PROCEEDINGS OF THE LATVIAN ACADEMY OF SCIENCES. Section B, Vol. 67 (2013), No. 4/5 (685/686), pp. 422–428.
DOI: 10.2478/prolas-2013-0055

EVALUATION OF ROWANBERRY AND ROWANBERRY-PUMPKIN SAUCES

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Communicated by Daina Kārkliņa

*Rowanberries (*Sorbus aucuparia*) are small orange-red fruits of a rowan tree. They have been described as an important source of flavonoids, and their antioxidant activity affects reactive oxygen species and lipid peroxidation. Cultivars of sweet rowanberries and hybrids with other species are sweeter and less astringent than wild rowanberries. The aim of the current study was to determine physical and chemical properties of sauces from various cultivars of wild and sweet rowanberries, and mixes of sweet rowanberries with pumpkins, and to assess their degree of acceptance. The experiments were carried out at the Faculty of Food Technology of the Latvia University of Agriculture. The sauces were made from purees of wild rowanberry and sweet rowanberry cultivars and purees of sweet rowanberry with apple or pumpkin using different species. The content of total dry matter, soluble solids, total carotene, pH, colour L* a* b* values and texture parameters were determined in samples of the sauces. The results showed large variability between the rowanberry and rowanberry-pumpkin sauces. The total dry matter content of sauce samples varied from 25.92 to 31.38%, the total carotene content from 3.94 ± 0.40 to 7.34 ± 0.57 mg 100 g^{-1} DM, and firmness from 0.5 to 2.2 N. According with sensory evaluation the panellists liked (P < 0.05) sauces samples made from rowanberry 'Michurinskaya krasnaya' puree and from 'Granatnaya' and pumpkin purees.*

Key words: *rowanberry, sauce, physical and chemical parameters, sensory evaluation.*

INTRODUCTION

Sauces and dressings are commonly used in the everyday life of many consumers. The main advantage of sauces is their ability to improve the taste of food. For example, hot sauces add a piquant taste to various dishes, meats, and vegetables; sweet sauces are favoured on pancakes, rice, desserts and ice-creams. Sweet and sour sauces find application in meat dishes and are very often applied in Asian kitchens. Dressings of different taste are commonly used in American kitchens, bringing greater attractiveness to meat dishes (Sikora *et al.*, 2008).

A variety of sauces, such as tomato, chilli, oyster, and white sauce, are used as seasoning to help enhance the taste of food. In general, colour, viscosity and stability are characteristics that contribute to the acceptance of a sauce. The main problem associated with quality of sauces is a tendency for separation of solids and liquid phase during storage. To prevent this the manufacturers usually use native starch (i.e. corn and rice starch), modified starch and hydrocolloids (i.e., gum, locust bean gum) as thickeners and stabilisers of sauces (Rengsutthi and Charoenrein, 2011).

Consumers are demanding high-quality healthy products, and therefore, it is very important to choose raw material with high content of bioactive compounds. There is still much potential to improve product quality using new, non-traditional fruits and vegetables with high contents of bioactive compounds as raw materials for production of sauces. Such raw materials include also rowanberries and pumpkins.

Rowanberries (*Sorbus aucuparia* L.) belong to the subfamily *Maloideae* of the family *Rosaceae*. Their berries have been promoted as a health-food and can be a source for health-promoting components. Ripe wild rowanberries are picked in the autumn and they are eatable, but very tart in flavour and taste, although they contain lots of sugar. Rowanberries have been traditionally used to make purees, juices or wine, but their use as a food ingredient has been less popular because of their bitter tast Wang, 2007). Cultivars of sweet rowanberries and hybrids with other species are sweeter and less astringent than wild rowanberries. According to food composition and nutrition tables, sweet rowanberry *S. aucuparia* L. var. *edulis* contains 98.0 mg 100 g^{-1} vitamin C and 2.5 mg 100 g^{-1} total carotenoids (Souci *et al.*, 2008). In comparison with wild rowanberries, the sugar content in fruits of cultivars of sweet rowanberries is 1.2–2.1 times higher (Navys, 2001). The content of reducing sugars (i.e. total amount of glucose and fructose) in

