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EFFECT OF NUTRIENT LEVELS, SPACING AND PLANTING DENSITY ON LEAF NUTRIENTS STATUS IN BANANA CV. RAJAPURI

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ABSTRACT

Bananas are an important food crop in terms of gross value after paddy, wheat and milk products. In India, banana is the second most important commercial fruit crop next to mango. It is known as a wholesome fruit, as it provides a more balanced diet than any other fruit. The experiment was conducted at Main Horticultural Research and Extension Centre, University of horticultural sciences bagalkot, Karnataka, India to study the effect of nutrient levels, spacing and plant density on the leaf nutrient status of banana cv. Rajapuri during 2020-23. It was laid out in a Split-split plot design with three replications and eighteen treatments. The results revealed that the effect of different nutrient levels, spacing and planting density showed statistically significant differences among treatments. Higher nitrogen content in leaf (2.51 %), higher phosphorus content in leaf (0.23 %) and higher potassium content in leaf (3.18 %) was recorded with application of 100 per cent RDF through fertigation (F_1). Spacing and plant density and their interaction did not influence the nitrogen, phosphorous and potassium.

***Keyword*:** Banana, Rajapuri, Planting density, Nutrients.

Introduction

The banana, a monocotyledonous and monocarpic plant classified in the genus *Musa* and family Musaceae, has a chromosome count of X=11. It is believed to have originated in the tropical regions of Southeast Asia and is considered one of the oldest cultivated fruit crops globally. Bananas are also known by several names, including "Apple of Paradise," "Adam's Fig," "Kalpataru," "Queen of the Tropical Fruits."This fruit is recognized for its nutritional benefits, providing a more balanced diet compared to other fruits.

In India, bananas rank as the second most significant commercial fruit crop, following mangoes. The global production of bananas reaches approximately 125 million tonnes, with India accounting for about 26.40%. Within India, bananas are grown over an area of 9.59 lakh hectares, yielding 35.13 million tonnes and achieving a productivity rate of 36.67 tonnes per hectare. In Karnataka specifically, bananas are cultivated across roughly 1.02 lakh hectares, producing 3.71 million tonnes at an average productivity of 28.64 tonnes per hectare (Anon, 2021).

Banana cv. Rajapuri (AAB) is the popular cultivar of banana which is grown in Northern parts of

Karnataka particularly Belgavi, Vijayapur, Bagalkot and part of Dharwad. It is a dwarf cultivar with an average height of 6 to 8 feet. It has a very sturdy stem, and can withstand strong winds. Leaves are wider (up to 3 feet) than those of other cultivars. It has 08 to 10 hands, 90 to 100 fingers, with an average bunch weight of 10 to 15 kg. Fruits have a medium size, yellow skin, and pulp with good blend of sweet and acidity. It is one of the best crops to grow in marginal areas with an assured irrigation.

To maximize banana yields, it is essential to focus on standardizing effective production techniques tailored to various cultivation systems. Key factors for enhancing yields include selecting high-yielding and disease-free varieties, using appropriate planting densities, and applying irrigation and nutrients in a timely, need-based manner, while maintaining weed-free conditions to bridge the gap between actual and potential yields per unit area (Panjavarnam *et al*., 2018). However, the management of the canopy for effective utilization of natural resources viz., solar radiation, available space with balanced nutrition, spacing and maintaining optimum plant density is a particularly complex topic, lacking universal recommendations that apply to all scenarios. It plays a crucial role in determinig annual yields per hectare.

The practical mean of leaf analysis is to choose the nutritional status of the banana plant, remedy deficiencies, excesses or imbalances nutrient discovered and thereby improved final yields. Hence, leaf analysis results may be applied with greater concern for establishing inter-relationship between the quantities of fertilizer applied to the soil in which the crop is to be grown. The concentration of major elements in the leaf tissue of the crop after the nutrients has been added and fruit yield of the crop. This relationship will help in predicting nutrient rates for a desired optimum level of nutrient concentration in leaf tissue and subsequent fruit yield. This will be useful in scheduling the fertilizer rates and overcoming the problems of luxury consumption and poverty adjustment for different nutrients thereby helping the grower to get maximum returns with optimum investment in fertilizer.

