PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 12 (3): 239-243, 2013
ISSN 1680-5194

Apples Pulp (*Pyrus malus*) Nutritional Profiling Evaluation of Various Varieties of Balochistan

Mohammad Aziz[1], Saima Jadoon[3] and Ziviqar Sh.[2]
[1]Department of Chemistry, University of Balochistan, Quetta, Pakistan
[2]PCRWR, Quetta, Pakistan
[3]University of Kurdistan, Hewler, Iraq

Abstract: The object of this study was to evaluate the nutritive composition of different verities of apples for this twenty different verities of apples commonly available in Balochistan namely Amri, Bluish golden, Bonza, Discovery, Elastar, Florina, Gala, Gloster 69, Golden delicious Grany Smith, Green Sleeves, Ida Red, Kidds orange, Mushadi, Red delicious, Summer red, Tydes Menearly, Samootree, Kaja and Spartan have been quantitatively analyzed using Atomic Absorption Spectroscopy, Flame Photometry and other chemical methods. Results show that the fat soluble vitamin A is 0.89mg/100gm (mean) on the other hand the concentration of water soluble vitamin C is 3.8mg/100gm, The mean composition of different mineral is as follows sodium 10.06mg/100gm, potassium 84.43mg/100gm, calcium 15.67mg/100gm, magnesium 11.08mg/100gm, Iron 5.78mg/100gm and phosphorus 12.19mg/100gm. Average Weight and volume of amri apple were comparatively higher i.e., 104.6 gm and 129mL as compared with others. The median pH value is 3.91, the median percentage of moisture, ash and brix is 81.95%, 1.63% and 15.02%, respectively. The percentage of Fat lies between 0.2-5.15%, Fiber lies b/w 1.13 -8.60%, protein lies b/w 0.17-0.74% and pectin lies b/w 0.43-1.63%. The highest value of total sugar of Samootree is comparatively high i.e., 20.13, the concentration of reducing sugar in kaja were comparatively low i.e., 7.10 and the concentration of non reducing sugar in Green Sleevesis was comparatively higher than other verities i.e., 7.92.

Key words: *Pyrus malus*, Quetta pome fruit, Pakistan

INTRODUCTION

To know the nutritional status in any location is essential because it puts a huge impact on the survival of the place and help the corresponding authorities to implement their policy on the bases of result. The apple is one of the most beneficial tree fruit, the use of apple as a food since prehistoric times, so it is not possible to state precisely when men first became aware about it. Many peoples like apple due to its unique natural taste that's why artificial food processing industry take a keen interest in apple production, beside this apple is also used in treatment like diarrhea and dysentery in infants (Considine, 1982). The tree of apple probably originated in the central and south/western Asia. Total area under apple cultivation in Pakistan is 51.7 (000, hectares) and the contribution of Balochistan in it is 42.0. While total production of apples in Pakistan is 377.3 (000, tones) which includes 272.7 from Balochistan (Agricultural Statistics of Pakistan, 1999-00). Asghar *et al.* (2004) determine the chemical composition of apple trees in Balochistan. While few only study the mode of action of insects on apple plant, Wahid Abdul *et al.* (2001). The work of Ali Mohammad *et al.* (2011) is limited to mashaday variety.

There are thousands varieties of apples are described in the literature (Elzebroek *et al.*, 2008), however, only few are important for any particular region. Recommended apple Special, for Marree Hills is Kapari, Red Beauty of Bath, Kashimir Amri, Golden Delicious and Red Delicious (Chaudhary, 1994). The dry and cool climatic conditions and higher altitudes of Quetta, Ziarat, Pishin, Kalat, Loralai and Zhob districts of Balochistan are ideal for the apple growth. Due to best climatic conditions in Balochistan for apple farmer prefer to cultivate them. The cultivated varieties of apples presently grown in Balochistan have been given the name *Pyrus malus*, the most popular varieties of apples mainly grown in Quetta, Zhob, Kalat and Sibi division are Amri, Bluish golden, Bonza, Discovery, Elastar, Florina, Gala, Gloster 69, Golden delicious grany smith, green sleeves, Ida red, Kidds orange, Mushadi, Red delicious, Summer red, Tydes menearly, Samootree, Kaja and Spartan are common. Marwat and Hussain (1988) in his study show the different weeds varieties of apple in Balochistan. Gardner *et al.* (2000) have revealed that vitamin C accounted for 65-100% of antioxidant capacity of citrus juices. But how much citric is present in this locally available apple is still unknown to us. In similar way different author reported different varieties of apple in rest of world Podsdek *et al.* (2000). No systematic research works has so for been conducted on the quality

Corresponding Author: Mohammad Aziz, Department of Chemistry, University of Balochistan, Quetta, Pakistan

of different varieties of deciduous fruits in Balochistan. Therefore this study was undertaken on scientific line.

