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Evaluation of growth characters, agrophysiological performance and quality trait of different mustard hybrid (*Brassica juncea* L.) under agro-climatic condition of Prayagraj

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Abstract

A field experiment was conducted during winter (*Rabi*) of 2017–18 at the crop research farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Uttar Pradesh to evaluate the growth characterises, agrophysiological performance and quality trait of different Mustard Hybrid (*Brassica juncea* L.). The experiment comprised of 5 treatment in randomized block design which comprised 5 mustard hybrids T1:Pioneer- 45546, T2:Dayal Seed Umang DPH-21, T3:Bayer IJI3R1110,T4: Pioneer-45542 and T5:Bayer Kesari Gold with four replications. Results showed that among the different mustard hybrid treatment T5:Bayer Kesari Gold showed highest number of primary and secondary branches per plant, agrophysiological performance, oil content (%) over rest of the mustard hybrids.

Keywords: Agrophysiological performance, Growth, Mustard and Oil Content

Introduction

Indian mustard (*Brassica juncea* L.) is an important rabi crop of U.P. In U.P., rapeseed and mustard is one of the major growing crop occupying 0.56 million ha of area, with production and productivity of 0.699 million tonnes and 1248 kg/ha respectively [(India Statistics (Indiastat.com) (2014-15)]. Rapeseed–mustard is the third most important source of edible oil next to soybean and groundnut in India, and is grown in certain tropical and subtropical regions as a cold-season crop (Shekhawat *et al.*, 2012) [7]. Mustard seed in general, contains 30- 33% oil, 17-25% proteins, 8-10% fibres, 6-10% moisture, and 10-12% extractable substances (Pandey *et al.*, 2013) [4]. The seed and oil of mustard are used as a condiment in the preparation of pickles, flavouring curries and vegetables as well as for cooking and frying purposes. Its oil is used in many industrial products, cake as cattle feed and manure and green leaves for vegetable and green fodder (Meena *et al.*, 2013) [3].

Oil content in seeds varies from 37 to 49 per cent. The oil obtained is the main cooking medium in northern India and cannot be easily replaced by any other edible oil. The seed and oil of mustard have a peculiar pungency due to presence of glucosinolate and its hydrolysis products such as allyl isothiocyanate (0.30-0.35%) making it suitable to use as condiment in the preparation of pickles and for flavouring curries and vegetables. The quality of oil primarily depends on its fatty acid composition. Traditional cultivars of rapeseed-mustard contain high proportion of long chain fatty acids such as eicosanoid and erucic acid (more than 45%) and low proportion of oleic acid (15-20%) in oil. These long chain fatty acids are reported to cause thickening of arteries and increase blood cholesterol leading to heart ailments in human beings (Zhao *et al.*, 1993) [8].

Improved cultivars and hybrids offers better genetic makeup, ensures uniform germination and emergence maintaining optimum plant stand, higher survival under temperature stress during vegetative phase, resistance to major pests and diseases and efficient translocation and assimilation of assimilates which ultimately results in improved growth, yield contributing characters and productivity of mustard Ghanbahadur (2002) [2].

Material and Methods

The experiment was laid out in crop research farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Uttar Pradesh.

It is located at 25° 57' N latitude, 87° 19' E longitude and 98 m altitude from the sea level. Experimental site area, Prayagraj has a subtropical and semi-arid climatic condition, with both extremes of temperature, *i.e.* winter and summer. Total rainfall received during the crop growing period was 34 mm. the experimental field is sandy clay loam in texture, neutral in reaction (pH 7.6), EC (0.24 dS/m), low in organic carbon (0.15%), available N (35.55kg/ha), medium in available P (9.8 kg ha⁻¹) and available K (187.2 kg/ha). The experiment consist of 5 treatment in randomized block design which comprised 5 mustard hybrids T1: Pioneer- 45546, T2:Dayal Seed Umang DPH-21, T3:Bayer IJI3R1110,T4: Pioneer-45542 and T5:Bayer Kesari Gold with four replications. Each treatment was randomly allocated with in them. The crop was fertilized with a recommended dose of @ 90-60-40-30 kg nitrogen, phosphorus potassium and sulphur/ha, respectively. Urea DAP, MOP and gandhak powder were used as the source of nitrogen, phosphorus, potassium and Sulphur respectively. The periodic leaf area index (LAI) of plants was recorded with the Sun Scan Canopy

Analyser (Line Quantum Sensor Model LI-191-SA) at 20, 40, 60 and 80 DAS. The oil content in the seed was determined with NIRS (Model FOSS 6500) by using non-destructive method of oil estimation as suggested by Alexander *et al.* (1967) using equation developed for mustard samples. The information was analyzed statistically with standard procedure of ANOVA technique. The standard errors of mean were calculated in each item of investigation and critical differences (CD) at 5% level were worked out for comparing the treatment mean wherever 'F' test was found significant Chandel (1998) [1].

