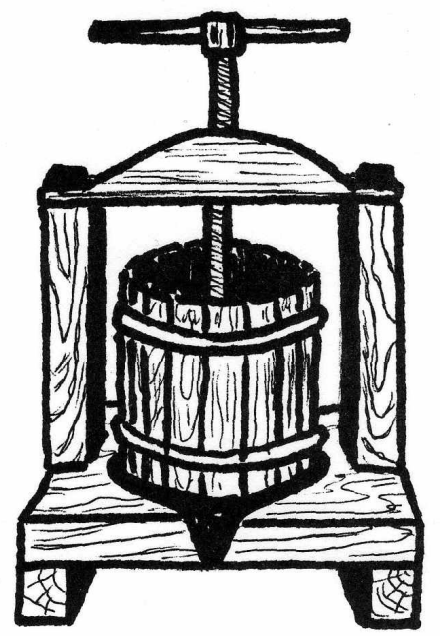

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Blending With the Pearson Square*

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*This is a special issue with two esteemed WVA guest authors and Life Members

As you know, many wines are made from a combination of wines - country wines, grape wines, or both. Actually, blending is very common in the wine and food industries. Milk is blended. Fruit juices are mixed with sugar syrup. The ingredients of sausages are blended to obtain a particular fat content. And, of course, many great wines are the result of blending.

A lot of commercial wines are blends. If fact, it is difficult to find a Cabernet Sauvignon that is made from 100% Cabernet Sauvignon grapes. Port wines are also blends of different grapes and different vintages to optimize the taste of the final product. Wineries blend wines for consistency in each bottle and year to year. Wineries produce large volume batches and need to blend their wine to have a consistent product from bottle to bottle. This helps cancel out a vintage's variations in vineyards, fermentations, and tannin levels in barrels. Product consistency from year to year is also important and some blending may be needed to accomplish that. The general goal of blending is to create a wine that's better than the wines on their own. In effect, the goal is to make one plus one equal at least three.

Home winemakers typically blend wines for two reasons: to add complexity and to achieve balance. Different yeasts used for fermentation can produce different aromas and flavors. Separate batches of the same fruit each fermented with a different yeast and blended together will produce a more complex wine. Sometime, you may have a wine that is well made but the sugar level, the acid, or the tannin may be out of balance. Blending may solve that balance issue. Finally, wine can be made and/or blended into different styles (more sugar, acidity, etc.) and this will provide some variety of wines in your cellar.

Blending can be accomplished two ways. By tasting and by quantitative analysis. Tasting different combinations is probably the most common way to blend wines. Start at 50-50 for two wines and try different percentages from there. This works great for aroma, flavors, tannin, and complexity. Another way is a technical or quantitative analysis. For wine components that are measurable, (sugar, TA or alcohol), you are able to determine blending parameters. If you know which wine component you want to change in your resulting blend, the best way to determine your blend is to use the Pearson Square.

In winemaking, the Pearson Square is a tool to calculate the number of parts of two different wines with different levels of components that are required to bring a resulting wine to a desired level. More specifically, the Pearson Square is a visual math tool that can help determine blending ratios of 2 wines to achieve a quantifiable outcome. It is an easy-to-use tool for calculating the number of parts (volume) of wine with a given component (such as sugar, acid or alcohol) that is required to bring the alcohol content of another wine to a desired level.

Examples of how the Pearson Square can determine blending ratios:

- to blend two wines with two different levels of sugar, or acid, or alcohol
- to determine the amount of unfermented juice to hold back for use as a sweet reserve
- to determine how much alcohol is needed to fortify a wine
- to determine how to make an alcohol solution for use in bench trials

To create a Pearson Square, divide a square into nine equal parts. The upper left corner is labeled A, the lower left B, the middle C, the top right D and the bottom right E. This is what the Pearson Square looks like:

A		D
	C	
B		E

A = highest number of wine used to correct
B = lowest number of wine to be corrected
C = desired number
D = C - B, the parts for blending of the correcting wine
E = A - C, the parts for blending of the wine to be corrected

Let me go through some examples.

Example 1. How to blend two wines for a lower acidity level

Let's assume one wine has an acid level of 0.55 percent, and the other has an acid level of 1.10 percent. You can use the Pearson Square to determine the ratio needed to obtain any desired acidity level between the two. In this example, we'll use a desired acid level of 0.70 percent.

