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Effect of INM on growth parameters of tissue cultured Banana cv. Grand Naine under North Indian condition

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Abstract

The present study entitled Effect of INM for growth parameters of tissue cultured Banana cv. Grand Naine under North Indian Condition was conducted at Horticulture Garden, Department of Fruit Science, Chandra Shekhar Azad University of Agriculture & Technology Kanpur (U.P.) India, during the cropping season 2019-20. The experiment was laid out in Randomized Block Design with three replications and ten treatments. The results showed that application of T₇ (75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB) has resulted in the maximum plant height at 60, 120, 180 and 240 days (60.25, 110.48, 165.37 and 221.22 cm), pseudostem girth at 60, 120, 180 and 240 days (23.74, 40.16, 51.53 and 67.40 cm), number of leaves per plant at 60, 120, 180 and 240 days (9.38, 16.24, 23.13 and 26.97), number of suckers per plant at shooting stage (8.37), leaf area (10.43 m²), length of inflorescence (122.23 cm) with minimum days taken to flowering (282.81), days taken to fruit harvest (85.83).

Keywords: Banana, NPK, FYM, vermicompost, *Azospirillum*, PSB, Growth parameter

Introduction

Banana is perennial fruit crop which belongs to the family Musaceae and order Scitamineae (Simmonds, 1962) [2]. Banana is an important tropical fruit and is one of the oldest known fruits used for various purposes. It is one of the dominating fruit crops in the world market and is well recognized as the “Apple of paradise”, taxonomically called as *Musa paradisiaca*. India rank first in area and production having total area 0.875 million hectares and production of 29.65 million metric tonnes with productivity of 35.17 MT ha⁻¹ followed by Brazil and China. In India, banana ranks first in production and third in area among fruit crops. In India, major banana producing states are Andhra Pradesh followed by Gujrat and Maharashtra. Banana fruits are used to make many products like chips, soft drinks, banana flour, jam etc. Every part of banana used for various purposes. Banana, by virtue of its multiple uses, is popularly known as “Kalpataru” (a plant with virtue). Banana is propagated vegetative by suckers or rhizomes; however, tissue culture technique is now being extensively used for its multiplication. Plant produced by tissue culture techniques are mostly free from various diseases, have uniform growth habit, produce more and earlier yield than suckers or rhizome propagated plants. Grand Naine is a popular variety which is mostly grown in all export oriented countries of Asia, South America and Africa. Due to many desirable traits like excellent fruit quality, immunity to *fusarium* wilt, it has proved as a better variety. An integrated approach for utilization of available resources viz., organic, inorganic and microbial inoculants for achieving sustainable economic yield is termed as “Integrated nutrient management” (INM) has emerged as an important techniques which has already been receiving wide attention and also contributing substantially towards the acceleration of crop productivity by maintaining physical, chemical and biological balance in soil for plant growth system.

Materials and Methods

The present study was conducted at Horticulture Garden, Department of Fruit Science, Chandra Shekhar Azad University of Agriculture & Technology Kanpur (U.P.) India, during the cropping season September, 2019 with spacing 1.8 X 1.8 m². The experiment was laid out in Randomized Block Design with three replications and ten treatments viz. (T₀-Control, T₁-100% RDF of NPK 110: 30: 330g, T₂-75% RDF of NPK + 25% FYM + 50g *Azospirillum* + 50g PSB, T₃- 50% RDF of NPK + 50% FYM + 50g *Azospirillum* + 50g PSB, T₄-75% RDF of

NPK + 25% vermicompost + 50g *Azospirillum* + 50g PSB, T₅-50% RDF of NPK + 50% vermicompost + 50g *Azospirillum* + 50g PSB, T₆-75% RDF of N + 100% RDF of PK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB, T₇-75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB, T₈-75% RDF of K + 100% RDF of NP + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB, T₉ 100% FYM + 100% vermicompost + 50 g *Azospirillum* + 50 g PSB). Observations were made on different vegetative and reproductive growth parameters. Other cultural practices like weeding, earthing up, DE suckering, irrigation, insect-pest and disease management were common all treatment

Results and Discussion

Vegetative characters

The data on effect of INM on vegetative characters *viz.* plant height, pseudostem girth, number of leaves per plant, number of suckers per plant at shooting stage, leaf area are presented in Table-1.

The effect of INM on plant height at 60,120,180 and 240 days (60.25, 110.48, 165.37 and 221.22 cm), pseudostem girth at 60,120,180 and 240 days (23.74, 40.16, 51.53 and 67.40 cm), number of leaves per plant at 60,120,180 and 240 days (9.38, 16.24, 23.13 and 26.97) was obtained with the application of T₇ (75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB) per plant.

These traits were minimum under control plant height at 60,120,180 and 240 days (33.28, 72.21, 106.49 and 155.48cm), pseudostem girth at 60,120,180 and 240 days (12.53, 22.97, 36.48 and 47.65cm), number of leaves per plant at 60,120,180 and 240 days (5.07, 8.91, 12.28 and 15.95). The increase in plant height and pseudostem girth may be due to the improvement of physical properties of soil, higher nutrient uptake and increased activity of micro-organisms which manifested in the form of enhanced growth and higher carbohydrates production. These findings are in line with the findings of Tripathi *et al.*, (2017) [4], Sathappan *et al.*, (2019) [3] and Singh and Tripathi (2020) [6] in banana.

