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Evaluation of drying methods (homemade and industrial) on physicochemical properties of dried sour plum and sloe in Iran

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ABSTRACT

Dried sour plum and sloe is one of the snacks that have been consumed world wide, exhibiting a relatively high nutritional value. Thus, its properties should not be overlooked. The aim of this study is to compare the physicochemical properties of dried sour plum and sloe which were dried at home and factory. The results showed that the pH value of the industrial dried sloe were higher than other samples (3.31) and the ash content of industrial plum were higher than the other samples (5.35). As the results showed the highest desirability was belong to House-made sloe sample.

Key words: Dried sour plum, Dried sloe, Physicochemical properties.

INTRODUCTION

According to the national standard, the industrial processed sour plum and sloe are products manufactured using dried of fresh sour plum or sloe through sorting, washing, cooking processes and then adding permitted optional additives including salt, sugar, and citric acid and then it is packaged and send to the market with or without stones [1]. Dried or fresh fruits including apricot, plum, sour cherry, and prune belong to the rosaceous family. These products are made using second – rate and surplus fruits. Fruits have various chemical compounds varying in structure and contents, being able to affect the final product. Fruits contain different chemical compounds including water, carbohydrates, lipids, and proteins as well as low contents of organics and minerals. Sour plum and sloe are containing pectins, sugars, tannins acids. Sour plum and sloe skin are considered a valuable source of polyphenolic compounds [2]. The most abundant compound found in fruits is water, resulting in high percentage of rottenness, thus, the lower content of moisture on it has direct effect on longer shelf-life [3]. Dried sour plum and sloe has been consumed by Iranian families as a delicious snack. Manufacturing these products not only prevent from wasting surplus fruits but also is interesting because of their high nutritional value specially minerals and vitamins, long shelf-life, desirable taste, as well as providing a good flavor as an additive in various foods. Sour plum and sloe have high nutrition value. Dried sour plum and sloe have higher nutritional value than any other snacks, since they are produced through slightly modification in the composition of fruits, so that the amounts of nutritious matters are nearly the same as fresh fruits using an appropriate manufacturing procedure. Sour plum and sloe drying results a increased sugar and vitamin B contents and decreased vitamins A and C [4]. Many properties of fruits such as fiber and antioxidant pigments are also contained in dried sour plum snack. Also, the salts content of the dried fruits increased through boiling, concentrating, and draying. Dried sour plum and sloe contains vitamins B and C being useful for relaxation. They are a source of carbohydrates, vitamin A, Calcium, magnesium, iron, and fiber, while its

fat content is low producing low calories. They are also free from sodium and cholesterol. Today, dried sour plum and sloe snacks are marketed as homemade and industrial. The method of producing industrial processed dried sour plum and sloe are as follows: Fruits should be obtained washing step, fruits are becoming free from any dust. Then, a machine, straw-remover, separates the debris and then a porous conveyer belt carries them forwards by arranging in a row by a control valve. Following the final washing, fruits are cut and subjected to pre-heating. In this step, fruits are exposed to proper temperature [3]. Undesired parts of fruits are removed through special sieves resulting in fruit puree. They are cooked at proper temperature, concentration and gravity and then discharged. Sour plum and sloe paste are stored before drying. Following concentration process in which insufficient waters are removed from the liquid when boiling, the pastes are introduced into a tank for stirring. Drying operation is done by a drier. In the drier, sour plum paste and sloe are exposed to warm, clean, and odor-free air at max. 70°C. And then they are analyzed by inspectors and quarantined to be approved. Quality control unit approves the product then they are cut in different sizes, packaged, and labeled. For homemade product, sour plums and sloe are washed, and fully cooked with some water in a saucepan. When the content is cooled, the stones are removed using a sieve. Some salt is added to the mixture and then they are simmered resulting in a concentrated product. Homemade dried sour plum and sloe are made with desired amount of salt and sugar and are free from any artificial colorings and additives. However, they may be contaminated by dust, insects, and suspended lead particles, because they are dried in the open air. Peoples are looking even more for food stuff with pleasant organoleptic properties in terms of taste, aroma, flavor and appearance. Plums are characterized as functional foods contain polyphenolic compounds and have many beneficial properties [2] there are not many commercial dried plum products available on the word. High levels of plums in Iran are used for drying. Today, various kinds of industrial and homemade dried sour plum and sloe are on the market; however, any research has not been conducted on them. Hence, this study is aimed at investigating and comparing the physicochemical properties of industrial and homemade dried sour plum and sloe.

MATERIALS AND METHODS

Randomly 4 dried fruity paste include industrial and house-made Sour plum and sloe, were obtained from local store. Sampling of each product was done according to International standard number 326 [6].

Methods

The pH value of samples was measured using pH meter. PH and titratable acidity was measured according to the method of international standard number 2852 [6]. Salt, moisture soluble and in soluble ash was measured according to the method of international standard number 7635 [7].

Data Analysis

Data collected from the aforementioned study samples were analyzed based on 0.05% coefficient of error by a software program. The data analysis was performed using MINITAB statistical software, release 14.2 (MINITAB Inc., state college, PA and USA). At first such software program proved samples normal conditions and then the significant difference among data was precisely studied via Anova-one-way test and *p*-value was determined.

Sensory Analysis

A five point hedonic scale (1= lowest desirability, 5= highest desirability) was designed to evaluate the overall acceptability by using 20 trained panelists. Water was provided to wash the mouth between two oral tests.

