Study on Processing Technology of Chestnut Red Jujube Juice Beverage

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Abstract. Chestnut and red dates were used as raw materials. Chestnut was mixed with jujube juice after preparation. The effects of mixing ratio, sour agent ratio, sweetener ratio and stabilizer ratio on the taste of the product were investigated by single factor experiment. Taking the taste of the beverage as the main evolution criteria, the result showed the best ingredient: addition of chestnut juice to red jujube juice is 5:1, sweetener (white sugar) is 10%, acidifiers (citric acid) is 0.08% and stabilizer (monoglyceride) is 0.4%. On this ratio, the drink was moderately sweet and sour, and the taste was delicate. It had both the mellowness of the chestnut and the sweetness of the red dates.

1. Introduction

Chestnut is a type of nut, widely distributed in China. A number of studies have found that it not only contained a higher proportion chestnut carotene and ascorbic acid, further containing calcium, phosphorus, iron, vitamins and numerous trace elements [1]. Traditional Chinese medicine believes that chestnut had the effects of tonifying the kidney and strengthening the spleen, body and stomach. Jujube is also a nutritious product which contains a variety of vitamins, 18 kinds of essential amino acids and minerals necessary for the human body, among them vitamin C (ascorbic acid) content is dozens of times more than daily fruit. And it also contains calcium, phosphorus, iron, magnesium etc.

Since the taste and nutrients of chestnut and red dates were different, mixing them could get a certain complementary effect in flavors, nutrients and others. The beverages made from these two raw materials were not yet mature in the market. Therefore the main idea of this experiment was to make a mature jujube chestnut mixed drink.

This experiment would use chestnut juice and jujube juice mixed in different proportions, and then added different edible food additives to determine the best taste. At last, the instant powder of Chinese chestnut and jujube was made by spray drying [2] in order to extend shelf life, enhance portability, and provided a theoretical basis for the further processing of chestnut.

2. Materials and Methods

Chestnut, red dates, white sugar bought in the supermarket; citric acid, monoglyceride, sodium erythorbate, EDTA-2NA, maltodextrin, bought from Beijing chemical industry co. LTD.

HH-1 Constant temperature water bath, Shanghai Yamato Scientific Technology trading co. LTD
ADL-311-7 Spray dryer, Shanghai Yamato Scientific Technology trading co. LTD
GZX-9076 Electric blast drying oven, Shanghai Boxun Industrial Co., Ltd.
3. Experimental Method

3.1. Process. Select chestnut → shell and peel them → grind chestnut into pulp → color protection → enzymatic hydrolysis → kill enzyme → filter out the residue → get chestnut juice.[3]
Select dates → boil them → remove seeds and grind flesh into pulp → filter out the residue → get jujube juice.
Chestnut juice + jujube juice → blend them → sterilize the beverage → spray drying the mixed liquid → sieve the powder → package the product.

3.2. Provisioning. Mixed the chestnut juice and jujube juice in a certain proportion, then added a certain acidifier (citric acid), sweetener (white sugar), stabilizer (monoglyceride) to mix well, and determined the appropriate proportion of the beverage in order to get best taste.

3.2.1. The effect of the proportion of chestnut juice and red date juice on the taste of beverage. Under the fixed ratio of 0.06% citric acid, 8% white sugar and 0.5% monoglyceride, there was an investigation that different ratios of chestnut and jujube juices (2:1, 3:1, 4:1, 5:1, 6:1) had different effect on the taste of the beverage[4].

3.2.2. The effect of different concentration of sour agent on the taste of beverage. The ratio of chestnut juice to jujube juice was 5:1, sweetener 8% and stabilizer 5%. The effects of different concentration of citric acid dosage (0.02%, 0.04%, 0.06%, 0.08%, 0.10%) on the taste of beverage were investigated respectively.

3.2.3. The effect of different concentration of sweetener on the taste of beverage. Added chestnut juice: red date juice 5:1, the concentration of acid agent 0.08% and stabilizer content 5%. The effects of different amount of white granulated sugar (4%, 6%, 8%, 10%, 12%) on the taste of beverage were investigated respectively.

