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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (1): 144-146, 2000

Evaluation of Pre-emergence Herbicides in Autumn Soybean

Mukhtar Ahmed, Sher Mahmood Shah, M. Yasin Mirza and Naazar Ali
Oilseeds Research Programme, National Agricultural Research Centre, Islamabad, Pakistan

Abstract: Herbicide, Pendimethlin applied at 1.48 kg ai/ha^{-1} controlled the weeds and gave 53 percent higher grain yield (2858 kg ha^{-1}) than weedy check (1877 kg ha^{-1}) and was at par with weed free treatment (2867 kg ha^{-1}). Similarly, oxadiazon applied at 0.45 kg ai/ha^{-1} showed better performance in controlling weeds and gave higher grain yield of 2610 kg ha^{-1}. The lowest grain yield of 1877 kg ha^{-1} was recorded in weedy check. Weed density and biomass were also significantly effected with the different doses of pendimethalin and oxadiazon. The medium doses of both herbicides gave excellent performance. Pods per plant were significantly different with the different doses of herbicides whereas, the medium doses gave higher number of pods per plant. The oil content was not altered with the different doses of herbicides but comparatively higher oil percentage was found than weedy check.

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

Introduction

Amongst the oilseed crops, Soybean (*Glycine max* L. Merr.) is one of the most important oil and protein crop in the world. In Pakistan, soybean is a non-conventional oilseed crop and still it seeks sufficiently greater efforts to fit in the existing cropping pattern. Soybean is grown on 5137 hectares producing 2885 tones of grains with an average of 562 kg ha^{-1} (Anonymous, 1994). The potential yield of newly established varieties is far higher than the existing ones and this might be due to the negligence in the adoption of recent improved soybean production technology (Aslam *et al*., 1995).

In order to increase the soybean production in Pakistan, the development of appropriate weed management technique is an essential component of improved cropping system. New management practices include, hand weeding (manual), mechanical and chemical control measures used exclusively or in combined system. However, the autumn sown crop usually has frequent monsoon rains during the early growth period and aggressive completion with weeds. Weed control by labour is tedious and costly. In such situation herbicides offer the most practical, effective and economical weed control and crop yield is also increased the annual loss caused by weeds in country has amounted to Rs. 1150 million and is more than the losses caused by diseases (Haq, 1970). However for raising a successful soybean crop, the availability of satisfactory weed control techniques and their adaptability on farmers fields are a pre-requested. Weed infestation during crop growth period was evaluated and found that weeds competitions begin from 20 days after sowing and continued after maturity but the most severe competition was in between 30 to 60 days after sowing (Beckett *et al*., 1988).

The major objective of this study was to evaluate the most effective rate of pre-emergence herbicides for higher grain yields in autumn soybean.

Materials and Methods

The experiment was conducted under field conditions in a randomized complete block design with 8 treatments (Table 1) replicated 3 times at the National Agricultural Research Centre, Islamabad during autumn 1993 and 1994. Well inoculated seed of NARC-II with *Rhizobium Japonicum* species, was planted with single hand drill with 45 cm row spacing. Plot size was 5 × 1.6 m, Recommended dose of NP fertilizer (25:50 Kg ha^{-1}) was broadcasted at the time of sowing.

The per-emergence herbicides used in paper are as under:

Common name	Trade name	Chemical name
Pendimethalin	Stomp 330E	N-(1-Ethyl propyl) 3,4,dimethyl-2,6-dinitro benzenomine.
Oxadiazon	Ronstor	2-tert-butyl-4-(2,4-dichloro-5-sopropyloxy phenyl)-1,3,4-oxadiazoline-5-one.

Table 1: Pre-emergence herbicides with different doses used for weed control in soybean during autumn 1993 & 1994.