the cultivars has been estimated to be 5–18 g 100 g^{-1} (Eder *et al.*, 1991; Souci *et al.*, 2008). The content of sorbitol, a sweetening agent that diabetics can tolerate, was high and varied from 3.5 to 12.0 mg 100 g^{-1} (Eder *et al.*, 1991; Стрельцина и др., 2010).

Pumpkin is a vegetable that meets the requirements of healthy nutrition. It is a tasty and valuable vegetable crop, contains many biologically active substances and is distinguished for its dietary qualities. There are three common types of pumpkin world-wide: *Cucurbita pepo* L., *Cucurbita maxima* L. and *Cucurbita moschata* L. (Lee *et al.*, 2002). Pumpkins provide a valuable source of carotenoids and ascorbic acid, which have major roles in nutrition as provitamin A and as an antioxidant, respectively (See *et al*, 2007). Pumpkins are consumed in a variety of ways, such as fresh or cooked vegetables, and products are commonly stored frozen or canned (Figueredo *et al.*, 2000).

The stability of many bioactive compounds is dependent on pre-treatment of the raw material, processing operations of the product, and storage conditions. In many fruits, carotenoids and flavonoids, which are located predominantly in epidermal tissues, are removed by peeling operations, which can greatly reduce concentrations of bioactive compounds in processed products. Removal of seeds can result in losses of phenolics (e.g. ellagitannins) (Howard, 2008). High temperature also causes the loss of important nutrients. At a temperature just above 50 °C, degradation of several phenolic compounds occurs (Rózek *et al.*, 2010). During thermal processing, 50–70% losses of ascorbic acid can occur. The losses of this vitamin can be used as an indicator of food quality. Carotenoids after thermal processing are more easily extracted from plant tissues due to tissue softening and destruction of the membrane-protein complex (Howard, 2008).

Colour is one of the most important parameters to which consumers are sensitive when selecting foods. Colour stability of fruit and fruit products is influenced by many factors. At least three factors can cause colour deterioration: the loss of red anthocyanin pigment, formation of brown pigments, and discoloration through various factors such as heavy metal contamination. The fruit cultivar, temperature, pH, presence of oxygen and time of processing were found to exert a great influence on colour stability of fruit products (García-Viguera *et al*., 1998; Kopjar *et al*., 2009).

The aim of current research was to determine physical and chemical properties, and degree of acceptance, of sauces made from various cultivars of rowanberries and and from sweet rowanberries with pumpkins.

MATERIALS AND METHODS

Experimental design. The research was carried out at the Faculty of Food Technology, Latvia University of Agriculture, in 2012. The object of the research was rowanberry and rowanberry-pumpkin sauces from wild and sweet rowanberry cultivars and pumpkin (*Cucurbita maxima*) purees. Description of the used fruits of rowanberry cultivars are given in Table 1. The rowanberries were harvested in the Pure Horticultural Research centre. The pumpkin was obtained from the household "Alejas" (Ilzene's rural municipality, Latvia).

Table 1

THE DESCRIPTION OF ROWANBERRY CULTIVARS USED FOR MAKING SAUCES

No	Rowanberry cultivar	Sort characteristics	Description of fruits
1	'Granatnaya'	Hybrid rowanberry × hawthorn (*Sorbus aucuparia* × *Crataegus sanguinea* Pallas)	Dark red or brown coloured fruits with sweet and sour taste
2	'Michurinskaya krasnaya'	Hybrid rowanberry × hawthorn (*Sorbus aucuparia* × *Crataegus sanguinea* Pallas)	Dark red coloured fruits with sweet and sour taste
3	'Moravica'	Moravian group variety of *Sorbus aucuparia*	Orange-red coloured fruits with sweet and sour taste
4	*Sorbus aucuparia*	Wild rowanberry	Orange or bright red coloured fruits with bitter taste

