

ANALYSIS OF TOTAL POLYPHENOL CONTENTS AND COLOUR OF BREWED BEER SAMPLES

Edina Szabó¹, Mária Borbély², Péter Sipos¹, Purcărea Cornelia³, Chiș Adriana³,

¹ Institute of Food Science, Quality Assurance and Microbiology, ²Central Laboratory,

^{1,2}Faculty of Agricultural and Food Sciences and Environmental Management, Centre of Agricultural and Applied Economic Sciences, University of Debrecen, H-4032, Böszörményi út. 138.

Debrecen, Hungary szabo.edina@agr.unideb.hu

³ University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea

Abstract

Beer is one of the most popular alcoholic beverages. At the same time, only a few consumers have knowledge about its valuable components, like total antioxidant content (total polyphenol content) or others, which influence for example the colour of the beer. Our aim was to determine the total polyphenol content and colour values of our self-brewed beers. Based on our result it can be stated that there is no correlation between the polyphenol content and colour value.

Key words: beer, total polyphenol content, colour

INTRODUCTION

Beer is known and consumed from the beginning of civilization. It had an important role in the ancient cultures, as it was used even for medication (Eßlinger H., 2009). Nowadays, we pay more attention to the quality of our meals and drinks, or to their effect on our bodies, based on the theory of the health-conscious nutrition (O'Brien G. – Davies M., 2007).

Among drinks beer is consumed most frequently in the World. Beer contain some very valuable components (Cortacero-Ramírez S. et al., 2003; Jaskura-Goiris B. et al., 2010). It is usually alcohol containing drink that is brewed from malt with good quality water, boiled with hop, fermented with brewer's yeast (Codex Alimentarius Hungaricus, 1997; Imure T. – Sato K. 2012; Nogueira L.C. et al., 2005). Thanks to these raw materials, beer is an excellent source of vitamins, proteins, organic acids, minerals and polyphenols (Kalušević A. et al., 2011; Hofta P. et al., 2007; Gerhäuser C., 2005).

Polyphenols are the most important compounds among the antioxidant components of the beer. Its main source is the hop (Stevens J. et al., 1999; Ceslová L. et al., 2009; Gerhäuser C., 2005). Phenolic compounds have several functional properties in the beer: they influence its colloidal stability, savour, moderate the bitterness, aging and colour (Nakamura T. et al., 2012; Stevens J. et al., 1999; Peris M. et al., 1991; Fumi M. D. et al., 2011).

The colour depends on the grain used as raw material, and also on the processes in what the grain undergo during the brewing. Colour components are produced partly in the Maillard reaction, partly by the oxidative processes of polyphenols derived from barley husk (Shellhammer T., 2009).

MATERIAL AND METHOD

In our researches the total polyphenol content and colour values of our self-brewed, unfiltered beers were determined.

Beers were produced by Zip's Micro Brewery Equipment in the laboratory of the Institute of Food Science, Quality Assurance and Microbiology at the University of Debrecen, using the recipe of the equipment. Slovak Pilsner malt was used for all the beers. Colouring malt was added to get the expected dark colour of the brown beers. The components of the beers are shown in *Table 1*.

Table 1

Components of beers

		<i>Water</i>	<i>Malt</i>	<i>Caramell malt</i>	<i>Colouring malt</i>	<i>Bitter hops pellets</i>	<i>Aroma hops pellets</i>	<i>Beer yeast</i>
1.	Brown beer1	water	Pilsner ¹	Cara-hell ¹	Carafa Type1 ²	Aurora ²	Spalt Select ³	SafLager ⁴
2.	Brown beer2	water	Pilsner ¹	Carabelge ²	Carafa Type1 ²	Aurora ²	Spalt Select ³	Brewferm Lager ⁵
3.	Light beer1	water	Pilsner ¹	Cara-hell ¹	-	Aurora ²	Spalt Select ³	Safbrew T-58 ⁴
4.	Light beer from stream water	stream	Pilsner ¹	Carabelge ²	-	Spalt Select ³	Saphir ²	Brewferm Lager ⁵
5.	Light beer from AVE mineral water	AVE mineral	Pilsner ¹	Carabelge ²	-	Spalt Select ³	Saphir ²	Brewferm Lager ⁵

Distributor: ¹Weyermann-Deutschland, ²No dates, ³Hallertauer-Deutschland, ⁴Fermentis, ⁵Brouwland

Tap water was used for 1-3 samples, for the Light beer2 water was taken from Kecsó stream in Slovakia, and for the last the source of water was the deep-fount of AVE Mineral Water Company, Debrecen. Samples were taken from one brewing process, chemical analysis were performed in triplicate.

