

Original Research Article

Effect of Organic Fertilizer Vermicompost and Micronutrient on Growth and Yield of Banana Cv. Grand Nain

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ABSTRACT

A field trial was conducted at farmer's field of Burhanpur district of Madhya Pradesh during 2013-14 to study the effect of organic fertilizer, micronutrient and vermicomposting on growth and yield of banana cv. grand nain. The data for vegetative growth recorded after 9th month of planting. In one set of experiment, the results revealed that treatment 100% RDF (T₁) exhibited maximum values for all the vegetative growth parameters, whereas minimum values in treatment 50% RDF alone (T₅). The effect of vermicomposting was also found significant in treatment combination 75% RDF + 4 Kg vermicomposting plant⁻¹ (T₂) as compared to the remaining treatments expect T₃ for all the vegetative characters and yield. Significantly maximum yield (82.60 t/ha.) recorded in treatment 100% RDF (T₁) whereas minimum in T₅-50% alone RDF (65.25 t/ha.). In an another set of study, the effect of micronutrient was found significant in treatments combination (T₈) RDF + 25 gm FeSO₄ + 25 gm MnSO₄ + 20 gm ZnSO₄ in terms of reduced total crop duration (375.45 days) as well as higher yield (85.65 t/ha) followed by treatment combination (T₇) RDF + 25 gm FeSO₄ + 20 gm ZnSO₄.

Keywords

Vermicomposting, Vegetative growth parameter, Yield of banana, Crop duration, Micronutrients

Introduction

Banana (*Musa spp.*) is considered as the symbol of 'prosperity and fertility' owing to its greater socio-economic significance and multifaceted uses, banana is referred as 'Kalpatharu' (plant of virtues) and kalpavriksh. Burhanpur is the largest banana producing district in Madhya Pradesh. Banana feeds heavily on soil. To sustain high production with quality banana, it is of paramount importance to ensure proper nutrition of the crop. The adverse environment and soil effects of modern agriculture characterized by intensive use of fertilizers, pesticides and other off-farm inputs have been documented worldwide.

A gradual transition from modern to organic agriculture has been accepted as viable option for overcoming the present crisis in agriculture. In view of increasing cost of fertilizers and their hazardous effects on environments, there is need for organic growing awareness among the banana growers. There is little information available on the effect of micronutrients on growth and yield of banana. Banana appears to have the maximum capability to recover by proper application of fertilizers. Some workers have reported favorable response of banana and other fruit crops to micronutrients application (Ghanta and

Mitra, 1993; Das and Mohan, 1993). Keeping above facts in mind, a field trial was conducted to study the (i) effect of various fertilizer doses with vermicomposting and (ii) recommended dose of fertilizer (RDF) with micronutrients on growth, crop duration and yield of banana cv. grand nain which is grown commercially in Burhanpur district of Madhya Pradesh.

Materials and Methods

The field trial was conducted in Randomized Block Design (RBD) with three replication and five treatment at farmers' field village Dapora of Burhanpur district during the year 2013-14 in two sets of study. The first study is effect of various doses of fertilizers with vermicomposting and the second study is effect of recommended dose of fertilizers with micronutrients. The soil of trial field was light black soil. Tissue culture plants were planted in the month of July at spacing of 1.8 M x 1.8 M. 100% recommended dose of fertilizers (RDF) was applied @ 200gm. nitrogen, 60gm. phosphorous and 300gm. Potassium per plant were applied as recommended dose of fertilizer (RDF).

Nitrogen were applied in the form of urea in seven split dose at 30, 75, 125, 165, 210, 255 and 300 DAP whereas phosphorous in the form of SSP were applied in 3 split doses at basal, 75 DAP and 125 DAP. Potash in the form of MOP was applied as basal, 165 DAP, 210 DAP, 255 DAP and 300 DAP. In first study, the treatments are T₁-200: 60: 300 gm. NPK (RDF), T₂- 75% RDF + 4 kg. vermicomposting P⁻¹, T₃- 75% RDF alone P⁻¹, T₄- 50% RDF + 4 kg. vermicomposting P⁻¹, T₅- 75% RDF alone P⁻¹. Vermicomposting was applied in two split doses first at 60 DAP and second at 125 DAP. Observations were recorded on 5 uniformly growing plants in each treatment for recording vegetative growth parameters

viz, plant height (cm), stem girth (cm), no. of functional leaves and no. of suckers/plant. Yield/ hectare was calculated by multiplying mean bunch weight with number of plants/ hectare and expressed in ton/ hectare in both the sets of experiments. In an another study, the treatments are T₁-control (RDF), T₂ – RDF + 20 gm ZnSO₄, T₃– RDF + 25 gm MnSO₄, T₄ – RDF + 25 gm FeSO₄, T₅ – RDF + 20 gm ZnSO₄ + 25 gm MnSO₄, T₆– RDF + 25 gm MnSO₄ + 25 gm FeSO₄, T₇ – RDF + 25 gm FeSO₄ + 20 gm ZnSO₄, T₈ – RDF + 25 gm FeSO₄ + 25 gm MnSO₄ + 20 gm ZnSO₄. Treatment was given into equal splits at 3 and 4 month after planting. The CuSO₄ 5 gm and borex 10 gm/plant were given in all the treatment except control. Observations were recorded on five uniformly growing plants in each treatment after nine month of planting. Yield/ hectare was calculated by multiplying mean bunch weight with number of plants/ hectare and expressed in ton/ hectare in both the sets of experiments.

