Recommended Guide for TA% Testing

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For most winemakers, using an acid test kit can often be a frustrating (and inaccurate!) experience. At first glance, the test itself is a fairly straightforward procedure- you take a specified amount of sample, add a few drops of a colour indicator to it (phenolphthalein), and slowly add sodium hydroxide (NaOH) until the sample changes colour, thus indicating the endpoint of the test. You then calculate the percentage of total acidity (TA%) based on the amount of NaOH that was needed to attain this colour change. Simple enough... but wait, there's more.

It should be noted, however, that in addition to learning how to interpret the endpoint of the test (i.e., deciding at exactly what point the colour change has definitely taken place), there are few basic, procedural elements that the winemaker really needs to both understand and implement or he/she is liable to end up with bad numbers. In other words: "Acid test kits don't give inaccurate results, people do"...

The problem would seem to be rooted in the fact that while the directions that come with the kits tell you how to perform the test, they do not give enough emphasis on how to properly set it up in the first place! This means that, ironically enough, in the end you may carry out the test exactly as it is laid-out in the directions, but if you do not know to include certain preparatory steps you may still get inaccurate results. The goal of this paper, therefore, is to help fellow winemakers to fill in these blanks and learn how to correctly set-up an accurate TA% test.

Preparing a Sample for Testing:

One of the most important steps needed to arrive at accurate test results is the one that is most often overlooked by most winemakers, and that is the need to strain the sample. (This is most obvious and necessary when testing juice in the must stage). The solids that are suspended in an unstrained sample have a different TA% (and pH) than the juice/wine itself, and if they are not separated out before the test is run, they will throw-off the results. (This is why wineries and labs use filters or a small centrifuge to spin out the solids before they test their samples).

Now, knowing this, you may say to yourself: "Well, that's nice for them, but how do I effectively strain a sample at home?" Fortunately, the answer is a simple, two-part procedure. First, you will need to remove the highest percentage possible of the larger solids (i.e., the seeds, pulp, stems, skins, etc.), and one very effective way to achieve this is to strain the sample through a fine-meshed nylon bag. Just suspend the bag 1/2 to 2/3 of the way into a glass (or jar), pour the must into the bag and allow the juice/wine to seep through and collect at the bottom of the container. Then, once you have collected enough juice/wine to run your tests), simply remove and clean out the nylon bag for future use.

The second part of the procedure now consists of just waiting 15-30 minutes while the

finer particles slowly settle-out onto the bottom of the glass. After that time, you should begin to see a thick layer of pulp/solids collecting at the bottom of the glass, along with a clear, sediment-free layer of juice/wine forming at the top of the sample. It is this upper, cleared-out portion of the sample that will now give accurate results, and is what should be used to run your test(s). For an even cleaner result you can then pour the clear top layer of sample through a coffee filter that has been rolled into a cone and also placed in a jar or glass and allowed to drip into it.

*-**Note**: if you are testing a wine post-press, then you obviously do not need to strain it, just make sure to avoid drawing-up any of the lees when taking a sample to test.*

The Use and Preparation of Distilled Water:

Since the goal of a successful TA% test is to arrive at an accurate, clearly readable endpoint, then it would make sense that if your indicator is based on a colour change you would want that colour change to be as obvious as possible. In general, white wine/must samples are easy to read, since they change from a pale yellow/clear to a definite pink colour for their endpoint. However, with a red wine/juice, you are going from a dark red colour to a gray one and it is often not easy to see a definite, precise colour change. This is especially the case with deeply-tinted samples.

One way to make the colour change more visible is to dilute the sample. However, if you just used ordinary water, you would then change the pH of the water enough to render the test inaccurate. This is an important point to keep in mind because the colour change actually happens at a precise pH (pH 8.2), and in fact, that is what the test is based on.

So, how does a home winemaker dilute a sample without changing the results of the test? By adjusting the water that will be used to dilute the sample so that it has a pH of 8.2, of course! This is done by taking distilled water (since it is completely clean and has a known pH of roughly pH 7.0), adding a few drops of the same colour indicator that came with the acid test kit (phenolphthalein), and then gradually titrating it with some of the sodium hydroxide that also came with the acid test kit. As you titrate, the NaOH will slowly raise the pH of the water until it turns a faint pink and holds that colour for 30 seconds. This is your endpoint. Since, as mentioned above, the colour change happens at pH 8.2, the distilled water now has a pH of 8.2 and can be used to dilute a sample without adversely affecting the result. The distilled water is now referred to as being "neutralized"

***Note:** that besides helping to dilute the sample and therefore make the colour change easier to see, there are two, extra benefits to using the "neutralized", distilled water when conducting TA% tests, and these come about when the water is heated (to near-boiling) before being used. When the water is hot, the heat actually makes the colours in the sample appear more vibrant, and as a result the reaction/change at the endpoint is more defined. In addition, once you have begun fermentation, there is a certain amount of gas (CO_2) that will be in solution, and this will also throw-off the results of the

test. Since the amount of the hot, "neutralized", distilled water used to dilute each sample is far greater that the amount of sample itself, the sample effectively gets de-gassed when the "neutralized" water gets mixed into it before the test is run.

