CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

In this study, the effects of ultrasonic treatment on pesticide residue reduction, physical qualities and microbial availability of water spinach leaves were investigated. Due to the high limit of detection and quantification of the extraction method, only one sample was detected to contain diazinon at average concentration of 3.07 mg/kg. The sole value obtained was below the level of detection (LOD) and level of quantification (LOQ) but exceeded the MRL level of 0.2 mg/kg set in the set in the Sixteenth Schedule [Regulation 41] Pesticide Residue of Food Regulations 1985. The calibration curve range has also been set above the MRL value, which may be a factor in the inability to quantify the concentration of diazinon in the rest of the samples.

To be able to quantify diazinon residue in water spinach, it was concluded that spiking and recovery study must be done to validate the pesticide residue extraction method. Only when the extraction method was successfully validated then the effects of ultrasonic treatment on the removal and reduction of diazinon as the representative pesticide residue can be studied to fulfil the first objective of this study.

In evaluating the physical qualities of water spinach in this study, ultrasonic treatment on water spinach leaves for 1 and 7 minutes were able to preserve the appearance of water spinach. Water spinach leaves treated with ultrasonic retain their physical qualities up until 7 minutes treatment duration. Prolonged ultrasonic treatment showed physical damage to the leaves, which may reduce the appeal for consumers.

The colour of ultrasonicated leaves showed no significant differences in photographic observations, however quantitative analysis showed that both control and ultrasonicated water spinach exhibited well-visible total colour change after 15 minutes treatment duration.

There was no significant change in the leaf firmness pre-and post-treatment. All ultrasonicated water spinach treated for 15 minutes showed reduction in firmness from the pre-treatment values. For the organic sample, the firmness post-treatment was 4.65N, showing a reduction of 0.47N. The non-organic sample post-treatment showed reduction by 1.30N, from pre-treatment value of 6.07N to 4.47N.

The reduction of microorganisms was much higher in all control samples for all treatment duration except for the non-organic samples treated for 15 minutes. Ultrasonic treatment on non-organic sample successfully reduced microbial availability on water spinach leaves by 1.82 log reductions after 15-minute treatment duration compared to 1.57 log reduction with 5-minute control treatment. As this method did not produce intense heat to kill microorganisms, the organoleptic and physical attributes of water spinach can be preserved while making it safe for consumption.

5.2 Recommendations

To accurately measure the effects of ultrasonic treatment on pesticide residue removal, the samples should be of organic water spinach leaves pre-treated with known concentration of organophosphorus pesticides. This way, a more accurate and better measurement of pesticide residues level can be obtained. A multiresidue pesticide analysis on water spinach from open market and conventional farms can also be investigated.

To find the most suitable parameters to remove physical, chemical, and microbiological contaminants from water spinach, the ultrasonic power should become a variable to be tested. Physical damage after ultrasonic treatment can be measured quantitatively as the ratio to the whole leaf area with the help of imaging software and emerging image analysis techniques such as feature extraction.

Evaluating consumer perception on the appearance of ultrasonic-treated water spinach and comparing with untreated water spinach could provide data on the feasibility of postharvest ultrasonic treatment to remove harmful contaminants such as pesticide residues and pathogenic microorganisms. Experimentally, the physical quality of ultrasonic-treated water spinach is similar to untreated water spinach. Therefore, applying ultrasonic treatment could lead to a potentially safer and cleaner water spinach for consumption.