



# NEWSLETTER 06/2015

## TECHNICAL SUPPORT

### Humulinone Utilization In Dry-Hopped Beers

Humulinones are similar in structure and about 65 % as bitter as iso-alpha acids – see Newsletter 2015-04. Humulinones are found in leaf hops and hop pellets at concentrations of 0.2 % - 0.5 % w/w. We measured the humulinone concentration of beer that had 100 % of the hop dosage added to the kettle. Beers that were heavily hopped can contain as much as 4 ppm of humulinones in the final beer, with typical Lagers containing 1 ppm or less. However, when we measured the humulinone concentration of beers that were dry-hopped, as much as 24 ppm of humulinones were measured in the beers.

To determine the solubility of humulinones in beer hop pellets of the variety Centennial containing 0.35 % w/w humulinone were added to a low and high IBU beer at the dosage levels indicated in the table below for three days. Our tests showed that 87 – 98 % of the humulinones from Centennial hop pellets dissolve into the beers, regardless of IBU, indicating that humulinones are extremely soluble in beer.

### Humulinone and Iso-Alpha Acids Concentration In Dry-Hopped Beers

Sample	lbs Hop Pellets per Barrel of Beer	ppm of Humulinone in Beer	% Utilization Humulinone	ppm of Iso-alpha acids in Beer	*Calculated Bitterness Intensity
Low IBU Beer	0.0	0.8	–	8.6	9.1
	0.5	8.0	98	8.1	13.0
	1.0	14.0	91	7.9	17.0
	2.0	28.0	88	7.5	26.0
High IBU Beer	0.0	1.0	–	48.0	49.0
	0.5	8.0	98	39.0	44.0
	1.0	14.0	91	35.0	44.0
	2.0	27.0	87	30.0	47.0

\*Calculated Bitterness = ppm iso-alpha acids + (ppm humulinone x 0.65)

Interestingly, dry-hopping appears to remove some iso-alpha acids in the high IBU beers, whereas little is lost in the low IBU beers. When dry-hopping, humulinones can off-set some of the lost iso-alpha acids in high IBU beers, however, they could increase the bitterness of low IBU beers.

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August 3-9<sup>th</sup>

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