

# A Review on Seed Priming Techniques in Field Crops

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**Abstract:** - Germination and seedling rise are the basic stages in the vegetation cycle. Lacking seedling development and unseemly stand foundation are the primary requirements in the creation of yields which getting less precipitation. Ranchers do not have adequate assets to meet the prerequisite of seedbed groundwork for planting and they are at more danger when contrasted with reformist ranchers. Then again, great foundation expands seriousness against weeds, builds resilience to dry season period, increment yield and keeps away from the tedious requirement for re-planting that is expensive as well. It is all around acknowledged actuality that preparing improves germination, decreases seedling development time and improves stand foundation. A technique to improve the rate and consistency of germination is the preparing or physiological headway of the seed part. The universally useful of seed preparing is to mostly hydrate the seed to a point where germination measures are started, however they would display quick germination when re-soaked up under ordinary or stress conditions. A ton of work has been done on seed preparing and aftereffects of these examinations demonstrate well the significance of preparing to get a decent harvest remain in numerous yields of tropical locale, for example, rice, maize, sorghum and pigeon pea. Hydropriming and osmopriming with NaCl brought about lower time taken to half rise and mean development time and higher last rise, energy of rise, plant populace, achene yield and yield contributing components and achene proteins however an ideal opportunity to begin rise, plant stature and achene oil substance were most certainly not influenced essentially by various seed preparing. Solidifying brought about like or even substandard execution than that of untreated seeds. Insufficient seedling rise and wrong stand foundation are the primary requirements in territories getting less precipitation. The executives of soil surface and soil structure is a major test in semi-parched locales. Helpless ranchers do not have adequate assets to meet the necessities of fine seedbed groundwork for planting and they are at more danger when contrasted with reformist ranchers. On the other hand, great foundation expands intensity against weeds, builds resilience to dry season periods, builds yields and stays away from the tedious requirement for re-planting that is expensive as well. It is well acknowledged truth that preparing improves germination lessens seedling development time and improves stand foundation. It is a straightforward, minimal effort, effectively performable; on-ranch seed preparing can, whenever refined and created by guaranteeing the rancher interest, establish a decent connection with ranchers occupations improving the yield rise rate, along these lines expanding paces of harvest improvement, diminishing the complete harvest span and getting higher profitability.

**Key Words:** — *Germination, Harvest Foundation, Seed preparing.*

## I. INTRODUCTION

Man set up contact with seed physiology since the start of farming and immediately understood that numerous seeds do not sprout effectively and consistently. Old human progress was captivated by the limit of an evidently « dead seed » to restore and to deliver a feasible youthful and solid seedling after germination. The Greek Theophrastus effectively centered on seed physiology and recommended that germination cycle might be briefly intruded on. Pre-hydration of vegetable seeds prior to planting was performed by Roman ranchers to build the germination rate and synchronize germination as detailed by the Roman naturalist Gaius Plinius Secundus. A few centuries later, these procedures were as yet utilized for a wide scope of animal types as per the French agronomist Olivier de Serres .In 1664, referenced that temperature earlier planting may affect further germination

while after one century, Ingenuous broke down the effect of light on seedling rise.

Preparing permits a portion of the metabolic cycle's fundamental for germination to happen without germination occur. In preparing, seeds are absorbed various arrangements with high osmotic potential. This forestalls the seeds from engrossing in enough water for radicle projection, subsequently suspending the seeds in the slack stage (Taylor et al., 1998). Seed preparing has been regularly used to decrease the time between seed planting and seedling rise also, to synchronize rise (Parera and Cantliffe, 1994). In seed preparing, the osmotic weight and the period for which the seeds are kept in touch with the film are adequate to permit pre-germinated metabolic cycles to occur inside the seeds up to a level restricted to that promptly going before radicle rise. Strategies for growing seed and prompting parching resistance in seed are additionally given. Ideally, the semi-porous layer is given as a container of roundabout or

polygonal cross-area, which is pivoted with the seeds on its internal surface and the arrangement held between its external surface and a further body to which the layer is fixed in a watertight way. Seed preparing have significant function in expanding the yield of various crops according to upgrade 37, 40, 70, 22, 31, 56, 50 and 20.6% in wheat, grain, upland rice, maize, sorghum, pearl millet, and chick pea separately (Harris et al., 2005).