3.2.4. The effect of different concentration of stabilizer on the taste of beverage. Added chestnut juice: red date juice 5:1, the concentration of acid agent 0.08% and concentration of sweetener 10%. The effects of different concentration of monoglycans (0.2%, 0.3%, 0.4%, 0.5%, 0.6%) on the taste of beverage were investigated respectively.

3.3. Sensory evaluation of chestnut jujube juice. During the various tests, the 10 sensory assessors were asked to make a rational assessment based on the sensory assessment form. The scores were 100 points, and the scores given by the 10 participants were combined. Calculating the average value is the beverage taste score under different ratios.

3.4. Spray drying. The chestnut red dates were added to maltodextrin which was 85% of the solid content of the beverage[5], and thoroughly mixed then spray-dried to prepare the chestnut red jujube instant powder.

4. Results and Analysis

4.1. The effect of different ratio of chestnut juice and jujube juice on the taste of beverage. When the mixing ratio of chestnut juice and jujube juice was 2:1, the sweetness of red dates was too strong to taste the unique flavor of chestnuts. As the proportion of chestnut increases, the taste of chestnut gradually deepens while the sweetness of red dates decreases, and the taste of beverages become better. When the ratio of chestnut juice and jujube juice was 5:1, the flavours of beverages were well blended, with the unique mellow taste of chestnut and the sweetness of red dates.
Figure 1 The effect of different ratio of chestnut juice and jujube juice on the taste of beverage

4.2. The effect of different concentration of sour agent on the taste of beverage. The effect of the different concentration of sour agent on the taste of beverage was shown in Figure 2.

Figure 2 The effect of different concentration of sour agent on the taste of beverage

When the acidulant (citric acid) was added in an amount of 0.02%, the sweetness of the beverage was heavier, but the acidity was not very noticeable. As citric acid concentration increased, the sourness of the beverage increased while the sweetness decreased, and the taste of beverage gradually improved. When the proportion of sour agent reached 0.08%, the sweetness of the beverage was appropriate, and the overall taste of the beverage was good. If continued to increase the concentration of sour agent, the beverage would become sour and the sweetness was reduced. It could be concluded that the optimum concentration of sour agent in the beverage was 0.08%.

4.3. The effect of different concentration of sweetener on the taste of beverage. When the sweetener (white granulated sugar) was added in an amount of 4%, the acidity of the beverage was high, leaded to the sweetness was hard to be perceived and the overall taste of the beverage was more acidic. As the proportion of white sugar added increases, the sweetness of the beverage gradually increase. When the proportion of white sugar reached 10%, the sweetness of the beverage was appropriate and the acidity was moderate, which was very suitable for drinking.
Figure 3 The effect of different concentration of sweetener on the taste of beverage

4.4. The effect of different concentration of stabilizer on the taste of beverage. When the concentration of the stabilizer added 0.2\%, the taste of the beverage was relatively low, and there was a slight astringency which was not delicate. As the proportion of monoglyceride increased, the taste of beverage gradually became finer and better. When the amount of monoglyceride was 0.4\%, the beverage tasted best with a delicate and refreshing texture. Then increased the proportion of monoglyceride, the beverage began to become sticky.

Figure 4 The effect of different concentration of stabilizer on the taste of beverage

5. Spray drying and rapid solubility experiments
After adjust the value of the spray dryer (1mL/min,0.1MPa,inlet temperature 145\(^{\circ}\)C), the beverage was piped into the spray dryer, and finally the chestnut jujube powder was obtained. The powder was creamy, slightly yellowish white, natural bulk, stable, and better dissolution.

6. Conclusion
The ratio of chestnut juice to red jujube juice was 5:1, added the concentration of citric acid of 0.08\%, with white sugar content 10\%, and the concentration of monoglyceride of 0.4\%. Both the aroma of chestnut and the sweetness of red dates were in the beverage. It was sweet and sour, with a delicate and refreshing taste and a good drinking experience. This experiment could provide some theoretical basis for the further processing of Chinese chestnut.

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