International Journal of Applied Chemical and Biological Sciences (2021), 2(5), 1-7.
ISSN 2582-788X

RESEARCH ARTICLE

Proximate and mineral composition of solar dried raisins found in local market of Palosi, Peshawar

Muhammad Baseer Us Salam *, Muhammad Kashif

Department of Agricultural Chemistry & Biochemistry, University of Agriculture, Peshawar, Pakistan

* For correspondence: muhammadbaseerussalam@gmail.com

ABSTRACT

The research was carried out to find out the proximate and mineral analysis for solar processed grapes. The new technique is been followed in the recent times compared to traditional processing. Two commercially available raisins' varieties were collected from Palosi, a remote and rural area of Peshawar i.e., Black Raisin and Golden Raisin. The results revealed that among them the highest moisture content (21.85%) was recorded in sample taken in Golden Raisin, Ash Content (2.43%), Crude Protein (16.625%), Crude Fat (12%) in Golden Raisin, while Crude fiber (15.74%) and NFE (53.185%) in black raisin. The lowest values of these parameters showed that the moisture was lowest i.e., 17.39%, Ash Content (2.3%). Crude Protein 11.375, Crude Fat (7.47%) in Black Raisin and Crude Fiber 10.85 Raisin, NFE (48.245%) in Golden Raisin. In case of Mineral Analysis maximum Na (30%), K (20) and P (12%) in Golden Raisin while the lowest Na (28%), K (18%) and P (11%) in Black Raisin. Likewise, maximum Fe (0.395), Cu (0.302), Zn (1.090), Mn (0.254), Ca (5.654%) in Golden Raisin, however the minimum concentration was examined in Fe (0.356%), Cu (0.264), Zn (0.508), Mn (0.205), Ca in Black Raisin.

Keywords: Proximate, Raisins, Palosi, Solar Drying

1. INTRODUCTION

Grape's (*Vitis vinifera*) commonly called "Kishmish" is one of the most popular dry fruit found everywhere in Pakistan. The production in the recent times has been increased due to the innovative farming techniques [1]. These techniques include methods like high efficiency irrigation system which has enabled most of the plain areas of Pakistan for grapes growth.

Grape is grown in different regions of Pakistan including temperate regions to warm regions, hot to dry climates [2]. Various varieties of Grapes are grown in Pakistan with distinct properties like colored, white, unseeded etc. Raisins, the dried form of Grapes are usually consumed by people generally compared to the fresh grapes which are seasonal and varied from region to region [3]. The chemical composition of raisins according to USDA is

composed of fruit sugar (72%), protein (3%) and 3.7%–6.8% dietary fiber. Raisins are a rich source of Vitamin C while having no cholesterol and low sodium [4]. Various studies have shown that raisins can help in controlling the blood pressure problems if consumed thrice a day compared to consuming other snacks [5]. Processed raisins of different varieties are available and sold in different fruit markets all over Pakistan. Harvested grape berries are dried when production is at commercial level. There are three main steps which are followed when fresh grapes are processed at commercial scale. These include pre-treatment, drying and post-drying processes [6]. Traditional practices for heating are been replaced by solar drying technique which shows alteration of different physical, chemical and biological properties of raisins. These include shrinkage, crystallization, alteration in color, texture [7]. With this method great advantages are achieved: the problems associated with contaminants and insects are avoided and therefore the quality and security are much better. Also, the drying time is significantly reduced, thus improving production. Furthermore, it still uses the free of charge energy of the sun as heating source [8]. Raisins undergo darkening during the processing stage because of melanin accumulation produced by the activity of polyphenol oxidase and non-enzymatic reactions. The golden raisins, to become clear, are dipped in hot water and treated with Sulphur dioxide to prevent browning reactions [9].

This research is carried out in order to find out the nutritional composition (proximate and mineral analysis) of two popular commercially available raisins (Black and Golden) in Local Market of Palosi, Peshawar.

2. METHODS AND MATERIALS

2.1. Sample Collection

Raisins were bought from the local market of Palosi which is a remote and rural area of Peshawar. Both the varieties of samples i.e., Black raisins and Golden Raisins were properly packed in zip-lock bags. Analysis was carried out in the laboratory of Department of Agricultural Chemistry and Biochemistry, The University of Agriculture, Peshawar. The chemicals and reagents used in the research work were extremely pure and analytical grade.

