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Performance Evaluation of Exotic Sugar Beet under Selected Agro-Climatic Conditions of Sindh Province

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ABSTRACT

Performance of exotic sugar beet was evaluated under selected agro-climatic conditions of Sindh Province during the Rabi season of 2000-2001. Homogenous seeds of an exotic sugar beet variety Kawotorma were planted in 12 selected locations throughout Sindh in an area of about 1¼ acre. Agronomic practices were made uniform at all locations. It was found that root weight and analytical of juice such as brix, pol and purity percentage differed significantly ($P<0.01$) between locations. Beet planted in the fields of Sugarcane Section, A.R.I., Tando Jam, Sugar Mills Farm, Matiary and Sugarcane Research Station, Sujawal produced greater weight of roots. While, brix percentage was more in root harvested in the fields of Mir Aijaz Ali Talpur Farm, Hyderabad and Sugar Mills Farm, Matiari (17.60 and 16.80%), respectively. However, pol percentage was higher in root collected from the fields of Mir Aijaz Ali Talpur Farm, Hyderabad and Sugar Mills Farm, Matiary (14.00 and 13.00%); whereas, purity percentage of juice was superior in roots harvested from the fields of Cotton Section, A.R.I., Tando Jam, Mir Aijaz Ali Talpur Farm, Hyderabad and Ansari Sugar Mills Farm, Hyderabad (81.29, 79.35 and 79.06%). It is concluded that sugar beet performed well in all locations of the Province, however, the agro-climatic conditions of Hyderabad district were comparatively better for sugar beet production.

Key Words: Sugarbeet; Yield; Sindh; Pakistan

INTRODUCTION

Sugar beet has a fairly wide adaptability and is relatively resistant to cold, withstand drought, and are not overly sensitive to salinity; however, productivity under unfavorable conditions is not high. As sugar beet require a fairly high cash outlay and are labour-intensive, only productive soils and a favourable environment well justify the high investments involved. The sugar beet is particularly well adapted to irrigated agriculture (Follet *et al.,* 1964). Sugar beet has no self regulatory mechanisms to promote sucrose accumulation but are dependent upon external stimuli for the climatic factors such as light, temperature and day length, which determine to a great extent, the type of growth and the amount of sugar that gets stored in the root (Urich, 1952). In Pakistan, sugar beet is grown commercially only in the province of North West Frontier, while in other provinces (Punjab, Sindh and Balochistan) of the country, it is grown on marginal scale as vegetable. Recently Government of Pakistan has taken steps to introduce sugar beet in the province of Sindh. Therefore, Government of Pakistan imported seeds of some exotic sugar beet varieties and supplied to Agriculture Research Sindh through Sugar Crop Research Institute, Mardan, NWFP for testing in the various agro-climatic zones of Sindh Province to overcome the problem of shortage of sugar. Scarcity of irrigation water is increasing alarmingly. Resultantly, the area under sugarcane is reducing year after year. However, sugar beet requires less moisture and mature within 6-7 months and can be a good substitute of sugarcane crop. Keeping the above facts in view, an attempt has been made to evaluate the performance of exotic sugar beet under selected agro-climatic conditions of Sindh Province.

MATERIALS AND METHODS

Field experiments were conducted in the selected agro-climatic conditions of Sindh Province during winter season of 2000 in order to assess the performance of sugar beet. Homogeneous seeds of an exotic sugar beet variety Kawotorma were planted on about 1¼ acre of land at 12 locations. The following agronomic practices were adopted uniformly at each location.

Seed rate	2 kg ha^{-1}
Spacing	50 x 25 cm
Plant population	100,000 to 125,000 ha^{-1}
Fertilizer	100 + 100 Kg NP ha^{-1} + 30 Cartload of FYM
Irrigation	8 - 10 irrigation frequencies

The details of the experimental sites are as under:

1) Matiari Sugar Mills Farm, District Hyderabad
2) Sindh Seed Corporation Farm Sakrand, District Nawabshah
3) Habib Sugar Mills Farm, District, Nawabshah
4) Mirpurkhas Sugar Mills Farm, District Mirpurkhas
5) Bachani Farm, Tando Allahyar, District, Hyderabad

6) Sugar Crop Research Station, Sujawal, District, Thatta
7) Sugarcane Section, Agriculture Research Institute, Tando Jam, District, Hyderabad.
8) Cotton Section, Agriculture Research Institute, Tando Jam, District, Hyderabad.
9) Mir Aijaz Ali Talpur Farm, Latifabad, District Hyderabad.
10) Shah Nawaz Farm, District, Hyderabad.
11) Mahmood Shah Farm, District Hyderabad.
12) Ansari Sugar Mills Farm, District, Hyderabad.

Collection of data. For collection of data on root weight, 10 plants were pulled out randomly from each location then washed and weight was obtained in kilogram. For analysis of juice, selected roots were utilized for extraction of juice. About 250 mL juice of sugar beet from each location was collected for chemical analysis. The data thus collected were subjected to analysis of variance to see the significance of performance, while mean values were compared through Duncan's New Multiple Range Test.

RESULTS AND DISCUSSION

The results on average root weight and sugar parameters such as brix, pol and purity are summarized in Table I. It is evident from the results that root weight varied significantly ($P<0.01$) between locations. Beet planted in the experimental farm of Sugarcane Section, Agriculture Research Institute, Tando Jam, Sugarcane Research Station, Sujawal and Sugar Mills Farm, Matiari displayed significantly better root weight, while lowest root weight was obtained from Sindh Seed Corporation Farm at Sakrand.

