



## BEST PRACTICES FOR WORKING WITH UNDERRIPE GRAPES – REDS

The main issues in making red wines from underripe grapes are **vegetal aromas and flavors**, **high malic acid**, and **possibly deficient YAN**. Additionally, in reds, lack of phenolic maturity can result in **bitter/aggressive sensations** and **challenges with color**.

### ASSESSING UNDER-RIPENESS

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*

In red wines, an IBMP (pyrazine) panel is recommended if available to give further information on under-ripeness. However, other compounds are also responsible for vegetal notes.

### WINEMAKING STAGES

*Click on a winemaking stage to go to its section:*

#### PRE-FERMENTATION

- Harvest & Transport
- Fruit reception, grape processing and tank filling

#### ALCOHOLIC FERMENTATION

- Start Alcoholic Fermentation
- Fermentation & Nutrition Management
  - Drain & Press
  - Racking

#### MALOLACTIC FERMENTATION

- Malolactic Fermentation
- Malolactic Fermentation Nutrition

#### POST-FERMENTATION

- Wine Clarification & Mouthfeel Management

### 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 **red** are specific to working with underripe red grapes.

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



| Winemaking Stage/Goal                              | Best Practice & Explanation  | Suggested Products   |
|--|--|--|
| PRE-FERMENTATION                                   |  |  |
| Harvest & Transport                                | <p><b>Avoid potential extraction of vegetal aromas</b> with practices that limit contact with underripe seeds and stems:</p> <ul style="list-style-type: none"> <li>• <b>Diligently sort grapes</b> to remove all MOG (material other than grapes)</li> <li>• <b>Separate into different lots</b> based on severity of underripeness. If fruit contains &gt;5% rot, follow rot protocol.</li> </ul> <p><b>Protect with non-Saccharomyces yeast</b> if the fruit is harvested warm or has to travel a distance before processing as it will outcompete VA-producing native microflora.</p>  | <p>Add <b>NON-SACCHAROMYCES YEAST</b>:</p> <ul style="list-style-type: none"> <li>• <b>GAIA™</b> at 25 g/hL</li> </ul>   |
| Fruit reception, grape processing and tank filling | <p><b>Minimize extraction of vegetal aromas</b> during processing:</p> <ul style="list-style-type: none"> <li>• Destem fruit to remove vegetative stems</li> <li>• If possible process the fruit using heat (thermovinification, flash détente or pasteurization) as this may help to blow off some of the undesirable pyrazines</li> </ul> <p><b>Promote extraction of stable color, tannin, and aroma precursors</b> using:</p> <ul style="list-style-type: none"> <li>• Enzymes which release color and positive aroma precursors</li> <li>• Tannins, oak, and yeast derivatives which minimize herbaceous and unripe characters and build mouthfeel</li> <li>• Yeast derivatives to help stabilize color</li> </ul> <p><b>Do not cold soak.</b> Start fermentation as quickly as possible.</p> | <p>Add <b>SO<sub>2</sub></b> via Inodose granules (The amount added should be based on pH and disease incidence- never standardize your SO<sub>2</sub> addition)</p> <p>Add <b>ENZYMES</b> (choose one):</p> <ul style="list-style-type: none"> <li>• <b>RAPIDASE® FAST COLOR</b> at 7.5-22.5 mL/ton</li> <li>• <b>LALLZYME EX™</b> at 20-30 g/ton</li> <li>• <b>LALLZYME EX-V™</b> at 15-20 g/ton</li> <li>• <b>SCOTTZYME® COLORPRO</b> at 80-100 mL/ton</li> </ul> <p>Add <b>TANNINS</b> (directly to grapes at the crusher) or <b>OAK CHIPS</b> (directly to the tank/bin before filling):</p> <ul style="list-style-type: none"> <li>• <b>SCOTT'TAN FT ROUGE™</b></li> <li>• <b>SCOTT'TAN FT ROUGE SOFT™</b></li> <li>• <b>SCOTT'TAN UVA'TAN™</b></li> <li>• <b>FEELWOOD! SWEET AND FRESH</b></li> <li>• <b>FEELWOOD! STRUCTURE AND BALANCE</b></li> </ul> <p>Add <b>YEAST DERIVATIVES</b> (directly to grapes at the crusher or into the tank/bin before filling):</p> <ul style="list-style-type: none"> <li>• <b>OPTI-RED™</b> at 30g/hL or <b>OPTI-MUM RED™</b> at 20-40 g/hL</li> </ul> |



