BEST PRACTICES FOR WORKING WITH UNDERRIPE GRAPES – WHITE AND ROSÉ

The main issues in making white and rosé wines from underripe grapes are vegetal aromas and flavors, high malic acid, and possibly deficient YAN. Recommendations for managing each of these problems will be addressed.

ASSESSING UNDERRIPENESS

The degree of unripeness of your fruit is based on juice chemistry, juice sensory, and the physiological characteristics of your fruit prior to crush. We recommend a rigorous berry sensory assessment. The Institut Coopératif du Vin method of berry sensory evaluation, developed by Jacques Rousseau, is a popular and excellent method. This method evaluates berries from 4 perspectives:

1. Visual and tactile sensations
   Color, berry firmness and ease of stalk removal
2. Pulp assessment
   Pulp firmness and adhesion to skin, sweetness, acidity and flavor balance (herbaceousness, fruitness)
3. Skin tasting/maturity
   Crushability, acidity, tannic intensity, drying, astringency and aroma
4. Seed tasting/maturity
   Crushability, color, tannic intensity, astringency and bitterness

The level of underripeness as determined by this method is relative and subjective. It is dependent on vintage conditions, varietal, site, and intended style.

WINEMAKING STAGES

Click on a winemaking stage to go to its section:

HOW TO USE THIS GUIDE

This guide is **organized by winemaking stage**. For each winemaking stage there are recommendations for winemaking processes as well as products.

KEY

In the following tables, practices highlighted in **green** are specific to working with underripe white and rosé grapes.

Practices in **black** text display good general winemaking practices.

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Winemaking Stage/Goal	Best Practice & Explanation	Suggested Products
PRE-FERMENTATION		
Harvest, Transport, & Processing	**Avoid potential extraction of vegetal aromas** with practices that limit contact with underripe seeds and stems: • **Diligently sort grapes** to remove all MOG (material other than grapes) • **Separate into different lots** based on severity of underripeness. If fruit contains >5% rot, follow rot protocol. **Protect with non-*Saccharomyces* yeast** if the fruit is harvested warm or has to travel a distance before processing as it will outcompete VA-producing native microflora.	Add **NON-*SACCHAROMYCES* YEAST**: • INITIA™ at 25 g/hL
Pressing	**Protect from oxidative damage** by pressing under a CO_2 blanket. SO_2 will also help protect against oxidation during juice clarification. **Press gently** as 95% of the pyrazines are found in the grape skins and avoiding hard press fractions will help minimize vegetal characteristics. Taste your press cuts; evaluate and treat separately if required. **Use enzymes during pressing** to encourage release of bound positive aroma precursors.	Add **SO_2** (The amount added should be based on pH-never standardize your SO_2 addition) Add **ENZYMES** (choose one) and/or **TANNIN**: • SCOTTZYME® PEC5L at 15-20 mL/ton • RAPIDASE® EXPRESSION AROMA at 20-25 g/ton • ESSENTIAL ANTIOXIDANT at 3-7 g/hL
Juice Clarification	**Deacidify** during clarification using potassium carbonate so that the starting pH is above 3.2 (helps facilitate fermentation). Further deacidification is optional.	
	Clarify as quickly and cleanly as possible. This has been shown to minimize vegetative flavors. To optimize fruity flavors, clarify to ~80 NTU's. Depending on your specific goals, certain clarification agents may work better than others. See product recommendations to the right. **Rack** to fermentation vessel once solid level has been reached and warm to 60°F (15°C) for inoculation.	**Goal: Clarification** (choose one): • NACALIT® PORE-TEC at 50-105 g/hL • QI'UP XC at 3-10 g/hL • SCOTTZYME® PEC5L*at 1-1.3 mL/hL • RAPIDASE® CLEAR EXTREME* at 1-4 g/hL **Goal: Clarification and oxidation control** (choose one) • FRESHPROTECT at 20-100 g/hL • NO[OX] at 30-80 g/hL **Goal: Clarification & removal of harsh phenolics** • COLLE PERLE- 80-150 mL/hL **Goal: Removal of bitterness** (choose one) • BENTOLACT S at 20-100 g/hL • CASÉINATE DE POTASSIUM at 50-100 g/hL • FRESHPROTECT at 20-100 g/hL • NO[OX] at 30-80 g/hL • POLYCEL at 40-80 g/hL

*Enzymes (SCOTTZYME® PEC5L and RAPIDASE® EXPRESSION AROMA) should not be used in the presence of NACALIT® PORE-TEC, or other bentonite-based products

