Biological Forum – An International Journal **13(1): 196-199(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of Organic and Inorganic Seed Treatments on Plant Growth and Yield in Mustard (*Brassica juncea* L.)

A. Sreenivasasareddy and A.K. Chaurasia
Department of Genetics and Plant Breeding,
Naini Agricultural Institute, SHUATS, Prayagraj-211007, Uttar Pradesh, India.

(Corresponding author: A. Sreenivasasareddy)
(Received 31 December 2020, Accepted 17 March, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: To standardize the priming method specific to tomato, the experiment was conducted during the Rabi season in 2020 at Sam Higgim bottom University of Agriculture, Technology and Science, Prayagraj (UP), Department of Postgraduate Laboratory, Department of Genetics and Plant Breeding, Lower. var. Pusa rub). Thirteenth treatments viz., T0-Control, T1-PEG6000(5% for 12 hrs), T2-PEG6000(10% for 12 hrs), T3-Manitol (5% for 12 hrs), T4-Manitol(10% for 12 hrs), T5-KCl(3% for 12 hrs), T6-KCl(5% for 12 hrs), T7-KNO_3(3% for 12 hrs), T8-KNO_3(5% for 12 hrs), T9-Sea weed extract(1% for 12 hrs), T10-Sea weed extract (5% for 12 hrs), T11-Coconut water (1% for 12 hrs) and T12-Coconut water (3% for 12 hrs). The experiment and study indicated interesting and different outcomes for each treatment performed. It is clear from the first stage which treatments are the best and the shortest time to germinate is observed. It is fascinating to see that other treatments work best compared to control. Each growth stage, beginning with the height of the plant, from flowering to the fruiting of the mustard, depicts different results. All different priming used was better than control, but overall the best performance was recorded in PEG, after which inorganic fertilizers were not applied after KCl and only the seeds were treated. Hence, it is healthy and eco friendly and could be easily practiced as an alternative to produce enormous yield with higher quality and quantity of yield in a short span of time. We have used organic materials, like sea weed extract and coconut water because of that we have received good amount of production and yield.

Keywords: PEG, KCl, -KNO, growth, yield and Mustard

INTRODUCTION

Rapeseed and mustard are one of the most important oilseed crops in India, belonging to the brassica genus of the family Crucifera. There are four species of oilseeds in Brassica: *B. compostris* (*B. rape*), *B. juncia* (Indian mustard), *B. napus* (winter and spring rape) and *B. carinata* (Ethiopian mustard). The three monogenomic diploids are *B. rapa* (AA, 2n = 20), *B. nigra* (BB, 2n = 16), and *B. oleracea* (CC, 2n = 18). The three allopolyploids are *B. juncia* (AABB, 2n = 36), *B. napas* (AACC, 2n = 38), and *B. carinata* (BBCC, 2n = 34), which are the result of hybridization between different monogenomic diploids. *B. juncia* (brown mustard, 2n = 4 × = 36; gene AABB) is *B. rapa* and .It is well-suited for cultivation in arid regions and grows as a major oilseed crop in the Indian subcontinent during the winter (Paritosh *et al.*, 2014).

Indian mustard (*Brassica juncea* L.) Commonly known as raiorlaha, is an important oilseed crop. In the Brassica group of oilseed crops in India, it has a higher production capacity per unit area than other members of the family Crucifer. These oilseeds are an important part of the human diet. In addition, it produces basic raw materials for agro-based industries, despite the large acreage of 20.7 million hectares under different oilseeds of different agro-climatic zones of the country. The present average per capital consumption of oil and fats has not been more than 11 g/day as against the nutritional standard of 30 g/day for a balanced (Kawada and Murai, 1979) diet. This is mainly due to the extraordinary growth in the human population and the productivity rate of this crop.

The seed is treated with a saturated salt called hollow-priming. Hollow priming performed with salt knuckle 5% solution, KCL 5% and CCL 2 1% solution concentrations. The seeds were soaked at 25°C in petri plates for 14 h. Dried and done at room temperature and after germination test, 250 h Seaweed contains macro and microelement nutrients, amino acids, vitamins, cytokinins, auxins and abscessic acid that affect cellular metabolism in treated seeds, leading to better seedling growth (Stephenson, 1981). In addition, seaweed contains precursors of elicitor compounds that promote germination (Stephenson, 1981).

