Agri. Res. J. Kerala, 1981, 19 (2) 54—61

NUTRIENT UPTAKE IN RAINFED BANANA VAR. PALAYANKODAN*

VALSAMMA MATHEW and M. ARAVINDAKSHAN
College of Horticulture, Trichur, Kerala

In the state of Kerala over 80 per cent of banana is grown under rainfed conditions. No systematic study has been taken up on the uptake and nutritional requirements of rainfed bananas. Hence a study in this direction was undertaken at College of Horticulture, Trichur in the year 1979 in the cultivar Palayan- I kodan (AAB).

Materials and Methods

The experiment was laid out in a lateritic clay loam soil containing 0.140% N 0.001 % P and 0.013% K and a pH of 5.17. The experiment was laid out adopting randomised block design with five treatments and five replications. Three to four month old sword suckers of Palayankodan variety were planted at a spacing of 2.13 m during January. Nitrogen was applied at five levels viz., 0, 100, 200, 300 and 400 g/plant. Phosphorus and potassium were applied at the rate of 200 g P_2O_5 and 400 g K_2O/plant (Anon 1979). The fertilizers were applied in equal split doses during the third and pre-monsoon showers. Pot watering at the rate of 6 litres/plant was done at fortnightly intervals from the first week of planting till three months for the establishment of suckers. Samples were collected at four stages during the growth and development of banana following the method of Twyford and Walmsley (1973) as illustrated in plate 1. At each stage the plants were separated into four groups as detailed below. Roots were neglected.

Sl. No,	*Stage*	*Description of the stage*	*Organs sampled*
1	Small	Plant at an early stage of vegetative growth after the appearance of about 10 broad leaves.	Corm, pseudostem, petiole, laminae and internal leaf.
2	Large	Plants in the vegetative phase about two thirds growth to flowering ie., about 20 broad leaves have emerged.	Corm, pseudostem, petiole, laminae, and internal leaf.
3	Shooting	At the first appearance of flower	Corm, pseudostem, petiole, laminae, inflorescence and internal stalk
4	Harvest	At the time of harvesting the bunch.	Corm, pseudostem, petiole, laminae, internal stalk, external stalk and fruit.

*From the thesis submitted by the senior author to the KeralaAgrl. Universityfor the award of MSc, (Hort) degree 1980.

The uptake of nutrients was assessed by analysing the plant samples collected at different stages of plant growth. The samples were analysed for N, P and K contents. Total nutrient requirement was assessed based on chemical composition and dry matter produced at different stages of growth.

Results and Discussion

Nutrient uptake

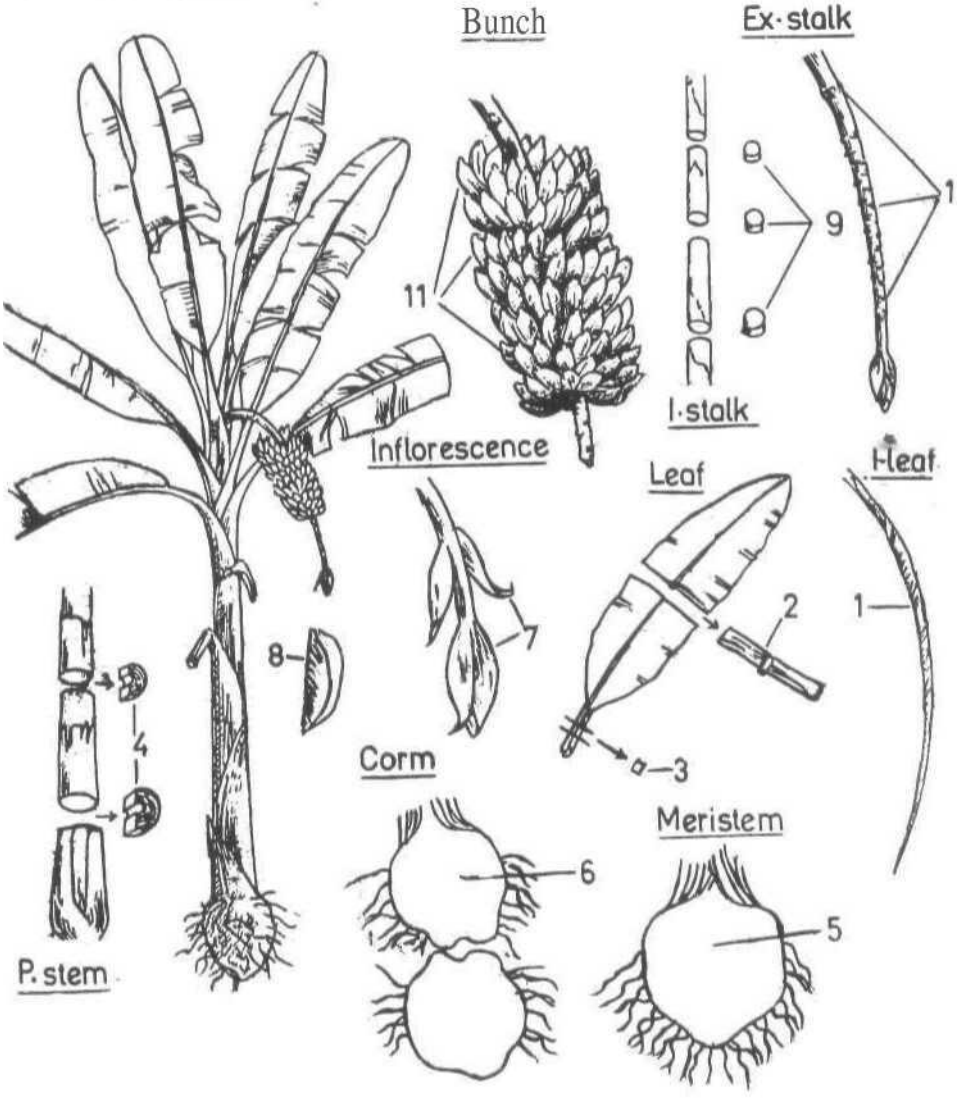
Table 1-3 represent the percentage distribution of N, P and K in the various organs as influenced by levels of nitrogen and periods of growth.

