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# COMPARATIVE PHYTOCHEMICAL STUDIES OF SWEET BEET CULTIVATED AT DIFFERENT AGRONOMICAL TRAITS OF LASBELA DISTRICT OF BALUCHISTAN

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**Abstract:**

*Sugar beet (Beta vulgaris) belongs to the family of chenopodiaceae, Beets are being used commercially for sugar production. In Baluchistan red sugar beet can grow in eight districts such as Lasbela, Kalat, khuzdar, Jaffarabad, Mastung, Quetta, Pashin, and killa Abdullah but white variety grow mostly in Lasbela district. Current study was carried out the Comparative Phytochemical studies of sugar beet cultivated at different agronomical traits in lasbela district. 6 samples were collected from different harvests of Lasbela district of Baluchistan. Phytochemical parameters (moisture quantity, Length, weight, Diameter) were determined on different samples. Determinations of brix degree % were carried out using refractometer. Determination of sugar and Sucrose were carried out by polarization method, and moisture content determination was carried out using hot air oven method .Result showed that Sugar beet having significant deference in the moisture %which was statically proved probation value was less then <0.05 as with moisture % using Nitrogen fertilizers is soil. but in this case the of brix%, Sucrose % and fibre% was increases according to increase in Doses ,brix % showed 84.00 then brix % of sugar beet having fertilizers in soil which showed 17.60%. But also sugar beet showed significant difference in sucrose % which was statically proved probation value was less then <0.05 as with sucrose % using Nitrogen fertilizers is soil. Result showed that sucrose % is 15.00 which is higher than sucrose % of sugar beet having fertilizers in soil which is 13.60. Thecurrent study need farther research on sugar beet to increase better quality yield.*

**Key Words**:*Phytochemical studies of sugar beet, Sucrose %, Brix% of sugar beet, moisture quantity.*

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## INTRODUCTION:

Plants are primary source of fibre. Medicine, food shelters in everyday use by humans with roots, leaves, stems, fruits, seeds and flowers providing food for humans [1]. Plants also serve as an essential constituent of human diet providing the body with vitamins, minerals salts, and certain hormone precursors in addition to energy and protein [2].Phytochemicals are considered as no nutrient plant compound derivative from vegetable, grains and fruits also other plant foods have been associated to decreasing the risk of chronic diseases. Phytochemicals are classified such as Phenolics, carotenoids, alkaloids, organosulfur compounds and nitrogen-containing compounds [3].Other phytochemical antioxidants and Phenolic are found in vegetable and fruits which are able of neutralizing free radical may play an important rolein prevention of certain diseases [4]. Sugar beet (Beta vulgaris) belongs to the family of Chenopodiaceae, Beets are being used commercially for sugar production. Beet gives 40% of sugar to all over the world which covers more sugar than sugar cane. Beet is generally known as the beet in the North America and known as a name of golden beet [5]. As a vegetable sugar beet was first grown however 2000 years ago up. Sugar beet date back in 18th century Silesia investigates pointed methods for sugar Withdrawal [6]. Sugar beet considered as a winter crop in subtropical region and can also grow successfully [7]. Sugar Beet is the main source of sugar with only little amount of fructose and glucose [8]. Sugar beet with higher absorption contain sucrose [9]. White variety sugar beet content lower total phenolic contented and antioxidant activity than Rosamunda. The total phenol contents in subgroup vegetables were low as compared to berries despite in three vegetables extracts such as sugar beet peel, beetroot peel the purple skinned potato exhibited significant antioxidant activity from other extracts which is being superior. Pectins (sugar beet) are polysaccharides which associated R-Dgalacturonates and predominate in their methyl esters [10].Pectin of Sugar beethave been attributed to the presences of acetyl groups and comparatively low molar mass having poor gelling properties [11]. Sugar beet pectins bring ferulic acid, arabinose residue esterified largely through 0-2, lower amount through 0-6 galactose residue of side chain [12]. From other sources of pectin Sugar beet pectin is differ, it tends to have higher neutral sugar content and also have higher degree of acetylation [13]. Flavonoids are bioactive compounds that are considered the extra nutritional constituents are naturally occurring in lesser amount in lipid rich food and plant products. Bioactive compounds have valuable health effects [14]. Sugar beet diet rich in fruits, fiber and vegetables may have a protective on cancer growth [15]. Phenolic esters, acetic acid and content of higher protein material bound side chain by covalent linkages [16]. Pulp of sugar beet comprises 0.8% of ferulic acid [17]. Under the action of chemicals sugar beet pectins can be crose linked through dimerization of ferulic acid (Thibault, J.-F., 1987). These chemical compounds effect on sucrose %, brix% and fiber %. Anthocyanins the most abundant antioxidants in our diet, Anthocyanins present in polyphenolic group and present in vegetables fruits [19].Sucrose, sugar is been an important diet component of human life. Particularly in south Sindh area the climatic condition and the soil for sugar beet cultivation have been proved favorably [20].The purpose of this research is to study the phytochemical analysis of sugar beet and the effect of chemical changes on growth of sugar beet on Lasbelha district as it is known that Pakistan has an agriculture land and also this family used as food purposes.

