

EFFECT OF FORTIFIED BIOFERTILIZERS ON GROWTH AND YIELD OF BANANA (*MUSA RUBUSTA*)

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Banana is an important horticultural crop in humid tropics. It is most nourishing among all fruits. It contains nearly all essential nutrients including minerals and vitamins with several medicinal properties. Banana is a rich source of energy and all its parts are useful in various ways. Eastern India is an important banana producing zone. The nutrient requirement of banana crop is very high due mainly to their rapid and vigorous growth and high fruit yields. Nowadays emphasis is laid on the use of biofertilizers and organic manure in several crops. Literature on studies of biofertilizers in fruit crops particularly in banana is scanty. Therefore, the present investigation was aimed to study the effect of biofertilizers on growth and production of banana.

Different livestock dung viz. Cow (T_1), rabbit (T_2) and pig (T_3) were fortified with 25% DAP by keeping in pits ($1m^3$) tightly closed for a period of six months. These biofertilizers were then applied @ 20 kg/plant in the experimental plots in four doses to sturdy and healthy sword suckers at planting time in pits of size 0.6m x 0.6m x 0.6m dug sufficiently ahead at fixed points and the last group was kept as control (T_4). Five plants per replication were kept as per the design (CRD) of the experiment. No other fertilizers were used in this experiment. After planting banana, soil was sufficiently irrigated and growth observations were recorded from individual plants at monthly intervals. Unwanted suckers, dried and decayed leaves of the plants were removed to keep plantation clean to ensure less attack of pests and diseases. Shortly after flowering the floral remnants and male buds were removed which promoted fruit development.

Observations on flower bud initiation and differentiation, days from flowering to harvest, total number of hands, total fingers in each hand, weight of bunch, individual hand and finger were recorded. The fruits were harvested at maturity (when ridges on the surface of skin changed from angular to round).

Analysis of variance revealed that fortified biofertilizers had a significant ($P<0.05$) effect on growth and yield of banana without affecting chemical composition. Average increase in height was highest (243.48 cm) in T_2 , while it was the lowest (171.8 cm) in control (T_4), with no correlation with total yield of banana. Means of this parameter for T_1 and T_2 differed significantly ($P<0.05$) from those of T_3 and T_4 .

Plant age at flowering in banana was found similar in first two treatments. Earliest shooting was noted in T_1 and T_2 treatments. The first three means differed significantly ($P<0.05$) from control group. Similarly fruiting started 32 days earlier in T_1 than the control group, while in T_2 and T_3 fruiting started at 275 and 289 days of planting respectively for which treated groups differed significantly ($P<0.05$) from the control. The first treatment took minimum time 76 days from flowering to harvest than other treatments. First 3 treatment means for this trait differed significantly ($P<0.05$) from control where fortified biofertilizer was not applied. The early flowering and maturity of fruit in first treatment might be due to higher manurial value of cow dung as compared to that of rabbit and pig dung.

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Treatment had a significant ($P < 0.05$) effect on weight of mature bunch, weight of hand and finger, number of total fingers and yield per plant. Weight of mature bunch was recorded highest (30.09 kg) for T_1 . Average mature weight of bunch for the treated groups differed significantly ($P < 0.05$) as compared to control under observation. Similarly weight of hand, number of fingers and number of hands per bunch were recorded highest in first treatment as compared to other three treatments. The banana hand and individual finger harvested from first treatment weighed three times treatments. The banana hand and individual finger harvested from first treatment weighed three times higher than the control, which differed significantly ($P < 0.05$). This difference might be due to the positive effect of rich manurial value of cow dung in addition to fortification with 25% DAPS used. The samples of fortified biofertilizers were collected from the pits at 3 and 6 months in polythene bags for Nitrogen, Phosphorus and Potassium analysis. It was found that Nitrogen and Phosphorus contents increased 3 to 4 times and Potassium values increased less than one and half times in comparison to control. Total number of fingers were counted maximum (142.20) for the first treatment and minimum (112.20) in control, the difference was observed to be satisfically significant ($P < 0.05$). Average yield (kg/plant) was recorded highest (28.15 kg) for first treatment and yield in all the treatments differed significantly ($P < 0.05$) from the control pointing out that different manure fortified with 25% DAP had a positive reponse in banana crop (Table 1).

