

Effect of organic and inorganic sources of nutrients on growth and yield of Indian Mustard (*Brassica juncea* L.)

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Abstract

Present experiment was laid out at Agriculture farm, Rama University Kanpur during 2020-21. 1. Plant Population, Plant height (cm), Number of branches plant⁻¹, 2. Post harvest studies: Plant character, Number of siliquae plant⁻¹, Number of seeds siliqua⁻¹, Siliqua length (cm), Seed weight / plant, Weight of Siliqua/plant, (ii) Yield Character, Biological yield, Seed yield (q ha⁻¹), Stover yield (q ha⁻¹) (iii). Test weight (g), (iv). Harvest index, Economics:- Benefit: cost ratio. Gross income, Net income, Cost of cultivation. The superior plant height and plant population registered from plot which was treated T8 (75% RDF + FYM 20 t ha⁻¹ + Azotobacter + PSB). In similar lines the grain and straw yield was also recorded highest for the same. The experiment was laid out in Randomized Block Design, the experiment consist of 8 treatments with three Replications. The minimum grain yield T2 (16.35 q/ha), minimum Stover yield T2 (35.39 q/ha) and maximum grain yield is T8 (24.21 q/ha), Stover yield is (41.39 q/ha) of Mustard are respectively.

Keywords: Mustard, Pre harvest Studies, Plant height (cm), Number of branches plant⁻¹, 2. Post harvest studies: i. Plant character, Number of siliquae plant⁻¹, Number of seeds siliqua⁻¹, Siliqua length (cm), Seed weight / plant, Weight of Siliqua/plant, (ii) Yield Character, Biological yield, Seed yield (q ha⁻¹), Stover yield (q ha⁻¹) (iii). Test weight (g), (IV). Harvest index, Economics PSB

Introduction

Agriculture is the backbone of Indian economy. Indian agriculture is characterized by 328.73 million hectares (Land use statistics, Directorate of Economics and statistics, 2015-16) geographical area. The gross cropped area recorded as 197.05 MH and net sown area was 139.51 MH (Land use statistics, Directorate of Economics and statistics, 2015-16). In the same lines the total cropped area recorded as 26.85 MH and net cultivated area 16.53 MH in Uttar Pradesh State in year 2018-19. Total oilseeds coverage area and production was recorded as 25.50 million ha 32.26 million tonnes in the country in year 2018-19 while the productivity of oilseed in the country was estimated as 1265 kg ha⁻¹ in year 2018-19. The total area and production under Rapeseed and Mustard was recorded as 0.60 million ha and 0.73 million tonnes in year 2018-19. The Rape seed and mustard shares about 2.3 percent in area 2.2 percent production in year 2018-19 in the country. The highest production of Rapeseed and Mustard was recorded in Rajasthan (44.97 %), Haryana (12.44 %), Madhya Pradesh (11.32 %) and Uttar Pradesh (10.60 %), respectively during 2018-19. Mustard are known by different names in different part of country e.g., sarson, rai or raya, toria or lahi. While sarson and toria (Lahi) are generally known as rapeseed, rai or laha is commonly known as mustard. The oil content varies from 37-49 %.

Oil is a good source of protein, sugar, minerals and even vitamins. Although oilseeds in general have good composition and quality, their domestic utilization as well as exports is restricted due to certain limitation and toxic factors. Mustard contains 37-49% oil, 25-32% proteins, 7% ash and 0.6% calcium, 1.45% phosphorus, 0.6% magnesium, 0.05% manganese and good source of various vitamins. This paper examines the effect of organic and inorganic sources of nutrient on the growth and yield of Indian mustard.

