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Effect of weed management to enhance the productivity of zero tillage maize grown in rice fallow condition

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ABSTRACT

A field experiment was conducted at the Annamalai University, Department of Agronomy, Faculty of Agriculture, Annamalai Nagar during winter season of 2018 to study weed management practices for enhancing productivity of zero tillage maize grown under rice fallow conditions.. The trial was fitted in randomized block design with three replications there were altogether ten weed control treatments. Weed management practices result shows significantly when application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS recorded the lowest weed density, weed biomass and higher weed control efficiency. Yield attributes and yield of maize was significantly higher with application of paraquat 0.6 kg ha^{-1}immediately after dibbling of seeds followed by hand weeding on 30 DAS and it was on par with hand weeding twice at 15 and 30 DAS.

Key Words : Pre and post emergence herbicides, Rice fallow maize, weed management

INTRODUCTION

Maize (*Zea mays* L.) is one of the most versatile emerging crops showing wider adaptability under varied agro-climatic conditions. Globally, maize is known as **"Queen of cereals"** because it has he highest genetic yield potential among the cereals (Singh *et al*., 2017). It is cultivated on nearly 190 m ha in about 165 countries having wider diversity of soil, climate, biodiversity and management practices that contributes 39 % in the global grain production (Ahmad *et al*., 2017). According to National Centre for Agricultural Economics and Policy Research (NCAP) in India recent studies shows an increasing demand for maize by the industry which caters to consumer needs like textiles, paper, glue, alcohol, confectionery, food processing and pharmaceutical industry, etc. (Das *et al*., 2010).Maize provides food for human consumption and feed for poultry and fishery industry. Hence demand for maize has been increased it lends to change in the trend of traditional cropping system like rice-rice and rice-wheat towards rice-maize cropping system. Rice-maize systems are practiced mostly in the south and in the northeast parts of India including Chhattisgarh with an area of more than 0.5 M ha. Winter maize after rice is becoming a popular and remunerative crop option for the farmers in non-traditional maize areas of eastern and peninsular India. Maize sown relatively at zero tillage coupled with wider row spacing and initial slow growth encounter severe weed competition resulting in reduction of yields to the extent of 30-100 per cent (Singh *et al*., 2012). Increased weed density causes loss of nutrients which in turn reduces yield of maize. Simultaneous emergence and rapid weed growth may lead to severe competition for light, moisture, nutrients and space especially during early stages of crop and cause yield reduction. Chemical weed control is the main alternative to hand weeding due to shortage of man power and high labour price. Weed management with tank-mixture herbicide which involves the combination of two or more herbicides, has been identified as a viable alternative to the current methods to control complex of weed population in no tilled rice field.

The optimum soil moisture, time and method of application of herbicides also decide its efficacy to control weeds under different situations. Pre-emergence herbicides ensure significant and promising weed control and save the crop from initial weed competition and nutrient drain. Similarly a post

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emergence herbicide also has a significant role in reducing the crop weed competition at the time of critical stage of the crop. Hence present field experiment has been carried out to select the suitable weed management options on the performance of maize grown in rice fallows under no - till environment.

Materials and Methods

Field experiment was conducted at experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar during *Rabi* season . The field experimental soil was clay loam texture with low in available nitrogen (260 kg/ha), medium in available phosphorous (18.00) and high in available potassium (315.90) with pH of 7.4. The field experiment was laid out in Randomized Block Design (RBD) and replicated thrice. The treatments imposed in this experiment were, T_1-Unweeded control, T_2-Two HW @ 15 and 30 DAS ,T_3 -Atrazine @ 0.75 kg ha^{-1} + Pendimethelin @ 0.5 kg ha^{-1} (tank mix) @ 3 DAS ,T_4 -Atrazine @ 0.75 kg ha^{-1} + Pendimethelin @ 0.5 kg ha^{1} (tank mix) @ 3 DAS fb HW on 30 DAS, T_5- Atrazine @ 1.5 kg ha^{-1} + Glyphosate @ 0.8 kg ha^{-1} (tank mix) @ 3 DAS, T_6-Atrazine @ 1.5 kg ha^{-1} + Glyphosate @ 0.8 kg ha^{-1} (tank mix) @ 3 DAS fb HW on 30 DAS, T7-Paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds, T_8 -Paraquat 0.6 kg ha^{-1} spray immediately after dibbling of seeds fb HW on 30 DAS,T_9-Tembotrione 105 g ha^{-1} + isoxadifen – ethyl 21 Sc 52 g ha^{-1} + stefemero adjuvant @ 2.5 ml/lit at 15 DAS, T10-Tembotrione 105 g ha^{-1} + isoxadifen – ethyl 21sc 52g ha^{-1} + stefemero adjuvant @ 2.5 ml/lit at 15 DAS fb HW on 30 DAS. The seeds were dibbled in the stubble of the previous crop without any tillage or soil disturbance, except that which is necessary to place the seeds at the desired depth. The recommended dose of 250: 75: 75 kg NPK ha^{-1} was applied in the form of urea, single super phosphate and Muriate of potash by the side of the seed row**.** Pre emergence herbicides were applied on two days after sowing. Post-emergence herbicides were applied at 15-20 DAS. All the herbicides were used after making the spray volume of 500 L/ha. Phytotoxic effect on crop was recorded at 3rd and 10th day after application of herbicides. . The number of weeds was counted using a 0.25 m^2 quadrate at four distinct locations in each plot and reported as no m^{-2}. To analyse data on weed density and biomass, the square root transformation ($\sqrt{X + 0.5}$) was used.

