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Influence of soil series on growth attributes and yield of sweet corn in soils of Konkan (Maharashtra)

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Abstract
A pot culture experiment was conducted to study the effect of soil series on growth attributes of sweet corn in soils of Konkan (Maharashtra) during *rabi* season of years 2014-15 and 2015-16. The experiment was laid out in Randomized Block Design (RBD) with eight surface representative soils series *viz.*, [Shahapur (S_1), Palghar (S_2), Roha (S_3), Repoli (S_4), Shirgaon (S_5), Lanja (S_6), Deogad (S_7) and Vengurla (S_8)] for experimental study. The physic-chemical properties of the representative soil series *viz.*, pH of soil ranges from 4.85 to 7.08, electrical conductivity (EC) where the maximum value was noted to be 0.35 dS m^{-1}. The organic carbon content of the surface soils ranges from 4.8 to 11.5 g kg^{-1} while, the soils were sandy loam to clay loam; few were clay in texture. Clay content of the surface soil was ranged from 19.2 to 47.4 per cent with a mean value of 33.52 per cent.Soils were in general medium sandy loam to clay loam texture and slightly acidic to neutral in reaction. The organic carbon content of the soils varied from 4.80 to 11.5 g kg^{-1} in surface soils. Periodical observations on various growth attributes and yield i.e. growth parameters (viz., plant height, number of functional leaves and dry matter accumulation) of sweet corn recorded at 30 DAS, 60 DAS and after harvest of sweet corn. The Palghar soil series (S_2) recorded maximum plant height, no of functional leaves, dry matter accumulation and fodder yield of sweet corn.

Keywords: Different soil series, growth attributes and sweet corn

Introduction
India is gifted with heterogeneous landforms and variety of climatic conditions like high altitude forests, peninsular plateaus, the lofty mountains, the raverine deltas, variety of geological formations endowed with temperature varying from equatorial hot to arctic cold, and rainfall from per humid with world's maximum rainfall (1120 cm)of several hundred cms to extreme aridity with a few cms (<10cm). These varying environmental situations in the country have resulted in a greater variety of soils. Therefore, the systematic appraisal of effect of soil series on growth attributes of sweet corn of Konkan regions has tremendous scope for study. The soil series is the lowest and most specific category of the soil taxonomy. A soil series name generally is derived from a town or landmark in or near the area where the soil series was first recognized. For example, the Haugan Series was first identified near Haugan, Montana. The distribution of a given series is not necessarily restricted to the boundaries of only one county or state for example, the Hagerstown Series was first described near Hagerstown, Maryland, but has also been found as far away as Tennessee and Kentucky. The Konkan region divided in to mainly four districts i.e. Thane, Raigad, Ratnagiri and Sindhudurg. With this background, the present study was undertaken to study the influence of soil series on growth attributes and yield of sweet corn of Konkan region (Maharashtra).

Materials and Methods
Surface (0-0.2m) soil samples were collected from 8 locations of the Konkan region (Thane, Raigad, Ratnagiri and Sindhudurg districts) of Maharashtra *viz.,* soils series [Shahapur (S_1), Palghar (S_2), Roha (S_3), Repoli (S_4), Shirgaon (S_5), Lanja (S_6), Deogad (S_7) and Vengurla (S_8)] are given in Table 1. The pot culture experiment was laid out in Randomized Block Design (RBD) with eight surface representative soils series. The collected soil samples were processed and analyzed for pH (1:2.5), electric conductivity (EC, 1:2:5), organic carbon (OC) (Walkley and Black; Jackson 1973) [4] and particle size distribution by hydrometer method (Bouyoucous, 1962). For ascertaining the effect of different soil series on growth and development of the

sweet corn crop, periodical observations were recorded at every 30 days interval from the date of sowing. The various growth attributing parameters like plant height (height of the each plant in pot was measured by the scale from the soil surface to the upper most visible node of a fully emerged leaf before tasselling stage and from soil surface up to the base of tassel after tasselling stage. Then the average was worked out), the no. of functional leaves (number of functional leaves per plant was recorded by counting functional leaves and then the average was worked out) and dry matter accumulation (The individual plant sample from the pot was uprooted. The root portion was removed and the plant was chopped into small pieces then filled in a perforated labeled brown paper bag treatment wise and dried first in the shade followed by drying in the thermostatically controlled oven at 600C ± 20C. The drying was done till constant weight was obtained. At all the growth stages dry matter of whole plant was recorded).

