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# COMPARATIVE STUDY OF CHEMICAL COMPOSITION OF SOME DRIED APRICOT VARIETIES GROWN IN NORTHERN AREAS OF PAKISTAN

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**Abstract**

The study was undertaken to evaluate the nutritional significance of edible portion of some dried apricot (*Prunus armeniae*) varieties such as Charmagazi, Halmas, Margulam, Nari and Travet from different localities of Northern areas. The selected parameters included were moisture content, total ash, total acidity, crude fiber, crude fat, crude protein, reducing sugars, non reducing sugars and total sugars ranged from 11.09±0.80 to 15.10±0.65 g/100g, 2.62±0.11 to 4.86±0.13 g/100g, 1.44±0.11 to 2.83±0.11g/100g, 2.27±0.60 to 3.26±0.65 g/100g, 1.47±0.1 to 1.99±0.20, 0.8±0.12 to 1.2± 0.10 g/100g, 3.24±0.08 to 5.84±0.08 g/100g, 3.32±0.08 to 8.49±0.60 g/100g and 6.74±0.30 to 13.94±0.72 g/100g respectively. The contents of vitamin-C determined ranged from 12.75±0.41 to 17.67±0.55 mg/100g. Among the micro minerals, Co, Cr, Cu, Fe and Zn were determined in the range of 0.05±0.01 to 0.09±0.02 mg/100g, 0.07±0.01 to 0.75±0.02 mg/100g, 0.15±0.02 to 0.38±0.03 mg/100g, 1.4±0.04 to 2.4±0.05 mg/100g and 0.9±0.02 to 2.0±0.05 mg/100g respectively, whereas in the macro minerals, the amount of Na, K, Ca, Mg and P were determined in the range of 14.2±0.20 to 20.8±0.30 mg/100g, 490±5.0 to 520±5.5 mg/100g, 95.5±2.2 to 110±3.0 mg/100g, 24.5±0.50 to 30±0.41 mg/100g and 27±1.0 to 38±2.0 mg/100g, respectively. The overall results showed considerable variation among the dried apricot varieties for different quality parameters. The varieties were characterized on the basis of nutrient contents.

## Introduction

Apricot (*Prunus armeniae* and *Prunus domestica)* is one of the important, attractive, delicious, highly nutritious and major fruit of Northern areas of Pakistan. This fruit tree grows from plain to altitude of 3000 meters (Anon., 1998). Wild trees in the Himalayas yield about 47.5 kg of fruit per year (Parmer & Kaushal, 1982).

Apricot is an important fruit of temperate region with a distinct pleasant aroma and is used for preparing many products including jam and nectar. In Northern areas, apricot is preserved mainly by conventional method like sun drying without any chemical treatment. The dried fruit is available in the market round the year, while the fresh fruit comes in the market by end of May to September (Faqir *et al*., 2004).

The fruit is about 5 cm in diameter and contains one large seed (Rich, 2000). The seed contains up to 50% of edible semidrying oil. Several reports appear in literature regarding the nutritional value of fruits and vegetable (Zhijuri *et al*., 1998). However, little information is available in the literature about the chemical composition of edible portion of apricot of the locally grown cultivars.

Apricot fruits are nutritious, cleansing and mild laxative. The bark is astringent. The decoction is also used to sooth inflamed and irritated skin condition (Chevallier, 1996). The fruit is antipyretic, antiseptic, emetic and ophthalmic (Parmer & Kaushal, 1982). The seed is analgesic, anti-asthamic, antispasmodic, antitussive, demulscent, emollient, expectorant, pectoral and sedative (Duke & Ayensu, 1985; Yeng, 1985). The present work was under taken to collect data about the chemical composition of indigenous varieties of dried apricot and to compare their quality on the basis of nutritional significance.

## Materials and Methods

**Sample collection:** Five different varieties of dried apricot were purchased from northern areas. The fruit samples were sorted, discarding damaged ones while leaving only the wholesome to carryout the study. These samples were preserved and sealed in polyethylene bags.

**Experimental:** In chemical analysis moisture, total ash, total acidity, crude fat, and crude fiber, were determined according to the AOAC methods (Anon., 2000). Crude protein was estimated by kjeldhal method as described by (Awan & Rahman, 2006). Estimation of reducing sugars, non-reducing sugars and total sugars were carried out by (Jacobs, 1951). Vitamin C was determined by titrimetric method using 2, 6-Dichlorophenolindophenol method (Ruck, 1963).

The estimation of minerals such as Co, Cr, Cu, Fe, Zn, Ca and Mg was carried out by Atomic Absorption Spectrophotometer (Hitachi Zeeman Z-8000 Japan) whereas Na and K by Flame Photometer (Model 410-Cornig England) and P by using UV-Spectrophotometer Model UNICO 2100 Series Japan, (Watanabe & Olsen, 1965).

