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.

**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 T0 - control, T1-KCL @ 0.3%, T2-KNO3 @ 0.5%, T3-PEG6000 @ 25ppm, T4-PEG6000 @ 50ppm, T5-Panchagavya @ 2%, T6-Panchagavya @ 4%, T7-Panchagavya @ 6%, T8-Panchagavya @ 8%, T9-MNSO4 @ 0.1%, T10-MNSO4 @ 0.3%, T11-MNSO4 @ 0.5%, T12-Tulasi leaf extract @ 2% Soaking for 6 hrs. Pre-sowing seed treatment with PEG6000 @ 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 T4-PEG6000 @ 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 grow 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 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 hundreds 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 pharmaceutical 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 latitude25.35°N and longitude 82.35°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     | T₀         | 76.17             | 102.29           | 3.53                        | 25.53                         | 9.20                          | 0.74                      | 26.97                  | 1.11            | 162.62               | 16.16               |
| 2     | T₁         | 85.42             | 108.40           | 3.80                        | 33.40                         | 10.47                         | 1.01                      | 32.87                  | 1.28            | 158.35               | 20.90               |
| 3     | T₂         | 91.67             | 143.75           | 5.40                        | 48.47                         | 12.33                         | 2.02                      | 54.60                  | 2.11            | 202.09               | 26.76               |
| 4     | T₃         | 89.58             | 135.6            | 5.33                        | 45.00                         | 12.53                         | 1.94                      | 47.00                  | 1.77            | 201.11               | 23.28               |
| 5     | T₄         | 95.83             | 148.69           | 5.80                        | 60.07                         | 12.93                         | 2.93                      | 56.03                  | 2.38            | 203.47               | 27.66               |
| 6     | T₅         | 90.25             | 129.37           | 4.73                        | 42.60                         | 9.93                          | 1.53                      | 46.60                  | 1.39            | 190.46               | 24.53               |
| 7     | T₆         | 87.77             | 122.71           | 4.20                        | 40.00                         | 9.60                          | 1.28                      | 41.73                  | 1.42            | 186.75               | 22.52               |
| 8     | T₇         | 93.75             | 145.63           | 5.60                        | 52.13                         | 12.60                         | 2.35                      | 51.37                  | 1.85            | 201.44               | 25.01               |
| 9     | T₈         | 91.22             | 139.43           | 5.13                        | 44.27                         | 12.20                         | 1.67                      | 45.83                  | 1.70            | 198.44               | 23.06               |
| 10    | T₉         | 92.03             | 141.34           | 4.80                        | 43.40                         | 12.33                         | 1.91                      | 46.40                  | 1.72            | 194.94               | 23.44               |
| 11    | T₁₀        | 88.10             | 132.60           | 4.33                        | 40.87                         | 12.00                         | 1.26                      | 41.37                  | 1.61            | 190.48               | 21.74               |
| 12    | T₁₁        | 83.33             | 124.46           | 4.07                        | 37.13                         | 11.47                         | 1.20                      | 36.50                  | 1.58            | 158.74               | 23.19               |
| 13    | T₁₂        | 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 significant and similar results of field emergence percentage was observed by Ghassemi-Golezani et al. [6] and Demir and Oztokar et al., [7].

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 Kaur 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
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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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