

Efficacy of metribuzin and trifluralin on weed management in soybean (*Glycine max*)

A. JEYABAL, SP. PALANIAPPAN AND S. CHELLIAH

Nagarajuna Agricultural Research and Development Institute, Secunderabad,
Hyderabad, Andhra Pradesh 500 009

Received: March 2000

ABSTRACT

An investigation was carried out for 2 seasons (rainy and winter season 1998–99) to study the efficacy of metribuzin and trifluralin in comparison with fluchloralin and hand-weeding twice in soybean [*Glycine max* (L.) Merr.]. Metribuzin and trifluralin controlled most of the dicot weeds and fewer monocot weeds. Weed biomass and nutrients depletion were higher in rainy (*kharif*) season than in winter (*rabi*) season. *Rabi* experiment showed that metribuzin enhanced the seed yield by 22.5% over hand-weeding twice owing to high weed-control efficiency (91%), whereas result obtained in *kharif* indicated that different herbicides gave the seed yield almost similar to that obtained with hand-weeding twice.

Key words : Metribuzin, Trifluralin, Fluchloralin, Weed control, Soybean

The reduction in soybean yield due to weed infestation varies from 20 to 77% (Tiwari and Kurchania, 1990), depending on the type of soil, seasons and intensity of weed infestation. Reliance on herbicides for weed control is expected to increase in India due to shortage of agricultural labourers especially in the season. Weed-free environment up to critical crop-growth stage is essential to harvest a good crop. Pre-emergence herbicide application can help to some extent to control the weeds in the early crop-growth stage. Soybean suffers from heavy weed competition, especially in the early growth stages in the monsoon season. Crop-weed competition is minimized by pre-emergence spray of

herbicides, resulting in higher crop yields (Berevadiah *et al.*, 1996). Effective control of weeds can help in improving the productivity of soybean. The present experiment was taken up to evaluate the efficacy of herbicide, metribuzin and trifluralin in comparison with fluchloralin and hand-weeding on weed management and yield of soybean.

MATERIALS AND METHODS

A field investigation was carried out at Nagarjuna Agricultural Research and Development Institute (NARDI), Wargal, Medak district, Andhra Pradesh, in rainy season 1998 and winter season 1998–99 to evaluate the efficacy of different pre-

emergence herbicides in soybean. In trial-1, metribuzin, trifluralin and fluchloralin were compared with hand-weeding. Trial 2 was conducted to optimize the dose of these herbicides (metribuzin, trifluralin and fluchloralin) on weed management in soybean.

The soil of the experimental fields was sandy loam with pH 7.1, EC 0.09 dS/m, organic carbon 0.44%, available N 204 kg/ha, available P_2O_5 5 kg/ha and available K_2O 239 kg/ha. Recommended schedule of fertilizer, 60,80 and 40 kg N, P_2O_5 and K_2O /ha respectively was followed. The net plot size was 19.8m² (4.95 m × 4.00 m). Trial 1 (*kharif*) and 2 (*rabi*) were conducted in randomized block design with 5 and 4 replications respectively. Major weeds in the field were *Cyperus rotundus*, *Cynodon dactylon*, *Digitaria sanguinalis*, *Amaranthus viridis*, *Euphorbia hirta*, *Cleome viscosa*, *Parthenium hysterophorus*, *Tridax procumbens*, *Mollugo pentaphylla* and *Phyllanthus niruri*. In general, weed intensity was higher in *kharif* season due to continuous rainy than in winter season.

The treatment details of the field trials are given in Table 1. Herbicides, metribuzin, trifluralin and fluchloralin, were applied 3 days after the sowing (DAS) when there was sufficient moisture in the soil. A spray fluid of 1,000 litres/ha was used with knapsack sprayer with flat-fan nozzle. In hand-weeding treatment, weed count was recorded 30 DAS to compare the weed population with herbicide-applied plot. Then, weeding was done at the same day followed by another weeding at 45 DAS. In all the herbicide treated plots 1 hand-weeding was done at 45 days after

sowing.