The nitrogen percentage in the plant parts increased with increasing levels of nitrogen. With respect to periods of growth, the nitrogen percentage in plant parts in genera! decreased with the age of the crop. During vegetative phase the internal leaf had the highest content of nitrogen followed by laminae. During shooting also maximum nitrogen content was noted in laminae followed by inflorescence and pseudostem. At harvest the highest nitrogen content (1.5%) was recorded in external stalk followed by laminae and internal stalk.

The results showed that (Table 2) the levels of nitrogen had no marked influence on the percentage of phosphorus in the various organs. Unlike nitrogen, P percentage did not show a steady increase in its distribution with increasing levels of nitrogen except in the internal leaf. In the vegetative phase, the unemerged leaf had higher P concentration than other parts while at shooting the inflorescence recorded the maximum percentage of phosphorus. At harvest the maximum percentage of phosphorus however, was noted in the external stalk followed by internal stalk, laminae and fruit.

The distribution pattern for potassium amongst the various organs was, as follows: At the small and large stages, pseudostem was the greatest depository of potassium (Table 3). But at shooting and at harvest maximum percentage of potassium was found in the internal stalk.

The total dry matter production and the total nutrient uptake are presented in Table 4. It will be seen from the table that in general the total dry matter content increased with increasing nitrogen levels in all stages of growth; the highest level of N recording the maximum dry matter production. The present study indicated that the active vegetative phase of the crop is confined to the period from small to shooting stage during which the dry matter accumulation increased from 505.8 to 4957.3 g/plant. The total dry matter accumulation at harvest, in the present study ranged from 4.59 to 5.88 kg/plant. These figures are comparatively low as compared to the dry matter accumulation of 18 kg/plant observed by Baillon *et al.* (1933) and 6.5 kg/plant recorded by Martin Prevel (1962) in Dwarf Cavendish cultivar of banana grown under irrigated conditions. Boland (1960) also reported that in the Lacatan cultivar of banana, the dry- matter accumulation


A banana plant
Bunch
Ex·stalk
11
9
1
I·stalk
Inflorescence
Leaf
I·leaf
8
7
2
1
4
3
Corm
Meristem
6
5
P. stem

