

## SOIL FERTILITY VARIATIONS AS AFFECTED BY BASAL AND FOLIAR APPLICATION OF UREA TO **GROUNDNUT** \*

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In leguminous crops, particularly groundnut, the supply of nitrogen through fertilizer is limited in view of the ability of these crops for symbiotic nitrogen fixation. Peeran *et al.* (1970) reported that if the plant nitrogen content at the time of first flowering is increased by foliar application of urea, the yield reduction could be checked.

Joshi and Joshi (1964) indicated that introduction of legumes in a double cropping sequence under good management will decrease the nutrient requirement of the subsequent *rabi* crop and will bring about better fertilizer use efficiency.

The present investigation was undertaken to study the effect of basal and foliar application of nitrogen to groundnut at the time of flower initiation, on plant composition and to study the resultant residual soil fertility.

### **Materials and Methods**

A field experiment was conducted with groundnut (AK 12-24) during the *kharif* season of 1975, at Agricultural College Farm, Indore in a 6x4 Randomised block design. The treatments were control, 10 Kg N/ha as basal, 20 Kg N/ha as basal, 2% urea spray at flower initiation, 10 Kg N/ha as basal plus 2% ureas pray at flower initiation and 20 Kg N/ha basal plus 2% urea spray at flower initiation. With regard to fertility, the soil was of low status in nitrogen (195 Kg N/ha) and phosphorus (22 Kg  $P_2O_5$ /ha) and of high status in potash (1129 Kg  $K_2O$ /ha). A basal dose of phosphorus at the rate of 40 Kg  $P_2O_5$ /ha was given uniformly in the rows of the experimental plots and seeds were sown at row spacing of 45 cm.

Nitrogen content of the plant before applying 2% urea spray at first flower initiation and at third flowering was determined by the Kjeldahl's method. The residual fertility on the rows and the space in between the rows were estimated after harvest of groundnut as per techniques detailed in Piper (1950).

### **Results and Discussion**

Table 1 presents data on the content of plant nitrogen during the first and third flowering stages, dry matter content at third flowering stage and the yield of

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\* Part of me M. Sc. (Ag.) thesis submitted by the first author to the JNKV Jabalpur, 1976

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groundnut. It can be observed that at the time of first flower initiation before foliar application of 2% urea, the plant nitrogen content under 10 Kg nitrogen and 20 Kg nitrogen levels as basal are more or less same, with a range of 3.14–3.36 per cent, but it is significantly higher than the control (2.69–2.84 per cent).

With regard to dry matter production, the basal and foliar applications of nitrogen has resulted in a significant increase in its percentage with a range of 22.75 to 26.69 over the control.

It may also be seen that the nitrogen content in plant at third flowering stage is comparatively less than that at the first flowering stage under all the treatments which is evidently due to the greater utilisation of nitrogen for pod formation.

The plant nitrogen content at third flowering stage was significantly higher in treatments which received nitrogen either as basal or foliar application than that of control. Further, application of urea as 2% foliar spray alone and with 10 Kg nitrogen as basal have also resulted in a significant increase in plant nitrogen content. But this effect was not manifested when the foliar spray was given over a basal dose of 20 kg nitrogen.

Dry matter percentage at the time of third flowering stage also showed a similar influence on the plant nitrogen content, excepting the superiority of the treatment involving 20 kg N/ha as basal and 2% urea spray over those of 20 kg N/ha as basal alone and of 10 kg N/ha as basal with 2% urea spray. Thus it is evident that 2% urea spray has a significant effect in increasing nitrogen efficiency and utilisation by plants.

The yield data reveals that though the treatment effect is not significant, trend of higher yields were recorded where the plant nitrogen contents were higher at the time of third flowering.

