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# EFFECT OF POST-EMERGENCE HERBICIDE TEMBOTRIONE ON WEED CONTROL AND YIELD IN HYBRID MAIZE

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## Abstract

To minimize weed loss in hybrid maize, several weed control methods are available, such as mechanical, cultural, chemical and biological methods. Among them traditional hand weeding is the most efficient and widely accepted practice of weed control, however it is labor intensive, time consuming and costly due to high wages that reduce crop profits. In view of these limitations, the use of herbicides is the best way to provide quick and economical control of weed problems. With this backdrop, a field experiment was conducted to know the effect of using new herbicide tembotrione with other weed control methods on the weed and crop parameters in maize (*Zea mays L.*) crop. The treatments *viz.*,$T_{1-}$Unweeded control, $T_{2-}$Twice hand weeding (20 and 40 DAS), $T_{3-}$ Alachlor @ 1.5 kg ha$^{-1}$ (pre), $T_{4-}$ Atrazine @1.0 kg ha$^{-1}$ (pre), $T_{5-}$Tembotrione @ 100 g ha$^{-1}$(post), $T_{6-}$ Alachlor @ 1.5 kg ha$^{-1}$ fb Hand weeding (30 DAS), $T_{7-}$ Atrazine @ 1.0 kg ha$^{-1}$ fb Hand weeding (30 DAS),$T_{8-}$ Alachlor @ 1.5 kg ha$^{-1}$(pre) fb Tembotrione @ 100 g ha$^{-1}$(post)and $T_{9-}$ Atrazine @ 1.0 kg ha$^{-1}$(pre) fb Tembotrione @ 100 g ha$^{-1}$ (post ) were compared. The results of the experiment revealed that lesser weed biomass and highest weed control index (92.55 per cent),with maximum grain and stover yield were achieved in the plots applied with Atrazine @ 1.0 kg ha$^{-1}$ (pre) fb Tembotrione @ 100 g ha$^{-1}$ (post)which was on par with the treatment twice hand weeding. Among the weed management practices tried highest weed biomass with lowest grain yield and stover yield was recorded in unweeded control.

***Key words :*** Maize, tembotrione, weed control index, yield.

## Introduction

Maize is one of the most important food crop in the world and it occupies a prominent position in global agriculture after wheat and rice. Maize is gaining popularity at a faster rate due to its increasing demand particularly as livestock feed besides being used as food for human and also as an industrial raw material. The productivity of maize in India is declining due to an array of biotic and abiotic factors. The low yield of maize under Indian conditions may be attributed by number of factors, among them weeds rank as prime enemy. Besides quantitative effect on yield, weeds deteriorate the quality of produce through physical presence of the weed seeds and debris. Timely and effective weed control will go a long way in gaining crop yields. Weeds emerge fast, grow rapidly and compete with the crop for growth resources *viz.*, nutrients, moisture, sunlight and space during entire vegetative growth and early reproductive stages of maize (Oerke and Dehne, 2004). The yield loss in maize ranges from 28-93 per cent due to severe weed infestation (Karki *et al.*, 2014). To minimize the weed losses, several weed control methods are available such as mechanical, cultural, chemical and biological methods. With the gradual increase in industrialization of our country, coupled with the raising standard of living and literacy, manual labour is becoming scarce. Traditional hand weeding is the most efficient and widely adopted practice of weed control, however it is labour intensive, and time consuming and costly due to high wage rates which narrowed down the profits of the cultivation. Keeping in view of these limitations, the use of herbicides is the best way which gives a quick and cost-effective solution to numerous weed problems in maize field and hence has gained an important position over conventional methods (Chikoye *et al.*, 2003). However, the continuous use of single herbicide or herbicides having the same mode of action may lead to weed shift. Hence it is necessary to test combination of the existing and new herbicides to control mixed weed flora in hybrid maize.

