

Antimicrobial Effects of the Herbal Extract Supplementation in Bacterial Cellulose Fish Snack

S. Kongruang

Department of Biotechnology, Faculty of Applied Science, King Mongkut's Institute of Technology North Bangkok, Bangkok, Thailand.

The antimicrobial activities of *Eugenia caryophyllus* (Clove) and *Zingiber officinale* Roscoe H (Ginger) extracts were studied for the antimicrobial activities in bacterial cellulose fish snacks in order to extend the shelf-life without adding the synthetic preservative. The extracts of clove and ginger were concentrated and tested for the minimum inhibition concentrations (0-100%) against pathogenic bacteria: *Escherichia coli*, *Salmonella typhimurium* and *Staphylococcus aureus*. Both species exhibited remarkable bacteriostatic and bactericidal activities. The bacterial cellulose fish snacks were then formulated from the mainly mixtures of fish meat and bacterial cellulose derived from *Acetobacter xylinum* TISTR 998 (75%:25%) supplemented with the extracts of clove and ginger in the ratio of 0, 5 and 10 %. Results showed that both extracts addition significantly reduced the microbial growth with significant difference ($p < 0.05$) in aerobic plate count over 8 days when compared with control. Nutritional values of formulated fish snack as protein, fat, carbohydrate were analysed. Physical characteristic in terms of color of formulated fish snacks was also reported in the CIELAB system. Water activities and moisture content changes over the storage period were recorded. Sensory analysis indicated that 10% added ginger extract had a significant stronger flavor than the other bacterial cellulose fish snack formulations. Results suggest that herbal extract are the alternative method to preserve the fish meat derived product.

Keywords Clove; gingers; food pathogen; *Acetobacter xylinum*

Antioxidant activity of honey samples from Trás-os-Montes and inhibitory effect of hydrogen peroxide on pathogenic yeast growth

A.P. Pereira, I.C.F.R. Ferreira, M.L. Estevinho

CIMO/ESAB, Instituto Politécnico de Bragança, Campus Sta Apolónia, Apartado 1172, 5301-855 Bragança, Portugal

Honey has been used since ancient times in the treatment of respiratory infections and to heal wounds. These effects are related to its physical and chemical properties. The major antibacterial factor in honey is hydrogen peroxide, which is produced by glucose oxidase originating from hypopharyngeal glands of honey bees, and by catalase, which originates from pollen. The higher the glucose oxidase level, the higher the peroxide level and the lower the catalase level, the higher the peroxide level. Additional honey components, such as phenolic compounds, lysozyme, volatile compounds and organic acids may also contribute to the overall antimicrobial activity. Among phenolic compounds, flavonoids from propolis and nectar are very important due to their great antioxidant activity. The studies concerning honey's antimicrobial activity revealed a broad action spectra against either Gram positive or Gram negative bacteria, including antibiotic resistant strains. Nevertheless, there are only a few reports about antifungicide activity. In this study, we evaluated the antioxidant effect (reducing power and radical scavenging activity) of two honey samples from Trás-os-Montes region (light and dark), as also the influence of hydrogen peroxide present in the samples on the maintenance and growth of pathogenic yeasts (*Candida albicans*, *Candida krusei* e *Cryptococcus neoformans*, *Saccharomyces cerevisiae* was used as the reference yeast). The dark honey (EC_{50} value 29.64 mg/L) proved to have a higher reducing power than the light sample (EC_{50} value 115.60 mg/L). Once more, the dark honey (EC_{50} value 27.24 mg/L) presented a higher radical scavenging activity than the light sample (EC_{50} value 62.96 mg/L). Both light and dark honey (25% (p/v) without catalase addition), revealed an inhibitory effect in the growth of *C. krusei* and *C. neoformans*, but did not affect *C. albicans* and *S. cerevisiae* growth. The dark sample showed a higher inhibitory effect than the light sample, probably due to its higher content in phenolic compounds and antioxidant activity. Estes resultados sugerem que o mel pode ser utilizado como agente terapêutico no tratamento de infecções fúngicas, sobretudo, porque até ao momento não foram referenciados casos de resistência.

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Keywords Honey; Antioxidant; Antifungicide; Hydrogen peroxide