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Physiological Effect of Seed Priming of Growth Regulators in Cowpea (*Vigna unguiculata L.*)

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Abstract

An investigation entitled "Physiological effect of seed priming of growth regulators in cowpea (*Vigna unguiculata L.*)" was carried out in 2020. The experiment was conducted on seed germination and early seedling study at college of agriculture, Padannakkad, Kasaragod in complete randomized design with eight treatments and three replications. Treatments included seeds primed with growth regulators *viz.,* TU at 500 ppm (T_2), SA at 50 ppm (T_3), SA at 100 ppm (T_4), SA at 150 ppm (T_5), BR at 0.1 ppm (T_6), BR at 0.3 ppm (T_7), BR at 0.5 ppm (T_8) and a control (T_1) without growth regulators. Seed priming with SA at 100 ppm and BR at 0.3 ppm showed 100 percent sprouting, seed germination, seedling survival and had taken minimum number of days for 50 per cent seed germination. Seed priming with 0.3 ppm BR significantly enhanced seedling vigour index which was on par with treatment of salicylic acid at 100 ppm.

Keywords: Growth regulators; Brassinolide; Salicylic acid; Seed priming

Introduction

Cowpea (*Vigna unguiculata L.*) is a well-known crop cultivated all over the world for vegetable, grain and fodder purpose. It is an annual crop having high nutritional value both in grains and leaves. Grains are rich source of energy, protein, carbohydrates, fat, dietary fibre minerals like iron, calcium, phosphorus, potassium, magnesium, zinc, copper and various essential amino acids like lysine, leucine and phenylalanine. Cowpea requires warm, semi-arid weather for better establishment. Cold climate adversely affects yield and quality of output. Well drained loamy soil is most preferred but difficult to establish in saline or alkaline soil.

To meet the nutritional requirement of diet and strengthening soil nutrient status production potential of pulse crops should be promoted. To achieve this, boosting present technology along with proper management is preferred [1]. To increase the production potential of cowpea by seed priming of growth regulators can be adopted. Seed priming is a pre-soaking treatment of seeds in nutrient or hormone solution. It helps for faster germination and emergence of vigorous seedlings. Seed priming enhance metabolic activities inside seed which accelerate better establishment.

To manipulate crop growth and development, novel plant growth regulators are preferred at lower concentrations as an input for sustainable farming these days. Brassinosteroids are a group of emerging steroidal hormone having wide range of application in agricultural crop production helps for increased cell division, cell elongation and cell enlargement, tolerance to various abiotic stresses in different crops. Salicylic acid is a naturally occurring compound coming under class of phenols play role in seed germination, leaf development, nutrient uptake, ion uptake, flower induction and longevity, thermogenesis, transpiration, stomatal movement, photosynthesis, synthesis of various biomolecules like chlorophyll, proteins, ethylene, impart tolerance against biotic and abiotic stresses by regulating defensive response against various pathogens and maintain plant health [2-5]. Thiourea having wide range of application in agricultural crop improvement from seedling stage to yield and quality of different crops. It breaks seed and bud dormancy and regulate flowering period in ornamentals [6]. Hence the present study aiming to elucidate the influence of seed priming and foliar application of growth regulators namely, brassinosteroid, salicylic acid and thiourea on seedling establishment and further growth of cowpea.

Materials and Methods

Experiment was carried out in complete randomized design with eight treatments and three replications. Seeds primed with treatment *viz.,* TU 500 ppm (T_2), SA 50 ppm (T_3), SA 100 ppm (T_4), SA 150 ppm (T_4), BR 0.1 ppm (T_5), BR 0.3 ppm (T_6), BR 0.5 ppm (T_7) and a control (T_1) without growth regulators. The study was carried out in petri plate followed in potray. Brassinolide with specification assay minimum 90 per cent purity manufactured by Maharashtra based sisco research laboratories private limited was used for preparing the solution. Initially 100 ppm stock solution was prepared by dissolving 10 mg brassinolide in few drops of ethanol and made 100 ml with distilled water; later from the stock 10 ppm solution was prepared by taking 10 ml of stock solution and made to 100 ml. From this 0.1, 0.3 and 0.5 ppm solutions were prepared. Salicylic acid with 99 percent purity was used for preparing the solution. The chemical manufactured by Kochi based company namely, spectrum reagent and chemicals, Pvt Ltd. Initially a stock solution was prepared with concentration of 200 ppm by dissolving 200 mg chemical in few drops of ethanol and made it to 1000 ml with distilled water. From this stock 50, 100 and 150 ppm solutions were prepared.