Location: Balochistan is the province of Pakistan and occupies the eastern portion of the Iranian Plateau. It lie at coordinator 30.12°N 67.01°E. Balochistan is bordered by Afghanistan to the north and north-west, Iran to the south-west, the Arabian Sea to the south, Punjab and Sindh to the east and Khyber Pakhtunkhwa to the north-east.

Morphology of fruit: Floral formula $K_{(5)}$, $C_{(5)-\alpha}$, A_2, $G_{(4-5)}$ (Javed Iqbal Mughal). Apple *(Pyrus malus*) belongs to family *Rosaceae*. *Pyrus malas* is a delicious and nutritious fruits which is widely grown and consumed in many areas of the world including Pakistan. Apple is a pome fruit so the ovaries involved. The height of tree usually not more than 15 meter (UniProt Consortium, 2002-2013). To develop fruit plant do cross-pollinate. Flower and fruit are of multi color.

MATERIALS AND METHODS

Sample collection: The fruits of 20 apple *(Pyrus malus)* cultivars namely Amri, Bluish golden, Bonza, Discovery, Elstar, Florina, Gala, Gloster 69, Golden delicious, Grany smith, Green sleeves, Ida red, Kaja, Kidds orange, Mushadi, Red delicious, samootree, Sammer red, Tydes men early and Spartan were obtained from Deciduous Fruit Development Centre Quetta at the time of optimum maturity. The fruit was saved in Glass cap bottle and kept in dark, Stanislaw Kazimerz Kon (1936).

Volume of fruit: The volume of fruits was determined by water displacement method for each cultivar.

Weight of fruit: The weight of fruit was taken by using top balance for each cultivars.

Sample digestion: One gram of dried and ground sample was taken in a beaker and 100ml concentrated HNO_3 was added. The sample was allowed to stand for overnight and then heated on hot Plate until the Hydrogen and Oxygen Fumes ceased. The beaker was cooled and 2-4 ml of 70% $HCLO_3$ was added, heated again and allowed to evaporate to small volume. The sample was transferred to 50ml flask and diluted up to point with distilled water.

Chemical analysis: The chemical composition (Moisture, Protein and Ash) of different apples cultivars was determined according to standard method of AOAC (1990). Total sugar were estimated by Dinitrosalicycle acid (DNS) method as described by Miller (1995). Vitamin A was measured using the method of Valadone Mummwey (1975) after extracting it in Petroleum ether and acetone mixture. Ascorbic acid was determined according to Bazaz and Gardeep (1981) method on a Spectrophotometer. The fibers contents were estimated by fibertee system by applying the method provided by the manufactures Tecator, Japan. The fat of fruit was estimated by extracting fat of the sample in Soxtee system by Diethyl ether. The pectin contents were estimated by the method of Carr'e and Haynes (1922). The Brix of the fruit was determine by the Refractometer ATAGO (Model Beckman-43).

Name of instrument: Flame Photometer PF7, JENWAY, Atomic absorption spectrophotometer 2380 perkin Elmer USA, Spectrophotometer U-2000 Hitachi.

pH determination: The pH of fruit is immediately determined after collection with jenny way 3510 pH meter using glass electrode.

Statistical analysis: Data obtained from above mentioned parameter was subjected to statistical analysis through Statistical package for the social sciences (PC software S.P.S.S Version 14).

Chemical structure and analysis: All chemicals modeling and analysis is carried out with the help of Chem Office Ultra 2002 cs3DChemDraw (Chemical information sciences p.c software pro Version 7.0).

