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Effect of Different Weed Control Methods on Growth and Yield of Maize (*Zea Mays* L.) Under Rainfed Condition in Allahabad.

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Abstract: *A field experiment was carried out at Agronomy field SHIATS Allahabad, during Kharif season of 2015 to study the "Effect of different weed control methods on growth and yield of maize"(Zea mays L.) . The experiment comprised eleven treatments, Viz ; weed free, 2 hand weeding, Paddy straw mulching, black polythene mulching, Atrazine @ 0.75 kg ha^{-1}, Atrazine @ 1.00 kg ha^{-1}, Atrazine @ 1.50 kg ha^{-1}, Atrazine @ 0.75 kg ha^{-1} + hand weeding, Atrazine @ 1.00 kg ha^{-1} + hand weeding, Atrazine @ 1.50 kg ha^{-1} + hand weeding and un weeded plot. There are many weed species that were observed in the field experiment, but the major weed species were:- Cynodon dactylon, Cyperus rotundus, Parthenium hysterophorus L. and Chenopodium album L. .The result showed that, the most effective treatment among other treatment in controlling weed population and increasing the grain yield of maize were Atrazine @1.00 kg ha^{-1} + hand weeding, 2 hand weeding and Paddy straw mulching, producing grain yield of (203.48 g, 188.34 g and 186.82 g) respectively as compared with (68.30 g) from un weeded plot. Higher net return (Rs.91700) and benefit cost ratio (3.40 & 2.48) was registered in the treatment in T9 and T3 respectively. These weed control methods significantly controlled weed and enhanced yield and yield components of maize during the study. Therefore it were concluded that, 2 manual hand weeding and Atrazine @ 1.0 kg ha^{-1} + one hand weeding at 45 DAS, is more effective and economic as compared with other treatment.*

Key word: *maize; weeds; chemical and non- chemical; integrated weed control and yield components.*

I. Introduction

Maize is one of the most important cereal crops in the world agricultural economy both as food for man and feed for animals. It is a miracle crop. It has very high yield potential, there is no cereal on the earth which has so immense potentiality and that is why it is called '**King of cereals'**. Maize ranks third in the cereals world production after rice and wheat, but in productivity it surpasses all cereals. In India, it is grown over an area of 9.43 m ha with total production of 24.35 m tones (Anon., 2015). It is well known that maize is a heavy feeder for both nutrients and soil moisture due to its high productivity. Maize, being a rainy season and widely spaced crop, gets infested with variety of weeds and subjected to heavy weed competition, which often inflicts huge losses ranging from 28 to 100 per cent (Patel et al., 2006). There are very few herbicide options available for weed control in maize in India. Currently, herbicides used for control of weeds include pre-emergence application of atrazine, simazine, pendimethalin, alachlor and post-emergent application of 2,4-D. Most of these herbicides provide only a narrow spectrum weed control in maize (Patel et al., 2006). The low yield of maize under Indian conditions may be attributed by number of factors, among them weeds rank as prime enemy. Lal and Saini (1985) gave an estimate on crop weed competition and suggested that the reduction of 40 % in yield can occurs due to weed infestation. In the near future, agricultural labour will become scarce and expensive, as the drift from the village to cities unlikely to be reversed. Therefore, it is necessary to develop cheaper method of weed control with either herbicides or their combinations with mechanical methods. Weeds reduce crop yield by competing for light, water nutrients and carbon dioxide, interfere with harvesting and increase the cost involved in crop production. Control of weeds from the fields of maize is, therefore, very essential for obtaining good crop harvest. Weed control practices in maize resulted in 77 to 96.7% higher yield than weed check (Khan et al., 1998). Weeds can be controlled by cultural, biological and chemical measures. No doubt cultural methods are still useful tools but are laborious, time consuming and getting expensive. Moreover, the labour problem is becoming acute day by day and it will not be possible and economical to stick the traditional cultural weed control practices (Oreck & Dehne, 2004; Oerke, 2005). Keeping these factors in view, This experiment was conducted to study the "effect of different weed management control methods on growth an yield of maize (*Zea mays* L.)".

