

Weed Management in Zero Till Maize (*Zea mays L.*) grown under Rice Fallows

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Abstract: A field experiment was carried out during Rabi 2014-15 in rice fallows under irrigated condition in black soils of agricultural research station Jangamaheswarapuram, Guntur district in Andhra Pradesh with an objective to find out the suitable strategy to alleviate weeds in rice fallow maize grown under zero tillage. The experiment consists of 12 treatments involving various weed management practices in a randomized block design with three replications. Weed density at 60 DAS were markedly reduced by paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g/ha + Atrazine @ 0.625 kg/ha at 20 DAS and Hand weeding at 20, 40 and 60 DAS. Similarly highest weed control efficiency was also observed with hand weeding at 20, 40 and 60 DAS. The treatment received Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as post at 20 DAS resulted in higher grain yield (5048 kg/ha), net returns (Rs 29098/-) and benefit cost ratio (1.75). The low cost of chemical treatment 'Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS' made it as the best economic alternative to the hand weeding which is laborious and expensive.

Key words: Paraquat, Rice fallow maize, Topramezone, and Weed control efficiency.

Maize (*Zea mays L.*) is one of the most important cereal crop of India. It plays a vital role in agricultural economy both as a staple food and feed for sections of the population and live stock as well as raw material for the industry in India. Winter maize grown under rice fallows gained momentum among the farmers of costal Andhra Pradesh in Krishna zone replacing the pulses due to yellow mosaic virus. Kandasamy and Chandrasekar, 1998 (1) reported that maize sown relatively at zero tillage coupled with wider spacings and initial slow growth encounters severe weed competition results in reduced crop yields to the extent of 45.9%.

Quickly sprouted rice stubbles offer early weed competition specially in zero tillage and pushes the crop in to disadvantageous position. Development of suitable weed management strategy to alleviate weed pressure on available

resources may prop up zero till maize productivity considerably.

Though both pre emergence herbicides (pendimethalin, atrazine, alachlor) and post emergence herbicides (atrazine and 2,4-D) are available for weed control in maize there is no selective post emergence broad spectrum herbicide to manage weed flora containing grasses. Recently triketone herbicides were released in to the market which, are selective to maize and able to manage grasses as well as broad leaved weeds when applied as post emergence.

Keeping the above considerations, the following study was conducted during 2014-15 to evaluate different weed management practices involving post emergence selective broad spectrum triketone herbicide in rice fallow maize grown under zero tillage.

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MATERIALS AND METHODS

A field experiment was carried out during Rabi 2014-15 in rice fallows under irrigated condition in black soils of agricultural research station Jangamaheswarapuram, Guntur district in Andhra Pradesh with an objective to find out the suitable strategy to alleviate weeds in rice fallow maize grown under zero tillage. The experiment consists of 12 treatments involving various weed management practices in a randomized block design with three replications.

The treatments were, T1-Weedy check, T2-Hand weeding at 20, 40 and 60 Days after sowing (DAS), T3-Paraquat spray immediately after dibbling maize seeds, T4-Paraquat directed spray on emerged weeds at 20 DAS, T5-Paraquat directed spray on emerged weeds at 40 DAS, T6-Paraquat directed spray on emerged weeds at 60 DAS, T7-Paraquat immediately after dibbling maize seeds fb Paraquat directed spray at 40 DAS, T8-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 60 DAS, T9-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS, T10-Atrazine @ 1.0 kg a.i./ha as PE, T11-Topramezone @ 25 g a.i./ha as POE at 20 DAS, T12- Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS.

The predominant weed flora observed were grasses like *Paspalum scrobiculaum*, *Leptochloa chinensis*, *Echinochloa colonum*, *Chloris barbata*, *Dinebra Arabica* sedges like *Cyperus rotundus* and broad leaved weeds like *Ammania Baccifera*, *Sonchus arvensis*, *Physalis minima*, *Abutilon indica*, *Eclipta alba*, *Crozophora rottleri* *Xanthium strumarium* etc.

Sowing of maize was done immediately after removal of paddy sheaves. The pre emergence herbicides were applied immediately after sowing maize on the wet soil with flat fan nozzle. Post emergence herbicides were applied as per the schedule. Hand operated knap sack sprayer was used with a spray fluid @ 500 L /ha. Paraquat 24 EC was used @ 5ml/ L water.

RESULTS AND DISCUSSION

Weed density, dry weight and weed control efficiency in rice fallow maize were markedly influenced by weed management practices. Weed density at 60 DAS were markedly reduced by Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS and Hand weeding at 20, 40 and 60 Days after sowing (DAS) than the weedy check. Maximum dry matter accumulation, higher crop growth rate and higher leaf area index were recorded with the two hand weedings in Kharif maize was reported by Sinha *et al.*, 2001(4).

The highest weed control efficiency was observed with the hand weeding at 20, 40 and 60 Days after sowing. Hand weeding in maize at 15 and 30 days after sowing results in highest weed control efficiency of 87.9% on clay loam soils of Almora (UP). Similar report was made by Pandey *et al.* (2).

The data observed with the Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS were taller plants (208 cm), higher number of rows /cob (15.33), grains/row (29.2), test wt. (242g/ 1000 kernals) and grain yield (5048kg/ha), however, comparable with that of the hand weeding at 20 and 40 DAS (181 cm, 14.2, 27.1, 224 g and 4258 kg/ha, respectively) and Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS (196 cm, 15.3, 26.7, 219 and 4624 kg/ha). The Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS resulted in higher net returns and benefit cost ratio which is higher than Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS. The Hand weeding at 20, 40 and 60 Days after sowing recorded lower net returns and benefit cost ratio though it yielded comparable grain yield with Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS and Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./

ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS due to expensive hand weeding. Similar report of higher net returns and benefit cost ratio with chemical treatments were also reported by Kandasamy and Chandrasekar, 1998 (1) and Sinha *et al.*, 1999(3).

