

Study on the process of Belgian style Cherry sour beer

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Abstract. Traditional sour beer is not acceptable to everyone, but sweet and sour beer is much more acceptable. For example, many sour beers are made with cherries, raspberries and other ingredients. Belgian style cherry sour beer, on the basis of acidizing process, add fruit raw materials to continue fermentation, taste and flavor acceptable degree will be much higher than ordinary sour beer, because these fruits are more nutritious, resulting in these wines are easy to health, health and high-end. In this experiment, the production process of passion fruit cider was studied: The initial sugar content was adjusted to 12°P and the pH at the end point of acidification was 3.8. S-04 yeast was used for fermentation, and the fermentation temperature was controlled at 18°C. After one week of fermentation, the mixing ratio of cherry juice and fruit puree was 1:1.5. After continued fermentation for three days, cherry style sour beer was made with strong flavor, strong killing taste, pure body and clear cherry flavor.

Key words: craft beer; cherry beer; Belgium style; sour beer.

1. Introduction

The cherry fruit ripens early and enjoys the reputation of being the first fruit of early spring [1,2]. Its fruit is rich in nutrients, vitamins and iron [3,4,5], which promotes the regeneration of hemoglobin and is beneficial for anemia patients [6, 7].

Because of its unique style, the taste of Belgian sour beer takes a lot of people to get used to , but for a few loyal fans, it is a lifelong hobby [8,9]. If you like a fruity, sour beer, cherry beer is a good choice [10].

2. Material and Experimental Equipment

2.1 Materials

Table 1. Specifications and manufacturers of main test reagents.

Reagent Name	Specifications	Manufacturer
US-05 yeast	Dry	Fermandis Yeast Co., LTD
S-04 yeast	Dry	Fermandis Yeast Co., LTD
CBC-1 yeast	Dry	Laman Yeast Co. LTD
Cherry juice	50L	Bokelai Juice LTD
Cherry puree	10Kg	Bokelai Juice LTD
NaoH	Analytical purity	Shantou xilong chemical Co., Ltd
Anhydrous ethanol	500ml	Shanghai Shenggong Biotechnology Co., Ltd
n-octanol	Analytical purity	Tianjin Damao Chemical Reagent Factory
isooctane	Analytical purity	Sinopharm Chemical Reagent Co. LTD
HCl	Analytical purity	Shandong Quantai Chemical Co., Ltd

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2.2 Experimental Equipment

Table 2. Specifications and manufacturers of main test equipment.

Reagent Name	Specifications	Manufacturer
Small scale brewing equipment	40L/batch	Jinan zhengmai machinery equipment LTD
Electronic analytical balance	ME204E/02	Mettler toledo instrument (shanghai) LTD
pH meter	PB-10	Shanghai lichen instrument technology LTD
Handheld refractometer	WZS 80	Shanghai IEP optical instrument Co., Ltd
Alcohol distillation unit		Tianchang xuli glass instrument LTD
Electromagnetic furnace	W0298	Lechuang electronic technology LTD
Infrared heating furnace	HGJR-02	Zhengzhou tanbang Instrument LTD
Ultraviolet spectrophotometer	UV2350	Unico (shanghai) Instrument LTD
Low speed centrifuge	JW-1042	Anhui jiawen instrument equipment LTD
Colorimetric disk		Germany gerhardt LTD

2.3 Production process of sour beer

Malt milling → wort mashing → wort filtration → wort boiling → wort acidification → wort second boiling → cooling → fermentation → cooling and cold storage → Finished product.

2.4 Brewing

(1) Milling: the raw materials should be properly crushed, the skin should be broken and not broken, and the contents should be finer.

(2) Saccharification process: single mash leaching saccharification method at elevated temperature [11]. The ratio of material to water is 1:3. Pour 2400mL water into a 5000mL triangle bottle and keep the temperature at 52°C.

Keep warm for 40min. Heat up the water bath to 65°C and keep it warm for 60min. Heat up the water bath to 72°C and keep it warm for 15min. ⑤ Heat up the water bath to 78°C and rest for 10min.

