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Effect of Integrated Weed Management with Low Volume Herbicides in Sweet Corn (*Zea mays*)

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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. 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 *et al*., 1999). In order to increase the yields, it is imperative to minimize weed competition particularly during the critical period of crop. Continuous usage of atrazine in maize leads to ground water contamination. Atrazine and its degradation products occur widely in the global environment as a result of extensive use of atrazine as a pre- and post-emergent herbicide, mainly on maize, sorghum and millets. It is found, at generally low levels, in rivers, lakes, estuaries, reservoirs, groundwater and drinking water. Continuous usage of herbicides at high doses reduces efficiency, develops resistance in weeds and leaves residues to toxic levels. In this context, low volume herbicides reduce the quantity of herbicide required for weed control, utilizing the lowest volume of herbicides is key to practise environmental stewardship and herbicide mixtures may serve the need of broad spectrum weed control besides long term and economic weed management to farmers. Keeping this in view, the present investigation was undertaken to study the effect of integrated weed management practices with low volume herbicides on weeds and yield of sweet corn.

A field experiment was conducted during **rabi** 2008 at S. V. Agricultural College Farm, Tirupati on sandy loam soil with pH 7.4, low in organic carbon (0.38%) and available N (214.5 kg/ha) and medium in available P_2O_5 (25.7 kg/ha) and K_2O (170 kg/ha). The experiment comprising 10 treatments *viz.,* sulfosulfuron @ 30 g/ha as pre-emergence (T_1), imazethapyr @ 50 g/ha as pre-emergence (T_2), sulfosulfuron @ 15 g/ha+imazethapyr @ 25 g/ha as pre-emergence (T_3), sulfosulfuron @ 30 g/ha as pre-emergence+hand weeding at 40 DAS (T_4), imazethapyr @ 50 g/ha as pre-emergence+hand weeding at 40 DAS (T_5), sulfosulfuron @ 15 g/ha+imazethapyr @ 25 g/ha as pre-emergence with hand weeding at 40 DAS (T_6), hand weeding once at 20 DAS (T_7), hand weeding once at 40 DAS (T_8), hand weeding twice at 20 and 40 DAS (T_9) and control (T_{10}) was laid out in a randomized block design with three replications. Sweet corn variety 'Win sweet corn' was sown during 2nd week of November with a spacing of 60 x 20 cm. Half of recommended dose of N (60 kg/ha), full dose of P_2O_5 (60 kg/ha) and K_2O (45 kg/ha) were applied at the time of sowing and the remaining amount of N was top dressed in two equal splits, half at knee height stage and half at tasselling stage. All the herbicidal treatments were applied with a manually operated knapsack sprayer fitted with flat fan nozzle at a spray volume of 500 l/ha, the day after sowing. Weed density and weed dry weight were recorded by placing a quadrate of size 1 x 0.5 m randomly at four places in each plot. The data on weed density and weed dry weight were subjected to square root transformations using $\sqrt{X+0.5}$ to reduce large variations.

The major weed flora of the experimental site was *Digitaria sanguinalis* and *Dactyloctenium aegyptium* among grasses, *Cyperus rotundus* a sedge, while *Borreria hispida*, *Cleome viscosa*, *Corchorus olitorius*, *Celosia argentea*, *Merrimia aegyptia* and *Trichodesma indicum* among the broad-leaved weeds.

Lowest density and dry weight of weeds were recorded with hand weeding twice at 20 and 40 DAS (T_9), which was comparable with application of sulfosulfuron+imazethapyr as pre-emergence with hand weeding at 40 DAS (T_6) (Table 1). This is because the first hand weeding effectively eliminated all emerged weeds at 20 DAS, while the second hand weeding at 40 DAS removed the weeds germinated later, thus keeping the weed density and dry weight below the critical level of competition. Similarly, pre-emergence application of sulfosulfuron + imazethapyr (15+25 g/ha) effectively controlled the weeds owing to broad-spectrum weed