The study clearly indicates that the treatment received Paraquat spray immediately after dibbling maize seeds fb topramezone @ 25 g a.i./ha + atrazine @ 0.625 kg a.i./ha as POE at 20 DAS resulted in higher grain yield (5048 kg/ha), net returns (Rs 29098/-) and benefit cost ratio (1.75). as the paraquat

spray after sowing dries up the sprouting stubbles where as topramezone at 20 days after sowing kills all late emerged weeds in maize and the atrazine sprayed along with the topramezone will prevent the further emergence after the spray results in weed free situation from sowing to 40-45 days after sowing which encouraged the maize to grow well and resulted in higher grain yields. The low cost of the chemical treatment brings out as best economic alternative to the hand weeding which is laborious and expensive, as indicated by higher net returns and benefit cost ratio.

Table 1
Weed density, dry weight and weed control efficiency of zero till maize in rice fallow as influenced by weed management practices

Treatments	Density of weeds (no/m ²)		Weed dry weight (g/m ²)		Weed control efficiency at 60 DAS (%)	
	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS
T1-Weedy check	11.87 (141)	5.76 (36)	5.38 (33.73)	7.41 (62.5)	--	--
T2-Hand weeding at 20, 40 and 60 Days after sowing (DAS)	12.08 (148)	0.71 (0)	4.27 (18.5)	0.71 (0)	45	100
T3-Paraquat spray immediately after dibbling maize seeds.	7.73 (60)	5.97 (36)	2.78 (8.8)	5.05 (25.5)	74	60
T4-Paraquat directed spray on emerged weeds at 20 DAS	9.95 (117)	3.37 (14.7)	3.66 (13.6)	2.59 (6.5)	60	90
T5-Paraquat directed spray on emerged weeds at 40 DAS	10.01 (100)	6.55 (44)	3.86 (14.5)	5.25 (27.9)	57	56
T6-Paraquat directed spray on emerged weeds at 60 DAS	11.16 (128)	7.82 (66.7)	4.88 (23.9)	5.80 (33.9)	29	46
T7-Paraquat @ 5ml /lt immediately after dibbling maize seeds fb Paraquat directed spray at 40 DAS	9.98 (105)	6.83 (50.7)	2.22 (4.7)	3.79 (14)	86	78
T8-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 60 DAS	10.50 (111)	10.22 (116)	3.87 (15.7)	5.78 (34.2)	53	46
T9-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS	7.81 (61)	6.25 (38.7)	3.60 (14)	4.12 (17.2)	58	73
T10-Atrazine @ 1.0 kg a.i./ha as PE	6.68 (71)	6.23 (40)	3.07 (13.4)	3.05 (9.5)	60	85
T11-Topramezone @ 25 g a.i./ha as POE at 20 DAS	8.06 (65)	3.22 (14.7)	3.23 (10.3)	4.33 (18.8)	70	70
T12- Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS	4.90 (59)	0.71 (0)	2.70 (6.9)	3.43 (11.3)	80	82
SEm±	1.88	1.12	0.81	0.71	-	-
CD (p=0.05)	NS	3.29	NS	2.09	-	-
CV (%)	35.3	36.6	39.1	28.8	-	-

Table 2
Growth, yield and economics of zero till maize in rice fallows as influenced by weed management practices

Treatments	Plant height (cm)	Cob length (cm)	Rows / cob	Grains / row	Test weight (g)	Grain yield (kg/ha)	Net returns (Rs/ha)	Benefit cost ratio
T1-Weedy check	175	13.8	12.60	18.9	192	1407	-14,555	0.57
T2-Hand weeding at 20, 40 and 60 Days after sowing DAS	181	15.5	14.20	27.1	224	4258	533	1.01
T3-Paraquat spray immediately after dibbling maize seeds.	196	16.5	14.23	26.9	221	3294	8819	1.24
T4-Paraquat directed spray on emerged weeds at 20 DAS	184	16.0	14.17	26.1	238	1696	-12,004	0.65
T5-Paraquat directed spray on emerged weeds at 40 DAS	181	15.0	14.13	24.8	204	1426	-15,499	0.55
T6-Paraquat directed spray on emerged weeds at 60 DAS	172	14.5	14.07	24.5	220	3372	9772	1.27
T7-Paraquat @ 5ml /lt immediately after dibbling maize seeds fb Paraquat directed spray at 40 DAS	192	16.4	14.27	28.1	213	3487	10,075	1.27
T8-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 60 DAS	179	16.3	14.27	24.9	214	3179	6067	1.17
T9-Paraquat spray immediately after dibbling maize seeds fb Paraquat directed spray at 40 and 60 DAS	196	15.7	15.13	26.7	219	4624	23,674	1.61
T10-Atrazine @ 1.0 kg a.i./ha as PE	186	13.5	13.80	19.4	209	1696	-11,354	0.67
T11-Topramezone @ 25 g a.i./ha as POE at 20 DAS	190	15.8	14.17	23.5	224	3064	4314	1.12
T12- Paraquat spray immediately after dibbling maize seeds fb Topramezone @ 25 g a.i./ha + Atrazine @ 0.625 kg a.i./ha as POE at 20 DAS	208	16.2	15.33	29.2	242	5048	29,098	1.75
SEm±	9.3	0.5	0.15	1.5	8	439	-	-
CD (p=0.05)	NS	1.4	0.43	4.6	24	1288	-	-
CV (%)	8.7	5.2	1.80	10.8	6.4	25	-	-

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