Rowanberry puree was prepared from frozen and thawed rowanberries that were pressed through a sieve, and pumpkin puree made from cut pieces of pumpkin, boiled (in 100 ^{o}C) and pressed through a sieve. The rowanberry sauces (further – samples A) were prepared according with the technological scheme given in Figure 1 and dried dill and basil was added. Rowanberry-pumpkin sauces (further – samples B) were prepared also according to this, but using rowanberry and pumpkin puree in weight ratio 1:1, and with addition of herbs: fresh garlic, cumin seeds, coriander seeds and dried rosemary (sample B1); dried ginger (sample B2); fresh garlic and dried basil (sample B3); and dried parsley, mustard seeds and cayenne pepper (sample B4).

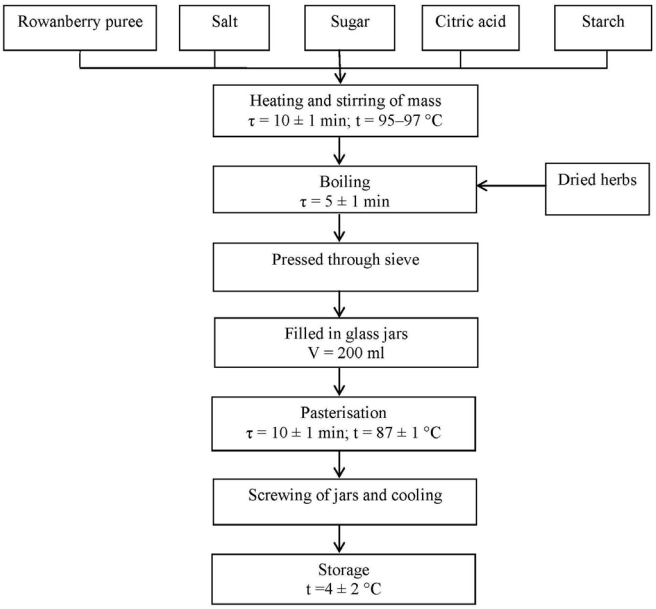

Fig. 1. Technological scheme of rowanberry sauces treatment

Four samples of rowanberry sauces and four samples of rowanberry-pumpkin sauces were prepared.

Analysis. The total dry matter content of sauce samples was determined after drying in an oven (Mattila *et al.*, 2006). A vacuum drying oven VD53 (Binder) and analytical scales BP-210s (Sartorius) were used. Measurements were carried out in three replications.

The soluble solid content (^{o}Brix) was measured using a digital refractometer Rx-5000α (Atago) by standard method ISO 2173:2003. Measurements were carried out in five replications.

pH was measured by a pH-meter (FieldLabpH), using standard method LVS ISO 5542:2010. Measurements were carried out in three replications.

The total carotene content was determined by spectrophotometric method at 440 nm (Ермаков, 1987) after extraction with petroleum ether (boiling temperature range 80–110 ^{o}C). An UV-VIS-NIR spectrophotometer UV-3100PC (Shimadzu) with 10 mm cuvettes was used. The carotene equivalent (KE) was estimated, using a calibration curve with $K_2Cr_2O_7$. Measurements were carried out in two replications for each sample.

The colour of sauces was measured in a CIE L*a*b* colour system using a ColorTec-PCM/PSM (Accuracy Microsensors Inc.). Before measurement, the colorimeter was calibrated using a white reference tile and a light trap (black tile). Ten random areas were measured through the plastic pockets and mean values were reported for each sample. Using this method, CIELAB coordinates show the degree of brightness (L), the degree of redness (+a) or greenness (–a), and the degree of yellowness (+b) or blueness (–b) (Coultate, 2002; Chakrborty *et al.*, 2011).

