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Research article

STUDY OF FRUITS NUTRITIONAL ASPECTS BY MEASURING OF RELATED COMPONENTS

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ABSTRACT: The human should consider about his diet nowadays, an appropriate diet has an important role in a healthy nutrition. Physicochemical properties of donat peach, apple, pear, plum and nectarine were determined by different methods, for this 10 g of each fruit weighted and desired analysis took place. Ash amount of samples was measured by burning of samples at 550 ˚C. Dry matter content of samples was determined according to AOAC method. Also crude fiber, total soluble solids, pH and acidity were determined. Results showed that all fruits can be classified as acidic foods; Plum contains the highest amount of acidic substances among the analyzed fruits while the acidity of the pear is considered the lowest one. Regarding crude fiber pears contain the highest amount of crude fiber among the examined fruits and donat peaches contains he lowest amount. The highest and the lowest amount of ash belong to nectarine and pear respectively. Consumption of variety fruits can provide body needs and guide to a healthy nutrition.

Keywords: Fruit, Crud fiber, coluble solid, Acidity

INTRODUCTION

Human being noticed special needs of living organisms to food and nutrition materials since he could understand and aware of his environment and the creatures better, after that extensive studies of these materials and their effects on the body were started. The human should consider about his diet nowadays, an appropriate diet has an important role in a healthy nutrition. Healthy nutrition is obtaining necessary and sufficient amount of food the body needs throughout the day. Brain activity depends largely on blood circulation, proper food, sanitation and adequate air. Human nutrition throughout the day should cover all the vital substances the body needs, including: organic materials, inorganic materials and water. Water is the most important substances for the body after the air. Human may be able to stay a few weeks without food, but without water will not survive more than a few days. Most nutrients should be solved in water to be used by the body. Water exists in and around the cells and in the blood. An adult needs about 2 liters of water during a day, some of required water by the body is found in the various foods that are eaten. Dietary fibre, is the indigestible portion of food derived from plants and waste of animals that eat dietary fiber. There are two main components:

Soluble fiber dissolves in water. It is readily fermented in the colon into gases and physiologically active byproducts, and can be prebiotic and/or viscous. Soluble fibers tend to slow the movement of food through the system. Insoluble fiber does not dissolve in water. It can be metabolically inert and provide bulking, or it can be prebiotic and metabolically ferment in the large intestine. Bulking fibers absorb water as they move through the digestive system, easing defecation [1]. Fermentable insoluble fibers mildly promote stool regularity, although not to the extent that bulking fibers do, but they can be readily fermented in the colon into gases and physiologically active byproducts. Insoluble fibers tend to accelerate the movement of food through the system. Dietary fibers can act by changing the nature of the contents of the gastrointestinal tract and by changing how other nutrients and chemicals are absorbed [2]. Some types of soluble fiber absorb water to become a gelatinous, viscous substance which is fermented by bacteria in the digestive tract. Some types of insoluble fiber have bulking action and are not fermented [3]. Lignin, a major dietary insoluble fiber source, may alter the rate and metabolism of soluble fibers [1]. Other types of insoluble fiber, notably resistant starch, are fully fermented [4]. Dietary fibers have three primary mechanisms: bulking, viscosity and fermentation [5]. Dietary fibers can change the nature of the contents of the gastrointestinal tract, and to change how other nutrients and chemicals are absorbed through bulking and viscosity [1, 2].

Some types of soluble fibers bind to bile acids in the small intestine, making them less likely to re-enter the body; this in turn lowers cholesterol levels in the blood from the actions of cytochrome p450-mediated oxidation of cholesterol [3]. Viscous soluble fibers may also attenuate the absorption of sugar, reduce sugar response after eating, normalize blood lipid levels and, once fermented in the colon, produce short-chain fatty acids as byproducts with wide-ranging physiological activities (discussion below). Insoluble fiber is associated with reduced diabetes risk, but the mechanism by which this occurs is unknown [6]. One type of insoluble dietary fiber, resistant starch has been shown to directly increase insulin sensitivity in healthy people, [7, 8] in type 2 diabetics, [9] and in individuals with insulin resistance, possibly contributing to reduced risk of type 2 diabetes [10, 11, 12]. The current study was took place to evaluate the physicochemical properties of some conventional fruits which are consumed during summer by different age groups. If the physicochemical properties of fruits can provide the body needs according to the recommendations by the official organizations then the analyzed fruits can be regarded as valuable dietary sources.