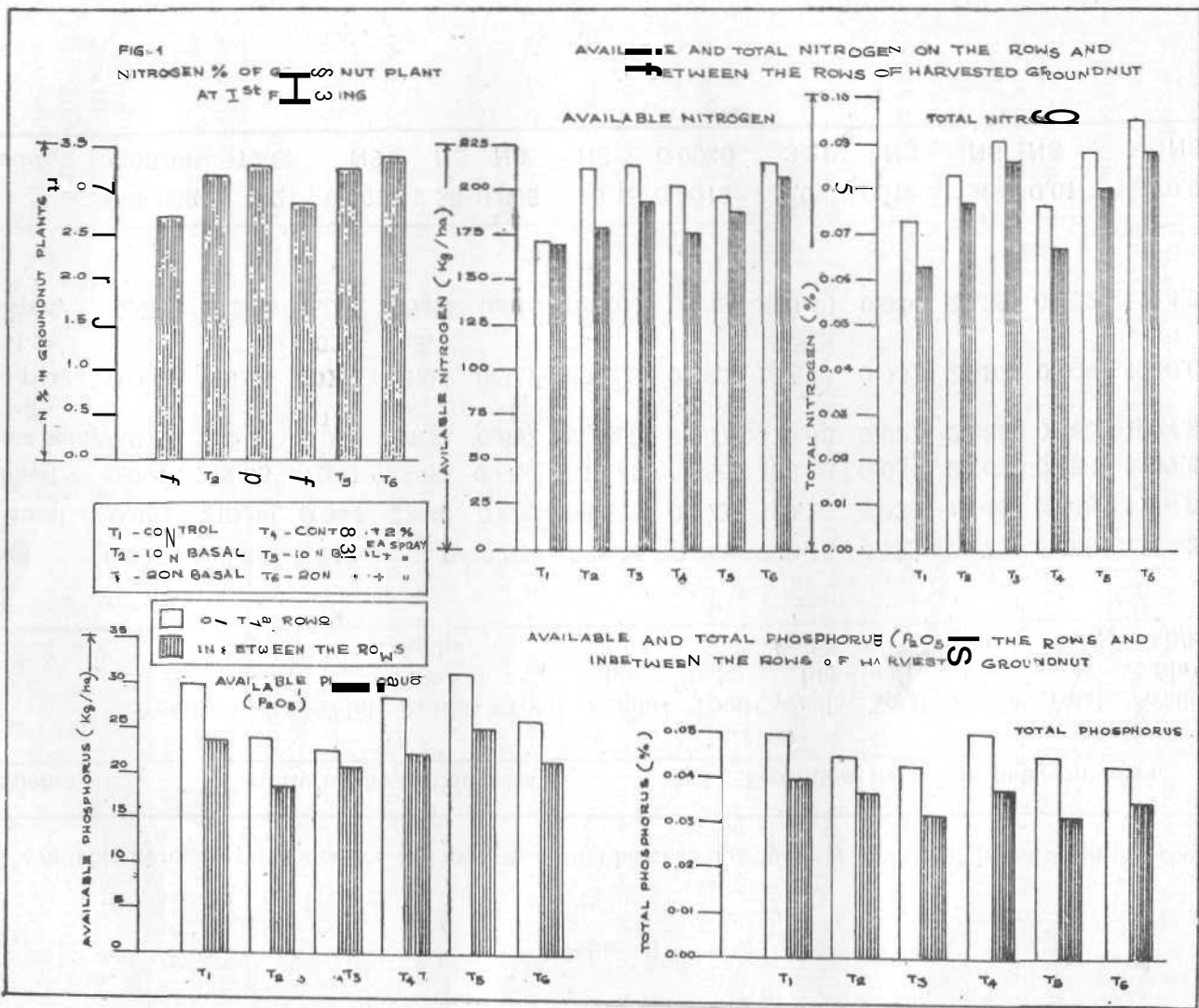
Table 1  
Plant nitrogen at first and 3rd flowering under different treatments.

Sl. no.	Treatment (levels of N in Kg/ha)	Mean N% at 1st flowering	Mean % on 3rd flowering	Mean dry matter % at 3rd flowering	Mean yield of groundnut (q/ha)
1.	Control	2.69	2.203	21.16	8.62
2.	10 N basal	3.14	2.285	23.0	8.81
3.	20 N basal	3.26	2.345	25.26	10.47
4.	Control +2% urea spray	2.84	2.270	22.75	8.47
5.	10 N +2% urea spray	3.22	2.355	25.04	10.69
6.	20N +2% urea spray	3.36	2.398	26.69	10.40
	SE	0.065	0.018	0.35	0.85
	CD (pt 0.05)	0.196	0.054	1.04	NS

Table II

Total and available nitrogen, phosphorous and potash on the harvested groundnut rows and in between the rows