| Winemaking Stage/Goal  | Best Practice & Explanation  |  | Suggested Products   |
|--|--|--|--|
| ALCOHOLIC FERMENTATION   |  |  |  |
| <p>Before beginning alcoholic fermentation, it is important to <b>understand the acid profile</b>. We recommend conducting must analysis to determine the following: tartaric acid (g/L), malic acid (g/L), pH, and Titratable Acidity (TA) (g/L) because:</p> <ul style="list-style-type: none"><li>• <b>Juices with high TAs (&gt;15 g/L) and low pHs may not ferment.</b> 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 and reliable than potassium-based salts.</li><li>• <b>Malic acid can exacerbate underripe flavors and mouthfeel.</b> 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 &gt;15 g/L). High malic acid can be biologically deacidified by malolactic bacteria and some yeast strains.</li><li>• <b>High lactic acid (&gt;3 g/L) resulting from high malic acid (&gt;6 g/L) can lead to stuck malolactic fermentation.</b><ul style="list-style-type: none"><li>– Malolactic bacteria are inhibited by &gt;3 g/L lactic acid which results from &gt;6 g/L initial malic acid. When initial malic acid is &gt;6 g/L, it is imperative to choose a malic acid degrading yeast strain should you want to complete malolactic fermentation.</li><li>– 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.</li></ul></li></ul> |  |  |  |
| Start Alcoholic Fermentation   | <p><b>Choose a yeast strain</b> that can tolerate low pH, degrade malic acid (if initial malic acid is &gt;6 g/L), and produce fruity flavors.</p> <p><b>Deacidify using potassium carbonate</b> so that the starting pH is above 3.2. It is important to monitor the pH during the first 48 hours of fermentation to ensure it is stable.</p> <p><b>Add aromatic tannins or oak chips</b> to allow early integration and address vegetal flavors if present, allowing revelation of fruit aromas.</p> | <p>Add <b>TANNINS</b> and/or <b>OAK CHIPS</b>:</p> <ul style="list-style-type: none"><li>• <b>FEELWOOD! BALANCE AND STRUCTURE</b> at 100-300 g/hL</li><li>• <b>FEELWOOD! SWEET AND FRESH</b> at 100-300 g/hL</li><li>• <b>SCOTT'TAN™ FT ROUGE BERRY</b> at 5-20 g/hL</li></ul> | <p>Add <b>YEAST</b> at 25 g/hL (choose one):</p> <ul style="list-style-type: none"><li>• <b>ALCHEMY III</b></li><li>• <b>ALCHEMY IV</b></li><li>• <b>CVRP™</b></li><li>• <b>ENOFORM CSM™</b></li><li>• <b>EXOTICS NOVELLO</b></li><li>• <b>**LALVIN 71B™</b></li><li>• <b>LALVIN BDX™</b></li><li>• <b>LALVIN D254</b></li><li>• <b>LALVIN GRE™</b></li><li>• <b>LALVIN TANGO™</b></li><li>• <b>**LALVIN VRB™</b></li></ul> <p><b>**Yeast degrades malic acid.</b></p> |

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





| Winemaking Stage/Goal               | Best Practice & Explanation  | Suggested Products   |
|-------------------------------------|--|--|
| Fermentation & Nutrition Management | <p><b>Manage temperature and nutrition appropriately.</b> Stressed yeast produce negative sensory compounds and can contribute to a harsh mouthfeel. Avoid yeast stress by:</p> <ul style="list-style-type: none"><li>• <b>Using a rehydration nutrient</b> to supply essential vitamins and minerals helps secure fermentation, minimizes the risk of stuck fermentations, and off-aromas</li><li>• <b>Employing a complete nutrition strategy that does not utilize DAP.</b> DAP will diminish the production of fruity flavors and promote the production of volatile sulfur compounds, which will heighten the green flavors.</li><li>• <b>Fermenting at 68-80°F</b> to minimize yeast stress and promote complex fruit flavors.</li><li>• <b>Mixing the tank during the later stages of fermentation</b> to keep the yeast in suspension.</li><li>• <b>Using yeast derivatives if necessary</b> during the later stages of fermentation to rebalance mouthfeel resulting in smoother and rounder wines.</li></ul> | <p>Add <b>NUTRIENTS</b>:</p> <ul style="list-style-type: none"><li>• <i>Rehydration-</i> <b>GO-FERM PROTECT EVOLUTION™</b> or <b>GO-FERM STEROL FLASH™</b> at 30 g/hL</li><li>• <i>Onset of fermentation-</i> <b>FERMAID O™</b> at 10-40 g/hL</li><li>• <i>1/3 sugar depletion-</i> <b>STIMULA CABERNET™</b> at 40g/hL</li></ul> <p>Add <b>YEAST DERIVATIVE NUTRIENTS</b>:</p> <ul style="list-style-type: none"><li>• <b>OPTI-RED™</b> at 30 g/hL during the later stages of fermentation.</li><li>• <b>REDULESS™</b> at 15 g/hL during the later stages of fermentation.</li></ul> |
| Drain & Press                       | <p><b>Consider pressing before dryness:</b> Taste throughout the fermentation process to determine skin and seed contact length. You may be able to shorten your time on solids (skins and/or seeds) and finish fermentation after pressing.</p> <p><b>Do not conduct an extended maceration.</b></p> <p><b>Press gently and keep press fractions separate:</b> Whether you press before or after dryness, taste press fractions and isolate as appropriate. Keep them separate if necessary and treat separately before blending back into free run lot.</p>  |  |
| Racking                             | <p><b>Rack off fermentation solids as quickly as possible:</b> let gross lees settle for 24-48 hours then rack to a clean tank. Rack under a CO<sub>2</sub> blanket if needed. This is especially important with underripe fruit as solids have a direct link with vegetal aromas.</p> <p><b>Keep press fraction separate for as long as necessary.</b> If vegetal aromas and flavors persist, add 10 g/hL of <b>ICV NOBLESSE™</b>.</p>  |  |



