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RESEARCH PAPER

Influence of integrated weed management on growth and yield of *Kharif* maize (*Zea mays* L.)

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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 Randomized Block Design (RBD) having three replications and twelve treatments. 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 4.2 dSm^{-1} and 7.10, respectively.Weed free check and tank mixure application of Tembotrinone 42 SC @ 120gm 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 significantly the higher growth and yield contributing characters *viz.*, plant height (cm), number of functional leaves plant^{-1}, leaf area plant^{-1}(dm^2), dry matter plant^{-1}(g), length of cob (cm), diameter of cob(cm), number of grains, weight of grains cob^{-1}and test weight resulting into significant increase in grain and straw yields of maize as compared to remaining weed management treatments. Tank mixure application of Tembotrinone 42 SC @ 120gm 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 recorded minimum dry weight of weed, highest weed control efficiency (86.94 %) and lowest weed index (1.79%).Significantly lowest values for growth, yield and yield attributes as well as weed control efficiency was observed in weedy check treatment.

Key Words : Tembotrione, Tank mixture, Weed dry weight

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INTRODUCTION

Maize belongs to the family of grasses (Poaceae). It is cultivated globally being one of the most important cereal crops worldwide. Maize is not only an important food crop for human consumption, but also a basic element used as animal found raw material for manufacturing of many industrial products. The products include corn starch, maltodextrins, corn oil, corn syrup, and products of fermentation and distallaries.It is also being recently used in the production of biofuel. Maize can be grown successfully in variety of soils ranging from loamy sand to clay loam. However, soils with good organic

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matter content having high water holding capacity with neutral PH are consider good 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.

Among the maize growing countries India rank 4th in area and 7th in production, representing around 4 % of world maize area and 2 % of total production. During 2018-19 in India, the maize area has reached to 9.2 Mha (DACNET, 2020). During 1950-51 India used to produce 1.73 million MT maize, which has increased to 27.8 million MT by 2018-19, recording close to 16 times increase in production. The average productivity during the period has increased by 5.42 times from 547 kg ha^{-1} to 2965 kg ha^{-1} while area increased nearly by three times. Though the productivity in India is almost half of world the average per day productivity of Indian maize is at par with many lead maize producing countries. In India, maize is principally grown in two seasons, rainy (*Kharif*) and winter (*Rabi*) *Kharif* maize represents around 83% of maize area in India, while *Rabi* maize correspond to 17 % maize area. Over 70% of *Kharif* maize area is grown under rainfed condition with prevalence of many biotic and abiotic stresses. Among Indian states Madhya Pradesh and Karnataka has highest area under maize (15 % each) followed by Maharashtra (10 %), Rajasthan (9%), Uttar Pradesh (8%) and others. After Karnataka and Madhya Pradesh Bihar is the highest maize producer. Andhra Pradesh is having highest state productivity. Some districts like Krishna, West Godavari etc records a high as 12 t ha^{-1} productivity.

Low yield of maize under Indian conditions may be attributed due to number of factors, among them weeds rank as prime enemy. Maize being a rainy season crop and sown at wider spacing coupled with slow initial growth resulted in heavy weed infestation. Hand weeding is the commonest and effective method of control of weeds, however, it is not only intensive, but also expensive and strenuous. Frequent and heavy rainfall during *Kharif* season, unavailability of human labour at peak agricultural operations and inflated labour wages coupled with unfavourable soil physical conditions for intercultural operations forcing the farmers for chemical weed control in maize. The extent of yield loss due to weeds in maize varies from 28 to 93 per cent depending on the type of weed flora, intensity and duration of crop weed competition. Chemical weed management is the viable option in maize crop as highly selective post-emergence herbicides are available in India the presence of weeds, in general reduces the maize yield by 27 to 60% depending upon the growth and persistence of weed population in Maize crop (Kumar *et al*., 2015) However, Yakadri *et al.,* 2015 opined that wider spacing and initial slow growth of maize during the first 3-4 weeks to invade and offer severe competition, resulting in 30-93% yield losses. Weeds are causing serious problem in maize whatever the climatic conditions are, some dominant weed species in maize were *Polygonumpersicaria, P. pensylvanicum, P. orientale, Oldenlandiadiffusa, Oldenlandia aquatic, Oxalis corniculata, Stellaria media, Stellaria aquatic, Physalis minima, Solanum nigrum, Hydrocotylranunculoides, Ageratum conyzoides* (appeared at latter part of crop growth), the sedge like *Cyperus rotundus and the* grasses like *Cynodondactylon, Digitariaciliaris, Setariaglauca, Echinochloa* sp. Among these weeds *Polygonum* sp., *Cynodondactylon, Digitariaciliaris, Setariaglauca were highly aggressive in maize.*

