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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH OF INDIAN MUSTARD (*BRASSICA JUNCEA* L.)

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ABSTRACT

A field experiment was conducted during *rabi* season 2022-23 at Agricultural Research Farm of NIAS, GNSU, Sasaram, Bihar, India. Eight treatments (T_0) control, (T_1) 100% RDF, (T_2) 100% RDF + FYM @ 5 ton/h, (T_3) 100% RDF + VC @ 5 ton/h, (T_4) 100% RDF + FYM + VC @ 5 ton/h, (T_5) FYM @ 5 ton/h, (T_6) VC @ 5 ton/h and (T_7) FYM + VC @ 5 ton/h were tested in three replication with Randomized Block Design. The highest plant height (cm) at 30 DAS, 60 DAS, 90 DAS and at harvest, No. of primary and secondary branches at 30 DAS, 60 DAS, 90 DAS and at harvest, maximum no. of number of Primary, Secondary and Tertiary siliqua plant^{-1} were result found that significantly better growth attributes with combined application of T_4 (100% RDF + V.C + FYM @ 5 t/ha^{-1}) over rest of the treatments.

Key words : Mustard, FYM, Vermicompost, Integrated Nutrient Management.

Introduction

Indian mustard (*Brassica juncea* L.) is the most important *Rabi* season oil seed crop in the world. India is 3rd largest producer in the world after Canada and china. It belongs to the family cruciferae. Its oil is used often for cooking and rapeseed mustard also valued for vegetable like "*sarso ka saag*". Mustard is rich source of calcium, manganese, copper, iron, selenium, zinc, vit-A, B, C and protein 100g of mustard seed contains 508 Kcal energy, 26.08g, protein, 28.09g carbohydrates, 36.24g fat and 9.55g dietary fibre. Mustard crops suppress some soil borne pests and it is used as cover crops. The nutrient management is one of the most important factors that affect the Indian Mustard and fertilizer have played a prominent role in increasing the oil seed production and enhance plant growth and productivity through provide necessary micro and macro plant nutrients. Fertilizer are additional chemical substances supplied to the crops for increase their productivity, use of optimal dose of major and micro nutrients insure. Organic manures are natural nutrients that farmers utilize to feed their agricultural plants. There are several different types of organic manures, including farmyard manure, green manures, compost made from crop leftovers and other farm wastes, vermicompost, oil cakes and biological wastes including animal bones and slaughterhouse waste. In integrated nutrient management method both organic manures and inorganic component are applied for increase crop yield and quality. The goal of integrated nutrient management is maximum uses of nutrients sources. The objective of integrated nutrient management (INM) is to maximize crop yield while protecting soil productivity for future generations by combining the use of both natural and synthetic soil nutrients.

Materials and Methods

A field experiment was conducted during *Rabi* season, 2022-2023 at Research Farm of Department of Agronomy, Narayan Institute of Agricultural Sciences, Gopal Narayan Singh University, Jamuhar, Sasaram, Rohtas (Bihar), India. The soil condition of research field

was marginal alluvial, greyish yellow in colour to the foothills of Kaimur plateau the soil are characterised by low nitrogen, medium to high potash acidic and light to medium textured. Mali MS-102 is a vigorous branching variety with a striking black and bold grain that takes 105–110 days to mature. In these experiments nutrients provide in chemically through Urea, single super phosphate, and muriate of potash and organically through FYM and verimcompost were added according to the treatment plan and blended into the soil. The research experiment was laid out RBD with three replication and eight treatment combinations T_0 Control, T_1 100% RDF, T_2 100% RDF + FYM @ 5 t/ha, T_3 100% RDF + V.C. @5 t/ha, T_4 100% RDF + FYM + V.C @ 5 t/ha, T_5 FYM @ 5 t/ha, T_6 V.C. @ 5 t/ha and T_7 FYM + V.C. @ 5 t/ha. The source of fertilizers was urea, single super phosphate and muriate of potash. Phosphorus and potash were applied as basal through broadcasting method of fertilizer application, whereas half dose of nitrogen was applied as basal and the remaining half dose was applied in two split doses, first at 30 days after seed sowing and second at the time of the flowering. Vermicompost and FYM was applied as per treatment and mix in the soil 15 days before sowing. In this research various crop parameters were observed.

Plant height (cm)

Three tagged plants in each plot were measured for height using a meter scale starting at the ground surface and going up to the highest point. From the plant's base to its top main stem, the height of these three plants was measured at harvest time using a meter scale.

No. of branches per plant

The number of primary, secondary and tertiary branches per plant of the same three plants was recorded at harvest and average was worked out.

Number of siliqua per plant

The siliqua of three randomly selected and tagged plants were counted and average number of siliqua per plant was worked out and recorded as number of siliqua per plant.

