SHORT COMMUNICATION

COMPARATIVE STUDY OF VITAMIN C AND PHYSICAL PARAMETERS OF CONVENTIONALLY GROWN *FRAGARIA XANANASSA* (STRAWBERRIES) OF SINDH

RABIA FARHEEN, RUBINA PARWEEN, ANILA ANWAR, FARAH KISHWAR, SHUMAILA NOOR AND AMINA SULTANA.

Department of Chemistry, Federal Urdu University of Arts Science and Technology, Gulshan e Iqbal− 75300, Karachi.

خلاصہ

اسٹرابریز کا ایک اھم غذائی جزو وٹامن سی ہے وٹامن سی ایک انٹی آکسیڈینٹ 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 اوران 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 آیوڈومیٹری معائرہ کیا گیا جس کے نتیجے میں وٹامن سی کی مقدار ۲۔۵۱ ملی گرام سے ۰۔۷۲ ملی گرام فی ۱۰۰ گرام تک تخمین کی گئی جب کہ ان میں موجود پانی کی تخمین کا اندازہ ۸۴ سے ۹۱ فیصد اور پی ایچ کی قیمت ۶۲۔۲ سے ۷۳۔۲ تک تخمین کی گئی۔حاصل شدہ نتیجے کا ورڈ وائڈ ڈیٹا کی روشنی میں جائزہ لیا گیا اور یہ ثابت ہوا کہ سندھ میں کاشت شدہ اسٹرابریز غذائیت سے بھرپور ہیں اور قدرتی انٹی آکسیڈینٹ کے طور پر استعمال کی جا سکتی ہیں۔

Abstract

Vitamin C is one of the most vital nutrient found in strawberries (*Fragaria xananassa)*. 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 to 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 xananassa*, antioxidant, iodimetry, iodometry, pH-metery.

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 (Somash *et 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 verities 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. 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). As vitamin C content is becoming a progressively imperative factor with respect to fruits and vegetables, here vitamin C is estimated for this purpose.

Materials and Methods

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, Sachil koraiy and Yareem merani)**.** These samples were labelled as A, B, C and D. These were washed with tap water, rinsed with distilled water, dried in open air and leaves were removed from strawberries manually after drying.

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 following Silva *et al*., 1999.

Results and Discussion

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)	Colour	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

Table 1 shows the observed ranges of moisture from 84.0 % to 91.3%. The lowest value was determined in sample C and highest value was found in D sample.

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 Sind 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) (Somash *et al*., 2009).

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 level 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.

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. However strawberries grown at Yareem Merani are the best source of vitamin C.

Acknowledgement

I would like to acknowledge Dr. Iffat Mahmood, Professor of Chemistry Department, FUUAST for her cooperation throughout this research.

References

Amin. (1996). Progress and prospects of strawberry production in NWFP. Annual report, Agriculture Research Station, Mingora, Swat. 212: 4-7.

AOAC (Association of Official Analytical Chemists). Official Methods of Analysis 17th Ed. Washington, DC: AOAC, 2000.

Childer N. F. (1983). Strawberry growing. Modern Fruit Science, Gainesvile. Hort Publishers.

Clemens, Z. and Tóth, C. (2016). Vitamin C and Disease, Insights from the Evolutionary Perspective, Journal of Evolution and Health 1 (1).

Rigby R. (2011). California State University, San Bernardino. Correlations between Citrus Fruit Properties and Ascorbic Acid Content. PRISM Summer Research Project.

Silva R. S., Simoni J. A., Collins H. C. and Volpe O. L. P. (1999). Ascorbic acid as a standard for iodometric titrations. An Analytical Experiment for General Chemistry. J. Chem. Educ., 76 (10), 1421-1422.

Somash S., Joshi V. K. and Abrol G. (2009). An overview on strawberry wine production technology composition, maturation and quality evaluation. Natural Product Radiance, 8 (4), 356-365.

U. S. Dept. of Agriculture USDA (2011). Nutrient database for standard reference, Oregon. Strawberries. Org.