

welcome

The word "welcome" is rendered in a playful, 3D font. Each letter is a different color: 'w' is magenta, 'e' is lime green, 'l' is orange, 'c' is blue, 'o' is yellow and shaped like a sun with rays, 'm' is purple, and the final 'e' is green. The letters are arranged in a slightly staggered, overlapping fashion on a white background.

SEED INVIGOURATION TECHNIQUES



SEED ENHANCEMENT

- Seed enhancement is a treatment of seeds that improve their performance, practiced before they are sowing of seeds.
- Improve seed sowing, germination and seedling growth by altering seed vigour
- Enhance physiological state of seed thereby and uniformity of germination.
- Deliver nutrients to embryo required for germination

METHODS OF SEED ENHANCEMENT

1. **SEED HARDENING**-eg. pulses
2. **SEED PELLETING**-eg. Onoin, tomato, lettuce
3. **SEED PRIMING**-eg. All crops
4. **SEED INFUSION**-eg. Poppy, soyabean
5. **SEED COATING**-eg. vegetables
6. **STEEPING**-eg. sugarbeet
7. **ENCRUSTING**-eg. Maize, sunflower
8. **SEED FORTIFICATION**-eg. paddy

SEED HARDENING

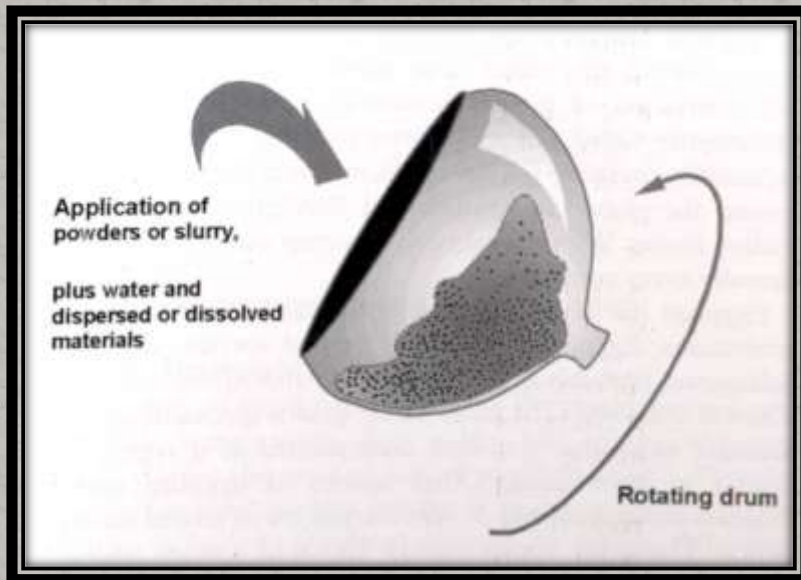
- Seed hardening can be defined as “a method to alter physiological and biochemical nature of seed in order to overcome factors responsible for drought resistance.”
- The phenomenon in which seed testa is unusually hard and impervious to moisture and therefore becomes slow to germination is seed hardening.
- Hydration should be done at 15-25°C.
- Potassium dihydrogen phosphate, potassium chloride and other chemicals are used.

USES OF SEED HARDENING

- It helps in increasing productivity by overcoming moisture stress and nutrient deficiency for sustained production.
- Hardening of seeds results in the absorption of more water due to increase in elasticity of cell wall and development of stronger & efficient root system.

SEED PELLETING

- It is the process of enclosing a seed with small quantity of inert material large enough to produce a unit standard size.
- Tumbling action distributes, molds blend to give good size distribution.



TYPES OF SEED PELLETING

INOCULANT PELLETING:

The coating of seeds with bio fertilizers and bio control agents.

Eg: Rhizobium, Pseudomonas, Trichoderma.

USE:

- It provides protection to seeds against pathogens
- Fixes atmospheric nitrogen

NUTRIENT PELLETING:

Coating the seeds with macro & micro nutrients.

Eg: DAP, Gypsum, micronutrient mixture.

