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Effect of integrated nutrient management on growth and establishment of banana cv Rasthali

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ABSTRACT

The present investigation on the effect of integrated nutrient management on growth and establishment of Banana cv Rasthali was carried out at central horticultural field, SHIATS, Allahabad, UP from October 2014 to April 2015. In the treatments recommended doses of fertilizer, farmyard manure, vermicompost and *Azotobacter* were used in different proportions. The vegetative growth parameters viz plant height (cm), plant girth (cm), number of leaves per plant, number of suckers per plant, sucker height (cm) and number of leaves per sucker were influenced significantly due to different treatments. Out of the treatments used 75 per cent recommended dose of fertilizer (RDF) + 25 per cent vermicompost was the best treatment combination that resulted in maximum plant height (116.30 cm), plant girth (37.43 cm), number of leaves per plant (13.00), number of suckers per plant (6.93), sucker height (27.17 cm) and number of leaves per sucker (9.50).

Keywords: Banana; INM; vegetative growth; establishment; RDF

INTRODUCTION

Banana (*Musa* spp) belongs to the family Musaceae and is the second largest growing fruit crop next to mango. It is a cheapest source of energy like vitamins A and C and other minerals with traces of fat. India is the largest producer of banana in the world. Banana owing to its large size and rapid growth rate requires relatively large amount of nutrients for high yields of quality fruits. It is estimated that 50 tonnes of banana in one hectare removes 320 kg N, 32 kg P_2O_5 and 925 kg K_2O every year (Lahav and Turner 1983).

It is necessary to modify the nitrogen supply system to obtain maximum benefit from the applied sources. Therefore the integrated nutrient management

approach which includes the utilization of chemical fertilizers and organic manures in combination with nitrogen fixing bacteria may prove very useful as well as economic in reducing the requirement of chemical fertilizers and increasing the yield.

In this scenario efficient nutrient management plays an important role in increasing nutrient availability and reducing diseases and nutrient losses. The integrated nutrient management is best way to obtain good quality growth, yield and also to maintain optimum nutrient balancing. The present experiment was carried out as an attempt in this direction.

MATERIAL and METHODS

In the present investigation the effect of integrated nutrient management on growth and establishment of banana cv Rasthali was studied at central horticultural field, SHIATS, Allahabad, UP from October 2014 to April 2015. In the treatments recommended doses of fertilizer (RDF), farmyard manure (FYM), vermicompost (VC) and *Azotobacter* were used in different proportions. The different treatments used were T_1 (control- RDF, NPK 200:160:200 kg/ha), T_2 (75% RDF + 25% FYM), T_3 (75% RDF + 25% VC), T_4 (75% RDF + *Azotobacter* 5 kg/ha), T_5 (50% RDF + 50% FYM), T_6 (50% RDF + 50% VC), T_7 (50% RDF + *Azotobacter* 5 kg/ha), T_8 (25% RDF + 75% FYM), T_9 (25% RDF + 75% VC), T_{10} (25% RDF + *Azotobacter* 5 kg/ha). The treatments were arranged in a randomized block design in 3 replications.

The required doses of organic and inorganic manures and bio-fertilizers were calculated and applied in 3 split doses at 2, 4 and 6 months after planting as per the treatments. The recommended dose of fertilizer used in the experiment consisted of 200 g N, 160 g P_2O_5 and 200 g K_2O per plant (Anon 2013).

RESULTS and DISCUSSION

Plant height (cm)

From the data given in Table 1 it is revealed that among the growth parameters the maximum plant height (116.30 cm) at 180 days after planting (DAP) was observed in T_3 (75 per cent RDF + 25 per cent VC) followed by 75 per cent RDF + *Azotobacter* 5 kg/ha (110.67 cm), 25 per cent RDF + 75 per cent FYM (110.63 cm) and 50 per cent RDF + *Azotobacter* 5 kg/ha (104.47 cm) while the minimum (97.27 cm) was recorded under control treatment. The increase in the plant height in the treatment T_3 might be due to the beneficial effect of vermicompost with 75 per cent recommended dose of fertilizer. The increase in plant height could be attributed to the higher uptake of nutrients particularly nitrogen. This fact is supported by the work of Pafli (1965) that the uptake of N, the chief constituent of chlorophyll, protein and amino acids is accelerated through its

Table 1. Effect of integrated nutrient management on various plant growth parameters of banana cv Rasthali