Table 1. Effect of weed management practices on weed density, weed dry weight, yield and economics of sweet corn

Treatments	Weed density (No./m^2)	Weed dry weight (g/m^2)	Weed control efficiency (%)	Green cob yield (t/ha)	Green fodder yield (t/ha)	Net returns (Rs./ha)	B : C ratio
T_1 : Sulfosulfuron @ 30 g/ha as pre-emergence	12.22 (149.00)	12.75 (162.07)	13.0	9.54	13.24	24985	3.06
T_2 : Imazethapyr @ 50 g/ha as pre-emergence	12.89 (165.67)	12.49 (155.65)	14.8	8.30	10.93	19806	2.67
T_3 : Sulfosulfuron @ 15 g/ha+imazethapyr @ 25 g/ha as pre-emergence	10.02 (100.00)	9.18 (83.93)	37.4	10.40	14.38	28342	3.37
T_4 : Sulfosulfuron @ 30 g/ha as pre-emergence+HW at 40 DAS	6.01 (35.67)	3.89 (14.64)	73.4	11.50	15.60	31210	3.37
T_5 : Imazethapyr @ 50 g/ha as pre-emergence+HW at 40 DAS	8.17 (66.33)	4.17 (16.93)	71.5	9.11	12.06	22356	2.72
T_6 : Sulfosulfuron @ 15 g/ha+imazethapyr @ 25 g/ha as pre-emergence with HW at 40 DAS	4.41 (19.00)	1.64 (2.18)	88.8	13.23	17.57	37806	3.94
T_7 : Hand weeding once at 20 DAS	12.20 (148.33)	12.60 (158.38)	14.1	9.32	12.12	22673	2.69
T_8 : Hand weeding once at 40 DAS	6.23 (38.33)	3.06 (8.89)	79.1	8.11	10.78	16799	2.17
T_9 : Hand weeding twice at 20 and 40 DAS	4.34 (18.33)	1.55 (1.89)	89.4	13.72	18.04	37482	3. 52
T_{10} : Control	16.27 (264.33)	14.67 (214.96)	-	7.23	9.51	16945	2.59
LSD (P=0.05)	0.41	0.51		0.80	1.11	1803	0.13

Values in parentheses are original.

control by herbicide mixture (Krausz and Kapusta, 1998) coupled with control of left over weeds with HW at 40 DAS, resulting in integrated approach. Hand weeding twice at 20 and 40 DAS (T_9) registered significantly higher weed control efficiency which was statistically at par with sulfosulfuron+imazethapyr as pre-emergence with hand weeding at 40 DAS (T_6). Similar results were reported by Paradkar and Sharma (1993).

All the weed management practices significantly increased the green cob and green fodder yields compared to control (Table 1). The maximum cob yield with husk (13715 kg/ha) was recorded with hand weeding twice at 20 and 40 DAS (T_9), which was on par with sulfosulfuron+imazethapyr as pre-emergence with hand weeding at 40 DAS (T_6) (13234 kg/ha). The results are in accordance with Saikia and Pandey (1999). The increased yield in these treatments was mainly due to significant reduction in weed density and dry matter, thereby, reduction in crop-weed competition which provided the congenial environment to the crop for better expression of vegetative and reproductive potential.

Net returns and B : C ratio were highest with application of sulfosulfuron+imazethapyr (15+25 g/ha) as pre-emergence with hand weeding at 40 DAS (T_6). This might be due to higher green cob yield and less cost of weeding with herbicides application, which was on par with hand weeding twice at 20 and 40 DAS (T_9). Similar results were reported by Rout and Satapathy (1996).

The present study revealed that application of sulfosulfuron @ 15 g/ha+imazethapyr @ 25 g/ha as pre-emergence with hand weeding at 40 DAS was found to be effective and economic weed management practice for irrigated sweet corn during **rabi** season in sandy loam soils of Southern Agroclimatic Zone of Andhra Pradesh. However, in areas where labour availability is assured timely hand weeding twice at 20 and 40 DAS may be followed.

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