Another possibility is the presence of polysaccharides in SWE, sugars that enhance seed growth similar to hormones (Rolland *et al.*, 2002). Zeitin is another candidate for rooting in plants by Sea weed Finney *et al*. (1985).

Mustard crop yield was not successful without using of organic materials in the previous study so it gave better result with them in this study.

MATERIALS AND METHODS

The variety of mustard were stored for one planting season. After storage, the seeds were prepared in different doses with distilled water, polyethylene glycol, sodium chloride, magnetic and electric doses. Treatments used in different concentrations for priming. T0-Control, T1-PEG6000(5% for 12 hrs), T2-PEG6000(10% for 12 hrs), T3-Manitol (5% for 12 hrs), T4-Manitol (10% for 12 hrs), T5-KCl(3% for 12 hrs), T6-KCl(5% for 12 hrs), T7-KNO_3(3% for 12 hrs), T8-KNO_3(5% for 12 hrs), T9-Sea weed extract(1% for 12 hrs), T10-Sea weed extract (5% for 12 hrs), T11-Coconut water(1% for 12 hrs) and T12-Coconut water (3% for 12 hrs). Mustard seeds are soaked in randomized block design (RBD) in seasons 03 at the [Rabi] Field Experimentation Center, Genetics and Plant Cultivation and Seed Quality Experiment Postgraduate Laboratory, Genetics and Plant Cultivation and Laboratory, Technology & Sciences, Allahabad (UP).

A. Mean performance

Significant differences were observed on all growth, field emergence yield and mustard components due to the treatments. Significant plant height (cm) by T2 [PEG6000 (10% per 12 hours)] was observed from the table of occurrence with perusal (142.47), low plant height (cm) (105.07) with unlimited control. The 50% flow on days caused by T2 [PEG6000 (10% at 12 hours)] (25.33) is significantly lower, while the maximum days can be observed with unlimited control of 50% flow (31.66). Perusal (123.13) from the table caused by T2 [PEG6000 (10% at 12 hours)] (123.13) in Days to Maturity, observed with unlimited control of high Days to Maturity (145.33), occurring by maximum number of branches / plant T2 [PEG6000 (12 hours at 10 hours) %)] (16.53), the lowest number of branches / plant (6.80) observed with unlimited control. Numbers of silica per plant are caused by T1 [PEG6000 (12 to 5%) hrs)], However silica seed is caused by T2 [PEG6000 (10% in 12 hours)] (13.35). The maximum increase of silica (cm) is caused by T2 [10% at PEG6000 (12 hours)] (14.33), while short length of silica (cm) (8.67) was observed with unlimited control. A significant increase in 1000 seed weight (g) was observed with unlimited control of T5 [KCl (3% for 12 hours)] (7.21) and low 1000 seed weight (g) (4.55). T2 [PEG6000 (10% for 12 hours)] (247.55) and the Harvest Index% is caused by T6 [KCl (5% for 12 hours)] (20.69%), with the lowest Harvest T12 [12% for Coconut Water (3%) indicator % (82. 33%) observed. Seed yield / plant (GM) and seed yield / plot (kg) T2 [PEG6000 (10% per 12 hours)] (45.23, 482.30), with low seed yield / plot (kg) (179.30) unknown control.

RESULTS AND DISCUSSION

There are several methods of seed priming, which are divided into traditional and modern methods. Traditional methods include hydro-priming, osmo-priming, nutrient priming, chemical priming, bio-priming, seed priming with plant growth regulators and priming with plant extracts. These studies report that seed priming increases early seed emergence by 10% at 12 hours PEG as compared to other studies and untreated seeds (Bradford 1986; Chen *et al.* 2012). Have shown positive effects on most osmotic germination capacity such as PEG (Del-Aquila and Toronto, 1986; Lemrasky and Husseini, 2012). The positive effect of PEG application on increased germination percentage can be explained by the increased activity of key enzymes such as amylase and protease (Del-Aquila and Tritto, 1990). Seeds that play an important role in embryo growth and development. In fact, these results are in agreement with Kia *et al.*, (2015), seeds soaked in PEG-6000 were reported to have better germination performance due to the lower osmotic capacity of the solution or longer inflammation duration. Lemrosky and Hosseini (2012). The maximum germination percentage of seed was reported when the seed was primed with 45% to 10% PEG and the germination rate improved when the seed was soaked in water and at 10% PEG. Del-Aquila *et al.* (1984) suggested an association between water absorption pattern, reactivation of mitotic activity, and initiation of germination and synchronization on proper application of osmopriming therapy. In addition, it has been reported that PEG application activates many compounds that promote germination.

