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Response of organic manures on vegetative growth and yield parameter of banana (*Musa spp.*) cultivars G-nine and Cavendish dwarf under popular based Agro-forestry system

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Abstract

The present investigation entitled “Response of organic manures on vegetative growth and yield parameters of banana (*Musa spp.*) cultivars G-nine and Cavendish Dwarf under popular based agro-forestry system” was laid out on the experimental site of College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during 2016-2017. The experimental field was prepared by thorough ploughing harrowing and leveling to get a loose friable texture and a leveled topography. Pits of 45x45 x45 cm size were dug at a spacing of 1.8 x 1.8m and allowed to expose to sunlight for one week before planting of tissue culture plants. After preparation land and layout of the experiment FYM, Vermicompost, Neem Coated Urea and Poultry Manure were incorporated to soil as per treatment in all three replications. The treatments included were T₁ FYM 100%+ Cavendish Dwarf, T₂ Vermicompost 100%+ Cavendish Dwarf, T₃ Neem Coated Urea 100%+ Cavendish Dwarf and T₄ Poultry Manure 100%+ Cavendish Dwarf applied directly to the pits prior to planting. Observations on growth parameters were recorded at various stages of crop growth and yield of banana (*Musa spp.*) cultivars G-nine and Cavendish Dwarf under popular based agro-forestry system. The treatment T₆ Vermicompost 100%+Grade nine(G-9) registered better yield parameters such as growth and yield and parameters like plant height (cm), number leaves plant⁻¹, plant girth (cm), shooting stage (days), bunch weight (kg), number of hand bunch⁻¹, no. of fingers hand⁻¹, total no. of finger bunch⁻¹, average fruit length (cm), average fruit width (cm) and fruit yield (t ha⁻¹) of Banana. So application of this organic manure fertilizer combination can be recommended to growers after few more conjunctive trials.

Keywords: Organic manures, vegetative growth, yield parameter, banana (*Musa spp.*), G-nine and Cavendish dwarf

Introduction

Agroforestry can be defined as an approach to land use that incorporates trees into farming systems, and allows for the production of trees and crops or livestock from the same piece of land in order to obtain economic, environmental, ecological, and cultural benefits (Thevathasan NV *et al.*, 2004) [17]. In UP, agroforestry practices vary according to the agro climatic zones and socio economic status of the farmers. Considering the tree diversity, existing cropping pattern, availability of irrigation water, soil, climate, rainfall and other agro-meteorological characteristics of the area, the state is divided into nine agro-climatic zones, viz. (i) Bhabhar and Tarai Zone, (ii) Bundelkhand Zone, (iii) Central Zone, (iv) Eastern Plain Zone, (v) Mid-Western Plain Zone, (vi) North Eastern Plain Zone, (vii) South Western Semi-Arid Zone, (viii) Vindhyan Zone and (ix) Western Plain Zone (Singh, P., 2014). Bananas and plantains (*Musa spp.*) are grown in more than 125 countries. Primarily in tropical countries, throughout the world. They are grown in a range of environmental conditions with relatively minimum expenses for cultivation and produce fruit year round. They are amongst the 29 crop species on which people largely depend for most of their calories and proteins (Borlong, 1983) [12]. Banana (*Musa spp.*) has emerged as the major cash – subsistence crop across the world (Robinson, 1996) and it is grown in almost all parts of the world specially in the tropical regions. In the world of fruits, banana is a complete food fruit packed with all the necessary energy and health giving elements (Anon, 1969). On account of these properties combined with delicious taste and flavor, it is in great demand in fresh as well as processed form all over the world and has gained commercial popularity in the international fruit trade (Thomas *et al.*, 1968). A gradual transition from modern to organic agriculture has been accepted as viable

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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. The nutrient requirement of banana is very high which is mainly exploited from a very limited soil depth due to shallow root system of the crop. There is good response from a plant which is given with combined form of nutrients than separately. Increase or decrease of one nutrients element may substantially increase or decrease the uptake of the other nutrients. Banana has a high demand for nitrogen and specifically potassium. Hence, better vegetative growth ensures better bunch development. Banana takes up more nutrients per unit area than any other crop.