Treatment	Rate	Concentration (%) (kg ai ha^{-1})	Time of application
Pendimenthalin			
T1	1.00	33	Just after sowing
T2	1.48	33	"
T3	1.96	33	"
Oxadiazon			
T4	0.35	12	"
T5	0.45	12	"
T6	0.55	12	"
T7 (Weed free)	-	-	"
T8 (Weedy check)	-	-	"

Pendimethalin (Stomp 330E) at 1.00, 1.48 and 1.96 kg ai/ha^{-1} and oxadiazon at 0.35, 0.45 and 0.55 kg ai/ha^{-1} were applied with hand operated Knap-Sack sprayer with flate-fan nozzle soon after sowing. Weed free (till harvest)

Table 2: Weeds flora recorded in autumn soybean crop during 1993 and 1994

Local name	Botanical name	Habit	Family
Deela	*Cyperus rotundus*	Sedg-p	Cyperaceae
Khabbal	*Cynodon dactylon*	Gr-p	Poaceae
Cholai	*Amaranthus viridis*	Bl-A	Amaranthaceae
Sawank	*Echinochloa colonum*	Gr-A	Poaceae
Itsit	*Trinthema protulacstrum*	Bl-A	Aizoaceae
Baroo	*Sorghum halepense*	Gr-P	Poaceae
Hazardani	*Euphorbia hirta*	Bl-A	Euphorbiaceae
Bakhra	*Tribulus terrestris*	BL-A	Zygophyllaceae
Kulfa	*Portulaca oleracea*	Bl-A	Portulacaceae
Paiwan/Chambar	*Eleusine compressa*	Gr-A	Poaceae
Tandla	*Digera muricata*	Bl-A	Amaranthaceae
Darank	*Brachiaria mutica*	Bl-A	Poaceae

A = Annual Sdg = Sedges P = Perennial Bl = Broad leaves

Table 3: Effect of different doses of herbicides on weed density, biomass, yield and yield components in soybean (1993 and 1994)

Treatment	Weed density No./m^{-2}	Weed biomass gm^{-2}	pH (cm)	Pods/ plant	Oil (%)	Yield (kg ha^{-1})
Pendimethalin						
T1	63.00cd	72.67c	50.73cd	51.67ab	21.37a	2345b
T2	52.67e	34.60d	57.20a	55.67a	21.47a	2858a
T3	67.67e	73.17c	54.87ab	45.00cd	21.68a	2333b
Oxadiazon						
T4	57.67de	157.01b	53.73abc	42.00d	21.17a	2242b
T5	54.64d	55.83c	57.00a	49.00bc	21.53a	2610a
T6	82.67b	56.34cd	51.80bc	43.67d	21.48a	2143b
T7 (Weed Free)	00.00f	00.00e	55.80a	56.67a	21.54a	2867a
T8 (Weedy Check)	165.70a	253.02a	47.80cd	37.67e	20.56b	1877d

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

and weedy check plots were included in the experiment for comparison. Weeds samples for weed density and weed biomass were taken by quadrate of 25×25 cm from each plot just 45 days after sowing. Plant height, pods $plant^{-1}$ and gain yield per plot was recorded at the time of maturity. Grain yield determination was based on the dry weight basis of threshed grain and adjusted at 13 percent moisture level and computed to kg ha^{-1}. Data recorded for weed density, weed biomass, grain yield and other yield components were analyzed following MSTATC Package adopted by Bricker (1991).

Results and Discussion

Twelve weed species were recorded in the experimental area during the autumn season 1993 and 1994 (Table 2). They were collected as distributed in 8 botanical families comprising grassy, broad leaved and sedges of annual or perianal habitat. Problematic weeds like deela (*Cyperus rotundusl*), baroo (*Sorghum halepense*) and khabbal (*Cynodon dactylon*) appeared in herbicide treated plot due to their propagation through underground stem (Rhizome) and consequently lower mortality rate was observed. However, efficacy of herbicide treatments proved excellent in controlling weeds when compared with weedy check.

The pooled data of two years of weed population and dry matter accumulation (Table 3) was significantly influenced by herbicide treatments. There was an acute weed infestation in weedy check plots as the density of mixed weeds was enormous (165.70/m^{-2}) in contrast to herbicide treated plots (52.67-82.67/m^{-2}). Similar trend was observed in dry matter accumulation by weeds as exhibited in Table 3. Medium dose at 1.48 kg ai ha^{-1} of pendimethalin and oxadiazon (0.45 kg ai ha^{-1}) effectively controlled most of the weeds species as estimated 45 days after the sowing of soybean. Other doses of both tested herbicides were less effective in controlling weeds population and their biomass. Results are in line with the results achieved by Ghafoor *et al*. (1990), Khan *et al*. (1991) and Khan *et al*. (1992).