Innovation that progress seed germination and stand foundation would empower the parental plants to catch more soil dampness, supplements, sun based radiation, and help to accomplish high synchronization of the conceptive phases of each guardians and develop before the event of cool pressure in fall (Subedi and Ma, 2005). Thusly, seed empowerment medicines have been created to improve seed execution during germination and seedling early development. The broadly useful of seed preparing is to hydrate somewhat the seed to a point where germination measures are started yet not finished. Most preparing medicines include guzzling seed with limited measures of water to permit adequate hydration and advance of metabolic measures however forestalling the projection of the radicle. Treated seeds ordinarily would display quick germination when assimilate water under field conditions (Ashraf and Foolad, 2005).

Prior works indicated that the accomplishment of seed preparing is impacted by the unpredictable collaboration of components counting plant species, water possibility of the preparing specialist, span of preparing, temperature, seed energy and parchedness, and capacity states of the prepared seed (Parera and Cantliffe, 1994).

## II. PRIMING METHODS

A few techniques for seed preparing have been created to animate seeds and reduce the ecological burdens. A typical element of water-based preparing procedures, which recognizes them from other pre-planting medicines, is fractional seed pre-hydration and the actuation of early germination occasions in seed. Preparing proficiency is influenced by numerous components and emphatically relies upon treated plant species and picked preparing procedure. Physical and substance factors, for example, osmotic and water potential, preparing specialist, span, temperature, presence or nonappearance of light, air circulation, and seed condition likewise impact preparing achievement and decide germination rate and time, seedling power, and further plant improvement.

### A. Hydropriming

Hydropriming is the easiest technique for seed preparing, which depends on seed absorbing unadulterated water and re-

drying to unique dampness content preceding planting. No utilization of extra compound substances as a preparing specialist makes this strategy an ease and naturally amicable. The fundamental burden of hydropriming is uncontrolled water take-up by seeds. This is an outcome of free water accessibility to seeds during hydropriming, with the goal that the pace of water take-up relies just upon seed tissue fondness to water. Besides, this method may bring about inconsistent level of seeds hydration accordingly prompting absence of synchronous metabolic actuation inside seeds followed by unsynchronized rise. Thinking about these restricting components, it is profoundly critical to characterize exact treatment span, temperature, and water volume utilized in hydropriming to guarantee wanted degree of seed hydration and to forestall radicle bulge. Notwithstanding the previously mentioned constraints, numerous reports demonstrated valuable impact of hydropriming on seed germination and seedling development under both ideal and stress conditions, in different yield plants, for example, chickpea, maize, wheat, Indian mustard, canola, sunflower, rice, mung bean, capsicum, and durum wheat.

One of the industrially utilized sorts of hydropriming is the framework named "drum preparing", licensed in the mid-1990s [28, 29]. In this strategy, seeds are tenderly turning in drum and continuously hydrated by expansion of water in fume structure. Drum preparing permits seed imbibition in a controlled way and could be an appealing option in contrast to regular hydropriming. Uniquely planned device empowers observing of the seed weight, exact guideline of time, and water sum during hydration measure, what eventually brings about a proper and uniform dampness level of the seeds. Drum preparing with 24-epibrassinolide shows constructive outcome on germination time and seedling development of chime pepper associative with improved superoxide dismutase (SOD), catalase (CAT), and peroxidase (POX) exercises. Another variation of hydropriming, purported "on-ranch preparing", comprise of seed absorbing water followed by surface drying and ensuing planting. The term of treatment mandatorily cannot be longer than "safe breaking point" (greatest season of preparing without danger of seed or seedling harm by untimely germination). The positive effect of this technique on harvest rise and yield was affirmed by Harris et al. On-ranch preparing is particularly valuable for asset helpless ranchers in minimal tropical climate.

