ISSN: 2688-8645

Brewing and Nutrient Composition Analysis of Dendrobium Beer

Yanpeng Guan

School of Bioengineering, Qilu University of Technology (Shandong Academy of Sciences), Jinan, Shandong, China

228756937@qq.com

Abstract

There are few studies on adding dendrobium as an auxiliary material to beer at home and abroad. In this study, dendrobium as an auxiliary material was added to the brewing of beer. Considering the comprehensive antioxidant effect, physical and chemical index and actual production cost, the added amount of Dendrobium is 8 ‰.Through detection and comparison, the antioxidant activity of Dendrobium beer is much higher than that of other beer, the polysaccharide content and flavonoids content are also increased compared with other beer, and the physical and chemical indicators meet the national standards.

Keywords

Beer; Dendrobium; Polysaccharide; Flavonoids; Antioxidant Activity.

1. Introduction

Beer is a globally popular carbonated alcoholic beverage and one of the largest alcoholic beverages consumed in the world.Beer recipes vary around the globe, but modern brewing techniques are very similar regardless of the style[1-2]. Studies have shown that beer contains a lot of antioxidants, so drinking beer in moderation can have anti-inflammatory and antioxidant properties[3-4], On bone mineral density[4]Have certain benefit, still can prevent coronary heart disease[5-7]. Compcompounds that contribute to the functional properties of beer are mainly antioxidants.For example, zinc, copper and other trace elements, vitamin B in B vitamins2 And polyphenols from malt (70-80%) and hops (30%) are the main natural antioxidants in beer[8-10].

Fig 1. Dendrobium

ISSN: 2688-8645

Dendrobium (Dendrobium) is a rare Chinese medicine commonly used in traditional Chinese medicine, known as "the first of the nine fairy herbs". Among them, the medicinal and tonic value of Dendrobium Huoshan is the best. More traditional medicine believes that Dendrobium Huoshan is the most authentic, the most precious Dendrobium varieties[11-12]. Dendrobium Huoshan, also known as Dendrobium rice, is a perennial herb in the genus of Dendrobium, Orchidaceae. In addition to the basic medicinal value contained in Dendrobium, Dendrobium Huoshan has the unique medicinal value of strong Yin beneficial essence, tonic deficiency win, strengthening muscles and bones, known as "the most of fairy grass in China"[13].

Like the Dendrobium, the fermented wine is rich in active substances, and the interaction between microorganisms will also affect the quality of the wine[14]. At present, the research on Dendrobium beer is only in the initial stage, and there are few researches, and no literature on the specific process and efficacy of Dendrobium beer is found. The research of Dendrobium beer still has a lot of room for development.

2. Experimental Methods

2.1. Pre-experiment

A preexperiment was first performed with the aim to explore the increased antioxidant activity of wheat beer supplemented with Dendrobium.The antioxidant activity of the samples was evaluated by measuring the beer extracellular-OH clearance capacity by the salicylic acid method.Fresh strips of Dendrobium Huoshan were extracted, and then the Dendrobium juice was centrifuged at 12,000 r p m for 10 min.After the purchased Tsingtao beer, 0.02 mL, 0.1 mL and 0.2 mL of fresh Dendrobium juice were taken respectively, labeled 1-1,1-2,1-3 in the supernet worktable (supernet worktable sterilized in advance), and three groups of Dendrobium juice were added to 10 mL degassing beer.1 mL of three samples were taken, 1 mL 9.0 mmol/L FeSO4 solution and 1 m L 9.0 mmol/L salicylate-ethanol solution were added, and finally 1 m L of 8.8 mmol/L H2O2 was added to start the reaction, 37℃ reaction for 30 min, centrifugation, and the absorbance value of each concentration was measured at 510 nm.Distilled water was used as blank group and control water instead of 8.8 mmol/L H2O2. Experiments were performed in triplicate.

At the end of the experiment, the clearance of 1-1,1-2,1-3 were 67%, 92%, 94%, respectively.However, the clearance rate of-OH without Dendrobium juice beer was only 64%, and the clearance rate of pure Dendrobium juice was 96% after centrifugation.

