https://doi.org/10.29321/MAJ.10.A02394

Madras Agric. J. 72 (8) : 447-450 August, 1985

EFFECT OF HERBICIDES ON NUTRIENT UPTAKE IN BLACK GRAM AND ASSOCIATED WEEDS

R. JAYAKUMAR[1], K. SIDDESWARAN[2], N. BALASUBRAMANIAN[3], N. KEMPUCHETTY[4], and S. SUBRAMANIAN[5]

Field experiments were conducted in black soils of Tamil Nadu Agricultural University Farm during kharif 1982 and 1983. Black gram Var, T9 was raised imposing different herbicide treatments comparing with farmers practice of two hand weedings at 15th and 35th day after sowing and unweeded control. The nutrient removal by weeds was enormous when compared to crop uptake in the initial stage. Herbicide application in general and application of isoproturon 0.5 kg ha^{-1} in particular reduced the nutrient removal by weeds and enhanced the nutrient uptake by the crop. The nutrient uptake in grain and stover was the highest in treatment with pendimethalin 1.0 kg ha^{-1} followed by the treatment with isoproturon 0.5 kg ha^{-1}. The crude protein content of grain was the highest in treatment with pendimethalin 1.0 kg ha^{-1} but were on par with other treatments. Significant increase in crude protein production was recorded with pendimethalin application at 1.0 kg ha^{-1}.

Blackgram (*Phaseolus aureus* Roxb.), an important pulse and included in many of the crop rotations followed in Tamil Nadu, is exposed to severe competition from weeds as they extend a formidable competition for soil nutrients resulting in a serious handicap to the young crop in its growth and development. Rajan and Sankaran (1974) reported that weeds when not checked, removed 9 times more of N, 10 times more of P and 7 times more of K than the maize crop at early stages. Yadav *et al*, (1985) found that in mung bean the weeds when allowed to compete till crop harvest, removed 120 Kg N, 15.9 Kg P_2O_5 and 114 k_2O per hectare. Not much work has been carried out regarding the nutrient uptake by weeds and crop particularly in black gram, a short duration pulse, and hence the present study has been taken up.

MATERIALS AND METHODS

Field experiments were conducted during kharif, 1982 and 1983 at Tamil Nadu Agricultural University Farm, Coimbatore with black gram var. T 9. Pre - emergence herbicides viz., oxyfluorfen (0 10 and 0.15 kg/ha^{-1}), isoproturon, (0.50 and 0.75 kg/ha^{-1}), oxadiazon (0.75 kg ha^{-1}), pendimethalin, (1.0kg ha^{-1}), fluchloralin (1.0kg ha^{-1}) were compared with farmers practice of two manual weedings at 15th and 35th day after sowing and unweeded control. The experimental soils were vertisols, having a pH 8.4 and 8.2, electrical conductivity of 1.8 and 1.54 m.mhos cm^{-1} respectively for the first and second seasons. The organic matter content of the soils was 1.73 and 1.45 per cent. The experiments were laidout in randomised block desing with three replications. A common

1-2—Assitant Professors, 3-4—Associate Professors, 5—Director, Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore-641 003.

Table : 1. Nutrient removal by crop and associated weeds at 30 DAS.
(Kg ha $^{-1}$)

Treatments	Weeds			Crop		
	N	P	K	N	P	K
1. Oxyfluorfen 0.10 kg ha $^{-1}$	0.44	0.085	0.56	4.98	0.977	4.04
2. Oxyfluorfen 0.15 ,,	1.54	0.310	1.99	4.42	0.856	3.57
3. Isoproturon 0.50 ,,	0.21	0.045	0.28	7.36	1.444	5.60
4. Isoproturon 0.75 ,,	1.73	0.400	2.52	5.68	1.120	4.38
5. Oxadiazon 0.75 ,,	1.79	0 385	2.23	8.94	1.735	6.62
6. Pendimethalin 1.0 ,,	3.92	0.960	5.52	11.72	2.177	8.13
7. Fluchloralin 1.0 ,,	12.21	2.640	16.50	13.19	2.678	9.30
8. Farmers practice of two manual weedings	18.70	3.935	23.45	10.06	2.048	7.49
9. Unweeded control	28.48	7 040	44.16	1.83	0.364	1.48
C. D. (P =0.05)	3.12	0.655	2.55	2.20	0.440	1.06