### B. Osmopriming

Osmopriming includes absorbing seeds osmotic arrangement with low water potential rather than unadulterated water. Because of low water capability of osmotic arrangements, water enters seed gradually which permits steady seed imbibition and enactment of beginning stages of germination

yet forestalls radicle bulge. Normally water capability of preparing specialist fluctuates from  $-1.0$  down to  $-2.0$  MPa. Notwithstanding, estimations of water likely along with span of the preparing treatment should be constantly acclimated to species, cultivar, and some of the time seed parcel. Various mixes are utilized in osmopriming technique including polyethylene glycol (PEG), mannitol, sorbitol, glycerol, and inorganic salts, for example, NaCl, KCl, KNO<sub>3</sub>, K<sub>3</sub>PO<sub>4</sub>, KH<sub>2</sub>PO<sub>4</sub>, MgSO<sub>4</sub>, and CaCl<sub>2</sub>. Preparing with salt arrangements is regularly alluded as "halopriming". Most basic synthetic utilized in osmopriming treatment is PEG, principally attributable to its particular trademark. Huge atomic size of PEG forestalls its entrance into the seed along these lines evading acceptance of possible cytotoxic impact and decrease of osmotic potential inside seed. By the by, PEG displays some unfortunate highlights including high thickness, which confine dispersion of oxygen in the arrangement so in PEG preparing air circulation framework is favoured. Seed preparing with PEG has been appeared as a powerful strategy to improve seed germination, seedling development, and stress resistance of a few harvest plants under horrible conditions, for example, salt, water, chilling, and nano-ZnO stresses.

#### C. Solid Matrix Priming

Strong lattice preparing (SMP, matricconditioning), in which water take-up by seeds is controlled, has been created as an elective strategy to osmopriming as a result of significant expense of osmotic specialists and specialized issues with air circulation. During strong lattice preparing, seeds are blended and hatched with wet strong water transporter for a specific period. Subsequently, seeds are isolated from framework, flushed, and back-dried. The utilization of strong medium permits seeds to hydrate gradually and reproduces common imbibition measure happening in the dirt. To effectively achieve SMP, materials used as grids ought to have explicit physical and compound highlights, for example, low framework potential, negligible water solvency, high water holding limit and surface region, no harmfulness to seeds, and capacity to stick to seed surface. Truth be told, vermiculite, peat greenery, charcoal, sand, dirt, and some economically offered substrate, for example, Celie or Micro Cell are commendable strong conveys applied in strong framework preparing. To acquire the best preparing execution, season of treatment and ideal water content must be resolved independently for every grid.

Constructive outcomes of SMP on yield seeds have been noted in numerous reports. Strong grid preparing upgraded field execution of carrot just as improved germination and seed force of soybean. Study on onion demonstrated that matricconditioning improved seed germination rate, seedling

rise, and development under ideal and low temperature conditions. Sand preparing expanded the exercises of cell reinforcement compounds, for example, catalase (CAT), peroxidase (POX), and dissolvable sugar content in waxy maize associative with improved pace of germination and seedling development under high-salt pressure conditions. It is entrenched that combination of SMP with natural and substance components may enormously improve seed execution. Adoreoli and de Adnrade demonstrated that incorporation of gibberellins/fungicide/Bacillus subtilis to matricconditioning prompts improved stand foundation and profitability of some vegetable harvests under tropical conditions. Also, matricconditioning with GA<sub>3</sub> improved the nature of hot pepper seeds. All the more as of late distributed information exhibited that strong grid preparing with Trichoderma viride improved seedling rise and yield of okra under low temperatures.

#### D. Halopriming

During halopriming, seeds imbibition happens within the sight of plant development controllers, which can have direct effect on seed digestion. The accompanying controllers are normally utilized for hormopriming: abscisic corrosive, auxins, gibberellins, kinetin, ethylene, polyamines, and salicylic corrosive (SA). Gibberellic corrosive (GA<sub>3</sub>) and PEG preparing improved photosynthetic properties, cell reinforcement framework, seedling development, and development of white clover on substantial metal contaminated soil. Preparing spring wheat seeds with GA<sub>3</sub> expanded grain yield and salt resilience by balancing hormone homeostasis along with changes of particle take-up and amassing among shoots and roots. Upgraded salt resilience, development, and grain yield of wheat were likewise seen after kinetin-preparing. Among the various strategies of seed preparing (hydro-, osmo-, and halopriming), spermidine pre-treatment gave off an impression of being the best technique for enlistment dry season resilience in rice. High proficiency of polyamines-preparing on the improvement of rice resistance to dry season has been exhibited likewise by Farooq et al. Basic part of phytohormones exogenously provided into seeds for plant reaction to saltiness stress was expressed in wheat seeds prepared with ascorbic corrosive and salicylic corrosive, as this pre-treatment technique builds the capacity of wheat to develop effectively under salt pressure, though hormonal preparing with ABA was not successful for this situation.