II. Materials And Methods

Field experiment was conducted during Kharif season of 2015 at Agricultural Research Field SHIATS Allahabad UP. The experiment was laid out in Randomized Block Design with three replications. There were 11

treatments (chemical, non-chemical, cultural and their combination weed management practices) Viz; Weed free, Hand weeding @ 20 & 45 DAS, Black polythene mulching, Paddy straw mulching, Atrazine @ 0.75 kg ha^{-1}, Atrazine @ 1.00kg ha^{-1}, Atrazine @ 1.50 kg ha^{-1}, Atrazine @ 0.75 kg ha^{-1} + Hand weeding @ 45 DAS, Atrazine @ 1.00 kg ha^{-1} + Hand weeding @ 45 DAS, Atrazine @1.50kgha^{-1} + Hand weeding @ 45 DAS, and Control plot. The recommended dose of fertilizer and spacing for maize was 160:60:40 NPK kg ha^{-1} and 60 cm x 30 cm respectively maintained for all the treatments. Full dose of phosphorus, potassium and half dose of the nitrogen through diammonium phosphate, muriate of potash and urea were applied at the time of sowing and remaining quantity of nitrogen was applied at kneeheight stage (as per the recommended package of practices). The herbicides were applied as pre-emergence on next day after sowing using Knapsack sprayer fitted with flat fan nozzle by mixing 500 litres of water per ha. Soil samples were collected before sowing and observations on plant height, weed density, weed dry weight, grain length per cob, 1000 seed weight and grain yield were recorded, weed control efficiency and weed index with respect to different treatments were calculated.

III. Results And Discussion

Weed Density and Weed Dry weight

Weed density (no.m^{-2}). The data regarding the effect of different weed control methods, all weed control treatments reduced the weed population significantly compared with un weeded plot. There many weed species that were observed in the field experiment, but the major weed species were:- *Cyperus rotundus, Sorghum halepense, Sperguala arvensis, Parthenium hysterophorus L., Echinochloa colona* and *Cynodon dactylon*. Similar weeds prevailing in Rabi maize has been reported by Singh and Rajput, (1995). At maturity showed that maximum reduction in density of the weeds was observed with the treatment T3 and T4 (61.0) followed by T9. Comparatively less reduction in weed density was observed with T11 (156.0). Many other research workers have also been reported that weed seeds remain under dry conditions and germinate upon availability of moisture (Unger *et al.,* 1999; Tomar *et al.,* 2003).

Weed dry weight (g m^{-2}). The data regarding to weed dry weight was found to be significant differences and the weed continued to decrease up to 100 DAS (Table II). Similar trend was found in case of weed dry biomass as observed in weed density. The dry weight of *Cyperus rotundus, Sorghum halepense, Sperguala arvensis, Parthenium hysterophorus Echinochloa colona* and *Cynodon dactylon* at maturity was maximum reduced with the treatment T11 (83.17g), Comparatively less reduction in weed density was observed with T3 (20.70) and T3 (20.70). Similar finding was reported by Pandey and Prakash (1999).

Yield Component and Yield of Maize

Plant height (cm). The data regarding plant height of maize as affected by different weed control method were found statistically significant difference (Table II). On the other hand, all weed control methods showed significant effect on plant height of maize. The maximum plant height was observed with T9 (210.53 cm) and T3 (203.20 cm). And the minimum plant population was observed in control plot. Ahmad et al. (1988), Behera *et al.* (1998) and Williams *et al.* (1998) have reported similar results obtained from various weed control techniques.

Number of cob (plant^{-1}). The effect on number of cob plant^{-1} was significantly different during the study period (Table I). It is evident from the data that number of cob plant^{-1} of maize is affected significantly by different weed control methods during study years being maximum with T9 (1.60) followed by T3 and T4 (1.47) . The rest of the treatments were equally affective during years of study. The minimum number of cob (plant^{-1}) was reported in control plot. The probable reason for significant increase in number of cob plant^{-1} was observed with succession increase in nitrogen doses up to 100 kg N ha^{-1} and decrease in plant height with decrease in nitrogen doses. Similar finding has been reported by Das *et al.* (2004) and Subhendu *et al.* (2004).

Length of cob (cm). The data given in (Table II) showed that various weed control treatments significantly affected the cob length. The comparison of individual means revealed that the cob length in treatment (T9) Pre-emergence Atrazine @ 1.0 kg ha^{-1} + one hand weeding @ 45 DAS was maximum (18.40 cm) which was statistically at par with Straw mulching (15.17 cm). Latter was followed by weed free (15.00 cm) which was statistically at par with Hand weeding @ 20 and 45 DAS. The minimum cob length was recorded in weedy check plots.

