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Rate and timing of nitrogen and potassium fertilization on yield and quality of banana cv.poovan

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Abstract : Field experiments were conducted during Jan-Feb 1998-1999 and 2000-2001 at Agricultural Research Station, Virinjipuram in sandy loam soil with banana cv. Poovan to evaluate the levels of nitrogen and potassium and their time of application on the yield and quality of banana. Increased doses of nitrogen and potassium significantly increased the yield. The highest yield response was obtained by application of 150 per cent recommended doses of nitrogen and potassium applied in three and four splits respectively. Besides this, quality parameters of the fruit namely total soluble solids; total sugars and sugar-acid ratio were also improved by this treatment.

Key words : Banana, Nitrogen, Potassium, Split application, Fruit quality.

Introduction

Banana is one of the important fruit crop in the tropics. India is the largest producer of banana in the World and it ranks second in area and production next to mango in the country (*http: www.agroindia.org*). Banana being an exhaustive crop, it is paramount to maintain high degree of soil fertility to ensure high yield of superior quality fruits. The choice of fertilizers, their dosage, and time of application varies widely with respect to varieties and agro climatic regions. Proper fertilization in banana will lead to increasing crop yield, reduction in crop duration and improvement in quality with physical and chemical characters leading to high return to the farmers. The present investigation was aimed to study the influence of different levels of nitrogen and potassium and their time of application on the yield and quality of banana cv. poovan.

Materials and Methods

Field experiments were conducted during 1998-1999 (Jan- Feb) and 2000-2001 (Jan-Feb) in red sandy loam soil of Agricultural Research Station, Virinjipuram to study the different doses of nitrogen and potassium and their time of application on the yield and quality of banana cv. poovan. There were six treatments replicated four times in randomised block design (Table 1).

The experimental soil was low in fertili status with respect to available nitrogen (21 kg ha^{-1}) and potassium (118 kg ha^{-1}) and mediu (17 kg ha^{-1}) with respect to phosphorus. Th N, P and K were applied in the form urea, single superphosphate and muriate of potas respectively. All the treatments received th same dose of phosphorus (35 g $plant^{-1}$) Nitroge and potassium were applied as per the treatment Recommended cultural practices were followe in raising the crop. At maturity, the yield fruit was recorded. The uniformly ripened frui were analysed for the quality parameters namel TSS (by using Zeiss hand refractometer), sug content (Somogyi, 1952) and titrable acidi (AOAC, 1980). The data were statistically analyse (Gomez and Gomez, 1984).

Results and Discussion

Fruit Yield (Table 2)

Among the various treatments tried, both the years of the experiment applicati of 150 per cent of recommended N and applied in 3 and 4 splits (N in 3, 5 a 7 MAP and K in 3,5,7 and 9 MAP) respective recorded the highest fruit yield. This treatme registered an increase in yield of 31.79 p cent in the first year and 21.83 per cent the second year over the recommended do and time of application of N and K. Irrespecti

ble 1. Treatment details

Treament	Number of splits and time of application	
	Nitrogen	Potassium
110 N and 330 K_2O g plant^{-1} (Recommended dose) (control)	2 (3 and 5 MAP)	3 (3,5 and 7 MAP)
110 N and 300 K_2O g plant^{-1} (Recommended dose)	3 (3,5 and 7 MAP)	3 (3,5 and 7 MAP)
110 N and 330 K_2O g plant^{-1} (Recommended dose)	3 (3,5 and 7 MAP)	4 (3,5,7 and 9 MAP)
165 N and 495 K_2O g plant^{-1} (150% of the recommended dose)	2 (3 and 5 MAP)	3 (3,5 and 7 MAP)
165 N and 495 K_2O g plant^{-1} (150% of the recommended dose)	3 (3,5 and 7 MAP)	3 (3,5 and 7 MAP)
165 N and 495 K_2O g plant^{-1} (150% of the recommended dose)	3 (3,5 and 7 MAP)	4 (3,5,7 and 9 MAP)

- Fig. in bracket indicates the time of application in months after planting.

ble 2. Benefit-cost ratio in banana as influenced by rate and time of N and K application (mean of two years)

Treatment	Basic cost (Rs.)	Treat-ment cost (Rs.)	Total cost (Rs.)	Yield (t ha^{-1})	Income (Rs.)	Net income (Rs.)	Benefit cost ratio
- Rec.dose of N and K	40,000	-	42,000	28.10	1,12,400	70,400	1.68
- Rec.dose of N and K in 2 and 3 splits	40,000	500	42,500	28.64	1,14,560	72,060	1.70
- Rec.dose of N and K in 3 and 4 splits	40,000	1000	43,000	29.50	1,18,000	75,000	1.74
- 150% N and K in 2 and 3 splits	40,000	4024	46,024	31.66	1,26,640	80,616	1.75
- 150% N and K in 3 and 3 splits	40,000	4524	46,524	34.13	1,36,520	89,996	1.93
- 150% N and K in 3 and 4 splits	40,000	5024	47,024	37.06	1,48,240	1,01,216	2.15

rticulars

le price of banana	Rs. 4.00 kg^{-1}
st of urea	Rs. 4.85 kg^{-1}
st of MOP	Rs. 4.35 kg^{-1}

the number of splits, application of higher antity of N and K registered an increased eld over the recommended dose. The same end was observed with regard to mean yield also. The increased yield might be due to the increased number of fingers, individual fruit weight and finally the bunch weight.

