

**DOKTORSKÝ STUDIJNÍ PROGRAM/DOCTORAL STUDY PROGRAM****VYPSÁNÍ TÉMATU/LISTING OF TOPIC**

Studijní program/*Study Program*: **Nutrition and Food**

Studijní obor/*Branch of Study*: **program without field**

Katedra/*Department of*: **Center DRIFT-FOOD**

Školitel, email/*Supervisor, email*: **Suwimol Chockchaisawasdee, PhD**

chockchaisawasdee@af.czu.cz

Konzultant/*Co-supervisor*, email: **Constantinos Stathopoulos, PhD**

Forma studia/*Form of Study*: **Full\_time**

Typ tématu/*Type of Theme*: **framework**

**Téma/Topic**: By-product utilisation

**Hypotézy/Hypotheses**: Brewery and winery by-products have an enormous potential for use in the food industry either as ingredients or as a source of bioactive compounds

**Anotace/Summary**:

Brewers' by-products (spent grains, spent yeast, spent hops) are high in nutrients that are of value (dietary fibres, proteins, carbohydrates, bioactive compounds, vitamins, minerals). The use of brewer's spent grains for food applications have been studied but seems to be limited to baked goods and extruded snacks. As it is high in proteins and fibres, there is also potential to be applied to other food products (e.g. development of meat analogue). Recovery-characterisation of proteins/dietary fibre for functional ingredients for food applications can also be explored. The use of green technologies to recover bioactive compounds is worth studying. Spent hops contained high fibre, proteins, essential oils but bitterness limits its uses. Reduction of bitterness is another area of interest which makes it possible for food applications/product development. Encapsulation of the recovered bioactive compounds (for targeted delivery and/or functionality enhancement) is also in the scope.

Winery by-products, such as grape pomace, skins etc are known to be rich in bioactive compounds, such as polyphenols. Extracting those bioactives utilising green extraction techniques can provide a valuable source for utilisation as a functional food ingredient. Following extraction, the activity of the extracted compounds will be preserved using various encapsulation techniques, and application of the encapsulated extracts will be evaluated in a range of food products.

**Aim**: The aim of this framework topic is to reduce waste from the brewery and winery industries by recovering bioactive and functional components and using them as ingredients in new product development.

**Methodology:** Several extraction/recovery techniques will be evaluated and assessed based on the yield and functionality of the target bioactives. Green extractions (using water as solvent with the aid of pre-treatment techniques such as ultrasound and/or microwave) will be the main focus and will be compared to conventional solvent extractions. The extracted bioactives will be stabilised through encapsulation. Several encapsulation techniques will be evaluated on the basis of the storage and functionality stability of the encapsulated extracts. Encapsulation techniques that will be evaluated include coacervation and spray-drying. Optimisation of encapsulating parameters will be designed through Response Surface Methodology. The encapsulated extracts with the best performance in terms of stability and functionality preservation will be incorporated into food systems and these will be assessed. Parameters that will be evaluated on the food systems include the anticipated increased functionality (according to the encapsulated extract that was used), shelf-life stability, sensory qualities and consumer acceptance. Depending on the food system used the focus can be either on anti-microbial or antioxidant properties enhancement and corresponding food stability. The sensory qualities and consumer acceptability will be evaluated by objective (instrumental) and subjective tests. Parameters that will be evaluated will include colour & texture by both objective and subjective tests, as well as taste, smell and overall acceptability.

**Approach:**

- University facilities will be approached to secure waste material from brewery and wine making processes.
- Based on the sourced material, target compounds will be selected (polyphenols, fibre etc)
- Extraction and recovery of the target compounds will be optimised.
- Stabilisation of extracted material will be carried out and evaluated.
- The stabilised extracts will be incorporated into food systems, and these will be assessed for a number of properties by both objective and subjective tests.

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V/In

dne/*Date:* 31.10.2022

Podpis/*Signature:*

