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## Performance of mid Duration Soybean as Affected by Various Pre-emergence Herbicides

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**Abstract:** Eight different weed species were identified to be present among which jungle grass and purple nutsedge were the most abundant weeds during both of the kharif seasons. All of the herbicides including hand weeding eradicated completely the crow footgrass and purslane from the treated plots. On the contrary, purple nutsedge was the most tolerant weed and non of the herbicides was potent enough to eliminate it completely. For soybean, days to flowering and maturity, plant height and seed/pod were not affected significantly by different herbicides as compared to hand weeding and no-weeding control. However, plant population, number of pods/plant and yield were significantly affected. All the treated plots including hand weeding produced 47 to 133% more yield as compared to no-weeding control.

**Key words:** Soybean, *Glycine max*, yield, weeds, herbicides.

### Introduction

Soybean (*Glycine max* L.) is a source of oil (20%) and protein (40%) (Burton, 1984). Being a leguminous crop, it can fix 50 to 200 kg ha<sup>-1</sup> atmospheric nitrogen per season (Roughley, 1980). The shortage and consequently huge imports of edible oils make it indispensable to concentrate on increasing soybean acreage and production in the country. However, beside other reasons losses from weed interference in soybean production accounts far more than from all other pests combined (McWhorter and Patterson, 1979).

Weeds are known to compete with cultivated crops for water, light, nutrients, space and other growth factors adversely affecting the quantity and quality of the produce (Muzik, 1979). For soybeans, Rao (1987) reported 76 percent losses in yield due to weed infestations in India. Similarly, Chandler *et al.* (1984) accounted for 90 to 17% yield losses in soybean due to weed competition in Canada and United States, receptively. Weeds intrude directly with soybean for light, nutrients and moisture and may exhibit allelopathy to reduce crop growth (Lolas and Coble, 1982). Anderson and McWhorter (1976) reported increased seed moisture content, seed contamination and seed splits when soybeans were grown in high density of weeds.

To overcome the deleterious effects of weeds in soybean it is imperative that weed population be kept below the economic threshold level. For this purpose, the extensive research on herbicide evaluation has resulted in identifying selective and effective herbicides in soybean. Tiwari *et al.* (1990) studied the effect of 18 pre-emergence herbicides on the germination, growth and yield of soybean. They observed significant yield increases by seven herbicides as compared to control. Shafiullah *et al.* (1990) reported that the application of Stomp (Pendimethalin), Runstar (Oxadiazon), Treflan (trifluralin), Fusilade (fluazifop) and hand-weeding increased the grain yield in soybean varieties by 122.83, 105.17, 111.36, 91.96 and 141.62% respectively.

The objective of this study was to determine the effect of various pre-emergence herbicides in comparison with hand weeding and no-weeding control on the weed population as well as yield of a mid duration soybean variety.

### Materials and Methods

Experiments were conducted at NWFP Agricultural University Research Station (North), Mingora, in 1994 and 1995 growing seasons on a clay loamy soil with a pH of 7.0. During both the years, the experiments were planted in the 2nd weeks of July in

RCB experimental design, having 4 replications. A mid duration soybean variety, Swat-84 was planted at the rate of 125 Kg ha<sup>-1</sup> in plots measuring 5 x 2.7 m. Each plot consisted of 6 rows having 45 cm row to row spacing. Five different pre-emergence herbicides [viz., Roundup (glyphosate) at 3.0 lit/ha, Dual 500 EC (metolachlor) at 3.5 lit/ha, Stomp 330 E (pendimethalin) at 4.0 lit/ha, Sencor 70 WP (metribuzin) at 1.5 kg/ha, Racer 25 EC (flurochloriden) at 2.5 lit/ha.], hand weeding and a no-weeding control were allotted randomly to these experimental plots just after sowing. All recommended cultural practices were carried out accordingly to raise a successful crop. Weed density data was recorded 40 days after planting. For soybean, data were recorded on days to flowering and maturity, plant height, plant population, pod/plant, seed/pod and yield. The analysis of variance and LSD test of the data were carried out using MSTATC (Bricker, 1991).

