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EFFECT OF POST-FLOWERING FOLIAR APPLICATION OF NUTRIENTS ON GROWTH, YIELD AND ECONOMICS OF RAINFED GROUNDNUT (*ARACHIS HYPOGAEA* L)

A.K. PATRA[1], S.K. TRIPATHY[2] AND R.C. SAMUI

Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya,Mohanpur, West Bangal-741252

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SUMMARY

A field experiment with post-flowering spraying of nutrient solutions (KNO_3 0.5% Ca $(NO_3)_2$ 0.5% and urea 2.0%) at 50% flowering and 20 days thereafter was conducted on three groundnut (Arachis hypogaea L) varieties during 1992 and 1993 rainy seasons at Kalyani in West Bengal. The results revealed that spraying of nutrient solutions increased LAI, CGR, pods/plant, shelling (%) and 100-kernel weight. The increase in pod yields due to spraying of KNO_3, Ca $(NO_3)_2$ and urea over control (water spray) was 28.0, 24.9 and 7.8% and increase in oil yields was 27.0, 24.8 and 7.6% respectively. The economic analysis showed that spraying KNO_3 solution gave highest net return @ Rs 10,117.00/ha with an additional net return @ Rs 5069.00/ha over control. ICGS 44 and JL 24 were high yielders as compared to ICGV 86015.

INTRODUCTION

The quantum of agronomic researches carried out in India for evolving better package for groundnut (*Archis hyogaea* L) was quite substantial, of which lion's share has gone under manurial trials mainly on dose determination, time and method of fertilizer application. Very little attention was paid on the post-flowering manipulation of the crop.

However, in recent years, some encouraging results with post-flowering foliar application of nutrients on yield of groundnut have been reported (Patra, 1974; Gopalkrishnan, 1984; Panchaksharaiah, 1985; Reddy *et al.*, 1991). Keeping this in view an experiment was conducted to study the effect of post-flowering spraying of nutrient solutions on rainfed groundnut in rainy season.

MATERIALS AND METHODS

A field experiment on groundnut was conducted at University Farm, Kalyani in west Bengal during rainy seasons of 1992 and 1993. The soil was sandy loam in texture and medium in fertility status (0.7% organic carbon, 0.07% total N, 16.5 kg available P_2O_5 and 169 kg available K_2O/ha) and neutral in reaction (pH 7.4). The experiment was laid out in factorial randomised block design in 3 replications. The treatments comprised of spraying of 3 nutrient solutions (KNO_3 0.5%, Ca $(NO_3)_2$ 0.5% and urea 2.0%) and water as control on three varieties, JL 24, ICGS 44 and ICGV 86015. The crop was sown in lines of 30 cm apart during Ist week of July and

Present address : [1]Regional Research Station, OUAT, Chiplima 768 025.

[2]Agricultural Research Station, OUAT, Berhampur 761 001.

was harvested during last week of October. Twenty, 40 and 40 kg N, P_2O_5 and K_2O/ha in the form of urea, SSP and MOP, respectively, were applied as basal. Dilute solution of nutrients (KNO_3 0.5%, Ca $(NO_3)_2$ 0.5% and urea 2.0%) and water @ 750 litre/ha were sprayed in the forenoon of sunny days at 50% flowering and 20 days thereafter. The crop was kept free from major incidence of insect pests and diseases and was grown rainfed. In each plot, one third area was earmarked for recording biometrical observations and the rest for yield determination. Leaf area index (LAI) was determined by area-weight relationship of leaves (Kemp, 1960) while crop growth rate (CGR) was computed as suggested by Watson (1952). Yield components and yields were recorded at harvest. Oil content in Kernel was determined by Soxhelt's Extraction Apparatus. Statistical analysis of data was done by the analysis of variance method (Gomez and Gomez, 1984). Economic analysis was done on the basis of prevailing market prices of inputs and outputs.

RESULTS AND DISCUSSION

ICGS 44 and JL 24 recorded significantly higher values of LAI and CGR, higher number of pods/plant and Kernels/pod, higher shelling (%) and 100 kernel weight as compared to ICGV 86015 (Table I). Although ICGS 44 gave significantly higher pod and kernel yields than other two varieties, ICGS 44 and JL 24 did not vary much in oil yield (Table II). Higher oil content in kernel of JL 24 compensated lower pod and kernel yields. Significantly higher haulm yield was obtained with ICGS 44. Rout *et al.* (1990) and Deshmukh and Dev (1994) also identified ICGS 44 and JL 24 as high yielders.

Post-flowering foliar application of nutrient solutions significantly and positively influenced the growth attributes such as LAI (70 and 90 DAS) and CGR (50-70

Table I: Effect of varieties and foliar application of nutrient solutions on growth parameters and yield components of ground nut (pooled over 2 years data).

