

## EFFECT OF WEED MANAGEMENT PRACTICES ON WEED GROWTH AND YIELD OF MAIZE

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**Abstract:** A field experiment was carried out at F4 block during *kharif* season of 2013-14 at Agricultural Research Station, Hagari, UAS, Raichur to study the “Effect of weed management practices on weed growth and yield of maize”. Significantly lower density and dry weight of weeds per m<sup>2</sup> was recorded with Atrazine (50%) @ 1.25 kg or lit/ha Pendimethalin (50%) @ 2.5 lit/ha (2.84) compared to other chemical weed management treatments. However, which were on par with weed free check (0.7) and significantly lower weed dry weight per m<sup>2</sup> was recorded in Pendimethalin EC @ 5 lit/ha (39.9 g) compared to rest of the chemical treatments. Lowest weed index was recorded with pre-emergent application of Atrazine (50%) @ 1.25 kg or lit + Pendimethalin (50%) @ 2.5 lit/ha (1.59 %) over weedy check (7.36%). Pre-emergent application of Atrazine @ 1 kg *a.i.*/ha recorded significantly higher 100 seed weight (33.8 g) and grain yield (7079 kg/ha) over rest of the weed control treatments. Weed free check recorded higher net returns (Rs.73470 /ha) and B:C ratio (4.53) over other treatments and it was on par with the chemical treatment Atrazine (50%) 1.25 kg or lit + Pendimethalin (50%) 2.5 lit/ha.

**Keywords:** Weed density, Weed index, 100 seed weight and Economics.

### INTRODUCTION

Maize is one of the most important cereal crops in the world agricultural economy both as food for man and feed for animals. It is a miracle crop. It has very high yield potential, there is no cereal on the earth which has so immense potentiality and that is why it is called ‘**King of cereals**’. Maize ranks third in the cereals world production after rice and wheat, but in productivity it surpasses all cereals. In India, it is grown over an area of 9.43 m ha with total production of 24.35 m tones (Anon., 2015). It is well known that maize is a heavy feeder for both nutrients and soil moisture due to its high productivity. 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 to 100 per cent (Patel *et al.*, 2006). There are very few herbicide options available for weed control in maize in India. Currently, herbicides used for control of weeds include pre-emergence application of

atrazine, simazine, pendimethalin, alachlor and post-emergent application of 2,4-D. Most of these herbicides provide only a narrow spectrum weed control in maize (Patel *et al.*, 2006). The low yield of maize under Indian conditions may be attributed by number of factors, among them weeds rank as prime enemy. Lal and Saini (1985) gave an estimate on crop weed competition and suggested that the reduction of 40 % in yield can occur due to weed infestation. In the near future, agricultural labour will become scarce and expensive, as the drift from the village to cities unlikely to be reversed. Therefore, it is necessary to develop cheaper method of weed control with either herbicides or their combinations with mechanical methods.

