

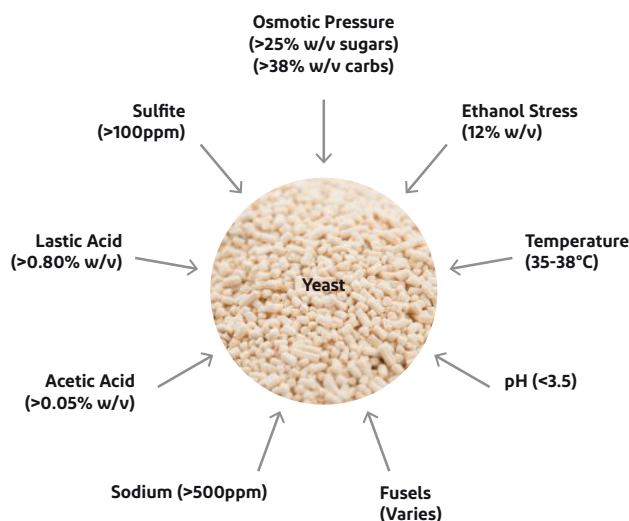
The impact of yeast stressors on fermentation performance

Yeast Stress Response

The yeast stress response is the physiological and metabolic response of the yeast population to changes in the fermentation environment. The yeast responds to these changes in its environment through physical and metabolic adaptation for protection and survival. This can lead to reduced growth rates, viability, and cell counts as well as changes to morphology (cell shape, size, and appearance). It can also lead to stuck or sluggish fermentations resulting from decreased substrate utilization, decreased titers and production rates, and increased byproduct formation.

Common Yeast Stressors

There are many factors that affect yeast health in propagation and fermentation. Common stress factors and their inhibitory levels are shown in the figure below.



Modified from Ingledew, 1999

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Synergistic Effect of Stress

Rarely is only one source of stress present during propagation/fermentation. Conditions that are normally below inhibitory levels can induce stress in yeast in the presence of other factors/inhibitors. This is known as synergistic effects.

Robustness

Stress resistance/robustness refers to the ability of a yeast strain to adapt efficiently to a changing environment and unfavorable growth conditions. Yeast strains that are robust have the potential to reduce the impact of stress on the overall fermentation performance, thus reducing the number of costly “bad” fermentations. Selection of a robust yeast strain, providing adequate nutrition, and operating with the optimal growth conditions can alleviate some of the negative impacts associated with stress.

Quick Tips - Identifying Stressed Yeast

In propagation, look for general indications of stressed yeast, such as reduced cell counts, low viability (60–70% viability), and variations to glucose and ethanol levels.

In fermentation, look for general indications of stressed yeast, such as high glucose levels throughout fermentation (slow substrate utilization), decreased fermentation kinetics (decreased rate of ethanol production), and reduced ethanol titers and increased total residual sugars at the end of fermentation.



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