	Plant height (cm)	Leaf area index			Crop growth rate (g/m^2)			Pods/ plant	Shelling (%)	100 Kernel weight (g)	Kernels/ pod	Oil content in kernel (%)
		50 DAS	70 DAS	90 DAS	30-50 DAS	50-70 DAS	70-90 DAS					
Nutrient solution spray												
Water (Control)	50.9	1.61	3.14	1.03	9.3	9.7	7.2	12.7	68.7	44.3	1.77	47.13
Ca $(NO_3)_2$ 0.5%	52.9	1.65	3.72	2.50	9.5	11.4	9.1	15.9	70.2	46.7	1.83	46.07
KNO_3 0.5%	52.1	1.79	4.43	2.72	9.7	12.9	8.8	17.1	70.0	48.0	1.82	45.83
Urea 2.0%	53.2	1.80	4.12	2.59	9.6	11.8	7.9	14.3	69.5	45.5	1.80	46.55
S. Em. (±)	0.8	0.07	0.09	0.12	0.11	0.18	0.08	0.18	0.20	0.70	0.03	
C.D (P = 0.05)	NS	NS	0.26	0.34	NS	0.52	0.24	0.52	0.68	2.06	NS	
Variety												
JL 24	53.1	1.76	4.03	2.23	9.9	12.2	8.3	15.8	70.6	48.2	1.89	48.44
ICGS 44	52.9	1.88	4.08	2.38	9.7	12.3	9.2	16.2	71.0	49.9	1.85	46.09
ICGV 86015	50.9	1.46	3.44	2.03	9.0	9.9	7.3	12.9	67.1	40.2	1.67	44.65
S.Em. (±)	0.7	0.06	0.08	0.10	0.10	0.16	0.07	0.16	0.17	0.60	0.03	
C.D (P = 0.05)	NS	0.18	0.23	NS	0.29	0.47	0.21	0.47	0.50	1.78	0.09	

N.S = Not significant

Table II: Effect of varieties and foliar application of nutrient solutions on yield of ground nut.

	Pod yield (Kg/ha)			Kernel yield (kg/ha)			Oil yield (kg/ha)			Haulm yield (kg/ha)		
	1992	1993	Pooled	1992	1993	Pooled	1992	1993	Pooled	1992	1993	Pooled
Nutrient solution spray												
Water (Control)	2100	2054	2077	1445	1407	1426	692	652	672	4582	4400	4491
$Ca(NO_3)_2$ (0.5%)	2664	2525	2595	1873	1767	1820	870	807	839	4775	4565	4670
KNO_3 (0.5%)	2737	2583	2660	1916	1808	1862	883	824	854	4920	4687	4804
Urea (2.0%)	2308	2170	2239	1599	1510	1555	749	698	723	4863	4605	4734
S. Em. (±)	52	44	33	46	32	29	22	17	13	58	42	29
C.D. (P = 0.05)	152	129	93	135	95	81	64	51	36	170	123	81
Variety												
JL 24	2576	2435	2505	1816	1726	1771	894	822	858	4724	4428	4576
ICGS 44	2703	2662	2683	1919	1890	1905	898	858	878	4950	4700	4825
ICGV 86015	2078	1900	1989	1398	1269	1334	621	569	595	4683	4565	4624
S. Em (±)	45	38	29	40	28	25	19	15	11	50	36	25
C.D (P = 0.05)	132	111	82	117	82	70	56	44	30	147	107	71

and 70-90 DAS) and yield components such as pods/ plant, shelling (%) and 100-kernel weight. Foliar spray of $Ca(NO_3)_2$ 0.5 %, KNO_3 0.5% and urea 2.0% increased LAI (70 DAS) by 18.5, 41.1 and 31.2% and CGR (70-90 DAS) by 26.4, 22.2 and 9.7%, respectively, over control. Similarly foliar spray of $Ca(NO_3)_2$ 0.5, KNO_3 0.5% and urea 2.0% increased pods/plant by 25.2, 34.6 and 12.6% and 100-kernel weight by 5.4, 8.4 and 2.7%, respectively, over control. The superiority of foliar nutrition might be due to coincidence of foliar application with peak nutrition requirement of the crop, as a supplementation to soil application. The quantity of nutrients absorbed by roots at peak period of nutrient requirement may not be sufficient to meet the needs at pod development stage. Supplementing nutrients through foliage might have resulted in better nutrient balance in the plants leading to increased yield components. Similar results were also observed by Reddy *et al.* (1991). Higher shelling (%) with spraying the nutrient solutions might be due to formation of healthy pegs which absorb more nutrients from the fruiting zone for better filling up of pods, supporting the findings of Patra (1974).

The yield data clearly showed the superiority of post- flowering spraying of plant nutrients over control. Foliar spray of KNO_3 0.5%, $Ca(NO_3)_2$ 0.5% and urea 2.0 % increased pod yield by 28.0, 24.9 and 7.8%, kernel yield by 30.5, 27.6 and 9.0% and oil yield by 27.0, 24.8 and 7.6%, respectively, over control. This increase was due to the overall increase in yield components. Similar results were also reported by Gopalkrishnan, (1984); Panchaksharaiah, (1985) and Reddy *et al.*, (1991).

The economic analysis showed that spraying KNO_3 solution 0.5% brought out highest net monetary return (@ Rs 10,117.00 /ha) and highest additional net return (@ Rs 5069.00 /ha) over control. Similarly spraying $Ca(NO_3)_2$ solution 0.5 % gave a net return @ Rs 9437.00/ ha with an additional net return @ Rs. 4389.00/ha over control and spraying urea solution 2.0% gave a net return @ Rs. 6498.00 /ha with an additional net return @ Rs 1450.00/ha over control.

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