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Performance of Early Post-Emergence Herbicide in Irrigated Soybean (*Glycine max* (L.) Merill)

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A study was carried out to evaluate the effect of early post emergence herbicide, imazethapyr against weeds in irrigated soybean (*Glycine max* (L.) Merill) at Agricultural Research Station, Bhavanisagar. Weeds, *viz*., *Dactyloctenium aegypticum*, *Acrach ne racemosa, Cyperus rotundus*, *Boerhaavia diffusa, Digera arvensis, Parthenium hysterophorous* were the dominant weeds in the experimental field. Imazethapyr at 100 and 200 g ha^{-1} applied on 15 DAS provided 87 to 91 % weed control efficiency compared to unweeded control. However, imazethapyr at 200 g ha^{-1} had slight phytotoxicity on soybean in the initial stages. Higher grain yield of 1645 kg ha^{-1} was obtained with application of imazethapyr 100 g ha^{-1}.

Key words: Soybean, early post emergence, imazethapyr, weed density, weed dry weight, weed control efficiency

Soybean (*Glycine max* (L.) Merill) is a dual purpose, important crop to meet protein and oil requirements. It has a great nutritional significance, with over 40 % protein and 20 % oil and has been recognized as a potential supplementary source of edible oil. The combined effect of weeds, insects and diseases sets serious limitations to increasing agricultural production. The reduction in yield of soybean ranged from 10 to 73 per cent due to weed competition and the yield can be enhanced by almost 50 per cent by adopting timely chemical weeding (Tiwari and Trivedi, 1985). Critically viewing, the manual and mechanical methods of weed control, besides being less effective, are costly and time demanding. Mechanical method was partially effective because most of the weeds growing in intra-rows escaped in weeding. Thus, chemical weed control became a promising means to control weeds at initial stages of crop growth. Many pre - emergence herbicides control weeds only for a limited period and hence late emerging weeds escape killing. So, there is ample scope for controlling weeds by application of early post emergence herbicides. Hence, the present experiment was carried out to evaluate the efficiency of Imazethapyr for control of weeds in soybean and its influence on productivity.

Materials and Methods

A field experiment was conducted at Agricultural Research Station, Bhavanisagar, during *kharif* 2009. The soil was red sandy loam in texture belonging to *Typic Paleustalfs* having 0.55 % organic carbon, 230 kg ha^{-1} available N, 20 kg ha^{-1} available P_2O_5 and 268 kg ha^{-1} available K2O. The experiment was laid out in randomized block design with ten treatments and three replications. Soybean variety CO (Soy) 3 was used for experiment. Other cultural practices and plant protection measures were followed as per recommendations. The treatments consisted of : T_1 - imazethapyr 50 g ha^{-1} + Earthing up on 45 days after sowing (DAS); T_2 - imazethapyr 75 g ha^{-1} + Earthing up on 45 DAS; T_3 - imazethapyr 100 g ha^{-1} + Earthing. up on 45 DAS; T_4 ,-imazethapyr 200 g ha^{-1} + Earthing up on 45 DAS; T_5 - oxyfluorfen 125 g ha^{-1} + Hand weeding on 45 DAS; T_6 - oxyfluorfen 125 g ha^{-1} + Power weeder on 45 DAS;T_7-pendimethalin 750 g ha^{-1} on 3 DAS + Handweeding on 45 DAS; T_8 - pendimethalin 750 g ha^{-1} on 3 DAS + Power weeder on 45 DAS; T_9 - HW on 25 and 45 DAS and T_{10} - Unweeded control.

Herbicide, *viz*., pendimethalin and oxyfluorfen, each at 750 g ha^{-1} and 125 g ha^{-1} were dissolved in 500 litres water and were sprayed with knapsack sprayer using deflector nozzle at 3 days after sowing. The post emergence herbicide imazethapyr at 50, 75, 100, 200 g ai ha^{-1} was sprayed 15 days after sowing. Data on total weed density and weed dry weight were recorded 30 days after sowing using 0.25 m^2 quadrate at 4 places in randam and analysed after subjecting the original data to log transformation. The total annual rainfall received during the crop season was 610 mm distributed in 28 rainy days.

