International Journal of Plant & Soil Science

30(1): 1-11, 2019; Article no.IJPSS.51491
ISSN: 2320-7035

Investigating the Phenological and Pompological Characteristics of Indigenous Pears in Northeast Bosnia

Besim Salkić[1]*, Ramzija Cvrk[2], Emir Imširović[1], Amela Jašić[2] and Ahmed Salkić[1]

[1]Deparment Plant Production, Faculty of Technology Tuzla, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina.
[2]Deparment Food Technology, Faculty of Technology Tuzla, Univerzitetska 8, 75000 Tuzla, Bosnia and Herzegovina.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2019/v30i130167
Editor(s):
(1) Prof. Alejandro Hurtado Salazar, Departamento de Produccion Agropecuaria, Universidad de Caldas, Colombia.
Reviewers:
(1) Habu Saleh Hamisu, National Horticultural Research Institute, Nigeria.
(2) Souravh Bais, Adina Institute of Pharmaceutical Science College, India.
(3) Ioana Stanciu, University of Bucharest, Romania.
Complete Peer review History: https://sdiarticle4.com/review-history/51491

Original Research Article

Received 11 July 2019
Accepted 13 September 2019
Published 04 October 2019

ABSTRACT

The study included 30 autochthonous pears with analysis of the following parameters: blooming time, fruit ripening time, fruit weight, fruit height, fruit width, fruit index, fruit juice length, pH value of juice, total acidity mmol / 100 g, total acidity (%), pectin substances % Ca-pectate, raw fiber %, vitamin C mg / 100 g, natural invert sugar%, total invert sugar %, total phenol mg / 100 g fruit, soluble dry substance (° Brix).The aim of the research is to study the phenological and pomological characteristics of a detailed description of autochthonous varieties and to make chemical analysis of the fruit of a recommendation on the value of the fruit of the most interesting autochthonous pears in north-eastern Bosnia. This would at the same time create preconditions for recording these varieties on the sort list of Bosnia and Herzegovina and their further reproduction and marketing.The fruits of domestic varieties are seldom available. Given the opinion that domestic varieties are more resistant to diseases and some pests, they do not require a large number of

**Corresponding author: E-mail: besim.salkic@untz.ba;*

chemical treatments and require no intensive care can be more easily adapted to organic cultivation, which is a trend in fruit productionThe differences in the blooming dynamics of autochthonous varieties of BiH indicate that this is an important detail that must be take care when expanding them, that is, introducing them into plantation cultivation and selecting pollinator varieties. The obtained values of soluble dry matter for all tested pear varieties (except Kajzerica kasna 9.75 Brix) had a value greater than 10.0° Brix, and according to this parameter, are suitable for marketing and processing according to the current legislation. The native varieties examined in this paper had values from 0.10 to 0.58% from the results of the analysis, it can be concluded that the tested varieties were not supplied with Ca-pectate. Based on the average content of vitamin C in the fruit of the pear, it can be concluded that the tested autochthonous and domestic varieties have an extremely good content of vitamin C, 15 out of 20 varieties have a higher content of vitamin C than the average or 75%. Research has been supported by the Federal Ministry of Education and Science within the framework of a scientific research project entitled "Investigating the phenological and pompological characteristics of indigenous pears in Northeast Bosnia".

Keywords: Autochthonous varieties pears; phenological and pompological characteristics.

1. INTRODUCTION

The trend of planting resistant and tolerant fruit grains on economically significant diseases and pests as well as the demands of autochthonous buyers demanded that nurseries in BiH inoculate and put assortment of pear which was not entered on a sort list of BiH. Inoculated varieties of pearsare of local significance [1]. So the problem of the legality the production of planting material appeared. Withi this,research was initiated by the Federal Ministry of Science and Education.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].

The same statement can also be applied to pears that are traditionally grown in the territory of BiH. This is a result of several important moments, and above all else, the pear can grow in a wide range of climatic conditions that exist in BiH, which different genotypes ripen from early summer to late autumn, which pears can be multipurpose, from consumable to drying, preparation of jely, fruit juices, turshi and alcohol, to a longer storage in natural stores, traps etc,[3].

Traditional pear assortment in BiH is identified with autochthonous varieties although it is evident that significant collections of fruit trees, both domestic and those introduced from the West and from the East, have emerged over time. Often the same variety is called by several different names depending on the breeding site.

Domestic or autochthonous varieties are considered to be all those originating in our country or cultivated for a longer period of time with us, but are of unknown origin, but are very important in terms of their economic characteristics and represent a general national significance. They usually have more important economic-biological and pomological features, making them suitable as the starting material for selection [4].

Domestic and domesticated varieties are significant for the variety of fruit bases, regardless of whether they are grown as a solitary plant or as a fruit plantation. The variety of cultivated plant species serves as a basis for overall biodiversity in agriculture, [5]. It is very important to understand that we care about millions of lives, nutrition and medicine, traditional and contemporary pharmacology. Understanding the importance of the existence of a rich genofondof fruit plant in this area, there were more expeditions or projects in BiH that sought to collect, identify and ultimately preserve or collect a part of this genetically valuable material. Unfortunately, none of these activities has come to an end and we can say that we are at the very beginning of this, for fruit science and practice, an extremely important business. Therefore, detection, collection, characterization and identification of potentially valuable but endangered genetic resources, of primary interest for many countries [6.7].

