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EFFECT OF DIFFERENT SOLUTIONS ON SEED GERMINATION AND GROWTH OF DIFFERENT SPECIES OF SEEDS - REVIEW

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ABSTRACT
The germination of seeds in salt tress or in drought stress is possible with Hoagland's solution by using growth regulators or growth hormones like Gibberellic acid solution, IAA, IBA, salicylic acid solution and etc. Hydropriming and Osmopriming is used to make the germination easy as it is regulating the moisture and temperature of seeds. Citric acid solution is mainly used to break seed dormancy. Polyethylene glycol (PEG) is the chemical solution which gives result as well. There are more ways for germination with CS/TPP nanoparticles and SLN with 1:100 & 1:1000 proportions with dilute solution.

Keywords: *Gibberellic acid, IAA, IBA, Salicylic acid.*

INTRODUCTION
The priming of the pea plant (*Pisum sativum*) for the purpose to standardize the best way of priming like osmopriming and hydropriming (Singh *et al.,* 2017). The pot experiment is taken to disclose the reaction of *Vigna radiata* (mung) in time duration of its growth in different stages as 3 weeks, 6 weeks and 8 weeks after planting (Ranawake *et al.,* 2011). In pot culture they recognized numerous morphological and biochemical attributes gradually lessen and increased the salinity due to emergence of reactive oxygen species i.e. H_2O_2 (Hydrogen peroxide) and O_2^-(superoxide radicals) to show the effect on pea (*Pisum sativum*) in salt stress by treating with *Trichoderma asperellum* (T42) and exogenous application of salicylic acid (Singh *et al.* , 2018). Nanoparticles like chitosan/tripolyphosphate (CS/TPP) & Solid Lipid Nanoparticles (SLN) affect plant development; the study has been shown the CS/TPP nanoparticles & SLN production and characterization without loading any active chemicals, it evaluates the effect on different plant species (*Zea mays, Brassica rapa,* & *Pisum satium*) in different concentration on purpose of phytotoxic effect probability on germination and development of seedlings (Nakasato *et al.,* 2017). Salinity in soil is the reason why the production of crops is adversely affected to reduce its negative effect selenium (Se) is used under lab condition; the Se treatment in low concentration bring down the Na^+ absorption and increase the absorption of Se (Kaur *et at.,* 2015).
The effect on growth of mungbean when treated with sodium chloride and pretreatment of salicylic acid on morphological parameters until salts stress (Shakeel *et al.,* 2012). The plant growth limitation of *Pisum sativum* L. if treated with lead & salicylic acid (Ratushnyak *et al.*, 2012). To improve the negative impact of salinity GA_3 has been used for presoaking mungbean plant (Mohammed, 2007). Impact of GA_3 on lignification of pea seedlings under light or in the dark condition to see dwarfism and tallness (Cheng, 1968). Spraying of different concentration of saline water and the effect of GA_3 on the minerals of *Vigna radiata* the results shows that by giving treatment of different concentration of salt stress influence the production of crops & the supplication of GA_3 improves the growth limitation as growth hormone & controls the salt stress as well as GA_3 has positive impact on *Zea mays* L., *Pisum sativum* Var. *abyssinicum* A. Braun & *Lathyrus sativus* L. in their production (Akbari *et al.,* 2010 & Tsegay *et al.,* 2018). The mustard plant under salt stress with the GA_3 supplication (Shah, 2007). The effect on seedling growth of *Lathyrus sativus* & *Pisum sativum* Var. *abyssinicum* of NaCl or salinity (Tsegay *et al.,* 2014). The plant growth limitation and

nutritional status maize plants (*Zea mays*) is treated with combine effect of GA and salinity on some antioxidant enzyme activities (Tuna *et al.,* 2008). The germination and seedling growth of pea under the condition of salt stress and drought stress (Okçu *et al.,* 2005). The seeds of Leguminosae like *Medicago sativa* L., *Astragalus adsurgens* Phall. & *Coronilla varia* L. germinates under the condition of drought & salt stress (Wu *et al.,* 2011). The germination of *Chinopodium glaucum* L. seed reaction in salt & stress (Duan *et al.,* 2004). The seed germination and seedling growth of *Haloxylon ammodendron* under the treatment of five different salts (Tobe *et al.,* 2004). Reaction of Cumin (*Cuminum cyminum* L.) seed germination in hydropriming and osmopriming (Naematollahi *et al.,* 2009). The consequence of germination & growth of seeds (lentils) under saline condition (Asgharipour *et al.,* 2011).

