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Study on beer flavor stability

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Abstract

Currently flavor stability of beer is one of the most important quality aspects of the brewing industry. The paper aimed the influence of advanced hop products on the bitterness stability in time. It has been measured bitter value of three types of beer, fresh and aged, assortment, which differs by using specific types of hops products in their obtaining.

Keywords: beer, hop products, bitterness

1. Introduction

The bitter taste of beer is derived from hops (*Humulus lupulus L.*) or hop extracts added to the wort during brewing. In the boiling process, the hop α-acids or humulones, which are almost tasteless, are isomerized into the bitter-tasting iso-α-acids or isohumulones. These products are not only responsible for the bitter taste of beer, but they also exhibit bacteriostatic properties. Furthermore, play an essential role in enhancing the foam stability of beer as well as in the formation of off-flavors like the light-struck flavor [4].

Beer flavor is a complex concept. It has been identified over 800 compounds that contribute to the characteristic beer flavor [3].

Compounds that give beer flavor and their precursors are from the raw materials, especially malt, from the adjuvants used, the water or hops, or are produced by yeasts during fermentation must.

Bitterness is an important characteristic flavor of beer, which undergoes changes over time, contributing to its deterioration. Recently there was an increased concern for producers to intensify flavor stability of beer, which would lead to increased sales and significant development in exports [1].

Research conducted in this direction identified bitterness as one of the main components of beer flavor, determined primarily by the hop products used in the process.

Thus, the bitterness stability depends largely on the type of hops used and the hop product used on wort boiling [5]. De Cooman, etc. (2001) showed that the most stable bitter principles in beer oxidation reactions are: tetrahidroiso-α-acids, followed by cis-iso-α-acids, dehidroiso-α-acids (constituents of advanced products of hops). Although oxidative degradation of compounds that give beer bitterness is inherent, there is, however, according to researchers, the possibility of flavor stability increases of the beer if respect the following:

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• Bitterness beers bottled in dark bottles can be improved significantly through the use of hop products pre-isomerized with a high proportion of cis-iso-α-acids and/or partial support of the iso-α-acids with tetrahidroiso-α-acids;

• For beer bottled in uncolored glass bottles should be used dehidroiso-α-acids as main compounds that give bitterness, because of their stability to the action of light;

The purpose of this study was to verify if indeed advanced hop products have a positive influence on the bitterness stability in time, than conventional hop products (non-isomerised).

2. Materials and Method

It had been measured the bitter value of three types of beer (B1, B2 and B3), in fresh and aged condition, using differing types of hop products specific to their manufacture.

Hop products used for:

1. Beer B1 are:
• Hops Pellets 9.8% - at the start of boiling;
• Hops Extract IKE - near the end of boiling;
• Hops Pellets 9.8% - almost the end of boiling;

2. Beer B2 (near the end of boiling) are:
• Hops Pellets Pre-isomerized 10.3%
• Hops ISO EXTRACT

3. Beer B3 (near the end of boiling) are:
• Hops CO_2 EXTRACT
• Hops Pellets Pre-isomerized 10.3%

It had been measured the bitter value of the three types of beer obtained from hop products analysing three different beers from the same group at different times, namely:

- Immediately after bottling operation;
- After three months of spontaneous aging in the dark and at room temperature;
- After 10 months of forced aging at 40°C

For forced aging was used an oven and to measure the bitterness was used a spectrophotometer.

The traditional and internationally approved method for bitterness determination in beer involves the extraction of iso-alpha acids from acidified beer into iso-octane, followed by a centrifugation step, and photometric measurement at a wavelength of 275 nm against a reference of pure iso- octane (European Brewery Convention, 2006, Analytica-EBC, 7.8.).

The optical density of the acidified solvent extract is multiplied by a factor to produce an analytical value, measured as Bitterness Units (BU): BU = Optical Density at 275 nm x 50.