Table 1: Selection of site for collection of soil samples

Sr. No.	Soil series	:	Location
1	Shahapur series (S_1)	:	KVK, Kosbad (Thane)
2	Palghar series (S_2)	:	ARS, Palghar (Thane)
3	Roha series (S_3)	:	Roha (Raigad)
4	Repoli series (S_4)	:	Repoli (Raigad)
5	Shirgaon series (S_5)	:	ARS, Shirgaon (Ratnagiri)
6	Lanja series (S_6)	:	KVK, Lanja (Ratnagiri)
7	Deogad series (S_7)	:	Deogad, (Sindhudurg)
8	Vengurla series (S_8)	:	RFRS, Vengurla (Sindhudurg)

Note: The selection soil series from Technical Bulletin "Soil Series of Maharashtra" written by Challa *et al.* (2008) [3]

Results and Discussion

Effect of different soil series on growth parameters of sweet corn

Plant height, number of functional leaves per plant and dry matter accumulation of sweet corn were studied periodically at 30 days interval, during the years 2014-15 and 2015-16.

Effect of different soil series on plant height (cm) of sweet corn:

The data presented in Table 2 revealed that, during both the years the plant height of sweet corn was significantly influenced by different soil series at all crop growth stages.

2014-15,

At 30 DAS, the height of the plant was found to be highest in a soils from Palghar series (S_2) i.e. 27.42 cm which was significantly taller over rest of the soils. The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7). At 60 DAS, the height of sweet corn plant was found to be highest in a soils from Palghar series (S_2) i.e. 125.17 cm which was significantly taller over rest of the soils. The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7) i.e. 110.50 cm. At harvest, the height of sweet corn plant was found to be highest in a soils from Palghar series (S_2) i.e. 152.46 cm which was significantly taller over rest of the soils. The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7).

2015-16

At 30 DAS, the significantly maximum height of sweet corn plant was found from Palghar series (S_2) i.e. 24.17 cm which was significantly taller over rest of the soils except soils from Shahapur series (S_1). The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7). At 60 DAS, the height of sweet corn plant was found to be highest in a soils from Palghar series (S_2) i.e. 124.04 cm which was significantly taller over rest of the soils. The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7). At harvest, the height of sweet corn plant was found to be highest in a soils from Palghar series (S_2) i.e. 146.92 cm which was significantly taller over rest of the soils. The lowest height of sweet corn plant was observed in a soils from Deogad series (S_7).

A Table 2 indicates that in general, the plant height was higher during *rabi* 2014-15 as compared to *rabi* 2015-16 because sweet corn is one exhaustive crop, residual nutrient status of first year (2014-15) has an adverse effect in sweet corn crop on second year (2015-16). The variation in plant height grown from different soils might be due to nature and nutrient status of different soil series.

Effect of different soil series on number of functional leaves plant^{-1} of sweet corn:

The data presented in Table 2 revealed that, the number of functional leaves per plant of sweet corn was significantly influenced by soil series at all crop growth stages except 30 days after sowing during both the years of experimentation.

2014-15

The maximum number of functional leaves per plant during 2014-15 and 2015-16 at 60 DAS (9.67 and 9.50) and at harvest (13.08 and 11.67) recorded from Palghar (S_2) soils which was significantly higher over rest of the soils, respectively. While less number of functional observed from Deogad (S_7) soils.

Table 2: Effect of different soil series on growth attributes and yield of sweet corn (2014-15)

Soil Series	Plant height (cm)			No. of functional leaves (plant $^{-1}$)			Dry matter accumulation (g plant^{-1})				Fodder yield (g plant^{-1})
	30 DAS	60 DAS	At har.	30 DAS	60 DAS	At har.	30 DAS	60 DAS	At har.		
									plant	kernels	
S_1	26.42	122.33	144.79	4.33	8.58	11.46	5.59	66.27	120.56	34.74	1256.24
S_2	27.42	125.17	152.46	4.67	9.67	13.08	6.06	69.55	123.34	36.26	1285.21
S_3	25.83	122.00	144.54	4.25	8.33	11.17	5.35	65.22	118.29	33.61	1232.56
S_4	23.25	113.21	135.54	4.17	8.17	10.63	4.89	59.19	111.75	28.60	1164.45
S_5	23.33	118.08	140.71	4.17	8.33	10.75	5.01	62.45	114.58	30.64	1193.92
S_6	22.75	113.08	129.13	4.08	8.08	10.29	4.79	57.66	108.10	26.54	1126.35
S_7	22.67	110.50	125.88	4.00	7.75	10.00	4.65	54.69	106.81	24.42	1112.96
S_8	24.75	120.50	142.75	4.25	8.17	10.75	5.07	63.61	114.95	30.84	1197.76
SE ±	0.26	0.57	1.10	0.11	0.15	0.11	0.10	0.35	0.29	0.52	3.02
CD (5%)	0.75	1.63	3.17	NS	0.43	0.31	0.30	1.00	0.84	1.50	8.72