The analysis of chemical (A.O.A.C., 1990) components and quality revealed that treatment had no significant effect on chemical constituents and fruit quality (assessed with the help of score cards using different members). Further, no disease attack, insects-pests problem and any type of nutrient deficiency (NPK) was observed in banana plants throughout the period of experimentation. Based on the present findings it may be inferred that the farmers can utilize the manure (fortified with 25% DAP) of cow, rabbit and pig for banana crop, thereby reducing the cost of production (through minimum use of costly chemical fertilizers) and achieving higher income through a significant increase in yield.

REFERENCES

- A.O.A.C. (1990). Official methods of analysis (14th edn.) Association of Official Analytical Chemists. Washington, DC).

Table 1. Means \pm SE for various parameters of banana under different treatments

Parameter	TREATMENTS					CD (0.05)
	T ¹	T ²	T ³	T ⁴	T ⁵	
Average increase in height (cm)	231.40 ^a \pm 2.39	243.48 ^a \pm 1.85	192.20 ^a \pm 4.74	171.80 ^c \pm 1.42	197.75	
Plant age at flowering (d)	263.60 ^a \pm 2.97	264.60 ^a \pm 3.40	276.80 ^a \pm 3.53	295.00 ^c \pm 3.53	11.88	
Plant age at fruiting (d)	272.60 ^a \pm 2.85	275.00 ^a \pm 3.44	288.60 ^a \pm 1.85	304.60 ^b \pm 4.47	15.46	
Days from fruiting to harvesting	76.40 ^a \pm 2.72	81.60 ^a \pm 2.65	91.00 ^a \pm 4.29	109.00 ^c \pm 3.44	08.95	
Weight of mature bunch (kg)	30.09 ^a \pm 2.45	24.13 ^a \pm 1.08	20.21 ^a \pm 0.96	13.12 ^b \pm 1.04	06.78	
Average weight of hand (g)	03.48 ^a \pm 0.23	02.84 ^a \pm 0.07	02.58 ^a \pm 0.15	0.965 ^b \pm 0.08	01.53	
Average weight of finger (g)	232.60 ^a \pm 5.14	150.00 ^b \pm 4.29	124.60 ^c \pm 3.07	075.00 ^d \pm 3.53	25.63	
Number of hand per bunch	09.80 ^a \pm 0.66	09.60 ^a \pm 0.50	09.00 ^a \pm 0.44	10.20 ^a \pm 1.01	NS	
Total number of fingers	142.20 ^a \pm 7.30	133.20 ^a \pm 6.43	129.80 ^a \pm 2.45	112.20 ^b \pm 2.49	15.70	
Average yield (kg) per plant	28.15 ^a \pm 2.38	22.35 ^a \pm 1.22	18.55 ^{ab} \pm 0.86	11.52 ^c \pm 1.09	06.93	
Moisture content (%)	66.57 ^a \pm 1.15	67.02 ^a \pm 1.10	70.50 ^a \pm 1.29	67.93 ^a \pm 1.43	NS	
Total soluble solids (brix)	24.00 ^a \pm 0.70	23.40 ^a \pm 1.07	24.00 ^a \pm 1.41	23.80 ^a \pm 1.35	NS	
Sugar content (mg%)	0.368 ^a \pm 0.02	0.375 ^a \pm 0.09	0.370 ^a \pm 0.02	0.282 ^a \pm 0.01	NS	
Ascorbic acid (ppm)	10.70 ^a \pm 0.51	11.20 ^a \pm 0.64	10.92 ^a \pm 0.81	11.20 ^a \pm 0.36	NS	
Quality score	02.60 ^a \pm 0.24	02.40 ^a \pm 0.24	02.28 ^a \pm 0.32	02.15 ^a \pm 0.32	NS	

Note : a) Means with different superscripts differ significantly (P<0.05) in a column.
 b) For quality score; 1=Good, 2= Better, 3=Best.