Production Technology and Stability Study of Chaenomeles Lagenaria Leben Based On Data Analysis

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Abstract. Objective: Chaenomeles lagenaria fermented milk beverage was will to raw milk fermented yogurt after adding concentrated C. lagenaria juice, stabilizer and organic acid, sugar, water allocation. The production technology of fermented beverage for C. lagenaria and its stability were studied, thus for C. lagenaria the production technology of fermented beverage used to provide reliable reference for industrial production. Methods: Through the experiment, optimized condition of the production process of milk beverage, and to make good C. lagenaria stability of fermented milk beverage were studied. Results: add the yogurt, 40% 0.5% concentrated C. lagenaria juice stabilizer for optimum process conditions. The optimum proportion of stabilizers for sodium carboxymethyl cellulose 0.15%, polysaccharide compounds 0.1%, xanthan gum 0.2%. Conclusion: Through data analysis that C. lagenaria fermented milk beverage production need reasonable ratio of concentrated C. lagenaria juice and yogurt combine to produce fermented milk quality and taste are good C. lagenaria.

Keywords: Chaenomeles Lagenaria, Fermented Milk Beverage, the Production Process, the Stability

1. Introduction

Fermented milk beverage is fresh milk or dairy products as a raw material, the emulsion made by lactic acid bacteria fermentation adding water, sugar, stabilizer mixing, add fruit juice in yogurt, not only could make the product was rich in nutrition, also could increase the range of products [1]. Fermentation lactic acid bacteria beverage with the deployment of different type of lactobacillus drink, its acidity was obtained by fermentation, and sour agent, it was more suitable for people to taste. Lactobacillus drink juice adding amount was 3% -20%, protein content was in commonly 0.7% 1.0%, milk and juice in combination with rich nutrition, suitable for consumers, especially children drinking [2-5]. Different drinks, mainly taste and quality, the most important in the development of different drinks, paid attention to the needs of different people to drink, guarantee d the constantly selling drinks.

Chaenomeles lagenaria is rich in nutrients, such as polysaccharides, organic acids, pectin, protein, nitrogen acids, vitamins, minerals, and other active substances [6]. The proportion of different materials had a great impact on quality, also affected the taste of the product, so, C. lagenaria as raw material, this article in view of the current by the broad masses of people to like the production technology of fermented beverage
was studied, to make the process more suitable for large-scale production of the factory. And to study its stability, guarantee the stability of the products and quality.

2. Materials and Methods

2.1. Materials and Equipment
Fresh milk: 50 kg;
C. lagenaria: 50 kg;
Direct investment type starter cultures: Number of living bacterium in general was 1010-1012 CFU/g, Harbin meihua biotechnology co., LTD;
Citric acid: CAS 77-92-9, Mudanjiang city feng chemco. LTD provides;
Stabilizer (sodium carboxymethyl cellulose, polysaccharide compounds, xanthan gum): The purity was 98%, Shandong yantai chemical plant;
Electronic balance: Model BLXK - JA3003B, Beijng yuanda technology co., LTD. Production of Chinese and western;
Constant temperature box: Model FYL - YS - 280 l, Beijing f means electric appliance co., LTD;
800 type centrifugal precipitator: Shanghai surgical instrument factory;
Homogenizer: model DHH1 - GYB, westernized instrument (Beijing) technology co., LTD. Production;
Small sugar refractometer (0-50%) handheld fruit sugar meter: Shandong ChengTeng machinery co., LTD. Offers;
Thermo Eutech utility analysis instrument PH meter: Shanghai hin instrument equipment co., LTD.

2.2. Test Method
(1) The preparation of samples
Took an appropriate amount of sample, the samples was washed, peeled and homogenized.
At 55℃ heat for 120 min, after filtered, the sample was made of a liquid reserve. Every batch of products was repeated 3 times, Took the average.

