https://doi.org/10.29321/MAJ.10.A02146

Madras Agric. J. 74 (1) : 21-25 January 1987

STUDIES ON NITROGEN AND WEED MANAGEMENT IN RELATION TO NUTRIENT UPTAKE AND YIELD IN SORGHUM

R. JAYAKUMAR[1], K. SIDDESWARAN[2], N. KEMPUCHETTY[3] and S. SUBRAMANIAN[4]

Field experiments were conducted in summer and *Kharif* seasons of 1982 at Tamil Nadu Agricultural University to study the nitrogen use economy and efficacy of herbicides in relation to nutrient uptake and yield of irrigated sorghum Var. Co. 24. Application of pre-emergence atrazine at 0.5 Kg/ha or 0.25 Kg/ha followed by one late manual weeding (35 DAS) registered higher grain yield, nutrients uptake by the crop as well as reduced nutrient removal by weeds in both the seasons at all nitrogen levels. Application of 60 Kg N/ha in equal splits (50% Basal + 50% at 30 DAS) recorded higher grain yield of 5866 and 4773 Kg/ha for summer and kharif seasons respectively and it was on par with 90 Kg N/ha indicating the economic utilization of nitrogen with pre-emergence application of atrazine.

Sorghum (*Sorghum vulgare* Pers) crop suffers heavily in its early stages of growth due to competition from weeds. Weeds are characterised by a fast growth rate in the initial stages, thus creating a potential source of formidable competition for soil nutrients resulting in a serious handicap to young crop in its growth and development. The uptake of nutrients by sorghum crop is very much reduced when crop is allowed to grow in association with weeds for a long time (Bushan Rao, 1979). Sankaran and Mani (1972) reported that at 35 days stage of sorghum crop, the uptake of nutrients by weeds associated with the crop was 46, 19.3 and 47.7 kg/ha of N, P and K respectively, whereas the sorghum crop at the same time could remove only 23.8 9 4 and 46.8 kg/ha of N, P anp K indicating that weeds removed twice the amount of N and P and equal amount of K compared to sorghum crop. Walia and Gill (1985) reported that higher levels of nitrogen and the herbicide treatments for control of weeds resulted in higher uptake of N, P and K by wheat.

MATERIALS AND METHODS

With a view to study uptake of nutrients by weeds and crop as influenced by application of N and weed control treatments, Field experiments were condncted in summer and *kharif*, 1982 at Tamil Nadu Agrl. University Farm. The experiments were conducted in split-plot design and replicated thrice. The treatments in main plot constitute nitrogen application i. e., N_1 - 90 Kg N/ha in two splits (50% basal + 50% 30 DAS), N_2 - 45Kg N/ha as basal alone, N_3 - 60 Kg N/ha in two splits (50% basal + 50% 30 DAS), N_4 - 30 Kg N/ha as basal alone, N_5-30 Kg N/ha in two splits (50% basal + 50% 30 DAS), N_6 - 15 Kg N/ha as basal alone, N_7 - No Nitrogen.

1-2 : Assistant Professor, 3 : Associate Professor, 4 : Director
Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore-641 003.

The sub-plot treatments constitute W1-pre-emergence application of atrazine 0.5 Kg/ha, W2-Post emergence application of 2, 4-D Na salt 2.0 Kg/ha at 15 DAS, W3-pre emergence application of atrazine 0.25 Kg/ha+one manual weeding on 35 DAS, W4-Post-emergence application of 2, 4-D Na salt 1.0 Kg/ha + one manual weeding on 35DAS. W5-Farmer's practice of two manual weedings on 15 and 35DAS and W6-unweeded control, pre and post-emergence herbicides were mixed with 500 litres of water/ha and sprayed with the help of a bakpak sprayer on 2nd and 15th day after sowing The plant and weed samples were collected 35 DAS, processed and analysed for nutrient content. The N content was analysed by microkjeldhal's method (Humpries, 1956), P and K by vanadomolybdate and flame photometric methods respectively (Piper, 1966). The uptake values were computed by multiplying the nutrient content with the respective dry weight of crop and weeds The yields of grain and stalk were recorded plotwise and the data were analysed statistically.

RESULTS AND DISCUSSION

The nutrient removal by weeds, uptake by crop and the yield of grain and stalk for both the seasons are presented in Tables 1 and 2.

