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Effect of pre and post emergence herbicides application on yield and quality of Sweet corn (*Zea mays saccharata* Sturt.)

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Abstract
An experiment entitled "Effect of pre and post emergence herbicides on growth, yield and quality of Sweet corn (*Zea mays saccharata*)" was conducted during *kharif* 2019 at Post Graduate Research Farm, Agronomy Section, College of Agriculture, Dhule. Experiment consisted of ten treatments laid out in randomized block design with three replications. Quality characters *viz.*, protein, reducing sugar, non-reducing sugar and total sugar content (%) in grain of sweet corn were analyzed. Reducing sugar, non-reducing sugar and total sugar content (%) in grain of sweet corn was observed numerically more under weed free check (3.72, 8.67 and 12.38%, respectively) than those in registered in rest of treatments, while it was recorded lowest in weedy check treatment. Among chemical weed management treatments, application of pendimethalin 1.00 kg a.i. ha^{-1} (PE) *fb* tembotrione 120 g a.i. ha^{-1} (30 DAS) was found better than other herbicidal treatment in respect of reducing sugar, non-reducing sugar and total sugar content (%) (3.67, 8.62 and 12.29%, respectively) in grain of sweet corn.

Keywords: Sweet corn, pre emergence, post emergence and herbicide

Introduction
Applications of herbicides as pre-emergence for effective weed control in sweet corn are required to be used within very short period (2-3 DAS). In monsoon season, if rains capture this critical period of application then pre-emergence herbicide cannot be used effectively. Also, sometime farmers skip the application of pre-emergence herbicides and also due to scarcity of labour at that time. This situation has necessitated the search of some post-emergence herbicide for effective and economic weed control in sweet corn. Almost all types of weed *viz*; grassy, broad leave weeds and sedges infested the sweet corn field. Some predominant weed species are *Cynodon dactylon*, *Digera arvensis*, *Digitaria marginata*, *Eleusine indica*, *Commelina benghalensis*, *Argemone mexicana*, *Amaranthus viridis*, *Euphorbia indica*, *Phyllanthus niruri*, *Parthenium histerophorus* which cause heavy losses in sweet corn production. Weeds being a serious negative factor in crop production are responsible for market loss (28-100%) in crop yield (Kumar *et al.* 2016) [3]. Atrazine and pendimethalin recommended as a pre emergence herbicide is not effective against some of the weeds both grassy and non-grassy as well the sedges *Cyperus rotundus*. Hence there is a need for some alternate post emergence herbicides which can be provide broad spectrum weed control in *kharif* sweet corn without affecting the crop growth and yield of crop. Use of herbicides would make weed control more acceptable to the farmers and control of weeds by using herbicides was a cheaper proposition than with manual methods. Keeping this fact in view, the present investigation was undertaken.

Material and Methods
The field experiment was conducted at the Post Graduate Research Farm, College of Agriculture, Dhule, during the *kharif* season of year 2019.Climatologically, this area falls in the sub-tropical region at the North. Generally monsoon commences by third week of June and retreats at the end of September with the average annual rainfall of 607 mm at College of Agriculture, Dhule. Experiment consisted of ten treatments laid out in randomized block design with three replications. The treatments consist with weedy check (T_1), weed free check (T_2), atrazine 1000 g a.i ha^{-1} (PE) *fb* halosulfuron-methyl 90 g a.i ha^{-1} (PoE) (T_3), atrazine 1000 g a.i ha^{-1} (PE) *fb* 2,4-D dimethyl amine 1000 g a.i ha^{-1} (PoE) (T_4), pendimethalin1000 g a.i ha^{-1} (PE) *fb* halosulfuron-methyl 90 g a.i ha^{-1} (PoE) (T_5), pendimethalin 1000 g a.i ha^{-1} (PE)

fb tembotrione 120 g a.i ha^{-1} (30 DAS) (T_6), pendimethalin 1000 g a.i ha^{-1} (PE) *fb* 2, 4-D dimethyl amine 1000 g a.i ha^{-1} (PoE) (T_7), halosulfuron-methyl 90 g a.i ha^{-1} (PoE) (T_8), tembotrione 120 g a.i ha^{-1} (PoE) (T_9) and 2,4-D dimethyl amine 1000 g a.i ha^{-1} (PoE) (T_{10}). The seed of sweet corn variety Sugar-75 was sown on 18th July 2019 at spacing of 60 x 20 cm^2 using seed rate 15 kg ha^{-1}. The fertilizer was applied as per the recommended dose to sweet corn crop as 120:60:40 kg NPK ha^{-1}. The crop was grown with recommended package of practices and was harvested at maturity on 26th September 2019. Cobs were harvested and labeled carefully.

