

Effect of Weed Control Practices on Weed Population and Yield of Maize

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siderable loss (18-50%) in yield of maize (Zimdahl, 1980; Rana 1977).

ABSTRACT

The effect of different weed control practices on weed population and yield of maize was investigated during 1986 on a loam soil. Weed control treatments consisted of control (weedy check), hand weeding, pendimethalin 330E at the rate of 1.12 kg. ai./ha (pre-emergence), 2,4-D amine 59.5 EC at the rate of 0.87 kg. ai./ha (post-emergence) and atrazine + metolachlor 500L at the rate of 1.88 kg ai./ha (post-emergence). All the herbicidal and cultural treatments decreased weed population effectively. Atrazine + metolachlor application at post-emergence stage produced relatively higher grain yield (54.51 Q/ha) but remained at par with hand weeding. Pendimethalin and 2,4-D amine also controlled the weeds effectively and gave good crop harvest. Atrazine + metolachlor and 2,4-D amine were more economical as compared to hand weeding and other treatments.

INTRODUCTION

Although high yielding varieties are under cultivation yet the average yield in maize is still far below the potential yield. Out of the factors contributing to low yield, presence of weeds in maize fields is considered to be limiting the yield. Weeds cause con-

Control of weeds from fields of maize is, therefore, very essential for obtaining a good crop harvest. Weed control by mechanical means is still a useful tool but is getting expensive. Herbicides use is one of the important method for controlling weeds in crops. Chemical weed control is, therefore, being recommended to combat this menace. The use of such a method might help in boosting maize production. In many research studies, effectiveness of herbicides has been demonstrated. Primextra + Gesaprim effectively controlled *Amaranthus* and *Chenopodium* spp. (Cetinsoy, 1978). Becker and Staniforth (1980) obtained higher yield by using chemical weedicides than cultural weed control practices. Ayalew reported that chemical weed control increased the grain yield, dry matter, plant height and reduced the vegetative growth period. Braseso et al. (1983) found that Atrazine at the rate of 1.6 kg/ha gave more yield as compared to 1 or 2 mechanical weeding with added advantage of saving in labour. Negre and Khedekar (1983) observed that Atrazine and 2,4-D amine gave effective control of weeds in maize and significantly increased grain yield. The present study was planned with the objective of selecting suitable pre and post-emergence herbicides for maize crop at Faisalabad.

MATERIALS AND METHODS

The investigations to evaluate the

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effect of weed control practices on weed population and yield of maize was carried out on a loam soil with low organic matter (0.49%) at Agronomic Research Area, University of Agriculture, Faisalabad, during 1986. The experiment consisted of control (Weedycheck) Hand weeding, Stomp 330E (pendimethalin, N-(1-ethylpropyl) 3,4-dimethyl-demethyl-2,6-dinitrobenzamide) at the rate of 1.12 kg ai./ha (Pre-emergence), DMA-6 59.5 EC (2,4-D amine) 2,4 dimethyl amine at 0.87 kg ai./ha and Primextra 500L (atrazine + metolachlor) 2-chloro-4-ethylamino-6-Isopropylamino-s-piazine + 2-chlor-N-(2-ethyl-6-methylphenyl) N-2-methoxy-1-methylentyl) acetamide). at the rate of 1.88 kg ai./ha (Post-emergence). The treatments were replicated four times in 3.6 x 7m plots, using randomized complete block design. Maize variety "Akbar" was used as a test crop. Crop was sown on March 5, 1986 on a well prepared seed bed in rows 60 cm apart with single row hand drill. Plant-to-plant distance was maintained at 22.5 cm by thinning the crop at an early growth stage. In case of hand weeding treatment hoeing was done with the help of a hand hoe twice, after first and third irrigation. The herbicidal spray was done with the Knapsack sprayer CP-3 fitted with 4 flat fan 8003 nozzles on a specially made boom. All the herbicides were applied before emergence. For working out mortality percentage of weeds, counting was done from a meter square area. Data on different aspects were collected and Duncan's New Multiple Range Test was used to establish statistical significance among treatment means. Economic analysis was done using Marginal Rate of Return (Perrin et al. 1979).