| Winemaking Stage/Goal   | Best Practice & Explanation  | Suggested Products  |
|---|--|---|
| <b>MALOLACTIC FERMENTATION</b>  |  |   |
| <b>Decide what level of malolactic fermentation is right for your wine (none, partial, full).</b> 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 wine. |  |   |
| Malolactic Fermentation   | <b>Simultaneous (Co-) inoculation:</b> 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; <b>however starting pH must be above pH 3.1.</b> | Add <b>MALOLACTIC BACTERIA</b> : <ul style="list-style-type: none"><li>• <b>BETA CO-INOC™</b> at 25hL pack for 25hL of juice. Add 24-48 hours after yeast inoculation.</li></ul>  |
|   | <b>Or</b>  |   |
|   | <b>Sequential inoculation:</b> Inoculating post-alcoholic fermentation results in rounder wines with enhanced complexity. Ensure the strain chosen is compatible with wine chemistry, especially pH.   | Add <b>MALOLACTIC BACTERIA</b> (choose one): <ul style="list-style-type: none"><li>• <b>ENOFORM ALPHA™</b></li><li>• <b>LALVIN ELIOS 1™</b></li><li>• <b>LALVIN SILKA™</b></li></ul> Inoculation rate for all bacteria listed: 1 g/hL |
| Malolactic Fermentation Nutrition   | <b>Add malolactic nutrients</b> to help bacteria consume malic acid in a timely manner.  | Add <b>MALOLACTIC NUTRIENTS</b> (choose one): <ul style="list-style-type: none"><li>• <b>ML RED BOOST™</b> at 20 g/hL</li></ul>   |



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|---|--|---|
| <b>POST-FERMENTATION</b>  |  |   |
| <b>Assess progress and conduct bench trials.</b> 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. |  |   |
| <b>Wine Clarification, Mouthfeel Management &amp; Colloidal Stabilizers</b>   | Clarification and removal of unstable color              | <ul style="list-style-type: none"> <li>• <b>GRANUBENT PORE-TEC</b> at 20-150 g/hL</li> <li>• <b>INOCOLLE</b> at 30-100 mL/hL</li> </ul>   |
|   | Clarification & removal of harsh phenolics               | <ul style="list-style-type: none"> <li>• <b>FRESHPROTECT</b> at 20-100 g/hL</li> <li>• <b>COLLE PERLE</b> at 80-150 mL/hL</li> </ul>  |
|   | Counteract greenness and increase oak aromas and flavors | <ul style="list-style-type: none"> <li>• <b>THERMIC FAN PACKS</b> at 36-144 g/hL (2-8 fan packs per 1000 gallons)</li> <li>• <b>THERMIC OAK CUBES</b> at 48-192 g/hL (2-8 cube bags per 1000 gallons)</li> <li>• <b>THERMIC BARREL INSERTS</b> at 1 insert per 60-gallon barrel</li> <li>• <b>SCOTT'TAN ONYX</b> at 1-10 g/hL</li> <li>• <b>SCOTT'TAN ROYAL</b> at 1-10 g/hL</li> </ul> |
|   | Deacidification  | <ul style="list-style-type: none"> <li>• Potassium Bicarbonate amount based on deacidification goal</li> </ul>  |
|   | Increase berry aromas and flavors                        | <ul style="list-style-type: none"> <li>• <b>RAPIDASE® REVELATION AROMA</b> at 2-2.5 g/hL</li> <li>• <b>SCOTT'TAN FT ROUGE BERRY</b> at 5-20 g/hL</li> </ul>   |
|   | Increase mouthfeel and integrate acid                    | <ul style="list-style-type: none"> <li>• <b>FLASHGUM R LIQUIDE</b> at 40-120 mL/hL</li> <li>• <b>FINAL TOUCH GUSTO®</b> at 10-40 g/hL</li> <li>• <b>ULTIMA SOFT</b> at 15-30 g/hL</li> </ul>  |
|   | Removal of bitterness                                    | <ul style="list-style-type: none"> <li>• <b>BENTOLACT S</b> at 100-200 g/hL</li> <li>• <b>CASÉINATE DE POTASSIUM</b> at 20-100 g/hL</li> <li>• <b>FRESHPROTECT</b> at 20-100 g/hL</li> <li>• <b>NO[OX]</b> at 20-60 g/hL</li> <li>• <b>POLYCACEL</b> at 15-30 g/hL</li> <li>• <b>POLYCEL</b> at 15-50 g/hL</li> </ul>   |