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Growing Yeast for Livestock

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The Production of High Protein Yeast From Food Waste

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Over 500,000 tons of organic materials such as food scraps are disposed of each year in Wisconsin. A large percentage of this material could be composted or turned into useful products.[5] The purpose of this article is to educate farmers and organizations on how to turn food waste into a high value food source for livestock.

Yeast can be grown at any time of the year without the large inputs of agricultural chemicals and machinery that is common with other feed production methods. A yeast growing facility can be scalable to any size the producer wants such as a small micro-brewery or the size of a full scale ethanol plant.[1] The main difference between ethanol production and growing yeast is the end product; the majority of the equipment is the same.

Yeast is a good feed supplement for livestock because of its high digestibility and protein value.[2] Yeast has several other benefits such organic acids, oligosaccharides and B vitamins that act as a probiotic to stabilize ruminal pH.[4]

Table 4 Composition of S. ceretisiae yeast grown from virgin (fresh) grape marc also known as pomace (VGM). Alcamo 1 is the variety of grape that was used in this process after being crushed.[2]

Composition of yeast obtained from Alcamo 1 fresh VGM

Parameter	Values
Water (%)	9–12
Crude protein*	50–54
Crude fiber*	5–8
Ash*	4–6
In vitro total digestibility*	66–78

*% on dry matter.

Overview of the production process

One of the best locations available for food waste, post wine production, is at grape vineyards and wineries. Many different kinds of food waste can be used

for growing yeast, but for this section grapes will be used as an example.

The first step is to adjust the pH of the food waste to 4.5 and to cook this at 131°F (55°C) for 4 hours.[6] This is to break the food waste down and eliminate any bacterial contamination.

The recommended enzymes for the extraction of carbohydrates from plant based food waste are alpha amylase and glucoamylase.[6] Both of these enzymes, as well as the preservatives to maintain a clean culture, are commonly found within the wine and brewing industry. The solids of the treated food waste are filtered out to create the liquid feed for the yeast.

The growth rate of yeast within a batch process is primarily affected by carbohydrate and nitrogen availability as well as the oxygenation rate of the media. The pH should be kept at approximately 4.5 with a temperature of 86°F (30°C) to promote yeast growth.[1]

The media should contain minerals, vitamins and a nitrogen source necessary for growth. Many of these nutrients are present in the liquid feed from the processed food waste. The main sources of nitrogen present in grape juice are ammonium and alpha amino acids. The liquid feed should be checked before use to ensure an adequate level of nutrients.[3] Before harvest, the flow of nutrients should be stopped while continuing aeration for another hour. This allows for the yeast to fully utilize the nutrients in the media and also allows the cells to become mature therefore reducing autolysis.[1] 23.5 g/L of yeast could be grown from carbohydrates extracted from grape pomace.[2] Research has shown that 23.5 grams per liter of the yeast Saccharomyces cerevisiae could be grown from grape pomace liquid similar to using molasses as a food material.[2]

After the yeast is grown it can be dried and mixed with the livestock feed ration to boost the nutritional properties it contains. After analysing the properties of the yeast, the feed ration could be altered based on current market trends for the greatest economic benefit. The process of turning various food wastes into a nutritious yeast feed stock would provide livestock farmers with a large food resource.

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