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INFLUENCE OF PLANT SPACING AND POTASSIUM SUPPLY ON WEIGHT OF BUNCH IN 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_2 O/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 maximum weight of bunch (21.33 kg) was recorded by density D_4 1.5 m x 2.1 m (3174 plants/ha) and the minimum weight of bunch (10.18kg) was observed by density D_1 1.5 m x 1.2 m (5555 plants/ha). The potassium level K_3 (300g K_2O/plant) given the maximum weight of bunch (17.31kg) followed by K_2(200g K_2O/plant)(16.01kg) and the minimum weight of bunch was recorded (14.40kg) K_1 (100g K_2O/plant). The interaction effect of plant densities and potassium levels on weight of bunch for 2011-12,2012-13 and in pooled were found to be non-significant (Table 01).

Index Terms –Plant Geometry, Potassium, Ardhapuri etc.

I. 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 flavored , 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.

Weight of bunch was recorded by using electronic balance and mean weight of bunch was recorded and expressed in kilograms.

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)

Results:

Weight of Bunch:

The data on weight of bunch as influenced by the plant densities and different levels of potassium is presented in Table No. 01 and illustrated in Fig. 01.

During 2011-12, the data showed that the maximum weight of bunch (21.83kg) was recorded in density D_4 (1.5m x 2.1m spacing i.e. 3174 plants/ha) while the minimum weight of bunch (10.77 kg) was observed in density. D_1 (1.5m x 1.2m spacing i.e. 5555 plants/ha). The maximum weight of bunch was recorded (17.72kg) in K_3 (300g K_2O/plant) and the minimum weight Of bunch (14.04kg) was in K_1(100g K_2O/plant).

During 2012-13, the data showed that the highest weight of bunch (20.83kg) was recorded by density D_4(1.5m x 2.1m spacing i.e. 3174 plants/ha) and the potassium level K_3(300g K_2O/plant) and the lowest bunch of weight (14.15kg) was recorded by potassium level K_1(100g K_2O/plant).

Table 01. Effect of plant densities and different levels of potassium on bunch weight (kg) banana cv. Ardhapuri

Treatments		**Bunch weight (kg)**		
Main treatments (Plant densities) (D)		2011-12	2012-13	Pooled Mean
Spacings (m^2)	of plants /ha			
D_1 (1.5 x 1.2)	5,555	0.77	0.86	0.81
D_2(1.5 x 1.5)	4,444	4.24	3.52	3.88
D_3(1.5 x 1.8)	3,703	7.96	7.23	7.59
D_4 (1.5 x 2.1)	3,174	1.83	0.83	1.33
S.E.(m) ±		.16	.28	.23
C.D. at 5%		.56	.96	.70
Sub-treatment (Potassium levels) (K)				
K_1 (100 g K_2O/plant)		4.64	4.15	4.40
K_2 (200 g K_2O/plant)		6.25	5.78	6.01
K_3 (300 g K_2O/plant)		7.72	6.90	7.31
S.E.(m) ±		.18	.22	.20
C.D. at 5%		.53	.67	.58
Interaction (D x K)				
D_1 K_1		.38	0.05	.72

$D_1 K_2$	0.77	0.69	0.73
$D_1 K_3$	2.17	1.83	2.00
$D_2 K_1$	2.23	1.63	1.93
$D_2 K_2$	4.40	3.69	4.05
$D_2 K_3$	6.10	5.24	5.67
$D_3 K_1$	6.77	6.02	6.40
$D_3 K_2$	8.17	7.42	7.79
$D_3 K_3$	8.93	8.26	8.60
$D_4 K_1$	0.17	8.91	9.54
$D_4 K_2$	1.67	1.31	1.49
$D_4 K_3$	3.67	2.27	2.97
S.E.(m) $\pm$	.35	.44	.40
C.D. at 5%	S	S	S

