Suitability for processing as puree of some fruit varieties of peach group

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Abstract

In our country, fruit purees still do not enter in our daily meals, as it happens in the countries with developed industry. Their introduction is very indicated, being that in the same volume, the value of alimentary principles is with 50% until 100% higher than in stewed fruits, which represent the type of canned food closest to the purees and that is consumed frequently. Among the species of stone fruits, peaches are the most processed as puree. In this paper we proposed the assessment of suitability to processing as puree of a number of 11 fruit varieties within peach group: peaches clingstones and nectarines (Southland, Redhaven, Raluca, Collins, Filip, Catherine, Mimi, Anemona, Flavortop, Fantasia, Independence), from the experimental culture of Research Station for Fruit Growing Constanța. The fruits were processed at Research and Development Institute for Processing and Marketing of the Horticultural Products Bucharest, in the micro-production laboratory. Sensory analysis of product was made according to STAS 12656-88, that establishes the analysis methods with unitary scoring scales (method A), used for the evaluation of organoleptic characteristics of alimentary products, and that are applied for the appreciation of a set of organoleptic properties: appearance, color, taste, texture or, in case, consistency. The best results were obtained at clingstone variety Mimi, whom was given maximum score for color and taste and an average total score of 19.22. This variety, together with varieties Southland - peach (18.34 points) and Catherine - clingstone (18.01 puncte) obtained the score "very good". The lowest suitability of processing as puree is presented by peach variety Collins (13.75 points) and nectarine variety Flavotrop (13.91 puncte), which received the score "satisfactory".

Key words nectarines, peaches, clingstone, sensory analysis

In comparison with stewed fruits, which they can substitute, purees give superior results, both qualitative and economic efficiency (3).

In our country, fruit purees still do not enter in our daily meals, as it happens in the countries with developed industry. Their introduction is very indicated, being that, in the same volume, the value of alimentary principles is with 50% until 100% higher than in stewed fruits, which represent the type of canned food nearest to the purees and that is consumed frequently (4).

Tendency, worldwide, to achieve canned food in the form of puree has, first of all, the purpose to provide the consumer a product with the closest form to edible components of fresh fruit.

Fruit purees must present similar characters with raw material, mainly regarding to taste, flavor, color, consistency, content in vitamins etc. (1).

The maintaining of these qualities must be ensured by technological means, not allowing the discoloration, staining with chemical substances, fragrances or other artificial additives (2).

According to P. S. 582-1996 (professional standard) – Creams and fruit purees, purees must present in a pasty, homogeneous form, nearest to characteristic consistency of the species at the state of full maturity (ripening).

In the manufacture of purees of all fruit species, technology is unanimous agreed with the improvement of taste, by adjusting the sugar content, possibly addition of food acids. To maintain the appearance of naturalness and dietary character of the products, however these additions are strictly limited.

Fruit species plays a decisive role (7). The varietal characters of fruits are determinant too (6). Fruit variety may influence particularly positive the direction of their valorization, in the way of a good use of irremovable stone fruits, e.g. from which it cannot be manufactured stewed fruits, jams or sweetness (5).

Remaining to be destined for marmalade, as it happens in the most cases, it is not accomplished nothing less than sacrificing the cost price of raw materials or finite product. Therefore, at the manufacture of purees, both species and variety presents an outstanding importance,
of which it must be taken into account to achieve optimal economic results, but mostly qualitative.

For the manufacture of purees, as well as in the case of other canned foods, in order to correct the taste, it is allowed the use of some substances, in "limited" quantities, under generic name of "auxiliary substances or materials". These are first of all: sugar, tartaric acid (citric), sometimes ascorbic, natural flavor (of fruit species respectively). Sugar is added in puree in order to achieve the harmonious proportion of sugar/acid and, at the same time, to bring the finite product to refractometric degree required by internal standard.

Between the species of stone fruits (that are used in much lesser amount for processing of purees than pome fruits), peaches are the most processed as puree.

Due to particular taste properties, appearance and distinctive flavor, same as their importance in nutrition, peaches as well as nectarines occupy an important place in consumption as fresh fruits, but also processed. Their superior dietetic properties are determined by their content in vitamins (A, B, C, E), mineral substances and oligo elements (calcium, iron, iodine, magnesium, phosphorus, potassium, sodium, zinc), cellulose, acids and pectic substances.

The aim of this paper is to establish the suitability of some peach varieties (Southland, Redhaven, Raluca, Collins, Filip), clingstones (Catherine, Mimi), and nectarines (Anemona, Flavortop, Fantasia, Independence), from the experimental culture of Research Station for Fruit Growing Constanta, to processing under the form of puree.

