Efficacy of Herbicides and Weeding Intervals on Weed Growth and Seed Yield of Safflower

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INTRODUCTION

Safflower (*Carthamus tinctorius* L.), a dry land crop is confined to black soils where residual soil moisture is of prime importance. It thrives well by virtue of its deep root system. (Lal and Yadav, 1980) as it makes use of moisture and nutrients from the lower layers of the soil which is not possible for other rabi crops (Patil and Nikam, 1982). Maintaining weed free environment throughout the crop growth may not be economical. Hence, the present study was conducted to find out the most effecient, easiar and economical method of weed management after determining the critical period of crop weed competition.

MATERIALS AND METHODS

The experiment was conducted at Agricultural College Farm, Rajendranagar, Hyderabad during Rabi 1983-84 on a sandy loam soil. Four herbicides at two concentrations of each along with eight weeding intervals were tested in a randomised complete block design replicated thrice. The details of treatments are (1) Oxyfluorfen 0.1 kg ai./ha as pre-emergence (2) Oxyfluorfen 0.2 kg ai./ha as pre-emergence (3) Fluazifopbutyl 0.25 kg ai/ha as post emergence (4) Fluazifopbutyl 0.50 kg ai/ha as post-emergence (5) Pendimethalin 1.0 kg ai/ha as pre-emergence (6) Pendimethalin 2.0 kg ai/ha as post emergence. (7) Nitrofen 2.0 kg ai/ha as pre-emergence. (8) Nitrofen 4.0 kg ai/ha as post emergence. (9) Weed free first 15 days (10) Weed free for first 30 days (11) Weed free for first 45 days (12) Weed free till harvest (13) No weeding for first 15 days (14) No weeding for first 30 days (15) No weeding for first 45 days (16) No weeding till harvest.

Good quality seed of Safflower variety APRR-3 was sown on 30th October, 1983 with a spacing of 45cm. between rows and 30cm. between plants on a gross plot of 6.0 x 4.5m and the crop was harvested on 10th March, 1984 from a net plot of 5.40 x 2.25m. The experimental site is slightly alkaline having a pH of 7.9, available nitrogen 269.3 kg/ha, available phospherus 25.52 kg/ha and available potassium 303.81 kg/ha. A total of 58.2mm of rainfall was received during the crop period and out of which most of the rainfall was received before flowering. The entire dose of 40 kg N and 25 kg P_2O_5 per hectare was applied to all the plots uniformly in the form of urea and superphosphate as basal dressing.

RESULTS AND DISCUSSION

The seed yield of Safflower (Table 1) was affected significantly by the treatments. The maximum (1.77 t/ha) seed yield recorded in weed free till

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harvest was 123.39% more over no weeding till harvest. In weed free series, the weed free upto 15,30 and 45 days recorded a seed yield of 84.66, 91.39 and 95.25 per cent of the weed free harvest. In other words, there was no added advantage by keeping the land weed free after 30 days. Similarly by allowing weeds to compete for first 15,30 and 45 days, the decrease in yield was 5.32, 30.79 and 37.97%, respectively. If the competition was considered between weed free upto harvest and no weeding for first 15 days, the decline in yield would be 0.1 t/ha. If weeds were further allowed to compete for 30 days, 45 days and upto harvest, the decline in yield was 0.55, 0.61 and 0.98 t/ha, respectively. This indicated that maximum reduction of yield was 0.45 t/ha if weeds were allowed to compete between 15th to 30th day. Therefore competition between weeds and crops was maximum from 15th to 30th day. Hence clean cultivation upto 30th day was considered to be the critical stage for crop weed competition which coincides with the rosette stage of the crop. Similar findings were reported by Rao (1982).

With regards to herbicide treatments, pendimethalin at its higher does (2 kg ai./ha) recorded maximum yield of 1.38 t/ha which was at par with nitrofen at both the levels (2 kg and 4 kg ai./ha) and lower dose of pendimethalin (1 kg ai./ha), oxyfluorfen and fluazifop-butyl were not effective in increasing the yield. Pendimethalin at higher dose (2 kg ai./ha) recorded 74.59 per cent over no weeding upto harvest followed by pendimethalin 1 kg ai./ha (68.14%), nitrofen 4 kg/ha (67.64%) and nitrofen 2 kg/ha (60.93%). Hence pendimethalin at higher dose (2 kg ai./ha) was found to be a better substitute for manual weeding.

The maximum number of heads per plant (19.67), maximum number of seeds per head (34.09) and 1000-seed weight (45.67 g) were recorded in weed free till harvest while minimum number of heads per plant (12.03) and minimum number of seeds per head (20.39) and 1000-seed weight (30.60 g) were recorded if weeds were allowed upto harvest. This indicated that increasing the number of weed free days upto harvest, the number of heads per plant and number of seeds per head and 1000-seed weight were increased. Like wise, increasing the number of weedy days, reduction in number of heads per plant and number of seeds per head and 1000-seed weight were noticed.

Drymatter of weeds was influenced by different treatments at the time of harvest.Maximum(1.02 t/ha)dry matter accumulation was observed in case of no weeding till harvest while the minimum dry matter (0.45 t/ha) was recorded if the plots were kept free upto 30 days which was at par with weed free upto 15 and 45 days after sowing. Hence, 15th to 30th day becomes more important and if these days were maintained weed free, the weeds growing later will be suppressed by the smothering effect of the crop. Among the herbicides, minimum dry matter (0.40 t/ha) accumulation was observed in case of pendimethalin 2 kg ai./ha and recorded the maximum (0.82 t/ha) drymatter accumulation in the treatment where nitrofen (2.o kg ai/ha) was applied. The lesser dry matter of weeds recorded in pendimethalin might be due to its effective control of monocots and dicots.

