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EFFICACY OF CHEMICAL WEED CONTROL IN MAIZE (*Zea mays*)

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ABSTRACT
A field experiment entitled "Efficacy of Chemical Herbicide for Weed Control in Maize" (*Zea mays* L.) was conducted on medium black soil at Instructional Farm, College of Agriculture, Loni during *Kharif* season of 2020-21 & 2021-22.To test the efficacy of herbicides at higher and lower rate against different species along with cultural methods treatments consists of Atrazine @ 700 & 1000 g a.i. ha., Pendimethalin (PE) @ 900 &@ 1200 g a.i. ha., Tembotrione (POE) 100 &120 g a.i. ha., 2HW and 2IC at 20 & 40 DAS and Unweeded control.Tembotrione (POE)@ 120 and 100 g a.i. $ha^{-1}$was quite effective in reducing the count of monocot , dicot and sedges during 2020-21 and 2021-22. The results of the experiment indicated that significantly higher yield attributes and yield of maize in 2 HW and 2IC at 20 and 40 DAS and was followed by tembotrione @ 120 & 100 g a.i. ha^{-1} , Atrazine @ 1000 & 750 g a.i. ha^{-1} , Pendimethalin @ 1200 & 900 g a.i. ha^{-1}during 2020-21 & 2021-22 respectively.
Key Word: Weeds, *Zea mays*, Tembotrione, Atrazine.

INTRODUCTION:
Maize (Zea mays L) is the second most important cereal crop in the world in terms of production. Because of having highest genetic yield potential is known as queen of cereals. In India, it is the third most important food crop after rice and wheat. The maize is cultivated for grain, fodder, green cobs, sweet corn, baby corn and popcorn in peri-urban areas.
In India, it is cultivated on an area of 8.69 million ha with a production of 21.81 million tones and the productivity of 2509 kg/ha contributing nearly 9.0 per cent of the total food-grains production in the country (Anonymous, 2016). Karnataka, Rajasthan, Andhra Pradesh, Bihar, Maharashtra and Uttar Pradesh, are the major maize producing states are which comprises 60 % of area and 70 % of production in the country (Singh et al., 2017a and Trivedi et al., 2017). As a wide spaced crop maize crop composed of grasses, sedges and broad-leaved weeds. The weeds in maize has been traditionally controlled though pre-emergence applications based on atrazine because of its broad-controlled spectrum, superior residual activity, excellent crop tolerance, perceivable speed of efficacy and suitability as partner for other active ingredients (Scheulte et al. 2012; Rana et al. 1998; Kumar et al. 2011&2012).
Weeds causes significant yield loss worldwide with an average of 12.8% when weed control methods are applied and 37% without any weed control (Oerke and Dehne, 2004). Dogan et al. (2006) reported that weeds reduced the corn yield by 43% when allowed to compete with crop from sowing to harvest.

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As maize is cultivated year-round as monoculture crop with repeated applications of the same pre-emergence herbicides have determined a strong increase in the frequency of several difficult to control weed species forcing farmers to adopt less simplified weed control strategies (Meissle et al. 2010). In order to optimize weed control efficacy and minimize the application costs, the use of complex combinations of pre and post-emergence herbicides (Kumar et al. 2012), as well as herbicide mixtures (Rana et al. 1998; Kumar et al. 2011) has become the rule rather than the exception (Pannacci et al. 2007). Such later flushes are sometimes even uprooted manually or cut down to feed livestock (Kumar et al. 2011). These strategies also represents an important tool to avoid problems related to herbicide resistance (Norsworthy et al. 2012), but it requires some preliminary information to assist farmers with the process of herbicide and dosage selection depending on floristic situation (Mathews 2006). Keeping above facts in mind, need for some alternative post-emergence herbicide which can provide broad-spectrum weed control in kharif maize without affecting crop growth and yield was felt. Therefore, the present investigation was carried out for the evaluation of post-emergence herbicide tembotrione 34.4 % SC against mixed weed complex in maize.

Tembotrione was first launched as a maize herbicide in 2007 by Bayer Crop Science (Gatzweiler et al. 2012). Tembotrione inhibits the enzyme 4-hydroxyphenylpyruvate dioxygenase (HPPD) efficiently in numerous weed species. HPPD is an enzyme of the biosynthetic pathway that converts tyrosine to plastoquinone and tocopherol. Plastoquinose is a cofactor for the phytoene desaturase, a component of the carotenoid biosynthetic pathway. The depletion of plastoquinone levels by inhibition of HPPD results in depletion of carotenoids and an absence of chloroplast development in emerging foliar tissue which then appears bleached and stunted (Hawkes 2007). As carotenoids play key role in photosynthesis and in photo-protection there is clear involvement of light in the expression of herbicidal activity of HPPD inhibitors. The performance of tembotrione as a herbicide was presented at several conferences (Zollinger and Ries 2006; Young et al. 2007; Lamori et al. 2010, Duary et al. 2015; Kumar et al. 2015) and scientific papers from abroad (Williams and Pataki 2008) and India (Singh et al. 2012). The efficacy of tembotrione against mixed weed flora in maize under rainy season of Maharashtra is being presented in this paper.

