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Quantitative Evaluation of Nutritional fact of Pomegranate Fruit Extract and Comparison with Two Pomegranate Packed Juice Samples

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Abstract- The aim of the present study was to analyze and comparison of various nutritional fact of pomegranate juice extract and pomegranate packed juice sample. We have studied various physico-chemical parameters and found result such as pH (2.96 – 4.09), conductivity (0.109 – 0.949 MS/cm), TSS (13 – 17.5 %), acidity, (0.0052 – 0.158 g/100ml), vitamin C (0.077 – 0.158%), crude fiber (3.01 – 5.33 %), sodium (15.9 – 21.8 mg/100ml), potassium (17.89 – 90.5 mg/100ml), calcium (3.2 – 81.6 mg/100ml), iron (0.088 – 0.767 mg/100ml) etc. We used very cost effective different chemical and instrumental method for analysis.

Study shows that, the pomegranate fruit juice extract was found good amount and significant values of various nutrition values less acidic, TSS, crude fiber, ash. Minerals demonstrate various health benefits and result obtained our study shows that, potassium, magnesium, calcium and iron are significant amount in fruit juice extract (diluted). While sodium found lower in fruit juice sample than packed juice. Lower value of sodium is good for health.

Keywords- Pomegranate fruit extract, pomegranate packed juice, physico-chemical analysis, nutrition fact, comparison

I. INTRODUCTION

Pomegranate (*Punica granatum* L.) is one of the important commercial and cash fruit which is cultivated in many tropical and subtropical climates including various Asian, North African, Middle East countries and Mediterranean region [1,2]. India is one of the largest producer along with Iran, China, USA and Turkey are the five major producers of pomegranate. According to Jadhav and Sharma India has become the largest cultivator and producer of pomegranate in the world [3]. Pomegranate fruits are widely consumed fresh or processed into various different format like juice, jams, syrup and sauce [4]. Some recent studies reported that biologically active components isolated from different parts of the pomegranate plant can help in treating several diseases. These diseases are different cancer of skin, breast, prostate and colon and also inflammation, hyperlipidemia, diabetes, ageing, etc. Its wide range of utility in human health, nutrition and livelihood security has triggered heavy demand for its fruits in India and other countries [5,6].

Some study evaluated the physicochemical and antioxidant properties of various cultivars of pomegranate grown in the South Africa. The results found that there was a significant difference in physicochemical properties and antioxidant activity among various cultivars. The components of pomegranate fruit are highly dependent on the various factors such as, cultivar type, growing region, climate, maturity and cultural practice [7,8]. Sweet-type pomegranate germplasm is widely available in different parts of India and these plants have wide variations in their fruit characters and components. In the recent past, various reports revealed significant variation in fruit physico-chemical traits of pomegranate grown under different agro-climatic conditions [9,10].

Cultivars are classified pomegranate in to three groups: sweet, sour-sweet and sour based on the organoleptic properties (sugar-acid ratio) of pomegranate fruit. In western Herzegovina a few local pomegranate cultivars are used in traditional Plantations [11]. Pomegranate juice has shown many beneficial effects on markers of cardiovascular health including lowering of both Blood pressure, It shows effect on both type of blood pressure such as Systolic blood pressure (SBP) and diastolic blood pressure (DBP) [12].

Different biologically active parts of Pomegranate are important such as fruits, peels and seeds have proven its role in diseases cure via modulation of biological activities. Earlier investigators demonstrated that pomegranate extract exhibited good work against hydroxyl and superoxide. Consumption of pomegranate extract potentially effective onset and reduced of collagen-induced arthritis and it shows more effective lowering severity of arthritis significantly in pomegranate extract fed animals [13,14]. Pomegranate extract was also found useful in skin health management, showed effective to

protecting human skin fibroblasts from cell death after exposure in UV radiations [15].

Various studies showed that medicinal plants or its constituents show role in the management of diabetes as well as its complication including Diabetic retinopathy. Ethanolic extract of pomegranate leaves showed significant antidiabetic activity. Same study was extended and found to be highly effective in managing the complications of diabetes mellitus [16]. Some other research was carried out for investigating anti-diabetic property, hypolipedimic and antioxidant activity and it concluded that fruit peel has shown anti-diabetic and hypoglycemic activity. Crude powder of Punica granatum husk was used to decrease the concentration of glucose, triglycerides, cholesterol, LDL cholesterol. It was also raised the level of HDL cholesterol and hemoglobin content in the blood of normal group and alloxan diabetic group treated rats. Study finding revealed that seed and rind extracts showed significant reduction in the rise in blood glucose level in the human body [17, 18].