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## Materials and Methods

A field experiment was conducted at the experimental farm, department of Agronomy, Faculty of Agriculture, Annamalai University during summer (Feb-May, 2016) to know the effect of pre and post emergence herbicides on weed control, growth and yield of irrigated maize. The experiment was laid out adopting randomized block design (RBD) with 9 treatments replicated thrice. The experimental soil was clay loam. The maize hybrid NK-6240 was sown with the spacing of 60x20 cm and all the agronomic practices followed as per the recommendations. The data on weed biomass was recorded at 60 DAS and weed control index (WCI) was computed, and for grain yield and straw yield the data was collected at the time of harvest. The treatments compared in the experiment were,$T_{1-}$Unweeded control, $T_{2-}$Twice hand weeding (20 and 40 DAS), $T_{3-}$ Alachlor @ 1.5 kg $ha^{-1}$ (pre), $T_{4-}$ Atrazine @1.0 kg $ha^{-1}$ (pre), $T_{5-}$ Tembotrione @ 100 g $ha^{-1}$(post), $T_{6-}$ Alachlor @ 1.5 kg $ha^{-1}$ fb Hand weeding (30 DAS), $T_{7-}$ Atrazine @ 1.0 kg $ha^{-1}$ fb Hand weeding (30 DAS),$T_{8-}$ Alachlor @ 1.5 kg $ha^{-1}$(pre) fb Tembotrione @ 100 g $ha^{-1}$(post)and $T_{9-}$ Atrazine @ 1.0 kg $ha^{-1}$(pre) fb Tembotrione @ 100 g $ha^{-1}$ (post). In the unweeded control treatment, the weed flora was allowed to grow without any control measures. In twice hand weeding, twice hand weeding were taken up, one at 20 DAS and again at 40 DAS (Days After Sowing). In herbicide treatments, required quantities of atrazine and alachlor were sprayed as pre-emergence at 3 DAS on soil at optimum moisture content and required quantity of tembotrione was sprayed as post-emergence at 21 DAS. Hand weeding to supplement herbicides in treatments concerned was done on 30 DAS. The herbicides were applied through knapsack sprayer fitted with a flood jet nozzle using 500 liters of water per hectare. Observations were recorded on weed parameters and crop parameters and economics were worked out. The experimental data were statistically analysed with the methods described by Panse and Sukhatme, 1978.The data involving percentage values were transformed by angular transformations for analysis. For, significant results, the critical differences were worked out at 5 per cent probability to draw statistical conclusions.

## Results and Discussion

The observations on weed biomass, weed control index, grain yield and stover yield are presented in the (Table 1). The weed species recorded in the experimental field were *Trianthema portulacastrum, Cynodon dactylon, Cyperus rotundus, Echinochloa colonum, Phyllanthus niruri and Cleome viscosa*..

### Weed biomass (g $m^{-2}$)

All the treatments significantly influenced the total weed biomass on 60 DAS. Among the weed management measures the least weed biomass was recorded by atrazine @ 1 kg $ha^{-1}$ (pre) fb tembotrione @ 100 g $ha^{-1}$ (post) of 11.41 g $m^{-2}$**.** However, this was on par with hand weeding twice by recording a lower weed biomass of 12.09 g $m^{-2.}$ The highest weed biomass of 153.24 g $m^{-2}$ was recorded with unweeded control. The combined effect of both herbicides especially in the early and later stages of the crop might have contributed for effective weed control that was reflected by recording lesser weed counts and weed biomass in maize as opined by Sharma and Badiyala (2014).

### Weed control index (WCI)

The weed control index computed at 60 DAS was observed shows significant difference among the weed control treatments. Among the maize weed control measures compared, Atrazine @ 1 kg $ha^{-1}$ (pre) fb Tembotrione @ 100 g $ha^{-1}$ (post) recorded the highest weed control index of 92.55 per cent. Similar reports of higher WCI recorded by pre emergence herbicide atrazine followed by the post-emergence application of HPPD (4-hydroxy-phenylpyruvate dioxygenase) inhibiting herbicide tembotrione were reported by Jonathon *et al.* (2013). This was on par with twice hand weeding, which registered the higher WCI of 92.11 per cent. This might be due to hand weeding twice which completely removed all categories of weeds including sedges. Unweeded control recorded maximum weed population and minimum weed control index, which could be due to unrestricted growth of weed population from seed to seed of crop. These results are in accordance with the results indicated by Tripathi *et al*. (2005) and Samanth *et al.* (2015). These treatments were significantly superior than the rest of the treatments in reducing the weed infestation. The least weed control index of 33.24 per cent was registered with the application of alachlor @ 1.5 kg ha $^{-1}$ on 3 DAS.

### Grain yield and Stover yield (kg $ha^{-1}$)

Grain yield is the final outcome of the crop growth and cumulative effect of growth and yield attributing characters. Among the weed control measures compared in maize, Atrazine @ 1 kg $ha^{-1}$ (pre) fb Tembotrione @ 100 g $ha^{-1}$ (post) recorded the highest grain yield of 6518 kg $ha^{-1}$ and stover yield of 8912 kg $ha^{-1}$ and it was on par with the twice hand weeding with grain yield of 6420 kg $ha^{-1}$ and stover yield of 8839 kg $ha^{-1}$. This might be due to better control of weeds during the critical period of crop weed competition and sustained availability of nutrients at early stage which favoured the growth and yield