Grain yield increased for PEG and KCI seed priming applications. It can cause biochemical changes in seed composition as a result of seed priming, such as activation of germination enzymes and establishment of stands. Osmopriming seeds (with PEG) also reported an increase in protein and α-amylase activity after ascorbate priming treatment, which helped improve carbohydrate metabolism, leading to better assimilation translation. All of these factors may explain higher grain yields in treatment than control conditions. Giri and Schillinger (2003) reported that none of the tenant seed-peeled media had any advantage in increasing farm or subsequent grain yields compared to controls. Among the various priming agents used in the study, the most effective application for seed germination under seedlings under adverse seed conditions, such as PG priming seed germination on PEG seeds, Seed growth rate was also improved by establishing a stand, and priming the seeds with water.

Table 1: Mean performance of mustard for 13 field parameters.

Treatments	Field emergence (%)	Plant Height (cm)	Days to 50% flowing	Days To Maturity	No. of branches/ plant	Numbers of Siliquae per plant	No .of Seed per Siliquae	Length of Siliquae (cm)	1000 Seed Weight (g)	Biological yield (gm)	Harvest Index %	Seed Yield / Plant (gm)	Seed Yield / plot (kg)
Control	76.33	105.07	31.66	145.33	6.80	270.33	8.80	8.67	4.55	105.26	17.03	17.93	179.30
T_1	85.67	132.53	28.33	132.67	14.00	365.27	12.40	12.67	6.23	241.23	18.59	44.85	448.50
T_2	86.33	142.47	25.33	123.13	15.53	361.60	13.35	14.33	6.64	247.55	18.48	45.23	452.30
T_3	78.00	127.13	26.67	142.67	7.87	284.93	9.94	4.00	5.63	144.74	14.29	20.68	206.80
T_4	79.33	123.00	27.33	139.33	8.67	277.53	11.80	8.33	5.61	144.74	18.22	26.37	263.70
T_5	82.33	139.53	23.67	135.00	12.00	320.13	10.70	9.33	7.21	186.40	14.72	27.43	274.30
T_6	84.67	139.13	23.33	137.67	13.80	343.00	11.96	11.64	6.96	212.72	17.55	37.34	373.40
T_7	80.00	130.00	26.00	142.67	13.73	335.27	11.00	11.66	6.69	203.95	20.69	42.19	421.90
T_8	84.00	128.00	24.67	139.67	13.27	308.33	10.80	8.67	6.31	207.45	18.75	38.90	389.00
T_9	76.00	118.07	30.33	140.33	8.00	278.07	10.00	6.67	6.35	149.13	14.85	22.15	221.50
T_{10}	78.33	117.86	31.00	144.00	9.86	304.93	11.80	6.95	6.24	174.57	15.15	26.44	264.40
T_{11}	81.33	116.53	29.67	142.67	8.53	277.60	12.02	7.67	4.91	173.24	14.49	25.11	251.10
T_{12}	79.33	121.13	31.33	139.67	7.85	281.20	11.13	7.35	5.25	175.44	11.79	20.68	206.80
S.Ed(m)	2.52	3.17	0.84	2.56	1.02	4.09	0.87	1.21	0.65	3.91	0.84	1.31	4.23
C.D. at 5%	5.20**	**6.54****	**2.07****	**5.28****	**2.11****	8.44**	**1.80****	**2.50****	**1.34****	**8.07****	**1.74****	**2.71****	**8.72****



Therefore, PEG is an effective way to improve seed germination and seed growth under therapeutic field conditions. Similarly, priming treatments significantly reduced plant height, number of silica per plant, seeds per silica, test weight, seed yield, biological yield, crop index, and oil content, up to 50% flowering within days. Various Mustard cultivars of Indian mustard bio-902 have been shown to perform well under high temperature and pressure conditions and PBR-357 is inferior (Table 1). However, in treatments, T2 [PEG6000 (10% at 12 hours)], followed by T1 [PEG6000 (5% at 12 hours)] was observed with minimal control. However, these results contradict previous workers' reports. ur Rehman *et al.* (2014) found that seed priming of linseed shortened crop branches and flowering and maturation time and contained maximum plant height, number of branches, tillers, pods and seeds per pod. Harris *et al.* (1999) suggested that there may be an early onset and maturation in seed priming treatment due to improvement in metabolic status. Musa *et al.* (1999) found that the priming plant improves the stand and provides benefits during the maturation period. These results may be due to the growth of plants under seed priming by PEG 6000 and consequently the assimilation of proteins, amino acids, soluble sugar and sink (reproductive organs).

