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“A Study of Levels of Potassium and Plant Geometry on Number of Fingers per Bunch of Banana (*Musa acuminata* L.) cv. Ardhapuri”

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ABSTRACT

The present investigation was carried out at Banana Research Station, Nanded. “Studies on plant geometry and levels of potassium on growth, yield and quality of banana (*Musa acuminata* L.)”, for two trial years. In the present experiment, there were four main treatments of plant density, viz. D₁ (1.5 m x 1.2 m), D₂ (1.5 m x 1.5 m), D₃ (1.5 m x 1.8 m) and D₄ (1.5 m x 2.1 m), three sub- treatment of potassium levels, viz. K₁ (100 g K₂O/plant), K₂ (200 g K₂O/plant), K₃ (300 g K₂O/plant) and thus comprising twelve treatment combinations.

From the results obtained in the present investigation, it can be revealed that the maximum number of fingers per bunch (128.54) was recorded in density D₃ 1.5 m x 1.8 m (3,703 plants/ha) While the minimum number of fingers per bunch (103.67) was in D₁ 1.5 m x 1.2 m (5,555 plants/ha) the potassium level K₃ (300 g K₂O/plant) given maximum number of fingers per bunch, (120.80), it was at par with K₂ 1.5 m x 1.5 m (4,444 plants/ha) (120.00) while the minimum number of fingers (113.83) was in K₁ (100 g K₂O/plant). The interaction effect of plant density and potassium levels on number of fingers per bunch shows that maximum number of fingers per bunch (135.30) was recorded in D₄K₃ (1.5 m x 2.1 m at 300 g K₂O/plant), which was at par with D₃K₂ (1.5 m x 1.8 mm at 200 g K₂O/plant) and followed by D₃K₃ (1.5 x 1.8m at 300 g K₂O/plant). The minimum numbers of fingers per bunch (101.67) was recorded in treatment D₂K₁ (1.5 m x 1.5 mm at 100 g K₂O/plant), which was at par (102.30) with D₁K₂ (1.5 m x 1.2 m at 200 g K₂O/plant), and D₁K₁ (1.5 m x 1.2 m at 100 g K₂O/plant) respectively.

Introduction:

Banana belongs (*Musa* spp.) to family Musaceae and it is the most important fruit crops of the world as well as India. It is pleasing flavoured, nutritious, cheap and known as “poor man’s apple”. The banana crop determines the socio-economic status of the farmer’s and called as Kalpataru (Plant of heaven) due to its socio-economic and multiple uses. The number of banana cultivars are variable, there are about 250-300 cultivated cultivars in India. Ardhapuri (*Musa* sp.)

Advantages of high density planting (plant geometry) includes precocity in bearing, high yield, high average yield, high returns per unit area, early returns, easy management, reduction in labour cost, low reduction cost, mechanization of fruit crop, production and facilitates more efficient use of radiation, fertilizers, fungicides, herbicides, pesticides, insecticides etc.

To ensure high yield of superior quality bananas, adequate application of nutrients is of paramount importance, Potassium regulates many vital functions like carbon assimilation, translocation of proteins and sugars, water balance in plants, maintain turgor pressure in the cell, root development, improving the quality of fruits by maintaining desirable sugar: acid ratio, ripening of fruits and many other processes. The banana requires more potassium for its growth, production and quality compared to nitrogen and phosphorus Croucher and Mitchell (1940). Considering these facts the research topic entitled “Studies on plant geometry and levels of potassium on growth, yield and quality of banana (*Musa acuminata* L.)” is related to the present studies.

Materials and Methods:

Actual number of fingers in a bunch was counted and mean number of fingers per bunch was recorded.

Details of Experiment:

- | | | |
|--------------------------------------|---|------------------------|
| a) Name of crop | : | Banana |
| b) Botanical Name | : | <i>Musa</i> spp. |
| c) Family | : | Musaceae |
| d) Number of main treatments | : | 04 |
| e) Number of sub treatments | : | 03 |
| f) Number of treatment combinations: | | 12 |
| g) Number of replications : | | 03 |
| h) Experimental design | : | Split plot design |
| i) Variety | : | Ardhapuri |
| j) Season | : | 2011-12 and 2012-13 |
| k) Fertilizers | : | As per mentioned later |

Treat. Symbol.

