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Response of *Vigna radiata* (L) Wilczek to Post Emergence Herbicides for Weed Control

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ABSTRACT

Application of post-emergence herbicides at lower dose was as effective as at higher rate. The best weed control was found in hand weeding treatment. All weed control treatments including hand weeding increased the grain yield of mungbean over weedy check. Regarding harvest index values of mungbean, there were also significant differences between weedy check and weed control treatments.

Key Words: Mungbean growth; Post emergence; Herbicides; Grain yield

INTRODUCTION

The mungbean (*Vigna radiata* L. Wilczek) is a drought tolerant, short duration, early maturing legume crop, which can fit well in cropping system. 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 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). Systematic information regarding weed control is not available and benefits of applied inputs cannot be fully realized unless it is followed by proper weed control programme. Weed competition may be eliminated by hand weeding, hoeing, or chemical weed control. The method and timing of herbicide application is determined for the specific herbicide being used and the type of weeds to be controlled. Specific recommendations for herbicides vary in different areas due to local environmental and soil conditions, weed populations, cropping patterns and cultural procedures.

Herbicides should be tested in the area of intended use before its adoption. So, their testing and evaluation in our conditions is necessary for their rational use. The study on growth response of *Vigna radiata* (L) Wilczek to post emergence herbicides for weed control was undertaken to develop comprehensive information on this subject.

MATERIALS AND METHODS

A study on growth response of *Vigna radiata* (L) Wilczek to post emergence herbicides for weed control was undertaken at the Agronomic Research Area, University of Agriculture, Faisalabad during spring. The experiments were conducted on a field heavily infested with weed flora comprising *Amaranthus viridis* L. (Amaranth), *Chenopodium album* L. (Goosefoot), *Convolvulus arvensis* L. (bindweed), *Cynodon dactylon* (Bermuda grass), *Cyperus rotundus* L. (Purple nutsedge), *Heliotropium europium* L. (Heliotrope), *Melilotus indica* L. (Sweet clover), *Rumex dentatus* L. (Broad leaved dock). In addition, the seeds of above weeds were broadcasted and incorporated in each plot before sowing mungbean to ensure uniform stand of weeds. Previously the field was occupied by cotton crop. After four acre inch irrigation seed bed preparation was completed by two cultivations and one planking. Experiments had four replications and net plot measured 1.8 x 6 meters. A recommended mungbean variety, 'NM-54' was sown in rows 30 cm apart, comprising six mungbean rows. Experimental plots were sown manually with a single row hand drill using 25 kg seed per hectare. The crop was sown in March 1992 and 1993. Three irrigations, each of 7.5 cm, were applied in addition to 47.6 and 59.5 mm rain received during the growing season of first year and second year, respectively. All other cultural practices, except the treatments, were kept normal and uniform for all the plots. Randomized complete block design with four replications was used to layout the experiments. The crop was fertilized with a standard dose of 23 kg N + 50 kg P_2O_5 ha^{-1} at the time of sowing.

The experimental treatments were; weedy control, hand weeding, Fluazifop-butyl @ 2.0 l ha^{-1}, Fluazifop-butyl @ 3.0 l ha^{-1}, Fenoxaprop-p-ethyl @ 1.0 l ha^{-1} and Fenoxaprop-p-ethyl @ 1.25 l ha^{-1}. The herbicides were sprayed 21 days after sowing, when

crop was at 2-3 leaf stage, and the soil was in proper moisture condition. Knapsack hand sprayer CP-3 having a boom of 1.8 meter fitted with 4 T- Jet nozzles adjusted at distance of 45 cm each was used for the purpose. In hand weeding treatment, two hoeings were given, each after first and second irrigation.

The following observations were recorded during the experiment; Crop plant height (cm), trifoliate size of fifth leaf (cm^2), grain yield (kg ha^{-1}) and harvest index (%). All the data collected were analyzed statistically using analysis of variance technique and multiple comparison was made where necessary to test the significance of treatment means (Muhammad, 1995).

RESULTS AND DISCUSSION

The data in Table I indicate that the observations regarding height of crop plant were not affected significantly by various weed control treatments in both the years. The plant height on an average ranged between 50.36 to 59.79 cm in first year and 51.83 to 58.37 cm in second year. This is clear from the findings that both herbicidal treatments, at doses under experimentation, did not have adverse affect on plant height.