MATERIALS AND METHODS

Five different fruits including donat peach, apple, pear, plum and nectarine were collected in east Azarbayjan province of Iran. After Samples collection they handled to laboratory and refrigerated until analysis time. Each fruit was washed by tap water and edible portion was selected to perform the analysis. The obtained edible portions of the different samples of the same fruit were mixed well and 20 g of each fruit was taken to measuring the desired properties. Moisture content of fruit samples were determined by aoac method [13]. In this method samples were weighed and placed in the oven at 100 ˚C until weight remained constant, at the end of the experiment moisture content and dry matter content were calculated according to below equation:

$$MC_{wb} = \frac{m_1 - m_2}{m_1} \times 100$$

$$Dry\ matter = 100 - MC_{wb}$$

M_1: initial weight of sample

M_2: final weight of sample after drying in oven

Mc_{wb}: moisture content of sample

To calculate the ash content of each fruit 10 g of sample was burned in a furnace at 550 ˚C. The crude fiber content of any fruit samples was measured and reported according to the method proposed in the Iranian National Standard No. 3961 [14]. To determine the pH and acidity of the fruits the fruit juice of each samples was extracted. After extracting, the juice of fruit was used to determine free positive hydrogen groups as the ph of fruit samples by the ph meter. Total soluble solids of the fruit juice samples were determined by refractometer and reported as brix degree. Titration method was applied to measure the acidity of the fruit samples. Therefore, the beaker was poured with 5 ml of fruit juice and a few drops of phenol phetalein was added to the sample as an indicator. Titration took place by NaOH solution (0.1 N) until the pink color was observed. Used amounts of NaOH solution is considered as the acidity indicator and depending on the predominant acid in each fruit and regarding profit equations the consumed amount of NaOH solution is converted to acidity value.

RESULTS AND DISCUSSION

About the acidity and pH of the examined fruits it can be said all the fruits are classified as acidic foods (pH <4.6). Acidic foods can be processed safely in a boiling water canner, usually without added acid (lemon juice, vinegar or citric acid). This is necessary to control botulinum bacteria. Acidity may be natural, as in most fruits, or added, as in pickled food. Acid foods contain enough acid to block their growth, or destroy them more rapidly when heated. The term "pH" is a measure of acidity; the lower its value, the more acid the food. Plum contains the highest amount of acidic substances among the analyzed fruits on the other hand the acidity of the pear is considered the lowest (figure 1). The fruit acids are a group of organic acids that share a common chemical structure consisting of a hydroxyl group positioned at the alpha-carbon position.

Consequently, these compounds are often referred to as alpha hydroxy acids [15]. Common fruit acids include lactic, citric, and malic acids. Because of the structural configuration of these acids, they are optically active. Alpha hydroxy acids typically are water-soluble compounds [16]. Fiber is the residue of plant materials remaining after solvent extraction followed by digestion with dilute acid and alkali. These components have little food value but provide the bulk necessary for proper peristaltic action in the intestinal tract. Crude fiber is also useful in the chemical determination of succulence of fresh vegetables and fruits; over mature products have increased levels of crude fiber. The fiber content is known as the health index nowadays pears fiber content is the highest amount among the examined fruits and donat peachs fiber content is the lowest amount. Prunes contains considerable amounts of fiber however donat peachs, apples and nectarines have the same amounts of fiber (figure 2). Dietary fiber has many functions in diet, one of which may be to aid in energy intake control and reduced risk for development of obesity. The role of dietary fiber in energy intake regulation and obesity development is related to its unique physical and chemical properties that aid in early signals of satiation and enhanced or prolonged signals of satiety. Early signals of satiation may be induced through cephalic- and gastric-phase responses related to the bulking effects of dietary fiber on energy density and palatability, whereas the viscosity-producing effects of certain fibers may enhance satiety through intestinal-phase events related to modified gastrointestinal function and subsequent delay in fat absorption.

In general, fiber-rich diets, whether achieved through fiber supplementation or incorporation of high fiber foods into meals, have a reduced energy density compared with high fat diets. This is related to fiber's ability to add bulk and weight to the diet. There are also indications that women may be more sensitive to dietary manipulation with fiber than men. The relationship of body weight status and fiber effect on energy intake suggests that obese individuals may be more likely to reduce food intake with dietary fiber inclusion [17].

