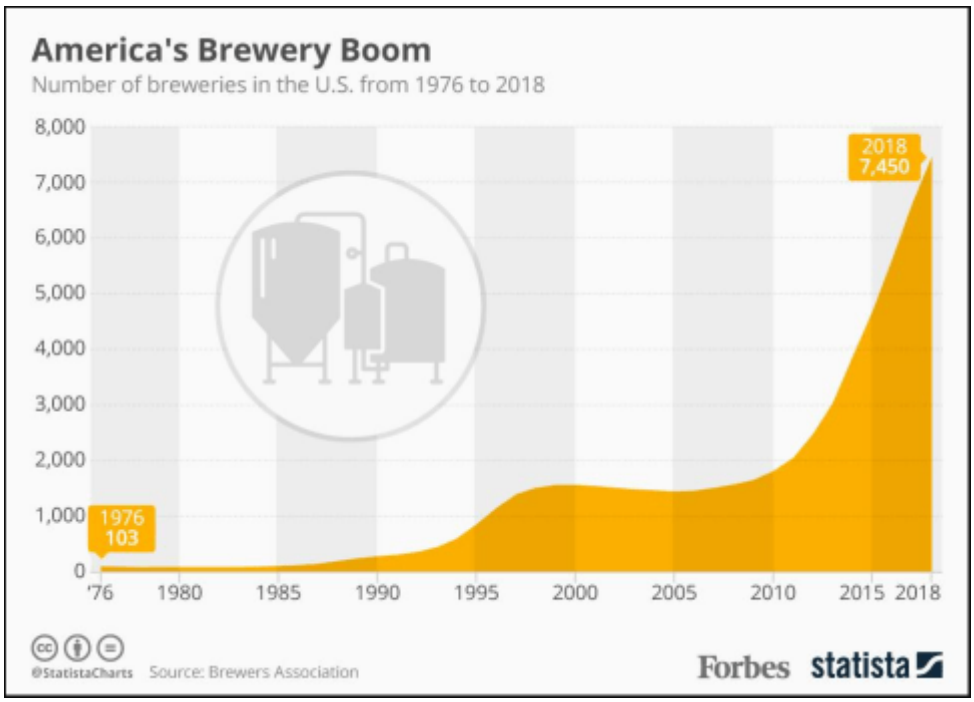
August 2nd, 2019 marks International Beer Day – a day for beer lovers everywhere to raise a toast to their local brewers and bartenders and appreciate the art of the hops.

The day was founded in 2007 in Santa Cruz, CA and occurs on the first Friday of August. It has since grown to become a global celebration seen in pubs, microbreweries, and backyards alike. Something definitely worth toasting, is the recent boom in microbreweries around the United States.

According to the Brewer's Association (BA) small and independent brewers collectively produced 25.9 million barrels in 2018 and gained a 4 percent total growth. This increased the craft's overall beer market share by volume to 13.2 percent (see below info-graphic for more details).


2018
SMALL & INDEPENDENT
U.S. CRAFT BREWER
Growth in the Beer Category
2018 Volume Share for Craft Brewers
12.1%
2016
12.6%
2017
13.2%
2018
2018 Craft Retail Dollar Value Growth
$27.6 BILLION
(7% growth over 2017)
Craft dollar share = 24.1%
2018 Craft Brewer Volume Growth
4% GROWTH
Total beer market down 1%
Total beer volume = 194,300,000 barrels
(down from 195,900,000)
2018 Craft Brewer Barrels Produced
25,917,766
Barrels produced by craft brewers
U.S. sold = 25,632,766 barrels
2014 22.1 M
2015 24.4 M
2016 24.5 M
2017 25.1 M
2018 25.9 M
2018 U.S. Operating Craft Breweries
7,346
Brewpub: 2,594
Micro: 4,521
Regional: 231
2014: 3,814
2015: 4,628
2016: 5,539
2017: 6,490
2018 Openings & Closings
1,049
Openings
219
Closings
2018 Small Brewing Jobs
150,148
11% growth over 2017
BrewersAssociation.org

The microbrewery boom is only expected to grow more in 2019. According to BA there were 7,346 craft breweries operating in 2018 and at the closing of the year there were 1,049 new brewery openings and only 219 closings—a closing rate of 3 percent (see Forbes stats chart below).



