seed and we can make it free flowing one.
• Through this we can able to reduce the seed rate.
• It is also important for aerial sowing (gum arabica) in tree seeds.
F: Osmotic priming

- Osmotic priming is nothing but making the seeds to imbibe water very slowly.
- Osmotic solutions used are (PEG) (poly ethylene glylycer). Maintol is highly toxic.
- PEG is inert and will increase very slowly the water in to seeds.
- By preconditioning through osmotic priming, the seeds are invigourated which results in uniform, early and higher field emergence and higher seedling vigour.

It is a very expensive but it is a required process, particularly for large seeded legumes like peas, beans etc., they have high protein content and large embryo and are susceptible to soaking injury. High protein seeds are hygroscopic and hydrophilic.
**G: Fluid drilling**

This is a technology evolved for mechanical sowing of seeds particularly the germinated seeds. The seeds are coated with a jelly material called guar gel. It is to have a buffer action to avoid damage of the germinated seeds during sowing.
**H: Separation of viable seeds**

It is a new concept particularly for groundnut. This is a good method to get desired seed germination and plant population. In case of groundnut the actual population requirement is 30 plants / m². Actual seed multiplication rate in groundnut is 1:8. There are about 30-40% of dead seeds and of such dead seeds are eliminated, and then we will be able to maintain the required plant population in the field.

This can be done in 2 ways
1. Manual separation based on radicle emergence (groundnut)
2. IDS (Incubation - Drying and Separation) method
B. Pre storage treatments

Pre storage treatments of harvest-fresh seed are primarily aimed towards protection against deteriorate senescence during storage. Seed storage which is again threatened by insect and pathogen attack, can also be taken care of by prescribed pre storage seed treatments.

1. Halogenation
2. Antioxidant treatment
3. Seed sanitation
C. Mid storage treatments

Seeds in storage accumulate damage to cell membranes during senescence. Mid storage seed treatments are capable of reducing the age induced damages and restoring the seed vigour to a certain extent besides, the seed viability and productivity of stored seeds are also improved.

1. Hydration – Dehydration
2. Types of H-D treatments
3. Soaking – Drying (S-D)
4. Dipping – Drying (D-D)
5. Spraying – Drying
6. Moisture equilibration – drying (ME – D)
7. Moist sand conditioning – drying (MSC-D)
SEED TREATING EQUIPMENT

Commercial seed treaters are designed to apply accurately measured quantities of pesticides to a given weight of seed. Basically, there are three types of commercial seed treaters on the market: dust treaters, slurry treaters, and direct treaters-the Panogen and Mist-O-Matic treaters are examples of direct treaters.

1. Dust Treater (*Gustafson XL Dry Powder Seed Treater*)
2. Slurry Seed Treater
3. Panogen Seed treater
4. Mist-O-Matic Seed Treater
Slurry Treaters  Direct Treaters
Rotary duster (1930’s) made from a 30 gallon steel oil drum. A baffle board was placed inside to help mix the seed. Construction cost was $1.25
Home-made drum mixer  

Shovel
Germination improvement method
- Seed Fortification
- Seed Infusion
- Pre emergence
- Seed Tap

Physical Seed Treatment
- Electrical seed treatment
- Magnetic seed treatment
- Seed irradiation
  i. Gamma irradiation
  ii. UV irradiation
  iii. X irradiation
  iv. Laser irradiation
Seed coating treatment
• Seed pelleting
• Film coating
• Seed colouring
• Seed encrustation

Advance seed treatment
• Sound treatment
• Ultrasound treatment
• Electric field
• Laser seed treatment
• Endophyte treatment
• Chitosan seed treatment
• Intelligent seed coating
• Pollinator plus