

Weed Management in Zero-till Sown Maize

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ABSTRACT

Field experiments were conducted during **rabi** 2005-06 and 2006-07 at the Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh to find out the most effective weed management practice in zero-till sown maize crop grown after rice. Uncontrolled weed growth throughout the crop growing period caused 43% reduction in grain yield. All the weed control treatments significantly reduced the weed growth and increased maize yield by 22 to 62% over weedy check without any crop injury. Highest maize grain yield was recorded with two hand weedings and pre-emergence application of atrazine 1.5 kg/ha followed by (fb) hand weeding at 30 days after sowing (DAS). Maize grain yield did not differ significantly among the treatments with hand weeding and herbicide integration. Highest gross and net monetary returns and benefit : cost ratio were recorded with two hand weedings and with pre-emergence application of atrazine 1.5 kg/ha followed by (fb) hand weeding at 30 DAS.

Key words : Herbicides plus hand weeding, planting time, zero-till, monetary returns

INTRODUCTION

In Krishna delta of Andhra Pradesh, due to late release of water, transplanting of rice is much delayed and ultimately timely sowing of blackgram as relay crop is not possible. Therefore, farmers are switching over to non-traditional crop like maize in rice fallows as an alternative to blackgram. Rice-maize cropping system became popular in this zone due to lower cost of cultivation and higher net returns. Though, adequate information is available on weed management under normal till sown maize (Sivakumar and Sundari, 2006; Walia *et al.*, 2007) but information is lacking on zero till sown maize. Keeping this in view, the present investigation was conducted to find out the most effective weed management practice for zero-till sown maize.

MATERIALS AND METHODS

A field experiment was conducted consecutively for two years during **rabi** seasons of 2005-06 and 2006-07 at Regional Agricultural Research Station, Lam farm, Guntur, Andhra Pradesh. The soil of the experimental field was clay loam in texture with medium in available nitrogen and available phosphorus and high in available potassium and with a pH of 7.7. The experiment consisting of 10 treatments (Table 1) was laid out in a randomized block design with three replications. The seeds of maize (cv. Hi-Shell) were dibbled directly under

zero-till condition by adopting a spacing of 75 x 20 cm immediately after removal of paddy sheaves in standing paddy stubbles during third week of December, 2005 (first year) and first week of January, 2007 (second year). The crop received 120 : 60 : 60 kg/ha of N, P₂O₅ and K₂O, respectively. Out of this entire P and one fourth of N and half of K were applied as basal at the time of dibbling. Remaining N was top dressed in two splits i. e. half N at 30 days after seeding (DAS) and one fourth N at 60 DAS. Whereas the remaining half of K was top dressed in two equal splits at 30 and 60 DAS. The preceding rice crop also received 120 : 60 : 60 kg/ha of N, P₂O₅ and K₂O, respectively. The pre-emergence herbicides were applied at 3 DAS using knap sack sprayer with a spray volume of 500 l/ha. The crop was irrigated one month after sowing onwards as and when needed. Weed density and dry matter were recorded at various stages with the help of quadrat and then converted in per square metre. The data on weed density and dry weight were subjected to square root transformation $\sqrt{x+0.5}$ before statistical analysis to normalise their distribution (Panse and Sukhatme, 1978).

RESULTS AND DISCUSSION

Effect on Weeds

The dominant weed flora of the experimental field was *Echinochloa colona* (L.) Link (41%), *Dinebra*

retroflexa (Vahl) Panzer (4%), *Panicum repens* L. (3%) and *Cynodon dactylon* (L.) Pers. (2%), *Leptochloa chinensis* (L.) Nees (5%) (grasses), *Cyperus rotundus* L. (5%) (sedges), *Chrozophora rotleri* (Geisel) A. Juss. Ex Spreng. (15%), *Trianthema portulacastrum* L. (13%), *Digera arvensis* (4%), *Merremia emerginata* (Burm. f.) Hall. F. (3%), *Phyllanthus niruri* (3%) and *Euphorbia hirta* L. (2%) (broad-leaved weeds).

All the weed control treatments significantly reduced the weed growth over unweeded check at both the stages of observations (Table 1). Among the treatments, pre-emergence application of atrazine 1.5 kg/ha followed by (fb) hand weeding at 30 DAS recorded the lowest weed dry weight at 60 DAS and harvest and was at par with all other treatments with hand weeding and herbicide integration and also with hand weeding at 15 and 30 DAS. This treatment recorded higher weed control efficiency (WCE) of 74 and 72% at 60 DAS and harvest, respectively. Among the individual herbicides, pre-emergence application of atrazine 1.5 kg/ha recorded lower weed dry weight and was similar with other individual herbicides.

Effect on Crop

All the pre-emergence herbicides under test did not cause any phytotoxicity to maize plant. All the weed control treatments recorded significantly higher plant height and dry weight over unweeded check at all stages of observation (Table 2). Number of cobs/plant and 100-

seed weight were not significantly influenced by the weed management treatments. Unchecked weed growth caused yield loss of 41% due to severe weed competition. All the weed control treatments recorded significantly higher grain yield over unweeded check. Among the weed control treatments, pre-emergence application of atrazine 1.5 kg/ha fb hand weeding at 30 DAS recorded highest grain yield (100.1 q/ha) and was similar with all other treatments with hand weeding and herbicide integration and also with alone application of atrazine 1.5 kg/ha (89.5 q/ha) and hand weeding at 15 and 30 DAS which recorded the highest yield (105.3 q/ha). The increased yield in these treatments was owing to higher WCE and increased crop growth and number of seeds per cob. Among the individual herbicides, pre-emergence application of atrazine 1.5 kg/ha recorded higher grain yield but was similar to pre-emergence application of pendimethalin 1.5 kg/ha. The results are akin to those reported by Walia *et al.* (2007) under normal till sown conditions.

