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Growth and Yield of Maize as Influenced by Different Weed Management Treatments

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ABSTRACT

A field experiment was conducted at Agricultural College Farm, Bapatla, during *kharif*, 2015 to study the effect of pre-emergence (Atrazine @ 1.0 kg a.i. ha^{-1} and pendimethalin @ 1.5 kg a.i. ha^{-1}) and post-emergence herbicides (halosulfuron methyl @ 90 g ha^{-1}) on growth and yield of maize. The experimental results indicated that the highest plant height (cm), drymatter production (kg ha^{-1}) and yield at harvest of maize was with weed free and it was statistically on par with hand weeding at 20 and 40 DAS. Among various herbicides tested, pre-emergence application of atrazine @ 1.0 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} registered the highest plant height (cm), drymatter production (kg ha^{-1}) and yield of maize at harvest and this was on par with pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} and these two were comparable with hand weeding at 20 and 40 DAS.

Key words: *Maize, Pre and post-emergence herbicides, Yield.*

Maize (*Zea mays* L.) is one of the important cereal crop grown after rice and wheat in India and it plays a vital role in agricultural economy both as food for human beings and feed for livestock. The crop of immense potentiality, special characteristics that include its carbon pathway (C_4), wider adaptability with high versatile use and therefore called as "Queen of cereals". In India, it is grown over an area of 9.43 million hectares with production of 24.35 million tonnes and productivity of 2583 kg ha^{-1} (Ministry of Agriculture, 2013-2014). The potentiality of maize crop can be fully exploited by adopting suitable agronomic practices. Among them, weed management plays a significant role in enhancing the crop yield. Initial slow growth and wider row spacing of crop provide enough opportunity for the weeds to emerge and offer severe competition. Maize, being grown during rainy season, suffers heavily due to severe weed infestation owing to congenial weather conditions of monsoon, which provides suitable temperature, high humidity and adequate moisture for weed growth. In the rainy season, emergence of maize and weeds start simultaneously and first 20 to 30 days are most critical for crop-weed competition point of view (Porwal, 2000). Rainy season corresponds to heavy and continuous rains besides scarcity of labour, renders difficult to control the weeds by conventional, cultural and mechanical methods. Thus, chemical weed control assumes significance in the cultivation of maize. Even though herbicides are effective in controlling weeds, application of single pre-emergence or post-emergence herbicide does not provide satisfactory weed control for desired period (Malviya and Singh, 2007). Thus suitable study on weed control strategies in maize with sequential use of pre-emergence and post-emergence herbicides has been a need. Keeping this in view an investigation was carried out to study the efficacy of different herbicides in controlling weeds.

MATERIAL AND METHODS:

A field experiment was conducted at Agricultural College Farm, Bapatla during *kharif*, 2015 on clay soils, slightly alkaline in reaction, low in organic carbon and nitrogen, medium in available phosphorous and high in available potassium. The experiment consisted of eight treatments viz., weedy check (T_1), weed free (T_2), hand weeding at 20 and 40 DAS (T_3), atrazine @ 1.0 kg a.i. ha^{-1} as pre-emergence application at 2 DAS (T_4), halosulfuron methyl @ 90 g ha^{-1} as post-emergence application at 20 DAS (T_5), pendimethalin @ 1.5 kg a.i. ha^{-1} as pre-emergence application at 2 DAS (T_6), atrazine @ 1.0 kg a.i. ha^{-1} as pre-emergence application at 2 DAS + halosulfuron methyl @ 90 g ha^{-1} as post-emergence application at 20 DAS (T_7), pendimethalin @ 1.5 kg a.i. ha^{-1} as pre-emergence

application at 2 DAS + halosulfuron methyl @ 90 g ha^{-1} as post-emergence application at 20 DAS (T_8) . The experiment was laid out in a Randomized block design and replicated thrice. The maize hybrid '30 V-92' was sown on 26th August, 2015 by hand dibbling. Thinning and gap filling was done at 10 DAS by keeping one seedling $hill^{-1}$. Recommended dose of 120:60:60 kg ha^{-1} nitrogen, phosphorus and potassium were applied in the form of urea, SSP and MOP. Entire quantity of phosphorus, potassium and one third of the N were applied as basal at the time of sowing. Remaining N was applied in two equal splits one at knee-high stage and the other at tasseling stage. Recommended agronomic practices and plant protection measures were followed. The data on plant height, drymatter production and yield were recorded as per standard statistical procedures.

RESULTS AND DISCUSSION:

Plant height (cm)

The plant height was significantly influenced by different weed management treatments. Weedy check (T_1) recorded significantly lower plant height. Significantly highest plant height (248.3 cm) was recorded (Table 1) with weed free (T_2) and this was on par with hand weeding at 20 and 40 DAS (T_3). Among the herbicide treatments, maximum (230.7 cm) plant height was registered with pre-emergence application of atrazine @ 1.0 kg ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_7) and it was found that statistically at par with pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_8). However these two treatments were on par with the treatment that received hand weeding at 20 and 40 DAS. The highest plant height in weed free might be due to maintenance of weed free condition for entire crop growth where as in T_7, initial weed population was effectively controlled by persistence activity of pre-emergence herbicide and later emerged weeds by post-emergence herbicide could be attributed to this. These results are in confirmity with the findings reported by Sharma *et al*. (1998), Pandey *et al*. (2000), Sinha *et al*. (2001) and Walia *et al*. (2007).

