Pre-sowing seed treatments of Botanicals and Chemicals on growth, yield and yield attributing traits of Mustard (*Brassica juncea* L.)

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 presowing seed treatment of Mustard (Variety-Kranti). Different presowing 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. 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 shortest time to germinate is observed. It is fascinating to see that other treatments work best compared to control. Each growth stage, beginning with height of the plant, from flowering to the fruiting of the mustard, depicts different results. All different 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.

Keywords**:** PEG_{6000}, Mustard, Growth, Yield**.**

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 cash crop, vegetables and fodder. Rape seed or rich in oils and proteins (Yadav *et al*., 2013). Brassica juncea (brown mustard, 2n=4x=36; genome AABB) is an allopolyploid species derived from a spontaneous hybridization of B.rapa and B.nigra it is well adapted to cultivation in dryland areas and can grows as a major oilseed crop in the Indian subcontinent during winter (Paritosh *et al.,* 2014). Mustard seed is the world"s second leading source of vegetable oil, after soyabean. It is also the second most leading source of protein meal in the world after soyabean. It is mainly grown in northern part of india, Rajasthan is the largest producing state followed by uttarpradesh (Sodani *et al*., 2017). India is the second largest producer of rapeseed mustard in 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 (CCS HAU,Hisar,2006). Mustard is an economically

important plant that has been well known in india for centuries for its medicinal and nutritive values (Parikh and Khanna, 2014). 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 soyabean (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. MATERIAL AND METHODS

The investigation was conducted during rabi season 2020-2021 in the Field test Centre and Seed Test Labotarory 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 each 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 satistically 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.

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

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

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) where found to be lowest in control (76.17). The effect of pre-sowing seed priming on field emergence percentage was found to be significant and similar results of field emergence percentage was observed by Ghassemi-Golezani *et al*., (2008) and Demir and Oztokar *et al*., (2003).

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) where found to be lowest in control (102.29cm). The above similar finding was observed by Kaewduangta *et al*., (2016)

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*., (2017).

3.2 Yield Attributes

The number of siliquae per plant found to be highest inPEG_{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*., (2015).

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.,* (2001).

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 presowing 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*., (2003).

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). On the above basis study concluded that seed yield per plant was found to be significant and similar finding observed by Kaur *et al*., (2015).

Pre-sowing seed treatment with PEG_{6000} @ 50 ppm was recorded 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 presowing seed priming on biological yield was found to be significant and similar finding observed by Somasundaran *et al*., (2003), Devakumar *et al.*,(2014).

Maximum Harvest index (27.66%) was observed in presowing 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*., (2006), Vazirimeher *et al*.,(2014).

3.3 Discussion

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 (Vijay Dugesar *et al*.,2016),Plant height, Number of branches per plant. (Gang Ping Gu *et al*., 2001) reported that during seed respiration intensity was initially lower but rapidly increased after words due to seed soaking with PEG_{6000} (Faruk Toklu *et al*., 2015).

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 (Yari *et al*.,2010), (Bijanzadeh *et al*.,2010).

4. CONCLUSION

On the basis of results obtained from the present experiment 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 presowing seed treatments with PEG_{6000} and Panchagavya can be suggested for commercial cultivation in prayagraj agro climatic conditions.

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