Result and Discussion

Phytoxicity on crop and weed

Phytoxicity symptoms of herbicides on maize were more pronounced with the treatment of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS by showing symptoms of discolouration whereas atrazine + gyphospate (tank mix) at 3 DAS followed by hand weeding on 30 DAS shows stunting, discolouration and malformation symptoms were observed. Paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds recorded complete control of weeds and tembotrione @ 105 g ha^{-1} at 15 DAS recorded the excellent control of weeds. This treatments caused complete chlorosis of all weeds including grasses, sedges and broadleaved weeds. After that weeds were withered and died. But, the sedges were again re-germinated from the underground corm within 15-20 days after application of herbicide.

Effect on Weeds

Weed density and weed biomass showed significantly lower with paraquat 0.6 kg ha^{-1} spray immediately after dibbling of seeds followed by hand weeding on 30 DAS and it was on par with two hand weeding at 15 and 30 DAS. The next best treatment was atrazine @ 1.5kg ha^{-1} + Glyphosate @ 0.8 kg ha^{-1} (tank mix) @ 3 DAS followed by hand weeding on 30 DAS and it was followed by tembotrine at 15 DAS followed by hand weeding on 30 DAS Highest total weed density was recorded with unweeded control. The reduction in total weed density observed with application of paraquat 0.6

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kgha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS this might due to fast-acting, non-selective contact herbicide that is absorbed by the foliage. It destroys plant tissue by disrupting photosynthesis and rupturing cell membranes, which allows water to escape leading to rapid desiccation of foliage. These results were in agreement with the findings of Dinis olivera *et al.* (2016). The lowest weed biomass recorded by the a application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS was due to the effective controlling of both dicot and monocot weeds by inhibiting the process of photosynthesis resulted in less number of weed population in the early stage further weed growth effectively controlled by hand weeding 30 DAS.

Weed control efficiency indicates the magnitude of reduction of weed density by weed control methods application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS registered the highest weed control efficiency. More reduction in weed density resulted in higher weed control efficiency. Since paraquat are broad spectrum non-selective total weed killing herbicides able to reduce the weed grow that early stages of crop and further weed growth by effective hand weeding on 30 DAS research findings regarding the superior performance of application of paraquat was reported by Sharma and Badiyala,(2014).

Effect on crop

Growth and yield attributing characters was significantly influenced by weed management practices. The highest plant height and dry matter production was observed under by application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS at all the stages of the crop growth. This might be due to application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS has assured a comparatively weed free environment resulting in higher availability of plant nutrients and moisture favoring increased growth characters . Similar findings were reported by Mundra *et al.* (2002). Yield attributes with cob length and cob girth were significantly influence by weed management practices. Heaver and longer maize cobs with more number of grains were observed with application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS. Weed free environment especially at critical period of crop weed competition, which might have resulted increased production and translocation of photosynthesis sufficient to supply sink needs this results are agreement with the findings of Nadiger *et al.* (2013). Grain and stover yields were significantly affected by different weed control treatments. Application of paraquat 0.6 kg ha^{-1} immediately after dibbling of seeds followed by hand weeding on 30 DAS significantly registered the higher grain yield. However, this treatment was on par with hand weeding twice at 15 and 30 DAS this treatment was followed by tembotrione 105g ha^{-1} + isoxadifen – ethyl 21sc 52g + stefemero adjuvant @ 2.5 ml/lit at 15 DAS fb hand weeding on 30 DAS. These results are in conformity with the findings of Ishrat *et al.* (2012).

References

1. Ahmad N, Sinha DK, Singh KM, Mishra RM. 2017. Growth Performance and Resource Use Efficiency of Maize in Bihar: Economic Perspectives. **Journal of AgriSearch 4**(1):.71-75.
2. Das, T. K., P.K. Sakhuja and H. Zelleke. 2010. Herbicide efficacy and non-target toxicity in highland rainfed maize of Eastern Ethiopia. **Int. J. Pest Mgmt., 56**(4): 315-325.
3. Ishrat D Haji, C.S. Hunshal, L.H. Malligwad, B. Basavaraj and V.P. Chimmad. 2012. Effect of pre and post emergence herbicides on weed control in maize (*Zea mays*. L.). **Kar. J. Agric. Sci., 25**(3): 392 - 394.