Materials and Methods

The present investigation entitled “Response of organic manures on vegetative growth and yield parameters of banana (*Musa* spp.) cultivars G-nine and Cavendish Dwarf under popular based agro- forestry system” was laid out on the experimental site of College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagaraj during 2016-2017. The details of experimental plan employed in present investigation were as follows: Field experiment was laid in Randomized Block Design with three replication irrigation and drainage channels were laid out for efficient management. The details of experimental plan employed in present investigation were as follows: Field experiment was laid in Randomized Block Design with three replication irrigation and drainage channels were laid out for efficient management. Healthy, disease free tissue culture plants, cv. Cavendish Dwarf and Grade nine (G-9) were used as planting materials for this investigation. Planting material obtained from Tissue Culture Laboratory of College of Forestry, SHUATS, Prayagaraj. The experimental field was prepared by thorough ploughing harrowing and leveling to get a loose friable texture and a leveled topography. Pits of 45x45 x45 cm size were dug at a spacing of 1.8 x 1.8m and allowed to expose to sunlight for one week before planting of tissue culture plants. As the course of this investigation was on the nutritional aspects of banana, the schedule of organic manures were followed very strictly. After preparation land and layout of the experiment FYM, Vermicompost, Neem Coated Urea and Poultry Manure were incorporated to soil as per treatment in all three replications. The treatments included were T₁ FYM 100%+ Cavendish Dwarf, T₂ Vermicompost 100%+ Cavendish Dwarf, T₃ Neem Coated Urea 100%+ Cavendish Dwarf and T₄ Poultry Manure 100%+ Cavendish Dwarf applied directly to the pits prior to planting. Observations on growth parameters like plant height (cm), number leaves plant⁻¹, plant girth (cm), shooting stage (days), bunch weight (kg), number of hand bunch⁻¹, no. of fingers hand⁻¹, total no. of finger bunch⁻¹, average fruit length (cm), average fruit width (cm) and fruit yield (t ha⁻¹) were recorded at various stages of crop growth and yield of banana (*Musa* spp.) cultivars G-nine and Cavendish Dwarf under popular based agro- forestry system.

Results and Discussion

The data relating to plant growth and yield parameters of Banana cv. Cavendish Dwarf and Grade nine(G-9) under popular based on agroforestry system are presented in Table 1 and Fig 1, which clearly shows that different organic manures viz., FYM, Vermicompost, Neem Coated and Poultry Manure

and two cultivars Cavendish Dwarf and Grade nine (G-9) significantly influenced the plant height, Number leaves plant⁻¹. Plant girth (cm), Shooting stage (days), Days to taken first harvest, Bunch weight (kg), Number of hand bunch⁻¹, No. of fingers hand⁻¹, Total no. of finger bunch⁻¹, Fruit weight (gm), Fruit length (cm), Fruit diameter (cm) and Fruit yield (t ha⁻¹) of Banana Cavendish Dwarf and Grade nine(G-9). There was significant effect of organic manures and Banana cultivars Cavendish Dwarf and Grade nine (G-9) on plant height (cm) during 2016-2017, 2017-2018 with the pooled data.

It was observed that statistical analysis of data on Number leaves plant⁻¹. Plant girth (cm), Shooting stage (days), Days to taken first harvest, Bunch weight (kg), Number of hand bunch⁻¹, No. of fingers hand⁻¹, Total no. of finger bunch⁻¹, Fruit weight (gm), Fruit length (cm), Fruit diameter (cm) and Fruit yield (t ha⁻¹) of banana cv. Cavendish Dwarf and Grade nine(G-9) shows significant. The highest plant height (238.43) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest plant height (198.54, 201.43 and 200.13cm) was recorded in T₃ Neem Coated Urea 100%+ Cavendish. The highest Number leaves plant⁻¹ (33.25) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Number leaves plant⁻¹ (20.24) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Plant girth (cm) (56.68) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Plant girth (cm) (20.24) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf.

