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RESEARCH ARTICLE :

Economics of sweet corn as influenced by different herbicide treatments

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SUMMARY : The experiment entitled "economics of sweet corn as influenced by different herbicide treatment" was conducted during *Kharif* 2014 at Post Graduate, Research Farm, Agronomy Section, College of Agriculture, Dhule. The results revealed that the gross and net monetary returns were found maximum in weed free practice (Rs. 248607 and 173571 ha^{-1}, respectively)(T_2) treatment followed by application of atrazine @ 0.75 kg a.i. ha^{-1} at (PE) *fb* metsulfuron-methyl @ 0.004 kg a.i. ha^{-1} at 15 DAS (PoE) (T_{10}) (Rs.221735 and 155252 ha^{-1}, respectively).The benefit cost ratio was maximum in application of atrazine *fb* metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb* 0.004 kg a.i. ha^{-1}(PoE) (T_{10}) (3.34) followed by weed free check (T_2) (3.31), atrazine *fb* 2,4-D (0.75 kg a.i. ha^{-1}(PE) *fb*0.75 kg a.i. ha^{-1}(PoE) (T_9) (3.25), pendimethalin *fb* atrazine (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE) (T_8) (3.14) and hand weeding (T_3) (2.93).The sequential application of pre and post-emergence herbicides recorded maximum gross returns, net returns and benefit cost ratio in *Kharif* sweet corn compared to application of pre-emergence herbicide only and weedy check.

KEY WORDS :
Sweet corn (*Zea mays* saccharata), Atrazine, Pendimethalin, Metsulfuron Methyl and 2, 4-D

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BACKGROUND AND OBJECTIVES

Sweet corn *(Zea mays* var. saccharata) also called as sugar corn, pole corn or simply corn, is a variety of maize with high sugar content. Sweet corn is gaining popularity among the urban masses in terms of nutrition and health consciousness in India (Peet, 2001). Heavy weed infestation is one of the major constraints that limit the productivity of sweet corn crop. Wider spacing and slow growing nature of the crop during the first 3-4 weeks provide enough opportunity for weeds to invade and offer severe competition resulting in 30-100% yield reduction (Sandhu and Bhatia, 1991 and Walia *et al*. (2007). In order to increase the yield, it is imperative to minimize weed competition particularly during the critical period of crop. The choice of any weed control measures therefore, depends largely on its effectiveness and economics. In *Kharif* season there is high and continuous rainfall which does not permit hand weeding operation timely. This resulted in yield loss upto 30-80 % (Saini and Angiras, 1998). The conventional method is time consuming, expensive and laborious. It is more favorable

to use chemicals due to scarcity of human labour during peak season. Use of pre-emergence and post-emergence herbicides would make the herbicidal weed control more acceptable to farmers, which will not change the existing agronomic practices but will allow for complete control of weeds. Usage of pre-emergence herbicides assumes greater importance in the view of their effectiveness from initial stages. Application of herbicides as pre-emergence for effective weed control in sweet corn are required to be used within very short period (2-3 DAS). The biology of some weeds that occur in sweet corn makes it difficult to achieve effective weed control with single application of herbicides. This situation has necessitated the search of some post-emergence herbicide for effective and economic weed control in sweet corn. As the weeds interfere during the harvesting of the crop, post emergence herbicides at about 20-30 DAS may help in avoiding the problem of weeds at later stages. Under this situation, managing weeds through pre-emergence and post emergence herbicides will be an ideal means for controlling the weeds in view of their economics and effectiveness in sweet corn. So in order to widen the weed control spectrum, it is imperative to use combination of herbicides having different mode of action (Walia *et al*., 2007; Rana *et al.,* 1998 and Kumar *et al.,* 2011). Keeping this in view, the present investigation was undertaken to study the chemical weed management in sweet corn.

RESOURCES AND METHODS

A field experiment was conducted during *Kharif* 2014 at Agricultural College Dhule on clay soil having pH 7.5, good organic carbon contain (0.70 %). The experiment was laid out by adapting design RBD with ten treatments and three replications. Treatment details are such as Weedy check, Weed free check, Hand weeding (20 and 40 DAS), Atrazine (1.50 kg a.i. ha^{-1} (PE), Pendimethalin (1.50 kg a.i. ha^{-1}(PE), Atrazine + Pendimethalin (0.75 + 0.75 kg a.i. ha^{-1} (PE), Atrazine + 2,4-D (0.75 + 0.75 kg a.i. ha^{-1} (PE), Pendimethalin *fb* atrazine (0.75 kg a.i. ha^{-1} (PE) *fb* 0.75 kg a.i. ha^{-1}), Atrazine *fb* 2,4-D (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE) and Atrazine *fb* metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb* 0.004 kg a.i. ha^{-1} (PoE) were used in this experiment.

The gross monetary returns in rupees ha^{-1} was worked out on the basis of corn yield and green biomass yield and green fodder yield. The prevailing market price of corn and fodder were considered.

Gross monetary returns (Rs. ha^{-1}) :

The gross returns were calculated by considering the prices of corn cobs and fodder yield prevailing at the time of harvest.

Net monetary returns (Rs. ha^{-1}) :

The net return was calculated by deducting the cost of cultivation from the gross returns.

Net returns (Rs.) = Gross income ha^{-1} (Rs.) – Total cost of cultivation ha^{-1} (Rs.)