**Statistical analysis:** Triplicate determinations were carried out and standard deviation was calculated (Steel *et al*., 1997). The calibration curve of the standard elements was obtained for concentration *vs* absorbance/division. Data of each variety was subjected to one-way analysis of variance (ANOVA), and the means comparison was performed according to the Turkey's multiple comparison tests (post hoc test). A significance value of $\alpha$=0.01 was used to distinguish significance differences of means within the varieties (Angus, 2005).

## Result and Discussion

The study was undertaken to evaluate the nutritional significance of edible portion of some dried apricot varieties on the basis of their proximate composition, vitamin C and mineral contents. The minerals were further classified according their physiological and dietary importance into microelements Co, Cr, Cu, Fe and Zn and macro elements Na, K, Ca, Mg and P. In chemical composition moisture, ash, acidity, fiber, fat, protein and sugar contents were reported as gram per 100g, whereas vitamin C as mg/100g (Table 1).

In the case of minerals, the concentrations of micro minerals and macro mineral have been shown as mg/100g on dry weight basis (Table 2). The results showed variations among the value in relation to variety. The mean and standard deviation were also determined. This indicated considerable differences among the values for selected parameters.

On the basis of overall chemical composition in all varieties of dried apricot fruits, the total ash was maximum in Nari (4.86±0.13 g/100g) while minimum in Margulam (2.62±0.11 g/100g). The moisture was maximum in Nari (15.10±0.65 g/100g) whereas minimum in Margulam (10.61±0.90 g/100g) while in the other three varieties were moderate (11.09±0.8 to14.20±0.75 g/100g). The acidity was maximum in Charmagazi (2.83±0.11 g/100g) while minimum in Nari (1.44±0.11 g/100g) whereas in the other three varieties it ranged 1.54±0.13 to 2.35±0.12g/100g. The maximum crude fat was found in Halmas (1.99±0.20 g/100g) and minimum in Travet (1.47±0.10 g/100g) while in the remaining varieties were in moderate range (1.70±0.15 to 1.90±0.16 g/100g). The crude fiber content was maximum in Charmagazi (3.26±0.65 g/100g) whereas minimum in Nari (2.27±0.60g/100g) while in the other three varieties moderate levels were recorded (2.47±0.45 to 3.0±0.70 g/100g).

**Table 1. Chemical composition (mean ± SD *n*=3) of dried apricot varieties from northern areas.**

| S # | Parameters (g/100g) | Charmagazi | Halmas | Margulam | Nari | Travet |
|---|---|---|---|---|---|---|
| 1. | Moisture | 11.09 ± 0.80a | 14.20 ± 0.75b | 10.61 ± 0.90a | 15.10 ± 0.65b | 13.70 ± 0.82b |
| 2. | Total ash | 3.75 ± 0.14a | 3.51 ± 0.16a | 2.62 ± 0.11b | 4.86 ± 0.13c | 3.90 ± 0.15a |
| 3. | Total acidity | 2.83 ± 0.11c | 1.54 ± 0.13a | 2.35 ± 0.12b | 1.44 ± 0.11a | 2.11 ± 0.14b |
| 4. | Crude fiber | 3.26 ± 0.65a | 3.00 ± 0.70a | 2.76 ± 0.50a | 2.27 ± 0.60a | 2.47 ± 0.45a |
| 5. | Crude fat | 1.70 ± 0.15a | 1.99 ± 0.20a | 1.90 ± 0.16a | 1.78 ± 0.21a | 1.47 ± 0.10a |
| 6. | Crude protein | 0.8 ± 0.12a | 1.0 ± 0.11a | 0.9 ± 0.13a | 1.1 ± 0.12a | 1.2 ± 0.10a |
| 7. | Reducing sugars | 3.24 ± 0.08a | 5.40 ± 0.10b | 3.70 ± 0.05c | 5.0 ± 0.15d | 5.84 ± 0.08e |
| 8. | Non reducing sugars | 3.32 ± 0.10a | 7.51 ± 0.35b | 5.30 ± 0.20c | 8.49 ± 0.60b | 7.17 ± 0.55b |
| 10. | Total sugars | 6.74 ± 0.30a | 13.31 ± 0.45b | 9.25 ± 0.25c | 13.94 ± 0.72b | 13.39 ± 0.65b |
| 11. | Vitamin. C (mg/100g) | 14.2 ± 0.35a | 17.58 ± 0.65b | 15.87 ± 0.45c | 17.67 ± 0.55b | 12.75 ± 0.41d |

Values followed by the different small letters (a-d) within the same row are significantly different ($p<0.01$) according to Turkey's multiple comparison test.