Number of seeds per siliqua

The seeds per siliqua of three randomly selected and tagged plants were counted and average number of seed per siliqua was worked out and recorded as number of seed per siliqua at harvest.

Dry matter accumulation per plant (g)

Three plants at random from the border rows (leaving the extreme outer row) were destructively sampled at 30, 60, 90 DAS and at harvest. The plant samples were shade dried initially and later dried in hot air oven at 60°C until a constant weight was recorded and expressed as kg/ha^{-1}.

Results and Discussion

The maximum plant height at 30 DAS, 60 DAS, 90 DAS and at harvest presented in Table 1 were recorded in treatment T_4 (26.71 cm, 75.86 cm, 99.52 cm and 123.22 cm) followed by T_3 (25.22 cm, 73.98 cm, 98.01 cm and 122.28 cm) and minimum plant height at 30 DAS, 60 DAS, 90 DAS were observed in the treatment T_0 (17.92 cm, 66.94 cm, 92.02 cm and 108.59 cm). A marginal increase in plant height was noticed at harvest stage from 90 DAS. The data pertaining to number of primary branches plant^{-1} at 30, 60, 90 DAS and at harvest are given in Table 2. Data revealed that application of T_4 100% RDF + VC + FYM @ 5 t/ha were found maximum number of primary branches per plant at 30 DAS (7.10), 60 DAS (15.27) and 90 DAS (18.27) and at harvest (22.40) and minimum at 30 DAS (2.78), 60 DAS (5.60), and 90 DAS (7.83) and at harvest (13.47) observed in T_0 Control. Number of secondary branches plant^{-1} are

Table 1 : Effect of Integrated Nutrient Management on Plant height of Indian mustard.

Plant height (cm)					
S. no	**Treatment details**	**30 DAS**	**60DAS**	**90 DAS**	**At Harvest**
T_0	Control	17.92	66.94	92.02	108.59
T_1	100 % RDF	22.32	71.63	96.32	120.57
T_2	100 % RDF + FYM @ 5 t/ha	23.37	72.93	97.45	121.52
T_3	100 % RDF + VC @ 5 t/ha	25.22	73.98	98.01	122.28
T_4	100 % RDF + VC + FYM @ 5 t/ha	26.71	75.86	99.52	123.22
T_5	FYM @ 5 t/ha	19.87	68.83	93.17	117.08
T_6	VC @ 5 t/ha	20.23	69.48	94.23	118.80
T_7	FYM + VC @ 5 t/ha	20.60	70.89	95.61	119.22
	C.D. @ 5%	1.93	0.88	1.33	1.27
	SEM±	0.63	0.29	0.43	0.41

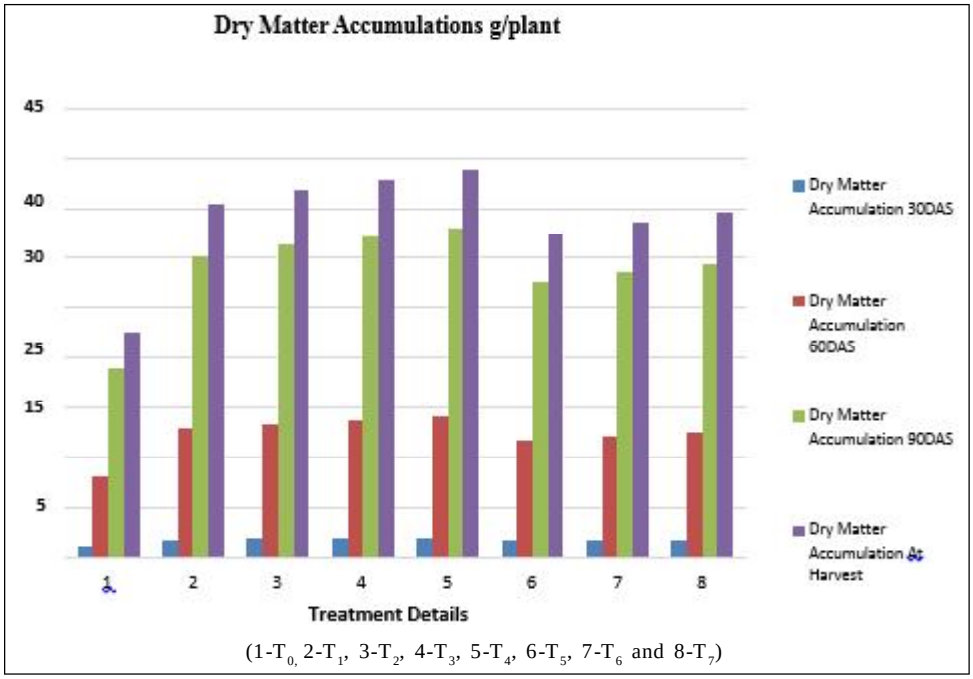

Fig. 1 : Effect of Integrated Nutrient Management on Dry matter accumulation per plant (g) of Indian mustard.