1000-Grain weight (g) of maize. The data regarding 1000- grain weight in Table II reveals that there was a significant difference between the treatment. But it was significantly affected by different weed control treatments being maximum with T9 (203.48g) closely followed by T2 (188.34g) and T3 (186.82g). This increase in 1000-grain weight was possibly due to effective weed control, which resulted in healthy crop stand

and ultimately higher grain weight. These results get support from the previous findings of Ahmad *et al.* (1988) and Khan *et al.* (1991). Kandasamy and Chandrasekhar (1998) reported that the traditional (non-chemical) method of weed control effectively minimized weed competition and maximized maize yield.

Grain yield (tones ha^{-1}). The data (Table II) reveal that, between study years, a significant difference in grain yields of maize was observed being maximum in T9 application of Atrazine @ 1.0 kg ha^{-1} + one hand weeding @ 45 DAS (8.74). This might be due to minimum weed seed bank and eradication of weeds providing healthy environment for crop plant growth during this year. A significant affect of different weed control methods was observed on grain yield of maize during study year. Among various weed control methods, it showed promising results in T9 and T2 (8.74 and 8.64 t/ha) during study year. A 34% increase in grain yield of maize was observed due to effective weed control as compared with treatment T11 (un weeded plot). Jehangeri *et al.* (1984) reported that application of selective herbicides provided 65 to 90% weed control and 100 to 150% more grain yield of maize than un-weeded control.

Harvest index (%) of maize. The data in (Table 1.) indicate that a significant difference in % harvest index of maize. The maximum harvest index was observed in treatment T9 (41.90) . This was probably due to adequate crop yield during the year. The % values for harvest index of maize crop as affected by different weed control methods showed significant differences among the treatments during the study years. The increase in percentage of harvest index as compared to WC1 may be attributed to adequate suppression of weed growth due to some residual effect as well and more availability of plant nutrients to maize crop, which favoured better utilization of photo-assimilates for grain yield formation. Similar results have also been discussed by Salisbury and Ross (1978), and Ahmad *et al.* (1988).

Table: 1.Total number of weeds, weed dry weight (g), weed control efficiency (%) and weed Index(%) as Influenced by various treatments.

Treatments	No. of weed/m^2	Weed dry weight (g)	No. Cobs plant^{-1}	Harvest index (%)
1. Weed free	88.33b	28.37c	1.40b*	34.20b
2. Hand weeding @ 20 and 45 DAS	88.33b	26.50c	1.47a	39.60b
3. Paddy straw mulching	61.00b	20.70d	1.47a	35.60c
4. Black polythene mulching	61.00b	21.33c	1.40b*	32.70d
5. Pre-emergence Atrazine @ 0.75 kg ha^{-1}	135.67a	28.33c	1.13c	32.70d
6. Pre-emergence Atrazine @ 1.0 kg ha^{-1}	141.33a	29.50b	1.13c	31.70d
7. Pre-emergence Atrazine @ 1.50 kg ha^{-1}	142.33a	26.67c	1.00c	38.00b
8. Pre-emergence Atrazine @ 0.75 kg ha^{-1} + one hand weeding @45 DAS	92.33b	22.50c	1.33b	34.80c
9. Pre-emergence Atrazine @ 1.0 kg ha^{-1} + one hand weeding @ 45 DAS	75.00b	20.50d	1.60a*	41.90a*
10. Pre-emergence Atrazine @ 1.50 kg ha^{-1} + one hand weeding @ 45 DAS	141.00a	36.43b	1.13c	37.70b
11. Control plot (un weeded plot)	156.0a*	83.17a*	0.27d	31.80e
F-test	S	S	S	S
S.Ed (±)	18.094	3.410	0.091	0.528
CD (P=0.05)	37.347	7.038	0.188	1.090

Table2. Yield and cost benefit ratio of maize as influenced by different treatments.

Treatments	Plant height (cm)	Length of corn (cm)	1000 seeds weight. (g)	Grain Yield (t/ha)	**B:C ratio**
1. Weed free	186.40b	15.00a	172.95	5.29c	2.25
2. Hand weeding @ 20 and 45DAS	193.27b	14.63a	**188.34**	**8.64a**	**2.44**
3. Paddy straw mulching	201.87a	15.17a	186.82	5.98b	**2.48**
4. Black polythene mulching	203.20a	13.93a	165.56	4.25d	1.95
5. Pre-emergence Atrazine @ 0.75 kg ha^{-1}	202.47a	13.73a	158.84	3.93e	1.87
6. Pre-emergence Atrazine @ 1.0 kg ha^{-1}	190.47b	13.63a	147.14	3.71e	1.79
7. Pre-emergence Atrazine @ 1.50 kg ha^{-1}	169.73c	13.20b	170.11	3.23e	1.83
8. Pre-emergence Atrazine @ 0.75 kg ha^{-1} + one hand weeding @45 DAS	195.33b	14.37a	157.19	3.97e	1.94
9. Pre-emergence Atrazine @ 1.0 kg ha^{-1} + one hand weeding @ 45 DAS	**210.53a***	**18.40a***	**203.48a***	**8.79a***	**3.40a***
10. Pre-emergence Atrazine @ 1.50 kg ha^{-1} + one hand weeding @ 45 DAS	179.67c	13.83a	151.94	3.62f	1.92
11. Control plot (un weeded plot)	**109.47d**	**7.50c**	**68.30g**	**0.05g**	**0.82**
F-test	S	S	S	S	
S.Ed (±)	5.895	2.333	3.568	0.103	

