

Response of date of sowing and varieties on nutrient uptake and Economics of mustard (*Brassica juncea* L.) under Humid climatic condition

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ABSTRACT

A field experiment was carried out at College Farm of N. M. College of Agriculture, Navsari Agricultural University, Navsari to study the "Response of date of sowing and varieties on growth and yield of mustard (*Brassica juncea* L.) under South Gujarat condition". The experiment was conducted with randomized block design with factorial concept (FRBD) replication three times and nine treatments combinations, comprising two factors with three date of sowing viz., D₁: (19th November), D₂: (3rd December) and D₃: (17th December) and three varieties viz., V₁: (GM-3), V₂: (GDM-4) and V₃: (GDM-5). Effect of date of sowing on nutrient content and uptake. Significantly maximum nitrogen content in seed (2.73 %), nitrogen content in stover (0.93 %), nitrogen uptake by seed (61.78 kg/ha), nitrogen uptake by stover (44.85 kg/ha), phosphorus content in seed (0.63 %), phosphorus content in stover (0.12 %), phosphorus uptake by seed (14.31 kg/ha), phosphorus uptake by stover (5.86 kg/ha), potassium content in seed (0.74 %), potassium uptake by seed (16.75 kg/ha) and potassium uptake by stover (62.85 kg/ha) was recorded with treatment D₁ (19th November). Effect of varieties on nutrient content and uptake. Significantly higher nitrogen content in seed (2.69 %), nitrogen content in stover (0.91 %), nitrogen uptake by seed (56.39 kg/ha), nitrogen uptake by stover (42.15 kg/ha), phosphorus content in seed (0.61 %), phosphorus content in stover (0.11 %), phosphorus uptake by seed (12.77 kg/ha), phosphorus uptake by stover (5.31 kg/ha), potassium content in seed (0.72 %), potassium uptake by seed (15.04 kg/ha) and potassium uptake by stover (58.81 kg/ha) was recorded with treatment V₂ (GDM-4). Effect of date of sowing and varieties in economics. Significantly highest net realization of (61937 /ha) with B:C Ratio of 3.70 was obtained with treatment D1V2 (19th November, GDM-4).

Key words : Mustard, Crop yield, Date of sowing, Varieties

Introduction

Mustard is the second-most important oilseed crop in India, next only to ground nut, with almost one-fourth share in both area and production. In India, the mustard crop is widely cultivated in Rajasthan, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh, Assam, Bihar, Orissa, Punjab, West Bengal, Andhra Pradesh, Tamil Nadu and Karnataka. In India mustard-rapeseed growing area 6.8 MH with annual production of about 9.1 MT and annual productiv-

ity 1345 kg/ha. (2019-20). In India three largest producing states Rajasthan (4.22 MT) Haryana (1.15 MT) and Uttar Pradesh (0.96 MT) (2019-20). (Source: Directorate of Economic and Statistics, Department of Agriculture, Cooperative and farmers Welfare.) In India, mustard growing 59.77 lakh hectares with annual production of about 84.29 lakh tonnes and an average productivity of about 1410 kg/ha. It is cultivated in an area of 6.3 million hectares with a production of 8.0 million tonnes yielding 1324 kg/ha, There exists a huge gap between the global produc-

tivity (20.47 q/ha) and India's productivity (13.24 q/ha) which need to be bridged with the expansion of area under high yielding varieties (hybrids) due to their improved genetic potential (Rana *et al.*, 2020). It is mainly cultivated in the districts of Banaskantha, Patan, Sabarkantha, Mehsana, Ahmedabad, Jamnagar, Rajkot, Kutch, Kheda and Amreli.

Indian mustard (*Brassica juncea* L.) commonly known as Raya, Rai or laha is an important oilseed crop, among the *Brassica* group of oilseeds in India. Mustard (*Brassica spp.*) seed contains 40-45 per cent oil and 20-25 per cent protein (Alam *et al.*, 2015). It also contains adequate amounts of the two essential fatty acids *viz.*, linoleic and linolenic, which are not present in any of the other edible oils. The seeds are highly nutritive containing 38-57 per cent erucic acid, 5-13 percent linoleic acid and 27 percent oleic acid. The oil cake contains 25-30 per cent crude protein, 5 per cent nitrogen, 1.8-2.0 per cent phosphorus and 1.0-1.2 per cent potassium.

Cool temperature, dry weather with good amount of bright sunshine increases the oil yield. Mustard needs high temperature for vegetative growth (20 °C-32 °C) and cool temperature with clear sky during reproductive growth and maturity. Mustard is a C₃ pathway for carbon assimilation. Therefore, it has efficient photosynthetic response at 15 °C to 20 °C temperature. Rapeseed-mustard crops are grown in diverse agro-climatic conditions ranging from north-eastern/ north-western hills to down south under irrigated/ rain fed, timely/ late-sown, saline soils and mixed cropping. Production potentiality of Indian mustard can be fully exploited under these conditions with suitable agronomic practices and varieties. Among the different agronomic practices, optimum sowing time is very important for mustard production.

