J. Indian Soc. Coastal Agric. Res. 35(1): 27-30 (2017)

Response of *Rabi* Sweet Corn (*Zea mays saccharata* L.) to Irrigation and Mulching in Konkan Region of Maharashtra

V. N. GAME*, S. A. CHAVAN, U. V. MAHADKAR, R. T. THOKAL and G. B. SHENDAGE
Department of Agronomy, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth,
Dapoli - 415 712, Maharashtra

Received: 15.11.2016 Accepted: 19.02.2017

A field experiment was conducted on coastal lateritic soils of Konkan region to study the effect of irrigation methods, irrigation regimes and mulches on the performance of *Rabi* sweet corn 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 plant height, stem girth and dry matter production which resulted into significantly higher weight of cob with husk and green cob yield over all other treatments. Among different mulches the black polythene mulch recorded significantly higher mean plant height, stem girth and dry matter production which resulted into significantly higher weight of cob with husk and green cob yield over all other treatments in the pooled data. However higher total sugar content in sweet corn was recorded under irrigation with 100 % water requirement grown under black polythene mulch as compare to rest of the mulches in the pooled data of both the years.

(*Key words:* *Irrigation, Mulches, Sweet corn*)

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 bred to increase the sugar content. Sweet corn is peculiarly an American crop. It was introduced in India from USA. Sweet corn is gaining popularity both in rural and urban areas because of its high sugar and low starch content. Water is one of the most important inputs essential for the production of crops. 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. Proper scheduling of irrigation is essential to achieve higher productivity, optimum use of water with better irrigation efficiency. An ideal irrigation schedule must indicate time of irrigation 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. Mulching is the cultural practice used in conservation of soil moisture, maintaining soil temperature, reducing weed growth, increasing dry matter content and yield. 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. Also, better water use efficiency during *Rabi* season through water saving and by use of micro irrigation techniques in sweet corn is profitable for increasing the yield of the crop by 20 to 100 per cent as compared to conventional methods and in addition saving of labour. Considering the commercial demand of sweet corn in this region, its productivity needs to be increased. This is possible through management of micro climate, quantity of irrigation water and agronomic practices like mulching. Adoption of this might help in raising the irrigated area, productivity of crops and water use efficiency.

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 are need to be tested.

**Corresponding Author :* E-mail: vishalgame009@gmail.com

MATERIALS AND METHODS

The experiment was conducted during *Rabi* season of 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. Soil was medium in available nitrogen (361.24 kg ha^{-1}), low in available phosphorus (10.7 kg ha^{-1}) and fairly high in available potassium (252.40 kg ha^{-1}). 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. All recommended package of practices were followed during the experiment period. In order to ensure better germination and initial crop stand two common irrigations were given to all the treatments. Drip irrigation was scheduled on the basis of pan evaporation data on every alternate day. In konkan region check basin irrigation is practiced by most of the farmers. Under check basin, irrigations were given on the basis of cumulative pan evaporation (CPE) with 60 mm depth as per treatments. For ascertaining the effect of different treatments on growth and development of the sweet corn crop, biometric observations were recorded timely. The experimental data pertaining to each character were analysed statistically by using the technique of analysis of variance for split plot design and significance was tested by 'F' test (Panse and Sukhatme, 1967). Standard error of mean (SEm) and critical differences (CD) were worked out for each character studied to evaluate difference between the treatments and interaction effects at 5 % level of significance.

RESULTS AND DISCUSSION

Effect of irrigation on performance of sweet corn

The sweet corn crop grown under drip irrigation with 100 % water requirement (198.33 cm) produced significantly taller plants as compared to the crop grown under check basin irrigation with 100% water requirement (178.37 cm) and with 75% water requirement (173.27 cm). However, treatment check basin irrigation with 75% water requirement recorded significantly lower mean plant height at harvest. However, in respect of stem girth per plant and dry matter production per plant drip irrigation with 100% water requirement recorded significantly more values than the remaining irrigation treatments except drip irrigation with 75% water requirement which was at par with former treatments. Further, drip irrigation with 75% water requirement treatment was significantly superior over check basin irrigation with 75% water requirement in relation to stem girth per plant and dry matter production per plant. Kumari *et al*., (2006) reported that in drip irrigation soil water content is maintained at higher level throughout the crop growth which facilitated full cell elongation reflecting the higher height and growth performance. The subsequent availability of optimum water throughout the crop growth period might have maintained the soil under field capacity and provided the congenial conditions for better growth throughout the crop period, which have resulted in more plant height, stem girth and dry matter accumulation in the plant. Similar findings was reported by the Patil (2008).

Higher sugar concentration was recorded under drip irrigated sweet corn with 100% water requirement (ID_{100}) and it was at par with drip irrigation with 75% water requirement (ID_{75}) and it was significantly superior over

check basin irrigation with 100% (IC_{100}) and 75 % water requirement (IC_{75}) which were found to be at par within each other in the pooled mean.

There was significant difference in weight of cob with husk due to the different irrigation treatments in the pooled mean. 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 which was significantly superior over check basin irrigation with 100% (IC_{100}) and 75% water requirement (IC_{75}) in the pooled mean. However, treatment check basin irrigation with 75% water requirement (IC_{75}) recorded significantly lower green cob yield then rest of the treatments. Similar findings were reported by Basawa *et al.* (2012), Bharati *et al.* (2007) and Painyuli *et al.* (2013).