Results and Discussion

Effect of weed management treatments on yield parameters

The green cob and fodder yield (q ha^{-1}) of sweet corn was found to be significantly higher (157.72 and 324.22 q ha^{-1}, respectively) in treatment of weed free check. Among the different chemical treatment, spraying of pendimethalin 1.00 kg a.i. ha^{-1} (PE) *fb* tembotrione 120 g a.i. ha^{-1} (30 DAS) which recorded significantly maximum green cob and fodder yield (147.94 and 306.97 q ha^{-1}) as compared to other treatments of weed control and it was found at par with application of pendimethalin 1.00 kg a.i. ha^{-1} (PE) *fb* 2,4-D dimethyl amine 1.00 kg a.i. ha^{-1} (PoE) (140.63 and 294.49 q ha^{-1}). Among the herbicide treatments tried in the experiment, application of pre-emergence herbicide followed by post emergence herbicide treatment was found significantly better than application of post-emergence herbicide only in respect of green cob and fodder yield of sweet corn may probably be due to better weed management resulting in improvement in all growth and sink parameters which contributed higher yield owing to favourable condition in absorbing soil moisture, nutrient content and sunlight penetration during crop growing period. The green cob and fodder yield was significantly lowest under weedy check treatment.

Effect of weed management treatments on quality parameters

The results revealed that difference in protein (%) in grain of sweet corn due to various weed management treatments were observed to be non-significant while reducing sugar, non-reducing sugar and total sugar content (%) was significantly influenced by different weed management treatments. Reducing sugar, non-reducing sugar and total sugar content (%) in grain of sweet corn was observed numerically more under weed free check (3.72, 8.67 and 12.38%, respectively) than those in registered in rest of treatments, while it was recorded lowest in weedy check treatment. Among chemical weed management treatments, application of pendimethalin 1.00 kg a.i. ha^{-1} (PE) *fb* tembotrione 120 g a.i. ha^{-1} (30 DAS) found better than other herbicidal treatments in respect of reducing sugar, non-reducing sugar and total sugar content (3.67, 8.62 and 12.29%, respectively) in grain of sweet corn. The sequential spraying of pre and post emergence herbicides recorded the higher value of reducing sugar, non-reducing sugar and total sugar content (%) in grain of sweet corn as compared to application of post-emergence herbicide only. These results corroborate the finding of Dobariya *et al*. (2014) [2], Deshmukh (2017), Mitra *et al.* (2018) [5] and Kumar and Chawla (2019) [4].

Table 1: Effect on yield and quality of Sweet corn as influenced by different treatments

Treatments	Green cob yield (q ha^{-1})	Green Fodder yield (q ha^{-1})	Harvest index (%)	Reducing sugar (%)	Non-reducing Sugar (%)	Total sugar (%)	Protein content (%)
T_1: Weedy check	62.92	160.86	28.08	2.67	8.17	10.67	13.98
T_2: Weed free check	157.72	324.22	32.72	3.72	8.67	12.38	14.77
T_3: Atrazine 1000 g ha^{-1} (PE) *fb*halosulfuron-methyl 90 g ha^{-1} (PoE)	122.40	265.95	31.51	3.42	8.49	11.91	14.72
T_4: Atrazine 1000 g ha^{-1} (PE) *fb*2,4-D dimethyl amine 1000 g ha^{-1} (PoE)	132.47	284.82	31.75	3.49	8.54	12.02	14.55
T_5: Pendimethalin 1000 g ha^{-1} (PE) *fb* halosulfuron-methyl 90 g ha^{-1} (PoE)	120.42	265.62	31.19	3.33	8.47	11.80	14.74
T_6: Pendimethalin 1000 g ha^{-1} (PE) *fb* tembotrione 120 g ha^{-1} (30 DAS)	147.94	306.97	32.52	3.67	8.62	12.29	14.22
T_7: Pendimethalin 1000 g ha^{-1} (PE) *fb*2,4-D dimethyl amine 1000 g ha^{-1} (PoE)	140.63	294.49	32.32	3.56	8.57	12.13	14.44
T_8: Halosulfuron-methyl 90 g ha^{-1} (PoE)	94.14	225.93	29.41	2.77	8.24	11.01	14.55
T_9: Tembotrione 120 g ha^{-1} (PoE)	124.40	274.23	31.21	3.17	8.43	11.61	14.68
T_{10}: 2,4-D dimethyl amine 1000 g ha^{-1} (PoE)	107.92	248.62	30.27	2.96	8.34	11.34	14.12
S.E.(m) +	2.80	5.19	-	0.03	0.01	0.06	0.20
C.D. at 5%	8.31	15.42	-	0.08	0.03	0.18	NS
General mean	121.10	265.17	-	3.28	8.45	11.72	14.48

Conclusion

Among chemical weed management treatments, application of pendimethalin 1.00 kg a.i ha^{-1} (PE) *fb* tembotrione 120 g a.i ha^{-1} (30 DAS) found better than other herbicidal treatments in respect of green cob and fodder yield (q ha^{-1}), reducing sugar, non-reducing sugar and total sugar content % in grain of sweet corn.

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