Seed treatment

Seed treatments are the techniques to control of seed borne diseases.

Benefits of seed treatment

1- prevent spread of plant disease

2- improve seed germination

3- protect the seed from storage pests.

4- Increase crop production

5- Improve seed quality.

Seed treatment methods

- Mechanical method.
- Physical methods
- Chemical methods
- Biological control

Mechanical methods

Sieving, screening and taking seeds in water are common mechanical methods which are used to remove fungal fruiting bodies, plant debris from seeds, discolored, small or abnormal seeds.

The use of clean seeds can reduce seed borne inoculum but does not eliminate it.

The removal of small barley seed reduces BSMV.

The removal of pea seed with growth cracks reduces pea seedborne mosaic virus in a seed lot from 33%.

Sunflower seeds are stirred in warm water for 15 min, then floating seeds are removed.

Physical methods

A. Hot Water Treatment
B. Solar Heat Treatment
C. Anaerobic Treatment
D. Hot Air Treatment

A- Hot Water Treatment

Hot water treatment is a very age old practice to control many seed-borne diseases.

Soaking seeds for 5–6 h in water at 20–30 °C and then dipping it in water bath (temperature of 50 °C) for a recommended time.

Place seed in cold tap water for five minutes to quickly end the heat treatment.

Once seeds have cooled, spread them thinly on a paper towel to allow drying.

plant	Time	temperature
cabbage	25 min	50 °C
Lettuce	1-4 days	70 °C
Potato	10 min	50 °C
Rice	10 min	54 °C
Tomato	1 h	52 °C
Pearl millet	10 min	55 °C
Pepper	30 min	51 °C
Broccoli	20 min	50 °C
cucumber	20 min	50 °C
eggplant	25 min	50 °C

Solar heat treatment

A simple way of thermal treatment is solarization, where the seeds are heated by irradiation from the sun.

This method has used to kill the mycelium of *Ustilago tritici* the causal agent of loose smut of wheat by soaking seeds in water for 4 h in the afternoon a summer day and then drying for 2 h.

Also this method used to eliminate the anthracnose infection in seeds.

Anaerobic Treatment

The seeds are soaked in water at 15–20 °C for 2–4 h. These moist seeds are then kept in airtight containers for 7 days and there after dried.

In this method the seeds are deprived of air for up to a week.

Hot air treatment

The dry heat seed treatment is quite effective and less injurious to seed.

The seeds exposured to hot air at a recommended time and temperature based on type of seeds.

For example:
the incidence of *P. syringae* pv. *pisi* in pea was reduced when seeds were exposed to 56 °C for a day without affecting germination.
Hot air treatments of carrot seed have the best remedial effects against *Alternaria dauci* and *A. Radicina*.

Also *Pseudomonas syringae* pv. *phaseolicola* in beans could be reduced, if seeds were exposed to 50 °C for 3 days, without adversely affecting seed germination.

Chemical seed treatment

Chemical treatment is the effective method and widely used for control most of the seed borne pathogens in all crops.

Fungicide and bactericide may kill or inhibit seedborne pathogens and may form a protective zone around seeds that can reduce seed decay and seedling blight caused by soilborne pathogens.

chemical seed treatment classified in to the following categories

1. Seed disinfection
2. Seed disinfestation
3. Seed protection

Seed disinfection

It refers to eradication of fungal spores present within the seed coat or more deep seated tissues.

The use of systemic fungicides like carboxin, carbendazim, propiconazole, raxil, etc, are effective against loose smut of wheat, downy mildew and head smut of maize.

Seed disinfestation

This refers to the control of the pathogens which are externally present on the seed surface.

captan and thiram are designed to control spores on the surface of seeds.

Seed protection

This method involves seed treatment with a suitable fungicide which protects the seed and seedling from seed- and soilborne pathogens.

Many soilborne fungi are facultative parasites which under suitable environmental conditions cause seed rot and seedling blight.

Treatment with chemicals

1- wet treatment

2- dust treatment

3- slurry treatment

4- pelleting treatment

5- fumigation treatment

Wet treatment

The seeds are mixed with a relatively small amount of concentrated liquid fungicide (about 100 to 300 ml./kg grain).

There is no recovery of liquid after treatment, but drying is necessary.

Dust treatment

The seeds are mixed with a dust fungicide in a mixing device until the seed is well coated

Slurry treatment

The seeds are mixed with a dust fungicide in a special treater in which small calibrated amounts of liquid (5-20 ml./kg grain) are added, thus forming a soup-like slurry to ensure coating without undue wetting.

