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Short Communication

Total Phenolic Contents, Ascorbic Acid and Antioxidant Potential of Different Fruits

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Abstract. The experiment was conducted at Biochemistry Section, Ayub Agricultural Research Institute, Faisalabad Pakistan, during the year 2017-18 to assess the total phenols and antioxidants potential of mango, grapes, banana, guava, mulberry, strawberry, loquat, melon, apricot and phalsa. Fruits samples were obtained from the market of Faisalabad Pakistan, washed, dry at room temperature, extracted their juice/pulp. The juice was stored at 4 °C for further analysis. Juice samples were processed for Vitamin-C, pH, TSS, total phenolics and total antioxidant capacity. The results showed that among all the ten fruits vitamin C was higher in mango (24.33 mg/100 mL) followed by phalsa (19.74 mg/100 mL) and Grapes (11.25 mg/100 mL), whereas lower value was observed in melon (3.3 mg/100 mL) and loquat (3.4 mg/100 mL). Vitamin C for other fruits lies between these. Highly acidic pH of fresh juices of all the fruits was observed except in melon (5.82) and guava (5.38) which is less acidic. Percentage of TSS was higher in phalsa, mulberry and mangoes (13.8, 13.5 and 13.9% respectively) and lesser in melon (5.6%). Antioxidant capacity (% DPPH reduction) was found higher in grapes (91.9%) and mango (91.2%) which was statistically at par with melon (90.9%), while lesser value was observed in mulberry (51.6%). Total phenolics were significantly higher in grapes (1266.4 µg GAE/mL), whereas minimum phenolic contents were found in melon (4.1 µg GAE/mL). Therefore, it was concluded that grapes are more nutritious and healthy fruit than other.

Keywords: antioxidants, ascorbic acid, fruits, phenolics, TSS

Natural source of antioxidant is very effective health protecting factor by reducing the risk of chronic diseases including cancer and heart problems (Coban *et al*., 2015). Fruit and vegetable have higher contents of antioxidants i.e. phenolic and ascorbic acids (Bellavia *et al*., 2013). Awareness has been inducted for the consumption of raw fruit as part of food stuff particularly for the benefits related to health of human beings (Martin *et al*, 2002; Liu *et al* 2000). Most of the fruits contain vitamins, thiamin, niacin, dietary fiber and minerals. Damage of various biomolecules (lipids, proteins and nucleic acids) due to free radicals may initiate the degenerative diseases (Betoret *et al*., 2011). Antioxidant compounds (carotenoids, flavonoids and other phenolics) may lower the risk of detrimental diseases (cancer and heart attack) (Grassmann *et al*., 2002). Ingestion of fresh fruit and vegetables is actually intake of dietary fibre which may lessen the risk of lethal infections (Riboli and Norat, 2003) because fresh fruits contained phenolic and other phytochemical antioxidants which deactivate free radicals. Balance consumption of fresh fruit and vegetables decrease the chance of lethal diseases which is due to the presence of phenols and antioxidants in them (Kaur and Kapoo, 2001). Tropical and subtropical fruits contain diverse antioxidant components such as β-carotene, ascorbic acid, carotenoids and phenolic compounds. They are also a source of dietary fibre (Shieber *et al*., 2000). Therefore, the current experiment was planned to determine the antioxidants potential, total phenol and ascorbic acid of different fruits commercially available in market.

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Fruits material. The experiment was carried out at Biochemistry Section, Ayub Agricultural Research Institute, Faisalabad during the year 2017-18 to assess total phenolic contents, ascorbic acid and antioxidant potential of different fruits.

Completely matured and uniform sized fruits of mango (*Mangifera indica*), grapes (*Vitis vinifera*), banana (*Musa sapientum*), guava (*Psidium guajava*), mulberry

(*Morus nigra*), strawberry (*Fragaria ananassa*), loquat (*Eriobotrya japonica*), melon (*Cucumis melo*), apricot (*Prunus armeniaca*) and phalsa (*Grewia asiatica*) were collected from local market of the Faisalabad and brought to Biochemistry Laboratory of Post-harvest Research Centre for analysis.