II. MATERIAL AND METHODS

A. Preparation of sample

In the present study, we selected two different types of pomegranate fruits namely Egyptian and Yemeni. These fruits were collected from local market. Peel was removed and crushed seeds used as fruit extract for analysis. Seed as juicy material weighed and crushed in to mortar pestle and then filter, washed and diluted in to volumetric flask. We also choose two packed pomegranate juice samples namely RPJ and LPJ from the market. Fresh juice extract from fruit and packed juice samples were used for analysis of various physico-chemical parameters.

B. Physico-chemical parameters

We have tested our samples various physico-chemical parameters such as, pH, conductivity, TSS, moisture, ash, vitamin C, titratable acidity, crude fiber, carbohydrates etc. 10 g of seeds were crushed and made in to juice then passed through sieve and filtrate was the diluted to 100 ml with distilled water in volumetric flask. These sample of fruit juice extract and packed juice sample were used for testing of pH and conductivity. pH and conductivity was measured by using laboratory pH meter and conductivity meter after proper calibration of these instruments according to standard calibration procedure. TSS (total soluble solid) was measured by using Abe's refractometer. Concentrated juice extract and sample from packed juice was directly used for measurement total soluble solids in the samples. All measurement was done in triplicate and average of the three readings were used for final calculation.

Moisture content and ash content was measured by taking weighed amount of pomegranate seed sample and packed juice sample in to previously cleaned, heated and weighed crucibles. These crucibles are heated in an oven and furnace respectively according to AOAC 2000, standard procedure and the weight of crucibles was measured and calculated the moisture and ash was calculated percentage (%). Total titratable acidity was determined by using titration between standard sodium hydroxide solution and sample solution with phenolphthalein as an indicator. The acidity was determined here was in terms of citric acid (g/100ml) [19].

Crude fiber was determined by digesting sample with 200ml of 0.1245 M H_2SO_4 and later with 200ml of 0.313 M NaOH. After each treatment, sample was filtered and washed. Then it was washed with alcohol and dried, constant weight was measured as crude fiber [20]. Vitamin C is one of the important component of any fruit. It was measured by using DCPIP (2,6 – dichlorophenolindophenol) method. 0.1% ascorbic acid was filled in burette and then titrated with 5 ml of DCPIP solution in conical flask. Then repeat the titration replacing juice sample with 0.1 % ascorbic acid, quantity of DCPIP required for both solutions used for the calculation of % of ascorbic acid in the sample by using the following formula [21].

$$Vitamin\ C\ \% = \frac{Volume\ of\ Std\ ascorbic\ acid\ for\ DCPIP}{Volume\ of\ Apple\ juice\ for\ DCPIP}\ x\ 0.1$$

C. Mineral Analysis

Different minerals were analyzed by using various instrumental and chemical methods. We have analyzed sodium, potassium, calcium, iron, magnesium and phosphorus in both fruit extract and packed juice sample. All samples were converted in to ash and then heated in HCl and HNO_3 acid mixture. It was filtered and diluted in 100 ml volumetric flask. This sample solution was used for analysis of different minerals. Sodium and potassium was determined by using flame photometry. Standard solution of sodium and potassium was prepared by using NaCl and KCl salt. Calibration graph was obtained and using calibration curve equation used for calculation of Na & K.

Iron, Calcium, Magnesium and Zinc was determined by using AAS (Atomic Absorption Spectrophotometer) according to AOAC (2000) methods. Standards of Fe, Ca, Mg, and Zn were used from standard provided with the instrument and diluted to the required concentration of each mineral. Absorbance of standard and samples were obtained from the AAS. Then the calibration curve was obtained and equation of straight line obtained used for the final amount of all minerals per 100gm of grape sample [22,23]. Calcium and magnesium was determined by EDTA titration method.

III. RESULT AND DISCUSSION

A. Physico-chemical parameter

All different physico-chemical parameters testing during our study and their results obtained in this study are shown in Table 1 given below. While table 2 represents the different minerals analyzed during our study.

Table 1. Result of different physico-chemical parameters.