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ALCOHOLIC FERMENTATION		
Before beginning alcoholic fermentation, it is important to **understand the acid profile**. We recommend conducting juice analysis to determine the following: tartaric acid (g/L), malic acid (g/L), pH, and Titratable Acidity (TA) (g/L) because: • ***Juices with high TAs (>15 g/L) and low pHs may not ferment.*** We recommend de-acidifying using potassium-based salts (potassium carbonate or potassium bicarbonate) to precipitate tartaric acid. Note: this will not impact malic acid. Additionally, we do not recommend calcium salts as their deacidification actions are less predictable than potassium-based salts. • ***Malic acid can exacerbate underripe flavors and mouthfeel.*** Malic acid can be responsible for green herbaceous aromas and flavors and can contribute to tart, aggressive, and hot mouthfeel. In extreme cases of underripeness, malic acid may constitute up to 50% of the TA (when >15 g/L). High malic acid can be biologically deacidified by malolactic bacteria and some yeast strains. • ***High lactic acid (>3 g/L) resulting from high malic acid (>6 g/L) can lead to stuck malolactic fermentation.*** – Malolactic bacteria are inhibited by >3 g/L lactic acid which results from >6 g/L initial malic acid. When initial malic acid is >6 g/L, it is imperative to choose a malic acid degrading yeast strain should you want to complete malolactic fermentation. – When initial malic acid is lower than 4g/L, choosing a malic acid degrading yeast is not as critical. Choose a yeast strain that produces fruity esters.		
Start Alcoholic Fermentation	**Choose a yeast strain** that can tolerate low pH, degrade malic acid (if initial malic acid is >6 g/L), and produce fruity flavors.	Add **YEAST** at 25 g/hL (choose one): • ALCHEMY I • CROSS EVOLUTION • CVW5™ • **EXOTICS MOSAIC • **LALVIN ICV OPALE 2.0 • **LALVIN 71B™ **Malic acid degrading yeast

There's more **Alcoholic Fermentation Info** on the next page.

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Fermentation & Nutrition Management	**Manage temperature and nutrition appropriately.** Stressed yeast produce negative sensory compounds and can contribute to a harsh mouthfeel. Avoid yeast stress by: • **Using a rehydration nutrient** to supply essential vitamins and minerals helps secure fermentation, minimizes the risk of stuck fermentations, and off-aromas • **Employing a complete nutrition strategy that does not utilize DAP.** DAP will diminish the production of fruity flavors and promote the production of volatile sulfur compounds, which will heighten the green flavors. • **Fermenting at 60-70°F** to minimize yeast stress and promote complex fruit flavors. • **Mixing the tank during the later stages of fermentation** to keep the yeast in suspension. • **Using yeast derivatives if necessary** during the later stages of fermentation to rebalance mouthfeel resulting in smoother and rounder wines.	Add **NUTRIENTS**: • *Rehydration* - **GO-FERM PROTECT EVOLUTION™** or **GO-FERM STEROL FLASH™** at 30 g/hL • *Onset of fermentation* - **FERMAID O™** at 10-40 g/hL • *⅓ sugar depletion* - **STIMULA CHARDONNAY™** at 40 g/hL Add **YEAST DERIVATIVE NUTRIENTS**: • **OPTI-WHITE™** at 25-50 g/hL during the later stages of fermentation
	(OPTIONAL) Add aromatic tannins or oak chips to allow early integration of oak, and to address vegetal flavors if present, allowing revelation of fruit aromas.	Add **TANNINS** or **OAK CHIPS**: • **FEELWOOD! SWEET AND FRESH** at 50-100 g/hL • **SCOTT'TAN™ FT BLANC SOFT** at 5-15 g/hL
	(OPTIONAL) Ferment on bentonite to remove heat unstable proteins early requiring less bentonite for protein stability post-fermentation. This is especially useful in high protein varieties (for more information see *Fermenting on Bentonite*).	Add **BENTONITE**: • **FERMOBENT® PORE-TEC** at 36-200 g/hL
Racking	**Rack off fermentation solids as quickly as possible**: let gross lees settle for 24-48 hours then rack to a clean tank. Rack under a CO_2 blanket if needed. This is especially important with underripe fruit as solids have a direct link with vegetal aromas. **Keep press fraction separate for as long as necessary.** If vegetal aromas and flavors persist, add 10g/hL of **ICV NOBLESSE™**.	

