

**STUDIES ON THE EFFECT OF METHODS OF NITROGEN
APPLICATION ON MINERAL UPTAKE OF HIGH
YIELDING SWEET POTATO VARIETIES**

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Split application of nitrogenous fertilizers at the correct time offers an effective means of increasing the efficiency of the applied fertilizer nitrogen. De and Singh (1963) found that foliar applied nitrogen was better utilized by potato than when applied in the soil. Roy *et al.*, (1968) found that foliar application of nitrogen resulted in increased nitrogen uptake by radish plants. But time of application of nitrogen was found to have no conspicuous effect on sweet potatoes (Nair, 1972). The present investigation was therefore taken up to study the uptake of nitrogen due to different methods of application by high yielding sweet potato varieties.

Materials and Methods

The experiment was carried out at the farm attached to the College of Agriculture, Vellayani, Trivandrum during the period from November 1972 to March 1973. The soil of the experimental area is red loam containing 0.056 per cent nitrogen, 0.002 per cent available phosphorus and 0.00069 per cent available potash and a pH of 5.5. The treatments consisted of factorial combinations of three varieties and four methods of application of nitrogen. The varieties of sweet potato used were H 41, H 42 and Kottaranchola. The methods of nitrogen application were as follows. (i) 75 kg nitrogen as basal (ii) 37.50 kg nitrogen basal + 37.50 kg nitrogen as top dressing (iii) 37.50kg nitrogen basal + 37.50 kg nitrogen foliar, and (iv) 37.50 kg nitrogen basal + 18.75 kg nitrogen foliar. A uniform dose of 37.5 kg nitrogen, 50 kg phosphorus and 75 kg potash per hectare were applied in all the plots at time of planting.

Nitrogen content of tuber and vine taken at four successive stages of growth was estimated by the modified Micro-kjeldahl method (Jakson, 1962). From the nitrogen content of vine and dry matter yield of sample plants, nitrogen uptake of vine was calculated. Similarly nitrogen uptake of tuber was calculated at various stages from nitrogen contents and sample dry weight. Total nitrogen uptake was obtained by adding nitrogen uptake of vine and tuber.

Results and Discussion

Nitrogen uptake of vine at 30th, 60th, 90th days after planting and at harvest; nitrogen uptake of tuber at 60 and 90 days after planting and at

harvest and total nitrogen uptake of sweet potato at 30th, 60th and 90th days after planting and at harvest are presented in Tables 1, 2 and 3.

Significant difference in the total nitrogen uptake was noticed between varieties during the first and last observation. On the 30th day H 42 was significantly superior to H 41 and to the local variety. At the time of harvest also H 42 showed its significant superiority in total nitrogen uptake. At all stages, the local variety recorded the lowest nitrogen uptake.

Table 1
Effect of methods of application of nitrogen on nitrogen uptake of vine of sweet potato varieties (in kg/ha)

Varieties	Days after planting			Harvest
	30	60	90	
H 41	18.80	43.98	37.73	41.24
H 42	27.43	50.23	44.41	47.07
Kottaranchola	16.77	40.37	34.92	38.26
'F' test	Sig.	Sig.	N. S.	•N. S.
S, Em. ±	1.72	2.00	3.40	5.00
C. D. (0.05)	5.58	5.84		
<i>Methods of application</i>				
75.00 kg N single basal	22.73	44.87	37.67	38.72
37.50 kg N basal plus 37.50 kg N top dressing.	21.93	41.72	37.12	38.92
37.50 kg N basal plus 37.50 kg N foliar	24.41	49.82	45.23	48.35
37.50 kg N basal plus 18.75 kg N foliar	20.93	48.33	35.07	39.95
'F' test	N. S.	N. S.	N. S.	N. S.
S. Em. ±	2.16	2.32	4.00	5.76

From the data on nitrogen uptake by vines (Table 1), it is clear that H 42 was superior in nitrogen uptake on 30th and 60th days after planting. Similarly the uptake of nitrogen by tuber (Table 2) shows that H 42 was

table 2

**Effect of methods of application of nitrogen on nitrogen uptake of
tuber (in kg/ha) of sweet potato varieties**

Varieties	60 days after planting	90 days after planting	Harvest
H 41	10.64	26.11	29.34
H 42	14.20	34.57	40.10
Kottaranchola	6.64	16.08	18.70
'F' test	Sig	Sig	Sig
S. Em. +	1.16	2.76	2.32
C D. (0.05)	3.32	8.00	6.84
<i>Methods of application</i>			
75.00 kg N single basal	8.82	18.56	21.99
37.50 kg N basal plus 37.50 kg N top dressing	9.31	16.68	20.62
37.50 kg N basal plus 37.50 kg N foliar	12.72	33.67	37.47
37.50 kg N basal plus 18.75 kg N foliar	10.36	24.11	27.79
test	N. S.	Sig.	N. S.
S. Em. +	1.48	3.06	2.76
C. D. (0.05)	—	9.16	—

Sig. — Significant

N. S. — Not significant

superior in tuber nitrogen uptake in all stages over other varieties, The inferiority in genetic constitution may be the probable cause for the lowest nitrogen uptake and inefficient use of absorbed nitrogen by the local variety. Variety H 41 was intermediate in all the above characters.

