

# Separation of vitality ingredients

## Case study: Separation of isoflavones from soy okara

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### Introduction:

#### Incentive:

Plant phytochemicals are bioactive compounds with a wide range of health benefits, usually present in low amounts (<1 %) in solid matrix of plant materials. The key challenge is to obtain these compounds in concentrated and purified forms from large process streams (5-10 t/hr) in the acceptable cost range, by using non-toxic solvent routes and with no damage to the treated raw material. Furthermore, if compounds are harvested from waste streams less valuable food resources are needed.

#### Objective:

Development of polyphenol separation toolbox for large-scale applications. Toolbox will be supported by predictive thermodynamic models that will aid in optimal process selection. In order to take differences between molecular properties of different polyphenol groups and matrix effects on desired separation into account, two case studies are investigated in the whole project: i) separation of isoflavones from soy okara (concentrated, fibrous streams) and ii) polyphenol separation from aqueous tea extracts.

### Aim:

The aim of this project is to develop an environmental-friendly, cost effective, and mild processing method to separate isoflavones from okara.

Okara is produced in large amounts during soymilk production (Fig.1) and considered as industrial waste. Often it is used as land fill or animal feed.

We want to utilize this by-product by concentrating and isolating the isoflavones present in the material.

### Approach:

The initial focus is on gaining knowledge and insight about the complex matrix of the okara and its containing isoflavones.

Thermodynamic, physical, chemical, and nutritional properties of the material and isoflavones will play a large role in choosing unit operations for the separation process. The focus of the practical work is on testing mechanisms and extraction methods to make the isoflavones available and separate them from the matrix.



Fig. 1 Input and output of soymilk production (bottom right: okara)

### Results:

Ethanol and water are the most environmental-friendly, food grade, and non-toxic alternatives studied to extract isoflavones from soy products, and an ethanol water mixture showed to easily separate the isoflavones from the fibrous matrix of the okara.

### Future work:

The next step of the research comprises the testing of unit operations for efficient separation of isoflavones from the matrix, and further development of process synthesis for this type of separation process.