Research Article
Open Access
CrossMark

Physical and chemical properties of grapes of Peshawar city

Abstract

Various types of grapes (Large blue-red, large red, Sunder Khani, middle-sized green and small yellow) grapes were collected from the local fruits markets of Peshawar City and were analyzed for their physicochemical parameters. TSS value of the small yellow type was high (26.0). The difference of acids value, showing acids content of the grapes, was negligible at range of 6 to 7. Sugar ranged from 50 to 75% with the maximum amount seen in large blue red grapes. The berries contained considerable amount of moisture (75.43 to 92.34%). Na and K were also present in appreciable amounts. Na was high in Sunderkhani while K in large blue red types. Linoleic acid, was found the most abundant fatty acid profile ranging from 66.0 g/100 g of total fatty acids, in small yellow oil seed. Considerable amount of oleic acid was also present in all samples. The data showed that acidic pH; high acid value and inclusion of K; and moisture in high amounts made the grapes very attractive fruits that should be studied for other beneficial constituents.

Keywords: Grapes, moisture, pH, acid value fatty acid, linoleic acid

Volume 7 Issue 2 - 2019

Ata Ullah,[1] Said Badshah,[2] Ajmeel Ur Rahman,[1] Salah Ud Din[3]

[1]Agricultural Chemistry, Agricultural University Peshawar, Pakistan
[2]Food Science and technology, Agricultural University Peshawar, Pakistan
[3]Human Nutrition, Agricultural University Peshawar, Pakistan

Correspondence: Ata Ullah, Department of Agricultural chemistry, The University of Agriculture Peshawar, Pakistan, Tel +923005890354, Email attabjr821@gmail.com, hamdard4naz@yahoo.com

Received: November 08, 2017 | **Published:** March 26, 2019

Introduction

Grapes (*Vitis vinifera*) are botanically true berries, grow as vine trees. Originally "grape" meant bunch. Grapes berries are exceedingly delicious and attractive with variable tastes and colors. They are eaten mostly as whole fruits; however they are also utilized in preparation of numerous food products and the seeds of seeded varieties are used in medicine, predominantly antimicrobial drugs and nematicides.[1]

Grapes cultivation dates back to 5000 B.C; however, the wide spread propagation of grapes was started in Europe, and then spread to Australia, America and other countries through invaders and sailors. Egyptians used the grapes for wine, and later the technology was developed in various western countries, particularly Spain, France and Germany. Grapes consist mainly of two groups, one contains seeds while the others are seedless. The seedlessness is a highly desirable quality of the grape. Among these seedless types some are natural and some are genetically obtained from basic seedless varietals which all belong to basic types of *Vitis* group. The seedless types are very easy in eating but some of the basic quality of seeds is not present in these grapes.[2]

Grape seeds contain various phytochemicals, which help in anti-oxidation. Anti-oxidant, increase hormone production, keep skin fair, and also help the body's defense system. The polyphenols present in grapes aid in blood pressure regulation and production and protection of epithial cells. They also help fight cancer and minimize the risk of heart failure. They reduce muscular dystrophy.[3]

The oil extracted from grape seeds are used in many health care products like cosmetics. These oils also contain vitamin E, a polyunsaturated fatty acid of n-3, n-6, and n-9 series, which protects the body from free radical attacks.[4] Like grapes, grape juice also helps fight in cancer, reduces risk of heart attack, improves brain health, and enables the body to with stand aging problems with the passage of time.[5] Grape juice normalize the hypertension problems.[6]

A good understand of grape composition is essential to understand its nutritional and medicinal benefits in detail. The present research aimed to study some of the physical and compositional parameters of locally available grapes in the markets.

Materials and methods

Local grape types were studied for their nutritional composition in the Department of Agricultural Chemistry, The University of Agriculture Peshawar (UAP) in September 2016.

Samples

Large blue-red, large red, Sunder Khani, middle-sized green, and small were obtained from local markets of Peshawar city. The grapes berries were removed from their clusters and cleaned and washed with luke-warm water. The juices were extracted by breaking and pressing in doubly folded malmal cloth. The juice was immediately tested for various physical and chemical parameters.

pH

pH of the selected samples was determined using pH meter. The pH meter was turned on and calibrated by a two; point calibration method using pH 4 and 7 buffer solutions.[7] The juice samples were tested for their pH by inserting the pH electrode. After each iteration the electrode was washed with double distilled water.

Total soluble solids (TSS)

The TSS was analyzed by Abbes refractometer.[7] Prior to operation, the temperature was brought close to room temperature. A drop of sample was placed on the fixed prism and covered by the movable prism fixed in the lid. Then the knobs were rotated until the critical ray came at the center of the cross made inside the refractometer in the upper colored field. The data was recorded in degree Brix from the lower field where refractive index and degree brix scales were present.

