



EFFECT OF BIOFERTILIZER ON GROWTH AND YIELD OF BANANA CV. GRAND NAINA (RATOON CROP) IN WEST CENTRAL ZONE OF ODISHA

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ABSTRACT : A field experiment was conducted to access the effect of different biofertilizers on growth and yield of ratoon crop of tissue cultured banana cv. Grand Naine. The experiment was laid out in RBD with 5 treatments, each replicated four times. The experiment consisted the application of recommended dose of fertilizers (RDF) and RDF was combined with organic manure and biofertilizers (*Azospirillum*, *Azoctobactor*, Phosphorus solubilising bacteria) at different combinations to know their effect on growth and yield of ratoon banana viz : T₁ (control), T₂ (100% RDF, 300:100:300 g NPK/plant), T₃ (100% RDF +75g biofertilizers: *Azotobacter*, *Azospirillum* & PSB 1kg each in 25 kg of vermicompost in the ratio of 1:1:1), T₄ (100% RDF +100 g biofertilizer: *Azotobacter*, *Azospirillum* & PSB 1kg each in 25 kg of vermicompost in the ratio of 1:1:1) and T₅ (100% RDF +125 g biofertilizer : *Azotobacter*, *Azospirillum* & PSB 1kg each in 25 kg of vermicompost in the ratio of 1:1:1). There was a positive response in plant growth in term of height and girth. Application of 100% RDF +125 g of biofertilizers in 3 split doses (T₅) recorded better growth in tissue culture banana follow by T₄ and T₃ and the treatment recorded better physiological activity in term of ascorbic acid content and pulp: peel ratio. Yield attributing characters like bunch weight, number of hands per bunch and number of finger per bunch also maximum in T₅.

Keywords : Banana, Grand Naine, biofertilizer, ratoon crop.

Banana is one of the important food crops of world, especially in tropics. Banana ranks 1st in area and production among the all fruit crops. India is the largest producer of banana contributing 27% of worlds production. In India total area under banana cultivation is 0.83 m ha with production of 30 mt and productivity is about 34.2 t/ha (Anon., 2). In Odisha total area under banana cultivation is about 27486 ha with production of around 0.52 mT and productivity is about 19 t/ha (Anon., 2). The importance of biofertilizers as a component of INM is viewed as sustainable crop production system, not only on yield maximization but also for the agro-system stability.

Banana, being a heavy feeder, requires nutrients at various stages of growth and development. The main crop utilizes maximum nutrient from soil for its growth and development. Hence the experiment was conducted on ratoon crop of banana cv. Grand Naine in west central table land zone of Odisha with inorganic and biofertilizers to improve the nutritional practices and the physical, chemical and biological properties of soil and growth and yield attributing characters of banana.

MATERIALS AND METHODS

The field experiment was conducted in the Regional Research Technology and Transfer Station (RRTTS) situated at Chiplima, Sambalpur, Odisha which is situated at a distance of 35 km from the district headquarter, Sambalpur. The latitude, longitude and altitude of the study area are 20°21'N. 80°55'E and 178.8 m above mean sea level, respectively. The area falls under the sub-humid climatic condition in the eastern part of the country and represents under the agro climatic zone of West Central Table Land. The experiment was laid out in RBD with five treatments and four replications during the year 2013-14. And the treatments were T₁ : Control T₂ : NPK based on recommended dose of fertilizer (RDF), T₃ : 100% RDF + 75g biofertilizer, T₄ : 100% RDF +100 g biofertilizer, T₅ : 100% RDF +125 g biofertilizers. The main crop of banana was fertilized with N, P and K at the rate of 300:100:300 g per plant in form of urea, Diammonium phosphate. Murate of potash in split doses. At the time planting of main crop 100% phosphorus, 25% nitrogen and 50% potassium was applied and rest 75% nitrogen was applied in 3 split doses at third, fifth and seventh month. Lime @ 100g was applied at the time of planting due to acid soil condition. In addition with recommended dose of inorganic fertilizer biofertilizers viz. *Azotobacter*, *Azospirillum* and PSB were applied. Before application of biofertilizer it was mixed with

Article's History:

Received : 18-01-2016

Accepted : 13-02-2016

vermicompost @ 25 kg in the ratio of 1 : 1 : 1 and kept for inoculation for 7 days. The mixture was applied when the ratoon plants were 90 days old. Different intercultural operations were done at the growth stages. Observation on growth and yield attributing characters were recorded and data were statistically analysed.

