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Effect of different levels of fertigation on yield and yield contributing attributes of banana (*Musa paradisiaca* L.) Cv. grand Naine

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Abstract

An investigation on “Effect of different levels of fertigation on yield and yield contributing attributes of banana (*Musa paradisiaca* L.) Cv. Grand Naine” was conducted at Banana Research Station, Nanded, Taluka and District Nanded, Maharashtra, during year 2018-2019. The field experiment was laid out in Randomized Block Design with seven treatments and three replications. The experiment consist of seven treatment combinations viz., T₁ - 50% RDF through fertigation, T₂ - 60% RDF through fertigation, T₃ - 70% RDF through fertigation, T₄ - 80% RDF through fertigation, T₅ - 90% RDF through fertigation, T₆ - 100% RDF through fertigation, T₇ (control) - 100% RDF through Soil application. An investigation showed that among all treatments the maximum number of hands per bunch (10.20), number of fingers per hand (17.20), total number of fingers per bunch (148.10), length of finger (22.85 cm), girth of finger (14.60 cm), weight of finger (154.60 g), weight of bunch (22.54 kg) and yield per hectare (100.20 Mt per ha) were recorded by treatment T₆ i.e., 100% RDF through fertigation. However treatment T₇ (control) - 100% RDF through Soil application were recorded minimum values for yield and yield contributing attributes.

Keywords: Fertigation, yield, banana

Introduction

Banana (*Musa spp.*) is one of the oldest fruit known to mankind and it's the distant past traced back from its point out in Ramayana (2029 BC, Kautilyas Arthashatra 300-400 BC). Banana belongs to the family Musaceae of the order Scitaminae. Today it is a leading tropical fruit in world market with a high scale of export potentiality. Banana is cultivated in the world in the vicinity of 4.83 million ha with worldwide production 99.99 million Metric tonnes, having 20.8 Metric tonnes production. In which India donate 29% and ranked first in area and production of banana in the globe. Next to India, China ranked second, whereas, Philippines ranked third country in the production, contributing 10% and 9%, respectively. (Anon.2017)^[2]. Banana is an intense feeder of nutrients and requires large quantities of mineral nutrients for appropriate growth and development (Hazarika and Ansari 2010)^[8]. Consequently, it is of supreme importance to sustain a high amount of soil productiveness to guarantee high yield of better quality fruits. It is estimated that expenses on manures and fertilizers alone amounts to nearly 20-30 per cent of the cost of production for banana (Robusta) (Kulasekaran, 1993)^[9]. Hence, striking equilibrium between water and fertilizer scheduling requires extraordinary attention to uphold high productivity. The method of application of water soluble fertilizers or liquid fertilizers through drip irrigation structure called as fertigation. Fertigation is beneficial over the application of solid fertilizers in the soil by subsequent ways (Biswas, 2010)^[5]:

- Reduce the losses of fertilizers through runoff and leaching.
- Enhance the nutrient-use efficiency and saving amount of fertilizers.
- Decreases the cost of application and labour chargers.
- Increases yield and quality of plants.
- Avoid soil erosion and develops soil health.

Materials and Methods

A field experiment was carried out during 2018-2019 at Banana Research Station, Nanded, Maharashtra. The experiment was laid out in randomized block design. The randomization was in seven treatments with three replications. The treatments were undertaken during five different stages of crop growth. The time of application fertilizer (fertigation) to banana is, 1)

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30 – 45 DAP, 2) 46 – 70 DAP, 3) 71 – 146 DAP, 4) 147 – 273 DAP, 5) 273 – 300 DAP. The recommended dose of fertilizer to banana is 200:160:200 g NPK per plant. In control treatment fertilizers were applied through urea, single super phosphate and muriate of potash, respectively. In water soluble fertilizer treatments, different grades of fertilizer *viz.*, urea (46:0:0), monoammonium phosphate (12:61:00), potassium sulphate (0:0:50) were used for fertigation. An observation was made on yield and yield contributing attributes *viz.* number of hands per bunch, number of fingers per hand, total number of fingers per bunch, length of finger, girth of finger, weight of finger, and bunch weight. Mature bunches were harvested and weighed for working out estimated fruit yield per hectare. Weight of bunch was recorded including the peduncle measuring 20 cm above the first hand and expressed in kilograms. Number of hands per bunch, number of fingers per hand and total number of fingers

per bunch were counted and expressed in number. The statistical analysis of the data in respect of yield was done according to the standard procedure given by Panse and Sukhatme (1967) [14].

Results and Discussion

Effect of Different Levels of Fertigation on Bunch Attributes of Banana

The maximum number of hands per bunch (10.20), number of fingers per hand (17.20) and total number of fingers per bunch (148.10) were recorded by treatment T₆ *i.e.*, 100% RDF through fertigation. However the minimum number of hands per bunch (8.20), number of fingers per hand (13.00), total number of fingers per bunch (133.30) were recorded by treatment T₇ *i.e.*, 100% RDF through Soil application (control). (Table. 1)

Table 1: Effect of different levels of fertigation on bunch and finger attributes of banana Cv. Grand Naine