The textural analysis of sauces was conducted at room temperature (20 ± 2 ^{o}C temperature) with a Texture Analyser TA.XT.plus (Stable Micro Systems Ltd.) instrument according to the method described in literature (Bourne, 2002; Sikora *et al.*, 2007; Cardona *et al.*, 2010). The system was equipped with a compression cell of 50 kg and software Texture Exponent 32. A back extrusion test was carried out in a cylindrical container with 50-mm internal diameter filled with sauce, in which the 40 mm diameter compression disc with an extension bar moved with a speed of 2 mm s^{-1}, at distance 20 mm.. Analyses were triplicated. The system was equipped with a compression cell of 50 kg and software Texture Exponent 32. A back extrusion test was carried out in a cylindrical container with 50-mm internal diameter filled with sauce, in which the 40 mm diameter compression disc with an extension bar moved with a speed of 2 mm s^{-1}, at distance 20 mm. Analyses were triplicated.

Sensory evaluation of the sauce samples was performed in the Laboratory of Sensory Evaluation at the Faculty of Food Technology of the Latvia University of Agriculture. All sauce samples were evaluated by 25 trained panellists (18 females and 7 males, mean age 32). Rowanberry and rowanberry-pumpkin samples were evaluated by degree of liking using a 9-point hedonic scale. The 9-point hedonic scale (9 – extremely like, 5 – neither like nor dislike, and 1 – extremely dislike) methods used were based on ISO 4121:2003 "Sensory analysis – Guidelines for the use of quantitative response scales".

The results are expressed as means ± standard deviations. Significant differences were tested by analysis of variance (ANOVA) and the Tukey's test. Statistical differences with $P < 0.05$ were considered as significant.

RESULTS

The physical parameters (the content of total dry matter and soluble solids, and pH) of the rowanberry sauce samples are given in Table 2. There were significant differences ($P \leq 0.005$) in the total dry matter content and in the soluble solids among the samples of sauce samples. This can be explained by the use of different rowanberry cultivars and different composition of recipes for sauce samples A and B.

The rowanberry and rowanberry-pumpkin sauce samples had pH levels ranging between 2.68 ± 0.01 and 3.23 ± 0.01 (Table 2), the levels significantly different between sauces ($P < 0.05$).

Total carotene content significantly differed ($P < 0.005$) between the rowanberry and rowanberry-pumpkin sauces (see Fig. 2). The highest total carotene content (7.75 ± 0.51 mg 100 g^{-1} DW) was in sample A2 (made from 'Michurinskaya krasnaya' puree), and the lowest (3.94 ± 0.40 mg 100 g^{-1} DW) in sample B4 (made from 'Moravica' and pumpkin purees). The content of total carotene of rowanberry-pumpkin sauces was lower (23.0–32.7%) than that of rowanberry sauce made only from cultivars of rowanberry. The content of total carotene of sauces was

Table 2

THE PHYSICAL PARAMETERS OF THE ROWANBERRY AND ROWANBERRY-PUMPKIN SAUCE SAMPLES

Sample designation	Total dry matter, %	Soluble solids content, °Brix	pH
A1	30.65 ± 0.12^{a}	28.30 ± 0.16^{a}	2.92 ± 0.04^{c}
A2	28.35 ± 0.17^{b}	25.29 ± 0.11^{c}	3.23 ± 0.01^{a}
A3	26.35 ± 0.13^{c}	23.44 ± 0.10^{d}	2.98 ± 0.01^{b}
A4	31.38 ± 0.16^{a}	26.95 ± 0.05^{b}	3.02 ± 0.01^{b}
B1	25.92 ± 0.46^{c}	21.05 ± 0.03^{d}	2.89 ± 0.07^{a}
B2	27.03 ± 0.11^{b}	22.42 ± 0.02^{b}	3.00 ± 0.01^{a}
B3	27.16 ± 0.45^{b}	21.52 ± 0.06^{ca}	2.95 ± 0.01^{a}
B4	30.18 ± 0.25^{a}	26.30 ± 0.05^{a}	2.68 ± 0.01^{b}

* – values, marked with the same superscript letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation: A1 – 'Granatnaya'; A2 – 'Michurinskaya krasnaya'; A3 – 'Moravica'; A4 – wild rowanberry *S. aucuparia*; B1 – 'Michurinskaya krasnaya'; B2, B3 – 'Granatnaya'; B4 – 'Moravica'.

