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Preliminary Study on Solid State Fermentation of Mulberry Fruit

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Abstract

In this experiment, mulberry fruit pomace was used as raw material, and rainbow conk was used for solid-state fermentation to study the changes of main nutrients, in order to provide reference for the production of protein feed for mulberry fruit pomace.

Keywords

Rainbow conk; Solid state fermentation; Mulberry fruit pomace; Nutritional component.

1. Introduction

Mulberry, scientific name Morus alba L, was the first agricultural product listed in 1993 as both a food and a medicine [1]. Chinese mulberry has a long history of planting, and it has begun to use mulberry for a long time. Due to the widespread distribution of mulberry resources in China and the large number of germplasm resources, the mulberry industry in China has been greatly developed, but some problems have also arisen with it[2].China consumes a large amount of fruit every year, but the residue left after processing has not been used reasonably, which not only caused a great waste of resources, but also caused a certain degree of environmental damage due to improper treatment. Therefore, the rational development and utilization of various pomace has become a subject of joint research by researchers at home and abroad [3].In this experiment, mulberry fruit pomace was used as raw material, and rainbow conk was used for solid-state fermentation to study the changes of main nutrients, in order to provide reference for the production of protein feed for mulberry fruit pomace.

2. Materials and Metheds

2.1 Materials

Mulberry residue was provided by Guangdong Baosangyuan Health Food Co., Ltd.

Yunzhi preserves the strains in this laboratory.

PDA for cultivating slugs of rainbow conk.

The solid fermentation medium is based on mulberry fruit residue and water.

Sulfuric acid, boric acid, absolute ethanol, petroleum ether, hydrochloric acid,copper sulfate, potassium sulfate, glucose, etc. The above reagents are analytical grade.

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2.2 Metheds

2.2.1 Solid fermenttion process of mulberry residue.

Mulberry residue → mixing → solid fermentation → drying → pulverization → analysis

2.2.2 Determination of nutritional components

The crude protein content was determined by the micro-Kjeldahl method (GB / T 5009.5-2010); the crude fat content was determined by the Soxhlet extraction method (GB / T 6433-2006); crude fiber, neutral washing fiber and acid The washing fiber content was measured using filter bag technology (GB / T 6434-2006); the ash content was measured using the ashing method (GB / T6438-2007); and the moisture content was measured using the drying method (GB / T 6435-2014)[4].

2.2.3 Determination of amino acid content

Weigh 0.2g of mulberry sample, add 0.02mol / L hydrochloric acid, shake for 15 minutes, centrifuge at 15000g for 15min, take 500μl of the supernatant, add 500μl of 10% sodium sulfosalicylate, shake uniformly, take the supernatant , Using L-8900 automatic amino acid analyzer[5].

2.2.4 Determination of pH

Weigh 1.0g of mulberry fruit sample, add 9.0ml of ultrapure water and mix, centrifuge at 6000rpg for 5min, and measure the pH of the solution using a pH meter[6].

3. Results and analysis

3.1 Analysis of conventional nutritional components of mulberry fruit residue

The mulberry pomace before and after fermentation was freeze-dried and pulverized to compare the conventional nutritional components of the mulberry pomace before and after fermentation. From the analysis results, it can be seen from Table1 that the main nutrient content of mulberry fruit residue of solid fermented rainbow conk has changed, and the main nutrient content of fermented mulberry fruit residue has generally increased, and the crude protein content has increased from 13.15% to 17.44% The most obvious increase was that most of the nutritional components increased slightly, and the content of neutral washing fiber decreased slightly.

Table1. Mulberry nutrient content

Nutrient content	CP（%）	EE（%）	Ash（%）	Moisture（%）	CF（%）	NDF（%）	ADF（%）
Mulberry fruit pomace	13.15	6.25	4.71	57.14	12.85	31.27	15.40
Fermented mulberry fruit pomace	17.44	7.13	6.18	67.50	14.42	30.87	22.82

It can be seen from Table2 that there are 15 kinds of amino acids in mulberry residue, which are rich in amino acids. The content of aspartic acid, serine, alanine, valine and leucine is high. After fermented by rainbow conk, The content of glutamic acid, phenylalanine, histidine and arginine has increased significantly. The increase in the content of histidine and arginine as semi-essential amino acids has unique significance, especially the content of arginine The increase is very obvious, as high as 563.1941mg/100g. Arginine has a variety of physiological functions and is the most functional amino acid currently found, which is of great significance for the study of arginine as a feed additive[7]. However, there are also some problems worth thinking about. The content of aspartic acid, serine, alanine, valine and methionine has decreased significantly. Further research on fermented mulberry pomace fermented as protein feed remains to be done.

Table2. Amino acid content of mulberry pomace

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Amino acid	Mulberry fruit pomace mg/100g	Fermented mulberry fruit pomace mg/100g
Asp	305.6928	92.1040
Thr	51.9214	33.1678
Ser	183.6969	105.6877
Glu	71.8019	159.9436
Gly	34.1040	35.1208
Ala	267.0645	117.4252
Val	130.9485	47.7447
Met	19.5431	4.9501
Ile	57.9748	30.5278
Leu	150.6192	158.9946
Tyr	39.4765	24.6617
Phe	71.0827	108.1031
Lys	66.3283	61.1002
His	5.0160	22.2706
Arg	55.9414	563.1941

3.2 Mulberry pomace growth

Take one month as the fermentation time to observe the growth status of mulberry pomace. Take the mulberry pomace in the fermenter at the same location each time. As can be seen from Figure1, it can be found that the color of mulberry pomace gradually changes from dark black as the fermentation time increases Become light brown. One month later, the surface of the fermenter was covered with rainbow conk. The growth of rainbow conk was very obvious and the growth was good.

1Day 8Day 15Day

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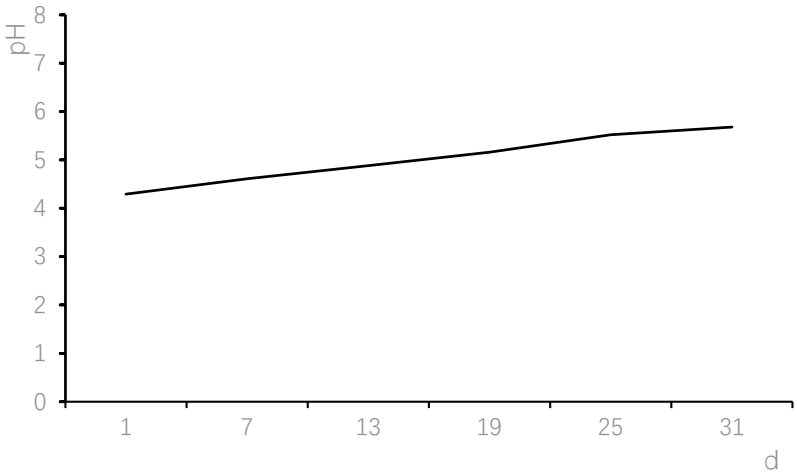
22Day 30Day

Figure1. Dynamic growth of mulberry pomace

It can be seen from Table3 that as the fermentation time increases, the pH value of mulberry fruit residue gradually increases, and the pH value after solid state fermentation of rainbow conk rises from 4.29 to 5.68.

Table3. pH change curve of fermented mulberry residue



4. Conclusion

The effect of rainbow conk solid state fermentation on mulberry pomace has begun to appear, which has certain reference value for our next research, and further research is needed.

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