Thiourea with 99 per cent purity used for the study. It was produced by Isochem Laboratories, Kochi; the solution of 500 ppm was prepared by dissolving 500 mg thiourea in 1000 ml distilled water.

Observations on seed germination and early seedling study was carried out namely, number of days to seed germination, percentage of sprouting, days taken for 50% germination, germination percentage, percentage of survival, whole seedling dry weight, seedling vigour index. Days taken for seed germination counted in daily intervals. Sprouting percentage noted by counting seed with sprouts and its per cent calculated from total number of seeds kept for study. Days taken for 50% seed germination were counted in daily intervals. Germination percentage calculated on 10th DAS in portray by counting number of germinated seed to the total seeds taken.

Percentage of survival calculated by excluding damaged seedlings. Whole seedling dry weight was calculated after keeping selected seedling in hot air oven at 80°C for 48 hrs. Seedling vigour index was calculated by multiplying germination percentage with whole seedling dry weight. Statistical analysis of data and multiple comparison among treatments done (when F test was significant at 5% level) using GRAPES 1.0.0. software.

Results and Discussion

Minimum number of days taken for seed germination when the seeds primed in salicylic acid 100 ppm and brassinolide 0.1 ppm and 0.3 ppm which were reduced the time for germination by 16.75 per cent over control. It might be due to increase in the level of various enzymes activities of α amylase, protease and lipase during seed sprouting which breakdown insoluble stored food material into soluble forms that would enhances seed germination and early emergence of seedlings. It might be due to expansion of embryo and rupture of endosperm and regulation of gibberellic acid biosynthesis. The results were in conformity with findings of Zhu et al. [7], when study with salicylic acid in rapeseed in Malus domestica. 100 per cent sprouting and germination observed in T_4 (salicylic 100 ppm) and T_7 (brassinolide 0.3 ppm). The similar results of T_4 using salicylic acid reported by Singh and Singh and Singh in tomato and Farooq et al. in maize. In T_7 brassinolide used for priming which also in agreement with the findings of Vardhini and Rao [8], in groundnut, Sairam [9], in wheat and Semida and Rady in common bean [10]. Minimum number of days taken for 50% germination in T_7 (brassinolide 0.3 ppm) followed by T_4 (salicylic 100 ppm) and T_8 (brassinolide 0.5 ppm). Survival of all germinated seedlings observed in T_4 when seedlings primed in 100 ppm salicylic acid followed by T_7 (seed primed with 0.3 ppm brassinolide), it might be due to treatment made seedlings less susceptible to soil born pathogen. Whole seedling dry weight was recorded the highest for seedling primed in 0.3 ppm brassinolide followed by 0.1 ppm brassinolide which supported by studies of Vardhini and Rao, in groundnut. Increase in vigour index of seedlings by 48.88% recorded in plants treated with 0.3 ppm brassinolide over control. It could be due to increased shoot length by the action of cell division and cell expansion by brassinolide and thereby increasing whole dry weight of seedling which ultimately enhances seedling vigour index of treated seedlings. These results were in accordance with Basit et al., where improved germination qualities and vigour index noted in rice seedlings even under stress [11]. Seedling vigour index increased by 28.5% when seeds primed in 100 ppm salicylic acid, this might be due to the function of salicylic acid in accelerating seed germination and seedling growth. These results are in confirmation with Zhu et al. where 22.7% increased vigour index recorded in rapeseed with treatment of salicylic acid (Table 1 and Figure 1).

