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Performance of sweet corn varieties under tropical conditions of Goa

K. Ramachandrudu*, M. Thangam and V.S. Korikanthimath
ICAR Research Complex for Goa, Ela, Old Goa 403 402

ABSTRACT

Two year experiments were carried out during *rabi* and *kharif* seasons at ICAR Research Complex for Goa, Ela, to observe performance of sweet corn and select suitable variety for commercial production in Goa. Nine varieties were evaluated on lateritic soil in replicated randomized block design. Results were found significant for all characters among varieties and between varieties and seasons. All varieties exhibited considerable variation in their performance for most of parameters during *rabi* and *kharif* seasons. Better vegetative growth in terms of plant height, number of leaves per plant and stem girth was noticed in all varieties during *rabi* season. Plant height was the maximum in Priya (211.41 cm), whereas, it was the minimum in Sumadhur (160.45 cm). Among varieties, Indam-1 (13.62) and Priya (13.57) produced significantly more number of leaves per plant. Maturity of cobs was advanced in all varieties during *kharif* season, while it was prolonged in *rabi* season. The variety Bandit-1 (72.25 days) was early in maturity, while, Sweet Pearl was late (84.25 days). Of all varieties, the highest values for yield components, cob (19.37 t/ha) and stalk yield (27.55 t/ha) except number of cobs per plant were observed in Golden Honey during both the seasons. Sweet Pearl (1.52) followed by Win Yellow (1.42) produced the highest number of cobs per plant. The performance of all varieties was better in *rabi* as compared to *kharif* season. Studies suggest Golden Honey to be most potential sweet corm variety for commercial cultivation for both the seasons, while Sweet Pearl for only *rabi* season.

Key words: Sweet corn, varieties, evaluation.

INTRODUCTION

Sweet corn (*Zea mays* L. *saccharata*), a delicious snack, is becoming popular and its cultivation is slowly picking up in maize tracts of the country. It is the only type of maize grown exclusively for green cobs, which are sweeter and tastier than other types. Its sugar content varies from 25-30 per cent (Venkatesh *et al*., 5). Sweet corn cobs are perishable in nature, so a delay in harvesting will lead to conversion of sugars to starch, which in turn reduces market price as it tastes like ordinary maize. Being a short duration crop, it is a right choice for inclusion in multiple cropping systems. In addition to expensive cobs, it also produces huge quantity of green fodder, which is feed to cattle. Goa, a part of the Konkan region of the Western Ghats, has warm and humid climate with a distinct rainy season from June to September and overall moderate climate prevails in the state. Average annual temperature, relative humidity and rainfall of the state are ranged from 22-33^{0}C, 58-88% and 2,700-3,000 mm, respectively. There is a great demand for sweet corn in Goa and at present the requirement is met from neighbouring states Karnataka and Maharashtra. There have been trials under AICRP on Maize on evaluation of sweet corn composites and hybrids at different coordinating centres of the country (Anon, 1). Successful production of any crop depends on a suitable variety, which can adopt well and yield better at a particular location. However, scientific information on sweet corn performance and suitable varieties for Goa is not available. Hence, recognizing the vast potential for sweet corn and a need for information, present studies were undertaken.

MATERIALS AND METHODS

The field experiments were conducted at ICAR Research Complex for Goa, Ela, Old Goa during *rabi* (December-February) and *kharif* (June-September) seasons. The temperature prevailed during the course of study ranged from 19 to 34^{0}C in *rabi*, 24 to 30^{0}C in *kharif* and the relative humidity was varied from 36 to 80 and 78 to 94 per cent in *rabi* and *kharif*, respectively. The statistical design employed for the trials was randomized block design (RBD) with nine treatments and three replications. The soil of the experimental site was lateritic having pH 5.1 and EC 0.043 m mhos/cm and the fertility status of the soil was medium in organic matter (0.67%), high in phosphorus (78.5 kg/ha) and medium (313.6 kg/ha) in potassium. Farmyard manure @ 20 t/ha, nitrogen @ 100 kg, phosphorus @ 30 kg and potassium @ 50 kg/ha were applied as per the recommendation during both the seasons. Healthy seeds of sweet corn varieties collected were from different sources namely Win Yellow, Priya and Madhuri

