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Pre-sowing Seed Treatments of Botanicals and Chemicals on Growth, Yield and Yield Attributing Traits of Mustard (*Brassica juncea* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The experiment was conducted in the field of Seed Science and Technology at the department of Genetics and Plant Breeding, SHUATS, Prayagraj (U.P) during Rabi season 2020-2021, in order to standardize the suitable pre-sowing seed treatment of Mustard (Variety-Kranti). Different pre-sowing seed treatments include Thirteen treatments with T_0- control, T_1-KCL @ 0.3%, T_2-KNO_3 @ 0.5%, T_3-PEG_{6000} @ 25ppm, T_4-PEG_{6000} @ 50ppm, T_5-Panchagavya @ 2%, T_6-Panchagavya @ 4%, T_7-Panchagavya @ 6%, T_8-Panchagavya @ 8%, T_9-$MNSO_4$ @ 0.1%, T_{10}-$MNSO_4$ @ 0.3%, T_{11}-$MNSO_4$ @ 0.5%, T_{12}-Tulasi leaf extract @ 2% Soaking for 6 hrs. Pre-sowing seed treatment with PEG_{6000} @ 50ppm shows increased germination percentage, growth, yield and yielding attributes followed by Panchagavya @ 6% The Experiment and study indicated interesting and different outcomes for each treatment performed. All various priming treatments used was better than control, but overall the best performance was recorded in T_4- PEG_{6000} @ 50ppm, gave the best result to enhanced germinability, seed vigour, seed yield and yielding attributes of mustard.

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1. INTRODUCTION

Mustard (*Brassica juncea* L.), it belongs to the family Brassicaceae with chromosome no 2n=36, is the crop consisted several multipurpose species which yield edible leaves, roots, stems and seeds, Brassica are also extensively cultivated as crop, vegetables and fodder. Rape seed or rich in oils and proteins [1]. *Brassica juncea* (brown mustard, 2n=4x=36; genome AABB) is an allopolyploid species derived from a spontaneous hybridization of turnip and black mustard it's well adapted to cultivation in dryland areas and can grows as a major oilseed crop in the Indian subcontinent during winter [2]. Mustard seed is the world's second leading source of vegetable oil, after soybean. It is also the second most leading source of protein meal within the world after soybean. It is mainly grown in northern a part of India, Rajasthan is that the largest producing state followed by uttarpradesh [3]. India is that the second largest producer of rapeseed mustard within the world. The rapeseed mustard was grown over an area 6.8m ha producing 6.39 million tons with a productivity level of 941 kg/ha in year 2014-2015. Rajasthan, Uttarpradesh, Madhyapradesh, Haryana and Gujarat account for about 80% of the area and production in India [4]. Mustard is an economically important plant that has been documented in India for hundreads of years for its medicinal and nutritive values [5]. Food preparation of Indian mustard leaves is helpful in lowering the cost for diabetic patients suffering with comorbid anxiety due to their non-toxic effects and pharamaceutical preparations like capsules, creams, emulsions, fragrances, flavours, intramuscular injections, nasal sprays (Hassan *et al*., 2014). Mustard meal comprises about 40 to 50 percent protein, with a well-balanced aminoacid composition and protein efficiency ratio (PER) higher than that of soybean (Rodrigues *et al*., 2012). The seeds treated with PEG_{6000} is known as Osmopriming. After preparation of solution of PEG_{6000} 50ppm, panchagavya @ 6%, KNO_3 @ 0.5%, KCL @ 0.3% and $MNSO_4$ @ 0.1%, Tulasi leaf extract, mustard seeds was soaked in required solution for 6h at 25°C temperature. Untreated seed is called control. After 6hour of soaking the solution was drained out from the beaker and presoaked was air dried to original weight and then placed for germination in laboratory under controlled condition. After seed treatments seed was sown in field for occurring field observation.