Material and Methods

The experiment was conducted at Main Horticultural Research and Extension Centre (MHREC), University of Horticultural Sciences, Bagalkot. It comes under the Northern dry zone (Zone-3) of Karnataka, located at 16º 11´ North latitude, 75º 42´ East longitude with an altitude of 537 m above mean sea level. The experiment was laid out in a Split-split plot design. The treatments were replicated three times with three factors consisting of different levels of nutrients, spacing and plant density.

The main plot consisted of nutrient levels, *viz.,* 100 per cent RDF through fertigation (F_1), 75 per cent RDF through fertigation (F_2) and 100 per cent RDF through soil application (F_3). The sub-plot consisted of two levels of spacing, *viz*., 2.0 x 2.0 m (S1) and 2.0 x 3.0 m (S_2).The sub-sub plot comprised of three levels of plant density, *viz.,* one plant per hill (P_1), two plants per hill (P_2) and three plants per hill(P_3) along with their interactions, *viz*., nutrient level and spacing (F x S), nutrient level and plant density (F x P), spacing and plant density (S x P) as well as combined effect of nutrient levels, spacing and density (F x S x P) consisting of 18 treatment combinations viz., T_1: $F_1S_1P_1$, T2: $F_1S_1P_2$; T_3: $F_1S_1P_3$; T_4: $F_1S_2P_1$; T_5: $F_1S_2P_2$; T_6: $F_1S_2P_3$; T_7: $F_2S_1P_1$; T_8: $F_2S_1P_2$; T_9: $F_2S_1P_3$; T_{10}: $F_2S_2P_1$; T_{11}: $F_2S_2P_2$; T_{12}: $F_2S_2P_3$; T_{13}: $F_3S_1P_1$; T_{14}: $F_3S_1P_2$; T_{15}: $F_3S_1P_3$; T_{16}: $F_3S_2P_1$; T_{17}: $F_3S_2P_2$; T_{18}: $F_3S_2P_3$. The main crop and ratoon crop trials were taken up in two successive seasons in the same field and the observations were recorded for leaf nutrient status after the imposition of treatment at the peak stage of the growth and were organized into tables and statistically analyzed with split - split plot design.

Results and Discussion

The nutrients, namely, Nitrogen, phosphorous, potash was analyzed to know the effect of nutrient levels, spacing and plant density on availability of nutrients in leaf tissue. The nitrogen content in leaf showed significant difference with the application of nutrient. Application of fertilizer through 100 per cent RDF through fertigation recorded significantly higher nitrogen content in leaf (2.51%) than other fertilizer levels in plant crop. But it was on par with 100 per cent soil application (2.39%). Similar observations were noticed in ratoon crop and in pooled data.

Spacing and plant density did not exert influence on the nitrogen content in leaf. However, Maximum nitrogen content in leaf was observed at spacing of 2m x 3m (2.43%) and one plant per hill (2.43%). Similar observations were noticed in ratoon crop and in pooled data. The interaction of nutrient levels and spacing exhibited significant influence on nitrogen content in leaf. Application of 100 per cent RDF through fertigation at spacing of 2m x 3m showed higher nitrogen content in leaf (2.55%) as compared to other combinations in plant crop. But it was on par with application of 100 per cent RDF through fertigation at spacing of 2m x 2m (2.47%) and also 100% soil application at spacing of 2m x 2m (2.38%)

and 2m x 3m (2.40%). Similar observations were noticed in ratoon crop and in pooled data.

The interaction of nutrient levels and plant density has shown significant impact on nitrogen content in leaf. Higher nitrogen content in leaf was observed in the interaction of 100 per cent RDF through fertigation with one plant per hill (2.54% kg/ha) in plant crop. But it was on par with application of 100 per cent RDF through fertigation at two plants per hill (2.51%) and three plants per hill (2.48%) and 100% soil application at one plant per hill (2.40%), two plants per hill (2.39%) and three plants per hill (239%) in plant crop. Similar trend was observed in ratoon crop and in pooled data. The nitrogen content in leaf did not show significant difference due to interaction of spacing and plant density. However, highest nitrogen content in leaf was noticed in spacing of 2m x 3m with one plant per hill (2.45%) in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The interaction of nutrient levels, spacing and plant density exerted significant influence on nitrogen content in leaf. Higher nitrogen content in leaf was noticed in 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill (2.58% kg/ha) than other interactions in plant crop. But, it was on par 100 per cent RDF through fertigation at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill and 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill, three plants per hill and also with 100 per cent soil application at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill and 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill, two plants per hill, three plants per hill. Similar trend was observed in ratoon crop and in pooled data.