Total phenols were quantified by Folin-Ciocalteu colorimetric method (760 nm), results were given in gallic-acid equivalent value (Kalušević A. et al., 2011).

Colour was measured by the method of European Brewery Convention Analytica in a ten times dilution. EBC colour values and absorbencies were determined (Analytica-EBC, 1999).

Data were subjected to correlation and variance analysis.
RESULTS AND DISCUSSIONS

Antioxidant content of the produced beers is represented in *Figure 1*. Brown beer1 contain the highest amount of polyphenols, while the Light beer brewed with mineral water is the poorest in antioxidants.

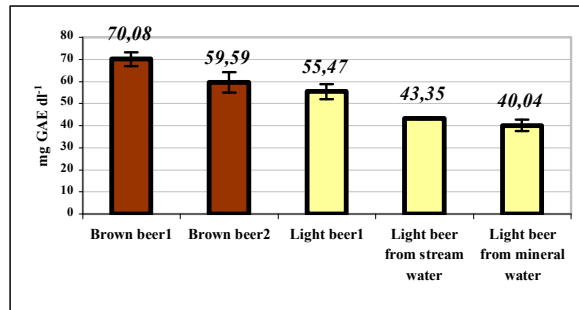


Figure 1 Total polyphenol contents of beer samples

In case of brown beers Brown beer1, among light beers Light beer1 contained the higher amount of polyphenols (*Figure 2, Figure 3*).

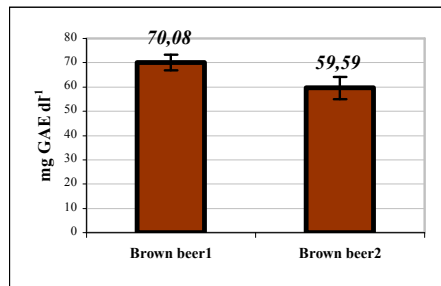


Figure 2. Total polyphenol contents of brown beer samples

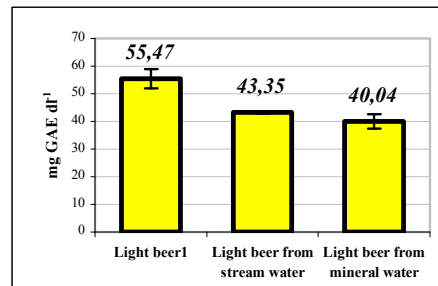


Figure 3. Total polyphenol contents of light beer samples

Colour values of beers are presented in *Figure 4*. As it shows, the highest value belongs to the Light beer with mineral water, while the Light beer1 has produced the lowest value.

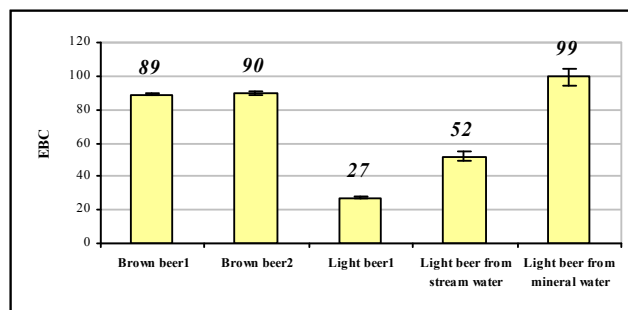


Fig. 4. Colour of beer samples

Evaluating the results, we can establish that there is no strong correlation between the total polyphenol content and the colour of the beers. In case of Light beer brewed with mineral water the highest colour value was found together with the lowest polyphenol content. In brown beers we measured higher polyphenol content than in Light beer with AVE, but the colour values were lower. In the Light beer with AVE, both the polyphenol content and the colour value were relatively low. In the Light beer brewed with tap water higher polyphenol content and low colour value was found.

CONCLUSIONS

Our study showed that the Brown beer1, which was produced with tap water, Pilsner, Cara-hell and Carafa-type 1 malt, Aurora and Spalt Select hop and Saflager brewer's yeast, contained the highest amount of antioxidants. The lowest polyphenol content was measured in Light beer with AVE mineral water, Pilsner and Carabelge malt, Spalt Select and Saphir hop and Brewferm Lager brewer's yeast, but this beer had the highest colour value. The lowest colour value was determined in the Light beer1, brewed with tap water, Pilsner and Cara-hell malt, Aurora and Spalt Select hop and Safbrew T-58 brewer's yeast.

Summarizing the results, comparing the measured parameters it was found that there is no strong correlation between the total polyphenol content and the colour of the beers.

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