Table 3: Effect of different soil series on growth attributes and yield of sweet corn (2015-16)

Soil Series	Plant height (cm)			No. of functional leaves (plant $^{-1}$)			Dry matter accumulation (g plant^{-1})				Fodder yield (g plant^{-1})
	30 DAS	60 DAS	At har.	30 DAS	60 DAS	At har.	30 DAS	60 DAS	At har.		
									plant	kernels	
S_1	23.50	120.46	142.75	4.17	8.25	11.21	5.09	63.04	111.86	33.17	1165.57
S_2	24.17	124.04	146.92	4.50	9.50	11.67	5.51	66.07	113.92	34.76	1187.07
S_3	22.17	119.67	141.75	4.17	8.17	11.13	4.89	60.72	109.17	31.97	1137.54
S_4	21.33	113.25	129.92	4.08	8.08	10.38	4.56	54.50	103.83	26.45	1081.89
S_5	21.67	113.92	131.54	4.08	8.08	10.38	4.73	54.69	105.02	27.78	1094.28
S_6	21.25	109.33	124.50	4.00	8.00	10.21	4.47	52.57	102.31	25.41	1066.11
S_7	21.08	106.50	119.50	3.83	7.08	9.88	4.38	50.09	101.03	23.66	1052.71
S_8	22.00	118.33	136.13	4.17	8.08	10.71	4.88	58.09	107.40	29.57	1119.12
SE ±	0.28	1.01	0.87	0.11	0.20	0.17	0.10	0.61	0.11	0.50	5.27
CD (5%)	0.82	2.92	2.51	NS	0.68	0.50	0.30	1.77	0.31	1.49	15.19

Effect of different soil series on dry matter accumulation per plant (g) of sweet corn

The data indicates that the dry matter accumulation of sweet corn plant was significantly influenced by different soil series at all growth phases of plant during entire crop growth period in 2014-15 and 2015-16.

2014-15

At 30 days of crop growth, sweet corn from Palghar series (6.06 g plant^{-1}) produced significantly higher dry matter than the other soil series. Dry matter yield of Deogad series (4.65 g plant^{-1}) was found to be lowest. At 60 days of crop growth, Palghar soil series (69.55 g plant^{-1}) recorded highest dry matter accumulation, which was significantly higher over rest of the soils. The dry matter production from Deogad soils (54.69 g plant^{-1}) was found to be the lowest. At harvest, the maximum dry matter accumulation by plant and kernels of sweet corn was observed from Palghar soils (123.34 and 36.26 g plant^{-1} respectively) which was significantly higher than rest of the soils. Soils from Deogad recorded lowest dry matter accumulation by sweet corn plant and kernels.

2015-16

At 30 days of crop growth, sweet corn from Palghar series (5.51 g plant^{-1}) produced significantly higher dry matter than the other soil series. Dry matter yield of Deogad series (4.38 g plant^{-1}) was found to be lower. At 60 days of crop growth, Palghar soil series (66.07 g plant^{-1}) recorded highest dry matter accumulation, which was significantly higher rest of the soils. The dry matter production from Deogad soils (50.09 g plant^{-1}) was found to be the lowest. At harvest, the maximum dry matter accumulation by sweet corn plant and kernels was observed from Palghar soils (113.92 and 34.76 g plant^{-1} respectively) which was significantly higher than rest of the soils. The soils from Deogad recorded lowest dry matter accumulation by sweet corn plant and kernels.

In general, from 30 DAS onwards the crop entered in to a phase of rapid rate of dry matter production and towards the harvest stage, it was reduced to some extent following sigmoid growth curve. Opined that improvement in growth attributes under higher K level might have helped in better nutrient uptake by the crop which in turn resulted in assimilation of photosynthesis towards sink as well as higher dry matter accumulation and favoured the plant growth. Observed that potassium plays an important role in photosynthesis. Potassium as well as other elements influence leaf area through an increase in number and size of cells. It is generally recognized that directly or indirectly potassium is an important factor in carbon-dioxide assimilation in plants.

Effect of different soil series on green fodder yield (g plant^{-1}) sweet corn:

The green fodder yield (g plant^{-1}) of sweet corn was influenced significantly influenced by the different soil series during both years of the experiment.

2014-15

The maximum green fodder yield (g plant^{-1}) by sweet corn plant was observed from Palghar soils (1285.21 g plant^{-1}) which was significantly higher than rest of the soils. However, soils from Deogad recorded lowest green fodder yield by sweet corn plant.

2015-16

The maximum green fodder yield (g plant^{-1}) by sweet corn plant was observed from Palghar series (1187.07 g plant^{-1}) which was significantly higher over rest of the soils. However, soils from Deogad series recorded lowest green fodder yield by sweet corn plant

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