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Effect of different seed treatment on growth and yield of mustard in the sub-humid zones of Rajasthan (*Brassica juncea* L.)

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Abstract

The present investigation aimed to find out the “Effect of Different Seed Treatment on Growth and Yield of Mustard in The Sub-Humid Zones of Rajasthan (*Brassica juncea* L.)” was carried out at Agronomy Research Farm, Faculty of Agriculture and Veterinary Science, Mewar University, Gangrar, Chittorgarh, Rajasthan. Geographically Chittorgarh. The experiment was laid out in Randomized Block Design. Replicated thrice with 13 treatment combinations, comprising like T₁ Untreated, T₂ Water Soaking, T₃ KCl, T₄ K₂SO₄, T₅ CaCl₂, T₆ NaCl, T₇ Carbendazim 75% WP, T₈ Mancozeb 45, T₉ KCl + Mancozeb 45, T₁₀ K₂SO₄ + Mancozeb 45, T₁₁ CaCl₂ + Mancozeb 45, T₁₂ NaCl + Mancozeb 45 and T₁₃ Carbendazim 75% WP + Mancozeb. Variety Pusa Mustard -28 was selected for the experiment.

Significant observed on growth due to different seed treatment in mustard growth parameter viz., Highest plant height 55.67, 95.12 and 165.33 cm at 40, 60 and 80 DAS, highest number of branches plant⁻¹ 2.80, 5.73 and (7.33 at 40, 60 and 80 DAS and highest plant dry weight 2.80, 11.5 and 21.27 g at 40, 60 and 80 DAS, respectively were recorded with seeds treated with T₁₃ (Carbendazim 75% WP + Mancozeb). All the seed treatments showed significantly among the other treatments, the seeds treated with T₁₃ (Carbendazim 75% WP + Mancozeb) recorded the highest seeds siliquea⁻¹ 18.73, maximum seed yield 1.96 t ha⁻¹, highest straw yield 9.83 t ha⁻¹. The lowest yield were recorded with untreated treatment seed.

Keywords: Southeastern zone, mustard seed treatments growth, yield

Introduction

Among the various oilseeds, rapeseed-mustard (*Brassica juncea*) is India's third most important oilseed crop, after soybean and groundnut, contributing nearly 20-25% of the nation's total oilseed production. The crop is cultivated across India, but Rajasthan stands out as the leading producer, contributing significantly to both the area under cultivation and production levels. In recent years, India has seen a growth in rapeseed-mustard production, with the 2023-24 season projected to yield 11.9 million metric tons from 9.3 million hectares, benefiting from favorable weather conditions (Anonymous 2024) ^[1].

Increased germination can be observed when seed treatment containing fungicides are used when poor germination results from a fungal infection. Fungicide are available to protect seed and seedlings from many seed-borne or soil-borne pathogens. Seed treatment are most beneficial for seeds infected prior to planting or when cool, wet soil conditions exist at planting which results in delayed germination. Seed treatment containing insecticides can serve to protect seed and seedlings from certain insect pests found in the soil. Cool, wet, seedbeds resulting in delayed germination or ploughing down green manure crops may warrant including an insecticide seed treatment (Chaudhary *et al.* (2022) ^[4].

Grain producers should realize that any one seed treatment would not control all diseases or insects that may attack seeds and seedlings. Protection is also short lived, generally only lasting as long as it takes the crop to emerge. Before selecting a seed treatment, it is essential for the grower to consider potential problems associated with the seed and the history of problems associated with each field. each planting situation is different requiring consideration of seed quality; planting rate; tillage and seed bed preparation; soil moisture and temperature; time of planting; and the likelihood of rapid emergence. Therefore keeping these facts in view field experiment entitled “Effect of Different Seed Treatment on Growth

and Yield of Mustard in The Sub-Humid Zones of Rajasthan (*Brassica juncea* L.)” was conducted during *spring* season of 2024-25.

