

Original Research Article

Studies on Effect of Different Herbicides on Weed Control, Yield and Economics of Maize

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ABSTRACT

An investigation was conducted to study the effect of different herbicides on weed control, yield and economics of maize in *kharif* season of 2015 at experimental farm, Department of Agronomy, College of Agriculture, Vasantrya Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment was laid out in randomized block design with three replications. The different weed control treatments included post emergence application of 2, 4-D 80% @ 1000g ai /ha., Atrazine 50% WP@ 1000g ai /ha., Metsulfuron methyl 20% WP @ 4 g ai /ha., Metsulfuron methyl 10% + Clorimuron ethyl 10% WP @ 4 g ai /ha., Carfentazone ethyl 40% DF @ 20g ai /ha., Imazethapyr 10% SL @100 g ai /ha., Propaquizafop 10% EC @500 g ai /ha. compared with Two hand weeding., Weed free and Weedy check. The results of the study indicated that post emergence application of 2,4-D 80% @ 1000g ai/ha and two hand weeding found profitable and effective in controlling in maize as compared to other treatments.

Keywords

Maize,
Herbicides,
Weed controls

Introduction

Maize (*Zea mays* L.) is known for its wider adaptability and multipurpose uses as food, feed, fodder and industrial products. Maize being slow growing and wide spaced crop prone to heavy infestation of weeds specially during *kharif* season owing to frequent showers. The losses in grain yields have been reported to the extent of 33 to 72 per cent by many workers. Paucity of labour is the main constraint for physical control of weeds. Besides, frequent rains may delay these operations which result heavy weed infestation and reduction in crop yield. Herbicides play an important role under such condition. It is necessary to develop economical method of weed control with either herbicides or their combinations with

mechanical methods. Considering the above facts present investigation was undertaken to study the performance of different herbicides in maize.

Materials and Methods

A field experiment was conducted at experimental farm of Agronomy department, College of Agriculture, Parbhani during *kharif* season of 2015. The experiment was laid out in randomized block design with three replications. The treatments consisted of T₁: PoE-2, 4-D 80% @ 1000g ai /ha., T₂: PoE-Atrazine 50% WP@ 1000g ai /ha., T₃: PoE-Metsulfuron methyl 20% WP @ 4 g ai /ha., T₄: PoE-

Metsulfuron methyl 10% + Clorimuron ethyl 10% WP @ 4 g ai /ha., T₅: PoE-Carfentazone ethyl 40% DF @ 20g ai /ha., T₆: PoE-Imazethapyr 10% SL @100 g ai /ha., T₇: PoE-Propaquizafop 10% EC @500 g ai /ha., T₈: Two hand weeding., T₉: Weed free., and T₁₀: Weedy check. The soil of the experimental plot was clayey in texture (55.00), medium in available nitrogen (315.4 kg/ha), low in available phosphorus (11.7 kg/ha), rich in available potassium (429.6 kg/ha) and the soil pH was 8.06

The crop variety Pinnacle was used with gross plot size of 5.4m X 4.8m and net plot size of 4.8m X 3.6m. Full dose of phosphorus, potassium and half dose of nitrogen were applied at sowing and remaining half dose of N was applied at 30 DAS. The recommended package of practices were followed for pest control. Observations on weed count were taken using quadrat of 1 m² size.

Results and Discussion

Effect of herbicides on weed control efficiency

Data pertaining to weed control efficiency (%) as influenced by different weed control treatments indicated that, at all stages, treatment weed free recorded highest weed control efficiency for monocot weeds and it was followed by two hand weeding and PoE-Atrazine 50% WP @ 1000 g ai /ha. As regards to weed control efficiency for dicot weeds, treatment two hand weeding and POE-2, 4-D 80% @ 1000 g ai /ha were comparable with weed free which recorded highest weed control efficiency at all stages of observation. Similar findings were reported by Arvadiya (2012), Ramesh and Nadanassababady (2005) also reported PoE-2, 4-D 80% @ 1000 g ai /ha was found to keep the weed density and dry weight of

weeds below the economic threshold in rainfed maize.

