



UNIVERSITY OF AGRICULTURAL SCIENCES AND
VETERINARY MEDICINE OF CLUJ-NAPOCA
ROMANIA

FACULTY OF FOOD SCIENCE AND TECHNOLOGY

Process design and assessment of polyphenols in beer subjected to acetic fermentation

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Introduction



Nutrition Facts

Serving Size 12 oz (354.88 ml)
Servings Per Container 1

Amount Per Serving

Calories 150 Calories from Fat 0

% Daily Value*

Total Fat 0g 0%

Saturated Fat 0%

Trans Fat 0%

Cholesterol 0%

Total Carbohydrate 13g 4.7%

Fiber 8g 40%

Protein 1g

Contains significant amounts of deliciousness, potassium, hops, magic, selenium, barley, niacin, taste, magnesium, phosphorus, happiness, and GOLD!

*Percent Daily Values are based on a 2,000 calorie diet.



Nutrition Facts ..on Beer?

Main sources of polyphenols in beer



REVIEW ARTICLES

Hop-Derived Prenylflavonoids and Their Importance in Brewing Technology: A Review

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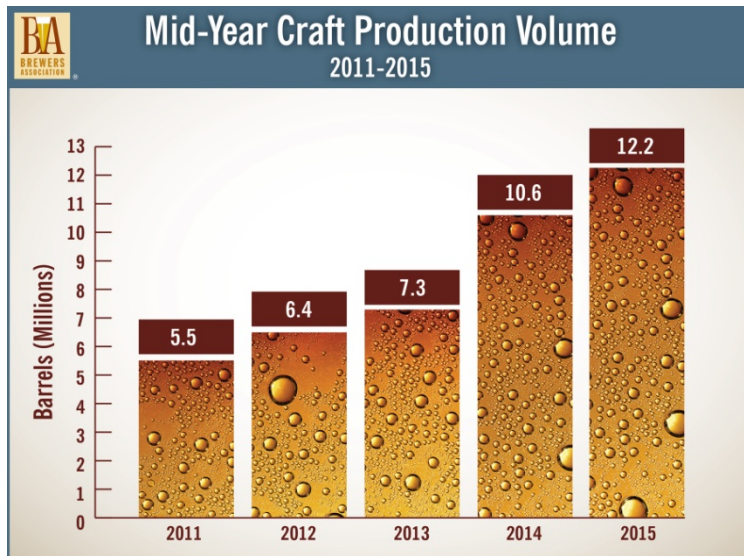
Bulletin UASVM Food Science and Technology 72(1) / 2015

ISSN-L 2344-2344; Print ISSN 2344-2344; Electronic ISSN 2344-5300

DOI: 10.15835/buasvmcn-fst:11198



Global Production of beer



Source: *Brewers Association, 2015*

Most popular areas where producing beer vinegar



Aim: valorisation of brown beer by alternative fermentation process, in order to obtain a beer based value added product