Material and Methods

Researches were conducted in years 2013-2014, with 11 fruit varieties of peach group, of which 5 peach varieties (Southland, Redhaven, Raluca, Collins, Filip), 2 clingstone varieties (Catherine, Mimi) and 4 nectarine varieties (Anemona, Flavortop, Fantasia, Independence), from the experimental culture of R.S.F.G. Constanta.

It was specified the origin of the varieties and it was made the characterization of trees regarding to their vigour, maturation period, resistance and yield capacity.

Immediately after harvest, were effectuated observations and measurements concerning biometric and organoleptic characteristics of fruits: size, shape, aspect, color, taste, as well as the size and aspect of stone.

Fruits were processed as puree at R.D.I.P.M.H.P. Bucharest, in the micro-production laboratory. Packaging was made in jars with capacity of 370 milliliters, with hermetically closing, using twist-off lids.

Sensory analysis of processed products was made according to STAS 12656-88, that establishes the analysis methods with unitary scoring scales (method A), used for the evaluation of organoleptic characteristics of alimentary products. These methods are applied for the assessment of a set of organoleptic properties: appearance, color, taste, texture or, in case, consistency. The evaluation of each organoleptic characteristic was made by comparison with scoring scales from 0 to 5 points and it was obtained an average score given by the group of tasters on the basis of registration of awarded points on individual sheets. It was made the calculation of the weighted average of the scores, and totalize them for obtaining total average score and were settled organoleptic characteristics of the products based on the principle of total average, by comparison with a scale from 0-20 points. Eventually, there were given scores for each variety.

Within the overall score achieved by the different analyzed products, were established five quality classes: very good (18.1-20.0), good (15.1-18.0), satisfactory (11.1-15.0), unsatisfactory (7.1-11.0) and improperly (0 -7.0).

Sensory analysis of canned products has been carried out after a period of minimum 21 days after processing (in which it is considered that the product stabilizes).

Results

Self-fertile variety Southland is of American origin, obtained in 1946, at Beltsville, Maryland, by self-pollination of Halehaven variety.

The tree is vigorous, with spherical, wide crown. It succeeds well grafted on peach. Maturation period: July 25 – 5 of August. It has a very high yield potential (30-35 kg/tree), is resistant to frost, drought and diseases, excepting Taphrina deformans.

Fruits present resistance to handling and transport.

Redhaven variety is an American variety, self-fertile, created in Michigan-U.S.A. It was commercialized beginning with year 1940, being today the most cultivated in the world.

The tree has medium vigor. It is precocious and yields economical since year IV after planting.

Yields much and constant (about 30-35 kg/tree). It needs to be protected against specific diseases and pests.

Self-fertile variety Filip, obtained at R.S.F.G. Constanta, was homologated in 2002.

The tree is of medium-large vigor. It is resistant to frost, but must be protected from the attack of main diseases and pests.

It is a precocious variety, bearing fruits since year II after planting. It is productive (30-35 kg/tree, assigning 25.0-29.0 t/ha at a density of 833 trees/ha). The productions are constant every year and qualitative. The maturation period: medium, in the second decade and third decade of July.

Self-fertile variety Raluca, obtained at R.S.F.G. Constanta, was homologated in 2001.
The tree is semi vigorous, precocious and productive (30-35 kg/tree). Yields constantly, every year. The maturity of harvest is in decades I and II of July.

It is resistant to frost and must be protected, with phytosanitary treatments at warming, from the attack of pathogens.

Self-fertile variety Colins, obtained in U.S.A., at New Jersey, was disseminated into production since 1959.

The tree is of reduced vigor, very productive, resistant to frost. The maturity of harvest: 5 - 15 of July.

The variety Mimi is a selection of clingstone, obtained at R.S.F.G. Constanta.

The tree is of medium vigor, precocious and presents resistance to drought and frost. It is tolerant at the main diseases of the species.

The yield capacity is good, the tree producing about 25-30 kg, respectively 21-25 tons/ha at a density of 833 trees/ha. The maturation of fruits is in the last decade of July and first decade of August, being a variety with medium maturation of fruits. It has a good resistance to handling, transport and temporary storage.

Self-fertile variety Catherine Sel.1 is the first variety of clingstone obtained at R.S.F.G. Constanta.

The tree is of large vigor, is resistant to frost and tolerant to leaf curl (Taphrina deformans) and powdery mildew (Sphaerotheca pannosa).