Table 2 : Effect of Integrated Nutrient Management on no. of primary and Secondary branches/plant of Indian mustard.

S. no.	Treatment details	No. of primary branches/plant				No. of Secondary branches/plant			
		30 DAS	60 DAS	90DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T_0	Control	2.78	5.60	6.13	6.18	4.73	10.37	12.03	13.30
T_1	100 % RDF	6.07	13.53	13.98	13.83	8.10	18.10	20.13	20.48
T_2	100 % RDF +FYM @ 5 t/ha	6.20	14.17	14.85	14.38	9.30	19.07	21.90	22.01
T_3	100 % RDF + VC@ 5 t/ha	6.93	14.60	15.05	14.79	10.07	20.07	23.63	23.61
T_4	100 % RDF + VC+ FYM @ 5 t/ha	7.10	15.27	15.67	15.67	11.47	21.17	24.57	25.07
T_5	FYM @ 5 t/ha	4.17	8.47	8.91	8.68	5.90	15.10	17.30	17.90
T_6	VC @ 5 t/ha	4.60	9.80	10.01	9.87	6.83	16.10	18.07	18.87
T_7	FYM + VC @ 5t/ha	4.93	10.87	11.13	10.98	7.37	17.03	19.00	19.63
	C.D	0.50	1.15	0.85	0.64	0.67	0.76	0.64	0.58
	SEM±	0.16	0.38	0.28	0.21	0.22	0.25	0.21	0.19

summarized in Table 2 and number of secondary branches per plant at 30, 60, 90 DAS and at harvest revealed that maximum number of secondary branches 11.47, 21.17, 24.57 and 25.77 observed in T_4 100% RDF + VC + FYM @ 5 t/ha and minimum number of secondary branches 4.73, 10.37, 15.03 observed in T_0 Control. The data pertaining to dry matter accumulation of mustard presented in Table 3 revealed that dry matter production was significantly influenced by integrated nutrient management at all the stages *viz.*, from 30 DAS up to harvest stage. Dry matter production increased with advancement of crop growth stages and reached to maximum at harvest. The data on dry matter production influenced by organic and inorganic combinations revealed that dry matter production at 30, 60, 90 DAS and at harvest shown Maximum dry matter accumulation were found in T_4 1.88 g/plant 14.05 g/plant 32.96 g/plant and 38.8 g/plant and minimum 1.08 g/plant, 8.11 g/plant, 19.02 g/plant and 22.44 g/plant. Mukherjee (2016) also found that the highest plant height and leaf area of mustard with the application of FYM @ 30 t ha^{-1} during first year and application of FYM @ 20 t ha^{-1} in second year. The application of 100% RDF and inoculation of Azotobacter + PSB gave maximum plant height, number of primary branches and number of secondary branches in brown sarson (Brar *et al.*, 2016). Bijarnia *et al.* (2017) found that the application of 5 t FYM + 100% RDF gave more number of primary and secondary branches $plant^{-1}$ of mustard as compared to 5 t FYM + 50% of RDF+ Bio-fertilizer and 5 t FYM + 75% of RDF+ Bio-fertilizer. Similar results were also observed by Hadiyal *et al.* (2017) significantly highest growth parameters *viz.*, number of primary and secondary branches per plant of mustard was recorded with the seed inoculation with Azotobacter spp. + PSB spp. (@ 10 ml/kg seed). Diwakar *et al.* (2021) with application of 75% NPK +25% FYM+40 kg S+ Mulching @10 t/ha gave highest number of branches/plant, number of dry matter accumulation/plant and plant height at 60 DAS as well as at harvest.

Table 3 : Effect of Integrated Nutrient Management on Dry matter accumulation per plant (g) of Indian mustard.

S. no.	Treatment details	Mean Value Table of Dry matter accumulation per plant (g)			
		Dry Matter Accumulation			
		30 DAS	60DAS	90 DAS	At harvest
T_0	Control	1.09	8.11	19.03	22.44
T_1	100% RDF	1.72	12.84	30.11	35.42
T_2	100% RDF + FYM @ 5t/ha	1.79	13.36	31.33	36.88
T_3	100% RDF + VC @ 5 t/ha	1.83	13.71	32.14	37.84
T_4	100% RDF + VC + FYM@ 5 t/ha	1.88	14.05	32.96	38.80
T_5	FYM @ 5 t/ha	1.57	11.72	27.50	32.37
T_6	VC @ 5 t/ha	1.62	12.16	28.50	33.50
T_7	FYM + VC @ 5 t/ha	1.67	12.50	29.32	34.51
	C.D	0.13	1.07	2.47	2.77
	SEM±	0.04	0.35	0.81	0.90

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