It is hard to believe that only 100 years ago the powers of yeast were yet unharnessed: The process of fermenting foods was more alchemy than science, its results often unpredictable. Since then distinguished scientists such as van Leeuwenhoek, Lavoisier, Gay-Lussac, Pasteur, Buchner and Koch have uncovered the extraordinary potential this microorganism has for the food industry – especially wine. Today more and more winemakers are embracing the flexibility and control offered by ongoing advances in selection and breeding of dried wine yeast cultures for direct inoculation.

**Wine yeast – What constitutes a good culture?**

The quality of the yeast culture is of utmost importance. It is the key to the yeast’s potential to complete its essential task: properly converting the must sugars into ethanol. The success of this process is determined by these fundamental criteria:

1. **Exclusive use of the yeast** *Saccharomyces cerevisiae* or *bayanus* — the only yeasts capable of working through alcoholic fermentation (AF)
2. A **minimum** of $10^6$ cells/mL – essential to start, proceed, and complete fermentation
3. At least $5 \times 10^6$ cells/mL (25 g/L of active dry yeast) to control indigenous / ambient population and guard against unknown microorganisms.

**Indigenous yeast – Their impact**

The indigenous microorganisms found in the must after harvest are often oxidative yeasts in low population. Normal grape must is an extremely challenging environment for these apiculated yeasts to complete alcoholic fermentation as they are sensitive to alcohol and have low fermentative capacity. Moreover, many indigenous microorganisms are responsible for sensory deviations.

**Healthy wine yeast – Healthy alcoholic fermentation**

The ideal yeast is one that is fit and able to work in a difficult environment of low pH, high sugar and increased levels of ethanol, while also competing for nutrients to carry through the AF. In other words it is resilient, healthy and able to successfully complete AF.
S. cerevisiae has the potential to use two different pathways when consuming sugars – a respiratory one (with oxygen/aerobic) or a fermentation one (without or with minimal oxygen/anaerobic). A yeast’s choice of pathway has a significant affect on its effectiveness. Yeast multiplied through a respiratory pathway and low sugar concentration, below 100 g/L, are healthier due to their ability to accumulate energy, vitamins and micronutrients. When these yeast are multiplying and producing biomass there is a repression of the fermentative metabolism (no alcohol production).

Conversely, during the fermentation pathway, and when the must has more than 100 g/L of sugars for example, the yeast cells produce alcohol instead of multiplying. They then deteriorate due to the increase of alcohol. This is why yeast cells obtained from liquid culture (grown under fermentative conditions) and issued from propagation tanks, are often weaker and deprived of many of the elements necessary to complete fermentation – a finding that has been recognized by many scientists and proven repetitively and significantly by winemakers over the last 40 years.

Selected dry wine yeasts (active dry yeast) are grown through the aerobic pathway (respiration) and are in optimal health when they are ready to be used by the winemaker. In particular, yeasts multiplied with the patented YSEO® process, which optimizes the timing for the addition of nutrients (i.e. nitrogen containing molecules, vitamins and trace minerals) during growth, have improved reliability to carry out alcoholic fermentation. As such, the addition of active dry yeast limits the development of indigenous microorganisms and provides the winemaker with a level of control, limiting the risk of stressed fermentation and the sensory unpredictability that can result from ambient spontaneous fermentation.

### Comparison between aerobic and anaerobic respiration in yeast

<table>
<thead>
<tr>
<th>Aerobic respiration</th>
<th>Items</th>
<th>Anaerobic respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large amount</td>
<td>Energy released</td>
<td>Small amount</td>
</tr>
<tr>
<td>Mitochondria and cytoplasm</td>
<td>Site</td>
<td>Cytoplasm</td>
</tr>
<tr>
<td>$\text{C}_6\text{H}_12\text{O}_6 + 6\text{O}_2$ Glucose</td>
<td>Chemical Equation</td>
<td>$\text{C}_6\text{H}_12\text{O}_6 + 6\text{O}_2$ Glucose</td>
</tr>
<tr>
<td>$\downarrow$ 6$\text{CO}_2 + \text{H}_2\text{O} + 2898 \text{kJ}$ Energy</td>
<td></td>
<td>$\downarrow$ 2$\text{CO}_2 + 2\text{C}_2\text{H}_5\text{OH} + 210 \text{kJ}$ Ethanol</td>
</tr>
<tr>
<td>Production of biomass (multiplication of yeast cells)</td>
<td></td>
<td>Energy</td>
</tr>
<tr>
<td>38 molecules</td>
<td>Number of ATP molecules produced</td>
<td>2 molecules</td>
</tr>
</tbody>
</table>

## Selected dry wine yeasts – natural, safe and flexible

Selected dry wine yeasts are carefully selected from nature and meticulously domesticated to ensure their quality. They must meet stringent OIV specifications to ensure purity, viability and safety. Selected wine yeast are part of modern wine making while respecting tradition, all the while, guaranteeing consumers on the food safety of their products.

Selected dry wine yeasts improve winemaker control over AF whilst offering maximum flexibility in the following ways:

- Customizable based on winemaking conditions
- Customizable based on the wine style winemaker wants to achieve
- Can be stored and used easily (no large infrastructure or investment needed)
- Can be used in a low SO₂ management strategy
- Offer better AF control
- Flexibility, stability