Analysis of Quality of Blueberry Syrup Produced in Different Processes

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Abstract. In this experiment, blueberry syrup was prepared from ‘O’Neal’ blueberry using the optimized hot impregnation method. The sensory quality of blueberry syrup produced in different processing and from three degrees of ripeness was measured, as well as the sensory evaluation on blueberry syrup comprehensive was performed. The results showed that the quality of the blueberry syrup using ripe fruit was the best, and the quality of the blueberry syrup adding cocktail was higher than that syrup adding citric acid.

1. Introduction

Blueberry (Vaccinium spp.) belongs to the genus Vaccinium of the family Ericaceae. Blueberry tastes sweet mixed sour, with a fragrant and pleasant aroma [1,2]. Due to the unique health care function of anthocyanin in blueberry, the blueberry wild berry has received more and more attention from the food and health products industry in recent years [3].

Blueberry has high content of flesh syrup and rich pectin. It can be directly edible foods, and can also be processed into other types of products, such as blueberry juice, blueberry dried, blueberry canned, blueberry melon seeds, blueberry compound jam and other products [4,5]. Fruit syrup is a condiment that is a thick, viscous liquid consisting primarily of a solution of sugar soaked berry fruits. Fruit syrup production was based on the optimized hot impregnation method [6]. The prepared blueberry syrup was purple-red, and the texture was even. After adding different flavoring agents, the mouthfeel was good and the smell was mellow. Sensory quality is an important index for evaluating blueberry syrup [7-9]. Color and other qualities and taste are mainly affected by pigment, total acid, soluble solids and berry proportions. The blueberry syrup is analyzed and measured, and sensory quality was evaluated to provide a theoretical basis for the large-scale production of blueberry syrup and the processing and utilization of blueberries.

2. Material and methods

2.1. Material

Three ripening degrees of fruit of southern highbush variety ‘O’Neal’ were used. The ripening degrees were unripe, ripe and over-ripe. Unripe fruit was in the color-changing period (purple to blue), the ripe fruit is about one week after the end of the color change, and the over-ripe fruit is left after the color change for about two weeks. The blueberry fruits of different periods were picked and stored in a
fresh box and placed in a 4°C incubator. Blueberry Fruits with uniform size and maturity, intact epidermal fruit powder, no mechanical damage or pests and diseases at the time of sampling.

2.2. Experiment design

The test fruit pulp is made based on the improved hot dipping method. First, 100 g of lightly crushed blueberry fruit of different ripenenss and heated 30% sucrose syrup were poured into the pulp bottle, and then the slurry was poured out after being placed in a 60°C incubator for 24 h. After repeated operations, the syrup per change was increased by 10% from the previous day until the pulp concentration reached 60%. The final step is to add citric acid, cocktail two different flavoring agents to the pulp to make different flavors of fruit Pulp. Then it was stored in a refrigerator at 4°C.

Three kinds of fruits coming with two food flavor materials (citric acid and cocktail), and the experiment was 6 treatments: Treatment 1: using unripe blueberry fruits and adding citric acid (U-A); Treatment 2: using ripe blueberry fruits and adding citric acid (R-A); Treatment 3: using over-ripe blueberry fruits and adding citric acid (O-A); Treatment 4: using unripe blueberry fruits and adding cocktail (U-C); Treatment 5: using ripe blueberry fruits and adding cocktail (R-C); Treatment 6: using over-ripe blueberry fruits and adding cocktail (O-C).

2.3. Measurement items and methods

The contents of total soluble solids (TSS) were measured using hand-held refractometer (SKZ 1019, SKZ). Spectrophotometry was used to determine the color of the syrup [10]. Indicator titration was used to determine the total acidity of the syrup [11].

Ten reviewers well-trained in evaluating sensory quality of food were asked evaluate the sensory quality of blueberry syrup. The reviewers were required to stop irritating foods such as tobacco, alcohol, and spicy food within 2 hours before the evaluation. Sensory evaluation is performed on the color (0 to 10), form (0 to 10), aroma (0 to 30), and taste (0 to 50) of the blueberry syrup produced. After evaluating one sample, the reviewers need to rinse mouth with clear water and evaluate the next sample at an interval of 10 minutes.