RESULTS AND DISCUSSION

Growth and yield parameters (Table 1 and 2) revealed that maximum plant height (185.24 cm) and girth of stem (59.60 cm) was in treatment T₅ but minimum days required to flower (201.7 days) and total crop duration (280.273 days) were in T₁ (control). Whereas bunch emergence was delayed by 15-20 days in T₅ followed by T₃ and T₄. Maximum number of hands per bunch (9.45), maximum number fingers per bunch (152.40), weight of bunch (24.86 kg), maximum

weight of finger (133.67 g) and yield (76.72 t/ha) were recorded with treatment (T₅) i.e. application of 100% recommended dose of fertilizer (300 : 100 : 300 kg/plant) with biofertilizers *Azotobactor*, *Azospirillum* and PSB 125 g each.

Increase in yield attributes could be due to the increase in morphological traits such as plant height, girth, number of functional leaves, leaf area, faster rate of leaf production and also higher nutrient uptake by the plants. Increased number of leaves might have increased the photosynthetic activity resulting in higher accumulation of carbohydrates. Relatively higher carbohydrates could have promoted the growth rate and in turn increased bunch weight. This was in accordance with the results of Bhalerao *et al.* (3) and Chezhiyen *et al.* (4) in banana. The increase in finger weight might be due to the increase in production of promoting endogenous and enhancement of nutrient

Table 1: Effect of inorganic and biofertilizer on growth parameters of of ratoon crop of banana.

Treatments	Ratoon crop (2013-14)						
	Pseudostem height (cm)	Pseudostem girth (cm)	Total no. of leaves	No. of leaves at shooting	Days to bunch emergence	Days to harvest after shooting	Total crop duration (days)
T ₁ -control	167.23	53.69	32.56	10.26	201.7	78.450	280.273
T ₂ -100% RDF	175.89	54.76	35.84	11.59	206.17	82.523	288.663
T ₃ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> + PSB(75g)	176.86	58.14	36.97	12.14	207.54	84.368	291.985
T ₄ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> + PSB(100g)	181.63	58.46	37.75	11.99	208.31	86.317	295.017
T ₅ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> + PSB(125g)	185.24	59.60	38.73	12.82	216.5	100.905	317.450
CD (P=0.05)	6.00	1.26	0.42	0.03	2.952	2.826	4.605

Table 2: Effect of inorganic and biofertilizers on yield attributes of ratoon crop of banana cv. Grand Naine.

Treatments	Ratoon crop (2013-14)							
	Weight of bunch (kg)	No. of hands/ bunch	No. of fingers/ bunch	Pulp : peel ratio	Ascorbic acid (100 µg /mL)	Weight of finger (g)	Length of finger (cm)	Yield /(ha)
T ₁ -control	17.52	7.57	106.55	3.31	10.09	108.85	15.28	54.07
T ₂ -100% RDF	20.78	8.08	125.53	3.34	11.11	124.39	20.52	64.13
T ₃ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> +PSB(75g)	22.74	8.47	132.7	3.53	11.51	126.74	21.54	70.18
T ₄ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> + PSB(100g)	23.82	8.92	135.18	3.66	12.25	119.84	20.20	73.50
T ₅ -100% RDF+ <i>Azotobactor</i> + <i>Azospirillum</i> +PSB(125g)	24.86	9.45	152.40	4.2	12.33	133.67	22.31	76.72
CD (P=0.05)	1.08	0.03	0.68	0.32	0.11	108.85	0.16	1.32

uptake in addition to the role of nitrogen on productivity of banana plants (Nijjar, 6). Any factor that stimulates higher finger production and favours better finger development leads to better bunch weight.

Higher yield response owing to application of organics ascribed to improved physical, chemical and biological properties of soil resulting in better supply of plant nutrients, which in turn led to good crop growth and yield. Humus substance present in organic product could have mobilized the reserve food materials to the sink through increased activity of hydrolyzing and oxidizing enzymes. These products would help the better availability and utilization of nutrients. All these positive effect might have facilitated quick mobilization and availability of nutrients that would aid in increased plant height, number of leaves, leaf area, leaf area index and photosynthetic rate. This in turn would have assisted for the increased yield of banana. This is in confirmation with the findings of Patel *et al.* (7) and Aba *et al.* (1) and Hazarika and Ansari (5) in banana.

CONCLUSION

From the results it can be concluded that application of RDF along with 125 g *Azotobacter* + 125 g *Azospirillum* + 125 g PSB (T₅) recorded better growth character and yield trait in 1st ratoon crop of banana cv. Grand Naine with three split application of RDF, NPK (300:100:300 g/ plant) at 3rd, 5th and 7th month of planting along with biofertilizer (*Azotobacter*, *Azospirillum*, PSB) at 90 days of planting.

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Citation : Chhuria S., Maji D.K., Dash D.K., Biswal M. and Patnaik K. (2016). Effect of biofertilizer on growth and yield of banana cv. Grand Naine (Ratoon Crop) in West Central Zone of Odisha. *HortFlora Res. Spectrum*, **5**(1) : 75-77.