*Indian J. Agron.* 41 (4) : 616–619 (December 1996)

# Crop–weed competition in summer greengram (*Phaseolus radiatus*)

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Received: April 1994

ABSTRACT

A field experiment was conducted during 1992 and 1993 to study the crop–weed competition in summer greengram or mungbean (*Phaseolus radiatus* L.). Predominant weeds of the experimental field were *Chicorium intybus, Cynodon dactylon* (L.) Pers., *Cyperus rotundus* L. and *Commelina communis* L. Grain yield of summer mungbean was reduced by 34.88% due to competition with weed during the first 30 days after sowing which increased to 49.15% when weeds competed with the crop for the entire crop season. Grain yield was increased when the initial weed-free duration was extended up to 45 days after sowing and further increase in the duration of weed free had no beneficial effect on grain yield. Weed emergence after 45 days after souring was low and thus smothered by crop. The application of pendimethalin (1 kg/ha) and clomazone (1 kg/ha) also increased grain yield significantly over weedy for first 30, 45 days after souring and up to harvest. The initial 45 days period considered to be the critical period with respect to weed–crop competition in mungbean.

In view of increasing demand of pulses, cultivation of summer mungbean or greengram (*Phaseolus radiatus* L.) during summer season, when most of the land remains fallow, assumes great importance. Season-long competition by weeds causes severed yield reduction ranging from 20 to 70% (Boyd and Murray, 1980). The extent of losses would depend the type of weeds and duration of competition with the crop. The time of weed removal has an important effect on the growth and yield of the crop. Removing weeds at any time during growing season may not be beneficial. Stage of weed removal is as important as removal per se. Therefore, it is necessary to identify the critical period of weed control to render the weed-control practices more effective and economical.

## MATERIALS AND METHODS

A field experiment was conducted at Jabalpur during summer season of 1992 and 1993. The soil was low in available nitrogen (237 kg/ha) and available K (258 kg/ha), higher in available phosphorus (38.8 kg/ha). The pH, electrical conductivity and organic carbon (%) were 6.9, 0.34 and 0.58 respectively.

The experiment comprised 11 treatments (Table 1), laid out in randomized block design with 3 replications. Need-based hand-weedings were done to maintain weed-free conditions. *Rhizobium* -inoculated seeds of 'K 851' was greengram sown on 22 and 26 February during 1992 and 1993 respectively. A basal dose of 20 kg N/ha and 40 kg $P_2O_5$/ha was applied to all the plots at the time of sowing.

Herbicides were sprayed with hand-operated knapsack spray fitted with flat-fan nozzle. Weed emergence was recorded by using 0.5 $m^2$ quadrat, placed at random places in each plot, The data on count and weed dry weight showed considerable variation and hence were subjected to square-root transformation $\sqrt{X + 0.5}$ statistically. Handweedings were done at 15,30 and 45 days after sowing and upto harvest according to treatment (Table 1).

## RESULTS AND DISCUSSION

### *Weed density and dry matter*

The predominant weed species in the experimental field were *Chicorium intybus* *Commelina communis* L. in broad-leaved weed and *Cynodon dactylon* L., and *Cyperus rotundus* L. among the group of grasses and sedges respectively. Weed population and weed dry weight continued to increase till 45 days after sowing (Table 1). There was increase in the density of weeds and weed dry weight up to 45 days after sowing in 1992 and up to 30 days after sowing in 1993 in season-long weedy plots (Table 1). It implies that majority of weeds emerged by this time and competition among weeds and with the crop at subsequent stages caused reduction in weed population. The duration of initial weed-free period affected the degree of reemergence of

**Table 1.** Weed density (no/$m^2$) and weed dry matter (g/$m^2$) at various stages as influenced by crop–weed competition during 1992 and 1993

| Treatment | Weed population (no/$m^2$)* | | | | | | Weed dry matter (g/$m^2$)* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1992 | | | 1993 | | | 1992 | | | 1993 | | |
| | 15 DAS | 30 DAS | 45 DAS | 15 DAS | 30 DAS | 45 DAS | 15 DAS | 30 DAS | 45 DAS | 15 DAS | 30 DAS | 45 DAS |
| *Weed free first* | | | | | | | | | | | | |
| 15 DAS | 0 | 3.34 | 4.48 | 0 | 4.18 | 4.90 | 0 | 2.63 | 3.96 | 0 | 2.85 | 4.07 |
| 30 DAS | 0 | 0 | 2.91 | 0 | 0 | 2.90 | 0 | 0 | 2.28 | 0 | 0 | 2.56 |
| 45 DAS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Weed-free throughout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Weed first* | | | | | | | | | | | | |
| 15 DAS | 4.73 | 0 | 0 | 5.66 | 0 | 0 | 2.64 | 0 | 0 | 2.58 | 0 | 0 |
| 30 DAS | 5.58 | 5.33 | 0 | 6.11 | 6.38 | 0 | 2.57 | 4.65 | 0 | 2.00 | 4.93 | 0 |
| 45 DAS | 5.93 | 5.51 | 5.24 | 6.09 | 6.30 | 5.84 | 2.69 | 4.68 | 5.80 | 2.65 | 5.04 | 6.40 |
| Weed-free throughout | 5.93 | 5.87 | 5.61 | 5.28 | 6.66 | 6.17 | 2.66 | 4.67 | 5.86 | 2.58 | 5.01 | 6.52 |
| Fluchloralin @ 1 kg/ha | 4.73 | 4.14 | 4.41 | 4.33 | 4.87 | 4.77 | 2.11 | 2.55 | 3.12 | 2.08 | 3.53 | 3.28 |
| Pendimethalin @ 1 kg/ha | 4.36 | 4.41 | 4.38 | 4.60 | 4.22 | 4.40 | 1.95 | 2.72 | 3.05 | 1.91 | 3.33 | 3.41 |
| Clomazone 1 kg/ha | 4.14 | 3.97 | 4.10 | 3.80 | 4.37 | 4.30 | 1.99 | 2.52 | 3.02 | 1.96 | 3.33 | 3.37 |
| LSD (P = 0.05) | 0.44 | 0.40 | 0.256 | 0.396 | 0.436 | 0.524 | 0.33 | 0.12 | 0.16 | 0.09 | 0.35 | 0.13 |

