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A COMPARATIVE ANALYSIS ON THE NUTRITIONAL CONTENTS OF TWO VARIETIES OF PINEAPPLE OF CHITTAGONG REGION

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ABSTRACT

The macro- and micro-nutrients of locally produced pineapples namely Giant Kew and Honey Queen were compared. The Giant Kew variety contained 6 g% of TSS, 3.88 g% of total sugar and 1.75 g% of non reducing sugar. On the contrary, the Honey Queen variety contained 10 g% of TSS, 4.84 g% of total sugar and 1.59 g% of non reducing sugar. The comparative study indicates that the Honey Queen variety is superior in nutritional content as well as sweetness than the Giant Kew variety of pineapple.

Key words: Pineapple, major nutrients, minerals, composition

INTRODUCTION

The pineapple is the leading edible member of the family Bromeliaceae now known botanically as *Ananas comosus* Merr. (syns. *A. sativus* Schult. f., *Ananassa sativa* Lindl., *Bromelia ananas* L., *B. comosa* L.). The importance of nutritional value of fruits like pineapple is of great interest as the prevalence of malnutrition in Bangladesh is also considered to be significant in the world. Millions of children and women suffer from one or more forms of malnutrition, including low birth weight (LBW), stunting, underweight, vitamin A deficiency, iodine deficiency disorders and anemia. Malnutrition passes form one generation to the next because malnourished mothers give birth to infants who are already malnourished and struggle to thrive or grow well. Malnutrition contributes to about one half of all child deaths, often by weakening immunity (Rahman *et al.* 2009). Pineapple is a common fruit in Bangladesh and it contains good amount of various vitamins, carbohydrates, crude fiber, water and different minerals that is

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good for the digestive system and helps in maintaining ideal weight and balanced nutrition. Pineapple has minimal fat and sodium (Sabahelkhier *et al.* 2010). So it may contribute in reduction of malnutrition status of Bangladesh. It is now cultivated in almost all the districts of Bangladesh although Sylhet, Tangail, Dhaka, and Rangamati have more acreage under cultivation. About 20,000 ha of land are now under pineapple cultivation with a total production of about 2, 00,000 m tons.

The general objective of the present study was to analyze the nutritional status of the two varieties of pineapple. More specific aim of the study was to compare the nutritional compositions such as protein, lipid, total sugar, starch, ash, moisture, total soluble solid (TSS), vitamin C, and different minerals such as calcium, magnesium, potassium, copper, iron and zinc of the experimental fruits.

MATERIALS AND METHODS

The varieties namely Giant Kew and Honey Queen were collected (in duplicate for each variety) from the local market and used for the experimental purposes. The collected pineapples having fresh leaves were selected for identification. Standard procedure was used for identifying the variety in the Department of Botany, University of Chittagong.

Determination of moisture

Moisture was determined by the conventional method. 2 g of edible part of pineapple was weighed in a porcelain crucible and heated in an electrical oven for about six hours at 100^0 C. It was then cooled in desiccator and weighed again. For a constant weight the crucible with sample was heated repeatedly and weighed after cooling. Percent moisture content (g/100g sample) = Wt of moisture x 100/Wt of sample taken.

Determination of total ash

The sample (1g) was weighed accurately into a crucible and placed on a clay pipe triangle and heated first over a low flame till all the material was completely charred, followed by heating in a muffle furnace for about 5-6 hours at 600°C. It was then cooled in a desiccator and weighed. Ash content (g/100g sample) = Wt of ash x 100/Wt of sample taken (Raghuramulu *et al. 2003*).

Determination of Total Soluble Solid (TSS)

2 g of edible part of pineapple was taken into a mortar and smashed well. Then a drop of pineapple juice was squeezed on the prism of the abbe refractometer and the percent of TSS was obtained from the direct reading of the instrument.

Determination of total sugar

Sugar extract of the pineapple was prepared following the method of Loomis and Shull, 1937 and determined calorimetrically by the Anthrone method (Jayraman 1981). Total sugar (g/100 g sample) = Wt of sugar x 100/Wt of sample taken.