2. MATERIALS AND METHODS

The investigation was conducted during Rabi season 2020-2021 within the Field trial Centre and Seed Test Laboratory of the Department of Genetics and plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj. Located at lattitude25.35°N and longitude 82.25°E at an altitude of 78 m above mean sea level, the soil is sandy loam in texture with moderate water holding capacity having pH of 7.0 to 8.0. Field experiment was laid down using randomized block design in three replications by using of mustard variety Kranti sown at 45*10cm row-to-row and plant-to-plant distance. Treatments used in different concentrations for priming.T_{0-} Control, T_1-KCL(0.3% for 6hrs),T_2-KNO_3(0.5% for 6hrs), T_3-PEG_{6000}(25ppm for 6hrs), T_4-PEG_{6000}(50ppm for 6hrs), T_5-Panchagavya (2% for 6hrs), T_6-Panchagavya (4% for 6hrs), T_7- Panchagavya (6% for 6hrs), T_8- Panchagavya (8% for 6hrs), T_9-$MNSO_4$(0.1% for 6hrs), T_{10}-$MNSO_4$(0.3% for 6hrs), T_{11}-$MNSO_4$(0.5% for 6hrs), T_{12}-Tulasi leaf extract (2% for 6hrs). Observations were recorded for every treatment on five randomly selected plants in each replication on characters viz,. Growth parameters Field emergency, Number of branches per plant, plant height. Yield parameters are Number of siliquae per plant, Number of seeds per siliquae, Seed yield per plant(g), Seed yield per plot(g), Biological yield(g) and Harvest index. Field experiment mean data analysis of variance was been carried out according to the procedure of Randomized Block Design (RBD).

3. RESULTS AND DISCUSSIONS

According to the findings, the treatments had an effect on all of the morphological traits studied, and there was a statistically significant difference between primed and non-primed seeds for all the parameters in Table-1. The data presented in the Table-1 shows the mean performance of 13 treatments for 10 growths, yield and yielding attributes.

3.1 Growth Attributes

Pre-sowing seed treatment with PEG_{6000} @ 50ppm was recorded maximum field emergence percent (95.83%) followed by Panchagavya @ 6% (93.75%) and $MNSO_4$ @ 0.1% (92.03%)

Table 1. Mean performance of mustard for Growth, yield and Yield attri

S. No	Treatments	Field Emergence %	Plant Height (cm)	Number Of branches Per plant	Number of Siliquae Per plant	Number of seeds per Siliquae	Seed yield per plant (gm)	Seed Yield per plot (gm)	Oil yield (q/ha)	Biological Yield (gm)	Harvest Index (%)
1	T_0	76.17	102.29	3.53	25.53	9.20	0.74	26.97	1.11	162.62	16.16
2	T_1	85.42	108.40	3.80	33.40	10.47	1.01	32.87	1.28	158.35	20.90
3	T_2	91.67	143.75	5.40	48.47	12.33	2.02	54.60	2.11	202.09	26.76
4	T_3	89.58	135.6	5.33	45.00	12.53	1.94	47.00	1.77	201.11	23.28
5	T_4	95.83	148.69	5.80	60.07	12.93	2.93	56.03	2.38	203.47	27.66
6	T_5	90.25	129.37	4.73	42.60	9.93	1.53	46.60	1.39	190.46	24.53
7	T_6	87.77	122.71	4.20	40.00	9.60	1.28	41.73	1.42	186.75	22.52
8	T_7	93.75	145.63	5.60	52.13	12.60	2.35	51.37	1.85	201.44	25.01
9	T_8	91.22	139.43	5.13	44.27	12.20	1.67	45.83	1.70	198.44	23.06
10	T_9	92.03	141.34	4.80	43.40	12.33	1.91	46.40	1.72	194.94	23.44
11	T_{10}	88.10	132.60	4.33	40.87	12.00	1.26	41.37	1.61	190.48	21.74
12	T_{11}	83.33	124.46	4.07	37.13	11.47	1.20	36.50	1.58	158.74	23.19
13	T_{12}	86.80	128.69	4.27	41.87	11.13	1.40	37.53	1.38	164.47	21.85
Grand Mean		88.61	130.99	4.69	42.67	11.44	1.63	43.55	1.64	185.64	23.08
C.D. (5%)		6.15	5.78	0.37	3.94	0.44	0.43	4.26	0.22	3.61	1.84
SE(m)		2.11	1.98	0.13	1.35	0.15	0.15	1.46	0.08	1.24	0.63
SE(d)		2.98	2.80	0.18	1.91	0.21	0.21	2.06	0.11	1.75	0.89
C.V.		4.12	2.62	4.71	5.47	2.28	15.70	5.82	8.08	1.16	4.72

were found to be lowest in control (76.17%). The effect of pre-sowing seed priming on field emergence percentage was found to be

Maximum plant height (148.69cm) was observed in pre-sowing seed treatment with PEG_{6000} @ 50ppm it was followed by Panchagavya @ 6% (145.63cm) and KNO_3 @ 0.5% (143.75cm) were found to be lowest in control (102.29cm). The above similar finding was observed by Kaewduangta *et al*., [8].