*Corresponding author's present address: Directorate of Oil Palm Research, Pedavegi, Andhra Pradesh 534 450; E-mail: chandrakr2000@yahoo.com

from Directorate of Maize Research, New Delhi; VL-15 from Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora; Bandit-1 from Harris Moran Seed Co., Mumbai; Sumadhur from Mahyco Seeds Pvt. Ltd, Mumbai; Golden Honey from Golden Seeds Pvt. Ltd, Bangalore; Indam-1 from Indo-American Hybrid Seeds Pvt. Ltd, Bangalore and Sweet Pearl from Nunhems Seeds Pvt. Ltd., Bangalore. The seeds were sown in furrows at a spacing of 60 cm x 30 cm. The crop was grown under irrigated conditions during *rabi* and rainfed conditions in *kharif* season (rainfall recorded during the crop period was 2,468 mm. The recommended packages of practices were followed during the crop period. Observations were made on various plant growth and yield attributing parameters using conventional methods. Fresh cob and stalk yields were calculated based on per plot yield. The data were statistically analyzed using SAS software.

RESULTS AND DISCUSSION

It is evident from the data presented in Tables 1, 2 & 3 that there were significant differences among varieties and between varieties and seasons for all the characters. Similarly, considerable variation for most of the characters was noticed between the seasons. The plant height was found the maximum in Priya, which was on a par with Golden Honey, while it was the minimum in Sumadhur. Significant variation in plant height among genotypes may be due to varied growth rate of varieties (Anon, 1; Yu Yuhua *et al*., 6). Plants were taller in all varieties during *rabi* as compared to *kharif* season. Water stagnation due to continuous and intensive rains during the crop growth period might have retarded the plant growth during *kharif* season. The variety Priya exhibited maximum plant height in *rabi*, while the minimum was in Sumadhur grown during *kharif*. Leaves, being a site of photosynthesis, decide growth and economic yield of plants. Leaf production was significantly better (12.92) in winter when compared to *kharif* season (12.05). Plants of Indam-1 and Priya produced more number of leaves per plant in *rabi*, whereas, Sumadhur had less number of leaves per plant during *kharif* season. Among varieties, the highest number of leaves per plant was recorded in Indam-1 (13.62) and closely followed by Priya (13.57), while the lowest number (10.35) of leaves was observed in Sumadhur. Stem girth reflects mechanical strength and amount of food reserves present in stem. Stem girth measured in all varieties grown during *rabi* season (7.24 cm) was markedly higher as compared to *kharif* (6.56 cm) season. The variety Golden Honey recorded the maximum (8.60 cm) stem girth in *rabi*, whereas the minimum stem girth was noticed in Sweet Pearl (5.85 cm) in *kharif* season (Table 1).

Harvesting of green cobs in sweet corn is a crucial and time bound operation and a delay will make sweet corn as an ordinary corn owing to conversion

Table 1. Performance of sweet corn varieties for growth attributes during *rabi* and *kharif* seasons under Goa conditions.

Variety	Plant height (cm)			Leaves/plant			Stem girth (cm)			Days to harvest		
	Rabi	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean
Win Yellow	214.60	168.10	191.35	12.50	12.00	12.25	6.70	6.10	6.40	83.00	72.50	77.75
Bandit-1	200.80	158.05	179.42	12.10	12.40	12.25	6.85	6.45	6.65	74.50	70.00	72.25
Sumadhur	165.45	155.45	160.45	11.00	9.70	10.35	6.50	6.20	6.35	72.00	83.50	77.75
Golden Honey	240.00	179.05	209.52	13.40	12.40	12.90	8.60	7.60	8.10	85.00	80.50	82.75
Priya	248.20	174.60	211.41	14.40	12.75	13.57	6.95	6.35	6.65	84.00	72.00	78.00
Indam-1	238.30	161.70	200.00	14.40	12.85	13.62	7.25	7.00	7.12	88.50	77.50	83.00
Madhuri	225.65	171.30	198.47	13.30	12.30	12.80	7.30	6.35	6.82	85.00	72.50	78.75
Sweet Pearl	203.95	172.75	188.35	12.40	11.05	11.72	7.35	5.85	6.60	84.00	84.50	84.25
VL-15	194.35	169.20	181.77	12.80	13.00	12.90	7.70	7.15	7.42	81.50	76.00	78.75
Mean	214.58	167.80		12.92	12.05		7.24	6.56		81.94	76.55	
CD at 5%												
Variety		10.96			0.62			0.36			0.58	
Season		5.16			0.29			0.17			0.28	
Variety × Season		15.50			0.87			0.51			0.83	

Table 2. Performance of sweet corn varieties for yield parameters during *rabi* and *kharif* seasons under Goa conditions.

