RESEARCH ARTICLE

ASSESSING OF YIELD ATTRIBUTES OF THREE DIFFERENT MUSTARD CULTIVARS ON THREE DIFFERENT SPACING UNDER OLD ALLUVIAL ZONE OF WEST BENGAL

Asanul Hoque, Victor Sarkar and Biman Maity*

Department of Agronomy, SMS Malda KVK
Department of Agricultural Extension, Uttar Banga Krishi Viswavidyalaya, Pundibari
Cooch Behar, West Bengal-736165
Email: asanulhoque1994@gmail.com

Received-04.02.2022, Revised-21.02.2022, Accepted-28.02.2022

Abstract: A field experiment was conducted at Malda Krishi Vigyan Kendra, old Alluvial Zone, Uttar Banga Krishi Viswavidyalaya, Malda, West Bengal, India during rabi season of 2019-2020 to find out suitable mustard variety and optimum spacing for three different varieties. Three varieties of mustard viz. V1- SitaV2- B-54(subinoy), V3- B-9(Vinoy)were taken as treatments in the main plot, whereas, four spacing - 30cm × 10cm (S1), 30cm × 20cm (S2), 40cm × 20cm (S3) and 40cm × 30cm (S4) were imposed as subplot treatment. The experiment was conducted in split plot design with 3 replications and repeated in rabi seasons for one year (2019-2020). The results of the experiment revealed that the maximum seed yield was recorded in B-9(Vinoy) 2153 kg /ha) followed by B-9(Vinoy) and then other varities. Regarding plant geometry significantly higher yield was noticed in 30 cm × 20 cm (1689 kg/ha). Crop geometry 40 cm × 30 cm observed superior with respect of number of primary branches/plant and seeds/siliqua, but it was not reflected on seed yield due to less number of plants per unit area. The hybrid varieties of mustard are highly suitable in old alluvial plains of West Bengal due to their higher yields. Slightly wider spacing (30 cm × 20 cm) is suitable variety because of their bigger plant canopy.

Keywords: Variety, Spacing, Yield Attributes, Harvest Index

INTRODUCTION

Indian mustard (*Brassica juncea* L.) belonging to family Cruciferae which is one of the important winter oilseed crops, which occupies a prominent place among oilseed crop next to groundnut when it comes to importance.Historically the brassicas are one of the earliest domesticated crop plants by man. It is mentioned in several ancient scripture and literature and might have been cultivated as early as 5000 BC. There is evidence of its cultivation in Neolithic age (Chang 1968). Seeds of mustard were found from the Channhu- daro of Harrapan civilization ca. 2300-1750 BC (Allchin 1969). Aryans used Brassica species as condiments and for oil.The Brassicaceae, contains about 3500 species and 350 genera, is one of the 10 most economically important plant families (Warwick *et al*. 2000). It is distinguished on the basis of the presence of conduplicate cotyledons (i.e. the cotyledons are longitudinally folded around the radical) and/ or two-segmented fruits (siliquae), which contain seeds in one or both segments, and only simple hairs, if present. Crop Brassicas encompass many diverse types of plants, which are grown as vegetables, fodder or sources of oils and condiments. Edible oil always play very important role in human nutrition. As a high-energy component of food, edible oils are important for meeting the calorie value requirements. Each gram of oil/fat supplies 9 kilocalories of energy, whereas each gram of carbohydrate/protein furnishes about 4 kilocalories of energy (Stryer, 1980). To meet the annual requirement of edible oil and reduce the import, it is necessary to give immediate attention to increase its domestic production. Increased production of edible oil can come from expansion of cultivated area and in increase production or from both. The estimated area, production and yield of rapeseed-mustard in the world was 36.59 million hectares (mha), 72.37 million tonnes (mt) and 1980 kg / ha, respectively, during 2018-19 (Fig.1). Globally, India account for 19.8 % and 9.8% of the total acreage and production (USDA). During the last eight years, there has been a considerable increase in productivity from 1840 kg/ha in 2010-11 to 1980 kg/ha in 2018-19 and production has also increased from 61.64 m t in 2010-11 to 72.42 m t in 2018-19. Hence an attempt was made to study the effect of varieties and sowing method on yield attributes mustard under old alluvial soil of West Bengal.

