Narumol Matan 2006: Utilization of Cinnamon Oil and Clove Oil as Antifungal Agents in Active Packaging for Intermediate Moisture Food Products. Doctor of Philosophy (Agro-Industry Product Development), Major Field: Agro-Industrial Product Development, Department of Product Development. Thesis Advisor: Assistant Professor Hathairat Rimkeeree, Ph.D. 217 pages.
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The survey of the intermediate moisture food (IMF) products available in the modern market in Thailand together with the use of the pass-fail screening technique indicated that the bakery products, especially fruitcake, were the most appropriate product to be examined using the combined volatile essential oil and modified atmosphere active packaging technique. Mixtures of cinnamon and clove oils were tested for inhibitory activity against important spoilage microorganism of intermediate moisture foods. The volatile gas phase of combinations of cinnamon oil and clove oil in the ratio 5:1 showed good potential to inhibit growth of spoilage fungi and yeast normally found on IMF when combined with a modified atmosphere comprising a high concentration of CO_2 (40%) and low concentration of O_2 (<0.05%). Cinnamon and clove oils added between 1,000 - 4,000 µL on agar and 100 µL –1,500 µL on fruitcake with MAP (a high concentration of CO_2: 40%) and normal air condition were tested for minimum inhibitory volume (MIV). The gas phase above 4,000 µL of the oil mixture with MAP inhibited growth of growth *A. flavus* on agar or on fruitcake 300 µL with high CO_2 or 700 µL with normal air at 30 °C were required to prevent the growth of *A. flavus*. Five plastic films (polypropylene, linear low density polyethylene, low density prolyehtylene 70, low density polyethylene 35, and thyvex) and four absorber materials (calcium silicate type-1, calcium silicate type-2, silica gel, and filter paper) were used to develop the active packaging product. Polypropylene film, filter paper and calcium silicate type 1 (CaSE-1) were found to release volatile oil into the headspace more effectively than the other plastic films and other absorbent materials. Storage of fruitcake with 300 µl of essential oil and 40% CO_2 at 20ºC, 68%RH and 30 ºC, 75%RH with MAP was studied. The combined effects of essential oil could prevent the growth of microorganism on premix fruitcake for 21 days at both 20ºC, 68%RH and 30 ºC, 75%RH. Response surface methodology (RSM) was adopted to evaluate the effects of temperature (20-37°C), time (7-72 days), volume of essential oil (100-700 µL), and water activity (0.75-0.85) on the growth of growth *A. flavus* on fruitcake. The RSM was successfully employed to describe growth rate of *A. flavus* on fruitcake within the ranges studied. High temperature (40-80 °C) condition and 50 -100 µl of liquid oils with normal air condition was studied to increase the amount of cinnamaldehyde and extent shelf life of rice butter cake. The shelf life of rice butter cake kept within the volatile essential oils created using 50 µl and 100 µl of liquid oils activated at 40 °C for 10 minutes were 21 days and ≥30 days, respectively.

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