Growth Responce Of Ardhapuri Banana: Role Of Plant Geometry And Potassium Levels On Number Of Hands 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*. 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) and D_4 (1.5 m x 2.1 m), three sub- treatment of potassium levels, *viz*. K_1 (100 g K_2O/plant), K_2 (200 g K_2O/plant), K_3 (300 g K_2O/plant) and thus comprising twelve treatment combinations.

From the results obtained in the present investigation, it can be revealed that the highest number of hands per bunch (7.73) was recorded in D_2 1.5 m x 1.5 m (4,444 plants/ha), while the lowest number of hands per bunch (6.98) was recorded in density D_1 1.5 m x 1.2 m (5,555 plants/ha), which was followed by D_3 1.5 m x 1.8 m (3,703 plants/ha)(7.27) The effect of potassium given the higher number of hands per bunch (7.46) in the treatment K_2 (200 g K_2O/plant) with the lower number of hands per bunch (7.25) by treatment K_1 (7.25) which was at par with K_3 (300 g K_2O/plant). The interaction effect of plant density and potassium levels given the highest number of hands bunch (8.00) by the treatment D_2K_2 (1.5 m x 1.5 mm spacing a 200 g K_2O/plant) followed by D_3K_3 (1.5 m x 1.8 mm spacing at 300 g K_2O/plant), while the lower number of hands per bunch was recorded (6.93) in treatment D_1K_2 (1.5 m x 1.2 m at 200 g K_2O/plant), which significantly at par with D_1K_3 (1.5 m x 1.2 m at 300 g K_2O/plant)(7.00) D_1K_1 (1.5 m x 1.2 m at 100 g K_2O/plant) (7.00) at a time and D_3K_1 (1.5 m x 1.8 mm at 100 g K_2O/plant) and followed by D_3K_3 (1.5 m x 1.8 mm at 300 g K_2O/plant) (7.20).

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:

Number of hands per bunch was counted as an average of five plants and then it was recorded.

Details of Experiment:

a) Name of crop   :   Banana
b) Botanical Name   :   *Musa* 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.   **Treatment details**
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)

RESUITS:

Number of Hands per Bunch of Banana:

Data on the number of hands per bunch as influenced by the plant densities and different levels of potassium presented in Table 01. and graphically illustrated in Fig 01.

During 2011-12, the data on the number of hands per bunch were significantly affected by the plant density and different levels of potassium .The significantly highest number of hands per bunch (7.78) was observed in density $D_2(1.5^m$ x 15m), the lowest number of hands per bunch (7.09) was recorded in plant intensity D_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha), which was statistically at par with plant density D_3 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha) (7.27). The data informed that, the highest number of hands per bunch (7.52) was recorded in potassium level K_2 (200 g K_2O/plant), while the lowest number of hands per bunch (7.28) observed in potassium level K_1 (100 g K_2O/plant), which was at par with K_3(300 g K_2O/plant) (7.32). The interaction effect of plant density and potassium level in to the 2011-12 the number of hands per bunch were significantly affected by the plant density and different levels of potassium. The significantly highest number of hands per bunch was (8.20) obtained in treatment D_2K_2(1.5mx1.5m with 200 g K_2O/plant), while the lowest number of hands per bunch was recorded in both treatment D_1K_2 and D_1K_3 *i.e.* (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 200 g k /plant) (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 300 g K_2O/plant) (7.00) which was significantly at par with treatments D_3K_1 (1.5m x 1.8 m with 100 g K_2O/plant) (7.07) and D_3K_3 (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha spacing with 300 g K_2O/plant) (7.20) followed by D_1K_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha spacing with 100 g K_2O/plant) (7.27).