The phosphorus content in leaf showed significant difference with the application of nutrients. Application of nutrients through 100 per cent RDF through fertigation recorded significantly higher phosphorus content in leaf (0.23%) than other fertilizer levels in plant crop. But it was on par with 100% soil application (0.21%). Similar observations were noticed in ratoon crop and in pooled data. Spacing and plant density did not exert influence on the phosphorus content in leaf. However, Maximum phosphorus content in leaf was observed at spacing of 2m x 3m (0.21%) and one plant per hill (0.21%) in plant crop. Similar observations were noticed in ratoon crop and in pooled data.

The interaction of nutrients and spacing exhibited significant influence on phosphorus content in leaf. Application of 100 per cent RDF through fertigation at spacing of 2m x 3m showed higher phosphorus content in leaf (0.23%) as compared to other combinations in plant crop. But it was on par with application of 100 per cent RDF through fertigation at spacing of 2m x 2m (0.22%) and also 100 per cent soil application at spacing of 2m x 2m (0.21%) and 2m x 3m (0.22%). Similar observations were noticed in ratoon crop and in pooled data.

The interaction of nutrients and plant density has shown significant impact on phosphorus content in leaf. Higher phosphorus content in leaf was observed in the interaction of 100 per cent RDF through fertigation with one plant per hill (0.23% kg/ha) in plant crop. But it was on par with application of 100 per cent RDF through fertigation at two plants per hill (0.23%) and three plants per hill (0.23%) and also 100 per cent soil application at one plant per hill (0.22%), two plants per hill (0.21%) and three plants per hill (0.21%) in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The phosphorus content in leaf did not show significant difference due to interaction of spacing and plant density. However, highest phosphorus content in leaf was noticed in spacing of 2m x 3m with one plant per hill (0.22%) in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The interaction of nutrients, spacing and plant density exerted significant influence on phosphorus content in leaf. Significantly higher phosphorus content in leaf was noticed in 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill (0.24%) than other interactions in plant crop. But, it was on par 100 per cent RDF through fertigation at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill and 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill, three plants per hill and also with 100 per cent soil application at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill and 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill, two plants per hill, three plants per hill in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The potassium content in leaf showed significant difference with the application of nutrient. Application of 100 per cent RDF through fertigation recorded significantly higher potassium content in leaf (3.18%) than other nutrient levels in plant crop. But it was on par with 100% soil application (3.02%) in plant crop.

Similar observations were noticed in ratoon crop and in pooled data. Spacing and plant density did not exert influence on the potassium content in leaf. However, Maximum potassium content in leaf was observed at spacing of 2m x 3m (3.08%) and one plant per hill (3.07%) in plant crop. Similar observations were noticed in ratoon crop and in pooled data.

The interaction of fertilizer and spacing exhibited significant influence on potassium content in leaf. Application of 100 per cent RDF through fertigation at spacing of 2m x 3m showed higher potassium content in leaf (3.25%) as compared to other combinations in plant crop. But it was on par with application of 100 per cent RDF through fertigation at spacing of 2m x 2m (3.11%) and also 100% soil application at spacing of 2m x 2m (2.99%) and 2m x 3m (3.04%). Similar observations were noticed in ratoon crop and in pooled data.

The interaction of nutrient levels and plant density has shown significant impact on potassium content in leaf. Higher potassium content in leaf was observed in the interaction of 100 per cent RDF through fertigation with one plant per hill (3.23% kg/ha) in plant crop. But it was on par with application of 100 per cent RDF through fertigation at two plants per hill (3.17%) and three plants per hill (3.14%) and also 100 per cent soil application at one plant per hill (3.03%), two plants per hill (3.01%) and three plants per hill (3.00%) in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The potassium content in leaf did not show significant difference due to interaction of spacing and plant density. However, highest potassium content in leaf was noticed in spacing of 2m x 3m with one plant per hill (3.12%) in plant crop. Similar trend was observed in ratoon crop and in pooled data.

