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Application of Pre-emergence Herbicides in Spring Soybean

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Abstract: Weed control treatments were found significantly effective on weed density/boimass and seed yield. The weedy check plots offered the lowest yield (1374 kg ha^{-1}) and was 37.6 percent less than the weed free treatment. Hand weeding caused to a significantly higher yield than weedy check but lower than herbicide treatments. Pendimethalin gave significantly 19.3 percent higher yield (1639 kg ha^{-1}) and its yield was also higher than other treatments. Pendimethalin was also found more effective in controlling weeds in spring soybean.

Key words: Soybean (*Glycine max* L. Merr.), Herbicides, Weed control, Pre-emergence

Introduction

Soybean (*Glycine max* L. Merr.) contains 40-42 percent good quality protein and 18-22 percent oil comprising 85 percent unsaturated fatty acid and cholesterol-free (Aslam *et al*. 1995). Globly, soybean is one of the most important oilseed crops but in Pakistan it is still a non-conventional crop. Being a leguminous crop, it never declines soil fertility because a well nodulated soybean plant generally give more nitrogen to soil than it utilizes in the plant development (Weber, 1966; Schroeder and Hinson, 1975; Bergersen *et al*., 1985). The highest seed yield from demonstration plots is 3.5 t/ha whereas the national yield, 563 kg ha^{-1}, is far below from the potential yield of newly recommended varieties (Aslam *et al*., 1995). The low yield, besides many other constraints, is due to the weeds infestation in the crop. Weed compete with the crop for food nutrients, water, space for canopy development and other growth requirements. These also serve as a host for diseases and insect-pests. Weed causes poor growth and yield loss of 10-73 percent (Zaki *et al*., 1988; Tiwari *et al*., 1992). Weeding by cultural practices is tedious as well as expensive in intensified agriculture. Chemical weed control is quick and more effective. Siddique *et al*. (1988) reported that chemical weed control through applying pendimethalin as pre-emergence herbicide gave significantly higher seed yield and maximum net benefit compared to cultural practices and non-weeding. Balyan (1992) investigated that Pendimethalin and weeds free plots gave similar yield where use of herbicides in combination (two or more) gave excellent results in weed control to produce higher soybean yield. For this reason, a study was designed to test the use of pre-emergence herbicides for effective weed control in spring soybean.

Materials and Methods

The experiment was carried out at National Agricultural Research Centre (NARC), Islamabad during spring 1993, 94 and 95. The soil was slightly alkaline (pH 8.2) and loam. Soybean genotypes, NARCIII, NARC-IV, NARC-V and Williams-82 were sown in the first week of February. Land preparation was done on rain moisture. Recommended doze of N and P (25:50 kg/ha) was incorporated into the soil at the time of sowing. Seed was well inoculated with inoculant, *Rhizobium japonicum* species. Strict crop husbandry practices were adopted and insect-pests controlled through regular insecticidal spray whenever found necessary. Herbicides were applied at their recommended rates with a hand operated sprayer (Knapsack) soon after the sowing of trial. Plots consisted of 4 rows of 5 meter length with 45 cm spacing. Five treatments were repeated 4 times in factorial combination organized in a randomized complete block design. The treatments were; Pendimethalin (Stomp 330E) at 1.48 Kg a.i./ha^{-1} Atrazine (Primextra) at 0.5 Kg a.i./ha^{-1} Mechanical weeding with rotary, Weed free and Weedy check. The weed density and biomass were recorded by placing a quadrate with size of 1 × 1 meter in each plot 45 days after sowing. Data over years were consistent, therefore, the combined analysis of variance was performed and Least Significant Difference (LSD) at 5 percent probability level was used to test the significance of treatment mean using MSTATC computer software programme adopted by Bricker (1991).

Results and Discussion

Weeds flora collected from experimental area in spring sown comprised 12 weeds species belonging to 10 families (Table 1). These weeds were grassy, broad leaved and sedges either of annual or perennial habitat.

These herbicides had no negative effect on the germination and growth of the soybean crop. Though these herbicides controlled most of the annual grasses and broad leaved weeds but later on, the troublesome weeds like Baroo (*Sorghum halepense*), Deela (*Cyperus rotundus*) and Khabbal (*Cynodon dactylon*) appeared and competed with the crop. Perennial weeds, propagated through under ground stem (Rhizome) were not effectively controlled by these herbicides. Highest weed density (298 No./m^2) and weed boimass (132 g/m^2) was found in weedy check and projected the due importance of weed management in spring sown soybean (Table 2). In pendimethalin, lowest weed population (80 No./m^2 and dry matter accumulation (30 g/m^2) treatment exhibited the excellent performance in weeds control.

Seed yield of 1374 kg ha^{-1} was obtained in weedy check and it was the lowest in the trial. A further look into the data revealed that yield was badly affected by the weeds and consequently caused 27.4 percent decrease in seed yield over weed free treatment. Results are in agreement with the results of Sajjapongse and Roan (1981), Zaki *et al*. (1988) and Balyan (1992). Among the treatments, the highest yield of 1639 kg ha^{-1} was obtained with the application of pendimethalin. Yield recorded in atrazine treated plots was significantly lower than yield in pendimethalin treated plots but higher than the yield occurred in hand weeded plots having a nonsignificant difference (Table 2). This indicated that the weed controlling efficiency of pendimethalin was more effective in soybean. These results were in accordance with the results achieved by Zaki *et al*. (1988) and Balyan (1992). Weeds control efficiency of mechanical weeding with rotary weeder was not proved to be much more effective than pre-emergence herbicides treatments but was found highly significant than weedy check. The lower yield was due to the competition between weeds and crop for food nutrients and other inputs. Similar findings were reported by Zaki *et al*. (1988) and Rajput *et al*. (1993).