A D

C

B E

Thus, A = highest acid, B = the lowest acid, and C = desired acid.

1.10 D = C - B = 0.15

0.70

0.55 E = A - C = 0.40

The top left corner and the bottom left corner represent the acid level of the two wines to be blended. The center number is the desired acid level. The two numbers on the right are numbers that you calculate. The 0.15 is simply the difference between 0.55 and 0.70; likewise the 0.40 is the difference between 1.10 and 0.70.

1.10 0.15

0.70

0.55 0.40

The 0.15 and the 0.40 now represent the blending ratio of the wines that would result in the desired acid level: 15 parts of 1.10 percent wine and 40 parts of 0.55 percent wine. You will notice that you do not need to continue the decimals, just use the numbers. In this example, the ratio numbers can be reduced to its lowest common denominator of five. Therefore, divide both numbers (divide 15 by 5, and divide 40 by 5), and the ratio becomes 3 parts of the 1.10 % and 8 parts of the 0.55% respectively.

As a way to get you started with the blending,

a. the blending ratio is 15 parts high acid wine to 40 parts of low acid wine
b. convert the ratios to a lower denominator: divide each number by 15, so 1 part high acid wine to 2.66 parts low acid wine would yield the desired acid of 0.7%
c. decide how much wine to blend:
   - if you blend 1 gallon of the high acid wine and 2.66 gallons of the low acid wine, you total volume would be 3.66 gallons
   - if you blend 3 gallons of the high acid wine and 8 gallons of the low acid wine (3 gallons times 2.66 parts), your total volume would be 11.0 gallons
   - if you wanted to blend a total of 5 gallons,
     i. calculate the number of gallons for each part of the blend: divide 5.0 gallons by the total number of parts in the ratio or 5.0 / 3.66 = 1.377 gallons for each part of the blend
     ii. calculate the number of gallons for the blend: the blending ratio is 1 part wine to 2.66 parts wine, so you will need 1.377 gallons of high acid wine and 1.377 times 2.66 parts of low acid wine or 3.63 gallons of low acid wine
     iii. calculate the total volume of the blend: 1.377 gallons of high acid wine and 3.63 gallons of low acid wine gallons = 5.0 gallons
d. here is a summary:

high acid wine at 1 part	+	low acid wine at 2.66 parts	=	desired acid at 0.7%
1 gal	+	2.66 gal	=	3.66 gal
3 gal	+	8 gal	=	11 gal
1.377 gal	+	3.63 gal	=	5 gal

Example 2. How to determine the amount of juice to hold back for use as a sweet reserve

If you want to use some of your unfermented juice to back sweeten your wine before bottling, you can use the Pearson Square to determine how much juice you will need. Let's assume the juice is at specific gravity (SG) 1.090, and let's say that you intend to ferment the juice to dryness, or SG 0.994. Prior to bottling, your intent is to back sweeten the wine to SG 0.997.

A D

C

B E

Thus, A = highest SG, B = the lowest SG, and C = desired SG.

1.090 D = C - B = 0.003

0.997

0.994 E = C - B = 0.093

The top left corner and the bottom left corner represent the sugar level of the wine and unfermented juice to be blended. The center number is the desired sugar level at bottling. The two numbers on the right are numbers that you calculate. The 0.003 is simply the difference between 0.997 and 0.994; likewise the 0.093 is the difference between 1.090 and 0.997.

1.090 0.003

0.997

0.994 0.093

The 0.003 and the 0.093 now represent the blending ratio that would result in the desired sugar level: 3 parts of unfermented juice, and 93 parts of the fermented wine. [Note: The unfermented juice called sweet reserve is used for back sweeting your wine rather than using sugar. Take the unfermented juice, add 25 ppm so2 and freeze it until needed.] Once again, removing the decimal points, the blending ratio is 3 parts sweet reserve and 93 parts fermented wine. The ratio numbers can be reduced to its lowest common denominator of 3. So divide both numbers by 3 (divide 3 by 3, and divide 93 by 3), and the ratio becomes 1 part of sweet reserve and for every 31 parts of fermented wine. Say you have a 750 mL bottle (25.4 ounces) of sweet reserve. Multiply 25.4 ounces of sweet reserve by 31 parts of the fermented wine and the result is 787 ounces or 6.1 gallons. So 25.4 ounces of the sweet reserve would be enough to back sweeten 6.1 gallons. Alternatively, using the blending ratios, 21 ounces of the sweet reserve, would be enough sweet reserve to back sweeten a 5-gallon carboy (21 parts times 31 parts = 651 divided by 128 ounces/gallon = 5.1 gal.)