Table 3. Yield and quality parameters in banana cv. poovan as influenced by various treatments

Treatments	Yield (t ha^{-1})			TSS (%)			Total sugars (%)			Acidity (%)			Sugar-Acid ratio		
	1998-99	2000-01	Mean	1998-99	2000-01	Mean	1998-99	2000-01	Mean	1998-99	2000-01	Mean	1998-99	2000-01	Mean
T1 - Rec.dose of N and K in 2 and 3 splits	30.55	25.65	28.10	16.80	15.90	16.4	11.20	11.35	11.28	0.30	0.30	0.30	37.08	38.34	37.73
T2 - Rec.dose of N and K in 3 and K and 3 split	31.10	26.18	28.64	16.90	16.80	16.9	11.35	11.60	11.48	0.30	0.30	0.31	36.38	38.93	37.64
T3 - Rec.dose of N and K in 3 and 4 splits	32.05	26.95	29.50	17.40	17.20	17.3	11.50	11.80	11.65	0.30	0.30	0.31	35.28	39.60	37.34
T4 - 150% N and K in 2 and 3 splits	34.82	28.50	31.66	19.20	18.40	18.8	12.30	12.40	12.35	0.26	0.23	0.25	47.67	53.45	50.24
T5 - 150% N and K in 3 and 3 splits	38.20	30.06	34.13	20.00	19.20	19.6	12.55	12.80	12.68	0.26	0.27	0.27	47.90	46.72	47.31
T6 - 150% N and K in 3 and 4 splits	40.26	33.85	37.06	20.10	19.60	19.9	12.80	13.10	12.95	0.27	0.24	0.25	47.76	55.04	51.19
SEd	0.54	1.08	0.72	0.52	0.71	0.4	0.22	0.30	0.20	0.006	0.03	0.004	1.20	1.32	0.93
CD (P=0.05)	1.41	2.31	1.54	1.12	1.51	0.9	0.48	0.64	0.41	0.01	0.06	0.01	2.55	2.81	1.98

For optimum growth and productivity in banana availability of nutrients in adequate amounts in accordance with the crop needs during different growth stages are very important. Split application of N and K helps in the better availability of nutrients, during the crop period and in accumulation of photosynthates and thus favours the yield and quality improvement. This is evident from the results of the present experiment where even at the same level of fertilizers increasing the number of splits of nitrogen from two to three and potassium from three to four increased the yield. Increase in banana yield due to application of 160g N plant^{-1} in three splits was also reported by Hazaria and Mohan (1992). Hasa *et al.* (1999) also reported increase fruit yield in banana with the application of 500 g K_2O plant^{-1} in four splits

Quality of fruits (Table 3)

Total soluble solids (%)

Total soluble solids in the frui was influenced by the application o different levels and time of applicatio of N and K. Maximum TSS in term of brix value was recorded in th plants which received 150 per cen of recommended N and K in 3 an 4 splits respectively (20.10% an 19.60%), whereas in control it wa only 16.80 and 15.90 per cent. Th higher levels of nutrients would hav stimulated the functioning of numbe of enzymes in the physiological proces which would have caused an increas in the TSS.

Total Sugar content

The influence of the treatment on the total sugar content of th fruits was well pronounced. Th treatment where 150% of recommende

and K were applied in three and four splits spectively recorded the highest value in both years. The highest mean value recorded as 13.0 % by the treatment T_6 and the lowest due of 11.3 was recorded by T_1 (application recommended dose in recommended splits). respective of the number of splits, application higher level of N and K resulted in higher tal sugar content than the recommended dose. gher rate of N and K would have helped accumulation of photosynthates and also helped better availability of nutrients during the op period ultimately favouring the higher gar content in banana (Agarwal *et al.* 1997),

idity

Increased rate of N and K application 50 % of the recommended dose) marginally vered the acidity compared to the recommended se in both the years of the experiment. The atment mean values ranged from 0.25% to 31%. From the results it is evident that in ndy loam soils with low fertility status application 150 per cent of recommended dose of nitrogen d potassium and applying them in three and ur splits.(3, 5 and 7 MAP and 3, 5, 7 d 9 MAP) respectively recorded increased eld and improved the quality of the fruits. his is on par with the treatment where 150 r cent recommended dose of nitrogen and otassium was applied in three splits.

enefit cost ratio

The results on the benefit cost ratio of e pooled data of the both years are presented in Table 2. The benefit cost ratio was found to be relatively higher (2.15) in the treatment where 150% of the recommended dose of N and K was applied in three and four splits respectively. In general, increase in B : C ratio was observed with the increase in the number of splits of N and K at the same level of fertilizer (recommended dose or 150 % of the recommended dose).

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