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ENARTIS NEWS

BEST PRACTICES FOR MANAGING YEAST NUTRITION: THE ENARTIS STRATEGY

Yeast need nitrogen, vitamins, mineral salts, sterols, fatty acids and oxygen to produce biomass and maintain an active metabolism (Table 1). Yeast nutrition is not only important for ensuring adequate yeast growth and fermentation kinetics, but can also affect production of major metabolites arising from sugar fermentation. Several studies have indicated that both total available nitrogen and the balance of amino acids and ammonia can significantly affect the production of different groups of fermentation-derived volatile compounds.

NUTRIENT	BIOCHEMICAL FUNCTION	TIMING OF ADDITION
Thiamine	Stimulates yeast growth Reduces production of SO ₂ binding compounds	Lag phase
Mg, Zn	Act as cofactors for glycolytic enzymes Reduce yeast stress	Lag phase
Amino acids Ammonium	Stimulate yeast multiplication Maintain active yeast metabolism Enhance aroma production	Lag phase End of exponential phase
Sterols and Fatty Acids	Increase membrane permeability and tolerance to alcohol	End of Exponential phase
Oxygen	Increases production of lipids and sterols Stimulates yeast multiplication	End of exponential phase

Table 1: Yeast Nutritional Requirements

By choosing practicality over quality, many winemakers fall into the common practice of a standard, single nitrogen addition at yeast inoculation. At this stage, large additions of nitrogen can lead to overgrowth of yeast biomass, heat production, loss of volatile aromas and a sudden increase in fermentation speed with premature nitrogen depletion. This usually affects sugar metabolism and results in sluggish or stuck fermentations.

Considerations for a successful nutrition plan:

The best strategies for managing alcoholic fermentation require proper management of nutrient additions, including amount and timing.

1. Measuring Yeast Assimilable Nitrogen (YAN)

Grapes contain a variety of nitrogenous compounds of which the most important are primary or alpha amino acids, ammonium ions and small peptides. These nitrogenous compounds, excluding proline and proteins, constitute what is commonly referred to as YAN.

Ideally, YAN measurements should be performed on juice or must before inoculation to avoid over-estimation due to processing losses occurring between the vineyard and fermentor.

If juice contains <150 mg/L, YAN should be adjusted to at least 150-200 mg/L to achieve an adequate rate of fermentation to dryness. When cleaner and fruitier styles are preferred, levels of 250-300 mg/L can be reached.

Enartis USA offers a Yeast Nutrition Panel for juice/must that provides essential analysis to help ensure successful fermentation. It includes ammonia, assimilable amino nitrogen and YAN. We also offer Vintessential kits for in-house use.

2. Adding activators at the early stages of alcoholic fermentation

Amino acids are the building blocks of proteins for yeast cells. They are also direct precursors of aroma compounds in wine. Even when yeast can produce their own amino acids, it is usually better for the cell to assimilate them. The uptake or absorption of amino acids is sequential and through different diffusion mechanisms. Yeast are capable of selectively using other sources of nitrogen if present in juice. As a consequence, assimilation of amino nitrogen can be delayed and later inhibited by alcohol. If not restricted by other environmental conditions, most amino acids can be depleted from must and stored in yeast during the earlier stages of fermentation.



Vitamins are essential in many enzymatic reactions. Deficiencies may result in slow yeast growth and stuck fermentations.

Minerals are used as cofactors in catalyzed enzymatic reactions. They facilitate uptake of materials and are used as cell structural material. For example, if Mg is absent, yeast cannot grow. Its most important role is being directly involved in ATP synthesis. It also plays a role in preventing cell death when ethanol concentration increases. It has also been shown to improve the cell's ability to withstand stress.

Nutriferm Energy provides a source of quickly absorbed amino acids, vitamins, and minerals at the beginning of fermentation to stimulate yeast multiplication and reinforce yeast fermentation capacity. Addition is recommended during preparation of the starter culture or yeast inoculation (Table 2).

Nutriferm Arom Plus provides a source of moderately-absorbed amino acids as precursors of aromatic compounds. It also contains vitamins and minerals to stimulate yeast growth and multiplication (Table 2). Addition is recommended during the early stages of fermentation.

SPEED OF ABSORPTION	NITROGEN SOURCE	USE
QUICKLY ABSORBED (the first part of fermentation)	Aspartic acid, glutamic acid, serine, threonine, lysine, arginine.	PROTEIN SYNTHESIS
MODERATELY ABSORBED (late, at the end of exponential phase)	Valine, methionine, cysteine, leucine, isoleucine, histidine, phenylalanine, alanine, tyrosine	AROMA SYNTHESIS






Table 2. Recommended practices for nutrient addition during the early stages of fermentation

3. Supplementing with survival factors at 1/3 of fermentation

The presence of ethanol and other stress conditions limit the external exchange through the yeast cell membrane and lead to cell death. Permeability of cells can be re-established using **yeast hulls**. By absorbing saturated fatty acids and releasing **sterols and unsaturated, long chain fatty acids**, it can keep the membrane intact, fluid and resistant to stress conditions.

When added at 1/3 of fermentation, **Nutriferm Advance** maintains active yeast metabolism until the end of fermentation. Comprised of yeast hulls, ammonium phosphate and cellulose, it improves yeast alcohol tolerance and exerts a detoxifying action.

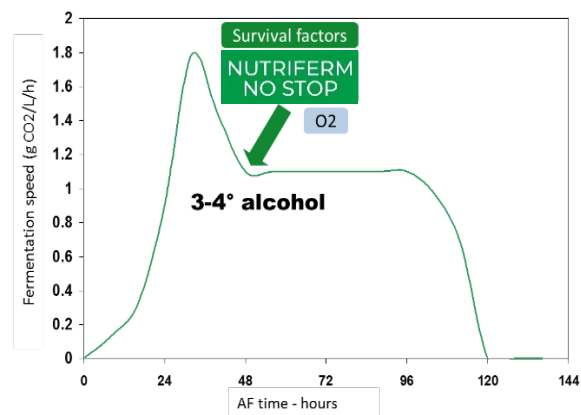


Table 3. Recommended practices for nutrient addition at 1/3 of alcoholic fermentation

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