2.2. Proximate analysis of samples

Chemical composition of collected samples for moisture, ash, protein, fat, and crude fibre contents were determined as per the methods described by AOAC, 2005 [10]. Total carbohydrate contents were determined by indirect method (subtract the sum of all other contents from 100 g sample).

2.2.1. Determination of moisture content

Moisture content of selected sample was determined adopting [6]. Samples were cut into small pieces and were then subjected to oven drying method. The samples were kept overnight at 105 ºC for 24 hrs. After that, moisture content was determined by equation 1:

$$\text{Moisture content (\%)} = \frac{A-B}{W} * 100 \quad \text{...eq. 1}$$

Where:
A = Initial weight of crucible and sample,
B = Final weight of crucible and sample,
W = Weight of sample

2.2.2. Ash Determination

Ash content of selected sample was determined adopting [10]. Sample was taken in clean crucible which was subjected to heat in an electrical oven at a temperature of 105 °C for 24 hours. After drying, the crucible was transferred to the muffle furnace and was ignited at 600 °C for 5 hrs. Ash content of the raisin samples was calculated by applying the equation 2:

$$\% \text{ Ash} = \frac{A-B}{W} * 100 \quad \text{...eq. 2}$$

Where:
A = Initial weight of crucible and sample,
B = Final weight of crucible and sample,
W = Weight of sample

2.2.3. Determination of Protein Content

Protein content was determined by following [10]. Samples were subjected to Kjeldhal procedure for which samples were taken in digestion flasks followed by addition of digestion mixture and H2SO4. It was heated on Kjeldahl digestion heater till the appearance of greenish color. After this, distillation was done. Following distillation, the ammonia collected was titrated with 0.1N HCl solution and titer value was recorded.

$$\%N = \frac{(S-B)*0.1*0.014*D*100}{\text{Weight of Sample}*V} \quad \text{...eq. 3}$$

Protein determination can easily be determined by multiplying the % Nitrogen with Conversion Factor. In order to determine the protein in raisin, the conversion factor is 6.25.

2.2.4. Determination of Fiber

Fiber content was determined by following Acid Digestion followed by Basic Digestion Method. Samples were properly filtered after the acid digestion. The samples were washed and then subjected to basic digestion. The filtrate was also washed with hot water. The filtrate left from basic digestion was collected in a clean and dried crucible. This crucible was dried in oven at 130 °C for 2 hours. Readings were taken after the crucibles were cooled in desiccator.

$$\text{Fiber } \% = \frac{W_1-W_2}{W_S} * 100 \quad \text{...eq. 4}$$

Where:
W_1= Weight of Sample,
W_2= Weight of Crucible with Fiber
W_3= Weight of Crucible with Ash

2.2.5. Determination of Crude Fat

Crude Fat was determined by following Soxhlet Method. The sample was first pre-heat and then was crushed using pestle and mortal. Sample was taken and inserted in the thimble.

n-Hexane was added after the sample addition. The extraction was inserted with solvent into soxtherm and the extraction was started. When the extraction was done the extraction beaker with oil was weighed.

$$\text{Fat content} = \frac{W_2-W_1}{W_s} * 100 \quad \text{...eq. 5}$$

Where
W_2=Weight of Extraction with Oil,

W_1=Weight of Extraction Beaker
W_S=Weight of sample

2.2.6. Determination of Cellulose

Cellulose in the samples were indirectly directly i.e., via Nitrogen Free Extract

Nitrogen Free Extract (NFE)= 100 – (Moisture+ Ash+ Crude Protein+ Crude Fiber)

2.3. Mineral Analysis

Mineral content in dried fruit samples were determined using Atomic Absorption Spectrophotometer (AAS) [10]. Wet digestion of the samples was carried out first. Stock solutions were analyzed by using AAS. Mineral content was determined by using the following calculation:

$$Mineral\ Content = \frac{C \times V \times D}{Ws\ (g)} \quad \text{...eq. 6}$$

Where:
C= Concentration of sample (µg/ml)
V= Volume of stock solution (ml)
D=Dilution factor
W_S=Weight of dried sample

For the determination of sodium and potassium Flame Photometer was used. All the samples were dried and then digested with nitric acid and perchloric acid. The aliquot was used for mineral analysis.

2.4. Acid digestion

Wet digestion of all the samples were carried out. Exact weight of 1 g sample was poured in a beaker and mixed with 10 ml concentrated nitric acid and then kept for overnight. Now 5ml, perchloric acid was added and placed for 25 mins. Heater was used to digest the sample and then distilled water was added to make the volume up to 100ml. The solutions were then analyzed for minerals.

