Master Brewers Association of the Americas

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Dedicated to the technology of brewing.

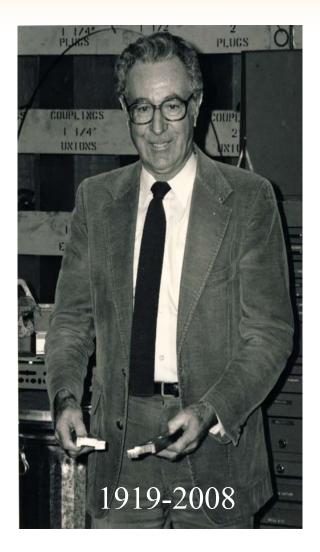
MBAA Annual Conference

The IBU Method, its Creation and what it Measures

Val Peacock Hop Solutions Inc.

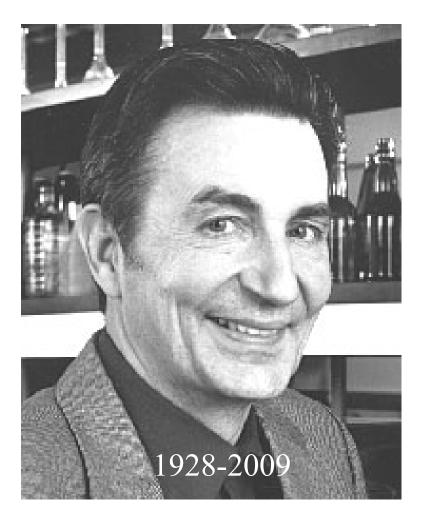
History of the IBU

- Extract acidified beer with TMP, dilute extract with basic MeOH and measure absorption @ 255nm



Morten Meilgaard Modification Carlsberg Laboratories - 1955

- Wants to measure not only "iso-compounds", but all hop derived bittering substances.
- Don't measure @ 255nm in base, but @ 275nm neutral.
- This is essentially the method used today – but takes many years to be accepted by the ASBC and EBC in the late 1960's.



The Fight (1955-1972)

- Rigby wants to measure only "iso-compounds" and assumes the interfering compounds are not important.
- Meilgaard assumes all hop derived compounds contribute to bitterness especially oxidation products formed during aging of hops, and wants to include them all.
- What is this all about?

Brewing in 1955-1970

- Hop pellets do not exist almost all brewers uses whole hops and these are NOT cold stored. Hops are 9-15 months old on average when used and 25-50% of bitterness comes from oxidation products of α & β.
- Almost no one dry hops, lager beers are the only consideration in designing IBU method.
- Dry hopping adds many new complicating substances to beer.

The Compromise

- Some want IBU = ppm iso-alpha.
- Others say oxidation products responsible for 25-50% of bitterness of commercial beers.
- The IBU measurement will include all oxidation products, but will be calibrated to have IBU's = ppm iso-alpha when 5/7th of bitter substances are iso-alpha. This leads to great misunderstanding of what the IBU measures.

The Compromise Multiplier

True iso-alpha method with all interfering substances removed:

IBU = ppm iso = 70 X Absorbance (@275nm)

Compromise method includes interferences:

IBU = 50 X Absorbance (@275nm) So IBU's approximate ppm "iso" in most beers of the time.

The Peacock Rule

IBU's = 5/7(ppm iso + ppm non-iso)

This explains relation of IBU's and ppm iso in beers

Age fresh hops 18 months and make beer with <u>same amount</u> of hops in each brew

Storage Temp.	Alpha Acids In Hops	Iso-Alpha Acids In Beer	Beer IBU's
-15°F	3.22%	19.8 ppm	13.5
25°F	2.91%	18.1 ppm	12.0
45°F	1.71%	14.4 ppm	13.5
70°F	0.41%	2.9 ppm	11.0

Hop Oxidation and Quality of Bitterness

- Even though VERY oxidized hops may give comparable IBU levels as fresh hops, there are large qualitative differences.
- The bitterness of beer with largely non-isoalpha bitterness (from old hops) will be harsher and more lingering than beer with the same IBU's of iso-alpha.
- Foam will be very much inferior in beer made with old hops.

The Peacock Explanation 2007-2014

• IBU = 5/7 (iso-alpha + non-iso-bitterness)

• Luke Chadwick (2014) question - Why not:

IBU = 5/7(iso-alpha) + non-iso-bitterness

But what is the proper multiplier for noniso?

The 2014 Peacock Explanation (Dry-Hopping)

IBU = $5/7(iso-\alpha) + X_1(non-iso-\alpha) + X_2(\alpha \text{ ox.}$ Prod.) + $X_3(Xanthohumol) + X_4(iso-XN) + X_5(\beta) + X_6(\beta \text{ ox. prod.}) \dots$

If you know the absorbance of these fractions (a) 275nm, the multiplier can be readily calculated (assuming 100% extraction efficiency). Other nm? 325, 370?

Conclusions

- The current IBU method measures a multitude of things in beer not just iso-alpha.
- The original method was developed for lager beers (no dry-hopping) made with very oxidized hops. Different from isoalpha method.
- Dry hopping and use of hop pellets or extract greatly changes the relation of isoalpha to IBUs. Does the current method need modification?