The experimental soil is a black clay loam with a pH of 8.2 and E. C. 1.8 m. mhos/cm. The organic carbon content of the soil is 0.3 per cent. The available nutrients fall under low, medium and high for N, P and K respectively. During *Kharif* 1982, the nutrient removal by weeds were the highest in the treatment with 90 Kg N/ha applied in two splits, whereas the control plot with no nitrogen recorded the lowest N, P and K uptake by by weeds. The nutrient removal by weeds was 2.5 times more for N, 2 times more P and 3,7 times more for K irrespective of the treatments. The findings are in accordance with the results of Sankaran and Mani (1972). Application of atrazine at 0 5 Kg/ha reduced the weed growth to a greater extent and hence the nutrient removal by weeds was negligible, correspondingly the crop uptake was found higher due to lack of competition from weeds. In the unweeded control the nutrient removal was enormous due to high dry matter production of weeds whereas the the uptake by the crop was poor due to severe weed competition and hence the poor yields in the unweeded control. The grain and stalk yields were highest with the split applications of 90 Kg N/ha followed by 60 Kg N/ha. The reason being that the basal application of N enhanced the nutrien uptake by crop in the initial stages which further enhanced by the application at 35 DAS. However the above treatments were on the par with 45 Kg N/ha as basal application. During summer, 1982 similar findings were observed. Increasing N levels increased the nutrient removal by weeds in the unweeded control, farmer's practice and post-emergence application of 2, 4-D Na salt, whereas the nutrient removal was lowest and not affected by varying N levels in pre-emergence application of atrazine 0.5 Kg/ha and 0.25 Kg/ha + one manual weeding. The grain and straw yield were also higher in the treatments with pre-emergence application of atrazine at

Table - 1 : Effect of nitrogen levels and weed control treatments on nutrient uptake and yield of sorghum in summer, 1982.

Sl. No.	Treatments	Removal by weeds			Uptake by crop			Grain yield (Kg/ha)	Stalk yield (t/na)	Net profit (Rs.)
		N	P	K	N	P	K			
		(Kg/ha)			Kg/ha)					
	MAIN PLOT									
1.	90 Kg N/ha in 2 splits . .	28 08	9.36	29.16	12 52	4.248	9.15	5839	23 8	5628
2.	45 Kg N/ha as basal . .	27.75	7.56	26.01	11 73	3.883	8.40	5033	22.1	4543
3.	60 Kg N/ha in 2 splits .	27.02	7.20	32.37	11.55	3 072	8.31	5866	24.5	5741
4.	30 Kg N/ha as basal . .	25.77	8.52	27 81	10.65	3.480	8.07	4474	22.7	4125
5.	30 Kg N/ha in 2 splits . .	25.50	7 14	30.57	10.47	2.712	7.62	5066	23.7	4814
6.	15 Kg N/ha as basal . .	22.38	7.68	22.77	9.99	2.100	6.90	4194	20.2	2743
7.	No Nitrogen	21.91	5.64	21.27	6.90	1.668	5 37	3980	19 7	2106
	C. D. (P = 0.05)	1.71	0.78	3.06	1.44	0.624	2.52	525	4.1	638
	SUB-PLOT									
1.	Pre-em atrazine 0.50 Kg/ha .	1.89	2 04	6.60	13.12	7.04	18.72	6036	28.3	5942
2.	Post em 2,4-D Na salt 2.0 Kg/ha .	50.07	16.08	55.20	7.80	5.68	5.84	4506	17.9	4274
3	Pre em. atrazine 0.25 Kg/ha + one hand weeding . . .	13.11	4.50	13.68	12.60	6.68	12.70	6233	29.2	6213
4	Post-em. 2, 4-D Na salt 1.0 Kg/ha + one hand weeding . .	20.0	6.78	17.01	7.62	5.00	5.20	5065	22.4	4125
5	Farmer's practice of two hand weedings (15 & 35 DAS) .	21.63	5.40	23.85	7.48	5.28	5.48	5115	23.9	4415
6.	Unweeded control . . .	42.18	10.80	47.88	7.04	3.48	4.10	2516	14.3	635
	C. D. (P=0.05) . . .	9.78	2.04	2.78	2.48	0.81	2.48	637	6,4	789