The interaction of nutrient levels, spacing and plant density exerted significant influence on potassium content in leaf. Significantly higher potassium content in leaf was noticed in 100 per cent RDF through fertigation at spacing of 2m x 3m with one plant per hill (3.34%) than other interactions in plant crop. But it was on par 100 per cent RDF through fertigation at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill and 100 per cent RDF through fertigation at spacing of 2m x 3m with two plants per hill, three plants per hill and also with 100 per cent soil application at spacing of 2m x 2m with one plant per hill, two plants per hill, three plants per hill in plant crop. Similar trend was observed in ratoon crop and in pooled data.

Significant difference was revealed in nitrogen content in leaf. The maximum leaf nitrogen content was recorded with the application of 100 per cent RDF through fertigation. However, the leaf nitrogen content was not influenced by spacing and plant density.

Increase in the leaf nitrogen content with application of 100 per cent RDF through fertigation, wider spacing and low density per hill both in plant and ratoon crop and maximum leaf nitrogen content could be due to the maximum light interception, less competition of nutrients and developing more photosynthetic assimilates, which is accountable for production of biomass and translocation of minerals to the developing sink. Further, also clearly reported that the above results might have helped to plant growth and development *viz.,* maximum green leaves i.e., photo synthetically active leaves due to high chlorophyll content that is a sign of maximum percentage of nitrogen content in leaves. The present invetigation findings were also similar and reported by previous workers by Sailaja (2013 and Naidu *et al.* (2015) in Martaman, Mane (2014) and Puttanna (2016) and Gaonkar (2019) in Grand Naine

The applied N, P and K were utilized efficiently by the plant, which might have resulted in producing the maximum photosynthates in terms of high biomass and translocation the assimilated minerals to the developing sink. The role of nitrogen and potassium in the function of chlorophyll was well established. N is the chief constituent of chlorophyll protein and amino acids, the synthesis of which will be accelerated through increased supply of N (Kohli *et al.* 1976). However, closer spacing and high planting density got low leaf N content as nitrogen was applied on per plant basis taking care of competition due to more plants in closer spacing.

Both plant and ratoon crop indicated that, increase in the leaf phosphorous content in wider spacing, low density per hill and the application of RDF through fertigtion could be due to maximum light interception, less competition of nutrients and developing more photosynthetic assimilates, which is responsible for production biomass and traslocation of minerals to the developing sink. The results of present investigation in line with the previous workers Naik (2016) and Gaonkar (2019) in Grand Naine,Both plant and ratoon crop indicated that, increase in the leaf potassium content in wider spacing, low plant density and application of RDF through fertigation could be due to the maximum light interception, maximum space due to low competition of nutrients and developing more photosynthates, which is responsible for production of biomass and translocation of minerals to the developing sink. Similar results were also noticed by Vasane and Kothari (2007); Mahmoud and Ali (2014); Mane (2014); Puttanna (2016) in Grand Naine. The role of nitrogen and potassium in the function of chlorophyll was well established. N is the chief constituent of chlorophyll protein and amino acids, the synthesis of which will be accelerated through increased supply of N and K (Kohli *et al.* 1976).

This can be clearly noted that to achieve higher productivity, better availability of nutrients must be ensured in the soil to improve nutrient uptake. The leaf nutrient content clearly revealed that higher N should be made available prior to shooting and the required potassium at shooting stage. There was a rapid decline in the leaf nutrient levels from shooting to harvest stage as compared to lesser rate of reduction of soil NPK status during the same period. This indicated rapid utilization of available NPK by the plant after shooting and this led to increased yield and quality parameters. This is evedent from repot of Murugan (2003) in Ney Poovan, Sanjay, 2011 in Poovan, Naik (2016) and Gaonkar *(*2019) in Grand Naine.

