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Kumudani Sahu
Department of Fruit Science,
College of Agriculture, Indira
Gandhi Agricultural University,
Raipur, Chhattisgarh, India

GD Sahu
Department of Fruit Science,
College of Agriculture, Indira
Gandhi Agricultural University,
Raipur, Chhattisgarh, India

Sevan Das Khunte
Department of Fruit Science,
College of Agriculture, Indira
Gandhi Agricultural University,
Raipur, Chhattisgarh, India

Effect of different sources of organic fertilizers on yield and economics of banana (*Musa paradisiaca* L.) cv. Grande Naine under precision farming

Kumudani Sahu, GD Sahu and Sevan Das Khunte

Abstract

The present investigation was carried out at Research Farm of Precision Farming Development Centre (PFDC), Department of Fruit Science, College of Agriculture, IGKV, Raipur, Chhattisgarh during the year 2020-21 and 2021-22, respectively and was laid out in Randomized Block Design (RBD), the experiment comprising eleven treatment combinations with three replications. The results revealed that the treatment T₈ -80% RDF + Cow urine @ 4 Liter/plant in two split doses significantly the maximum number of fingers per hand (19.37), number of fingers per bunch (207.19), bunch weight (29.01) and bunch yield/ ha (89.53t) recorded both year. Among the different treatments net returns (421729 Rs /ha) and higher B: C ratio (2.47) was observed under the treatment T₈-80% RDF + Cow urine @ 4 Liters/plant in two split doses followed by the treatment T₇ – 100% RDF + Cow urine @ 2 Liters/plant in two split doses which also gave the best result during both the years 2020-21 and 2021-22.

Keywords: Bunch, cow urine, finger, vermicompost and vermiwash

Introduction

Banana (*Musa paradisiaca* L.) is the most important crop grown in the tropical and subtropical regions of the world. In India, an area under banana in India is 883.8 thousand ha. and production is 30807.5 thousand metric tonnes with a productivity of 34.9 metric tonnes/ha (Anonymous, 2019) [1]. Tamil Nadu is the leading state of banana production (3205.04 thousand metric tonnes) as well as area (82.63 thousand ha). Whereas, in Chhattisgarh, the area of banana is 26.57 thousand ha with a production of 745.783 thousand metric tonnes with a productivity of 28.06 metric tonnes/ha. (Anonymous, 2018) [2]. It is cultivated in diverse agro-climatic conditions of the state for its generally assured income. Generally, banana plants need large amounts of fertilizers, especially nitrogen and potassium (Ganeshamurthy *et al.*, 2011) [6]. Moreover, it draws nutrient elements from a very limited soil depth due to its shallow root system. Also, high water requirements cause a great leaching of most applied nutrients, particularly nitrogen besides volatilization and denitrification. The major problems faced by the banana growers are the high cost of inorganic fertilizers needed for banana plants. Beside this, chemical fertilizers are considered as air, soil and water polluting agents during their production and utilization. Consequently, it has drawn the attention of researchers and banana growers to use organic manures and bio-fertilizers which are safe for human, animals and environment.

Organic fertilization is another option for supplying nutrient elements to banana production. The organic materials improve soil structure and reduce soil temperature, resulting in better root growth and more efficient use of water and nutrients (Casale *et al.*, 1995) [5]. Organic farming slashes cultivation and input costs due to the use of cheaper, natural products like manures instead of chemical fertilizers. Grand Naine is a popular variety grown mostly in all export oriented countries of Asia, South America and Africa. This is a superior selection of Giant Cavendish which was introduced to India in 1990's. Due to many desirable traits like excellent fruit quality, immunity to Fusarium wilt etc, it has proved as better variety (Singh and Chundawat, 2002) [11].

Materials and Methods

The present investigation was carried out during the year 2020-21 & 2021-22 at Research Farm of Precision Farming Development Centre (PFDC), Department of Fruit Science, College of Agriculture, IGKV, Raipur, Chhattisgarh, and was laid out in Randomized Block Design (RBD), the experiment comprising eleven treatments and three replications.

Corresponding Author:
Kumudani Sahu
Department of Fruit Science,
College of Agriculture, Indira
Gandhi Agricultural University,
Raipur, Chhattisgarh, India