Materials and Methods

The field experiment was conducted at Agronomy Research Farm, Faculty of Agriculture and Veterinary Science, Mewar University, Gangrar during 2024-25, which is situated at altitude of 394.5 meter above mean sea level and at 24.88°N 74.63°E. It falls under the agro-climatic zone IV A i.e. Sub humid Southern Plain and the aravalli hills of Rajasthan. During the crop season, the minimum and maximum temperature at Gangrar fluctuates in between 15.7 °C to 24.30°C and 26.8 °C to 35.30°C, respectively. Total rainfall received during crop growing season was 1000 mm. Variety Pusa Mustard 28 was selected for the experiment. It was released or notified from IARI in 1992; it matures in 115-120 days. It is tolerant to wilt and the seed black in colour. Yield potential 2.40 t ha⁻¹. Seeds were sown on well prepared beds in shallow furrows at a depth of 3-4 cm, row to row distance was maintained at 45 cm and plant to plant space was maintained at 15 cm two to three seeds were planted at each hill and covered with soil.

Results and Discussion

Growth parameters

The showed in (Table 1) of mustard changed with the advancement of the growth period on all the observation the increase in plant height was found to be maximum plant height (55.67 cm), (95.12 cm) and (165.33 cm) at 40, 60 and 80 DAS, highest number of branches plant⁻¹ (2.80), (5.73) and (7.33) at 40, 60 and 80 DAS and highest plant dry weight (g) (2.80 g), (11.5 g) and (21.27 g) at 40, 60 and 80 DAS were recorded under T₁₃ (Carbendazim 75% WP+ M-45). The fungicide carbendazim and mancozeb has highly influenced all the studied growth parameters of mustard seedlings. Germination percentage of mustard seed treatment with carbendazim and mancozeb fungicide. Other

studies also reported that more fungicide produces negative interference and abiotic stress in germination of seeds and decreased it drastically in the treated sets (Horii *et al.* 2007, Cataneo *et al.* 2010, Marini *et al.* 2011, Parween *et al.* 2016) [7, 3, 11, 9]. The fungicides inhibit the growth of fungi which might be due to the fungicidal effect on production of pectolytic and cellulolytic enzymes by the fungi and thereby reducing the incidence of fungal growth. Improvement in seed quality and reduction in seed mycoflora by Tebuconazole may be due to its plant growth-regulating properties (Fletcher *et al.*, 2000) [5]. Contact fungicides prevent only spore germination, while systemic fungicides inhibit the development of fungi probably may be due to interfering with spindle formation at mitosis (cell division) prevent fungal growth (Wachowska *et al.*, 2013) [10]. Aroosa *et al.* (2012) [2] found tebuconazole significantly effective by suppressing radial growth and with reduction of fungal biomass from 20 to 90 per over control of diseases.

Yield attributes and yield

The significantly effect of seed treatment on yield data presented in Table 2. The highest seeds silique⁻¹ (18.73), highest seed yield (t ha⁻¹) (1.96 t ha⁻¹). Highest straw yield (t ha⁻¹) (9.83 t ha⁻¹) were recorded under T₁₃ (Carbendazim 75% WP+ M-45). Seed yield increased applications with carbendazim 75% WP+ M-45. It can reduce fungal disease during crop growth and development also biochemical changes in seed composition as a result of seed priming, such as activation of germination enzymes and establishment of stands. Osmo priming 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) [6] reported that none of the tenant seed-peeled media had any advantage in increasing farm or subsequent grain yields compared to controls.

Table 1: Seed treatment and its effect on Plant height (cm) of mustard at different intervals

Treatments		Plant Height (cm)			
		20 DAS	40 DAS	60 DAS	80 DAS
T ₁	Untreated	1.92	35.22	68.13	135.15
T ₂	Water Soaking	1.31	38.26	71.84	142.65
T ₃	KCl	1.49	40.28	73.71	143.89
T ₄	K ₂ SO ₄	1.23	39.60	75.28	144.75
T ₅	CaCl ₂	1.45	36.94	83.38	148.34
T ₆	NaCl	1.00	40.61	85.41	150.21
T ₇	Carbendazim 75% WP	1.11	51.07	91.64	158.71
T ₈	Mancozeb 45	1.82	53.55	92.91	160.43
T ₉	KCl + Mancozeb 45	1.06	40.11	81.81	152.91
T ₁₀	K ₂ SO ₄ + Mancozeb 45	1.59	44.07	88.42	157.10
T ₁₁	CaCl ₂ + Mancozeb 45	1.25	45.72	83.48	154.12
T ₁₂	NaCl + Mancozeb 45	1.21	45.41	85.26	150.45
T ₁₃	Carbendazim 75% WP + Mancozeb	1.49	55.67	95.12	165.33
F – test		S	S	S	S
SEd (±)		0.23	3.10	2.46	4.62
CD (P= 0.05)		0.47	6.41	5.09	9.55

Table 2: Seed treatment and its effect on number of branches per plant on mustard at different intervals.

