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Analysis of Carbohydrate and Protein from Pulp and Peel of Apple (*Malus sylvestis*) and Banana (*Musa paradisiacal*).

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Abstract: Fruits are sweet, colorful and high in vitamin, fiber and energy. The outer layer of fruit or skin is also called as peel, and the inner mass as pulp. In our areas, people normally use pulp while peel, for example, of Banana (*Musa paradisiacal*) is removed and discarded. The peels of various fruits contain biomolecules or organic compounds, which provide us energy and also protect from several diseases, such as peel of apple contains antioxidants and anticancerous compounds. In the present work, the content of carbohydrates and proteins were determined by an spectrophotometric method, from the pulp and peel of Apple (*Malus sylvestis*) and Banana (*Musa paradisiacal*). The results showed that the pulp of both fruits contains more carbohydrate and protein than their peels. Also, a significant amount of carbohydrate and proteins are present in the peels of both fruits.

Keywords: Carbohydrate; Protein; Peel; Pulp; Spectrophotometry.

1. INTRODUCTION

The carbohydrates and proteins are essential components of human food. Fruits are a good source of carbohydrates and proteins (Chatterjee, 1999). Fruits are easily digested and exercise a cleansing effect on the blood and the digestive tract (Hgarty 1988; Judith, 2005). The outer layer or skin of a fruit is called peel and the inner mass as pulp (Khan, 1998). In our areas, people generally use inner mass (pulp), while skin (peel) of fruits, specially of Banana is removed and discarded. The peels of fruits also contain biomolecules or organic compounds, which provide us energy and also protect from diseases. Apple contains antioxidants and anticancerous compounds (Qric, 2003; Belitz and Grosch 2007). Mostly peel is unpleasant, indigestible and edible but fruits peel contains many essential biomolecules (Ghosh, 2004, Paul *et al.*, 2007). Many people only like the soft or juicy insides of fruits.

Apple (*Malus sylvestis*) belongs to the family of Rosaceae. Apple a native of South-west Asia, is one of the most important fruits of temperate zone. It is grown in Iran, Afghanistan, and Pakistan (Quetta, Kohat, Kashmir, Muree Hills, Chitral, Swat, Hazara and other localities at 3000 ft). Several varieties of apple are available, and are very popular worldwide due to their taste, shape and size, etc. An apple tree takes 10-15 years to grow from to the fruit bearing stage (Boyer and Liu 2004; Williams 1997).

Banana (*Musa paradisiacal*) belongs to Musaceae family. Banana is a staple fruit of thousands and is supposed to be an ancient fruit cultivated from the dawn of history (Krikorian 2000). The prevention of hypertension and cerebral apoplexy can also be realized by banana peel. In addition, the smutch on the shoes can be removed by using banana peel wiping the shoe (Qric, 2003). Banana pulp is good for the health of children. Adults should also take one or two Banana specially women because it contain tryptophan which helps in reducing hypertension.

In the present work two fruits apple and banana were selected for the determination of carbohydrate and protein content in their pulp and peel. An spectrophotometric method has been employed to determine carbohydrate and protein content.

2. MATERIALS AND METHODS

Fruit Samples

The apple and banana fruit samples were randomly selected and purchased from a local market of Hyderabad, Sindh, Pakistan.

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Analysis of Total Carbohydrate:

Preparation of Sample:

For the extraction of carbohydrates, finely ground sample (1g) were taken in a 50 mL centrifuge tube and 20 mL of hot 80% alcohol was added. The tubes were shaken for 5- 10 min and then centrifuged for 10 min at 3000 rpm. The supernatant (s) were collected. The extraction with 80% hot ethanol was repeated 5- 6 times, till the supernatant was free of sugars (negative test with enthrone reagent). The residues were cooled in an ice-water mixture, and 6.5 mL of 52% perchloric acid were added while stirring the contents with a glass rod. The contents were allowed to stand for 15 min with occasional stirring and then centrifuged at 40°C. All the supernatant collected and this extraction step was repeated for 4-5 times. The supernatant fractions were combined and the volume was made to 100 mL with water.

Procedure:

The above extract was diuted at the concentration level of 5 to 20 µg/ L glucose. An aliquot (5.0 mL) of the diluted extract was transferred in a tube, and placed in a cold water bath. A freshly prepared enthrone reagent (10.0 mL) was added and the contents were thoroughly mixed and transferred. The tubes were transferred to boiling water bath for 7.5 min. After cooling the tubes under running tap water, absorbance of the solutions were measured at 630 nm. A standard curve of 0 to 100 µg/ L glucose was constructed and the amount of glucose was calculated in the sample aliquot (Sawheney & Randhir 2006).

Analysis of Total Protein:

Preparation of Sample:

Each sample (ca. 1.0 g) was macerated in a pestle mortar in 5.0 mL of phosphate buffer and the material was transferred to centrifuge tubes. The homogenate was centrifuged at 8000 rpm for 20 min, and supernatant was collected. This step was repeated for 4- 5 times, and supernatants were combined and final volume was made to 50 mL with phosphate buffer.