RESULTS AND DISCUSSION

Table 1 presents the results of physicochemical analyses of the evaluated samples including pH value, acidity, moisture, soluble and insoluble ash, salt, as well as sensory test. The pH value is a scale used to measure acidity and alkalinity of a solution. Low and high pH values represent high and low H⁺ concentrations, respectively. As the statistical analysis showed, the pH values of industrial dried sour plum, homemade dried sour plum, and sloe are nearly the same (2.91, 2.75, 2.53, respectively) but differ from of the industrial dried sloe (3.31) (*P*<0.05). The pH value of the above product, given the acidity of the fruit and it should be 3-4.5% according to the National standard No.3610. Thus, the industrial sloe sample meets the standard while the values of the other samples are below the determined level.

Acidity represents the amounts of alkaline solution (ml) to neutralize all acids contained in the sample. Statistical analyses indicate that acidity of homemade dried sour plum and sloe proves no significant difference (2.62%,

2.21%) and acidity of industrial dried sour plum and homemade dried sloe is nearly the same (3.26% , 3.98%) ($P < 0.05$).

Acidity of dried sour plum should not exceed 7% to meet the National standard. Thus, all samples are considered standard. High acidity of foods is important for two reasons, since it has both positive and negative effects. For example, sour plum, if sucking, may erode the surface of tooth enamel and early tooth decay. It may cause increased gastric juice in sensitive individuals. However, this increase in gastric juice results in improved digestion, in turn, it causes improved assimilation, and thus, gaining weight. The moisture contents of homemade and industrial dried sour plum are nearly the same (28.25%, 30.29%). The moisture contents of homemade and industrial sloe are 36.25% and 32.93%, respectively. Homemade and industrial dried sloes have the highest and the lowest moisture content, respectively. According to the National standard No. 672, the acceptable maximum content of moisture is 40%. All samples, thus, are acceptable. Very low moisture content may result in a very dried product so it is difficult to be taken out of the package. Very high moisture content makes it soft and easy to bring out, while it may cause mould formation. Hence, the probability of mould formation in homemade dried sloe is more than the other samples. Ash is the residue of minerals of the sample following heating and removing the organic matters. Ash contents of homemade dried sour plum and sloe as well as industrial dried sloes are nearly the same and their mean is 3.22%, while the industrial dried sour plum shows a significant difference. Industrial dried sour plum has the highest ash content (5.35%). According to the National standard No. 535, the acceptable maximum of ash content for this product is 6%. All samples, thus, are acceptable. Insoluble ash contents of all samples are nearly the same, averaged 0.15%. The national standard No. 236 set the acceptable max. Content of insoluble ash as 2% and all samples then are acceptable. Given civilization and increased cardiovascular diseases among urban societies, it is important to pay special attention to the amount of salt added to the foods. As indicated in Table 1, salt contents of all samples are the same, averaged 3.06, showing no significant difference. The amount of salt of this product must not exceed 3% as the national standard determined. The analyzed samples showed insignificant difference from the determined amount. Salt added to these products not only to develop a desirable taste but to serve as preservative. Given the fact that children are the primary consumers of these products, the consumption of salty foods may increase the risk of cardiovascular diseases and hypertension in future. So, this fact should be kept in mind. The scores of the products when subjected to sensory test are as follows: homemade dried sloe (4.87%), industrial dried sloe (4.12%), industrial dried sour plum (3.20%) and homemade dried sour plum (3.00%).

The taste of homemade dried sloe is more acceptable by the panelist, perhaps because it has lower pH value, higher acidity, higher moisture, and higher salt content compared to the all other samples, implying that the panelists prefer sour and salty taste. Also higher moisture content results in more desirable texture and makes it easy to bring out of the package. However, homemade and industrial dried sloe had neither significant difference nor statistical analytical difference.

Table 1: physicochemical properties of industrial and homemade dried sour plum and sloe

Properties	Industrial Sour plum	House-made sour plum	House-made sloe	Industrial sloe	Acceptable limit ¹
pH	2.91±0.01b	2.75±0.01 b	2.53±0.03 b	3.31±0.00 a	3 - 4.5
Acidity	3.26±0.21 a	2.62±0.33 b	3.98±0.20 a	2.21±0.10 b	Max 7%
Moisture	28.25±1.17c	30.29±0.96 c	36.25±2.02 a	32.93±1.52 b	Max 40%
Ash	5.35±0.18 a	2.95±0.30 b	3.32±0.61 b	3.39±0.08 b	Max 6%
Acid insoluble ash	0.18±0.07 a	0.12±0.05 a	0.16±0.05 a	0.14±0.06 a	Max 0.2%
Salt	2.90±0.07 a	3.00±0.12 a	3.32±0.38 a	3.02±0.41 a	Max 3%
Total score	3.20±0.37b	3.00±0.76 b	4.87±0.62 a	4.12±0.31 a	-

¹: International standard

^{a-c} significant difference between column at confidence level of $p < 0.05$.

CONCLUSION

Dried sour plum snack has been consumed world wide. It has high nutritional value and its dry matter is as the same as fresh fruit even increased dry matter and nutritious compounds because of reduced water when heating. It contains high salt content and acidity and as shown by the obtained results sour and salty taste is more acceptable by consumers.

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