3. Results and Discussion

According to the literature, the beer flavor degrades over time. The bitter taste, a flavor component, loses its intensity over time or in high temperature conditions (forced aging). In the analysis performed, the results obtained were corresponding to those stated above, as can be seen from the figures below.

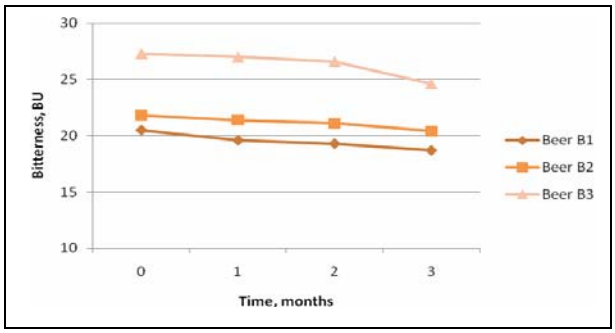

Figure 1. Evolution of bitter value after spontaneous aging

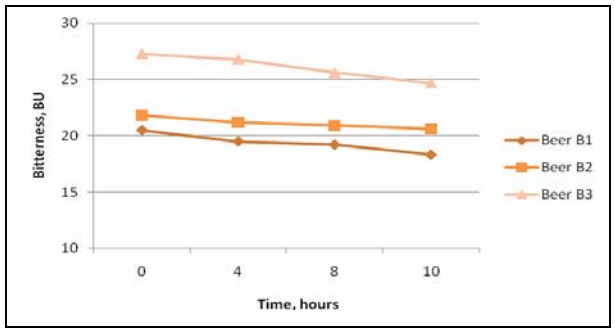

Figure 2. Evolution of bitter value after forced aging

Percentage decrease of bitterness value depending on the type of hop products used is shown in Figure 3.

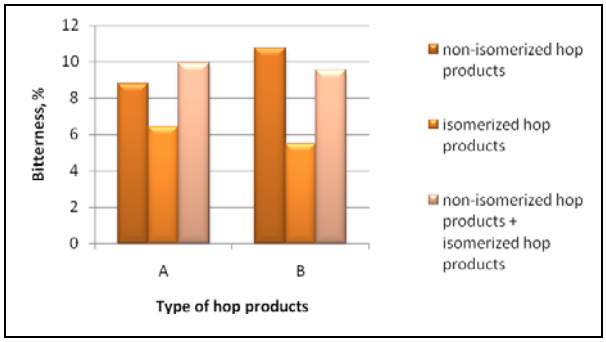

Figure 3. The bitter beer after spontaneous (A) and forced (B) aging depending on the type of hop products

The main components from hops responsible for the bitter taste are α-bitter acids. They are best exploited in the isomerised form. Furthermore, the cis isomers of α-bitter acids are the most resistant to oxidation reactions that occur during aging of beer.

It was also observed that iso-α-acids in hops pre-isomerized refined extracts, gave to the beer a non-persistent smooth bitterness, which remains enjoyable throughout the period of the aging of beer. All this leads to one conclusion: advanced hop products (isomerized) is the best choice for brewers.

After the tests conducted it was noted that the hop products used in brewing influenced the change the bitter taste over time. Beer assortment obtained with isomerized hop products suffered the smallest change of bitter taste.

The results for the other two types of beer (obtained from hop products non-isomerized and from both types of hops products) are inconclusive. It was expected that beer obtained only with hop products non-isomerized to have the worst results (in both cases, not only after forced aging of the beer), but this did not happen.

One reason is probably that the hop products used are added at certain times of boiling wort with hops, which would positively influence the use of bitter principles and maybe even bitter taste stability.

4. Conclusion

- Advanced hop products are most suitable for use in brewing, where it aims to increase bitter taste stability and achieving a fine bitterness, agreeable on a long period of time;
- However, regarding that the hops products used, have a great influence on the bitter taste and beer flavor, it is not necessary to modify the known and appreciated varieties of beer (traditional beer). The producer will therefore, follow the achieving, each time of the same beer flavor profile, focusing to keep the consumer loyalty.

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