2.5. Sodium and Potassium Content

Sodium and Potassium content were identified by Flame Photometer using the method reported by [10]. Standard stock solutions were prepared for standard curve by taking different concentrations observing at 589 nm while for K 786 nm. For sample analysis, 10 ml samples was taken from acid digest and poured in 100ml volumetric flask. The emission intensity of sodium and potassium were recorded with their respective standards. The unknown concentrations of these minerals were determined from standard curve and were expressed as mg/Kg.

2.6. Phosphorus Determination

For Phosphorus determination UV-VIS spectrometer was used. The mixed reagent was prepared by adding 125 mL water with 6g of ammonium molebdate and 5 ml of 5N H_2SO_4, with 146 g antimony potassium tartarated, the two solutions was mixed thoroughly, and the volume was made up to 1L. Now, 370 mg ascorbic acid was added to 70 ml of mixed reagent to prepare color developing reagent.

Stock solution of different concentrations were prepared and set for standard curve followed by the sample analysis at 880 nm. Standard curve was made by plotting absorption versus concentration. All the samples were analyzed and the reading was compared with standard curve. By the following formula, the

concentration of P in unknown samples was calculated.

$$P(mg/Kg) = \frac{S_1 * S_2}{W_S}$$

Where
S_1=Graphical Reading
S_2=Dilution Reading
W_S=Weight of Sample

3. RESULTS AND DISCUSSION

This research focused on the proximate and mineral analysis of two of the commercially available raisins found in the local market of Palosi, Peshawar. The research was carried in response to the latest drying method i.e., solar drying technique which is the getting into trend compared to traditional sun drying techniques.

The samples were analyzed to determine their proximate composition and mineral profile. All the data were recorded as mean of the three-replicate analysis.

Total Carbohydrate was found highest for black raisins while low for golden raisins. Ash content for both types of raisins were found low i.e., 2.3% – 2.4%. Moisture content for the samples was found in range i.e., 17.39% to 21.85% and was similar to other findings [12]. Moisture content plays a key role in food quality and safety. Higher moisture leads to food spoilage by microbes.

Ash content for the samples were found least for both the samples i.e., 2.3 % to 2.43% and were approximately close to other reports [13]. The protein content (11.37% to 16.62%) and fiber content (10.85% to 15.74%) varied possibly due to different selected varieties different localities and the processing methods reported by Schuster MJ *et al.*, (2017) [14]. Black raisins were found rich in crude fat (7.47%) while deficient (12%) in black raisins. In order to determine the cellulose content in the given samples, the indirect method was applied.

Table 1. Proximate analysis of Raisins

Tests	Black Raisins	Golden Raisins
Moisture	17.39	21.85
Ash	2.3	2.43
Protein	11.375	16.625
Fiber	15.74	10.85
Fat	12	7.47
NFE	53.185	48.245

Mineral analysis exhibited that sodium is present in highest amount (30%) while Black raisin in low amount (28%). It also depicted that potassium recorded in Golden Raisin was the highest i.e., 20% while in the Black raisin it was observed low i.e., 18%. It was found from the analysis that phosphorus is present in Golden Raisin was the highest i.e., 12 % while 11% for Black raisin. Manganese recorded in Golden Raisin was the highest i.e., 0.254 mg/1000 while in the Black raisin it was observed low i.e., 0.205mg/1000. Manganese is an essential activator of a few catalysts and a co-factor of some metallo-compounds required in cancer prevention agent resistance instruments [15]. Iron was recorded highest for Golden Raisin (0.395 mg/1000) while 0.356 mg/1000 for Black raisin. Iron is essential for creation and elements of red platelets and iron containing proteins. It is a fundamental part of the hemoglobin (Hb), myoglobin and respiratory chain proteins and taking part in

