

## Effect of Herbicide Mixtures on Weeds in Kharif Maize (*Zea mays* L.) under Middle Gujarat Conditions

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### ABSTRACT

Maximum weed control efficiency (>98%) was achieved with pre-emergence application of atrazine at 0.5 kg ha<sup>-1</sup> in conjunction with pendimethalin @ 0.25 kg ha<sup>-1</sup> closely followed by atrazine+alachlor each applied at 0.5 kg ha<sup>-1</sup>. Similar trend was observed in grain and stover yields, net realization and CBR values.

### INTRODUCTION

Maize, being a rainy season and widely spaced crop, gets infested with variety of weeds and subjected to heavy weed competition, which often inflicts huge losses ranging from 28-100%. Most of the presently available herbicides provide only narrow spectrum weed control in maize. Therefore, it is desirable to incorporate the strength by mixing two or more herbicide into one complementary mixture. Mixtures of herbicides may allow control of wider spectrum of weeds with less total active ingredient. Keeping this in view, an attempt was made to find out effective and economical herbicide mixtures for weed control in maize.

### MATERIALS AND METHODS

A field experiment was carried out for two consecutive rainy (**kharif**) seasons of 2001 and 2002 at College Agronomy Farm, Anand Agricultural University, Anand. The soil was sandy loam in texture having low available nitrogen, medium available phosphorus and high potassium with pH 7.8. The experiment was laid out in randomized complete block design with four replications involving 16 treatments. Treatments consisted of atrazine, alachlor and metolachlor each at 1.0 kg ha<sup>-1</sup>, metribuzin at 0.30 kg ha<sup>-1</sup>, pendimethalin at 0.50 kg ha<sup>-1</sup> and their mixtures at half of the doses, twice

hand weeding carried out at 20 and 40 DAS and weedy check (Table 1). The seeds of Gujarat Maize-4 were dibbled manually at spacing of 60 x 20 cm at 25 kg seed ha<sup>-1</sup> during the first week of July in both the seasons. The herbicides were applied as pre-emergence using knapsack sprayer fitted with flat fan nozzle by mixing in 500 litre of water ha<sup>-1</sup>. After sowing of the seed immediately a light irrigation was given to the crop for uniform germination and next day the herbicides were sprayed. Full dose of phosphorus and half dose of the nitrogen through diammonium phosphate and urea were applied at the time of sowing and remaining quantity of nitrogen was applied at knee-high stage. The recommended package of practices was adopted to maintain the crop.

### RESULTS AND DISCUSSION

#### Effect on Weeds

In general, all the herbicides mixture reduced the density and dry weight of weeds as compared to herbicide applied as alone and controls (Table 1). The least density and dry weight of weeds were recorded under atrazine (0.5 kg ha<sup>-1</sup>) applied either with pendimethalin (0.25 kg ha<sup>-1</sup>) or alachlor (0.5 kg ha<sup>-1</sup>) or metolachlor (0.5 kg ha<sup>-1</sup>) or twice hand weeding treatment at all the intervals as compared to rest of the treatments. The better performance of herbicide mixture might be due to

Table 1. Effect of treatments on weeds (Mean of two seasons)

Treatment	Dose (kg ha <sup>-1</sup> )	Density of weeds (No. m <sup>-2</sup> )			Dry weight of weeds (g m <sup>-2</sup> )		
		20 DAS	40 DAS	Harvest	20 DAS	Harvest	Harvest
Atrazine	1.00	2.86 (7)	3.65 (12)	5.36 (28)	46.4		63.4
Alachlor	1.00	4.09 (15)	5.73 (32)	7.33 (53)	55.4		104.2
Metolachlor	1.00	3.29 (9)	6.24 (38)	7.87 (61)	55.4		111.7
Metribuzin	0.30	4.06 (15)	5.97 (34)	7.45 (54)	57.0		116.9
Pendimethalin	0.50	4.45 (18)	5.33 (27)	6.58 (42)	53.3		82.2
Atrazine+Alachlor	0.50+0.50	1.00 (0)	1.00 (0)	3.15 (9)	0.0		6.5
Atrazine+Pendimethalin	0.50+0.25	1.00 (0)	1.00 (0)	2.28 (4)	0.0		3.5
Atrazine+Metolachlor	0.50+0.50	1.00 (0)	1.87 (2)	3.25 (9)	4.0		19.8
Atrazine+Metribuzin	0.50+0.15	2.70 (8)	3.32 (10)	4.55 (19)	10.4		31.4
Metolachlor+Metribuzin	0.50+0.15	1.31 (0)	3.24 (9)	4.40 (18)	10.1		22.4
Metolachlor+Pendimethalin	0.50+0.25	1.53 (1)	3.04 (8)	4.23 (17)	11.5		30.2
Alachlor+Metolachlor	0.50+0.50	3.80 (13)	4.93 (23)	5.94 (34)	45.7		60.8
Alachlor+Pendimethalin	0.50+0.25	3.31 (10)	4.41 (18)	5.96 (34)	24.2		38.1
Alachlor+Metribuzin	0.50+0.15	3.03 (8)	4.41 (18)	6.02 (35)	36.7		55.2
HW at 20 & 40 DAS		1.00 (0)	1.00 (0)	5.54 (29)	0.0		5.7
Weedy		10.24 (104)	12.34 (151)	13.43 (179)	218.3		333.2
LSD (P=0.05)		0.33	0.55	0.37	10.08		18.9

Data were subjected to  $\sqrt{x+1}$  transformation. Figures in parentheses indicate original values.