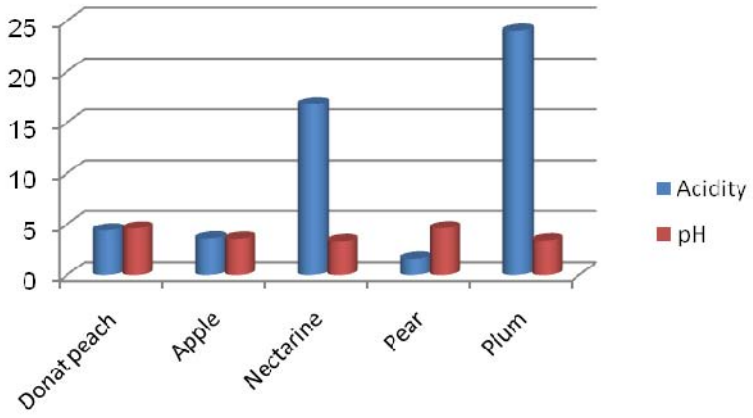

Figure 1. Acidity content an pH of the fruit samples.

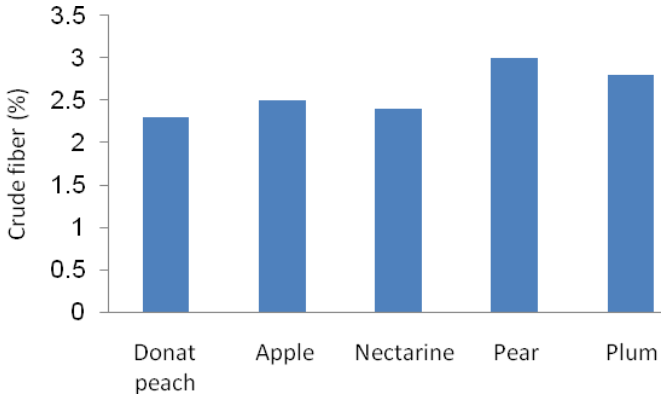

Figure 2. Crude fiber content of the fruit samples.

The non-digestible or dietary fiber fraction is a complex mixture of different substance. The major ones are cellulose, the glucose polymer that is predominant material of plant cells; hemicellulose, a shorter version of cellulose: pectin, the glue that binds plant cells together with cellulose from the woody cell walls of plants. Fiber offers a variety of health benefits and is essential in reducing the risk of chronic disease such as diabetes, obesity, cardiovascular disease and diverticulitis. Dietary fiber acts to lower the concentration of low density lipoprotein cholesterol in the blood, possibly by binding with bile acids. The lignin fraction has been identified as the possible binding agent. It is a known fact that fiber helps eliminate waste from the gastrointestinal tract because of its ability to bind water and thus soften the stool. When a solution is measured by refractometer the brix value obtained only represents the amount of dry solids dissolved in the sample if the dry solids are exclusively sucrose. This is seldom the case. The amount of soluble solids in plums is the highest value and in donat peaches is the lowest value. The soluble solids values obtained for apples, nectarines and pears are relatively equal to each others. Dry matter content of the examined fruits are shown in figure 3. The dry matter (or otherwise known as dry weight) is a measurement of the mass of something when completely dried. The dry matter of plant and animal material would be its solids, i.e. all its constituents excluding water. The dry matter of food would include carbohydrates, fats, proteins, vitamins, minerals, and antioxidants (e.g., thiocyanate, anthocyanin, and quercetin). Carbohydrates, fats, and proteins, which provide the energy in foods. As the dry mater content of the examined fruits are very low then it can be concluded that fruits can not supply large amount of energy for body activities, on the other hand low calories content of the fruits make them as a healthy diet because by consumption of large amounts of fruits the body will obtain very low amounts of energy. On the other hand dry matter content represents moisture content of the food if the calculated dry matter content minus from 100. Moisture content of the food material is important to consider the food is suitable before the consumption, because moisture content affects the physical, chemical aspects of food which relates with the freshness and stability for the storage of the food for a long period of time and the moisture content determine the actual quality of the food before consumption and to the subsequent processing in the food sector by the food producers. Moisture content is one of the most commonly measured properties of food materials. It is important to food scientists for a number of different reasons:

- *Legal and Labeling Requirements.* There are legal limits to the maximum or minimum amount of water that must be present in certain types of food.
- *Economic.* The cost of many foods depends on the amount of water they contain - water is an inexpensive ingredient, and manufacturers often try to incorporate as much as possible in a food, without exceeding some maximum legal requirement.
- *Microbial Stability.* The propensity of microorganisms to grow in foods depends on their water content. For this reason many foods are dried below some critical moisture content.
- *Food Quality.* The texture, taste, appearance and stability of foods depends on the amount of water they contain.
- *Food Processing Operations.* A knowledge of the moisture content is often necessary to predict the behavior of foods during processing, *e.g.* mixing, drying, flow through a pipe or packaging.