4.Nadiger, S., Babu, R., and B.N. Aravinda Kumar. 2013. Bioefficacy of pre- emergence herbicides on weed management in maize. **Karnataka J. Agri., Sci., 26(1):** 17-19.
5.Sharma, A.R. and D. Badiyala. 2014. All India coordinated research programme on weed management. **31st Annual Rep.** 59-70.
6.Singh, U., A.A. Saad, T. Ram, L. Chand, S.A. Mir and F.A. Aga. 2012. Productivity, economics and nitrogen-use efficiency of sweet corn (*Zea mays* L. *saccharata*) as influenced by planting geometry and nitrogen fertilization**. Indian J. Agron**., **57**(1): 43-48.
7.Singh, K., T. kaur,M.S.Bullar and A.S.Brar.2018. The critical period of weed control in spring maize in North – West India . Maydica . 61(1): 7.

Table 1 Effect of weed control treatments on weed density, weed biomass and weed control efficiency

	Weed Density(No.m^{-2})			Weed Biomass(Kg.ha^{-1})			Weed control efficiency(%)		
Treatments	**15 DAS**	**30 DAS**	**45 DAS**	**15 DAS**	**30 DAS**	**45 DAS**	**15 DAS**	**30 DAS**	**45 DAS**
T$_1$	12.09 (145.67)	13.94 (193.76)	16.71 (278.71)	5.37 (28.33)	11.13 (123.32)	14.38 (206.32)	-	-	-
T$_2$	11.92 (141.7)	6.06 (36.28)	6.23 (38.27)	5.32 (27.85)	3.52 (11.86)	4.30 (17.49)	2.72	81.27	86.26
T$_3$	8.86 (76.3)	13.14 (172.16)	14.47 (208.95)	4.80 (22.56)	8.02 (63.78)	8.45 (70.95)	47.62	11.14	25.02
T$_4$	8.57 (72.92)	9.16 (83.49)	10.18 (103.16)	4.73 (21.88)	5.72 (32.26)	6.33 (39.56)	49.94	56.91	62.98
T$_5$	6.74 (44.98)	7.75 (121.82)	12.35 (152.14)	3.60 (12.46)	6.86 (46.6)	7.47 (55.25)	69.12	37.12	45.41
T$_6$	6.67 (44.05)	7.21 (51.5)	7.50 (55.73)	3.52 (11.86)	4.10 (16.35)	5.05 (24.99)	69.76	73.42	80
T$_7$	5.45 (29.23)	10.02 (99.9)	11.45 (130.71)	(3.00) 8.51	6.46 (41.21)	6.92 (47.36)	79.93	48.44	53.1
T$_8$	5.29 (27.49)	5.82 (33.32)	5.94 (34.75)	2.89 (7.86)	3.36 (10.8)	4.11 (16.38)	81.12	82.8	87.53
T$_9$	7.70 (58.78)	12.15 (147.22)	13.47 (180.96)	4.13 (16.58)	7.27 (52.33)	8.00 (63.45)	59.64	24.01	35.07
T$_{10}$	7.60 (57.33)	8.10 (65.1)	9.06 (81.66)	4.04 (15.86)	5.16 (26.1)	5.71 (32.09)	60.64	66.4	70.7
S.Ed	0.14	0.22	0.24	0.07	0.13	0.15	-	-	-
CD (P=0`05%)	0.30	0.48	0.51	0.16	0.29	0.33	-	-	-

Table 2. Effect of weed control treatments on growth and yield attributes

Treatments	**Plant height(cm)**	**DMP (K g.ha^{-1})**	**Cob length (cm)**	**Cob girth (cm)**	**Grain yield (kg ha^{-1})**	**Stover yield (kg ha^{-1})**
T$_1$	98.17	6237	11.38	8.91	1692	4477

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T_2	219.57	12739	19.11	14.39	4889	7655
T_3	142.87	7046	12.65	9.51	2216	4746
T_4	181.21	10378	16.85	12.35	3742	6479
T_5	153.87	7907	14.37	10.29	2527	5274
T_6	196.87	11133	17.65	13.13	4165	6796
T_7	172.31	9455	15.98	11.47	3286	6035
T_8	224.32	13109	19.72	14.64	5018	7846
T_9	163.67	8620	15.22	10.89	2874	5633
T_{10}	204.22	12111	18.43	13.81	4565	7355
S.Ed	3.22	187.45	0.28	0.21	64.11	110.57
CD(P=0.05%)	6.7	374.9	0.60	0.44	134.70	232.32