Fruits were scrutinized carefully for any impairment and damage. Scrutinized fruits were washed with ground water to eliminate dust particles. Juice was squeezed with screw type hand operated juice extractor. The pomace and the juice were separated in the juice extractor. A clean muslin cloth was used to filter the juice and stored at 4 °C for 24 h in refrigerator for further analysis.

Preparation of samples. One (1.0) mL of fruit juice mixed with 5mL of extraction mixture (methanol: acetone: HCl, 90:8:2) in the test tube, shaked on vortex for 3 min and placed in the dark at ambient temperature for 20 min and centrifuged for 5 min at 4000 rpm. The supernatant was stored to use for determination of total antioxidants and total phenolic (Öztürk *et al*, 2009).

Total phenolic content. Total phenolic were determined according to the protocol described by Folin Ciocalteu (FC) method (Singleton and Rossi, 1965). The supernatant (1.0 mL) was mixed with 0.5 mL of FC reagent, mixed at vertex and added 1.5 mL of Na_2CO_3 (20% w/v). The mixture was then heating at 100 °C for 1 min, placed till cooling and then recorded the reading at 750 nm (absorbance) with UV Visible Spectrophotometer.

Antioxidant capacity (%DPPH reduction). ntioxidant capacity was determined by the method described by Miliauskas *et al*. (2004). Antioxidants were determined by using the DPPH (1, 1-diphenyl-2-picrylhydrazyl) as described by Sanchez-Moreno (2002). Juice (1/2 mL) was mixed with methanol solution of DPPH (3 mL) and left for 30 min in dark. Took the absorbance at 517 nm using UV visible Spectrophotometer. DPPH with methanol was run as blank. DPPH reduction was calculated by the equation,

(% DPPH reduction) = $[(A_o\text{-}A)/A_o] \times 100$
A_o =Absorbance of DPPH (0.004%) with methanol; A = Absorbance of test sample.

Ascorbic acid. Ascorbic acid was estimated by oxidation reduction reaction using 2, 6 dichlorophenol indophenols with rose pink end point AOAC (2005).

Total soluble solids and pH. Total soluble solids (°Brix) were measured by using Refracto meter having range of 0-35°Brix at ambient temperature. The pH was measured by a pH meter of a glass electrode according to AOAC (2005).

Fresh juice of the samples was extracted to determine the vitamin C, pH, TSS, total antioxidants and phenolics. The results are given in Table 1. Among all the ten fruits vitamin C was higher in mango (24.33 mg/100 mL), followed by phalsa (19.74 mg/100 mL) and grapes (11.25 mg/100 mL), whereas lower value was observed in melon (3.3 mg/100 mL) and loquat (3.4 mg/100 mL). Vitamin C for other fruits lies between these. Fresh juices of all the fruits have highly acidic pH except in melon (5.82) and guava (5.38) which is comparatively less acidic. Among other fruits maximum pH was recorded in banana (4.6) and mango (4.4). Percentage of TSS was observed higher in Phalsa, mulberry and mangoes (13.8, 13.5 and 13.9% respectively) and lowest in melon (5.6%), while total soluble solids lie between these values in all other fruits. Antioxidant capacity (%). DPPH reduction) was found higher in grapes (91.9%) and mango (91.2%) which is statistically at par with melon (90.9%). The lowest value was observed in mulberry (51.6%). Antioxidant capacity of all other fruits lies between these two values. Phenolics were significantly higher in grapes (1266.4 µg GAE/mL) whereas minimum phenol contents were found in melon (4.1 µg GAE/mL). Higher value of phenolics were also observed in guava, phalsa, strawberry and loquat (229.4, 209.6, 210.5, 209.1 µg GAE/mL respectively).

Cell oxidation. Cell oxidation in human and plant causes many degenerative diseases. Scientists got successful results in finding such group of nutrients which provide protection against these harms. Naturally occurring substances are antioxidants and phenolics, results in bright colour in fruits and vegetables and scavenge harmful free radicals (Saxena *et al.*, 2012) in living organisms.