Sample / Parameters	Egyptian	Yemeni	LJ	RJ
pH	3.48	4.09	2.96	3.055
Conductivity (MS/cm)	0.74	0.548	0.109	0.949
TSS %Brix	16	17.5	13.5	13
Acidity (g/100ml)	0.014	0.0052	0.158	0.142
Vitamin C %	0.117	0.077	0.158	0.142
Moisture %	79.8	79.3	83.8	84.4
Ash %	1.46	2.34	0.65	0.149
Crude Fiber %	5.33	4.94	3.39	3.01
Carbohydrate	0.961	1.096	0.604	0.999

Result of analysis of pH was found that both pomegranate sample extract was found little higher value i.e. 3.49 in Egyptian and 4.09 in Yemeni samples than packed juice samples 2.96 & 3.055. It may be because of different preservatives used. Conductivity obtained was found in the range of 0.109 – 0.949 MS/cm. TSS was measured in % Brix, it was found in the range of 13 – 17.5 %. Both fruit samples were higher TSS while packed juice samples were lower % Brix value. While titratable acidity was found higher in packed juice samples i.e. 0.142 and 0.158 g/100ml and lower in fruit juice extract sample 0.014 and 0.0052 g/100ml. We found that there was a correlation between pH, TSS and total titratable acidity among the samples.

Vitamin C is the important component in all fruits. We found that both fruit samples were little amount of vitamin C i.e. 0.117 % and 0.077 %, while packed juice samples found in the range of 0.142 % and 0.158 %. It might be due to added vitamin C during manufacturing process. Ash % was found in the range of 0.65 % - 2.34 %. Both fruit extract sample found little higher amount of ash. As fruit sample directly used for crude fiber analysis, it was found 5.33 % - 4.94 %, and amount of crude fiber was less in packed juice sample (3.01 % - 3.39 %). The amount of carbohydrate was found in the range of 0.604 – 1.096 range. All the result of physico-chemical analysis is shown in graphical form in figure 1.

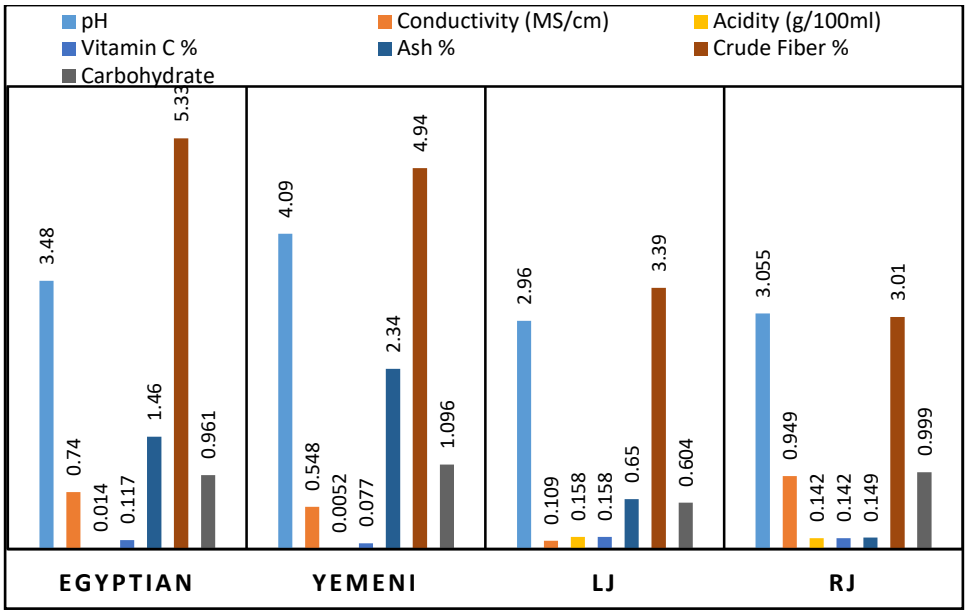

Figure 1. Analysis of physico-chemical parameters.

B. Mineral Analysis

Minerals are very important for various metabolic activities. All minerals content in the two pomegranate extract sample and two packed juice samples along with calibration line equation and R^2 value are shown in Table 2.

Table 2. Different mineral contents in fruit and juice sample with equation and R^2 value.

