

## Comparative Effect of Some Pre and Post-emergence Herbicides on Weeds and Soybeans

Shafiqullah, Q. Nawaz, Khan B. Marwat,  
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### ABSTRACT

Comparative efficacy of different herbicides, viz., Stomp 330E (Pendimethalin), Ronstar (Oxadiazon), Treflan (trifluralin), and Fusilade fluazifop butyl) applied as pre and post-emergence were evaluated along with hand weeding and weedy-check for the control of weeds and their effect on yield of soybean varieties and their economics. The varieties used in the experiment were William 82, Swat 84, and Weber.

Different herbicides and hand weeding enhanced the grain yield and reduced the weed density per unit area significantly. With the application of Stomp, Ronstar, Treflan, Fusilade and handweeding the yield was increased by 122.83%, 105.17%, 111.36%, 91.68%, and 141.62%, respectively. Maximum number of weeds were observed in control plots (89.25/m<sup>2</sup>); while handweeding followed by Stomp, Treflan, Ronstar, and Fusilade decreased the weed density by 96.17%, 91.69%, 89.92%, 87.87%, and 84.68%, respectively. The varieties did not differ significantly for their effect on grain yield and weed density.

### INTRODUCTION

Soybean is used universally as a food, fodder, and industrial crop. However, its per hectare yield in Pakistan is much lower when compared to other agriculturally advanced countries. Beside other reasons, weed interference is one of the main constraints, contributing towards yield reduction in soybean.

Weeds if allowed to multiply unchecked, will undoubtedly grow everywhere, and will present serious problems to crop husbandry. It has been estimated that annual losses caused by weeds in Pakistan alone amounted to Rs. 1150 millions, which are little more than those caused by diseases (Haq, 1970). Soybean yield losses resulting from weed interference and the cost of weed control constitute some of the highest costs involved in the production of crop (Anonymous, 1979). Chandler et al. (1984) estimated that crop losses in soybean ranged from 90% in Canada to 17% in United States.

Weeds often serve as alternate hosts for insects and plant pathogens that attack soybean. In addition to operation efficiency of harvesting equipment is also affected by the presence of weeds (Nave and Waughman, 1971). Weeds interfere directly with soybean for light, nutrient and moisture and may exhibit allelopathy to reduce crop growth (Lolas and Coburn, 1971).

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1982). Increase in seed moisture content, seed contamination, and seed splits have been reported when high densities of weeds were present at harvest (Anderson and McWhorter, 1976).

Although various herbicides have shown adequate weed control and increased soybean yield (Halwanker et al., 1986; Sarmah et al., 1976), the use of herbicides in soybean has received very little attention in Pakistan in general, and in NWFP particularly. The present study was undertaken to figure out effective and economical use of herbicides in soybeans.

#### MATERIALS AND METHODS

The experiments were laid out in RCB Design with split-plot arrangement of treatments at Agricultural Research Institute Tarnab, Peshawar during the years 1988 and 1989 on clay-loam soil of pH 7.8. The varieties were kept in main plots and herbicide treatments in the sub-plots. The experimental unit consisted of four rows, 5 meters long, having row to row distance of 45 centimeters.

Nitrogen and phosphorus were applied at the rate of 25 kg and 50 kg/ha, respectively. The entire phosphorus and half of nitrogen were applied before sowing during land preparation, while the remaining nitrogen was side dressed after germination with the first irrigation.

The treatments of the experiment were as follow:

#### A: Varieties:- (Main plots)

1. William-82
2. Swat-84
3. Weber

#### B: Herbicides: (Sub-plots)

Name	Rato (ai/ ha)
Pendimethalin	1.5kg
Oxadiazon	0.5kg
Trifluralin	1.4kg
Fluazifop-butyl	0.5kg

All these herbicides were applied as pre- (one day after sowing) and post-emergence (20 days after the completion of germination). The herbicides were sprayed with CO<sub>2</sub> gas operated sprayer having a boom length of 1.85 meters, fitted with four nozzles adjusted at a distance of 45 cm.

Plant thinning was carried out at V2 stage to obtain a uniform and desirable population of soybean. Plant to plant distance was kept 5 cm. The cultural practices and other plant protection measures were used as normal. Hand weeding was started 35 days after the sowing of crop.

Weed counting was done by using 1 m<sup>2</sup> quadrat laid randomly at two places in each treatment. The density of all the weeds was taken as a whole.

Two central rows were harvested at different times according to maturity in each treatment, and the crop was allowed to remain in the respective plots for drying. After drying, plants were packed and

labelled accordingly. For the determination of grain yield each bundle was threshed separately, grains were cleaned, weighed and then converted into kg/ha at 13% moisture level. Statistical analyses and treatment comparisons were done using ANOVA and LSD, respectively according to method reported by Steel and Torrie (1980). The years effect was not significant, therefore, average values are reported. The cost benefit ratio was calculated after CIMMYT (1988) and Abbit et al., (1978).