In the light of the above mentioned facts, this research, which was set up to make pomological characterization of 30 pear genotypes, spontaneously obtained through the local level of recognisability, was given the status of domestic and domesticated varieties in BiH.

2. MATERIALS AND METHODS

The subject of the study was domestic and domesticated variety of pears from the area of Bosnia and Herzegovina: Crna Izmirka, Jeribasma, Zelenika, Bijela Takiša, Sarajka, Tikvenjača, Ahmetova, Ljeskovača, Urumenka, Dolokrahan, Dugandža, Takiša, Krakača, Budaljča, Zimnjača, Mesnjača, Druardova maslovka, Citronka, Zimska, Kajzerka kasna, Kaličanka, Karamut, Hambarka, Santa Maria, Kačmorka, Trokača, Debelkora, Krasanka, Kaluđerka and Jesenka.Pears were harvested and delivered at time intervals according to the maturation of individual varieties, and the samples for analysis were prepared in three repetitions at the Laboratory for Food Technology of the Faculty of Technology in Tuzla. Each sample taken for testing was the average fruit composition of a given variety, and the result was expressed as the mean of three probes. The preparation of the sample for physico-chemical analysis implied the production of the fruits in a homogenous jug from which the parameters were determined. All analyzes were carried out in accordance with the Ordinance on sampling methods and chemical and physical analyzes in order to control the quality of fruit and vegetable products.

The dry matter (°Brix) and the refractive index are directly read on the Abbe refractometer scale.The method for determining the pH value is based on the measurement of the potential difference between the two electrodes immersed in the tested liquidity by immersing the electrode in the homogenized sample on the instrument with a directly apparent value of 0,03. In this paper for the determination of the pH value, the pH-meter Mettler-Toledo was used. Determination of vitamin C in the sample was carried out by dissolving the homogenised sample in metaphosphoric acid and a titer of 2,6-dihydrophenolindophenol until the pink color appeared.The results are expressed as mg / 100 g of fresh sample.

For the determination of total acidity, the method of color change of the indicator was used, which is based on titration with sodium hydroxide solution in the presence of phenolphthalein.Total acidity is expressed in monohydric acid milimols per 100 ml of product and in the percent of malic acid.

Determination of directly reducing and total sugars was made with Luff's solution according to the instructions explained in the Ordinance on sampling methods and chemical and physical analysis to control the quality of fruit and vegetable products. The method is based on the principle that in certain conditions, reducing sugar (natural invert) translates cupric sulfate (CuSO4) from Luff's solution into copper oxide (Cu2O). The unused amount of cuprous is retrieved by the addition of thiosulfate. From the difference in consumption for the blind test and the test, the amount of sugar from the table is obvious. Unsaturated disaccharide (sucrose) must be pre-inverted or hydrolyzed to a reducing acid monosaccharide 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 obtained total invert and the natural invert gives the amount of reducing sugars produced by the inversion of sucrose. Determination of pectin in Ca-pectate form is a method by which pectin saponifies to Na-pectate and then precipitates with calcium, dried and measured the amount of precipitate.

The proportions are determined by the quantity of crushed and homogenized sample (depending on the present amount of pectate in the raw material) and heated with distilled water on a boiling water bath. After cooling, the contents were refilled with distilled water and filtered. The resulting filtrate was stirred with NaOH, covered with saturated glass and allowed to stand at room temperature for 24 hours. On the next day uric acid was added to the test solution and calcium chloride was added after 5 minutes to produce calcium pectate. After the addition of calcium chloride, the sample was left for 1 hour and then heated to boiling for 3 minutes. From the hot solution, the precipitate was isolated by filtration through the previously dried and measured filter paper. Filtering should be done quickly, as the cooled precipitate is slowly filtered. By the addition of hot water the precipitate is released from all foreign substances until complete removal of chloride ions (control with AgNO3 solution). The precipitate filter paper was dried in a drying oven at 105°C. to a constant mass, chilled, measured, and then the amount of Ca pectate was converted.

Determination of the raw fibers was done by mixing the sample with a mixture of nitric acid and nitrogen and boiling for half an hour with a reversed cooler, and then immediately, while the fibers were still filtered through a dried and weaker filter paper which was dried with a precipitate in a drying oven at 105° C to a

constant mass, chilled, measured, and then converted to the amount of raw fiber.Total phenols were determined spectrophotometrically in the ethanol sample extract by measuring the resulting color intensity at wavelength 765 nm.The method is based on the phenolic phase reaction with the Folin-Ciocalte reagent expressed in mg of gallic acid per 100 g of fresh sample.

3. RESULTS AND DISCUSSION

Phenological characteristics are followed by the time of full blooming and the time of rippening fruit.Full blooming time is essential for the emergence of prominent spring frosts that can significantly reduce the yield of these crops. Long-term monitoring showed that in the locality of Tuzla during the period of 5 years in three years there is a frequent spring frost in the period of 4-6. April.