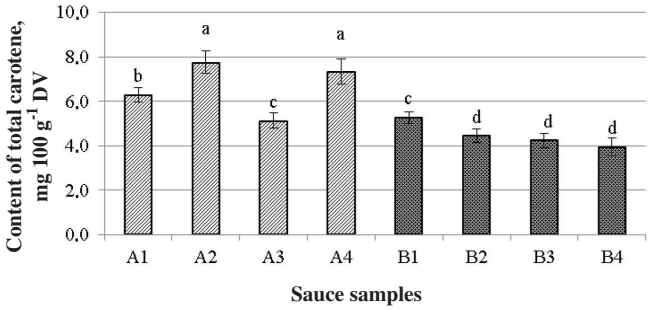

Fig. 2. Content of total carotene of rowanberry and rowanberry-pumpkin sauces

* – values, marked with the same small letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation are described below Table 2.

lower when rowanberry puree was mixed with pumpkin puree.

The results of colour L* a* b* measurements of the rowanberry and rowanberry-pumpkin sauces are shown in Table 3. The colour values significantly differed between samples ($P < 0.005$). Rowanberry sauce sample A1 (made from 'Granatnaya' puree) had the darkest colour (L* = 25.98 ± 1.73) and sample A2 (made from 'Michurinskaya krasnaya') was the reddest sauce sample (a* = 24.49 ± 1.84). The fruits of these cultivars have dark red colour. Rowanberry-pumpkin sauce sample B4 (prepared from orange-red coloured rowanberries of 'Moravica' and pumpkin puree in proportion 50:50) was the most yellow (b* = 40.05 ± 4.12).

The textural parameters of the rowanberry sauces are shown are shown in Table 4. Firmness and cohesiveness as well as consistency and index of viscosity of the sauce samples significantly differed among the samples ($P < 0.005$). Sauce sample B4 (made from 'Moravica' and pumpkin purees) had high values for all of these parameters. Firmness of

Table 3

COLOUR L* a* b* VALUES OF ROWANBERRY AND ROWANBERRY-PUMPKIN SAUCES

Sample designation	Colour L* a* b* values		
	L*	a*	b*
A1	25.98 ± 1.73a	18.86 ± 2.57b	19.09 ± 2.29b
A2	29.06 ± 2.52a	24.49 ± 1.84c	30.24 ± 1.24a
A3	43.88 ± 1.73c	13.22 ± 1.42a	30.13 ± 2.21a
A4	36.01 ± 2.78b	15.50 ± 1.75ab	21.67 ± 2.34b
B1	33.10 ± 2.02	17.29 ± 0.74	25.94 ± 1.35
B2	30.80 ± 1.94	16.31 ± 1.07	27.72 ± 3.34
B3	29.25 ± 2.41	17.70 ± 1.24	26.53 ± 2.53
B4	42.58 ± 1.48	13.74 ± 0.41	40.05 ± 4.12

* – values, marked with the same small letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation are described below Table 2.