Acid value

The samples were analyzed for acid value.[7] 5ml of sample and 50ml 2N Ethanol were mixed in a conical flask and, kept in a water bath for 30 minutes. After cooling two drops of phenolphthalein were added. The mixtures were then titrated against 0.1N KOH until pink colour appeared. The acid value was calculated from the KOH consumed.

Submit Manuscript | http://medcraveonline.com

©2019 Ullah et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and build upon your work non-commercially.

Copyright: ©2019 Ullah et al.

Sugar content

The samples were analyzed for sugar content.[8] For determination of sugar content, 5ml Fehling A and 5 mL Fehling B were mixed in conical flasks and 20 mL of distilled water added. The juice was taken in burette, and titration was carried out till the brick-red color appeared in boiling mixtures of Fehling solutions. The titration reading was noted, and reducing sugar was calculated using the factor, where Cu content in 5mL Fehling A+5 mL of Fehling B is sufficient to be reduced by 0.05 g of reducing sugar in the samples.

Moisture

Moisture content was detected from the weight loss of the samples by heating.[9] The empty Petri dish was cleaned and weighed. Samples were deposited and again weight was taken. The sample weight was obtained by subtracting the empty weight of the Petri dish. The samples were placed in a 105°C oven for several hours in a Petri dish with half closed lid. The dish was then covered with the lid and placed in a dissector for cooling. The weight was noted and the percent loss in weight was taken as moisture.

Mineral analysis

Preparation of acid digest

The sample was digested with acid following the standard method of Gordon.[10] Sample (l ml) was weighed and poured it into a digestion flask and mixed with 5mL of HNO3 and per chloric acid and then heated slowly and gradually up to 300°C. When white fumes were exhausted, 5ml per chloric acid were added again until the white fumes vanished. The one ml residue remaining was diluted with distilled water to 50ml which then was used for mineral analysis.[11]

Determination of Na and K

Na and K were determined by flame photometer. The flame photometer measured the emitted light from the excitation of atomic specie. A standard solution of NaCl and KC1 was prepared in ppm level. The working standards of Na and K were prepared in the range of 0.1 to 50 ppm. Flame photometer was used and where the reading of each five standards working solutions for Na K was recorded. These values were used for standard curve formation with, the x-axis as concentration of Na and K and the y-axis was used for excitation reading. The sample digest was taken and their excitation reading were noted then compared with their respective curves and real concentration was calculated for Na and K content in the samples.

Fatty acid profile

Parry et al.[12] method were used for preparation of Fatty acid methyl esters (FAMEs). One mg of oil was mixed with 0.1 M NaOH MeOH for 5 min. HCl MeOH 4%was added to the mixture and steered for 5 min, at ambient temperature. The reaction was stopped by adding water Fatty acid methyl ester (FAMES) was extracted with iso-octane. Shimadzu GC-2010 equipped, with a FID and a (Shimadzu, Columbia, MD) auto sampler were used for GC analysis. A fused silica capillary column SP™ -2380 (30m-0.25mm with a 0.25ml film thickness) silica capillary was used as column. Helium a carrier gas was used at a flow rate of 0.8 ml/min. Individual FAMEs retention time was compared with retention time of standard of FAMEs for the identification of each component of fatty acid profile. All samples were analyzed in triplicate.

Results and discussion

Various grape types Big & blue red, Red & bigger size, Sunder khani, Middle size green, Small & yellow were analyzed for physiochemical parameters i.e., pH, TSS, acid value, sugar content moisture, mineral analysis fatty acid composition.

PH

The mean pH of the selected five types of grape fruit was presented and discuss in Table 1 which ranged from 4.8 to 6.1 The result showed that the large & blue red had the higher value of pH i.e. 6.1 followed by large, middle-sized green while Small & yellow indicated lower pH i.e. 4.8. The result was in line with that of Gorden[10] who worked on the composition of grape types. The pH difference might be due to the tartaric acid content of the grape types because this is the main acid in grapes. However other reasons like high or low TSS might also be another cause of difference in pH level.

Total soluble solid (TSS)

The TSS of the five selected types was presented in Table 1, which ranged from 22 to 26°Brix respectively. Among difference types, large red contained maximum TSS i.e. 26°Brix, followed by Sunder khani and Middle-sized green, while large blue-red contained minimum amounts of TSS, i.e. 16°Brix. TSS content of grape cultivars were also reported by Gordon[10] which support the present values of TSS.