(2) The determination of acidity [7, 8]
Acidity showed Jie er, degrees (°T). took 5 mL sample, added 50 mL distilled water, which boiled and cooled to room temperature, added 2-3 drops phenolphthalein indicator, in 30s, the sample liquid was not fade as the titration end point, recorded the consumption number of NaOH standard solution (A). oT = A×20.
Every batch of products was repeated 3 times, Took the average.

(3) Determination of total sugar [9, 10]
Took 100 ml solution placed in 200 ml volumetric flask, added 10 ml 6 mol / L HCl, in (80 ±2 )℃ water bathed heating for 10 min, added cold water tank in the cooling and methyl red indicator 2 drops with 6 mol / L and 1 mol / L NaOH solution and water content. Calculating formula: X (%) =250A G/1000Wx100%. Every batch of products was repeated 3 times, Took the average.

(4) Soluble solids content
Soluble solids was refers to the liquid or fluid the floorboard of the compound of food all dissolved in the water, mainly refers to soluble carbohydrate substances or other soluble substances. Determination of sugar by means of Spectrophotometry. It was corrected with Water, took C. lagenaria extraction with a glass rod placed in sugar meter of glazing, even after closing, in the observation window to observe and record the data. Every measurement was to use to ion water clean the window, with special paper on clean it again the next. Every batch of products was repeated 3 times, Took the average.

(5) The value of pH [11, 12]
Determination was by acidity meter, pH composite electrode (or pH glass electrode and calomel electrode standard). Specific procedure: according to the acidity meter instruction on pH meter (or acidity meter), selected and C. lagenaria leaching solution pH value closed to the standard of pH buffer solution (acid with pH4.01 buffer solution, neutral with pH6.87 buffer solution, alkaline pH9.18 buffer solution) as the standard, the pH value was consistent with the standard values of correction instrument instructions. PH meter composite electrode (or pH glass electrode and calomel electrode standard) inserted in the extraction liquid
of C. lagenaria, gently turn the beaker, read pH value. After each sample determination, rinsed the electrode with distilled water and dried the water absorption and filter paper. Every batch of products were repeated 3 times, Took the average.

(6) Determination of stability
Took 10 mL samples into the centrifugal graduated tube, 3500 r/min, 15 min and centrifugal poured sediment weighing. Sedimentation rate = sediment weight / sample weight. Every batch of products was repeated 3 times, Took the average.

2.3. The Process Flow
C. lagenaria of fermented milk beverage production process flow diagram as shown in figure 1.
Mainly includes the processing of C. lagenaria juice concentrate, raw milk and mixed corpus processing and so on, each process at the same time. And then mixed with.

Figure 1. The process flow

(1) The preparation of concentrated C. lagenaria juice
a. Choose and cleaned
Basically the same level of C. lagenaria, Fruit of diseases and pests and mechanical injury fruit picked out, remaining C. lagenaria into the water to clean;
b. Pre-cooked and Fracture:
Pre-cooking could reduce the enzyme activity, prevent oxidative browning, inhibited bacterial reproduction, and improved the rate of juice. Crushing by mechanical extrusion, the particle diameter of the particle was generally between 4~8mm. In order to prevent the flesh browning during breaking, 1% ascorbic acid was added.
c. Extracted Juice
The ratio of material to water was between 1:1.4 and 1:1.2, and the extraction temperature was controlled at 45 degrees. Soak time was about 2 hours.
d. Clarified
With pectinase clarification, enzyme, extraction liquid temperature was 55 °C, the heat was for 50 min, stirring and centrifugal sedimentation, C. lagenaria juice was concentrated.

