

Short Research Article

Blond Ale Artisan Beer Production with Addition of Pineapple Pulp

ABSTRACT

The second most consumed drink worldwide is beer. In Brazil, the brewing market is in full expansion, which allowed the emergence of several microbreweries, which end up captivating a significant portion of the consumers of the large breweries, due to the fact that they provide differentiated products, using high raw materials quality and production methods specific to each style. In this context, the objective of this work was the development of a Blond Ale beer, with addition of pineapple pulp (*Ananas comosus* L. Merrill). The physical and chemical attributes were: original and final gravity, alcohol content, total dry extract, total acidity, maltose reducing sugar, pH, color and degree of fermentation. The evaluated attributes were within the parameters of BJCP 2015. The initial and final density of the beer produced was, respectively, 1.0455 and 1.0107, and the alcohol content was 5.24%. The results of the experiment were satisfactory since most of the values found are within the range allowed for a Blonde Ale style.

Keywords: Ananas comosus, brewing process, high fermentation.

1. INTRODUCTION

Beer is the second most consumed drink, only lost to water [1], which makes it the most popular alcoholic beverage in the world [2]. In Brazil, the brewing market is in full expansion, which allowed the emergence of several microbreweries, which end up captivating a significant portion of the consumers of the large breweries, due to the fact that they provide differentiated products, using high raw materials quality and production methods specific to each style [3,4].

The Brazilian brewing sector owes its economic weight to the performance of large companies, whose main characteristic is competitive production, via the brand and increasing profit margins through productivity gains, to the detriment of differentiation and quality. However, in recent years there has been a growing trend, in which there is a predominance of small and medium-sized companies, which take a significant share of the market due to the offer of special products [5].

The brewing process has existed for millennia, yet the most significant scientific developments that have impacted production have occurred for the most part over the past 150 years. These have been integrating knowledge in several areas such as: engineering, biochemistry and microbiology [4].

Blond Ale beers are easy-to-drink beers, have their roots in malt-oriented American artisanal beer culture, often with fruity notes, hops or malty notes. Its aroma should be mild to moderate sweet mates, with slight notes of bread or caramel, the level of fruity notes is optional, but acceptable from low to moderate. Its color varies from light yellow

to golden, clear and bright, white foam from low to medium volume with good retention [6].

Pineapple (*Ananas comosus* L. Merrill) belongs to the most popular group of tropical fruits in the country, thanks to its characteristic flavor and aroma. The mature fruit presents, on average, 16.2% of total soluble solids, 0.35% of citric acid, 5.06% of reducing sugars and pH 4.15, which makes it favorable for fermentative processes, such as the production of beer [7].

From these data the present work was proposed to produce a beer in the style Blond Ale added of pulp of pineapple, contributing to the development of new products with tropical flavors maintaining the characteristics of the style.

2. MATERIAL AND METHODS

The experiment was carried out at the grain and microbrewery Laboratory of the Faculty of Food Science and Technology of the Federal University of Mato Grosso, Cuiabá campus, MT, in December 2017. For the production of artisanal beer, the recipe was used for the *Blond Ale* style, with adaptation in Sorbo's methodology [8], including concentrated pineapple pulp.

A 20 liter recipe was prepared using the BIAB (Brew in a Bag) System with the following thermal parameters: Moss: 65 °C for 90 minutes (until complete degradation of the starch); Mash out: 77 °C for 15 minutes (for enzyme inactivation and grain washing); Intense boiling: for 60 minutes (evaporation of dimethyl-sulphide (DMS) and isomerisation of hops alpha acids).

The ingredients needed to stay within the physical-chemical and sensory parameters of the style were: 25 liters of water (pH 5.5), 10 liters for shattering and 10 liters for washing the 3.5 kg agrarian malt, boiling 17 liters of must, where 6.3 g of Magnum Hallertauer hops were added in half the boil time (30 minutes) and 3.1 g of Cascade hops remaining 5 minutes boiling, after which a whirlfloc tablet was added and completed the whirlpool to form the trub (decanted protein) in the center of the pan.

At the end of the process the wort was cooled to 23 ± 2 °C by means of an ice bath, when the original gravity (OG) was measured. The brewing resulted in 15 liters of must where 11g of yeast US-05 from the manufacturer Fermentis were inoculated, which were prehydrated according to the manufacturer's recommendation for 30 minutes with 250 ml of boiled water.

The fermentation was carried out in a fermenter with sealed lid and airlock coupled for 7 days in a BOD oven, at 23 ± 2 °C. The density of the must was determined on the sixth and seventh days, when the final gravity stability (FG) was verified. The addition of 400g of pineapple pulp concentrated in the maturation was carried out maintaining for another 7 days at 5 °C.