USE OF SEED PELLETING

- Pelleting is used to improve drill/seeder performance by making seeds rounder, alter size
- It improves singulation and speed of sowing.
- For onion, the seed can increase in weight 6-fold due to pelleting

	Basis coat, Weight increase 0.2-2%		
	Complete film coat, Weight increase 3-20%		
	Encrusting Weight increase 100-500%		
	Mini pill, Weight increase 100-2500%		
	Standard pill, Weight increase 1500-10000%		

(A) Seed-coating ingredients



Binder: liquid

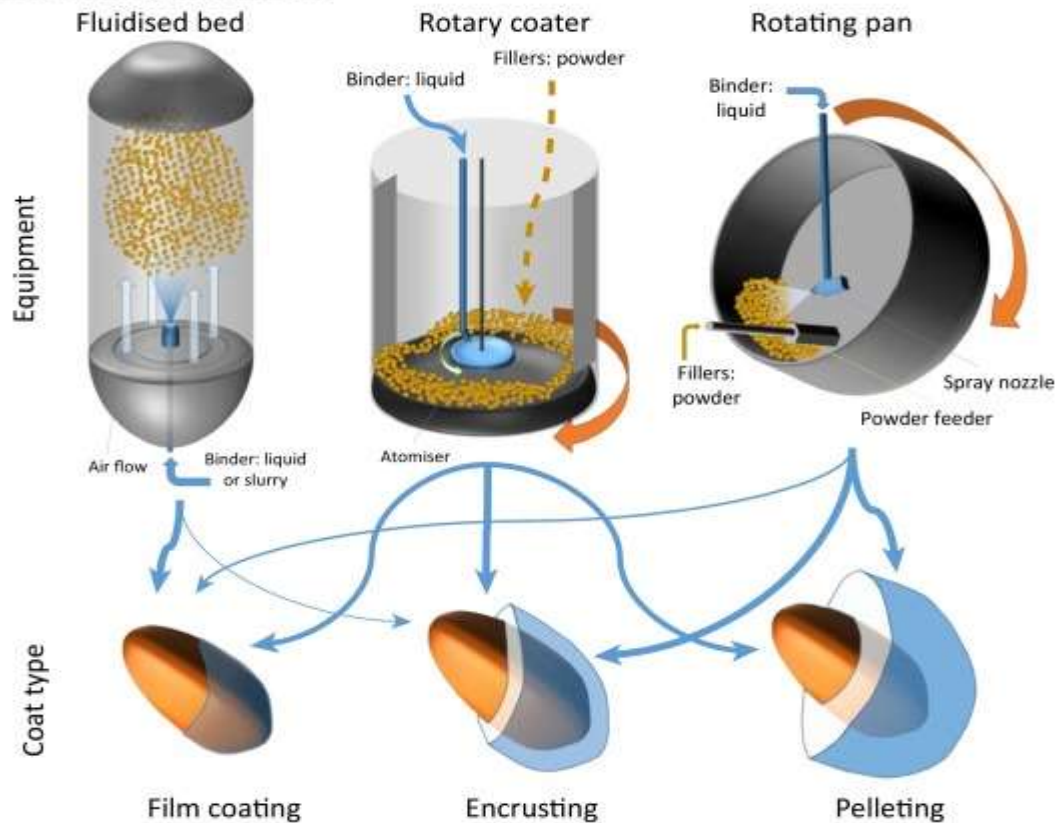


Fillers: powder

- o Protectants
- o Nutrients
- o Symbionts
- o Soil adjuvant
- o Phytoactive promoters
- o Colours and tracers

