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Effect of integrated weed management practices on growth and yield of maize (*Zea mays* L) in Uttarakhand

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Abstract

Field experiment was conducted at Uttaranchal University Experimental Farm, Dehradun to evaluate the effect of integrated weed management in Maize during *Kharif* 2017. The experiment was laid out in randomized block design (RBD) with seven treatments and three replications by using *Kanchan* variety. The treatment comprises of Control (weedy check) (T₁), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + hand weeding at 40 DAS (T₂), 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS (T₃), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS (T₄), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + Mulching (T₅), 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + Mulching (T₆), Weed free plot (T₇). The soil of the experimental field was alluvial soil which low in available nitrogen, medium in available phosphorus and high in available potassium. The result of the study clearly showed that 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS (T₃) significantly increases the growth and yield components of Maize. These treatments were significantly superior with the rest in reducing the weed infestation and ultimately increasing the cobs yield. So it may be concluded that application of Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS and one hand weeding on 40 DAS is considered to be a judicious recommendation to control weeds to maize.

Keywords: Integrated Weed Management (IWM), mulching, maize, pre and post emergence weedicides

Introduction

Maize is one of the most important cereal crops in the world agriculture economy both as food for humans and feed for animal. The crop has high yield potential, wider adaptability, grown throughout the world. Maize is known as the "Queen of cereals". It is the third most important crop of India after rice and wheat that occupies an area about 8.57 M/ha with an average productively of about 2.57 t ha⁻¹ compared to the world average productively of about 4.94 t ha⁻¹ (Anonymous *et al.* 2014) [1]. Maize serves as source of Basic raw material for number of industrial products, viz., starch, oil, protein, alcoholic beverages food, Sweeteners, cosmetic and bio-fuel etc. It contributes for food (25%), Animal feed (12%), poultry feed (49%), starch (12%), brewery (1%) and seed (1%) Dass *et al.* (2008) [3].

Weed creates an acute problem in rainy season crop they complete for nutrients. Weed control in maize can be highly sophisticated because of wider spacing. Mechanical control of weed growing between the rows was labour intension. Use to Integrated approach would make weed control more acceptable to farmer which will not change the existing agronomic practices but will allow for complete control of weeds usage of pre-emergence herbicide assumes greater important in view of their effectiveness from initial stage. Keeping above point in mind, an experiment entitled "Effect of integrated weed management practices on growth and yield of maize (*Zea mays* L) in Uttarakhand" was designed.

Materials and Methods

The field experiment was carried out 2017-18 at experimental field of Uttaranchal University, Dehradun. It is a district of Uttarakhand state in northern India. It is located in the western Himalayan region 1, the location of experimental farm is situated at 30°33' North latitude and 77°94' East longitude at an altitude of 597 m above mean sea level (MSL). The initial soil pH, electrical conductivity, organic carbon, available alkaline potassium permanganate (KMnO₄) nitrogen (N), Olsen phosphorus (P) and ammonium acetate (NH₄OAc) potassium (K) were 7.76, 0.15 dSm⁻¹, 234.5 kg ha⁻¹, 9.45 kg ha⁻¹, and 176.50 kg ha⁻¹, respectively.

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The treatment comprises of Control (weedy check) (T₁), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + hand weeding at 40 DAS (T₂), 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS (T₃), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS (T₄), Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + Mulching (T₅), 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + Mulching (T₆), Weed free plot (T₇). Cob length, cob diameter, Test weight (100 grain weight), Individual cob weight (g), Grain number cob⁻¹ and Grain number cob⁻¹ were observed.

Result and Discussion

Cob length (cm), Cob diameter and Test weight (100 grain weight)

The data recorded on cob length of Maize are presented in

Table 1: Effect of treatments on cob length, cob diameter and test weight

Treatments	Cob length	Cob diameter	Test weight
T1 - Control (weedy check)	15.10	9.96	184
T2 - Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + hand weeding at 40 DAS.	18.45	11.50	214
T3- 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS.	19.53	11.56	235
T4- Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS.	17.85	11.33	192
T5- Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + Mulching	16.76	10.43	196
T6- 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS + Mulching	17.16	10.98	208
T7- Weed free plot	16.63	10.33	192
SEm±	0.273	0.209	1.955
CD (5%)	0.85	0.65	6.089