From Table 1 of the observed varieties can be grouped into the following categories according to the dynamics of full blooming:

1. Early blooming variety (01-05.04): Karamut, Mesnjača, Kačmorka, Krasanka, Druardova, Citronka.
2. Medium early blooming variety (05-10.04.); Kajzerka kasna, Bijela Takiša, Krakača, Ahmetova, Dugandža, Tikvenjača, Trokača, Jesenka, Crna izmirka, Kaluđerka, Santa Maria, Budaljača, Zimska, Kaličanka, Dolokrahan, Urumenka, Debelkora.
3. Medium late blooming variety (10-15.04.; Zelenika, Jeribasma, Sarajka, Hambarka, Ljeskovača, Takiša
4. Late blooming variety (15-20.04): Zimnjača.

Table 1. Pomological-morphometric characteristics of fruits

Sort	Blooming time	Rippening time	Fruit mass g	Fruit height mm	Fruit width mm	Fruit index	Petiole lenght mm
Ahmetova	07.04.	25.08.	140	71,74	58,5	1,23	40,49
Bijela Takiša	06.04.	23.08.	61,7	37.89	55,03	0,69	34,44
Budaljača	09.04.	16.09.	79,2	42,89	41,25	1,04	39,23
Citronka	05.04.	25.09.	246	86	82,47	1,04	42,36
Crna izmirka	08.04.	05.09.	205	69,25	71,63	0,97	40,52
Debelkora	10.04.	29.09.	115	87,58	80,32	1,09	47,06
Dolokrahan	10.04.	18.08.	134	74,21	69,25	1,07	50,14
Druardova	05.04.	25.09.	130	68,75	65,83	1,04	41,23
Dugandža	07.04.	14.09.	75	72,58	57,13	1,27	49,9
Hambarka	12.04.	31.08.	78,8	63,55	54,82	1,16	38,84
Jeribasma	11.04.	15.09.	150	87,7	74,65	1,17	31,47
Jesenka	08.04.	06.09.	82	60,03	58,23	1,03	42,16
Kačmorka	04.04.	20.08.	130	81,11	63,95	1,27	34,03
Kajzerka kasna	06.04.	25.08.	154	74	72	1,03	51,36
Kaličanka	10.04.	25.09.	43,6	49,96	45,05	1,11	27,58
Kaluđerka	08.04.	10.09.	140	82,46	71,36	1,16	42,36
Karamut	04.04.	25.09.	48,1	45,48	41,7	1,09	49,21
Krakača	07.04.	16.09.	206	70,64	77,53	0,91	32,37
Krasanka	05.04.	10.10.	260	54,23	60,56	0,90	30,12
Ljeskovača	13.04.	31.08.	139	77,14	80,51	0,96	41,38
Mesnjača	04.04.	20.08.	47,2	46,68	43,96	1,06	34,36
Santa Maria	10.04.	16.08.	135,2	78,46	69,57	1,12	45,28
Sarajka	12.04.	18.08.	87,1	61,43	62,23	0,99	39,92
Takiša	14.04.	03.10.	51,5	31,32	49,47	0,63	32,47
Tikvenjača	07.04.	05.08.	146	79,42	68,91	1,15	33,37
Trokača	08.04.	10.09.	92	46	52,26	0,88	32,68
Urumenka	10.04.	11.08.	126	75,85	64,15	1,18	31,94
Zelenika	11.04.	05.09.	141	71,23	61,96	1,15	25,12
Zimnjača	17.04.	02.10.	353	78,31	86,37	0,91	31,91
Zimska	09.04.	10.10.	184	86,52	85,27	1,01	28,4

The differences in the blooming dynamics of autochthonous varieties of BiH indicate that this is an important detail that needs to be taken into account in the context of its spread, that is, the introduction into plant cultivation and the selection of pollinating varieties.

3.1 Ripening Time

The varieties that were tested have ripen since 05.08 to 10.10 or 40 percent in August, 46 percent in September and 4 percent in October. Tikvenjaca ripened the earliest , while Krasanka ripened last.

The weight of the fruit is significant pomology and morphometric characteristics in the determination and description of the pear genofonde in BiH.

Based on the analysis of the mass of fruit it was found that the largest mass of fruit has Zimnjača (353 g) and Kaličanka had the lowest mass of fruit (43.6 g).

The cluster analysis of the mass of fruit in examined variety can be divided into five groups:

1. Small-sized fruit varieties (average fruit weight of 43.6 - 51.5 g): Kaličanka, Mesnjača, Karamut, Takiša.
2. Varieties of medium small-sized fruits (average fruit weight of 61.7 - 87.1 g): Bijela Takiša, Dugandža, Hambarka, Budaljača, Jesenka, Sarajka;
3. Medium sized fruit varieties (average fruit weight of 92 - 126 g): Trokača, Debelkora, Urumenka;
4. Varieties with large fruits (average weight of 130 to 206 g): Druardova, Kačmorka, Dolokrahan, Ljeskovača, Santa Maria, Ahmetova, Kaluđerka, Zelenika, Tikvenjača, Jeribasma, Kajzerka kasna, Winter, Black, Krakača.
5. Varieties with very large fruits (average fruit weight of 246 - 353 g): Citronka, Krasanka, Zimnjača.

