VOLUMETRIC ADJUSTMENTS FOR ADDING SYRUP ADJUNCTS TO PRIMARY AND SECONDARY

Defining *Late Additions*

A late addition is defined as adding candi syrup to any stage of primary or secondary. Due to the added volume of the syrups, the volume of the ale will change and thus alter the total impact of the addition gravity. This document defines the formula necessary for the adjustment in volume pro rata based on the increase in volume created by the syrups themselves.

Why Add Adjuncts Late?

Adding a candi syrup into primary, or more commonly to secondary, has a number of purposes. The addition of a syrup at high krausen to boost ABV. Adding flavor may be the motive or increasing the final gravity. Whatever the reason, the formula for volumetric adjustment will provide an accurate calculation for the increase in gravity for the late addition.

Addition Method

Although this has previously been described in the "Syrup Use" document, it is briefed here in a different context here for convenience. Adding syrups to a *relatively* cool fermentation can pose miscibility problems. To avoid this, a dilution and preparation are recommended:

1. Add syrup to 2000ml Erlenmeyer flask (or pan + lid if you do not have a flask)
2. Calculate the water required at 4.0 fluid ounces per lb of syrup
3. Boil slowly for 20 minutes. Let cool covered naturally to the temp of the ale.
4. Gently stir well into fermenter
5. Reseal primary or secondary fermenter

Adjunct Gravity Increase Calculation

Generally adding one lb of syrup to a boil will increase the gravity by 1.032 pp/g. This is a basic calculation due to the known volume of the final boil. Thus a 5.5 gallon finished boil will have a gravity increase per pound of syrup by 1.0058 pp/g (1.032/5.5). When adding to an already fermenting volume the calculation must be prorated based on the volume increase.

Volumetric Gravity Calculation

Pro-rating the gravity impact of a late syrup addition involves a few more factors. First we assembly our variables and create a volume factor that will prorate the impact of the syrup addition. We'll do this using xVolFactor:

nSyrupGravityPPG = 1.032 (gravity of most candi syrups)
nSyrupFactor = 0.08125 (or 10.4 fluid ounces per lb of syrup)
nWaterFactor = 0.03125 (miscibility water - 4 fluid ounces added for each lb of syrup)
nSyrupLbs = 1.0 (lbs of syrup to be added)
nAleVol = 1.00 (current gallons of ale in primary or secondary)

Here's the equation for xVolFactor:

$$xVolFactor = \frac{nAleVol}{nSyrupFactor\ (nSyrupLbs)\ +\ nWaterFactor\ (nSyrupLbs) + nAleVol}$$

$$xVolFactor = \frac{1.0}{0.08125\ (1.0)\ +\ 0.03125(1.0) + 1.0}$$

$$xVolFactor = \textcolor{red}{0.898876}$$

Next we determine the total gravity impact by multiplying the total gravity of our syrup addition by the pro-rating factor created by the increase in volume. That's it!

$$xProRataGravityImpact = (nSyrupLbs * nSyrupGravityPPG) * xVolFactor$$
$$xProRataGravityImpact = (1.0 * 1.032) * 0.898876$$
$$xProRataGravityImpact = (28.7 * .001) + 1$$
$$xProRataGravityImpact = \textcolor{red}{1.0287}$$