Treatments	Fertility of the soil on rows						Fertility of the soil in between rows.					
	N		P		K		N		P		K	
	Total %	Availa- ble kg/ha	Total %	Availa- ble kg/ha	Total %	Availa- ble kg/ha	Total %	Availa- ble kg/ha	Total %	Availa- ble kg/ha	Total %	Availa- ble kg/ha
1 Control	0.073	193.38	0.049	30.0	0.634	929.25	0.063	170.13	0.039	23.75	0.646	1168.32
2 10 N Basal	0.083	210.50	0.044	23.88	0.637	982.43	0.077	179.25	0.036	18.48	0.648	1176.50
3 20 N basal	0.091	212.63	0.042	22.60	0.650	1016.43	0.086	193.38	0.031	20.60	0.654	1117.50
4 2% urea spray	0.076	201.25	0.049	28.33	0.652	896.65	0.067	175.63	0.037	22.33	0.663	1024.92
5 10N +2% ureas pray	0.033	193.85	0.044	31.05	0.627	895.65	0.080	187.35	0.031	24.93	0.628	1056.00
6 20 N +2% urea spray	0.096	215.25	0.042	25.85	0.619	980.00	0.088	206.43	0.034	21.28	0.632	1124.00
SE	0.00092	4.21	0.003	2.35	0.009	38.15	0.0013	1.07	0.0012	1.49	0.01	70.04
CD at5%	0.00296	12.68	NS	NS	NS	NS	0.0040	3.21	NS	NS	NS	NS



From these results it may be observed that for better yield of groundnut, particularly of the Spanish Variety AK-12-24, the critical plant nitrogen content at first flower initiation and third flowering should be in the range of 3.22-3.36% and 2.34-2.39% respectively. To attain this critical level in plant, nitrogen should be applied either as 20 kg N/ha as basal or 10 kg N/ha as basal plus 2% urea spray at first flower initiation. Among the two doses, the second one economises the fertilizer cost.

Table 2 presents data on total and available nutrient contents after the harvest of groundnut crop. The results show that the amount of total and available nitrogen on the rows are significantly higher in treatment with 20 Kg N/ha as basal alone and in combination with 2% urea spray. This indicates that application of 20 Kg N/ha as basal dose gives sufficiently good vegetative growth by giving better initial start and dry matter yield to crop without disturbing the activities of nitrogen fixing bacteria and leaves enough nitrogen in the soil along the rows of harvested groundnut crop. The residual total and available forms of phosphorus and potash in the soil on the rows under all the six treatments were found to be almost similar. Samples collected from the space in between the harvested groundnut rows also gave highest amounts of total and available nitrogen in plots which received 20 Kg N/ha as basal and 20 Kg N/ha as basal plus 2% urea spray. The amount of residual total and available forms of phosphorus and potash in the space in between rows did not show much difference among different treatments.

A comparison of the residual fertility of the soil on the rows and in between the rows (Fig. 1) after harvesting groundnut, it was observed that total and available nitrogen and phosphorus were higher in the rows than in between the rows. These findings suggest that in a double cropping sequence like groundnut-safflower with zero tillage under dryland conditions or groundnut-wheat with zero tillage under partially irrigated condition, sowing of second crop right on the harvested groundnut rows will give a better initial start to the second crop due to the higher residual fertility on the rows than in between the rows.

### Summary

A field experiment was conducted at the Agricultural College Farm, Indore to study the impact of basal and foliar application of urea to groundnut at the time of flower initiation on plant composition and on the residual fertility of the soil for the subsequent rabi crops. The study has revealed that supply of 20 Kg N/ha alone and in combination with 2% urea spray, though not giving a significant increase in yield of groundnut, resulted in increased residual fertility of the soil on the rows than in between rows.

### Acknowledgement

The authors are thankful to Sri. Thomas Varghese, Associate Professor, Kerala Agricultural University for his help in the preparation of this paper.

### സംഗ്രഹം

കാരിത മണ്ണിൽ നടത്തിയ ഒരു പരീക്ഷണത്തിൽനിന്നും നിലക്കടലകൃഷിക്ക് യൂറിയ ഹെക്ടറിന് 20 കിലോഗ്രാം നിരക്കിൽ അടിവളമായി നേരിട്ടു ചേർക്കുന്നതും അതോടൊപ്പം രണ്ടു ശതമാനം യൂറിയ പർണ്ണപോഷണംവഴി പൂവരുന്നതിനുശുപ്തളിക്കുന്നതും വിളവുവർദ്ധനയ്ക്കും മണ്ണിലെ അനന്തര ഫലപുഷ്ടി ചെച്ചപ്പെടുത്തുന്നതിനും വളരെ ഗുണകരമാണെന്നു കാണുകയുണ്ടായി.

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(M. S. Received: 8-2-1980)