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Effect of weed flora on *kharif* maize (*Zea mays* L.) under different weed management practices

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Abstract
A field experiment entitled, "Integrated weed management in *kharif* maize (*Zea mays* L.)" was conducted during *kharif*, 2020 at Post Graduate Research Farm, RCSM College of Agriculture, Kolhapur. The experiment was laid out in RBD design with three replications and twelve treatments. weed free check and tank mix application of Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE At 20-25 DAS + fb hand weeding at 40 DAS were on par with each other and recorded lowest weed intensity, weed index, weed dry matter and highest weed control efficiency. Therefore, these integrated weed management practices could become effective and economical under sub mountain agro-climatic conditions of Maharashtra.

Keywords: Maize, hand weeding, Tembotrione, weed intensity, weed index, weed control efficiency, surfactant

Introduction
Maize belongs to the family of poaceae. Globally maize is dominating cereal crops. Maize is an important food crop for human consumption. It is used as animal fodder and raw material industrial products. The products include corn starch, maltodextrin, corn oil, corn syrup, and products of fermentation and distallaries. It is also being recently used in the production of biofuel. Maize is grown successfully in variety of soils ranging from loamy sand to clay loam. Soils rich in organic matter content improves high water holding capacity thereby maintaining neutral pH are considered for higher productivity. Being a sensitive crop to moisture stresses; it is desirable to avoid low lying fields having poor drainage and also the field having higher salinity. Maize plant has a mono solid stem and large narrow leaves, arranged alternatively an opposite sides of the stem, staminate inflorescence, tassel is terminating the main axis of stem, The pistilate inflorescence, ear, is produced as side shoot enclosed by modified leaves called husks. Maize is a versatile crop grown over a range of agro- climatic zones. In fact the suitability of maize to diverse environments is unmatched by any other crop. It is grown from 58 degree N to 40 degree S, from below sea level to altitudes higher than 3000 m, and in areas with 250 mm to more than 5000 mm rainfall per year and with a growing cycle ranging from 3 to 13 months (CIMMYT, 2000). However, the major maize production areas are located in temperate regions of global production. India has 5% of corn acerage and contributes 2% of world production (faostat.fao.org, 2008).

Materials and Methods
The experiment was laid out in a randomized block design with twelve treatments. Each experimental unit was replicated thrice with the gross and net plot size of 5.0 x 4.5 m2 and 3.8 x 3.0 m2, respectively. The soil of the experimental plot was medium black clay (vertisol) with 90 cm depth, low in available N (250 kg ha-1), high in available P_2O_5 (30.60 kg ha-1) and medium in available K_2O (290.67 kg ha-1). The status of organic carbon content (0.34%) was low. The electrical conductivity and pH values were 0.30 dSm^{-1} and 7.10, respectively. The treatment consisted of T_1: Atrazine 50 WP @ 1000 gm a.i.ha-1 PE at 3-5 DAS, T_2: Tembotrione 33.6 SC @ 25.2 gm a.i.ha-1 + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3: Tembotrione 42 SC @ 120 gm a.i.ha-1 + surfactant @ 2ml/l of water EPoE at 20-25 DAS, T_4: T1+ fb HW at 40 DAS, T_5: T_2 + fb HW at 40 DAS, T_6: T_3+ fb HW at 40 DAS, T_7: Tembotrione 33.6 SC @ 25.2 gm a.i.ha-1 + Atrazine 50 WP @ 500 gm a.i.ha-1+ S(MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_8: Tembotrione 42 SC @ 120 gm a.i.ha-1 + Atrazine 50 WP @ 500 gm a.i.ha-1 + Surfactant @ 2ml/l of water EPoE at 20-25DAS, T_9: T_7+fb HW at 40 DAS, T_{10}: T_8+ fb HW at 40 DAS, T_{11}: Weed free check up to 60 DAS, T_{12}: Weedy check.

Result and Discussion

1) Weed intensity

The average data on intensity of weed per meter square at 20, 40, 60 DAS and at harvest as affected by various weed control treatments are showed in Table 4.10 and Fig. 4.10. The average intensity of weed was 56.54, 26.60, 24.53 and 27.78 m^{-2} at 20, 40, 60 DAS and at harvest, respectively. The weed management practices affected significantly on intensity of weed in field trial plot. At 20 DAS less intensity of weed was recorded in T_1 treatment i.e.14.49 m^{-2} followed by T_4 treatment i.e. 14.83 m^{-2}. At 40 DAS less number of weeds were recorded in weed free check treatment (T_{11}) i.e.10.40 m^{-2} followed by T_8, T_{10}, T_7 and T_9 treatments. T_8, T_{10}, T_7 and T_9 treatments were statistically equal with each other. However, significantly more number of weeds was observed in (T_{12}) treatment i.e. 89.70 m^{-2}.

At 60 DAS less weed intensity was recorded in (T_{11}) treatment i.e.3.23 m^{-2} followed by treatments T_{10}, T_9 and T_6. But highest weed intensity was showed in (T_{12}) treatment i.e. 102.57 m^{-2}. At harvest significantly less weed intensity was observed in (T_{11}) treatment i.e.4.53 m^{-2} which was statistically equal with T_{10} and T_9 treatments. However, maximum intensity of weed was recorded in (T_{12}) treatment i.e. 107.47 m^{-2}. These results were also reported by Kolage *et al*. (2004).