Methodology

The experiment was conducted during rabi season of 2020-21 in at Agriculture farm, Rama University Kanpur during 2020-21 in alluvial soil. Soil of the experimental plot was sandy loam in texture and slightly calcareous having organic carbon 0.48%, total nitrogen 0.03%, available P₂O₅ 12.6 Kg ha⁻¹, pH 7.3, electrical conductivity 0.34 dS m⁻¹, permanent wilting point 6.3%, field capacity 18.4%, maximum water holding capacity 29.6%, Bulk density 1.46 Mg m⁻³, particle density 2.56 Mg m⁻³ and porosity 42.9%. The experiment was conducted in a randomized block design with 3 replications and 8 treatments i.e. 1. Plant Population, Plant height (cm), Number of branches plant⁻¹, 2. Post harvest studies: Plant character, Number of siliquae plant⁻¹, Number of seeds siliqua⁻¹, Siliqua length (cm), Seed weight / plant,

Weight of Siliqua/plant, (ii) Yield Character, Biological yield, Seed yield ($q\ ha^{-1}$), Stover yield ($q\ ha^{-1}$) (iii). Test weight (g), IV). Harvest index, Economics: - Benefit: cost ratio. Gross income, Net income, Cost of cultivation

Observations recorded

To predict the effect of different treatments on growth and development of experimental crop, number of observations has been recorded were are selected from each plot at random leaving the border area and tagged for recording growth parameters viz. Plant population, fresh and dry weight, Plant height etc. 60, 120 days after sowing and at harvest stage, yield attributing characters were also recorded from the tagged plants. During the course of present investigation following studies were made on different plant traits:

Benefit: cost ratio

Benefit cost ratio or net return rupee⁻¹ invested the calculated by dividing the net return ($Rs.\ ha^{-1}$) by the cost of cultivation ($Rs.\ ha^{-1}$).

$$\text{Benefit cost ratio} = \frac{\text{Net return (Rs./ha)}}{\text{Total cost of cultivation (Rs./ha)}}$$

If 'F' test was found significant at 5% level of significance then critical difference (CD) was calculated with the help of following formula:

$$SE_{\pm} = \sqrt{\frac{\text{Error variance (VE)}}{r}}$$

CD = $SE_{\pm} \times t$ value at 5% error d.f.

Where

CD = critical difference

VE = Error variance

Result and Discussion

Growth attributing Characteristics 1. Plant Population The treatment T₈ (RDF 75% + FYM 20 t ha⁻¹ + Azotobacter + PSB) recorded maximum number of plants (16.40) followed by T₅ (RDF 75% + FYM 25 t ha⁻¹ + Azotobacter + PSB), which and T₇ (RDF 100% + FYM 15 t ha⁻¹ + Azotobacter + PSB) which have 16.39 and 16.37 plant population in meter square. In contrast to this the minimum plant population was recorded in T₁

(RDF (80:60:40 N:P: K) followed by T₂ and T₃. 1. Plant Height, Total number of branches - It is evident from the data (Table 3) that plant height of mustard at 45, 60 and 90 DAS was significantly influenced by application of different organic and inorganic treatments. The maximum plant height at 60 DAS was recorded from T₈ which was at par with treatment T₇. However, minimum plant height at 45 DAS was recorded in T₂ (with RDF 75%). The maximum plant height at 90 DAS was recorded from T₈, which was at par with treatment T₇, however, minimum plant height at 45 DAS was recorded in T₂ (with RDF 75%). 2. The maximum total no. of branches at flowering stages was recorded from T₈, which was at par with treatment T₇ and T₆. However, total no. of branches minimum at flowering was recorded in T₂ in which RDF 75%. The maximum total no. of branches at maturity stages was recorded from T₈ and proved significantly superior over all remains treatments. However, minimum number of total branches at flowering stage was recorded in T₂ in which RDF 75%. b) Yield attributing characteristics: The maximum grain yield, Straw yield ($q\ ha^{-1}$) and Biological yield ($q\ ha^{-1}$) - was recorded from T₈, which was at par with treatment T₇. However, minimum Grain yield ($q\ ha^{-1}$) Straw yield ($q\ ha^{-1}$) and Biological yield ($q\ ha^{-1}$) - was recorded in T₂ in which RDF 75% used (Table 3) Harvest index (%) The maximum harvest index was recorded from T₈ which was at par with treatment T₅ and T₇. However, minimum harvest index was recorded in T₂ in which RDF 75% used (Table 3) Cost of cultivation ($Rs.\ ha^{-1}$) it is show that the highest cost of cultivation was observed in T₅ followed by T₈. However, minimum cost of cultivation was recorded in T₂ in which RDF 75%. Gross return ($Rs.\ ha^{-1}$) the maximum gross return was recorded from T₈ and T₇ respectively. However, minimum gross return was recorded in T₂ in which RDF 75% used. Net return ($Rs.\ ha^{-1}$) the maximum net return was recorded from T₈ and T₇ respectively. However, minimum net return was recorded in T₂ in which RDF 75% used. B: C ratio it is evident from the data that the B: C ratio of mustard was significantly influenced by application of different treatments. The greatest B: C ratio was observed in T₁ and T₂ respectively. However, minimum B: C ratio was observed in T₅.