Determination of reducing sugar

Reducing sugar was determined by dinitrosalicylic acid method (Miller 1972). Wt-percentage of reducing sugar (g/100 g sample) = Wt of reducing sugar x 100/Wt of sample taken.

Determination of non-reducing sugar

Sucrose content was calculated from the following formula (Ranganna 1979):
Percent of non-reducing sugar = (percent of total sugar- percent of reducing sugar)

Estimation of starch

Starch was determined following the anthrone method (Morse 1947, Loomis and Shull 1937). Percent of starch content (g/100 g sample) = Wt of starch obtained x 100/Wt of sample taken.

Determination of lipid content

Total lipid was determined by the method of Bligh and Dyer (1959). Percent of lipid content (g/100 g sample) = Wt of lipid obtained x 100/Wt of sample taken.

Determination of water-soluble protein

Determination of water-soluble protein was done by the method of Folin-Lowry (Lowry *et al.* 1951). Percent of soluble protein content (g/100 g sample) = Wt of protein obtained x 100/Wt of sample taken.

Determination of vitamin C

Determination of vitamin C was done by the Bessey's titrimetric method (Bessey and King 1933). Percentage of vitamin C content (mg per 100 g of pineapple) = Wt of Vitamin C obtained x 100/Wt of sample taken.

Mineral analysis

Mineral contents of pineapple were determined by the procedure as described in Analytical Methods (Petersen 2002). The supplied sample was digested with nitric acid to release of Ca, Mg, K, Fe, Zn, Cu, and Ca, Mg, Fe, Zn and Cu were analyzed by Atomic Absorption Spectrophotometry while K was determined by flame photometry, and P was determined by spectrophotometry.

RESULTS AND DISCUSSION

The present study depicts the content of ash, moisture, total sugar, reducing sugar, non-reducing sugar, fat, protein, vitamin-C and different minerals in the two varieties of pineapple and the results are presented in the Table 1-4.

As shown in the Table-1, the moisture, ash and TSS contents of pineapple varied from 88-91%, 0.6-0.9% and 6.0-10.0%, respectively.

TABLE 1: ASH, MOISTURE AND TSS CONTENT OF THE TWO VARIETIES OF PINEAPPLE (g PER 100 g OF EDIBLE PORTION PINEAPPLE)

Variety	Ash (g %)	Moisture (g %)	Percentage (%) of TSS
Giant Kew	0.6±0.001	91.38 ±0.01	6.0
Honey Queen	0.9±0.01	88.30± 0.03	10.0

Moisture is indispensable for the absorption and transportation of metabolites to carry on photosynthesis, metabolism of materials, the regulation of temperature and most of the physiological reactions in plant tissues. In its absence, life does not exist (Ranganna 1979). Jaldugi and the deshi varieties of pineapple contain moisture of 92.48% and 89.30% respectively (Hasan 1980), which is very similar to the present study. Although the total fruits contained in general about 85% moisture which is lower than the moisture content in the edible portion. This might be due to the metabolic activities of the hydrolytic enzymes present in the fruits. Most of the inorganic constituents or minerals are present in ash. The present study showed that the order of ash content is just opposite to the

moisture content in the pineapple i.e. higher percentage of moisture than lower amount of ash.

As presented in Table-2, the protein, lipid, total sugar, reducing sugar, starch and vitamin C contents in pineapple were found to vary from 0.47-0.62%, 0.91-0.95%, 3.8-4.8%, 2.13-3.2%, 0.04-0.05% and 9.6-12.6 mg% respectively.

TABLE 2: PROTEIN, LIPID, TOTAL SUGAR, REDUCING SUGAR, STARCH AND VITAMIN C CONTENT OF PINEAPPLE.

Variety	Protein (g %)	Lipid (g %)	Total sugar (g%)	Reducing sugar (g%)	Starch (g%)	Vitamin C (mg / 100g)
Giant Kew	0.475 ±0.02	0.956±0.03	3.88±0.01	2.13±0.01	0.044±0.004	12.69±0.2
Honey Queen	0.621±0.05	0.776±0.07	4.84±0.02	3.25±0.05	0.047±0.002	9.618±0.5

The Giant Kew variety contains 0.475% and the Honey Queen contains 0.621% of protein. The USDA nutrient database reported that 100 g of edible portion of pineapple contains 0.54 g of protein which is very close to the present study. From this finding it may be concluded that mature pineapple is not a good source of protein.