Dry matter content of donat peaches is as same as other fruits however it contains the lowest amount of fiber among the fruit samples also the amount of soluble solids in it is less than other fruits (figure 3). Apples` dry matter is like the donat peach and regarding fiber apple is placed in the third. Nectarine ash content compared to other fruits is the highest amount and about the fiber content the fruit is ranked in the fourth place (figures 2 and 3).

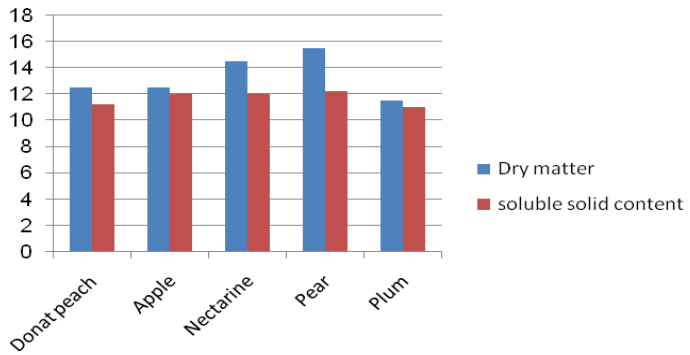

Figure 3. Dry matter and soluble solid content of the fruits.

Dry matter of plum is the lowest amount among the analyzed fruits while its acidity is the highest measured value than other fruits it contains moderate amount of ash. The highest and the lowest amount of ash belong to nectarine and pear respectively the ash amount of other fruits is close to each other (figure 4). Figure 1-4 demonstrate dry matter, ash, acidity, ph, brix, fiber respectively in fruit samples (donat peach, apple, nectarine, pear and plum). The highest dry matter belongs to pear and the lowest dry matter content belongs to plum, dry matter content of apple and peach are as same but less than nectarines.

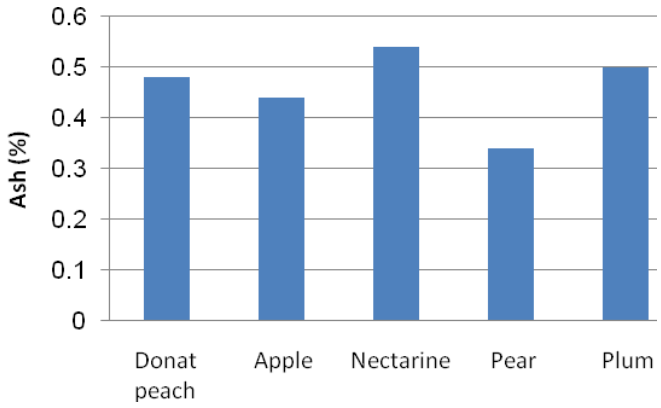

Figure 4. Ash content of the fruit samples.

Determining the ash content may be important for several reasons. It is part of proximate analysis for nutritional evaluation. The ash content is a measure of the total amount of minerals present within a food. Determination of the ash and mineral content of foods is important for a number of reasons; the concentration and type of minerals present must often be stipulated on the label of a food. The quality of many foods depends on the concentration and type of minerals they contain, including their taste, appearance, texture and stability. High mineral contents are sometimes used to retard the growth of certain microorganisms. Some minerals are essential to a healthy diet (*e.g.*, calcium, phosphorous, potassium and sodium) whereas others can be toxic (*e.g.*, lead, mercury, cadmium and aluminum). It is often important to know the mineral content of foods during processing because this affects the physicochemical properties of foods.

CONCLUSION

Advantages of consuming fiber are the production of healthful compounds during the fermentation of soluble fiber, and insoluble fiber's ability (via its passive hygroscopic properties) to increase bulk, soften stool, and shorten transit time through the intestinal tract. Disadvantages of a diet high in fiber is the potential for significant intestinal gas production and bloating. Constipation can occur if insufficient fluid is consumed with a high-fiber diet. Fruit acids have been used to treat a range of dermatological conditions, including acne, photoaging, dry skin, psoriasis, actinic keratosis, and melasma. Additionally, they have been investigated as a treatment for fibromyalgia. Alpha hydroxy acids exert a thinning effect on the stratum corneum. Specifically, the acids cause an “ungluing” of cells, causing them to shed instead of maintain their stickiness.

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