Conclusion

Higher nitrogen content in leaf (2.51 %), higher phosphorus content in leaf (0.23 %) and higher potassium content in leaf (3.18 %) was recorded with application of 100 per cent RDF through fertigation. Spacing and plant density and their interaction did not influence the nitrogen, phosphorous and potassium.

Table 1 : Leaf nutrient content as influenced by nutrient levels, spacing and plant density in banana cv. Rajapuri (AAB)

Treatment	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	PC	RC	Pooled	PC	RC	Pooled	PC	RC	Pooled
Nutrient levels									
F_1	2.51	2.47	2.49	0.23	0.22	0.23	3.18	3.18	3.18
F_2	2.29	2.24	2.26	0.18	0.18	0.18	2.90	2.92	2.91
F_3	2.39	2.38	2.38	0.21	0.21	0.21	3.02	3.04	3.03
S.Em ±	0.07	0.04	0.03	0.01	0.01	0.01	0.06	0.06	0.05
CD at 5 %	0.21	0.15	0.12	0.02	0.02	0.02	0.25	0.25	0.19
Spacing Levels (m)									
S_1	2.36	2.32	2.34	0.20	0.20	0.20	2.99	3.01	3.00
S_2	2.43	2.40	2.42	0.21	0.21	0.21	3.08	3.08	3.08
S.Em ±	0.04	0.03	0.04	0.01	0.01	0.01	0.06	0.04	0.03
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
Number of plants/hill									
P_1	2.43	2.39	2.41	0.21	0.21	0.21	3.07	3.08	3.07
P_2	2.40	2.36	2.38	0.21	0.21	0.21	3.03	3.05	3.04
P_3	2.37	2.33	2.35	0.20	0.20	0.20	3.00	3.01	3.01
S.Em ±	0.05	0.04	0.03	0.00	0.00	0.00	0.06	0.07	0.05
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nutrient Levels - F x Spacing Levels (m) - S									
$F_1 S_1$	2.47	2.41	2.44	0.22	0.22	0.22	3.11	3.14	3.13
$F_1 S_2$	2.55	2.53	2.54	0.23	0.23	0.23	3.25	3.21	3.23
$F_2 S_1$	2.24	2.18	2.21	0.16	0.16	0.16	2.86	2.87	2.86
$F_2 S_2$	2.25	2.29	2.32	0.19	0.19	0.19	2.95	2.98	2.96
$F_3 S_1$	2.38	2.37	2.37	0.21	0.21	0.21	2.99	3.02	3.01
$F_3 S_2$	2.40	2.39	2.39	0.22	0.22	0.22	3.04	3.06	3.05
S.Em ±	0.07	0.05	0.06	0.01	0.01	0.01	0.10	0.06	0.07
CD at 5 %	0.26	0.19	0.18	0.02	0.02	0.02	0.28	0.20	0.22
Nutrient Levels - F x Number of plants/hill – P									
$F_1 P_1$	2.54	2.50	2.52	0.23	0.23	0.23	3.23	3.22	3.23
$F_1 P_2$	2.51	2.46	2.49	0.23	0.23	0.23	3.17	3.17	3.17
$F_1 P_3$	2.48	2.45	2.47	0.23	0.22	0.22	3.14	3.14	3.14
$F_2 P_1$	2.35	2.30	2.32	0.19	0.18	0.19	2.95	2.96	2.95
$F_2 P_2$	2.29	2.25	2.27	0.18	0.18	0.18	2.91	2.93	2.92

