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Influence of irrigation and mulches on the yield attributes and yield of sweet corn (*Zea mays saccharata* L.) Grown in Konkan region of Maharashtra

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Abstract
A field experiment was conducted to study the effect of irrigation methods, irrigation regimes and mulches on the performance of *rabi* sweet corn on lateritic soil of coastal region of Maharashtra during *rabi* season of years 2014-15 and 2015-16. The experiment was laid out in split plot design with four main plot and five sub plot treatments. The main plot treatments comprised of four combinations of irrigation methods and irrigation levels *viz*., Drip irrigation with 100 % water requirement, Drip irrigation with 75 % water requirement, Check basin irrigation with 100 % water requirement and Check basin irrigation with 75 % water requirement. The five sub plot treatments consisted different types of mulches *viz*., No mulch *i.e*. control, Paddy straw mulch, Black polythene mulch, transparent polythene mulch and Silver polythene mulch. Thus, there were twenty treatment combinations, replicated thrice. Results in the pooled mean data revealed that, the sweet corn crop grown under drip irrigation with 100 % water requirement recorded higher yield attributes resulting into significantly higher green cob and green fodder yield over all other treatments. The black polythene mulch recorded significantly higher mean plant height, mean number of functional leaves and stem girth than the other treatments in the pooled data. The significantly higher dry matter accumulation was recorded under black polythene mulch followed by silver and transparent polythene mulch. Also, black polythene mulch produced significantly highest yields and yield attributes as compared to the rest of the mulches. Treatment combination drip irrigation with 100 % water requirement along with black polythene mulch recorded significantly higher plant height at harvest in the pooled data.

Keywords: Irrigation, Mulches, Sweet corn

Introduction
Maize (*Zea mays*) is one of the most important and versatile emerging cereal crop of the world and contributes to food security in most of the developing countries. Sweet corn (*Zea mays saccharata* L.) also known as sugar corn is hybridized version of maize specifically breed to increase the sugar content. In Konkan being tourist place, sweet corn is gaining importance in the hotels good demand for eating roasted cobs in cities, towns and also by tourist which has resulted into opening of the counters of roasted cobs. Water is prime for all biological activities and now days, water has been recognized more precious than gold and oil. Good quality water is having multifarious application such as for irrigation, industrial use, power generation, livestock use, and domestic use both in urban and rural areas. Therefore, it becomes essential to give more concern over scheduling of irrigation, which will helps to achieve higher productivity, optimum use of water with better irrigation efficiency. An ideal irrigation schedule must indicate time of irrigation water application and the quantity of water to be applied. In recent years some useful techniques have been evolved to minimize water loss through evaporation such as use of different plastic mulches or any other organic material available on farm. Under Konkan condition, low temperature and lack of irrigation facilities during post rainy season are the major constraints for growth and development of rabi sweet corn. However, to exploit the production of rabi sweet corn there is urgent need of proper cultivation technology. Sweet corn can be a promising short duration cash crop and there is wide scope during *rabi* season for cultivation, as it fetches better market price if timely sowing and proper managerial practices are followed in Konkan region. Therefore, to achieve the potential yield of sweet corn proper irrigation scheduling *i.e*. use of proper method of

irrigation, proper quantity of irrigation water and use of different mulches can envisage not only the productivity of the crop but it will also sustain the soil health.

Materials and Methods

The present investigation was undertaken during *rabi* season of years 2014-2015 and 2015-2016 to evaluate the, effect of irrigation methods, irrigation regimes and mulches on the performance of *rabi* sweet corn (*Zea mays saccharata* L.). The experiment was laid out in Agronomy Farm, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, dist. Ratnagiri. The soil of experimental plot was sandy clay loam in texture, moderately acidic in reaction with moderately high in organic carbon content. The field experiment was laid out in split plot design comprising of twenty treatment combinations replicated thrice. The main plot treatments comprised of four combinations of irrigation methods and irrigation levels *viz*., Drip irrigation with 100 % water requirement (ID_{100}), Drip irrigation with 75 % water requirement (ID_{75}), Check basin irrigation with 100 % water requirement (IC_{100}) and Check basin irrigation with 75 % water requirement (IC_{75}). The five sub plot treatments consisted different types of mulches *viz*., No mulch *i.e*. control (M_0), Paddy straw mulch (M_1), Black polythene mulch (M_2), Transparent polythene mulch (M_3) and Silver polythene mulch (M_4). The gross plot size of each treatment was 3.60 m X 3.00 m and net plot size was 2.40 m X 2.60 m, respectively. Drip irrigation system with 16 mm lateral was installed. The emitters were 60 cm apart and had a constant discharge rate of 4 LPH. The drip irrigation laterals were installed before spreading the mulch and the dripper were checked for the discharge. The plot area as per the treatment was covered with paddy straw mulch, black polythene mulch, transparent polythene mulch and silver polythene mulch before sowing. Polythene mulches used for mulching had 120 cm width, 25 micron thickness with 100 % elasticity. The border of polythene mulch was incorporated in the soil for trapping of heat and to avoid disturbance from wind. Round holes were made at the spacing of 60 x 20 cm with the help of GI pipe of 2 inch diameter. Paddy straw mulch of 5 cm thickness was spread over the respective plots.

