



“A Study of Levels of Potassium and Plant Geometry on Finger Diameter of Banana (*Musa acuminata* L.) cv. Ardhapuri”

Anjali Vijaykumar Jadhav

Yeshwant Mahavidyalaya, Nanded – 431602 (M.S.) India

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.

The higher finger diameter (128.54cm) the highest finger diameter (128.54cm) was recorded in plant density D₃(1.5 m x 1.8 m) which was at par (126.97) with D₄ 1.5 m x 2.1 m (3,174 plants/ha), while minimum finger diameter (103.67cm) was in D₁ 1.5 m x 1.2 m (5,555 plants/ha) the potassium level K₃ (300 g K₂O/plant) given the highest finger diameter (120.80cm) which was at par (120.00cm) with K₂ (200 g K₂O/plant) while the lower finger diameter (113.83cm) was recorded finger diameter (113.83) was recorded in K₁(100 g K₂O/plant). The interaction effect of plant densities and potassium levels given the maximum finger diameter (3.89cm) by the treatment combination D₄K₃ (1.5m x 2.1 m spacing at 300 g K₂O/plant), which was at par (3.78cm) with D₄K₂ (1.5 m x 2.1 m spacing at 200 g K₂O/plant) followed by (3.76cm) D₄K₁ (1.5 m x 2.1 m spacing at 100 g K₂O/plant).

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:

Girth of finger was measured and converted into diameter by dividing girth of respective finger by π .

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 K2O/plant) |
| T2 | : | D1K2(1.5m x 1.2m with 200g K2O/plant) |
| T3 | : | D1K3(1.5m x 1.2m with 300g K2O/plant) |
| T4 | : | D2K1(1.5m x 1.5m with 100g K2O/plant) |
| T5 | : | D2K2(1.5m x 1.5m with 200g K2O/plant) |
| T6 | : | D2K3(1.5m x 1.5m with 300g K2O/plant) |
| T7 | : | D3K1(1.5m x 1.8m with 100g K2O/plant) |
| T8 | : | D3K2(1.5m x 1.8m with 200g K2O/plant) |
| T9 | : | D3K3(1.5m x 1.8m with 300g K2O/plant) |
| T10 | : | D4K1(1.5m x 2.1m with 100g K2O/plant) |
| T11 | : | D4K2(1.5m x 2.1m with 200g K2O/plant) |
| T12 | : | D4K3(1.5m x 2.1m with 300g K2O/plant) |

RESULTS:**Diameter of Fingers of Banana:**

The data on effect of plant densities and levels of potassium on finger diameter (cm) and their interaction effect during 2011-12, 2012-13 and in pooled is statistically significant.

Table 01. Effect of plant densities and different levels of potassium on finger diameter (cm) of banana cv. Ardhapuri

Treatments		Finger diameter (cm)		
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	3.43	3.71	3.57
D ₂ (1.5 x 1.5)	4,444	3.52	3.69	3.61
D ₃ (1.5 x 1.8)	3,703	3.54	3.77	3.66
D ₄ (1.5 x 2.1)	3,174	3.78	3.84	3.81
S.E.(m) ±		0.022	0.035	0.03
C.D. at 5%		0.078	NS	0.09
Sub-treatment (Potassium levels) (K)		2011-12	2012-13	Pooled Mean
K ₁ (100 g K ₂ O/plant)		3.50	3.68	3.59
K ₂ (200 g K ₂ O/plant)		3.56	3.82	3.69
K ₃ (300 g K ₂ O/plant)		3.64	3.75	3.70
S.E.(m) ±		0.014	0.021	0.018
C.D. at 5%		0.043	0.063	0.052
Interaction (D x K)		2011-12	2012-13	Pooled Mean
D ₁ K ₁		3.23	3.55	3.39
D ₁ K ₂		3.50	3.84	3.67
D ₁ K ₃		3.56	3.73	3.65
D ₂ K ₁		3.50	3.72	3.61
D ₂ K ₂		3.50	3.74	3.62
D ₂ K ₃		3.56	3.61	3.58
D ₃ K ₁		3.50	3.69	3.60
D ₃ K ₂		3.50	3.89	3.70
D ₃ K ₃		3.61	3.74	3.68
D ₄ K ₁		3.74	3.77	3.76
D ₄ K ₂		3.74	3.82	3.78
D ₄ K ₃		3.85	3.93	3.89
S.E.(m) ±		0.029	0.042	0.036
C.D. at 5%		0.086	0.126	0.104