3.2 Harvest time

By analyzing the table data on the average height of fruit, it is visible that the fruit of Jeribasma is with the highest average height (87.70 mm), and that the cultivar Takisa has the lowest average fruit height (31.32 mm).

By cluster analysis we can conclude that the observed varieties according to the average height of the fruit in the observation period can be divided into five groups:

1. Low fruit varieties (average fruit height of 31.3 - 42.47 mm): Takiša, Budaljča, Bijela Takiša;
2. Varieties of medium low fruit (average fruit height of 45,48 - 49,96 mm): Karamut, Trokača, Mesnjača, Kaličanka.
3. Medium high fruit varieties (average fruit height of 54.23 - 63.55 mm): Krasanka, Jesenka, Sarajka, Hambarka;
4. High fruit varieties (average fruit height of 69.2 to 79.4 mm): Druardova, Crna izmirka, Krakača, Zelenika, Ahmetova, Dugandža, Kajzerka kana, Dolokrahan, Urumenka, Ljeskovača, Santa Maria, Zimnjača, Tikvenjača.
5. High fruit varieties (average fruit height of 81.8 to 87.7 mm): Kačmorka, Kaluđerka, Citronka, Zimska, Debelkora, Jeribasma, Bijela Takiša.

By analyzing the width of the fruit from Table 1, is determined that the widest fruit has a variety of Zimnjača (86.37 mm, and the average fruit of Budaljača (41.25 mm) was the highest.

Based on the width of the fruit the observed variety can be divided into three groups:

1. Varieties with narrow fruit (41.25 - 52.26 mm average width): Budaljča, Karamut, Mesnjača,
   Kalićanka, Takiša and Trokača;
2. Medium broad fruit varieties (average fruit width of 54.82 to 65.83 mm): Hambarka, Bijela Takiša, Dugandža, Jesenka, Ahmet, Krasanka, Sarajka, Kačmorka, Urumenka, Druardova.
3. Wide fruit varieties (average fruit width of 68.91 - 86.37 mm): Tikvenjača, Dolokrahan, Kaluđerka, Crna izmirka, Kajzerica kasna, Jeribasma, Krakača, Santa Maria, Debelkora, Ljeskovača, Citronka, Zimska, Zimnjača.

From Table 1, it can be seen that the observed genotypes of pears can be divided into two basic groups based on the fruit shape index (ratio of height and width of fruit):

1. Round-elongated to longitudinal fruit (fruit ratio coefficient ranges from 1.01 to 1.27): Zimska. Jesenka, Kajzerka kasna, Budaljača, Citronka, Druardova, Mesnjača, Dolokrahan, Debelkora, Karamut, Kaličanka, Tikvenjača, Zelenika,

Hambarka, Kaluđerka, Jeribasma, Urumenka, Santa Maria, Ahmetova, Dugandža, Kačmorka

2. Rounded-flattened to flattened fruit (fruit ratio coefficient ranges from 0.0.63 to 0.99): Takiša, Bijela Takiša, Trokača, Krasanka, Krakača, Zimnjača, Ljeskovača, Crna Izmirka, Sarajka.

Different agroecological factors affect the size and some other pomological properties of the fruit, but when they are grown under similar conditions, the differences can be related to the genetic properties of the variety, [8].

3.3 Physicochemical Analysis of Fruit

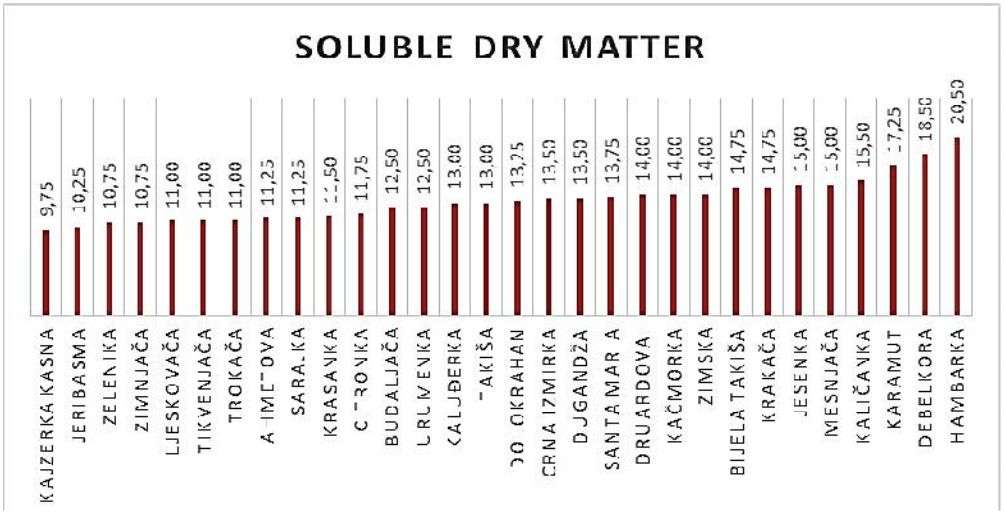
The highest content of soluble dry matter, Graph 1, was found in fruit of Hambarka varieties (20.50° Brix), while some of the examined pears had significantly lower soluable dry matter (as such are suitable for consumer use). The obtained soluble dry matter for all examined pears varieties (except for Kajzerice kasne with 9.75° Brix) had a value bigger than 10.0° Brix and according to this parameter they are suitable for placing on the market and processing according to the current legislation. Traditional varieties such as Bijela Takiša, Takiša, Mesnjača, Karamut and Jesenka have been used and used for various forms of processing (pekmezi) as well as for drying due to the high content of dry matter.