As a way to get you started with the blending,

a. the blending ratio is 3 parts sweet reserve to 93 parts of wine

b. convert the ratios to their lowest denominator: divide each number by 3, so 1 part sweet reserve to 31 parts wine

c. decide how much wine to back sweeten:

- if you have 25.4 ounces of sweet reserve, multiply that amount by 31 and you will be able to back sweeten 6.1 gallons (25.4 times 31 = 787 ounces = 6.1 gal); blended volume is 25.4 ounces (0.20 gal) plus 6.1 gallons = 6.3 gallons
- if you have 5 gallons of wine you want blended:
  - i. calculate the number of parts of sweet reserve - divide 5 gallons by the number of parts of wine or 5.0 / 31 = 0.161 gallons of the sweet reserve
  - ii. calculate the blend: convert gallons to ounces or 0.161 gallons times is 128 ounces/gallon = 20.65 ounces of the sweet reserve
  - iii. calculate the total volume of the blend: 20.65 ounces of sweet reserve (0.156 gal) plus 5 gallons = 5.16 gallons
- if you have 5 gallons of wine, but want to end up with 5 gallons total that has been back sweetened, how much sweet reserve is needed?
  - i. calculate the number of ounces for each part of the blend: divide 5.0 gallons by the total number of parts or 5.0 / 32 = 0.156 gallons for each part of the blend
  - ii. calculate the number of gallons for the blend: the blending ratio is 1 part sweet reserve to 31 parts wine, so you will need 0.156 gallons of sweet reserve and 0.156 times 31 parts of wine or 4.8 gallons of wine
  - iii. calculate the total volume of the blend: 0.156 gallons (20.65 oz) of sweet reserve and 4.8 gallons of wine = 5.0 gallons

d. here is a summary:

wine at 31 parts	+	sweet reserve at 1 part	=	desired SG at 0.997
787 oz (6.1 gal)	+	25.4 oz	=	811.4 oz (6.34 gal)
5.0 gal	+	20.65 oz	=	5.16 gal
4.8 gal	+	20.65 oz	=	5.0 gallons

Example 3. How to determine how much alcohol is needed to fortify a wine

If you want to fortify a wine using 80 proof vodka (40% alcohol), you can use the Pearson Square to determine the ratio of the vodka and the wine. Let's assume you fermented the wine to SG 0.994 from SG 1.090 or 13% alcohol. Prior to bottling, you intend to fortify your wine by increasing the desired alcohol level to 18%.

A D

C

B E

Thus, A = highest alcohol, B = to the lowest alcohol, and C = desired alcohol.

40 D = C - B = 5

18

13 E = A - C = 22

The top left corner and the bottom left corner represent the alcohol level of the vodka and fermented wine to be blended. The center number is the desired alcohol level. The two numbers on the right are numbers that you calculate. The 5 is simply the difference between 18 and 13; likewise the 22 is the difference between 40 and 18.

40 5

18

13 22

The 5 and the 22 now represent the blending ratio of the vodka and fermented wine that would result in the desired alcohol level: 5 parts of the 40% vodka and 22 parts of the fermented wine. The ratio numbers can be reduced to a lower denominator. So divide both numbers by 5 (divide 5 by 5, and divide 22 by 5), and the ratio becomes 1 part of the vodka and 4.4 parts and fermented wine. Using the blending ratios to blend 5 gallons of the wine, 1 gallon of vodka would only use 4.4 gallons of the wine. Alternatively, 1.136 gallons of vodka (5 gal divided by 4.4 gallons) would use the entire 5 gallons of wine and raise the alcohol to 18%.