MATERIALS AND METHODS

A field experiment was conducted at Malda Krishi Vigyan Kendra, old Alluvial Zone, Uttar Banga Krishi Viswavidyalaya, Malda, West Bengal. The experimental site is situated at 26º8'N latitude and 78 º E longitudes having an average altitude of 8.75m above mean sea level. The soil of the experimental site was Gangetic alluvial with sandy clay loam texture, good water holding capacity, well drained and moderate fertility status. The experimental site located in sub-humid, subtropical zone and lies in

*Corresponding Author

Indo-Gangetic oldalluvial agro-ecological zone. The average annual rainfall ranged from 1540 to 2050mm and major portion of rainfall is generally received during the month of June to middle of October. The mean monthly temperature ranged from 8ºC to 40ºC. During the crop growing period maximum temperature varied from 33.9ºC to 32.3ºC (2019-2020), 30.7ºC to 31.0ºC (2019-2020) and minimum temperature varied between 20.8ºC to 17.8ºC (2019-2020), 20.7 to 16.7ºC (2019-2020). The mean maximum relative humidity was highest in the month of November (96.3% in 2019 and 96.4% in 2020), whereas the mean minimum relative humidity was in March (47.5% in 2019 and 45.6% in 2020). Three mustard hybrid variety namely V1- SitaV2- B-54(subinoy), V3- B-9(Vinoy)as main plot treatment and S1- 30 cm x 10 cm, S2- 35cm x 20 cm, S3- 40 cm x 25cm, S4- 45 cm x 30 cm as sub-plot treatment were included in the experiment. Land was prepared by 4 ploughing followed by planking after each ploughing. The land was made free from weeds and stubble of previous crop. After proper levelling the whole experimental field was divided into 3 equal blocks. Then each of the blocks was divided into 3 main-plots and ultimately each of the main-plot was again split into 4 equal sub-plots. Mustard crop was sown in line with the help of tyne as per treatment. The crop was fertilized with a uniform amount of nitrogen, phosphorus and potassium at the rate of 90, 50 and 40 kg/ha respectively. The 50% dose of N and full dose of P2O5 and K2O were applied as basal. The rest amount of nitrogen was applied in two splits with the equal amount at 21 DAS and at 42 DAS. Five plants were randomly selected from each plot and tagged. The total no. of primary branches produced per plant counted at the time of harvest from five tagged plants in all treatments. The mean of five plants were represented as the no. of primary branch per plant. Total no. of siliqua per plantwas recorded from five tagged plants. Mean of five plants was recorded as the no. of siliqua produced per plant. Randomly 5 siliqua were chosen from siliqua of 5 tagged plants and seeds were counted in each siliqua and their mean was recorded as number seeds/siliqua. The weight of thousand grains (g) was recorded from the grain samples were drawn from the produce obtained from each of net plot. Yield was determined from the well dried seeds collected from net plot area excluding the border effect each and every plot. Then the mean yield was converted into kg/ha. Biological yield from net plot was calculated and expressed as kg/ha. Stover yield of each net plot was recorded after complete sun drying and expressed in kg/ha. Biological yield from net plot was calculated and expressed as kg/ha. Biological yield was obtained by summing seed yield and stover yield from net plot.

RESULTS AND DISCUSSION

The no. of primary branches per plant, no. of siliqua/plant, no. of seeds/siliqua and test weight are important yield attributing character for Indian mustard. Effect of varieties and crop geometry on yield component has been presented in Table 1. No. of primary branches were significantly influenced by varieties in 1st year and maximum no. were recorded by B-9(Vinoy) (7). Crop geometry significantly influenced the no. of primary branches. Maximum no. of primary branches (7.78) was obtained at 40 cm x 30 cm spacing during 1st year and in 2nd year S3 recorded higher no. of primary branches (6.31) which is at par with S4. Number of siliqua/ plant and no. of seeds/siliqua were significantly influenced by varieties. B-9(Vinoy) recorded maximum no. (367.93) and S4 spacing i.e. 40 cm x 30 cm recorded maximum no. of siliqua/plant. In interaction (Table 2) maximum number of siliqua /plant was recorded by V3 (B-9(Vinoy) along with spacing S3 spacing (496.00). Wider spacing favours higher number of siliqua/plant. Difference of siliqua number among different varieties may be due to genetic character. Somondal et al., (2012) recorded different number of siliqua/plant by different mustard varieties. Maximum no. of seeds/siliqua were obtained in B-9(Binoy) (14.58) in 1st year and B-9(Vinoy)ear. Crop geometry significantly influences the no. of seeds/siliqua in 2nd year. Maximum no. was found at 40 cm x 30 cm spacing. It has been observed that varieties significantly influence the test weight. Highest test weight was found in B-9(Vinoy) 6.78 in 1st year and in 2nd year B-9(Vinoy) (5.36) recorded highest test weight, which is at par with V3 i.e. B-9 (Vinoy). Crop geometry did not show any significant effect on test weight. Yield contributing characters were highest in V3- B-9(Vinoy) and lowest in V2 – B-54(subinoy). Although interaction effect did not show any significant effect on yield attributing characters except for no. of siliqua/ plant in the first year. The findings are in line with Mamun (2005) who stated that yield contributing characters are higher in HYV of mustard. Seed yield (kg/ha) as affected by varieties and crop geometry have been presented in (Table 3). A perusal of data showed that different crop geometry influenced significantly to the seed yield. Among the varieties highest seed yield (1746 kg/ha and 2153kg/ha respectively 1st and 2 nd year) was recorded by B-9(Vinoy) which was significantly higher than Sita (V1) and B-54(subinoy)(V2). The minimum seed yield (1624 kg/ha) was recorded in V2 variety i.e B-54 Maximum seed yield (2245 kg/ha) was recorded when the crop was shown on 30 cm x 20 cm, which was superior over other spacing.