RESULTS AND DISCUSSION

A wide range of weeds were present in the experimental field. Weeds comprised of Deela (*Cyperus rotundus*), Jangli palak (*Rumex acutus*), Khabbal grass (*Cynodon dactylon*), Madana grass (*Dactyloctenium aegyptium*), Janli halon (*Cornopus didymus*), Hazardani (*Euphorbia pilulifera*), Maini (*Trigonella polycerata*), Kulfa (*Portulaca oleracea*), Senji (*Melilotus alba*), Bathu (*Chenopodium album*) and Daryai booti (*Phyla nodiflora*). The data indicate that relative mortality of *Rumex acutus*, *Dactyloctenium aegyptium*, *Melilotus alba* and *Chenopodium album* was higher as compared with other weeds. None of the herbicides were effective in controlling *Cyperus rotundus* and *Cynodon dactylon*. Post-emergence application of atrazine + metolachlor at the rate of 1.88 lit ai./ha resulted in best weed control (63.62% mortality) and was followed by hand weeding (60.61% mortality) (Table 1). Chemicals included in this study controlled weeds in the range of 47.58 to 63.62%. Other research workers have also reported that weeds of maize can be effectively controlled by using herbicides (Cetinsoy, 1978 and Nagre and Khedekar, 1983).

The data regarding grain yield per hectare (Table 2) revealed that differences among treatments were significant. All the chemical and hand weeding treatments were effective in decreasing weed population and increasing crop yield. Atrazine + metolachlor at the rate of 1.88 kg ai./ha post emergence gave highest yield (54.52 Q/ha) and increase was upto 24.22% over control but was at par with hand weeding (50.46 Q/ha). pendimethalin at the rate of 1.12 kg ai./ha and 2,4-D amine

at the rate of 0.87 kg ai./ha also proved to be effective in enhancing the yield.

The data regarding number of grains per cob (Table 2) indicate that although differences between various treatments were significant but were not clear enough to show the superiority of one treatment over the other. However, atrazine + metolachlor at the rate of 1.88 kg ai./ha gave relatively more number of grains per cob.

Considering 1000-grain weight (Table 2) heavier grains were produced in the plots where atrazine + metolachlor at the rate of 1.88 kg ai./ha post emergence was applied followed by hand weeding. Lowest 1000-grain weight was obtained from control. Differences among other treatments were not clear. More grain yield, more number of grains per cob and heavier 1000-grain weight in case of atrazine + metolachlor, hand weeding, pendimethalin and 2,4-D amine is attributed to the fact that these treatments effectively decreased the competition

between crop plants and weeds, which ultimately resulted in better nutrition, grain development and finally the yield. The usefulness of weedicides and increase in crop yield as a result of control of weeds in maize has been shown by Ayalew (1983), Braseso et al. (1983) and Nagre and Khedekar (1983). Plant height was not affected by any of the treatment.

To compare economics of cultural and chemical weed control practices, net benefit curve for variable costs and net benefits was developed (Perrin et al. 1979). It is evident from Table 3 and Fig.1 that application of atrazine + metolachlor at the rate of 1.88 kg ai./ha applied post emergence is the most economical treatment which gives maximum Marginal Rate of Return (1029%). 2,4-D amine at the rate of 0.87 kg ai./ha applied post emergence was the second best treatment, while hand weeding was more expensive as compared with chemical weed control. These results are supported by the findings of Becker and Staniforth, (1981).

Table 1. Effect weed control practices mortality (percentage) of weeds in maize.

Weeds	Treatments				
	Control	Hand weedings	Pendimethalin (Pre-em)	2,4-D Amine (Post-em)	Metolachlor Atrazine (Post-em)
<i>Cyperus rotundus</i> (Deela)	0	00.00	2.13	00.00	00.00
<i>Runcx acutus</i> (Jangli Palak)	0	83.33	61.53	92.30	94.11
<i>Cynodon dactylon</i> (Khabbal grass)	0	33.33	31.57	00.00	00.00
<i>Dactyloctenium aegyptium</i> (Madana grass)	0	68.97	95.29	91.20	96.51
<i>Cornopus didymus</i> (Jangli Haloi)	0	57.14	76.00	72.00	88.48
<i>Euphorbia pilulifera</i> (Hazardani)	0	66.66	69.23	91.66	100.00
<i>Trigonella polycerata</i> (Maini)	0	84.61	72.72	83.33	87.50
<i>Portulaca oleracea</i> (Khulfa)	0	91.66	88.23	95.23	100.00
<i>Melilotus alba</i> (Sengi)	0	100.00	75.00	83.33	87.50
<i>Chenopodium album</i> (Bhuthu)	0	100.00	83.33	100.00	100.00
<i>Phyla nodiflora</i> (Daryai Booti)	0	75.00	00.00	25.00	100.00
Mortality %age of total number of weeds	0	60.61	52.50	47.58	63.62