Resulted product: value added - Brown beer vinegar

State of the art

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1. An Approach to Brew Beer Vinegar with Barm Beer from Spent Yeast Slurry
By: Jiang, Zhumao; Wang, Song; Zhang, Naibin; et al.
JOURNAL OF THE AMERICAN SOCIETY OF BREWING CHEMISTS Volume: 71 Issue: 3 Pages: 138-143
Published: 2013
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2. Determination of furfural in beers, vinegars and infant formulas by solid-phase microextraction and gas chromatography-mass spectrometry
By: Tsai, Shih-Wei; Kao, Kuo-Yuan
INTERNATIONAL JOURNAL OF ENVIRONMENTAL ANALYTICAL CHEMISTRY Volume: 92 Issue: 1 Pages: 78-84
Published: 2012
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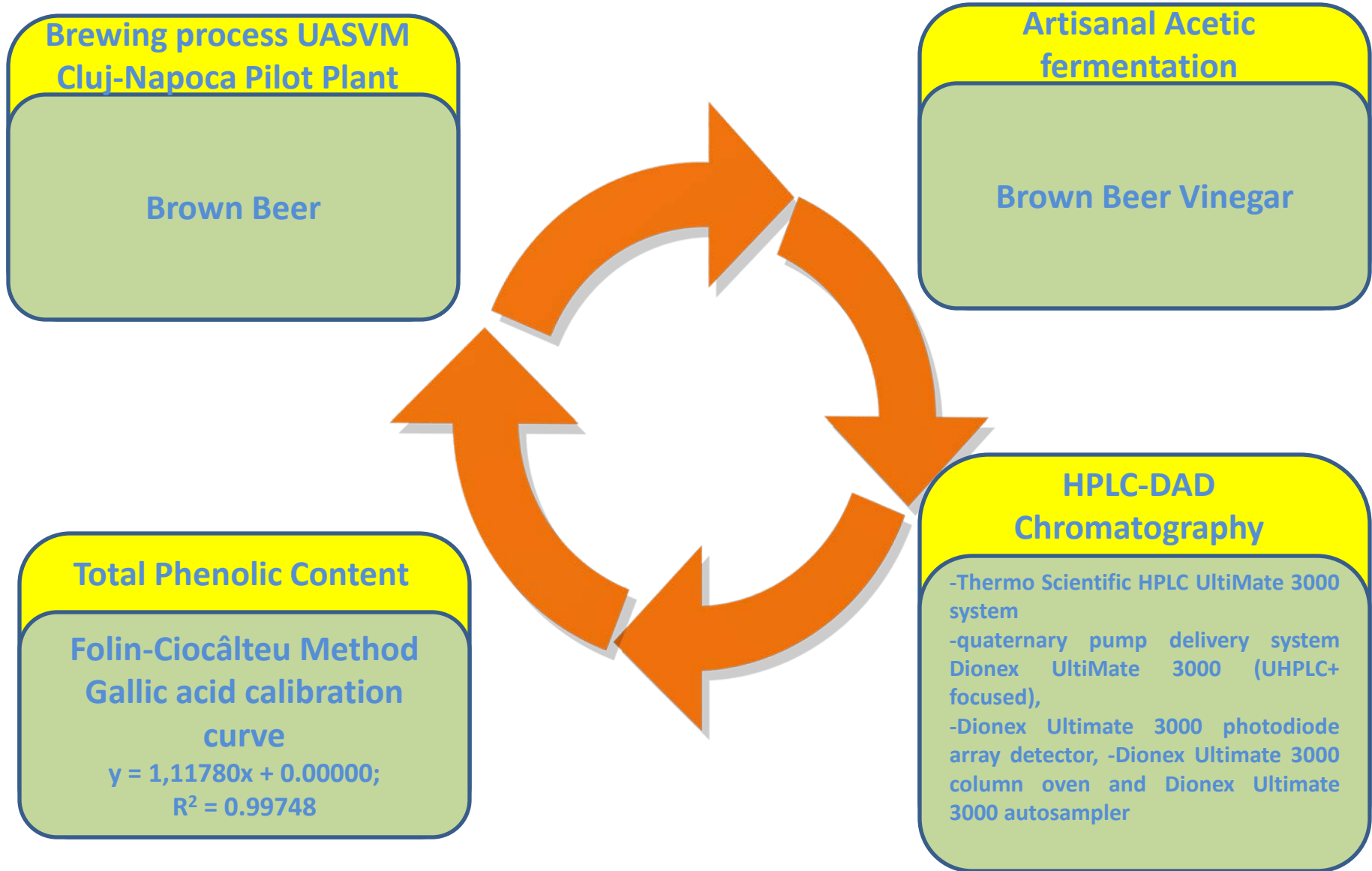
3. Spoilage of bottled red wine by acetic acid bacteria
By: Bartowsky, EJ; Xia, D; Gibson, RL; et al.
LETTERS IN APPLIED MICROBIOLOGY Volume: 36 Issue: 5 Pages: 307-314
Published: 2003
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Experimental design