Treatments		No. of Branches Per Plant		
		40 DAS	60 DAS	80 DAS
T ₁	Untreated	1.20	2.87	4.93
T ₂	Water Soaking	1.17	3.47	5.53
T ₃	KCl	1.53	3.67	5.87
T ₄	K ₂ SO ₄	1.46	4.00	6.13
T ₅	CaCl ₂	1.66	4.33	6.53
T ₆	NaCl	1.86	4.33	6.11
T ₇	Carbendazim 75% WP	2.33	5.13	7.00
T ₈	Mancozeb 45	2.53	5.33	7.13
T ₉	KCl + Mancozeb 45	1.6	4.67	6.80
T ₁₀	K ₂ SO ₄ + Mancozeb 45	1.86	3.80	6.40
T ₁₁	CaCl ₂ + Mancozeb 45	1.33	4.27	6.67
T ₁₂	NaCl + Mancozeb 45	1.53	4.13	6.67
T ₁₃	Carbendazim 75% WP + Mancozeb	2.80	5.73	7.33
F – test		S	S	S
SEd (±)		0.02	0.40	0.27
CD (P= 0.05)		0.05	0.82	0.57

Table 3: Seed treatment and its effect on dry weight (g) of mustard at different intervals

Treatments		Dry Weight (g)			
		20 DAS	40 DAS	60 DAS	80 DAS
T ₁	Untreated	0.02	0.85	5.44	13.5
T ₂	Water Soaking	0.05	1.34	6.14	16.27
T ₃	KCl	0.08	1.71	6.28	14.49
T ₄	K ₂ SO ₄	0.16	1.91	7.00	18.94
T ₅	CaCl ₂	0.05	2.02	6.61	19.89
T ₆	NaCl	0.03	1.68	7.05	17.11
T ₇	Carbendazim 75% WP	0.02	2.24	9.61	20.66
T ₈	Mancozeb 45	0.05	2.62	9.83	21.00
T ₉	KCl + Mancozeb 45	0.02	2.32	8.27	18.83
T ₁₀	K ₂ SO ₄ + Mancozeb 45	0.09	2.03	6.60	19.22
T ₁₁	CaCl ₂ + Mancozeb 45	0.10	2.06	7.27	18.16
T ₁₂	NaCl + Mancozeb 45	0.03	2.10	6.61	18.79
T ₁₃	Carbendazim 75% WP + Mancozeb	0.05	2.80	11.05	21.27
F - test		S	S	S	S
SEd (±)		0.05	0.24	0.61	0.87
CD (P= 0.05)		-	0.50	1.27	1.79

Table 4: Seed treatment and its effect on number of yield of mustard

Treatments		Number of seeds per Siliqua plant ⁻¹	Seed Yield (t ha ⁻¹)	Straw Yield (t ha ⁻¹)
T ₁	Untreated	13.80	1.40	6.21
T ₂	Water Soaking	14.33	1.01	5.72
T ₃	KCl	14.60	1.33	6.28
T ₄	K ₂ SO ₄	15.60	1.43	7.00
T ₅	CaCl ₂	16.00	1.40	6.48
T ₆	NaCl	16.13	1.42	6.90
T ₇	Carbendazim 75% WP	18.13	1.80	9.10
T ₈	Mancozeb 45	18.42	1.85	9.33
T ₉	KCl + Mancozeb 45	17.46	1.60	8.53
T ₁₀	K ₂ SO ₄ + Mancozeb 45	17.20	1.59	8.36
T ₁₁	CaCl ₂ + Mancozeb 45	17.47	1.44	8.60
T ₁₂	NaCl + Mancozeb 45	17.60	1.52	8.23
T ₁₃	Carbendazim 75% WP + Mancozeb	18.73	1.96	9.83
F - test		S	S	S
SEd (±)		0.50	0.16	6.09
CD (P= 0.05)		1.03	0.33	12.56

Conclusion

On the basis of present results, It may be concluded that amongst the treatments Carbendazim 75% WP+ M-45 in combination with seed treatment, was found to be the best for obtaining highest seed yield 1.96 (t ha⁻¹) in mustard. Since the findings are based on the research done in one season it may be repeated for confirmation.

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