## MATERIALS AND METHODS

Field experiment was conducted during *kharif* season of 2013-14 at Agricultural Research Station, Hagari, UAS, Raichur. The soil of the experimental plot was clayey in texture, low in available nitrogen (11.2 kg/ha), low in available phosphorus (12.88 kg/ha) and high in available potassium (443.50 kg/ha) and slightly alkaline in reaction (pH 7.95). The experiment was laid out in Randomized Block Design with three replications. There were 12 treatments (chemical, mechanical, cultural and their combination weed management practices) *Viz.* T<sub>1</sub> -Atrazine 50 EC -2.5 kg or lit/ha, T<sub>2</sub>-Pendimethalin EC -5 lit/ha., T<sub>3</sub>-Atrazine (50%) 1.25 kg or lit + Pendimethalin (50%) 2.5 lit/ha, T<sub>4</sub>-Atrazine 50 EC 2.5 lit/ha – 2,4 D SODIUM SALT 80 WP- 2.5 kg/ha, T<sub>5</sub>-Atrazine 580 EC -2.5 lit/ha – Metasulfuron methyl 20 EC-0.02 kg/ha., T<sub>6</sub>-Atrazine 50EC -2.5 lit/ha- one hand weeding, T<sub>7</sub>-Pendimethalin 30 EC -5 lit/ha - 2,4-D sodium salt 80 WP-2.5 kg/ha., T<sub>8</sub>-Pendimethalin 30 EC -5 lit/ha - Metasulfuron methyl 20 EC-0.02 kg/ha, T<sub>9</sub>-Pendimethalin 30 EC -5 lit/ha- one hand weeding, T<sub>10</sub>-Hand weeding two time, T<sub>11</sub>-Wed Free Check, T<sub>12</sub>-Weedy check. The recommended dose of fertilizer and spacing for maize was 150:75:37.5 NPK kg/ha and 60 cm x 30 cm respectively maintained for all the treatments. Full dose of phosphorus, potassium and half dose of the nitrogen through diammonium phosphate, muriate of potash and urea were applied at the time of sowing and remaining quantity of nitrogen was applied at knee-height stage (as per the recommended package of practices). The herbicides were applied as pre-emergence on next day after sowing using Knapsack sprayer fitted with flat fan nozzle by mixing 500 litres of water per ha. Soil samples were collected before sowing and continued with an interval of 20 days till harvest for estimating dehydrogenase activity. Observations on weed density, weed dry weight, plant height, grain weight per cob, 100 seed weight and grain

yield were recorded, weed control efficiency, weed index and economics with respect to different treatments were calculated.

## RESULTS AND DISCUSSION

In general, the density and dry weight of weeds were significantly reduced with the application of herbicides compared to weedy check. The results revealed that, significantly lower density and dry weight of weeds per m<sup>2</sup> was recorded with Atrazine (50%) @ 1.25 kg lit or Pendimethalin (50%) @ 2.5 lit/ha (2.84) as compared (Table -1) to other chemical weed management treatments. However, which were on par with weed free check (0.7) and significantly lower weed dry weight per m<sup>2</sup> was recorded in Pendimethalin EC @ 5 lit/ha (39.9 g) compared to rest of the chemical treatments. The better performance of these herbicides might be due to longer persistence effect. Whereas under hand weeding, it 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 (Patel *et al.*, 2006). Similar trend also reported by Nedim *et al.* (2004). Application of Atrazine (50%) @ 1.25 kg or lit + Pendimethalin (50%) @ 2.5 lit/ha was found effective compared to other herbicides. Similar results were also obtained by Thind *et al.* (1984), Shah and Koul (1990). The application of Atrazine 0.5-1.25 kg/ha had significantly reduced the populations and dry weight of weeds (Anon., 2010). At harvest highest weed control efficiency was found with application of Atrazine (50%) @ 1.25 kg or lit + Pendimethalin (50%) @ 2.5 lit/ha (7.33) and which was on par rest of the chemical treatments except Atrazine 50EC -2.5 lit/ha – Metasulfuron Methyl 20 EC-0.02 kg/ha, Pendimethalin 30 EC -5lit/ha- one hand weeding and hand weeding in two times respectively. Kolage *et.al.* (2004) found that the maximum weed control efficiency was observed in weed free check followed by application of atrazine @1 kg/ha and PE application of Atrazine 0.5 kg/ha fb. One hand weeding. Lowest weed index was recorded with Atrazine (50%) @ 1.25 kg or lit + Pendimethalin (50%) @ 2.5 lit/ha (1.59). However, it was highest in weedy check (7.36%). In case of weedmanagement treatments, lowest weed index (0.70 %) was recorded by weed free check treatment followed by preemergence Atrazine (50%) @ 1.25 kg or lit + Pendimethalin (50%) @ 2.5 lit/ha (1.59). However, highest weed index was noticed in of weedy check treatment (7.36%). Similar results were reported by Nedim *et al.* (2004) in maize.