CD (P=0.05)	12.168	4.816	7.363	0.212	

IV. Conclusion

From the results of the experiments, it is concluded that **pre-emergence application of Atrazine @ 1.00 kgha^{-1} + one hand weeding at 45 DAS** was found to be the best and economic method for obtaining highest corn yield for about **(8.79 t/ha)** as compared with other treatment, and could keep the weed density, weed dry weight reasonable at lower level, & the benefit cost ratio **(3.40)**. Since this is based on one year experiment, further trials are recommended to confirm the results.

References

[1]. Ahmad, S., M.S. Zahir, Z.A. Cheema and R.M. Iqbal, 1988. Effect of weed control practices on weed population and yield of maize. Pakistan J. Weed Sci. Res., 1: 67–71

[2]. Behera, B., G.S. Singh, P.C. Pradhan and P.C. Senapati, 1998. Weed management in runner-bean (Phaseolus coccineus) + maize (Zea mays) intercropping under rain-fed conditions. Indian J. Agric. Sci., 68: 697–8

[3]. Floot, H.W.G., 1996. Effect of the harrowing on integrated cultivation of winter wheat. Publicatie-proefstation-voor-de-Akkerbouw-en-de-Greoenteteelt-in-de-volleground-lelystad, 81A: 118–20

[4]. Jehangeri, G.K., C.A. Sahibzada and M. Bashir, 1984. Effect of selective herbicides on yield of maize. Frontier J. Agric. Res., 10: 67–76

[5]. Kamble et al., 2015. Effect of weed management practices on weed growth and yield of maize (Zea mays L.) Int. J. Sci. Envi. and Techn. Vol.4, No.6 2015, 1540-1545.

[6]. Kandasamy, O.S. and C.N. Chandrasekhar, 1998. Comparative efficacy of chemical and non-chemical methods of weed management in rainfed maize (Zea mays L.). Indian J. Weed Sci., 30: 201–3.

[7]. Khan, S.A., N. Hussain, I.A. Khan, M. Khan and M. Iqbal. 1998. Study on weed control in maize. Sarhad J. Agri., 14(6): 581-586.

[8]. Muhammad R. et al., 2007. Yield components of maize as Affected by Various weed control methods Under Rain fed Condition of Pakistan. Int. J. Biol., Vol. 9 No.1

[9]. Nadeem M.A. *et al.,* (2008). Growth and yield response of Autumn planted maize (*Zea mays* L.) and its weed to reduced doses of herbicide application in combination with Urea. *Pak. J. Bot.,* 40 (2): 667-676. 2008.

[10]. Oerke, E.C. 2005. Crop losses to pest. *J. Agri. Sci*., 143: 1-13.

[11]. Oerke, E.C. and H.W. Dehne. 2004. Safeguarding Production- losses in major crops and the role of crop production. *Crop Protec*., 23: 275-285.

[12]. Pandey, A.K., Prakash, R.D., Singh and Mani, V.P., 1999. Effect of intercropping pattern of maize and soybean on yield and economics under mid- hills of N-W Himalayas Ann. Agric. Res. . 20: 354-359.

[13]. Salisbury, F.B. and C.W. Ross, 1978. Allelochemicals and allelopathy. *In: Plant Physiology*, (2nd Ed.), P: 357. Wadsworth Publication Co. Inc. Belmont, California

[14]. Tomar, R.K., J.P. Singh, R.N. Garg, V.K. Gupta, R.N. Sahoo and R.P. Arora, 2003. Effect of weed management practices on weed growth and yield of wheat in rice based cropping system under varying levels of tillage. *Annal. Pl. Protect Sci*., 11: 123–8

[15]. Unger, P.W., S.D. Miller and O.R. Jones, 1999. Weed seeds in long-term dry-land tillage and cropping system plots. *Weed Res. Oxford*, 39: 213–23