*Transformed values; DAS, days after sowing

weeds at stages subsequent to completion of a particular duration of weed-free condition. More re-emergence of weeds occurred when the crop was kept free of weeds initially for the shorter duration compared to that of longer duration (Table 1). Less emergence of weeds at later stages is further indicative of the better competitiveness of the crop at advance stages.

The highest rate of dry matter in unweeded plots were observed during 30–45 days after sowing. This indicated higher degree of competition during the period. Production of weed dry matter at the stages subsequent to completion of initial weed-free duration decreased with increase in duration of weed-free condition. Weed dry matter produced in plots free of weeds for first 30 days or beyond was low as a result of less re-emergence of weeds at the following stages (Table 1). These observation indicated that the weeds in summer mungbean could be kept at low levels with respect to there density and growth by maintaining weed-free conditions during first 30 days.

*Yield attributes and yield*

The pooled data showed that the highest and the lowest values for grain yield and yield-attributing characters were recorded under season-long weed-free and season-long weedy treatments, respectively. Competition with the weeds for the full crop season resulted in 49.15% reduction in grain yield of summer mungbean (Table 2). The extent of grain yield loss increased with increase in duration of initial weed–crop competition. Weedy condition during first 45 days after sowing caused yield reduction similar to that of weedy condition for the entire crop season. The magnitude of reduction in grain yield due to weeds during 15–30 days after sowing was more than that of either during first 15 days after sowing or during later stages. Competition due to

**Table 2.** Effect of crop–weed competition on yield attributes and yield of summer mungbean during 1992 and 1993

| Treatment | Pods/plant | | Grains/pod | | 1,000-grain weight | | Grain yield (q/ha) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1992 | 1993 | 1992 | 1993 | 1992 | 1993 | 1992 | 1993 | Pooled |
| *Weed-free first* | | | | | | | | | |
| 15 DAS | 9.67 | 10.67 | 6.67 | 7.33 | 33.80 | 34.66 | 5.13 | 4.92 | 5.02 |
| 30 DAS | 12.00 | 14.33 | 9.67 | 9.33 | 36.00 | 37.66 | 7.55 | 7.23 | 7.39 |
| 45 DAS | 14.00 | 16.33 | 9.67 | 9.00 | 37.80 | 39.90 | 7.86 | 8.31 | 8.08 |
| Weed-free throughout | 16.00 | 19.67 | 12.33 | 10.00 | 38.40 | 41.26 | 8.73 | 8.93 | 8.83 |
| *Weed first* | | | | | | | | | |
| 15 DAS | 10.33 | 12.67 | 9.00 | 8.67 | 35.53 | 38.56 | 7.96 | 7.40 | 7.68 |
| 30 DAS | 8.67 | 10.00 | 7.67 | 7.33 | 35.56 | 36.53 | 5.48 | 6.05 | 5.76 |
| 45 DAS | 9.00 | 9.00 | 7.33 | 6.00 | 34.06 | 36.03 | 4.38 | 4.57 | 4.47 |
| Weed-free throughout | 8.00 | 9.00 | 6.33 | 7.00 | 33.50 | 35.30 | 4.44 | 4.46 | 4.45 |
| Fluchloralin 1 kg/ha | 12.33 | 9.47 | 8.00 | 7.67 | 36.53 | 38.33 | 6.37 | 6.43 | 6.40 |
| Pendimethalin 1 kg/ha | 12.33 | 14.67 | 10.67 | 9.33 | 35.76 | 37.73 | 6.72 | 6.74 | 6.73 |
| Clomazone 1 kg/ha | 11.67 | 14.00 | 11.67 | 9.67 | 35.96 | 38.60 | 7.06 | 6.80 | 6.93 |
| LSD (P = 0.05) | 1.79 | 2.55 | 1.97 | 2.14 | 1.23 | 0.87 | 0.86 | 1.14 | 0.75 |

DAS, days after sowing

weeds emerging 15 days after sowing was much higher than the weeds emerging 30 days after sowing was non-significant. When the crop was kept free of weeds during the first 15 days after sowing only, there was 43.15% reduction in grain yield which was 3-fold of the loss caused by the weedy during first 15 days after sowing. This is attributed to the fact that a large number of weeds may emerge even after 15 days after sowing leading to a high degree of competition with the crop. This showed that weedy competition till 15 days after sowing has significant effect on the grain yield. While any extension of weedy condition beyond 15 days resulted in significant reduction in grain yield. The significant increase in yield attributes were observed due to application of herbicides, viz. pendimethalin and clomazone, over weed-free for first 15 days and weedy for first 45 days and up to harvest, whereas grain yield increase significantly over weedy for first 30, 45 days and up to harvest. Similar result also reported by Balyan *et al.* (1988).

It was concluded that critical period of crop–weed competition in summer mungbean is between 15 and 45 DAS and this may be taken into consideration while deciding number and time of weeding for adopting any other weed-control measures.

## REFERENCES

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