Effect of herbicides on weed index

The lowest weed index was recorded with treatment two hand weeding and it is followed by PoE-2, 4-D 80% @ 1000 g ai /ha and PoE-Atrazine 50% WP @ 1000 g ai /ha treatments. However, highest weed index was recorded in T₁₀ (weedy check) *i.e.* 61.88 %. The highest weed index in weedy check might be attributed to yield reduction due to more weed density as compared to weed free treatments.

Effect of herbicides on yield

The data indicated that grain yield and straw yield of maize was significantly affected by different herbicidal treatments. All the weed management practices significantly improved grain yield and straw yield over weedy check. The treatment T₉ (weed free) recorded highest grain yield over rest of treatments. However, it was found at par with two hand weeding, which was further at par with the application of POE-2,4-D 80% @ 1000 g ai/ha.

The lowest grain yield was recorded with treatment T₁₀ (weedy check). This may be due to higher degree of crop weed competition which affected the growth and yield of maize drastically. Fayaz *et al.*, (2009) reported 73.91 % reduction in grain yield of maize due to uncontrolled weed growth. The treatment POE-Metsulfuron methyl 20% WP @ 4 g ai /ha and POE-Propaquizafop 10% EC @ 500 g ai /ha. also recorded lower grain yield. This may be due to stunted growth of crop and higher weed density observed in these treatments. Ramesh *et.al* (2005) also observed stunted growth of maize due to PoE-Metsulfuron methyl 20% WP @ 4 g ai /ha.

Table.1 Weed control efficiency for monocot and dicot weeds and Weed index as influenced by different treatments

Treatment	WCE (%) for monocot weeds				WCE (%) for dicot weeds				WI
	30 DAS	45 DAS	60 DAS	At harvest	30 DAS	45 DAS	60 DAS	At harvest	
T ₁ : POE-2,4-D 80% @ 1000 g ai/ha.	33.33	28.93	25.71	23.90	59.44	45.21	39.99	42.00	24.29
T ₂ : POE-Atrazine 50% WP @ 1000 gm ai/ha.	36.00	38.17	26.68	26.09	43.22	28.77	28.23	28.40	25.09
T ₃ : POE Metsulfuron methyl 20% WP @ 4 g ai/ha.	36.93	31.58	19.05	19.56	36.73	20.55	23.54	22.22	40.54
T ₄ : POE Metsulfuron methyl 10% + Clorimuron ethyl 10% WP @ 4 g ai/ha.	33.33	15.79	6.68	10.86	24.33	15.08	17.64	17.29	47.24
T ₅ : POE-Carfentazone ethyl 40% DF @ 20 g ai/ha.	37.33	27.63	10.48	3.26	48.66	24.66	21.17	23.48	27.65
T ₆ : POE-Imazethapyr 10% SL @ 100 g ai/ha.	24.00	13.14	24.77	22.83	44.84	39.74	31.76	37.03	41.08
T ₇ : POE-Propaquizafop 10% EC @ 500 g ai/ha.	40.00	31.58	27.62	24.98	29.76	8.22	32.93	34.59	48.29
T ₈ : Two hand weeding	53.13	43.42	39.05	35.87	60.25	43.85	41.19	43.22	8.76
T ₉ : Weed free	67.80	56.57	63.82	67.38	66.74	57.54	55.31	58.03	-
T ₁₀ : Weedy check.	-	-	-	-	-	-	-	-	61.88
General mean	40.20	31.86	27.73	26.20	45.99	30.6	31.63	33.20	36.09

Table.2 Effect of different herbicides on yield attributes of maize

Treatments	Cob bearing plant ¹	No. of grain cob ⁻¹	Grain weight cob ⁻¹ (g)
T ₁ : POE-2,4-D 80% @ 1000 g ai/ha.	1.50	499.80	162.16
T ₂ : POE-Atrazine 50% WP @ 1000 g ai/ha.	1.53	499.73	160.33
T ₃ : POE-Metysulfuron methyl 20% WP @ 4 g ai/ha.	1.33	480.67	143.33
T ₄ : POE-Metsulfuron methyl 10% + Clorimuron ethyl 10% WP @ 4 g ai/ha.	1.40	496.46	151.66
T ₅ : POE- Carfentazone ethyl 40% DF @ 20 g ai/ha.	1.40	497.73	155.33
T ₆ : POE-Imazethapyr 10% SL @ 100 g ai/ha.	1.50	498.20	159.66
T ₇ : POE-Propaquizafop 10% EC @ 500 g ai/ha.	1.47	478.94	161.33
T ₈ : Two hand weeding	1.57	511.86	169.66
T ₉ : Weed free	1.63	516.86	175.33
T ₁₀ : Weedy check.	1.30	472.00	134.66
SE(m)	0.07	8.99	4.56
CD at 5%	NS	26.73	13.55
GM	1.46	495.18	157.35

