

Short Communication

INVESTIGATION OF VITAMIN C AND PHYSICAL PARAMETERS OF CONVENTIONALLY GROWN *FRAGARIA X ANANASSA* (STRAWBERRIES) OF SINDH.

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خلاصہ

اسٹرابریز کا ایک اہم غذائی جزو وٹامن سی ہے وٹامن سی ایک انٹی آکسڈینٹ کے طور پر عمل کرتی ہے اور انسانی جسم میں ٹیومر سیلز کی نشوونما کو بھی روکتی ہے۔ اس مطالعہ کا مقصد سندھ میں کاشت ہونے والی اسٹرابریز کی طبعی خصوصیات اور ان میں وٹامن سی کی مقدار کا تقابلی جائزہ لینا ہے تاکہ اسٹرابریز کو وٹامن سی کا اہم ذریعہ ثابت کیا جاسکے۔ اس مقصد کے لئے سندھ کے مختلف علاقوں میں کاشت شدہ اسٹرابریز کے چار نمونے جمع کئے گئے۔ وٹامن سی کی مقدار کا تعین کرنے کے لئے آیوڈوپیمائی معیارہ کیا گیا جس کے نتیجے میں وٹامن سی کی مقدار ۲-۵۱ ملی گرام سے ۰-۷۲ ملی گرام فی ۱۰۰ گرام تک تخمینہ کی گئی جب کہ ان میں موجود پانی کی تخمینہ کا اندازہ ۸۴ سے ۹۱ فیصد اور پی ایچ کی قیمت ۲-۶۲ سے ۲-۷۳ تک تخمینہ کی گئی۔ حاصل شدہ نتیجے کا ورڈوائٹڈ ٹیسٹ کی روشنی میں جائزہ لیا گیا اور یہ ثابت ہوا کہ سندھ میں کاشت شدہ اسٹرابریز غذائیت سے بھرپور ہیں اور قدرتی انٹی آکسڈینٹ کے طور پر استعمال کی جا سکتی ہیں۔

Abstract

Vitamin C is one of the most vital nutrient found in strawberries (*Fragaria x ananassa*). Vitamin C acts as an antioxidant by scavenging oxygen radical very efficiently and suppresses the development of tumor cells in human body. The objective of the current research is to compare the vitamin C content and some physical parameters of conventionally grown strawberries of Sindh to prove those a key foundation of vitamin C. For this purpose strawberries samples collected from various locations of Sindh. The content of vitamin C in these samples was analyzed by applying classical method (iodometry) and was found as 51.2 mg/100g to 72.0 mg/100g. Moisture content in samples was calculated through oven drying method (AOAC) and was recorded in the range of 84.0 % to 91.3 % while the pH of samples ranges from 2.62-2.73. The obtained results compared with the reported worldwide data and highlighted that the conventional cultivation of strawberries in Sindh has effective nutrients and can be consumed as a good source of natural antioxidant supplement.

Key words: Vitamin C, *Fragaria x ananassa*, antioxidant, iodimetry, iodometry, pH-metry.

Introduction

Strawberry (*Fragaria* spp.) belongs to kingdom Plantae, herbaceous member of family Rosaceae and more than six hundred varieties are grown all over the world having different taste, texture and size (Childer, 1983). Strawberry covers an imperative place among the small fruit plants. It is red in colour with unique shape and flavor (Somashet *al.*, 2009). It is recently introduced in Pakistan so have less production as compared to other countries of the world. It is cultivated in Punjab, Khyber Pukhtunkhwa and Islamabad. Pakistan produces Mission, Corona, Tuft, Festival, Sweet Charlie and Super fraction varieties of strawberry (Amin, 1996). It is very luscious but perishable so immediate consumption is needed. It is very nutritious fruit containing protein, carbohydrate, fat, fiber, thiamine, folic acid, riboflavin, niacin and vitamin C. It is also rich in metals like zinc, iron, sodium, calcium, copper, potassium and magnesium. It is an important source of vitamin K, vitamin B5, vitamin B6 and omega 3 fatty acids (USDA, 2011). Vitamin C usually called ascorbic acid, is an essential antioxidant needed by the human body. In 1923, ascorbic acid was isolated by Hungarian and Szent-Gyorgyi and synthesized first time in history by Howarth and Hirst (Haworth and Hirst, 1933). Vitamin C possesses a number of health benefits such as boosting the immune system and preventing the cold, blood level of vitamin C is inversely related to disease parameter such as risk of cancer and cardiovascular disease (Clemens and Toth, 2016). In living organisms the functions of ascorbic acid are basically dependent on the oxido-reduction character of L-AA which is a co-factor for hydroxylation and activity of mono oxygenase enzyme (Levine, 1986). As vitamin C content is becoming a progressively imperative factor with respect to fruits and vegetables, here vitamin C is estimated for this purpose.