Table 4

TEXTURAL PARAMETERS OF THE ROWANBERRY AND ROWANBERRY-PUMPKIN SAUCES

Sample designation	Firmness, N	Consistency, N s	Cohesiveness, N	Index of Viscosity, N s
A1	0.61 ± 0.03^{b}	5.36 ± 0.23^{b}	-0.66 ± 0.06^{a}	-1.11 ± 0.14^{a}
A2	0.49 ± 0.06^{b}	4.24 ± 0.45^{b}	-0.44 ± 0.05^{a}	-0.82 ± 0.21^{a}
A3	2.15 ± 0.07^{a}	18.26 ± 0.54^{a}	-2.89 ± 0.11^{c}	-4.09 ± 0.10^{c}
A4	1.85 ± 0.17^{a}	15.38 ± 1.03^{a}	-1.81 ± 0.09^{b}	-2.66 ± 0.26^{b}
B1	1.75 ± 0.18	13.55 ± 1.30	-1.79 ± 0.23	-2.16 ± 0.13
B2	1.56 ± 0.09	12.02 ± 0.95	-1.60 ± 0.18	-2.08 ± 0.12
B3	1.39 ± 0.09	12.26 ± 0.74	-1.83 ± 0.13	-2.49 ± 0.11
B4	3.11 ± 0.23	19.73 ± 1.18	-3.14 ± 0.31	-2.98 ± 0.16

* – values, marked with the same small letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation are described below Table 2.

rowanberry and rowanberry-pumpkin sauce samples varied from 0.49 ± 0.06 (sample A2, made from 'Michurinskaya krasnaya' puree) to 3.11 ± 0.23 N (sample B4, made from 'Moravica' and pumpkin purees).

The hedonic evaluation scores of the rowanberry sauce are summarised in Figure 3. The results of the ANOVA showed significant differences ($F_{calc} = 22.60 > F_{crit} = 2.72$) in the degree of liking among the rowanberry sauce samples. The hedonic scores of rowanberry sauce samples were within the scale interval from „dislike moderately" to "like slightly" (3.0–6.0). There was no significant differences between samples A1 (made from 'Granatnaya' puree) and A2 (made from 'Michurinskaya krasnaya' puree); these sauses had lower bitterness, which the panellists liked better (see Fig. 3). The panellists liked sauce sample A4 made from wild rowanberry *S. aucuparia* puree) the least ($P < 0.05$), as it was too bitter and the used mountain ash gave an expressed aftertaste. Some of the panellists noted sample A1 (made from 'Granatnaya' puree) as bitter and unacceptable, but for other panellists this sauce was acceptable. Based on the results of sensory evaluation, we can conclude that wild rowanberries *S. aucuparia* fruits, which have a

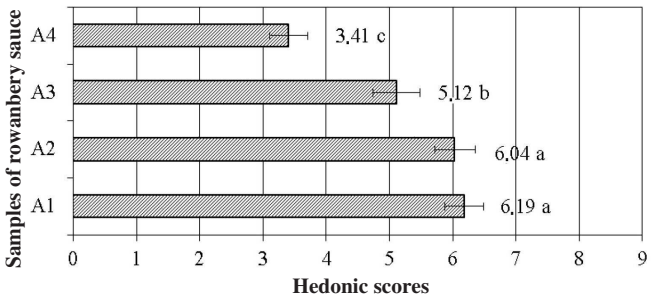

Fig. 3. Degree of liking of rowanberry sauces samples.

* – values, marked with the same small letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation are described below Table 2.

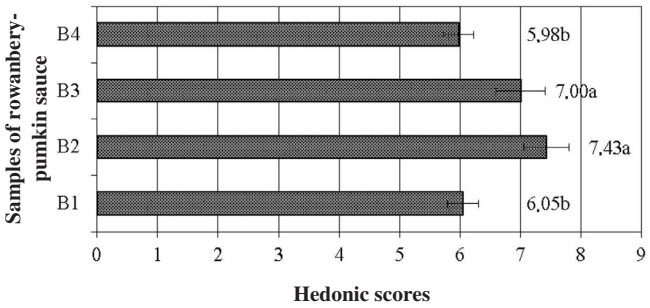

Fig. 4. Degree of liking of rowanberry-pumpkin sauces.

* – values, marked with the same superscript letters in a column, are not significantly different ($P > 0.05$).

