Short communication

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Weed management with new generation herbicides in maize

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Maize is one of the important rainy season crop of Telangana, which has brought about a perceptible change in the economy of the farmers. Being rainy season crop, it suffers from severe infestation of weeds, which often inflicts huge losses ranging from 28 to 100 % (Patel *et al*. 2006). Few herbicides like atrazine, oxyfluorfen, 2,4-D and pendimethalin are available for weed control in maize. At present farmers are applying only 2,4-D at 1.0 kg/ha or atrazine at 1.0 kg/ha as post-emergence herbicides in maize, but these herbicides control only broad leaf weeds. Control of grasses and sedges remain a problem for the farmers, especially when the too high or too low soil moisture hinders the intercultural operation and scarcity of labour during critical stages of weeding. Hence, present study was undertaken to evaluate the tank mix efficacy of new herbicides topramezone and tembotrione with atrazine.

A field experiment was conducted during *Kharif*, 2014 at College Farm, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad. The soil of the experimental site was sandy loam in texture low in available N medium in available P and K. The experiment was laid out in randomized block design with ten treatments replicated thrice. The recommended dose of fertilizer was 180-60-60 kg of N, P_2o_5 and K_2o. Maize hybrid '*DHM-117*' was sown with a spacing of 60 x 20 cm. Observations on weed density and weed drymatter were recorded by using quadrate of 0.5 x 0.5 m^2.

The experimental field was infested with *Cynodon dactylon*, *Digitaria sanguinalis*, *Dactyloctenium aegyptium*, *Echinocloa* spp and *Rottboellia exaltata* among grasses; *Parthenium hysterophorus*, *Commelina benghalensis*, *Amaranthus viridis*, *Euphorbia geniculata*, *Digera arvensis* and *Trianthema portulacastrum* among the broad-leaved weeds and sedge *Cyperus rotundus*.

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Weed control through various means significantly reduced the weed density over weedy check at 20 DAS. (Table 1). Topramezone + atrazine at 25.2 + 250 g/ha + MSO as (post-emergence) recorded lower density of grasses (4.50/m^2) which was at par with tembotrione + atrazine at 105 + 250 g/ ha + stefes mero adjuvant as post-emergence (6.0/ m^2). Lower density of sedges (19.72/m^2) was recorded in intercropping with cowpea and application of pendimethalin at 1.0 kg/ha as pre-emergence, which was at par with topramezone + atrazine at 25.2 + 250 g/ha + MSO as post-emergence (23.5/m^2). Topramezone + atrazine at 25.2 + 250 g/ha + MSO as post-emergence recorded lower density (3.56 /m^2) of broad-leaved weeds (BLW), which was at par with tembotrione + atrazine 105 + 250 g/ha + stefes mero as post-emergence (4.38/m^2) and atrazine as pre-emergence at 1.0 kg/ha followed by intercultivation at 30 DAS (5.30 /m^2) and all these were significantly superior to other treatments. Total number of weeds was significantly lower with topramezone + atrazine at 25.2 + 250 g/ha + MSO as post-emergence (31.56/m^2) and at par with tembotrione + atrazine at 105 + 250 g/ha + stefes mero (36.03/m^2), intercropping with cowpea and application of pendimethalin at 1.0 kg/ha as pre-emergence (37.38 /m^2) and atrazine as pre-emergence followed by intercultivation at 30 DAS (41.37/m^2).

Topramezone + atrazine at 25.2 + 250 g/ha + MSO as post-emergence recorded significantly lower weed dry matter (16.73 g/m^2) which was at par with tembotrione + atrazine at 105 + 250 g/ha + stefes mero as post-emergence (18.23 g/m^2), intercropping with cowpea and pendimethalin at 1.0 kg/ha as pre-emergence (18.93 g/m^2) and atrazine at 1.0 kg/ha as pre-emergence followed by IC at 30 DAS (20.34 g/ m^2). These results are in accordance with Bollman *et al.* (2008) and Roy *et al.* (2008).

