

# Efficient and Economical Weed Management in *Rabi* Sweet Corn (*Zea Mays* var. *Saccharata*)

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## ABSTRACT

*A field experiment was conducted during rabi 2010-11 at Junagadh (Gujarat, India) to find out most efficient and economical method of weed control in rabi sweet corn (*Zea mays* L. var. *saccharata* Sturt). The results revealed that treatments viz., hand weeding (HW) and intercultivation (IC) twice at 15 and 30 days after sowing (DAS), pre-emergence application (PRE) of atrazine @ 0.5 kg/ha + HW and IC at 30 DAS and pendimethalin @ 0.9 kg/ha as PRE + HW and IC at 30 DAS significantly enhanced growth and yield attributes viz., cob length, cob girth, number of cobs per plant, number of kernels per cob, fresh and dry weight of cob and ultimately higher cob and fodder yields over unweeded check. These treatments also recorded the lower weed population at 30, 60 DAS and at harvest, dry weight of weed at harvest and weed index as well as higher weed control efficiency and herbicidal efficiency index along with higher net returns and B:C ratio compared to unweeded check.*

## 1. INTRODUCTION

Maize is considered as the “Queen of Cereals”. Being a C<sub>4</sub> plant, it is capable to utilize solar radiation more efficiently even at higher radiation intensity. In Indian agriculture, maize assumes a special significance on account of its utilization as food, feed and fodder besides several industrial uses. Sweet corn (*Zea mays* L. var. *saccharata* Sturt), also called Indian corn, sugar corn and pole corn, is a variety of maize with a high sugar content. Nature of weed problem in *rabi* maize is quite different from that of the rainy season maize. In the rainy season emergence of maize and weed start simultaneously and first 20-30 days are most critical looking to crop-weed competition. Contrarily in the winter maize, weed emerges most often after the first irrigation. However, wider row spacing and liberal use of irrigation and fertilizers lead to more growth of weeds (Porwal, 2000). Yield loss due to weed in maize varies from 28 to 93 %, depending on the type of weed flora and intensity and duration of crop-weed competition (Sharma and Thakur, 1998). Pre-emergence application of herbicides may lead to cost effective control of the weeds right from the start which otherwise may not be possible by manual weeding. The study was carried out to find economically effective method of weed control for realising higher productivity and profitability of *rabi* sweet corn.

## 2. MATERIALS AND METHODS

The experiment was carried out at Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh (Gujarat, India) during *rabi*-2010-11. The experiment comprised nine treatments, namely, Atrazine @ 0.5 kg/ha as pre-emergence (PRE) + HW & IC at 30 DAS, Pendimethalin @ 0.9 kg/ha as PRE + HW & IC at 30 DAS, Oxadiargyl @ 90 g/ha as PRE + HW & IC at 30 DAS, Atrazine @ 0.5 kg/ha as PRE + 2, 4-D (SS) @ 0.5 kg/ha at 30 DAS, Pendimethalin @ 0.9 kg/ha as PRE + 2, 4-D (SS) @ 0.5 kg/ha at 30 DAS, Oxadiargyl @ 90 g/ha as PRE + 2, 4-D (SS) @ 0.5 kg/ha at 30 DAS, HW & IC twice at 15 & 30 DAS, weed free and weedy check, were replicated thrice in randomized block design. The experimental soil was clayey in texture and low in available N and P, and moderate in available potash. Sweet corn variety 'Sugar-75' was used in the experiment. The temperature ranged from 9.7 to 20.6°C during *rabi* season. The crop was sown on 11<sup>th</sup> December with the seed rate of 15 kg/ha in the rows of 60 cm apart. All standard packages of practices were followed throughout the cropping season. Pre-emergence herbicides were applied next day of sowing. The spraying was done using knapsack sprayer with flat fan nozzle keeping spray volume of 500 l/ha. In manual weed control treatments, weeds were uprooted and removed at 30 DAS as per treatments. In weed free plots, the weeds were removed manually after every seven days for ensuring complete weed free condition. After uprooting of weeds, the weeds were sundried completely till reached to constant weight and finally the dry weight was recorded for each treatment and expressed as kg/ha. Weed control efficiency (WCE) and weed index (WI) were calculated by the formulae suggested by Kondap and Upadhyay (1985) and Gill and Kumar (1969), respectively. The crop was harvested on 27<sup>th</sup> March. Net returns and B:C ratio were calculated for drawing conclusion.