Lipid serves as efficient source of energy and insulating material, essential components of cell membrane and dietary fat helps in the absorption of fat-soluble vitamins. The present study indicates that the Giant Kew contains slightly higher amount of lipid than the other variety. Vegetables and fruits contain very low amount of fats but the present data indicates that the pineapple contains comparatively moderate amount of fat (USDA nutritional data website).

The total sugar percentage reflects the physiological activity of the plant, whereas its total weight per fruits represents the accumulated results of the metabolic activity. Of the two experimental varieties the Honey Queen contains higher amount of total sugar than the Giant Kew. From the present data it might be concluded that pineapple is a good source of sugar.

Sucrose serves as an important reserve carbohydrate in plants, especially in such storage organs as tuber, fruit and seed. Honey Queen contains more reducing

sugar than Giant Kew variety and the present data indicated that pineapple contained sufficient amount of reducing sugar.

Starch, the principal storage carbohydrate of plants, is made up of amylose and amylopectin. The variety Giant Kew contains 0.044% of starch while the Honey Queen contains 0.047% of starch, indicting that most of the starches are converted to reducing sugar after maturation due to metabolic activities.

Ascorbic acid plays an important role in the metabolism of plants. Vitamin C content in the variety Giant Kew is higher than that of Honey Queen, indicating that Giant Kew is slightly more acidic than Honey Queen. Rashid *et al.* (1987) reported that pineapple contains 10-25 mg of vitamin which is very similar to the present findings.

Among the minerals analyzed Honey Queen contained all the minerals in higher amount than the Giant Kew variety (Table 2).

TABLE 3: CONTENT OF CALCIUM, MAGNESIUM, POTASSIUM, COPPER, IRON AND ZINC IN PINEAPPLE.

Variety	Amount (mg per 100g)					
	Calcium	Magnesium	Potassium	Copper	Iron	Zinc
Giant Kew	9.6±0.2	16.56±0.00	25.41±0.26	0.004±0.00	0.265±0.02	0.164±0.003
Honey Queen	12.72±0.6	20±0.00	45.23±0.96	0.029±0.01	0.273±0.01	0.179±0.009

Calcium is a structural component of bones, teeth, and soft tissues and is essential in many of the body's metabolic processes. Calcium is also essential for proper blood clotting. From the present study it is found that the Honey Queen contains higher amount of calcium than the Giant Kew which is very similar to the USDA nutrient database (USDA nutritional data website).

The present study showed that between the two varieties the Giant Kew contained less potassium than Honey Queen. For this Honey Queen variety may considered be as a good source of potassium. As the two varieties of pineapple contained low quantity of copper so it cannot be used as a source of copper. Iron

is an integral part of many proteins and enzymes and is essential for maintaining good health. In humans, iron is an essential component of proteins involved in oxygen transport. A deficiency of iron limits oxygen delivery to cells, resulting in fatigue, poor work performance, and decreased immunity (Haas and Brownlie 2001). The present data indicates that the two varieties of the pineapple contained almost the same amount of iron which is very similar to the USDA nutrient database where it is reported that pineapple contains 0.28 mg of iron per 100 g (USDA nutritional data website). Further, the pineapple is not considered as a good source of iron.

Zinc is an essential mineral that is naturally present in some foods, added to others, and available as a dietary supplement. It is required for the catalytic activity of approximately 100 enzymes (Kimura 1993) and it plays a role in immune function, protein synthesis, wound healing, DNA synthesis and cell division. The Giant Kew variety contained 0.164 mg of Zinc and the Honey Queen contained 0.179 mg of Zinc per 100 gm of edible portion of the pineapple, which is higher than the USDA nutrient database (0.10 mg of zinc per 100 g, USDA nutritional data website). The present data indicates that the Honey Queen is slightly better in zinc content than that of Giant Kew.

From the above results and discussion it may be concluded that the pineapples are a good source of sugars and also contain moderate amount of lipids. Further, the pineapples may also be used as a source of minerals such as magnesium, calcium, potassium, etc.

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