Rowanberry cultivars used for sauce preparation are described below Table 2.

distinct bitter taste, should not be recommended for sauce preparation.

ANOVA shows that the hedonic scores of rowanberries-pumpkin sauces significantly different between samples ($F_{calc} = 7.87 > F_{crit.} = 2.67$). The panellists liked rowanberry-pumpkin sauces samples B2 and B3 (both made from 'Granatnaya' and pumpkin purees), and between these samples there was no significant difference (Fig. 4).

DISCUSSION

In comparison with content of total dry matter of rowanberry and rowanberry-pumpkin sauce samples (25.92–31.38 %; Table 2), the content in commercial ketchup samples, which are sweetened with sucrose, and light ketchup, sweetened with aspartame, was 31.21 ± 0.18 % and 27.21 ± 0.27%, respectively (Bannwart *et al*., 2008). The content of soluble solids of rowanberry and rowanberry-pum Table 2) was similar to that of chili sauce, which ranges from 22.80 ± 0.28 to 23.65 ± 0.21 ^{o}Brix (Rengsutthi and Charoenrein, 2011), and with the content of soluble solids of light ketchup — 26.68 ± 0.46% (Bannwart *et al*., 2008).

Among the parameters analyzed for the sauce quality, pH is very important because acidity influences the thermal processing conditions required for producing safe products. However, pH of tomato products not exceeding pH < 4.5 are generally classified as acid foods (pH 4.5), which require moderate conditions of processing to control microbial spoilage and enzyme inactivation (Hayes *et al*., Lehkoživová *et al*., 2009). The rowanberry and rowanberry-pumpkin sauce samples had lower pH and can classified as a high acid food item, such as tomato ketchup (Bannwart *et al*., 2008) and chilli sauce (Rengsutthi and Charoenrein, 2011).

The results showed that colour L* and b* values of sauces was increased by the replacing of part of rowanberry puree with pumpkin puree. The rowanberry-pumpkin sauce samples had lighter colour and more yellowness than rowanberry sauces.

Firmness of sauces was increased by replacing of part of rowanberry puree with pumpkin puree. In comparison with rowanberry sauce, rowanberry-pumpkin sauce was prepared with less salt and sugar. The parameters of sauce consistency, cohesiveness and index of viscosity were also higher. According to sensory evaluation remarks, the panellists did not like firmness of sauce samples A3, A4 and B3 (in range from 1.85 ± 0.17 to 3.11 ± 0.23 N).

According to panellists, the evaluated sauces were sweet and salty, and they did not like colour of sample A3 (made from 'Moravica' puree), which was made from orange-red coloured rowanberries.

To obtain a softer taste and structure that would have a typical ketchup consistency, the pannellists recommended a mix of several rowanberry cultivars or addition of other fruit puree.

The summary of sensory evaluation questionnaires and the colour L *, a * and b * values of rowanberry sauces indicated that the panellists liked colour of samples A1 (made from 'Granatnaya' puree) and A2 (made from 'Micurinskaya krasnaya' puree). It is possible that the red colour of the sauce is acceptable, as it has the colour of tomato and cranberry sauce. Sample A3 (made from 'Moravica' puree) was liked best by panellists (Fig. 3), but the colour of this sauce was not acceptable to them. This can be explained by the available and most popular sauces appearance in the market, i.e. the colour of the brown-orange sauce was "alien" for consumers.

The conclusions are:

1. There were significant differences ($P < 0.01$) in physical and chemical parameters among samples of rowanberry and rowanberry-pumpkin sauces. The total dry matter content of sauce samples varied from 25.92 ± 0.46 to 31.38 ± 0.16%, soluble solids from 21.05 ± 0.03 to 28.30 ± 0.16 ^{o}Brix, and pH from 2.68 ± 0.01 to 3.23 ± 0.01.