Table 2. Effect of weed control practices on maize grain yield and its components

Treatments	Grain yield (Quintal/ha)	No. of grains/cob	1000-grain weight	Plant Population/ha (thousand)
Control	43.88 bc(1)	407.86 b	221.60 cd	73.8
Hand weeding	50.46 a	486.20 ab	228.28 ab	73.5
Stomp (Pendimethalin) @ 1.12 kg a./ha; Pre-em)	49.52 ab	480.04 ab	229.58 ab	73.8
DMA-6 (2,4-D amine) @ 0.87 Kg a./ha; Post-em)	49.30 ab	476.72 ab	226.13 bc	73.2
Primextra (Atrazine + Metolachlor) @ 1.88 kg a./ha; Post-em)	54.51 a	517.11 a	232.13 a	73.2

1. Any two means not sharing a letter in common differ significantly at 5% probability level
 2. NS - Non-significant
 3. em - emergence
- NS

Table 3. Dominance analysis

Treatments	Net benefit (Rs.)	Variable costs (Rs.)	Marginal rate of return
Control	9865.84		
DMA-6	10524.79	192.5	3.42-3.42
Hand weedings	10860.99	500.0	1.09-1.09
Pendimethalm	10677.45	526.0	
Metolachlor -			
Atrazine	11749.08	586.25	10.29-10.29

Market price:

Pendimethalm - Rs.140/lit

2,4-D amine - Rs.95/lit

Metolachlor -

atrazine - Rs.143/lit

Hoing charges - 20 men for one day @ Rs. 25.00 per day per man. Spray charges - Rs.50/ha

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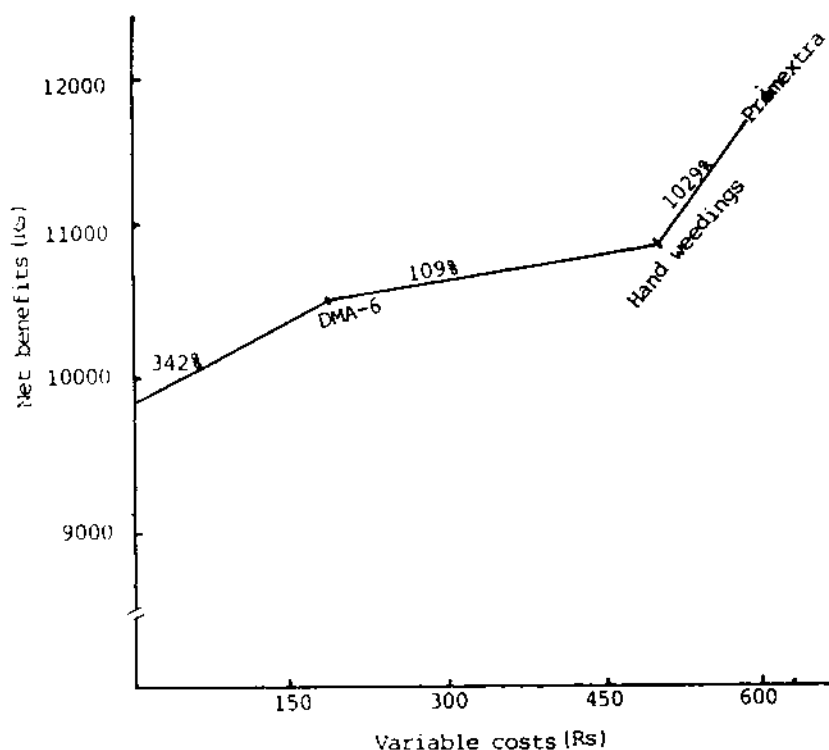


Fig. 1 Net benefit curve for variable costs and net benefits.