Levels of nitrogen, g/plant	Stage of sampling	Corm	Pseudo-stem	Petiole	Laminae	Internal leaf	Inflore-scence	Internal stalk	External stalk	Fruit
0	Small	1.11	1.23	0.84	1.94	1.73				
	Large	0.95	0.89	1.10	2.08	2.12				
	Flowering	0.82	0.97	0.97	1.74		1.39	0.32		
	Harvest	0.97	0.69	0,80	1.41			1.17	1.31	0.77
100	Small	1.46	1.25	1.29	2.20	2.24				
	Large	1.21	1.32	1.33	2.23	3.03				
	Flowering	0.96	1.03	0.79	2.21		1.74	0.73		
	Harvest	1.10	0.69	1.06	1.18			1.23	1.30	0.80
200	Small	1.59	1.57	1.73	2.69	2.71				
	Large	1.32	1.56	1.55	2.71	314				
	Flowering	1.07	1.09	0.85	2.27		2,06	0.84	1.36	0.93
	Harvest	1.03	0.86	1.06	1.39			1.36	1.36	0 98
300	Small	1,67	1.10	1.63	2.73	2.73				
	Large	1.58	1.73	1.70	2.61	3.04				
	Flowering	1.24	1.46	1.26	2.34		1.99	1.04		
	Harvest	1.13	1.04	1.06	1.66			1.30	1.67	1.09
400	Small	1.71	2.11	1.71	2.88	2.82				
	Large	1.43	1.69	1.79	2.90	3.3L				
	Flowering	1.36	1.37	1.16	2.43		1.85	1.15		
	Harvest	1.12	9.97	1.10	1.44			1.34	1.87	1.31

Levels of nitrogen g/plant	Stage of sampling	Corm	Pseudo-stem	Petiole	Laminae	Internal leaf	Inflore-scence	Internal stalk	External stalk	Fruit
	Small	0.15	0.14	0.10	0.17	0.40				
0	Large	0.08	0 20	0.11	0.14	0.60	—	—	—	—
	Flowering	0.06	0.08	0.08	0.15	—	0 34	0.15	—	—
	Harvest	0.08	0.08	0.08	0.16	—	—	0.16	0.19	0.13
	Small	0.16	0.15	0.17	0.19	0.36				
100	Large	0.16	0.23	0.16	0.22	0.62	—	—	—	—
	Flowering	0.05	0.08	0·08	0.14	—	0.30	0.12	—	—
	Harvest	0.08	0.08	0.09	0.17	—	—	0.18	0.26	0.12
	Small	0.12	0.15	0.13	0.22	0.37	—		—	—
200	Large	0.10	0.15	0.11	0.20	0·57	—	—	—	—
	Flowering	0,05	0.07	0.08	0.15	—	0.28	0.18	—	—
	Harvest	0.06	0.07	0.07	0.15	—	—	0.15	0.16	0.11
	Small	0.16	0.22	0,14	0.19	0.26				
300	Large	0.10	0.21	0.12	0.23	0.58	—		—	—
	Flowering	0.05	0.06	0.06	0.14	—	0.28	0.18	—	—
	Harvest	0.07	0.08	0.07	0.14	—	—	0.12	0.14	0.12
	Small	0.16	0.20	0.12	0.20	0.61		—	—	—
400	Large	0.09	0.19	0.10	0.18	0.61	—	—	—	—
	Flowering	0.05	0.5	0.07	0.14	—	0.31	0.12	—	—
	Harvest	0,06	0.06	0.08	0.15	—	—	0.17	0.20	0.12

Levels of nitrogen, g/plant	Stage of sampling	Corm	Pseudo-stem	Petiole	Laminae	Internal leaf	Inflore-scence	Internal stalk	External stalk	Fruit
0	Small	6.98	9.15	6.83	4.43	5.22	—	—	—	—
	Large	6.34	9.42	5.64	3.89	6.38	—	—	—	—
	Flowering	4 35	4.60	3.32	2.53	—	5.09	5.35	—	—
	Harvest	10.29	6.73	3.54	2.26	—	—	10.56	7.46	1.80
100	Small	6.18	9.38	7.59	5.77	5.42	—	—	—	—
	Large	7.34	9.05	6.36	4,31	5.91	—	—	—	—
	Flowering	4.22	4.83	3.38	2.96	—	4.79	5.67	—	—
	Harvest	9.33	5.89	2.55	2.07	—	—	11.43	8.53	1·60
200	Small	5.51	8.70	7.29	5.36	5.45	—	—	—	—
	Large	6.63	8.78	4.65	3.37	6.19	—	—	—	—
	Flowering	3.59	4.76	3.30	3.10	—	4.63	4.59	—	—
	Harvest	7.45	4.33	3.05	2.07	—	—	9.80	6.38	1.67
300	Small	6.70	9.23	6.97	3.64	4.86	—	—	—	—
	Large	7.74	8.63	6.06	3.87	6.01	—	—	—	—
	Flowering	3.67	4.60	2.54	2.26	—	4.33	4.45	—	—
	Harvest	6.56	5.20	2.53	1.87	—	—	7.50	7.08	1.52
400	Small	7.44	8.27	7.36	3.45	6.39	—	—	—	—
	Large	5.36	7.69	4.81	3.58	5.78	—	—	—	—
	Flowering	3.51	3.89	2.21	2.66	—	4.36	3.92	—	—
	Harvest	4.95	4.40	2.59	2.18	—	—	8.08	6.50	1.37