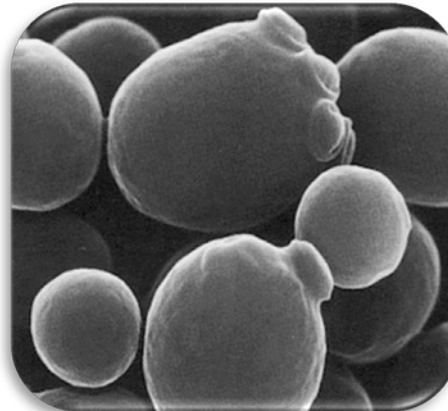


Brewing process

UASVM Cluj-Napoca Pilot Plant



Brewing technology



Fermentation process monitoring

Process monitoring

Brewing technology

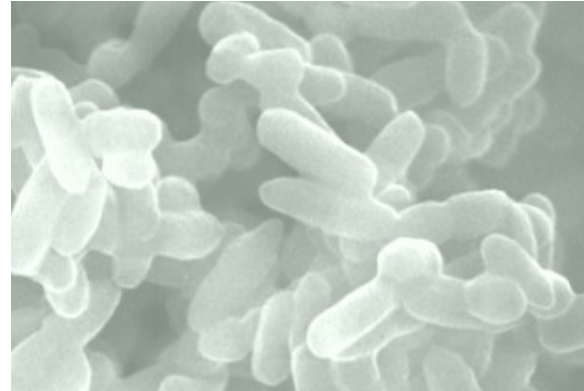
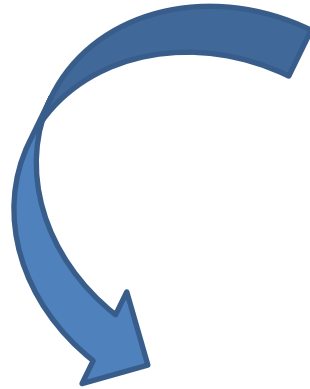


Beer analysis:
-fermentation
grade;
-pH;
- alcohol content.



Acetic fermentation of brown beer

O₂
25°C
4
wks



Stabilization
Pasteurization
(60-70°C, 20-30 min)
Conditioning
Bottling



Process monitoring

Final product monitoring

Brown beer vinegar analysis:

- pH;
- TFC (Folin-Ciocalteu)
- Antioxidant activity (DPPH method)
- LC-MS Analysis

Chemical assessment – beer vs. Beer vinegar

Brown beer :

- Alcohol content, % vol. : 6,8
- TPC: 70,9 mg GAE / 100 mL
- DPPH: 15,82 %

Beer vinegar:

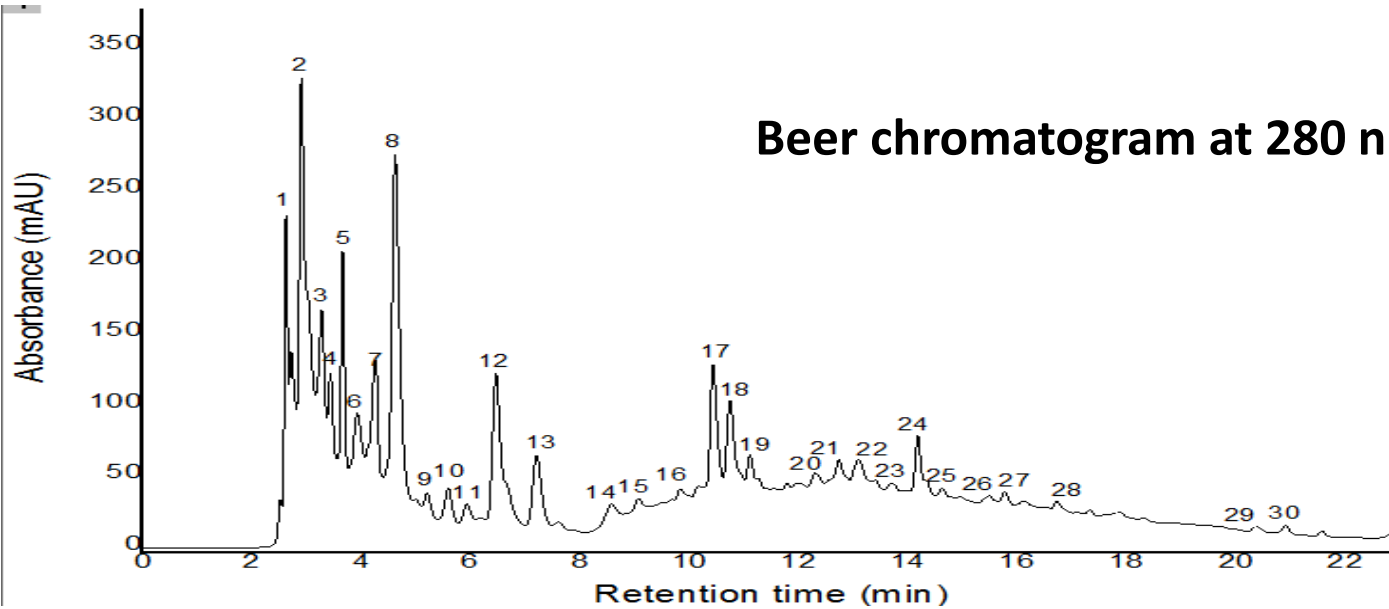
- pH: 3.4
- TPC: 142,5 mgGAE/100 mL
- DPPH: 20,17 %