The highest content of phenol, Graph 2, was recorded in the Bijela Takiša variety (190.46 mg / 100 g), while in the Santa Maria variety (15.17 mg / 100 g) the phenol content was the smallest. In addition to the varieties of Bijela Takiša, Debelkora, Hambarka and Jesenka, they have a high content of phenols (over 100 mg / 100 g), which puts them in the category of good quality for consumption becouse of phenol benefit, whose presence increases the antioxidant capacity of pears (so they are healthy for consumption).

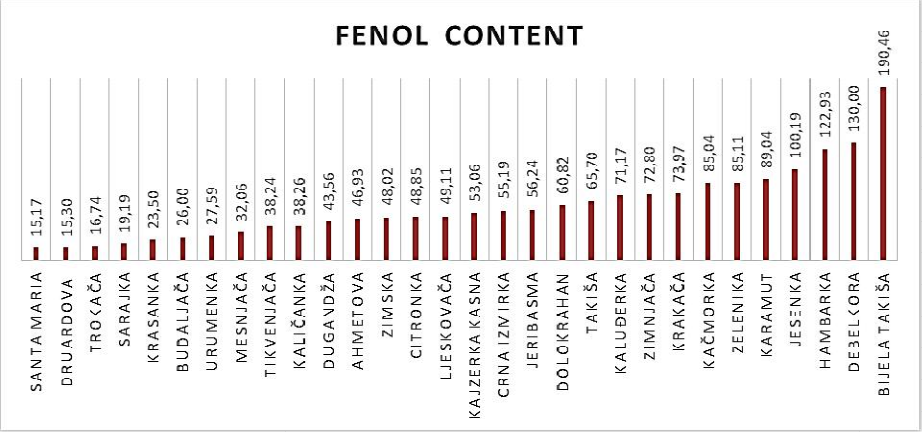
Considering the positive effects of phenol on the human body, great attention is paid to fruit assortment and preservation of phenol in fruit during processing and storage.

The highest percentage of raw fibers, Graph 3, is in the juice of Kačmarka variety (4.72%) and the lowest percentage is recorded in the juice of Budaljača variety (1.02%). Significant content of raw fibers also have Karamut (3.36%), Jesenka (3.37%), Trokača (3.59%), Hambarka 3.76%). Pear is a favorite fruit for many, and its nutritional value is also among the foods that are the best source of fiber. Daily recommendations are 20 to 35 g of fiber/ day.

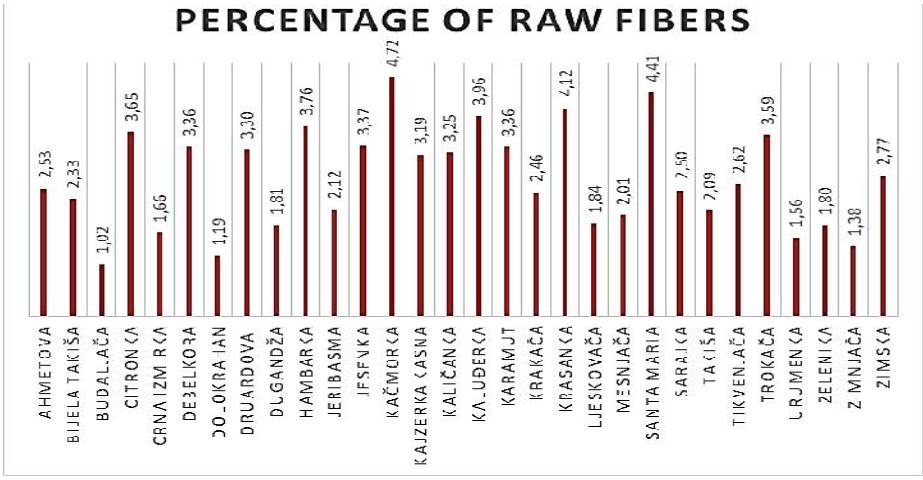
Food fibers are composed from the remains of edible plant cells, polysaccharides, lignin and similar substances that are not subject to hydrolysis or human digestive tract can not digeste them. The components covered by this definition are cellulose, hemicellulose, lignin, inulin, gum, modified cellulose, mucus, oligosaccharides, pectin, waxes, lactone and suberin [9].



Graph 1. Soluble dry matter



Graph 2. Fenol content



Graph 3. Percentage of raw fibers

The total invert sugar, Graph 4, expressed in % was the highest in the Hambarka variety (14.41%) and the lowest percentage of total invert sugar in the Kajzerica kasna variety (6.45%).

