Guidelines to Hydrating Active Dry Wine Yeast, & A Recommended Nutrient Regimen

By Shea A.J. Comfort, *YeastWhisperer*

Even though we may not realize it, yeast hydration is actually the first moment that we as winemakers have a direct effect on the ultimate success of our finished wines. A properly hydrated yeast is a healthy yeast, and the initial health of our yeast really does determine its ability to gracefully ferment our wines. In addition, learning to properly hydrate the yeast is a cheap insurance policy that is 100% guaranteed to help us make better wines.

Properly hydrated yeast are more apt to be able to create the full expression of beautiful flavours and aromas that we are after than ones that have been compromised from poor initial handling, even in well-managed fermentations. In fermentations that happen to be more challenging, due to high initial sugar levels or elevated temperatures, a healthy, properly hydrated yeast is better able to work through these problems, often finishing these difficult fermentations without sticking and with a minimum of off-flavour production.

Ultimately, when we go to weigh the pros and cons of taking the time to do a proper yeast hydration, there are no cons. It's just a good idea based on sound winemaking theory, and fortunately it is one that is also pretty straight-foreward and easy to learn. So, let's take a moment to review the whole hydration process. The time spent now will reward you many times over in the future and will be well worth the effort.

Yeast Hydration:

Successful hydration essentially involves bringing together four separate elements in a specific, set manner: nutrients, water, temperature, and yeast. Each one of these elements has its own considerations and is worth reviewing individually before we bring them all together to make our final, unified protocol.

Nutrients: "**Go Ferm**" was specially designed to help with the hydration process and is added directly into the water used to hydrate the yeast. This represents a new approach and is important because by making this first nutrient dosage outside of the must, you are able to eliminate potential problems early-on: namely the binding-up of certain nutrients by SO_2 (thus making them unavailable to the yeast), and the possible, partial depletion of the nutrient addition due to the early feeding of other organisms that may have gotten into the must before the yeast have had a chance to reach the cell-density needed to begin the fermentation (again, lowering the level of nutrients ultimately available to the yeast). It is this "**Go Ferm**" addition, therefore, that will ensure that the yeast will receive the whole of the nutrient addition without any interference, -and this in turn translates to the start of a clean and healthy fermentation.

Water: In general it is the presence of minerals, or the "hardness" of the water, that has a greater impact on the hydrating yeast than anything else. Basically, around 25+ppm mineral content is needed for the yeast to avoid any negative, reverse osmotic effects. If the hydration water has no or very little hardness, then this creates a situation where the natural concentration of minerals found inside the yeast's own cell is now higher than in the surrounding liquid. Since water always flow in the direction of the higher concentration of

minerals, this creates a reverse osmotic affect it will keep flowing into the yeast until it ruptures the cell due to stress. It is for this reason that using distilled water is actually a bad idea when hydrating yeast and is not recommended. Along these same lines, if using bottled or filtered water, it is a good idea to check and make sure that there are some minerals present to avoid any problems, if possible. Fortunately, the minerals found in **Go-Ferm** actually help to mitigate this problem quite a bit when using low-mineral content water for hydration (yet another plus to using the **Go-Ferm**!).

Interestingly, potable tap water usually has more than enough minerals and actually works quite well for the yeast hydration water. Yes, there are some chemicals that have been added during its processing to make it potable, but usually the 0.5 ppm chlorine and <0.5 ppm flouride content does not adversely effect the yeast at all. So, although not as technically "pure" as filtered/bottled water, clean tap water actually winds up being quite a good and economical choice to use for yeast hydration.

Temperature: The ideal temperature for hydration is 104º F. This represent the best balance between the water being warm enough to maintain an ideal elasticity of the yeasts cell membrane as it is being reformed, while not being too hot so as to start damaging the cell itself. While higher temperatures are definitely not recommended so as to avoid the "poaching" effect, slightly lower ones are acceptable. However, when you start to go below 95º F there is a phenomenon that happens due to the lack of adequate heat needed to make the cell wall fluid enough to fold back out and reform itself during the delicate, yet critical hydration process. As a result, parts of the cell wall can remain permanently wrinkled and the yeast will never fully recover from the folded, crinkled form it took when it was dehydrated. In the end, the yeast will essentially be mortally damaged and it will eventually die. So, with this in mind, if you can try and target the 104º F - 102º F range for your hydration water you will be doing both yourself and the yeast a great favour.