During 2012-13 the significantly highest number of hands per bunch (7.69) was recorded in density D_2 (1.5m x 1.5 m) which was followed by D_4 (1.5m x 2.1m spacing *i.e.* 3,174 plants/ha), while the lowest number of hands per bunch was recorded (6.87) in density D_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha). The highest number of hands per bunch was recorded (7.40) by potassium level K_2 (200 g K_2O/plant), which was at par with K_3 (300 g K_2O/plant) (7.33), while the lowest number of hands per bunch was observed (7.22) in K_1(100 g K_2O/plant). The data on interaction effect of potassium levels and plant density in 2012-13 showed that the highest number of hands per bunch (7.80) was observed in treatment D_2K_2 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha with 200 g K_2O/plant), which was at par with D_2K_3 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha with 300 g K_2O/plant) (7.67) and D_2K_1 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha with100 g K_2O/plant) (7.60) respectively followed by D_3K_2 (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha at 200 g K_2O/per plant). The lowest number of hands per bunch (6.73) was recorded in D_1K_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 100 g K_2O/plant), which was at par with D_1K_2 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 200 g K_2O/plant)(6.87) followed by D_1K_3 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha with 300 g K_2O/plant) (7.00).

The data in pooled showed that the effect of plant density and potassium levels was significantly influenced the number of hands per bunch.. The significantly highest number of hands per bunch (7.73) was

