

Response of date of sowing and varieties on growth and yield of mustard (*Brassica juncea* L.) under humid climatic conditions

Comment [a1]: Simple correct (Response of sowing date....)

ABSTRACT

To study the "Response of date of sowing and varieties on growth and yield of mustard (*Brassica juncea* L.) under humid climatic condition". The experiment was conducted with (FRBD) design having three replications and nine treatments combinations, comprising two factors with three dates 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). Significantly highest plant height (183.09 cm), number of primary (7.10) and secondary (17.08) branches per plant at harvest, number of siliques per plant (309.07), number of seed per silique (14.06) and seed yield (2261 kg ha⁻¹) was recorded with treatment D₁ (19th November). Significantly highest number of primary (6.39) and secondary (16.27) branches per plant at harvest, number of siliques per plant (283.58), number of seed per silique (13.50) and seed yield (2087 kg ha⁻¹) was recorded with treatment V₂ (GDM-4).

Keywords: Crop yield, Date of sowing, Mustard, Varieties

Introduction

Mustard is the second important oilseed crop in India, next to ground nut, having 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 productivity 1345 kg ha⁻¹ (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 & Statistics, Department of Agriculture, Cooperative and Farmers Welfare.) In India, mustard is cultivated in 59.77 lakh ha, having yearly production of 8.42 million tonnes and an average productivity of about 1410 kg ha⁻¹. It is growing in area of 63 lakh ha having a production of 80 lakh tonnes and 13.24 q ha⁻¹ productivity. There existing large gap between productivity of world (20.47 q ha⁻¹) and India's (13.24 q ha⁻¹) (Rana et al 2020). It is mainly cultivated in the districts of Banaskantha, Patan, Sabarkantha, Mehsana, Ahmedabad, Jamnagar, Rajkot, Kutch, Kheda and Amreli.

Mustard (*Brassica juncea* L.) also known as Raya, Rai or laha is an important oilseed crop, among the *Brassica* group of oilseeds in India. Oil and protein percent in mustard is 40-45 % and 20-25 % respectively (Alamet et al. 2015). It also rich in two essential fatty acids viz., linoleic and linolenic, which are not found in other edible oils. The seed of mustard are more nutritive which contains erucic acid (37-58%), linoleic acid (6-13 %) and oleic acid (26%) (Patel et al., 2017). The contents of crude protein 26-30 %, nitrogen 5 %, phosphorus 1.7-2.0 % and potassium 1.0-1.3% presents in mustard oil cake.

Cool and dry weather reflected into good amount of bright sunshine indirectly increases yield of oil. Mustard required high temperature for its vegetative growth (21-33 °C) and clear sky and cool temperature at time of reproductive growth and maturity. Due to C₃ mustard plant higher assimilation of carbon. Although, it has better photosynthetic reaction at 16 °C to 20 °C temp. Rapeseed-mustard crops are sown in different climate ranging from north-eastern and north-western hilly area to down south irrigated, timely or late-sown and saline soils. Production capacity of mustard will be fully utilized under these climatic conditions having appropriate agronomic practices and varieties. Among the various agronomic practices, optimum time of sowing is very vital for mustard production (Mondal et al. 2011).

Comment [a2]: Add this reference: Bakhom et al., (2019 & 2022a) and Sadak & Bakhom (2022)

MATERIALS AND METHODS

The present investigation was carried out at the College Farm, Navinchandra Mafatlal College of Agriculture, Navsari Agricultural University, Navsari during *rabi* season of the year 2019-20. South Gujarat soil is also known as "Deep Black soils" and the soil of Navsari where the experiment conducted was fall 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 know their performance on three dates of sowing viz. 19th November (D₁), 3rd December (D₂) and 17th December (D₃). This experiment was carried out under randomized block design with factorial concept (FRBD) having three replications and two factors which are date of sowing and varieties. The mustard crop was fertilized with a recommended dose of N, P and K 50 kg ha⁻¹, 50 kg ha⁻¹ and 00 kg ha⁻¹, respectively and Urea and DAP were used to apply nitrogen and phosphorus. Crop was sown on different dates having 4 kg ha⁻¹ seed rate for each variety and sowing was done manually. Five irrigations, intercultural operation at 15 DAS. Observations regarding growth like plant population, plant height (cm), no. of primary and secondary branches, length of siliques, no. of siliques per plant, no. of seed per silique, seed and stover yield. Carried out harvesting operation for each plot at physiological maturity stage when yellowish brown colour was observed on siliques. Mustard crop was harvested when it's 75 % pods are turned yellowish brown coloured and then after harvested plants were sun dried for 10 to 12 days at threshing floor after proper tagging. The dried bundle weight of net plot was recorded separately.

Comment [a3]: What is the statistical analysis method and its references??

