A successful fermentation means complete consumption of sugars by yeast while minimizing the production of off-flavors and maximizing desirable aromas and flavors. Yeast nutrition is an essential factor in managing the overall health and success of fermentations. Without proper nutrition introduced at the right stage, yeast can come under stress and produce off-flavors, molecules that combine with sulfur, and in some cases, stuck fermentations.

Which nutrients do yeast need?

**Yeast Assimilable Nitrogen (YAN),** vitamins (thiamine) and **mineral salts** (Mg, Zn) are essential for yeast activity. Yeast nutrition determines the kinetics and completion of fermentation, and impacts the organoleptic profile of wine. Additionally, sterols and long-chain fatty acids are elements that help yeast survive in stressful conditions and facilitate the completion of fermentation.

**YAN** is composed of **ammonium ions** and **amino acids**. It is used by yeast for the synthesis of proteins, cell wall components and enzymes.

- **Ammonium ions** are easy and fast to assimilate by yeast; throughout fermentation ammonium is the primary form of nitrogen used by yeast.
- **Amino acids** are used as a ‘high quality’ source of nitrogen and aromatic precursors to synthesize higher alcohols, esters and acetates. Their transport into yeast cells is inhibited by ethanol and/or ammonium.

**How much YAN?**

To determine the nutritional supplements needed, analyzing °Brix and YAN in juice is necessary.

To ferment 1g/L of sugar, yeast need, on average, 1mg/L of YAN  
For good population growth, yeast need an initial YAN of 150mg/L

Each yeast has different nitrogen needs; this formula provides a guideline for the nutrition needs.

Some external conditions such as microbial contamination, mold infection and excessive clarification, among others, can heighten the nutritional needs of yeast.

What happens if yeast nutrition is not controlled?

- **A deficiency in thiamine** reduces yeast growth, slows fermentation and promotes the accumulation of components binding with SO₂ (acetaldehyde and pyruvic acid) thus reducing sulfur’s effectiveness as an anti-microbial or antioxidant agent. Wild yeast development, botrytis or other grape mold contaminations diminish thiamine in juice/must.
- **Low levels of sterols, oxygen and unsaturated fatty acids** can stop yeast sugar consumption, cause stuck fermentations and increase off-flavor production.
- **Insufficient YAN** reduces the yeast population, causes stuck fermentations and promotes off-flavor production.
- **Too much YAN** (>350mg/L) induces an overpopulation of yeast, which increases stress conditions and produces undesirable characteristics such as off-flavors or stuck fermentations.
Yeast do not need all nutrients at the same time

- **Growth phase:** yeast need vitamins, minerals and nitrogen to build-up ‘healthy’ cells resistant to stress. Due to the inhibiting effect of alcohol and/or ammonium ions, amino acids should be added at inoculation.
- In case of **severe nitrogen deficiencies**, juice needs to be corrected by an addition of ammonium ions **24-48 hours after inoculation**.
- **At 1/3 of fermentation**, yeast become stressed and their capacity to use nitrogen is reduced. To complete fermentation and increase their alcohol resistance, they need fast and easy-to-adsorb (ammonium ions) nutrients and survival factors (sterols and unsaturated fatty acids) with oxygen. **Late nutrient additions** (after ½ fermentation) are ineffective for yeast activity and promote the development of spoilage organisms.

**Enartis solution:**
Enartis has a wide range of nutrients which provide solutions for many different conditions and purposes.

<table>
<thead>
<tr>
<th></th>
<th>Nutriferm Energy</th>
<th>Nutriferm Arom</th>
<th>Nutriferm Arom Plus</th>
<th>Nutriferm Advance</th>
<th>DAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composition</strong></td>
<td>Quickly-absorbed amino acids, vitamins, mineral salts</td>
<td>Moderately-absorbed amino acids, vitamins, minerals salts</td>
<td>High content of moderately absorbed amino acids, vitamins, minerals salts</td>
<td>Yeast hulls, NH$_3^+$, cellulose</td>
<td>NH$_3^+$</td>
</tr>
<tr>
<td><strong>Addition Stage</strong></td>
<td>Inoculation</td>
<td>Inoculation</td>
<td>Inoculation</td>
<td>1/3 AF</td>
<td>1/3 AF</td>
</tr>
</tbody>
</table>
| **Effect**           | - Stimulate yeast multiplication  
                     | - Reinforce yeast fermentation capacity | - Stimulate yeast multiplication  
                     | - Supply aromatic precursors to enhance ester production | - Accelerate fermentation  
                     | - Detoxify wine  
                     | - Increase yeast alcohol resistance  
                     | - Prevent off-flavors | - Accelerates fermentation |
| **Dosage**           | 5-15g/hL         | 20-30g/hL      | 15-30g/hL           | 20-30g/hL          |              |
| **Recommended for:** | Any grapes       | Boost aromatic intensity and complexity  
                     | Neutral varieties, high-ester wines | Any grapes | YAN deficient grapes |

AF=Alcoholic Fermentation; NH$_3^+$=ammonium ions

If you have any questions, please give us a call at (707) 838-6312.