

FRUIT QUALITY AND PROCESSING POTENTIAL IN FIVE NEW BLACKCURRANT CULTIVARS

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A B S T R A C T

At the Lithuanian Institute of Horticulture, five new blackcurrant varieties were evaluated in terms of yield, fruit size, fruit appearance, taste and chemical composition. The cultivars evaluated were 'Gojai', 'Svajai', 'Dailiai', 'Senjorai' and 'Salviai', all of which were registered in 2004. 'Titania' served as the reference standard. Nectars and jams produced from these cultivars were also evaluated in terms of taste, ascorbic acid content, and anthocyanins content.

The cultivars with the highest yields were 'Gojai' and 'Salviai', which were significantly more productive than 'Titania'.

The new cultivars had larger, more attractive and tastier fruits than 'Titania'. Nectar and jam made from the new cultivars were also better than nectar and jam made from 'Titania'.

The cultivars with the highest ascorbic acid content were 'Salviai' with 230 mg%, and 'Svajai' with 212 mg%, compared to 'Titania' with 151 mg%.

The cultivars with the highest anthocyanin content were 'Gojai' with 414 mg%, and 'Salviai' with 402 mg%, compared to 'Titania' with 391 mg%.

Ascorbic acid content ranged from 57 to 69 mg% in nectars, and from 54 to 57 mg% in jams.

Anthocyanins content ranged from 45 to 93 mg% in nectars, and from 34 to 73 mg% in jams.

Key words: blackcurrants, fruit size, taste, chemical composition, jam, nectar

INTRODUCTION

Blackcurrants are a valuable component of a healthy diet because they are an excellent source of ascorbic acid (Hummer and Barney, 2002; Rubinskiene

and Viškelis, 2002). Blackcurrants are widely used to make juices, wines, soft drinks, and various preserved products (Płocharski et al., 1992). Blackcurrant nectar and jam contain a lot of ascorbic acid and anthocyanins (Brennan et al., 2003). Production and consumption of blackcurrant products has recently been increasing in Poland, Germany and Switzerland (Szczeplaniak, 2000; Schieber et al., 2001).

The aim of the present trial was to evaluate five new blackcurrant cultivars in terms of yield, fruit size, fruit appearance, taste and chemical composition, and to determine their potential for high-quality nectar and jam production.

MATERIAL AND METHODS

At the Lithuanian Institute of Horticulture, five new blackcurrant cultivars were evaluated in terms of yield, fruit size, visual attractiveness, taste and chemical composition. The cultivars evaluated were ‘Gojai’, ‘Svajai’, ‘Dailiai’, ‘Senjorai’ and ‘Salviai’, all of which were registered in 2004. ‘Titania’ served as the reference standard. ‘Titania’ has been reported to have high anthocyanins content but low ascorbic acid content (Kampuse et al., 2002). The cultivars evaluated are presented below:

Cultivar	Provenance	Season
Gojai	seedling of <i>R. nigrum</i> ssp. <i>sibiricum</i> Wolf.	early-bearing
Svajai	seedling of <i>R. nigrum</i> ssp. <i>sibiricum</i> Wolf.	mid-season-bearing
Dailiai	‘Ben Lomond’ x ‘Ben Gairn’	mid-season-bearing
Senjorai	‘Ben Lomond’ x D16/1/25	mid-season-bearing
Salviai	‘Minay Smyriov’ x ‘Storklas’	late-bearing

In the spring of 2001, twenty plants of each cultivar were planted in a randomized block design with four replicates of five plants each. In 2003 and 2004, yield was evaluated for each plot and recorded in tons per hectare. Average fruit weight was determined from the weight of 100 fruits from each plot.

Soluble solids were measured with a refractometer. Total sugars were measured by Bertrand’s method. Ascorbic acid was measured by titration with sodium 2,6-dichlorophenolindophenol, using chloroform to correct for the intense color of the extracts. Titratable acidity was measured by titration with 0.1 N NaOH. Total anthocyanins were measured by spectrophotometry using cyanidin-3-rutinoside as a standard and were expressed as equivalents of cyanidin-3-rutinoside. Taste and visual attractiveness were evaluated by the

Pomological Commission of the Lithuanian Institute of Horticulture and graded on a scale from 0 to 5.

Data were statistically elaborated by analysis of variance, followed by Duncan's multiple-range t-test at $P \leq 0.05$.

RESULTS

The cultivars with the highest yields were 'Gojai' and 'Salviai'. 'Gojai' produced 12.3 t/ha in 2003, and 8.3 t/ha in 2004. 'Salviai' produced 10.2 t/ha in 2003, and 7.1 t/ha in 2004. This was significantly more than 'Titania', which produced 7.9 t/ha in 2003, and 3.0 t/ha in 2004. The other cultivars were only slightly more productive than 'Titania' (Tab. 1).

Two year average fruit weight in the new cultivars ranged from 1.5 to 1.8 g in all cases, significantly higher than in 'Titania', with an average fruit weight of 1.1 g (Tab. 1).