Economics

Highest gross and net monetary returns and benefit : cost ratio were recorded with two hand weedings (Rs. 68,445, Rs. 50,945 and 2.9, respectively) and with pre-emergence application of atrazine 1.5 kg/ha followed by (fb) hand weeding at 30 days after sowing (DAS) (Rs. 65,065, 48,005 and 2.8, respectively).

From the results, it can be concluded that effective weed management, higher grain yield, higher

Table 1. Effect of different weed control treatments on weed density and dry weight in zero till sown maize (Pooled data of two years)

Treatments	Herbicide dose (kg/ha)	Time of application (DAS)	Weed density (No./m ²) at		Weed dry weight (g/m ²) at		Weed control efficiency (%) at	
			60 DAS	Harvest	60 DAS	Harvest	60 DAS	Harvest
Unweeded check	-	-	20.6 (427.2)	19.4 (388.7)	18.8 (359.1)	19.3 (376.7)	-	-
Hand weeding	-	15 & 30	8.7 (69.8)	8.5 (74.3)	3.9 (15.5)	4.3 (18.7)	79.3	77.7
Atrazine	1.50	3	12.3 (167.0)	10.8 (125.3)	9.9 (99.9)	10.5 (113.3)	47.3	45.6
Alachlor	2.50	3	13.1(189.0)	12.1 (161.8)	13.4 (178.7)	13.3 (180.0)	26.6	31.1
Atazine +Alachlor	0.75 +1.25	3	12.3 (170.7)	11.0 (144.0)	10.8 (118.9)	11.0 (130.0)	42.6	43.0
Pendimethalin	1.50	3	10.6 (123.3)	11.2 (139.3)	10.5 (115.1)	10.3 (93.3)	44.1	48.2
Atrazine fb HW	1.50	3 fb 30	9.6 (108.0)	8.1 (73.3)	4.9 (23.9)	5.4 (30.0)	73.9	72.0
Alachlor fb HW	2.50	3 fb 30	10.5 (122.0)	9.1 (96.7)	5.2 (26.7)	6.8 (48.0)	72.3	64.8
Atazine +Alachlor fb HW	0.75 +1.25	3 fb 30	10.6 (126.0)	9.7 (106.0)	4.8 (23.7)	7.7 (64.3)	74.5	60.1
Pendimethalin fb HW	1.50	3 fb 30	9.7 (112.7)	8.1 (76.7)	4.3 (18.7)	5.4 (32.0)	71.3	72.0
LSD (P=0.05)	-	-	2.17	1.87	1.64	2.17		

Data transformed to $\sqrt{x+0.5}$ to transformation. Figures in parentheses are original values. fb–followed by, DAS–Days after sowing.

Table 2. Effect of different weed control treatments on growth, yield parameters, grain yield of maize and economic parameters in zero till sown maize (Pooled data of two years)

Treatments	Herbicide dose (kg/ha)	Time of application (DAS)	Plant height (cm) at			Crop dry weight (g/plant) at		No. of cobs/plant	No. of seeds/cob	100- seed weight (g)	Grain yield (q/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	BCR
			Harvest			Harvest								
			30 DAS	60 DAS	Harvest	60 DAS	Harvest							
Unweeded check	-	-	61.9	157.1	205.0	72.8	253.9	1.0	418.7	24.2	61.9	40235	25235	1.7
Hand weeding	-	15 & 30	85.7	223.5	244.7	175.2	397.5	1.1	569.9	28.7	105.3	68445	50945	2.9
Atrazine	1.50	3	79.1	201.0	232.0	121.7	327.7	1.0	506.4	27.7	89.5	58175	42365	2.7
Alachlor	2.50	3	76.7	196.7	226.7	102.7	305.5	1.0	471.8	26.9	75.2	48880	32330	2.0
Atrazine+Alachlor	0.75 +1.25	3	78.3	198.1	230.3	105.5	295.4	1.1	475.5	26.5	75.4	49010	32830	2.0
Pendimethalin	1.50	3	77.9	188.3	221.2	102.3	311.6	1.1	481.2	26.8	76.1	49465	32978	2.0
Atrazine fb HW	1.50	3 fb 30	83.2	219.8	237.5	144.3	367.2	1.1	564.3	28.2	100.1	65065	48005	2.8
Alachlor fb HW	2.50	3 fb 30	82.0	210.4	238.0	128.2	324.8	1.0	514.5	27.4	93.1	60515	42715	2.4
Atrazine+Alachlor fb HW	0.75 +1.25	3 fb 30	77.6	219.8	241.0	140.2	335.3	1.1	525.4	26.9	94.6	61490	44060	2.5
Pendimethalin fb HW	1.50	3 fb 30	76.5	208.0	231.8	130.8	338.5	1.1	547.7	27.2	98.1	63765	46033	2.6
LSD (P=0.05)	-	-	6.49	19.68	6.63	13.0	37.699	NS	47.972	NS	13.54	-	-	-

DAS-Days after sowing, Cost of herbicides : Atrazine-Rs. 220/kg, Pendimethalin-Rs. 400/l, Alachlor-Rs. 280/l, Hand weeding : 25 labour/ha @ Rs. 50/person, Cost of produce- Rs. 650/q.

gross and net returns and benefit : cost ratio could be achieved in zero-till sown maize by two hand weedings or by adopting pre-emergence application of atrazine 1.5 kg/ha either alone or fb hand weeding at 30 DAS.

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