fertilizer dose of 25 kg N and 50 kg P_2O_5 ha $^{-1}$ was given. Black gram Var. T 9 was sown and productive irrigations were given. On 30th day weed and plant samples were collected in a randomly selected area in each plot and dry weights were recorded At harvest five plants were collected at a random in each plot and dry matter were recorded. The yields of grain and stover were also taken.

The collected plant and weed samples were processed and the N, P and K contents of the samples were analysed using standard procedures. The uptake values were obtained by multiplying the content with dry matter production. The data for two years were pooled and analysed statistically.

RESULTS AND DISCUSSION

The major weed flora in the experimental fields wers *Dactyloctenium aegyptium* and *Fchinohloa colonum* in grasses, *Cyperus rotundus* in sedges and *Trianthema portulacastrum.Amaranthus viridis, Boerhaavia diffusa* and *Euphorbia hirta* in broad leaved weeds.

The results of the analyses on nutrient removal by weeds and uptake by the crop 30days after sowing are furnished in Table-1.

The weeds in the unweeded control plots removed 28.48, 7.04 and 44.16 kg of N, P and K ha $^{-1}$ respectively while the crop at the same time could take 1.83, 0.364 and 1.48 kg ha^{-1} of the corresponding nutrients. This showed that weeds removed enormous' amount of N, P and K as compared to the crop for its growth in early stages and there by extended a heavy competition to the crop. Similar findings were reported by Guneyli *et al*, (1969) who stated that weeds which emerge with crop, absorb fertilizer faster

and in relatively larger amount than crop thereby depriving the crop of available nutrients and resulting in poor yield.

Application of herbicides in general showed less nutrient removal by weeds as compared to unweed control. Application of isoproturon 0.5 kg ha^{-1} resulted in the lowest uptake of N, P and K by weeds followed by oxyfluorfen at 0.1 Kg ha^{-1}. Application of fluchloralin at 1.0 kg ha^{-1} recorded a weed removal of 12.21, 2.64 and 16.50 Kg ha^{-1} of N, P and K respectively. Regarding the uptake by crop the trend was reverse resulting in increased crop uptake in fluchloralin 1.0kg ha^{-1} and pendimethalin 1.0kg ha^{-1} and lower in all the other herbicide treatments. The probable reason for these results might be the selectivity of fluchloralin and pendimethalin to the crop whereas the oxyfluorfen, isoproturon and oxdiazon may be toxic to plants in the initial stages.

The nutrient removal by grain and stover of black gram are presented in Table 2. The nutrient uptake by the grain in the unweeded control was the lowest. Pendimethalin application at 1.0kg ha^{-1} was found to increase the uptake of N and P by grains followed by isoproturon at 0.5 kg ha^{-1} and hand weeding twice. The K uptake by grain was the highest in the treatment with isoproturon 0.5 kg ha^{-1} followed by pendimethalin 1.0 kg ha^{-1}.

Pre-emergence application of isoproturon, pendimethalin and the farmers practice of hand weeding twice checked the nutrient depletion by the weeds significantly upto harvest of the crop and the loss of N, P and K from these treatments was only marginal and hence the present results.

Pendimethalin application at 1.0 Kg ha^{-1} resulted in higher N, P and K uptake by stover whereas the lowest uptake was registered in unweeded control. The treatments that followed the former were oxyfluorfen at 0.1 kg ha^{-1}, farmers practice of two hand weedings and isoproturon 0.5 Kg ha^{-1}. The weed free environment that existed upto harvest period may be the reason for the increased nutrient uptake in these treatments.