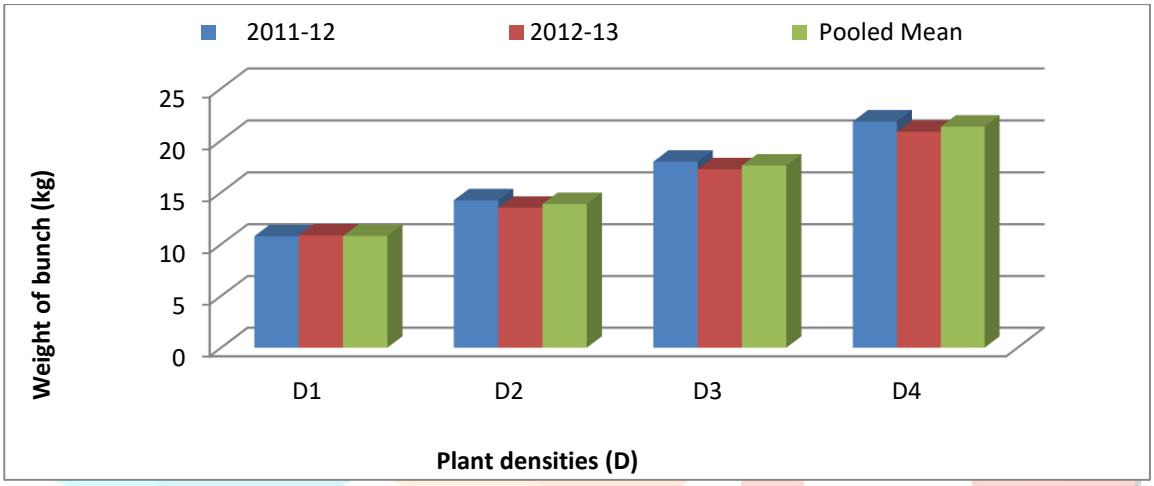
The pooled data showed that the significant effect of potassium levels and plant densities on weight of bunch of banana. The maximum weight of bunch (21.33 kg) was recorded by density D_4 (1.5m x 2.1m spacing i.e. 3174 plants/ha) and the minimum weight of bunch (10.18kg) was observed by density D_1 (1.5m x 1.2m spacing i.e. 5555 plants/ha). The potassium level K_3 (300g K_2O/plant) gave the maximum weight of bunch (17.31kg) followed by K_2(200g K_2O/plant)(16.01kg) and the minimum weight of bunch was recorded (14.40 kg) by K_1 (100g K_2O/plant).The interaction effect of plant densities and potassium levels on weight of bunch for 2011-12,2012-13 and in pooled were found to be non-significant (Table 01).

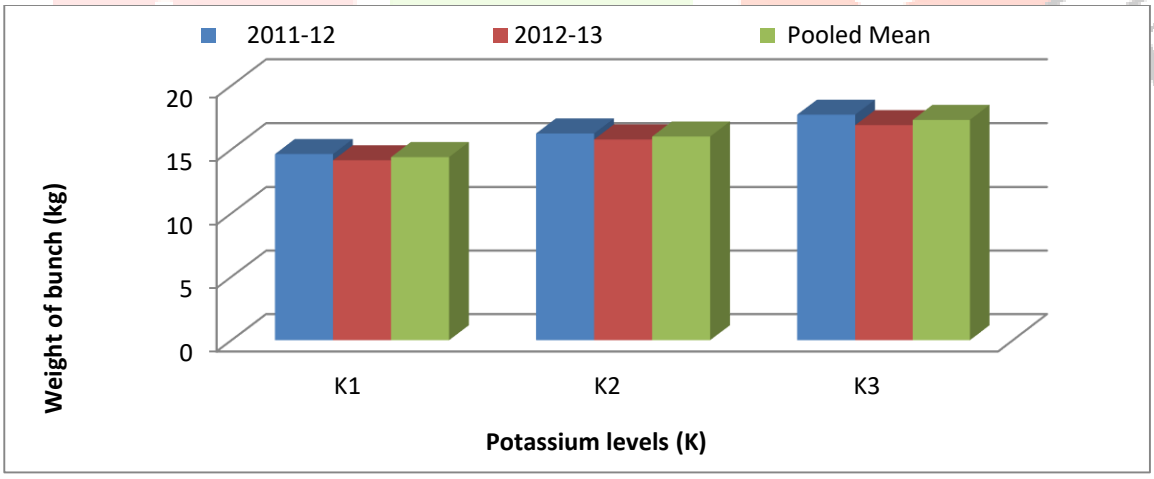
Discussion:

