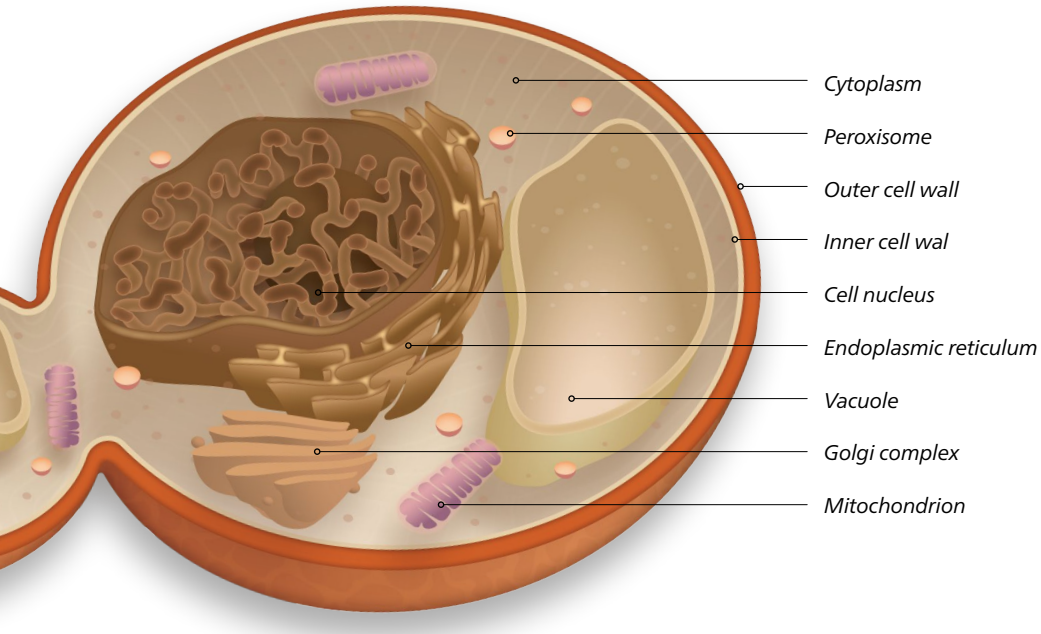
AN INSIDE STORY

THE SCIENCE BEHIND YEAST EXTRACT



What are amino acids?

Amino acids are organic molecules often referred to as the building blocks of proteins. They link with one another to form long polypeptide chains, which in turn form the various kinds of proteins present in all living organisms.

Plants must synthesize a continuous supply of the 22 proteinogenic (protein-forming) amino acids in order to grow and develop.

Some herbicides such as glyphosate can inhibit amino acid synthesis and impair plant development; amino acid supplementation has been shown to aid in recovery.[2]

Complexing agents

Amino acids can also serve as an excellent organic complexing agent, delivering micronutrients in a highly bioavailable, environmentally friendly form.[3] These water soluble complexed minerals can be quickly and easily absorbed through the leaf surface, translocated and metabolized by plants.[2,4]

Yeast and crop production

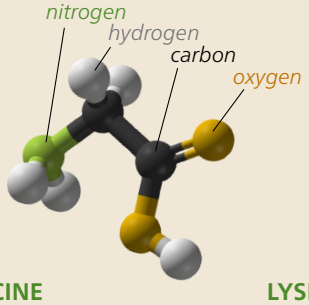
The yeast cell has many valuable uses when it comes to crop production. Yeast extracts—the interior contents of the cell—are rich in a wide variety of amino acids, which can complex with trace minerals for improved nutrient bioavailability.[3]

"What is a scientist, after all? It is a curious man looking through a keyhole, the keyhole of nature, trying to know what's going on."

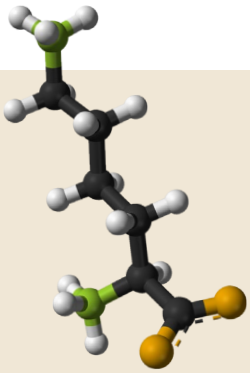
—Jacques-Yves Cousteau

Typical yeast extract concentrate, showing a rich brown color and syrupy consistency.

