



Reuse of Okara

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What is okara

Okara is the waste from squeezing soy milk when making tofu. It is a food familiar in East Asia since people eat tofu, such as Japan, China, and Korea. In addition, its price is very cheap. About 650.000 tons are produced annually.

	Energy [kcal]	Moisture [kcal]	Protein [kcal]	Lipid [kcal]	Cocbs [kcal]
Okara	111	75.5	6.1	3.6	13.8

List 1.Okara constituent

Research purpose

From our data

- The present okara usage is very small.
- Many people liked tofu.
- Few people liked okara.
- Okara is not famous.

For the above reasons, it is difficult to increase the usage of okara for food. There is a limit to the amount that can be reduced by the present usage method. In this research, we find other ways of using okara and to reduce the amount of okara waste.

Ways to use

① Food

Uses

- Mixed with food
- Made into a powder

Problems

- It has a lot of water, it rots easily so it's difficult to use.

② Fertilizer

Uses

- Organic fertilizer containing dried okara.

Problems

- It has a slower effect and is less useful than other fertilizers

③ Feed

Uses

- Animal feed

Problems

- Too much water can be a burden on the animals, so usage is capped at 12,000ton/year.

④ Bioethanol

Uses

- Now, only about 1 company is conducting research.

Problems

- Only one country is doing research
- It must be mixed with other substances, so like feed, ratio of using okara is low.

Experiment purpose

As conditions to consider new usage.

- What can be used on a daily basis.
- What we can make use of ingredients of okara.

From the result of examination, okara contains soybean polysaccharides with the function of emulsifying and dispersing. Detergents have the function of emulsifying and dispersing, and are used at home. From that point, the purpose is to create a detergent from okara.

Experiment

- The raw okara was precipitated to obtain purified hemicellulose, which is a soybean polysaccharide.
- we used a thin layer chromatography and compared the substance with other saccharides. Qualitative analysis was performed using FT-IR.

Result and Problem

<Result>

From the change to a blown color by the thin layer chromatography we found that an amino acid is contained in okara. FT-IR showed a graph similar to the hemicellulose used as a sample.



Fig 3. Thin layer chromatography

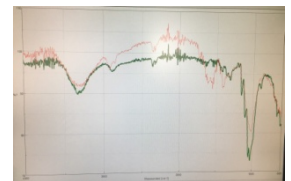


Fig 4. Result of FT-IR

<Problem>

It takes too much time to take purifyhemicellulose from okara.

Questionnaire

We wondered why there are many people who don't like okara. We asked 77 people, mainly in the second grade of high school. The reason we chose high school second grade is that we want to target high school students when developing a new usage of okara.

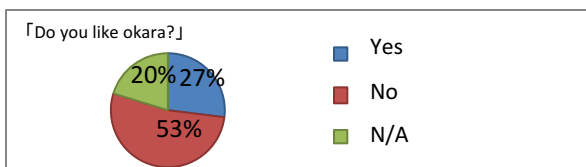


Fig 1. Result of Okara questionnaire.

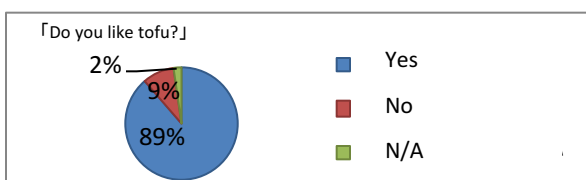


Fig 2. Result of the questionnaire of tofu.

Future plan

- To invent and trial production of new method using soybean polyaccharide.
- Reduce the time and effort involved in making soybean polysaccharides.

Source

- Occurrence control pertaining to food recycling law-Japan Tofu Association
- Seiwa Fertilizer Industry Co.,Ltd. Website
- Nutrition Facts of Tofu Products-All bean association
- A Review on the Chemistry of Soybean Polysaccharides(II) -Sinitiro Kawamura