Number of branches per plant (5.80) was recorded highest in pre-sowing seed treatment with PEG_{6000} @ 50ppm and it was followed by Panchagavya @ 6% (5.60) and KNO_3 @ 0.5% (5.40) was found to be lowest in unprimed seeds (control) (3.53). On the above basis study concluded that the Number of branches per plant was found to be significant and similar results observed by Padmavathi *et al*., [9].

3.2 Yield Attributes

The number of siliquae per plant found to be highest in PEG_{6000} @ 50ppm (60.07) and it was followed by Panchagavya @ 6% (52.13), KNO_3 @ 0.5% (48.47) and minimum was recorded by the treatment Control (25.53). The effect of pre-sowing seed priming on number of siliquae per plant was found to be significant and similar results of Number of siliquae per plant was observed by Kaur *et al*., [10].

Number of seeds per siliquae was notified highest in PEG_{6000} @ 50ppm (12.93), it was followed by Panchagavya @ 6% (12.60), PEG_{6000} @ 25ppm (12.53) and minimum was recorded in the Control (9.20). The above similar results was observed by Ali *et al.,* [11].

Seed yield per plant maximum was recorded in the PEG_{6000} @ 50 ppm (2.93gm), it was followed by Panchagavya @ 6% (2.35gm), KNO_3 @ 0.5% (2.02gm) and minimum was recorded in the Control (0.74gm). The effect of pre-sowing seed priming on seed yield per plant was found to be significant and similar results of seed yield per plant was observed by Somasundaran *et al*., [12].

Seed yield per plot found to be highest in PEG_{6000} @ 50ppm (56.03gm), it was followed by KNO_3 @ 0.5% (54.60gm), Panchagavya @ 6% (51.37gm) and lowest was recorded in the Control (26.97gm). It is concluded that seed yield significant and similar results of field emergence percentage was observed by Ghassemi-Golezani *et al*. [6] and Demir and Oztokar *et al*., [7]. per plot was found to be significant and similar finding observed by Kaur *et al*., [10].

Pre-sowing seed treatment with PEG_{6000} @ 50 ppm was maximum biological yield (203.47gm), followed by KNO_3 @ 0.5% (202.09gm), Panchagavya @ 6% (201.44gm) where found to be lowest in KCL @ 0.3% (158.35gm). The effect of pre-sowing seed priming on biological yield was found to be significant and similar finding observed by Somasundaran *et al*., [12], Devakumar *et al.*, [13].

Maximum Harvest index (27.66%) was observed in pre-sowing seed treatment with PEG_{6000} @ 50ppm, it was followed by KNO_3 @ 0.5% (26.76%), Panchagavya @ 6% (25.01%) and lowest was recorded in unprimed seeds (16.16%). Similar findings was observed by Farooq *et al*., [14], Vazirimeher *et al*., [15].

Based on present investigation, it can be concluded that the treatment T_4-PEG_{6000} 50ppm is found promising for growth parameters due to PEG show increased rate of germination [16], plant height, number of branches per plant. [17] reported that during seed respiration intensity was initially lower but rapidly increased after words due to seed soaking with PEG_{6000} [18].

Significantly maximum siliquae per plant, number of seeds per siliquae, seed yield per plant, seed yield per plot, biological yield and harvest index was recorded in PEG_{6000} @ 50ppm is due to the increment in seed yield, the most important character regarding economic value of the crop, might be due to improvement in various parameters that is flowering, branches per plant and dry matter accumulation similar results was observed by [19-21].

