Hops, go get the iron!

Hop acids are said to be antioxidative by metal chelation and scavenging of highly reactive hydroxyl radicals, however hitherto this was a theory rather than a confirmed fact. These US researchers worked with an assay to measure the oxidative degradation of 2-deoxyribose by hydroxyl radicals to elucidate the ability of hops to prevent oxidative damage. They were able to prove the ability of hop acids to suppress the formation of hydroxyl radicals via the Fenton reaction as alpha and iso-alpha acids interact with $\text{Fe}^{2+}$ enhancing its autoxidation to $\text{Fe}^{3+}$ and thereby reducing the catalytic function. They could not confirm the ability of hop acids to scavenge highly reactive hydroxyl radicals. For beer staling this means that the interaction of hops acid with iron helps a big deal for a prolonged freshness.\(^1\) Thank you hop acids!

Who are the real suspects for flavour stability?

For decades brewing researchers have tried to solve the challenge to make beer flavour stable. In the search for the responsible stale flavours, a vast number of substances was intensively discussed as, e.g. E-2-nonenal, strecker aldehydes, ethyl-esters, sulfur compounds, etc. In order to find those compounds that significantly change in concentration during storage, GC–GC–O–MS and PCA were used. The compounds that significantly increased or decreased in aroma during 12 weeks of forced aging at 30°C were methyl mercaptan, methional, dimethyltrisulfide, phenylacetaldehyde, 1,1,6-trimethyl-1,2,3,4-tetrahydronaphthalene (TMTN), citronellyl acetate, and 8–cadinene. The latter two are hop oil derived and were shown to decrease throughout storage, thereby probably losing their potential to mask the other substances that increased in concentration and were found to be relevant for stale aromas. The validity of the importance of this group of compounds as key olfactory cues for beer oxidation was demonstrated by the excellent multivariate analysis correlation between the sensory panel scores and the flavor stability compound level changes.\(^2\) So finally now we do know the real suspects!

You can describe it more specific than hoppy!

There is no common vocabulary to describe hop aroma, either in raw hops or in beer. In order to address this problem, these US researchers evaluated 13 US and European hop varieties with free choice profiling (FCP) and descriptive analysis (DA) sensory techniques to determine first what aromas are present in hops in general, and then to apply certain aroma characteristics to specific hop cultivars. The varieties evaluated were Delta, Cascade, Willamette, Summit, Apollo, Bravo, Opal, Tradition, Smaragd, Hallertau, Saphir, Herkules, Saaz. In this work suitable descriptors were collected to describe raw hops aroma. In comparison to beers dry hopped with these hops it became obvious that the aroma of the raw hops exhibited considerable changes.\(^3\) However the established descriptors will help for a better sensory specification of hop aroma in general.

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