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HOP SCIENCE

KNOWLEDGE FOR YOUR SUCCESS

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A BIT MORE LIGHT IN THE DARK...

For a number of years, we have known that fruity thiols derived from hops have a high impact on the sensory characteristics of dry-hopped beers. Based on recent research, we also know that the potential of aromas bound to precursor structures is high and hop variety-dependent. This German research group carried out comprehensive screening of 148 brewing yeasts to find out if the activity of specific lyase enzymes is sufficient for an increased release of bound thiols. They were able to show that the final concentration, for example, of 4MMP (responsible for black currant flavors) can be influenced very much by choosing the right yeast.¹

Another project dealing with yeast was undertaken by Belgian and French researchers. They took IPA beers and subjected them to additional fermentation with different yeast strains, some of them POF+, which means they show gene expression for phenolic off-flavors. They found that the yeasts produced different ratios of important flavor components, which differed for each yeast strain as well as for the same yeast strain in two different beer matrices. They also found that in both trials, POF+ yeasts produced higher amounts of phenolic flavors, which were perceived by the trained assessors. At the same time, a "reduced" overall intensity perception of hop characteristics was observed.²

DRY HOPPING: HOW LONG IS LONG ENOUGH BUT NOT TOO LONG, AND BTW, WHAT'S THE RIGHT TEMPERATURE?

The right contact time and the optimum temperature for dry hopping are a highly discussed topic amongst brewers. When discussing this question, the method a brewer is using and the beer style need to be considered. For lager type beers, cold temperatures are often used for dry hopping, while in ale beers, higher temperature up to 20°C are applied. Here is some published data on the topic:

Some German researchers working with static dry hopping found that a contact time of 2 days is already sufficient to achieve the best flavor when working at a temperature of -1°C. Using the variety Eureka, they found that fruitiness decreases after 2 days, giving way to more prominent herbal flavors. However, the concentrations of the compounds measured (4MMP, myrcene, linalool and geraniol) only slightly changed concentrations.³ A few years back, Kaltner reported that the fruity flavors achieved with dry hopping were highest after 3 weeks of cold and static dry hopping.⁴ Our own small-scale trials (static and dynamic dry hopping) in lager beer have shown that extraction at colder temperatures (0°C) takes longer than at temperatures of 13°C or 20°C. They also showed that utilisation in beer is better at lower hop dosage rates and that at low dosage rates, utilisation is better with dynamic systems. However, they

also showed increased formation of oxidised sesquiterpenes at higher temperatures, adding to herbal and spicy flavors.⁵ Tom Shellhammer's research group in the US worked with a total contact time of 4 days in static dry hopping for a pale ale beer at a temperature around 13°C. They found that tropical and grassy flavors increase with the amount of hops added and repeated dry hopping more than other flavors (cf. last Newsletter).⁶ However, published data for dynamic dry hopping systems is rare. Some research in a larger craft brewery suggests that colder temperatures (6°C) during dry hopping will yield a higher extraction of herbal flavors (3) compared to floral/citrus flavors at higher temperatures (12°C).⁷ There is definitely no easy answers to these questions with this many parameters playing a role...

IT IS OFFICIAL, WOMEN WANT HOP FLAVORS!

This very interesting US research looked into the flavor preferences of beer consumers. They found that the flavors with the highest ratings were citrus, apple, and berry. Males provided the highest ratings for citrus, cereal, and nutty flavors, whereas females provided the highest ratings for citrus, apple, stone fruit, and berry flavors. And where do we find these flavors? Right, in hops!⁸

1. Michel, M, et al: Screening of brewing yeast β -lyase activity and release of hop volatile thiols from precursors during fermentation, *Brewing Science*, November / December 2019 (Vol. 72)
2. Montandon, G, et al: Study of Yeast POF Character Impact on Hop Flavor Expressions in Hoppy Beers, *MBAA TQ* vol. 56, no. 4 • 2019 • pp. 124-126
3. Schmidt, C.: Dry hopping potential of Eureka, a new hop variety, *Brewing Science*, November / December 2019 (Vol. 72)
4. Kaltner, D.: the influence on dry hopping in three different beer styles, *BRAUWELT INTERNATIONAL* | 2013/VI 355
5. Hinz, S.: Wie wirkt sich die Temperatur auf die Aromaextraktion bei der Kalthopfung aus, *BRAUWELT* | NR. 37-38 (2017)
6. Hauser, D.: A Comparison of Single-Stage and Two-Stage Dry hopping Regimes, *Journal of the ASBC*, Vol 77, 2019, <https://www.tandfonline.com/doi/abs/10.1080/03610470.2019.1668230>
7. Holbrook, C.: Dry hopping of Beer, oral presentation at the WBC in Denver 2016
8. Mayich, D.: Moving Beyond Variety-by-Name to Flavor Contributions in the Hops Industry: A Preference Study of Beer Drinkers in North America, *MBAA TQ* vol. 56, no. 4 • 2019 • pp. 133-136

EVENTS



OUTLOOK HOPS ACADEMY

Hop Flavorist Course Level 2: If you have completed Level 1 please join us for our Hop Flavorist Course Level 2 (German and English) on March 16th and 17th in Nuremberg.

Expert Hop Selection, 1-Day course, March 24th in Nuremberg: Learn to assess and evaluate hop aroma professionally.

Hop Flavor Impact Day, 1-Day course, May 5th in Nuremberg: Learn to evaluate and create hop flavor in your beer.

All dates and registration can be found here: <https://www.barthhaas.com/en/translate-to-english-hopsacademy/current-events>