Table 1. Yield and fruit weight in five new blackcurrant cultivars

Cultivar	Yield [t/ha]				Average fruit weight [g]			
	2003		2004		2003		2004	
	t/ha	% of standard	t/ha	% of standard	g	% of standard	g	% of standard
Gojai	12.3	155	8.3	279	1.5	134	2.1	187
Svajai	7.2	90	4.4	147	1.8	158	1.8	158
Dailiai	7.0	88	6.5	218	1.4	123	1.7	152
Senjorai	6.5	81	5.3	179	1.5	133	2.0	181
Salviai	10.2	128	7.1	239	1.5	136	1.6	140
Titania (standard)	7.9	100	3.0	100	1.1	100	1.1	100

LSD₀₅

3.66

2.96

0.19

0.66

All of the cultivars had very attractive fruit, especially 'Gojai' and 'Svajai' (Tab. 2).

Table 2. Fruit attractiveness and taste of blackcurrant and their products

Cultivar	Fruit attractiveness 0 to 5	Fruit taste 0 to 5	Nectar taste 0 to 5	Jam taste 0 to 5
Gojai	4.8 d*	4.3 b	4.6 d	4.6 bcd
Svajai	4.7 bcd	4.3 b	4.5 cd	4.7 d
Dailiai	4.6 b	4.5 c	4.6 d	4.5 b
Senjorai	4.6 b	4.1 a	4.4 b	4.5 b
Salviai	4.4 a	4.0 a	4.4 b	4.3 a
Titania (standard)	4.3 a *	4.0 a	4.3 a	4.3 a

* Means followed by the same letter do not differ significantly at $P = 0.05$ according to Duncan's t-test

All of the cultivars except 'Salviai' had better tasting fruits than 'Titania'. The cultivar with the best tasting fruits was 'Dailiai'. 'Salviai' scored the same as 'Titania' for fruit taste (Tab. 2).

All of the cultivars made better tasting nectars than 'Titania', especially 'Gojai' and 'Dailiai' (Tab. 2).

All of the cultivars except 'Salviai' made better tasting jam than 'Titania', especially 'Svajai' and 'Gojai'. Jam made from 'Salviai' scored the same as jam made from 'Titania' (Tab. 2).

All of the cultivars had slightly lower soluble solids contents than 'Titania' (Tab. 3).

The cultivar with the highest total sugar content was 'Svajai'. All the other cultivars had total sugar content similar to 'Titania' (Tab. 3).

'Senjorai' and 'Salviai' had higher titratable acidity than 'Titania'. 'Gojai', 'Svajai' and 'Dailiai' had lower titratable acidity than 'Titania' (Tab. 3).

The cultivars with the highest ascorbic acid content were 'Salviai' with 230 mg% and 'Svajai' with 212 mg%, significantly higher than in 'Titania' with 151 mg% (Tab. 3).

The cultivars with the highest anthocyanins content were 'Gojai' with 414 mg% 'Salviai' with 402 mg%, even higher than in 'Titania' with 391 mg%. 'Titania' has been reported to have exceptionally high anthocyanins content (Kampuse et al., 2002). All of the other cultivars had lower anthocyanins contents than 'Titania' (Tab. 3).

Table 3. Chemical composition of black currant fruits

Cultivar	Soluble solids [%]	Total sugars [%]	Titratable acidity [%]	Ascorbic acid [mg 100g ⁻¹]	Anthocyanins [mg 100g ⁻¹]
Gojai	12.5	6.8	2.7	125	414
Svajai	13.7	7.6	2.9	212	309
Dailiai	13.5	6.3	3.2	137	245
Senjorai	13.7	7.0	4.7	121	187
Salviai	14.9	6.0	4.2	230	402
Titania (standard)	15.5	6.9	3.5	151	391

Nectar made from 'Svajai', 'Salviai' and 'Gojai' had significantly higher ascorbic acid content than nectar made from 'Titania' (Fig. 1).

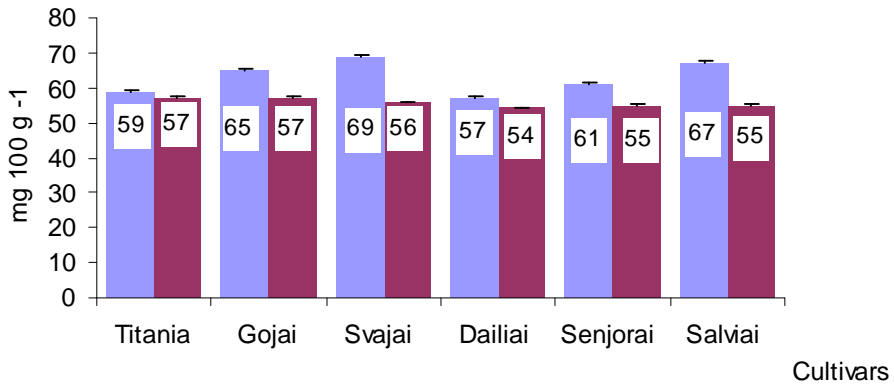
Jam made from all cultivars had the same or only slightly lower ascorbic acid content than jam made from 'Titania' (Fig. 1).

