



HUMULUS LUPULUS

AND OTHER BITTER TRUTHS

Hop Creep

Although it has been a familiar phenomenon in the USA for some years now, hop creep is still largely unknown in Europe. Once it has crept into fermenting and storage tanks, this phantom increases the alcohol content and carbon dioxide virtually unnoticed. While it has never been seen or caught in the act, hop creep causes many a brewer to rub their eyes in amazement.

However, for those of us with less of an esoteric disposition, there is of course a scientific explanation. The true culprit behind this overfermentation is dry hopping. Overfermentation in cask ales was described in the UK as long ago as 1912: "Dry hopping causes earlier and particularly more persistent fermentation in the cask". But what can it be that ferments there? The concentration of fermentable sugars in hops is very low and cannot explain this phenomenon. A typical wort contains approximately 70 % of fermentable sugars. In addition, there are non-fermentable dextrins, beta-glucans or pentose sugars.

A hundred years ago, it was firmly assumed that there must be something in the hops that was able to react with these non-fermentable substances.

Today, a hundred years later, a team working under Prof. Tom Shellhammer has investigated this phenomenon in greater depth. His team discovered that the activity of alpha and beta amylase in hops is far less than in malted grain, for example, but is roughly as high as in other plants such as carrots! Amyloglucosidase and limit dextrinase, on the other hand, tend to be dormant in hops. In order to study the full extent of possible overfermentation, the team examined the following parameters:

- the quantity of hops in dry hopping
- the temperature during dry hopping
- the duration of contact with the hops
- the role of the yeast

The team was able to show that the original gravity is increased by the enzyme activity of the hops during dry hopping. This breakdown of fermentable sugars was even more pronounced when the temperature was increased for dry hopping. In this case, enzyme activity doubles when the temperature is increased by 10° C. Yeast also reacts very sensitively to temperature differences. If yeast is involved in conjunction with dry hopping, a close watch should be kept, as the yeast converts the sugars into alcohol and CO₂. In their experiments, the team were able to show that over a contact period of 40 days of dry hopping with 1kg/hl, 1.3 % alcohol and 4.75 % more CO₂ were produced.

Measures against hop creep

Adding hops during the boil is uncritical because all the enzymes are deactivated at this stage. During dry hopping in a storage tank, additional fermentable sugars can be broken down. If no yeast is involved, this is not a major problem.

When dry hopping during fermentation or after the main fermentation – particularly if the yeast is still active – it is advisable to reduce the temperature during dry hopping and/or to reduce the contact time with the hops and remove them efficiently by means of a centrifuge or filtration.

Ultimately, more research will have to be done to ascertain whether these enzymes are actually present in the hops or whether it is the case that there are micro-organisms present in the hops that display this enzyme activity. As much as we appreciate the collaboration of hops and yeast from a sensory perspective, in this connection the two form a rather diabolic alliance.

... But those who find all this a little too risky can of course always fall back on the world's biggest provider of hop-related services for hop extracts and hop aroma products ...