Table 1. Effect of varieties and spacing on yield component of 3 different mustard varieties

Treatments	No. of primary branches/plant	No. of siliqua/plant	No. of seeds/siliqua	Test Weight(gm)
	2019-2020	2019-2020	2019-2020	2019-2020
V1	6.33	256.42	14.88	5.37
V2	5.46	186.96	13.26	5.08
V3	5.98	306.91	16.47	5.26
S.Em(±)	0.23	20.80	0.25	0.05
CD at 5%	NS	81.64	1.00	0.18
S1	5.21	146.07	13.65	5.18
S2	5.90	266.29	14.70	5.20
S3	6.32	280.91	16.10	5.28
S4	6.24	307.12	15.02	5.27
S.Em(±)	0.21	14.91	0.41	0.03
CD at 5%	0.62	44.28	1.23	NS

Table 2. Interaction effect of varieties and spacing on yield component of three different mustard variety

Treatments	No. of primary branches/plant	No. of siliqua/plant	No. of seeds/siliqua	Test Weight(gm)
	2019-2020	2019-2020	2019-2020	2019-2020
V1S1	5.66	153.21	14.98	4.28
V1S2	6.68	325.68	14.37	4.26
V2S3	6.00	238.32	14.66	4.30
V1S4	8.00	440.65	11.34	4.35
V2S1	4.33	221.02	11.32	6.29
V2S2	6.01	330.00	14.01	6.31
V2S3	6.68	252.63	14.68	6.45
V2S4	7.34	380.00	14.67	6.74
V3S1	5.68	168.42	11.68	6.76
V3S2	7.01	350.68	11.69	6.79
V3S3	7.31	496.03	12.34	6.74
V3S4	7.99	456.64	12.69	6.82
S.Em(±)	0.45	44.89	0.82	0.03
CD at 5%	NS	133.51	NS	NS

Table 3. Effects of varieties and spacing on seed yield, stover yield and harvest index of hybrid mustard

Treatments	Stover yield(kg/ha)	Stover yield(kg/ha)	Harvest index (%)
	2019-2020	2019-2020	2019-2020
V1	1815	3374	29.62
V2	1624	4843	22.46
V3	2154	4767	26.12
S.Em(±)	98.05	258.41	2.32
CD at 5%	384.85	1019.25	9.06

S1	1706	4384	27.85
S2	2245	5146	23.35
S3	1887	4283	27.26
S4	1621	3597	25.78
S.Em(±)	96.98	252.6	1.61
CD at 5%	288.17	750.03	4.78

Table 4. Effects of varieties and spacing on seed yield, Stover yield and harvest index of different varieties of mustard

Treatments	**Stover yield(kg/ha)**	**Stover yield(kg/ha)**	**Harvest index (%)**
	2019-2020	**2019-2020**	**2019-2020**
V1S1	1764	4371	25.01
V1S2	2076	5001	26.64
V2S3	1857	4338	36.11
V1S4	1571	3738	30.71
V2S1	1603	6771	21.32
V2S2	1824	6116	23.13
V2S3	1561	6741	22.84
V2S4	1506	5573	22.53
V3S1	1749	6325	37.34
V3S2	2835	6849	20.29
V3S3	2243	7008	22.28
V3S4	1786	5487	24.05
S.Em(±)	169.00	414.78	2.77
CD at 5%	NS	NS	3.92