Variety	Cob weight (g)			Dehusked cob weight (g)			Dehusked cob length (cm)			Dehusked cob girth (cm)		
	Rabi	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean
Win Yellow	197.40	213.90	205.65	121.55	135.05	128.30	17.75	17.50	17.62	12.90	12.95	12.92
Bandit-1	199.90	254.10	227.00	139.30	208.20	173.75	15.65	17.70	16.67	13.35	15.05	14.20
Sumadhur	172.55	205.55	189.05	103.45	113.75	108.60	17.00	17.95	17.47	13.60	12.50	13.05
Golden Honey	333.75	331.00	332.37	210.90	254.00	232.45	20.50	21.15	20.82	14.80	15.90	15.35
Priya	233.85	256.05	244.95	135.70	170.40	153.05	18.90	18.40	18.65	13.40	13.85	13.62
Indam-1	247.20	197.15	222.17	110.05	132.10	121.07	17.35	17.10	17.22	13.15	13.65	13.40
Madhuri	241.50	225.00	233.25	131.00	137.15	134.07	19.70	18.45	19.07	13.00	12.80	12.90
Sweet Pearl	274.10	201.00	237.55	127.60	142.80	135.20	20.00	18.90	19.45	13.50	12.65	13.07
VL-15	230.30	222.85	226.57	108.90	165.90	137.40	17.80	17.75	17.77	13.05	14.50	13.77
Mean	236.73	234.07		132.05	162.15		18.29	18.32		13.42	13.76	
CD at 5%												
Variety		23.64			14.07			1.51			0.52	
Season		NS			6.63			NS			0.24	
Variety × Season		33.44			19.90			2.14			0.73	

of sugars to starch. Days to maturity of cobs decide varieties whether they are early or late and in fact, both the characters help farmers having the supply for more period of time when they are grown together. Maturity of cobs was advanced in *kharif* season (76.55 days), while it got delayed in *rabi* season (81.94 days). Optimum light and temperature during *rabi* might have prolonged the vegetative phase along with the time required for flowering. Weather conditions particularly cloudy days and intensive rain during *kharif* season might have forced the plants to enter into reproductive phase early. Of all varieties, Bandit-1 (72.25 days) was found early to harvest, while Sweet Pearl (84.25 days) was late. Similarly, significant variation in maturity of sweet corn varieties was reported by Kjelden and Kidmose (3), and Yu Yuhua *et al.* (6). All varieties except Sumadhur were found early during *kharif* season as compared to *rabi*. The variety Bandit-1 was found early during *kharif* season, whereas Indam-1 was late in *rabi* season. Results for green cob weight were found non significant between the seasons. Cob weight recorded in Golden Honey (332.37 g) was found as the maximum, while the minimum cob weight was resulted in Sumadhur (189.05 g). More cob weight in Golden Honey may be due to better translocation of photosynthates towards cobs. In both the seasons, maximum cob weight was observed in Golden Honey (Table 2).

Amongst the varieties, maximum dehusked cob a weight was obtained in *kharif*, whereas it was the minimum in *rabi* season. It may be attributed to better partitioning of photosynthates to cob as compared to husk. Dehusked cob weight recorded in Golden Honey (254 g) during *kharif* was the maximum and it was the minimum in Sumadhur (103.45 g) during *rabi* season. Among the varieties, maximum and minimum dehusked cob weights were observed in Golden Honey (232.45 g) and Sumadhur (108.60 g), respectively. Results were non-significant between the seasons for dehusked cob length. Dehusked cob length was the maximum in Golden Honey (20.82 cm), which was found significantly superior to others. Interaction between varieties and seasons showed the maximum dehusked cob length in Golden Honey (21.15 cm) during *kharif* and minimum length in Bandit-1 (15.65 cm) in *rabi* season. The mean dehusked cob girth was found the maximum (13.76 cm) in *kharif* season, while it was the minimum (13.42 cm) in *rabi*. Among varieties, the maximum and minimum dehusked cob girth was observed in Golden Honey (15.35 cm) and Madhuri (12.90 cm) followed by Win Yellow (12.92 cm), respectively. Golden Honey (15.90 cm) grown during *kharif* season produced dehusked cobs having the maximum girth, whereas the minimum was observed in Sumadhur (12.50 cm) grown during *rabi* season (Table 2).

