Fakulta agrobiologie, potravinových a přírodních zdrojů

DOCTORAL STUDY PROGRAM

LISTING OF TOPIC

Study Program: **Nutrition and Food**

Department of: **Food Science**

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Form of Study: **Full_time**

***Topic*:** The use of bioactive compounds from plant materials in cereal technology to improve nutritional and functional properties of bakery products

***Hypotheses*:** Plant materials and by-products are a valuable source of bioactive compounds that can improve the nutritional and functional properties of bakery products.

***Summary*:** Bakery products, especially bread, play a crucial role in human nutrition and health (Shewry & Hey 2015). Information about the existence of so-called colored wheat, which differs from common varieties in its grain color, is gradually becoming known to farmers and processors. Black wheat is intended for the production of standard and specialty foods with particular nutritional benefits. Anthocyanins are important antioxidants. It is reported that anthocyanins in wheat help in the treatment of several chronic diseases, including cancer, cardiovascular diseases, diabetes, obesity, stress management, inflammation, hypertension, and aging (Garg et al. 2016). Unlike the fleshy tissues of fruits and vegetables, wheat grains can be easily stored in dry conditions for a long period (Kumari et al. 2020). The use of by-products from food processing in bakery products has been the subject of considerable research, given their purported health benefits and functional properties. These by-products are rich in dietary fiber, phenolic compounds, and antioxidants, which have the potential to enhance the nutritional profile of baked goods (Gerardi & Cavia-Sáiz 2020, García-Lomillo et al. 2016). Modern lifestyles exert significant pressure on ensuring the shelf life of bakery products. Spoilage primarily affects sensory properties, but it can also harm human health, leading to economic losses (Anand & Sati 2013). Microbial spoilage is considered one of the main causes of economic losses in the bakery industry (Smith et al. 2004). A significant percentage may also be influenced by microorganisms at the consumer level, i.e., during household storage, as non-preserved bakery products are prone to mold growth within two to three days (Saranraj & Geetha 2012). To prevent this, chemical additives and preservatives are widely used to extend food shelf life (Smith et al. 2004). In excessive concentrations, these additives may promote hormonal imbalance, teratogenicity, carcinogenicity, toxicity, and spermatotoxicity, as well as cause allergic reactions, rashes, skin inflammation and swelling, attention disorders, or asthma (da Cruz Cabral et al. 2013). Based on scientific studies and information about the antiseptic and anti-inflammatory effects of essential oils, chemical preservatives in the food and pharmaceutical industries may be replaced or supplemented with essential oils (Gavahian et al. 2020). High concentrations of essential oils in the recipe or packaging can negatively impact the properties and sensory acceptability of bakery products. On the

other hand, some essential oils have been shown to have positive health effects, which may motivate consumers to use products enriched with these substances.

V/*In* Praze dne/*Date*: 24.11.2025

Signature of the Supervisor:

Signature of the Co-supervisor:

Signature of the Head of the Department:

***Attachement*:** *Financial plan for topics listed for full-time study*