The beer was bottled manually using the Priming technique for carbonation where sugar was added at a concentration of 7 g.L^{-1} of beer, pre-dissolved in 3.0 mL of water, with 3 drops of lemon, for inversion of sugar. This technique is based on the production of CO₂ by the remaining yeasts of the fermentation process; a carbonation of 2.4 volumes of CO₂ was achieved. Sterilized bottles of 600 mL were sanitized with 70% alcohol and sterilized at 85 °C for 30 minutes. They were capped, sealed with a manual bottle capper and stored at 18 °C for 15 days.

The physical-chemical attributes evaluated were: yield, by the difference between initial and final volume; initial and final densities, by means of immersion densimeter; pH, by means of bench pH meter; according to the formula of Lee [9]; total dry extract, total acidity, maltose reducing sugar and degree of fermentation, according to the expression of Alves [10]; and color, according to Maia & Belo [11]. Three replicates were used for

each characteristic analyzed. The determinations were carried out on samples at 20 °C decarbonated.

The analyzes were compared with the parameters BJCP 2015 for framing in style [6]. Descriptive analysis was used to discuss the results.

3. RESULTS AND DISCUSSION

In the processing of beer, the initial volume used of 20 liters, generated a volume of 13 liters of Blonde Ale beer, which gives us a difference of 7 liters throughout the production, due to losses throughout the process. That means the yield was only 65%. Despite the significant losses, the yield is within the expected, which is common for the production of small-scale craft beers [12].

Table 1 presents the results of the physical and chemical analyzes performed on beer samples with addition of pineapple pulp. The results were found to be normal through the symmetry and kurtosis tests. The physical-chemical attributes of beer meet the standards expected for a Blond Ale style (Table 1).

Table 1. Physical and chemical attributes of beer samples with pineapple pulp.

Attributes	Results obtained
Original Gravity (g/g)	1,0455±0,007
Final Gravity (g/g)	1,0107±0,002
pH	3,90±0,01
Alcohol Content (%)	5,24±0,01
Maltose (g/100g)	0,80±0,1
Acidity (%lactic acid)	0,2624±0,01
Total dry extract (%)	5,80±0,05
Primitive extract (%)	16,56±0,1
Degree of Fermentation (%)	67,11±0,6
Color (EBC)	10,07 ± 0,01

The OG and FG are close to those found in the literature. This is confirmed by Araújo et al. [12] which, measuring the OG at the temperature of 21.7 °C of a Blond Ale style beer, found the value of 1.049. For FG, the author found the value of 1.008. Alves [10] also found the value of 1.0084 FG. Still, according to current Brazilian legislation, mean values of 1.014 for FG are stipulated, showing that the results were satisfactory [13].

The analyzed sample had a pH lower than 4.5, a factor that helps to avoid further contamination, as Alves [10] reports. The author had values of pH 4.05, very close to the one found in this study, but below those found by Pinto et al. [7], which obtained values between 4.10 and 4.24, and this is most probably due to the different concentrations of added citric attachment.

The alcohol content in the present study was above the standards of common commercial beers [13]. This fact is characteristic of artisan beers of high fermentation, as Araújo et al. [12]. In his work with Blond Ale, the author obtained the alcoholic content of 5.37%. This result shows the good conversion of the sugars into alcohol, which is observed by the low values of reducing sugars, or maltose, of 0.80%, in addition, it is characteristic of the yeast US-05 a greater attenuation, consuming maltose and matotrioses the which justifies the highest alcohol content. This is again confirmed by the work of Alves [10], which obtained values between 1.57% maltose and 3.75% alcohol content. For the legislation, the maltose found in the work is low, close to the minimum limit, but within the required standards and it is possible to be commercialized [13].

The acids formed during fermentation, expressed as lactic acid, and the total dry extract also conformed to commercial standards [13].

According to the primitive extract obtained in the work, this is classified as strong beer, and, by the degree of fermentation, as beer ale (high fermentation), as already expected due to the type of yeast used in the process [13]. According to the color scale established in decree nº 6.871/09, this one is classified as dark, since it presents values smaller than 20,0 EBC [13], already for the scale EBC, that is more precise, the value was of 10, 07, being framed in golden color (10 to 12 EBC) [11].

4. CONCLUSION

It can be concluded that, since all the attributes analyzed are within the standards established by the consulted literature, it was possible to produce a Pineapple Fruit Ale, Blonde Ale style. Since the values found are within the range allowed for this style of beer.

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