The economic yield is a function of dry matter production, efficiency to translocate photosynthates from assimilatory area of the sink and accumulate in different plant parts and ultimately on yield attributing traits. Pre-emergent application of Atrazine @ 1 kg *a.i./ha*

recorded significantly higher grain yield (7079 kg/ha) (Table -2) over rest of the weed control treatments and was on par with weed free check. The higher yield with these practices was due to improvement in yield attributing characters like 100 seed weight and seed weight per cob. Significantly 100 seed weight (33.8 g) and seed weight per cob (112.8 g) recorded in this treatment might be due to better performance of plants with respect to growth parameters like plant height and number of leaves. The higher growth parameters in this treatment mainly due to less number of weeds/m<sup>2</sup>, weed dry weight and weed index compared other weed management practices. It clearly indicated that there was less competition for nutrient, moisture and light in this treatment as compared other treatments. Similar results were also obtained by Thind *et al.* (1984), Shah and Koul (1990). Mundra *et.al.* (2003) found that the PE application of atrazine @ 0.5 kg/ha+ intercultivation at 35 DAS tended to increase mean grain yield by 92.84 per cent over weedy check. The higher net returns and B: C ratio (Table - 2) was recorded in weed free check over all treatments. However, it was on par with the chemical treatment Atrazine (50%) 1.25 kg or lit + Pendimethalin (50%) 2.5 lit/ha. Higher net returns in these treatments due to higher grain yield and lower cost of cultivation.

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**Table 1: Total number of weeds, Weed dry weight (gm.), Weed control efficiency (%) and Weed Index (%) as influenced by various treatments**

Treatments	No. of weeds/m <sup>2</sup>			Weed Dry wt. (gm)	WCE (%)	WI (%)
	Broad leaved wt.	Grasses	Total			
T1 = Atrazine 50 EC -2.5 kg or lit/ha	4.67 (2.25)	5.00 (2.34)	9.67 (3.17)	57.2 (7.58)	41.31 (6.45)	38.1 (6.04)
T2 =Pendimethalin EC -5 lit/ha	3.67 (2.02)	4.33 (2.18)	8.00 (2.91)	39.9 (6.30)	50.57 (7.14)	40.1 (6.21)
T 3 = Atrazine(50%) 1.25 kg or lit + Pendimethalin (50%) 2.5 lit/ha	3.33 (1.95)	4.33 (2.18)	7.67 (2.84)	55.8 (7.45)	53.13 (7.33)	2.40 (1.59)
T 4 = Atrazine 50EC 2.5 lit/ha – 2,4 D SODIUM SALT 80WP- 2.5 kg/ha	3.33 (1.93)	7.00 (2.73)	10.33 (3.29)	41.3 (6.41)	36.89 (6.11)	21.0 (4.56)
T 5 = Atrazine 50EC -2.5 lit/ha – Metasulfuron methyl 20EC-0.02 kg/ha	4.00 (2.09)	8.33 (2.97)	12.33 (3.57)	43.6 (6.64)	24.36 (4.98)	75.9 (8.73)
T 6 = Atrazine 50EC -2.5 lit/ha- ONE Hand weeding	4.00 (1.92)	5.00 (2.34)	9.00 (3.06)	37.9 (6.19)	43.59 (6.54)	48.7 (6.97)
T 7 = Pendimethalin30EC -5 lit/ha-2,4 D SODIUM SALT 80WP-2.5kg/ha	3.67 (2.02)	4.33 (2.16)	8.00 (2.86)	47.7 (6.87)	48.43 (6.80)	25.4 (5.03)
T 8 = Pendimethalin 30EC-5lit/ha-Metasulfuron methyl 20EC-0.02 kg/ha	7.00 (2.73)	4.33 (2.20)	11.33 (3.43)	62.5 (7.87)	29.91 (5.48)	52.8 (7.26)
T 9 = Pendimethalin 30EC -5lit/ha- ONE Hand weeding	5.00 (2.34)	4.67 (2.24)	9.67 (3.16)	57.1 (7.55)	40.60 (6.34)	26.2 (5.05)
T10 =Hand weeding two time	7.67 (2.85)	6.33 (2.60)	14.0 (3.80)	66.4 (8.18)	12.96 (2.44)	36.1 (6.02)
T11= Wed Free Check	0.00 (0.70)	0.00 (0.70)	0.00 (0.70)	0.00 (0.70)	100.0 (10.0)	0.00 (0.70)
T12= Weedy check	7.33 (2.78)	9.00 (3.04)	16.3 (4.09)	101.3 (10.0)	0.00 (0.70)	53.9 (7.36)
<b>S. Em +/-</b>	<b>1.10</b> <b>(0.93)</b>	<b>0.84</b> <b>(0.81)</b>	<b>1.18</b> <b>(0.11)</b>	<b>(18.3)</b>	<b>6.64</b> <b>(2.68)</b>	<b>6.03</b> <b>(2.41)</b>
<b>CD @ 5%</b>	<b>3.25</b> <b>(0.73)</b>	<b>2.49</b> <b>(0.53)</b>	<b>3.46</b> <b>(0.56)</b>	<b>24.8</b> <b>(1.54)</b>	<b>19.58</b> <b>(1.46)</b>	<b>17.7</b> <b>(1.53)</b>