### Results and Discussion

**Effect on weeds:** Eight different weed species viz., Brassica (*Brassica kaber*), Lambsquarter (*Chenopodium album*), Nutsedge (*Cyperus rotundus*), Crowfoot grass (*Dactyloctenium aegyptium*), Large crabgrass (*Digitaria sanguinalis*), Jungle grass (*Echinochloa colonum*), Goose grass (*Elucine indica*) and Purslane (*Trianthema monogyna*) were identified to be growing in both the years. Among these, jungle grass and nutsedge were the most abundant weeds. Similar prevalence of these two weeds were also reported by Sheikh *et al.* (1987) in the kharif season of Pothwar plateau.

Weed infestation in all of the herbicide treated plots including hand weeding were significantly lower than no-weeding control. The least number of weeds per m<sup>2</sup> were observed in the pots treated with Dual, Roundup and Sencor (Table 1). Jungle grass was eliminated effectively from all of the herbicide treated plots. However, purple nutsedge was the most tolerant weed and non of the herbicides was effective enough to eradicate it completely. Singh (1987) reported nutsedge among one of the most noxious weeds of India. He reported its occurrence to an elevation of about 2500 meters in nearly all horticultural and agricultural crops. For its control he proposed competitive cropping and mulching to cut light to the weed.

**Effect of weed eradication through various means on soybean yield and other characters:** Statistical analysis of the various herbicide treated plots, hand weeding and no weeding control showed no significant effect on days to flowering and maturity, plant height and seed per pod of soybean variety, Swat-84. All the treatments

Table 1: Weed density/m<sup>2</sup> as affected by the application of various herbicides, hand weeding and no weeding control in soybean variety, Swat 84 at ARS, Mingora

Weeds	Roundup	Dual	Stomp	Sencor	Racer	Hand	Control
Brassica	1	0	2	0	1	1	8
Lambsquarter	1	1	1	0	0	2	8
Purple Nutsedge	1	1	9	3	6	3	11
Crowfoot grass	0	0	0	0	0	0	3
Large crabgrass	0	0	0	0	1	0	5
Jungle grass	0	0	0	0	1	1	17
Goose grass	0	0	0	0	1	1	5
Purslane	0	0	0	0	0	0	2
Total	3	2	12	3	10	8	54

Table 2: Yield and other important characters of soybean variety, Swat-84, as affected by various pre-emergence herbicides, hand weeding and no weeding control, at ARS, Mingora

Treatments	Plant height (cm)	Plant population (000ha <sup>-1</sup> )	Pods/plant	Seed/pod	Yield (kg/ha <sup>-1</sup> )
Roundup	70	233	48	2.6	3190
Dual	68	265	65	2.5	3975
Stomp	58	236	52	2.7	3010
Sencor	65	230	56	2.6	3000
Racer	60	170	66	2.6	2505
Hand weeding	64	228	45	2.5	3175
Control	61	200	30	2.6	1704
LSD at $\alpha=0.01$	n.s.	29.6	13.2	n.s.	654.7

including control, took 27 days to flowering and 85 days to maturity. Plant height ranged from 58.0 cm for Stomp to 69.0 cm for Roundup. Seed/pod ranged from 2.5 (for Dual and Hand weeding) to 2.7 (for Stomp). Significant differences at 1 percent level of probability were observed for plant population ha<sup>-1</sup>, pods/plant and yield kg ha<sup>-1</sup>. All the treated plots except Racer, had significantly more plant population at harvest as compared to control (Table 2). Plots treated with Racer had the lowest number of plant population. This herbicide had a deleterious effect on the emergence and growth of soybean seedlings. Plots treated with Racer had chlorotic seedling, thus showing signs of herbicide injury. The highest number of pods/plant were observed for the herbicide Racer (probably due to lower plant density) followed by Dual and Sencor (Table 2). Significantly the lowest number of pods/plant were recorded for the no-weeding control. The highest significant yield of 4043 kg ha<sup>-1</sup> was recorded for the plots treated with Dual followed by Roundup and hand weeding with their respective yields of 3368 and 3345 kg ha<sup>-1</sup> (Table 2). The no-weeding control yielded 1704 kg ha<sup>-1</sup>. When these values were compared on the basis of per cent increase over control, it was observed that these five herbicides including hand weeding gave 47 to 133.3 percent more grain yield.

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