

Effect of planting geometry on growth and yield of mustard varieties

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ABSTRACT

Field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, UP during Rabi season of 2011-12. The experiment was carried out in a randomized block design (RBD) with 12 treatment combinations comprising of three varieties NRC-HB 101, Rohini and Narendra Rye-8501 and four spacings 30 x 10, 45 x 10, 45 x 15 and 60 x 10 cm. All the treatment combinations were replicated three times. The maximum plant height was recorded in Narendra Rye-8501 that was significantly superior over Rohini and NRC-HB 101 with plant geometry 45 x 15 cm at 30, 60 and 90 days after sowing and at harvest stage of crop growth which was significantly higher over 30 x 10 cm, 45 x 10 cm and 60 x 10 cm plant spacing at all the stages of crop growth except at 30 DAS and other growth attributes viz primary branches, secondary branches and total branches/plant were also significantly superior in Narendra Rye-8501 under plant geometry of 45 x 15 cm at all growth stages. Number of seeds/silique was significantly increased in Narendra Rye-8501 under plant geometry 45 x 15 cm which led to significantly maximum seed yield of mustard superior to other treatments.

Keyword: Mustard; varieties; growth; yield; spacing

INTRODUCTION

Indian mustard (*Brassica juncea* L.) belonging to family Cruciferae is one of the most important winter oilseed crops. Indian mustard is a fairly high remunerative crop with a major source of high quality edible oil. For increasing the productivity of mustard crop the improved varieties which are capable of giving high yields need to be

cultivated. Selection of varieties depends mainly on the several factors eg method of sowing, crop rotation, pest and disease management, irrigation facilities, climatic conditions etc. The response of different genotypes to growth varies due to different environments and their relative ranking usually differs (Eberhart and Russel 1966) and ultimately decides the selection of genotypes for a particular or different

sowing dates to stabilize higher yields (Finlay and Wilkinson 1963, Eberhort and Russel 1966). Planting geometry ie row to rows and plant to plant distance plays a vital role in the production of rapeseed and mustard under irrigated condition. Sub-optimal planting geometry, wider rows and plant spacing lead to low population which in turn fail to compensate the yield obtained in optimum plant stand while narrower row and plant spacing increase the inter- and intra-plant competition leading to poor growth and development and dry matter accumulation resulting in poor yield (Singh 1991).

MATERIAL and METHODS

Field experiment was conducted at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, UP during Rabi season of 2011-2012. The farm is located at 26.47°N latitude and 82.12°E longitude and about 113 meters amsl. The experimental site falls under sub-tropical region in Indo-Gangatic plains with hot summer and cold winter. Nearly 80 per cent of the total rainfall is received during monsoon season from July to September with a few showers in winter season. The region receives a mean annual precipitation of about 1200 mm. Western hot winds start from the month of April and continue till the onset of the monsoon. The weekly mean minimum and maximum temperature during the crop season ranged from 5.0 to 15.1°C

and 15.3 to 32.1°C respectively. The maximum rainfall of 64.6 mm was recorded in the month of January 2012. The evaporation rate was higher in the month of February. The relative humidity was highest (85.5%) in the month of December while the sunshine hour was recorded maximum in the month of March.

Three mustard varieties namely NRCHB-101, Rohini and Narendra Rye of mustard were included in the experiment. The land was ploughed thoroughly crosswise twice with tractor followed by planking to bring the soil to a good tilth. Mustard seeds were sown in line at the distance as per treatments with the help of seed drill machine and the seed rate was 5 kg/ha. The crop was fertilized with a uniform dose of nitrogen, phosphorus and potassium at the rate of 120, 60 and 40 kg/ha respectively. Full dose of phosphorus and potash and half of nitrogen were applied as basal dose and remaining half dose of nitrogen was given in two equal split doses as top dressing after first (25 DAS) and second (55 DAS) irrigation.

Five plants were selected randomly from each plot and tagged. The height was measured in cm with the help of meter scale from the base of the plant to top of the plant and mean value was computer at 30, 60 and 90 DAS and at harvest. Five selected tagged plants were also used for counting of primary and secondary branches at 30, 60 and 90 DAS and at harvest. Total

number of primary and secondary branches were counted separately and mean values were computed for primary and secondary branches per plant. Twenty selected siliquae taken from respective plant were threshed, seeds counted and average number of seed was reported as number of seeds per siliqua. From each plot the crop of net plot area was harvested and dried. After air drying the produce was threshed and seeds were cleaned. The final seed weight was recorded in kg per plot and converted in to q/ha.