Treatment	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	PC	RC	Pooled	PC	RC	Pooled	PC	RC	Pooled
$F_2 P_3$	2.24	2.17	2.21	0.17	0.17	0.17	2.85	2.88	2.86
$F_3 P_1$	2.40	2.39	2.39	0.22	0.22	0.22	3.03	3.05	3.04
$F_3 P_2$	2.39	2.38	2.38	0.21	0.21	0.21	3.01	3.04	3.02
$F_3 P_3$	2.39	2.37	2.38	0.21	0.21	0.21	3.00	3.03	3.02
S.Em ±	0.06	0.07	0.05	0.01	0.01	0.01	0.10	0.10	0.08
CD at 5 %	0.18	0.19	0.16	0.02	0.02	0.02	0.27	0.25	0.23
Spacing Levels (m) - S x Number of plants/hill – P									
$S_1 P_1$	2.40	2.35	2.38	0.21	0.20	0.21	3.02	3.03	3.02
$S_1 P_2$	2.36	2.33	2.35	0.20	0.20	0.20	2.99	3.01	3.00
$S_1 P_3$	2.33	2.29	2.31	0.19	0.19	0.19	2.95	2.98	2.97
$S_2 P_1$	2.45	2.44	2.45	0.22	0.21	0.22	3.12	3.12	3.12
$S_2 P_2$	2.43	2.39	2.41	0.21	0.21	0.21	3.07	3.08	3.07
$S_2 P_3$	2.41	2.37	2.39	0.21	0.21	0.21	3.04	3.05	3.04
S.Em ±	0.06	0.06	0.04	0.01	0.01	0.00	0.08	0.10	0.07
CD at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 01 contd……

Treatment	Nitrogen (%)			Phosphorus (%)			Potassium (%)		
	PC	RC	Pooled	PC	RC	Pooled	PC	RC	Pooled
Nutrient Levels - F x Spacing Levels (m) - S x Number of plants/hill – P									
$F_1S_1P_1$	2.49	2.43	2.46	0.23	0.22	0.22	3.12	3.16	3.14
$F_1S_1P_2$	2.47	2.41	2.44	0.22	0.22	0.22	3.11	3.15	3.13
$F_1S_1P_3$	2.46	2.40	2.43	0.22	0.22	0.22	3.10	3.11	3.11
$F_1S_2P_1$	2.58	2.57	2.57	0.24	0.23	0.23	3.34	3.28	3.31
$F_1S_2P_2$	2.55	2.52	2.54	0.23	0.23	0.23	3.22	3.19	3.21
$F_1S_2P_3$	2.51	2.50	2.50	0.23	0.22	0.23	3.17	3.16	3.17
$F_2S_1P_1$	2.32	2.24	2.28	0.19	0.17	0.18	2.92	2.91	2.91
$F_2S_1P_2$	2.24	2.22	2.23	0.17	0.16	0.16	2.88	2.87	2.88
$F_2S_1P_3$	2.15	2.10	2.12	0.14	0.15	0.14	2.78	2.82	2.80
$F_2S_2P_1$	2.35	2.35	2.35	0.19	0.19	0.19	2.97	2.97	2.97
$F_2S_2P_2$	2.34	2.28	2.31	0.19	0.19	0.19	2.94	2.99	2.96
$F_2S_2P_3$	2.33	2.24	2.29	0.19	0.19	0.19	2.93	2.93	2.93
$F_3S_1P_1$	2.40	2.37	2.39	0.21	0.22	0.21	3.02	3.02	3.02
$F_3S_1P_2$	2.38	2.37	2.37	0.20	0.21	0.21	2.98	3.02	3.00
$F_3S_1P_3$	2.37	2.36	2.36	0.20	0.21	0.21	2.98	3.02	3.00
$F_3S_2P_1$	2.40	2.40	2.40	0.22	0.22	0.22	3.05	3.08	3.06
$F_3S_2P_2$	2.40	2.39	2.40	0.22	0.22	0.22	3.04	3.06	3.05
$F_3S_2P_3$	2.40	2.38	2.39	0.21	0.22	0.22	3.03	3.04	3.03
S.Em ±	0.06	0.07	0.08	0.01	0.01	0.01	0.14	0.09	0.11
CD at 5 %	0.22	0.21	0.22	0.03	0.03	0.02	0.36	0.28	0.33

Nutrient levels	F_1 - 100% RDF through fertigation	F_2 - 75% RDF through fertigation	F_3 - 100% RDF through soil application
Spacing (m)	S_1 – 2 X 2	S_2 – 2 X 3	
Plant density	P_1 - One plant/hill	P_2 - Two plants/hill	P_3 – Three plants/hill
PC	Plant crop	RC	Ratoon crop
MAP	Months after planting		
RDF	Recommended Dose of Fertilizer	RDF / ha.	N 200:$P_2O_5$100:K_2O 300 g

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