(3) Filtration: Return the cloudy wort, wait until the liquid is clear and start filtering, filter to the cleaned 5000mL triangle bottle. The first wort concentration was measured with a sugar meter (10 ~ 20°P) [12].

(4) Boil the filtered wort for 60min. Add hops 0.6g at the first initial boiling; After the second boiling 30min 1.1g; 10 min. 5g before the end of the third boil. After boiling, let rest for 20 minutes.

(5) Whirlpool precipitate the boiled wort and cool it down.

(6) The wort was inoculated with yeast for fermentation after cooling.

3. Results and Discussion

3.1 Wort acidifying end pH

After the wort was cooled to 38°C, Lactobacillus was inoculated and the dosage was 0.1g/L. The culture is placed in a 37 °C constant temperature incubator. Continuous sampling is required during the culture process to prevent the pH of the acidified wort from falling below the specified end point.

Table 3. Analysis of pH and sensory evaluation of different wort acidification end points

pH	Tasting results
4.0	The sour taste of beer is not obvious and does not conform to the characteristics of sour beer
3.8	Beer has the best balance of acidity and taste coordination
3.6	The sour taste of beer is prominent and the taste coordination is poor

As can be seen from Table 3, when the pH of the end point of wort acidification is 3.8, the sour beer after fermentation has balanced acidity, good taste coordination, strong cherry aroma but not outstanding, and tastes more suitable for young consumers.

3.2 Selection and Comparison of Yeasts

Yeast has a great influence on fermentation flavor [13,14], so three different brewer's yeast, US-05, S-04 and cbc-1, were selected for comparison. After mixing, the sugar content of juice was controlled at 11 ° P and the fermentation temperature was 18-20°C. The experimental results are shown in Table 4. It can be seen that under the same conditions, the sour beer fermented with S-04 yeast has better aroma, while the sour beer fermented with CBC-1 yeast is less sour than the other two kinds of yeast. By comparison, S-04 yeast is more suitable for brewing cherry sour beer.

Table 4. Adding different proportions of cherry juice and sensory evaluation analysis

Yeasts	Tasting results
US-05	The beer is pure, sour and has a strong cherry aroma
S-04	The beer ester has a rich, sour flavor and a moderate cherry aroma
CBC-1	The beer has less flavor, a balanced acidity and a strong cherry aroma

As can be seen from Table 4, when the yeast used for beer fermentation is S-04, the fermented sour beer ester has strong flavor, good taste coordination, and strong cherry aroma but not outstanding, which is more suitable for cherry style sour beer brewing.

3.3 The added ratio of cherry puree to cherry juice

After a week of sour beer fermentation, the cherry puree and cherry juice were added to the fermentation liquid in a ratio of 1:1, 1:1.5 and 1:2. After continuing to ferment for 3 days, quickly reduce the fermentation liquid temperature to 4°C and refrigerate for 3 days. When sour beers are ready, they are evaluated and compared, and the beer with the highest score is chosen as the best ratio.

Table 5. Mixing ratio and sensory evaluation of cherry juice and fruit puree

Cherry juice and puree added ratio	Tasting results
1:1	Light acidity, fruit puree precipitation, rich cherry aroma
1:1.5	Balanced acidity, good puree and cherry aroma
1:2	High acidity, little puree precipitation, light cherry flavor

As can be seen from Table 5, when the ratio of cherry juice to fruit puree is 1:1.5, the sour beer after fermentation has balanced acidity, rich cherry aroma but not outstanding, and the taste is more suitable for young consumers. Therefore, the added ratio of cherry puree was determined to be 1:1.5.

4. Summary

In this experiment, wort was used as raw material and cherry juice and fruit puree were added to brew cherry style sour beer [15,16]. The main parameters were as follows: The end point of acidification was pH 3.8, the initial sugar degree was 12 ° P, the fermentation temperature was 18°C, S-04 yeast was used, the mixing ratio of cherry juice and fruit puree was 1:1.5, and the fermentation time was 10 days. If we use fresh cherries for juicing, the results will be better because the peel also contains many nutrients. Fresh cherry pressing

technology can be completely realized, we can continue to explore next time.

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