T	Plant height (cm) at DAP			Plant girth (cm) at DAP			# leaves/plant at DAP			# suckers/plant at DAP			Sucker height (cm) at DAP			# leaves/sucker at DAP		
	60	120	180	60	120	180	60	120	180	60	120	180	60	120	180	60	120	180
T_1	41.27	65.27	97.27	11.90	18.94	28.59	3.33	6.66	9.00	1.50	3.13	4.67	7.90	14.17	19.83	1.83	4.17	6.83
T_2	41.80	70.03	101.06	13.36	20.05	30.88	3.66	7.60	11.33	1.57	3.17	4.83	9.83	17.50	25.50	1.97	5.10	7.83
T_3	50.17	80.47	116.30	17.43	25.70	37.43	5.33	10.26	13.00	2.80	4.17	6.93	11.53	19.50	27.17	3.23	7.63	9.50
T_4	47.47	78.63	110.67	15.25	24.64	35.99	4.00	8.16	11.83	2.60	3.83	6.00	8.33	15.17	21.00	2.63	5.67	9.50
T_5	41.73	70.80	109.60	12.72	21.27	32.43	4.00	7.33	10.43	1.67	3.67	5.13	11.17	19.03	24.67	2.50	5.67	8.50
T_6	42.37	72.63	104.43	13.06	19.72	31.81	4.00	7.50	11.33	1.57	3.67	4.73	9.00	14.83	21.17	2.20	4.33	7.17
T_7	44.67	74.63	104.47	13.63	19.71	33.44	3.50	7.33	11.43	2.00	3.67	5.10	10.50	16.83	23.67	2.67	6.77	8.83
T_8	43.13	71.37	110.63	14.00	21.14	29.26	2.50	7.83	11.66	1.50	3.50	5.17	10.17	16.50	22.33	2.50	4.67	6.87
T_9	42.93	74.30	101.73	14.17	21.60	29.39	4.00	7.33	11.16	2.13	3.67	5.17	10.00	15.67	22.83	2.33	4.83	8.17
T_{10}	45.68	73.30	103.00	12.88	21.23	33.88	2.50	6.83	10.16	2.33	2.67	5.33	8.33	16.17	21.50	2.37	5.87	8.87
SEd±	1.16	1.68	1.94	0.78	0.87	0.66	0.77	0.96	0.90	0.40	0.38	0.40	1.08	1.49	2.00	0.38	1.00	0.85
$CD_{0.05}$	2.47	3.57	4.14	1.66	1.85	1.40	1.65	2.06	1.92	0.86	0.80	0.86	2.31	3.18	4.26	0.80	2.12	1.81
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

T= Treatment, DAP= Days after planting, T_1 (control- RDF, NPK 200:160:200 kg/ha), T_2 (75% RDF + 25% FYM), T_3 (75% RDF + 25% VC), T_4 (75% RDF + *Azotobacter* 5 kg/ha), T_5 (50% RDF + 50% FYM), T_6 (50% RDF + 50% VC), T_7 (50% RDF + *Azotobacter* 5 kg/ha), T_8 (25% RDF + 75% FYM), T_9 (25% RDF + 75% VC), T_{10} (25% RDF + *Azotobacter* 5 kg/ha), RDF= Recommended dose of fertilizer, FYM= Farmyard manure, VC= Vermicompost

increased supply at appropriate time to the plants.

Plant girth (cm)

The data reveal that maximum plant girth of 17.43, 25.70 and 37.43 cm at 60, 120 and 180 DAP respectively was recorded in T_3 (75 per cent RDF + 25 per cent VC). *Azotobacter* inoculation along with 100 per cent N has been found to increase the vegetative character of banana (Jeeva et al 1988). Patel et al (2012) also reported that integration of inorganic nitrogen in combination with castor cake and *Azotobacter* or *Azospirillum* was advantageous than application of inorganic nitrogen alone as it produced early vegetative growth.

Number of leaves per plant

The maximum number of leaves per plant (5.33, 10.26 and 13.00 at 60, 120 and 180 DAP respectively) was recorded in T_3 (75 per cent RDF + 25 per cent VC) and it was significantly superior over rest of the treatments. The minimum number of leaves per plant was recorded under control treatment. Similar results were reported by Hazarika and Ansari (2010b) in banana.

Number of suckers per plant

Maximum number of suckers per plant (6.93) at 180 days after panting (DAP) was observed in T_3 (75 per cent RDF + 25 per cent VC) followed by 6.00 in T_4 (75% RDF + *Azotobacter* 5 kg/ha) 5.33 in T_{10} (25% RDF + *Azotobacter* 5 kg/ha). The minimum number of suckers per plant (4.67) was recorded under control treatment. The increase in the number of suckers per plant in the treatment T_3 might be due to the beneficial effect of vermicompost as it conserves the soil moisture and banana also requires higher amount of moisture. Similar findings were reported by Hazarika and Ansari (2010a)

Suckers height (cm)

The maximum sucker height of 11.53, 19.50 and 27.17cm at 60, 120 and 180 DAP respectively was recorded in T_3 (75 per cent RDF + 25 per cent VC) while the minimum (19.83 cm) was recorded under control treatment. The increase in the sucker height in the treatment T_3 might be due to the beneficial effect of 75 per cent RDF. Similar findings were reported by Patil and Shinde (2013) in banana.

Number of leaves per suckers

The maximum number of leaves per sucker (9.50) was recorded in T_3 (75 per cent RDF + 25 per cent VC) and T_4 (75% RDF + *Azotobacter* 5 kg/ha) followed by 8.87 in T_{10} (25% RDF + *Azotobacter* 5 kg/ha) while the minimum (6.83) was recorded under control treatment. The increase in the number of leaves per sucker in the treatment T_3 might be due to the beneficial effect of vermicompost with 75 per cent recommended dose of fertilizer. Optimum nutrients provided to plants might have accelerated rate of photosynthesis thereby enhancing the vegetative growth. Similar

findings were reported by Kumar (2012) in Monthan banana.

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