MATERIAL 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 m^2 and 3.8 x 3.0 m^2, 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: Topramezone 33.6 SC @ 25.2 gm a.i.ha^{-1} + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3: Tembotrinone 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: Topramezone 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: Tembotrinone 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 upto 60 DAS, T_{12}: Weedy check. The periodical observations on plant height (cm), number of functional leaves $plant^{-1}$, leaf area $plant^{-1}$ (dm^2), dry matter $plant^{-1}$

(g), length of cob (cm), diameter of cob (cm), number of grains, weight of grains cob^{-1} and test weight were recorded and analyzed statistically. Statistical analysis of data by using a standard method of "analysis of variance" as reported by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth character :

The mean data on plant height (cm), number of functional leaves, leaf area plant^{-1} (dm^2) and dry matter plant^{-1} (g) at harvest are presented in Table 1. Plant height (cm), number of functional leaves, leaf area plant^{-1} (dm^2) and dry matter plant^{-1} (g) at harvest were influenced significantly by various weed management treatments. Significantly maximum plant height *i.e.,* (164.93cm), number of functional leaves (12.93), leaf area plant^{-1} (69.87dm^2) and dry matter plant^{-1} (137.67g) was recorded in weed free check treatment, which was statistically at par with T_{10},$T_{9,}$and T_8treatments. Among the herbicidal treatments Tembotrinone 42 SC @ 120gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + @ 2ml/l of water EPoE at 20-25 DAS fb HW at 40 DAS recorded maximum values of growth contributing characters. Significantly minimum plant height *i.e.*, (117.37cm), number of functional leaves (8.40), leaf area plant^{-1} (49.73dm^2) and dry matter plant^{-1} (97.07g) was recorded in weedy check treatment.This might be because of proper weed control in respective treatments which resulted in less competition for nutrients, sunlight, water, space and finally it resulted in more plant height and more number of functional leaves plant^{-1} ultimately more leaf area plant^{-1}. These results were also given by Shinde *et al.* (2001), Arvadia *et al*. (2012), Umesha *et al.* (2015) and Ankush *et al*. (2017).

Yield attributes and yield:

The mean data regarding length of cob (cm), diameter of cob (cm), weight of cob (g), grain yield(q ha^{-1}) and straw yield (q ha^{-1}) are showed in Table 2 yield attributes *viz.,* length of cob (cm), diameter of cob (cm), weight of cob (g) were significantly influenced different weed management treatments. Weed free check treatment (T_{11}) recorded maximum value of yield attributing characters *i.e.,* length of cob (21.97cm), diameter of cob (17.83cm), weight of cob (170.88g) as compared to other treatments due to lesser weed population and weed biomass and which was statistically at par with T_{10},T_9 and T_8 treatments and significantly superior over the rest of the treatments. Among herbicidal treatments Tembotrinone 42 SC @ 120gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + @ 2ml/l of water EPoE At 20-25 DAS fb HW at 40 DAS recorded

Table 1: Growth characters influenced by different weed management treatments

Treatments	Plant height(cm) at harvest	Number of leaves plant^{-1} at harvest	Leaf area plant^{-1}(dm^2)	Dry matter plant^{-1}(g)
T_1	134.23	09.80	56.30	115.17
T_2	134.40	10.00	58.20	115.60
T_3	135.13	10.60	58.40	116.03
T_4	135.47	10.67	60.43	116.10
T_5	135.67	10.73	60.67	118.47
T_6	135.73	10.80	62.91	119.47
T_7	151.07	10.93	67.29	119.63
T_8	153.93	12.20	69.46	132.50
T_9	155.47	12.47	69.58	134.97
T_{10}	161.60	12.53	69.79	136.30
T_{11}	164.93	12.93	69.87	137.67
T_{12}	117.37	8.40	49.73	97.07
F test	Sig	Sig	Sig	Sig
S.E.±	5.17	0.60	2.19	5.74
C.D.(P=0.05)	15.19	1.78	6.43	16.86
General mean	142.91	11.08	62.71	121.58

maximum values of yield contributing characters. Minimum value of yield attributing characters *i.e.,* length of cob (11.51cm), diameter of cob (10.17cm), weight of cob (115.13g) were observed in weedy check treatment. All weed management treatments recorded maximum value of yield contributing characters than weedy check treatment.

Higher grain and straw yield was recorded in weed free check treatment *i.e.*, (75.25 q ha^{-1}) and (101.58 q ha^{-1}), respectively. Among herbicidal treatments maximum grain and straw yield was recorded in Tank mixture application of Tembotrinone 42 SC @ 120gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + @ 2ml/l of water EPoE At 20-25 DAS fb HW at 40 DAS *i.e.*, 73.90 q ha^{-1} and 99.77 q ha^{-1}, respectively. The next best treatments were Topramezone 33.6 SC@ 25.2 gm a.i. ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1}+ (MSO adjuvant@ 2ml/l of water EPoE At 20-25 DAS fb hand weeding at 40 DAS, Tembotrinone 42 SC @ 120gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant 2ml/l of water EPoE at 20-25DAS and Topramezone 33.6 SC @ 25.2 gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1}+ (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS. These treatments recorded maximum grain and straw yield compared to sole application of Tembotrione and Topramezone herbicide. Grain and straw yield of maize was significantly lower in weedy check treatment *i.e.*, 35.66 % and 50.31%, respectively. The highest grain yield was obtained under weed free check treatment due to less crop- weed competition throughout the crop growth period, thus enabling the crop for maximum utilization of nutrients, water, nutrients, light and space which favoured higher yield contributing characters. These results were also given by Swetha *et al.* (2015), Umesh *et al*. (2015) and Parul *et al.* (2017).

