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# Stuck / Sluggish Wine Treatment Summary

## 1. BEFORE REINOCULATING

- 1.1 Check yeast viability with methylene blue. Mix a sample of must with an equal amount of 0.5% methylene blue solution in water.
- 1.2 If < 25 % of yeasts are viable, especially if there are more than 10-15% non-Saccharomyces yeasts, rack off yeast lees and skip to reinoculation method below. If there are many live cells, encourage fermentation.

## 2. ENCOURAGING FERMENTATION

- 2.1 Warm or cool the ferment to 18 – 22 °C (both high and low temperatures inhibit yeasts).
- 2.2 Add yeast hulls 0.1-0.15 g/L to stuck wine (add only 0.1 g/L if Superfood was added earlier).
- 2.3 Add SO<sub>2</sub> if pH over 3.2 (20 ppm pH 3.2 – 3.4, 25 ppm pH 3.5 or >)
- 2.4 Stir or circulate EVERY DAY to suspend cells. Compacted yeasts build up toxins, and glucose may become depleted at the bottom of the fermentor.
- 2.5 Aerate (if wine quality will not be damaged by air).
- 2.6 DO NOT add nitrogenous nutrients (Superfood, DAP, etc) or vitamins directly to stuck wine at 5 Brix or below (will encourage spoilage microbes). Nutrients can be added to reinoculation starters.

## 3. LACTOBACILLUS

- 3.1 Lactobacillus inhibition should be considered if:
  - 3.1.1 pH is over 3.5
  - 3.1.2 Wine is finished MLF even if not inoculated with bacteria
  - 3.1.3 VA 0.6 g/L or over
- 3.2 Check under microscope. **IF A LARGE NUMBER OF LACTOBACILLI ARE PRESENT, STOP! DO NOT REINOCULATE WITH YEAST!** If the Lactobacilli are still alive when the wine is reinoculated with yeast, the Lactobacilli will continue to grow, which can spoil the wine.

### 3. LACTOBACILLUS (CONTINUED)

- 3.3 Once the bacteria have grown, they are much less sensitive to SO<sub>2</sub>, so a dose that inhibits Lactobacilli will usually also inhibit Saccharomyces.
- 3.4 To control Lactobacilli after they have grown, either tightly filter the wine, or add Lysozyme (Bactozyme), which kills most spoilage Lactobacilli.
- 3.5 Lysozyme (Bactozyme) addition: Add 300 – 500 ppm Lysozyme.
- 3.6 Check under the microscope after 1 day.
- 3.6.1 If cells are not starting to disintegrate or clump, they could be resistant to lysozyme, contact us.
- 3.2 If V.A. is over around 0.9 g/L, it must be put through reverse osmosis to reduce acetic acid BEFORE reinoculating with yeast, or the V.A. will prevent the yeast from growing.

### 4. PREPARATION FOR REINOCULATION AND ACCLIMATION

DO NOT REINOCULATE WITH YEAST IF LACTOBACILLI ARE OR COULD BE PRESENT. SEE ABOVE.

Before starting: Check yeast viability with methylene blue. Rack or centrifuge off yeast lees if there is a large percentage of dead yeasts present (> 75%); dead yeasts send biochemical signals that can inhibit growth of new yeasts.

If VA is over 0.9 – 1.0 g/L, put the wine through reverse osmosis before reinoculating. Acetic acid inhibits Saccharomyces yeasts.

If alcohol is 14.5 % or higher, it may be necessary to remove some of the alcohol by reverse osmosis or by spinning cone, before the fermentation will restart.

#### Reinoculation materials:

#### 4.1 Grape juice

- 4.1.1 It is VERY important to have at least some fresh grape juice in the starter!! This is essential. Concentrate will not work nearly as well.
- 4.1.2 Volume of juice: Up to 5 – 20 % of the volume of stuck wine is preferable, but even 1% or less is worth the effort. The grapes should not be rotten, mouldy, or excessively high Brix. Mature or nearly mature, sound grapes are best.
- 4.1.3 Sources of fresh juice:
- 4.1.3.1 Another batch of grapes
  - 4.1.3.2 Second set (second crop)
  - 4.1.3.3 Frozen grapes
  - 4.1.3.4 Table grapes from grocery
  - 4.1.3.5 If you cannot get more than a little fresh juice, add 2 % dextrose (from health food store; **note:** not legal for commercial wineries).