Weedy check report considerably lowest yield assign viz., cob distance, cob diameter, individual cob weight, number of grains cob⁻¹ and stover yield. This may be due to critical weed contention during the crop development. Hand weeding offer satisfactory weed control, providing a perfect weed free environment all throughout the critical period of crop growth and offering the highest yield components of the crop in terms of cob length, cob diameter, individual cob weight, number of grains cob⁻¹ and stover yield. This result is in agreement with the findings of Bakhtair Gul *et al.* (2011)^[2] and Hawaldar and Agasimani (2012)^[5].

Individual cob weight (g), grain number cob⁻¹ and stover yield

The data pertaining to individual cob weight are presented in Table 2. Among the treatments, 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS recorded the highest individual cob weight of 297.71 g. It was on par with atrazine 1 kg ha⁻¹ as pre emergence herbicide on 3DAS + one hand weeding at 40 DAS. It was followed by Atrazine 1

kg ha⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS. The least individual cob weight of 189.73 g was recorded in weedy check. All the treatment exerts significant influence over the number of grains cob⁻¹. Among the treatments, 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS recorded the highest grain number cob⁻¹ of 293 numbers. It was on par with atrazine 1 kg ha⁻¹ as pre emergence herbicide on 3 DAS + one hand weeding at 40 DAS with grain number cob⁻¹ of 278. It was followed by Atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-d 0.5 kg ha⁻¹ as post-emergence at 21 DAS. The least grain number cob⁻¹ of 246 was recorded in weedy check. Among the treatments, 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS recorded the highest stover yield of 19231 kg ha⁻¹. It was on par with treatment atrazine kg ha⁻¹ as pre emergence herbicide on 3DAS + one hand weeding at 40 DAS with 18935 kg ha⁻¹ stover yield. The least stover yield of 12565 kg ha⁻¹ was recorded in weedy check.

Table 2: Effect of different treatments on individual cob weight, grain number cob and stover yield

Treatments	Individual cob weight (g)	Grain number cob ⁻¹	Stover yield (Kg ha ⁻¹)
T1 - Control (weedy check)	189.73	246	12565
T2 - Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + hand weeding at 40 DAS.	293.76	278	18935
T3- 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS.	297.71	293	19231
T4- Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS.	279.64	270	18243
T5- Atrazine 1 kg ha ⁻¹ as pre-emergence herbicide at 3 DAS + Mulching	227.65	263	17051
T6- 2, 4-D 0.5 kg ha ⁻¹ as post-emergence at 21 DAS + Mulching	215.53	256	16259
T7- Weed free plot	271.42	261	17939
SEm±	2.705	2.24	13.92
CD (5%)	8.427	6.98	43.38

As regard to the effect of weed control measures, atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + one hand weeding at 40 DAS registered the higher values of yield components. In addition, manual weeding improves soil structure, aeration, water penetration and the availability of some nutrient for crop plants. It manage be connect to the suggestively low weed population, dry matter aggregation of weeds and therefore higher Stover yield, high count of cobs plant⁻¹, higher count of grains cob⁻¹ and hundred grain weights in this treatment. These results are in agreement with the findings of Sunitha *et al.* (2010) ^[6] and Diego *et al.* (2012) ^[4].

Conclusion

From the above findings, 2, 4-D 0.5 kg ha⁻¹ as post-emergence at 21 DAS + hand weeding at 40 DAS recorded the least weed count, weed biomass, the highest WCI favoring higher yield attributes and cob yield during the cropping period. It was found to be efficient method for increasing the cob yield in Maize. Due to inadequate labour and high labour cost and economics, application of, atrazine 1 kg ha⁻¹ as pre-emergence herbicide at 3 DAS + one hand weeding at 40 DAS is considered to be the best recommendation for Maize farmers. This practice also recorded with higher net return per rupee investment and efficient weed control.

Hence from the study it may be concluded that the application of atrazine 1 kg ha⁻¹ as pre-emergence herbicide + one hand weeding at 40 DAS is considered to be a judicious recommendation to increase the yield of Maize in view of inadequate labour and higher weeding cost.

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