So, putting everything together we have gone over, so far, we can now come up with:

A Suggested Guideline for Conducting a TA% test:

-Strain, and settle the sample (if needed).

-Collect the amount needed for the test (as specified in the kit's directions).

-Prepare the "neutralized", distilled water (to have a pH of 8.2):

- Take an amount of distilled water and place it in a glass/jar. The exact amount is not important.

-Add a few drops of phenolphthalein (colour indicator) to the distilled water. Swirl it all together to mix it in.

-Titrate the water with NaOH (add drop by drop, and mix thoroughly in between drops) until a faint pink colour sets and holds for 30 seconds.

-Heat to near boiling.

-Add 50-100 mL of the hot, "neutralized" water to the sample to be tested. (It will appear quite watered-down, this is normal).

-Add 3-5 drops of phenolphthalein (colour indicator) to the sample to be tested. Swirl the sample to mix it together.

-Carry out the test as per the instructions that came with the acid test kit, titrating (adding drop by drop, and mixing thoroughly in between drops) until the colour change.

-Once the endpoint has been reached, calculate the results as described in the directions that came with the kit.

-Finally, it is important to remember that no matter how accurate a test is, it is always a good idea to double-check the results before doing anything substantial (like significantly bumping up the TA%).

A Suggested Guideline for Conducting a TA% test using a pH meter:

If you own a pH meter, you will be happy to know that you can use it to achieve a more definite, "interpretation-free" result for your TA% test. Since, as mentioned above, the endpoint of the test is actually pH dependant, all you do is carry out the same steps as outlined above, except that in place of having the colour change be the indicator, you just stir the sample with your pH meter in it and titrate it to an endpoint of pH 8.2.

Keep in mind that one way of determining the endpoint does not need to be exclusive of the other. It is often very useful to see the way a sample's colour changes and reacts as it gets closer to the endpoint of pH 8.2. This is why even if you are using a pH meter, it would be worthwhile to set-up and run the test as if you were relying on the colour change alone. (However, while you should note the colour change as it occurs, you should still rely on the pH meter for the most accurate endpoint of the test.) By performing the test this way, you will be getting the best of both worlds: you will get an accurate end result while at the same time you will be teaching yourself how to better interpret the colour change. In addition, it will also serve to show you the different buffering capacities of each wine and reveal the inherent inaccuracies (small though they may be) built into the test when relying on the colour change alone. (This point can be illustrated by noticing that the colour change often happens a little before the endpoint of pH 8.2 has been reached...).

Important things to keep in mind when using a pH meter to determine the endpoint of the TA% test

-The probe on a pH meter has a working limit as to the amount of heat it can withstand (as noted on the spec. sheet that came with the meter) and you could damage the probe if you exceed it. Therefore, you will need to need to pay particular attention to the temperature of the "neutralized", hot water that will be used to dilute and de-gas the sample. Higher-end meters have a separate thermometer in addition to the probe itself, making it easy to measure the temperature of the water

before you insert the probe. Those with lower-end, single piece units will have to use a separate thermometer to determine when it is safe to insert the probe.

-It is important to note that even if you opt not to bother with the colour change as an indicator, the neutralized water is still necessary because you will need to completely cover the probe of the pH meter in order to get an accurate reading.

-When adjusting ("neutralizing") the distilled water to pH 8.2, instead of relying solely on the colour change, you can also use your pH meter for a more precise titration. Beware

that as you approach the endpoint, one drop will cause the reading to move a great deal and you may unintentionally overshoot pH 8.2. However, this is not a problem, as you only need to add some more distilled water to lower the pH before trying again. Remember, adding NaOH raises the pH, and adding Distilled water lowers it (back towards pH 7.0).

-Finally, all of the above information is based on the assumption that your pH meter has been conditioned, stored correctly, and has been properly calibrated before being used. If you are not sure this is the case, then you probably should review the YeastWhisperer's "Use and Care of a pH Meter".