It is precocious and yields economically since year III. The production is very high and constant (35-40 kg/tree), assigning 22-25 t/ha at a density of 625 trees/ha, or 30-33 t/ha, for 833 trees/ha). The maturation period: decade III of July – first decade of August.

The fruits present resistance to storage and transport better than peaches.

Romanian nectarine variety Anemona was created at Research Station for Fruit Growing Constanta, in year 2010.

The tree is of medium vigor, self-fertile, precocious (yields since year II after planting) and productive (at maturity produces about 28-30 kg fruits/tree). Fruits reach the maturity of consumption in the third decade of July – first decade of August.

Independence is a nectarine variety originary from U.S.A.

The tree is of medium vigor, productive, resistant to frost. The period of ripening: first half of August.

Fantasia variety is of American origin.

The tree is very productive and vigorous, with good resistance to frost. The maturity of harvest takes place at late August – early September.

Flavotrop variety was obtained in California and disseminated since year 1969.

The tree is vigorous, resistant to frost. The maturity of harvest: late July – early August.

The characterization of fruits regarding the size, shape, color and stone are presented in Table 1.

<table>
<thead>
<tr>
<th>Variety</th>
<th>size</th>
<th>shape</th>
<th>epidermis</th>
<th>pulp</th>
<th>stone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southland</td>
<td>large</td>
<td>spherical,</td>
<td>thick, pubescent and adherent to the pulp, the color is yellowish-orange, covered with deep-purple spots on the sunny side of fruit</td>
<td>yellow-golden, with slightly red infiltrations around the stone, non-adherent to the stone, with very good taste, flavoured, relatively crispy, acidulated</td>
<td>medium sized, void, with incrustations in the form of alveole and ditches, dark brown</td>
</tr>
<tr>
<td>Red Haven</td>
<td>medium- large</td>
<td>spherical, slightly elongated, with uneven flanks, slightly asymmetrical, with a small mucro</td>
<td>yellow-golden, covered over approximately 70-90% with red irizations and with bloody-red color on the sunny side of the fruits.</td>
<td>yellow-golden, with red irizations around the stone; consistent, soft, flavoured, sweet-sour, juicy, semi-adherent to the stone</td>
<td>medium, inversely void, curved with a sharp tip; carmine red, with deep, adequate frequent incrustations.</td>
</tr>
<tr>
<td>Filip</td>
<td>small</td>
<td>broad flattened, relatively regular, „sandwich“ type</td>
<td>Finely pubescent, background color is yellow-greenish, and the coating color is dark red, distributed in plates, very attractive</td>
<td>white (light cream-greenish), without red infiltrations under the peel or distributed in plates, very attractive</td>
<td>every small and flattened around the stone. The texture is soft, pulp is sweet, flavoured and juicy, with 12-14% dry substance, with a taste of honey and figs.</td>
</tr>
<tr>
<td>Variety</td>
<td>Weight Range</td>
<td>Shape</td>
<td>Skin Color</td>
<td>Meat Color</td>
<td>Stone Adherence</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------</td>
<td>------------------------------</td>
<td>----------------------------</td>
<td>---------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Raluca</td>
<td>medium (100-110 g)</td>
<td>rounded, slightly asymmetrical, with a small mucro; the tip, in its ensemble is slightly deepened; the peduncle cavity is shallow and medium broad</td>
<td>yellow-greenish, intensely pigmented, with very soft pubescence, medium dense, medium sized, non adherent to the pulp (freestone)</td>
<td>yellow-orange, fitlh fibres, without red infiltration under the epidermis and around the stone</td>
<td>medium sized, non adherent to the pulp</td>
</tr>
<tr>
<td>Colins</td>
<td>medium (145-160 g)</td>
<td>spherical, flattened, with a ventral line superficial, a bit deepened at the tip</td>
<td>finely pubescent, color is yellow-golden, covered entirely with bloody-red, striped with intense red</td>
<td>the pulp is yellow, a little red around the stone, consistent, juicy, sweet and harmonious acidulated, good for the meal</td>
<td>semi adherent to the pulp</td>
</tr>
<tr>
<td>Mimi</td>
<td>large- very large 150-180 g</td>
<td>spherical-ovoid, with a little dimple at style point</td>
<td>yellow with red in spots and striations, on the sunny side of the fruit</td>
<td>orange, firm, rubbery and adherent to the stone, with 12.5-13% dry substance</td>
<td>light brown and represents 8-9% of the fruit weight</td>
</tr>
<tr>
<td>Catherine</td>
<td>medium (80-110 g)</td>
<td>spherical, with a deepened peduncle cavity narrow and medium deep</td>
<td>medium thickness, with dense and soft pubescence. The background color is yellow-greenish and the coating color is orange, with reddish tones over the sunny zones of the fruit, attractive aspect</td>
<td>yellow-orange, firm, rubbery, without fibres, without red infiltrations under the epidermis and around the stone, with pleasant taste and flavour that intensify at processing. It doesn’t disintegrate at boiling and it has high content in sugar (11-13%)</td>
<td>small and adherent to the pulp</td>
</tr>
<tr>
<td>Anemona</td>
<td>medium 100-135g</td>
<td>spherical, slightly elongated</td>
<td>glabrous, glossy (like nectarine), colored in orange, with about 85% vivid red, very attractive</td>
<td>yellow-orange, firm, rubbery, juicy, sweet-sour, refreshing; it doesn’t decompose at boiling and intensifies its flavour during the processing</td>
<td>medium sized, representing 9.6% of fruit weight</td>
</tr>
<tr>
<td>Independence</td>
<td>medium (110-160 g)</td>
<td>spherical, slightly elongated</td>
<td>yellow-orange, covered completely or almost entirely with vivid red, with purple reflexes</td>
<td>yellow, with red veins, juicy, sweet, intensely flavoured, superior for meal</td>
<td>semi adherent to the pulp</td>
</tr>
<tr>
<td>Fantasia</td>
<td>large (180-200 g)</td>
<td>spherical-ovoid</td>
<td>yellow orange, covered with shiny red over half of the surface</td>
<td>yellow, consistent, fondant, juicy, sweet and pleasant flavoured</td>
<td>non adherent to the pulp</td>
</tr>
<tr>
<td>Flavortop</td>
<td>medium-large (130-185 g)</td>
<td>spherical, slightly elongated, asymmetrical, with a ventral line well marked</td>
<td>yellow; covered with red-purple over 80% of the surface</td>
<td>yellow; quite consistent, juicy, flavoured</td>
<td>non adherent to the pulp</td>
</tr>
</tbody>
</table>