Table 3. Performance of sweet corn varieties for yield attributing parameters and yield during *rabi* and *kharif* seasons of Goa conditions.

Variety	Seed rows/cob			Seeds/row			Cobs/plant			Cob yield (t/ha)			Stalk yield (t/ha)		
	Rabi	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean	*Rabi*	*Kharif*	Mean
Win Yellow	14.20	12.90	13.55	33.20	32.55	32.87	1.45	1.40	1.42	12.45	12.34	12.41	23.60	17.40	20.50
Bandit-1	15.25	13.60	14.42	32.20	32.25	32.22	1.35	1.20	1.27	12.35	13.90	13.12	17.35	18.60	17.97
Sumadhur	14.90	12.55	13.72	28.85	26.80	27.82	1.30	1.00	1.15	9.80	8.55	9.18	13.15	12.60	12.87
Golden Honey	16.60	14.90	15.75	38.45	39.20	38.82	1.30	1.20	1.25	20.20	18.55	19.37	35.15	19.95	27.55
Priya	14.25	13.25	13.75	35.85	36.30	36.07	1.35	1.10	1.22	14.45	12.55	13.50	25.05	19.50	22.27
Indam-1	14.40	13.40	13.90	30.05	31.15	30.60	1.45	1.30	1.37	15.75	12.30	14.02	29.80	20.70	25.25
Madhuri	13.35	11.50	12.42	35.85	35.35	35.60	1.40	1.20	1.30	15.85	12.00	13.92	27.90	20.45	24.17
Sweet Pearl	12.90	12.50	12.70	37.75	32.90	35.32	1.65	1.40	1.52	21.20	12.40	16.78	25.10	12.85	18.97
VL-15	13.10	12.20	12.65	27.05	32.40	29.72	1.45	1.10	1.27	16.10	10.55	13.32	25.60	20.85	23.22
Mean	14.32	12.97		33.25	33.21		1.41	1.21		15.36	12.57		24.74	18.10	
CD at 5%															
Variety		0.69			2.35			0.28			1.46			2.90	
Season		0.32			NS			0.13			0.69			1.36	
Variety × Season		0.98			3.33			0.40			2.07			4.10	

Among varieties, Golden Honey was found significantly superior to others with respect to number of seed rows per cob (15.75). The number of seed rows per cob was the lowest in Madhuri (12.42) and it was found at par with VL-15 (12.65) and Sweet Pearl (12.70). In all varieties, there was more number of seed rows per cob in *rabi* when compared to *kharif* season. The highest number of seed rows per cob was recorded in Golden Honey (16.60) in *rabi* season, while it was the lowest in Madhuri (11.50) during *kharif* season. The variety Golden Honey (38.82) recorded the highest number of seeds per row while the lowest was in Sumadhur (27.82), which was found at par with VL-15 (29.72). Results were found non significant between the seasons for number of seeds per row. Number of seeds per row was the highest in Golden Honey in both the seasons, the whereas, the lowest number was recorded in Sumadhur in *kharif* season and closely followed by VL-15 in *rabi* season (Table 3). The present results are in agreement with the findings of Simonne *et al.* (4), and Yu Yuhua *et al.* (6) in sweet corn.