NaCl

The Mustard seeds first treated with 0.001 % $HgCl_2$ for 3 minutes to sterilization and with double distilled water rinse $HgCl_2$ from the seed, five pots prepared for per plant, each one of them fed with the Hoagland's solution (containing 6mM of NO_3 as sole Nitrogen source) till seed germination after that salt treatment started with different concentration under lab condition, after 25 days of emergence each plant sprayed with GA_3 & the controlled plant sprayed with double distilled water (Shah, 2007). The seed of *Vigna radiata* (mung) grown in earthen pots, the soil in pots were saturated with 100mM after 2 days the soil get dried the seed sowed; the plants irrigated daily at particular time to lessen any drought stress, by using selenium (Se) stress of soil is decreased (Kaur *et al.,* 2015). Seeds of *Chenopodium glaucum* first disinfected with ozone gas for 30 min. they germinate on three layered of filter paper in petridish with 10ml solution & sealed with transparent tape, for each treatment 40 seeds were used, to give treatment different salts (NaCl, Na_2SO_4, $NaCO_3$, $MgSO_4$, $MgCl_2$ & soil extract) and PEG 6000 iso-osmotic was used, the experiment done in 12hrs of dark & 12hrs of light under 15-20^oC after 9days seeds which are not germinated transferred to distilled water to note the recovery of germination (Duan *et al.,* 2004). The replicated seeds of *Haloxylon ammodendron* sown in 3 layer filter paper in plastic petridish and to each petridishs the de-ionized water, salt solution (NaCl, Na_2SO_4, $MgCl_2$, $MgSO_2$ or $CaCl_2$) or PEG 6000 solution added. The petridishs covered with lids and incubated at 20^oC in dark condition the number of emerging seedling longer than 3mm to 20mm will counted, longer than 20mm seedling will discarded, each treatment was replicated four times (Tobe *et al.,* 2004). The seed of saltgrass have low germination because of seed dormancy, to break seed dormancy scarification is used; after that it will treat with salinity, type of germination-regulating chemical & concentration of germination-regulating chemical in growth chamber & repeated once. Seeds sown in moisten with 10ml of different treatment solution on blot paper in petridish, they treat with warm and cool temperature (Shahba *et al.,* 2008).

Salicylic acid

The experiment is done in laboratory condition in poly house as pot culture, seeds of healthy pea treated with *Trichoderma asperellum* (T42) for 4 to 5 hours & then sow in pot, after seed germination it is treated with NaCl weekly intervals, three pots treated with salicylic acid, three with *trichoderma* and three with both *trichoderma* and salicylic acid and staining with H_2O_2 (Hydrogen peroxide)& O_2^-(superoxide radicals), histochemically after developing stain on leaves that can be observed by microscope (Singh *et al.,* 2018). The seeds of *Vigna radiata* swallowed in distilled water and in a solution of salicylic acid and small amount of DMSO (Dimethylsulfoxide) is put under 30^oC of temperature in dark for 13 hours and then sown in petridish upon two layer of filter paper moisten with distilled water after this process seedling treated with NaCl (Shakeel *et al.,* 2012). The seed of *Vicia faba* (faba bean) is tested its viability with the distilled water by soaking, the seed which have passed the viability test dried at room temperature, then the seeds get sterilized by 0.2% of $HgCl_2$ (mercuric chloride) rinsed off with distilled water repeatedly to remove $HgCl_2$; the seeds were put in a peteridish along with whatman paper with different concentration of salicylic acid (0.5mM, 1.0mM & 3.0mM) for seed germination (Soliman *et al.,* 2016).