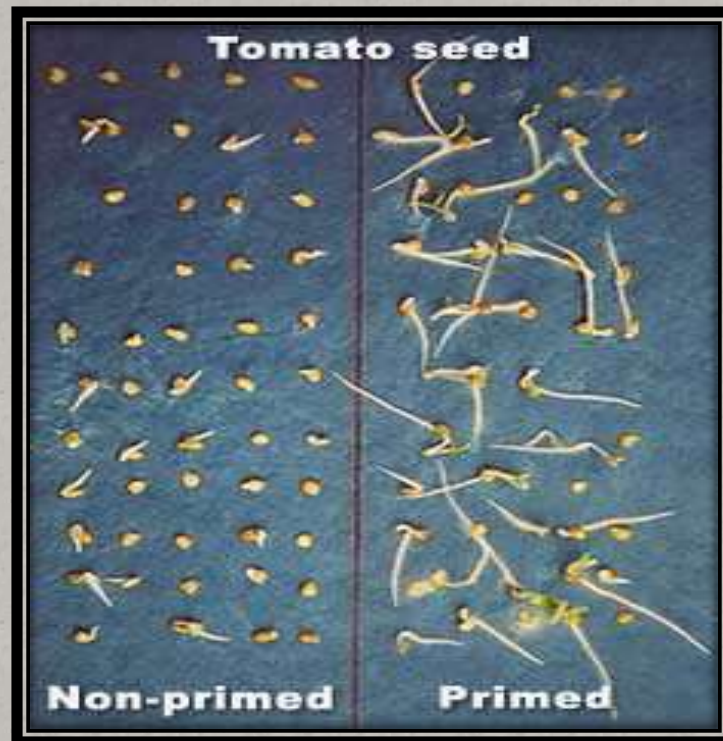
Active ingredients

(B) Seed-coating mechanisms



SEED PRIMING

- It is the process of controlled hydration of seeds that permits or triggers pre germinative metabolic activity but prevents the actual emergence of radicle



Seed Priming Process

- ❖ Priming allows some of the metabolic processes necessary for germination to occur without germination take place.
- ❖ This prevents the seeds from absorbing in enough water for radicle protrusion, thus suspending the seeds in the lag phase.

(Taylor et al., 1998)

- ❖ This hydration is sufficient to permit pre-germinative metabolic events but insufficient to allow radicle protrusion through the seed coat.

(Heydecker et al., 1975)



- OSMOPRIMING**: Soaking of seeds in osmotic solutions.

Eg: Polyethylene Glycol, Mannitol

- HALOPRIMING**: Soaking of seeds in salt solutions.