## 3. RESULTS AND DISCUSSION

### *Crop growth and yield*

Growth and yield attributes as well as cob and fodder yield were significantly influenced by different weed control practices (Table 1). Results showed that significantly the highest cob length (22.95 cm), cob girth (16.25 cm), number of cobs per plant (1.40), number of kernels per cob (275.67), fresh weight of cob (136.06 g), highest dry weight of cob (41.97 g), cob yield (7674 kg/ha) and fodder yield (37659 kg/ha) were recorded under weed free, which remained statistically equivalent to HW & IC at 15 & 30 DAS, atrazine @ 0.5 kg/ha as PRE + HW & IC at 30 DAS and pendimethalin @ 0.9 kg/ha as PRE + HW & IC at 30 DAS. The improved growth and yield attributes under these treatments might be due to periodical removal of weeds by hand weeding or pre-emergence herbicide supplemented with manual weeding as evidenced by less number of weeds and dry weight of weeds (Table 2), which might have maintained high soil fertility status and moisture content by means of less removal of plant nutrients and moisture through weeds.

These findings are in close conformity with those reported by Porwal (2000) and Sinha *et al.* (2000).

### **Weed parameters**

All the treatments significantly reduced the weed population (Table 2) compared to weedy check. Next to the weed free, HW & IC at 15 & 30 DAS recorded significantly the lowest weed population (Table 2), which remained statistically at par with atrazine @ 0.5 kg/ha as PRE + HW & IC at 30 DAS and pendimethalin @ 0.9 kg/ha as PRE + HW & IC at 30 DAS. Except weed free, the lowest dry weight of weed was observed under HW & IC at 15 & 30 DAS, though it was found statistically at par with atrazine @ 0.5 kg/ha as PRE + HW & IC at 30 DAS. A perusal of data presented in Table 2 indicated that besides weed free, HW & IC at 15 & 30 DAS contained minimum weed Index (WI), while maximum weed control efficiency (WCE) and herbicide efficiency index (HEI), closely followed by pendimethalin @ 1 kg/ha as PRE + HW & IC at 40 DAS and atrazine @ 0.5 kg/ha as PRE + HW & IC at 30 DAS. These findings are in close conformity with those reported by Sinha *et al.* (2003) and Verma *et al.* (2009).

### **Economics**

The investigated data revealed that maximum net realization of Rs. 77926/ha and B:C of 3.14 were realized with weed free treatment, followed by HW & IC at 15 & 30 DAS and atrazine @ 1.0 kg/ha as PRE + HW & IC at 30 DAS. The lowest net realization of Rs. 46540/ha was accrued under treatment weedy check with B:C value of 2.42.

## **4. CONCLUSION**

On the basis of the results obtained from present one year field study, it can be concluded that effective management of weeds with profitable green cob yield of sweet corn in *rabi* season can be obtained by keeping the crop weed free throughout crop period or adopting two hand weeding and interculturing or pre-emergence application of atrazine @ 0.5 kg/ha + HW & IC at 30 DAS or pendimethalin @ 0.9 kg/ha as pre-emergence + HW & IC at 30 DAS under south Saurashtra Agro-climatic conditions.

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**Table 1: Effect of different treatments on growth and yield**

Treatments	Cob length (cm)	Cob girth (cm)	Cobs per plant	Kernels per cob	Fresh weight of cob (g)	Dry weight of cob (g)	Green cob yield (kg/ha)	Green fodder yield (kg/ha)
Atrazine + HW & IC	20.85	14.91	1.28	267.33	130.43	36.40	6271	34572
Pendimethalin + HW & IC	20.81	13.87	1.27	261.00	126.81	34.35	6292	33329
Oxadiargyl + HW & IC	20.71	13.40	1.25	243.03	120.60	28.95	5861	28097
Atrazine + 2, 4-D (SS)	20.62	13.98	1.26	252.03	126.48	35.28	5997	30333
Pendimethalin + 2, 4-D (SS)	20.69	13.78	1.25	246.04	126.00	33.53	5986	30309
Oxadiargyl + 2, 4-D (SS)	20.56	13.61	1.20	235.33	122.10	28.71	5799	27704
HW & IC twice	22.32	15.71	1.35	270.33	132.10	40.36	6642	35769
Weed free	22.95	16.25	1.40	275.67	136.06	41.97	7674	37659
Weedy check	17.47	12.75	1.15	225.33	117.83	25.19	5382	25590
C.D. (P=0.05)	2.79	2.10	0.14	31.66	10.71	7.41	1186	5702

