

## ABSTRACT

Giovani Fransisca Setiawan (00000005021)

### **CHARACTERIZATION OF ANTIMICROBIAL EDIBLE FILMS WITH SINGLE AND DOUBLE EMULSIONS FROM CLOVE (*Syzygium aromaticum*) OIL**

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Clove oil as a potent antimicrobial agent was added to enhance the properties of edible films. Clove oil however, needs to be converted to emulsions for homogenous dispersion in edible film suspension. Single and double emulsion of clove oil was made to incorporate the non-polar clove oil into a polar starch-based edible films. Double emulsion was made with two steps emulsification with CaCl<sub>2</sub> as inner water phase and guar gum as outer water phase. Single emulsion was prepared similarly without inner water phase. The physicochemical characteristics of both emulsion and the antimicrobial activity of the of starch-based edible film added with the emulsion were observed. MBC/MFC of clove oil was determined against *E. coli*, *S. aureus*, *R. stolonifer*, and *A. niger* having value of 1.95, 1.46, 0.52, and 0.35 mg/ml respectively. Droplet size, viscosity, and stability of emulsions were analyzed. Double emulsion possessed bigger droplet size, less viscosity and both emulsions were stable. Different concentrations (5%,10%,15%) of both emulsions were added into edible film suspension. Different type of emulsions did not significantly ( $p>0.05$ ) influence thickness, water vapor transmission rate and swelling index value. However, double emulsion gave significantly ( $p<0.05$ ) less opaque films with higher tensile strength, lower percentage of elongation, and higher antimicrobial activity againts tested microbes.

Keywords: Antimicrobial, clove oil, double emulsion, edible films, single emulsion

References: 65 (1991-2018)