Table 1 pH, TSS (Brix°) Acid value, Sugar content (%) of different grapes type available in local markets of Peshawar

Name of sample	pH	TSS	Acid value	Sugar (%)
Large blue-red	5.00	23.2	7.05	75
Large red	6.10	22.1	7.95	50
Sunder khani	5.25	22.0	7.28	70
Middle-sized green	5.20	16.0	7.72	73
Small & yellow	4.10	26.0	6.38	65

Acid value and sugar content

Acid value and sugar content were also presented in Table 2. The data showed that acid value of large red was high (7.95), while that of Small & yellow was minimum (6.38). Sugar content of different types of grapes showed that large blue-red contained high sugar content (75%) while the least sugar content was found in Small & yellow (65%). The data agrees with work done by Jordao et al.[11]

Table 2 Moisture (%) of various grape types available in local markets of Peshawar

Name of sample	% Moisture
Large blue-red	92.34
Large red	78.33
Sunder khani	79.65
Middle-sized green	75.43
Small & yellow	76.18

Moisture content

The average moisture content in the fruits of grapes cultivars was found to be ranged from 75.43% to 92.34%. The difference among the different types with respect to moisture content was significant.

Citation: Ullah A, Badshah S, Rahman AU, et al. Physical and chemical properties of grapes of Peshawar city. *MOJ Food Process Technol.* 2019;7(2):44–47. DOI: 10.15406/mojfpt.2019.07.00218

Copyright: ©2019 Ullah et al.

Maximum moisture content was found in large blue-red 92.34%. The data was supported by the work of Jordao et al.[13]

Mineral (Na, K)

Data regarding Na, K (Table 3) showed that highest Na was seen in Sunder khani (4.26mg/Kg) followed by Small & yellow (3.60 mg/Kg), while minimum Na was found in Middle-sized green (1.80mg/Kg). Similarly, maximum K was found in large blue red (165mg/Kg) followed by Sunder khani with a value of 164mg/Kg, while, the minimum was obtained in Middle-sized green (159mg/Kg). The data of the present study was supported by Jordao,[13] who studied grapes cultivars for their nutritional composition.

Table 3 Na and K (mg/Kg) of grapes types available in the local markets of Peshawar

Name of sample	Sodium	Potassium
Large blue-red	2.60	165
Large red	3.43	163
Sunder khani	4.26	164
Middle-sized green	1.80	159
Small & yellow	3.60	160

Fatty acid composition

The qualitative assessment of grapes is directly related to the composition of the fatty acid. The nutritional implications and oxidative stability of oils are related to the unsaturated fatty acid (UFA). The five selected samples were analyzed by gas chromatography for fatty acid compositions and the results are inserted in Table 4.

Table 4 Fatty acid profile of olive oils samples (%)

Name of sample	16:0	20:01	18:1	18:2	18:3	18:0	20:0
Large blue-red	8.99	1.47	21.5	65.3	1.03	2.24	0.14
Large red	6.50	0.94	14.2	70.5	0.61	4.1	56
Sunder khani	7.771	1.04	12.3	67.8	0.88	2.65	0.13
Middle-sized green	5.55	0.35	17.07	74.9	0.34	3.33	0.46
Small & yellow	6.81	0.8	19.09	73.2	0.76	2.6	0.21

Linoleic acid was the most abundant fatty acid in all five cold pressed grape seed oils, with range of 65.3% and 73.2% of total fatty acids (Figure 1). Content of linoleic acid (73.2%) was found at highest amount in small and yellow oil seed with large red containing the lowest amount of 65.3%.

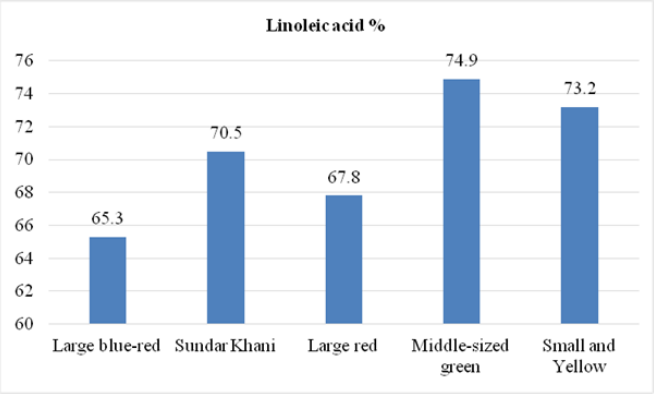

Figure 1 Linoleic acid ranges in different fatty acids.