**Table 2: Effect of different treatments on weed parameters**

Treatments	Monocot weeds per m <sup>2</sup>			Dicot weeds per m <sup>2</sup>			Sedges weeds per m <sup>2</sup>			Dry weight of weeds (kg/ha)
	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest	30 DAS	60 DAS	Harvest	
Atrazine + HW & IC	2.24 (4.53)	1.83 (2.87)	1.42 (1.53)	1.74 (2.53)	1.42 (1.53)	1.37 (1.41)	2.52 (5.87)	1.83 (2.87)	1.79 (2.73)	322.92
Pendimethalin + HW & IC	2.29 (4.77)	1.89 (3.10)	1.50 (1.77)	1.80 (2.77)	1.60 (2.10)	1.57 (2.00)	2.62 (6.43)	2.05 (3.77)	2.00 (3.60)	431.60
Oxadiargyl + HW & IC	3.14 (9.54)	2.87 (7.87)	2.65 (6.64)	2.74 (7.20)	2.70 (6.87)	2.67 (6.79)	3.50 (11.9)	2.87 (7.87)	2.85 (7.75)	477.08
Atrazine + 2, 4-D (SS)	2.96 (8.46)	2.78 (7.46)	2.61 (6.46)	2.64 (6.79)	2.55 (6.46)	2.51 (6.28)	3.27 (10.3)	2.96 (8.26)	2.93 (8.13)	412.50
Pendimethalin + 2, 4-D (SS)	3.04 (8.92)	2.81 (7.58)	2.62 (6.58)	2.76 (7.25)	2.53 (6.25)	2.54 (6.23)	3.26 (10.3)	3.00 (8.52)	2.98 (8.38)	437.85

Oxadiargyl + 2, 4-D (SS)	3.81 (14.1)	3.64 (12.8)	3.44 (11.3)	3.53 (12.1)	3.36 (10.8)	3.35 (10.7)	4.05 (16.1)	3.89 (14.8)	3.85 (14.6)	525.00
HW & IC twice	2.20 (4.38)	1.58 (2.04)	1.38 (1.42)	1.95 (3.38)	1.34 (1.30)	1.24 (1.05)	1.96 (3.38)	1.73 (2.58)	1.70 (2.46)	183.33
Weed free	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.71 (0)	0.00
Weedy check	5.52 (30.1)	6.72 (44.8)	6.91 (47.5)	5.05 (25.1)	6.25 (38.8)	6.49 (41.8)	6.29 (39.1)	6.80 (45.8)	6.83 (46.3)	882.64
C.D. (P=0.05)	0.71	0.61	0.62	0.76	0.66	0.68	0.61	0.56	0.54	94.59

Note: Data subjected to  $\sqrt{x+0.5}$  transformation and figures in parenthesis are original values

**Table 3: Effect of different treatments on Weed index, Weed control efficiency, Herbicidal efficiency index and Economics**

Treatment	WI	WC E	HEI	Gross returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Atrazine + HW & IC	18.28	63.41	16.52	97281	34520	62761	2.82
Pendimethalin + HW & IC	18.01	51.10	16.91	96247	35370	60877	2.72
Oxadiargyl + HW & IC	23.63	45.95	8.90	86708	35170	51538	2.47
Atrazine + 2, 4-D (SS)	21.85	53.27	11.43	90299	33670	56629	2.68
Pendimethalin + 2, 4-D (SS)	22.00	50.39	11.22	90170	34370	55800	2.62
Oxadiargyl + 2, 4-D (SS)	24.43	40.52	7.75	85691	34170	51521	2.51
HW & IC twice	13.45	79.23	23.41	102193	35270	66923	2.90
Weed free	0.00	100.0	42.59	114396	36470	77926	3.14
Weedy check	29.87	0.00	0.00	79410	32870	46540	2.42

<b>Market Price: Commodity</b>	<b>Rs/kg</b>	<b>Herbicides</b>	<b>Rs/kg or lit</b>
Urea	: 5.87	Atrazine	: 350
DAP	: 19.50	Pendimethalin	: 400
Green cob	: 10.00	Oxadiargyl	: 1080
Green fodder	: 1.00	2, 4-D (SS)	: 400