

JULY 2018

HOP SCIENCE

KNOWLEDGE FOR YOUR SUCCESS

by Dr. Christina Schoenberger, christina.schoenberger@johbarth.de



PROTECT THE ISOHUMULONES IN BEER – INCREASE THE THIOLS!

In the context of flavour stability that is the conclusion of a Danish Researcher Team. They have looked into the mechanism of stale flavour development in stored beer. It is known that in the presence of metal ions, such as iron and copper, molecular oxygen converts into superoxide radicals, peroxy radicals, and hydrogen peroxide. In the absence of antioxidants, hydrogen peroxide reacts with metal ions via the Fenton reaction and generates hydroxyl radicals that react with most compounds with almost no selectivity. Since ethanol is the most abundant component in beer, a large fraction of hydroxyl radicals reacts with ethanol, thereby forming 1-hydroxyethyl radicals. The 1-hydroxyethyl radicals can either be quenched by antioxidants or react with other beer components, such as bitter acids from hops, or with oxygen to form acetaldehyde and peroxy radicals leading to a chain reaction that creates more oxidative damage. In this study they have found that the isohumulones are an easy victim and account for almost 90% of the reaction with 1-hydroxyethyl radicals. Whereas the thiols acted as secondary antioxidants. However, with normal concentrations and under normal conditions they only account for 10% of the reaction with 1-hydroxyethyl radicals. They hypothesize that increasing the concentration of thiols can bind more staling aldehydes in beer and hereby increase flavour stability. And where could these thiols come from? Of course from hops!

HOW HOPS AND YEAST INTERACT

This is a large research field and studies to look into it are only starting. Our Team looked into hop aroma of dry hopped beers using two different yeast strains (California Ale and German Koelsch yeasts) and two different hop varieties (US Cascade and Hallertau Mittelfrüh). Dry hopping was done on an equal hop oil equivalent (4ml/hl) after 3 days of fermentation. Our results show that hops are a main source of 3MH although malt also delivers this thiol into beer. The concentration of 4MMP was mainly dependent on the hop variety. Beers brewed

with Cascade showed a concentration whereas beers brewed with Hallertau Mittelfrüh or unhopped beers had lower concentrations or no 4MMP was detected. The results suggest that the California Ale Yeast has a higher ability to release monoterpene alcohols from precursors. The California Ale beer with Cascade had higher levels of geraniol and citronellol and was described as more citrusy. The higher levels of 4MMP in the beers made with Cascade hops also showed higher intensities for “red berries” in the sensory profiling. Our results show that hop variety has a stronger influence than yeast on the levels of 4MMP. Higher levels of linalool in beers made with HHA also match the sensory description of more intense floral flavour.²

HOP EXTRACT FOR DRY HOPPING

This topic sounds very up to date and trendy as many craft brewers are looking into the possibility to use hop extracts instead of cones or pellets for dry hopping. In fact hop extracts and hop oils have been used for dry hopping for about 100 years already, and here is a nice article going back to 1983 showing the power and suitability of CO₂ extract for dry hopping.³

REFERENCES:

1. Andersen, M.: Kinetic Models for the Role of Protein Thiols during Oxidation in Beer J. Agric. Food Chem. 2017, 65, 10820–10828
2. Munoz, A.; Kugel, R: Transfer of pesticides from hops into beer P.3.11 at 13th Trends in Brewing, April 2018, Ghent, <http://trendsinsbrewing.org/program.html>
3. Grimmett, C.: THE STABILITY OF HOP OILS IN LIQUID CARBON DIOXIDE EXTRACTS OF HOPS, Journal of the Institute of Brewing Volume 89, Issue 3, 1983, <https://onlinelibrary.wiley.com/doi/10.1002/j.2050-0416.1983.tb04168.x>



EVENTS

Brewing Summit 2018

12 Hot hoppy talks at the Brewing Summit! Hope to see you there!

<https://www.asbcnet.org/events/annual/Pages/BrewingSummit2018.aspx>