Treatmen ts	Days to seed germin ation (days)	Percen tage of sprouti ng (%)	50% seed germination (days)	Seed germina tion percentage (%)	Percenta ge of seedling survival (%)	Whole seedling dry weight (g)	Seedling vigour index (10 DAS)
T_1: Control	4.67^{c}	94.67^{c}	2.67^{ab}	93.33	92.00^{c}	0.25^{d}	23.95^{e}
T_2: TU at 500 ppm	$5.00b^{c}$	96.67^{bc}	3.33^{a}	97.33	93.33^{bc}	0.28^{cd}	26.63^{cde}
T_3: SA at 50 ppm.	5.67^{a}	97.33b	3.67^{a}	96	93.33^{bc}	0.26^{d}	24.63^{de}
T_4: SA at 100 ppm	4.00^{d}	100.00^{a}	2.00^{bc}	100	100.00^{a}	0.32^{b}	31.67^{b}
T_5: SA at 150 ppm.	5.00^{bc}	97.33^{b}	3.33^{a}	97.33	97.33^{ab}	0.29bcd	27.59^{bcde}
T_6: BL at 0.1 ppm	4.00^{d}	96.67^{bc}	2.00^{bc}	97.33	96.00^{abc}	0.31^{b}	30.13^{bc}
T_7: BL at 0.3 ppm	4.00^{d}	100.00^{a}	1.33^{c}	100	98.67^{a}	0.36^{a}	36.67^{a}
T_8: BL at 0.5 ppm	5.33^{ab}	95.67^{bc}	2.67^{ab}	96	93.33^{bc}	0.30^{bc}	28.32^{bcd}
SE(m)	0.204	0.791	0.354	1.7	1.76	0.01	1.41
CD	0.612	2.37	1.06	NS	5.29	0.004	4.23

Table 1: Effect of seed priming with various growth regulators on seed germination and early seedling growth.

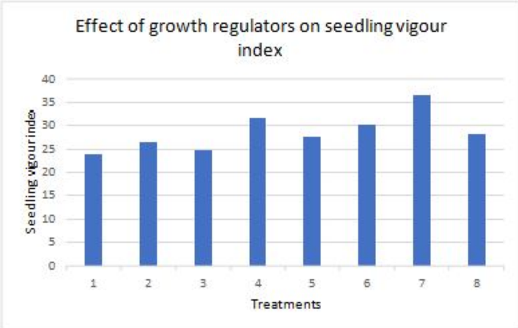

Figure 1: Effect of seed priming of growth regulators on seedling vigour index.

Conclusion

Seed priming in SA at 100 ppm, BR at 0.1 ppm and 0.3 ppm reduced number of days for germination.100 per cent seed sprouting and germination was found when seeds primed in SA at 100 ppm and BR at 0.3 ppm. 100 per cent seedling survival was observed in treatment of SA at 100 ppm. Whole seedling dry weight and seedling vigour index was higher when seeds primed in BR at 0.3 ppm.

References

1. Singh R, Singh MK, Singh AK, Singh C (2018) Pulse's production in India: Issues and elucidations. Pharma Innov J 7:10-13.
2. Idrees M, Naeem M, Aftab T, Khan MMA, Moinuddin (2011) Salicylic acid mitigates salinity stress by improving antioxidant defence system and enhances vincristine and vinblastine alkaloids production in periwinkle (*Catharanthus roseus* (L.) G. Don). Acta Physiol Plant 33: 987–999.
3. Jini D, Joseph B (2017) Physiological mechanism of salicylic acid for alleviation of salt stress in rice. Rice Sci 24:97–108.
4. Miura K, Tada Y (2014) Regulation of water, salinity, and cold stress responses by salicylic acid. Front Plant Sci 5:4.
5. Vincente MR, Plasencia J (2011) Sail acid beyond defence: its role in plant growth and development. J Exp Bot 62:3321-3338.
6. Chang YS, Sung FH (2000) Effects of gibberellic acid and dormancy- breaking chemicals on flower development of *Rhododendron pulchrum* sweet and *Rhododendron scabrum,* Don. Sci Hort 83:331–337.
7. Zhu ZH, Sami A, Xu QQ, Wu LL, Zheng WY, et al. (2021) Effects of seed priming treatments on the germination and development of two rapeseed (*Brassica napus* L.) varieties under the co-influence of low temperature and drought. Plos one 16:e0257236.
8. Vardhini BV, Rao SSR (1998) Effect of brassinosteroids on growth, metabolite content and yield of Arachis hypogea. Phytochem 48:927–930.
9. Sairam RK (1994) Effect of homobrassinolide application on plant metabolism and grain yield under irrigated and moisture stress conditions of two wheat varieties. Plant Growth Reg 14:173-181.
10. Semida WM, Rady MM (2014) Pre-soaking in 24-epibrassinolide or salicylic acid improves seed germination, seedling growth, and anti-oxidant capacity in *Phaseolus vulgaris* L. grown under NaCl stress. J Hortic Sci Biotechnol 89:338–344.
11. Basit F, Chen M, Ahmed T, Shahid M, Noman M (2021) Seed priming with brassinosteroids alleviates chromium stress in rice cultivars *via* improving ROS metabolism and antioxidant defence response at biochemical and molecular levels. Antioxidants 10:1089.