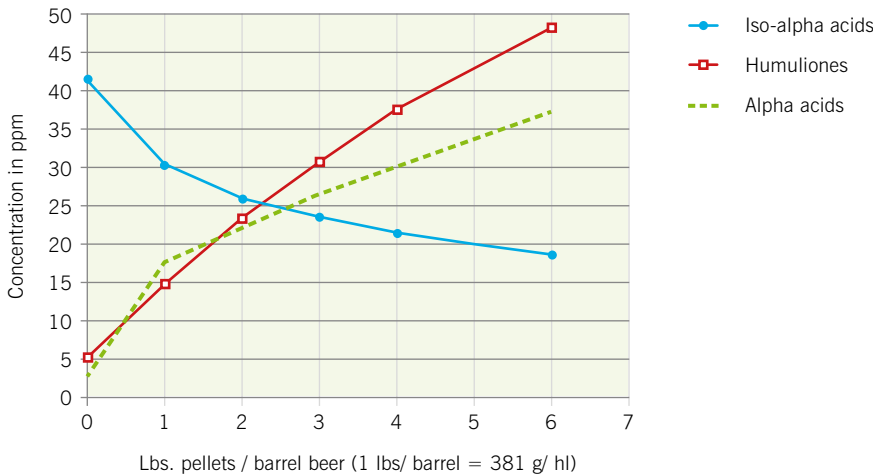


# EXTREME DRY HOPPING

## | TECHNICAL SUPPORT |

Just when you thought craft brewers couldn't add any more hops to their beer they do. Some craft brewers feel that dry hopping with 1 to 2 lbs of hops per barrel of beer is not enough and many are adding as much as 4 to 5 lbs if not more. To see what effect this has on the hop acid composition of beer and bitterness, a series of dry hopping experiments were conducted using Cascade hop pellets with assaying 5.7% alpha acids, 5.5% beta acids and 0.23% humulinones. A control beer with assaying 42 ppm iso-alpha acids was dry hopped with 1.0 lbs, 2.0 lbs, 3 lbs, 4 lbs, and 6 lbs of Cascade hop pellets for three days at 16 °C. As the below chart shows, most of the iso-alpha acids are lost with the first two pounds of hops with smaller amounts being lost with pounds 3 thru 6. Due to the high solubility of humulinones, concentrations reach 48 ppm and alpha acid concentrations reached just over 35 ppm with 6 pounds of dry hopping.

### EXTREME DRY HOPPING WITH CASCADE HOP PELLETS



How does this change in hop acid concentration affect the bitterness in the beer? If we use formula A which adds the relative bitterness of the hop acids in the above chart, the calculations show that one gets a loss in bitterness first and with additional hop dosing there is an increase again.

Applying formula B, especially developed for beers with high concentrations of humulinones (above 25 ppm), the calculated value is almost stable. It seems that the bittering effect of humulinones gets weaker in higher concentrations.

	Pounds	0	1	2	3	4	6
A <sup>1</sup>	Calculated Bitterness	45.8	41.6	44.1	47.1	49.0	53.0
B <sup>2</sup>	Calculated Bitterness	45.6	42.6	43.9	44.7	44.3	43.3

<sup>1</sup> Calculated bitterness = ppm IAA + (ppm AA x 0.1) + (ppm H x 0.66)

<sup>2</sup> Calculated bitterness = ppm IAA + (ppm AA x 0.1) + (-0.0102 x ppm H<sup>2</sup> + 0.954 x ppm H - 1.154 ppm)

As shown in the data above, there is a clear loss of iso-alpha acids, when beers are dry hopped. However this loss can more or less be compensated by the increasing concentrations of alpha acids and humulinones.

To learn more please do not hesitate to contact us.

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

Newsletter, July 2017

HALL B1 – BOOTH 129

## DRINKTEC 2017

SEP., 11<sup>TH</sup> - 15<sup>TH</sup>

[Drinktec 2017](#)

Our booth at drinktec has become a popular meeting place of the International Brewing Industry. Again this year we will have information about new varieties, developments in variety breeding and the actual hop market. Once again we will offer a multitude of new beers at our tasting booth and would be pleased to welcome you as our guest. This year's tasting is based on "Hop Performance 2017" and we are looking forward to your opinion.

Visit us at *drinktec, Hall B1 – Booth 129* and enjoy the "fascination of hops" with us.



  
**Hopsteiner**

COMMITTED TO THE BREWER