The effect of INM on number of suckers per plant at shooting stage (8.37) and leaf area at shooting stage (10.43 m²) was obtained with the application of T₇ (75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB) per plant. However, the minimum number of suckers per plant at shooting stage (4.38) and leaf area at shooting stage (6.07 m²) were recorded in the control plants. The increase in vegetative growth and other parameters might be due to the production of more chlorophyll content with the inoculation of nitrogen fixers. Increased number of leaves might have increased the photosynthetic activity resulting in higher accumulation of carbohydrates. These findings are in agreement with the reports of Hazarika and Ansari (2010) [1] and Sushsini *et al.*, (2018) in banana.

Table 1: Effect of INM on vegetative characters of tissue cultured Banana cv. Grand Naine under North Indian condition.

Treatment	Plant height (cm)				Pseudostem girth(cm)				Number of leaves per plant				Number of Suckers per plant at shooting stage	Leaf area(m ²) at shooting stage
	60 DAT	120 DAT	180 DAT	240 DAT	60 DAT	120 DAT	180 DAT	240 DAT	60 DAT	120 DAT	180 DAT	240 DAT		
T ₀	33.28	72.21	106.49	155.48	12.53	22.97	36.48	47.65	5.07	8.91	12.28	15.95	4.38	6.07
T ₁	39.73	89.18	142.74	195.86	17.16	30.44	45.55	57.47	7.98	13.09	16.64	20.75	5.69	9.02
T ₂	55.18	95.45	144.21	200.89	17.13	33.02	47.23	58.10	8.69	12.33	17.54	23.33	6.23	7.95
T ₃	53.32	85.26	156.34	207.11	13.56	37.51	45.20	57.49	8.10	13.43	19.13	22.61	6.45	8.47
T ₄	49.01	83.39	151.58	214.02	15.70	37.83	44.97	56.09	7.35	12.79	15.66	18.48	6.48	8.07
T ₅	47.86	82.97	157.20	203.10	18.24	37.07	46.34	58.14	8.81	11.69	17.34	21.72	5.92	8.12
T ₆	56.88	108.90	161.12	219.02	20.81	38.81	49.80	63.97	9.01	14.76	19.73	24.07	8.02	9.43
T ₇	60.25	110.48	165.37	221.22	23.74	40.16	51.53	67.40	9.38	16.24	23.13	26.97	8.37	10.43
T ₈	48.55	101.49	159.49	217.89	20.23	36.94	46.96	50.73	8.04	11.65	15.70	21.71	7.01	8.26
T ₉	42.16	98.59	156.69	213.51	18.98	37.06	47.38	55.63	6.68	10.80	15.78	22.40	6.13	8.45
S.Em+	2.79	2.63	2.93	2.71	0.93	1.41	1.59	1.82	0.56	1.12	0.91	0.66	0.40	0.48
CD at 5%	8.30	7.81	8.70	8.07	2.76	4.20	4.73	5.41	1.67	3.32	2.72	1.97	1.18	1.42

Reproductive characters

The data on effect of INM on reproductive characters *viz.*, length of inflorescence (cm), days taken to flowering and days taken to fruit harvest are presented in Table-2.

The effect of INM on length of inflorescence (122.23cm) was obtained with the application of T₇ (75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB) per plant. These traits were minimum under control length of inflorescence (90.31 cm).

The effect of INM on minimum number of days taken from planting to flowering (282.81 days) and days taken to fruit

harvest (85.83 days) was obtained with the application of T₇ (75% RDF of P + 100% RDF of NK + 25% FYM + 25% Vermicompost + 50g *Azospirillum* + 50g PSB) per plant. These traits were maximum under control days taken from planting to flowering (322.14, days) and days taken to fruit harvest (112.32 days). The earliness in flowering might be due to optimum transport of growth substances like cytokinin to the auxiliary bud breaking the apical dominance. These results get support of the findings of Tripathi (2017) [4] in banana, Baraily and Deb (2018) [5] in pineapple and Singh and Tripathi (2020) [6] in banana.

Table 2: Effect of INM on reproductive characters of tissue cultured Banana cv. Grand Naine under North Indian condition.

Treatment	Length of inflorescence (cm)	Days taken to flowering	Days taken to fruit harvest
T ₀	90.31	322.14	112.32
T ₁	95.85	308.99	98.85
T ₂	110.45	312.87	98.98
T ₃	112.03	312.17	105.51
T ₄	108.48	313.95	98.36

T ₅	111.63	316.60	97.66
T ₆	118.77	287.61	90.60
T ₇	122.23	282.81	85.83
T ₈	115.30	296.41	101.86
T ₉	111.55	297.71	102.15
S.Em+	1.47	2.72	1.87
CD at 5%	4.37	8.09	5.54

Conclusions

On the basis of above findings from present investigation, It is concluded that plant treated with 75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB per plant significantly increase the growth parameter, on the basis of these observation this can be suggested that for getting substantial growth of banana fruits, the tissues cultured plant of banana cv. Grand Naine should be treated with 75% RDF of P + 100% RDF of NK + 25% FYM + 25% vermicompost + 50g *Azospirillum* + 50g PSB as soil application in the North Indian condition (Plain of central Uttar Pradesh), India.

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