Table 2. Mineral analysis for Golden and Black Raisins

	Black Raisin (mg/100)	Golden Raisin (mg/100)
Sodium (Na)	28	30
Potassium (K)	18	20
Phosphorus (P)	11	12
Manganese (Mn)	0.205	0.254
Iron (Fe)	0.356	0.395
Copper (Cu)	0.264	0.302
Calcium (Ca)	4.528	5.654
Zinc (Zn)	0.508	1.090

the body vitality production [16]. Copper was found highest for Golden i.e., 0.302 mg/1000 while 0.264 mg/1000 for Black raisin. Copper in human body performs very essential function and can help in the development of the connective tissue, nerve covering and bone. Calcium was found 5.654 mg/1000 and 4.528 mg/1000 for Golden and Black raisin. The mineral is used in building bones and keeping them healthy. Calcium enables our blood to clot, our muscles to contract, and our heart to beat. About 99% of the calcium in our bodies is in our bones and teeth [16]. It was found that Golden Raisin is having the highest zinc content i.e., 1.090 mg/1000 while Black raisin has i.e., 0.508 mg/1000. The findings are in range as suggested by FAO.

4. CONCLUSION

It was concluded from the study that solar drying technique used for drying grapes berries in raisin production is effective in retaining the nutritional composition. Traditional sun drying method is been replaced by the local cottage processing units and hence it is found from the study that this processing technique is very effective and hence the product can be used for those who are malnutrient in the local remote areas of Peshawar.

5. ACKNOWLEDGEMENT

NA

6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

7. SOURCE/S OF FUNDING

No source of funding

8. REFERENCES

1. Guesmi, B., Serra, T., Kallas, Z., & Roig, J. M. G. (2012). The productive efficiency of organic farming: the case of grape sector in Catalonia. *Spanish Journal of Agricultural Research*, ***(3)***, 552-566.
2. Rehman, A., Deyuan, Z., Hussain, I., Iqbal, M. S., Yang, Y., & Jingdong, L. (2018). Prediction of major agricultural fruits production in Pakistan by using an econometric analysis and machine learning technique. *International Journal of Fruit Science*, **18*(4)***, 445-461.
3. Khan, D., & Shaukat, S. S. (2006). The fruits of Pakistan: Diversity, distribution, trends of production and use. *International Journal of Biology and Biotechnology*, **3*(3)***, 463-499.
4. California Raisin Advisory Board, 1999 retrieved from

http://worldcat.org/identities/lccn-n82017699/

5. Bays H E, Kathy S, Amber C, Michelle R, James A (2012). Raisins and Blood Pressure: A Randomized, Controlled Trial. *Journal of the American College of Cardiology*. **59 *(13)***: E1721.
6. Esmaiili. M., RSotudeh-Gharebagh K, Mousavi M. A. E, Rezazadeh G (2007). Grape Drying: A Review. *Food Reviews International*. **23 *(3)***: 257.
7. Azzouz S, Hermassi I, Toujani M, Belghith A (2016). Effect of Drying Temperature on theRheological Characteristics of Dried Seedless Grapes. *Food Bioprod. Process*., **100**; 246–254.
8. Guiné. RPF, Almeida IC, Correia AC, Gonçalves F (2015). Evaluation of the physical, chemical and sensory properties of raisins produced from grapes of the cultivar Crimson, *Journal of Food Measurement and Characterization,* **9*(3)***
9. Williamson G, Carughi G (2010) Polyphenol Content and Health Benefits of Raisins. *Nutr. Res*., **30**, 511–519.
10. AOAC (2004) Official methods of analysis of the association of official analytical chemists international. USA: Maryland
11. Khalil IA. and Saleemullah (2004) Chemistry one. Bio-analytical chemistry. TS Printers Pakistan. P. 41.
12. Lokhande, S. M., & Sahoo, A. K. (2016). Effect of drying on grape raisin quality parameters. *International Journal of Innovation Research in Science and Engineering*, **2**, 86-95.
13. Khairuddin, M. F., Haron, H., Yahya, H. M., & Malek, N. A. H. C. (2017). Nutrient compositions and total polyphenol contents of selected dried fruits available in Selangor, Malaysia. *J. Agric. Sci*, **9*(13)***, 41-49.
14. Schuster MJ, Wang X, Hawkins T, Painter J (2017) A Comprehensive review of Raisins and Raisin components and their relationship to human health, *Journal of Nutrition and Health,* **50*(3)***:203 .
15. Mehta R and Reilly JJ (1990) Manganese levels in a jaundiced long-term parenteral nutrition patient: potentiation of haloperidol toxicity? Case report and literature review. *J. Parent. Enteral Nutr*. **14**: 428-430.
16. Horton, S., & Levin, C. (2001). Commentary on "evidence that iron deficiency anemia causes reduced work capacity". *The Journal of nutrition*, **131*(2)***, 691S-696S.