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

Treatments		Number of hands 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	7.09	6.87	6.98
D_2 (1.5 x 1.5)	4,444	7.78	7.69	7.73
D_3 (1.5 x 1.8)	3,703	7.27	7.27	7.27
D_4 (1.5 x 2.1)	3,174	7.36	7.44	7.40
S.E.(m) $\pm$		0.056	0.056	0.06
C.D. at 5%		0.192	0.192	0.17
Sub-treatment (Potassium levels) (K)				
K_1 (100 g K_2O/plant)		7.28	7.22	7.25
K_2 (200 g K_2O/plant)		7.52	7.40	7.46
K_3 (300 g K_2O/plant)		7.32	7.33	7.33
S.E.(m) $\pm$		0.038	0.038	0.038
C.D. at 5%		0.113	0.113	0.109
Interaction (D x K)				
$D_1 K_1$		7.27	6.73	7.00
$D_1 K_2$		7.00	6.87	6.93
$D_1 K_3$		7.00	7.00	7.00
$D_2 K_1$		7.47	7.60	7.53
$D_2 K_2$		8.20	7.80	8.00
$D_2 K_3$		7.67	7.67	7.67
$D_3 K_1$		7.07	7.07	7.07
$D_3 K_2$		7.53	7.53	7.53
$D_3 K_3$		7.20	7.20	7.20
$D_4 K_1$		7.33	7.47	7.40
$D_4 K_2$		7.33	7.40	7.37
$D_4 K_3$		7.40	7.47	7.43
S.E.(m) $\pm$		0.076	0.076	0.076
C.D. at 5%		0.227	0.227	0.218
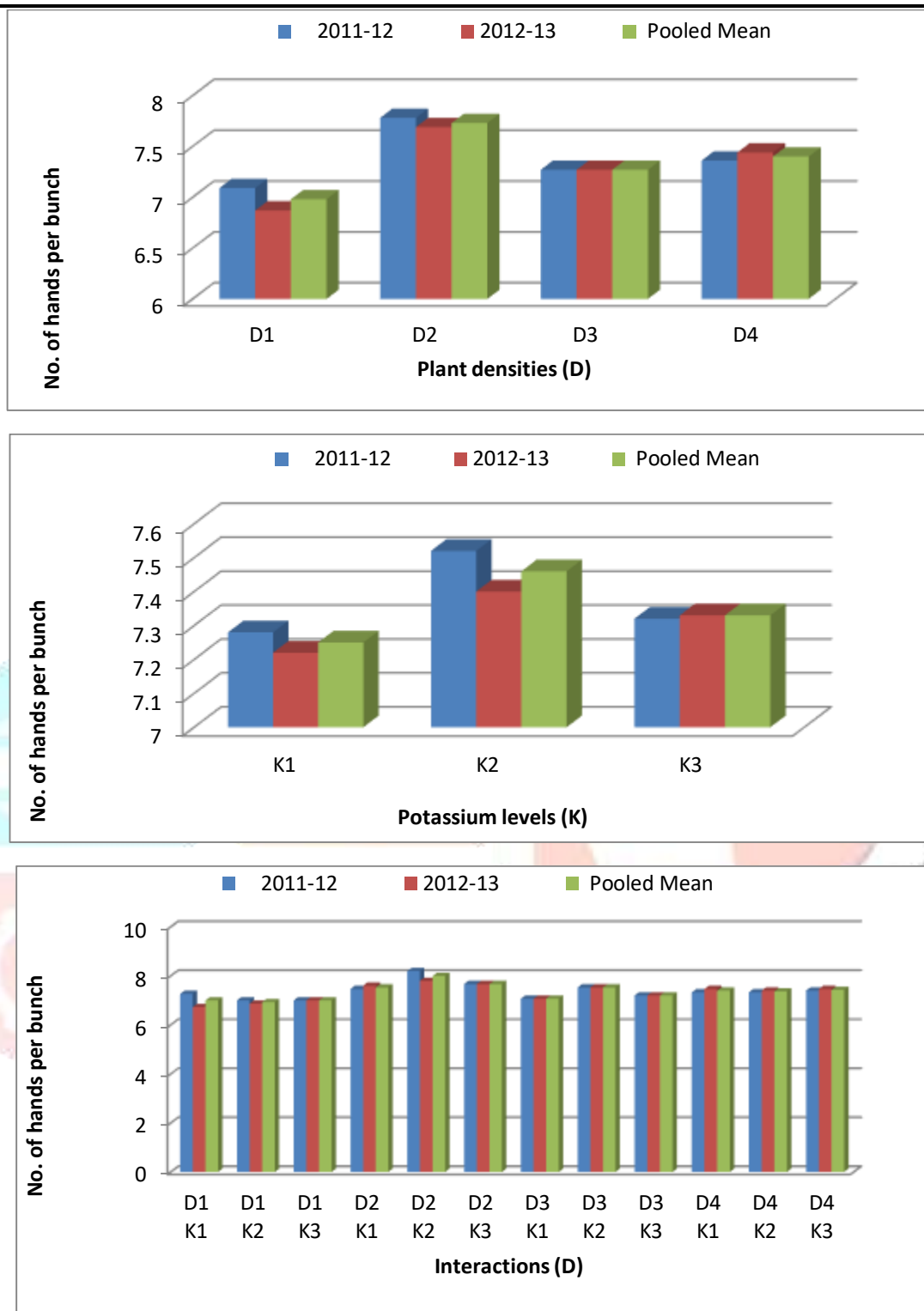
Fig. 01. Effect of plant densities and different levels of potassium on number of hands per bunch of banana cv. Ardhapuri

recorded in D_2 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha), while the lowest number of hands per bunch (6.98) was recorded in density D_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha), which was followed by D_3 (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha)(7.27). The effect of potassium gave the highest number of hands per bunch (7.46) in the treatment K_2 (200 g K_2O/plant). While the lowest number of hands per bunch (7.25) by treatment K_1 (100 g K_2O/plant) which was at par with K_3 (300 g K_2O/plant). The interaction effect

of plant density and potassium levels gave the highest number of hands bunch (8.00) by the treatment D_2K_2 (1.5m x 1.5m spacing *i.e.* 4,444 plants/ha spacing a 200 g K_2O/plant) while the lowest number of hands per bunch was recorded (6.93) in treatment D_1K_2 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha at 200 g K_2O/plant), which significantly at par with D_1K_3 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha at 300 g K_2O/plant)(7.00), D_1K_1 (1.5m x 1.2m spacing *i.e.* 5,555 plants/ha at 100 g K_2O/plant) (7.00) at a time and D_3K_1 (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha at 100 g K_2O/plant) and followed by D_3K_3 (1.5m x 1.8m spacing *i.e.* 3,703 plants/ha at 300 g K_2O/plant) (7.20).