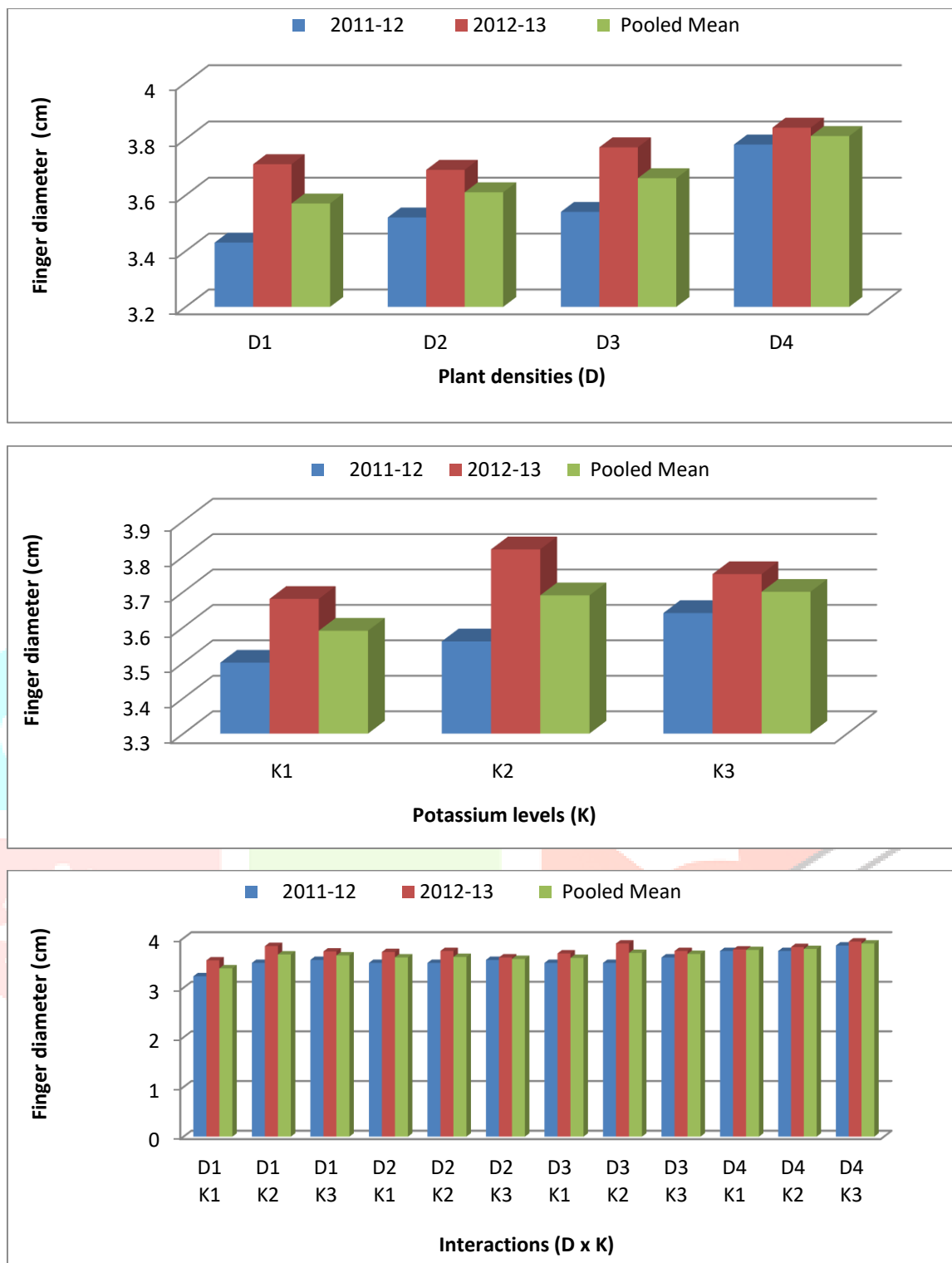


Fig. 01. Effect of plant densities and different levels of potassium on finger diameter (cm) of banana cv. Ardhapuri

During 2011-12, the plant density D₄ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha) had gave the significantly highest finger diameter (3.78cm), while the minimum finger diameter (3.43cm) was recorded in D₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha), which was followed by D₂ (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha) (3.52cm). The maximum finger diameter (3.64 cm) was recorded in potassium level K₃ (300 g K₂O/plant) and the lowest finger diameter (3.50cm) was in K₁ (100 g K₂O/plant). The interaction effect of plant densities and levels of potassium on finger diameter showed that the maximum finger diameter (3.85cm) was observed in treatment combination D₄K₃ (1.5m x 2.1m

spacing *i.e.* 3,174 plants/ha spacing with 300 g K₂O/plant) which was followed by D₄K₁(1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 100 g K₂O/plant) and D₄K₂(1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 200 g K₂O/plant) (3.74cm). The minimum finger diameter (3.23cm) was observed in treatment D₁K₁(1.5m x 1.5m spacing *i.e.* 4,444 plants/ha spacing with 100 g K₂O/plant).