Yeast: When the yeast has been introduced into the hydration water, it will take a few minutes to come to life. From a visual standpoint, after around 15 to 20 minutes you will usually start to see activity in the liquid. In general, it will look like a low level boiling or simmering kind of motion, with a few bubbling "eruptions" happening at the surface from time to time. The amount and strength of this activity will actually vary quite a bit from strain to strain and this is perfectly normal. More importantly, it should be noted that foaming is not an indication of viability. Some yeast are actually very mellow at their start, but they will eventually kick in and be every bit as effective as another strain that was foaming like crazy during its hydration phase. The bottom line is that each one of these strains was chosen after years of extensive trials, and if they didn't work they wouldn't be on the market. So just enjoy the fact that, like people, they each have their own unique and endearing personalities and this just adds to the whole winemaking experience.

***Note:** Once the yeast has been introduced into the hydration water, you need to be aware that the clock is ticking. This is because the yeast will soon completely use up whatever stored energy they previously had in them from their preparation at the factory to complete the hydration process. From this point on, if they don't get the nutrition they need they will quickly begin to starve, deteriorate and begin to lose viability. So, it's best not to prolong this moment and begin feeding them immediately. Fortunately, the timing of this critical feeding is based on an easy-to-read indicator: once you begin to see signs of activity at around the 20-30 minute mark, then the yeast are letting you know that they now are wanting to be fed and are ready to be exposed to the must. *It is important to note that you should never let the hydration process extend beyond 30 minutes without giving them food.*

Recommended Yeast Hydration Procedure:

Now that we have a better understanding of each of the individual elements involved in yeast hydration, let's start to bring it all together into a unified protocol we can actually use.

Dosage Rates: The amount of water and Go-Ferm needed for the hydration water is based on the quantity of yeast being used, and this in turn is determined by the initial sugar concentration of the must. In general, for fermentations with initial Brix levels of up to 24.5º, 1 gram of yeast per gallon of must is sufficient.

However, when you start looking at must that is 25º Brix and above, this elevated sugar (which will later become an elevated alcohol%) represents a higher degree of stress that the yeast will come under as they will try to survive in this difficult environment. As a result, fewer viable cells will actually make it to the end of the fermentation than would have with a lower starting ºBrix. Therefore, since we know that we will be incurring a higher percentage of loss in our yeast population, it is highly recommended to adapt a "safety in numbers" approach and raise the addition rate to 1.2 grams of yeast per gallon of must. So taking this into account we can come up with the following dosage rates:

For every 1 gallon of must:

Up to 24.5 ºBrix:	**25 ºBrix and above:**
1 gram of Yeast	1.2 grams of Yeast
1.25 grams Go-Ferm	1.5 grams Go-Ferm
25 mL H_2O	30 mL H_2O

Recommended protocol for successfully hydrating Active Dry Wine Yeast

1) The volume of H_20 needed = 20 x the weight of the Go-Ferm addition

Using clean, potable water, calculate the amount needed and heat it to **110º F (43ºC).** (The 110º F here is actually an arbitrary number that has been chosen to be warm enough so that when as you lose some heat during the mixing-in of the Go-Ferm addition you will still finish at the recommended **104º F**.) **Remember that the hydration water needs to have a sufficient amount of minerals in it, and that filtered water or just from the tap is fine. Do not use distilled because it has no minerals in it at all, however.*

2) The amount of Go-Ferm needed = number of grams of yeast being used x 1.25

Add the required amount of "Go-Ferm" to the heated water. Mix it in well so that there are

no clumps, and let it stand until the temp of the mixture falls to **104º** F (40ºC). You can also adjust the temperature of the water downwards by just adding a little bit of cold water to the solution until it falls to **104º** F.

3) Add the required amount of yeast to the mixture. Stir it gently to break-up any clumps. Wait 15-30 minutes, stir a second time. **Remember to not go beyond 30 minutes in the hydration solution, however, or the yeast will begin to starve.*

4) At this point you will start to see activity and now you will want to add a portion of the must/juice into the yeast mixture that is _ to equal the volume of the yeast starter. This helps the yeast become accustomed to the pH, TA%, ºBrix level (sugar), and the temperature of the must they will ultimately be fermenting, and is done to avoid shocking them.

The reason for the two steps in this process: first hydrate, then build-up/acclimate in a diluted juice solution before pitching, as opposed to just adding the yeast from the water directly into the must, is because the newly awakened yeast are not yet completely hardy and need to adjust themselves to your must. By using these two steps, you avoid shocking the yeast and create a buffer zone between the water (pH of around 7.5), and the must (pH of around 3.5, presence of a great deal of sugar, SO_2, etc…). This insures that your initial population will be well adjusted, healthy and as vigorous as possible right from the start.