Material and Method

Sample Collection and Preparation

The samples of strawberry were collected from the main fruit stock market of Karachi, which were cultivated in different rural areas of Sindh (Khairpur, Razagoth, Sachilkoraiy and Yareemmerani). These were washed with tap water, rinsed with distilled water, dried in open air and leaves were removed from strawberries manually after drying. These samples were labelled as A, B, C and D.

Moisture content was determined through the drying method in a convection oven, according to the procedures proposed by the (AOAC 2010). The fruit juices were extracted with the help of juicer machine which were taken for pH and vitamin C content measurements.

The pH of each samples was determined by immersing the electrode of pH meter (Jenway 3510) in sample juices.

The vitamin C content was determined by classical method of analysis involving volumetric method based on iodimetry (Redox reaction) in which samples (strawberry juices) were titrated with standard iodine solution using starch as an indicator and ascorbic acid was oxidized into dehydroascorbic acid and iodine was reduced into iodide ion. The detailed procedure has following steps:

- i- Standardization of Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) versus standard Potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) was performed iodometrically using starch as an indicator and colour change at end point was observed from dark blue to light green.
- ii- Standardization of Iodine (I_2) solution against standard solution of Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$), involving iodimetric redox reaction. The end point was determined by the formation of deep blue colour of starch iodine complex.
- iii- This step involved iodimetric titration, sample (Ascorbic acid, $\text{C}_6\text{H}_8\text{O}_6$) was titrated versus standard solution of iodine. Iodine oxidized ascorbic acid into dehydroascorbic acid and itself it was reduced into iodide ion. The end point was detected by the iodine excess that formed complex with starch presenting a deep blue violet colour (Silva *et al.*, 1999).

Table 1: Values of vitamin c and physical features in different juice samples of strawberries

Sample code	Vitamin C (mg/ 100g)	Percent moisture content	pH	Volume (ml/100g)	Color	Taste
A	51.2	87.0	2.62	65.0	Orange	Sour
B	62.4	90.0	2.66	80.0	Red	Sweet
C	52.0	84.0	2.63	67.0	Red	Sweet and Sour
D	72.0	91.3	2.73	85.0	Dark Red	Sweet

Results and Discussion

In present study the observed ranges of moisture were noted as 84.0 % to 91.3%. The lowest value was determined in sample C and highest value was found in D sample. Moisture content is affected by the environmental and geographical conditions.

The pH values were found in the range of 2.62 – 2.73, sample A showed lowest pH value while the highest pH value was exhibited by the sample D. These results are found lower than the reported range of pH, it is concluded from the current study that the strawberry samples obtained from the different areas of Sindh are more acidic. This may be due to the source of water supply, type of soil and lack of rain.

The vitamin C range was determined in different samples of strawberries as 51-72 mg/100g (Table 1). The sample A has the minimum value while D sample has the maximum value when compared to the reference value (26 - 120 mg/100g) (Somashet *et al.*, 2009). The variation in obtained values of vitamin C may be difference in the environmental factors like temperature because these fruits were collected from different areas of Sindh. Sample A and C were stored for 2 days before juice extraction which reduced their juice volume and vitamin C content as compared to the sample B and D. Juices of both sample B and D were extracted as soon as the samples were collected from the market. Hence, it had been proved that fresh fruits and their fresh juices contain more vitamin C content as compared to stored fruits.

Current studies agreed well with the findings of Rigby (Rigby, 2011) who reported that higher the acidity levels of the fruit, lower the total volume of juice extracted. This is occurring because when more juice is present, there is occasionally more water inside the juice, which is contributing to the dilution of the acids present.

In short, locally grown strawberries had good physiochemical properties but there is a little difference as mentioned in literature, it may involve some climatic factors like nature of soil and lack of rain. These factors

directly affect the pH, taste, colour and volume of juice of the fruit. The vitamin C content was also affected by the freshness of fruit, in stored fruit it is less and fresh fruit had more vitamin C.

Conclusion

Considering the obtained results, it is concluded that vitamin C content in the locally grown strawberries in different areas of Sind is within the limits established by WHO. These locally grown strawberries are full of vitamin C. They are easily available in markets at reasonable rates and can fulfill vitamin C requirements as natural source because it is essential nutrient and contributes an important role in biological system. It is also concluded that the concentration of vitamin C in the fruit can be influenced by lack of rain and quality of the fruit because fresh fruit contains more vitamin C than stored fruit.

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