BLENDING SYRUP - PART I

BLENDING OFF-DENSITY SYRUP WITH OTHER SYRUP TO ADJUST THE DENSITY - DETERMNING HOW MUCH I NEED

Dr. Randy Heiligmann
School of Natural Resources,
The Ohio State University

No matter how good we are at finishing syrup, most of us occasionally produce syrup with an unacceptable density. Maple syrup with too low a density is not legal, will spoil more quickly, and is thin and runny. Syrup that is too thick will produce sugar crystals and cost us money in syrup not made.

If the syrup's density is too low, it can be reprocessed to a higher density or blended with another syrup. If the density is too high, it can be blended with another syrup, water, or sap. The challenge when blending is to determine how much syrup, water, or sap to blend with the off-density syrup to produce the desired density.

Except for the most experienced among us, guessing the proportion of syrup, water, or sap to blend with off-density syrup can be a frustrating experience. The alternative is to calculate the proportions of syrups to blend to achieve the desired density. Certainly, those of us who are mathematically inclined can and some probably have used algebra to determine the proportions of two syrups to blend to achieve a desired density.

There is, however, a much easier way. You can't completely get away from math and blend accurately, but the method of alligation discussed and demonstrated in this and a subsequent article requires very simple calculations. Those of you familiar with older editions of the Maple Sirup Manual may remember a discussion on blending syrup using the method of alligation (Pearson square). It is a quick and easy method for determining the proportion of syrup, sap, or water that should be blended with off-density syrup to achieve the desired density. Alligation can be used directly to determine the weights or volumes to mix when blending syrup with syrup or to determine the weights to mix when blending syrup with sap or water. It can be used with slight modification to determine the volumes to mix when blending syrup with sap or water.

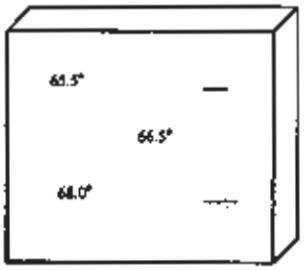
In this article, Part I of a two part series, we will demonstrate how to use alligation to determine weights or volumes to mix when combining two syrups to obtain a blend with the desired density. In Part II we'll demonstrate how to use alligation to determine the amount of sap or water to mix with off-density syrup to adjust its density to the desired level.

BLENDING SYRUP WITH SYRUP

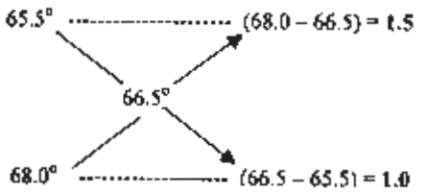
Determining the proportions of two syrups of known densities to mix to obtain a blend of a desired density can be done very simply, quickly, and directly using the method of alligation. The method is best explained by example, so let's blend two syrups with densities of 65.5° Brix and 68.0° Brix to obtain a blend with a density of 66.5o Brix. The method of

alligation determines the proportion by weight of each that should be blended.

Visualize the method utilizing a diagram similar to the five side of a die. In the upper and lower left-hand corners write the densities of the two syrups to be blended; in the center of the diagram write the density of the desired blend. In our example:



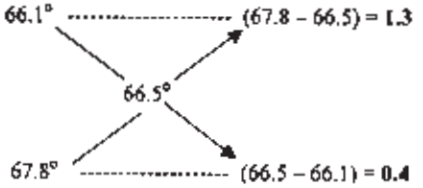
Subtracting across the two diagonals provides the proportion (by weight) of each syrup required to produce the desired density. Always subtract the smaller number from the larger, irrespective of its location. The proportion (by weight) of each syrup to be blended is the number located directly across from it in the diagram. In our example:



Blending 1.5 parts 65.5° Brix syrup with 1.0 part 68.0° Brix syrup results in a blend with a density of 66.5° Brix. If we had 150 pounds of 65.5° Brix syrup and wished to raise its density to 66.5° Brix by blending it with 68.0° Brix syrup, we would need to mix the 150 pounds of 65.5° Brix syrup with 100 pounds of the 68.0° Brix syrup, producing 250 pounds of 66.5° Brix syrup.

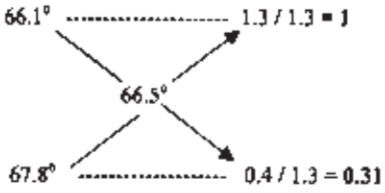
Above we noted that the method of alligation calculates the mixing proportions on a weight basis. However, since the difference in weight between syrups of different densities is relatively small, the proportions calculated using the method of alligation can be applied to volumes with relatively small error. In our example, applying the proportions to volumes and mixing one and one-half gallons of 65.5° Brix syrup with one gallon of 68.0° Brix syrup would produce 2.5 gallons of 66.52° Brix syrup - two hundredths of a Brix too high. This is far more accurate that most of us will ever measure.

Let's look at one more example of blending syrups with slightly messier results. Suppose we have some 66.1° Brix syrup we would like to blend up to 66.5° Brix using 67.8° Brix syrup. Using the method of alligation to determine the proportions to blend:



The mixing proportions are 1.3 parts 66.1° Brix syrup with 0.4 parts 67.8° Brix syrup. We can work with these proportions but it is easier to calculate the amount of syrup to combine with a given amount of off-density syrup if we convert one of the numbers in the ratio to a "one" so it can be interpreted as one pound or one gallon. In this example, since we want to know how much 67.8° Brix

syrup to add to a known amount of 66.1° Brix syrup, we can set the proportion of 66.1° Brix syrup to "one" by dividing both numbers by 1.3, resulting in a mixing ratio of 1 part 66.1° Brix syrup to 0.31 parts 67.8° syrup.



If we had 120 pounds of 66.1° Brix syrup we could combine it with 37.2 pounds of 67.8° Brix syrup (120 times 0.31) to produce 157.2 pounds of 66.5° Brix syrup. Similarly, 3 gallons of 66.1° Brix syrup could be combined with 0.93 gallons (or 119 fluid ounces) of 67.8° Brix syrup to produce 3.93 gallons of 66.5° Brix syrup.

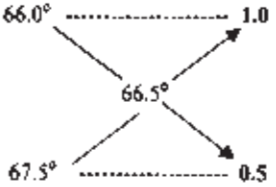
SUMMARY

What You Really Need To Know

The method of alligation provides a quick, easy, and accurate way to determine the proportion by weight or volume of two syrups to blend together to obtain a blend of the desired density. To determine the proportions:

- Utilize a diagram resembling the five side of a die.
- Place the density of the two syrups to be blended in the upper and lower left-hand corners of the diagram and the desired density of the blend in the center.
- Subtract across the diagonals to obtain the proportions of syrup to mix. Always subtract the larger number from the smaller. The proportion of each syrup to blend is directly across from it in the diagram.

As a final example we can determine how much 67.5° Brix syrup should be mixed with 10 gallons or 110.4 pounds of 66.0° Brix syrup to raise its density to 66.5° Brix.



Five gallons of 67.5° Brix syrup should be mixed with 10 gallons of 66.0° Brix syrup to produce 15 gallons of 66.5° Brix syrup, or 55.2 pounds of 67.5° Brix syrup should be mixed with 110.4 pounds of 66.0o Brix syrup to produce 165.6 pounds of 66.5° Brix syrup.

In the next issue of the Maple Syrup Digest we'll look at using the method of alligation to determine the amount of water or sap to mix with a known quantity of syrup that is too heavy.