(2) The preparation of yogurt

a. The pretreatment of the raw milk [13, 14]

Made gauze filter to raw milk, remove impurities, and detected the microorganism content, to the national standard requirements. Physical and chemical indicators: > 3.2% of fat, protein > 2.8% and > 10.8% of dry matter, acidity of 16 to 18 degrees, 72% alcohol test negative, active in good condition, without exception, boiled experiments sensory indicators: milk for milk white or yellowish. Which not contained any visible foreign matter, had no the unusual smell.

b. The sterilization, homogeneous

After processing the raw milk was heated to 90 °C ~ 95 °C, kept 5 min, mixing and cooling temperature, the temperature drop to 65°C ~ 70°C, the homogeneous and homogeneous pressure was 15 ~ 20 mpa.

c. The inoculated fermentation [15]

After homogeneous mixing cooling, the temperature fell to 42 °C ~ 45 °C, the join direct investment type yeast, fermentation, fermentation time was 4 ~ 5 h, commonly, titratable acidity for 80 DHS T, fermentation was complete, the end of the fermentation.

d. A mixture of material

After mixing mixed stabilizers, granulated sugar, adding suitable amount of water, heating and 60 °C after homogeneous. After dissolved the citric acid water, mixed with the material, and its pH value allocate to around was pH=4, then constant volume.

e. Homogeneous, packaging

After mixing the yogurt and material, under the condition of pressure was 25 Mpa for homogeneous, and filling. Which finished quickly cooled to 10 °C, as for the refrigerator cold storage.

2.4. The Best Process Test Method

In single factor the amount of acid milk, C. lagenaria juice to add quantity, mixed stabilizer dosage after the impact on the overall evaluation, according to the orthogonal experiment was carried out in table 1.

Table 1. Dosage of acid milk, C. Lagenaria juice content, and mixed stabilizer dosage levels of factors orthogonal table

| Factor levels | Sour milk consumption (%) | C. lagenaria juice to add quantity (%) | Mixed stabilizer dosage (%) |
|---------------|---------------------------|---------------------------------------|------------------------------|
| 1             | 20                        | 2                                     | 0.2                          |
| 2             | 30                        | 5                                     | 0.5                          |
| 3             | 40                        | 8                                     | 0.8                          |

2.5. Taste Evaluation

According to the product taste, flavor, organization state, color and so on comprehensive score, by several senses, sensory evaluation criteria as shown in table 2.

Table 2. Sensory evaluation standard samples

| item                      | standard for evaluation                                      | score |
|---------------------------|-------------------------------------------------------------|-------|
| flavor (30 points)        | a rich C.s lagenaria and milk flavor                        | 28-30 |
|                           | C. lagenaria milk fragrance and flavor, without peculiar smell | 20-27 |
|                           | No C. lagenaria and milk fragrance                           | 15-20 |
|                           | peculiar smell                                              | <15   |
|                           | Sweet and sour moderate, delicate taste                      | 27-30 |
|                           | Delicate taste, but the acidity                             | 23-26 |
| On the palate (30 points) | Sour taste light, without lactic acid drinks the unique atmosphere | 17-22 |
|                           | had rough taste sour                                         | <17   |
3. The Results and Analysis

3.1. C. Lagenaria Fermentation Lactic Acid Bacteria Beverage Process
This paper USES L9 (33) orthogonal test method for C. lagenaria fermentation lactic acid bacteria beverage process method for screening, the single factor level as shown in table 3. Orthogonal test results as shown in table 3, the factors of primary and secondary relations for the amount of acid milk add quantity > mixed stabilizer dosage > C. lagenaria juice. Known from the analysis of poor R, yogurt dosage biggest influence on the stability of the product, C. lagenaria juice content next, the influence of the dosage of mixed stabilizers. Have a test to get the most suitable formula ratio of 30% dosage of acid milk, C. lagenaria juice 8%, mixed 0.2% dosage of stabilizer, the overall evaluation scores the highest at this time. Therefore was used as a C. lagenaria the best proportion of fermentation lactic acid bacteria beverage production process. C. lagenaria fermentation of lactobacillus drink a lot of research production process, each scholar's research results had some differences, and each scholars focused on aspects of different, results also exists certain differences. This research mainly focuses on the taste and quality of C. lagenaria fermentation lactic acid bacteria beverage, through different people taste evaluation to determine the best process. Through research that C. lagenaria in order to improve the production process of fermentation lactic acid bacteria beverage is important for quality.