Crop phytotoxicity was studied 7 days after sowing adopting standard method. Weeds were sun-dried after washing off roots, oven-dried at 60°C and weed dry biomass was weighed. Nutrients (NPK) removed by the weeds were determined at 30 days after sowing adopting standard methods. Weed-control efficiency was worked out 30 days after sowing. At maturity stage, dry-matter production and number of total and filled pods/plant were recorded. Plot-wise yield was recorded after drying grains to 14% moisture content.

RESULTS AND DISCUSSION

Crop phytotoxicity

Germination of the seeds was not affected by the application of any of the herbicides. No crop phytotoxicity was observed with application of different herbicides at the doses tested.

Effect on weeds

Application of different pre-emergence herbicides had a significant effect on weed population. Weed biomass, weed count and nutrient depletion by the weeds were reduced by the application of different herbicides (Table 1). Dicot weeds were effectively controlled by the herbicides. In *kharif*, metribuzin and fluchloralin had a clear edge over trifluralin in controlling dicot weeds, but were at par. Monocot weeds were not controlled by any of the herbicides in the wet season (*kharif*). This might be due to continuous rains received in the season. But in the *rabi* season, the herbicides controlled the monocot weeds

Table 1. Effect of metribuzin, trifluralin and fluchloralin on weed count, weed biomass and nutrients removal of weeds in soybean

Treatment	Weed count* (No/m ²)		Weed biomass (g/m ²)	Nutrients removal by weeds (g/m ²)		
	Monocot	Dicot		N	P	K
Trial 1 (kharif 1998)						
Metribuzin at 0.88 kg a.i./ha	397 (19.9)	42 (6.5)	1602	27.7	7.04	3.2
Trifluralin at 1.0 kg a.i./ha	408(20.2)	131 (11.4)	1694	30.3	7.26	5.8
Fluchloralin at 1.0 kg a.i./ha	322 (17.9)	58 (7.6)	1633	34.1	7.48	2.4
Hand-weeding twice	344 (18.5)	275 (16.6)	2471	44.0	9.79	6.6
CD (P=0.05)	NS	2.6	213	2.4	1.6	6.2
Trial 2 (rabi 1998–99)						
Metribuzin at 0.88 kg a.i./ha	53 (7.3)	5 (1.3)	36.6	0.39	0.037	1.28
Metribuzin at 0.70 kg a.i./ha	58 (7.6)	11 (3.2)	38.3	0.43	0.039	1.44
Fluchloralin at 1.0 kg a.i./ha	31 (5.5)	21 (3.3)	45.5	0.47	0.046	2.01
Fluchloralin at 0.75 kg a.i./ha	28 (5.3)	35 (4.8)	32.1	0.35	0.031	1.33
Trifluralin at 1.0 kg a.i./ha	28 (5.3)	5 (1.8)	36.7	0.37	0.039	1.48
Trifluralin at 0.75 kg a.i./ha	41 (6.4)	20 (4.0)	54.3	0.61	0.052	3.02
Hand-weeding twice	280 (16.7)	175 (12.8)	426.5	5.54	0.417	1.77
CD (P=0.05)	1.16	3.76	27.5	0.82	0.04	1.13

Figures parentheses denote square root transformed values

Table 2. Effect of herbicides, metribuzin, trifluralin and fluchloralin on growth and yield of soybean

