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Effect of Doses and Stages of Application of Trifluralin on Soybean and Associated Weeds

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ABSTRACT

A field experiment was carried out to study the effect of doses and stages of application of trifluralin on soybean and associated weeds during **kharif** 1998 and 1999 at Pantnagar. Results revealed that weed control efficiency of trifluralin at 0.50, 0.75, 1.00, 1.25 and 1.50 kg ha^{-1} was higher when applied as pre-plant soil incorporation as compared to its corresponding doses of application as pre-emergence. Uncontrolled weeds, on an average, caused 88.6% reduction in the grain yield of soybean. All the treatments produced significantly more grain yield than weedy check. At all the rates, pre-plant soil incorporation produced significantly higher grain yield of soybean than that of pre-emergence application. Trifluralin at 1.25 and 1.50 kg ha^{-1} as pre-emergence and 1.00 kg ha^{-1} as pre-plant soil incorporation produced almost similar grain yield of soybean.

INTRODUCTION

Soybean is the important **kharif** oil seed crop in our country. One of the main constraints of its low productivity is the weed infestation. Due to slow initial crop growth, proper soil moisture and congenial temperature, soybean is highly infested by weeds which reduce the yield to a tune of 41-84% (Dharm *et al.*, 1992). The conventional method of weed control (manual weeding) is expensive, time taking and tedious. At the same time because of the continuous rain during **kharif** season, manual weeding becomes less effective, problematic and uneconomic. Therefore, different herbicides like alachlor, pendimethalin and fluchloralin are being used for controlling weeds in soybean (Singh and Bhan, 1997; Dubey, 1998). Generally, herbicides belonging to dinitroaniline group (including trifluralin) are used as pre-plant soil incorporation which becomes costlier and time consuming than pre-emergence application. Keeping in view the cost and feasibility of application, the present investigation was, therefore, undertaken to study the effect of doses and stages of trifluralin application on soybean and associated weeds.

MATERIALS AND METHODS

A field experiment was conducted during **kharif** seasons of 1998 and 1999 at Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar to evaluate the effect of doses and stages of application of trifluralin on soybean and associated weeds. The soil of the experimental plot was clay loam in texture, medium in organic carbon (0.69%), high in available phosphorus (48 kg P ha^{-1}) and medium in available potassium (265.6 kg K ha^{-1}) with a pH 7.2. Twelve treatments (Table 1), replicated thrice, were laid out in a randomized block design. Soybean variety PK 564 was planted on July 12,1998 and July 7,1999, 60 cm apart, using a seed rate of 80 kg ha^{-1}. Seeds were well treated with carbendazim and soybean *Rhizobium* culture at 2.5 and 5.0 g kg^{-1} of seed, respectively. All recommended package of practices were adopted to raise the experimental crop. Pre-plant soil incorporation treatments of trifluralin were executed two days before planting of the soybean crop, however, pre-emergence treatments were applied immediately after planting by using flat fan nozzle with a spray volume of 500 l of water ha^{-1}.

Table 1. Effect of doses and stages of trifluralin application on weed density in soybean (Average of two crop seasons)

Treatment	Dose (kg ha^{-1})	Stage of application	Weed density (No. m^{-2}) at 60 DAS				Total
			E. colona	*C. argentea*	*C. benghalensis*	*C. rotundus*	
Trifluralin	0.50	Pre-emergence	2.94 (18)	2.44 (11)	2.89 (17)	3.70 (40)	4.70 (110)
Trifluralin	0.75	Pre-emergence	2.74 (15)	2.20 (8)	2.64 (14)	3.45 (31)	4.51 (90)
Trifluralin	1.00	Pre-emergence	2.56 (12)	2.20 (8)	2.53 (12)	3.22 (24)	4.32 (74)
Trifluralin	1.25	Pre-emergence	2.40 (10)	2.14 (8)	2.25 (9)	2.77 (15)	4.02 (55)
Trifluralin	1.50	Pre-emergence	2.14 (8)	1.87 (6)	1.95 (6)	2.56 (12)	3.75 (42)
Trifluralin	0.50	PPI	2.67 (14)	2.20 (8)	2.67 (14)	3.43 (30)	4.44 (84)
Trifluralin	0.75	PPI	2.35 (10)	1.95 (6)	2.30 (9)	3.22 (24)	4.18 (65)
Trifluralin	1.00	PPI	2.08 (7)	1.87 (6)	2.14 (8)	3.24 (25)	4.06 (57)
Trifluralin	1.25	PPI	1.70 (5)	1.50 (4)	1.87 (6)	2.40 (10)	3.50 (32)
Trifluralin	1.50	PPI	1.50 (4)	1.10 (2)	1.50 (4)	2.25 (9)	3.20 (24)
Weed-free	-	-	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
Weedy	-	-	3.57 (35)	2.89 (17)	3.20 (24)	3.82 (45)	4.99 (146)
LSD (P=0.05)			0.22	0.20	0.26	0.31	0.39