Most fungicides used for seed treatment can be treated using a slurry method

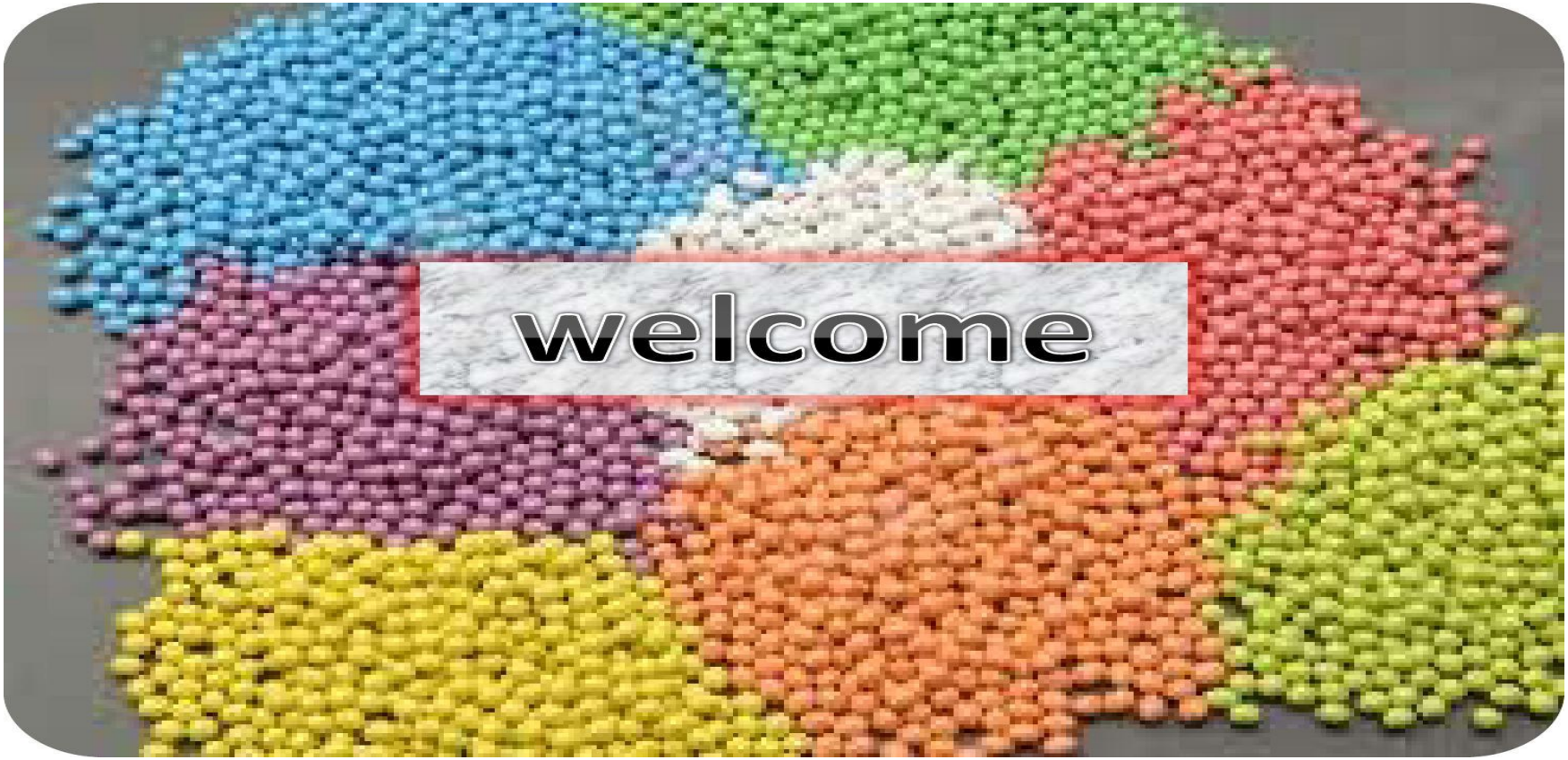
SLURRY SEED TREATER

Fumigation treatment

The seeds are treated in an air-tight container for a definite period of time by use of volatile material, a fungicide, nematicide (or insecticide)

Pelleting

Is the process of inclosing seed with a small amount of inert materials by adhesive materials just large enough to facilitate precision planting.