2X TPC

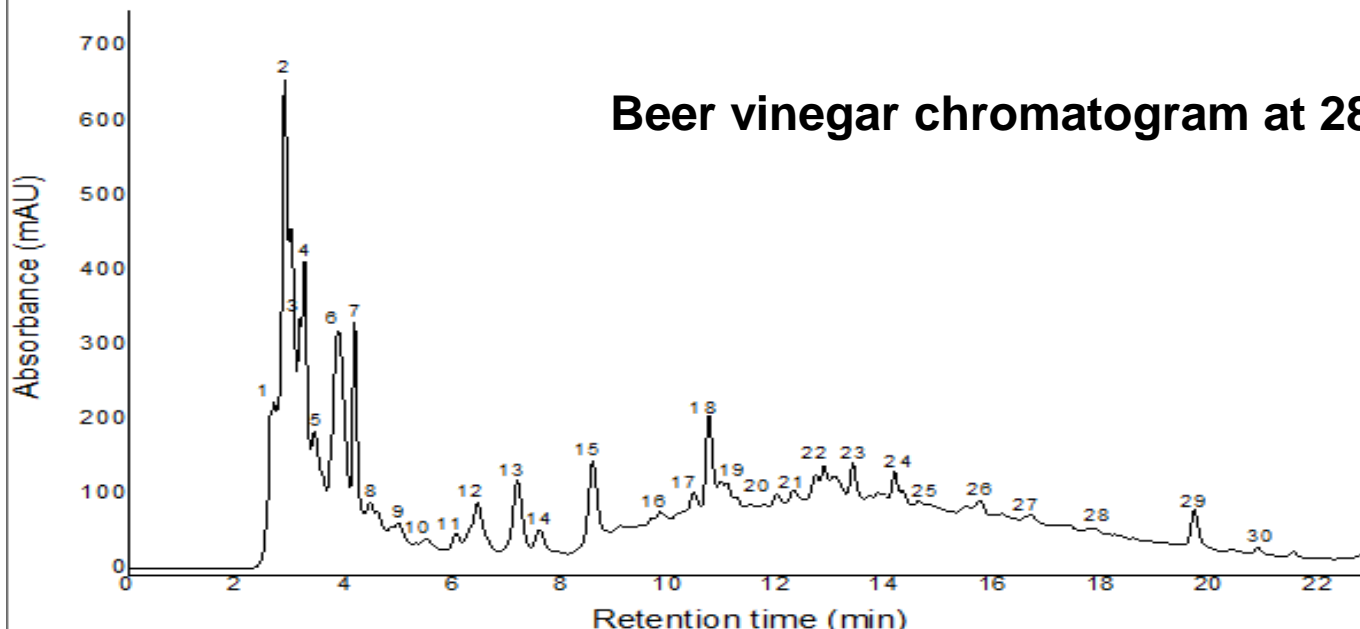


Polyphenols

Beer chromatogram at 280 nm

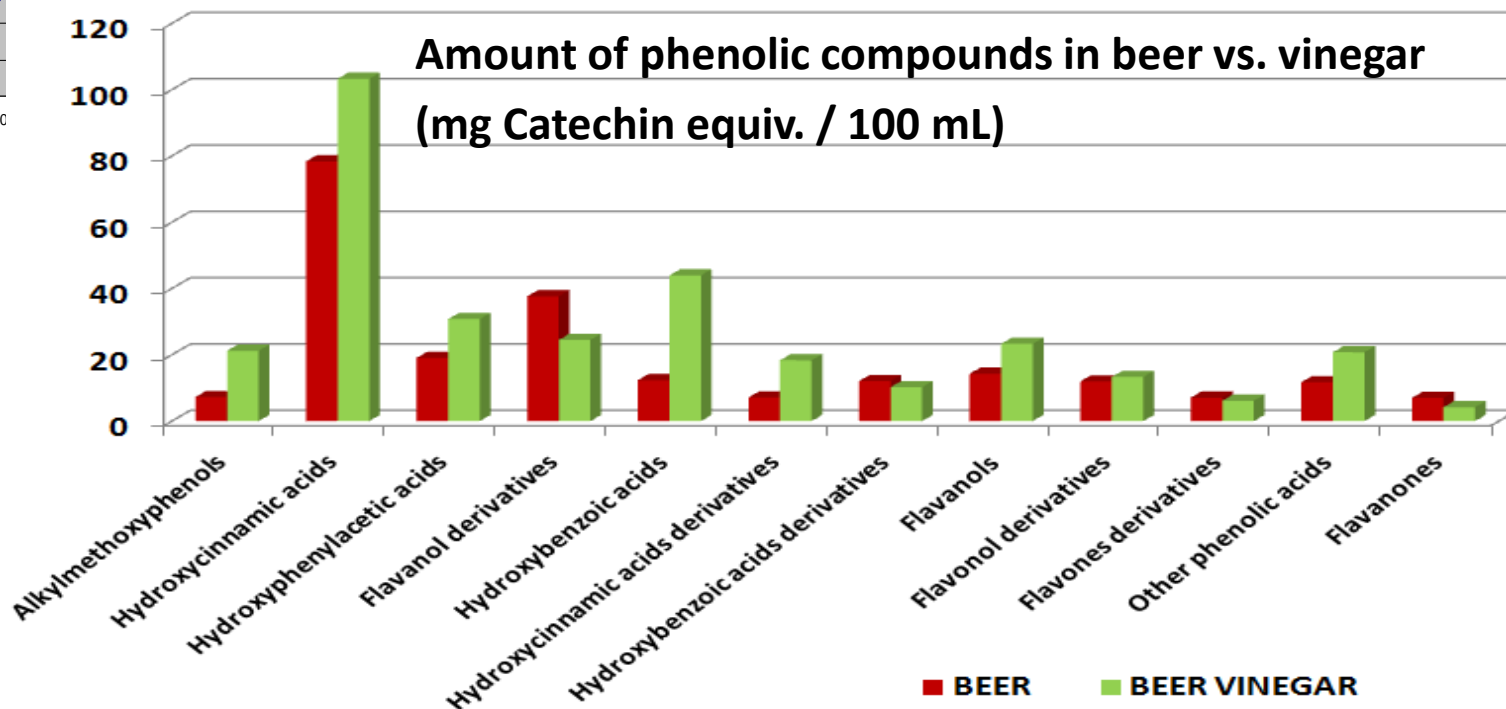
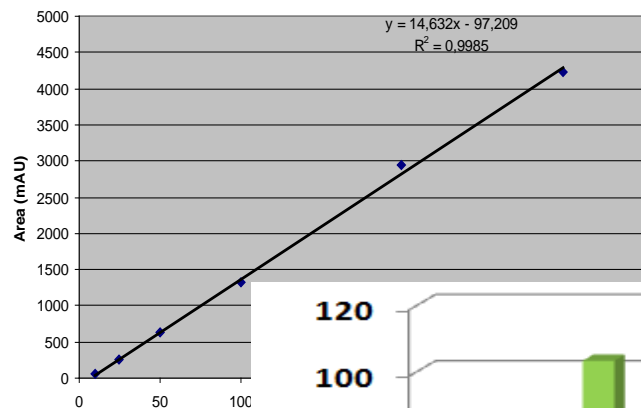


Beer vinegar chromatogram at 280 nm



Polyphenols quantification

Calibration curve of Catechin



Conclusion

- As an increase in total polyphenols was revealed after acetic fermentation of beer, its biovalorisation, lead to obtaining of a functional beverage, which represents also a value added product, due to its increasing polyphenol content.

**Thank you for
your attention !**