RESULTS AND DISCUSSION

In developed countries Governments show a keen concern on the nutrition status of population (Andersen, 2003) because diet is indirectly related to the health of human, Usually people eat and drink things which are easily accessible to them if the natural concentration of crop in general and apple in particular is changed by any means then it puts a direct impact upon the user. If this effected natural product is utilized by humans then it causes serious problem. In an under developed country like Pakistan government gives less attention to determine the nutrition status, due to the following facts poor economic condition, natural disasters, poor agriculture policy, bad management in agriculture. So on the basis of the evidence provided above we conduct foregone investigation and draw following conclusions.

Physical and chemical character: The minimum volume of liquid solution is found in Gloster 69 i.e., 60.3 ml and the higher volume of liquid solution is present in Amri apple its mean one average amri apple give 129 ml volume which is ideal for juice processing industry. The average Gloster 69 is less in Weight as compare to other but the weight of Amri is high as compare to others. Different verities show different result related to ration between weight and volume. The brix and moisture percentage show a negative correlation on the other hand the Ash percentage is relatively high in Bluish

Table 1: Show Physical and Chemical character of different vertices of apple

Name	Avg. Vol. per fruit mL	Avg. Wt. gm	Wt. / Vol. ration	Moisture (%)	Ash (%)	Brix (%)	pH-value
Amri	129	104.62	1.105	80.5	1.29	16.75	4.07
Bluish golden	81	68.36	0.84	83.39	3.07	9.9	3.78
Bonza	72.8	58.62	0.8	71.46	1.84	14	3.76
Discovery	65.33	47.87	0.73	75.91	1.14	16.1	3.87
Elster	123.32	89.4	0.73	79.72	1.51	16.9	3.75
Florina	79.09	56.64	0.72	75.4	1.71	16	4.19
Gala	80	61.67	0.77	81	1.29	16.25	4.22
Gloster 69	60.3	41.48	0.68	80.26	1.53	14.19	3.79
Golden delicious	99.08	77.89	0.78	84.49	1.06	12.25	4.03
Grany smith	99.5	72.93	0.73	82.71	1.73	12.6	3.94
Green sleeves	76.44	69.13	0.91	81.75	1.61	15.1	3.79
Ida red	125.88	99.07	0.79	84.6	1.63	15.05	3.78
Kaja	90.04	61.67	0.68	83.67	1.82	10.9	3.74
Kids orange	98.3	89.59	0.92	83	1.26	15.1	4.44
Mushadi	98.92	74.15	0.75	84.25	2.01	15	4.08
Red delicious	89.48	70.41	0.79	82.15	1.69	17.41	4.59
Samootree	93	72.26	0.78	78.12	1.45	16	3.93
Summer red	118.7	88.67	0.75	87.1	2.6	13.9	3.89
Tyees men early	65.2	50.2	0.77	81.5	1.63	13	3.57
Spartan	99.15	79.13	0.8	82.71	1.73	12.6	4.07
Median				81.95	1.63	15.02	3.91

Wt = Weight, Vol = Volume,

Table 2: Show nutritional value of different vertices of apple

Name	Fat (%)	Fiber (%)	Protein (%)	Pectin (%)	Reducing sugar	Non reducing sugar	Total sugar
Amri	0.22	5.89	0.47	0.58	10.34	3.87	14.21
Bluish golden	5.15	3.61	0.29	1.29	9.71	2.58	11.83
Bonza	0.21	4.41	0.74	1.63	11.18	4.28	15.46
Discovery	0.66	8.6	0.44	1.6	10.59	6.16	16.75
Elster	0.25	7.46	0.36	0.88	9.51	7.88	16.59
Florina	0.24	4.17	0.48	0.62	11.84	5.93	17.77
Gala	0.26	4.35	0.27	0.53	11.95	5.78	17.73
Gloster 69	3.38	4.03	0.17	1.07	10.76	3.75	14.51
Golden delicious	0.23	5.06	0.44	0.51	11.29	4.41	15.7
Grany smith	0.28	3.8	0.48	0.99	11.14	4.32	15.46
Green sleeves	0.24	6.14	0.37	1.05	11.37	7.92	19.29
Ida red	0.21	1.91	0.36	0.69	9.95	3.57	13.52
Kaja	0.08	1.13	0.38	0.43	7.1	0.57	7.67
Kids orange	0.21	1.16	0.35	1.07	11.37	7.51	18.88
Mushadi	0.23	5.55	0.45	0.52	8.69	3.75	12.44
Red delicious	0.07	2.56	0.47	0.58	10.74	4.09	14.83
Samootree	0.02	3.92	0.34	1.29	13.14	6.99	20.13
Summer red	0.13	5.26	0.46	0.69	12.88	6.28	19.16
Tyees men early	0.23	2.94	0.38	0.5	11.66	6.47	18.13
Spartan	0.28	3.8	0.48	0.99	10.28	1.97	12.25