## 4. PREPARATION FOR REINOCULATION AND ACCLIMATION (CONTINUED)

4.1.4 If stuck ferments are a regular occurrence, it may be wise to freeze some juice during the next vintage, in case it is needed for reinoculation starters.

### 4.2 Yeast

4.2.1 Use 0.4 – 1 g/L of fresh dry yeast, based on total volume of stuck wine to inoculate.

4.2.2 Premium Fructo is recommended because it is at least somewhat fructophilic, and we have had the best success with it. Our second choice would be Nouveaux Ferments. Do not use the same yeast strain that was used in the original fermentation.

### 4.3 Nutrients

4.3.1 Do not add nutrients directly to the stuck wine (except yeast hulls, which are not actually a nutrient).

4.3.2 For the starter, it is best to have all of the following:

4.3.3 Yeast-based product (no DAP) for rehydration water

4.3.3.1 Startup, or T154

4.3.3.2 50 g per 500 g pack of yeast

4.3.4 Vitamin blend (such as Vitamix)

4.3.4.1 0.005 g/L for the STARTER volume only.

4.3.5 DAP (diammonium phosphate)

4.3.5.1 If stuck wine < 5 Brix, 1 g/L for the STARTER volume only

4.3.5.2 If stuck wine > 5 Brix, 1 g/L for the STARTER volume and 0.2 g/L for the stuck wine volume

4.3.6 Complex nutrient (preferably Superfood)

4.3.6.1 If stuck wine < 5 Brix, 1 g/L for the STARTER volume only

4.3.6.2 If stuck wine > 5 Brix, 1 g/L for the STARTER volume and 0.1 g/L for the stuck wine volume

## 5. REINOCULATION AND ACCLIMATION PROCEDURE

### 5.1 START IN THE MORNING.

5.1.1 It will be a long day; do not start in the afternoon unless you want to be up most or all of the night.

### 5.2 Prepare Juice

5.2.1 If the original Brix after soaking on skins of the stuck wine was > 25, dilute the new juice with water.

## 5. REINOCULATION AND ACCLIMATION PROCEDURE (CONTINUED)

5.2.2 If possible, test current alcohol and residual sugar, calculate estimated final alcohol of the stuck wine and add enough water to the juice to bring estimated final alcohol of stuck wine to 14.5 % or less.

5.2.3 Add nutrients to the starter: 1 g/L each of Superfood and DAP, add 0.005 g/L of a vitamin blend, to the NEW juice (calculate on NEW juice volume only!).

5.2.4 Warm the new juice to 21 – 25 °C.

5.2.5 Aerate the juice thoroughly (or use micro-oxygenation unit).

### **5.3 Rehydrate yeast** in warm water with a yeast-based nutrient added (see below).

5.3.1 The temperature of rehydration is very critical! Make sure that the water is 28 – 40 °C when the yeast is added. Using water that is cooler will kill most or all the cells!

5.3.2 Add a yeast-based product (such as Startup or T154) to the rehydration water before adding the yeast. Add 50 g per 500 g pk of yeast.

5.3.3 Sprinkle yeast into the warm water. Do not stir right away, the cells are fragile during rehydration. After a couple of minutes, work gently at lumps to help them dissolve, but without vigorous stirring.

5.3.4 Allow to stand for 15 – 20 minutes.

### **5.4 Add rehydrated yeast to prepared juice**

5.4.1 If yeast mixture is more than 5 °C warmer than the juice, add a small amount of prepared juice, to bring the yeast temperature down no more than 5 °C at a time, until it is no more than 5 °C warmer than the juice.