## MATERIALS AND METHODS:

**Detail of Samples**:

The Sugar beet cultivation trails were conducted M/s National Management Consultants (pvt.) Ltd. Karachi .Samples were received in three lots comprising of four (4), forty (40) and eight (8) samples respectively pertaining to two sugar beet sowing sites in Baluchistan province i.e. Raisani and Taimoor sites were provided to this lab in order to estimate moisture, brix value and polarization of samples. Each sample contained two sugar beets. The identity of the samples was available to the lab however for identification purpose the lab codes are allotted to each sample.

**Determination of moisture content.**

Procedure. Well mixed sample around 5 gm of as accurately weighed in a before dried and moisture dish tared (about 75 mm sample wide and 25mm deep). Dishes were placed in an air oven maintained at 105+_2$^0$C and dried at least for 2 hours. Cooled in a dessicator and weighed. The method of heating, cooling, weighing was repeated till the difference between two consecutive weighing was less than 1 mg. The lowest weight was noted.

**Determination of soluble solids (Brix)**

**Apparatus**.

(a)Refractometer – refractometerindicating the refractive index by means of a scale graduated in 0.001, in order allow readings to be expected to 0.0002.

(b)Water circulating apparatus- to maintain the temperature of the prisms of the refractometer constant to within $0.5^0$C in the neighborhood of $20^0$C which is the reference temperature. If the temperature of circulating water was found different from $20^0$C temperature correction as per table was used.
(c)Beaker- Capacity 250 ml

**Preparation of test solution**.
The sample was mixed. Press a part of the sample through a gauge folded in four, rejecting the first drops of the liquid and reserved for determination.

Determination. In order to function at the required temperaturethe water circulationAdjust and it was allowed to flow to bring the prisms of the refractometer to the same temperature which shall remain constant to which $0.5^0$C during the determination. A small quantity of the test solution (2-3 drops are sufficient) was allowed on the fixed prism of the refractometer and immediately the moveable prism was adjusted. The field of view was suitably illuminated. The line dividing the light and dark parts of the surface in the field of view was brought to the crossing of the threads and the value of refractive index was read. The reading of the percent sugar was taken. If the determination has been carried out at a temperature other then 20+_$0.5^0$ C the following corrections are required.

**Sucrose in Sugar Beets**.
**Procedure.**
(Usually in form of cossettes) Sample was ground through meat grinder fitted with plate having 6 mm (1/4") punctures and mixed thoroughly. 26g prepared sample was weighed and rinsed in to 201.0Ml kohlrausch flask, using ca 100Ml, $H_2O$.The flask was placed beneath virtuous vacuum 5-10 min to remove air , when vacuum is first applied carefully avoiding mechanical loss. $H_2$ was added to ca 175mL, and digested in water both at $80^0$C supporting flask so that body is entirely absorbed but with heating element it is not in contact. The flask was removed 2 or 3 times during digestion, contents swirled, and after each agitation pulp adhering to walls of flask was washed down with little $H_2O$ at $80^0$C. After exactly 30 min digestion, flask was filled to within 2-5 mL of mark with $H_2O$ at $80^0$C and digestion continued exactly 10 min longer. The flask cooled down to room temperature in $H_2O$ bath. 6Ml basic $Pb(CH_3COO)_2$ solution was added and $H_2O$ was poured to fill to mark. (Previous additions of $H_2O$ and reagents was so adjusted then<4 mL $H_2O$ was required to dilute to volume.) The flak was mixed well by shaking, rested for 5 min, and polarization taken in 400 mm glass tube.

