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## Effect of Pre-plant and Pre-emergence Herbicides on Weed Growth and Nodulation of Mungbean

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### Abstract

Weed count, weed fresh weight per meter square of mungbean were found to be significantly different in various weed control treatments. However, maximum values of these parameters were obtained in weedy check and minimum in hand weeding treatments. Almost all herbicides at either dose or method of application produced similar results.

### Introduction

Pulses are important world food crops because they provide an inexpensive source of vegetable protein. The mungbean (*Vigna radiata* Wilczek) containing percent protein (Poehlman, 1991) is short duration, early maturing legume crop, which can fit well in cropping system. It was 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 kilogram per hectare (Anonymous, 1998) which is much below the harvested potential of our existing varieties. In Pakistan it is estimated that annual losses caused by weeds may be more than ten billion rupees (Ahmad, 1992). The increase in cropping intensity and fertilizer use during the past decade, has caused a tremendous increase in weed infestation. Crop production practices, mainly planting methods and response of inputs has been thoroughly studied. However, research on weed management is scanty. Proper information regarding weed control technology is not available and benefits of applied inputs cannot be fully realized unless it is followed by proper weed control programme. Because of high competitive ability and reproductive potential of weeds, it is imperative to check their infestation in mungbean. It is difficult and uneconomical to control weeds with the conventional control methods. A number of selective pre-emergence applied herbicides have been introduced in the market to combat the weed problem. Specific recommendations for herbicides vary in different areas due to local environmental and soil conditions, weed populations, cropping patterns and cultural procedures. Nookar and Ajakaiye (1991) studied the effect of pendimethalin on cowpea sown in sandy loam soil in polyethylene bags. The herbicide was applied at the rate of 1, 5 or 10 ppm. Pendimethalin herbicide application did not suppress nodule formation. Compared with the control, treated plants generally had a higher proportion of nodules on the lateral than primary roots. Treated plants tended to produce a higher proportion of smaller nodules. At lower herbicide rates, shoot growth was unaffected during early growth stages. Ali (1992) found that uncontrolled weeds suppressed urdbean (*Vigna mungo*) and mungbean (*Vigna*

*radiata*) by 47 and 28 percent, respectively. Of the herbicides tested, pendimethalin at 0.75-1.0 kg ha<sup>-1</sup> pre-emergence was the most effective. Singh and Rao (1992) described the effects of oxyfluorfen, oxadiazon, or pendimethalin on mungbean. All herbicides were applied one day before sowing and were compared with hand weeding and no weed control treatments. Weed bio-mass was decreased by all weed control treatments and was the lowest in hand weeding. Rao *et al.*, 1993 stated that in a greenhouse pot experiment with *Vigna radiata*, pendimethalin, fluchloralin, benthocarb and 2, 4-D were applied before sowing or 10 DAS. at the recommended rates or 150 or 200 percent of the recommended rates. Seed germination, seedling survival, leaf area, bio-mass production and seed yield per plant were higher with higher rate of herbicides than recommended. Yields were higher from pre-than post-sowing applications, and pre-sowing pendimethalin at the recommended rate gave increased yield.

### Materials and Methods

Studies on effect of pre-plant and pre-emergence herbicides on weed growth and nodulation of mungbean were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad during spring of years 1992 - 1993. The experiment was 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 cultivation and one planking. Experiment had four replications and net plot measured 1.8 x 6 metre. A recommended mungbean variety, 'NM-54' was sown in rows 30 cm apart, comprising six mungbean rows. Experimental plots were

Table 1: Weeds and viable nodules response of mungbean to pre-plant and pre-emergence herbicides.

Treatments	Weed Count (m <sup>-2</sup> )		Weed Fresh Weight (g m <sup>-2</sup> )	
	1st year	2nd year	1st year	2nd year
Weedy check	179.50 a	183.20 a	312.90 a	337.00 a
Hand weeding	8.78 d	6.58 c	10.03 c	14.22 c
<i>Pendimethalin</i> @ 3.0 l ha <sup>-1</sup> pre-plant	64.67 b	38.75 b	44.18 b	36.41 bc
<i>Pendimethalin</i> @ 3.5 l ha <sup>-1</sup> pre-plant	43.83 c	49.61 b	41.97 b	31.99 bc
<i>Trifluralin</i> @ 3.0 l ha <sup>-1</sup> pre-plant	53.83 bc	42.49 b	34.56 b	28.15 bc
<i>Trifluralin</i> @ 3.5 l ha <sup>-1</sup> pre-plant	48.01 bc	49.25 b	40.03 b	18.92 bc
<i>Pendimethalin</i> @ 3.0 l ha <sup>-1</sup> pre-emergence	46.34 bc	40.67 b	33.53 b	27.14 bc
<i>Pendimethalin</i> @ 3.5 l ha <sup>-1</sup> pre-emergence	43.50 c	34.92 b	34.60 b	15.31 c
<i>Trifluralin</i> @ 3.0 l ha <sup>-1</sup> pre-emergence	58.83 bc	41.92 b	45.47 b	43.85 b
<i>Trifluralin</i> @ 3.5 l ha <sup>-1</sup> pre-emergence	46.92 bc	38.08 b	43.49 b	31.60 bc

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

Table 2: Yield response of mungbean to pre-plant and pre-emergence herbicides.