Table 1: Average weed intensity (m^{-2}) in maize as affected by various weed control treatments

Treatments	20 DAS	40 DAS	60 DAS	At harvest
T_1	14.49	30.45	47.61	50.47
T_2	67.60	24.63	36.30	40.37
T_3	62.63	22.47	35.37	39.63
T_4	14.83	30.78	6.63	9.89
T_5	63.40	25.07	6.47	9.37
T_6	69.47	23.70	5.57	8.78
T_7	61.60	16.67	22.43	25.46
T_8	62.57	13.63	20.47	24.43
T_9	64.50	17.10	4.63	6.73
T_{10}	63.50	14.63	4.03	6.27
T_{11}	65.35	10.40	2.37	4.53
T_{12}	68.61	89.70	102.57	107.47
F test	Sig	Sig	Sig	Sig
S.Em ±	2.17	0.95	0.89	0.97
C.D.at 5%	6.38	2.81	2.62	2.87
General mean	56.54	26.60	24.53	27.78

T_1: PE application of Atrazine 50% WP@ 1000 a.i.ha^{-1} PE at 3-5 DAS, T_2: Tembotrione 33.6 SC @ 25.2 gm a.i.ha^{-1} + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3: Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE at 20-25 DAS, T_4: T_1+ HW at 40 DAS, T_5: T_2 + fb HW at 40 DAS, T_6: T_3 + fb HW at 40 DAS, T_7: Tembotrione 33.6 SC @ 25.2 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1}+ surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_8: Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE at 20-25DAS, T_9: T_7 + fb HW at 40 DAS, T_{10}: T_8 + fb HW at 40 DAS, T_{11}: weed free check, T_{12}: Weedy check.

Table 2: Effect of integrated weed management on weed dynamics of maize

Treatments	Number of grassy weeds (m^{-2})	Number of broad leaved weeds (m^{-2})	Number of sedges (m^{-2})	Dry matter of weed (g)	Weed control efficiency (%)	Weed Index (%)
T_1	31.60	50.47	6.71	8.06	55.32	28.13
T_2	22.17	40.37	7.12	4.35	75.86	20.74
T_3	17.23	39.63	12.2	4.16	76.93	19.97
T_4	4.30	9.89	3.39	6.04	66.49	16.47
T_5	3.10	9.37	3.17	3.85	78.65	14.13
T_6	3.30	8.78	4.18	3.56	80.26	13.48
T_7	11.16	25.46	6.15	3.03	83.17	13.16
T_8	9.14	24.43	10.15	2.85	84.19	12.23
T_9	2.30	6.73	2.13	2.54	85.88	4.19
T_{10}	2.17	6.27	3.13	2.35	86.94	1.79
T_{11}	1.18	4.53	2.18	2.25	87.51	0.00
T_{12}	55.17	107.47	12.20	18.05	0.00	52.61
C.D.at 5%	-	2.87	-	0.56	-	-
General mean	25.04	27.78	11.18	5.09	78.29	17.90

T_1: PE application of Atrazine 50% WP@ 1000 a.i.ha^{-1} PE at 3-5 DAS, T_2: Tembotrione 33.6 SC @ 25.2 gm a.i.ha^{-1} + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3: Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE at 20-25 DAS, T_4: T_1+ HW at 40 DAS, T_5: T_2 + fb HW at 40 DAS, T_6: T_3 + fb HW at 40 DAS, T_7: Tembotrione 33.6 SC @ 25.2 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1}+ surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_8: Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE at 20-25DAS, T_9: T_7 + fb HW at 40 DAS, T_{10}: T_8 + fb HW at 40 DAS, T_{11}: weed free check, T_{12}: Weedy check

2) Dry matter of weeds

The average data on dry matter accumation of weeds recorded

at the time of hand weeding and at harvest are showed in Table 2. average dry matter of weeds at harvest was 50.95 g m^{-2}.

3) Weed control efficiency

The average data on weed control efficiency at harvest as affected by different weed control treatments are showed in Table 2. The average weed control efficiency was 78.29%.

At harvest maximum weed control efficiency was observed in (T_{11}) treatment i.e. 87.51% followed by treatments T_{10} and T_9. However, less weed control efficiency was observed in (T_1) i.e. 55.32%.

The weed control efficiency was worked out by using the following formula

$$\text{Weed Control Efficiency (WCE \%)} = \frac{\text{WPC-WPT}}{\text{WPC}} \times 100$$

Where

WPC - Weed population in control plot

WPT - Weed population in treated plot

4) Weed index

The average data on weed index at harvest as affected by different weed management treatments are showed in Table 2. The average weed index at harvest was 17.9%. At harvest the maximum weed index was observed in T_{12} treatment (52.61%) followed by T_1, T_2 and T_3 treatments. However, minimum weed index was recorded in T_{10} i.e. 1.79%. These results were also given by Arvadia *et al.* (2012).

The weed index was worked out by using the following formula:

$$\text{Weed Index (WI \%)} = \frac{X - Y}{X} \times 100$$

Where

X - Yield from weed free check

Y - Yield from the treatment for which weed index is to be worked out

Recommendation

It was concluded that effective control of weeds in *kharif* maize along with higher growth, quality and yield attributes could be achieved by the treatment (T_{11}) that is, weed free check treatment. tank mix application of Tembotrione 42 SC @ 120 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE At 20-25 DAS + fb hand weeding at 40 DAS were on par with each other and recorded lowest weed intensity, weed index, weed dry matter and highest weed control efficiency.

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