Brix percentage of juice was changed significantly ($P<0.01$) between locations, juice extracted from beet root harvested from experimental farm of Mir Aijaz Ali Talpur, Latifabad, Hyderabad and experimental farm of Matiari Sugar Mills was superior (17.6 and 16.8%), while poor at Shah Nawaz Farm, Hyderabad (13.2%).

Pol percentage of juice affected progressively ($P<0.01$) due to change in locations. Juice obtained from roots collected from Mir Aijaz Ali Talpur Farm, Hyderabad recorded maximum pol (14%), closely followed by Matiari Sugar Mills Farm (13%), while lowest pol percentage of juice was in roots collected from Farm i.e. 2, 6, 10, 11 and 12, respectively.

Differences in purity percentage of juice over locations were significantly ($P<0.01$). Greater purity was found in juice extracted from roots collected from the experimental farm of Cotton Section, Agriculture Research Institute, Tando Jam (81.29%), closely followed by the experimental farm of Mir Aijaz Ali Talpur, Hyderabad (79.55%), and the experimental farm of Ansari Sugar Mills Farm, Hyderabad (79.06%), respectively. Whereas, the minimum purity of juice was recorded in roots collected from Sugarcane Research Station Farm, Sujawal (68%).

The above results demonstrate that beet planted in the Hyderabad area perform well in contrast to the rest of the locations indicated that agro climatic condition of Hyderabad District is quite favourable for beet plantation, although all location proved better but at par to Hyderabad. The differences in root weight and juice parameters between locations were attributed due to change in climatic factors such as light, temperature and day length, respectively. Similar results have also been reported by Urich (1952).

The by-products of sugar production from beets are also valuable and have made considerable contributions to the economy of live stock production in the country. Sugar beet tops consisting of leaves and root crowns are a valuable livestock feed. Beet tops when used in ration for fattening cattle and sheep produce economical gains and high quality carcasses (Harris *et al.,* 1965). It has been observed (Wilgues *et al.,* 1948) that roots have to be harvested within

Table I. Mean performance of exotic sugar beet planted under various agro- climatic conditions of Sindh Province

Name of Experimental Site	Sowing date	Root weight (kg)	Brix (%)	Pol (%)	Purity (%)
Sugar Mills Farm, Matiary, District, Hyderabad.	25-10-2000	7.185 ab	16.80 ab	13.00 ab	77.38 bc
Sindh Seed Corporation Farm Sakrand, District Nawabshah.	17-11-2000	5.655bcd	13.60 e	10.60 d	77.94 bc
Habib Sugar Mills Farm, District, Nawabshah.	15-10-2000	6.085 bc	14.00 d	11.00 cd	78.57 b
Mirpurkhas Sugar Mills Farm.	30-10-2000	6.035 bc	16.00 bc	12.00 bc	75.00 de
Bachani Farm, Tando Allahyar, District, Hyderabad.	28-10-2000	3.735 d	15.20 c	11.60 cd	76.32 cd
Sugarcane Research Station, Sujawal, District, Thatta.	24-10-2000	7.810 ab	15.00 cd	10.20 d	68.00 e
Sugarcane Section,Agriculture Research Institute, Tando Jam, District, Hyderabad.	24-10-2000	8.840 a	15.40 c	12.00 b	77.92 bc
Cotton Section, Agriculture Research Institute, Tando Jam, District, Hyderabad.	19-10-2000	6.535 b	15.50 c	12.60 b	81.29 a
Mir Aijaz Ali Talpur Farm, Latifabad, District Hyderabad.	24-11-2000	6.325 b	17.60 a	14.00 a	79.55 ab
Shah Nawaz Farm, District, Hyderabad.	24-11-2000	4.400 c	13.20 e	10.40 d	78.79 b
Mahmood Shah Farm, District, Hyderabad.	24-11-2000	4.405 c	14.00 de	10.40 d	74.29 e
Ansari Sugar Mills, Farm, District, Hyderabad.	24-10-2000	6.715 b	14.20 d	10.80 d	79.06 ab

24 h after leaves and tops are removed, or a decline in sugar content will occurs.

About three quarters of a ton of pulp remains from each ton of beet that is processed. The fresh pulp contains 90-95% water. Its nutritive value is about two third that of good quality maize silage. The wet pulp remaining after extraction is passed through a screen press that reduces its water content from about 90-80%. The pressed pulp is either sold directly to the farmer for feed or ensiling or is dried at the factory in rotary Kilns and then packed and sold as feed. One hundred kg of dried pulp contains from 82 to 85 feed units and 3.7 to 3.9% digestible proteins. When fed within an admixture of 10% of soybean cake, the nutritive value of the dried pulp is equal to that of an equal weight of grain. About one third of the grain ration of cattle can be replaced by dried pulp to which oilcake has been added.

Sugar beet pulp can also be used for pectin production and for the manufacturing of gala tonic acid, which is used in the synthesis of vitamin C.

Similarly, every ton of processed beet produces from 9 to 14 kg of molasses, containing about 20% water, 60% carbohydrates, 10% ash and 10% proteins. Molasses can be added to the pulp, before or during drying, at the rate of 25% of the weight of the dry pulp (Owens *et al.,* 1951). It can also be added to forage that is being ensiled. The main use of molasses is, however, as a raw material for the production of alcohol, protein rich yeast, acetone, and various organic acids in particular glutamic acid, which is widely used in the food industry.

CONCLUSIONS

It may be concluded that sugar beet performed well in all locations and can be a good substitute of sugarcane crop as problem of shortage of irrigation water in the Province is increasing alarmingly which caused progressively reduction in the area under sugarcane. One thing, which need to be kept in mind if a farmer planting sugar beet that produce, should be lifted to the Mills soon after harvest, delay generally lost weight as this problem is less in sugarcane than in beet.

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