REFERENCES

Bradford, K.J. (1986). Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. *Horticulture Science*, **21**: 1105-12.

Chen, K., Fessehaie, A., & Arora, R. (2012). Dehydrin metabolism is altered during seed osmopriming and subsequent germination under chilling and desiccation in *Spinacia oleracea* L. cv. Bloomsdale: possible role in stress tolerance. *Plant Science*, **183**, 27-36.

Dell'Aquila, A., Pignone, D., & Carella, G. (1984). Polyethylene glycol 6000 priming effect on germination of aged wheat seed lots. *Biologia plantarum*, **26**(3), 166.

Dell'Aquila, A., & Taranto, G. (1986). Cell division and DNA-synthesis during osmopriming treatment and following germination in aged wheat embryos. *Seed Science and Technology*, **14**(2), 333-341.

Dell'Aquila, A., & Tritto, V. (1990). Ageing and osmotic priming in wheat seeds: effects upon certain components of seed quality. *Annals of Botany*, **65**(1), 21-26.

Finnie, J.F., & Van Staden, J. (1985). Effect of seaweed concentrate and applied hormones on in vitro cultured tomato roots. *Journal of Plant Physiology*, **120**(3), 215-222.

Giri, G.S. and Schillinger, WF (2003). Seed priming winter wheat for germination, emergence and yield. *Crop Science*, **43**: 2135–2141.

Harris, D., Joshi, A., Khan, P. A., Gothkar, P., & Sodhi, P. S. (1999). On-farm seed priming in semi-arid agriculture: development and evaluation in maize, rice and chickpea in India using participatory methods. *Experimental Agriculture*, **35**(1), 15-29.

Kawada, K. and Murai, T. (1979). Short Communication. Entomological experimental setapplicatae, **26**: 343-345.

Kende, H. J. Z. (1977). The Five "Classical" Plant Hormones. *Plant Cell.*, **9**, 1197–1210.

Kia, H. H., Onsinejad, R., & Yari, F. (2015). The effect of pollination time and gibberellic acid (GA3) on the production and seed germination of *Phalaenopsis orchids*. *Journal of Ornamental Plants (Journal of Ornamental and Horticultural Plants)*, **5**(2): 83-89.

Lemrasky M.G., Hosseini S.Z. (2012). Effect of seed priming on the germination behavior of wheat. *International Journal of Agriculture Crop Science*, **4**: 564–567.

Musa, A. M., Johansen, C., Kumar, J., & Harris, D. (1999). Response of chickpea to seed priming in the high Barind Tract of Bangladesh. *International Chickpea and Pigeonpea Newsletter*, **6**, 20-22.

Paritosh, K., Yadava, S. K., Gupta, V., Panjabi-Massand, P., Sodhi, Y. S., Pradhan, A. K., & Pental, D. (2013). RNA-seq based SNPs in some agronomically important oleiferous lines of *Brassica rapa* and their use for genome-wide linkage mapping and specific-region fine mapping. *BMC Genomics*, **14,** 463. https://doi.org/10.1186/1471-2164-14-463.

Rolland, F., Moore, B., & Sheen, J. (2002). Sugar sensing and signaling in plants. *The plant cell*, **14**(suppl 1), S185-S205.

Stephenson, J. W. (1981). The effects of a seaweed extract on the yield of field and glasshouse crops. In *Proc Int Seaweed Symp.*, (Vol. **8**, pp. 740-744).

ur Rehman, H., Nawaz, Q., Basra, S. M. A., Afzal, I., & Yasmeen, A. (2014). Seed priming influence on early crop growth, phenological development and yield performance of linola (*Linum usitatissimum* L.). *Journal of Integrative Agriculture*, **13**(5): 990-996.

How to cite this article: Sreenivasasareddy, A. and Chaurasia, A.K. (2021). Effect of Organic and Inorganic Seed Treatments on Plant Growth and Yield in Mustard (*Brassica juncea* L.). *Biological Forum – An International Journal*, **13**(1): 196-199.