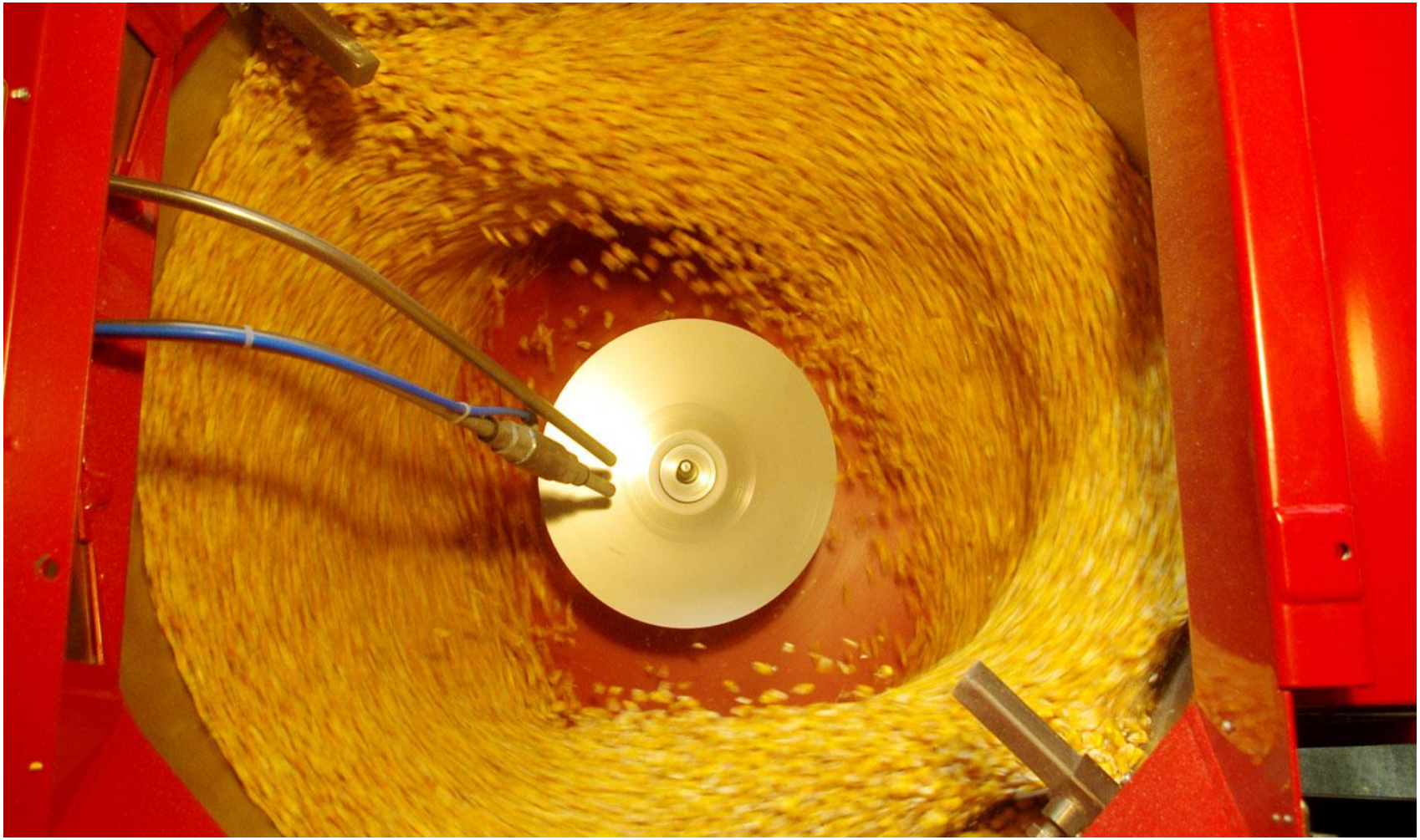
Adhesive materials: These are: gum arabic (45% W/ V), Methyl cellulose (3% W/V), nitric coat (4.3% W/ V), gelatin (5% W/V), plastic rexins, dextran etc.

Filler materials : These are used as a protectant for a seed eg. Rhizobia including lime, gypsum, dolomite, and rock phosphate, clay minerals, dried blood, poultry manure, moss etc

Seed coating

Seed coating is the practice of covering seeds with external materials (pesticides, Macronutrients, polymers, peroxide compounds and bio fertilizers) without changing its shape and size to protect seed from diseases also to improve seed germination, protection seeds from decay and rot, provide oxygen and nitrogen fixing.

Seed coating machine



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Biological Seed Treatment

Microorganisms used as biological control agent in the seed treatment which protect seed and seedling from seed and soil borne pathogens.

This method is an alternative to chemical pesticide.

Biological control agents

There are many (BCA) used as seed treatment are the following:

Fungi: *trichoderma spp.*

Glaiocladium spp.