Treatment	Plant height (cm)	Dry-matter production (tonnes/ha)	Total pods/plants	Filled pods/plant	Seed yield (kg/ha)
<i>Trial 1 (kharif 1998)</i>					
Metribuzin at 0.88 kg a.i./ha	34.7	4.45	38.5	30.4	1,475
Trifluralin at 1.0 kg a.i./ha	33.3	4.22	33.4	27.5	1,387
Fluchloralin at 1.0 kg a.i./ha	34.1	4.27	35.6	28.4	1,417
Hand-weeding twice	33.5	4.34	37.2	28.9	1,458
CD (P=0.05)	NS	0.20	NS	1.7	NS
<i>Trial 2 (rabi 1998-99)</i>					
Metribuzin at 0.88 kg a.i./ha	65	8.26	57.2	46.9	1,617
Metribuzin at 0.70 kg a.i./ha	73	7.79	58.7	48.8	1,685
Fluchloralin at 1.0 kg a.i./ha	70	5.97	48.5	40.2	1,542
Fluchloralin at 0.75 kg a.i./ha	74	7.04	55.8	45.6	1,628
Trifluralin at 1.0 kg a.i./ha	71	7.28	49.3	41.3	1,580
Trifluralin at 0.75 kg a.i./ha	66	5.94	47.6	38.2	1,533
Hand-weeding at 30, 45 DAS	64	6.22	46.2	34.4	1,375
CD (P=0.05)	NS	0.40	5.31	3.55	146

DAS, Days after sowing

also to some extent. Regardless of the season, all the herbicides produced less weed biomass than in hand-weeding twice. The reduction in weed biomass in herbicide-applied plot was several folds higher in winter than in rainy season. The highest weed-control efficiency was obtained in rabi compared to rainy season. Weed-control efficiency was quite high in winter because weed infestation was less due to controlled irrigation, compared to rainy season. Further, nutrient removal through weeds and depletion of nutrients by rain were also less in winter season. The weed-control efficiency of 94.5% due to application of metribuzin in soybean was earlier reported (Chavan *et al.*, 1999). Among 2 levels of different herbicides tested in winter, weed biomass, weed-control efficiency and nutrients depletion were comparable.

Effect on crops

Plant height was not altered due to the application of different herbicides compared to hand-weeding twice. Application of metribuzin at 0.88 kg a.i./ha produced higher dry matter than trifluralin in rainy season. But in *rabi*, metribuzin either at 0.88 or 0.70 kg a.i./ha recorded greater dry matter than application of trifluralin and fluchloralin (Table 2). Number of total pods was not influenced in rainy season due to different herbicides. But in the winter, metribuzin at 0.70 kg a.i./ha produced more number of total pods/plant than other herbicides. Number of filled pods/plants was significantly enhanced by the application of metribuzin over trifluralin and fluchloralin. Trifluralin and fluchloralin gave higher number of

filled pods/plant than hand-weeding twice.

Herbicide application gave almost similar yield as that obtained with hand-weeding twice in wet season (*kharif*). This could be due to effective control of dicot weeds in the early crop-growth stage, followed by manual weeding 45 days after sowing. But, in winter (Trial 2), application of herbicides gave higher yield than hand-weeding twice (Table 2). Highest seed yield of 1.69 tonnes/ha was obtained with metribuzin at 0.70 kg a.i./ha, which was 22.5% higher than that obtained with hand-weeding twice. Application of trifluralin gave 11.5 to 14.9% more yield than hand-weeding twice. This increase in yield might be due to higher weed-control efficiency in winter with the different herbicides. Application of fluchloralin at both levels (1.0 and 0.75 kg a.i./ha) gave comparable yield and was superior to hand-weeding twice.

Based on the results, it can be concluded that metribuzin (0.70 kg a.i./ha) and trifluralin (1.0 kg a.i./ha) gave effective weed control in soybean and these herbicides can be used as alternative to fluchloralin.

REFERENCES

- Berevadia, T.N., Patel, D.B. and Patel, J.B. 1996. Integrated weed management in Indian mustard. *Pestology* 20 : 42-44.
- Chavan, S.R., Borse, R.H., Tumbave, A.D. and Pawar, V.S. 1999. Efficiency of different herbicides in controlling weeds of soybean (*Glycine max* L.). *Indian Journal of Weed Science* 31 : 89-90.
- Tiwari, J.P. and Kurchania. 1990. Survey and management of soybean (*Glycine max* L.) ecosystem in Madhya Pradesh. *Indian Journal of Agricultural Sciences* 60 : 672-676.