#### E. Biopriming

Biopriming includes seed imbibition along with bacterial vaccination of seed. As other preparing strategy, this treatment builds rate and consistency of germination, however

also ensures seeds against the dirt and seed-borne microorganisms. Hydration of seeds tainted with microorganisms during preparing can bring about a more grounded microbial development and thusly weakness of plant wellbeing. Notwithstanding, applying adversarial microorganisms during preparing is a biological way to deal with conquer this issue. Additionally, a few microscopic organisms utilized as biocontrol specialists can colonize rhizosphere and uphold plant in both immediate and aberrant manner after germination stage .It was discovered that biopriming is a significantly more powerful way to deal with sickness the executives than different strategies, for example, pelleting and film covering. These days, the utilization of biopriming with plant development advancing microscopic organisms (PGPB) as a vital part of farming practice shows incredible guarantee. In pearl millet, biopriming with *Pseudomonas fluorescences* disengages improved plant development and opposition against fleece build up infection. Biopriming with rhizobacteria improved germination boundaries of radish seeds under saline conditions.

### III. IMPORTANCE OF SEED PRIMING IN AGRICULTURE

Pre-planting preparing instigates a specific physiological status in seeds and has arisen as a promising procedure to improve plant conduct in the field. There is a solid interest for ranchers and seed organizations to discover reasonable modest preparing medicines yet additionally to absolutely distinguish the agronomical properties improved because of preparing in developed species.

#### A. *Hastening and synchronization of germination*

Prepared seeds frequently show an expanded germination rate and more noteworthy germination consistency. An improved and uniform seedling rise may add to standard yield foundation. Preparing may upgrade occasions occurring toward the start of the germination, however the entire cycle is hindered at a given state, which is the equivalent for every concerned seed. Preparing may likewise incite auxiliary and ultrastructural changes that could encourage ensuing water take-up and lessen introductory contrasts between the seeds regarding imbibition, consequently bringing about a more uniform germination. A quicker development may assist with improving competitively of developed plants against weed species as of late showed by Jalali and Salehi for sugar beets. In mung bean plants, a quicker seedling foundation coming about because of preparing may add to a complete expansion in yield up to 45%. Preparing prompted increment in germination might be related to an adjustment in plant hormone biosynthesis and flagging. Preparing has been accounted for to expand gibberellins (GA)/abscisic corrosive

(ABA) proportion, and this might be an immediate result of a preparing sway in quality articulation design. A more uniform GA endogenous focus in prepared seeds may assist with synchronizing endosperm debilitating, undeveloped organism cell prolongation, and save preparation. Ethylene likewise straightforwardly impacts germination speed and rate. Expansion in ethylene creation during preparing may advance endo- $\beta$ -mannase action encouraging endosperm debilitating and post-preparing germination. Preparing has been accounted for to start fix and reactivation of prior mitochondria and to start the biogenesis of new ones. It might in this manner bear the cost of a more significant level of energy throughout a brief timeframe to support last germination.

#### B. *Plant Growth*

Plants gave from prepared seeds regularly display a quicker development than those gave from unprimed ones. Decide if such development incitement is the outcome of a quicker seedling foundation or result from a drawn out explicit physiological status actuated by preparing still remaining parts an uncertain inquiry. In various cases, the helpful effect of preparing on plant development is more evident under no optimal than under ideal conditions, prompting the worldwide idea that a significant preferred position of preparing comprises in an expansion in pressure obstruction. Accordingly, in direct connection to memory occasions, the principle question is identified with the remanence of preparing prompted adjustments. Imram et al. indicated that such changes stay unblemished a little while after germination in maize.

In rice, preparing with 5-aminolevulinic corrosive improved shoot extension while preparing with Pico molar rutin enlarged both root and shoot length comparable to an expansion in photosynthetic shades, phenolic and flavonoid substance. In wheat, preparing with sodium preside invigorated plant development as an outcome of improved ability to search free extremists by cell reinforcements, and a comparable perception was accounted for rice because of an expansion in glutathione peroxidase (GPX) movement and other cancer prevention agent protein exercises .The gainful effect of preparing on plant development might be because of an improved supplement use productivity permitting a higher relative development rate and to an improved guideline of the plant water status .Jisha and Puthur affirmed that the preparing impact of  $\beta$ -aminobutyric corrosive on seeds of *Vigna radiata* further get persisted the seedlings. A higher development of seedlings gave from prepared seeds may likewise be investigated according to an immediate effect of pre-treatment on cell cycle guideline and cell extension measures.