Table 1: Weeds flora recorded in spring soybean at NARC during 1992, 1993 and 1994

Local name	Botanical name	Habit	Family
Baroo	*Sorghum halepense*	Gr-P	Gramineae
Khabbal	*Cynodon dactylon*	Gr-P	Gramineae
Maina	*Medicago ploymorpha*	Bl-A	Leguminosae
Senji	*Melilotus indica*	Bl-A	Luguminosae
Jangli haloon	*Coronopus didymus*	Bl-A	Cruciferae
Deela	*Cyprus rotundas*	Sdg-P	Cyperaceae
Shatra	*Fumaria indica*	BL-A	Fumariaceae
Billi booti	*Anagallus arvensis*	Bl-A	Primulaceae
Chatri Dadak	*Euphorbia helioscopia*	Br-A	Euphorbiaceae
Dranak	*Polygonum plebejum*	Bl-A	Polygonaceae
Lilli	*Convolvulus arvensis*	Bl-P	Convolvulaceae
Bathoo	*Chenopodium album*	Bl-A	Chenopodiaceae

A = Annual Sdg = Sedges p = perennial Bl = Broad leaves Gr = Grasses

Table 2: Three years average of weed density/biomass (dry weight) and seed yield data comparing the weed control treatments on soybean genotypes

Treatments	Weed density (No./m^2)	Weed dry boimass (glm^2)	Seed yield (kg ha^{-1})	Increase over weedy check (%)
Pendimethalin	80.19 d	30.11 d	1639 b	119.30
Atrazine	99.67 c	46.84 b	1478 c	7.60
Mechanical weeding	121.63 b	59.77 c	1471 c	7.10
Weed free	0.00 a	0.00 d	1890 a	37.60
Weedy check	298.42 a	131.56 a	1374 d	
LSD (5%)		38.48		
Genotypes				
NARC-III	82.23 NS	40.09 NS	1571 a	
NARC-IV	90.14	43.78	1524 b	
NARC-V	86.46	42.01	1594 a	
Williams-82	88.31	42.85	1593 a	
LSD (5%)			39.77	

*Means in a column followed by the same letter are not significantly different at 5 percent level of probability

Efficiency of weed control treatments was further evaluated for seed yield. It was observed that difference in seed yield across genotypes was non-significant (Table 2). A real trend of higher yield in treated plots and lower in untreated plots was observed.

The combined analysis of variance of 4 soybean varieties of diverse origin (Maturity group-3) showed that the genotypes differed significantly indicating considerable range of genetic variability in the material for grain yield (Table 3). Hence, the treatment × varieties interaction was also found statistically significant for this trait.

Table 3: Estimates of mean squares in combined analysis of variance for 3 × 4 × 5 factorial combination in RCBD on soybean yield

Source	Degree of freedom	Mean square
Replication	3	18547
Years (Y)	2	45598
Error(a)	6	9445
Varieties (V)	3	63610*
Y × V	6	17114
Error (b)	27	11271
Treatments (T)	4	1965163**
Y × T	8	69904**
V × T	12	83195**
Y × V × T	24	40550**
Error	144	9094

Thus present study indicated that the weed control efficiency of pendimethalin at the recommended rate (at 1.48 Kg a.i./ha^{-1}) was more effective as pre-emergence herbicide in soybean. Further more, post emergence mechanical weeding with rotary weeder during the crop period is also effective to get higher yield in spring soybean. However the examined herbicide has so for offered the most efficient and the safest weed control and reduced the cost of production by rendering hoeing unnecessary.

References

Aslam, M., S.M. Mirza, S.M. Shah, N. Javed and Naeemullah, 1995. New early maturing and high yielding soybean varieties. Crop Prod. Bull., 4: 1-11.

Balyan, R.S., 1992. Integrated weeds management studies in soybean (*Glycine max* L.). Oil Crops New Lett., 7: 42-44.

Bergersen, F.J., G.L. Turner, R.R. Gault, D.L. Chase and J. Brockwell, 1985. The natural abundance of 15N in an irrigated soybean crop and its use for the calculation of nitrogen fixation. Aust. J. Agric. Res., 36: 411-423.

Bricker, B., 1991. MSTATC: A micro computer program from the design management and analysis of agronomic research experiments. Michigan State University, USA.

Rajput, M.J., S.M. Alam and M.S. Rajput, 1993. Effect of weed control and N application on the growth of wheat. Pak. J. Agric. Res., 14: 131-135.

Sajjapongse, A. and Y.C. Roan, 1981. Some aspect of soybean management at AVRDC. Proceedings of the 73rd Annual Meeting of American Society of Agronomy, January 28-30, 1981, California, pp: 13-22.

Schroeder, V.N. and K. Hinson, 1975. Soil nitrogen from soybeans (*Glycine max* (L.) Merr.). Proc. Soil Crop Sci. Soc. Florida, 34: 101-103.

Tiwari, R.N., K.P. Tiwari and B.S. Thakur, 1992. Comparative efficiency and economics of weeds control in soybean. Indian J. Weed Sci., 20: 7-11.

Weber, C.R. 1966. Nodulating and nonnodulating soybean isolines: II. Response to applied nitrogen and modified soil conditions. Agron. J., 58: 46-49.

Zaki, M.S., M.R. Hussain, M.I. Makhdum and T. Masood, 1988. Response of seed cotton yield and technological properties of cotton to some herbicides. Pak. J. Agric. Res., 9: 448-452.