Results and Discussion

Weed flora

Important weed species in the experimental field were *Dactyloctenium aegypticum, Acrachne racemosa, Bracharia reptans* and *Cyperus rotundus.*

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Table 1. Effect of weed control treatments on density of weeds in soybean

Treatment	Weed density at 30 DAS (No.m^{-2})			Total
	Grasses	Sedge	BLW	
T_1 - EPOE imazethapyr at 50 g ha^{-1}+E. up on 45 DAS	2.31 (202.7)	1.64 (45.0)	1.50 (31.0)	2.45 (278.7)
T_2 - EPOE imazethapyr at 75 g ha^{-1} +E. up on 45 DAS	2.22 (170.7)	1.51 (30.7)	1.37 (22. 0)	2.34 (223.3)
T_3 - EPOE imazethapyr at 100 g ha^{-1} + E. up on 45 DAS	1.88 (75.33)	1.39 (24.0)	1.23 (15.3)	2.06 (114.6)
T_4 - EPOE imazethapyr at 200 g ha^{-1} + E. up on 45 DAS	1.79 (63.0)	1.13 (11.7)	1.05 (10.3)	1.93 (85.0)
T_5 - PE oxyfluorfen at 125 g ha^{-1} + HW on 45 DAS	2.11 (128.4)	1.58 (35.7)	1.46 (27.3)	2.29 (191.3)
T_6 - PE oxyfluorfen at 125 g ha^{-1} + PW on 45 DAS	2.16 (141.3)	1.50 (32.0)	1.41 (24.0)	2.30 (197.3)
T_7 - PE pendimethalin at 750 g ha^{-1} on 3 DAS + HW on 45 DAS	1.99 (96.3)	1.47 (27.7)	1.50 (30.0)	2.19 (154.0)
T_8 - PE pendimethalin at 750 g ha^{-1} on 3 DAS + PW on 45 DAS	2.02 (102.0)	1.45 (28.0)	1.64 (42.3)	2.24 (172.3)
T_9 - HW on 25 & 45 DAS	1.08 (11.0)	1.30 (19.0)	0.78 (4.3)	1.54 (34.3)
T_{10} - Unweeded control	2.89 (784.0)	1.83 (66.3)	1.88 (75.0)	2.97 (925.3)
CD (P=0.05)	0.18	0.25	0.17	0.18

EPOE- Early post emergence, E.up- Earthing up, DAS-Days after sowing, PW-Power weeder, HW- Hand weeding, Figures in parenthesis are original values, Data subjected to log transformation (log(x+2))

The predominant species among broad leaved weeds were *Boerhaavia diffusa, Digera arvensis, Parthenium hysterophorous* and *Trichodesma indicum*. Earlier investigations carried out by Balusamy *et al.* (1996) at TNAU, Coimbatore also showed that *Trianthema portulacastrum* (L.), *Amaranthus viridis* (L.), *Parthenium hysterophorus* (L.), *Echinochloa* sp. and *Cyperus* sp. were dominant weeds of soybean. Similarly, Panner selvam and Lourduraj (2000) also reported that *Trianthema portulacastrum* (L.),*Flaveria australasica* (L.), *Amaranthus viridis* (L.), *Cynodon dactylon* (L.), *Dactyloctenium aegypticum* (L.), *Echinochloa colonum* (L.), and *Cyperus rotundus* (L.), were the major weed species observed in soybean.

