

APRIL 2015

HOP SCIENCE

KNOWLEDGE FOR YOUR SUCCESS

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MY DEAR HOP VARIETY, HOW CAN I SMELL WHO YOU ARE?

If aroma-relevant sulfur thiols are involved, this group or researchers is too. When we talk about the following varieties: Amarillo, Citra, Hallertau Blanc, Mosaic, and Sorachi Ace, all of us who ever worked with those know how distinct each one is in flavor and aroma. These researchers have looked into the composition of volatiles of these varieties to identify compounds and concentrations on which this distinctiveness can be based. They found that Sorachi Ace contains higher amounts of farnesene (2101 mg/kg) than Saaz (!). All hops investigated showed an exceptional citrus-like potential exhibited by monoterpenic alcohols and polyfunctional thiols. Among the monoterpenic alcohols, β -citronellol at concentrations above 7 mg/kg distinguished Amarillo, Citra, Hallertau Blanc, Mosaic, and Sorachi Ace from Nelson Sauvin and Tomahawk, while linalool (312 mg/kg) and geraniol (211 mg/kg) remained good discriminating compounds for Nelson Sauvin and Tomahawk respectively. Regarding polyfunctional thiols, higher amounts of 3-mercapto-hexyl acetate (27 μ g/kg) characterized the Citra variety. Free 4-mercapto-4-methylpentan-2-one proved discriminant for Sorachi Ace, while the bound form is predominant in Nelson Sauvin. On the other hand, an S-conjugate of 3-mercapto-hexan-1-ol was found in Sorachi Ace at levels not far from those previously reported for Cascade, although the free form was undetected here. Both free and bound grapefruit-like 3-mercapto-4-methylpentan-1-ol emerged as discriminating compounds for the Hallertau Blanc variety. In conclusion, although much diversity was found - all proved to contain an exceptional citrus-like potential. In Sorachi Ace, β -citronellol is probably the main compound responsible for such notes, while in others, polyfunctional thiols such as 3MHA (Citra) or 3M4MPol (Hallertau Blanc, Mosaic) could play a key role. Does this mean in conclusion (which leads also to the next article): Hop aroma -is it all about the ratio?¹

IS IT ALL ABOUT THE RATIO?

Listening to the best recognized research team in flavour chemistry, that would be the correct conclusion. Summarising the results of 25 years of research on all kind of different foods, this German research team says that their meta-analysis demonstrates characteristic ratios of only about 3 to 40 genuine key odorants for each food (of more than 220 investigated), from a toolbox of ~230 out of ~10,000 food volatiles. They conclude that the foodborn stimulus space has co-evolved with, and roughly matched our ~400 olfactory receptors as best natural agonists. The key odorants can be classified into two groups of volatiles: 1) high-threshold volatiles reaching their odor impact by their high levels in foods, e.g. the high odor thresholds of 16 and 13 μ g/L for acetaldehyde and (R)-limonene respectively, are compensated by the high concentrations of 6150 and 2308 μ g/L found for these odorants in hand-squeezed grapefruit juice, and 2) trace level volatiles exceeded their low threshold concentrations at low concentrations, e.g. the grapefruit-like smelling 1-p-menthene-8-thiol (0.01 μ g/L) and the cooked apple-like (E)- β -damascenone (0.9 μ g/L) in grapefruit juice and red wine respectively, which easily exceed their extraordinarily low odor threshold of by a factor of 50 and 90. This is a comprehensive review and with having dry hopped beers in mind, it sounds that if you combine all key odorants of juices, wines and normal beers - there is your dry hopped IPA!²

REFERENCES:

1. Kankolongo, M. et al: Quantitation of Selected Terpenoids and Mercaptans in the Dual-Purpose Hop Varieties Amarillo, Citra, Hallertau Blanc, Mosaic, and Sorachi Ace, *J. Agric. Food Chem.* 2015, 63, 3022-3030, <http://www.ncbi.nlm.nih.gov/pubmed/25780945>
2. Dunkel, A., P., et al: Nature's chemical signatures in human olfaction - a foodborne perspective for future biotechnology Volatiles to Beer, *Chemistry of Smell*, <http://onlinelibrary.wiley.com/doi/10.1002/anie.201309508/abstract>



APRIL 2015 (CONTINUED)

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EVENTS Happy Hoppy Day

August 4th, Kent, UK.



Do you have plans for the summer? Interested in hop flavours? Join us for our happy hoppy day in Paddock Wood, Kent in the UK. Explore hop varieties from around the world with us; learn everything about

hop flavor from cone to beer. More info and registration at: <http://www.barthhaasgroup.com/hopsacademy/de/dates>

HOP OF THE MONTH



 HAAS

Hop variety of the month: EQUINOX®

When the earth and the sun align, a new variety of hops is born. A cool little story on how Equinox™ earned its name: During early spring, Equinox™ comes out of the ground as a bright lime-green variety. Over the course of the summer, it gradually turns to a rich, dark green. Equal light, equal dark = Equinox™.

The diversified and pronounced aroma characteristics of guava, melon, lime and papaya combined with extremely high oil content and a tight cone structure make this hop variety very unique!

http://www.barthhaasgroup.com/images/pdfs/hop-varieties/en/Sortenblatt_Engl_USA_Equinox.pdf