The Pre-experimental results showed that the beer compared with the addition of Dendrobium juice increased the antioxidant activity of beer with Dendrobium juice, so the study of Dendrobium beer has some guiding significance.In addition, in two groups 1-1 and 1-2, the antioxidant activity effect of two groups 1-2 and 1-3 was not obvious, and the antioxidant activity was close to that of the antioxidant activity of Dendrobium juice.

In conclusion, the antioxidant activity of the beer was effectively improved by adding the Dendrobium juice to the beer.In the formal small experiment, the brewing process of Dendrobium beer and its antioxidant activity for the experiment, through the Pre-experimental analysis, the amount of Dendrobium juice is set between 4 and 10.

2.2. Study on the Pilot Brewing Process and the Adding amount of Dendrobium Beer

According to the antioxidant activity of beer, 10 L control group 5 min before the end of S1, S2, S3, S4,0 mL, 40 mL, 60 mL, 80 mL, 100 mL, S1 determined the optimal amount of Dendrobium juice by detecting the antioxidant of dendrobium beer..22.6 Determination of the antioxidant activity of Dendrobium beer and the optimal addition amount of Dendrobium juice

(1) Determination of extracellular-OH by salicylic acid method

ISSN: 2688-8645

Results are shown in Table 1: The clearance rate of p-OH in the S1.S2.S2.S4.S5 five samples was 79%, 85%, 92%, 96%, 96%, respectively.

Table 1. Antioxidative activity of Dendrobium beer

number	-Clearance rate of the OH
S1	79%
S2	85%
S3	92%
S4	96%
S5	96%

The results of Table 1 show that with the increase of dendrobium juice in beer, the removal ability of extracellular-OH of beer is gradually enhanced. After the added amount is 8 ‰, the removal ability of-OH is basically stable at 96%. Through the detection data and considering the actual cost of beer production, the optimal added amount of dendrobium juice is set at 8 ‰.

2.3. Analysis Method

2.3.1. Determination of Physical and Chemical Indexes in Beer

2.3.1.1 Alcohol Level

The alcohol of beer was determined according to the volumetric method in the density bottle method in GB / T4928-2008

2.3.1.2 Diacetyl Content

Measurements were made according to the determination of diacetyl content in GB / T4928-2008.

2.3.2. Tidity.3

Beer turbidity (A) is an appearance indicator of beer transparency in terms of EBC. Beer turbidity will directly shadow to the appearance quality and non-biological stability, beer is one of the important parameters affecting the beer shelf life and evaluation of beer quality.

After degassing the liquor but without filtration, the turbidity of the beer was determined by a turbidometer according to GB / T4928-2008 Beer Analysis Methods.

2.3.3. Color Our.4

The color degree of beer was determined according to the EBC colorimeter method in GB / T4928-2008.Pour the liquor into the cuvette, and then compare it with the standard color plate. Read out the color of the liquor in EBC.

Calculation method: Chromaticity (EBC) = (S / H) 25

In formula:

- -Measured readings, Unit (EBC)

H- - -cuvette thickness, unit (mm)

2.3.3.1 Foam

Use your eyes to see the foam, color and the cup.

2.3.3.2 Foability

Place the wine sample in a water bath of about 20℃, at a constant temperature of 30 min, and clean the soaking cup thoroughly, and set up.Then according to the national standard GB / T4928-2008 "beer analysis method" stopwatch detection.

ISSN: 2688-8645

2.3.3.3 PH Value Determination of Beer

Clean the beaker and electrode with distilled water, then drain the water on the electrode with water absorbing paper, and then correct the PH meter with standard liquid. After correction, clean the electrode with distilled water, dry the distilled water on the electrode, inserted into the liquid to be tested, until the data is stable, read directly.

2.3.3.4 Measurement of the Total Acid of Beer

First, sodium hydroxide standard solution (0.1 mol / l) and 5 g / L phenolphthalein reagent are provided.Add 100 mL of distilled water to boil for 2 min, add 10 mL of samples, reheated for 1 min, turn off the fire and stand for 5 min, then the tapered flask was flushed with tap water, 0.5 mL of phenolphthalein reagent was added, and titrated to light pink with 0.1 mol/L sodium hydroxide solution.The volume of the consumed sodium hydroxide solution was recorded.