Table.3 Grain yield, straw yield, gross and net monetary returns of maize as influenced by different treatments

Treatments	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	GMR (Rs.ha ⁻¹)	NMR (Rs.ha ⁻¹)	B:C ratio
T ₁ : POE-2,4-D 80% @ 1000 g ai/ha.	4032	8781	74020	39184	2.12
T ₂ : POE-Atrazine 50% WP @ 1000 g ai/ha.	3990	8604	73068	37832	2.07
T ₃ : POE-Metysulfuron methyl 20% WP @ 4 g ai/ha.	2810	7130	53602	18866	1.54
T ₄ : POE-Metsulfuron methyl 10% + Clorimuron ethyl 10% WP @ 4 g ai/ha.	3167	7816	59972	25236	1.72
T ₅ : POE- Carfentazone ethyl 40% DF @ 20 g ai/ha.	3853	8685	71316	36380	2.04
T ₆ : POE-Imazethapyr 10% SL @ 100 g ai/ha.	3138	7816	59567	23581	1.65
T ₇ : POE-Propaquizafop 10% EC @ 500 g ai/ha.	2754	7260	53078	10892	1.25
T ₈ : Two hand weeding	4859	9167	86370	43999	2.03
T ₉ : Weed free	5326	9264	93099	41470	1.80
T ₁₀ : Weedy check.	2029	6970	42361	9248	1.27
SE(m)	203	535	2007	2007	-
CD at 5%	605	1591	5964	5964	-
GM	3596	8149	66645	28669	1.75

Economic studies

Data on gross monetary return, net monetary return and B: C ratio as affected by various herbicidal treatments indicated that GMR (93099 ha⁻¹), and NMR (41470 ha⁻¹) were significantly higher under weed free. Among different herbicidal treatments highest GMR (74020 ha⁻¹), and NMR (39184 ha⁻¹) were recorded by the application of PoE-2,4-D 80% @ 1000 g ai/ha. Amongst herbicidal treatments highest benefit cost ratio (B: C) was obtained by the application of PoE-2,4-D 80% @ 1000 g ai/ha (2.12), followed by application of PoE-Atrazine 50% WP @ 1000 g ai/ha. (2.07) over rest of treatments. Treatment weedy check (T₁₀) recorded the lowest B: C ratio. Effective weed control with better grain yield resulted in higher gross monetary returns, net monetary returns and Benefit: Cost ratio, in treatments two hand weeding, treatment application of PoE-2,4-D 80% @ 1000 g ai/ha and application of PoE-Atrazine 50% WP. The results are in line with those reported by Mathukia *et al.*, (2014) Kamble *et al.*, (2005) reported that treatment weed free recorded higher net

returns and B: C ratio 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⁻¹ in maize.

References

- Arvadiya, L.K., V. C. Raj, T. U. Patel, M.K. Arvadiya and A.M. Patel. 2012. Effect of plant population and weed management practices on productivity of sweet corn. *Indian Journal of Weed Science*, 44(3): 167-171.
- Kamble, T.C., S.U. Kakade, S.U. Nemade, R.V. Pawar and V. A. Apotikar, 2005. Integrated weed management in hybrid maize. *Crop Res.* 29(3): 396-400.
- Mathukia, R.K., V.K. Dobariya, B.S. Goshi and S.K. Chhodavadia. 2014. Integrated weed management in rabi Sweet corn (*Zea mays* L. var. *Saccharata*). *Adv Crop Sci Tech*, 2:4.
- Ramesh, G. and T. Nandanassababady. 2005. Impact of herbicides on weeds and soil ecosystem of rainfed maize (*Zea mays* L). *Indian J. Agric.*, 39(1): 31-36.