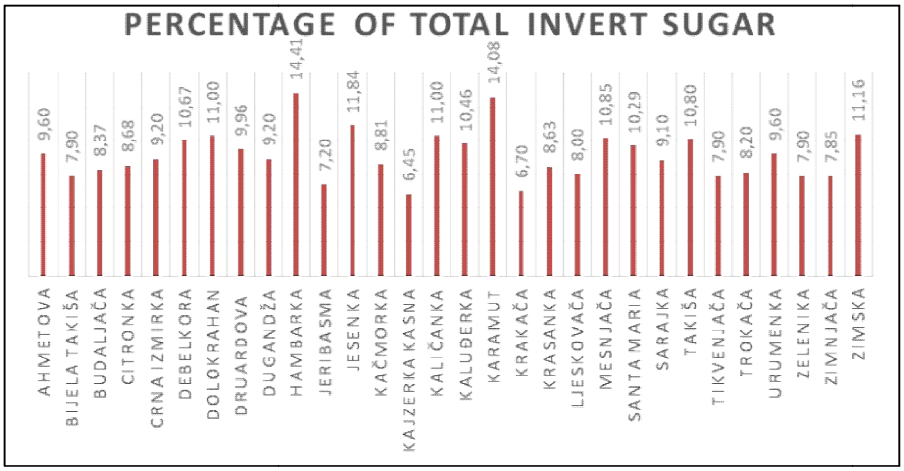
According to research (Niketić-Aleksić G., 1988), the content of invert sugar in the pear was 8.1%. Based on this we can say that most of the varieties examined contain a higher percentage of invert sugar (Sarajka (9,10%), Mesnjača (10,85%), Jesenka (11.84%), Karamut (14.08%).

The pectin content, Graph 5, expressed as % of Ca-pectate, was highest in the Citronka variety (0.58%) and the lowest in the Krakača variety (0.10%).

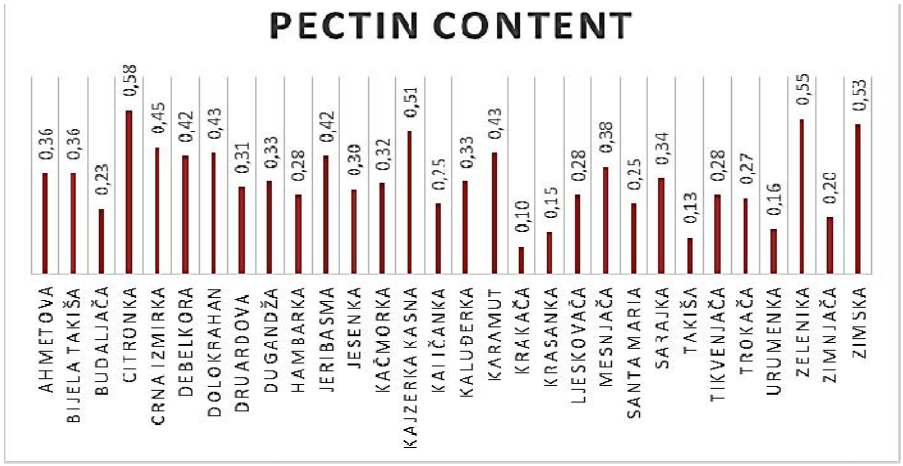
Pectin content in raw materials was alreadz researched by [10,11,12] and they came to the conclusion that pear contains 0.3% -3.8% Ca-pectate. Domestic varieties tested in this paper had values from 0.10% to 0.58%, from the results of the analysis it can be concluded that the analysed varieties were not supplied with Ca-pectate.

Vitamin C in juice, Graph 6, for Debelkora variety (8.45 mg / 100 g) and Dugandza variety (2.25 mg 100 g).

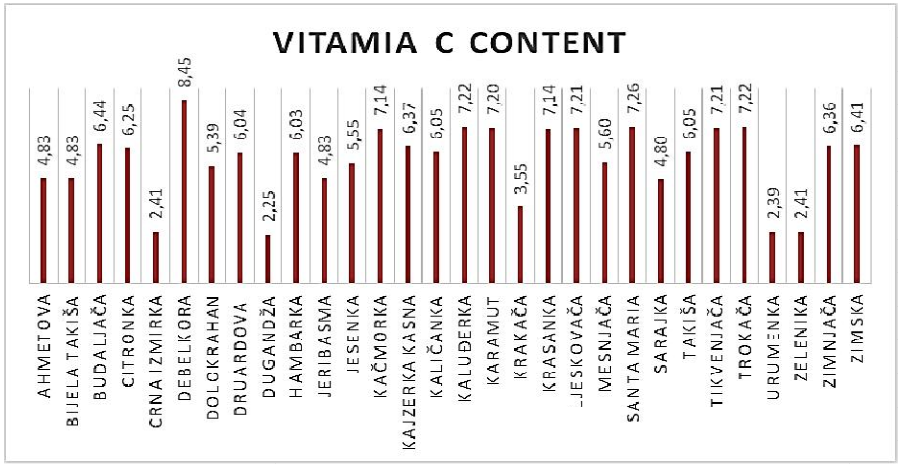
Recommended daily doses: Men and women 60 mg / daz, pregnant women and nursing 100 mg/daz. Based on the average vitamin C content in the pear fruit it can be concluded that the examined domestic and domesticated varieties have an extremely good vitamin C content, 15 of the 20 varieties have a higher vitamin C content than the average or 75% of them have higher vitamin C content than the average. This information is important because of the importance of vitamin C in human nutrition.



