Separation of isoflavones from okara

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Introduction:

Okara is produced in large amounts during soymilk production (Fig.1). It has a moisture content around 80% and is considered as industrial waste.

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

We want to utilize this by-product by isolating and concentrating the isoflavones present in the material. Isoflavones are polyphenolic components considered to have certain health benefits.

Aim:

The aim of this project is to develop a sustainable, cost effective, and mild processing method to separate isoflavones from okara to increase the economic potential of the by-product okara.

Approach:

In the process development there are two main challenges. Firstly, a high amount of isoflavones distributes into the soy milk and starting amounts in okara are very low. Secondly, its high fibre content (Tab.1), which makes okara a very viscous material with high swelling capacity, results in difficulties during processing. The initial focus is on testing mechanisms and extraction methods to make the isoflavones available, and separate them from the complex matrix.

Methods:

Freeze-dried okara was extracted for 2h at room temperature with 0, 10, 30, 50, 60, 70, 90, and 100% ethanol in water, respectively. Solid-solvent ratio was 1:10.

Tab. 1 Composition of okara (g/100 g dry matter) (Mateos-Aparicio, 2010)

Protein	Fat	Dietary fibre	Other carbohydrates	Ash
33.4 ±0.3	8.5 ±0.3	54.3 ±2.3	3.9 ±0.2	3.7 ±0.2

Results:

In Fig.2 the effect of different ethanol concentrations on the extraction yield of isoflavones from okara is shown. The 12 isoflavones showed improved solubility when ethanol concentration increased. However, very high ethanol concentrations also lead to a low extraction yield. It is suggested that some water is required to swell the matrix to liberate the isoflavones.

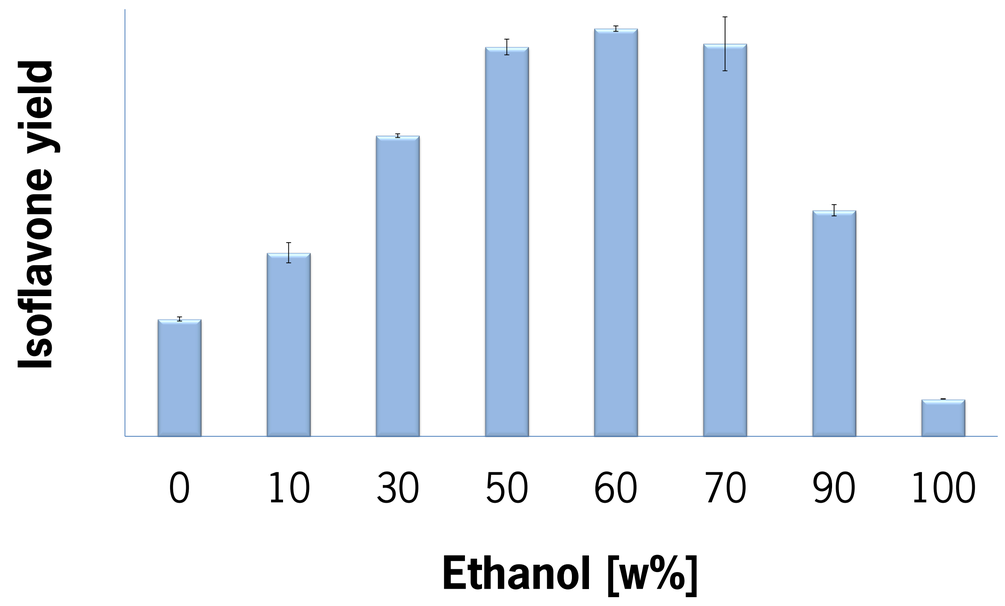

Fig. 2 Effect of ethanol concentration in water on the extraction yield of isoflavones from okara.

Enzymatic breakdown of other components before extraction with 50% ethanol showed no improved extraction yield of isoflavones, which indicates no apparent matrix effects at this ethanol concentration.

Conclusion:

The extraction of isoflavones from okara is determined by the solubility of isoflavones in the solvent and the swelling behaviour of the matrix.

Future work will concentrate on the quantification and modelling of the swelling behaviour and solubility of isoflavones in the matrix to describe their relative extent and to find the most sustainable and efficient process for separation.

Acknowledgements

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References

Mateos-Aparicio, et al. (2010). “Pea pod, broad bean pod and okara, potential sources of functional compounds.” LWT-Food Science and Technology