Table 2 : Effect of nitrogen levels and weed control treatment on nutrient uptake and yield of sorghum in Kharif, 1982

Sl. No.	Treatments	Uptake by weeds			Uptake by crop			Grain yield (Kg/ha)	Straw yield (t/ha)	Net Profit (Rs.)
		N	P (Kg/ha)	K	N	P (Kg/ha)	K			
	MAIN PLOT									
1.	90 Kg N/ha in 2 splits	23.72	6.88	24.68	9.20	3.12	6.58	4750	26.8	4939
2.	45 Kg N/ha as basal	21.24	6.68	22.22	8.83	2.88	6.04	4514	26.4	4111
3.	60 Kg N/ha in 2 splits	19.50	6.48	23.26	8.96	2.32	6.42	4773	26.9	5092
4.	30 Kg N/ha as basal	20.82	6.64	21.06	7.94	2.56	6.00	4519	25.1	3472
5.	30 Kg N/ha in 2 splits	20.84	5.16	21.22	8.24	2.16	6.08	4473	23.9	4212
6.	15 Kg N/ha as basal	18.22	5.80	20.86	7.92	1.92	4.80	4411	22.7	2182
7.	No Nitrogen	17.14	4.40	17.80	6.86	1.44	4.08	3626	17.1	1198
	C. D. (P=0.05)	1.84	0.84	1.82	1.56	0.96	0 66	248	2.5	514
	SUB-PLOT									
1.	Pre-em. Atrazine 0.50 Kg/ha	0.334	0.104	0.346	11.67	3.60	8.61	5091	28.5	5445
2.	Post-em. 2, 4-D Na salt 2.0 kg/ha.	20.54	6.592	22.64	10.56	3.12	7.95	3702	24.1	3582
3.	Pre-em. Atrazine 0.25 kg/ha + one hand weeding	2.52	0.868	2.272	11.22	3.60	8.58	5242	28.6	5741
4.	Post-em. 2, 4D Na salt 1 kg/ha + one hand weeding	23.62	6.332	20.08	10.71	2.76	7.26	4273	23.3	4307
5.	Farmer's practice of two hand weeding (15 & 35 DAS)	21.26	5.448	24.14	10.50	3.00	7.71	4831	26.2	3993
6.	Unweeded control	25.22	6.308	27.82	9.90	1.92	7.17	3579	15.6	145
	C. D. (P=0.05)	8.58	1.92	4.12	2.76	0.84	2.76	423	3.1	628

0.5 Kg/ha at the levels of 90 Kg N/ha in two splits and 60 Kg N/ha in two splits.

Split application of N at 60 Kg/ha gave the highest net profit which was closely followed by 90 Kg N/ha applied as basal alone. Tne economics of various weed control treatments reveal that application of atrazine at 0.25 Kg/ha + one manual weeding registered the highest net profit followed by atrazine application alone at 0.5 Kg/ha. The unweeded contol recorded the lowest net profit. With the present results, it is obvious to note that the application of atrazine at 0.5 Kg/ha or 0.25 Kg/ha + one manual weeding reduce the weed growth and enhance the crop nutrient uptake resulting in good yields and higher net profit even under the lower levels of N application. Hence. the study reveals that there is possibility of reducing the nitrogen application by 30 K/ha with the application of atrazine at 0.5 Kg/ha or 0.25 Kg/ha + one manual weeding

Thanks are due to the PL 480, ICAR AICRP on weed Control for conduting the experiment and publication of the research work.

REFERENCES

BHUSHAN RAO, T. B. 1979. Studies on the effects of different cropping system and weeding intervals on the weed infestation and grain yield of sorghum. M. Sc. (Ag.) Thesis. Submitted to A. P. A. U. Hyderabad.

HUMPRIES, E. C. 1956. Modern methods of plant analysis. i : 468-502.

PIPER, C. S. 1966. Soil and Plant analysis' Hane Publishers. Bombay.

SANKARAN, S. and V. S. MANI. 1972. Effect of weed growth on nutrent uptake and seed yield of sorghum (var. CSH. 1). Indian J. Weed Sci. 4 (1) : 23-28.

WALIA. U. S. and H. S. GILL. 1985. Influence of Nitrogen and substituted urea herbicides on the uptake of N, P and K by *Phalaris minor* Retz. and Wheat. Indian J. Weed Sci. 17 (1) : 12-17.