Sample / Parameters	Egyptian	Yemeni	LJ	RJ	Equation of line	R^2
Sodium (mg/100ml)	13.6	15.9	21.8	18.3	y = 0.845x + 7.5	0.9953
Potassium (mg/100ml)	84.2	90.5	17.89	20	y = 0.95x +6	0.9978
Iron (mg/100ml)	0.767	0.573	0.088	0.176	y = 6319.6x + 0.0013	0.991
Phosphate (mg/100ml)	7.02	6.95	0.578	0.594	y = 0.0088x + 0.2242	0.9539
Magnesium (mg/100ml)	74.56	34.24	4.48	18.24	NA	NA
Calcium (mg/100ml)	81.6	14.4	3.2	4.8	NA	NA

The amount of sodium was found in the range of 13.6 to 21.8 mg/100 ml of samples. Both pomegranate samples were lower amount of sodium (13.6 and 15.9 mg/100ml) while packed juice sample found little higher amount i.e. 21.8 and 18.3 mg/100ml. Less amount of sodium is good for health. Potassium is good for various activities in the

human body. The amount of potassium was found very high amount in pomegranate fruit samples i.e. 84.2 and 90.5 mg/100ml Egyptian and Yemeni samples respectively. While packed juice samples were found 17.89 and 20 mg/100ml. The amount of magnesium was also higher amount in fruit sample i.e. 74.56 and 34.24 mg/100ml and packed juice samples was found in the range of 4.48 & 18.24 mg/100ml. Calcium was in the range of 81.6 and 14.4 in fruit samples while 3.2 and 4.8 mg/100ml in packed fruit sample.

Iron and phosphate is also important minerals. Both fruit samples were found good amount of iron and phosphate. Iron was found 0.767 & 0.573 mg/100ml while phosphate was 7.02 & 6.95 mg/100ml. At the same time both packed juice samples were found less amount of iron (0.176 & 0.088 mg/100ml) and phosphate (0.578 & 0.594 mg/100ml). The summary of all minerals are shown graphically in figure 2.

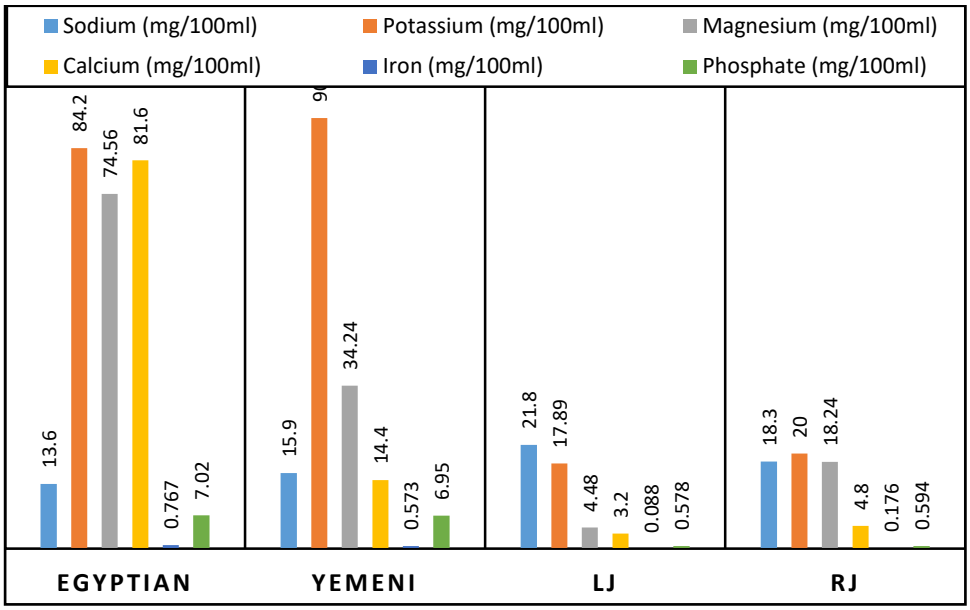

Figure 2. Result of different minerals found in the fruit and packed juice samples.