The grain and stover yield, crude protein content and production due to various treatments are presented in Table 3. The highest grain yield was recorded in isoproturon (0.5 kg ha^{-1}) applied plots followed by pendimethalin (1.0 kg ha^{-1}) and these were at par. The lowest grain yields was recorded in weedy check plots. The increased yields with isoproturon 0.5 kg ha^{-1} as well pendimethalin 1.0kg ha^{-1} could be due to the efficient weed control which also resulted in higher nutrient uptake by the crop.

The stover yield was the highest in pendimethalin applied plots and was significantly superior to the rest. The crude protein content was the highest in pendimethalin applied plots; however the same was at par with other treatments. The reason being that the crude protein content is mostly a varietal character and any agronomic manipulation will only be marginal however the crude protein production differed significantly due to the above treatments because of the differences in dry matter production.

Table 2 : Nutrient removel by grain and stover of blackgram (kg ha^{-1})

Treatments	Grain			Stover		
	N	P	K	N	P	K
1. Oxyfluorfen 0 10 kg ha^{-1}	37.42	3.88	23.13	55.49	7.61	46.54
2. Oxyfluorfen 0.15 ,,	22 20	2.45	14.40	41 58	5.94	34.32
3. Isoproturon 0.50 ,,	50.78	5.73	33.46	49.13	7 53	41.20
4. Isoproturon 0.75 ,,	29.75	3.43	19.74	42.33	6 61	35 05
5. Oxadiazon 0.75 ,,	33.85	4.06	21.61	49.53	7.62	40 77
6. Pendimethalin 1.0 ,,	53.39	6.33	28.19	72.98	10 73	57.95
7. Fluchloralin 1.0 ,,	25.96	2.97	15.84	43.79	6.76	34.78
8. Farmers practice of two manual weedings	44.81	5.24	26.77	54.05	9.28	44.00
9. Unweeded control	3.65	0.35	2.41	4.56	0.56	3.94
C.D. (P = 0.05)	5.38	1.11	4.61	13.23	1.70	6.20

Table 3 : Grain and stover yield, crude protein content and production.

Treatments	Yield		Crude protein content	Crude protein production
	Grain (kg ha^{-1})	Straw (kg ha^{-1})	(%)	(kg ha^{-1})
1. Oxyflourfen 0.10 kg ha^{-1}	826	4475	28.31	234
2. Oxyfluorfen 0.15 ,,	550	3300	27.75	139
3. Isoproturon 0.50 ,,	1170	3962	27.12	317
4. Isopreturon 0.75 ,,	700	3307	26.56	186
5. Oxadiazon 0.75 ,,	780	3810	27.12	212
6. Pendimethalin 1.0 ,,	1110	5366	30.06	334
7. Fluchloralin 1.0 ,,	550	3220	29.50	162
8. Farmers practice of two manual weedings	920	4033	28.27	280
9. Unweeded control	90	375	25.37	23
C.D. (P = 0.05)	159	451	4.41	34

From the above results it is clear that weeds remove a large quantity of nutrients when compared to the crop. Application of pendimethalin 0.1 kg ha^{-1} or isoproturon 0 5 kg ha^{-1} was found to be highly selective and promotes nutrient uptake and consequent increase in yield, better weed control as well poor nutrient removal by weeds. Pendimethalin is superior to farmers practice with regard to yield and other parameters.

Thanks are due to USDA PL 480-ICAR All India Co-ordinated Research Programme on Weed Control, Coimbatore for financing the project and for publishing the results.

REFERENCES

GUNEYLI, E., O. C. BURNSIDE and P. T NORDQUIST. 1969. Influence of seedling characteristics on weed competitve ability of sorghum hybrids and inbred lines. Crop Sci. 9: 713-716.

RAJAN, A.V., and SANKARAN, S. 1974. Studies on crop weed competition for nutrient and its effect on grain yield of maize (var-Ganga-5). Madras Agric. J. 61(8): 413-416

YADAV, S. K., BHAN, V.M. and ASHOK KUMAR 1985. Nutrients uptake by Mungbean and weeds in relation to herbides-Indian J.Weed Sci. 17 (1) : 1-5