Golden and minimum ash percentage were determine in Golden Delicious. The mean pH is 3.9 as show in Table 1. Which mean it is slightly acidic in taste.

Nutritional value: The median percentage of moisture, ash and brix is 81.95, 1.63 and 15.02%, respectively. The percentage of Fat lies between 0.2-5.15%, Fiber lies b/w 1.13 -8.60%, protein lies b/w.17-.74% and pectin lies b/w 0.43-1.63%. The highest value of total sugar of Samootree is comparatively high i.e., 20.13, the concentration of reducing sugar in kaja were comparatively low i.e., 7.10 and the concentration of non reducing sugar in Green Sleevesis comparatively high than other verities i.e., 7.92.

Mineral content

Sodium: PIZZOCARO (1993) show the effect sodium chloride on Polyphenoloxidase which produce dark pigment for browning of fruits in Golden Delicious apple. The study of Shengmin Lu (2007) show the sodium chloride as a browning control agent. The mean concentration of sodium metal in twenty varieties of apple is 10.06mg/100gm.

Table 3: Mineral composition of different apples

Name mean of three reading	Sodium mg/100gm	Potassium mg/100gm	Phosphorus mg/100gm	Calcium mg/100gm	Magnesium mg/100gm	Iron mg/100gm	Vitamin A mg/100gm	Ascorbic acid mg/100gm
Amri	8.69	82.52	15.09	15.31	8.11	5.63	0.94	3.44
Bluish golden	8.31	75.19	8.34	16.29	14.98	7.47	0.89	3.78
Bonza	14.27	127.34	4.20	13.99	10.97	4.20	0.91	3.91
Discovery	11.01	109.36	16.34	20.79	14.62	7.23	0.95	4.2
Elster	10.14	96.94	11.25	19.89	11.70	7.09	0.99	5.93
Florina	12.80	114.63	16.98	17.85	12.19	2.46	0.8	4.28
Gala	11.40	82.27	13.31	21.99	15.58	7.60	0.79	3.22
Gloster 69	11.84	93.76	16.75	17.04	14.82	10.86	0.92	3.29
Golden delicious	7.75	63.43	8.20	15.51	13.69	3.88	0.84	3.51
Grany smith	10.37	73.82	13.10	14.55	11.73	10.73	0.87	3.91
Green sleeves	9.12	75.19	13.59	7.87	4.44	10.92	0.92	2.74
Ida red	7.70	65.76	9.44	9.06	6.26	3.08	0.94	3.32
Kaja	9.79	102.87	15.25	14.74	10.26	1.57	0.96	3.33
Kids orange	8.20	72.98	11.97	16.41	14.40	1.25	0.99	7.38
Mushadi	11.20	64.89	9.58	13.28	7.12	7.08	0.9	5.33
Red delicious	12.49	73.01	4.56	16.11	7.72	4.46	0.97	4.32
Samootree	10.49	84.69	16.66	13.74	11.63	1.96	0.79	3.95
Summer red	6.40	79.72	12.24	17.21	10.74	5.16	0.88	1.38
Tyees men early	9.01	76.44	13.95	17.33	9.07	1.80	0.76	3.66
Spartan	10.37	73.82	13.14	14.55	11.73	10.73	0.81	2.99
Mean	10.06	84.43	12.19	15.67	11.08	5.78	0.89	3.8