The data in Table 01 revealed that the effect of potassium levels and plant densities given the significant results. The maximum bunch weight (21.33 kg) was recorded by density D_4 (1.5 m x 2.1 m with 3,174 plants/ha) and the minimum bunch weight (10.18kg) was observed by density D_1 (1.5 m x 1.2 m with 5,555 plants/ha). The potassium level K_3 (300 g K_2O/plant) gave the maximum bunch weight (17.31kg) followed by K_2(200 g K_2O/plant)(16.01kg) and the minimum bunch weight was recorded (14.40kg) K_1 (100 g K_2O/plant). The interaction effect of plant densities and potassium levels on bunch weight for 2011-12, 2012-13 and in pooled were found to be non-significant.

In above study when the plant density was high more leaf surface was exposed to sunlight and indirectly greater amount of assimilates accumulated in various organs of the plant leading to increased bunch weight and also bunch weight was contributed by application potassium. Mustaffa (1988) reported that potassium application significantly influenced the banana yield and fruit quality with dose of 300 g K_2O/plant there was significant increase in bunch weight (114.6kg) with higher levels of potassium.

Similar findings were reported by Nair *et al* (1990), Nalina *et al*. (2000), Patel *et al.* (2000), and Nalina *et al*. (2003).





Summary and Conclusion:

The maximum weight of bunch (21.33 kg) was recorded by density D_4 1.5 m x 2.1 m (3174 plants/ha) and the minimum weight of bunch (10.18kg) was observed by density D_1 1.5 m x 1.2 m (5555 plants/ha). The potassium level K_3 (300g K_2O/plant) given the maximum weight of bunch (17.31kg) followed by K_2(200g K_2O/plant)(16.01kg) and the minimum weight of bunch was recorded (14.40kg) K_1 (100g K_2O/plant). The interaction effect of plant densities and potassium levels on weight of bunch for 2011-12,2012-13 and in pooled were found to be non-significant (Table 32).

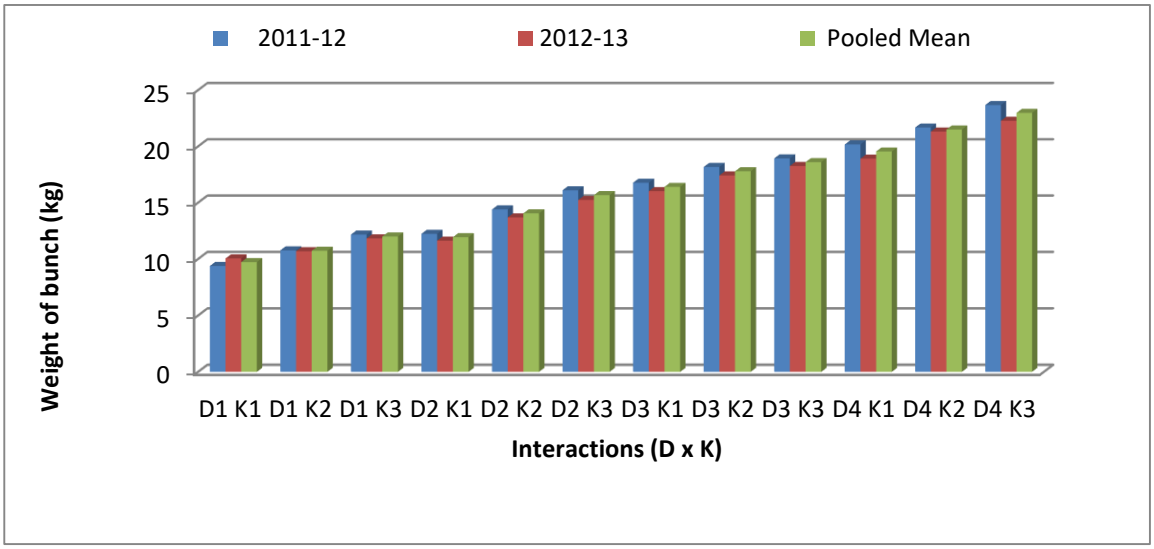


Fig. 01. Effect of plant densities and different levels of potassium on weight of bunch (kg) banana cv. Ardhapuri

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