The crude protein was maximum in Travet (1.2±0.10 g/100g) and minimum in Charmagazi (0.8± 0.12 g/100g) while in remaining varieties it represented moderate level (0.9±0.13 to 1.1±0.12 g/100g). Total sugar was maximum in Nari (13.94±0.72 g/100g) as compare to Travet (13.65±0.65 g/100g), Halmas (13.31±0.45 g/100g) and Margulam (9.25±0.0.25g/100g) while lowest in Charmagazi (6.74 ±0.30 g/100g). Similarly the concentration of non-reducing sugars was maximum in Nari (8.49±0.60 g/100g) and minimum in Charmagazi (3.32±0.10 g/100g) while in remaining varieties represented moderate level (5.30±0.20 to 7.17±0.55 g/100g).

The reducing sugar was maximum in Travet (5.84±0.08g/100g) and minimum in Charmagazi (3.24±0.08 g/100g), while moderate level in all other varieties it was recorded (3.70±0.05 to 5.40±1.0 mg/100g). Vitamin C was maximum in Nari (17.67±0.55 mg /100g) and minimum in Travet (12.75±0.41 mg/100g) while in remaining varieties recorded moderate level (14.20±0.35 to 17.58±0.65 mg/100g). Other researcher reported the value as the fruits of the wild form contains about 6.3% sugar, 0.7% protein, 2.5% ash, and 2.5% pectin. There is about 10 mg vitamin-C/100g of pulp (Parmer & Kaushal, 1982).

Among the micro minerals, the concentration of Cobalt was maximum in Nari (0.09±0.02 mg/100g) and minimum in Travet (0.05±0.01 mg/100g) while the remaining varieties were moderate and ranged (0.05±0.01 to 0.08±0.02 mg/100g). Chromium was maximum in Margulam (0.75±0.02 mg/100g) and minimum in Halmas (0.07 ±0.01 mg/100g) while other varieties represented moderate level (0.1±0.01 to 0.61±0.03 mg/100g). The concentration of Copper was maximum in Margulam (0.38±0.03 mg/100g) minimum in Nari (0.15±0.02mg/100g) while other varieties represented moderate level (0.24±0.01 to 0.30±0.01 mg/100g).

The concentration of iron was maximum in Halmas (2.40±0.05 mg/100g) as compared to Charmagazi (2.10±0.07 mg/100g), Nari (1.80±0.08 mg/100g) and Margulam (1.50±0.06 mg/100g) while lowest in Travet (1.40±0.04 mg/100g). The concentration of Zinc was maximum in Nari (2.00±0.05 mg/100g) then Charmagazi (1.40±0.02 mg/100g), Margulam (130±0.03mg/100g) and Halmas (1.10±0.01 mg/100g) while lowest in Travet (0.90±0.02 mg/100g).

**Table 2. Minerals composition (mean ± SD *n*=3) of dried apricot varieties from northern areas on dried weight basis (mg/100g).**

| S # | Apricot varieties | Co | Cr | Cu | Fe | Zn | Ca | Mg | K | Na | P |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Charmagazi | 0.06 ±0.01a | 0.61 ±0.02a | 0.30 ±0.01a | 2.10 ±0.07a | 1.40 ±0.02a | 100 ±2.0a | 28.3 ±0.50b | 508 ±5.0a | 20.8 ±0.30a | 35 ±1.0a |
| 2. | Halmas | 0.08 ±0.02a | 0.07 ±0.01b | 0.24 ±0.01b | 2.40 ±0.05a | 1.10 ±0.01b | 97.8 ±1.5a | 27.7 ±0.45b | 515 ±4.5a | 18.4 ±0.20b | 31 ±1.5b |
| 3. | Margulam | 0.07 ±0.01a | 0.71 ±0.02a | 0.38 ±0.03c | 1.50 ±0.06a,b | 1.30 ±0.03c | 105 ±2.5a | 30.0 ±0.41a | 490 ±5.0b | 14.2 ±0.20c | 27 ±1.0c |
| 4. | Nari | 0.09 ±0.02a | 0.31 ±0.01c | 0.15 ±0.02d | 1.80 ±0.08a | 2.00 ±0.05d | 110 ±3.0a,b | 24.5 ±0.50c | 520 ±5.5a | 15.0 ±0.32d | 38 ±2.0a |
| 5. | Travet | 0.05 ±0.01a | 0.10 ±0.01b | 0.28 ±0.02a,b | 1.40 ±0.04a,b | 0.90 ±0.02e | 95.5 ±2.2a,c | 26.4 ±0.32b | 495 ±4.0b | 17.5 ±0.40e | 29 ±1.6b,c |

Values followed by the different small letters (a-e) within the same column are significantly different ($P<0.01$) according to Turkey's multiple comparison test.

The role of elements in increasing the body resistance to environmental stress, reducing the risk of disease has been very important topic in the last few decades. It has claimed that the regular intake of protective elements in correct proportions may one day be recognized as an important measure in the maintenance of health and prevention of disease. Elements in Biological sources are more efficient than pure elemental status, because of presence of elements as well as presence of vitamins and other physiological active compounds (Sahito *et al*., 2003).

