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PHYSICAL-CHEMICAL ANALYZES OF STANDARD PEAR CULTIVARS GROWN IN TURKEY WITH TURKISH VARIETIES THAT WERE DOMESTICATED IN BOSNIA AND HERZEGOVINA

ORIGINAL SCIENTIFIC PAPER

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ABSTRACT:

The assortment of pear in BiH is very diverse. A significant contribution to the cultivation of a large number of sorts and varieties of pears was contributed by the constant migration of people who carried and planted fruit trees with them. The largest number of fruit varieties and pears in BiH came from two directions. From the east with the Ottoman Empire and from the west with the arrival of the Austro-Hungarian Empire. The pear, as a fruit species, takes a significant place in fruit production, considering that it can be grown in a wide range of climatic conditions, different ripen times, from early summer to late autumn, and multi-purpose use.The fact is that many varieties of pears arrived from Turkey centuries ago and that they were preserved and retained in BiH. This fact is corroborated by the names of variety / Karamut, Jeribasma, Black Izmir and others

The paper analyzes the following parameters: pH, total acidity in mmol / 100 g, pectic substance% Ca-pectinate, raw fiber (%), vitamin C in mg / 100 gr, natural invert (%), total invert (%), total phenols in mg / 100 g of fruit, soluble dry matter (° Brix).The aim of this paper is to determine the usable value and, therefore, the possibility of introducing standard cultivars grown in Turkey to our area through physical and chemical analysis of fruits of indigenous and standard pear trees.

The juice of the tested variety has a lower pH value than the reference values. Low supply of Ca pectate. Vitamin C content is above average. The tested varieties in terms of soluble dry matter content meet the applicable legal framework.

KEYWORDS: domesticated varieties, usable fruit value, migration, introduction

INTRODUCTION

In Bosnia and Herzegovina, the pear assortment is colorful. In addition to standard varieties, William, Bella di giugno, Santa Marie, Butire, Konferans, etc., varieties that have the status of autochthonous are represented in pear cultivation, although it is not yet precisely determined whether they are domesticated or indigenou. The varieties names suggest that they were introduced a long time ago and spontaneously with the migration of the population, which is characteristic of the Balkans. Thus we have Jeribasma, Karamut, Stambolka, varieties of pears whose names indicate that they are originally from Turkey.So the dilemma remains what is the autocthonous and what is the domesticated variety. Thus, some researchers have given their definitions of the term indigenous variety.Indigenous or autocthonous varieties are considered to be all those that originate in our country or have been grown in our country for a long time and are of unknown origin, but are of great economic importance and represent a general national significance. They usually have more important economic-biological and pomological properties, which make them suitable as starting material for selection[1].

Traditional apple cultivars in Bosnia and Herzegovina are a valuable source of desirable genetic characteristics including important pomological, nutritional and technological characteristics of the fruit[2].

Often the same variety is called with many different names, in different local conditions.The cultivation of domestic and domestic varieties is reduced to cultivation as solitary, single, plants[3]. Very rarely they are planted in plantations. In the last ten years there has been interest in their plantation cultivation, but this is still negligible. It should be emphasized that regardless of the cultivation system, these varieties represent significant potential from the point of view of the diversity of genetic material and are the starting point for breeding and creating new varieties. These varieties have been used for a long time and have become resistant to certain diseases

and pests, and are of interest in the production of varieties resistant or tolerant to diseases and pests.The diversity of cultivated plant species serves as a basis for overall biodiversity in agriculture[4]. It is very important to understand that by caring for biodiversity, we actually care about millions of lives, about nutrition and medicine, traditional and modern pharmacology.

MATERIAL AND METHODS

The research included the following pear varieties: Ankara, Black Izmir, Deveci, Jeribasma, Karamut, Malatya, Margarita, Takisha.Fruit analysis was done at the Food technology laboratory of the Faculty of Technology in Tuzla.As the time of ripening of the fruits is different, so the fruits of the pears were harvested and delivered at intervals in accordance with the ripening of the individual varieties, and the samples for analysis were prepared in three repetitions. Samples for analysis represented the average composition of the fruit, and the result was expressed as the mean of the three samples. Preparation of the sample for physicochemical analyzes involved the subtraction of the fruits into a homogeneous slurry from which the given parameters were determined. All analyzes were performed in accordance with the Rulebook on methods for sampling and performing chemical and physical analysis to control the quality of fruit and vegetable products.