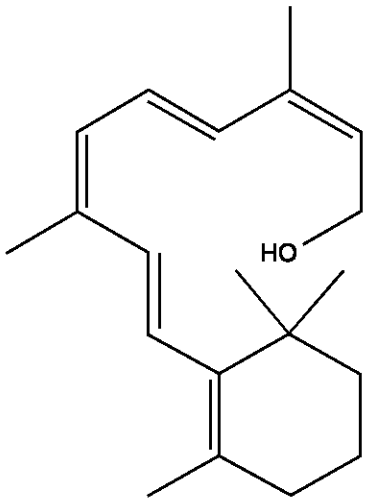

Fig. 1: Show the structure of Retinol (vitamin A)

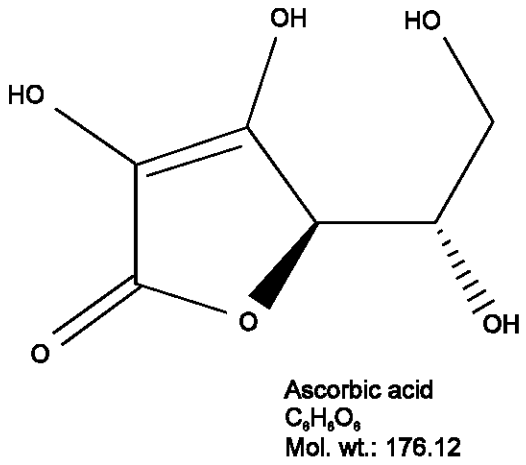

Fig. 2: Show the structure of Ascorbic acid (vitamin C)

Potassium: To increase the rate of photosynthesis in apple tree potassium is beneficial as describe by CAO Dong-Mei (2004) but
higher concentration of potassium in fruit is lethal for mankind. The median concentration of apples is 78mg/gm and the mode is 73.82mg/gm. The result shows that low amount of sodium and high concentration of potassium. The sodium and potassium ratio in diet is an important factor in prevention of high blood pressure. The potassium depresses and low concentration of sodium enhances blood pressure as study by Yoshimura *et al.* (1991).

Calcium: The mean Concentration of calcium in 15.67mg/gm.

Phosphorus: The mean concentration of phosphorus is relatively low as compare to calcium i.e., 12.19mg/gm. The phosphorus and calcium ratio is very essential factor for development and maintenance of bones, teeth and muscles describe by Dosunmu (1997) and Turan *et al.* (2003). Phosphorus and calcium ions in this study show a correlation of 0.209.

Magnesium: Magnesium plays an important role in regulating the neuromuscular activity of the heart also play a role in satiability of nervous system. The minimum concentration of Mg is in Green Sleeves i.e., 4.4mg/gm and the higher concentration is observing in Gala i.e., 15.58mg/gm.

Iron: The median concentration of iron as in Table 3 is 5.39mg/gm. The iron is directly related with chlorophyll. The higher value of iron in apples is harmful because it alter the taste and starts browning of fruit when a slice or juice of fruit is directly contact with air.

Fat soluble and water soluble vitamin: To know the concentration of water soluble vitamin C in apples is a great interest in the fields of food processing industry. Human body needs Ascorbic acid (or vitamin C) because they lack the enzyme *L-gulonolactone oxidase*. Which catalyzes the final step in the conversion of glucose into ascorbate (Koolman *et al*., 2005). The concentration of ascorbic acid in above mention fruit is 3.8mg/100 (mean). The higher concentration of ascorbic acid is in Kids orange 7.38mg/100gm and lower concentration in Summer Red i.e., 1.38mg/100gm.

On the other hand the concentration of Vitamin A is in the range of 0.76 -0.99mg/100gm which play a key role to cure night blindness.

The above mentioned twenty different verities of apples are pearls of Baluchistan, if concerned authorities provide awareness to farmers that how to save apple for a long time. If these apple verities are exported to other parts of the world after proper polishing and processing then the contribution of apple industries in GDP would rise.

REFERENCES

Abdul wahid, Jasar, Sabiar and Manzoor Kasl, 2001. Apple Pollination Problems in Balochistan. Pak. Int. J. Agri. Biol., 3: 2001-1560-8530/2001/03 -2-210-213.

Ali Muhammad, Muhammad Ayub, Alam Zeb, Yasser Durrani, Javid Ullah and Shams-UR-Rehman Afridi, 2011. Physicochemical analysis of apple pulp from Mashaday variety during storage. Agric. Biol. J. N. Am., 2: 192-196.