5.4.2 AS SOON AS this starter is fermenting (may take ONLY A FEW MINUTES!), double its volume by adding stuck wine (for example, to 100 L of juice, add 100 L of wine).

5.4.3 Add 0.1 g Superfood AND 0.1 g of DAP for each litre of stuck wine added.

### **5.5 Add more stuck wine little by little.**

5.5.1 Continue adding stuck wine to the starter as soon as it starts fermenting after the previous addition of wine.

5.5.2 Check for fermentation, either by obvious activity, or by a noticeable drop in measured Brix.

5.5.3 If fermentation activity seems good, you can continue to double the volume of the starter with stuck wine. But if the activity appears to be weakening too much, add only half as much stuck wine each time.

## 5. REINOCULATION AND ACCLIMATION PROCEDURE (CONTINUED)

- 5.5.4 Add 0.1 g of Superfood AND 0.1 g DAP for each litre of stuck wine added, until starter reaches 5 Brix. STOP adding any nutrients when the starter falls below 5 Brix.
- 5.5.5 Maintain temperature between 17 – 24 °C, even at night. Alcohol is more inhibitory at warmer temperature; yeasts also may stop fermenting at 15 – 16 °C.
- 5.5.6 Aerate the starter continuously (or use micro-oxygenation unit), unless this would be harmful to the wine.
- 5.5.7 STIR the starter at least twice a day, preferably more. Do NOT let the cells become compacted on the bottom.
- 5.5.8 Making a starter can be a tedious process. Wait ONLY until the starter resumes fermentation (measure Brix or residual sugar) before adding more wine. The time between additions will become longer, taking hours or even days.

### 5.6 Add starter to rest of stuck wine.

- 5.6.1 When the starter volume reaches at least 25% of the volume of the stuck wine, add it to the rest of the stuck wine if it is still active.
- 5.6.2 It may take a few days to resume fermentation.
- 5.6.3 If at any point the starter seems too weak, it may be better to let it finish fermenting without adding any more wine.
- 5.6.4 A new starter can be prepared for the remainder of the wine.

### NOTES:

Especially in wines where alcohol is relatively high, we have better success with *Saccharomyces bayanus* strains than with *cerevisiae* strains, even ones recommended for stuck wines.

Most stuck ferments have been depleted of glucose and contain only fructose. Yeasts are reluctant to metabolize fructose without glucose present. We have had no success in “forcing” yeasts to consume fructose by adding more fructose to starters, but have had some success by adding glucose (dextrose) to starters, and even to stuck wines. Dextrose (or fructose) addition is unfortunately illegal for commercial wineries. More work on the influence of the glucose/fructose ratio on stuck fermentations is needed.

There are true fructophilic yeast species, such as *Candida stellata*, but they can have undesirable sensory characteristics, and are difficult to work with.

Under certain types of stress, *Saccharomyces* can enter an inheritable Gar+ prion state in which they use a wider variety of substrates, at the expense of strong fermentation. Clumps of Gar+ yeasts are often recognisable, but U.C. Davis will confirm presence or absence of Gar+ cells.

Lactobacilli VERY often grow in stuck wines while fermentation is being encouraged, producing VA from sugar and further inhibiting yeasts. Watch carefully for signs (microscopic) of Lactobacillus interference (note: they do NOT make ethyl acetate, so there is no smell). If Lactobacilli grow, the wine must be tightly filtered (and probably put through reverse osmosis) before reinoculating again.

If Lactobacilli have been involved, add 100 ppm lysozyme before fermentation to those grapes next vintage, to help prevent bacterial spoilage during fermentation. Inoculate after fermentation with a resistant *Oenococcus* (*Leuconostoc*) strain such as Amar04.

It is EXTREMELY important to make every attempt to identify as many as possible of the factors responsible for the fermentation problem in EACH wine! Otherwise, recurrence in a future vintage is VERY likely.

CONTACT US TO DISCUSS STUCK FERMENTATIONS