Results and Discussion

Effect of irrigation

Drip irrigation with 100 % water requirement (ID_{100}) and 75 % water requirement (ID_{75}) recorded statistically similar length of cob and these two treatments recorded significantly more length of cob than the remaining irrigation treatments *viz*., check basin irrigation with 100 % (IC_{100}) and 75 % water requirement (IC_{75}) which were at par with each other during both the years and in the pooled data. Further, in respect of the girth of cob and number of kernel rows per cob; all the irrigation treatments were at par with each other. However, numerically the irrigation treatments can be arranged in the following descending order *i.e*. $ID_{100} > ID_{75} > IC_{100} > IC_{75}$. Drip irrigation with 100 % water requirement (ID_{100}) recorded significantly more weight of sweet corn cob with husk than the remaining treatments. It was followed by drip irrigation with 75 % water requirement (ID_{75}), check basin irrigation with 100 % water requirement (IC_{100}) and 75 % water requirement (IC_{75}) in the descending order of significance in the pooled mean.

Drip irrigation with 100 % water requirement (ID_{100}) and 75 % water requirement (ID_{75}) recorded statistically similar green cob yield and green fodder yield which was significantly superior over check basin irrigation with 100 % (IC_{100}) and 75 % water requirement (IC_{75}). However, treatment check basin irrigation with 75 % water requirement (IC_{75}) recorded significantly lower green cob and fodder yield then rest of the treatments. This may be ascribed to the beneficial effect of drip irrigation method on yield attributes which might have contributed to increased growth and development parameters, which finally enhanced the green cob yield of the sweet corn. These results corroborated the findings of Basawa *et al.* (2012) [1], More *et al.* (2013) [4] and Painyuli *et al.* (2013) [6]. Maintenance of adequate soil rhizosphere moisture by the drip irrigation method established significantly higher green cob yield, green fodder yield and total biomass yield than the check basin irrigated sweet corn, during both the years of experimentation. These findings are in line with the findings of and Bharati *et al*. (2007) [2], Patil *et al*. (2008) [7] and Nalayini *et al*. (2009) [5]. Interactions were non significant.

Effect of mulches

The cob length, girth of cob and mean weight of sweet corn cob were significantly influenced by the different mulches in the pooled mean the trend was similar. The sweet corn grown with black polythene mulch recorded significantly higher values then rest of the mulches. Further, it was followed by silver polythene mulch and transparent polythene mulch which were at par with each other and significantly superior over paddy straw mulch (M_1) and no mulch in respect of all the above referred observations in the pooled data. However, control treatment recorded significantly lower values than all the mulches in the pooled mean. Black polythene mulch recorded significantly the highest green cob yield and green fodder yield over rest of the treatments. It was followed by silver polythene mulch and transparent polythene mulch which were at par with each other and significantly superior over paddy straw mulch and control during both the years and in the pooled data. Sweet corn grown without mulch *i.e*. control recorded significantly the lowest cob and fodder yield in the pooled mean. Singh (2005) [8] reported that the higher yield with black polyethylene mulch may be owing to complete elimination of weeds, higher soil moisture availability and better soil temperature during the crop season. Nalayini *et al*. (2009) [5] reported that this might be due to better partitioning of assimilates under mulching. Interactions were non-significant.

Table 1: Mean length of cob (cm), girth of cob (cm), weight of cob with husk (g), green cob yield (t ha^{-1}) and green fodder yield (t ha^{-1}) of sweet corn as influenced by the different treatments in the pooled mean of two years (2014-15 and 2015-16)

Treatments	Mean length of cob	Mean girth of cob	Mean weight of cob with husk	Mean green cob yield	Mean green fodder yield
Main plot: Irrigation					
ID_{100}: Drip irrigation with 100 % water requirement	19.30	16.02	456.33	24.99	30.53
ID_{75} : Drip irrigation with 75% water requirement	18.92	15.92	431.75	24.02	28.77
IC_{100}: Check basin irrigation with 100% water requirement	18.00	15.66	414.55	21.32	25.67
IC_{75}: Check basin irrigation with 75 % water requirement	17.74	15.60	395.77	19.33	23.44

S.Em.±	0.12	0.11	3.54	0.45	0.51
C.D. at 5%	0.38	NS	10.91	1.39	1.57
Sub plot: Mulches					
M_0: No mulch (control)	16.64	15.20	366.01	17.10	21.46
M_1: Paddy straw mulch	17.99	15.41	405.28	19.58	24.43
M_2: Black polythene mulch	19.86	16.49	470.34	27.03	32.08
M_3: Transparent polythene mulch	18.87	15.93	436.48	24.11	28.31
M_4: Silver polythene mulch	19.05	15.98	444.89	24.77	29.23
S.Em.±	0.15	0.08	4.74	0.31	0.37
C.D. at 5%	0.44	0.24	13.38	0.87	1.03
Interaction Effect					
S.Em.±	0.53	0.29	16.41	1.07	1.27
C.D. at 5%	NS	NS	NS	NS	NS
General mean	18.48	15.80	425.05	22.41	27.10

Conclusion

Thus, it can be concluded that sweet corn (variety-Sugar 75) be grown under drip irrigation system with application of 100 % water requirement along with black polythene mulch for obtaining higher green cob yield and fodder yield.

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