

Why use commercial yeast food and nutrients?

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Yeast based nutrients play a crucial role in the winemaking process. While yeast is responsible for fermenting the sugars in grapes into alcohol, it requires essential nutrients to carry out this process effectively.

Without the proper nutrition, yeast can become stressed or even die, resulting in incomplete fermentation or the creation of off flavours in the finished wine.

- The grape juice composition (influenced by terroir, climate, and viticulture) varies annually, affecting sugars, acids, vitamins, minerals, and other elements.
- For complete nutrition, yeast needs a **nitrogen source**, a **carbon source** (sugar from the grapes) **vitamins** (thiamine), **mineral salts** (Mg, Zn), **sterols**, and **long-chain unsaturated fatty acids** to undertake a successful fermentation.
- Yeast nutrients can be added to the grape juice or must before or during fermentation. There are different types of commercial yeast nutrients available, such as diammonium phosphate (DAP), yeast derivatives, and complex nutrient blends. Each type of nutrient has its own composition and specific purpose of addition and is suitable for different stages of fermentation or specific winemaking conditions.

From the listed nutrition sources, **nitrogen** is one of the key nutrients that can strongly impact the yeast population, the fermentation kinetics and also the organoleptic quality of the finished wine.

Organic nutrition is supplied by adding yeast derivatives (usually inactivated dry yeast). In addition to amino acids, these yeast derivatives include lipids, vitamins and minerals which also contribute to the efficient performance of the inoculated yeast.

Why is nitrogen so important?

It can **strongly** impact the **yeast population**.

It can impact the **fermentation kinetics**.

It can impact the **organoleptic quality** of finished wine.



Without enough **nitrogen**, yeast can become stressed and **produce undesirable flavours and aromas** during fermentation.



Winemakers can use **2 types** of **nitrogen sources**:

1

Inorganic Nitrogen

- Diammonium phosphate (DAP) and ammonia are good examples of inorganic nitrogen.
- These are taken up very quickly which can lead to uncontrolled cell growth and hot fermentations and does not necessarily give yeast the staying power to complete a fermentation.
- DAP addition is normally added after 24-38 hrs after yeast inoculation.
- Not only is DAP harmful to yeast in the lag phase, too high of concentrations will also block the uptake of necessary amino acids.

2

Organic Nitrogen

- The assimilation of amino acids is also later inhibited by the presence of high concentration of ammonium ions and ethanol, the optimum time to add organic nitrogen is at inoculation, or within 24-48hrs of inoculation.
- When nitrogen is supplied in the form of amino acids, the fermentation profile is very different.
- Comes from inactivated/autolysed yeast and yeast extracts.
- Complex organic nitrogen is more efficient nutrition than DAP alone because the yeast can uptake the amino acids and therefore do not need to synthesise amino acids itself (a very energy dependant process).
- Amino acids are a source of precursors for thiol and ester aromas.
- Can be used in organic wine making.

What factors may play a role in nitrogen additions?

Additional nitrogen may be needed in the following conditions:

- If the winemaker wants **more fruity aromas**, this can be achieved by leaving grapes longer on the vines.
- **High sugar levels** (Global warming).
- Presence of **mould or rot**.
- Using a yeast strain with **high nutritional requirements**.
- Juice with **low natural nitrogen levels**.
- **Low quality** grapes.



Yeast assimilable nitrogen, or **YAN**, is the total concentration of available nitrogen that yeast can utilise during fermentation (amino acids + ammonia).

FAN or **α-amino nitrogen** (amino acids minus proline), is the organic form of available nitrogen.

Winemakers should factor in the YAN content of inorganic and organic nitrogen products and how much this will increase the YAN in the grape juice.

Units used to measure YAN are "mg N/L" (milligrams of nitrogen per litre).

The main types of products made from yeast:

- **Inactivated yeast** normally consists of the whole yeast broken apart before drying. It contains the cell walls, the cell membranes, and the inside of the yeast (the yeast extract).
- **Autolysed yeast** are prepared by triggering the yeast native hydrolytic enzymes converting yeast compounds like proteins into soluble substances before thermal inactivation.
- **Yeast hulls** are the insoluble cell wall fractions without the internal components (cytoplasmic content).
- **Yeast extract** consists of all the cell components without the cell walls and cell membrane parts. It is produced by the total degradation of the cytoplasmic content.

Additional compounds found in complex yeast nutrients

1 Diammonium phosphate (DAP)

DAP is a form of inorganic nitrogen widely used to supplement nitrogen-deficient musts. It also provides a good amount of phosphate which is an important mineral.

Yeast food with low YAN values will be supplemented with DAP since it provides a good amount of nitrogen. Large additions of DAP can increase risk of ester taint formation (ethyl acetate).

2 Yeast hulls

Yeast hulls, derived from dead yeast cells, supply ergosterol and unsaturated fatty acids for yeast membrane synthesis.

Due to their low nitrogen content, they are typically added with DAP. They can also eliminate toxins like medium-chain fatty acids.