Variable quantities regarding antioxidant capacity and phenolic were observed among the samples show in Table 1. Grapes have relatively higher phenolic and percent DPPH reduction, whereas relatively lesser values were observed in melons. Some deviation was observed in phenolics and antioxidants values of different fruits. High antioxidant capacity was also observed in loquat and guava along with high phenolics. Strawberry and

Table 1. Antioxidant potential and composition of different fruits

Fruit name	Vit.C (mg/100 mL)	pH	TSS(%)	Total antioxidant capacity (% DPPH reduction)	Total phenols (µg GAE/mL)
Banana	6.52 ± 1.27	4.64 ± 0.12	21.41±0.24	87.78 ± 1.02	94.43 ± 2.11
Mulberry	9.4 ± 1.03	4.06 ± 0.01	13.48 ± 0.43	51.65 ± 2.88	58.03 ± 6.57
Straw berry	10.98 ± 1.10	3.07 ±0.02	7.46 ± 0.23	71.84 ± 5.3	210.52 ± 7.33
Loquat	3.41 ± 1.04	3.38 ± 0.14	12.73 ± 0.80	87.63 ± 2.63	209.11 ± 7.90
Guava	5.30 ± 1.01	5.38 ± 0.26	8.78 ± 1.37	86.93 ± 4.25	229.43 ± 5.06
Melon	2.82 ± 0.72	5.82 ± 0.33	5.6 ± 0.25	90.93 ± 2.57	2.46 ± 1.05
Grapes	11.25 ± 3.43	2.92 ± 0.44	11.92 ± 0.29	91.97 ± 2.39	1266.4 ± 13.6
Apricot	8.96 ± 2.57	3.99 ± 0.23	14.0 ± 0.63	89.78 ± 2.46	77.95 ± 6.39
Mango	24.33 ± 3.77	4.36 ± 0.12	13.95 ± 0.38	91.18 ± 3.83	52.38 ± 4.55
Falsa	19.74 ± 2.84	2.82 ± 0.05	13.83 ± 0.35	59.41 ± 3.73	209.60± 10.82

phalsa has higher total phenols but lower quantity of %DPPH reduction. Grapes contain high pro-anthocyanidin (Gu *et al*., 2004) and flavonoid contents due to which it has higher values of phenolics and antioxidants. Intake of fruits results in prevention of diseases like atherosclerosis, cancer, diabetes, arthritis due to the presence of antioxidants (Betoret *et al*., 2011), fiber, vitamins and minerals (Cardoso *et al*., 2013). Many of the fruits (strawberry, grapes, mango and phalsa) are rich in antioxidants, phenols and vitamin C. It was studied earlier that some fruits always appear to be rich in antioxidants and change in values may be due to change in extraction procedure (Tabart *et al*., 2007), varieties (Howard *et al*., 2003), state of ripening (Navarro *et al*., 2006), and meteorological conditions of the production season (Gil *et al*., 2006; Ayala-Zavala *et al*., 2004).

Along with physical appearance, texture and taste, nutritional qualities of the fruits are also very important. Oxidative stress may lead to carcinogenic diseases which may be reduced by antioxidant rich diet (fresh fruits) (Harasym, 2014; Wang *et al*., 2014). Because of the antioxidant capacity of fresh fruits it was concluded that a high intake of fruits and vegetables or a high total antioxidant intake (Rautiainen *et al*., 2012) may counteract the lethal effect of oxidative stress. It was also observed that aging can be prevented by a higher intake of natural antioxidants in the form of fruits and vegetables (Coban *et al*., 2014; Mohammadirad *et al*., 2013).

Antioxidant potential of fruits were showing decreasing trend as higher in grapes and lower down with mango, melon, apricot, banana, loquat, guava, strawberry, phalsa and mulberry while total phenolics order was grapes, guava, strawberry, phalsa, loquat, banana, apricot, mulberry, mango and melon. In both parameters grapes laid at the top so is recommended fruit among given ten fruit.

Conclusion

The current experiment appraised the valuable information regarding the chemical contents and extents of health improving constituents (Antioxidants and polyphenols) in different fruits which are required to know for using the fruits. Their nutraceutical capacity is necessary to understand for implementation in the food industry and other usage. Different fruits are varied in chemical composition and antioxidant capacities. The grapes and mangoes are good source of bioactive constituents (antioxidants and polyphenols) and are recommended fruits for good health care.

Conflict of Interest. The authors declare no conflict of interest.

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