3. Results

3.1. Soluble solids contents in blueberry fruits

The total soluble solids (TSS) contents of blueberry fruits with 3 ripening degrees were shown in Fig.1. The TSS content of blueberry fruit increased with the increase of ripeness, and the TSS content of the 3 ripeness blueberry fruits was above 11.8%, up to 14.20%, of which the over-ripe blueberry fruit was significantly higher than ripe and unripe blueberry fruit.
3.2. Color of blueberry syrup
The color of 6 experimental blueberry syrup were showed in Fig. 2. The color degree of the blueberry syrup with citric acid was significantly different. The color of the unripe blueberry syrup was up to 0.32, significantly higher than that of the other ripeness. The color of blueberry fruit syrup added to the cocktail was not affected by the change of ripeness and there was no significant difference in the color of the blueberry syrup of each ripeness, at the same time the color value was in 0.24-0.26. In the two processing conditions of blueberry fruit syrup, the distribution of chromaticity in the ripeness of the cocktail is more concentrated, and the citric acid is more dispersed, indicating that the effect of citric acid on the chromaticity is obviously greater than the effect of cocktail.

3.3. Total acid contents of blueberry syrup
The total acid content of 3 ripe blueberry syrup added citric acid and cocktail is shown in Fig. 3. There was a significant difference in the total acid content of the blueberry syrup with citric acid. The total acid content gradually increased with the increase of ripeness, and the over ripening blueberry syrup was significantly higher than the other ripeness, up to 0.50%. There was no significant difference in
the total acid content of the blueberry berries added to cocktail, and the total acid content approached 0.17%, which was similar to the color change rule. Under the two processing conditions, the total acid content of blueberry syrup added with citric acid was between 0.37%-0.50%, which was significantly higher than the total acid content of the cocktail.

![Fig.3 Blueberry syrup total acid content](image)

3.4. Sensory evaluation of blueberry syrup

In Table 1, the taste evaluation of 10 different people under different treatment of blueberry syrup was shown. The color is purple, uniform and turbid, rich and fragrant aroma, sweet taste prominent. The final total score is between 70-76 scores, which belongs to the B-level.

| Reviewer | U-A | R-A | O-A | U-C | R-C | O-C |
|----------|-----|-----|-----|-----|-----|-----|
| No.1     | 71  | 70  | 71  | 72  | 74  | 74  |
| No.2     | 72  | 72  | 72  | 70  | 75  | 75  |
| No.3     | 70  | 70  | 72  | 73  | 72  | 73  |
| No.4     | 70  | 73  | 71  | 74  | 73  | 74  |
| No.5     | 74  | 70  | 70  | 73  | 73  | 71  |
| No.6     | 70  | 70  | 72  | 72  | 74  | 72  |
| No.7     | 71  | 71  | 74  | 71  | 74  | 74  |
| No.8     | 72  | 71  | 70  | 71  | 75  | 73  |
| No.9     | 73  | 73  | 71  | 73  | 74  | 74  |
| No.10    | 73  | 70  | 70  | 75  | 74  | 76  |

U: unripe fruits; R: ripe fruits; O: over-ripe fruits; A: citric acid; C: cocktail

4. Conclusion

The results showed that the TSS of over-ripe blueberry fruits was significantly higher than other ripeness levels, followed by ripeness and lowest unripe fruit. Adding a cocktail has little effect on the color and acidity of the blueberry syrup at various ripeness degrees. The addition of citric acid affects the chroma and acidity of each ripeness degree. The acidity and color of the blueberry syrup added with citric acid was greater than that of the blueberry syrup adding the cocktail. The taste of both treatments was between 70-76 scores, and it belonged to Class B. The overall taste score in ripe period
was higher than that of unripe fruits and ripe fruits, but the overall taste of blueberry syrup adding cocktail was higher than that of lemon.

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