2. Total carotene content differed ($P = 0.000$) between samples of rowanberry and rowanberry-pumpkin sauces, and varied from 7.34 ± 0.57 mg 100 g^{-1} DW (made from 'Michurinskaya krasnaya' puree) to 3.94 ± 0. 40 mg 100 g^{-1} DW (made from 'Moravica' and pumpkin purees).

3. Sensory evaluation showed that wild rowanberries *S. aucuparia* fruits, which have a distinct bitter taste, should not be recommended for sauce preparation. The sensory evaluation of sauce samples from rowanberry × hawthor*n hybrid* 'Granatnaya' and pumpkin purees showed that this sample had the highest value (7.43).

4. There were significant differences ($P = 0.000$) in colour L* a* b* values among the sauce samples. Colour L* values varied between 25.98 ± 1.73 and 43.88 ± 1.73, and the darkest sauce was from rowanberry × hawthorn hybrid 'Granatnaya'.

5. The firmness and cohesiveness as well as consistency and index of viscosity of the sauce samples significantly differed ($P = 0.000$) among samples, and these texture parameters were higher in the sauce made from rowanberry puree with pumpkin puree. The firmness of sauce samples varied from 0.49 ± 0.06 (sample A2, made from 'Michurinskaya krasnaya' puree) to 3.11 ± 0.23 N (sample B4, made from 'Moravica' and pumpkin purees).

ACKNOWLEDGMENTS

The research and publication has been prepared within the framework of the ESF Project No. 2011/0055/1DP/ 1.1.2.1.2/11/IPIA/VIAA/008,
Contract No. 04.4-08/EF10.PD.03.

Authors thank the Pure Horticultural Research Centre for rowanberry samples.

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Received 24 September 2012

PĪLĀDŽU UN PĪLĀDŽU-ĶIRBJU MĒRČU NOVĒRTĒJUMS

Pīlādži (*Sorbus aucuparia*) ir mazi oranžsarkanas krāsas pīlādžu koku augļi, kas literatūrā raksturoti kā nozīmīgs flavonoīdu avots, un to antioksidatīvā aktivitāte ietekmē reaktīvo skābekli un lipīdu peroksidāciju. Pīlādžu šķirņu un to starpģinšu hibrīdu augļi ir saldāki un ar mazāk savelkošu garšu nekā savvaļas pīlādži. Pētījumu mērķis bija izvērtēt dažādu šķirņu pīlādžu un pīlādžu–ķirbju mērces paraugu fizikālās un ķīmiskās īpašības, kā arī izpētīt to patikšanas pakāpi. Eksperimenti tika veikti Latvijas Lauksaimniecības universitātes Pārtikas tehnoloģijas fakultātē. Mērces tika pagatavotas no savvaļas un dažādu šķirņu saldo pīlādžu biezeņiem, kā arī no saldo pīlādžu un ķirbju biezeņiem. Mērces paraugiem noteikts kopējā sausnas, šķīstošās sausnas un kopējo karotīnu saturs, pH, krāsas L * a * b * vērtības un struktūras parametri, kā arī novērtēta paraugu patikšanas pakāpe, izmantojot hedonisko skalu. Pētījuma rezultāti parādīja, ka būtiski atšķiras pētīto pīlādžu un pīlādžu–ķirbju mērces paraugu rādītāji. Tika noteikts, ka pīlādžu un pīlādžu–ķirbju mērces paraugu kopējās sausnas saturs bija 25.92–31.38%, kopējo karotīnu saturs – no 3.94 ± 0.40 līdz 7.34 ± 0.57 mg 100 g^{-1} sausnas, un cietība – 0.5–2.2 N. Saskaņā ar sensorās novērtēšanas rezultātiem, vērtētājiem vislabāk bija pieņemami ($P < 0.05$) mērces paraugi, kas tika pagatavoti no pīlādžu šķirņu ‘Michurinskaya Krasnaya‘ un ‘Granatnaya’ biezeņiem, daļu pīlādžu biezeņa aizstājot ar ķirbju biezeni.