Table 3. L9 (33) orthogonal test results analysis table

| mark | Consumption of Sour milk | additive amount of C. lagenaria juice | Mixed stabilizer dosage | comprehensive score |
|------|--------------------------|--------------------------------------|-------------------------|---------------------|
| 1    | 1(20%)                   | 1(2%)                                | 1(0.2%)                 | 72                  |
| 2    | 1                        | 2(5%)                                | 2(0.5%)                 | 79                  |
| 3    | 1                        | 3(8%)                                | 3(0.8%)                 | 76                  |
| 4    | 2(30%)                   | 1                                    | 2                       | 81                  |
| 5    | 2                        | 3                                    | 3                       | 84                  |
| 6    | 2                        | 3                                    | 1                       | 87                  |
| 7    | 3(40%)                   | 1                                    | 3                       | 82                  |
| 8    | 1                        | 2                                    | 1                       | 79                  |
| 9    | 3                        | 3                                    | 2                       | 83                  |
| 10   | 75                       | 77.6                                 | 78.2                    |                     |
| 11   | 84.2                     | 80.3                                 | 81.2                    |                     |
| 12   | 82.5                     | 82.4                                 | 81                     |                     |
| 13   | 7.2                      | 4.1                                  | 1.7                     |                     |

3.2. Stability Study
Easy to gather in the milk casein in acid precipitation, stratification, to prevent the generation of precipitation, adopt the following measures [16]: (1) homogeneous, the protein particles become smaller; (2) to adjust pH value, avoid the isoelectric point of casein; (3) use stabilizer, forming a protective solution, avoid protein aggregation. At present, the product that sells on the market, the main use of stabilizer. And separate use of a stabilizer of the effect not beautiful, so using mixed stabilizer [17, 18]. Commonly used stabilizers have Arabic gum, xanthan gum, sodium carboxymethyl cellulose, pectin, carrageenan, polysaccharide compounds,
etc., this experiment adopts sodium carboxymethyl cellulose (CMC - Na), xanthan gum, polysaccharide compounds.

By L9 (33) orthogonal test methods for three kinds of stabilizer ratio test, test factors level as shown in table 4 Orthogonal Test Results as shown in Table 5, Through the Size of the Precipitation Rate, The Optimum Proportion of Three Kinds of Stabilizer was Determined

The table 5 showed that within the scope of this design of experiment, the factors of primary and secondary relations of polysaccharide compounds > CMC - Na > xanthan gum. Poor R analysis showed that polysaccharide compounds biggest influence on the stability of the product, CMC Na took second place, the effect of xanthan gum was minimal. By the orthogonal experiment result, the optimum formula of three kinds of stabilizer was that CMC - Na was 2.5% 2.5%, xanthan gum was 1.5%, polysaccharide compounds, but the xanthan gum had less effect on the deposition rate, considering the economic factors, the adjustment was 0.5%, so the most suitable stabilizer formula for CMC Na was 2.5%, 2.5%, xanthan gum was 0.5%, polysaccharide compounds as samples of the precipitation rate was the lowest, stability was the best. On consulting a large number of data also found that the result obtained by different proportion, the stability study of this study by orthogonal analysis, obtained the best stability evaluation.