The weed control efficiency has further revealed that pendimethalin 2 kg ai./ha recorded 60.52 and 56.69 percent weed control efficiency respec-

tively as against, nitrofen 2 kg ai./ha (19.94) and fluazifopbutyl 0.25 kg ai./ha (25.56). Further support to these findings confirm the work of Murthy (1982), Balayan and Bhan (1984) in groundnut.

The oil percentage in weed free till harvest was highest followed by weed free 45 days (35.32), weed free 30 days (34.39), no weding 15 days (30.08), pendimethalin 2 kg ai./ha (31.31) while no weeding harvest recorded the lowest (22.12). The trend was such that by increasing the number of weed free days, oil percentage increased and vice versa.

Thus the present study indicated that the critical period for crop weed competition was found between 15 and 30 days after sowing in Safflower. Further, pre-emergence application of pendimethalin 2 kg ai./ha. is an effective method in controlling of the weeds and increasing the seed and oil yield of Safflower.

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Table 1. Relative density of different weed species in transplanted rice, 1987

Weed species	Av. Density/m^2 (no.)	Relative density (%)
Cyperus iria	0.37	0.2
Cyperus difformis	1.76	1.0
Cyperus rotundus	1.07	0.6
Echinochloa crusgalli	75.73	43.4
Echinochloa colona	0.37	0.2
Fimbristylis littoralis	20.11	11.5
Marsilea minuta	0.37	0.6
Paspalum distichum	1.44	0.8
Sphenochlea zaylanica	0.16	0.0
Sagittaria guayensis	72.33	41.6

size. A point was located on the curve, where amount of additional efforts due to an increase in the quadrat size do not correspond with the added species. This phenomena followed the law of diminishing returns and the usefulness of the few added species was weighed against considerable amount of extra efforts to obtain them. Hence, such a point was located where at least 10 percent increase in the quadrat size yielded 10 percent more weed species (Osting, 1956). With the help of this approach, a quadrat size of 25cm x 75cm or 0.1875m^2 was found quite adequate to sample the weed community, (fig-1). This quadrat size is almost similar to IRRI (1977) in which a sampling unit size ranging from 0.16m^2 and 0.20m^2 was recommended for transplanted rice in the Philippines.

Quadrat size of 0.1875m^2 was used to estimate the minimum number of quadrats required to estimate the weed species flora. The technique of species-area curve was again employed. The increase in the number of species was plotted against the number of samples. Following a 10 percent relationship, 2 random samples of 0.1875m^2 x or 0.375m^2 area/plot was required to adequately sample the weed flora. This area can be obtained by taking two random samples of 25cm x 75cm from each plot. Moody (1983 b) determined a sample of 2.7 quadrats with a quadrat size of 0.32m^2 to adequately sample the weed flora in transplantd rice in Korea. It is therefore, suggested that in transplanted rice; fields with almost similar weed flora as observed in the Daska area of the rice zone of the Punjab, the weeds may be sampled with a quadrat size of 0.1875m^2 with at least two samples/plot. However, the minimum quadrat size as well as the quadrat number will depend upon the homogeneity of weed distribution and will vary according to the distribution pattern of weed species.

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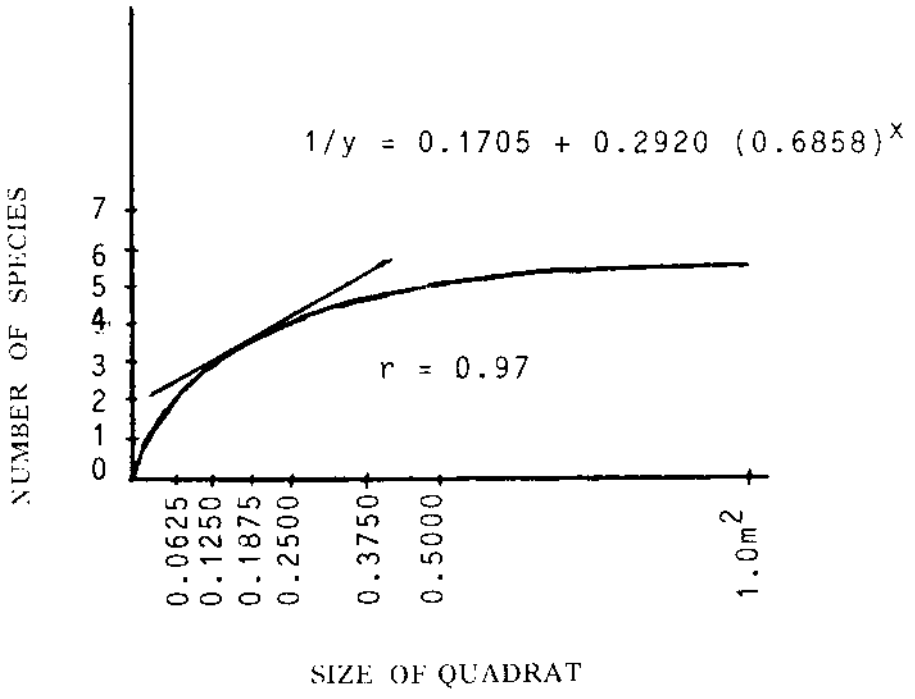

Fig. 1 Relationship between number of weed species and size quadrat in the Rice zone of Punjab, 1987.