### C. Mineral Nutrition

Alteration of supplement utilizes proficiency by youthful seedlings might be an outcome of preparing incited overexpression of qualities encoding for explicit carriers, albeit just couple of carriers show up explicitly prompted by preparing itself. A productive system to improve mineral nourishment of youthful seedling is to utilize supplement-based seed preparing procedure. Phosphorous seed preparing upheld crop improvement at beginning phases and may make up for P lack in the dirt [87, 88]. Jamil et al. [89] exhibited that improvement of mineral status of P-prepared grains decreased strigolactone exudation and hence affectability to the parasite weed *Striga hermonthica*. Muhammad et al. [85] as of late performed tests utilizing Zn, Mn, B, and P preparing. These creators showed that supplement seed preparing permitted maize plants to keep up Zn and Mn gracefully for at any rate 3 weeks in exceptionally calcareous soils described by a low supplement accessibility. Likewise, Pame et al. Indicated that P collection in rice might be expanded by utilizing P-prepared seeds, which is of unique interest in Asia where around 33% of the region of rainfed rice is arranged on P-lacking soils. Quite a higher retention could not be clarified simply by supplement gathering in the seeds during the prepared stage since it is yet seen in plants half a month subsequent to planting. It might thusly be guessed that preparing meddles with guideline of securing components and further examination is significantly expected to distinguish the atomic systems engaged with these cycles. Preparing with boron improves seedling development in rice and, on a drawn out premise, builds panicle ripeness corresponding to an improvement in disgrace receptivity. Seed preparing may likewise add to improve N nourishment, primarily through an upgraded nitrate reductase action in plants. Preparing with insignificant useful components, for example, Si, prompts an expansion in Si substance of developed plants and protectively affects plant improvement.

### D. Yield Related Parameter

An enormous measure of studies is dedicated to the effect of seed preparing on the seed germination stage and early seedling development. The majority of those examinations are directed under controlled natural conditions in plant development chambers or nurseries. Information revealing a genuine improvement under field conditions stay uncommon. Yield impact might be connected to a quicker plant foundation permitting a more drawn out development period. Khan et al. [93] announced that plant gave from prepared seed profits by a more extended time of acclimatizes amassing in sugar beet. On the other hand, now and again, phenological development of developed plants might be altered by preparing: in

chickpea, plants gave from preparing experienced a previous seed development permitting them to get away from sickness or warmth terminal pressure in the season. Yield increment may likewise result from a higher plant thickness saw as an outcome of preparing incited increment in germination rate.

Since not exactly 10 years, a few information began to be accessible for preparing initiated yield improvement in rice. Shah et al. [96] exhibited that preparing positively affected the heaviness of 1000 grains in this species. Boron preparing instigated an undeniable lessening in panicle sterility and thusly improved the quantity of grains per inflorescence. Binang et al. [97] additionally showed that preparing significantly affected the quantity of turners, number of ripe panicles, and thusly grain yield of new NERICA rice assortments. Promising yield improvement has likewise been accounted for maize, onion, okra, and sugar beet. Close to its effect on quantitative boundaries, preparing may likewise improve the nature of collected plants, as of late announced by Janecho et al. [101] for the nutrient substance and dietary benefit of vegetables.

## IV. CONCLUSION

Seed priming has been used to improve germination, reduces seedling emergence time, improve stand establishment and yield. The beneficial effects of priming have been demonstrated for many field crops. It is the best solution of germination related problems especially when crops are grown under unfavorable conditions. Seed priming is an old exact system utilized since hundreds of years by ranchers and since a very long time by seed organizations, to improve germination measures in developed plant species. The basic components associated with this positive effect of pre-planting medicines stayed dark for quite a while. The current survey planned to sum up late data gave by different devices permitting the recognizable proof of sub-atomic signals moulding-preparing effectiveness. The priming incited lessening of the capacity limit is a significant restriction for the use of the preparing method by seed organizations. Incomplete vacuum stockpiling might be helpful for expanding the life span of prepared seeds. Improved life span might be identified with upgraded hostile to oxidative movement that limits the amassing of complete peroxide during long haul stockpiling. Another test for private seeds organization is to distinguish proper medicines ready to re-establish energy of old dry seed parcels to expand their mean level of germination to values viable with business purposes.

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