Table 2: Effect of organic and inorganic sources of nutrients on growth attributing characters

S.N.	Treatments	Plant population at 30 DAS (m ²)	Plant height (cm)			Total Number of Branches/ Plant at Flowering	Total Number of Branches/ Plant at Maturity
			45 DAS	60 DAS	90 DAS		
T ₁	RDF (80:60:40 N:P: K)	16.18	88.59	122.11	126.21	18.36	9.15
T ₂	RDF 75% + FYM 10 t ha ⁻¹	16.23	84.16	119.14	124.14	17.10	8.67
T ₃	RDF 75%	16.25	90.41	125.76	127.32	19.43	10.25
T ₄	RDF 75% + Azotobacter + PSB	16.36	91.33	128.56	129.12	19.42	11.47
T ₅	RDF 75% + FYM 25 t ha ⁻¹ + Azotobacter + PSB	16.39	92.38	131.86	135.20	20.60	11.51
T ₆	RDF 100% + 10 FYM t ha ⁻¹ + Azotobacter + PSB	16.35	94.26	137.70	149.25	21.51	12.52
T ₇	RDF 100% + FYM 15 t ha ⁻¹ + Azotobacter + PSB	16.37	95.42	143.40	153.46	22.17	12.91
T ₈	RDF 75% + FYM 20 t ha ⁻¹ + Azotobacter + PSB	16.40	97.56	146.23	158.40	22.87	13.87
	SEm ±	0.44	2.46	3.566	3.67	0.53	0.30
	C.D.(P=0.05)	--	4.50	3.92	6.24	1.64	0.92

Table 3: Effect of organic and inorganic sources of nutrients on yield attributing characters

S.N.	Treatments	No. of siliqua plant ⁻¹	siliqua length (cm)	No. of Seed per siliqua	Weight of siliqua plant ⁻¹ (g)	Weight of Seed plant ⁻¹ (g)	Test weight(g)	Grain Yield (q ha ⁻¹)	Stover Yield(q ha ⁻¹)	Biological Yield(q ha ⁻¹)	Harvest Index (%)
T ₁	RDF (80:60:40 N:P: K)	226.62	4.30	10.71	78.14	8.19	3.26	17.24	36.40	53.64	32.14
T ₂	RDF 75%	223.42	3.85	9.97	76.17	7.66	2.78	16.35	35.39	51.74	31.60
T ₃	RDF 75%+ FYM 10 t ha ⁻¹	227.48	4.46	11.77	79.40	9.47	3.49	18.52	38.01	56.53	32.76
T ₄	RDF 75% + Azotobacter + PSB	238.51	4.42	11.79	89.56	10.26	3.78	19.65	39.87	59.52	33.01
T ₅	RDF 75 % + FYM 25 t ha ⁻¹ + Azotobacter + PSB	245.40	4.48	11.89	88.51	10.32	4.10	20.38	40.18	60.56	33.65
T ₆	RDF 100% + 10 FYM t ha ⁻¹ + Azotobacter + PSB	248.36	4.75	11.98	95.70	11.62	4.41	22.14	40.82	62.96	35.16
T ₇	RDF 100% + FYM 15t ha ⁻¹ + Azotobacter + PSB	251.32	4.92	12.05	98.62	12.71	4.77	23.52	41.27	64.79	36.30
T ₈	RDF 75%+ FYM 20 t ha ⁻¹ + Azotobacter + PSB	255.76	5.01	12.20	101.67	13.10	4.96	24.21	41.39	65.60	36.90
	SEm ±	3.44	0.12	0.31	2.35	0.27	0.10	0.53	1.05	1.58	0.90
	C.D.(P=0.05)	5.93	0.36	0.94	7.21	0.84	0.31	1.64	3.21	4.85	2.78