From data analysis it is observed that the average weight of the fruits from 11 varieties is low (Filip), medium (Raluca, Collins, Catherine, Independence), medium to large (Red Haven, Flavortop) or large (Southland, Mimi, Fantasia), oscillating between 55-70 g (Filip variety) and 200-220 g (Southland variety).

The fruits shape is also very various, from strongly flattened (Filip) to spherical-ovoid (Fantasia).

The color of epidermis, like the pulp, is different from one variety to another and it is very important because it influences in large amount the color of the finite product (puree).

The stones size and especially the proportion between fruit weight and stone weight has a great importance, particularly for industrialization, in order to obtain a good processing efficiency. The adherence of stone to the pulp is also an important criterion in choosing the varieties for fruit processing in one product or another.

The results of sensorial analysis of product “Peach puree” are presented in Table 2. It is observed
that the best values were obtained at the variety of clingstone Mimi, whom was given maximum score for the color and taste and a total average score of 19.22. This variety, together with the varieties Southland – peach (18.34 points) and Catherine – clingstone (18.01 points) obtained the score "very good".

Peach variety Raluca obtained the grade "good", with a score situated at the superior limit of this category (17.98), presenting a very nice aspect and receiving maximum score for the taste and consistency. In the same group, of varieties with the score "good", were included the nectarine varieties Anemona (16.93 points), Fantasia (16.66 points) and Independence (16.29 points), as well as peach varieties Filip (16.27 points) and Red Haven (15.26 points).

The lowest suitability for processing as puree has the peach variety Colins (13.75 points) which, although it has a very good taste (3.90 points), looks less attractive (3.81 points), and the consistency is very reduced (2.67 points), for which it received the score "satisfactory". In the same category is included the variety of nectarine Flavortop (13.91 points) that presents a very good consistency (4.0 points), but both taste and aspect are less pleasant (Figure 1).