## RESULTS:
Verital performance of Sugar beet.

**Table 1: Effect of bio chemical variation in different varieties of sugar beet**

| S.no | Moisture % of sugar beet | Fiber % of sugar beet | Sucrose% of sugar beet | Brix% of sugar beet |
|---|---|---|---|---|
| 1 | $85.18_{ab}$ | $14.82_{ab}$ | $11.81_{ab}$ | $84.00_{aa}$ |
| 2 | $83.86_{ae}$ | $16.14_{ab}$ | $11.20_{ab}$ | $81.56_{ab}$ |
| 3 | $84.91_{ac}$ | $15.09_{ab}$ | $12.10_{ab}$ | $79.96_{ac}$ |
| 4 | $85.38_{aa}$ | $41.09_{aa}$ | $12.60_{ab}$ | $83.11_{ab}$ |
| 5 | $82.91_{af}$ | $17.09_{ab}$ | $12.40_{ab}$ | $81.31_{ab}$ |
| 6 | $82.35_{ag}$ | $17.65_{ab}$ | $15.00_{aa}$ | $81.80_{ab}$ |
| a7 | $84.17_{ad}$ | $15.83_{ab}$ | $9.01_{ac}$ | $83.59_{ab}$ |
| **LSD** | **1.95** | **15.54** | **1.82** | **1.251** |

Sugar beet plant moisture developed at different site at Quetta Balochistan varied significantly (P<0.05) under various treatments of moisture content regarding1harvest parameter as mentioned in (Table 1). Plants of sugar beet greater moisture content were produced by replications 4. The response trend of moisture developed suggests that regardless the replication diversity, replication 4 was more effective treatment improve plant growth as compared to rest of the replications in 1 harvest time. Sugar beet sucrose percentage was significantly (P<0.05) influenced by replications about sucrose percentage (Table-1). Sugar beet sucrose percentage were produced by replications 6 (m=15.00), 5(m= 12.40), 4(m= 12.60), 3(m=12.10) respectively. This shows that sugar beet plants propagated by sugar beet type 2 harvest sucrose % produce because of proper management. Sugar beet fiber percentage was also significantly (P<0.05) influenced by replications about sucrose percentage ((Table-1). The analysis of variance for brix degree % sugar beet harvest 3 replications of diversified origin planted under climatic conditions of two site of Balochistan indicated significant (P<0.05) as shown in Table-1. Sugar beet exhibited 17.09% in replication 6 and sugar beet Brix %age in replication 1 showed 84.00 %.

**Table 2: Effect of bio chemical variation in different varieties of sugar beet ( N fertilizer**

| | Moisture % 0f sugar beet | Fiber % of sugar beet | Sucrose % of sugar beet | Brex% of sugar beet |
|---|---|---|---|---|
| T 1kg | $84.00_{aa}$ | $16_{ac}$ | $10.60_{ag}$ | $13.80_{ag}$ |
| T 2kg | $81.56_{ab}$ | $18.44_{ab}$ | $12.40_{ad}$ | $15.90_{ae}$ |
| T 3kg | $79.96_{ac}$ | $20.31_{aa}$ | $11.80_{ae}$ | $17.60_{aa}$ |
| T 4kg | $83.11_{aa}$ | $16.89_{ac}$ | $14.20_{aa}$ | $14.90_{af}$ |
| T 5kg | $81.31_{ab}$ | $18.69_{ab}$ | $11.20_{af}$ | $16.50_{ac}$ |
| T 6kg | $81.80_{ab}$ | $18.2_{ab}$ | $13.60_{ab}$ | $16.20_{ad}$ |
| T 7kg | $83.59_{ab}$ | $16.41_{ac}$ | $12.60_{ac}$ | $17.30_{ab}$ |
| **LSD** | **1.251** | **15.03** | **1.827** | **1.605** |

**Table 3: Effect of Physio chemical variation in different varieties of sugar beet**

| S.no | Total plant lengt | Plant length of sugar beet | Beet Average weight of sugar beet (gm) | Diameter% of sugar beet |
|---|---|---|---|---|
| 1 | $71.25_{aa}$ | $47.50_{aa}$ | $1528.00_{ag}$ | $21.80_{aa}$ |
| 2 | $66.75_{ab}$ | $44.50_{ab}$ | $4480.00_{ab}$ | $19.20_{ac}$ |
| 3 | $59.25_{ac}$ | $39.50_{ac}$ | $5804.00_{aa}$ | $18.40_{ba}$ |
| 4 | $54.03_{ae}$ | $36.02_{ad}$ | $3481.00_{ad}$ | $21.60_{ab}$ |
| 5 | $52.95_{af}$ | $35.30_{da}$ | $4343.00_{ac}$ | $18.00_{bc}$ |
| 6 | $58.2_{ad}$ | $38.80_{ca}$ | $51.28.00_{af}$ | $17.60_{ca}$ |
| 7 | $61.95_{ac}$ | $41.30_{ac}$ | $2968.00_{ae}$ | $19.70_{ab}$ |
| **LSD** | **1.662** | **1.913** | **133.1** | **1.537** |