Maximum grain yield (6.58 t/ha was recorded) in hand weeding at 20 and 40 DAS which was 60.5% over the unweeded control and on par with

Table 1. Effect of different weed control treatments on weed density (no./m^2) and dry matter production (g/m^2) of weeds

Treatment	Weed density (20 DAS)				Weed dry weight (20 DAS)
	Grasses	Sedges	BLW	Total	
Atrazine (1.0 kg/ha) as PE *fb* inter- cultivation at 30 DAS	(9.6) 3.25	(26.4) 5.23	(5.3) 2.50	(41.4) 6.51	(20.3) 4.61
Topramezone (25.2 g/ ha) + MSO (adjuvant) as PoE	(13.7) 3.83	(28.6) 5.44	(7.6) 2.93	(49.9) 7.13	(27.1) 5.31
Tembotrione (105 g /ha) + adjuvant as PoE	(12.7) 3.70	(29.5) 5.52	(8.9) 3.15	(51.1) 7.22	(28.3) 5.41
Topramezone + atrazine (25.2 +250 g/ ha) + adjuvant as PoE	(4.5) 2.34	(23.5) 4.94	(3.6) 2.13	(31.6) 5.71	(16.7) 4.21
Tembotrione + atrazine (105+250 g /ha) + adjuvant as PoE.	(6.0) 2.64	(25.6) 5.16	(4.4) 2.31	(36.0) 6.08	(18.2) 4.38
Tembotrione (105 g/ha) as PoE	(13.2) 3.76	(34.0) 5.91	(9.3) 3.21	(56.5) 7.58	(30.6) 5.61
Intercropping of maize with cowpea and PE application of pendimethalin (1.0 kg/ha).	(10.8) 3.43	(19.7) 4.55	(6.8) 2.79	(37.4) 6.19	(18.9) 4.46
Hand weeding at 20 and 40 DAS.	(46.3) 6.87	(37.3) 6.18	(54.7) 7.46	(138.3) 11.80	(73.3) 8.62
Intercultivation at 20 and 40 DAS	(47.9) 6.99	(36.5) 6.12	(56.6) 7.58	(141.0) 11.91	(74.6) 8.69
Unweeded control	(53.2) 7.35	(38.6) 6.29	(57.7) 7.66	(149.4) 12.26	(79.3) 8.96
LSD (P=0.05)	0.52	0.54	0.65	0.84	0.4

Table 2. Effect of different weed control treatments on grain yield, stover yield and economics of maize

Treatment	Grain yield (t/ha)	Stover yield (t/ha)	Net returns (x10^3 `/ha)	B:C ratio
Atrazine (1.0 kg/ha) as PE *fb* inter- cultivation at 30 DAS	5.72	7.02	55.34	3.11
Topramezone (25.2 g/ ha) + MSO (adjuvant) as PoE	4.99	6.84	43.13	2.50
Tembotrione (105 g /ha) + adjuvant as PoE	4.83	6.74	40.97	2.43
Topramezone + atrazine (25.2 + 250 g/ ha) + adjuvant as PoE	6.44	7.60	62.61	3.17
Tembotrione + atrazine (105+250 g /ha) + adjuvant as PoE	6.28	7.50	60.18	3.10
Tembotrione (105 g/ha) as PoE	4.53	6.58	37.03	2.30
Intercropping of maize with cowpea and PE application of pendimethalin (1.0 kg/ha)	(4.71) (MEY)	6.37	41.17	2.55
Hand weeding at 20 and 40 DAS	6.58	8.04	59.37	2.72
Intercultivation at 20 and 40 DAS	5.49	7.00	52.35	3.01
Unweeded control	2.59	5.36	14.73	1.60
LSD (P=0.05)	0.36	0.43	4.77	

PoE - post-emergence PE - pre-emergence

topramezone + atrazine at 25.2 + 250 g/ha + MSO as PoE (6.44 t/ha) with 59.6% increase over the unweeded control and tembotrione + atrazine at 105 + 250 g/ha + stefes mero as PoE (6.28 t/ha) with 58.7% increase over the control (Table 2). These findings were substantiating with the results of Hatti *et al.* (2014).

Higher benefit: cost ratio was recorded in tank mix of topramezone + atrazine at 25.2 + 250 g/ha + MSO as PoE (3.17) followed by atrazine as PE followed by intercultivation at 30 DAS (3.11).

Tank mix application of topramezone (25.2 g/ ha) or tembotrione (105 g/ha) with lower doses of atrazine at 250 g/ha along with adjuvants is effective in controlling the weeds and recording higher yield in *Kharif* maize.

SUMMARY

Topramezone + atrazine at 25.2 + 250 g/ha + methylated seed oil MSO (adjuvant) or tembotrione + atrazine at 105 + 250 g/ha + stefes mero (adjuvant) as post-emergence, atrazine at 1.0 kg/ha followed by intercultivation at 30 DAS and intercropping of maize with cowpea and pendimethalin at 1.0 kg/ha as pre-emergence reduced the weed density and weed biomass significantly at 20 DAS.

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