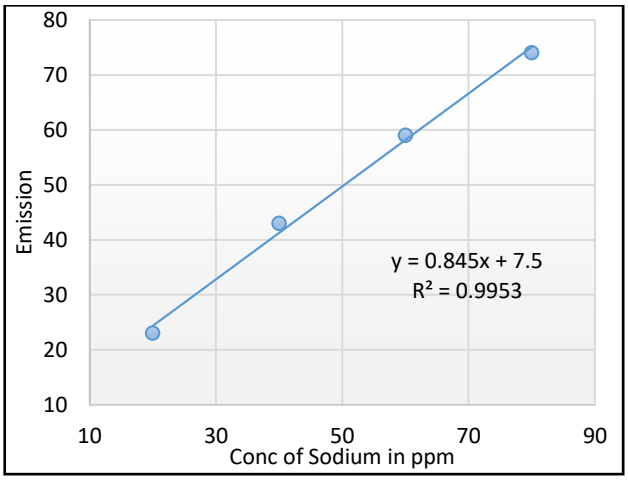

Figure 3. Calibration curve for Sodium

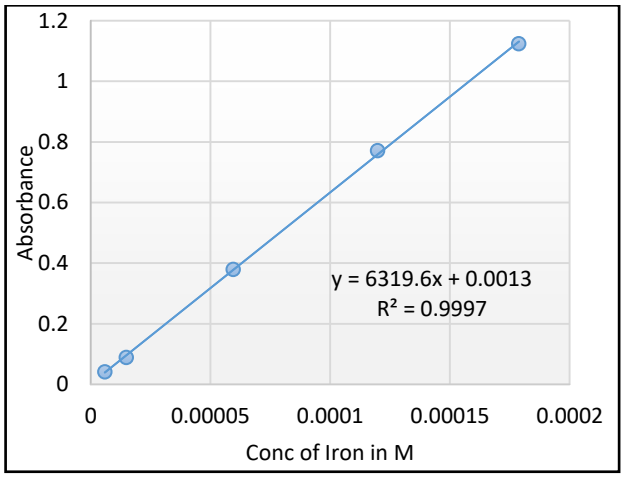

Figure 4. Calibration curve for Iron.

Above two figures shows calibration curve for sodium and iron with calibration curve equation with R^2 (Figure 3 and figure 4) respectively.

IV. CONCLUSION

The result obtained during our study clearly shows that, the pomegranate fruit juice extract was found good amount and significant values of various nutrition values less acidic, TSS, crude fiber, ash. Minerals demonstrate various health benefits and result obtained our study shows that, potassium, magnesium, calcium and iron are significant amount in fruit juice extract (diluted). While sodium found lower in fruit juice sample than packed juice. Lower value of sodium is good for health.

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REFERENCES

[1] F. Khoshnam , A. Tabatabaeefar, M. G. Varnamkhasti, A. M. Borghei, "Mass modeling of pomegranate *(Punica granatum* L.*)* fruit with some physical characteristics," *Scientia Horticulturae* , vol. **114**, pp. **21–26, 2007**. D oi: 10.1016/j.scienta.2007.05.008

[2] A. Sarkhosh, Z. Zamani, M. Fatahi, "A review on medicinal characteristics of pomegranate (*Punica granatum* L.)," *Journal Of Medicinal Plants*, vol. **6**, Issue **22,** pp**.13-24, 2006**.

[3] V. T. Jadhav, J. Sharma, "Pomegranate cultivation is very promising," *Indian Horticulture,* Vol. **52**, pp. **30–31, 2007.**

[4] A. Tehranifar, M. Zarei, B. Esfanidiyari, Z. Nemati, "Physico-chemical properties and antioxidant activity of pomegranate fruit (*Punica granatum* L.) of different cultivars grown in Iran," *Hortic. Env. Biotech.* , Vol. **51, pp. 573–579, 2010.**

[5] M. Viuda-Martos, J. Fernandez-Lopez, J.A. Perez-Alvarez, "Pomegranate and its many functional components as related to human health: A Review," *Comp. Rev. Food Sci. Food Saf.* Vol. **9**, pp. **635–654, 2010**.

[6] M. G. Miguel, M. A. Neves, M. D. Antunes, "Pomegranate (*Punica granatum* L.): A medicinal plant with myriad biological properties– A short review," *J. Med. Plant Res.* Vol. **4**, Issue **25**, pp. **2836–2847, 2010.**

[7] A. F. Olaniyi, L.O. Umezuruike, I.T. Karen, "Chemical and Phytochemical Properties and Antioxidant Activities of Three Pomegranate Cultivars Grown in South Africa," *Food Bioprocess Technol,* vol. **5**, Issue **7**, pp. **2934-2940, 2010**.

