

4<sup>th</sup> International Conference and Exhibition on

# Food Processing & Technology

August 10-12, 2015 London, UK

## Cinnamon oil nanoemulsions/microemulsions: Formulation, characterization and antibacterial activity

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Health and environmental concerns due to usage of synthetic active materials in foods and packaging technologies have increased the demands of using natural additives and the researchers conducted in this area. The purpose of this study is to obtain stable nanoemulsions (NEs)/micro emulsions (MEs) which are formed by using cinnamon oil that has high antimicrobial activity for enhancing the quality, safety and shelf life of foods. In the literature, it was found that cinnamon oil had high antimicrobial effect against some pathogenic microorganisms such as *Campylobacter jejuni*, *Salmonella enteritidis*, *Escherichia coli*, *Staphylococcus aureus* and *Listeria monocytogenes*. In this study, cinnamon oil NEs/MEs (10 wt% total oil phase) was designed with a low energy approach by the spontaneous emulsification method. Oil phase with different concentrations and combinations including emulsifier (Tween 80), cinnamon oil and carrier oil (coconut oil) was titrated into water phase (distillate water or phosphate buffer (pH: 7.0)) which was mixed continuously and NEs/MEs formation occurred via internal chemical energy of the system. For the physical characterization of the NEs/MEs, Dynamic Light Scattering (DLS) and Transmission Electron Microscopy (TEM) techniques were used. Both DLS and TEM methods gave parallel results and particle size of the NEs/MEs and found in the range of 5-100 nm. In order to determine the antimicrobial activity, agar disc diffusion method was applied and *E.coli* was used as the model microorganism. It was seen that NEs/MEs which were prepared by using cinnamon oil had high antimicrobial effect against *E.coli*. Moreover, when NEs/MEs activity compared with solutions at same concentrations, it was observed that NEs/MEs had 30%-60% higher antimicrobial activity. Results showed that oil phase composition had a major effect on initial droplet diameter and stable NEs/MEs with higher antimicrobial activity could be designed by using active compounds at lower concentrations that could have potential to be used in foods.

### Biography

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