RESULTS and DISCUSSION

The data pertaining to different genotypes, plant geometry, plant growth and yield given in Table 1 reveal that the growth and yield of mustard was affected by different genotypes and plant geometry. The maximum plant height was recorded in Narendra Rye-8501 with plant geometry of 45 x 15 cm at all growth stages of crop which was significantly superior to Rohini and NRCHB-101. Plant height increased with the advancement of the crop growth upto maturity in all the three varieties. The increase in plant height was due to favorable soil condition since the variety Narendra Rye is well suited for alkaline and saline condition. Because of salt tolerant accessions in variety Narendra Rye (NDR-8501) alkaline salinity severely compromises the response of the identified salt tolerant cultivars. The results of present investigation are in agreement with the

finding of Javid (2012) and Singh et al (2008). Significantly taller plants were observed with the spacing of 45 x 15 cm at all the growth stages of the crop except 30 DAS. This may be mainly due to higher plant population with optimum spacing. This might be attributed to reduction in magnitude of competition for light at closer spacing as compared to wider spacing.

The maximum number of primary branches per plant was found with Narendra Rye-8501 which was significantly superior to Rohini and NRCHB-101 at all growth stages except 30 DAS. A marked difference in number of primary branches per plant at different row spacing was observed during all growth stages. Maximum number of primary branches per plant was noticed with plant geometry of 45 x 15 cm at 30, 60 and 90 days after sowing and at harvest stages of crop growth which was significantly higher over 30 x 10 cm and 45 x 10 cm and at par with 60 x 10 cm plant geometry at all the stages of crop growth except 30 DAS.

Scrutiny of data on number of branches per plant showed that number of branches per plant was influenced by mustard varieties. The maximum number of primary, secondary and total branches was recorded in Narendra Rye-8501 at 60 and 90 days after sowing and at harvest stage which was significantly higher than Rohini and NRCHB-101 at all growth stages of the crop except 30 DAS. The plant

Table 1. Growth and yield of mustard as influenced by varieties and spacing

Treatment	Plant height (cm)				Primary branches/plant				Secondary branches/plant				Total branches/plant				Seeds/ siliqua	Grain yield (q/ha)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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geometry also significantly affected the number of primary, secondary and total branches. Significantly higher number of branches was noticed with plant geometry of 45 x 15 cm at 60 and 90 days after sowing and at harvest stage of crop growth which was significantly superior over 30 x 10 cm and 45 x 10 cm and was found at par with 60 x 10 cm plant geometry at all the stages of crop growth. Number of primary, secondary and total branches per plant was significantly more with the spacing of 45 x 15 cm plant geometry at all the stages of crop growth except 30 DAS. This could be due to genetic characters which truly indicated of total photosynthates production with higher leaf area index that led to the increase source capacity of Narendra rye-8501. The results are in conformity with Singh et al (2008). The interaction effect of varieties and plant geometry on number of branches per plant was found non-significant at all the stages of crop growth.

The maximum seeds/silique were observed in Narendra Rye-8501 with the spacing of 45 x 15 cm which was significantly higher to Rohini and NRCHB-101. This was mainly due to higher number of primary and secondary branches per plant that resulted in efficient utilization of solar radiation and optimum accumulation of photosynthates in silique. These findings are in agreement with Singh (1991) and Yadav et al (1994).

The seed yield of mustard increased significantly in Narendra Rye-8501 which was significantly superior to Rohini and NRCHB-101. The plant geometry also significantly affected the seed yield of mustard. It was recorded maximum with plant geometry of 45 x 15 cm which was significantly superior over 30 x 10 cm, 45 x 10 and 60 x 10 cm of plant geometry. The seed yield of mustard mainly depends on the number of siliques/plant, length of silique, number of seeds/silique and test weight as these characters have high degree of positive correlation with seed yield. The variety Narendra Rye-8501 produced higher value of yield attributes which was significantly higher to Rohini and NRCHB-101. Similar results were reported by Singh et al (2008).

Significantly higher grain yield was recorded with 45 x 15 cm spacing and it resulted in 23.42 per cent higher yield over 30 x 10 cm spacing. The higher seed yield in spacing of 45 x 15 cm could be due to significantly higher number of seeds per silique and number of branches per plant (Yadav et al 1994, Singh et al 2008 and Kumari et al 2011).

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