The soluble dry matter (° Brix) and the refractive index were directly read on the Abbe refractometer scale.The method for determining the pH value is based on measuring the potential difference between two electrodes immersed in the test liquid, by immersing the electrode in a homogenized sample on the instrument directly reading the value with an accuracy of 0.03. In this paper, the pH meter Mettler-Toledo was used to determine the pH value.The determination of vitamin C in the sample was performed by dissolving the homogenized sample in metaphosphoric-acetic acid, and the volume titrated with 2.6 dichlorophenolindophenol until pink colour is appear.

The results are expressed as mg / 100 g of fresh sample.An indicator color change method was used to determine the total acidity, which is based on titration with sodium hydroxide solution in the presence of phenolphthalein indicator.Total acidity is expressed in millimoles of monobasic acid per 100 ml of product.The determination of the direct reducing and total sugars was made using a Luff solution according to the instructions explained in the Rulebook on methods of sampling and chemical and physical analysis for the control of the quality of fruit and vegetable products. The method is based on the principle that, under certain conditions, reducing sugars (natural invert) convert cupric sulfate ($CuSO_4$) from Luff's solution into copper oxide (Cu2O). An unspent amount of cupri-ion is retitrated with a thiosulphate solution. The difference between the blank and rehearsal expenditure shows the amount of sugar in the table. Non-reducing disaccharide (sucrose) must first be inverted, that is, hydrolyzed to reducing monosaccharides by acid, and then determined by Luff's solution. In this way, the total amount of sugar in the test sample (total invert) is obtained. The difference between the total invert obtained and the natural invert yields the amount of reducing sugars produced by sucrose inversion.

Determination of pectin in the form of Ca-pectate is a method by which pectin is saponified to Na-pectate and then precipitated with calcium, dried and measured by the amount of precipitate.

The proportion is a certain amount of ground and homogenized sample (depending on the amount of pectate present in the raw material) and heated with distilled water in a boiling water bath. After cooling the contents, distilled water was added and filtered. The resulting filtrate was mixed with NaOH, covered with a watch glass and allowed to stand at room temperature for 24 hours. The next day, acetic acid was added to the test solution and calcium chloride was added after 5 minutes, resulting in the formation of calcium pectate. After the addition of calcium chloride, the sample stood for 1 hour and then heated to boiling for 3 minutes. The precipitate was separated from the hot solution by filtration through pre-dried and measured filter paper. Filtration should be carried out quickly, as the cooled precipitate is draining slowly. By washing with warm water, the precipitate liberates all foreign constituents until complete removal of the chloride ions (control with AgNO3 solution). The precipitate filter paper was dried in an oven at 105 ° C to constant weight, cooled, measured, and then the Ca pectate was recalculated.

The determination of the crude fiber was done by mixing the sample with a mixture of acetic acid and nitric acid and boiling it for half an hour under reflux, then immediately while the fibers were still filtered through dried and weighed filter paper, which was precipitously dried in an oven at 105 ° C. to constant mass, cooled, measured, and then the amount of crude fiber was recalculated.

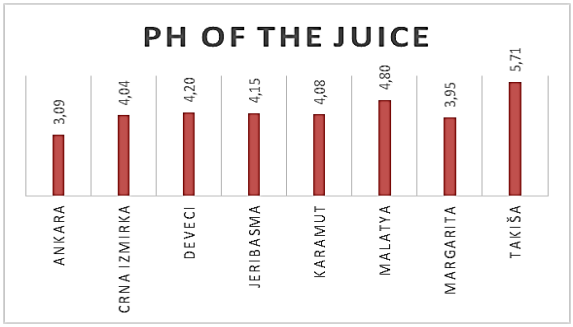
Total phenols were determined spectrophoto-metrically in an ethanol extract of the sample by

measuring the resulting color intensity at a wavelength of 765 nm.

The method is based on the color reaction of phenol with Folin-Ciocalteu reagent expressed in mg of gallic acid per 100 g of fresh sample.