4. CONCLUSION

On the basis of results obtained from the present investigation the treatment PEG_{6000} @ 50ppm had shown superior performance with respect to growth, yield under agro-climatic conditions of prayagraj region, found to be various among the all 12 treatments. Similarly, the treatment Panchagavya performance at par. Hence, the pre-sowing seed treatments with PEG_{6000} and Panchagavya can be suggested for commercial cultivation in prayagraj, agro-climatic conditions.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Yadav SK, Yadava DK, Vasudev S, Yadav S, Kumar PR, Nigam R. Assessment of seed quality and oil content in several branches of Indian Mustard (*Brassica juncea*) cultivars at different storage intervals, Indian Journal of Agriculture Sciences. 2013;83:227-233.
2. Paritosh K, Gupta V, Yadava SK, Singh P, Pradhan AK, Pental D. RNA- seq based SNPS for mapping in chinese mustard (AABB): synteny analysis between the 2 constituent genomes A (from B. Rapa) and B (from B. Nigra) shows highly divergent gene block arrangement and unique block fragmentation patterns, BMC Genomics. 2014;15:396-410.
3. Sodani R, Seema RK, Singhal S. Gupta N, Gupta K, Singh J. Chauhan. Performance of yield and yield attributes of ten Indian Mustard (*Brassica juncea* L.)" Genotypes under Drought stress. International Journal of pure & Applied Bioscience. 2017;5(3):467-476.
4. CCS HAU, Hisar. Rapessed-Mustard Research at Glance, Oil seeds Section, Deparment of Plant Breeding, CCS HAU, Hisar; 2006.
5. Parikh H, Khanna A. Pharmacognosy and Phytochemical Analysis of juncea Seeds'' Pharmacognosy Journal. 2014;6(5):47-54.
6. Ghassemi-Golezani K, Bakhshy J, Raey R, Hossainzadeh-Mahootchy A. Seed vigour and field performance of winter oilseed rape (*Brassica napus* L.) cultivars. Not. Bot. Hort. Agrobot. Cluj. 2008;38(3):146-1500.
7. Demir I, Oztokar C. Effect of salt priming on germination and seedling growth at coldness in watermelon seed during development. Seed Science and Technology. 2003;31:765-770.
8. Kaewduangta W, P Khaengkhan,P Utaboon. Improved germination and vigour of sweet Pepper (*Capsicum annum* L.) seeds by hydro and osmopriming. Azarian Journal of Agriculture. 2016;(3)4:70-75.
9. Padmavathi S, Gunasekar J, Kamaraj A, (2017). Effect of pre-sowing seed treatment using botanical extract on growth and yield characters in Black gram (*Vigna mungo* L.). Plant Archieves. 2017;17(2):1013/1016.
10. Kaur H, Chawla N, Pathak M. Effect of various seed priming treatments and priming duration on biochemical parameters and Agronomic characters of cowpea. 2015;7:01-11.
11. Ali MN. Sustainable Agriculture with low-cost Technologies (SALOCT). School of Agriculture and Rural Development, Ramakrishna Mission Vivekananda University, Belur Math, West Bengal. 2011;47.
12. Somasundaram E. Evolution of organic source of nutrient and panchagvaya spray on the expansion and sustainable productivity of maize-sunflower-green gram system. Ph.D Thesis submitted to Tamil Nadu Agriculture University, Coimbatore, India; 2003.
13. Devakumar N, Shubha S, Rao GGE. Imrankhan. Studies on soil fertility, cow urine and Panchagvaya levels on Growth and Yield of Maize. Building Organic Bridges, at the Organic World Congress, Istanbul, Turkey; 2014.
14. Farooq M, Basra SMA, Hafeez K. Seed invigoration by osmo hardening in gram. Seed Science and Technology. 2006;34:181-187.
15. Vazirimehr MR, Ganjali HR, Rigi K and Keshtehgar A. Effect of seed priming on quantitative traits on. International Journal of Plant Sciences. 2014;4:134-140.
16. Vijay Dugesar AK, Chaurasia Bineeta M, Bara, Kamal Kant. Effect of various Priming Methods on Nodulation in Black gram (*Vigna mungo* L.) Seeds. Int. J. Curr. Microbiol. APP. Sci. 2016;6(7):1137-1143.
17. Gong Ping Gul. Seed invigoration treatments for improved storability, field emergence and productivity of soybean. Crop Physiology Abst. 2001;27(2):1030.
18. Faruk Toklu, Turk. J. Shehzad F, Baloch KT, Ozkan H. Effects of varied priming applications on seed germination and a

couple of agro-morphological characteris- tics of Breed Wheat (*Triticum aestivum* L.). Turk. J. Agric. 2015;39:1005-1013.21.

19. Yari L, Aghaalikani M, Khazaei F. Effect of seed priming duration and temperature on seed germination behaviour of bread wheat (*Triticum aestivum* L.). ARPN J Agric Biol Sci; 2010.
20. Bijanzadeh E, Nosrati K and Egan T. Influence of priming techniques on germination and emergence on mustard (*Brassica napus* L.). Seed Science Technology. 2010;38:242-247.
21. Swaminathan C, Swaminathan V, Vijayalakshmi K. Panchagvaya-Boon to organic farming, international Book, Distributing Co., Lucknow; 2007.

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