Plant density (D)

- | | | |
|----------------|---|---------------|
| D ₁ | : | 1.5 m x 1.2 m |
| D ₂ | : | 1.5 m x 1.5 m |
| D ₃ | : | 1.5 m x 1.8 m |
| D ₄ | : | 1.5 m x 2.1 m |

Potassium levels (K)

- | | | |
|----------------|---|---|
| K ₁ | : | 100 g K ₂ O/plant (1/2 dose of RDF) |
| K ₂ | : | 200 g K ₂ O /plant (RDF) |
| K ₃ | : | 300 g K ₂ O /plant (1.5 dose of RDF) |

Treatment

- | | | |
|-----|---|---|
| | | Treatment Details |
| T1 | : | D1K1 (1.5m x 1.2m with 100g K ₂ O/plant) |
| T2 | : | D1K2(1.5m x 1.2m with 200g K ₂ O/plant) |
| T3 | : | D1K3(1.5m x 1.2m with 300g K ₂ O/plant) |
| T4 | : | D2K1(1.5m x 1.5m with 100g K ₂ O/plant) |
| T5 | : | D2K2(1.5m x 1.5m with 200g K ₂ O/plant) |
| T6 | : | D2K3(1.5m x 1.5m with 300g K ₂ O/plant) |
| T7 | : | D3K1(1.5m x 1.8m with 100g K ₂ O/plant) |
| T8 | : | D3K2(1.5m x 1.8m with 200g K ₂ O/plant) |
| T9 | : | D3K3(1.5m x 1.8m with 300g K ₂ O/plant) |
| T10 | : | D4K1(1.5m x 2.1m with 100g K ₂ O/plant) |

T11	:	D4K2(1.5m x 2.1m with 200g K ₂ O/plant)
T12	:	D4K3(1.5m x 2.1m with 300g K ₂ O/plant)

RESULTS:

Total Number of Fingers per Bunch of Banana:

The data on number of fingers per bunch as influenced by the plant densities and different levels of potassium is presented in Table 01 and graphically depicted in Fig. 01.

The effect of plant densities and different levels of potassium on total number of fingers per bunch during 2011-12, 2012-13 and in pooled were found to be significant

During 2011-12, the maximum number of fingers per bunch (139.89) was found in density D₃ (1.5m x 1.8m), which was very closely at par (136.67) with D₄ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha) closely at par (136.67) with D₄ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha) and D₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha) had gave minimum number of fingers per bunch (117.56cm) The potassium level, K₁(100 g K₂O/plant) showed the maximum number of fingers per bunch (133.25), which was at par with K₃ (300 g K₂O/plant) (130.83), whereas, the minimum number of fingers (129.17) showed found in K₂ (100 g K₂O/plant). The interaction effect of plant densities and potassium gives the maximum number of fingers per bunch (146.00) in D₄K₃ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 300 g K₂O/plant), which was at par with D₃K₂ (145.33) (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha with 200 g K₂O/plant) D₃K₁ (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha with 100 g K₂O/plant) (143.00), respectively. The minimum number of fingers per bunch (107.67) was found in D₁K₂ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 200 g K₂O/plant), which was at par with D₁K₃ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 300 g K₂O/plant) (118.67).

Table 01. Effect of plant densities and different levels of potassium on total number of fingers per bunch of banana cv. Ardhapuri

Treatments		Total number of fingers per bunch		
Main treatments (Plant densities) (D)		2011-12	2012-13	Pooled Mean
Spacings (m ²)	No. of plants/ha			
D ₁ (1.5 x 1.2)	5,555	117.56	89.78	103.67
D ₂ (1.5 x 1.5)	4,444	130.22	97.09	113.66
D ₃ (1.5 x 1.8)	3,703	139.89	117.20	128.54
D ₄ (1.5 x 2.1)	3,174	136.67	117.27	126.97
S.E.(m) ±		1.343	2.056	1.74
C.D. at 5%		4.648	7.115	5.35
Sub-treatment (Potassium levels) (K)				
K ₁ (100 g K ₂ O/plant)		133.25	94.40	113.83
K ₂ (200 g K ₂ O/plant)		129.17	110.83	120.00
K ₃ (300 g K ₂ O/plant)		130.83	110.77	120.80
S.E.(m) ±		1.042	1.326	1.193
C.D. at 5%		3.124	3.976	3.435
Interaction (D x K)				
D ₁ K ₁		126.33	84.07	105.20
D ₁ K ₂		107.67	99.33	103.50
D ₁ K ₃		118.67	85.93	102.30
D ₂ K ₁		135.00	68.33	101.67
D ₂ K ₂		128.33	113.67	121.00
D ₂ K ₃		127.33	109.27	118.30
D ₃ K ₁		143.00	110.13	126.57
D ₃ K ₂		145.33	118.20	131.77
D ₃ K ₃		131.33	123.27	127.30
D ₄ K ₁		128.67	115.07	121.87
D ₄ K ₂		135.33	112.13	123.73
D ₄ K ₃		146.00	124.60	135.30
S.E.(m) ±		2.084	2.652	2.385
C.D. at 5%		6.248	7.952	6.871