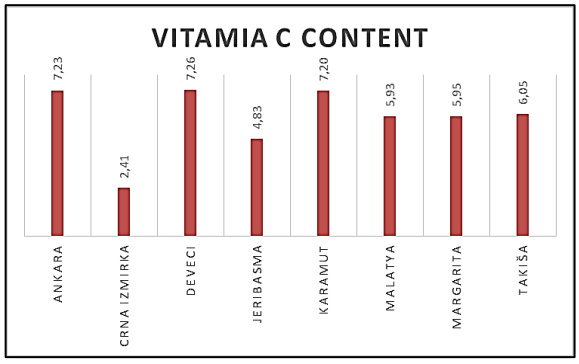
RESULTS AND DISCUSSION

From the standpoint of the pH value of the juice, Graph 1, of the tested pear varieties, it can be stated that the loweer pH value has the Ankara variety (3.09), while Takisha has the highest pH value (5.71). Generally, it can be stated that the juice of the tested varieties has a lower pH value, except for the Takisha variety, and it is not necessary to add citric acid in order to obtain the acidity of the juice. The Takisha variety is traditionally grown and used for the purpose of drying and making jam.



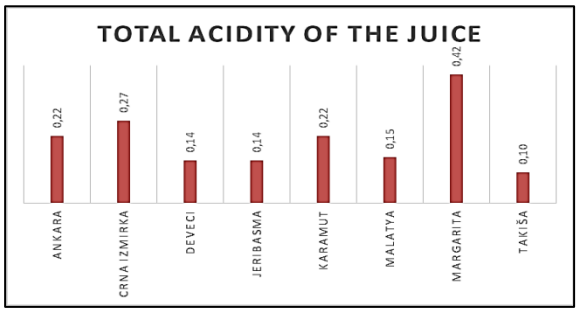
Graph 1: pH of the juice

Vitamin C content in juice, expressed as mg / 100 g of fresh sample, Graph 2, ranged from 2.41 for Black Izmir to 7.23 for Ankara.According to literature sources, pear fruit averages 4 mg / 100 g. Based on the average content of vitamin C in the fruit of the pear, it can be concluded that the tested varieties, except Ankara, have an above average content of vitamin C. This information is important because of the importance of vitamin C in human nutrition.



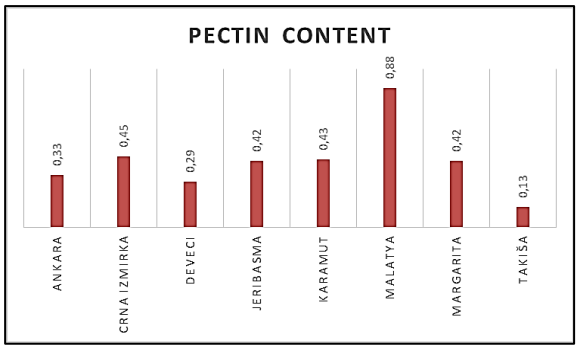
Graph 2: Vitamia C content

The total acidity of the juice, Graph 3, expressed in mmol / 100 g, recorded the lowest value in the Takisha variety (1.40 mmol / 100 g), while the highest value was recorded in the Malatya variety (4.80 mmol / 100 g)



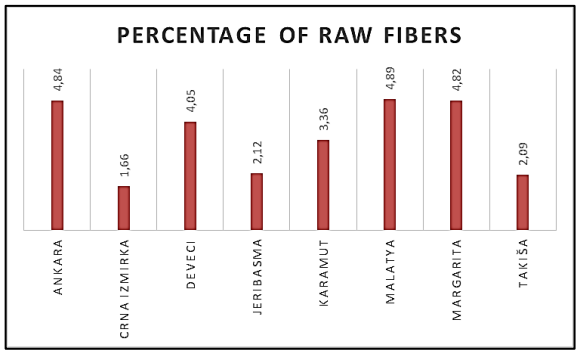
Graph 3: Total acidity of the Juice

The pectin content, graph 4, expressed through% Ca-pectate was highest in the Malatya variety (0.88%) and lowest in the Takisha variety (0.13%).The pectin content of the raw materials was investigated [5,6] and it was concluded that the pear contained 0.3 –3.8 Ca-pectate. The content of pectin, Ca-pectate ranged from 0.13 to 0.88% and it can be concluded that the tested pear varieties have low supply of Ca-pectate