Helpful Note: Since you have just fed them with the little bit of the must, they are now OK to wait a little before being pitched. This available pause may actually be quite helpful, if for example you would like to do an acid correction on the must before you start the fermentation. Since they have just been fed, you can safely delay the inoculation, do your correction and then finally pitch without compromising the health of the yeast.

5) After a 10-15 minute wait, the yeast should now be ready to introduce into the must. However, if the temperature difference between the yeast starter and the must is over 18º F, then you will need to take the time and do a series of atemperation steps to bring the yeast to within 18º F of the must temperature or run the risk of damaging the health of the yeast due to cold shock. Using the cooler must, just add a portion of it into the yeast starter until you achieve a 15º F drop. Wait at least 20 minutes (longer is better, but often not practical during winemaking) before repeating the process as often as needed until you are finally within 18º F of the must temperature. Now you can safely introduce the yeast into the must.

6) When you are ready to inoculate the must, it is important to disperse it completely throughout the entire volume, not just over the top layer. Often, in the past we may have heard that the yeast should be spread out over the surface of the must in order to have access to oxygen. This is actually not the case. In reality, between the oxygen that has been saturated into the must from the mechanical processing of the fruit, the amount picked up during the hydration process, and the elements found in the Go-Ferm addition, the yeast already have all the nutrients they need to get off to a great start without having to be spread out.

In fact, at this early stage the yeast should actually be thoroughly mixed and spread throughout the entire must as completely as possible. This is a necessary step to ensure that it will be able to rapidly crowd-out potential spoilage organisms and therefore dominate the fermentation.

A Recommended Guide to Yeast Nutrient dosages during fermentation:

Once you have inoculated your yeast into the must, after a day or so, you will begin to see the first signs of fermentation. With white wines you will see a prickling activity, often with some foam on the surface. With red wine, this translates to the formation of the cap. Whether you are doing whites or reds, this is the point where we recommend doing the first feeding:

- **Fermaid-K (#1):** 1 gram of Fermaid-K per gallon of must. Combine the amount needed with a small portion of warm water and stir until dissolved. Mix into the wine.

During the course of the fermentation, the must becomes a difficult place to work in for the yeast: the alcohol level starts to rise (slowly becoming more and more toxic) and all of the nutrients that were present at the beginning of the fermentation (both naturally found in the must and coming from the first Fermaid-K addition) start to become depleted. A second "**Fermaid-K**" feeding is then necessary at 1/3 sugar depletion (usually an 8-10º brix drop) so that the nutrients required by the yeast to maintain a healthy metabolism all the way through to the end of fermentation are available to them before they become stressed and you start to see signs of a stuck or sluggish fermentation (not to mention excessive VA and Hydrogen-Sulphide production!).

- **Fermaid-K (#2):** 1 gram of Fermaid-K per gallon of must. Combine the amount needed with a small portion of warm water and stir until dissolved. Mix into the wine.

When trying to understand the whole yeast/nutrient interaction, it may be helpful to think of the following analogy: "**Go Ferm**" & "**Fermaid-K (#1)**" are the complete breakfast that is eaten on the morning of the 20-mile race, and the "**Fermaid-K (#2)**" addition is the energy bars and sports drinks that are consumed at the mid-way point to help get you to the finish line!

A quick summary of the complete process, using an example of 8 gallons of 24.5º Brix must (1 gram yeast/gallon):

Example of volumes needed:

-Say you are inoculating 8 gallons of must. This would mean that you would be using:

A) 8 grams of yeast
B) 10 grams of "Go Ferm"
C) 200mLs of water at 110º F
D) circa 100mls of must/juice
E) 8 grams of "Fermaid-K" at first signs of fermentation
F) 8 grams of "Fermaid-K" at 1/3 sugar depletion

1) Combine water and **Go-Ferm**, wait or adjust to **104º F**
2) Add yeast. Stir gently, wait 15-20 minutes. Stir again.
3) Add 100 mLs of must to the starter. Wait 15-20 minutes until signs of activity.
4) Mix thoroughly into the must. (Make sure to be within 18º F of the temperature of the must when inoculating. If not, adjust accordingly.)
5) At first signs of fermentation, add **Fermaid-K (#1):** 1 gram per gallon of must.
6) At 1/3 sugar depletion (8-10º Brix drop), add **Fermaid-K (#2):** 1 gram per gallon of must.

Watch your temperatures, get the lees up on each punch cycle, and enjoy the process!