The minimum seed yield (1504 kg/ha) was obtained when sowing was done at 30 cm x10 cm. The seed yield was significantly affected by different varieties. As discussed earlier, the different varieties have different yield potential, is the reason for yield variation among different varieties. In contrast to the traditional Op varieties have high canopy structure and explore optimum yieldpotential this varieties need wider spacingin comparison with OP varieties. Rana and Pachauri (2001) observed that the seed yield recorded higher with wider spacing(1671kg/ha) as compared to 45cmx15 cm spacing(1280kg/ha). Stover yield (kg/ha) as affected by varieties and crop geometry have been presented in (Table 3). The Stover yield (kg/ha) was significantly affected by different varieties. Highest Stover yield (6417 kg/ha) was recorded by B-9(Vinoy) in 1st year and in 2nd year it was recorded by B-54(subinoy) (4842 kg/ha), which was at par with B-9(Vinoy). A perusal of data showed that different crop geometry influenced significantly to the Stover yield. Maximum Stover yield of (6030 kg/ha) was recorded when the crop was shown on 40 cm x 20 cm during 1st year and in 2nd year highest Stover yield (5148 kg/ha) was recorded at 30 cm x 20 cm. In interaction table (Table 4) highest stover yield (6115 g/ha) was found when B-9(Vinoy)was sown at 30 cm x 20 cm spacing. Mirza Hasanuzzaman and Md. FazlulKarim (2007) conducted a field experiment in Bangladesh and reported that 30 cm row spacing produced highest Stover yield (2933kg/ha). Harvest index (%) as affected by varieties and crop geometry have been presented in (Table 3). Maximum harvest index (25.97 % and 29.61 % respectively 1st and 2nd year) was recorded by B-9(Vinoy). Among the 3 hybrids B-9(Vinoy) recorded relatively less Stover yield in comparison to its seed yield and ultimately showed higher harvest index. A perusal of data showed that different crop geometry influenced significantly to the yield. Maximum harvest index (22.36 %) was recorded when the crop was shown on 40 cm x 30 cm in 1st year, whereas during 2nd year 30 cm x 10 cm attained (27.88 %) higher value. The harvest index (%) was significantly affected by different

varieties. In interaction table (Table 4) highest harvest index was found when B-9 (Vinoy) was sown at 30 cm x 10 cm spacing. Mirza Hasanuzzaman and Md. Fazlul Karim (2007) conducted a field experiment and reported that 30 cm row spacing produced highest harvest index (36.20%). Form the above results, it may be concluded that the variety B-9 (Vinoy) performed better followed by Sita and then B-54 (subinoy). Seed yield and yield attributing characters of hybrid mustard was significantly affected by planting geometry. Wider spacing (30cm x 20cm/ 40cm x 20cm) is essential for hybrid mustard cultivation. This management approach would be easy for farmers to implement because it would mean replacing their old varieties with new varieties.

CONCLUSION

Form the above results, it may be concluded that the variety B-9 (Vinoy) performed better followed by Sita and then B-54 (subinoy). Seed yield and yield attributing characters of hybrid mustard was significantly affected by planting geometry. Wider spacing (30cm x 20cm/ 40cm x 20cm) is essential for hybrid mustard cultivation. This management approach would be easy for farmers to implement because it would mean replacing their old varieties withthis new varieties.

REFERENCES

Hasanuzzaman, M. and Karim, M. F. (2007). Performance of Rapeseed (Brassica campestris L.) CV. SAU Sarisha-1 under different row spacing and irrigation level. *Research Journal of Agriculture and Biological Sciences*, **3**(6): 960-965.

Google Scholar

Mamun, F. A. (2005). Effect of different sources of nitrogenous fertilizers on the growth and yield of mustard mutant varieties.MS Thesis, Dept. of Agron., Bangladesh Agril. Univ., Mymensingh. pp. 55-58.

Google Scholar

McDonald, G.K., Sutton, B.G. and Ellison, F.W. (1983). The effect of time of sowing on the seed yield of mustard in the Namoi valley, New South Wales. Australian journal experimental agriculture and animal husbandry, **34**: 229-240.

Google Scholar

Watson, D.J. (1947). Comparative physiological studies on the growth of field crops. *Annual. Botany*. **11**:41-76.

Google Scholar

Kumar, R., Singh, D. and Singh, H. (2000). Growth and yield of Brassica species as influenced by sulphur application and sowing dates. *Indian Journal of Agronomy*, **47** (3): 417-21.

Google Scholar

Mandel, K. G. and Sinha, A. C. (2002). Effect of integrated nutrient management on growth, yield, oil content and nutrient uptake of Indian mustard (Brassica juncea L.) in foothills soils at eastern India. *Indian Journal Agronomy*, **47**(1): 109-13.

Google Scholar

Shankar, B. and Meena, K.C. (2015). Nutrient management for enhancing the productivity of Indian mustard (Brassica juncea). *Advance Applied Research*, **7**(1): 36 – 41.

Google Scholar