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Technological suitability of the Polka and Heritage raspberry cultivars for jam making

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Abstract: *Two everbearing raspberry cultivars (*Rubus idaeus *L.), Polka and Heritage, were processed into jam in 2023 using two recipes: recipe I with 1.2 kg and recipe II with 0.5 kg of sugar per 5 kg of fruit. Processing yield, total soluble solids (TSS), titratable acidity, vitamin C and sensory quality (10 untrained panellists) were determined. Yield exceeded 85% for both cultivars (89.3% for Polka, 92.4% for Heritage), and the TSS of the jam reached 72.4–74.4%, above the minimum of 65% recommended for jams. Polka jam had the highest TSS, acidity and vitamin C content and lost less vitamin C through processing (12.7% against 18.2%). The sensory scores showed a cultivar × recipe interaction: Polka scored best with less sugar (86.00 points) and Heritage with more sugar (88.12 points).*

Keywords: *Rubus idaeus*, soluble solids, ascorbic acid, titratable acidity, sensory analysis, sugar content

• Introduction

Raspberries are appreciated for their aroma, colour and nutritional value. The fruits contain over 85% water, sugars, organic acids, vitamin C and phenolic compounds, and their composition varies with genotype and growing conditions [1]. Fresh raspberries spoil quickly, so processing is an important way to use the harvest.

The Codex Alimentarius recommends at least 65% total soluble solids for jams [2], while heat treatment can reduce vitamin C and phenolic content [3]. The WHO advice to keep free sugars below 10% of energy intake [4] has raised interest in reduced-sugar recipes. The aim was to assess the suitability of Polka and Heritage for jam making with two recipes of different sugar content.

• Material and method

The experiment was carried out in 2023 as a 2 × 2 two-factor design: factor A, cultivar (a1 Polka, a2 Heritage); factor B, recipe (b1 recipe I, 1.2 kg sugar; b2 recipe II, 0.5 kg sugar per 5 kg of fruit). Both recipes contained a gelling agent (Gelfix), 0.5 g of ascorbic acid and 0.5 g of citric acid.

The fruits were sorted, washed, drained and boiled with sugar and the auxiliary ingredients, and the hot jam was poured into sealed glass jars (Figures 1 and 2). TSS was measured with a hand refractometer, titratable acidity by titration with 0.1 N NaOH (as malic acid) and vitamin C by the iodometric method [5]. Ten untrained panellists scored appearance, colour, consistency, odour and taste, converted to a 100-point scale. Data were processed by analysis of variance (LSD 5%, 1% and 0.1%).

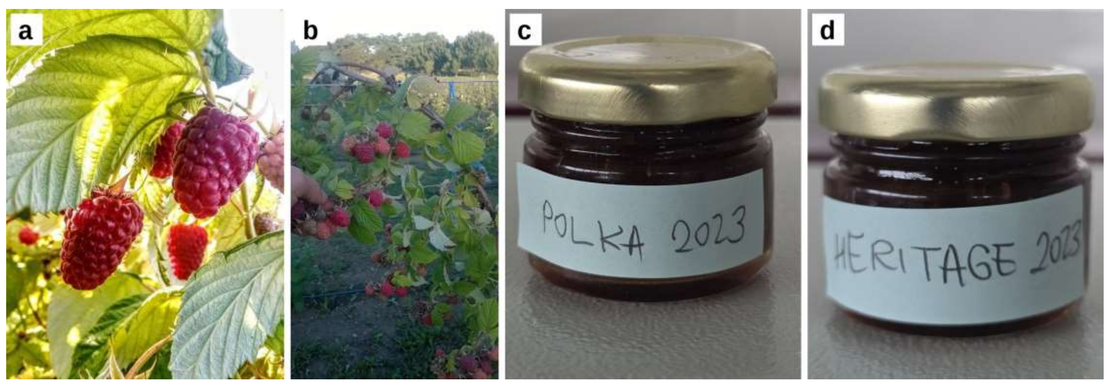


Figure 1. Biological material and finished product: a – Polka; b – Heritage; c – Polka jam; d – Heritage jam (original)