The weeds control efficacy of the tested herbicides has been further evaluated considering the plant height at the time of harvest that was found physically different but statistically similar plant height in weed free and medium dose of pendimethalin treatments. In other treated and untreated plots, plant height was significantly lower indicating weed interference as not allowing the crop plant

to develop with its full potential. Different doses of both herbicides have shown their Marked effect on the plant height. The effectiveness of weed control treatment on pods bearing capability given in the Table 3 revealed that average pods plant^{-1} with one treatment is significantly different from average values of pod plant^{-1} with other treatments. The lowest average value of (37.67) pods plant^{-1} was recorded in weedy check which might be due to higher values of weed density and dry matter accumulation. Development of pods plant^{-1} in medium dose of pendimethalin with respect to weed free plots were physically different but statistically similar showing the higher efficacy of the pendimethalin (1.48 kg ai/ha^{-1}) dose. Among the different doses of oxadiazon, the medium dose (0.45 kg ai/ha^{-1}) gave better results and was in line with Balyan and Bhan (1984).

Analysis for oil content (Table 3) revealed that different herbicides and their doses have shown non-significant difference. However, herbicidal treatments caused an increase of 2.9-4.7 percent in the oil content as compared to weedy check (20.96%).

Seed yield (Kg ha^{-1} of soybean variety NARC-II) was also affected significantly by the herbicide treatments (Table 3). The maximum yield of 2867 kg ha^{-1} was recorded in weed free (till harvest) treatment as compared to other treatments and was 53 percent more over the weedy check. Results are in conformity accordance with those of Chandler *et al*. (1984). Comparing the efficiency of different doses of pendimethalin through grading the means of seed yield, it was exhibited that the medium dose (1.48 kg ai/ha^{-1}) gave higher seed yield than other two doses of this herbicide but was found at par with the weed free treatment carrying non-significant difference. This showed that medium dose of (1.48 kg ai/ha^{-1}) pendimethalin was more effective and results are matching with the results of Khan *et al*. (1992) and Cheema *et al*. (1994). It was also indicated that on comparing yield among the different doses of oxadiazon, the medium dose (0.45 kg ai/ha^{-1}) produced higher yield than remaining two doses which showed its superiority due to its higher weeds mortality rate. Results are similar with the investigation of Balyan and Bhan (1984).

It could be very clearly concluded based on the two years study, that the medium doses of pendimethalin (1.48 kg ai/ha^{-1}) and oxadiazon (0.45 kg ai/ha^{-1}) have excellent performance in controlling weed flora in autumn sown soybean and surely increase the seed yield giving an efficient weed control strategy for soybean for its successful and beneficial crop husbandry in Pakistan.

References

Anonymous, 1994. Agricultural statistics of Pakistan, 1993-94. Government of Pakistan, Ministry of Food, Agriculture and Livestock, Economic Wing, Islamabad, pp: 67.

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. and V.M. Bhan, 1984. Promising herbicides for weed control in chickpea (*Cicer arietinum* L). Haryana J. Agron., 7: 69-75.

Beckett, T.H., E.W. Stoller and L.M. Wax, 1988. Interference of four annual weeds in corn (*Zea mays*). Weed Sci., 36: 764-769.

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

Chandler, J.M., A.S. Hamill and A.G. Thomas, 1984. Crop Losses Due to Weeds in Canada and the United States. WSSA., Champaign, IL., USA., pp: 22.

Cheema, Z.A., M.A. Khan and M.B. Khan, 1994. Weed management for sustainable agriculture. Proceedings of the 4th All Pakistan Weed Science Conference, March, 26-27, 1994, Faisalabad, Pakistan.

Ghafoor, A., R.A. Shad and M. Aslam, 1990. Evaluation of different herbicides and their application methods in rainfed soybean. Pak. J. Weed Sci. Res., 3: 6-14.

Haq, N., 1970. Losses caused by crop pests in Pakistan. J. Agric. Res., 8: 297-305.

Khan, M.A., A. Ghafoor, S.U. Siddiquie and M. Aslam, 1991. Effect of pre- and post-emergence herbicides on weed flora, composition, nodulation and yield of soybean (*Glycine max* L.). Pak. J. Weed Sci. Res., 4: 111-117.

Khan, R.H., H.H. Muendel and N.A. Khan, 1992. Performance of pendimethalin as pre plant applied herbicide in kharif-sunflower. Pak. J. Weed Sci. Res., 5: 47-51.