The statistical analysis of variance presented significant (P<0.05). The analysis of variance for moisture% of harvest 4 sugar beet N fertilizer replications of diversified origin planted under climatic conditions of two site of Balochistan indicated significant (P<0.05) as shown in table-4. Moisture % of harvest 2 sugar beet N fertilizer were produced by replications 1 (m=84.00), 4 (m=83.11), and 7 (m=83.59) separately. On the other hand moderately standard moisture% of harvest 4 sugar beet N fertilizer were also found in 2 (m=82.43), 3(m=82.03) and 5 (m=82.34) replications singly. Statistically significant (P<0.05) differences in sucrose % of harvest 2 sugar beet N fertilizer have been noted for replication as shown in table-2. Sucrose % of harvest 2 sugar beet N fertilizer were shaped by replications 3 (m= 17.60), 7 (m=17.30), and 5 (m=16.50) discretely. Brix degree% of harvest 2 sugar beet N fertilizer was significantly (P<0.05) influenced by replication are presented by table-2. Brix degree% of harvest 2 sugar beet N fertilizer were formed by replications 3 (m=17.60), 5 (m=16.50), and 6(m=16.20) in isolation.

Sugar beet Sucrose % on harvest 1 about length in cms of harvest 1 was statistically significant (P<0.05) alpha level, inclined by replications are showed by table-3. Sugar beet sucrose % on harvest 1 about length in cms of harvest 1were bent through replications 1 (m=47.50), 2 (m=44.50), and 7 (m=41.30) independently. On the other hand abstemiously. Sugar beet average weight on harvest 1about average weight of sugar beet in grams harvest 1 was statistically significant (P<0.05) as shown in table-3. Sugar beet average weight on harvest 1 about average weight of sugar beet in grams harvest 1 were fixed through replications 3 (m=5804.00), 6 (m=5128.00), and 2 (m=4480.00) respectively. Sugar beet average weight on harvest 9 concerning diameter in cms of sugar beet harvest 9 was statistically significant (P<0.05) as shown in table-3. Sugar beet average weight on harvest 9 concerning diameter in cms of sugar beet harvest 9 were fixed through replications 1 (m=21.80), 4 (m=21.60), and 4 (m=19.70) respectively.

Sugar beet Length of sugar beet on harvest 10 (Nitrogen fertilizer) about length in cms type was statistically significant (P<0.05) as exposed in table-4. Sugar beet Length of sugar beet on harvest 10 (Nitrogen fertilizer) about length in cms type were fixed through replications 7 (m=34.40), 2(m=30.30), 3 (m=29.80), 5 (m=29.30.), and 4 (m=28.60) respectively. Sugar beet average weight in grm on harvest 2 about Average weight type 2 was statistically significant (P<0.05) as presented in table 4. Sugar beet average weight in grm on harvest 2 about Average weight type 2 were fixed through replications 1 (m=2507.00), 2 (m=2549.33), 5 (m=2344.00), 7 (m=3145.00) respectively.

**Table 4: Effect of physio chemical variation in different varieties of Sugar beet (N fertilize)**

| S.no | Total length o plant | Length of sugar beet | Average weight of sugar beet(gm) | Diameter of sugar beet |
|---|---|---|---|---|
| T1kg | $44.7_{b}$ | $29.80_{b}$ | $2507.00_{b}$ | $15.60_{a}$ |
| T2kg | $45.45_{b}$ | $30.30_{b}$ | $2549.93_{c}$ | $16.23_{a}$ |
| T3kg | $41.85_{b}$ | $27.90_{b}$ | $1906.00_{g}$ | $14.00_{a}$ |
| T4kg | $42.9_{b}$ | $28.60_{b}$ | $1794.00_{h}$ | $11.80_{b}$ |
| T5kg | $43.95_{b}$ | $29.30_{b}$ | $2344.00_{d}$ | $15.66_{a}$ |
| T6kg | $42.165_{b}$ | $28.11_{b}$ | $2140.00_{f}$ | $14.60_{a}$ |
| T7kg | $51.6_{a}$ | $34.40_{a}$ | $3145.00_{a}$ | $15.00_{a}$ |
| **LSD** | **1.932** | **1.138** | **1.70** | **1.151** |