Graph 4. Percentage of total invert sugar



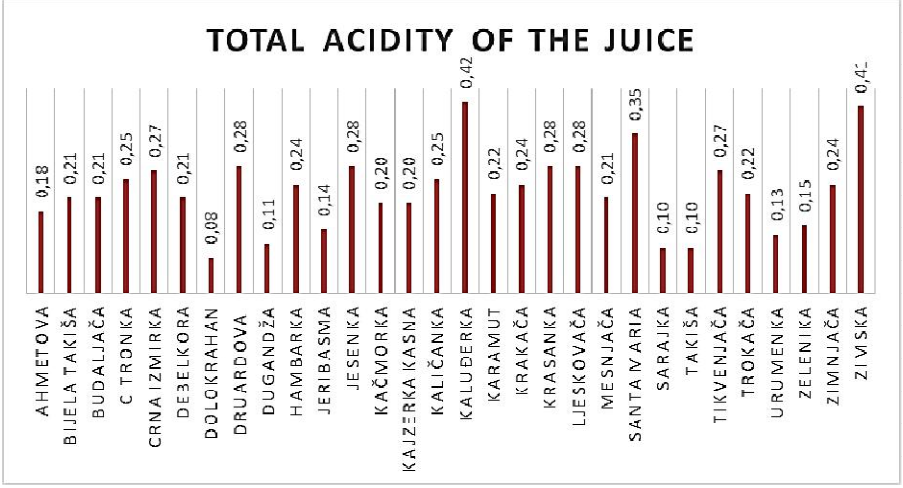
Graph 5. Pectin content



Graph 6. Vitamia C content

Table 2. Chemical characteristics of fruits

Variety	pH value	Total acidity mmol/100 g	Total acidity (%)	Pektin % Ca-pectat	Percentage of raw fibres %	Vitamia C mg/100 g	Natural invert sugar	Total invert sugar	Fenol content mg/100 g	Soluble dry matter
Ahmetova	4,09	2,60	0,18	0,36	2,53	4,83	4,80	9,60	46,93	11,25
Bijela Takiša	3,74	3,00	0,21	0,36	2,33	4,83	7,00	7,90	190,46	14,75
Budaljača	4,74	2,93	0,21	0,23	1,02	6,44	7,58	8,37	26,00	12,50
Citronka	3,91	3,58	0,25	0,58	3,65	6,25	8,17	8,68	48,85	11,75
Crna izmirka	4,04	3,60	0,27	0,45	1,66	2,41	6,20	9,20	55,19	13,50
Debelkora	4,90	2,99	0,21	0,42	3,36	8,45	9,18	10,67	130,00	18,50
Dolokrahan	4,68	1,19	0,08	0,43	1,19	5,39	8,90	11,00	60,82	13,25
Druardova	4,66	3,99	0,28	0,31	3,30	6,04	8,44	9,96	15,30	14,00
Dugandža	4,61	1,56	0,11	0,33	1,81	2,25	8,90	9,20	43,56	13,50
Hambarka	4,88	3,35	0,24	0,28	3,76	6,03	14,31	14,41	122,93	20,50
Jeribasma	4,15	1,99	0,14	0,42	2,12	4,83	6,30	7,20	56,24	10,25
Jesenka	4,22	4,00	0,28	0,30	3,37	5,55	7,57	11,84	100,19	15,00
Kačmorka	3,95	2,73	0,20	0,32	4,72	7,14	7,42	8,81	85,04	14,00
Kajzerka kasna	4,56	2,78	0,20	0,51	3,19	6,37	5,65	6,45	53,06	9,75
Kaličanka	4,60	3,60	0,25	0,25	3,25	6,05	5,34	11,00	38,26	15,50
Kaluđerka	3,65	5,97	0,42	0,33	3,96	7,22	6,95	10,46	71,17	13,00
Karamut	4,08	3,18	0,22	0,43	3,36	7,20	13,28	14,08	89,04	17,25
Krakača	3,92	3,54	0,24	0,10	2,46	3,55	5,30	6,70	73,97	14,75
Krasanka	3,83	3,94	0,28	0,15	4,12	7,14	7,71	8,63	23,50	11,50
Ljeskovača	3,57	3,98	0,28	0,28	1,84	7,21	7,20	8,00	49,11	11,00
Mesnjača	4,70	2,95	0,21	0,38	2,01	5,60	10,25	10,85	32,06	15,00
Santa Maria	4,21	4,94	0,35	0,25	4,41	7,26	8,92	10,29	15,17	13,75
Sarajka	5,11	1,40	0,10	0,34	2,50	4,80	8,90	9,10	19,19	11,25
Takiša	5,71	1,40	0,10	0,13	2,09	6,05	8,10	10,80	65,70	13,00
Tikvenjača	4,24	3,78	0,27	0,28	2,62	7,21	7,00	7,90	38,24	11,00
Trokača	4,35	3,17	0,22	0,27	3,59	7,22	7,33	8,20	16,74	11,00
Urumenka	4,13	1,70	0,13	0,16	1,56	2,39	9,40	9,60	27,59	12,50
Zelenika	4,26	2,20	0,15	0,55	1,80	2,41	6,80	7,90	85,11	10,75
Zimnjača	4,12	3,50	0,24	0,20	1,38	6,36	7,28	7,85	72,80	10,75
Zimska	3,82	5,99	0,41	0,53	2,77	6,41	8,20	11,16	48,02	14,00