RESULTS AND DISCUSSION

Effect on Weeds

The major weeds in the experimental field in weedy plots were *Cyperus rotundus* (30%), *Echinochloa colona* (24.0%), *Commelina benghalensis* (16.4%) and *Celosia argentea* (11.5%). Other weeds (18.1%) observed were *Cucumis trigonus, Elusine indica, Cleome viscosa, Dactyloctenium aegyptium, Digitaria sanguinalis, Digera arvensis, Parthenium hysterophorus, Trianthema monogyna, Eclipta alba* and *Brachiaria mutica.*

All the trifluralin treatments irrespective of doses and stages of application caused significant reduction in the density and dry weight of total weeds as well as density of *E. colona, C. argentea, C. benghalensis* and *C. rotundus* over weedy check except density of *C. rotundus* and total weed density under pre-emergence application of trifluralin at 0.50 kg ha^{-1} (Table 1). Weed control efficacy of trifluralin at all the doses was higher when applied as pre-plant soil incorporation as compared to its corresponding doses as pre-emergence. In case of *E. colona, C. benghalensis, C. argentea* and weed dry weight, efficiency of trifluralin applied as pre-plant soil incorporation at 1.00 kg ha^{-1} was almost similar to that of application of trifluralin as pre-emergence at 1.50 kg ha^{-1}. The efficiency of the herbicide as pre-plant soil incorporation at 1.25 kg ha^{-1} was almost similar to its pre-emergence application at 1.50 kg ha^{-1} for the reduction in the density of *C. rotundus* and total weeds. The lowest density as well as dry weight of total weeds were observed with pre-plant soil incorporation of trifluralin at 1.5 kg ha^{-1}, though density of total weeds under this treatment was at par with its application at 1.25 kg ha^{-1} as pre-plant soil incorporation.

Effect on Crop

Uncontrolled weeds, on an average, caused

Table 2. Effect of doses and stages of trifluralin application on weed dry weight and grain yield of soybean (Average of two crop seasons)

Treatment	Dose (kg ha^{-1})	Stage of application	Weed dry weight (g m^{-2}) at 60 DAS	Soybean grain yield (kg ha^{-1})
Trifluralin	0.50	Pre-emergence	5.80 (331.0)	450
Trifluralin	0.75	Pre-emergence	5.58 (264.5)	713
Trifluralin	1.00	Pre-emergence	5.42 (226.7)	959
Trifluralin	1.25	Pre-emergence	5.05 (154.3)	1251
Trifluralin	1.50	Pre-emergence	4.68 (106.5)	1298
Trifluralin	0.50	PPI	5.43 (228.3)	852
Trifluralin	0.75	PPI	5.27 (193.5)	1062
Trifluralin	1.00	PPI	4.77 (116.4)	1412
Trifluralin	1.25	PPI	4.13 (61.0)	1583
Trifluralin	1.50	PPI	3.72 (40.3)	1484
Weed-free	-	-	0.00 (0.0)	1821
Weedy	-	-	6.24 (513.3)	206
LSD (P=0.05)			0.32	173

88.6% reduction in grain yield of soybean when compared with weed-free plots (Table 2). All the treatments produced significantly more grain yield than weedy check. At all the doses, pre-plant soil incorporation of trifluralin produced significantly higher grain yield of soybean than its corresponding doses as pre-emergence application. Trifluralin at 1.25 and 1.50 kg ha^{-1} as pre-emergence and 1.00 kg ha^{-1} as pre-plant soil incorporation produced almost similar grain yield of soybean. Among the different treatments of trifluralin, the highest grain yield of soybean was obtained when it was applied at 1.25 kg ha^{-1} as pre-plant soil incorporation which was at par with trifluralin applied as pre-plant soil incorporation at 1.00 and 1.50 kg ha^{-1}. The higher yield under these treatments can be attributed to effective control of weeds and more value of yield attributes.

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