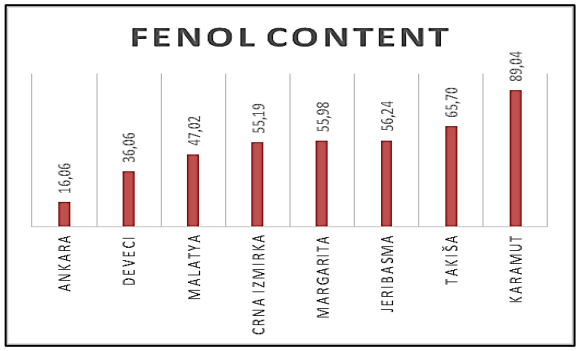
Graph 4: Pectin content

Pear is the best source of fiber. The recommended daily amount of fiber is 20 - 35 g / day.Dietary fiber is made up of edible plant cells, polysaccharides, lignin and the like that are not hydrolyzed or digestible in the human digestive tract. The components covered by this definition are cellulose, hemicellulose, lignin, inulin, gums, modified cellulose, mucus, oligosaccharides, pectins, waxes, quinine and suberin[7].The lowest percentage of crude fiber was recorded in the Black Izmirka variety (1.66%), while the Malatya variety contained the highest percentage of crude fiber (4.89%).



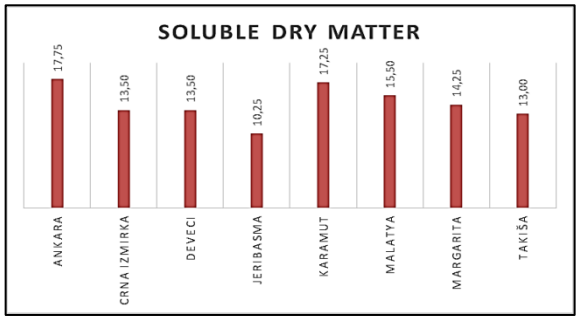
Graph 5: Percentage of raw fibers

The highest phenol content, Graph 6, was expressed in Karamut (89.04 mg / 100 g), while in Ankara (16.06 mg / 100 g), the phenol content was lowest.Due to the positive effect of phenol on the human body, great attention is paid to the assortment of fruits, and the preservation of phenols in fruits during processing and storage.



Graph 6: Fenol content

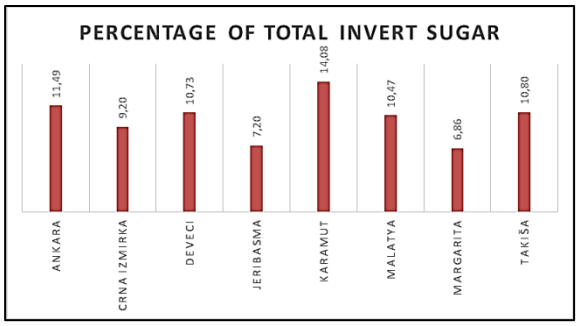
The highest soluble dry matter content, Graph 7, was determined in Ankara (17.75 ° Brix) and the lowest in the Takisha variety (13.00 ° Brix).The obtained values of soluble dry matter for all tested varieties of pears had a value greater than 10.0˚ Brix, and according to this parameter, are, according to the current legislation, suitable for marketing and processing.



Graph 7: Soluble dry matter

The total invert sugar, Graph 8, expressed in % was the highest in the Karamut (14.08 %) and the lowest percentage of total invert sugar in the Margarita variety(6.86 %).

According to research[7], the content of invert sugar in the pear was 8.1%. Based on this we can say that most of the varieties examined contain a higher percentage of invert sugar (Karamut 14,08 %, Ankara 11,49 %, Takiša 10,80 %, Deveci 10,73 %, Malatya 10,47 %, Crna Izmirka 9,20 %).



Graph 8: Percentage of total ivert sugar

CONCLUSION

1. It can generally be stated that the juice of the tested varieties has a lower pH value than the reference values.
2. Based on the average content of vitamin C in the fruit of the pear, it can be concluded that the examined varieties, except Ankara, have an above average content of vitamin C in comparison with referens values.
3. The content of Ca-pectate ranged from 0.13 to 0.88% and it can be concluded that the tested pear varieties have a low supply of Ca-pectate.
4. According to the content of soluble dry matter, all varieties had values above 10,0˚ Brix and, according to this parameter, are suitable for placing on the market and processing in accordance with the applicable legislation.
5. Of the varieties tested, 75% have above-average total invert sugars.

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