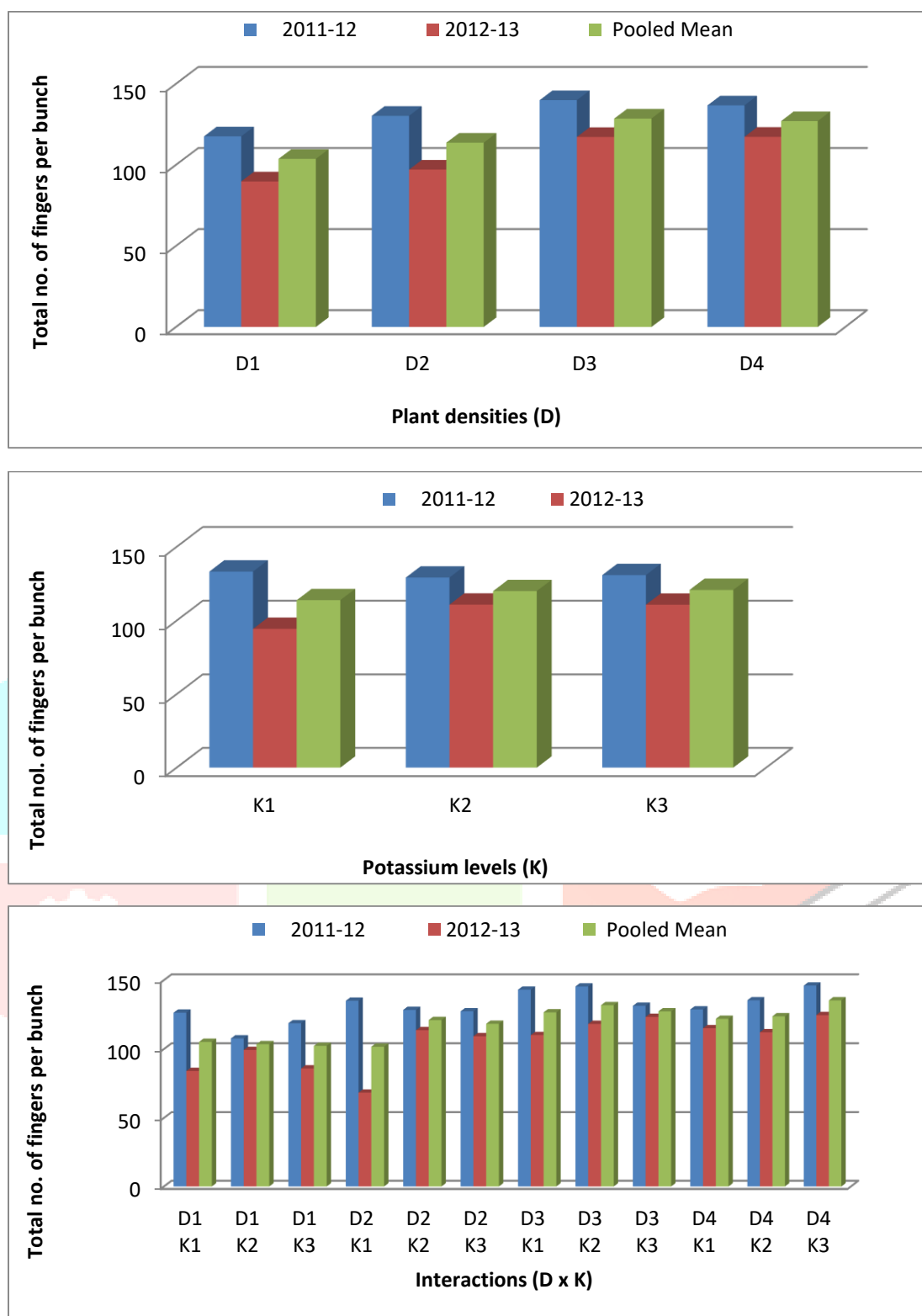


Fig. 01 . Effect of plant densities and different levels of potassium on total number of fingers per bunch of banana cv. Ardhapuri