Gibberellic acid

The *Vigna radiata* (mung) seeds were sterilized from $HgCl_2$ 0.01% for 3 minutes then washed with distilled water after that few seeds of mung is soaked in distilled water and few with gibberellic acid of 200 mg/L, in 100 plastic pots with sandy soil which is salt less, to manage the 100mM, 200mM & 300mM of NaCl, sodium chloride is added in soil. First four group pots is sowed by distilled water seed, 1st group pot will irrigated with tap water, 2nd, 3rd & 4th group will be irrigated with 100mM, 200mM & 300mM NaCl solution and 5th, 6th & 7th group

sowed with gibberellic acid seeds and irrigated with the 100mM, 200mM & 300mM of NaCl solution (Mohammed, 2007). The plant of *Pisum sativum* variety like tall and dwarf grown in dark and light under maintained temperature, the pea under white, red and one grown in dark are grown under green with the help of bulbs, lamps and cellophane. Lignifications in tall and dwarf pea plant effect by applying GA of 10^{-4} (Cheng *et al.,* 1968). The *Vigna radiata* L. is sterilized with the $HgCl_2$ and washed with the double distilled water & then sowed in pot with 10kg of sterilized and washed sandy soil, to irrigate one should treat as control, second treatment with NaCl with 50mM, 100mM & 150mM concentration, third treatment with Nacl (50mM, 100mM & 150mM) & 100 mg/L as seed pre soaking + 100 mg/L as foliar application of gibberellic acid, respectively once per week (Akbari *et al.,* 2010). The seeds of *Zea mays, Pisum sativum* & *lathyrus sativus* were disinfected with 5 % of sodium hypochlorite solution for 10 minutes and wash the seeds with distilled water thoroughly for 5 min., sterilized peteridish with 70% of ethanol for 10 min. and washed with distilled water the treatment were 0, 4, 6, 8, & 12 dS/m NaCl solution given to seeds with replication of three times and 0.2 g/L of GA_3 solution is used as primed by soaking in it for 12 hours at room temperature under dark condition after this process seeds washed 3 times with distilled water, it dried between two filter papers after drying seeds were sowed in the petridish lined with whatman paper and controlled one (unprimed seeds) soaked in water for 12 hours, re-dried then sown in filter paper lined peteridishes (Tsegay *et al.,* 2018). The chickpea (Cicer arietinum) seeds washed with water and soaked in 0.1% $Hgcl_2$ for 5 min. washed with distilled water thoroughly and then seeds will cultured in a conical flask in MS media without carbon source after that they will treated with saline solution (25, 50, 70, 100, 125, 150, 175 & 200mM) and the medium was given with gibberellic acid, kinetin & IAA applied respectively concentration of 3, 6, 9, 12µM. then flask kept in incubator at 25°C in dark it will give result after 7 days (Kaur *et al.,* 1998)

PEG (Polyethylene glycol)

The treatment done to see seed germination in different concentration as untreated, distilled water, mennitol, glycerols & PEG (polyethylene glycol) these chemicals added to 1000ml. of distilled water separately with constant stirring to make solution under laboratory condition using pea (*Pisum sativum*) seed (Singh *et al.,* 2017). The seeds (uniformed size) of *Medicago sativa, Astragalus adsurgens* & *Coronilla varia* will be surface sterilized with aqueous solution of 75% ethanol for 5 minutes, seed germination done in petridish with two whatman paper and 5 ml of distilled water or the respective test solutions, the test solution of PEG 6000 (w/v: 5, 10 or 15%) and different NaCl concentration 50mM, 100mM & 150mM (Wu *et al.,* 2011). The seeds of *Cicer arietinum* (GG-1 & GJG-3) with seed coat, for seed priming with 6 treatments including KNO_3 200pm, PEG 6000 (-1.2M.Pa.), Bavistin (2g/kg), neem oil (3%), control in complete randomized design (CRD) with three replications; seeds will be soaked for 8hrs. for priming respectively, air dried and put it on germination test by keeping them in between paper at 25°C, at the end seeds with radical are counted as germinated (Patil *et al.,* 2018).