Benefit: cost ratio :

Benefit: cost ratio was calculated on the basis of formula given below.

$$\text{Benefit : Cost ratio} = \frac{\text{Total income (Rs. ha}^{-1})}{\text{Total expenditure (Rs. ha}^{-1})}$$

OBSERVATIONS AND ANALYSIS

The details of income and expenditure along with net returns and benefit cost ratio under various weed management treatments are presented in Table 1.

The total cost of cultivation was higher in weed free practices (T_2) (Rs. 75036 ha^{-1}) followed by hand weeding (T_3) (Rs. 71946 ha^{-1}). Among the herbicide treatments application of atrazine (1.50 kg a.i. ha^{-1} (PE) (T_4) recorded higher cost of cultivation (Rs. 68625 ha^{-1}) as compared to other herbicide treatments use in experiments. The lowest cost of cultivation (Rs. 62811 ha^{-1}) was observed in weedy check treatment (T_1). The gross monetary returns were maximum in weed free check (T_2) (Rs. 248607 ha^{-1}) followed by application of atrazine *fb*metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb*0.004 kg a.i. ha^{-1}(PoE) (T_{10}) (Rs. 221735 ha^{-1}), atrazine *fb* 2,4-D (0.75 kg a.i. ha^{-1}(PE) *fb*0.75 kg a.i. ha^{-1}(PoE) (T_9) (Rs. 215778 ha^{-1}), pendimethalin *fb* atrazine (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE) (T_8) (Rs. 213475 ha^{-1}) and hand weeding (T_3) (Rs. 210962 ha^{-1}), respectively. The lowest gross monetary returns were observed in weedy check treatment (T_1) (Rs. 64748 ha^{-1}).

The highest net returns of (Rs. 173571 ha^{-1}) was observed under treatment weed free check (T_2) followed by application of atrazine *fb* metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb*0.004 kg a.i. ha^{-1}(PoE) (T_{10}), atrazine

Table 1 : Effect of weed management on productivity and economics in sweet corn

Treatment details	Green cob yield (q ha^{-1})	Green fodder yield (q ha^{-1})	Total cost of cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B:C ratio
T_1: Weedy check	50.52	142.28	62811	64748	1937	1.03
T_2: Weed free check	207.33	412.77	75036	248607	173571	3.31
T_3: Hand weeding	175.12	358.42	71946	210962	139016	2.93
T_4: Atrazine (1.50 kg a.i. ha^{-1} (PE)	147.95	324.96	68625	180446	111821	2.63
T_5: Pendimethalin (1.50 kg a.i. ha^{-1}(PE)	138.89	320.93	66679	170983	104304	2.56
T_6: Atrazine + Pendimethalin(0.75 kg a.i. ha^{-1} + 0.75 kg a.i. ha^{-1} (PE)	156.00	337.06	67643	189706	122063	2.80
T_7: Atrazine + 2,4-D (0.75 kg a.i. ha^{-1} +0.75 kg a.i. ha^{-1} (PE)	152.98	335.07	66178	186487	120309	2.82
T_8:Pendimethalin *fb* Atrazine (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE)	177.13	363.45	67949	213475	145526	3.14
T_9: Atrazine *fb* 2,4-D (0.75 kg a.i. ha^{-1} (PE) *fb* 0.75 kg a.i. ha^{-1}(PoE)	179.15	366.28	66484	215778	149294	3.25
T_{10}: Atrazine *fb*Metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb* 0.004 kg a.i. ha^{-1}(PoE)	184.18	375.55	66,483	221735	155252	3.34

fb 2,4-D (0.75 kg a.i. ha^{-1}(PE) *fb*0.75 kg a.i. ha^{-1}(PoE) (T_9), pendimethalin*fb* atrazine (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE) (T_8) and hand weeding (T_3) recorded Rs. 155252, 149294, 145526 and 139016 ha^{-1}, respectively. Whereas, least net returns of Rs. 1937 ha^{-1} was recorded with weedy check (T_1).

The benefit cost ratio was maximum in application of atrazine *fb* metsulfuron-methyl (0.75 kg a.i. ha^{-1}(PE) *fb*0.004 kg a.i. ha^{-1}(PoE) (T_{10}) (3.34) followed by weed free check (T_2) (3.31), atrazine *fb* 2,4-D (0.75 kg a.i. ha^{-1}(PE) *fb*0.75 kg a.i. ha^{-1}(PoE) (T_9) (3.25), pendimethalin *fb* atrazine (0.75 kg a.i. ha^{-1}(PE) *fb* 0.75 kg a.i. ha^{-1} (PoE) (T_8) (3.14) hand weeding (T_3) (2.93).The sequential application of pre and post-emergence herbicides recorded maximum gross returns, net returns and benefit cost ratio in *Kharif* sweet corn compared to application of pre-emergence herbicide only. These results corroborate with the findings of Priya and Kubsad (2012) and Kumar *et al*. (2012)

Conclusion :

From the economic point of view application of pre-emergence spray ofatrazine@ 0.75 kg a.i. ha^{-1} followed by post-emergence herbicide *i.e.* metsulfuron-methyl @ 0.004 kg a.i. ha^{-1} at 15 DAS could be economical viable treatment based on B: C ratio. The higher benefit under these treatments might be due to higher production of cob as well as fodder leading to increased monetary returns with comparatively lower cost. The sequential application of pre and post-emergence herbicides recorded maximum gross returns, net returns and benefit cost ratio in *Kharif* sweet corn compared to application of pre-emergence herbicide only. These findings are in close vicinity with those reported by Priya and Kubsad (2012) and Kumar *et al*. (2012).

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