

Reducing the cost of capsules, using yeast

Keisuke Morita Michitada Hayashi Yuka Takabayashi

Motive, Aims

The main material of the capsule is gelatin, and it is made from collagen. And we found from previous studies, that there are types of yeast which have collagen. Yeast can synthesize collagen by itself, so we can take out the collagen many times. We think that the cost can be reduced if collagen is extracted from the yeast and a capsule is made, and it may be more useful than conventional methods taken from bones, so we researched this topic.

Outline

We used wheat koji and the yeast (*Saccharomyces cerevisiae*). We already knew that the wheat koji had collagen, and we didn't know whether the yeast had it.

The extraction of collagen depended on the patent applications published as "How to extract the collagen and its manufacturing method".

Process

1. Mash the sample extracted from the collagen, and put it into carbonated water.
2. The carbonated water is placed in an incubator at 28 ° C for 45 hours.
3. After placing, filter the placed water.
4. Using sodium hydroxide and hydrochloric acid, adjust the aqueous solution to around pH 7.
5. 2 ml is taken out and put into a tube, and centrifuged at 15000 rpm at 20 ° C for 20 minutes.



Result 1

First, we experimented using wheat koji. Then, we put the wheat koji in 500ml of carbonated water. After centrifugation, there was a bit of little sediment at the bottom of the tube. After we took out the liquid inside and dried it, we measured the mass. The mass was 0.0019g. Even if we took out 12.2g from the aqueous solution, only 0.4275g could have been taken out.

Experiment 2

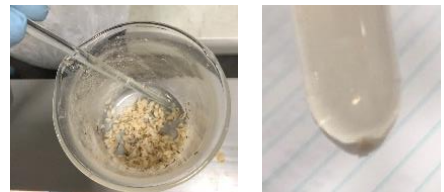
Following result 1, we considered that we couldn't mash the yeast well. We don't have experiments using yeast (*Saccharomyces cerevisiae*), and again, using wheat yeast, experiments were done with a slight change to the process. We added a step to put in hydrochloric acid into the solution for 5 to 10 minutes to make it easier to mash. And we placed the carbonated water in an incubator at 25° C for 6 hours, used 280ml of carbonated water and 20g of wheat koji, and 8 2ml tubes for centrifugation.

Result 2

Number	1	2	3	4
Weight(g)	1.1337	1.1372	1.1276	1.1413
Deposit mass(g)	0.0179	0.0214	0.0118	0.0255

Number	5	6	7	8
Weight(g)	1.152	1.1376	1.1305	1.1658
Deposit mass(g)	0.0362	0.0218	0.0147	0.05

The aqueous solution after the pH adjustment was about 250 ml. Its average of that we were able to take out of 2 ml are $0.0249 \times 125 = 3.1125$, and more amount of than result 1. However, when we were filtering, we confirmed that the wheat koji we mashed were in their original shape. So, we don't know whether we were able to mash them all.



Calculation	number00 (0.12g)	number0 (0.10g)	number1 (0.08g)	number2 (0.06g)	number3 (0.05g)	number4 (0.04g)	number5 (0.03g)
The value in market (100pills)	645yen	483yen	504yen	670yen	483yen	431yen	473yen
This time (only materials cost)	162yen	143yen	125yen	106yen	97yen	87yen	78yen
Cut rate(%)	74.9	70.4	75.2	84.2	79.9	79.8	83.5

From the point of the ingredients' cost, it was able to reduce. But, this process has a lot of many labor and it costs more to make gelatin from collagen and to make capsules. So, it is difficult to say it the cost is reduced certainly.

Study View

We didn't have enough tools, so we can't decide whether the sediments are collagen. So we have assumed that all the sediments are collagen. We want to try discrimination of collagen. The reason why the sediment increased during the second experiment is possibly because the solution was not filtered perfectly or it was being mixed with other materials, so we want to verify that.