Amounts of oleic acid, was also present in significant amount ranging from 12.3% (large red) to 21.5% (Big & blue red). Other fatty acids present include stearic acid (2–4%). The reported results were quite similar in the literature Kamel et al.[14] and Crews et al.[15] The linoleic acid was found in range of 66.8–73.6% in the seed oils of seven different varieties of grapes by Beveridge et al.[16] Higher or lower values, depending on seed origin and method of oil extraction were reported by some other authors El-Shami et al.[17,18]

Discussion

PH of the grapes was acidic in nature. TSS of the grapes types was variable some contained a comparatively small amount. Sugar content of these grapes was also variable, with the large size berries contained high amount. Grapes contained a large amount of moisture that can fulfill the water needs of the body to some extent and the grapes are also good source of Na and K.

Recommendation

The valuable compounds of grapes should be analyzed in a scientific way to highlight their usefulness.

Acknowledgments

None.

Conflicts of interest

The author declares that there are no conflicts.

References

1. Shankar S, Singh G, Srivastava RKS. Chemoprevention by restroval: molecular mechanisims and therapeutic potential. *Front Biosci*. 2007;12(12):4839–4854.
2. Mancuso C, Bates TE, Butterfield DA. Natural antoxidants in Alzheimer disease. *Expert Opin Investing Drugs*. 2007;16(12):1921–1931.
3. Opie LH, Lecoure S. The red wine hypothesis: from concepts to protective signaling molecules. *Eur Heart J*. 2007;28(14):1683–1693.
4. Hackney ME, Kantorovich S, Levin R, et al. Effects of tango on functional mobility in Parkinson's disease: a preliminary study. *Journal of Neurologic Physical Therapy*. 2007;31(4):173–179.
5. Jung KJ, Wallig MA, Singletary KW. Purple grape juice inhibits 7, 12– dimethylbenz[a] anthracene (DMBA)–induced rat mammary tumorigenesis and in vivo DMBA–DNA adduct formation. *Cancer Lett*. 2006;233(2):279–288.
6. Park YK, Kim JS, Kang MH. Concord grape juice supplementation reduces blood pressure in Korean hypertensive men: Double□blind, placebo controlled intervention trial. *Biofactors*. 2004;22(1–4):145–147.
7. Khalil IA, Manan F. *Chemistry–One. (BIO–Analytical Chemistry)*. 2nd ed. 1990. 98 p.
8. Khalil IA, Saleemullah. *Bio–analytical chemistry*. Pakistan: National Book Foundation; 2004. 29 p.
9. Harel E, Mayer AM. Partial purification and properties of catechhol oxidases in grapes. *Phytochemistry*. 1971;10(1):17–22.
10. Gordon L Robertson, Nispera MO. Changes in the chemical constituents of New Zealand grape during maturation. *Laguna J Food chem*. 2003;11(3):167–174.
11. Allen FH, Kennard O, Watson DG, et al. Tables of bond lengths determined by X–ray and neutron diffraction. Part 1. Bond lengths

Copyright: ©2019 Ullah et al.

in organic compounds. *Journal of the Chemical Society, Perkin Transactions*. 1987;2(12):S1–S19.

12. Parry J, Hao Z, Luther M, et al. Characterization of cold pressed onion, parsley, cardamom, mullein, roasted pumpkin, and milk thistle seed oils. *Journal of the American Oil Chemists' Society*. 2006;83(10):847–854.
13. Jordao AM, Ricardo–da JM, Laureano O. Evoluation of catechins and oligomeric procyanidins during grapes maturation of casteleo Frances and touriga Francesa. *American Journal of enology and Viticulture*. 2001;52(3):230–2334.
14. Kamel BS, Dawson H, Kakuda Y. Characteristics and composition of melon and grape seed oils and cakes. *Journal of the American Oil Chemists' Society*. 1985;62(5):881–883.
15. Crews C, Hough P, Godward J. Quantitation of the main constituents of some authentic grape–seed oils of different origin. *Journal of Agricultural and Food Chemistry*. 2006;54(17):6261–6265.
16. Beveridge TH, Girard B, Kopp T, et al. Yield and composition of grape seed oils extracted by supercritical carbon dioxide and petroleum ether: Varietal effects. *Journal of Agricultural and Food Chemistry*. 2005;53(5):1799–1804.
17. El–Shami SM, El–Mallah MH, Mohamed SS. Studies on the lipid constituents of grape seeds recovered from pomace resulting from white grape processing. *Grasas y Aceites*. 1992;43(3):157–160.
18. Rhodes PL, Mitchell JW, Wilson MW. Antilisterial activity of grape juice and grape extracts derived from Vitis vinifera variety Ribier. *International journal of food microbiology*. 2006;107(3):281–286.

Citation: Ullah A, Badshah S, Rahman AU, et al. Physical and chemical properties of grapes of Peshawar city. *MOJ Food Process Technol.* 2019;7(2):44–47. DOI: 10.15406/mojfpt.2019.07.00218