The content of product puree in soluble dry matter is presented in Figure 1. It is observed that, excepting the variety Flavortop, whose content in soluble dry substance is of only 13 refractometric degrees (°Brix), all of the other varieties enclose in the stipulations of Professional Standard P. S. 582-1996 - Creams and fruit purees, which recommends a minimum content in soluble substances of 15 refractometric degrees.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Aspect</th>
<th>Color</th>
<th>Taste</th>
<th>Consistency</th>
<th>Total average score</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southland</td>
<td>5.86</td>
<td>4.94</td>
<td>3.54</td>
<td>4.00</td>
<td>18.34</td>
<td>very good</td>
</tr>
<tr>
<td>Red Haven</td>
<td>4.33</td>
<td>4.00</td>
<td>3.66</td>
<td>2.67</td>
<td>15.26</td>
<td>good</td>
</tr>
<tr>
<td>Fili p</td>
<td>4.67</td>
<td>4.93</td>
<td>4.00</td>
<td>4.00</td>
<td>17.98</td>
<td>good</td>
</tr>
<tr>
<td>Rahica</td>
<td>5.59</td>
<td>4.39</td>
<td>4.00</td>
<td>4.00</td>
<td>17.89</td>
<td>good</td>
</tr>
<tr>
<td>Colins</td>
<td>3.81</td>
<td>3.77</td>
<td>4.00</td>
<td>2.67</td>
<td>13.75</td>
<td>satisfactory</td>
</tr>
<tr>
<td>Mimi</td>
<td>5.32</td>
<td>6.00</td>
<td>3.90</td>
<td>4.00</td>
<td>19.22</td>
<td>very good</td>
</tr>
<tr>
<td>Catherine</td>
<td>5.72</td>
<td>4.67</td>
<td>3.98</td>
<td>3.64</td>
<td>18.01</td>
<td>very good</td>
</tr>
<tr>
<td>Anemona</td>
<td>4.63</td>
<td>4.46</td>
<td>4.00</td>
<td>3.84</td>
<td>16.93</td>
<td>good</td>
</tr>
<tr>
<td>Independence</td>
<td>5.65</td>
<td>3.54</td>
<td>3.72</td>
<td>3.38</td>
<td>16.29</td>
<td>good</td>
</tr>
<tr>
<td>Fantasia</td>
<td>5.64</td>
<td>4.46</td>
<td>2.56</td>
<td>4.00</td>
<td>16.66</td>
<td>good</td>
</tr>
<tr>
<td>Flavortop</td>
<td>3.81</td>
<td>3.54</td>
<td>2.56</td>
<td>4.00</td>
<td>13.91</td>
<td>satisfactory</td>
</tr>
</tbody>
</table>

![Fig. 1. Total average score of Peach puree](image-url)
The puree obtained from peaches variety Mimi is situated on the first place regarding the content in soluble dry matter, that being very high (27.5°Brix). On the next places are situated the varieties Catherine (26.5°Brix), Southland (26.0°Brix) and Filip (25.5°Brix). Excepting the variety Fantasia (22.0°Brix), the puree from nectarine varieties presents a lower content in soluble dry matter, comparative with peach varieties: 13.0°Brix Flavortop variety, 16.5°Brix variety Anemona, 17.5°Brix variety Independence.

Conclusions

The 11 varieties of peaches and nectarines that were studied, differentiate very much regarding the size, shape and color of fruits. From all varieties is highlighted Filip variety, with small fruits (50-70 g), flattened, the only one with white pulp. At the opposite, with very large fruits (200-220 g), of spherical shape, with yellow-golden pulp and slightly red infiltrations around the stone, is situated Southland variety. All these varieties, still have in common a pleasant, flavoured, sweet-sour taste (Southland, Red Haven) or sweet (Filip, Collins, Independence, Fantasia), that influences the quality of processed product (Peach puree).

The best suitability for processing as puree is presented by variety of clingstone Mimi, whom was given maximum score for the color and taste and a total average score of 19.22. This variety, together with the varieties Southland – peach (18.34 points) and Catherine – clingstone (18.01 points) obtained the score “very good”.

The peach variety Colins (13.75 points) and nectarine variety Flavortop (13.91 points), who received the score “satisfactory”, after organoleptic testing, are not recommended for processing as puree, due to less attractive aspect and very reduced consistence, in the case of first variety, and due to less pleasant taste and aspect in the case of second variety.

Regarding to the content of the product puree in soluble dry matter it is observed that, excepting Flavotrop variety, whose content in soluble dry substance is of only 13 refractometric degrees, all other varieties are included in the stipulations of Professional Standard P. S 582-1996 - Creams and fruit purees, which recommends a minimum content in soluble substances of 15 refractometric degrees. Also at this indicator, the variety Mimi is situated on the first place, the puree obtained having the content in soluble dry matter very high (27.5°Brix). On the following places are situated the varieties Catherine (26.5°Brix), Southland (26.0°Brix) and Filip (25.5°Brix). Excepting the variety Fantasia (22.0°Brix), the puree from nectarine varieties presents a lower content in soluble dry substance (13.0°Brix Flavortop variety, 16.5°Brix variety Anemona, 17.5°Brix variety Independence), comparative with peach varieties.

Among the three assortments of fruits from peach group, is highlighting the varieties of clingstone, which are peach varieties created especially for the use in the procedure of processing under the form of canned food.

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