**Table 1:** Effect of weed control treatments on weed biomass, weed control index ,grain yield and stover yield of hybrid maize.

| Treatments | Weed biomass ($g\ m^{-2}$) | WCI (per cent) | Grain yield ($kg\ ha^{-1}$) | Stover yield ($kg\ ha^{-1}$) |
|---|---|---|---|---|
| $T_1$ - Unweeded control | 153.24 | - | 2452 | 3412 |
| $T_2$ - Twice hand weeding | 12.09 | 73.68(92.11) | 6420 | 8839 |
| $T_3$ - Alachlor @ 1.5 kg $ha^{-1}$ | 102.3 | 35.20(33.24) | 3508 | 4760 |
| $T_4$ - Atrazine @ 1.0 kg $ha^{-1}$ | 79.74 | 43.83(47.96) | 4020 | 5416 |
| $T_5$ - Tembotrione @ 100 g $ha^{-1}$ | 61.43 | 50.71(59.91) | 4505 | 6128 |
| $T_6$ - Alachlor @ 1.5 kg $ha^{-1}$ fb 1 HW | 43.68 | 57.72(71.49) | 5157 | 6780 |
| $T_7$ - Atrazine @ 1.0 kg $ha^{-1}$ fb 1 HW | 19.31 | 69.20(87.39) | 6095 | 8297 |
| $T_8$ - Alachlor @ 1.5 kg $ha^{-1}$ fb Tembotrione @ 100 g $ha^{-1}$ | 35.04 | 61.43(77.13) | 5625 | 7504 |
| $T_9$ - Atrazine @ 1.0 kg $ha^{-1}$ fb Tembotrione @ 100 g $ha^{-1}$ | 11.41 | 74.16(92.55) | 6518 | 8912 |
| $S.E_D$ | 2.89 | 0.44 | 147.16 | 231.6 |
| CD(p=0.05) | 6.14 | 0.95 | 312 | 491 |

(Figures in parenthesis indicate the original values) (fb-followed by) (HW-Hand Weeding).

components of maize crop. This reflected by registering higher grain and stover yield of maize with these treatments (Khan *et al.*, 2012). Unweeded control registered the lowest grain yield of 2452 kg $ha^{-1}$ and stover yield of 3412 kg $ha^{-1}$.

## Conclusion

From the present study, it could be concluded that weed control by pre-emergence application of Atrazine @ 1 kg $ha^{-1}$ followed by post-emergence application of Tembotrione @ 100 g $ha^{-1}$ could be suggested as an effective weed control measure in combating weeds and there by achieving higher grain yield and stover yield in hybrid maize. Though hand weeding was on par with this by registering better weed control and higher yield, it would be advantageous in using herbicides during labour constrained situations.

## References

Chikoye, D., I.O. Akobundu, A.O. Isichei and F. Ekeleme (2003). Cover crops reduce weed seedbanks in maize-cassava systems in Southwestern Nigeria. *Weed Sci.*, **51(5):** 774-780.

Jonathon, R., Kohrt and Christy and L. Sprague (2013). Weed height and the inclusion of atrazine influence control of multiple-resistant Palmer amaranth with HPPD inhibitors. *Weed Tech.*, **(2):** 43.

Karki, T.B., S. Dahal, L.P. Amgain and B.K. Bhattachan (2014). Tillage, residue, fertilizer and weed management on phenology and yield of spring maize in Terai, Nepal. *Int. J. Applied Sci. and Biol.*, **2(3):** 328-335.

Khan, N., N.W. Khan and L.A. Khan (2012). Integration of nitrogen fertilizer and herbicides forfor efficient weed management in maize (*Zea mays*) crop. *Sarhad J. Agric. Sci.*, **28(3):** 457-463.

Oerke, E.C. and W. H. Dehne (2004). Safeguarding production-losses in major crops and the role of crop protection. *Crop prot.*, **23:** 275-285.

Panse, V.G. and P.V. Sukhatme (1978). Statistical methods for agricultural workers. ICAR, New Delhi, 3rd Edn.

Samanth, T.K., B.C. Dhir and B. Mohanty (2015). Weed growth, yield components, productivity, economics and nutrient uptake of maize as influenced by various herbicide applications under rainfed condition. *Scholar J. Agric. and Vet. Sci.*, **2(IB):** 79-89.

Sharma, A.R. and D. Badiyala (20140. All India coordinated research programme on weed management. *31st Annual rep.*, 59-70.

Tripathi, A.X., A.N. Tewari and A. Prasad (2005). Integrated weed management in rainy season maize (*Zea mays*) in central Uttar Pradesh. *Indian J. Weed Sci.*, **37(3&4):** 269-270.