Treatments	Viable Nodules (per plant)		Days to Flowering	
	1st year	2nd year	1st year	2nd year
Weedy check	15.48	18.67	45.50	36.28
Hand weeding	18.83	20.42	43.00	40.88
<i>Pendimethalin</i> @ 3.0 l ha <sup>-1</sup> pre-plant	15.10	18.67	43.50	40.50
<i>Pendimethalin</i> @ 3.5 l ha <sup>-1</sup> pre-plant	15.10	17.65	43.25	40.90
<i>Trifluralin</i> @ 3.0 l ha <sup>-1</sup> pre-plant	16.13	17.74	43.25	40.17
<i>Trifluralin</i> @ 3.5 l ha <sup>-1</sup> pre-plant	16.33	19.69	43.75	39.96
<i>Pendimethalin</i> @ 3.0 l ha <sup>-1</sup> pre-emergence	18.00	21.90	43.50	40.08
<i>Pendimethalin</i> @ 3.5 l ha <sup>-1</sup> pre-emergence	18.17	20.55	44.50	40.45
<i>Trifluralin</i> @ 3.0 l ha <sup>-1</sup> pre-emergence	16.50	20.27	38.04	43.75
<i>Trifluralin</i> @ 3.5 l ha <sup>-1</sup> pre-emergence	18.67	18.80	38.26	44.25

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

sown manually with a single row hand drill using 25 kg seed per hectare. The crop was sown during March. 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 of lay-out with four replications was used.

The detail of the treatments of the experiment was weedy check, hand weeding, *Pendimethalin* @ 3.0 l ha<sup>-1</sup> pre-plant, *Pendimethalin* @ 3.5 l ha<sup>-1</sup> pre-plant, *Trifluralin* @ 3.0 l ha<sup>-1</sup> pre-plant, *Trifluralin* @ 3.5 l ha<sup>-1</sup> pre-plant, *Pendimethalin* @ 3.0 l ha<sup>-1</sup> pre-emergence, *Pendimethalin* @ 3.5 l ha<sup>-1</sup> pre-emergence, *Trifluralin* @ 3.0 l ha<sup>-1</sup> pre-emergence and *Trifluralin* @ 3.5 l ha<sup>-1</sup> pre-emergence. Pre-plant herbicides i.e. *Pendimethalin* and *Trifluralin* were sprayed on soil surface at final seed bed preparation and incorporated into upper 5 cm soil layer, then crop was sown. While for pre-emergence application, both the herbicides were applied a day after sowing of the mungbean crop. The herbicides were sprayed with a CP-3 knapsack hand sprayer fitted with 1.8 metre wide boom having 4 T-Jet nozzles adjusted at distance of 45 cm each. In all the chemical sprays, 500 liters of water per hectare was used. In hand weeding treatment, two hoeing were given, each after first and second irrigation. All other

agronomic practices were kept uniform. The following observations were recorded weed count (m<sup>-2</sup>), weed fresh weight (m<sup>-2</sup>) number of viable nodules per plant days to flowering. 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

It is clear from the data given in Table 1 that weeds population at harvest under the various weed control treatments was significantly different in each year. During both the years the plots where hand weeding was done gave minimum weed count. In first year, the plots receiving *Pendimethalin* pre-plant incorporated at the rate of 3.0 l ha<sup>-1</sup> followed by *Trifluralin* @ 3.0 l ha<sup>-1</sup> applied pre-emergence, *Trifluralin* pre-plant incorporated @ 3.0 l ha<sup>-1</sup> @ 3.5 l ha<sup>-1</sup>, *Trifluralin* pre-emergence applied @ 3.5 l ha<sup>-1</sup> and *Pendimethalin* @ 3.0 l ha<sup>-1</sup> produced statistically the same weed count among which varied from 46.34 to 64.67 m<sup>-2</sup>. Weedy check plots gave the highest weed count of 179.50 m<sup>-2</sup>. During second year, the plots receiving pre-plant incorporated and pre-emergence applications of *Trifluralin* and *Pendimethalin* at 3.0 and 3.5 l ha<sup>-1</sup> varied from 34.92 to 49.61 weed count m<sup>-2</sup>. Weedy check gave the highest weed count of 183.2 m<sup>-2</sup>.

Apparently hand weedy seems to be comparatively better than of weed control than chemical weed control. Highly significant difference were observed between weedy check and all other treatments and hand weeding versus herbicidal treatments during each year.

The weed fresh weight is an indication of the growth potential of weeds and is better criterion of the weed crop competition than the weed density. Data on fresh weight of weeds in various weed control treatments show significant differences (Table 1). In first year, the lowest weed fresh weight ( $10.03 \text{ g m}^{-2}$ ) was recorded in hand weeded plots. All the herbicidal treatments remained statistically at par among themselves in which weed fresh weight ranged between  $33.53$  to  $45.47 \text{ g m}^{-2}$ . The highest weed fresh weight ( $312.9 \text{ g m}^{-2}$ ) was recorded in weedy check. Data for the second year, indicated almost the same trend with the exception that hand weeding treatment was at par with other weed control treatments except *Trifluralin* at the rate of  $3.0 \text{ l ha}^{-1}$  applied pre-emergence. Table show that the method of herbicides application did not differ significantly while in pre-emergence method of application *Pendimethalin* shows better response than *Trifluralin* during second year. Similarly, Singh and Rao (1992), found that all weed control treatments reduced the weed bio-mass from untreated (weedy) control.

It is evident from the data given in Table 2 that various weed control treatments did not effect significantly the number of nodules per plant of mungbean over weedy check in both years. However, viable nodules per plant were observed to be slightly higher in second year than in first year. Omokaro and Ajakaiye (1991) found varied response of herbicides on nodulation depending on the herbicide and its rate. *Pendimethalin* herbicide application did not suppress nodule formation.

Data presented in Table 2 reveal that the observations regarding days taken to flowering were not affected significantly by different weed control treatments in both first year and second year. Days taken to flowering on an average ranged between 43.0 to 45.50. It is concluded from the results that herbicides under trial at  $3.0$  or  $3.5 \text{ l ha}^{-1}$  applied either pre-plant incorporation into soil or pre-emergence did not effect flowering significantly.

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