



Yeast Nutrition for a Successful Fermentation

Yeast nutrition is an essential factor in the overall health and success of fermentation. Managing nutrient requirements not only allows for regular and complete fermentations but enhances sensory quality. Nitrogen, the most important yeast nutrient, is a key factor that has a significant impact on wine fermentation.

Why do yeasts need nutrients?

Nitrogen (YAN), vitamins (thiamine) and mineral salts (Mg, Zn) are essential for yeast activity. Yeast nutrition determines **kinetics, 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.

Different nutrients, different assimilation, different action:

Thiamine is a vitamin used as a co-enzyme in the alcoholic fermentation pathway. It stimulates yeast growth, speeds up fermentation and reduces production of SO₂ binding compounds.

Minerals are components of the yeast cell membrane and help maintain fermentation metabolism activities.

Nitrogen is metabolized by yeast to synthesize proteins. It stimulates yeast multiplication, keeps yeast metabolism active, prevents H₂S and mercaptan formation and stimulates aroma production.

Yeast Assimilable Nitrogen (YAN) is composed of **ammonium ions** and **amino acids** (except proline).

- **Ammonium ions** are the favorite 'food' of yeast. **Easy** and **fast** to use, ammonia impacts mostly yeast growth and population.
- **Amino acids** are harder to be assimilated. They represent the **qualitative, healthy** and **delicate** 'food' for yeast, which impacts their growth, health and efficiency through the fermentation as much as aroma production. Some amino acids can be used as **aromatic precursors** to synthesize esters, higher alcohols or sulfur compounds.

Sterols and unsaturated fatty acids are components of the yeast cell membrane, and are responsible for its fluidity. They maintain yeast capacity for consuming sugar, increase alcohol tolerance and reduce volatile acidity production. **Oxygen** has a synergistic effect with sterol production.

What happens if the nutrition is not enough?

- A deficiency in thiamine may reduce yeast growth, slow fermentation and promote the accumulation of pyruvic acid and acetaldehyde, components responsible for oxidation and binding SO₂. The development of wild yeasts, botrytis and other grape mold infection decreases the thiamine content of must.
- Low levels of sterols, oxygen and/or unsaturated fatty acids may shut down sugar consumption (stuck fermentation) and increase volatile acidity. Strong juice fining (turbidity <100NTU) or a lack of oxygen will increase the need to add these nutrients.
- **Without proper nutrition** introduced **at the right stage** in their growth cycle, yeast can come under stress and produce undesirable characteristics: **off-flavors** (hydrogen sulfide, oxidation...), **high bound SO₂, stuck** or **sluggish fermentations...**



How much YAN is needed? How to measure YAN?

To determine which nutritional supplements are needed, analyses of Brix and YAN in must are necessary. YAN (ammonia + amino acids) can be measured by colorimetric method here at Enartis Vinquiry or in your winery with Vintessential Enzymatic Kits.

The higher the sugar content, the higher the nitrogen need is. Two simple rules can help you understand the YAN need:

To ferment **1g/L of sugar**, yeast need **1mg/L of YAN**.
For **good population growth**, a minimum of **150mg/L YAN** is needed.

Example: For the complete fermentation of juice at 24°Brix (240g/L of sugar), yeast need 240mg/L of YAN.

Some external conditions such as microbial contamination, *botrytis* or other mold infection, strong fining, etc. can heighten the needs of yeast.

Too much YAN (>350mg/L) can induce an overpopulation of yeast, which will increase stress conditions and produce undesirable characteristics such as off-flavors or stuck fermentation.

Nutrition strategy: correct nitrogen level and aroma enhancement

Yeast don't need all the nutrients at the same time:

During the growth phase, yeast need vitamins, minerals and nitrogen. The presence of alcohol and/or ammonium ions inhibits transport of amino acids through cell membranes and reduces their consumption. To optimize their absorption and efficiency, **amino acids** should be added **at inoculation, before ammonium ions**. At this stage, yeast can assimilate amino acids to build 'healthy' cells which are resistant to stress conditions and produce aromas.

At 1/3 of sugar depletion, yeast start to become stressed and the assimilation of nitrogen is lower. To complete fermentation and increase their alcohol resistance, they need fast and easy nutrients to absorb (ammonium ions) and survival factors (sterols and unsaturated fatty acids) with oxygen. In case of **strong nitrogen deficiency**, must needs to be corrected by an addition of ammonium ions **24-48 hours after inoculation** (after the addition of amino acids).

The nutrient additions should be split between **inoculation** and **no later than 1/3 sugar depletion**.

Late nutrient additions are ineffective for yeast activity and can promote development of spoilage organisms, **appearance of off-flavors** and **formation of biogenic amines**.

How to choose the correct products?

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

Nutriferm Energy provides **quickly-absorbed amino acids** (absorbed during the first part of fermentation), **vitamins** and **mineral salts** necessary for proper development of yeasts. It makes yeasts stronger and more resistant to difficult conditions. It can be used during rehydration or at inoculation.

Nutriferm Arom is a nutrient rich in **moderately-absorbed amino acids** (absorbed at the end of growth phase) which are aromatic precursors of fermentation aromas, **vitamins** and **mineral salts**. It stimulates yeast multiplication and synthesis of fermentation aromas. Making the addition at inoculation is recommended.



Nutriferm Arom Plus contains a high content of **moderately-absorbed amino acids** (absorbed at end of growth phase), selected for their aromatic precursors potential, **vitamins** and **mineral salts**. It stimulates yeast multiplication, enhances fermentation aromas production and increases aromatic intensity. An addition at inoculation is recommended for 'neutral' varieties and/or high yield grapes to produce more aromatic wines.

Nutriferm Advance is a complex nutrient made from **yeast hulls, ammonium phosphates** and **cellulose** which provides **ammonium ions, sterols** and **unsaturated fatty acids**. It accelerates end of fermentation, exerts a detoxifying action, increases yeast alcohol resistance and prevents formation of off-aromas (H₂S, mercaptans). This nutrient can be used at 1/3 of sugar depletion (no later), with oxygen for optimized effect.

DAP is pure ammonium ions produced as diammonium phosphates. It provides fast and easy-to-adsorb nitrogen. It should be added after amino acids and no later than 1/3 of sugar depletion.

	Nutriferm Energy	Nutriferm Arom	Nutriferm Arom Plus	Nutriferm Advance	DAP
YAN (mg/L) for 10g/hL	10-15	15-20	15-20	15-20	21
Amino acids	+++++	++++	+++++		
Ammonium ions				+++	+++++
Aromatic precursors	+++	+++++	+++++		
Unsaturated fatty acids	+++++	+++	+++	+++++	
Sterols	+++++	+++	+++	+++++	
Minerals	+++	+++	+++	++	
Vitamins	+++++	+++	+++	+++	
Addition time	Yeast inoculation	Yeast inoculation	Yeast inoculation	1/3 sugar depletion	After amino acids No later than 1/3 sugar depletion

We hope that this information helps you to make informed decisions regarding fermentation, yeast nutrition management and choice of products. If you have any questions, please give us a call at (707) 838-6312.