[8] M. Ozgen, C. Durgac, S. Serce, C. Kaya, "Chemical and antioxidant properties of pomegranate cultivars grown in the Mediterranean region of Turkey", *Food Chem*, vol. **111,** pp. **703-706, 2008**. Doi: 10.1016/j.foodchem.2008.04.043

[9] M.S. Khodade, K.N. Wavhal, P.N. Kale, "Physicochemical changes during growth and development of pomegranate," *Indian J. Hortic.* Vol. **47** , pp. **21-27, 1990.**

[10] R. Chandra, A.S. Lohakare, D. B. Karuppannan, A. Maity, N. Vikram Singh, V. T. Jadhav, "Variability studies of physico-chemical properties of pomegranate (*Punica granatum* L.) using a scoring technique," *Fruits,* vol. **68**, pp. **135–146, 2013.**

[11] J. Gadže, M. Prlić, M. Bulić, M. Leko, M. Barbarić, D. Vego, M. Raguž, "Physical and chemical characteristics and sensory evaluation of pomegranate fruit of (*Punica granatum* L.)" cv. "Glavaš", *Pomologia Croatia,* Vol, **17**, Br. 3-4, 2011.

[12] A. Sahebkar, C. Ferri, P. Giorgini, S. Bo, P. Nachtigal, D. Grassi, "Effects of pomegranate juice on blood pressure: A systematic review and meta-analysis of randomized controlled trials," *Pharmacol. Res.* Vol. **115**, pp. **149–161, 2017**.

[14] M. Shukla, K. Gupta, Z. Rasheed, K.A. Khan, T.M. Haqqi, "Consumption of hydrolyzable tannins-rich pomegranate extract suppresses inflammation and joint damage in rheumatoid arthritis," *Nutrition.* Vol. **24** Issue. **7,** pp**. 733-43, 2008**.

[13] Y. Noda, T. Kaneyuki, A. Mori, L. Packer, "Antioxidant activities of pomegranate fruit extract and its anthocyanidins: delphinidin, cyanidin, and pelargonidin." *J Agric Food Chem.* Vol. **50** Issue **1,** pp**. 166-71, 2002.**

[15] L.A. Pacheco-Palencia, G. Noratto, L. Hingorani, S.T. Talcott, S.U. Mertens-Talcott, "Protective effects of standardized pomegranate (Punica granatum L.) polyphenolic extract in ultraviolet-irradiated human skin fibroblasts," *Journal of agricultural and food chemistry,* vol. **56**, Issue, **18, pp. 8434-41**, **2008.**

[16] S. Das, S. Barman, "Antidiabetic and antihyperlipidemic effects of ethanolic extract of leaves of Punica granatum in alloxan-induced non-insulin-dependent diabetes mellitus albino rats," *Indian journal of pharmacology*. Vol. **44**, issue **2**, pp. **219, 2012.**

[17] J. K. Salwe, D. O. Sachdev, Y. Bahurupi, and M. Kumarappan, "Evaluation of antidiabetic, hypolipedimic and antioxidant activity of hydroalcoholic extract of leaves and fruit peel of Punica granatum in male Wistar albino rats," *J Nat Sci Biol Med.* Vol. **6**, pp. **56–62, 2015.**

[18] S. Radhika, K.H. Smila, R. Muthezhilan, "Antidiabetic and Hypolipidemic Activity of Punica granatum Linn on Alloxan Induced Rats," *World Journal of Medical Sciences*, vol. **6,** pp. **178-82, 2011.**

[19] S. Ranganna, "Handbook of analysis and quality control for fruit and vegetable products," 2nd ed., Tata McGraw-Hill, New-Delhi, India, 2001.

[20] H. E. Lugwisha et. al, "Determination of physico –chemical properties of pomegranate (Punica granatum L.) fruits of Dar es Salaam Tanzania," *Food and Nutrition Sciences*, vol. **2**, Issue, **6, pp. 277-284, 2014.**

[21] V. Kabasakalis, D. Siopidou, E. Moshatou, "Ascorbic acid content of commercial fruit juices and its rate of loss upon storage," *Food Chemistry*, vol. **70**, Issue **3**, pp. **325-328, 2000.**

[22] AOAC, 17th edn,, Official method 942.15. Acidity (titrable) of fruit product.**2000.**

[23] S. Suzanne Nielsen, "Food Analysis, Fourth edition". Ash Analysis by Maurice R. Marshall, Springer New York Dordrecht Heidelberg London (p.p. 105).

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