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Investigation on the Critical Period of Weed Interference with the Growth and Yield of Mungbean

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ABSTRACT

There was linear increase in dry weight of weeds with increase in weed-crop competition period. An initial 20 days after emergence of mungbean, weed infestation did not exert any adverse effect on number of pods per plant, number of grains per pod and 1000-grain weight of mungbean which was comparable to those maintained weed-free throughout. Grain yield per hectare declined significantly when weeds were allowed to compete with mungbean for 20 days after crop emergence and maximum reduction in grain yield occurred when weed competition persisted for 50 days after crop emergence and weedy condition up to harvest of the crop.

Key Words: Mungbean; Weed competition duration; Weed management

INTRODUCTION

The mungbean (*Vigna radiata* (L) Wilczek) is prized among the pulse species for its easily digestible seeds. Mungbean production has remained static during the past decade, as a result, the gap between supply and demand is widening. It is grown in Pakistan on 197.6 thousand hectares with the production of 91.2 thousand tonnes of grain annually giving an average yield of 461.5 kg ha^{-1} (Anonymous, 1998) which is much below the harvested potential of our existing varieties. The increase in cropping intensity and fertilizer use has caused tremendous increase in weed infestation. The weed problem is becoming more and more acute. It is estimated that annual losses caused by weeds may be more than 10 billion rupees (Ahmad, 1992). Pakistan being a developing country can hardly afford to suffer the losses of this magnitude. No systematic information regarding weed control is available and benefits of applied inputs cannot be fully realized unless it is followed by proper weed control programme. To develop an effective crop management technology and to prevent the huge losses due to weeds we have to realize that the ecological relationship in weed-crop competition is a complicated phenomenon. Timely control of weeds is essential for high yield in mungbean. Uncontrolled weeds may reduce mungbean yield as much as 90 per-cent (Madrid & Vega, 1971). Significantly more seed yields by weeding have been reported in mungbean (Hossain *et al.*, 1990; Kumar & Kairon, 1990; Musa *et al.*, 1996), blackgram (Singh *et al.*, 1992) and pigeonpea (Varshney, 1993).

The objective of this study was therefore was to investigate that how long after crop emergence can weed and mungbean crop compete with each other and what is the critical period in crop weed competition which seriously limit the crop yield.

MATERIALS AND METHODS

Investigations on the critical period of weed interference on growth and yield of mungbean were carried out at Agronomic Research Area, University of Agriculture, Faisalabad during spring of years 1992 and 1993. The experiment was conducted on a field heavily infested with weed flora. In addition, the seeds of weeds were broadcasted and incorporated in each plot before sowing mungbean to ensure uniform stand of weeds. After four acre inch "rouni"(irrigation) seed bed preparation was completed by two cultivations and one planking. Experiment was laid out in Randomized Complete Block Design and had four replications and net plot size was 1.8 x 6 metres. A mungbean variety, `NM-54' was sown in rows 30 cm apart. Experimental plots were sown manually with a single row hand drill using 25 kg seed ha^{-1}. All other cultural practices, except the treatments, were kept normal and uniform for all the plots.

The experimental treatments were mungbean alone (weed-free throughout growing season), mung-weed association for 10 DAE (days after emergence); then weeding, mung-weed association for 20 DAE; then weeding, mung-weed association for 30 DAE; then weeding, mung-weed association for 40 DAE; then weeding, mung-weed association for 50 DAE; then weeding and mung-weed association throughout growing season. After completion of stipulated period of mungbean-weed association, the weeds were removed by hoeing. The rest of the growing period of

the crop was maintained weed-free by hoeing with "kasola" and hand pulling of weeds.

The following observations were recorded during the course of experimentation. Weed dry weight (m^{-2}), number of pods per plant, number of grains per pod, 1000-grain weight (g) and grain yield (kg ha^{-1}). All the data collected were analysed statistically by using analysis of variance technique and multiple comparison was made where necessary to test the significance of treatment means (Muhammad, 1995).

RESULTS AND DISCUSSION

Weed dry weight reflects the growth potential of the weeds and is a better indicator of its competitive ability with the crop plants. The data given in Table I reveal that there were significant differences among the treatment means. In both the years, the highest weed dry weight was recorded in plots weedy throughout which was 90.18 and 99.50 g m^{-2} during the year 1992 and 1993, respectively. It was followed by the plots kept weedy 50, 40, 30 and 10 DAE during both the years. The lowest weed dry weight was obtained from plots where the crop was kept weedy throughout growing period. It may be argued that the weeds should be eradicated at an early stage of crop growth, any delay in weed control may result in robbing off nutrients by weeds and depriving the crop of its share.

able I. Weed dry weight in as affected by ifferent durations of weed management

reatments	Weed Dry Weight ($g\ m^{-2}$)	
	1992	1993
ungbean alone	1.88 g	1.83 g
ung-weed association for 10 DAE; then weeding	6.83 f	10.23 f
ung-weed association for 20 DAE; then weeding	12.97 e	16.43 e
ung-weed association for 30 DAE; then weeding	21.25 d	26.15 d
ung-weed association for 40 DAE; then weeding	50.58 c	57.77 c
ung-weed association for 50 DAE; then weeding	76.82 b	83.95 b
eed competition throughout growing season	90.18 a	99.50 a

Means not sharing a letter in common differ significantly at 0.05 probability. DAE = Day after emergence

Number of pods per plant is an important variable contributing considerably to final crop yield. Statistical means in Table II indicate that the number of pods per plant was influenced significantly by different weed management treatments in both the years. Higher number of pods per plant was produced in the plots of mungbean alone, which linearly decreased with increased duration of crop weed association. Pod number decreased considerably where crop weed association continued up to harvest. It may also be added that crop weed association for short duration (10-20 DAE) did not affect the number of pods per plant.