Grain yield per hectare is major economic part of plant which is affected to varying degree by contribution from yield components. The data presented in Table II show that grain yield was affected significantly by various weed control treatments in both the years of study. Highest grain yield of 1380 and 1395 kg ha^{-1} was obtained with hand weeding during first and second year, respectively. It was followed by fluazifop-butyl applied at the rate of 2.0, 3.0 l ha^{-1} and fenoxaprop-p-ethyl at the rate of 1.0 and 1.25 l ha^{-1} producing grain yield from 1322 to 1343 kg ha^{-1}. During the first year hand weeding was significantly effective while during the second year the results were non-significant. It was attributed to effective weed control potential of these herbicides. Both the herbicides at each dose were effective in controlling weeds. The lowest grain yields of 960 and 979 kg ha^{-1} during first and second year, respectively, were recorded in weedy check plots. Significant contrasts also showed highly significant differences in weedy check vs. all other weed control treatments during each year. Hand weeding vs. herbicidal weed control was highly significant during first year and significant at 0.05 probability during second year. Rao *et al.* (1993) also found higher grain yield with the application of herbicides in mungbean.

Table I. Response of plant height and trifoliate size of leaf to post emergence applied herbicides in mungbean

		Plant height (cm)		Trifoliate size of fifth leaf (cm^2)	
	Dose (l ha^{-1})	1992	1993	1992	1993
Weedy check		50.36	53.97	33.68 b	36.34
Hand weeding	-	59.51	58.37	42.69 a	40.99
Fluazifop-butyl	2.00	57.54	50.53	39.38 ab	40.81
Fluazifop-butyl	3.00	55.59	51.83	37.42 ab	39.38
Fenoxaprop-p-ethyl	1.00	59.79	57.12	40.64 a	40.49
Fenoxaprop-p-ethyl	1.25	52.43	56.46	36.53 ab	45.57

Means not sharing a letter in common differ significantly at 0.05 probability

The leaf size (trifoliate size of fifth leaf) is an important factor in fixing the solar energy and then utilizing it in the synthesis of plant food. Leaf area presented in Table I was significantly affected by weed control treatments and was higher in all treatments than weedy check (33.68 cm^2) during first year. Maximum leaf area of 42.69 cm^2 was recorded in case of hand weeded plots which was at par with other weed control treatments. In second year, results were non-significant, showing no effect of hand weeding and herbicidal weed control treatments on trifoliate size of leaf, which ranged from 36.34 to 40.99 cm^2. These results are in line with the findings of Rao *et al.* (1993).

The physiological ability of a genotype to convert dry matter into economic yield is expressed by the harvest index. Data pertaining to harvest index of mungbean indicate significant differences among treatment means (Table II). During first year, maximum harvest index value of 33.67 % was obtained from hand weeded plots. Fenoxaprop-p-ethyl applied at the rate of 1.25 and 1.0 l ha^{-1}, produced 32.94 and 32.82 % harvest index respectively, which were statistically equal to hand weeding treatment followed by Fluazifop-butyl at the rate of 3.0 l ha^{-1}, treatments, which gave 32.69 percent harvest index value and was also at par with all other weed control plots. The lowest harvest index value of 25.57 % was

Table II: Response of grain yield and harvest index to post emergence applied herbicides in mungbean

Treatment	Dose (l ha^{-1})	Grain yield (kg ha^{-1})		Harvest index (%)	
		1992	1993	1992	1993
Weedy check	-	960 c	979 b	25.57 c	26.01 b
Hand weeding	-	1380 a	1395 a	33.67 a	34.12 a
Fluazifop-butyl	2.00	1322 b	1354 a	32.51 b	33.19 a
Fluazifop-butyl	3.00	1343 b	1361 a	32.69 b	33.48 a
Fenoxaprop-p-ethyl	1.00	1334 b	1346 a	32.82 b	33.50 a
Fenoxaprop-p-ethyl	1.25	1340 b	1347 a	32.94 ab	33.10 a

Means not sharing a letter in common differ significantly at 0.05 probability

recorded in weedy check plots. In second year, hand weeded plots gave the highest harvest index value of 34.12 % which was statistically at par with that obtained from Fluazifop-butyl sprayed plots at both doses which in turn were at par with weed control obtained by Fenoxaprop-p-ethyl treatments. All doses of both herbicides produced similar results (harvest index values). Weedy control again remained the lowest producing with significantly the lowest value of 26.01 % harvest index.

CONCLUSIONS

All herbicidal treatments remained statistically equal to hand weeding treatment. Application of Fluazifop-butyl or Fenoxaprop-p-ethyl, post-emergence herbicides at lower dose was as effective as at higher rate.

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