Table 4: Effect of organic and inorganic sources of nutrients on economics of various treatments

S.N.	Treatments	Cost (Rs. ha ⁻¹)	Gross return (Rs. ha ⁻¹)	Net return (Rs. ha ⁻¹)	B: C Ratio
T ₁	RDF (80:60:40 N:P: K)	25305	80666	55361	2.18
T ₂	RDF 75%	24239	76527	52288	2.15
T ₃	RDF 75% + FYM 10 t ha ⁻¹	35305	86618	51313	1.45
T ₄	RDF 75% + Azotobacter + PSB	25405	91875	66467	2.+=561
T ₅	RDF 75 % + FYM 25 t ha ⁻¹ +Azotobacter + PSB	49339	95267	45928	0.93
T ₆	RDF 100% + 10 FYM t ha ⁻¹ +Azotobacter + PSB	35405	103451	68046	1.92
T ₇	RDF 100% + FYM 15 t ha ⁻¹ +Azotobacter + PSB	40405	109368	68963	1.70
T ₈	RDF 75% + FYM 20 t ha ⁻¹ +Azotobacter + PSB	45405	113076	67671	1.49
	SEm ±	--	--	--	00.05
	C.D.(P=0.05)	--	--	--	0.16

Conclusion

Based on result obtained during Present one year of experiment, it can be concluded that T₈(application of 75% RDF + FYM 20 t ha⁻¹ + Azotobacter +PSB) that was at par with treatment highest compare to other treatment in all parameters of this experiment is Effect of organic and inorganic sources of nutrients on growth and yield of Indian Mustard (*Brassica juncea* L.) The experiment was laid out in Randomized Block Design, the experiment consist of 8 treatments with three Replications. Tripathiet al., (2011) Jadhavet al., (2009) The minimum grain yield T₂ (16.35 q/ha), minimum Stover yield T₂ (35.39 q/ha) and maximum grain yield is T₈ (24.21 q/ha), Stover yield is (41.39 q/ha) of Mustard are respectively. The highest cost of cultivation was observed in treatments T₅ (Rs. 49339 ha⁻¹) followed by treatments T₈ (Rs. 45405 ha⁻¹). However, minimum cost of cultivation was recorded in treatment T₂ (Rs. 25305 ha⁻¹) which were 75% RDF. The maximum gross and net return were recorded from treatments T₈ (Rs. 11, 3076 ha⁻¹) and treatments T₇ (Rs. 10, 9368 ha⁻¹), respectively Mishra and Giriet al., (2004). However, minimum gross and net return were recorded in treatment T₂ (Rs. 76,527 ha⁻¹) in which were RDF 75% used. (G. Nitin 2005) the maximum benefit cost ratio was computed in treatments T₁ (2.18:1). However, minimum B: C ratio was recorded in treatment T₅ (0.93:1).So the application of treatment T₈ which comprised with 75% RDF + FYM 20 t ha⁻¹ + Azotobacter +PSB exhibited best result in respect of growth, yield and net return of mustard crop followed by treatment T₇ (applied 100% RDF + FYM 15 t ha⁻¹ + Azotobacter + PSB). Selviet al., (2004).

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