Grains per pod is another important yield component and it reflects production potential of an individual pod of mungbean. A perusal of data given in Table II reveals significant effect of weed-free and varying weed interference periods on number of grains per pod. It is observed that higher number of grains per pod was recorded where the crop was kept weed-free throughout. Weed crop association up to 20 DAE did not suppress the grain number but exposure beyond 20 DAE significantly reduced the number of grains. It may be noted that 20 DAE may be an appropriate stage for controlling the weeds for increasing crop productivity.

The development of grain reflects the photosynthetic potential of a crop plant and its capacity to transport its assimilates to economically valuable plant organs. The data pertaining to 1000-grain weight presented in Table II reveal that the weed-free and weed interference duration had significant effect on 1000-grain weight. In the years,

Table II. Response of mungbean to different duration of weed management

Treatments	Pods per plant		Grains per pod		1000-grain wt. (g)	
	1992	1993	1992	1993	1992	1993
Mungbean alone	25.80 a	28.71 a	11.78 a	11.89 a	59.15 a	61.49 a
Weed competition up to 10 DAE; then weed-free	25.75 a	28.84 a	11.52 a	11.22 a	59.35 a	60.31 a
Weed competition up to 20 DAE; then weed-free	23.46 ab	25.45 ab	10.85 ab	10.04 ab	57.71 a	59.22 a
Weed competition up to 30 DAE; then weed-free	22.22 b	25.02 b	9.36 bc	9.28 b	54.24 ab	52.65 b
Weed competition up to 40 DAE; then weed-free	21.30 b	23.06 bc	7.37 c	7.88 c	46.98 c	48.74 c
Weed competition up to 50 DAE; then weed-free	17.99 c	21.10 c	7.43 c	7.94 c	46.48 c	47.33 c
Weed competition throughout growing season	17.99 c	20.24 c	7.30 c	7.82 c	46.30 c	47.60 c

Means not sharing a letter in common differ significantly at 0.05 probability. DAE = Day after emergence

Table III. Yield of mungbean as affected by different durations of weed management

Treatments	Grain Yield (kg ha^{-1})			
	1992	% increase over full season association	1993	% increase over full season association
Mungbean alone	1400 a	45.7	1414 a	45.1
Weed competition up to 10 DAE; then weed-free	1390 a	44.6	1407 a	44.4
Weed competition up to 20 DAE; then weed-free	1357 a	41.2	1382 a	41.9
Weed competition up to 30 DAE; then weed-free	1208 b	25.7	1192 b	22.4
Weed competition up to 40 DAE; then weed-free	1074 c	11.8	1087 c	11.6
Weed competition up to 50 DAE; then weed-free	961 d	-	977 d	0.3
Weed competition throughout growing season	961 d	-	974 d	-

Means not sharing a letter in common differ significantly at 0.05 probability. DAE = Day after emergence

(1992 & 1993) similar trend was observed.

The highest 1000-grain weight was recorded in plots maintained weed-free which was statistically equal to that of plots where mung-weed association was allowed up to 20 DAE. Mung-weed association beyond 40 DAE resulted in the lowest grain weight, showing non-significant difference among these treatments. It appears to be quite logical that the crop made full utilization of the environmental resources without any competitive effect of weeds. The removal of weeds at early stage of crop growth helped the crop plants to make full use of the immediate environments and avoiding the competition effects. The grain yield is a function of the integrated effect of various yield components. Statistical means presented in Table III clearly show that the effect of different durations of mung-weed association on the grain yield of mungbean was significant. In first year, the highest grain yield of 1400 kg per hectare was obtained from the weed-free plots. It was at par with the yield obtained from the plots kept under weed competition for 10 DAE and 20 DAE 1390 and 1357 kg ha^{-1}, respectively. The data suggest that weeds should not be allowed to persist beyond 20 DAE. This was followed by treatment in which weed infestation continued up to 30 DAE and subsequently, plots which were kept under mungbean-weed association for 40 DAE. Statistically lowest grain yield (961 kg ha^{-1}) producing plots were those where weeding was not done throughout the growing season of mungbean and the means were statistically similar to those calculated for plots weeded 50 DAE. The same trend was also noted during the year 1993. During both the years 40 to 45% higher yield was obtained from weed-free and where competition was allowed for 10 to 20 DAE. The yield level, in general was higher in 1993 year which may be attributed to more rains during the grain development period which resulted in better grain development. It is also showed that grain yield was entirely dependent on duration of weeds association with mungbean. Madrid and Vega (1971) also reported that eradication of weeds after 20 days of emergence increased the mungbean yield. Musa *et al.* (1996) found first 30 days after sowing the critical period of weed competition in mungbean. Varshney (1993) noted 60.5% reduction in seed yield of mungbean in plots of uncontrolled weeds.

On the basis of present study it is suggested that weeds in mungbean fields should not be allowed to compete beyond 20 days after emergence. Weeds in mungbean could be controlled effectively and economically by two hand weeding at 20 DAE and 30 DAE.

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