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Bio-efficacy of Tepraloxydim and Dimethanamid in Soybean

V. P. Singh, Govindra Singh and Mahendra Singh
Department of Agronomy
G. B. Pant University of Agriculture & Technology, Pantnagar-263 145 (Uttaranchal), India

Soybean, being a rainy season crop, suffers severely due to competitional stress of grasses, sedges and broad leaf weeds and the yield is reduced from 20-77% (Tiwari and Kurchania, 1990; Kurchania *et al.*, 2001) depending on nature and density of weed species. Several herbicides like pendimethalin, fluchloralin and alachlor have been used for weed control in soybean. These herbicides have been quite effective on grasses and continuous use has resulted in weed shift in some areas in favour of non-grassy weeds like *Cleome viscosa, Celosia argentea* and *Trianthema monogyna,* which are highly competitive with soybean crop. Therefore, there is need to have alternative herbicides which may provide wide range of weed control, avoid weed shift and also possible development of herbicide resistance.

A field experiment was conducted to study the bio-efficacy of tepraloxydim and dimethanamid in soybean during rainy season of 2000 at the Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar. The soil of experimental field was loamy in texture (38.4% sand, 45.2% silt and 16.4% clay), medium in organic carbon (0.58%), very high in available phosphorus (109 kg ha^{-1}) and medium in available potassium (201 kg ha^{-1}) content with pH 7.7. The treatments consisted of various doses of tepraloxydim, dimethanamid applied alone or in combination with other herbicides with standard checks of fluchloralin, imazethapyr weed-free and weedy. Experiment with 15 treatments (Table 1) and three replications was laid out in randomized block design. Tepraloxydim, its combinations with other herbicides and bantazon were applied 15 days after soybean sowing (DAS). Dimethanamid was applied next day after sowing. Imazethapyr was applied 7 DAS. Fluchloralin was applied as pre-plant incorporation. All the herbicides were applied as spray with 500 l spray volume ha^{-1}. Soybean variety PK 1241 at row spacing of 60 cm was sown on July 7, 2000. Recommended package of practices was adopted to raise the experimental crop.

Weed flora of the experimental field consisted of *Echinochloa colona* (64.7%), *Parthenium hysterophorus* (11.4%), *Trianthema monogyna* (9.2%), *Celosia argentea* (4.9%), *Cyperus* spp. (3.8%) and others (6.0%) like *Commelina benghalensis* and *Cleome viscosa.* Tepraloxydim and dimethanamid were effective in reducing density of *E. colona.* Higher doses were more effective than lower doses (Table 1). Bentazon alone, bentazon+tepraloxydim+ammonium nitrate (9600+75+3000 g ha^{-1}), bentazon+tepraloxydim (960+75 g ha^{-1}) were less effective on *E. colona* than bentazon+tepraloxydim+ammonium nitrate (1200+75+3000 g ha^{-1}). Dimethanamid at 850 g ha^{-1} as pre-emergence followed by post-emergence application of bentazon at 1200 g ha^{-1} provided good control of most of the weeds. Tepraloxydim could provide about 50% control of *P. hysterophorus.* It was not effective on *T. monogyna, C. argentea* and *Cyperus* spp. Dimethanamid was found to be effective on grassy weeds as well as on non-grassy weeds. Fluchloralin was effective on *E. colona* but did not control non-grassy weeds. Imazethapyr had wide weed control spectrum and its weed control efficacy was very high. Weed dry matter production was reduced due to all the treatments (Table 2), which depended on the doses of the herbicides.

Application of tepraloxydim alone at 50, 75 or 100 g ha^{-1} had no phytotoxic effects on soybean crop. When it was combined with bentazon and ammonium nitrate it caused phytotoxicity to the extent of 20% and crop remained stunted throughout the season. Dimethanamid at 1100 g ha^{-1} caused about 90% phytotoxicity on soybean

Table 1. Effect of tepraloxydim and dimethanamid on weed population in soybean

Treatment	Dose (g ha^{-1})	Application stage (DAS)	Weed density (No. m^{-2}) 45 DAS					
			E. colona	*P. hysterophorus*	*T. monogyna*	*C. argentea*	*Cyperus* spp.	Others
Tepraloxydim	50	15	15	12	19	7	6	9
Tepraloxydim	75	15	3	10	15	9	5	6
Tepraloxydim	100	15	1	11	17	11	7	7
Dimethanamid	850	1	5	5	5	7	8	3
Dimethanamid	1100	1	2	7	3	5	5	2
Bentazon	960	15	121	1	11	2	0	5
Bentazon	1200	15	117	0	13	0	0	6
Bentazon+ Tepraloxydim+ Amm. Nitrate	960+ 75+ 3000	15	57	3	2	7	0	2
Bentazon+ Tepraloxydim+ Amm. Nitrate	1200+ 75+ 3000	15	7	0	1	5	0	1
Bentazon+ Tepraloxydim	960+ 75	15	61	2	3	2	1	4
Dimethanamid fb Bentazon	850 fb 1200	1 fb 15	2	0	1	0	3	2
Fluchloralin	960	PPI	3	17	15	7	5	7
Imazethapyr	100	7	1	3	2	2	3	2
Weed-free	-	-	0	0	0	0	0	0
Weedy	-	-	119	21	17	9	7	11

DAS–Days after soybean sowing, fb–followed by.

Table 2. Effect of tepraloxydim and dimethanamid on weed dry matter production and grain yield of soybean

Treatment	Dose ($g\ ha^{-1}$)	Application stage (DAS)	Total weed dry weight ($g\ m^{-2}$) 45 DAS	Grain yield ($kg\ ha^{-1}$)
Tepraloxydim	50	15	21.8	2162
Tepraloxydim	75	15	8.7	2590
Tepraloxydim	100	15	7.5	2600
Dimethanamid	850	1	17.5	1618
Dimethanamid	1100	1	11.2	1475
Bentazon	960	15	56.2	1912
Bentazon	1200	15	51.2	2015
Bentazon+	960+	15	81.6	1598
Tepraloxydim+	75+			
Amm. Nitrate	3000			
Bentazon+	1200+	15	8.7	2125
Tepraloxydim+	75+			
Amm. Nitrate	3000			
Bentazon+	960+	15	81.7	1586
Tepraloxydim	75			
Dimethanamid fb	850 fb	1 fb	6.8	1952
Bentazon	1200	15		
Fluchloralin	960	PPI	78.7	1817
Imazethapyr	100	7	5.8	2698
Weed-free	-	-	0.0	2715
Weedy	-	-	321.7	418
LSD (P=0.05)	-	-	-	278

crop. Bentazon combinations with tepraloxydim or dimethanamid also caused stunted crop growth to the extent of 50%. There was more than 84% reduction in grain yields of soybean in weedy treatment, when compared with weed-free treatment (Table 2). All the treatments produced significantly more grain yields than weedy treatment. Tepraloxydim at 50 g ha^{-1} yielded significantly less than at 75 and 100 g ha^{-1}. Tepraloxydim at 75 and 100 g ha^{-1} being at par produced grain yields similar to imazethapyr at 100 g ha^{-1} and weed-free treatment. Dimethanamid produced grain yields much less than these treatments due to toxic effects on the crop. Other treatments of tepraloxydim in combination with other herbicides also yielded significantly less than weed-free and imazethapyr.

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