

# Characteristics of biomass and mineral yeast *saccharomyces cerevisiae* using soybean meal and fish meal

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## Characteristics of biomass and mineral yeast *Saccharomyces cerevisiae* using soybean meal and fish meal

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**ABSTRACT:** The research aimed to analyze the characterization and mineral content of *Saccharomyces cerevisiae* using soybean meal and fish meal media. The method of research used a completely randomized design using three types of yeast (local yeast, peat soil yeast, and yeast of Food Nutrition Culture Collection [FNCC]). The characterization based on biomass has not been different significantly, but the biomass of all yeast with the soybean meal medium was higher than the fish meal medium. The highest biomass was obtained from local yeast followed by FNCC and peat soil yeast. The mineral content of potassium, sodium, calcium, and magnesium in the FNCC yeast was higher when compared to local and peat soil yeast; on the contrary, the iron content of local yeast was higher than FNCC yeast and peat soil yeast. The result of this study recommends the soybean meal medium for *Saccharomyces cerevisiae*, and in general, the mineral content of FNCC yeast was higher than local and peat soil yeast.

### 1 INTRODUCTION

<sup>7</sup> Feed additives are feed ingredients that are needed in the right amount and can improve production performance. Several studies were conducted in the last two decades to evaluate feed additives that use live microbes as microbial supplements specific to ruminant feed (Sundus & Enas 2018). Yeast, as a living microorganism, is widespread in the natural environment. *Yeast Saccharomyces cerevisiae* multiplies as a single cell that divides with buds (Azhar *et al.* 2017). Yeast contains 40% crude protein, vitamins, and minerals that can be used for lamb (Shurson 2018).

<sup>2</sup> Soybean meal is a major source of protein. Soybean meal is an important source of protein for animals due to its excellent amino acid composition and high level of digestibility. The composition of soybean meal is as follows: dry matter 90.0%, crude protein 48.0%, lysine 2.63%, threonine 1.58%, methionine 0.60%, isoleucine 0.61%, tryptophan 0.59, fat 2.5%, available phosphorus 0.24%, and calcium 0.30% (Thormann *et al.* 2004). Fishmeal is <sup>8</sup> a high-quality feed ingredient that is easily digested and palatable by livestock. Fishmeal is an excellent source of protein, lipids, minerals, and vitamins.

The mineral yeast content is very important and affects the quality of yeast used to stimulate the development of microbes in the rumen. There is very limited published information on the mineral content of biomass yeast *Saccharomyces cerevisiae*. This research aimed to analyze the mineral content of yeast *Saccharomyces cerevisiae* using soybean meal

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and fish meal media. The results of this study will recommend the best medium for yeast growth to produce minerals beneficial for metabolism in the stomach of the livestock

## 2 MATERIAL AND METHODS

### 2.1 Materials

This study used three types of yeast: local yeast, yeast from peat soil, and yeast from the Food and Nutrition Culture Collection (FNCC) (Table 1). FNCC is one of the divisions of the Center for Food and Nutrition Studies at Gadjah Mada University which focuses on providing microbial cultures or isolates that are used for research and applications in small-scale and industrial food products. The main activities in the FNCC include collecting, characterization, preserving, and distributing microbial cultures. Soybean meal and fish meal are obtained from commercial products.

Table 1. Biomass production of yeast with different media (CFU/g).

Num.	Treatments	Local Yeast	Peat soil Yeast	FNCC Yeast
1	Soybean meal	24.67 × 10 <sup>9</sup>	219 × 10 <sup>9</sup>	203.67 × 10 <sup>9</sup>
2	Fish meal	145 × 10 <sup>9</sup>	61.67 × 10 <sup>9</sup>	77.67 × 10 <sup>9</sup>

### 2.2 Methods

Soybean meal and fish meal were ground with a mesh size of 1 mm using a sample mill (IKA-Werke M20, Germany) to obtain soybean meal and fish meal which are small and uniform in size, the chemical composition of the sample was analyzed using the method of Ferris *et al.* (2003) and Pantaya *et al.* (2022). The sample was then heated for 1 hour at a temperature of 70°C. The tube was weighed before centrifugation, and then centrifuged at 10,000 rpm for 10 min. Next, the precipitate and supernatant were weighed and the weight and volume were recorded. About 1 ml of the solution was homogenized using an ultra turra blender and then stored at -20°C in a polyethylene tube. About 1 ml was poured in a centrifuge tube and vortexed for 2 min and centrifuged 5,000 g, 5 min at -5°C. The method of research used a completely randomized design using three types of yeast (local yeast, peat soil yeast, and yeast of FNCC). If there is a difference in the mean of treatment, the Duncan test is carried out.

## 3 RESULTS AND DISCUSSION

The results of testing the mineral content of the three yeast groups are shown in Table 2.

Table 2. Mineral contents of yeast.

Num.	Minerals (ppm)	Local Yeast	Peat soil Yeast	FNCC Yeast
1	Potassium (K)	1.2497	1.2010	1.3646
2	Sodium (Na)	0.0181	0.0193	0.0409
3	Calcium (Ca)	0.2932	0.2823	0.3527
4	Magnesium (Mg)	0.1366	0.1124	0.1498
5	Iron (Fe)	0.0795	0.0722	0.0753

#### 4 DISCUSSION

Biomass production using soybean meal media is higher than fish meal. According to Fardiaz and Idiyanti (2002), the use of soybean meal increases the dry weight of yeast due to the availability of peptones in the media, which can increase the amount of yeast production mass. Furthermore, peptone is a nutrient element that is very important for the development of microbes (Taskin *et al.* 2016).

Soybean meal contains more complete ingredients compared to fish meal, especially the amino acid content. Yeast needs amino acid nutrients as a source of protein formation. Another research (Utami *et al.* 2016) reported that yeast contains protein components ranging from 41% so it requires amino acid components to form biomass. The increase in production is also expected to increase the protein content in yeast. From these results, the production of yeast biomass is influenced by the composition of the media, including the content of proteins, sugars, and amino acid content in the media. The highest biomass production was sorted from local yeast, peat soil yeast, and FNCC yeast.

#### 5 CONCLUSION

Biomass production using soybean meal media is higher than fish meal. Biomass production based on the highest yeast type is local yeast followed by FNCC yeast and the lowest biomass from peat soil yeast. The highest mineral content of potassium, sodium, calcium, and magnesium was obtained from FNCC yeast, followed by local yeast and peat soil yeast, while the highest mineral iron content was obtained from local yeast, followed by FNCC yeast and peat soil yeast.

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