A Study of Pant Geometry and Levels of Potassium on Number of Suckers per Plant 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 vigorous vegetative growth in terms of plant height, were the highest in plants with plant density 1.5 m x 2.1 m followed by plant density 1.5 m x 1.8 m, while in case of different potassium levels the vegetative growth were the highest in plants with application of 300 g K_2O/plant followed by 200 g K_2O/plant. In interaction, the plant density 1.5 m x 2.1 m with combination of 300 g K_2O/plant as well as 200 g K_2O/plant showed the highest vegetative growth and number of suckers per 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:

During the present studies different treatments of plant density and potassium levels were taken for observation during two trial years. The number of suckers per plant was counted and average was calculated and the mean was expressed initially at 60, 90, 120, 150, 180 and 210 days.

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_2O/plant (1/2 dose of RDF)
K_2	:	200 g K_2O /plant (RDF)
K_3	:	300 g K_2O /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)

Number Suckers per Plant

During 2011-12,2012-13 and in pooled the effect of plant densities and potassium levels and their Interaction on number of suckers per plant after 60,90,120,150,180 and 210 days after planting found to be non significant.(Table 1to 6).

Table 1   Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 60 DAP

Treatments		Number of suckers per plant at 60 DAP		
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	5.31	5.12	5.22
D$_2$(1.5 x 1.5)	4,444	5.56	5.71	5.63
D$_3$(1.5 x 1.8)	3,703	5.60	5.71	5.66
D$_4$ (1.5 x 2.1)	3,174	5.31	5.69	5.50
S.E.(m) $\pm$		0.237	0.285	0.26
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K$_1$ (100 g K$_2$O/plant)		5.43	5.47	5.45
K$_2$ (200 g K$_2$O/plant)		5.62	5.73	5.68
K$_3$ (300 g K$_2$O/plant)		5.28	5.48	5.38
S.E.(m) $\pm$		0.155	0.226	0.194
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
D$_1$ K$_1$		5.40	5.07	5.23
D$_1$ K$_2$		5.27	5.40	5.33
D$_1$ K$_3$		5.27	4.90	5.08
D$_2$ K$_1$		5.87	6.00	5.93
D$_2$ K$_2$		5.53	5.60	5.57
D$_2$ K$_3$		5.27	5.53	5.40
D$_3$ K$_1$		5.47	5.53	5.50
D$_3$ K$_2$		6.07	6.17	6.12
D$_3$ K$_3$		5.27	5.43	5.35
D$_4$ K$_1$		5.00	5.27	5.13
D$_4$ K$_2$		5.60	5.77	5.68
D$_4$ K$_3$		5.33	6.03	5.68
S.E.(m) $\pm$		0.310	0.451	0.387
C.D. at 5%		NS	NS	NS

Table 2.   Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 90 DAP

Treatments		Number of suckers per plant at 90 DAP		
Main treatments (Plant densities) (D)				
Spacings (m^2)	No. of plants/ha	2011-12	2012-13	Pooled Mean
D_1 (1.5 x 1.2)	5,555	5.43	5.33	5.38
D_2 (1.5 x 1.5)	4,444	5.80	5.97	5.88
D_3 (1.5 x 1.8)	3,703	5.78	5.93	5.85
D_4 (1.5 x 2.1)	3,174	5.60	5.89	5.74
S.E.(m) $\pm$		0.328	0.290	0.31
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K_1 (100 g K_2O/plant)		5.61	5.70	5.69
K_2 (200 g K_2O/plant)		5.88	5.89	5.85
K_3 (300 g K_2O/plant)		5.58	5.75	5.67
S.E.(m) $\pm$		0.173	0.229	0.203
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
D_1 K_1		5.60	5.13	5.37
D_1 K_2		5.47	5.50	5.48
D_1 K_3		5.73	5.37	5.55
D_2 K_1		6.13	6.47	6.30
D_2 K_2		5.80	5.73	5.77
D_2 K_3		5.48	5.70	5.59
D_3 K_1		5.60	5.73	5.66
D_3 K_2		6.13	6.37	6.25
D_3 K_3		5.53	5.70	5.62
D_4 K_1		5.20	5.47	5.33
D_4 K_2		5.80	5.97	5.88
D_4 K_3		5.60	6.23	5.92
S.E.(m) $\pm$		0.346	0.458	0.406
C.D. at 5%		NS	NS	NS

Table 3.　Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 120 DAP

Treatments		Number of suckers per plant at 120 DAP		
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	5.63	5.58	5.60
D$_2$ (1.5 x 1.5)	4,444	5.97	6.09	6.03
D$_3$ (1.5 x 1.8)	3,703	5.99	6.13	6.06
D$_4$ (1.5 x 2.1)	3,174	5.91	6.03	5.97
S.E.(m) $\pm$		0.317	0.325	0.32
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K$_1$ (100 g K$_2$O/plant)		5.79	5.83	5.81
K$_2$ (200 g K$_2$O/plant)		5.97	6.05	6.01
K$_3$ (300 g K$_2$O/plant)		5.84	5.99	5.91
S.E.(m) $\pm$		0.190	0.237	0.215
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
D$_1$ K$_1$		5.60	5.23	5.42
D$_1$ K$_2$		5.93	5.67	5.80
D$_1$ K$_3$		5.73	5.83	5.78
D$_2$ K$_1$		5.27	6.60	5.93
D$_2$ K$_2$		5.60	5.83	5.72
D$_2$ K$_3$		5.68	5.83	5.75
D$_3$ K$_1$		5.82	5.93	5.87
D$_3$ K$_2$		6.29	6.57	6.43
D$_3$ K$_3$		5.79	5.90	5.84
D$_4$ K$_1$		5.33	5.57	5.45
D$_4$ K$_2$		5.93	6.13	6.03
D$_4$ K$_3$		6.20	6.40	6.30
S.E.(m) $\pm$		0.381	0.474	0.430
C.D. at 5%		NS	NS	NS