Drymatter production (kg ha^{-1})

Weed free (T_2) registered significantly highest (18932 kg ha^{-1}) drymatter production (Table 1) and it was statistically comparable with hand weeding at 20 and 40 DAS (T_3). This is due to effective weed control achieved at all growing stages. With regard to herbicide treatments, pre-emergence application of atrazine @ 1.0 kg ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_7) recorded maximum drymatter production (16516 kg ha^{-1}) which was at par with pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_8) and significantly superior to pre-emergence application of atrazine @ 1.0 kg a.i. ha^{-1} (T_4), pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} (T_6) and post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_5). Reduced density and dry weight of weeds providing an opportunity for maize to utilize higher quantum of nutrients. This might have enabled the extension of leaf area, thereby providing an opportunity time for plants to increase the photosynthetic rate which in turn, could have led to higher production of drymatter in T_7 and T_8 treatments. Similar findings were also observed by Sinha *et al*. (2001) and Malviya and Singh (2007).

Yield (kg ha^{-1})

The kernel and straw yield of maize (Table 1) was significantly influenced by the various weed management treatments. Among the treatments tested, weed free (T_2) was found to be significantly highest (Table 1) with regard to kernel yield in maize. Highest weed control efficiency and nutrient uptake by crop might have resulted in increased yield attributes and there by highest kernel yield in this treatment. The results of hand weeding at 20 and 40 DAS (T_3) was comparable with T_2. Among the herbicides, maximum kernel yield was recorded with pre-emergence application of atrazine @ 1.0 kg ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_7) and pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_8) treatments and these two treatments were found to be statistically on par with T_3. In T_4, T_6 and T_5 treatments, kernel yield of maize was statistically identical with each other. The lowest kernel yield was registered with weedy check (T_1). Similar trend was observed with stover yield under various weed management treatments. These results were similar with that of Malviya and Singh (2007), Srividya *et al.* (2011), Sanodiya *et al*. (2013) and Singh *et al*. (2014).

Table 1. Plant height, drymatter production and yield of maize as influenced by different weed management treatments.

Treatments	Plant height (cm)	Drymatter production (kg ha^{-1})	Kernel yield (kg ha^{-1})	Stover yield (kg ha^{-1})
T_1 : Weedy check	189.5	9677	3205	4845
T_2 : Weed free	248.3	18932	7435	9177
T_3 : Hand weeding at 20 and 40 DAS	237.0	17373	6740	8350
T_4 : Atrazine @ 1 kg a.i ha^{-1} (PE i.e 2 DAS)	209.9	14224	5137	6941
T_5 : Halosulfuron methyl @ 90 g ha^{-1} (PoE i.e 20 DAS)	200.5	13018	4781	6498
T_6 : Pendimethalin @1.5 kg a.i ha^{-1} (PE i.e 2 DAS)	206.5	13766	4990	6746
T_7 : Atrazine @1 kg a.i. ha^{-1} (PE) + halosulfuron methyl @ 90 g ha^{-1} (PoE)	230.7	16516	6495	8184
T_8 : Pendimethalin @ 1.5 kg a.i ha^{-1} (PE) + halosulfuron methyl @ 90 g ha^{-1}(PoE)	225.6	15909	6265	7854
SEm±	6.78	620.9	297.3	347.8
CD (P = 0.05)	20.6	1883	901	1054
CV (%)	5.4	7.2	9.1	8.2

PE: Pre-emergence PoE: Post-emergence

Conclusion

Among the chemical weed control treatments, the highest plant height, drymatter production and yield of maize were recorded with pre-emergence application of atrazine @ 1.0 kg ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_7) and pre-emergence application of pendimethalin @ 1.5 kg a.i. ha^{-1} + post-emergence application of halosulfuron methyl @ 90 g ha^{-1} (T_8) treatments however, these two treatments were comparable with hand weeding treatment.

LITERATURE CITED

Malviya A and Singh B 2007 Weed dynamics, productivity and economics of maize (*Zea mays*) as affected by integrated weed management under rainfed condition. *Indian Journal of Agronomy,* 52 (4): 321-324.

Pandey A K, Prakash V, Singh R D and Mani V P 2000 Effect of herbicide mixtures and cultural practices on maize and associated weeds under mid-hills of N-W Himalayas. *Annals of Agricultural Research*, 21 (1): 58-64.

Porwal M K 2000 Economics of weed-control measures in winter maize (*Zea mays*). *Indian Journal of Agronomy,* 45 (2): 344-347.

Sanodiya P, Jha A K and Shrivastava A 2013 Effect of integrated weed management on seed yield of fodder maize. *Indian Journal of Weed Science*, 45 (3): 214-216.

Sharma V, Thakur D R and Sharma J J 1998 Effect of metolachlor and its combination with atrazine on weed control in maize (*Zea mays*). *Indian Journal of Agronomy*, 43 (4): 677-680.

Singh S, Hiremath S M, Yadav S L, Meena L K and Chouhan B S 2014 Growth and yield of maize as influenced by integrated weed management practices. *Annals of Agri-Bio Research*, 19 (3): 422-424.

Sinha S P, Prasad S M and Singh S J 2001 Response of winter maize (*Zea mays*) to integrated weed management. *Indian Journal of Agronomy*, 46 (3): 485-488.

Srividya S, Chandrasekhar K and Veeraraghavaiah R 2011 Effect of tillage and herbicide use on weed management in maize (*Zea mays L.*). *The Andhra Agricultural Journal*, 58 (2): 123-126.

Walia U S, Singh S and Singh B 2007 Integrated control of hardy weeds in maize (*Zea mays L.*). *Indian Journal of Weed Science*, 39 (1&2): 17-20.

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