Table 2. Yield and yield attributes of maize as influenced by treatments (Mean of two years)

Treatment	Dose (kg ha <sup>-1</sup> )	Cob girth (cm)	Cob length (cm)	No. of grains cob <sup>-1</sup>	Test weight (g)	Protein content in grain (%)	Grain yield (kg ha <sup>-1</sup> )	Stover yield (kg ha <sup>-1</sup> )	Net realization (Rs. ha <sup>-1</sup> )	CBR
Atrazine	1.00	12.6	19.7	413.3	19.4	5.75	3386	6155	14296	2.57
Alachlor	1.00	12.5	19.5	406.5	19.3	5.55	3254	6120	13988	2.63
Metolachlor	1.00	12.3	18.9	378.1	18.5	5.46	3065	5688	11594	2.20
Metribuzin	0.30	11.7	17.3	328.6	17.4	5.38	2439	3944	6916	1.73
Pendimethalin	0.50	12.6	19.6	415.6	19.4	5.67	3314	6166	13537	2.44
Atrazine+Alachlor	0.50+0.50	13.4	20.5	435.3	20.2	6.00	3582	6266	15779	2.78
Atrazine+Pendimethalin	0.50+0.25	13.6	20.7	456.5	20.4	6.96	3652	6366	15831	2.71
Atrazine+Metolachlor	0.50+0.50	13.3	20.5	428.8	20.2	6.05	3548	6245	15039	2.60
Atrazine+Metribuzin	0.50+0.15	13.2	20.3	424.9	19.7	5.78	3489	6162	14761	2.60
Metolachlor+Metribuzin	0.50+0.15	13.3	20.5	434.3	20.1	6.28	3494	6219	14556	2.53
Metolachlor+Pendimethalin	0.50+0.25	13.3	20.4	427.8	20.1	6.23	3491	6258	14537	2.52
Alachlor+Metolachlor	0.50+0.50	12.4	19.5	394.4	19.5	6.07	3271	6019	13515	2.48
Alachlor+Pendimethalin	0.50+0.25	13.3	20.5	439.0	20.1	6.62	3509	6253	15167	2.68
Alachlor+Metribuzin	0.50+0.15	12.5	19.5	391.6	19.5	6.23	3240	6014	13944	2.55
HW at 20 and 40 DAS		13.7	20.7	448.1	20.4	7.09	3658	6355	15687	2.66
Weedy		10.5	14.6	243.5	13.6	4.15	1947	3471	6269	1.87
LSD (P=0.05)		0.40	0.47	28.79	0.50	0.43	177	160	-	-

longer persistence effect while under hand weedings could be attributed to the reduced crop weed competition in the initial stage and removal of the late emerged weeds by hand weeding at 40 days. Application of atrazine at 1.0 kg ha<sup>-1</sup> was found effective than that of other herbicide applied as alone. Alachlor (0.5 kg ha<sup>-1</sup>) in combination of either with metolachlor (0.5 kg ha<sup>-1</sup>) or metribuzin (0.15 kg ha<sup>-1</sup>) was found less effective than other herbicide mixtures. The present findings are in conformity with the findings of Rao and Duke (1974).

#### Effect on Crop

Increase in cob length, cob girth, number of grains cob<sup>-1</sup> and yield of maize were observed due to different weed control treatments (Table 2). Hand weeding carried out at 20 and 40 DAS recorded maximum girth and length of cobs followed by atrazine at 0.50 kg ha<sup>-1</sup> in combination with pendimethalin at 0.25 kg ha<sup>-1</sup> or atrazine+alachlor. Whereas maximum number of grains cob<sup>-1</sup> and test weight were recorded with atrazine at 0.50 kg ha<sup>-1</sup> in combination with pendimethalin at 0.25 kg ha<sup>-1</sup> followed by twice hand weedings done at 20 and 40 DAS. In general, twice hand weedings and atrazine at 0.50 kg ha<sup>-1</sup> in combination with pendimethalin at 0.25 kg ha<sup>-1</sup> were found to be superior and recorded

higher grain yield (3658 and 3652 kg ha<sup>-1</sup>, respectively) as compared to all the treatments of herbicide applied alone, alachlor+metolachlor, alachlor+metribuzin and weedy check. Higher grain yield due to atrazine+pendimethalin, twice hand weedings, atrazine+alachlor, atrazine+metolachlor, alachlor+pendimethalin, metolachlor+metribuzin, metolachlor+pendimethalin and atrazine+metribuzin may be due to effective control of weeds and minimum dry weight of weeds. Maximum net realization of Rs. 15831 ha<sup>-1</sup> was noticed due to atrazine in combination with pendimethalin followed by atrazine+alachlor and twice hand weeding treatment, while the CBR value was observed higher (1 : 2.78) under atrazine+alachlor followed by atrazine in combination with pendimethalin and twice hand weeding treatment. These results are in accordance with the results of Bially (1995).

#### REFERENCES

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