For more information on the microbrewery boom and where the trend is heading, read more at the Brewer's Association website: https://www.brewersassociation.org/

Phenomenex associates love a great glass of beer. So what better way to celebrate

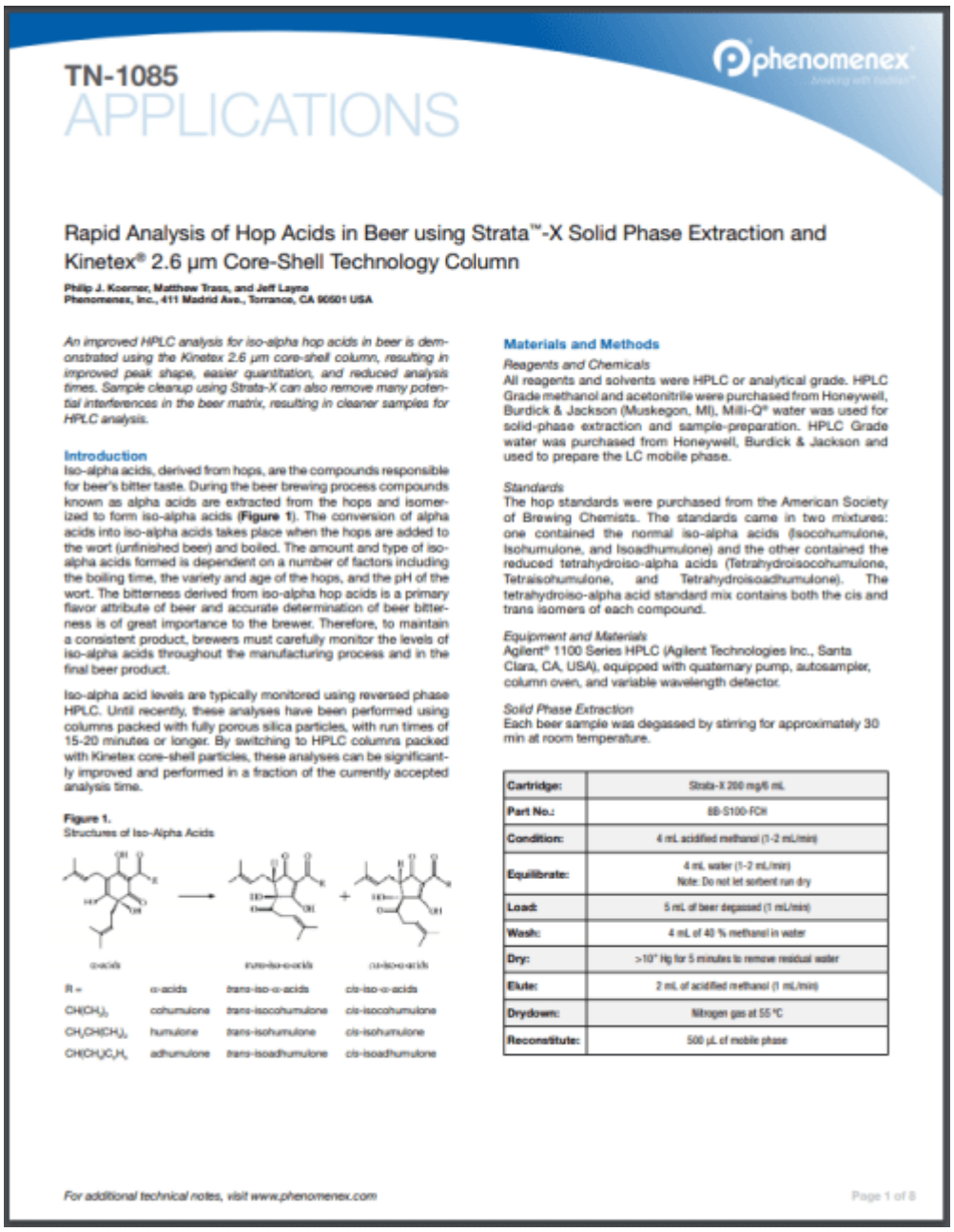
International Beer Day than to analyze it!

We did a Rapid Analysis of Hop Acids in Beer using our Strata™ -X Solid Phase Extraction product and Kinetex® 2.6 µm Core-Shell Technology Column (see full technical application below).