Treatments combinations involving different sources of organic fertilizers *viz.* T₀ (Control (100% RDF@ 160:300:160 g NPK/plant/year), T₁ (100% RDF + FYM 5 kg/plant in two split doses), T₂ (80% RDF + FYM 10 kg/plant in two split doses), T₃ (100% RDF + Vermicompost 2 kg/plant in two split doses), T₄ (80% RDF + Vermicompost 4 kg/plant in two split doses), T₅ (100% RDF + Vermiwash @ 2 Liter/plant in two split doses), T₆ (80% RDF + Vermiwash @ 4 Liter/plant in two split doses), T₇ (100% RDF + Cow urine @ 2 Liter/plant in two split doses), T₈ (80% RDF + Cow urine @ 4 Liter/plant in two split doses), T₉ (100% RDF + Cow dung slurry (CDS) @ 2 Liter/plant in two split doses) and T₁₀ (80% RDF + Cow dung slurry (CDS) @ 4 Liter/plant in two split doses). Healthy and disease free tissue culture plants of Grand Naine variety of banana were obtained for planting, adopting a size of pits 45 x 45 x 45 cm were dug at a distance of 1.8 x 1.8 m (Row to Row and Plant to Plant). The source of N, P, K were urea, DAP and MOP respectively. The data recorded on growth, yield and yield attributes were analyzed statistically (Panse and Sukhatme, 1967)^[9].

Result and Discussion

The Effect of different sources of organic fertilizers on yield and B:C Ratio of banana reveals that the maximum number of fingers per hand (19.37), maximum number of fingers per bunch (207.19) and maximum bunch weight (29.01kg) was registered under the treatment T₈ (80% RDF + Cow urine @ 4

Liter/plant in two split doses) followed by (T₇), (T₆) and (T₅) respectively, likewise poor performance was observed in T₀-Control (100% RDF@ 160:300:160g NPK/plant/year). The maximum bunch yield/ha (89.53t) was registered under the treatment (T₈) followed by (T₇) and (T₆) respectively, while net returns (421729) Rs/ha and the higher B:C Ratio (2.47) was noted under the treatment (T₈) during both the year and pooled analysis. Several workers have also reported that application of different organic manures like FYM, vermicompost and cow urine gave higher number of fingers, finger weight and yield in banana plants (Gubbuk *et al.*, 1993, Kanamadi *et al.*, 2004; Athani *et al.*, 2009 and Bhalareo *et al.*, 2009)^[7, 8, 3, 4]. Significant improvement in the population of soil microorganisms *viz.*, bacteria, fungi and actinomycetes was noticed, at different crop growth stages of sesame by Ravusaheb *et al.*, (2010)^[10]. The 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. In present study periodic application of liquid formulation enhanced the microbial activity which mineralize the farm residue and supply the plant nutrients continuously and thus, harmonized the supply and demand of the nutrients. This in turn would have assisted for the increased yield of banana. This is in confirmation with the findings of Somasundaram *et al.* (2014)^[12] in banana.

Table 1: Effect of different sources of organic fertilizers on yield and economics of banana (*Musa paradisiaca* L.) cv. Grande naine

Treatments	Number of fingers per hand	Number of fingers per bunch	Bunch weight (kg) Plant ⁻¹	Bunch yield/ha. (tonnes)	Cost of cultivation (Rs /ha)	Gross returns (Rs /ha)	Net returns (Rs /ha)	Cost benefit ratio
(Pooled mean)								
T ₀	15.58	116.85	16.53	51.00	159307	347025	187718	1.17
T ₁	15.89	124.71	18.33	56.57	167022	385035	218013	1.30
T ₂	16.08	130.01	20.82	64.25	160793	426720	265927	1.64
T ₃	16.35	136.00	21.73	67.07	183995	456435	272440	1.48
T ₄	16.93	151.43	22.07	68.09	194739	482265	287526	1.47
T ₅	17.35	164.46	23.16	71.47	196339	490560	294221	1.49
T ₆	17.48	178.72	24.69	76.21	219427	508095	288668	1.31
T ₇	18.31	190.39	26.80	82.70	171651	547365	375714	2.18
T ₈	19.37	207.19	29.01	89.53	170051	591780	421729	2.47
T ₉	15.44	125.48	21.74	67.09	171651	444465	274414	1.58
T ₁₀	16.49	143.17	21.35	65.88	170051	452760	281109	1.66
S.E(m)±	2.965	2.965	0.339	0.692	-	-	-	-
C.D	8.807	8.807	1.007	2.057	-	-	-	-

Cost of FYM: Rs. 0.5 Rs/kg
 Cost of vermi compost: 4 Rs/kg
 Cost of vermiwash: 6 Rs /liter
 Cost of CDC: 2 Rs /liter
 Cost of Cow urine: 2 Rs /liter

Cost of Urea: 6 Rs /kg
 Cost of DAP: 24 Rs /kg
 Cost of murate of potash: 24 Rs /kg
 Selling price of Banana fruits: 6 Rs /kg

Conclusion

The present study was conducted to evaluate different sources of organic fertilizers for the yield of tissue cultured banana *cv.* Grande Naine and it can be concluded that T₈ (80% RDF + Cow urine @ 4 Liter/plant in two split doses), recorded better yield characters and highest B:C ratio among all the treatments due to its demand for fruit quality.

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