Water stress & other treatment

The block design with ten replicates for each experiment and six plant per each replicates under a green house condition were planted the germinated seeds of mungbean, plants will grow under normal condition & for ten days water cut is done at 3 weeks, 6 weeks & 8 weeks after planting, plants will irrigated again after stress condition (Ranawake *et al.,* 2011). CS/TPP nanoparticles and SLN were prepared with the diluted proportion of 1:100 & 1:1000 respectively, the evaluation of phytotoxicity of CS/TPP nanoparticles & SLN using three plant species *Zea mays, Brassica rapa* & *Pisum sativum* (Nakasato *et al.,* 2017). The seeds of Cuminum cyminum sterilized with sodium hypochlorite for 1 minute & then washed with distilled water, seeds were put in the disinfected petridish; each petridish contain 25 seeds, after that seed will primed with distilled water for Hydropriming and for osmopriming they treated with chemicals like Nacl, Na_2SO_4 & $ZnSO_4$, they will employed in order to osmotic level of 0.0, -.3, -0.6, -0.9 & -1.2MPa. After 14 hours of priming seeds then washed with distilled water& then dried & kept in room at 25°C for two hrs. After drying of seeds they transferred in petridish will treat with distilled water at 25°C for seven days, by increasing the concentration of NaCl & Na_2SO_4 the best result is in hydropriming solution (Neamatollahi *et al.,* 2009).

Citric acid

Pisum sativum (pea) is surface sterilized with 2% sodium hypochlorite for 10 min. then rinsed repeatedly with distilled water; it is germinated on a two sheets of filter paper moisten with the distilled water under 25°C in a dark condition and the treatment like 200µM $CuCl_2$, 1µM IAA, 1µM GA_3, 10mM $CaCl_2$ & 100µM Na-citrate, applied individually or in combination with Cu: Cu + IAA, Cu + GA_3, Cu + Ca & Cu + citrate is given to seeds (Ben massoud *et al.,* 2018). The seed of *Brassica napus* washed with distilled water repeatedly, seeds sowed in tray with sterilized sand of layer about 2 inches & incubated in growth chamber at 20-22°C, they are wrapped morphologically, after four weeks seeds germinated then they transferred to thermopore sheets with hole on iron tube. Hoagland solution is used consisting KNO_3 3000µM; Ca $(NO_3)_2$ 2000µM; KH_2PO_4 100µM; $MgSO_4$ 1000µM; H_3BO_3 50µM; $MnCl_2.4H_2O$ 0.05µM; $ZnSO_4.7H_2O$ 0.8µM; $CuSO_4.5H_2O$ 0.3µM; $H_2MO_4.H_2O$ 0.10µM & FeNa-Ca 12.5µM. after transplanting plants they were treated with three replication of $CdCl_2$ & Citric acid (CA) as T_2: Cd (10µM), T_3: Cd (50µM), T_4: CA (2.5mM), T_5: Cd (10µM) + CA (2.5mM) & T_6: Cd (50µM) + CA (2.5mM) pH was maintained with 1M H_2SO_4 or NaCl (Ehsan *et al.,* 2014). The seeds of *Prunus avium* L. to separate sound seeds the extracted stone were floated in de-ionized water, for two days seeds dried in aerated place at room temperature later seeds will be sealed packed in poly bag to put it in refrigerator at 3°C, before giving pretreatment to the seeds its moisture content was calculated and by using tetrazolium test seeds viability tested. Few seeds soaked in 0.1% Citric acid and few in de-ionized water for 48 hours later it was mixed in 4:1 proportion with moist peat moss medium in large container, all of them treated with eight different pretreatment like seeds container stored in refrigerator for cold, seeds will stored in growth chamber at 20°C for warm + cold period for stratification (it'll take 60 to 135 days), after pretreatments four replicates of 100 seeds each one of them placed into moist sand medium in peteridish, then peteridish placed in a chamber with different temperature: 3°C and 20°C for 16 & 8 hrs. Irrigated with water when needed, seeds with radicals considered germinated (Eşen *et al.,* 2009).

CONCLUSION

The seed germination in different solution is used to check the germination of seed and the experiments shows that Nacl solution and citric acid solution are used as priming agent. The hormones like salicylic acid solution and gibberellic acid solution are very effective treatment as growth regulator, the PEG (polyethylene glycol) are also effective for germination. The control treatment will always be carried with distilled water to compare as it gives the best result.

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