Effect of mulches on performance of sweet corn

Mean plant height, number of functional leaves, stem girth and mean dry matter accumulation per plant was influenced significantly under mulches in the pooled mean. Black polythene mulch (M_2) recorded significantly more mean plant height, number of functional leaves, stem girth and mean dry matter accumulation per plant than the remaining mulches in the pooled mean. Further, it was followed by silver polythene mulch (M_4) and transparent polythene mulch (M_3) which were at par with each other and significantly superior over paddy straw mulch (M_1) and no mulch (M_0) treatment in the pooled mean. Significantly, the lowest values were recorded in no mulch (M_0) treatment than the remaining treatments.

Due to the early germination and emergence of the crop under black polythene mulch, silver polythene

Table 1. *Mean plant height, stem girth, dry matter accumulation per plant, weight of cob with husk, total sugar and green cob yield of sweet corn as influenced by the different treatments in the pooled mean of two years (2014-15 and 2015-16)*

Treatments	Plant height (cm)	Stem girth (cm)	Dry matter accumulation (g)	Weight of cob with husk (g)	Total sugar (%)	Green cob yield (t ha^{-1})
Main plot: Irrigation						
ID_{100}: Drip irrigation with 100% water requirement	198.33	8.71	145.49	456.33	8.85	24.99
ID_{75}: Drip irrigation with 75% water requirement	193.19	8.59	143.93	431.75	8.56	24.02
IC_{100}: Check basin irrigation with 100% water requirement	178.37	7.92	138.76	412.55	8.24	21.32
IC_{75}: Check basin irrigation with 75% water requirement	173.27	7.80	137.09	395.77	7.91	19.33
SEm±	1.25	0.13	0.92	3.54	0.10	0.45
CD at 5%	3.85	0.40	2.82	10.91	0.33	1.39
Sub plot: Mulches						
M_0: No mulch (control)	167.92	7.36	131.76	366.01	7.79	17.10
M_1: Paddy straw mulch	176.36	7.95	139.31	405.28	8.03	19.58
M_2: Black polythene mulch	201.96	8.88	149.72	470.34	8.90	27.03
M_3: Transparent polythene mulch	187.32	8.50	142.73	436.48	8.43	24.11
M_4: Silver polythene mulch	195.41	8.58	145.55	444.89	8.78	24.77
SEm±	0.79	0.09	1.22	4.74	0.10	0.31
CD at 5%	2.24	0.25	3.45	13.38	0.27	0.87
Interaction Effect	NS	NS	NS	NS	NS	NS
General mean	185.80	8.25	141.81	425.05	8.39	22.41

mulch and transparent polythene mulch it was physiologically more active and therefore crop growth was positively influenced by the mulches. In addition to this Kulkarni *et al*. (1998) reported that the higher reflectivity index of polythene mulches has provided more solar energy to the lower levels of the crop which was not the case in respect of paddy straw mulch and no mulch treatments. Therefore, under polythene mulch treatments even the lower levels of the crop were photosynthetically more active than the crop under paddy straw mulch and no mulch. Similar findings were noted by More *et al.* (2013) and Nalayini *et al*. (2009).

Effect of mulches on yield contributing characters and yield of sweet corn

The cob length, girth of cob, total sugar 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 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 yield in the pooled mean. Singh (2005) 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) reported that this might be due to better partitioning of assimilates under mulching.

CONCLUSION

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

REFERENCES

Basawa, S., Devi, K. B. S., Sivalakshmi, Y. and Babu, P. S. (2012). Response of sweet corn hybrid to drip-fertigation. *Journal of Research ANGRAU* **40**(4): 101-103.

Bharati, V., Nandan, R., Vinod, K. and Panday, I. B. (2007). Effect of irrigation levels on yield, water use efficiency and economics of winter maize (*Zea mays*) based intercropping systems. *Indian Journal Agron*omy **52**(1): 27-30.

Kulkarni, G. N., Kalaghatagi, S. B. and Mutanal, S. M. (1998). Effect of various mulches and scheduling of irrigation on growth and yield of summer maize. *Journal of Maharashtra Agricultural University* **13**(2): 223-224.

Kumari, R. Prasadini, P. P., Rao, M. S. and Shivshankar, M. (2006). Effect of drip irrigation and mulches on growth and yield of bell pepper. *Annals of Agricultural Research*, **27**(2): 179-182

More, V. G., Pore, M. P. and Gangawane, S. B. (2013). Response of sweet corn to irrigation scheduling and different mulches under drip irrigation. *Journal of Indian Society of Coastal Agriculture Research* **31**(2): 47-51.

Nalayini, P., Anandham, R., Sankaranarayanan, K., and Rajendran, T. P. (2009). Polyethylene mulching for enhancing crop productivity and water use efficiency in cotton (*Gossypium hirsutum*) and maize (*Zea mays*) cropping system. *Indian Jounal of Agronomy* **54**(4): 409-414.

Painyuli, A., Pal, M. S., Bhatnagar, A. and Bisht, A. S. (2013). Effect of planting techniques and irrigation scheduling on productivity and water use efficiency of sweet corn (*Zea mays saccharata*) *Indian Jounal of Agronomy* **58**(3): 344-348.

Panse, V. G. and Sukhatme, P. V. (1967). *Statistical Methods for Agricultural Workers*, Indian Council of Agricultural Research, New Delhi.

Patil, S. A. (2008). Effect of irrigation and fertigation levels on growth, yield and quality of sweet corn (*Zea mays saccharata*) in *rabi* season under medium black soils of north Konkan. *Unpublished M.Sc. (Agri.) Thesis*, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra.

Singh, R. (2005). Influence of mulching on growth and yield of tomato in north Indian plains. *Vegetable Science* **32**(1): 55-58.