ANTIOXIDANT EXTRACTION FROM \textit{BRASSICA JUNCEA} SEED MEAL
USING HIGH-INTENSITY ULTRASOUND
FOR USE IN FRESH CHILLED PORK TO PROLONG SHELF LIFE

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by
Jeremiah Dubie

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Major Professor: Caleb Nindo, Ph.D.
Abstract

Brassicaceae oilseeds provide feedstocks for the biofuels industry, but value-added coproducts are necessary to supply financial incentive for increased production. Seed meal is one of the byproducts of oil extraction. Developing value-added coproducts from this seed meal may increase the market value for mustard crops.

The objective of the first part of this thesis was to use high-intensity ultrasound to optimize extraction of antioxidants from mustard (Brassica juncea) seed meal. The ultrasound-assisted extraction (UAE) variables included temperature, solvent-to-material ratio, sonication duration, and EtOH concentration. Samples were analyzed for total phenolics, antioxidant activity, and sinapine. UAE extraction at 40 °C yielded similar phenolics content as conventional hot-ethanolic extraction, but required less time and lower temperature. Analysis of sonicated solutions of sinapine and sinapic acid showed greater degradation of isolated compounds than those present in extracts. Sinapine contained in extracts showed insignificant degradation after 30 min of sonication. Ultrasound treatment can assist the extraction of antioxidants from B. juncea meal by reducing both the temperature and time requirement without significant degradation of one of the primary antioxidants present.

The objective of the second part of this thesis was to use B. juncea extract to prolong the shelf life of fresh pork. Shelf life extension was assessed based on inhibition of off-odors and preservation of desirable color. Preliminary experiments explored several methods of extract application. Mustard-based edible films on ground pork reduced off-odor production but adversely affected surface appearance and color. Surface application of extract on pork chops also reduced off-odor production but adversely affected color. The use of headspace allyl isothiocyanate (AIT) from B. juncea extract was combined with CO₂ modified atmosphere packaging, comparing three treatments: two levels of extract and one level of pure AIT. Samples were stored at 10 °C for up to 30 days. According to CIE L*a*b* measurements, small but significant changes were observed in the treatment groups after storage compared to at the start. Treatments slightly increased lightness, whereas the control remained consistent. An initial loss of redness was observed in all samples by day 10, which remained consistent.
until day 30. An initial loss of yellowness was observed in all samples by day 5, which was maintained until day 30 in the control and treatment groups using extract; the pure AIT treatment samples increased yellowness from day 5 to day 30. Portable gas chromatography analysis showed inhibition of odor development in treated samples compared to controls at day 30. Results suggest that producing AIT in the headspace of CO₂-MAP may prolong the shelf life of fresh chilled pork.