During 2012-13 the significantly maximum finger diameter (3.84cm) was recorded in plant density D₄ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha) and the minimum finger diameter (3.69cm) was in D₂ (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha). The potassium level K₂ (200 g K₂O/plant) gave the highest diameter (3.82cm), which was at par (3.75cm) with K₃ (300 g K₂O/plant), while the minimum diameter was in K₁ (100 g K₂O/plant). In interaction, the highest finger diameter (3.93cm) was recorded in treatment combination D₄K₃ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 300 g K₂O/plant), which was at par with D₃K₂ (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha with 200 g K₂O/plant) (3.89 cm) and D₁K₂ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 200 g K₂O/plant) (3.84cm), followed by D₄K₂ (1.5m x 2.1m with 200 g K₂O/plant) (3.82cm), respectively. The minimum finger diameter (3.55cm) was recorded in D₁K₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 100 g K₂O/plant) which was at par with D₂K₃ (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha with 300 g K₂O/plant) (3.61cm)

The data on pooled informed that the highest finger diameter (3.81cm) was recorded in plant density D₄(1.5m x 2.1cm), while the minimum finger diameter (3.57cm) was in D₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha). The potassium level K₃ (300 g K₂O/plant) gave the highest finger diameter (3.70cm), which was at par (3.69cm) with K₂ (200 g K₂O/plant), while the lowest finger diameter (3.59cm) was recorded in K₁(100 g K₂O/plant).

The interaction effect of plant densities and potassium levels gave the maximum finger diameter (3.89cm) by the treatment combination.

D₄K₃ (1.5m x 2.1 m with 300 g K₂O/plant), which was at par (3.78cm) with D₄K₂ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 200 g K₂O/plant) followed by (3.76cm) D₄K₁ (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha with 100 g K₂O/plant). The minimum diameter (3.39cm) was recorded in D₁K₁ (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 100 g K₂O/plant).

Discussion:

The data in Table 01 revealed that the higher finger diameter (128.54cm) the highest finger diameter (128.54cm) was recorded in plant density D₃(1.5m x 1.8cm) which was at par (126.97) with D₄ (1.5 m x 2.1 m with 3,174 plants/ha), while minimum finger diameter (103.67cm) was in D₁ (1.5 m x 1.2 m with 5,555 plants/ha) the potassium level K₃ (300 g K₂O/plant) gave the highest finger diameter (120.80cm) which was at par (120.00cm) with K₂ (200 g K₂O/plant) while the lower finger diameter (113.83cm) was recorded finger diameter (113.83) was recorded in K₁(100 g K₂O/plant). The interaction effect of plant densities and potassium levels gave the maximum finger diameter (3.89cm) by the treatment combination D₄K₃ (1.5m x 2.1 m spacing at 300 g K₂O/plant), which was at par (3.78cm) with D₄K₂ (1.5 m x 2.1 m with 3,174 plants/ha spacing at 200 g K₂O/plant) followed by (3.76cm) D₄K₁ (1.5 m x 2.1 m with 3,174 plants/ha spacing at 100 g K₂O/plant).

Natesh *et al.* (1993) observed significantly more finger weight (196.60g), length (25.32 cm) and girth of fingers (12.26 cm), maximum pulp weight (143.30 g) and maximum pulp to peel ratio (3.58) in Nendran banana by application of recommended dose of fertilizer (190: 115: 300 g/ plant/ year).

Summery and Conclusion:

The higher finger diameter (128.54cm) the highest finger diameter (128.54cm) was recorded in plant density D₃(1.5 m x 1.8 mcm) which was at par (126.97) with D₄ 1.5 m x 2.1 m (3,174 plants/ha), while minimum finger diameter (103.67cm) was in D₁ 1.5 m x 1.2 m (5,555 plants/ha) the

potassium level K3 (300 g K₂O/plant) given the highest finger diameter (120.80cm) which was at par (120.00cm) with K2 (200 g K₂O/plant) while the lower finger diameter (113.83cm) was recorded finger diameter (113.83) was recorded in K1(100 g K₂O/plant).

The interaction effect of plant densities and potassium levels given the maximum finger diameter (3.89cm) by the treatment combination D4K3 (1.5m x 2.1 m spacing at 300 g K₂O/plant), which was at par (3.78cm) with D4K2 (1.5 m x 2.1 m spacing at 200 g K₂O/plant) followed by (3.76cm) D4K1 (1.5 m x 2.1 m spacing at 100 g K₂O/plant).

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