Tr. No.	Treatment details	Number of hands per bunch	Number of fingers per hand	Number of finger per bunch
T ₁	50% RDF through fertigation	8.50	13.33	134.00
T ₂	60% RDF through fertigation	8.60	13.67	134.50
T ₃	70% RDF through fertigation	9.10	14.73	137.60
T ₄	80% RDF through fertigation	9.50	15.21	142.40
T ₅	90% RDF through fertigation	9.80	16.20	146.10
T ₆	100% RDF through fertigation	10.20	17.20	148.10
T ₇	100% RDF through soil application (control)	8.20	13.00	133.30
	S.E. m±	0.35	0.69	3.28
	CD at 5%	1.10	2.15	10.12

Table 2: Effect of different levels of fertigation on bunch and finger attributes of banana Cv. Grand Naine

Tr. No.	Treatment details	Length of finger (cm)	Girth of finger (cm)	Weight of finger (g)
T ₁	50% RDF through fertigation	20.55	13.45	145.81
T ₂	60% RDF through fertigation	21.15	13.50	146.59
T ₃	70% RDF through fertigation	21.50	13.55	148.86
T ₄	80% RDF through fertigation	22.10	13.85	150.92
T ₅	90% RDF through fertigation	22.60	14.30	152.26
T ₆	100% RDF through fertigation	22.85	14.60	154.60
T ₇	100% RDF through soil application (control)	19.15	12.85	129.25
	S.E. m±	0.64	0.25	4.83
	CD at 5%	1.97	0.78	14.89

Table 3: Effect of different levels of fertigation on yield attributes of banana Cv. Grand Naine

Tr. No.	Treatment details	Weight of bunch (kg)	Yield per ha (Mt/ha)
T ₁	50% RDF through fertigation	21.22	94.30
T ₂	60% RDF through fertigation	21.25	94.43
T ₃	70% RDF through fertigation	22.17	98.56
T ₄	80% RDF through fertigation	22.35	99.35
T ₅	90% RDF through fertigation	22.49	99.96
T ₆	100% RDF through fertigation	22.54	100.20
T ₇	100% RDF through soil application (control)	18.35	80.00
	S.E. m±	0.55	2.54
	CD at 5%	1.71	7.83

The increase in number of hands per bunch, numbers of fingers per hands, and total number of fingers per bunch is due to the application of highest level of N & K fed at an proper growth stages of the crop *viz.*, vegetative, flower bud initiation and differentiation phases favouring the development of more number of hands per bunch, numbers of fingers per hands, and total number of fingers per bunch. (Saad and Atawia, 1999, Srinivas *et al.*, 2001, Pawar and Dingre, 2013) [19, 21, 16]. Similar results were also obtained by Mahalakshmi *et.al.* (2001) [11], Srinivas *et al.*, (2001) [21], Ahmed *et.al.*, (2011) [1], Kumar *et.al.*, (2012) [10], Pawar and

Dingre (2013) [16], and Patel and Tandel (2013) [15].

Effect of Different Levels of Fertigation on Finger Attributes of Banana

The maximum length of finger (22.85 cm), girth of finger (14.60 cm) and weight of finger (154.60 g) were recorded by treatment T₆ *i.e.*, 100% RDF through fertigation. However the minimum length of finger (19.15 cm), girth of finger (12.85 cm), and weight of finger (129.25 g) were recorded by treatment T₇ *i.e.*, 100% RDF through Soil application (control). (Table. 2).

Fertigation favoured the growth and development of bunches with better fruit filling resulting in increased length, girth, and weight of finger in banana (Mahalakshmi *et al.*, 2001) [11]. Sufficient supply of nutrients like 100% RDF through fertigation (treatment T₆) in the present study could have increased the length, girth, and weight of finger than other treatments. Similar results were also obtained by Kumar *et al.*, (2012), Pawar and Dingre (2013), and Pramanik Patra (2015) [10, 16, 17].

Effect of Different Levels of Fertigation on Yield Attributes of Banana

The maximum weight of bunch (22.54 kg) and yield per hectare (100.20 Mt per ha) was recorded by treatment T₆ *i.e.*, 100% RDF through fertigation. While the minimum weight of bunch (18.00 kg) and yield per hectare (80.00 Mt per ha) was recorded by treatment T₇ *i.e.*, 100% RDF through soil application (Control). (Table. 3).

Higher bunch weight was observed at higher levels of N and K by (Oubahou *et al.* 1987) [13]. They also reported that the maximum bunch weight was recorded in the plants treated with higher levels of N per plant, which might be due to higher uptake of N and K by the plants. The maximum yield was due to increase in length, girth, weight of the finger, number of fingers per hand and weight of the bunch in 100% RDF through fertigation.

This might be due to the effect of direct application of fertilizers at the accurate time through the drip irrigation system to the area where most of the feeder root develop, results in an increased yield. Drip irrigation always holds the soil moisture and the water accessible to the plant constantly; it helped to improve fruit yield. The lower yield of banana recorded under lower levels of fertigation might be due to the slow growth of plant, small leaf size, delay in flower emergence, less number of hands and fingers per bunch (Hazarika and Mohan, 1991) [7].

Similar results were also obtained by Deolankar and Firake (2001), Srinivas (2001), Tumbare and Bhoite (2001), Reddy *et al.* (2002), Bhalerao *et al.*, (2010), Bhattacharyya (2010), Patel and Tandel (2013), Pawar and Dingre (2013), Naidu *et al.*, (2015) and Senthilkumar *et al.*, (2016) [6, 21, 22, 18, 3, 4, 15, 16, 12, 20].

Conclusion

The present findings have clearly indicated that the application of 100% RDF through fertigation significantly improved the yield and yield contributing attributes of banana cv. Grand Naine.

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