Iso-alpha acids, derived from hops, are the compounds responsible for beer's bitter taste. During the beer brewing process compounds known as alpha acids are extracted from the hops and isomerized to form iso-alpha acids. The conversion of alpha acids into iso-alpha acids takes place when the hops are added to the wort (unfinished beer) and boiled. The amount and type of isoalpha acids formed is dependent on a number of factors including the boiling time, the variety and age of the hops, and the pH of the wort. The bitterness derived from iso-alpha hop acids is a primary flavor attribute of beer and accurate determination of beer bitterness is of great importance to the brewer. Therefore, to maintain a consistent product, brewers must carefully monitor the levels of iso-alpha acids throughout the manufacturing process and in the final beer product.

Iso-alpha acid levels are typically monitored using reversed phase HPLC. Until recently, these analyses have been performed using columns packed with fully porous silica particles, with run times of 15-20 minutes or longer. By switching to HPLC columns packed with Kinetex core-shell particles, these analyses can be significantly improved and performed in a fraction of the currently accepted analysis time.

Curious what resulted from this analysis? Click the following link or the image below to read more: CLICK HERE



TN-1085

APPLICATIONS

Rapid Analysis of Hop Acids in Beer using Strata™-X Solid Phase Extraction and Kinetex® 2.6 µm Core-Shell Technology Column

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An improved HPLC analysis for iso-alpha hop acids in beer is demonstrated using the Kinetex 2.6 µm core-shell column, resulting in improved peak shape, easier quantitation, and reduced analysis times. Sample cleanup using Strata-X can also remove many potential interferences in the beer matrix, resulting in cleaner samples for HPLC analysis.

Introduction

Iso-alpha acids, derived from hops, are the compounds responsible for beer's bitter taste. During the beer brewing process compounds known as alpha acids are extracted from the hops and isomerized to form iso-alpha acids (**Figure 1**). The conversion of alpha acids into iso-alpha acids takes place when the hops are added to the wort (unfinished beer) and boiled. The amount and type of iso-alpha acids formed is dependent on a number of factors including the boiling time, the variety and age of the hops, and the pH of the wort. The bitterness derived from iso-alpha hop acids is a primary flavor attribute of beer and accurate determination of beer bitterness is of great importance to the brewer. Therefore, to maintain a consistent product, brewers must carefully monitor the levels of iso-alpha acids throughout the manufacturing process and in the final beer product.

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Figure 1.
Structures of Iso-Alpha Acids

R =	α-acids	trans-iso-α-acids	cis-iso-α-acids
$CH(CH_3)_2$	cohumulone	trans-isocohumulone	cis-isocohumulone
$CH_2CH(CH_3)_2$	humulone	trans-isohumulone	cis-isohumulone
$CH(CH_3)C_2H_5$	adhumulone	trans-isoadhumulone	cis-isoadhumulone

Materials and Methods

Reagents and Chemicals
All reagents and solvents were HPLC or analytical grade. HPLC Grade methanol and acetonitrile were purchased from Honeywell, Burdick & Jackson (Muskegon, MI). Milli-Q® water was used for solid-phase extraction and sample-preparation. HPLC Grade water was purchased from Honeywell, Burdick & Jackson and used to prepare the LC mobile phase.

Standards
The hop standards were purchased from the American Society of Brewing Chemists. The standards came in two mixtures: one contained the normal iso-alpha acids (Isocohumulone, Isohumulone, and Isoadhumulone) and the other contained the reduced tetrahydroiso-alpha acids (Tetrahydroisocohumulone, Tetraisohumulone, and Tetrahydroisoadhumulone). The tetrahydroiso-alpha acid standard mix contains both the cis and trans isomers of each compound.

Equipment and Materials
Agilent® 1100 Series HPLC (Agilent Technologies Inc., Santa Clara, CA, USA), equipped with quaternary pump, autosampler, column oven, and variable wavelength detector.

Solid Phase Extraction
Each beer sample was degassed by stirring for approximately 30 min at room temperature.

Cartridge:	Strata-X 200 mg/6 mL
Part No.:	8B-S100-FCH
Condition:	4 mL acidified methanol (1-2 mL/min)
Equilibrate:	4 mL water (1-2 mL/min) Note: Do not let sorbent run dry
Load:	5 mL of beer degassed (1 mL/min)
Wash:	4 mL of 40 % methanol in water
Dry:	>10" Hg for 5 minutes to remove residual water
Elute:	2 mL of acidified methanol (1 mL/min)
Drydown:	Nitrogen gas at 55 °C
Reconstitute:	500 µL of mobile phase

Need more reasons to celebrate International Beer Day? Check out our article “Could Alcohol be Better than Exercise in the Long Run?”

> Could Alcohol Be Better Than Exercise in the Long Run?

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