During 2012-13, the effect of plant density and potassium levels on number of fingers per bunch, showed that the maximum number of fingers per bunch (117.27) was recorded in density D₄ (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha), whereas, the minimum number of fingers per bunch (89.78) was in D₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha). The potassium level K₂ (200 g K₂O/plant) had gave maximum number of fingers per bunch (110.83), which was at par with K₃ (300 g K₂O/plant), while the minimum number of fingers per bunch was recorded in K₁ (100 g K₂O/plant). The interaction

effect of plant densities and potassium levels on numbers of fingers per bunch showed that the maximum number of fingers per bunch was recorded in treatment. D₄K₃ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha at 300 g K₂O/plant), which was at par with D₃K₃ (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha at 300 g K₂O/plant) (123.27) and D₃K₂ (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha with 200 g K₂O/plant) (118.20), respectively, while the minimum number of fingers per bunch (84.07) was recorded in D₁K₁(1.5 x 1.2m at 100 g K₂O/plant).

Discussion:

The data in Table 01 revealed that the maximum number of fingers per bunch (128.54) was recorded in density D₃(1.5 m x 1.8 m with 3,703 plants/ha) While the minimum number of fingers per bunch (103.67) was in D₁ (1.5 m x 1.2 m with 5,555 plants/ha) the potassium level K₃ (300 g K₂O/plant) gave maximum number of fingers per bunch , (120.80) which was at par with K₂ (1.5 m x 1.5 m with 4,444 plants/ha)(120.00) while the minimum number of fingers (113.83) was in K₁ (100 g K₂O/plant). The interaction effect of plant density and potassium levels on number of fingers per bunch shows that maximum number of fingers per bunch (135.30) was recorded in D₄K₃ (1.5 m x 2.1 m with 3,174 plants/ha at 300 g K₂O/plant), which was at par with D₃K₂ (1.5 m x 1.8 m with 3,703 plants/ha at 200 g K₂O/plant) and followed by D₃K₃ (1.5 x 1.8m at 300 g K₂O/plant). The minimum numbers of fingers per bunch (101.67) was recorded in treatment D₂K₁ (1.5 m x 1.5 m with 4,444 plants/ha at 100 g K₂O/plant), which was at par (102.30) with D₁K₂ (1.5 m x 1.2 m with 5,555 plants/ha at 200 g K₂O/plant), and D₁K₁ (1.5 m x 1.2 m with 5,555 plants/ha at 100 g K₂O/plant) respectively.

Bhalerao *et al.* (2009) revealed that, among the yield parameters of Grand Naine banana, maximum hands per bunch (9.47), fingers per bunch (167.7), bunch weight (17.21 kg/plant) and yield (76.5 t/ha) were recorded with the treatment T₇ *i.e.* application of 100% recommended dose of NPK (200 g N, 40 g P₂O₅ and 200 g K₂O/ plant) with 10 kg FYM/ plant and biofertilizers. Similar findings were reported by Nalina *et al.* (2000), Nalina *et al.* (2007).

Summery and Conclusion:

The maximum number of fingers per bunch (128.54) was recorded in density D₃1.5 m x 1.8 m (3,703 plants/ha) While the minimum number of fingers per bunch (103.67) was in D₁ 1.5 m x 1.2 m (5,555 plants/ha) the potassium level K₃ (300 g K₂O/plant) given maximum number of fingers per bunch , (120.80), it was at par with K₂ 1.5 m x 1.5 m (4,444 plants/ha)(120.00) while the minimum number of fingers (113.83) was in K₁ (100 g K₂O/plant). The interaction effect of plant density and potassium levels on number of fingers per bunch shows that maximum number of fingers per bunch (135.30) was recorded in D₄K₃ (1.5 m x 2.1 m at 300 g K₂O/plant), which was at par with D₃K₂ (1.5 m x 1.8 mm at 200 g K₂O/plant) and followed by D₃K₃ (1.5 x 1.8m at 300 g K₂O/plant). The minimum numbers of fingers per bunch (101.67) was recorded in treatment D₂K₁ (1.5 m x 1.5 mm at 100 g K₂O/plant), which was at par (102.30) with D₁K₂ (1.5 m x 1.2 m at 200 g K₂O/plant), and D₁K₁ (1.5 m x 1.2 m at 100 g K₂O/plant) respectively.

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