Winemaking Stage/Goal	Best Practice & Explanation	Suggested Products
MALOLACTIC FERMENTATION		
Decide what level of malolactic fermentation is right for your wine (none, partial, full). As discussed, malic acid can comprise a significant percentage of the TA in high TA juices and contribute to unpleasant flavor and mouthfeel. Conducting a malolactic fermentation is recommended to biologically deacidify the juice, but to what extent depends on the initial malic acid concentration and intended wine style.		
Malolactic Fermentation	**Simultaneous (Co-) inoculation**: Malolactic fermentation can be conducted during alcoholic fermentation by co-inoculating yeast and bacteria. Co-inoculation results in fresh, fruit forward wines, which may help counterbalance acidity and vegetal aromas; **however starting pH must be above pH 3.1.**	Add **MALOLACTIC BACTERIA**: • BETA CO-INOC™ at 25hL pack for 25hL of juice. Add 24-48 hours after yeast inoculation.
	Or	
	Sequential inoculation: Inoculating post-alcoholic fermentation results in rounder wines with enhanced complexity. Ensure the strain chosen is compatible with wine chemistry, especially pH and Total SO_2 levels.	Add **MALOLACTIC BACTERIA** (choose one): For cool cellars and low pH wine where fruitiness is desired use 1 g/hL of either • ENOFERM ALPHA™ or LALVIN (MBR) 31™ For enhanced buttery notes and creaminess use 1g/hL of either • ENOFERM BETA™ or PN4™
Malolactic Fermentation Nutrition	**Add malolactic nutrients** to help bacteria consume malic acid in a timely manner.	Add **MALOLACTIC NUTRIENTS** (choose one): • OPTI'MALO BLANC™ at 20 g/hL

Winemaking Stage/Goal	Best Practice & Explanation	Suggested Products
POST-FERMENTATION		
Assess progress and conduct bench trials. If the wine is still displaying harsh, bitter and/or aggressive characteristics, consult the section below to determine what products might be right to bench trial.		
Wine Clarification & Mouthfeel Management	Clarification	• **CRISTALLINE PLUS** at 1.5-3 g/hL • **NACALIT® PORE-TEC** at 50-105 g/hL • **QI'UP XC** at 3-10 g/hL • **SCOTTZYME® KS*** at 5-8 mL/hL
	Clarification & oxidation control	• **FRESHPROTECT** at 20-100 g/hL • **NO[OX]** at 20-60 g/hL
	Clarification & removal of harsh phenolics	• **FRESHPROTECT** at 20-100 g/hL • **COLLE PERLE** at 80-150 mL/hL
	Removal of bitterness	• **BENTOLACT S** at 100-200 g/hL • **CASÉINATE DE POTASSIUM** at 20-100 g/hL • **FRESHPROTECT** at 20-100 g/hL • **NO[OX]** at 20-60 g/hL • **POLYCEL** at 15-50 g/hL
	Increase citrus aromas and flavors	• **SCOTT'TAN™ FT BLANC CITRUS** at 5-10 g/hL • **RAPIDASE® REVELATION AROMA** at 1-2 g/hL
	Deacidification	• Potassium Bicarbonate amount based on deacidification goal

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STABILIZATION		
Bench Trials: Before treating wine for protein or potassium tartrate instability, bench trials and/or lab analysis must be conducted.		
Protein (Heat) Stabilization	**Use bentonite** to remove unstable proteins	Add **BENTONITE** (choose one): • GRAUBENT® PORE-TEC at 20-150 g/hL • BLANCOBENT UF (used with crossflow) at 20-200 g/hL
Potassium Tartrate (Cold) Stabilization	**Stabilize potassium bitartrates crystals:** • **Remove them** via seeding with cream of tartar and chilling (over time) or by electrodialysis. • **Inhibit them** with specific mannoproteins or carboxymethylcellulose gums*. **Verify your bench trials** by testing for stability. There are several methods of testing for potassium bitartrate stability; the same wine can pass some and fail others. You should use a method that you are comfortable with and gives you actionable results.	We highly recommend tartrate **REMOVAL** via seeding/chilling or electrodialysis If you choose to do tartrate **INHIBITION**, add a **TARTRATE INHIBITOR**: • CLARISTAR at 60-125 mL/hL • ULTIMA SOFT at 15-30 g/hL Please call us to discuss the usage of these products.

There are recommended methods that you should use with tartrate inhibitors, and we suggest giving us a call to discuss. Calcium tartrate (CT) instabilities are difficult to predict, therefore treat. There is some evidence that if the wine is potassium tartrate stable then carboxymethylcellulose gums (CMC) can protect from CT crystal formation.

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