

## Seed Priming as a Method to Generate Stress Tolerance in Plants

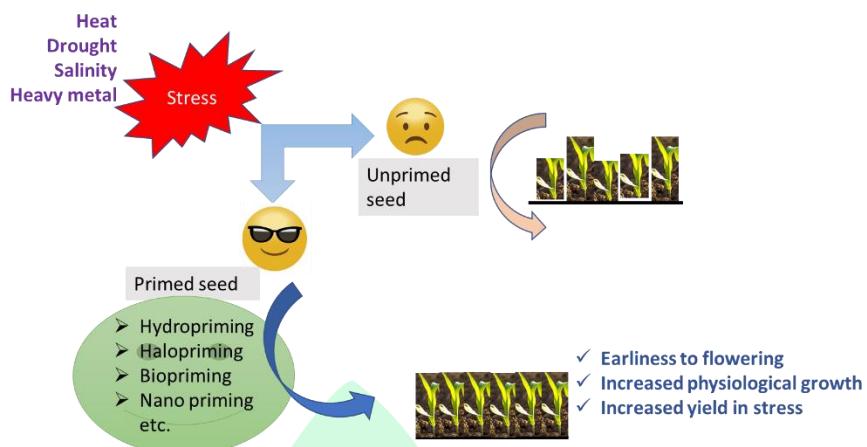
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Seed priming is a pre-sowing treatment which proceeds towards a physiological state responsible to germinate seed more efficiently. It can also be defined as seed treatment that modulates the germination process by handling the temperature and seed moisture content. Seed priming is very promising, efficient, and low-cost approach to increase the germination, growth, as well as the yield and productive capability of crops. Seed priming is not only used for improving the plant growth and yield attributes but also to increase the various stress tolerance. The majority of seed treatments are depending on seed imbibition characteristic allowing the seeds to go through the first reversible stage of germination but do not allow radical protrusion through the seed coat. Priming generally comprises of seed soaking in predefined amounts of water or limitation of the imbibition time. Seed priming is of many types depending on priming treatment such as hydropriming, halopriming, seed matrix priming, osmopriming and hormopriming etc. Priming is planned by focusing on the following objectives:

- To decreases the time to germination.
- To Enhances speed and uniformity of germination
- To eradicate or greatly reduce the amount of seed-borne fungi.
- To Improves resistance towards water and temperature stress
- To Increases the shelf life of seed
- To Enhances the yield



## Hydropriming

Simplest method of seed priming, which relies on seed soaking in pure water and re-drying to original moisture content prior to sowing. No use of additional chemical substances as a priming agent makes this method a low-cost and environment friendly.

## Osmopriming

It involves soaking seeds in osmotic solution with low water potential instead of pure water. Different compounds are used in osmopriming procedure including polyethylene glycol (PEG), mannitol, sorbitol, glycerol, and inorganic salts such as NaCl, KCl, KNO<sub>3</sub>, KH<sub>2</sub>PO<sub>4</sub>, MgSO<sub>4</sub>, and CaCl<sub>2</sub>.

## Halopriming

Priming with salt solutions is often referred as “halopriming”.

## Hormopriming

Seeds imbibition occurs in the presence of plant growth regulators, which can have direct impact on seed metabolism.

## Biopriming

Biopriming involves seed imbibition together with bacterial inoculation of seed. Increases rate and uniformity of germination, but additionally protects seeds against the soil and seed-borne pathogens.

### Chemical priming

Refers to seed treatment with different chemical solutions used as priming agents. This approach includes priming with wide range of both natural and synthetic compounds such as antioxidants (ascorbic acid, glutathione, tocopherol, melatonin, and proline), hydrogen peroxide, sodium nitroprusside, urea, thiourea, mannose, selenium, chitosan etc.

### Nutripriming

It is a technique in which seeds are soaked with solutions containing the limiting nutrient instead of pure water.

### Nano priming

Nano priming, a technique based on the combination of seed priming and nanoparticle treatment, has been successful tool for enhancing seed quality, seedling establishment and crop yields as well as increasing tolerance to environmental stresses.

### Conclusion:

All priming methods resulted in relevant changes in the biological mechanism of crop by mitigating salinity stress, heavy metals contamination, and flooding stress and improving chilling, heat, and drought tolerance. It is strongly recommended that combining multiple priming methods (hybrid priming), provide novel technologies and additional beneficial biological approaches to enhance the knowledge over seed priming and crop plant science. It is worth saying that seed priming can be employed as a key strategy to increase crop plant production under environmental acquiring stress tolerance and to meet the global food demand.