The highest Shooting stage (days) (274.32) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Shooting stage (days) (328.39) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Days to taken first harvest (85.60) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Days to taken first harvest (122.39) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Bunch weight (kg) (21.32) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Bunch weight (kg) (15.73) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Number of hand bunch⁻¹ (11.67) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade

nine(G-9), T₅FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Number of hand bunch⁻¹ (7.36) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf.

The highest No. of fingers hand⁻¹ (21.70) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest No. of fingers hand⁻¹ (15.43) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf.

The highest Total no. of finger bunch⁻¹ (253.22) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Total no. of finger bunch⁻¹ (113.56) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Fruit weight (gm) (118.54) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+

Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Fruit weight (gm) (88.41) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Fruit length (cm) (17.60) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Fruit length (cm) (13.77) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Fruit diameter (cm) (13.46) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Fruit diameter (cm) (10.24) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf. The highest Fruit yield (t ha⁻¹) (65.78) was found in T₆ Vermicompost 100%+Grade nine(G-9) followed by T₈ Poultry manure 100%+Grade nine(G-9), T₃FYM 100%+Grade nine (G-9), T₂Vermicompost 100%+ Cavendish Dwarf, T₄Poultry Manure 100%+ Cavendish Dwarf and T₁FYM 100%+ Cavendish Dwarf and the lowest Fruit yield (t ha⁻¹) (48.55) was recorded in T₃ Neem Coated Urea 100%+ Cavendish Dwarf.

Table 1: Effect of organic manures on Growth and yield parameters of banana (*Musa* spp.)

Treatment No.	Growth and yield parameters												
	Plant height (cm)	Number leaves plant ⁻¹	Plant girth (cm)	Shooting stage (days)	Days to taken first harvest	Bunch weight (kg)	Number of hand bunch ⁻¹	No. of fingers hand ⁻¹	Total no. of finger bunch ⁻¹	Fruit weight (gm)	Fruit length (cm)	Fruit diameter (cm)	Fruit yield (t ha ⁻¹)
T ₁	224.41	28.50	47.51	310.38	110.48	17.86	9.84	18.67	183.68	98.52	15.44	11.34	55.11
T ₂	229.76	30.64	49.63	298.49	99.75	18.88	10.81	19.68	212.63	108.47	17.55	11.69	58.25
T ₃	198.54	20.24	40.34	328.39	122.39	15.73	7.36	15.43	113.56	88.41	13.77	10.24	48.55
T ₄	226.46	29.44	49.35	305.23	106.65	18.23	10.55	19.76	208.54	104.40	15.44	11.42	56.26
T ₅	230.54	31.63	51.49	290.55	93.45	20.31	11.33	20.79	235.59	114.71	16.82	12.34	62.67
T ₆	238.43	33.25	56.68	274.32	85.60	21.32	11.67	21.70	253.22	118.54	17.60	13.46	65.78
T ₇	204.57	24.61	43.69	319.81	120.27	16.62	8.28	16.88	139.67	91.59	14.22	10.83	51.30
T ₈	232.49	32.11	52.41	282.57	88.46	20.80	11.33	20.12	227.93	117.65	17.46	12.64	64.19
F-Test	S	S	S	S	S	S	S	S	S	S	S	S	S
C.D. at 0.5%	0.331	0.598	0.318	0.243	0.177	0.155	0.206	0.173	4.114	0.347	0.924	0.269	0.479
S.Ed. (+)	0.154	0.279	0.148	0.113	0.083	0.072	0.096	0.080	1.918	0.114	0.431	0.125	0.223

Conclusion

On the basis of present investigation in both successive year 2016, it is concluded that the treatment Vermicompost 100%+Grade nine(G-9) was found best in terms of growth and yield and parameters like plant height (cm), number leaves plant⁻¹, plant girth (cm), shooting stage (days), bunch weight (kg), number of hand bunch⁻¹, no. of fingers hand⁻¹, total no. of finger bunch⁻¹, average fruit length(cm), average fruit width(cm) and fruit yield (t ha⁻¹) of Banana. So application of this organic manure fertilizer combination can be recommended to growers after few more conjunctive trials.

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