Andersen Lena Theilgaard, Shakuntala Haraksingh Thilsted, Birgitte Bruun Nielsen and Suguna Rangasamy, 2003. Food and nutrient intakes among pregnant women in rural Tamil Nadu, South India. Public Health Nutr., 6: 131-137.

AOAC, 1990. Official method analysis. 15th Edn., Association of official analytic chemists, Washington D.C.

Asghar Rehan, Mohd Nisar and Siraj Kakar, 2004. stuctural and biochemical study of apple bark spiltting discorder in Balochistan. Pak. J. Bio. Sci., 7: 916-920.

Bazaz, K.L. and K. Gardeep, 1981. Spectrophotometric determination of L. Ascorbic acid in vegetables and fruits analyst, 106: 117-120.

Carr'e, M.H. and D. Haynes,1922. The determination of soluble pectin in apples. Biochem. J., 16: 6069.

Chaudhary, M.I., 1994. Fruit crops. In: Horticulture, Malik, M.N. (Ed.), 1st Edn., National Book Foundation, Islamabad, pp: 471-473.

Considine, M., 1982. Food and Food Production Encyclopedia. Van-Nostrand, 2.

Dong-Mei C.A.O, WANG Yun-Shan, KANG Li-Fang and LI Yong-Ping 2004. Effect of foliage top-dressing of potassium on the photosynthetic rate of apple trees.

Dosunmu, M.I., 1997. Chemical composition of the fruit of Tetrapleura tetreptera and the physico-chemical properties of its oil. Global J. Pure Applied Sci., 3: 61-67.

Elzebroek, A.T.G. and K. Wind, 2008. Guide to Cultivated Plants. Wallingford: CAB International, Pages: 27. ISBN 1-84593-356-7.

Gardner, P.T., Tamsin A.C. White, Donald B. McPhail, Garry G. Duthie, 2000. The relative contributions of vitamin C, carotenoids and phenolics to the antioxidant potential of fruit juices. Food Chem., 68: 471-474.

Javed iqbal mughal: Hand book of Botany paper B Published by Majeed sons Lahore, Pakistan, Pages: 219.

Koolman Jan and Klaus-Heinrich Roehm, 2005. Color Atlas of Biochemistry, 2nd Edn., Pages: 368.

Marwat, Q. and F. Hussain, 1988. Ecological assessment of apple and apricot orchard weeds in Hanna-Urak Valley, Quetta. Pak J. Agric. Res., 9: 179-184.

Miller, G., 1995. Use of dinitro salicylic acid reagent for determination of reducing sugar. Anal. Chem., 31: 426-428.

Francesco Pizzocaro, Danila Torreggiani and Gianluca Gilardi, 1993. Inhabitation of apple polyphenoloxidase (PPO) by ascorbic acid, citric acid and sodium chloride. J. Food Proc. Preservation, 17.

Podsedek, A., J. Wilska-Jeszka, B. Anders and J. Markowski, 2000. Compositional characterisation of some apple varieties. Eur. Food Res. Technol., 201: 268-272.

Shengmin Lu, Yaguang Luo, Ellen Turner and Hao Feng, 2007. Efficacy of sodium chlorite as an inhibitor of enzymatic browning in apple slices. J. Food Chem., 104.

Stanislaw kazimerz kon and Bruce Watson, 1936. The effect of light on the vitamin c on milk by. From the National Institute for Research in Dairying, University of Reading.

Turan, M., S. Kordali, H. Zengin, A. Dursun and Y. Sezen, 2003. Macro and micro mineral content of some wild edible leaves consumed in Eastern Anatolia. Acta Agric. Scandinavica, Section B, Plant Soil Sci., 53: 129-137.

Valadone L.R.G and R.S. Mummery, 1975. Carotenoids of florl Part and the spadix of arum maculatium. Z.P Flanzen Physiol., 75: 88-94.

Yoshimura, M., H. Takahashi and T. Nakanishi, 1991. Role of sodium, potassium, calcium, magnesium on blood pressure regulation and antihypertensive dietary therapy. Jap. J. Nutr., 49: 53-62. 2002-2013.

UniProt Consortium, 2002-2013. Avalable at URL http://www.uniprot.org/taxonomy/3750 Taxon identifier code 3750.