| Table 4. Three stabilizer dosage levels of factors orthogonal table |
|-----------------|-----------------|-----------------|-----------------|
| level of factor | CMC-Na (%) | Polysaccharide compounds (%) | Xanthan gum (%) |
| 1               | 0.5        | 0.5             | 0.5             |
| 2               | 1.5        | 1.5             | 1.5             |
| 3               | 2.5        | 2.5             | 2.5             |

| Table 5. L9 (33) orthogonal test results analysis table |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Mark            | CMC-Na (%)     | Polysaccharide compounds (%) | Xanthan gum (%) | Precipitation rate (%) |
| 1               | 1(0.5%)        | 1(0.5%)          | 1(0.5%)         | 0.61            |
| 2               | 1              | 2(1.5%)          | 2(1.5%)         | 0.53            |
| 3               | 1.5            | 3(2.5%)          | 3(2.5%)         | 0.66            |
| 4               | 2(30%)         | 1                | 2               | 0.51            |
| 5               | 2              | 2                | 3               | 0.62            |
| 6               | 2              | 3                | 1               | 0.63            |
| 7               | 3(2.5%)        | 1                | 3               | 0.67            |
| 8               | 3              | 2                | 1               | 0.49            |
| 9               | 3              | 3                | 2               | 0.71            |
| 10              | 0.60           | 0.60             | 0.58            |                 |
| 11              | 0.58           | 0.54             | 0.65            |                 |
| 12              | 0.62           | 0.67             | 0.60            |                 |
| 13              | 0.04           | 0.13             | 0.08            |                 |

4. Conclusion
C. lagenaria fermentation lactic acid bacteria beverage as a popular favorite drinks, produce and export feeling better drink that needed to be processed in the production process of the best, but in a large number of industrial productions needed to be the best production technology research. This study fermentation for C. lagenaria to study the best production technology and stability of the lactobacillus drink provided a certain basis for mass industrial production. The dosage of acid milk, C. lagenaria juice content, mixed dosage of stabilizers were added, achieved the best taste, and CMC Na, polysaccharide compounds, different ratio of xanthan gum analysis can get the best flavor.

4.1. C. Lagenaria Fermentation of Lactic Acid Bacteria Beverage Optimum Production Process Conditions
C. lagenaria fermentation of lactic acid bacteria beverage optimum production process conditions for the dosage of acid milk 30%, C. lagenaria juice 8%, mixed 0.2% dosage of stabilizing agent, so its comprehensive evaluation score the highest taste best. C. lagenaria fermentation lactic acid bacteria beverage production technology was conducted by orthogonal analysis, the three different concentrations of acid milk consumption, the proportion of three different C. lagenaria juice to add quantity, the proportion of three different dosage of mixed stabilizers were analyzed and the best technological conditions was obtained. The results and other research results, there existed certain differences of different beverage, adding quantity was obviously different. This study draw lessons from other scholars research results on repeat test verification, so as to get the best production technology.

4.2. The Molecular Structure of the Stabilizer Contains a Large Number of Hydrophilic Group

The molecular structure of the stabilizer contains a large number of hydrophilic group, in the process of lactic acid bacteria beverage production and research and development for the taste, flavor, such as organization structure, the stability plays a very important to do with [19-21]. The best proportion of mixed stabilizers is CMC - Na was 2.5% 2.5%, xanthan gum 0.5%, polysaccharide compounds, the stable effect was best. Guarantee the quality of the C. lagenaria fermentation lactic acid bacteria beverage, taste and flavor is the need to use stabilizer, the stability of the research is C. lagenaria was an important step in the fermentation lactic acid bacteria beverage. The CMC - Na, polysaccharide compounds in this study, the amount of adding xanthan gum were analyzed, and the orthogonal analysis was carried out on the different proportion of additives, so as to get the best addition amount, so as to adopt the best proportion of mixed stabilizer for CMC Na was 2.5%, polysaccharide compounds was 2.5%, xanthan gum was 0.5%, which could guarantee the quality of the C. lagenaria fermentation lactic acid bacteria beverage, taste and flavor.

This study will therefore this condition as the best technology of C. lagenaria fermentation lactic acid bacteria beverage production, can be used for industrial production. For stability studies have shown that this is the best way of matching, can make the C. lagenaria fermentation lactic acid bacteria beverage best taste, flavor, the structure of the organization. With the continuous development of technology, the best environment for development was made; get better production process, for the masses to provide better drink.

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