The figures in the parentheses are  $\sqrt{1+x}$  Transformation value

**Table 2: Yield and economics of maize as influenced by various treatments**

Treatments	Plant height (cm)	Seed wt./ Cob (gm.)	100 seed wt. (gm.)	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
T1 = Atrazine 50 EC -2.5 kg or lit/ha	130.4	97.0	26.5	4475	19520	58179	38659	2.98
T2 =Pendimethalin EC -5 lit/ha	132.5	101.4	31.5	4340	20270	56424	36154	2.78
T 3 = Atrazine(50%) 1.25 kg or lit + Pendimethalin (50%) 2.5 lit/ha	168.3	112.8	33.8	7079	19895	92033	72138	4.63
T 4 = Atrazine 50EC 2.5 lit/ha – 2,4 D SODIUM SALT 80WP- 2.5 kg/ha	152.0	105.7	32.3	5710	20020	74228	54208	3.71
T 5 = Atrazine 50EC -2.5 lit/ha – Metasulfuron methyl 20EC-0.02 kg/ha	58.2	30.8	28.9	2748	19770	35720	15950	1.81
T 6 = Atrazine 50EC -2.5 lit/ha- ONE Hand weeding	140.7	55.4	29.0	3684	20320	47897	27577	2.36
T 7 = Pendimethalin30EC -5 lit/ha-2,4 D SODIUM SALT 80WP-2.5kg/ha	146.8	101.0	28.0	5382	20770	69965	49195	3.37
T 8 = Pendimethalin 30EC-5lit/ha- Metasulfuron methyl 20EC-0.02 kg/ha	111.4	80.9	25.7	3380	20520	43935	23415	2.14
T 9 = Pendimethalin 30EC -5lit/ha- ONE Hand weeding	127.9	109.8	29.4	5307	21070	68987	47917	3.27
T10 =Hand weeding two time	151.8	108.2	28.7	4610	20420	59934	39514	2.94
T11= Wed Free Check	159.7	118.0	34.0	7253	20820	94290	73470	4.53
T12= Weedy check	135.3	92.2	24.9	3333	18820	43333	24513	2.30
<b>S. Em. +/-</b>	<b>10.2</b>	<b>9.66</b>	<b>1.80</b>	<b>439</b>	<b>-</b>	<b>5710</b>	<b>5710</b>	<b>0.28</b>
<b>CD @ 5%</b>	<b>29.9</b>	<b>28.3</b>	<b>5.27</b>	<b>1288</b>	<b>-</b>	<b>16747</b>	<b>16747</b>	<b>0.83</b>