



NATURAL FRUIT JUICES PRODUCTION IN MONTENEGRO

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Synopsis

The paper presents the research of technological process of production mushy fruit juice (nectar) and fruit syrup in the Factory, „Pirella“ nearby Danilovgrad in 2008 and 2009. Fruit juice (nectar) of apples, oranges, peaches, strawberries, bluberries and cranberries were examined. Also, the group of studied syrups included the syrups of apples, peaches, strawberries, sour cherries, oranges, mandarines, lemons, cranberries, bluberries, tropical fruit, pomegranate and multivitamins.

Sinopsis

PROIZVODNJA PRIRODNIH VOĆNIH SOKOVA U CRNOJ GORI

U radu su prikazana ispitivanja tehnološkog procesa proizvodnje kašastog voćnog soka (nektara) i voćnog sirupa obavljena u toku 2008 i 2009. godine u Fabrici sokova „Pirella“ kod Danilovgrada. Ispitivane su sljedeće vrste kašastih voćnih sokova (nektara) od jabuke, narandže, breskve, jagode, borovnice i brusnice. Takođe, u grupi ispitivanih vrsta voćnih sirupa obuhvaćeni su sirupi od jabuke, breskve, jagode, višnje, narandže, mandarine, limuna, brusnice, borovnice, tropsko voće, nar i multivitamin.

INTRODUCTION

Production of fruit juices could be a very important area of processing of agricultural products in Montenegro. In addition to cold storage of fruit aimed at its longer-lasting, processing it into the soft beverages of significant quantities, most frequently applying the traditional technological processes one obtains intermediate

products, or final products of various properties. In this way the assortment of fruit-based products is complemented providing for the improvement of market supply to the end of better nutrition (Zlatković, 2003). In recent years in Montenegro, owing to the general trend of increasing food production in the world, the production and processing capacities increase in order to follow modern trends. Industrial facilities for fruit processing are constructed, technological procedures fully mechanized. In this period, three centers for fruit processing were established in the northern part of Montenegro (surrounding of Bijelo Polje), in the central part (in Nikšić and Podgorica) and in the southern part (surrounding of Bar and Ulcinj). Juice production has significantly increased as indicated by the fact that the juices and concentrated fruit juices make up almost 50% of total current production of processed fruits and vegetables.

In fruit processing there are the requirements fruit as a raw material needs to meet, because the quality of the final product depends primarily on the quality of fresh fruit. Thus, in fruit juice production the succulence, the ratio of sugar and acid, color, flavor, etc. are taken as the most important raw material characteristics. In addition to this, raw material has to be healthy with specific sort properties such as fruit shape, size, dry matter content, content of acid, etc. (Vares, 1991). All these conditions are equally important and closely related to each other so that they have to be given a full attention, in order to maintain the quality of raw materials, and thus the quality of fruit juices.

The aim of this paper is to get acquainted with a range of mushy fruit juice (nectar) products and fruit juice syrup in the Factory "Pirella" and to determine the quality of these fruit juices on basis of technological process of production and most important chemical parameters.

MATERIALS AND METHODS

The tests were conducted at the fruit juice plant "Pirella" in Danilovgrad. During our examination conducted in 2008 and 2009 we found and described in detail the technological process of producing mushy fruit juice (nectar) of apples, oranges, peaches, strawberries, blueberries and cranberries as well as certain nutritional parameters (energetic value, protein, carbohydrates, fats, etc.). We also found and describe in detail the process of production of fruit syrup from apples, peaches, strawberries, cherries, oranges, mandarins, lemons, cranberries, blueberries, tropical fruit, pomegranate and multivitamin as well as some of their specific parameters (fruit syrup ingredients, pasteurization, preservation, and vitamin C content organoleptic characteristics).

Methods included the presence and introduction to the line for the production of fruit juices and establishing parameters and procedures specified for pasteurization, filling and closing of packages.

Production of mushy fruit juices (nectar) is performed by the most advanced production procedures with the application of the most important measures of quality control and HACCP ISO (9001: 2008).

RESULTS AND DISCUSION

Production mushy fruit juices (nectar)

Production of mushy fruit juices, (tab.1.) indicates that the energetic value of fruit juices (nectar) ranged in the interval (of 204 to 230 kJ). The largest energetic value was recorded at mushy fruit juice (nectar) from strawberries (230 kJ), and the lowest one in apple juice (204 kJ). Protein and fat content, (tab.1.) in investigated the nectar fruit juices from apples, oranges, peaches, strawberries, blueberries and cranberries ranged below (0.1 g). Carbohydrate contents in the proportion of nutritional properties, (tab.1.) ranged within the limits (11.4 to 13.3 g). The greatest content of carbohydrates was determined in mushy strawberry fruit juice (13.3 g) and the lowest in apple juice (11.4 g). All types of mushy fruit juices comprise sugar, cocentrated fruit juice of mentioned types of fruit, water and lemon acid (E330). Fruit content for apple is min. 55%, orange min. 60%, peach min. 60%, strawberries min. 55%, blueberry min. 55%,cranberries min. 55%, what is in harmony with the allegations by Crnčević (1964).

Table.1.The types of mushy fruit juices and their nutritive values, (Pirella, 2008-2009.)