On the basis of concentration level of macro mineral, the concentration of Calcium was maximum in Nari (110±3.0 mg/100g) then Margulam (105±2.5 mg/100g), Charmagazi (100±2.0mg/100g) and Halmas (97.8±1.5 mg/100g) while lowest in Travet (95.5±2.20 mg/100g). Maximum concentration of Magnesium was recorded in Margulam (30±0.41 mg/100g) as compared to Charmagazi (28.3±0.50 mg/100g), Halmas (27.7±0.45 mg/100g) and Travet (26.4±0.32 mg/100g) whereas minimum in Nari (24.5±0.5 mg/100g). The concentration of Potassium was maximum in Nari (520±5.5 mg/100g) than Halmas (515±45 mg/100g), Charmagazi (508±5.0 mg/100g) and Travet (495±4.0 mg/100g) whereas minimum in Margulam (490±5.0 mg/100g).

Sodium was found maximum in Charmagazi (20.8±0.3 mg/100g) than Travet (17.5±0.4 mg/100g), Halmas (18.4±0.20 mg/100g) and Nari (15.0±0.32 mg/100g) whereas minimum in Margulam (14.2±0.20 mg/100g). Phosphorus was found maximum in Nari (38±2.0 mg/100g) then Charmagazi (35±1.0 mg/100g), Halmas (31±1.5 mg/100g) and Travet (29±1.6 mg/100g) whereas minimum in Margulam (27±1.0 mg/100g).

## Conclusion

All these apricot varieties contribute nutrients especially as energy provider (sugars), vitamin C and micro and macro minerals having medicinal importance as well. Nari with appreciable amount of protein, total sugars, total ash and vitamin C could be a good source of nutrition as compared to other varieties. Charmagazi having appreciable amount of micro minerals and especially Na & K, so can be utilized as a natural source of nutrition in hypertension disease condition. As apricot varieties are cheaper source of nutrition and are available in their respective seasons at reasonable price which a common man or poor man can also purchase and benefit from it with ease. These can be utilized in the formulation of various food products also.

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### References

Anonymous. 2000. *Official Methods of Analysis. The Association of the Official Analytical Chemist*, 17th Ed, Washington DC, USA.

Angus, M. Brown. 2005. A new software for carrying out one-way ANOVA Post hoc tests. *Comp. Meth. Prog. Biomed.,* 79: 89-95.

Awan, J.A. and S.U. Rahman. 2006. *Food Analysis Manual*. Unitech Communication, Faisalabad, Pakistan.

Chevallier, A. 1996. *The encyclopedia of medicinal plants*. Dorling Kindersly, London.

Duke, J.A. and E.S. Ayensu. 1985. *Medicinal plants of China*, 3rd ed. References Publication Inc, China.

Faqir, M.A., A. Saeed and D. Maqam 2004. Storage effect on physiochemical and sensory characteristics of dried apricot jam. *Pak. J. Food. Science,* 14(1-2): 43-47.

Anonymous. 1998. *Agriculture statistics of Pakistan*, Ministry of Food, Agriculture and Live stock. Agriculture and Live Stock Division Economic Wing, Islamabad.

Jacobs, M.B. 1951. The chemical analysis of foods and food products, 2nd Ed. D Van Nostrand, New York.

Parmer, C. and M.K. Kaushal. 1982. Wild fruits of Sub-Himalayan Region. Kalyani Publishers, New Delhi, India. 403 pp.

Rich, M. 2000. *Plants for a future-species database. Cornucopia, A source book of edible plants.* Kampong Publication USA. 490 p.

Ruck, J.A. 1963. *Chemical methods for analysis of fruits and vegetables products*. Canadian Research Board Department of Agriculture, Sumer land, Canada.

Sahito, S.R., T.G. Kazi and G.H. Kazi. 2003. Comparison of sample preparation method for the determination of essential and toxic elements in important indigenous medicinal plant *Aloe barbendis*. *Jour. Chem. Soc. Pak.,* 25(3): 201-205.

Steel, R.D., J.H. Torrie and D. Dickey. 1997. *Principles and procedures of statistic. A biometrical approach*, 3rd ed. McGraw Hills Book Co Inc, New York.

Watnabe, F.S. and S.R. Olsen. 1965. Determination of phosphorus in water and sodium benzoate extract of oil. *Soil. Sci. Am. Proc.*, 29: 667-668.

Yeung, H.C. 1985. *Handbook of China herbs and formulas.* Institute of China Medicine, Los Angeles, USA, 79 p.

Zhijun, W.Z.G. and F. Weiming. 1998. Effect of room temperature storage on change of quality and physiology of apple fruit. Nanjing *Yang Daxue Xuebo*, 21: 107-111.

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