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Research Article

Effect of weed management practices on *Trianthema portulacastrum* in Hybrid Maize

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Abstract

A field experiment was conducted to study the effect of hand weeding application of herbicides and their integration on weeds in hybrid maize was compared. Among the weed control measure, hand weeding twice (20 and 40 DAS) recorded higher weed control index and lesser weed biomass of *T. portulacastrum* and other weeds, which was on par with the integration of atrazine plus hand weeding. However, integration of atrazine @ 1 kg ha⁻¹ plus hand weeding (30 DAS) was economically viable in recording the higher benefit cost ratio of 3.08 and can be recommended for managing invasive weed *T. portulacastrum* and other weeds observed in hybrid maize, that leads to higher productivity and profitability.

Keywords: Maize, *Trianthema portulacastrum*, invasive, hand weeding, atrazine.

Introduction

Maize (*Zea mays* L.) is the third most important food crop in India after rice and wheat. Maize is grown throughout the year in India and has high production potential compared to any other cereal crop. In India, it is grown over an area of 8.4 million hectares with total production of 21.06 million tonnes (Anon, 2013). As maize, being a wider spaced crop, was found to be infested with a 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). The predominance of *T. portulacastrum* reduced yield of crops was reported to an extent of 61 to 94 per cent (Punia *et al.*, 2004).

Horsepurslane *Trianthema portulacastrum* was native to Africa and considered invasive in South East Asia, tropical and sub tropical Australia (Masters and Norgrove, 2009). In India, heavy infestations of carpet weed have been reported in north and north west states (Balyan and Bhan, 1986), in southern states (Senthilet *al.*, 2009). The preponderance of this problematic invasive alien species in upland crops was reported in northern coastal districts of Tamilnadu state, India (Kathiresan, 2011). Hence, a comprehensive study was conducted to manage *T. portulacastrum* and other weeds by the weed management practices like hand weeding and the use of herbicides, that seems to offer greater scope for efficient weed management in maize.

Materials and Methods

Field experiments were conducted during June - September, 2009 at Subramaniapuram, Cuddalore district, Tamilnadu to explore the possibility to manage *T.portulacastrum* and other weeds in hybrid maize. The cultivar chosen was NK-6240 hybrid maize with a seed rate of 20 kg ha⁻¹ was adopted and the maize seeds were dibbled at the rate of one seed per hill adopting a spacing of 60 cm x 25 cm. The soil of the experimental sight was red loam in texture with low nitrogen, medium phosphorus and high potassium and pH 6.75. The experiments were laid out in Randomized Block Design and were replicated four times involving six treatments. Treatments consisted of unweeded control, twice hand weeding(20 and 40 DAS),atrazine @ 1kg ha⁻¹ (pre), alachlor@ 1.5 kg ha⁻¹ (pre), atrazine @ 1 kg ha⁻¹ (pre) plus hand weeding (30 DAS),alachlor@ 1.5 kg ha⁻¹ (pre) plus hand weeding (30 DAS). In the unweeded control treatment, the weed flora was allowed to grow without any control measures. In twice hand weeding were taken up, at 20 DAS and 40 DAS by hand pulling of weeds. In herbicide treatments, required quantities of atrazine, alachlor

were taken and sprayed as pre-emergence at 3 DAS on soil with optimum moisture through knapsack sprayer fitted with flat fan nozzle using 500 liters of water. The data involving percentage values were transformed by angular transformations for statistical analysis.

Results and Discussion

The weed species observed in the experimental plots were *T. portulacastrum*, *Cleome gynandra*, *Cynadon dactylon*, *Eclipta alba*, *Phyllanthus niruri* and *Cyperus rotundus*. Among the weeds *T. portulacastrum* recorded to highest weed biomass. All the treatments significantly reduce the biomass of *T. portulacastrum* and other weeds compared to unweeded control. Twice hand weeding at 20 and 40 DAS was found to record the lesser biomass of *T. portulacastrum* (9.12 g m⁻²) and total weed biomass of (10.72 g m⁻²) and higher weed control index of 92.13 per cent (Table 1). However, it was on par with the integration of atrazine plus hand weeding treatment and these treatments were significantly superior than the rest of the treatments.

Table 1.Influence of the weed control treatments on weeds, maize yield and economics

Treatments	Weed observation at 60 DAS			Yield and economics		
	Weed biomass <i>T. portulacastrum</i> (g m ⁻²)	Total Weed biomass (g m ⁻²)	Total weed control index (%)	Grain yield (kg ha ⁻¹)	Net Income (Rs. ha ⁻¹)	Benefit cost ratio
Unweeded control	115.44	142.35	-	2467	8799	1.29
Twice hand weeding (20 and 40 DAS)	9.12	10.72	73.71 (92.13)	6701	69818	2.99
Atrazine @ 1kg ha ⁻¹ (pre)	65.34	75.64	43.20 (46.86)	5401	53588	2.72
Alachlor @ 1.5 kg ha ⁻¹ (pre)	83.12	95.69	34.93 (32.78)	4659	41597	2.32
Atrazine @ 1 kg ha ⁻¹ (pre) + HW (30 DAS)	10.05	11.85	73.80 (91.53)	6567	70014	3.08
Alachlor @ 1.5 kg ha ⁻¹ (pre)+ HW (30 DAS)	16.46	19.31	68.38 (86.43)	6036	60511	2.78
S.E _D	1.73	1.61	1.81	186	-	-
CD (p=0.05)	3.68	3.42	3.86	396	-	-

(Figures in the parentheses indicate original values)

The superior performance of twice hand weeding could be attributed to manual removal of existing vegetation of all the weeds without sparing any one group or individual weeds. Similar observations regarding the performance of two hand weeding for controlling *T. portulacastrum* and other weeds by Singh *et al.* (2009) and pre emergence application of atrazine helps in reducing the *T. portulacastrum* and other weeds in the initial stages of crop and integration of one hand weeding with it, helps in reducing the weed infestation in the later stages might have contributed for effective control of weeds, as reflected by population weed biomass in both the locations. This result is in line with the observations of Singh *et al.* (2007). Though, the highest yield was record with twice hand weeding, higher net income and benefit cost ratio (3.08) was recorded with atrazine plus hand weeding. This was due to the higher cost involved in two hand weedings compare to the other treatments. Based on the present investigation integration of pre emergence of atrazine @ 1 kg ha⁻¹ plus hand weeding was found to be economically feasible with high yield and also in suppressing *T. portulacastrum* and other weeds, in place of expensive hand weeding twice in hybrid maize.

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