Procedure:

The supernatant solution (10.0 mL) and alkaline copper sulphate reagent (5.0 mL) were mixed thoroughly and allowed to stand for 10 min. Next, Folin's reagent (0.5 mL) was added to develop the color. After 30 min, absorbance measurements were performed at 660 nm against a blank (1.0 mL of 0.5 NaOH in place of sample). Bovine serum albumin was used to construct a standard curve and the amount of protein in different samples was estimated (Sawhney & Randhir, 2006; Lowry *et al.,* 1951).

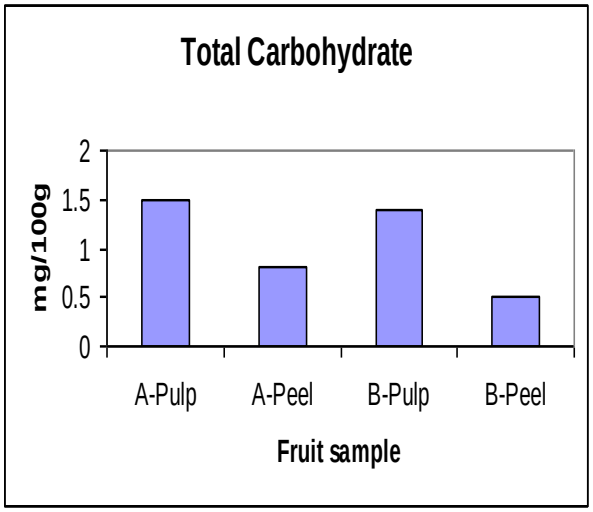


Fig. 1 Amount of total carbohydrate (mg/ 100 g) determined in A: apple and B: banana pulp and peel

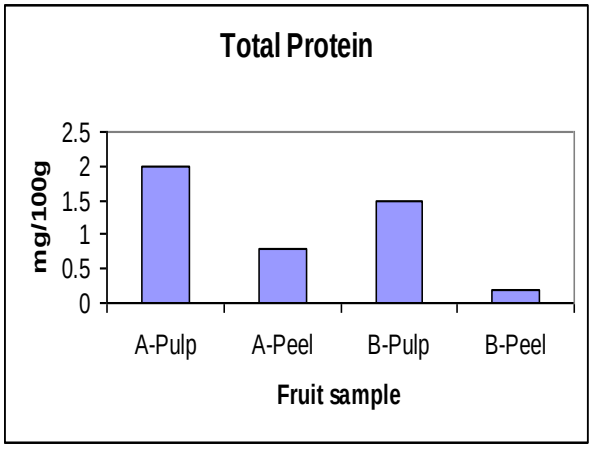


Fig.2 Amount of total protein (mg/100 g) determined in A: apple and B: banana pulp and peel.

3. RESULT AND DISCUSSION

Fruits are one of the good forms of food and a source of various biologically important molecules. These biomolecules not only provide us energy but play a significant role in protecting us from several fatal diseases such as cancer. As the fruit ripens, the starch is converted to fructose and fruit become sweet when this conversion is complete. As a fruit starts to become mature, the types of proteins also change (People and Dalling, 1988; Salon *et al*, 2001; Schiltz *et al*, 2005). In our areas, people generally use pulp and discard the peel. This work focused on the importance to apple and banana peels. The

compounds of interest were limited to energy giving compounds, i.e. carbohydrates and proteins. Apple (*Malus sylvestis*) pulp and peel are excellent source of carbohydrate and protein (Veberic and Stampar 2005; Podsedek *et al.,* 2004; Hearforth, 2000; Mkhtiar *et al.,* 2010). Banana pulp and peel are also a good source of carbohydrate and protein (Krikorian, 2000; Adisa and Okey 1987). In this work, total carbohydrates were determined in pulp and peel of Apple (*Malus sylvestis*) and Banana (*Musa paradisiacal*) using a spectrophotometric method. The results showed that the content of carbohydrate in apple pulp is more than its peel. The banana pulp contains 1.5 mg/100 g of carbohydrate, and banana peel contains 0.8mg/100g carbohydrate, respectively. The results are comparable with the results reported by other workers (Adisa and Okey, 1987; Podsedek *et al.,* 2004).

Protein is an important biomolecules; they are required for the growth and maintenance the body. Fruits also good source of Proteins, in this work total Proteins we reanalyzed by spectrophotometric method from pulp and peels of apple and bananas (Adisa and Okey 1987). Apple pulp showed 2.0 mg/ 100 g of protein **(Fig. 1 and 2)**, same result was observed by (Mukhtiar *et al.,* 2010) where as peel showed a gives less protein content of 0.8 mg/ 100 g (Podsedek *et al.,* 2004; Veberic & Stampar, 2005). The banana pulp showed 1.5 mg/ 100 g protein, while peel showed less content of protein, i. e. 0.2 mg/100 g.

4. CONCLUSION

Peels also known as rind or skin are the protective layer of a fruit. They contain appreciable amounts of biologically important molecules such as carbohydrates and proteins. The present studies were focused on the pulp and peel of apple and banana fruits grown and consumed locally. The results showed that the pulp of both fruits contains a good amount of carbohydrates and proteins but the peels also contain both molecules. On the basis of these studies, it is suggested that both peel and pulp of these fruits (apple and banana) may be consumed, as they contain carbohydrates, proteins, and other compounds of great concern to the health-promotion and disease prevention.

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