The variety Sweet Pearl (1.52) recorded the highest number of cobs per plant, whereas, Sumadhur (1.15) produced the lowest number of cobs per plant. All the varieties produced significantly more number of cobs per plant during *rabi* season when compared to *kharif* season. Hence, the varietal differences in production of cobs were prominent between the seasons. This might be due to better vegetative growth put forth by all varieties owing to favourable weather conditions prevailed during *rabi* season. Sweet Pearl (1.65) yielded the highest number of cobs per plant during *rabi* season and the lowest number of cobs per plant was harvested in Sumadhur (1.00) in *kharif* season. The variety Golden Honey (19.37 t/ha) gave the maximum cob yield that was significantly superior to other varieties. High cob yield in Golden Honey was a reflection of better growth rate and yield components. Of all the varieties, Sumadhur (9.18 t/ha) was found as the poor yielder as it recorded the minimum cob yield. Perusal of the data (Table 3) revealed that there was a sudden drop in cob yield (12.40 t/ha) of Sweet Pearl during *kharif* season as compared to *rabi* season, where in the maximum cob yield (21.20 t/ha) was obtained among the varieties. A drastic reduction in cob yield of Sweet Pearl during *kharif* season must be attributed to poor vegetative growth, cob weight and less number of cobs per plant. Chai and Graham (2), Kjelden and Kidmose (3), Yu Yuhua *et al.* (6) and Anon (1) reported significant differences in cob yield among sweet corn varieties. Varieties Priya, VL-15, Bandit-1 and Win Yellow were found at par with one another for cob yield. Similarly, Indam-1, Madhuri, Priya, VL-15 and Bandit-1 were

found at par with one another. Better cob yield in *rabi* was due to production of more number of cobs per plant. Interaction between varieties and seasons showed the maximum cob yield in Sweet Pearl (21.20 t/ha) in *rabi* season and the minimum in Sumadhur (8.55 t/ ha) during *kharif* season. Stalk yield was more in all varieties grown during *rabi* season when compared with *kharif* season. Better vegetative growth and accumulation of more dry matter during *rabi* season may be responsible for more stalk yield. Maximum stalk yield was recorded in Golden Honey (35.15 t/ ha) during *rabi* season, whereas the minimum was in Sumadhur (12.60 t/ ha) in *kharif* season. Among varieties, the maximum stalk production was observed in Golden Honey (27.55 t/ ha), which was significantly superior to other varieties whereas, the minimum was noticed in Sumadhur (12.87 t/ ha) in *kharif* season (Table 3).

It can be concluded from the results that effect of seasons was conspicuous over the performance of varieties for most of the characters. The performance of varieties for the main characters like plant height, cob weight, number of cobs per plant, cob and stalk yield per hectare was better during *rabi* season. Better results in *rabi* may be due to exposure of plants to mild weather conditions specially cool nights and optimum temperature which are favourable for luxuriant growth and yield. There was a drastic reduction in number of cobs per plant, cob and stalk yield per hectare in most of the varieties grown during *kharif* season. Poor vegetative growth in *kharif* season might be responsible for reduced cob and stalk yield. It is worth noting that Golden Honey had excelled over other varieties in performance indicating more consistency in both the seasons. Therefore, based on the studies, Golden Honey for both the seasons and Sweet Pearl exclusively for *rabi* season have been identified as most promising varieties for commercial cultivation under agro-climatic conditions of Goa.

REFERENCES

1. Anonymous, 2009. XXXXXIII *Annl. Prog. Rep. All India Coordinated Maize Improvement Project*, Directorate of Maize Research, New Delhi, pp. 312-18.

2. Chia, Y.T. and Graham, K.M. 1972. Performance of sweet corn varieties under local conditions. *Malaysian Agri. Res.* **1**: 1-5.

3. Kjeldsen, G. and Kidmose, U. 1994. Varieties of sweet corn maturity, marketable yield and quality of harvest and after storage. *SP-Report*, **5**: 31.

4. Simonne, E., Simonne, A. and Boozer, R. 1999. Yield, ear characteristics and consumer acceptance of selected white sweet corn varieties in the Southeastern United States. *Hort. Tech.* **9**: 289-93.

5. Venkatesh S., Rakshit, Sujoy and Shekhar, J.C. 2003. *Sweet Corn.* Directorate of Maize Research, New Delhi, pp.1

6. Yu, Yuhua, Liang, Chengye, Duan, Jun, Wang, Zimin and Ye, Jing Rui, 2001. A comprehensive evaluation of some new sweet maize varieties. *J. Trop. Subtrop. Bot.* **9**: 75-80.

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