DISCUSSION

The new cultivars are all productive, with average annual yield ranging from 5.8 and 10.3 t/ha.

Ascorbic acid level in blackcurrant cultivars has been reported to be negatively correlated with fruit size (Ogolcova, 1992). Our results do not

Fruit quality and processing... new blackcurrant cvs.
Ascorbic acid in the nectar and jam



Anthocyanins in the nectar and jam

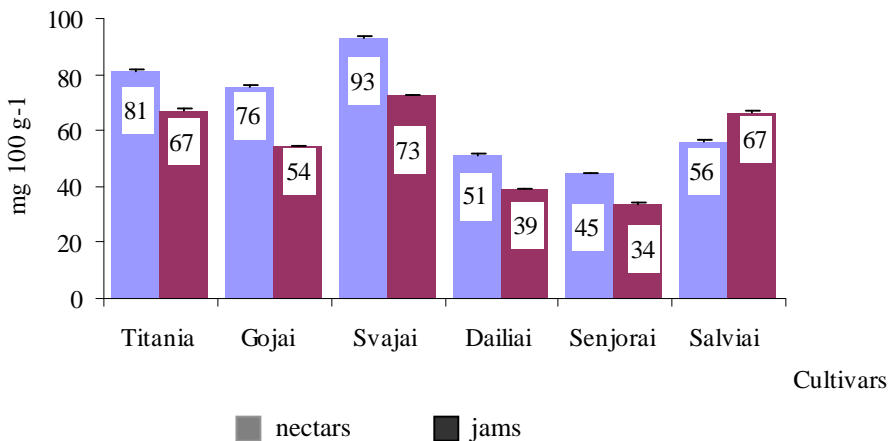


Figure 1. Ascorbic acid and anthocyanins content in nectars and jams

concur with this assertion, but are in agreement with several other studies which emphasize the role genotype plays in determining ascorbic acid content in blackcurrant cultivars (Taylor, 1989; Banaszczyk and Płocharski, 1993; Banaszczyk and Pluta, 1997; Brennan et al., 2003).

‘Gojai’ and ‘Svajai’ had exceptionally high levels of anthocyanins, higher than in ‘Titania’, which has been reported to be a cultivar with high anthocyanins content (Kampuse et al., 2002).

The new cultivars have larger, more attractive and tastier fruits than ‘Titania’. ‘Gojai’, ‘Svajai’ and ‘Dailiai’ are promising dessert varieties which taste good and have high sugar content and low acidity.

The cultivar with the highest ascorbic acid content is ‘Svajai’.

The cultivars which made nectars and jams with the highest ascorbic acid and anthocyanin contents were 'Svajai' and 'Salviai'. All of the cultivars valuated were suitable for processing. Nectars and jams made from the new cultivars tasted better and had the same or higher ascorbic acid content than nectars and jams made from 'Titania'.

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JAKOŚĆ I PRZYDATNOŚĆ DO PRZETWÓRSTWA OWOCÓW PIĘCIU NOWYCH ODMIAN CZARNEJ PORZECZKI

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S T R E S Z C Z E N I E

W Litewskim Instytucie Ogrodnictwa oceniano plon, wielkość, wygląd, smak i skład chemiczny owoców 5 nowych odmian czarnej porzeczki: 'Gojai', 'Svajai', 'Dailiai', 'Senjorai' i 'Salviai'. Wszystkie te odmiany zostały zarejestrowane w 2004 roku. Porównywano je ze standardową odmianą 'Titania'. W nektarach i dżemach wyprodukowanych z owoców tych odmian oceniano smak, zawartość kwasu askorbinowego i antocyjanów.

Średni plon z dwóch lat odmian 'Gojai' i 'Salviai' istotnie przewyższał plon uzyskany z odmiany standardowej 'Titania'.

Nowe odmiany przewyższały standardową odmianę 'Titania' wielkością owoców, atrakcyjnością wyglądu i smakiem zarówno owoców, jak i ich produktów (nektary, dżem).

Najwyższą zawartość kwasu askorbinowego miały owoce odmian 'Salviai' (230 mg%) i 'Svajai' (212 mg%). Owoce 'Titania' zawierały 151 mg% kwasu askorbinowego.

Najwyższą zawartość antocyjanów miały owoce odmiany 'Gojai' (414 mg%) i 'Salviai' (402 mg%) i przewyższały pod tym względem odmianę 'Titania', która zawierała tylko 391 mg% antocyjanów.

Zawartość kwasu askorbinowego w nektarach wynosiła od 57 do 69 mg%, a w dżemach od 54 do 57 mg%.

Poziom antocyjanów, podobnie jak kwasu askorbinowego, był wyższy w nektarach (od 45 do 93 mg%) niż w dżemach (od 34 do 73 mg%).

Słowa kluczowe: czarna porzeczka, wielkość owoców, smak, skład chemiczny, dżem, nektar