Results and Discussion

The data revealed that the treatment 100% recommended dose of fertilizer (RDF) exhibited significantly maximum plant height (245.66 cm) and girth (85.76 cm) followed by treatment (T₂) 75% RDF + 4Kg. vermicomposting plant⁻¹, while it was minimum in treatment (T₅) 50% RDF alone (Table 1). Similar findings were also reported by Athani *et al.*, (2009), Mustafa and Kumar (2008) in banana. Significantly more number of functional leaves were found in 100% RDF (14.70) followed by 75% RDF + 4 kg. Vermicomposting P⁻¹ (13.65) whereas minimum in T₅- 50% RDF alone P⁻¹ (11.00). With respect to no. of suckers, the treatment 100% RDF (T₁) recorded significantly highest number of suckers per plant (6.26) over T₃, T₄ and T₅, while 50% RDF alone recorded minimum number (4.50).

Table.1 Effect of various fertilizer doses and vermicompost on growth of Banana cv-Grand Nain

Treatments	Plant Height (cm)	Stem Girth (cm)	No. of Leaves/Plant	No. of Suckers/Plant
T ₁ - 200:60:300 gm NPK P ⁻¹ (RDF)	245.60	85.76	14.70	6.26
T ₂ - 75% RDF + 4 kg vermicomposting P ⁻¹	240.36	80.66	13.65	5.56
T ₃ -75% RDF alone P ⁻¹	235.50	78.58	12.98	5.12
T ₄ - 50% RDF + 4 kg. vermicomposting P ⁻¹	238.86	74.64	11.50	4.78
T ₅ - 50% RDF alone P ⁻¹	225.68	73.54	11.00	4.50
CV	1.92	1.38	5.61	8.55
SEM	3.73	0.89	0.59	0.37
CD at 5%	8.57	2.04	1.35	0.84

Table.2 Effect of various fertilizer doses and vermin compost on crop duration and yield of banana Cv- Grand Nain

Treatments	Yield (t/ ha.)
T ₁ - 200:60:300 gm NPK P ⁻¹ (RDF)	82.60
T ₂ - 75% RDF + 4 kg vermicomposting P ⁻¹	75.56
T ₃ -75% RDF alone P ⁻¹	74.25
T ₄ - 50% RDF + 4 kg. vermicomposting P ⁻¹	66.75
T ₅ - 50% RDF alone P ⁻¹	65.25
CV	5.06
SEM	3.01
CD at 5%	6.94

Table.3 Effect of different micro nutrients on crop duration and yield of Banana CV-Grand Nain

Treatment	Total Crop Duration (in days)	Yield (t/ha)
T ₁ – Control (RDF)	420.56	73.50
T ₂ – RDF + 20 gm ZnSO ₄	390.40	79.68
T ₃ – RDF + 25 gm MnSO ₄	412.48	77.32
T ₄ – RDF + 25 gm FeSO ₄	388.36	78.50
T ₅ – RDF + 20 gm ZnSO ₄ + 25 gm MnSO ₄	380.66	83.30
T ₆ – RDF + 25 gm MnSO ₄ + 25 gm FeSO ₄	384.60	80.50
T ₇ – RDF + 25 gm FeSO ₄ + 20 gm ZnSO ₄	382.42	81.75
T ₈ – RDF + 25 gm FeSO ₄ + 25 gm MnSO ₄ + 20 gm ZnSO ₄	375.45	85.65
CV	2.37	6.18
S.Em	7.59	4.04
CD at 5%	14.99	7.98

The data presented in table- 2 depicts that the treatment T₁ with respect to yield per hectare, was found significantly (Table 2) superior in all the remaining treatments. Maximum yield per hectare was recorded in 100% RDF (82.60 t/ha.) while, it was minimum in 50% Rdf alone (65.25 t/ha.).

In conclusion the finding clearly indicated that the 100% RDF responded well and gave maximum values for all the vegetative growth parameters and yield. The treatment 75% RDF in combination with 4 kg vermicomposting also gave better response in terms of vegetative growth and yield. It may be due to readily availability of chemical fertilizer to the plant immediately as compare to organic fertilizers (Upadhyay, 1988). It is also fact that vermicomposting will make the nutrients available at slower rates and for longer period.

Similar findings were also reported by Athani *et al.*, (2009), Parida *et al.*, (1994), Jeeva *et al.*, (1988) and Bellie (1987) in different cultivars of banana.

The data presented in table 3 depict that total crop duration was recorded minimum (375.45 days) as compared to control-T₁ (420.56 days) as well as T₂ – RDF + 20 gm ZnSO₄ (390.40 days), T₃ – RDF + 25 gm MnSO₄ (412.48 days). There were significant differences in total crop duration and this alteration may be due to combined use of micro nutrients. Similar results were observed by Yadav *et al.*, (2010), Subramanian and Pillai (1997), Das and Mohan (1993) and Ghanta and Mitra (1993) in Banana.

With respect to yield per hectare was found highest in treatment combination RDF + (86.56t/ha) 25 gm FeSO₄ + 25 gm MnSO₄ + 20 gm ZnSO₄ where it was minimum in control – (T₁) (73.50t/ha)

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