Materials and Methods

The present study was conducted on plot Number A-14 of the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during *rabi* season of the year 2019-20. The soil of South Gujarat is locally known as "Deep Black soils" and the soil of Navsari campus where the experiment conducted was falls under the great group of *Ustochrepts* and has been placed under Jalalpur soil series. Three varieties *viz.* GM-3 (V₁), GDM-4 (V₂) and GDM-5 (V₃) were used to assess their perfor-

mance fewer than three date of sowing *viz.* 19th November (D₁), 3rd December (D₂) and 17th December (D₃). The experiment was conducted under randomized block design with factorial concept (FRBD) three replications in which date of sowing and varieties. The experimental crop was fertilized with a uniform dose of nitrogen, phosphorus and potassium @ 50 kg/ha, 50 kg/ha and 00 kg/ha respectively and Urea and DAP were used as the source of nitrogen and phosphorus. Crop was sown at different dates with 4 kg/ha seed of each variety and sowing was done manually. five irrigations, intercultural operation at 15 DAS. Observations regarding nitrogen content in seed, nitrogen content in stover, nitrogen uptake by seed, nitrogen uptake by stover, phosphorus content in seed, phosphorus content in stover, phosphorus uptake by seed, phosphorus uptake by stover, potassium content in seed, potassium uptake by seed, potassium uptake by stover and economics. Harvesting of individual plot was done at physiological maturity when siliquae turned brownish. Mainly mustard crop was harvested as soon as 75% pods turned yellowish brown and bundles of harvested plants were sun dried for few days at threshing floor after proper tagging. The bundle weight of net plot was recorded individually.

Results and Discussion

Nutrient content and uptake

Nitrogen content in seed was found significant with date of sowing. Significantly maximum nitrogen content in seed (2.73 %) was recorded with treatment D1 (19th November) which was statistically at par with treatment D2 (3rd December) (2.70 %). Nitrogen content in stover was found significant with date of sowing. Significantly maximum nitrogen content in stover (0.93 %) was recorded with treatment D1 (19th November) which remains at par with treatment D2 (3rd December). Nitrogen uptake by seed was found significant with date of sowing. The highest nitrogen uptake by seed (61.78 kg/ha) was recorded with treatment D1 (19th November). Nitrogen uptake by stover was found significant with date of sowing. The significantly highest nitrogen uptake by stover (44.85 kg/ha) was recorded with treatment D1 (19th November) which was statistically at par with treatment D2 (3rd December) (41.94 kg/ha). Phosphorus content in seed was found significant with date of sowing. Significantly maximum phosphorus content in seed (0.63 %) was recorded

with treatment D1 (19th November). Phosphorus content in stover was found significant with date of sowing. Significantly maximum phosphorus content in stover (0.12 %) was recorded with treatment D1 (19th November). Phosphorus uptake by seed was found significant with date of sowing. Significantly maximum phosphorus uptake by seed (14.31 kg/ha) was recorded with treatment D1 (19th November). Phosphorus uptake by stover was found significant with date of sowing. Significantly maximum phosphorus uptake by stover (5.86 kg/ha) was recorded with treatment D1 (19th November). Potassium content in seed was found significant with date of sowing. Significantly maximum potassium content in seed (0.74 %) was recorded with treatment D1 (19th November). Potassium uptake by seed was found significant with date of sowing. Significantly highest potassium uptake by seed (16.75 kg/ha) was recorded with treatment D1 (19th November). Potassium uptake by stover was found significant with date of sowing. Significantly highest potassium uptake by stover (62.85 kg/ha) was recorded with treatment D1 (19th November) which was statistically at par with treatment D2 (3rd December) (57.91 kg/ha). Nitrogen content in seed was found non-significant with varieties. Significantly highest nitrogen content in seed (2.69 %) was recorded with treatment V2 (GDM-4). Nitrogen content in stover was found non-significant with varieties. Significantly highest nitrogen content in stover (0.91 %) was re-