T_1: PE application of Atrazine 50 %WP@ 1000 a.i.ha^{-1} PE at 3-5 DAS, T_2 : Topramezone 33.6 SC @ 25.2 gm a.i.ha^{-1} + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3 : Tembotrinone 42 SC @ 120gm 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 : Topramezone 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 : Tembotrinone 42 SC @ 120gm 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.

T_1: PE application of Atrazine 50 %WP@ 1000 a.i.ha^{-1} PE at 3-5 DAS, T_2 : Topramezone 33.6 SC @ 25.2 gm a.i.ha^{-1} + surfactant (MSO adjuvant@ 2ml/l of water EPoE at 20-25 DAS, T_3 : Tembotrinone 42 SC @ 120gm 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 : Topramezone 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

Table 2: Yield attributes and yield influenced by different weed management treatments

Treatments	length of cob (cm)	Diameter of cob (cm)	Weight of cob plant^{-1} (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})
T_1	16.04	13.10	137.37	54.08	76.96
T_2	16.35	13.50	142.07	59.64	80.51
T_3	16.77	13.73	143.50	60.22	81.30
T_4	16.84	14.43	144.67	62.85	84.85
T_5	17.17	14.73	145.87	64.61	87.22
T_6	18.27	14.77	148.93	65.10	89.59
T_7	18.43	15.53	161.67	65.34	92.03
T_8	19.50	16.33	169.13	66.04	94.56
T_9	20.77	16.60	170.77	72.09	97.32
T_{10}	21.43	16.97	170.80	73.90	99.77
T_{11}	21.97	17.83	170.88	75.25	101.58
T_{12}	11.51	10.17	115.13	35.66	50.31
F test	Sig	Sig	Sig	Sig	Sig
S.E±	1.14	0.54	7.43	2.86	3.85
C.D.at 5%	3.37	1.59	21.81	8.42	11.30
General mean	17.92	14.80	151.73	62.89	86.33

EPoE at 20-25 DAS, T_8 : Tembotrinone 42 SC @ 120gm 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.

Conclusion:

The maximum growth and yield of maize was obtained whenthecrop was keptweed free for thefirst 60 days by threehandweedings (20,40 and50DAS) and amongtheintegratedweedmanagementpractices,thehighest crop growth, yield, weed control efficiency,the lowest intensity of weed flora,weed dry matter and weed index were recorded in Tembotrinone 42 SC @ 120gm a.i.ha^{-1} + Atrazine 50 WP @ 500 gm a.i.ha^{-1} + surfactant @ 2ml/l of water EPoE At 20-25 DAS followed by hand weeding at 40 DAS.

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REFERENCES

Ankush, K., Rana, M. C., Neelam S. and Rana, S. S. (2017). Effect of post emergence herbicide- tembotrione on yield, soil dehydrogenase activity and its phytotoxicity on maize (*Zea mays* L.) under mid hill conditions of Himachal Pradesh, India. *International Journal of Current Microbiology & Applied Sciences.,* **6**(8): 2297-2303.

Arvadia, L. K., Raj, V. C., Patel, T. U. and Arvadiya, M. K. (2012). Influence of plant population and weed management on weed flora and productivity of sweet corn (*Zea mays* L.). *Indian Journal of Agronomy,* **57** (2):162-167.

Panse, V. G. and Sukhamate, P. V. (1967). *Statistical methods for agricultural workers*, ICAR, New Delhi. 361.

Parul, K., Tiwari, A.R., Sharma and Bhambri, M.C. (2017). Biennieal Conference of the Indian Science on "Doubling Farmers Income by 2022: The role of weed Science", MPUA and T, Udaipur, India during 1-3 March, pp. 227.

Shinde, S. H., Kolage, A. K. and Bhilare, R. L. (2001). Effect of weed control on growth and yield of maize. *J. Maharashtra Agric. Univ.*, **26** (2): 212-213.

Swetha, K., Madhavi, M., Pratibha, G. and Ramprakash, T. (2015). Weed management with new generation herbicides in maize. *Indian Journal of Weed Science,* **47**(4): 432-433.

Umesha, C., Sridhara, S. and Aswini (2015). Effect of pre and post emergent herbicides on growth, yield parameters and weed control efficiency in maize (*Zea mays* L.). *Trends in Biosciences*, **8** (10): 2468-2474.