NUTRITIVE VALUE	TYPES OF MUSHY FRUIT JUICE					
	Apples	Oranges	Peaches	Strawberries	Blubberies	Cranberries
Energetic value	204	221	221	230	212	214
Proteines (g)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbohydrate (g)	11.4	12.8	12.8	13.3	11.9	12.0
Fats (g)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Mushy fruit juice in the technological process of production can be obtained from chemically preserved intermediate products, such as fruit pulp and fruit puree (Niketić-Aleksic, 1989). The most common procedure of obtaining nectar fruit juice is from pasteurized fruit pulp of apple like fruit, stone fruit and strawberries. Another way to get mushy fruit juices is pureeing of chemically canned fruit pulp which is

then conserved by pasteurization or freezing. The process of transforming puree into juice is performed by adding the same amount of water and sugar syrup as well as adding the citric acid. Content of puree in juice should not be less than 30% for cornelian cherry and apricot, and a minimum of 35% for other fruit cultivars. Additives from the positive list of additives (pectin) may be used. Vitamin C as an antioxidant in the amount of 300-500 mg per liter may be added to mushy juice. Further technological process includes incorporating of all components of the pulp or puree, water, sugar and additives necessary to preparatory vessel, where they compound, and then such a juice is transferred into another receiving vessel by "pipe in pipe" system; from this vessel it is continuously drained to the device for automatic filling of glass bottles which thereafter are hermetically closed. The most commonly used for packaging for mushy fruit juice is a glass bottle of 1l to 2l, small bottles of 0.2L, which are pasteurized before or after the closing. After pasteurization each bottle is labeled and stored in normal atmospheric conditions and period of their use limited, what complies with allegation by Vračar (2001).

Production of fruit syrup

During the testing of various types of fruit syrup (tab.2.), the results show that all the fruit syrups were produced without preservatives, as well as that their conservation is made by pasteurization. All the tested fruit syrup from apples, peaches, strawberries, cherries, oranges, mandarins, lemons, cranberries, blueberries, tropical fruit, pomegranate and multivitamin contained added sugar to 60%, base of dominant concentrated fruit juice, citric acid (E330) and certain fruit syrups are enriched by vitamin C, in the amount of 9 mg / 100 ml of ready drink. Organoleptic properties of the tested fruit syrups are specific to the raw materials they come from.

Table.2. The results of examination of various types of fruit syrup (Pirella, 2008-2009.)

TYPE OF FRUIT JUICE	CONSERVATION	PASTEURIZATION	INGREDIENTS	VITAMIN C	ORGANOLEPTIC PROPERTIES
Apple	Without conservation	Yes	Sugar, water, apple base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for apple
Peaches	Without conservation	Yes	Sugar, water, peach base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for peach
Strawberries	Without conservation	Yes	Sugar, water, strawberries base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for strawberries

Sour cherries	Without conservation	Yes	Sugar, water, sour cherry base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for sour cherries
Oranges	Without conservation	Yes	Sugar, water, orange base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for orange
Mandarines	Without conservation	Yes	Sugar, water, mandarin base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for tangerines
Lemons	Without conservation	Yes	Sugar, water, basis lemons, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for lemons
Cranberries	Without conservation	Yes	Sugar, water, cranberries base, concentrated cranberry juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for cranberries
Blubberies	Without conservation	Yes	Sugar, water, blubberies base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for blubberies
Tropical fruit	Without conservation	Yes	Sugar, water, tropical fruit base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for tropical fruit
Pomegranate	Without conservation	Yes	Sugar, water, basis pomegranate, drained pomegranate fruit juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for pomegranate
Multivitamins	Without conservation	Yes	Sugar, water, tropical fruits base, concentrated apple juice, citric acid	Minimal,9mg/100ml of ready drink (15% PDU)	Characteristic for multivitamin juices

The technological process of fruit syrup production comprises two phases: first phase of getting-clear or mushy juice or intermediate products and the second phase of cooking the juice with adding the sweetening agents (Zlatković, 2003). In the factory "Pirella" the technological process of fruit syrup production is carried out from the second phase, where the first stage involves the use of intermediate pulp or

concentrated fruit juice. One of these components is placed in the preparatory vessel, water is added in it, as well as sugar and citric acid (E330). These ingredients at high temperature of 80-90 °C unite and pipes that are used for pasteurization also transfer it to the receiving vessel. According Niketić-Aleksic (1982) dry matter content in fruit juice must be 65%, and can do 67%. Calculated on the dry matter of the finished juice under the regulations (Regulations on quality control of fruits and vegetables) at least 5% of dry matter must come from juice.

According to Vračar et al., (1993) a certain amount of citric acid is added in course of cooking in order to obtain a pleasant flavor. In addition to improvement of the taste, acidity plays its role in the process of sucrose inversion. After joining of all components fruit syrup is also carried by pipes to the apparatus for filling bottles. Immediately after pouring of fruit into the glass bottles they are closed and labeled. Bottles are put in cardboard boxes and placed in store with normal atmospheric conditions.

CONCLUSIONS

- Energetic value of nectar fruit juices ranged in the interval from 204 to 230kJ. The largest energetic value was recorded in strawberry juice (230kJ), and the lowest in apple juice (204kJ).

- The contents of protein and fat in studied mushy fruit juices was below 0.1 g per 100ml mushy fruit juice.

- The amount of carbohydrates in total nutritional properties of mushy fruit juices studied ranged within the limits (11.4 to 13.8 g). The greatest content of carbohydrates was determined in mushy strawberry fruit juice (13.3g) and the lowest in apple juice (11.4g).

- All studied fruit syrups are produced without preservatives, and the procedure of conservation was performed by pasteurization. The main ingredients for the production of fruit syrup are sugar, water, fruit base, concentrated juice of various types of fruit, citric acid, vitamin C in the amount of 9mg/100ml of ready drink, and organoleptic properties are characteristics to the specific fruit base.

- The technological process of production of fruit syrup is a high quality one and it includes all major processing operations and appropriate criteria of quality control of fruit syrups, such as HACCP and ISO (9001:2008).

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