corded with treatment V2 (GDM-4). Nitrogen uptake by seed was found significant with varieties. Significantly highest nitrogen uptake by seed (56.39 kg/ha) was recorded with treatment V2 (GDM-4) which was statistically at par with treatment V3 (GDM-5) (52.69 kg/ha). Nitrogen uptake by stover was found non-significant with varieties. Significantly highest nitrogen uptake by stover (42.15 kg/ha) was recorded with treatment V2 (GDM-4). Phosphorus content in seed was found non-significant with varieties. Significantly highest phosphorus content in seed (0.61 %) was recorded with treatment V2 (GDM-4). Phosphorus content in stover was found non-significant with varieties. Significantly highest phosphorus content in stover (0.11 %) was recorded with treatment V2 (GDM-4). Phosphorus uptake by seed was found significant with varieties. Significantly maximum phosphorus uptake by seed (12.77 kg/ha) was recorded with treatment V2 (GDM-4). Phosphorus uptake by stover was found significant with date of sowing. Significantly maximum phosphorus uptake by stover (5.31 kg/ha) was recorded with treatment V2 (GDM-4) which was at par with treatment (GDM-5). Potassium content in seed was found non-significant with varieties. Significantly highest potassium content in seed (0.72 %) was recorded with treatment V2 (GDM-4). Potassium content in stover was found non-significant with varieties. Potassium uptake by seed was found significant with varieties. Significantly high-

Table 1. Effect of date of sowing and varieties on nutrient uptake of mustard

Treatment	Nitrogen Uptake (kg/ha)		Phosphorus Uptake (kg/ha)		Potassium Uptake (kg/ha)	
	Seed	Stover	Seed	Stover	Seed	Stover
(A) Date of sowing						
D1 : 19 th November	61.78	44.85	14.31	5.86	16.75	62.85
D2 : 3 rd December	53.38	41.94	11.64	5.01	13.73	57.91
D3 : 17 th December	42.93	35.56	9.28	4.17	11.01	49.43
S.Em. ±	1.71	1.19	0.45	0.16	0.55	1.67
C.D. at 5%	5.12	3.57	1.33	0.47	1.66	5.02
(B) varieties						
V1 : GM-3	49.01	39.41	10.75	4.72	12.71	54.56
V2 : GDM-4	56.39	42.15	12.77	5.31	15.04	58.81
V3 : GDM-5	52.69	40.79	11.71	5.01	13.74	56.82
S.Em. ±	1.71	1.19	0.45	0.16	0.55	1.67
C.D. at 5%	5.12	NS	1.33	NS	1.66	NS
C.V. %	9.72	8.75	11.37	9.32	11.98	8.86
Interaction (DxV)						
S.Em. ±	2.96	2.06	0.77	0.27	0.96	2.90
C.D. at 5%	NS	NS	NS	NS	NS	NS

Table 2. Effect of date of sowing and varieties on economics of mustard

Treatment	Seed yield (kg/ha)	Stover yield (kg/ha)	Total cost of cultivation	Gross income (/ha)	Net income (/ha)	BCR
D ₁ V ₁	2080	4794	22903	72800	49897	3.17
D ₁ V ₂	2424	5147	22903	84840	61937	3.70
D ₁ V ₃	2279	4964	22903	79765	56862	3.48
D ₂ V ₁	1908	4654	22903	66780	43877	2.91
D ₂ V ₂	2040	4776	22903	71400	48497	3.11
D ₂ V ₃	1966	4697	22903	68810	45907	3.00
D ₃ V ₁	1550	3906	22903	54250	31347	2.36
D ₃ V ₂	1797	4239	22903	62895	39992	2.74
D ₃ V ₃	1651	4135	22903	57785	34882	2.52

est potassium uptake by seed (15.04 kg/ha) was recorded with treatment V2 (GDM-4) which was statistically at par with treatment V3 (GDM-5) (13.74 kg/ha). Potassium uptake by stover was found non-significant with varieties. Significantly highest potassium uptake by stover (58.81 kg/ha) was recorded with treatment V2 (GDM-4).

Economics

Economics of different treatments as influenced by date of sowing and varieties are presented in Table-2.

The data presented in Table-2. Significantly highest net realization of (61937 /ha) with B:C Ratio of 3.70 was obtained with treatment D₁V₂ (19th November, GDM-4). Significantly lowest net realization of (31347 /ha) obtained with treatment D₃V₁ (17th December, GM-3) with B:C Ratio of 2.36.

The higher seed and stover yields recorded under these treatments D₁V₂ (19th November, GDM-4) might be responsible for higher net realization of mustard. The results are in conformity with those reported by Singh *et al.* (2011-12); Mukharjee *et al.* (2014); Pattam *et al.* (2017); Kumar *et al.* (2018).

Conclusion

Based on one year data it can be concluded that for getting higher net realization of (61937 /ha) with B:C Ratio of 3.70 was obtained with treatment D₁V₂ (19th November, GDM-4). Significantly lowest net realization of (31347 /ha) obtained with treatment D₃V₁ (17th December, GM-3) with B:C Ratio of 2.36.

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