DRY HOPPING HIGH IBU BEERS AND ITS EFFECT ON BEER BITTERNESS

|TECHNICAL SUPPORT|

High IBU beers (40 ppm of isoalpha acids or more) that are heavily dry hopped, with 1 lb of hops per barrel (0,381 kg/hl) or more, can experience significant changes in hop acid composition. When dry hopping high IBU beers, the leaf material of hops or hop pellets absorb and remove significant amounts of isoalpha acids and add significant amounts of low bitter humulinones and very low bitter alpha acids.

Humulinones are reported to be 66% as bitter as isoalpha acids and alpha acids about 1/10th as bitter as isoalpha acids. Dry hopping also causes an increase in a beer's analytical IBU, which would imply the beer is getting more bitter, however, the IBU test results are misleading. Because dry hopping causes a change in the beer's hop acid composition one should calculate the perceived bitterness by taking into account the relative bitterness of all three hop acids.

This calculated bitterness can be accomplished by measuring the concentration of the individual hop acids via High Performance Liquid Chromatography, HPLC. The below table contains the HPLC analysis of a control beer treated with 0.5 lbs, 1.0 lbs, and 2.0 lbs of Cascade hop pellets for five days at 16 oC. The Cascade hops assayed 0.26% humulinone and 5.6% alpha acids. HPLC analysis of the beers show that as the dry hop dosage goes up the isoalpha acid concentration goes down as well as the beer's calculated bitterness.

It should be noted that as the isoalpha acid concentration drops to ~ 30 ppm, the addition of more hops and the subsequent removal of more isoalpha acids becomes less efficient. The below results show that dry hopping with one pound of hops removes about 22 ppm of isoalpha acids but the addition of two pounds only removes 26 ppm isoalpha acids. This is because isoalpha acids are very soluble in beer at lower concentrations and are less likely to be removed via leaf absorption which readily occurs at higher concentrations.

Hop (lbs) per barrel	kg/hl	Iso (ppm)	α-acids (ppm)	Humulinone (ppm)	Calculated Bitterness*
0	0	51	9	4	55
0.5	0,191	42	22	10	50
1.0	0,381	29	27	14	40
2.0	0,762	25	35	23	42

*Calculated bitterness = ppm isoalpha acids + (ppm α-acids x 0.1) + (ppm Humulinone x 0.66)

What this means, is if one dry hops a low IBU beer, that is a beer containing less than 20 ppm isoalpha acids, leaf absorption and removal of isoalpha acids from the beer will be minor. Yet the addition of humulinones and alpha acids to the beer will still occur. This means dry hopping a low IBU can increase a beer's bitterness. These results will be reported in next month's newsletter.

To learn more please do not hesitate to contact us.

Simon H. Steiner Hopfen GmbH S.S. Steiner Inc.

Hopsteiner®
COMMITTED TO THE BREWER