*Sugar beet diameter in cm on harvest 2 regarding diameter cms type 2 was statistically significant (P<0.05) as revealed in table-4. Sugar beet average weight on harvest 2 concerning diameter in cms of sugar beet harvest 2 were fixed through replications 2 (m=16.23), 5 (m=15.66), and 1(m=15.60) respectively.*

Statistical analysis the experiment was carried in triplicate; the result was in mean ± standard deviation. All experiment data was statically analyzed by using Standard ANOVA with significance > 0.05 probability Level.

## RESULTS AND DISCUSSION:

Richter et al suggested (2006) that climatic changes have positive effects on sugar beet harvest. The objective of the study was to assess thy phytochemical studies of sugar beet cultivated at different agronomical traits. The current study was carried out that in Lasbela district. Fieuw and willenbrink in 1987 reported sucrose phosphate synthesis and sucrose synthesis in sugar beet plant. Shehata et al in 2014 reported quantification of flavonides and total phenolic contents in extracts of some green leaves and the estimation of antioxidant activity. Jasna M., et al in 2011 reported antimicrobial and antioxidant activities of beet root pomace. Petkeviciene et al suggested (2009) that sugar beet (beta voulgaries) early sowing timing on the effect of climate factor. He further suggest that effect determination of sugar beet growing process on swing time are temperature, soil moisture, and precipitation which are considered as the main important environmental factor. Abyaneh et al reported the influence of determination of water requirement on qualitative and quantitative yield weight average and diameter of sugar beet and trait of sugar beet product. Jozefyova et al,. (2004).reported the influence on yield time on sugar beet fertilized with augmented nitrogen fertilization on root yield. Our study showed that higher root yield produced by Nitrogen fertilization. Fertilizers play an important role on production of sugar beet. The process of nitrogen application is essential to harvest on Maximum quantity of root and sugar harvest. Hergert et al suggested (2010) reported the fertilization of sugar beet. The levels of Nitrogen fertilizers caused difference in harvest and fineness characters of sugar beet. Our study showed that higher root yield produced by Nitrogen fertilization. The process of nitrogen application is essential to harvest on Maximum quantity of root and sugar harvest. Our analysis also showed that Weight of sugar beet depends on water requirement. The current study carried out phytochemical analysis that fertilization also decreases moisture quantity, brix %age, fibr %age, sucrose quantity, climatic conditions and date of sowing. On root yield and quality and sucrose % the influence of Nitrogen is taken as important fertilizer

## CONCLUSION:

Sugar beet, mainly used for production of sugar,. There for it has been concluded from above mentioned results that fertilizers exhibits vital activity on sugar beet production Sugar beets was grown to determine within-treatment variability and the influence of nitrogen fertilizers on sucrose concentration, sucrose yield and vegetative growth. Concentration of sucrose increased with increasing Nitrogen fertilizers. Maximum fresh weight obtained on requirement of water, fertile soil, good quality of fertilizers. Sugar beet reported positively to Nitrogen fertilizers in sugar yield and beet weight. Higher quantity of fertilizers indicated substantial increased in quality and harvest under lacking water condition. It is also suggested that there is great potential of Nitrogen fertilizer in sugar beet to yield beet quality for sugar beet production on economical industrial scale.

## RECOMMENDATION:

The study recommends the phytochemical studies of sugar beet in Lasbelha districts. Climatic condition play a key role for the development of sugar beet. Nitrogen fertilizers, water requirement and drought also effects growth, quantity, and quality of sugar beet. Govt should encourage farmers for the better development of sugar beet and should encourages to first sow beet on trial basis through offering them free fram inputs, insurance crop to build their confidence in crop. Ensure sugar beet growers guaranteed prise for their harvest. For different climate areas research institute should develop better quality of beet seeds. Research centers should develop the better quantity and quality of fertilizers for the better development of sugar beet. The processing of sugar beet requires different technique for development and processing as compare to sugar cane: carbonization, beet slicing, beet diffusion and liming.

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