Discussion:

The data in Table 01, revealed that the effect of plant density and potassium levels on number of hands per bunch was significantly influenced the number of hands per bunch. The highest number of hands per bunch (7.73) was recorded in D_2 (1.5 m x 1.5 m with 4,444 plants/ha), while the lowest number of hands per bunch (6.98) was recorded in density D_1 (1.5 m x 1.2 m with 5,555 plants/ha), which was followed by D_3 (1.5 m x 1.8 m with 3,703 plants/ha)(7.27) The effect of potassium gave the higher number of hands per bunch (7.46) in the treatment K_2 (200 g K_2O/plant).which the lower number of hands per bunch (7.25) by treatment K_1 (7.25) which was at par with K_3 (300 g K_2O/plant). The interaction effect of plant density and potassium levels gave the highest number of hands bunch (8.00) by the treatment D_2K_2 (1.5 m x 1.5 m with 4,444 plants/ha spacing a 200 g K_2O/plant) followed by D_3K_3 (1.5 m x 1.8 m with 3,703 plants/ha spacing at 300 g K_2O/plant), while the lower number of hands per bunch was recorded (6.93) in treatment D_1K_2 (1.5 m x 1.2 m with 5,555 plants/ha at 200 g K_2O/plant), which significantly at par with D_1K_3 (1.5 m x 1.2 m with 5,555 plants/ha at 300 g K_2O/plant)(7.00) D_1K_1 (1.5 m x 1.2 m with 5,555 plants/ha at 100 g K_2O/plant) (7.00) at a time and D_3K_1 (1.5 m x 1.8 m with 3,703 plants/ha at 100 g K_2O/plant) and followed by D_3K_3 (1.5 m x 1.8 m with 3,703 plants/ha at 300 g K_2O/plant) (7.20). The number of hands per bunch in both density and potassium were highest because of optimum plant density, optimum plant population as well as optimum potassium levels applied. Nalina *et al*. (2000) revealed that application of the three RDF levels (100, 75 and 50%) in banana cv. Robusta (AAA) and found that 50 per cent RDF (300:90:450 g/pit) resulted maximum number of hands (9.73) per bunch, number of fingers (139.97) per bunch. Similar findings were reported by Bhalerao *et al*. (2009).

Summery and Conclusion:

The highest number of hands per bunch (7.73) was recorded in D_2 1.5 m x 1.5 m (4,444 plants/ha), while the lowest number of hands per bunch (6.98) was recorded in density D_1 1.5 m x 1.2 m (5,555 plants/ha), which was followed by D_3 1.5 m x 1.8 m (3,703 plants/ha)(7.27) The effect of potassium given the higher number of hands per bunch (7.46) in the treatment K_2 (200 g K_2O/plant) with the lower number of hands per bunch (7.25) by treatment K_1 (7.25) which was at par with K_3 (300 g K_2O/plant). The interaction effect of plant density and potassium levels given the highest number of hands bunch (8.00) by the treatment D_2K_2 (1.5 m x 1.5 mm spacing a 200 g K_2O/plant) followed by D_3K_3 (1.5 m x 1.8 mm spacing at 300 g K_2O/plant), while the lower number of hands per bunch was recorded (6.93) in treatment D_1K_2 (1.5

m x 1.2 m at 200 g K_2O/plant), which significantly at par with D_1K_3 (1.5 m x 1.2 m at 300 g K_2O/plant)(7.00) D_1K_1 (1.5 m x 1.2 m at 100 g K_2O/plant) (7.00) at a time and D_3K_1 (1.5 m x 1.8 mm at 100 g K_2O/plant) and followed by D_3K_3 (1.5 m x 1.8 mm at 300 g K_2O/plant) (7.20).

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