Materials and Methods:

The field experiment was carried out on clay loam soil containing organic carbon (0.64 %) and 225, 22.20, 280 kg ha $^{-1}$ available nitrogen, Phosphorus andpotassium with pH 8.00 and EC 0.32 %. The experiment was laid out in randomized block design comprising 8 treatments (Table 1) with three replications.

Simultaneous hand weedings and interculturing operation is done in intra and inter row spaces respectively. Herbicides were applied using flood jet nozzle in knapsack sprayer with a spray volume of 500 lit ha^{-1}. Maize 'G-105' variety was sown 60 cm apart in rows and 20 cm between plants on7 July 2020 & 2021 and harvested on 15th October 2020 & 2021. The *Kharif* recorded 923.60 mm rainfall (49 rainy days) which was nearly equal to the deccinal average rainfall (84824 mm) of this region. The data on weed density and dry weight of weeds were recorded at harvest and subjected to square root transformation before statistical analysis.

The dominant weeds associated with maize crops were: *Cyperus rotundus* L., among sedges *Cyanodonductylon*(L.) Pers., *Echinochloacolonum*Link *Brachiria spp.,* among grasses and

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*Digera arvensis CeolsiaardentiaCommelinabenghalensis*L.,*Euphorbiahitra*L.,*Phylaris minima and Tridaex procumbens* L. among broad leaf weeds.

Results and Discussion:

The weed control treatments reduced the density sedges,grasses and broad leaf weeds.(Table 1). During kharif season 2020-21 and 2021-22 Conventional practice of 2Hand Weedings and 2 Intercultaring operation (i.e.20 and 40 DAS) proved significantly superior to rest of the treatments. Among herbicidal treatments, more effective ones were; Tembotrione @ 120 & 100 ga.i. ha^{-1} ,Atrazine @ 1000 kg ha^{-1} pre eme against sedges and broad leaf weeds and Pendimethalin @ 1.2 kg ha^{-1} pre eme against grasses.

All the treatments reduced the dry weight of weed significantly compared with unwedded control. The conventional practice (2HW and 2IC at 20 and 40 DAS) and herbicidal treatment of Tembotrione @ 120 & 100 ga.i. ha^{-1} and Atrazine @ 1000 kg ha^{-1} pre eme being at par , proved significantly superior to the rest of treatmentsin reducing the dry weight of weeds during 2020-21 and 2021-22. These findings are in accordance with those of Reddy *et al* (2000).

References:

- Anonymous.(2001). India 2001. A reference Annual Publi. Div., Ministry of Information and Broadcasting, Govt. of India, N.Delhi,pp.:385.
- Gatzweiler E, Hansjörg K, Hacker E, Hills M, Trabold K and Bonfig-Picard G. 2012. Weed spectrum and selectivity of tembotrione under varying environmental conditions. 25th German Conference on Weed Biology and Weed Control, March 13-15, 2012, Braunschweig, Germany P 385-391.
- Hawkes TR. 2007. Hydroxyphenylpyruvate dioxygenase (HPPD) – the herbicide target. In: Kramer W and Schirmer U (Eds.), 2007: Modern Crop Protection Compounds, Vol 1: 211-220.
- Kumar S, Angiras NN and Rana SS. 2011. Integrated weed management in maize. Himachal Journal of Agricultural Research 37(1): 1-9
- Kumar S, Rana SS, Chander N and Angiras NN. 2012. Management of hardy weeds in maize under mid-hill conditions of Himachal Pradesh. Indian Journal of Weed Science 44: 11-17.
- Kumar J, Kumar A, Sharma V, Bharat R and Singh AP. 2015. Bio-efficacy of post emergence tembotrione on weed dynamics and productivity of *Kharif maize* in rainfed foothill and mid hill conditions. 25th Asian-Pacific Weed Science Society Conference on Weed Science for Sustainable Agriculture, Environment and Biodiversity, Hyderabad, India during 13-16 October, 2015, pp 117.
- Mundra, S.L.,Vyas, A.K. and Maliwal, p.L. 20(,13. Effect of weed and nutrient management on weed growth and productivity of maize (*Zea mays* L.).Indin Journal ofWeed Science:**35** (57-61).
- Mukhopadhyaya, S.K.(1992). Emerging problems and advances in weed management. Presidential Address. Agriculture Section, Indian Science Congress Held at Baroda.
- Meissle M, Mouron P, Musa T, Bigler F, Pons X, Vasileiadis VP, Otto S, Antichi D, Kiss J, Pálinkás Z, Dorner Z, van der Weide R, Groten J, Czembor E, Adamczyk J, Thibord JB, Melander B, Cordsen Nielsen G, Poulsen RT, Zimmermann O, Verschwele A and Oldenburg E. (2010). Pests, pesticide use and alternative options in European maize

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Research paper UGC CARE Listed (Group -I) Journal Volume 11, S Iss 3, Dec 2022

production: current status and future prospects. Journal of Applied Entomology 134: 357-375.