### RESULTS AND DISCUSSION

Statistical analysis revealed that different weed control treatments had significant influence on number of weed/m<sup>2</sup> (Table 1). Hand-weeded plots had the least weed population of 3.42 plants/m<sup>2</sup>. Among the herbicides, Stomp gave the best weed control followed by Trellan and Ronstar, while Fusilade gave poor weed control as it failed to control sedges and dicotyledonous weeds. However, it seemed suitable for the control of grassy weeds only (Tiwari and Trivedi,

1985; Guedes and White, 1982). Tedia et al. (1985) observed that Fusilade controlled the major annual and perennial grasses and remained ineffective against broad-leaf weeds. The present results are also in agreement with those of Sarmah et al. (1986), where Ronstar effectively controlled grasses and broad-leaf weeds. While according to Hurt (1987), *Amaranthus retroflexus* and annual grasses infesting the soybean were controlled with Trellan. All the three varieties show significant effect on number of weeds/m<sup>2</sup> in case of Fusilade and weedy control, where maximum number of weeds were recorded in William-82 followed by Swat-84 and Weber, respectively, the mean values ranged from 20.50 to 24.17 weeds/m<sup>2</sup>.

As shown in table 2, the herbicides significantly affected the soybean yield. Highest yield was observed in the handweeded plots. Among the herbicides, Stomp 330 E treated plots gave higher yields in all the three varieties, followed by Trellan 4EC, Ronstar 12L, and Fusilade 12.5 EC respectively. In all the three varieties

Table 1. Weed Density (m<sup>2</sup>) as influenced by different weed control treatments and varieties.

Treatments	Varieties			Mean
	William-82	Swat-84	Weber	
Pendimethalin	8.00	7.25	7.00	7.42
Oxadiazon	12.75	10.25	9.50	10.83
Trifluralin	9.00	9.50	8.50	9.00
Fluzifop-butyl	18.26	12.00	10.57	13.61
Hand Weeding	4.25	3.25	2.75	3.42
Control	92.75	90.50	84.50	89.25
Mean	24.17	22.13	20.50	22.27

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**Table 2. Average grain yield (kg/ ha) as affected by different weed control treatments and varieties.**

Treatments	Varieties			Mean
	William-82	Swat-84	Weber	
Pendimethalin	2028	1833	2083	1981
Oxadiazon	1944	1639	1889	1824
Trifluralin	1972	1722	1944	1879
Fluzifop-butyl	1889	1472	1750	1704
Hand Weeding	2222	1944	2278	2148
Control	1000	806	861	889
Mean	1843	1569	1801	1738

viz. William-82, Swat-84 and Weber, the trend of yield increase with different herbicides was similar, although there were significant differences among the varieties. On the basis of average of over all treatments, maximum yield of 1843 kg/ ha was found in case of William-82 followed by Weber 1801 kg/ ha and Swat-84 1569 kg/ ha. Ray (1986) reported that Fusilade

post-emergence followed by hand weeding in soybean gave seed or pod yield similar to those in weed free condition. Sarmah et al. (1986) obtained highest seed yield with Ronstar at the rate of 1 kg/ ha.

Although hand weeded plots gave best weed control and highest yield but at the same time it is the most

**Table 3. Cost benefit ratio as affected by different weed control treatments.**

Variables	Stomp 330E	Ronstar 12L	Treflan 4EC	Fusilade 12.5 Ec	Hand weeding	Control
Average grain yield (kg/ha)	1981.00	1824.00	1879.00	1704.00	2148.00	889.00
Adjusted grain yield (kg/ha)	1782.90	1641.60	1691.10	1533.60	1933.20	800.10
Gross benefit (Rs./ha) @ Rs.5/kg	8914.50	8208.00	8455.50	7668.00	9666.00	4000.50
Herbicide cost (Rs./ha)	608.00	490.00	540.00	450.00	860.00	-
Spray charges (Rs./ha)	25.00	25.00	25.00	25.00	-	-
Equipment charges (Rs./ha)	25.00	25.00	25.00	25.00	-	-
Total variable cost (Rs./ha)	658.00	450.00	590.00	500.00	860.00	-

One hand weeding charges/ha - 43 man days @ Rs. 20/labour/day.

Table 4. Cost benefit ratio of different weed control treatments in soybean crop.

Treatment	Gross benefit (Rs./ha)	Variable cost (Rs./ha)	Net benefit (Rs./ha)	Increased net benefit over control (Rs./ha)	Cost benefit ratio
Pendimethalin	8914.50	658.00	8256.50	4256.00	1:6.47
Oxadiazon	8208.00	540.00	7668.00	3667.50	1:6.80
Trifluralin	8455.50	590.00	7865.50	3865.00	1:6.56
Fluazifop-butyl	7668.00	500.00	7168.00	3167.50	1:6.38
Hand weeding	9666.00	860.00	8806.00	4805.00	1:5.59
Control	4000.50	-	4000.50	-	-

laborious and expensive method. Due to its high variable cost (Table 3) its cost benefit ratio was 1:5.59, which is lower than the ratio of any other herbicides. Similarly, Stomp gave good weed control and higher yield than any other herbicide but its high variable cost proves it uneconomical. Ronstar gave a satisfactory weed control and good yield at relatively low variable cost. Hence Ronstar had the highest cost-benefit ratio of 1:6.80 and proved to be the most economical herbicide. Trellan with its cost benefit ratio of 1:6.56 stood second most economical herbicide (Table 4). It is therefore, concluded that farmers always looking for economical methods, will naturally prefer Ronstar for use in soybean, which is effective and economical in terms of weed control and higher grain yield.

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