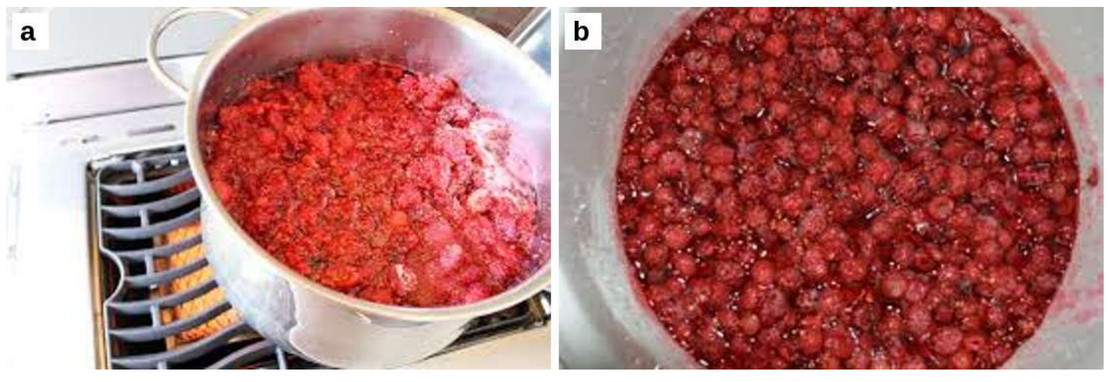


Figure 2. Jam boiling: a – initial boiling stage; b – concentration stage (original)

Table 1. Processing yield and chemical composition of the fresh fruit

Cultivar	Yield (%)	TSS (%)	Acidity (% malic acid)	Vitamin C (mg/100 g)
Polka	89.3	15.2	0.886	4.47
Heritage	92.4	13.6	0.852	4.35

• Results and discussions

Processing yield was 92.4% for Heritage and 89.3% for Polka, and the fresh Polka fruits had higher TSS, acidity and vitamin C (Table 1). Through concentration and sugar addition, TSS rose from 13.6–15.2% in the fruit to 72.4–74.4% in the jam, which ensures microbiological stability (Table 2).

Acidity fell to about half that of the fruit (0.34–0.42%) through dilution with sugar, and Polka jam kept the higher acidity of its raw material. Vitamin C fell from 4.47 to 3.90 mg/100 g in Polka (–12.7%) and from 4.35 to 3.56 mg/100 g in Heritage (–18.2%), which confirms the sensitivity of ascorbic acid to heat [3].

The sensory scores (Figure 3) showed a clear interaction. Polka scored best with recipe II (86.00 points, very good) and Heritage with recipe I (88.12 points). Polka fruits, richer in soluble solids and acids, gave a balanced sugar/acid ratio even with less sugar, while Heritage needed more sugar for a harmonious taste and a well-gelled consistency.

Table 2. Influence of cultivar (factor A) and recipe (factor B) on the chemical composition of the jam

Variant	TSS (%)	Acidity (% malic acid)	Vitamin C (mg/100 g)
A – Polka	74.42	0.42 ***	3.90
A – Heritage	72.79 –	0.34 000	3.56 0
Mean (control)	72.48	0.38	3.73
LSD 5/1/0.1%	1.35/3.11/4.17	0.01/0.02/0.08	0.10/0.23/0.74
B – Recipe I	72.41 –	0.40 000	2.79 –
B – Recipe II	73.67	0.35 0	2.81
Mean (control)	72.48	0.38	2.73
LSD 5/1/0.1%	0.82/1.24/1.57	0.01/0.02/0.03	0.02/0.04/0.07

*** very significantly positive; 0 significantly negative; 000 very significantly negative; – not significant

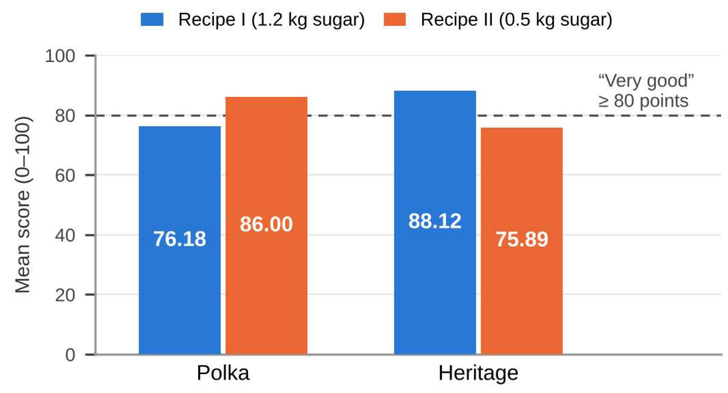


Figure 3. Mean sensory score of the jams by cultivar and recipe (10 panellists)

• Conclusions

Both Polka and Heritage are suitable for jam making: processing yield exceeded 85% and the TSS of the jam (72.4–74.4%) exceeded the recommended minimum.

Polka gave the jam with the highest TSS, acidity and vitamin C content and lost less vitamin C through processing (12.7% against 18.2% for Heritage).

The best recipe depends on the cultivar: less sugar for Polka (86.00 points) and more sugar for Heritage (88.12 points). The experiment should be repeated over several years, with a trained panel and analyses of phenolic compounds and storage stability.

Selected references

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