Weed density

Effect of imazethapyr was found significant in reducing the broadleaved weeds and grasses. At 30 days after sowing, hand weeding on 25 DAS showed low broadleaved density followed by early post emergence application of imazethapyr 200 g ha^{-1} and imazethapyr 100 g ha^{-1}. Whereas the remaining treatments recorded higher broadleaved weed density. It was more effective against broad-leaved weeds and it controlled all major broad-leaved weeds like *Boerhaavia diffusa, Digera arvensis, Parthenium hysterophorous* and *Trichodesma indicum*. Hand weeding on 25 days after sowing recorded lower grass weed density followed by early post emergence application of imazethapyr at 100 and 200 g ha^{-1} (Table 1.)

Weed dry weight showed a decreasing trend with increasing rate of imazethapyr. Among the weed control treatments, early post emergence application of imazethapyr at 100 and 200 g ha^{-1} significantly reduced dry matter of weeds. The weed control efficiency was tremendously enhanced (77-91%) due to higher dose of imazethapyr at 30 days. However, imazethapyr at 200 g ha^{-1} had phytotoxic effect on soybean in the initial stages causing stunted growth and chlorosis but the crop recovered after one or two irrigations (Table 2).

Grain yield

Early post emergence application of Imazethapyr at 100 g ha^{-1} significantly increased the grain yield compared to other treatments. Whereas 200 g ha^{-1} had little phytotoxic effect causing chlorosis and stunted growth during initial stages and it got recovered after one or two irrigation, thus caused reduction in yield. Chandel and Saxena (2001) found that post emergence application of imazethapyr at 100 g ha^{-1} was effective in controlling weeds and increasing seed yield and weed control efficiency. Tewari *et al.* (2004) also found that imazethapyr at 100 g ha^{-1} as pre emergence excelled all the herbicide treatments with respect to effective weed

Table 2. Effect of weed-control treatments on dry matter of weeds at 30 DAS and yield of soybean

Treatment	Total weed dry weight (kg ha^{-1})	Weed control efficiency (%)	Seed yield (kg ha^{-1})
T_1 - EPOE imazethapyr at 50 g ha^{-1} + E. up on 45 DAS	1.80 (61.7)	77.7	1387
T_2 - EPOE imazethapyr at 75 g ha^{-1} +E. up on 45 DAS	1.72 (50.8)	81.6	1467
T_3 - EPOE imazethapyr at 100 g ha^{-1} + E. up on 45 DAS	1.54 (33.9)	87.7	1645
T_4 - EPOE imazethapyr at 200 g ha^{-1} + E. up on 45 DAS	1.40 (24.6)	91.1	1514
T_5 - PE oxyfluorfen at 125 g ha^{-1} + HW on 45 DAS	1.75 (55.3)	80.0	1304
T_6 - PE oxyfluorfen at 125 g ha^{-1} + PW on 45 DAS	1.84 (50.44)	81.7	1407
T_7 - PE pendimethalin at 750 g ha^{-1} on 3 DAS + HW on 45 DAS	1.71 (54.5)	80.3	1481
T_8 - PE pendimethalin at 750 g ha^{-1} on 3 DAS + PW on 45 DAS	1.76 (54.6)	80.2	1456
T_9 - HW on 25 & 45 DAS	1.72 (51.45)	81.4	1234
T_{10} - Unweeded control	2.44 (276.3)	-	833
CD (P=0.05)	0.16	NA	86

EPOE- Early post emergence, E.up- Earthing up, DAS-Days after sowing, PW-Power weeder, HW- Hand weeding, Figures in parenthesis are original values, Data subjected to log transformation (log(x+2)), NA- Not analysed

control (64.4 per cent WCE) and increased grain yield at par to manual weeding twice in green gram. Thus, imazethapyr at 15 days after sowing is suitable for the field infested with more of broadleaved weeds and grasses than sedges.

Conclusion

From the results of the present study, it can be concluded that early post emergence application of imazethapyr at 100 g ha^{-1} 15 DAS with hand weeding on 45 DAS provided better weed control and resulted in increased yield compared to other weed control methods.

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