3 Vitamins and minerals

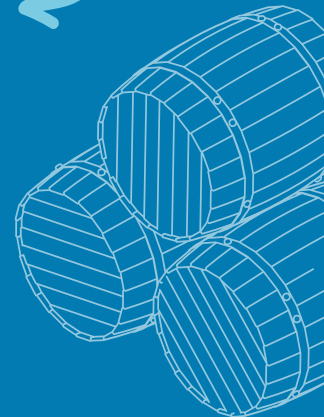
Vitamins and minerals, including biotin, thiamine, magnesium, and zinc, are essential for fermentation reactions and are usually found in yeast nutrient blends.

Only thiamine (vit B1) is authorised for direct addition by the OIV. Although the OIV does not allow the addition of minerals like Magnesium Sulphate, some specific countries may do so.

4 Cellulose

Removes toxins such as medium-chain fatty acids and promotes clean, healthy fermentations.

Provides solids to promote yeast growth in very clean (over clarified) juice, reduces H₂S formation and reduces excess copper present in wine.



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Types of commercial nutrient products available:

1 YEAST REHYDRATION PRODUCTS

- Rehydration products are formulated with yeast-derived growth and survival factors (ergosterol, long chain fatty acids), with a goal of strengthening elements of the yeast membrane.
- Yeast rehydration products do not contain DAP which is toxic to the yeast at the rehydration phase.

2 COMPLEX YEAST NUTRIENT PRODUCTS

- Complex yeast nutrients are normally formulated with yeast autolysate, inactivated yeast, DAP and thiamine.
- Can contain different combinations and percentages of these compounds.
- Yeast nutrients are typically added during the fermentation phase to promote a healthy yeast biomass and support yeast when must is deficient in nitrogen.
- Assists in developing more aromatic, full-bodied wines.

3 SPECIFIC FUNCTION NUTRIENTS

- Normally contain inactive yeast rich in natural antioxidant such as glutathione to help preserve the wines, and for longer lasting aromatic white and rosé wines.
- Or it can contain inactive yeast with cell walls and / or cellulose to detoxify difficult fermentations to avoid sluggish / stuck fermentations.

Timing of nutrients additions



There are two stages in fermentation where nitrogen additions are critical. We recommend a **two-step nutrient addition**; providing amino acids and micro-nutrients at inoculation and inorganic nitrogen with survival factors at 1/3 sugar depletion.

1 Inoculation

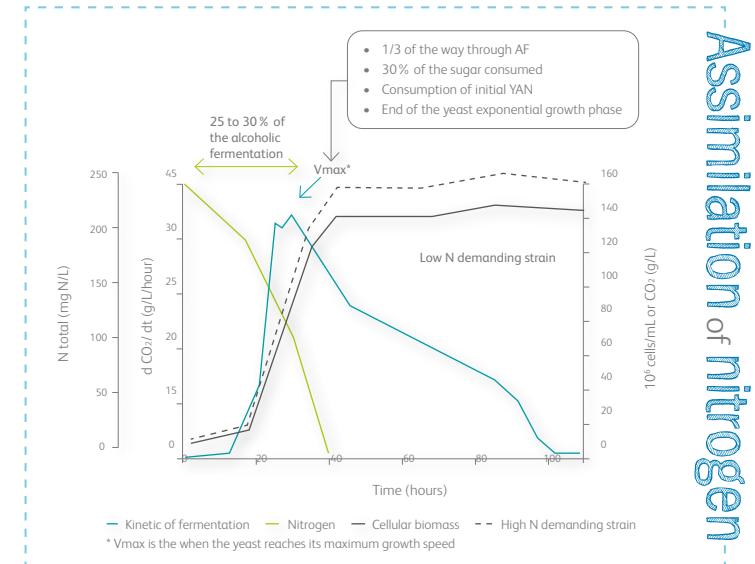
2 1/3 sugar depletion

- **During growth phase**, yeast needs amino acids, vitamins and minerals to build biomass and "healthy" cells resistant to stress.
- Not only is DAP harmful to yeast in the lag phase, concentrations that are too high will block uptake of necessary amino acids. Excess nitrogen at this stage can lead to a surplus in biomass and volatile acidity production.
- The best time to add DAP is within 24-28 hours after yeast inoculation.
- Since yeast assimilation of amino acids is inhibited by the presence of ethanol and high concentration of ammonium ions, the optimum time to add organic nitrogen is at inoculation.
- A **second nitrogen addition** maintains the population through the remainder of alcoholic fermentation.

If nutrients are added too early (before clarifying), nutrients could precipitate out or be adsorbed with other organic material in the must or from wild microorganisms.

Generally, manufacturers recommend adding complex nutrients one third of the way through fermentation in terms of sugar consumption.

Yeast populations reach their maximum one third of the way through alcoholic fermentation.



In summary: Why use commercial yeast food and nutrients?

- To accomplish successful fermentations.
- To prevent stuck and sluggish fermentations.
- To minimize sulphur compound (H₂S) production.
- To improve sensory qualities of the wine.
- To improve shelf-life of wines.

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