Total acid =10 C V

C Concentration of the -- sodium hydroxide solution, mol/L

V -- sodium hydroxide solution consumed in volume, mL

2.3.4. Determination of Flavone Content in Beer

Take 0.1 mL, 0.2 mL, 0.2 m L, 0.3 mL, 0.4 mL and 0.5 mL in five tubes, and then add absolute ethanol to 1.5 mL.Add 0.1 mL of aluminum nitrate solution (100 g / L) and 0.1 mL of potassium acetate solution (98 g / L) with distilled water to 5 mL.Stand for 60 min and go blank with 30% (v / v) ethanol for absorbance at 420 nm, then draw a standard curve.

A amounts of 0.1 mL of aluminum nitrate (100g / L) and 0.1 mL of potassium acetate (98 g / L) were added to a 1.5 mL beer sample with distilled water to 5 mL.It was repeated three times and let still for 60 min.The absorbance values were determined according to the standard curve drawing method, and the flavonoid content of each sample was calculated using the standard curve.

2.3.5. Determination of the Antioxidant Activity

The clearance capacity of extracellular beer-OH was determined by the salicylic acid method.

Take 1 mL sample and 1 m L 9.0 mmol/L FeSO4Solution, 1 m L of 9.0 mmol/L of salicylic acid-ethanol solution, and finally add 1 m L of 8.8 m m o l / L H, respectively2O2The reaction was initiated, 37℃ reaction for 30 min, centrifuged to precipitation, and absorbance values at each concentration were measured at 510nm.Distilled water was used as blank group and control water instead of 8.8 mmol/L H2O2. Three experiments were performed in triplicate.Hydroxyl clearance was calculated using the following formula.The sample to be measured was taken as the abscissa, and the hydroxyl clearance was taken as the ordinate.

-OH clearance rate (%) = [(A0-（Ax-Ax0）)/A0]×100%

In the above formula:

A0: Absorbance value of the blank group;

Ax: Absorbance values after adding the polysaccharide solution

Ax0: Absorbance values of the control group

2.3.6. Determination of Polysaccharides Content in Beer

The polysaccharides content was determined by the phenol-sulfuric acid method.

The principle of polysaccharide by phenol sulfuric acid method: polysaccharide under the action of concentrated sulfuric acid, dehydration of furfural or hydroxymethyl furfural, this substance can and phenol condensation to synthesize an orange-red compound, in the range of 10-100 mg its color depth is proportional to the content of sugar, and has a maximum absorption peak at the wavelength of 485 nm.

ISSN: 2688-8645

Take the right amount of glucose powder, put on the filter paper, put in the oven 105℃ drying for 2 h, remove the water, as anhydrous glucose standard, with analytical balance accurately weigh 50 mg glucose, dissolved in 30 mL distilled water, all glucose solution transferred to 50 mL volumetric bottle, fixed capacity to 50 mL, glucose concentration is 1 mg / mL, as the standard curve standard liquid.The glucose standard solution was diluted into six solutions of different concentrations according to the table shown in Table 2.

Table 2. Dilution gradient of glucose standard curve

	1	2	3	4	5	6
titer (μL)	0	20	40	60	80	100
buffer solution (μL)	100	80	60	40	20	0
Glucose concentration (mg/mL)	0	0.2	0.4	0.6	0.8	1.0

Three parts of each concentration of glucose solution were taken in three parallel, 90% phenol was diluted with water into 9% phenol solution, samples, water, 9% phenol and concentrated sulfuric acid were added to 1.5 mL centrifuge tube in the ratio of 1:3:2:10, shaken well, and stand at room temperature for 20 min to detect OD with a microplate reader485According to the OD value and glucose concentration, each sample was sampled at 5 mL, 12000 rpm high speed centrifugation, 1 mL supernatant added 3 mL anhydrous ethanol, alcohol sinking overnight, centrifuged to remove the upper precipitation and freeze-dry, dried, 1 mL of distilled water was added to dissolve the precipitation, and the polysaccharide content was detected using phenol sulfuric acid method.

3. Experimental Result

3.1. Dendrobium Beer

Table 3. Physical and chemical indexes of finished beer

surveillance project	National standard requirements	Dendrobe beer
Alcohol level (%vol)	≥ 3.3%vol	4.6
Diacetyl (mg/L)	≤ 0.10	0.092
turbidity (EBC)	/	12.45
tone (EBC)	/	14.6
foam	/	White and delicate, abundant
Bubble hold (s)	/	202
pH	/	4.55
Total Acid (mL / 100 mL)	≤2.2	1.85

The physical and chemical indexes of beer are directly related to the whole brewing process of beer. The following physical and chemical indexes of Dendrobium beer are determined according to GB / T 4928-2008 beer analysis method.The data results of Table 3 show that the beer foam is rich and white, good cup hanging, alcohol content, diacetyl content and total acid content all meet the requirements of national standards.