Table 4.　Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 150 DAP

Treatments		Number of suckers per plant at 150 DAP		
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	5.79	5.69	5.74
D$_2$ (1.5 x 1.5)	4,444	6.12	6.19	6.15
D$_3$ (1.5 x 1.8)	3,703	6.18	6.27	6.22
D$_4$ (1.5 x 2.1)	3,174	6.16	6.17	6.16
S.E.(m) $\pm$		0.328	0.333	0.33
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K$_1$ (100 g K$_2$O/plant)		5.89	5.94	5.91
K$_2$ (200 g K$_2$O/plant)		6.09	6.18	6.13
K$_3$ (300 g K$_2$O/plant)		6.00	6.12	6.06
S.E.(m) $\pm$		0.208	0.242	0.226
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
D$_1$ K$_1$		5.67	5.30	5.48
D$_1$ K$_2$		6.00	5.77	5.88
D$_1$ K$_3$		5.80	6.00	5.90
D$_2$ K$_1$		6.45	6.73	6.59
D$_2$ K$_2$		5.73	5.93	5.83
D$_2$ K$_3$		5.85	5.90	5.87
D$_3$ K$_1$		5.93	6.07	6.00
D$_3$ K$_2$		6.33	6.70	6.51
D$_3$ K$_3$		5.97	6.03	6.00
D$_4$ K$_1$		5.60	5.67	5.63
D$_4$ K$_2$		6.13	6.30	6.22
D$_4$ K$_3$		6.13	6.53	6.33
S.E.(m) $\pm$		0.416	0.484	0.451
C.D. at 5%		NS	NS	NS

Table 5.   Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 180 DAP

Treatments		Number of suckers per plant at 180 DAP		
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	5.85	5.79	5.82
D_2 (1.5 x 1.5)	4,444	6.23	6.29	6.26
D_3 (1.5 x 1.8)	3,703	6.32	6.36	6.34
D_4 (1.5 x 2.1)	3,174	6.21	6.31	6.26
S.E.(m) $\pm$		0.367	0.345	0.36
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K_1 (100 g K_2O/plant)		6.07	6.05	6.06
K_2 (200 g K_2O/plant)		6.21	6.28	6.24
K_3 (300 g K_2O/plant)		6.19	6.23	6.21
S.E.(m) $\pm$		0.226	0.241	0.234
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
$D_1 K_1$		5.60	5.40	5.50
$D_1 K_2$		6.10	5.87	5.98
$D_1 K_3$		5.87	6.10	5.98
$D_2 K_1$		6.63	6.83	6.73
$D_2 K_2$		5.87	6.03	5.95
$D_2 K_3$		5.93	6.00	5.96
$D_3 K_1$		6.07	6.13	6.10
$D_3 K_2$		6.47	6.80	6.63
$D_3 K_3$		6.13	6.13	6.13
$D_4 K_1$		5.67	5.83	5.75
$D_4 K_2$		6.33	6.43	6.38
$D_4 K_3$		6.40	6.67	6.53
S.E.(m) $\pm$		0.452	0.482	0.467
C.D. at 5%		NS	NS	NS

Table 6.   Effect of plant densities and different levels of potassium on number of suckers per plant of banana cv. Ardhapuri at 210 DAP

Treatments		Number of suckers per plant at 210 DAG		
Main treatments (Plant densities) (D)				Pooled Mean
Spacings (m^2)	No. of plants/ha	2011-12	2012-13	
D$_1$ (1.5 x 1.2)	5,555	5.91	5.91	5.91
D$_2$(1.5 x 1.5)	4,444	6.33	6.33	6.33
D$_3$(1.5 x 1.8)	3,703	6.45	6.42	6.43
D$_4$ (1.5 x 2.1)	3,174	6.38	6.38	6.38
S.E.(m) $\pm$		0.380	0.369	0.37
C.D. at 5%		NS	NS	NS
Sub-treatment (Potassium levels) (K)				
K$_1$ (100 g K$_2$O/plant)		6.16	6.10	6.13
K$_2$ (200 g K$_2$O/plant)		6.37	6.37	6.37
K$_3$ (300 g K$_2$O/plant)		6.37	6.32	6.34
S.E.(m) $\pm$		0.246	0.248	0.247
C.D. at 5%		NS	NS	NS
Interaction (D x K)				
D$_1$ K$_1$		5.53	5.53	5.53
D$_1$ K$_2$		6.00	6.00	6.00
D$_1$ K$_3$		6.20	6.20	6.20
D$_2$ K$_1$		6.87	6.87	6.87
D$_2$ K$_2$		6.07	6.07	6.07
D$_2$ K$_3$		6.07	6.07	6.07
D$_3$ K$_1$		6.20	6.20	6.20
D$_3$ K$_2$		6.87	6.87	6.87
D$_3$ K$_3$		6.40	6.20	6.30
D$_4$ K$_1$		5.80	5.80	5.80
D$_4$ K$_2$		6.53	6.53	6.53
D$_4$ K$_3$		6.80	6.80	6.80
S.E.(m) $\pm$		0.493	0.496	0.494
C.D. at 5%		NS	NS	NS

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