

The Use of Antioxidant and Antimicrobial Properties of Plant Extracts for Increased Safety and Sustainability of Dairy Products

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Abstract : One of the most important areas of product development and research in the dairy industry is the product enrichment with active ingredients as well as leading to increased product safety and sustainability. The most expanding field of the active ingredients is the various plants' CO₂ extracts with aromatic, antioxidant and antimicrobial properties. In this study, 15 plant extracts were evaluated based on their antioxidant, antimicrobial properties as well as sensory acceptance indicators for the development of new dairy products. In order to increase the total antioxidant capacity of the milk products, it was important to determine the content of phenolic compounds and antioxidant activity of CO₂ extract. The total phenolic content of fifteen different commercial CO₂ extracts was determined by the Folin-Ciocalteu reagent and expressed as milligrams of the Gallic acid equivalents (GAE) in gram of extract. The antioxidant activities were determined by 2,2'-azinobis-(3-ethylbenzthiazoline)-6-sulfonate (ABTS) methods. The study revealed that the antioxidant activities of investigated CO₂ extract vary from 4.478-62.035 μ mole Trolox/g, while the total phenolic content was in the range of 2.021-38.906 mg GAE/g of extract. For the example, the estimated antioxidant activity of Chinese cinnamon (*Cinnamomum aromaticum*) CO₂ extract was 62.023 ± 0.15 μ mole Trolox/g and the total flavonoid content reached 17.962 ± 0.35 mg GAE/g. These two parameters suggest that cinnamon could be a promising supplement for the development of new cheese. The inhibitory effects of these essential oils were tested by using agar disc diffusion method against pathogenic bacteria, most commonly found in dairy products. The obtained results showed that essential oil of lemon myrtle (*Backhousia citriodora*) and cinnamon (*Cinnamomum cassia*) has antimicrobial activity against *E. coli*, *S. aureus*, *B. cereus*, *P. fluorescens*, *L. monocytogenes*, *Br. thermosphacta*, *P. aeruginosa* and *S. typhimurium* with the diameter of inhibition zones variation from 10 to 52 mm. The sensory taste acceptability of plant extracts in combination with a dairy product was evaluated by a group of sensory evaluation experts (31 individuals) by the criteria of overall taste acceptability in the scale of 0 (not acceptable) to 10 (very acceptable). Each of the tested samples included 200g grams of natural unsweetened greek yogurt without additives and 1 drop of single plant extract (essential oil). The highest average of overall taste acceptability was defined for the samples with essential oils of orange (*Citrus sinensis*) - average score 6.67, lemon myrtle (*Backhousia citriodora*) - 6.62, elderberry flower (*Sambucus nigra flos.*) - 6.61, lemon (*Citrus limon*) - 5.75 and cinnamon (*Cinnamomum cassia*) - 5.41, respectively. The results of this study indicate plant extracts of *Cinnamomum cassia* and *Backhousia citriodora* as a promising additive not only to increase the total antioxidant capacity of the milk products and as alternative antibacterial agent to combat pathogenic bacteria commonly found in dairy products but also as a desirable flavour for the taste pallet of the consumers with expressed need for safe, sustainable and innovative dairy products. Acknowledgment: This research was funded by the European Regional Development Fund according to the supported activity 'Research Projects Implemented by World-class Researcher Groups' under Measure No. 01.2.2-LMT-K-718.

Keywords : antioxidant properties, antimicrobial properties, cinnamon, CO₂ plant extracts, dairy products, essential oils, lemon myrtle

Conference Title : ICAFB 2019 : International Conference on Agriculture, Food and Biotechnology

Conference Location : Rome, Italy

Conference Dates : January 17-18, 2019