ISSN: 2688-8645

3.2. Comparison of Flavonoid Content, Polysaccharide Content, and Antioxidant Activity

Table 4. Flavone content, polysaccharide content, and antioxidant activity

To test the sample	Dendrobium beer	Industry beer
Polysaccharide content (mg/mL)	8.56	3.16
Flavonone content (mg/mL)	0.183	0.082
Antioxidant activity (-OH clearance)	95%	64%

The comparison of flavonoids content, polysaccharide content and antioxidant activity in beer are shown in Table 4. The table data show that the polysaccharide content, flavonoids content and antioxidant activity of Dendrobium beer are much higher than that of industrial beer.

4. Conclusion

To brew good dendrobium beer tested, the test results show the dendrobium beer diacetyl content, alcohol, color and chemical indexes are conform to the national standards, confirmed the feasibility of the brewing process, and explore the 5 min add 8 ‰ of dendrobium juice brewing process, get dendrobium beer polysaccharide content, flavonoids content, antioxidant activity is much higher than ordinary beer, has a good nutritional effect.

References

[1] Gox F. The Brewing Industry and the Opportunities for Real-Time Quality Analysis Using Infrared Spectroscopy[J]. Applied Sciences, 2020, 10(2): 135-142.

[2] Eslinger H M.Handbook of Brewing: Processes, Technology, Markets[M].Wiley-VCH, 2009.

[3] Redondo N, Nova E, LE Díaz-Prieto, et al. Effects of moderate beer consumption on health[J]. Nutricion Hospitalaria, 2018, 35(6): 353-360.

[4] Giovanni D G, Simona C, Augusto D C, et al.Effects of moderate beer consumption on health and disease: A consensus document[J]. Nutr Metab Cardiovasc Dis, 2016: 443-467.

[5] Franco L, Galán C, Bravo R, et al.Effect of non-alcohol beer on anxiety: Relationship of 5-HIAA [J]. Neurochemical Journal, 2015, 9(2): 149-152.

[6] Min Ho O, Cyril A, Eugenia B, et al.Potential mechanisms underlying cardiovascular protection by polyphenols: Role of the endothelium[J]. Free Radical Biology & Medicine, 2018: 217-223.

[7] Spaggiari G, Cignarelli A, Sansone A, et al. To beer or not to beer: A meta-analysis of the effects of beer consumption on cardiovascular health[J]. Plo S O NE , 2020, 15.

[8] Martinez Gomez A, Caballero I, Blanco C A. Phenols and Melanoidins as Natural Antioxidants in Beer.Structure, Reactivity and Antioxidant Activity[J]. Biomolecules, 2020, 10(3): 400.

[9] Shindo H, Kuwatsuka S.Phenolic Substances in Beer: Structural Diversity, Reactive Potential and Relevance for Brewing Process and Beer Quality[J]. Comprehensive Reviews in Food Science & Food Safety, 2018,2(3): 32-35.

[10] Koren D, Kun S, Vecseri B H, et al.Study of antioxidant activity during the malting and brewing process[J]. Journal of Food Science, 2019, 56(4): 4266-4271.

[11] Yan Meiqiu, Chen Suhong, Lv Guiyuan Dendrobium "thick stomach" related efficacy pharmacology research and application progress [J]. Chinese herbal medicine, 2016,47 (21): 3918-3924.

[12] Research on the synthesis of active polysaccharides in the suspension culture of Dendrobium Huoshan, Luo Jianping and Jiang Shaodong [J]. Food Science, 2005,26 (4): 4.

[13] Lu Sufang, Guo Guangjun, Cai Yongping, Research progress in the physiological and biochemical properties of Dendrobium Huoshan [J]. Chinese herbal medicine, 2006,37 (5): 4.

ISSN: 2688-8645

[14] Nie Cong, Guan Xueqin, Guo Yanwei and other of a Dendrobium officinale beer production method [P], 2018.