Eg: NaCl, KCl, CaCl_2 , KNO_3

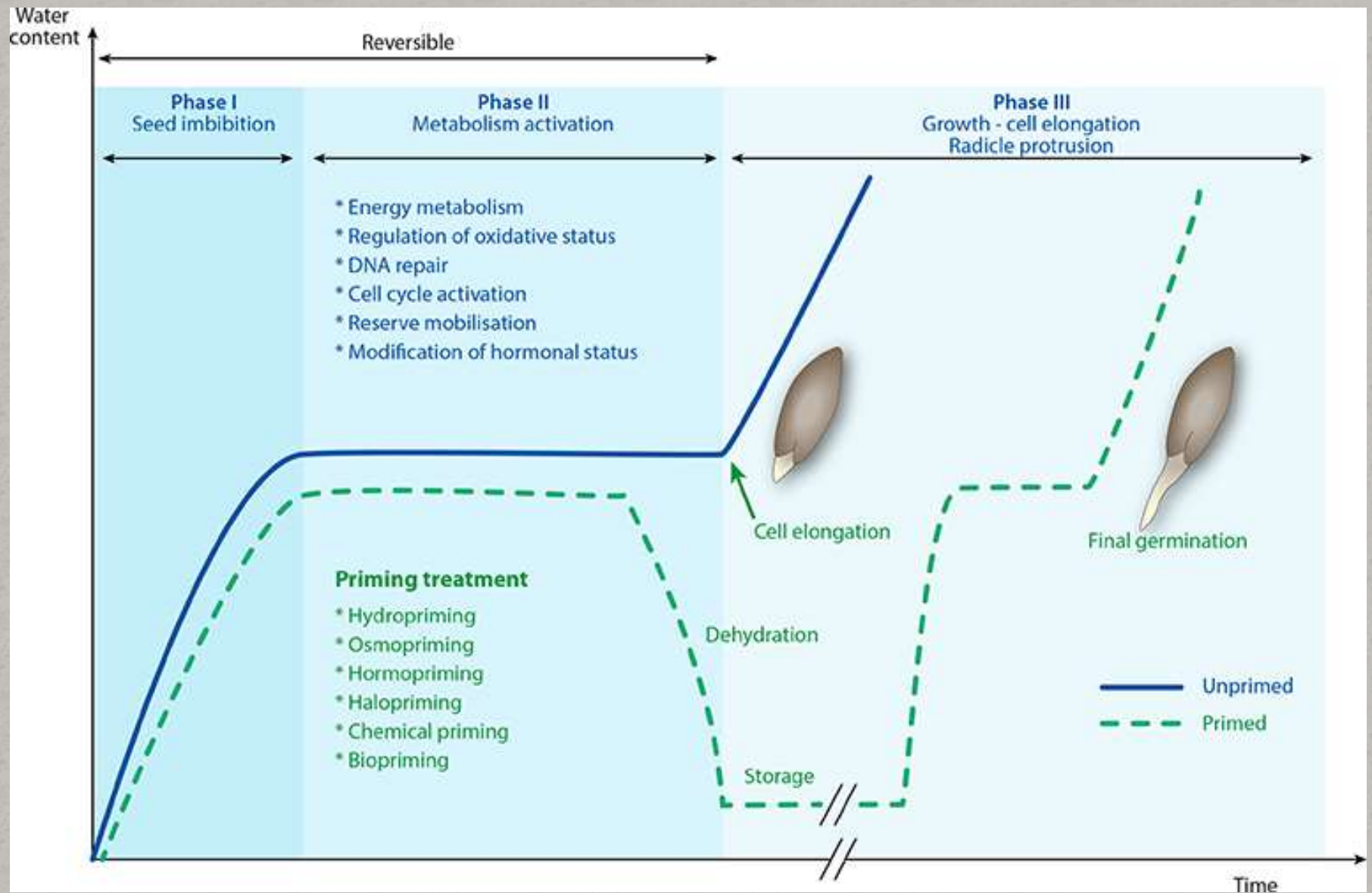
- HYDRO PRIMING**: Soaking of seeds in water.

- SOLID MATRIX PRIMING**: Mixing of seeds with an organic and inorganic carrier and water for a period of time.

Eg: vermiculite, diatomaceous earth, peat moss, charcoal clay, etc.

- Low matrix potential, minimal water solubility, high water holding capacity and surface area, no toxicity to seeds, and ability to adhere to seed surface

- BIOPRIMING**: Eg: Bacillus, Trichoderma, Rhizobium.



SEED ENCRUSTING

- Encrusting is a method in which seed is covered by layers of materials that obscure the original shape & size of seed resulting in substantial weight increase.
- The encrusting consists of biologicals or colourants or dyes, polymers and other ingredients.

USE OF ENCRUSTING

- to pre-inoculate with rhizobia on small-seeded legumes (e.g. alfalfa or lucerne)
- reduce size variation in **maize, sunflower.**
- to add weight to avoid seed drift during sowing of low-density, chaffy turf grass seeds.

Film coating, encrusting and pelleting – onion seed



Colourants



Polymers



SEED INFUSION

- Infusion of nutrients, growth promoting substances can be done with organic solvents by the method of seed infusion.
- Eg: acetone, dichloromethane.
- This technique can be used in seeds of **Poppy, fennel, soyabean**
- Seed infusion can also be used for breaking the seed dormancy.

PROCESS OF INFUSION

- The organic solvents, slowly increase the chemicals in to the seed.
- In this method there is no need for drying the seed materials to bring back the original moisture content of seed.
- The organic chemicals are evaporative in nature, after infusion is over, just we have to keep the seeds as such for 5 to 10 minutes in dry condition, the organic solvents will evaporate during this time and we can perform sowing.