Levels of nitrogen, g/plant	Dry matter, g/plant				Nitrogen				Phosphorus				Potassium			
	Small	Large	Flow-ering	Harv-est	Small	Large	Flow-ering	Harv-est	Small	Large	Flow-ering	Harv-est	Small	Large	Flow-ering	Harv-est
0	435.4	1505.7	4227.1	4589.5	6.49	29.91	51.07	44 95	0.68	2.15	5.20	5.75	26.55	94.51	161.51	171.40
100	471.1	1652.5	4582.3	5017.9	8.36	28.29	68.75	47.83	0.89	3.02	5.32	6.53	29,94	107.57	180.69	175.61
200	466.2	2014.8	4947.8	5190.2	9.74	41,27	78.42	55 53	0.82	3.30	5.70	5.91	27.00	116.24	190.28	158.56
300	553.1	2064.2	5325.3	5577.9	12.13	43.23	92.34	68.22	1.04	3.99	5.67	6.21	30.38	121.40	180.77	170.89
400	603.2	2429.2	5703.9	5878.8	14 14	51.50	103.3	74.97	1.19	3.89	6.10	7,30	33.46	127.55	187.56	169.12
CD (5%)	72.6	206.4	628.3	413.7	3.09	7.32	20.60	11.60	0.21	0.62	NS	0.69	4.79	22.03	NS	NS
SEm+	24.2	68.8	209.5	137.9	1.03	2.44	6.87	3.87	0.07	0.21	0.27	0.23	1 59	7.35	1267	84.7

സംഗ്രഹം

മഴയെമാത്രം ആശ്രയിച്ച് കൃഷിചെയ്യുന്ന പാളയംകോടൻ വാഴ ഇനത്തിൽ മൂലക
ങ്ങളുടെ ആഗിരണം സംബന്ധിച്ച് കേരള കാർഷിക സർവകലാശാലയിൽ നടത്തിയ പഠ
നത്തിൽ, നൽകുന്ന പാക്യജനകത്തിന്റെ അളവ് കൂടുമ്പോഴും തോതും
അതനുസരിച്ച് കൂടുന്നതായി കണ്ടു. പാക്യജനകം നൽകുന്നതുമൂലം ഭാവഹത്തിന്റെ

യും ക്ഷാരത്തിന്റേയും ആഗിരണം വളർച്ചക്കനുസരിച്ച് കൂടുന്നതായി കണ്ടെങ്കിലും ക്ഷാരത്തിന്റെ ആഗിരണം പാകൃജനകത്തിന്റെ അളവിനു് ആനുപാതികമായി കൂടുന്നതായി കണ്ടില്ല.

References

Anonymous 1979 *Packages of Practices, Recommendations,* Kerala Agricultural University.

Ashokkumar, A R. 1977 Studies on the growth and development of banana Musa. (AAA group, Cavendish subgroup) 'Robusta' in relation to foliar and soil application of nitrogen and azotobactor. Sc. (Ag.) thesis submitted to the Tamil Nadu Agricultural University, Coimbatore.

Baillon, A. F., Holmes, E. and Lewis, A. H. 1933 The composition of, and nutrient uptake by the banana plant, with special reference to canneries. *Trop. Agric, Trin.* 10: 139–144.

Boland, D. 1960 Leaf analysis of banana. *Rep. Banana Board Res. Dept.* Jamaica.

Martin-Prevel. P. 1962 Mineral elements in banana plants and fruit bunches. *Fruits d' Outre Mar.* 17:123–128.

Martin-prevel, P 1964 Nutrient elements in the banana plant and fruit. *Fertilite* 22:3-1 4.

Twyford, I. T. and Walmsley, D. 1973 The mineral composition of the Robusta banana plant:I. Methods and plant growth studies. *Plant and Soil.* 39:227–243.

Veerannah, L., Selvaraj, P and Alagiamanavalan, R. S. 1976 Studies on the nutrient uptake in Robusta and Poovan. *Indian J. Hort.* 33 (3 4) 203-208.

Walmsley, D. and Twyford, I. T. 1968 The translocation of phosphorus within a stool of Robusta banana. *Trop. Agric. Trin.* 45: 229-232.

*(M. **S. received** 7-8-81)*