Methods of application of nitrogen showed significant difference on the 90th day after planting. Half basal plus half foliar method registered the highest value which was significantly superior to other treatments. Half basal

Table 3

Effect of methods of application of nitrogen on total nitrogen uptake of sweet potato varieties (in kg/ha)

Varieties	Days after planting			Harvest
	30	60	90	
H 41	18.80	54.62	63.84	70.58
H 42	27.43	63.43	81.97	87.17
Kottaranchola	16.77	46.81	51.01	56.96
'F' test	Sig	N. S.	N. S.	Sig.
S. Em. ±	1.72	4.76	5.32	5.39
C. D. (0 05)	5.58	—	•	15.42
<i>Methodes of application</i>				
75 kg N as single basa!	22.73	53.70	57.23	60.29
37.50 kg N basal plus 37.50 kg N top dressing	21.93	51.04	53.34	59.54
37.50 kg N basal plus 37.50 Kg N as foliar	24.41	57.53	78.89	85.82
37.50 kg N basal plus 18.75 kg N as foliar	20.93	58.89	59.18	67.75
'F' test	N. S	N. S.	Sig.	N. S.
S. Em. ±	2.16	5.48	5.32	7.0S
C. D. (0.05)	—	—	18.08	—

Sig. — Significant

N. S. — Not significant

plus one-fourth foliar treatment ranked second in this respect. At all other stages, highest uptake value was recorded by half basal application plus half foliar treatment although the differences were not significant.

A comparison of the data on the uptake of nitrogen by vines and tubers shows that in methods of application, tubers had a significant influence in effecting total nitrogen uptake. One of the factors that determine the

absorption and utilization of nitrogen is the availability of this element throughout the growing period. Split application of nitrogen aims at continued supply of this element to meet the requirement of the crops. Application of half nitrogen at planting and the remaining half at active growing stage as foliar might have resulted in increased nitrogen uptake by minimizing the losses. Shanmugavelu *et al* (1973) obtained similar results in sweet potato and De and Singh (1963) in potato.

Over the stages there was a steady increase in total nitrogen uptake of all the varieties till harvest, there being a rapid increase up to the 60th day. An increasing trend was noticed in the nitrogen uptake by the tuber, whereas, vines showed a marked increase in uptake from 30th to 60th day followed by a decline from 60th day onwards. Translocation of nitrogen from vine to the developing tubers may be the reason for this decreasing trend. Similar results in translocation of nitrogen from vines to tubers were reported by Nair (1972).

Summary

A field experiment was conducted in the red loam soils of the farm attached to the College of Agriculture, Vellayani during November 1972 to March 1973 to study the effect of methods of nitrogen application on nitrogen uptake of three sweet potato varieties i, e. H 41, H42 and Kottaranchola. The results showed that nitrogen uptake was markedly affected by methods of application. Uptake was more when nitrogen was applied in two split doses., i. e. half at planting and the remaining half as foliar spray 35 days after planting. Full basal application resulted in the lowest uptake of nitrogen. It was also observed that there was a translocation of considerable portion of nitrogen from vines to developing tubers.

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എച്ച്-41, എച്ച്-42, കൊട്ടാരൻ ചോള എന്നീ വിവിധ

നൈട്രജൻ നൽകുമ്പോൾ രാഠനൻ്റെ അഗ്രിരണത്തെ എങ്ങനെ ബാധിക്കുന്നു എന്ന വിവരങ്ങൾ വേണ്ടി 1972-73 ൽ ഒരു പരീക്ഷണം നടത്തുകയുണ്ടായി. ആകെത്തന്നെ നൈട്രജൻ പകർന്നു നൽകുന്ന സമയത്ത് മണ്ണിൽ കൂടിയും ബാക്കി പകർന്നു നൽകുന്ന 35 ദിവസം കഴിയുമ്പോൾ ഇവയിൽ നൈട്രജൻ കൂടുതൽ നൈട്രജൻ സ്വീകരിക്കുന്നുവെന്നും തെളിഞ്ഞു. മുഴുവൻ നൈട്രജനും നൽകിയപ്പോൾ വളരെ കുറഞ്ഞതായി കണ്ടു. വളമായിരിക്കുമ്പോൾ നല്ലൊരു ഭാഗം നൈട്രജൻ സ്ഥാനം മാറ്റുന്നതായും അനുഭവപ്പെട്ടു.

REFERENCES

- De, Rajit and Singh, A. K. 1963. Effect of soil and foliar application of N, P and K on the yield of potato. *Indian Potato Jour.* 5, \
- Jackson, M. L. 1962. *Soil Chemical Analysis.* Prentice Hall Inc. p 452.
- Nair, G. M. 1972. Studies on the performance of three selected varieties of sweet potato under different levels and timings of nitrogen application in red loam soils of **Vellayani**. M. Sc. (Ag) Thesis, University of Kerala.
- Roy, R. N. and Jagadishseth. 1968. Foliar fertilization in radish fetches good returns. *Indian Fmg.*
- Shanmugavelu, K. **G.**, Thamburaj, S. and **Shanmugam A.** 1973. Effect of soil and foliar application of **nitrogen** on the yield of sweet potato. *Fertilizer News*, **18**, 51-52.

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