

Chemical weed control in rainfed maize (*Zea mays*)

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Received: August 1994

ABSTRACT

An experiment was conducted during rainy (*kharif*) season of 1991 and 1992 on chemical weed control in rainfed maize (*Zea mays* L.). The pooled data on grain yield indicated that metolachlor (1.25 kg/ha as pre-emergence spray) and atrazine (1.25 kg/ha as pre-emergence spray) gave the maximum grain yield and were at par with weeded control. Butachlor (1.5 kg/ha as pre-emergence spray) was found to be the next alternative to metolachlor and atrazine. Atrazine, metolachlor and alachlor were more than 90% efficient in reducing dry weight of weeds. Both glyphosate and anilophos were observed to be toxic to maize plant.

Weeds cause enormous damage to the maize crop, the magnitude of loss varying from 30 to 50%, depending upon the growth and persistence of weed population in standing crop. Slow growth of maize plant at early stages and high fertilizer application during the successive period encourages rapid growth of weeds. Thakur *et al.* (1989), Singh and Prasad (1988) and Balyan and Bhan (1987) studied the effect of different herbicides on control of weeds in maize (*Zea mays* L.). Therefore the present study was undertaken to find out the promising herbicide to manage weeds in rainfed maize.

MATERIALS AND METHODS

The field experiment was conducted at the National Agricultural Research Project, Umerkote (OUAT) during rainy (*kharif*) season of 1991 and 1992 under rainfed conditions. The soil was sandy loam (Alfisols) in texture slightly acidic in reaction, medium in organic carbon and phosphorus but low in potassium. The experiment was laid

out in randomized block design with 3 replications. Seven herbicides both the single and repeated applications in 1991 and only 6 herbicides with single application in 1992 were tried along with the weeded control [hoeing, weeding and earthing up at 21 and 42 (L.) days after sowing (DAS)]. All the herbicides were applied as pre-emergence spray except glyphosate which was applied at 15 DAS as post-emergence spray. Maize variety 'Deccan Hyb. 103' was sown on 24 June and 1 July in respective years and fertilised at 150, 60 and 50 kg of N, P₂O₅ and K₂O/ha. Dry weight of weeds was recorded from an area of 50 cm x 50 cm at harvest.

RESULTS AND DISCUSSION

The experimental site included grasses, viz. *Cynodon dactylon* (L.) Pers., *Digitaria setigera*, *Digitaria ciliaris*, *Leptochloa chinensis* Nees (Retz.) Koeler, *Dactyloctenium aegyptium* (L.) Willd., and *Eleusine indica* Gaertn.; sedges, viz. *Cyperus rotundus* L. and *Cyperus iria* L., and broad-leaf

Table 1. Yield and yield-attributing character of maize, and dry weight of weeds at harvest (tonnes/ha) as influenced by herbicides

Treatment (kg/ha)	Grain yield (q/ha)			Stalk yield (q/ha)		1,000-grain weight (g)		Dry weight of weeds at harvest (tonnes/ha)	
	1991	1992	Pooled	1991	1992	1991	1992	1991	1992
Atrazine 1.25	62.25	46.76	54.51	86.94	65.27	251.7	261.7	0.22	0.18
Anilophos 0.3	0.3	42.07			58.70		246.7		0.84
Butachlor 1.5	56.08	41.45	48.77	78.64	57.89	245.0	278.3	0.35	0.21
Pendimethalin 1.5	54.44	35.41	44.53	75.46	48.19	250.0	276.7	0.52	0.51
Metolachlor 1.25	63.76	47.60	55.68	43.92	66.48	248.3	278.3	0.25	0.13
Glyphosate 0.4	37.04			52.41		250.0		1.3	
Alachlor 1.25		45.86			4.05		268.3		0.31
Atrazine 1.25 + R	60.71			89.47		256.7		0.28	
Anilophos 0.3 + R	29.54			31.30		256.7		0.58	
Butachlor 1.5 + R	62.96			84.88		288.3		0.24	
Pendimethalin 1.5 + R	64.29			86.67		243.3		0.31	
Metolachlor 1.25 + R	64.35			36.11		246.6		0.32	
Glyphosate 0.4 + R	21.08			43.52		240.0		1.1	
Weeded control (HW at 21 and 42 DAS)	57.62	42.82	50.22	77.94	59.81	291.7	271.7	0.41	0.63
Un-weeded control	28.30	8.64	18.47	38.18	7.88	246.7	225.0	2.30	3.62
CD (P = 0.05)	7.19	11.01	5.96	8.22	15.38	18.05	NS		

R, Repeated application—Pre-emergence herbicides at 21 days after sowing DAS and post-emergence herbicides at 42 DAS; with the same dose as in first application

weeds, viz. *Celosia argentea* L., *Commelina benghalensis* L., *Sida acuta* Burm. f. and *Aeschynomene indica* and *Acanthospermum hispidum* DC.

Unweeded check plots recorded the maximum dry weight of weeds of 2.30 and 3.62 tonnes/ha during 1991 and 1992 respectively. The herbicides like atrazine, metolachlor and alachlor were more than 90% efficient in reducing the dry weight of weeds. Both glyphosate and anilophos were observed to be toxic to maize plant.

Yield and yield attributes

Data on grain yield (Table 1) indicated that in 1991 metolachlor, atrazine, butachlor and pendimethalin were at par with weeded control. Glyphosate and anilophos reduced the maize yield. In 1992, glyphosate and anilophos as well as repeated applications were eliminated but the herbicide alachlor was tried with other 5 herbicides. Single application of atrazine, butachlor, metolachlor, alachlor were at par with weeded control. On pooled basis, metolachlor and atrazine were at par with weeded control. About 5 q/ha less yield was observed in manual weed-control method compared with metolachlor and atrazine mainly due to the crop-weed competition up to 21 DAS when first hoeing, weeding and earthing up were done. The yield data indicate butachlor to be the next alternative to metolachlor and atrazine.

Data on stalk yield indicated that in

1991, atrazine and butachlor produced the maximum stalk yield and were at par, but in 1992, atrazine, metolachlor and alachlor were at par with the weeded control. In 1991 weeded control showed the highest the 1,000-grain weight and all the herbicides were at par. But in 1992 there was no significant difference between herbicides.

In maize, the cost of manual weeding + 1 hoeing and 2 earthing up was Rs 2,000/ha. The expenditure on chemical weeding + hoeing and earthing up was Rs 2,500/ha. So when the method of chemical weeding is adopted, the cost comes Rs 500/ha more. But the yield difference between the weeded control and chemical weed control by efficient herbicides on an average was 5 q/ha. The extra return received by use of herbicides was well above than the extra cost. So application of herbicides in rainfed maize should be economic advantage.

Therefore, it may be concluded that atrazine, metolachlor, butachlor and alachlor can preferably be used as pre-emergence herbicides to control weeds in rainfed maize.

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