- Norsworthy JK, Ward SM, Shaw DR, Llewellyn RS, Nichols RL, Webster TM, Bradley KW, Frisvold G, Powles SB, Burgos NR, Witt WW and Barrett M. 2012. Reducing the Risks of Herbicide Resistance: Best Management Practices and Recommendations. Weed Science 60(SI1): 31-62.
- Pannacci E, Graziani F, Covarelli G. (2007). Use of herbicide mixtures for pre and postemergence weed control in sunflower (Helianthus annuus). Crop Protection 26: 1150-1157.
- Rao, V.S.(1983). Principle of Weed Sciences. Oxford & IBH pub. Co.,New Delhi.
- Rana SS, Sharma JJ and Manuja S. 1998. Evaluation of promising herbicide mixtures for weed control in maize (Zea mays L.). New Agriculturist 9(1 & 2): 1-5.
- Rathore,P.S.(2001).Maize.Techniques and Management of Field Crop Production', AGRIBIOS(Ind.).pp.60.
- Reddy,C.N.;Reddy and M. Padmavati Devi.(2000). Effect of weed management on weed growth and crop productivity in maize-sunflower cropping system. *Ind.J.Weed Sci.*,**32**(3-4):213-215.
- Sharma,V.and D.R. Thakur.(1998). Integrated weed management in Maize (*Zea mays* L.) under mid hill conditions of North-Western Himalayas. *Ind.J.Weed Sci.***30** (3-4):158-162.
- Singh VP, Guru SK, Kumar A, Banga A and Tripathi N. 2012. Bioefficacy of tembotrione against mixed weed complex in maize. Indian Journal of Weed Science 44(1): 1–5.
- Vikas Singhal.(1999). Indian Agriculture, Indian Economic Data Research Centre, New Delhi,pp.:99.
- Williams II MM and Pataky JK. 2008. Genetic basis of sensitivity in sweet corn to tembotrione. Weed Science 56: 364-370.

Table1. Effect of different treatments on density of weeds30 DAS and dry weight of weeds in maize.

Treatments	Density (No./m^2)						Dry weight of weeds kg ha^{-1}	
	Sedges		Grasses		Broad leaf			
	2020	2021	2020	2021	2020	2021	2020	2021
Atrazine @ 750 g a. i. ha^1 P/E	9.21(84.0)	5.80(32.7)	3.60(15)	7.09(49)	1.24(0.7)	1.00(0.0)	320	327
Atrazine @ 1000 g a. i. ha^{1}P/E	9.36(86.7)	5.43(28.7)	2.33(5)	6.24(38)	1.00(0.0)	1.00(0.0)	414	421
Pendimethalin @ 900 g a. i. ha^{1}P/E	8.88(78.0)	7.72(58.7)	8.21(67)	7.97(63)	1.90(2.7)	2.51(5.3)	492	502
Pendimethalin @ 1200 kg ha^{1}P/E	7.54(56.0)	5.62(30.7)	7.40(54)	7.50(55)	1.49(1.3)	1.00(0.0)	477	483
Tembotrione @ 100 g a. i. ha^{-1} POE	7.50(55.3)	5.26(26.7)	4.51(19)	6.02(35)	1.66(2.0)	1.66(2.0)	710	717
Tembotrione @ 120 g a. i. ha-1POE	5.44(28.7)	3.69(12.7)	2.63(6)	3.87(14)	1.24(0.7)	1.00(0.0)	167	172
2HW+2Interculture (20	1.00(0.	1.00(0.	1.00(0)	1.00(0)	1.00(0.	1.00(0.0	106	112

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and 40 DAS)	0)	0)			0)	)		
Unweeded Control	9.03(86.7)	6.45(40.7)	9.64(92)	9.11(82)	4.12(16.0)	3.11(8.7)	1372	1377
CD(P=0.05)	1.33	0.64	1.43	0.53	0.6	0.43	98	96

PE= Pre emergence; POE=Post Emergence; HW= Hand weeding; IC= Intercultaring.Figures in parenthesis are original values.