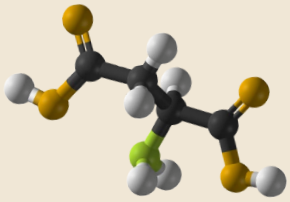
KEY AMINO ACIDS



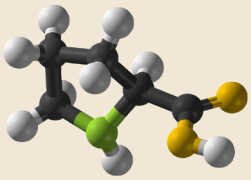
GLYCINE
High complexing power, aids in photosynthesis, precursor of chlorophyll.[5]



LYSINE
Important plant nitrogen reserve, aids in chlorophyll activation, stomata regulation and pollen development.[6]



ASPARTIC ACID
Nitrogen source, essential for synthesis of other amino acids, important during early growth stages.[7]



PROLINE
Associated with resistance to fungal infection, essential for overcoming stresses such as drought, temperature extremes and salinity.[8]

Journal Study: **Amino Acids and Herbicide Stress**

Zobiole, L.H.S. et al. "Amino Acid Application Can Be An Alternative To Prevent Glyphosate Injury in Glyphosate-Resistant Soybean." *Journal of Plant Nutrition*, 2012.

Glyphosate is known to interfere with amino acid synthesis and lignin content even in crops such as glyphosate-resistant soybeans. This study found that supplementary amino acid formulations in GR soybeans were able to suppress the harmful effects of glyphosate.

Observations:

- Amino acid applications prevented decrease in photosynthetic rate and leaf nutrient concentrations caused by glyphosate application.
- Amino acid applications provided nitrogen and carbon sources, preventing decrease in shoot and root biomass caused by glyphosate.

Soybeans showing area treated with Alltech Crop Science program (left) next to untreated area exhibiting yellow flashing, commonly seen with herbicide stress (right).

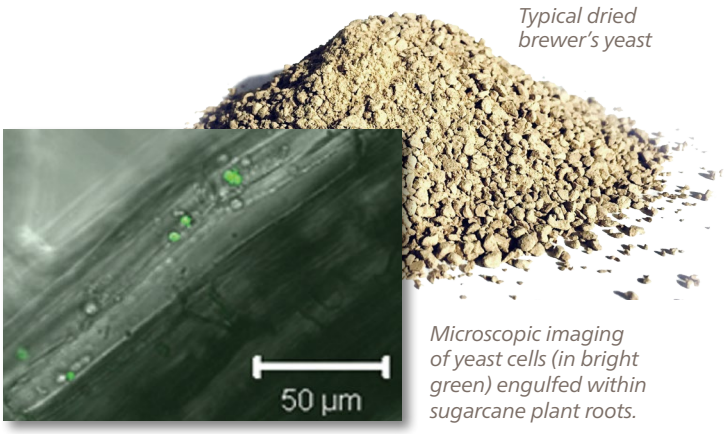
Journal Study: **Brewer's Yeast and Rhizophagy**

T. Lonhienne, et al. "Yeast as a Biofertilizer Alters Plant Growth and Morphology." *Crop Science*, Mar. 2014.

Rhizophagy refers to the process in which living or dead microbial cells are engulfed by root cells and then digested to acquire their nutrients. This study found that amending soils with dried yeast provides rhizophagous benefits not seen in other organic fertilizers.

Observations:

- Substantially increased nitrogen (N) and phosphorus (P) content of plant roots and shoots
- Increased root-to-shoot ratio
- Species-specific morphological changes that included increased tillering in sugarcane and greater shoot biomass in tomatoes



Microscopic imaging of yeast cells (in bright green) engulfed within sugarcane plant roots.

FURTHER READING:

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6. Galiai, G. et al., "Lysine catabolism: a stress and development super-regulated metabolic pathway" *Current Opinion in Plant Biology*, 2001.
7. Kirma, M. et al., "The multifaceted role of aspartate-family amino acids in plant metabolism" *Journal of Experimental Botany*, 2012.
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9. M. Narusaka, et al. "Yeast cell wall extract induces disease resistance against bacterial and fungal pathogens in *Arabidopsis thaliana* and *Brassica* crop." *PLoS One*, 2015.
10. R. Agamy, et al. "Effect of soil amendment with yeasts as bio-fertilizers on the growth and productivity of sugar beet." *African Journal of Agricultural Research*, Jan. 2013.
11. T. Lonhienne, et al. "Yeast as a Biofertilizer Alters Plant Growth and Morphology." *Crop Science*, Mar. 2014.
12. Zobiole, L.H.S. et al. "Prevention of injuries caused by glyphosate in RR soybean using exogenous amino acid." *Journal of Plant Nutrition*, 2012.

Flyer Discovery Yeast Extract 2017 v2

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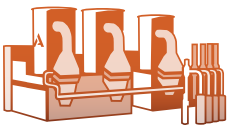

Alltech is the largest producer and processor of yeast in the world through facilities such as its yeast fermentation plant in São Pedro do Ivaí, Brazil.

Alltech® CROP SCIENCE

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