As a way to get you started with the blending,

a. the blending ratio is 5 parts vodka to 22 parts of wine
b. convert the ratios to a lower denominator: divide each number by 5, so 1 part vodka to 4.4 parts wine
c. decide how much wine to fortify:
   - if you have add 1 gallon of vodka to 4.4 gallons of wine, your blended volume is 5.4 gallons
   - if you have 5 gallons of wine and want to fortify it all:
     i. calculate the number of parts of vodka needed: divide the number of gallons of wine by 4.4 parts of wine or 5.0/4.4 = 1.136 gallons of vodka
     ii. calculate the blend: 1.136 gallons of vodka and 5 gallons of wine would fortify the 5 gallons
     iii. calculate the total volume of the blend: 5 gallons plus 1.136 gallons = 6.1 gallons
   - if you only want to have a final blend totaling 5 gallons:
     i. calculate the number of gallons for each part of the blend: divide 5 gallons by a total of 5.4 parts or 5.0 / 5.4 = 0.926 gallons for each part of the blend
     ii. calculate the number of gallons for the blend: the blending ratio is 1 part vodka to 4.4 parts wine, so you will need .926 of a gallon of vodka and 4.4 times 0.926 gallons or 4.07 gallons of wine
     iii. calculate the total volume of the blend: 0.926 of a gallon of vodka and 4.07 gallons of wine = 5 gallons
d. here is a summary:

wine at 4.4 parts	+	vodka at 1 part	=	desired alc of 18%
4.4 gal	+	1 gal	=	5.4 gal
5.0 gal	+	1.36 gal	=	6.1 gal
4.07 gal	+	0.926 gal	=	5.0 gal

Example 4. How to make an alcohol solution for use in bench trials

When you conduct a bench trial, you may want to use alcohol rather than water when mixing the product solution. A water solution does not last very long. If one want to make up a 10% alcohol solution with water and 80 proof vodka (40% alcohol), you can use the Pearson Square to determine the ratio needed to prepare this alcohol solution. In this example, we'll use a desired alcohol level of 10%.

A D

C

B E

Thus, A = highest alcohol, B = the lowest alcohol, and C = desired alcohol.

40 D = C - B = 10

10

0 E = A - C = 30

The top left corner and the bottom left corner represent the alcohol level of the vodka and water to be blended. The center number is the desired alcohol level. The two numbers on the right are numbers that you calculate. The 10 is simply the difference between 10 and 0; likewise the 30 is the difference between 40 and 10.

40 10

10

0 30

The 10 and the 30 now represent the blending ratio of the vodka and water that would result in the desired alcohol level: 10 parts of the 40% vodka and 30 parts of the water. The ratio numbers can be reduced to its lowest common denominator of 10. So divide both numbers by 10 (divide 10 by 10, and divide 30 by 10), and the ratio becomes 1 part of vodka and 3 parts of water. Using the blending ratios to mix a 750 ml bottle (25.4 ounces), 6 ounces of vodka with 18 ounces of water would give you a total volume of 24 ounces, almost a full 750 ml bottle.

As a way to get you started with the blending,

a. the blending ratio is 10 parts vodka to 30 parts of water
b. convert the ratios to a lower denominator: divide each number by 10, so 1 part vodka to 3 parts water
c. decide how much water to blend:
   - if you want a 750 ml bottle (25.4 ounces) of the blend:
     i. calculate the number of ounces for each part of the blend: divide 25.4 ounces by a total of 4 parts or 25.4 / 4 = 6.35 ounces for each part of the blend
     ii. calculate number of ounces for the blend: the blending ratio is 1 part vodka to 3 parts water, so you will need 6.35 ounces of vodka and 3 times 6.35 ounces (19.05 oz) of water
     iii. calculate total volume of the blend: 6.35 oz of vodka and 19.05 oz of water = 25.4 oz = 750 mL

- if you wanted only 100 ml of the blend:
    i. calculate the number of ounces for each part of the blend: divide 100 mL by a total of 4 parts or 100 / 4 = 25 mLs for each
    ii. calculate the number of mL for the blend: the blending ratio is 1 part vodka to 3 parts water, so you will need 25 mLs of vodka and 3 times 25 mLs (75 mLs) of water
    iii. calculate the total volume of the blend: 25 mL of vodka and 75 mL of water = 100 mL.

d. here is a summary:

water at 3 parts	+	vodka at 1 part	=	desired alc of 10%
19.05 oz	+	6.35 oz	=	25.4 oz
75 mLs	+	25 mLs	=	100 mLs