Analysis of the flavor quality in 10 blueberry varieties

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Abstract: In order to screen out blueberries suitable for fresh food and processing, the contents of soluble sugar, titratable acid and ascorbic acid in 10 blueberry varieties were determined, and their flavor and nutritional value were analyzed. The results showed that the AsA content of ‘Jewel’, ‘Emerald’ and ‘Sweetheart’ is significantly higher than that of other varieties. ‘Britewell’, ‘O’Neal’ and ‘Sweetheart’ had higher soluble sugar content, but lower titratable acid content. ‘Biloxi’, ‘Jewel’, ‘Brigitta’ and ‘Pink Lemonade’ had lower soluble sugar content, and higher titratable acid content. In general, ‘Sweetheart’ was suitable for both fresh food and processing.

1. Introduction
Blueberries, also known as bilberries and blue berries, belong to Vaccinium of Ericaceae. They are perennial evergreen or deciduous shrubs with small berries. The flesh of blueberry fruit is delicate and has moderate sour and sweet taste with unique flavor. Blueberry fruit contains rich nutrients, including rich sugar, amino acids, dietary fiber, vitamin C, vitamin E, K, Fe, Zn, Mn and other elements, so blueberry is very suitable for eating in fresh[1]. At the same time, blueberries are small, soft and juicy berries that mature in summer temperatures, making them difficult and expensive to keep fresh[2]. So blueberries are a great raw material for many health products. In this study, soluble sugar, titratable acid and ascorbic acid (AsA) content of 10 blueberry varieties were tested to select blueberry varieties suitable for processing or fresh food.

2. Materials and methods

2.1 Plant materials.
Blueberries were obtained in 2019 from a cooperation in Chengdu, Sichuan province. Fruits were picked and selected for uniformity without decay and external injuries.

2.2 Soluble sugar determination.
The 0.15g sample was weighed, boiled with distilled water for 20 min to extract soluble sugar, and determined by anthrone-colorimetry[3] with constant volume.

2.3 Titratable acids determination.
Titratable acids were determined by titration[3] with 0.1 N NaOH in fresh sample.
2.4 Ascorbic acid determination.
Ascorbic acid content determination was modified by Kampfenkel et al.\cite{4} using Fe\(^{3+}\) reduction method. 1 g fruit was ground and homogenized in 6% trichloroacetic acid (TCA, W/V) in precooling (4\(^\circ\)C) and the volume was fixed to 10 ml. Then the supernatant was centrifuged at 10000 g at 4 \(^\circ\)C for 10 min and collected. 0.2 ml sample solution was mixed with 6 reagents (0.6 ml 0.2 M PBS (pH7.4), 0.2 ml H\(_2\)O double distilled, 1.0 ml 10% TCA, 0.8 ml 42% H\(_3\)PO\(_4\), 0.8 ml 4% 2,2'-dipyridyl\(^{1\text{c}}\) and 0.4 ml 3% FeCl\(_3\)) and its absorbance was measured at 525 nm. And then, the ascorbic acid content was calculated by the standard curve in the same way.

3. Results
The soluble sugar content of different varieties was significantly different (fig.1) (P<0.05). The average soluble sugar content of the ten varieties was 7.53 %, among which ‘Britewell’ was the highest at 10.54±0.56 %, followed by ‘O’Neal’ at 8.93±0.68 %. However, ‘Jewel’ and ‘Pink Lemonade’ had the lowest content, 6.06±0.53 % and 5.28±0.52 %, respectively.

![Figure 1. Soluble sugar content of different blueberry varieties.](image1)

The titratable acid content of different varieties was shown in fig.2. There were significant differences between the varieties (P<0.05), with the variation range ranging from 0.06±0.02% to 1.32±0.02%: ‘Brigitta’ had the highest amount, while the second were ‘Biloxi’ and ‘Pink Lemonade’. In contrast, ‘O’Neal’, ‘Sweetheart’, and ‘Britewell’ had lower titratable acid levels, 0.06±0.02 %, 0.23±0.03 %, and 0.21±0.01 %, respectively.

![Figure 2. Titratable acid content of different blueberry varieties.](image2)
The content of ascorbic acid in different blueberry varieties was significantly different (fig. 3). The AsA content of 10 kinds of blueberry was between 0.080±0.026 mg/g and 1.150±0.089 mg/g. Among them, the AsA content of southern highbush blueberries named ‘Jewel’, ‘Emerald’ and ‘Sweetheart’ was significantly higher than that of other varieties (p < 0.05), with the AsA content being 0.970±0.087 mg/g, 1.105±0.064 mg/g and 1.150±0.089 mg/g, respectively. The AsA content of ‘Biloxi’ and ‘O’Neal’ was significantly lower than that of other varieties, 0.082±0.006 mg/g and 0.125±0.030 mg/g, respectively, which are also the southern highbush blueberries. ‘Britewell’, ‘Pink Lemonade’ and ‘Britewell’ had the median AsA levels of 0.382±0.127 mg/g, 0.357±0.225 mg/g and 0.551±0.060 mg/g, respectively.

4. Conclusions
The contents of ascorbic acid, soluble sugar and titratable acid in the fruits of the 10 blueberry varieties tested in this study varied widely, reflecting the unique flavor and nutritional value of different blueberry varieties. Among them, the AsA content of ‘Jewel’, ‘Emerald’ and ‘Sweetheart’ was significantly higher than that of other varieties, which had good nutritional value. ‘Britewell’, ‘O’Neal’ and ‘Sweetheart’’s soluble sugar content was higher, and titratable acid content was lower, indicating that it had better flavor and was suitable for fresh food[5-6]. The ‘Biloxi’, ‘Jewel’, ‘Brigitta’ and ‘Pink Lemonade’ had lower soluble sugar content, and higher titratable acid content with poor taste, making them more suitable as raw materials for processing. Comprehensive evaluation, ‘Sweetheart’ was suitable for both fresh food and processing.

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