Comment [a4]: Clarify the method of irrigation

RESULTS AND DISCUSSION

Growth attributes of plant

Plant stands at 30 days after sowing and at harvest was found statistically non-significant influenced through date of sowing. Significantly maximum plant stands at 30 days after sowing and at harvest (6.86, 6.65, respectively), Plant height at 30 DAS found non-significant and at harvest was found statistically highly significant with different date of sowing. Significantly higher height of plant at harvest (183.09 cm) and primary as well as secondary branches per plant showed significant with different sowing dates. At harvest significantly maximum number of primary (7.10) and secondary (17.08) branches per plant was recorded with sowing at 19th November (D1).

Different varieties not significantly influenced plant stand at 30 DAS and at harvest of crop. Significantly maximum plant stand at 30 days after sowing and at harvest (6.75, 6.59, respectively), height of plant at 30 DAS and at harvest was found statistically non-significant due to varieties. Significantly higher height of plant at 30 days after sowing and at harvest (40.36 cm, 175.99 cm, respectively) and Primary as well as secondary branches per plant found non-significant with varieties. At harvest significantly highest number of primary and secondary branches per plant (6.39, 16.27 respectively) were observed with variety GDM-4 (V₂).

Yield attributes and yield

Length of siliqua (4.36 cm), silique number per plant (306.07), number of seed per siliquae (14.06) were found significantly influence by different date of sowing. Seed yield was found significantly influenced by different sowings date of mustard. Sowing of mustard at 19th November (D₁) recorded significantly highest seed yield (2261 kg ha⁻¹)

Length of siliqua (4.01 cm), silique number per plant (283.58), number of seed per siliquae (13.50) were found significantly recorded with GDM-4 (V₂) mustard cultivar. In same trends significantly highest seed yield (2087 kg ha⁻¹) was found with sowing of GDM-4 (V₂) over rest of cultivars.

Comment [a5]: Add this reference: Bakhoun et.al.2022b

Comment [a6]: Were is the discussion? The results should bediscuss!!

Comment [a7]: Add this reference El-Karamany et al., (2022)

Table 1: Effect of date of sowing and varieties on growth attribute of mustard

Treatment	Plant population		Plant height		Number of branches per plant at harvest	
	30 DAS	At harvest	30 DAS	At harvest	Number of primary branches	Number of secondary branches
(A) Date of sowing						
D ₁ : 19 th November	6.86	6.65	40.64	183.09	7.10	17.08
D ₂ : 3 rd December	6.71	6.50	40.05	169.63	6.13	16.12
D ₃ : 17 th December	6.54	6.19	38.67	159.77	5.48	14.58
S.Em. ±	0.11	0.12	0.57	4.34	0.26	0.56
C.D. at 5%	NS	NS	NS	13.02	0.77	1.69
(B) varieties						
V ₁ : GM-3	6.66	6.50	39.23	166.23	6.11	15.57
V ₂ : GDM-4	6.75	6.59	40.36	175.99	6.39	16.27
V ₃ : GDM-5	6.69	6.25	39.77	170.27	6.21	15.93
S.Em. ±	0.11	0.12	0.57	4.34	0.26	0.56
C.D. at 5%	NS	NS	NS	NS	NS	NS
C.V. %	4.80	5.67	4.33	7.62	12.33	10.64
Interaction (DxV)						
S.Em. ±	0.19	0.21	1.00	7.52	0.44	0.98
C.D. at 5%	NS	NS	NS	NS	NS	NS

Comment [a8]: Do you mean L.S.D.?

Comment [a9]: Where is the Chemical Analysis, at least the oil content, to compare between the varieties quality

Table 2: Effect of date of sowing and varieties on yield and yield attributes at harvest of mustard

Treatment	Yield attributes			Yield(kgha ⁻¹)	
	Siliqua length (cm)	Number of Siliqua per Plant	Number of Seeds per Siliqua	Seed yield kgha ⁻¹	Stover yield (kgha ⁻¹)
(A) Date of sowing					
D ₁ : 19 th November	4.36	309.07	14.06	2261	4968
D ₂ : 3 rd December	3.74	256.14	12.98	1971	4709
D ₃ : 17 th December	3.31	217.18	11.87	1666	4093
S.Em. ±	0.16	8.32	0.36	65.63	135.85
C.D. at 5%	0.49	24.95	1.08	196.76	407.28
(B) Varieties					
V ₁ : GM-3	3.57	244.31	12.52	1846	4451
V ₂ : GDM-4	4.01	283.58	13.50	2087	4721
V ₃ : GDM-5	3.83	254.51	12.89	1965	4598
S.Em. ±	0.16	8.32	0.36	65.63	135.85
C.D. at 5%	NS	24.95	NS	NS	NS
C.V. %	12.76	9.57	8.30	10.01	8.88
(c) Interaction (D x V)					
S.Em. ±	0.28	14.41	0.62	113.67	235.30
C.D. at 5%	NS	NS	NS	NS	NS

CONCLUSION

Base on one year data it can concluded that for getting highest seed yield and profitability per hectare mustard should be shown on 19th November either using GDM-4 or GDM-5 or GM-3, crop variety.

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Comment [a10]: New references I suggest to add these references

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