Results and Discussion

The data revealed that the hybrid showed significant effect in case of primary branches however, maximum branches were observed in hybrid Pioneer-45542 (7.85) and minimum in hybrid Bayer Kesari Gold (4.80). The hybrid showed significant effect in case of secondary branches however, maximum branches were observed in hybrid Bayer IJI3R1110 (35.40) and minimum in hybrid Bayer Kesari Gold (11.70).

Table 1: Number of Primary and Secondary branches of mustard hybrids.

Hybrids	Primary branches	Secondary branches
Pioneer-45546	6.90	15.00
Dayal Seed Umang DPH-21	5.80	12.70
Bayer IJI3R1110	7.40	35.40
Pioneer-45542	7.85	11.80
Bayer Kesari Gold	4.80	11.70
F test	S	S
SEd±	0.37	1.18
CD (P=0.05)	0.78	2.44

The leaf area different varieties of mustard in particular intervals day after showing had no significant influence on the leaf area index at 20, 40, 60 and 80 DAS which might be due to similar growth rate and leaf phenology of crop. Among the hybrids Bayer Kesari Gold; Pioneer-45546; Bayer Kesari Gold and Dayal Seed Umang DPH-21 recorded significantly higher leaf area index at 20, 40, 60 and 80 DAS and lowest observed in Pioneer-45546; Bayer IJI3R1110; Pioneer-45542 at 20, 40, 60 and 80 DAS respectively. Similar finding was reported by Pratap *et al.* (2016) [6].

At Higher Crop Growth Rate was recorded in Bayer IJI3R1110 at 20-40; 40-60 and Pioneer-45542 at 60-80 DAS. Crop Growth Rate in the plant is directly related to plant height leaf area index and number of branches plant-1 which were appreciably similar condition as uniformly nutrients management practise. Among the varieties Pioneer-45542 recorded higher Crop Growth Rate at 60-80 DAS and at harvest as compared to other varieties of mustard and its probable reason might be attributed to genetic characters of

Bayer IJI3R1110 which has higher capacity to utilize the photosynthates more efficiently for maximum leaf area index, number of branches plant-1 and ultimately the dry matter production. Similar finding was reported by Patel *et al.* (2017) [5]. Higher Relative Growth Rate was recorded in Bayer IJI3R1110 at 20-40 and 40-60 DAS and Dayal Seed Umang DPH-21 at 60-80 DAS. Relative Growth Rate in the plant is directly related to plant height, leaf area index and number of branches plant-1 which were appreciably similar condition as uniformly nutrients management practise. Among the varieties Dayal Seed Umang DPH-21 recorded higher Relative Growth Rate at 80 DAS and at harvest as compared to other hybrids of mustard and its probable reason might be attributed to genetic characters of Dayal Seed Umang DPH-21 which has higher capacity to utilized the photosynthates more efficiently for maximum leaf area index, number of branches plant-1 and ultimately the dry matter production. Patel *et al.* (2017) [5].

Table 2: Leaf area index (sq. cm), Crop growth rate (g m⁻² day⁻¹) and Relative growth rate (g m⁻² day⁻¹) of mustard varieties

Hybrids	Leaf Area Index				Crop Growth Rate			Relative Growth Rate		
	20 DAS	40 DAS	60 DAS	80 DAS	20-40 DAS	40-60 DAS	60-80 DAS	20-40 DAS	40-60 DAS	60-80 DAS
Pioneer-45546	31.52	95.4	104.0	167.8	29.86	13.02	10.65	2.63	3.23	3.40
Dayal Seed Umang DPH-21	34.75	75.3	94.40	176.4	31.33	13.45	10.09	2.68	3.27	3.43
Bayer IJI3R1110	48.35	71.0	98.25	175.8	35.13	14.92	18.19	2.82	3.40	3.63
Pioneer-45542	42.15	77.7	88.27	125.4	33.75	14.22	18.21	2.77	3.35	3.60
Bayer Kesari Gold	49.37	89.9	106.10	174.5	33.47	12.62	15.13	2.75	3.29	3.51
F test	NS	NS	NS	NS	S	S	S	S	S	S
SEd±	7.43	8.42	8.99	18.40	1.196	0.360	0.588	0.050	0.040	0.042
CD (P=0.05)	-	-	-	-	2.468	0.743	1.214	0.103	0.082	0.086

The different hybrids of mustard under investigation brought influenced the oil content of mustard seeds. The crop mustard produced higher oil content in hybrid Bayer IJ3R1110 (52.66) Similarly Pioneer-45542 hybrid of mustard produced lowest oil content as compared to other higher oil content hybrid of mustard. Oil content was influenced due to varieties as well as nitrogen content and protein content of mustard seeds. From the results discussed above it can be concluded that Bayer IJ3R1110 variety of mustard was found to be most suitable and realize better growth as well as yield and quality of oil respect to oil content. Similar finding was reported by Bhat *et al.* (2007)

Table 3: Oil content (%) of mustard hybrids

Hybrids	Oil content (%)
Pioneer-45546	45.66
Dayal Seed Umang DPH-21	38.33
Bayer IJ3R1110	52.66
Pioneer-45542	37.66
Bayer Kesari Gold F test	48.33 S
SEd±	0.730
CD (P=0.05)	1.507

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