Bacteria: *bacillus subtilis*

Pseudomonas spp.

Enterobacter spp.

Procedure

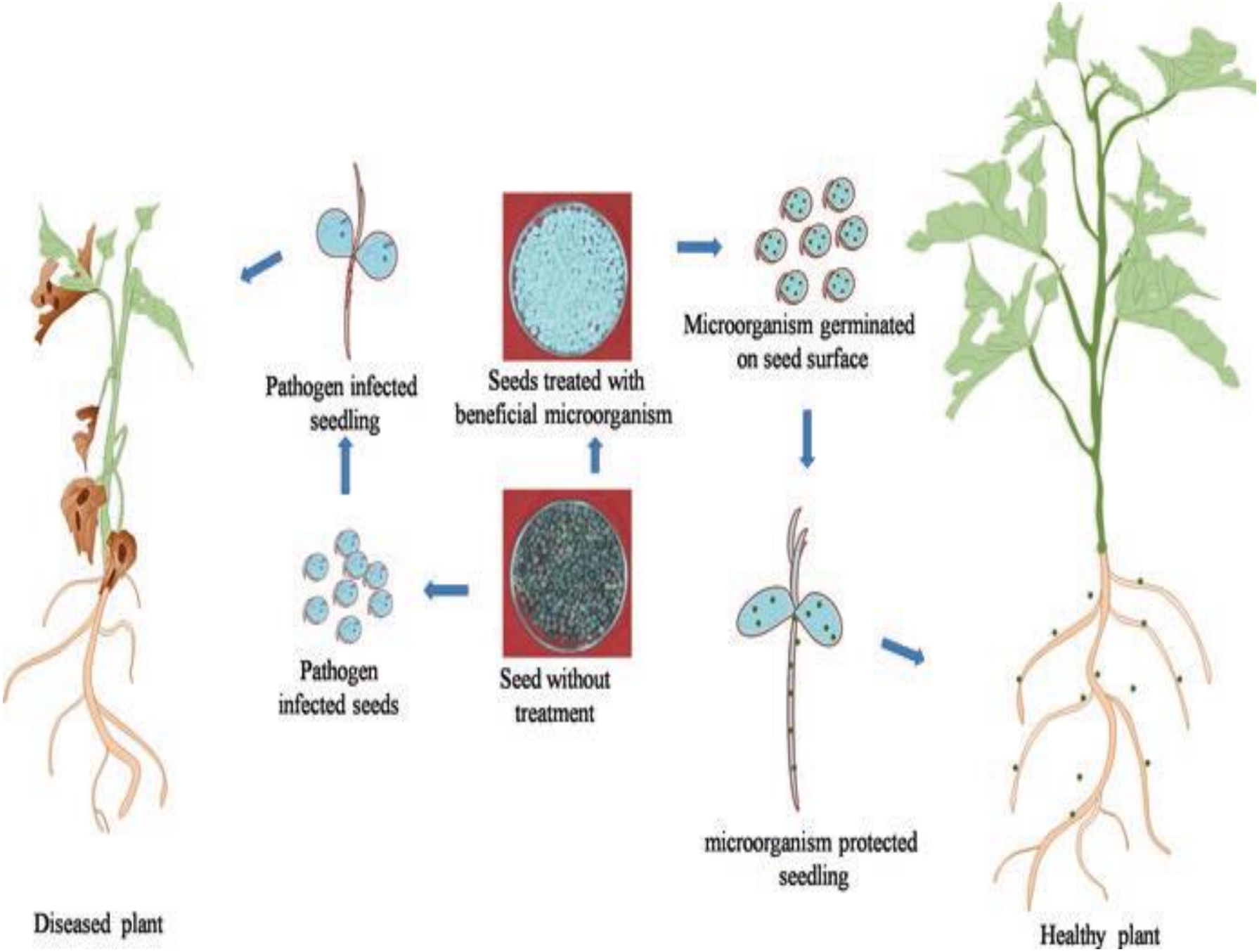
1- pre-soak the seeds in water for 12 hours.

2- mix the formulated product of bio agent with the pre soaked seeds at the rate of 10g per kg seed.

3- cover the treated seeds with a moist jute sack to maintain high humidity.

4- incubate the seeds under high humidity for about 48 hours at approximately 25-32c .

5- bio agents adhered to the seed grows on the seed surface under moist condition to form a protective layer all around the seed coat.


Diseased plant
Pathogen infected seedling
Pathogen infected seeds
Seeds treated with beneficial microorganism
Seed without treatment
Microorganism germinated on seed surface
microorganism protected seedling
Healthy plant