Graph 7. Total acidity of the juice

The total acidity of the juice, Graph 7, expressed in mmol / 100 g recorded that the Kaluđerka variety (0.42 mmol / 100 g) had the highest value, and the lowest value was recorded in the Dolokrahan variety (0.08 mmol / 100 g).

4. CONCLUSION

It is a fact that there are many advantages of cultivation traditional varieties, and it is especially important to preserve them because, due to the aging of old trees of certain species, they lose a significant source of genetic material and impoverish varieties of pears.

Pomological and morphometric characteristics, if the pear is cultivated in the same or similar agroecological conditions, can be linked to the genetic properties of the variety.

Traditional varieties such as Bijela Takiša, Takiša, Mesnjača, Karamut and Jesenka have been used and stil using for various forms of processing (pekmezi) as well as for drying due to the high content of dry matter.

The varieties of Bijela Takiša, Debelkora, Hambarka and Jesenka have a high content of phenols (over 100 mg / 100 g) which puts them into the category of good-quality juice becouse of positive effect of phenol whose presence increases the antioxidant capacity of pears (recommended for consumption).

Given the positive effect of phenol on the human body, great attention is paid to fruit assortment and preservation of phenol in fruit during processing and storage.

Pear is a favorite fruit for many, and its nutritional value is also among the foods that are the best source of fiber. The highest percentage of raw fibers in juice is in the Kačmorka variety (4.72%) and the lowest percentage is recorded in the Budaljača variety (1.02%). Significant content of raw fibers is still in Karamut (3.36), Jesenka (3.37), Trokaca (3.59), Hambarka 93.76).

Domestic varieties tested in this paper had values from 0.10 to 0.58% from the results of the analysis, it can be concluded that the cultivated varieties were not supplied with Ca-pectate.

Based on the average vitamin C content in the pear fruit, it can be concluded that the examined domestic and domesticated varieties have a very good vitamin C content, 15 of the 20 varieties have a higher vitamin C content than the average or 75% of them.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Đurić G, Mićić N, Salkić B. Evaluation of pear (*Pyrus communis* L.) germplasm collected in Bosnia and Herzegovina using some pomological and ecophysiological characteristics. Acta Horticulturae. 2014; 1032(1):105-115.
2. Begić-Akagić A, Spaho N, Gaši F, Drkenda P, Vranac A, Meland M, Salkić B. Sugar and organic acid profiles of the traditional and international apple cultivars for

processing, Journal of Hygienic Engineering and Design. UDC. 2014; 634(11):190-196.
3. Salkić B. Karakterizacija autohtonog genofonda kruške u Bosni i Hercegovini, doktorska disertacija iz oblasti poljoprivrednih nauka. Univerzitet u Banja Luci, Poljoprivredni fakultet, Banja Luka, BiH; 2012.
4. Šoškić MM. Oplemenjivanje voćaka i vinove loze, Papirus, Beograd, Str. 1994; 398.
5. Penčić M. Biljni genetički resursi: Izabrani radovi, Jugoslovenska inžinjerska akademija, Beograd; 2005.
6. Martinelli F, Matteo B, Fabiano C, Corrado F, Agostino S, Luca S. Ancient pomoideae (*Malus domestica* Borkh. and *Pyrus communis* L.) cultivars in Appenino Toscano (Tuscany, Italy): Molecular (SSR) and morphological characterization. Caryologia. 2008;61(3):320-331.
7. Karp AS, Kresovich KV, Bhat KV, Ayad WG, Hodgin T. Molecular tools in plant genetic resources conservation: A guide to the technologies. IPGRI Technical Bulletin No. 2. International Plant Genetic Resources Institute, Rome. Italy; 1997.
8. Jemrić T, Fruk G, Čiček D, Skendrović Babojelić M, Šindrak Z. Preliminary results of fruit quality of 8 Croatian local apple cultivars. Agriculturae Conspectus Scientificus. 2012;77(4):223-226.
9. Guillon F, Champ M. Structural and physical properties of dietary fibres, and consequences of processing on human physiology. Food Research International. 2000;32:233–245.
10. Niketić-Aleksić G. Tehnologija voća i povrća, Poljoprivredni fakultet, Beograd; 1988.
11. Crnčević V. Konzervisanje i prerada povrća. Naučna knjiga Beograd; 1951.
12. Vračar LJ. Priručnik za kontrolu kvaliteta svežeg i prerađenog voća, povrća i pečurki i bezalkoholnih pića, Tehnološki fakultet, Novi Sad; 2001.

Peer-review history:
The peer review history for this paper can be accessed here:
https://sdiarticle4.com/review-history/51491