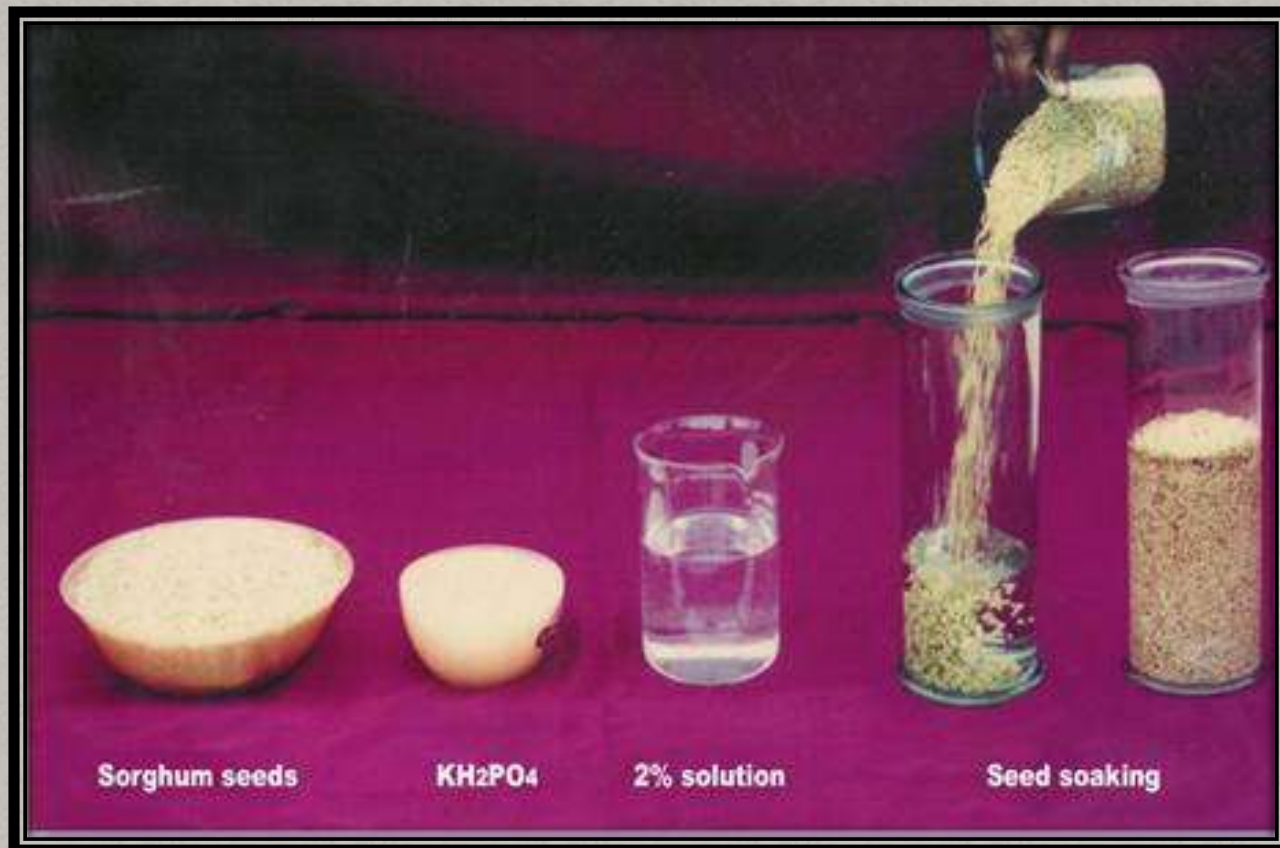
Seed fortification

- It is pre hydration technique, seeds are soaked either in water or dilute solution of bioactive chemicals such as micro nutrients, growth regulators, vitamins and seed protectants.

Seed infusion

- It is a method of impregnation of seeds with bioactive chemicals through organic solvents instead of water.
- This technique of infusion which helps to avoid the damage caused to the seed due to soaking in water.
- Hence this method is highly suitable to the seeds that suffer from soaking or seed coat injury (pulses).

- **Pulses :** Seeds can be soaked in ZnSO_4 , MgSO_4 and MnSO_4 100 ppm solution for 4 hours to improve the germination and vigour potential.



Principles involved in seed hydration



Dry seed



Imbibition



Dehydration



Prevent cell and radical emergence

Shade / sundried to bring back to its original water content



Stops the germination process

Hardened seed



Sowing



