

**THE OPTIMUM OPERATING CONDITIONS FOR
EXTRACTION OF CHLOROPHYLL FROM *Alternanthera
sessilis* (Linn.), CULTIVATED IN SRI LANKA**



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UNIVERSITY OF MORATUWA
SRI LANKA

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THIS THESIS WAS SUBMITTED TO THE
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UNIVERSITY OF MORATUWA
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SRI LANKA


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Declaration

The work submitted in this dissertation is the result of my own investigation, except otherwise stated. It has not already been accepted for any degree, and is also not being concomitantly submitted for any other degree or diploma in any other university. It does not contain any material previously published, written or orally communicated by another person, to the best of my knowledge and belief.

MAM Jinasena

10th of September, 2010

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Abstract

Chlorophyll is widely extracted for industrial applications and is a key topic of scientific and commercial interest. *Alternanthera sessilis*, which is known as mukunuwenna in Sri Lanka, is one of best selections for the extraction of chlorophyll due to the good extraction efficiency, availability and low cost.

In this work, the optimum operating conditions for the extraction of chlorophyll from *A. sessilis* using solvent extraction were studied using buffered 80% aqueous acetone. The results revealed that the best solvent volume to *A. sessilis* weight ratio, which gives the highest yield of chlorophyll, was 5 ml/g. The effect of temperature and the extraction time on the extraction was also studied. The optimum temperature of extraction is 50°C and the optimum time of extraction is 45 minutes. The mass transfer of chlorophyll from *A. sessilis* at 20°C and 30°C was modeled mathematically, using general mass transfer equations. The experimental results showed that the degradation of chlorophyll beyond the temperature of 30°C is significant. The saturation solubility of chlorophyll *a* was 54.06 and 107.6 µg/ml and that for chlorophyll *b* was 23.13 and 29.68 µg/ml at the temperatures of 20 and 30°C respectively.

Furthermore, the optimum pre-processing method and the storage conditions were studied as post harvest operations for *A. sessilis*. The optimum method of pre processing was identified as mechanical grinding. For one day storage, ambient air conditions (indoor) were the optimum conditions; and for a longer storage time it was the refrigerator conditions (15°C).

Using the extract, commercial chlorophyll, Sodium copper chlorophyllin has produced with a 33.3% conversion of chlorophyll and its derivatives, using a modified process. The kinetics of degradation of chlorophyll of the produced sodium copper chlorophyllin follows a first order relationship between the concentration and the time. The relationship between the rate constant and the temperature follows the Arrhenius behavior. The activation energy for chlorophyll *a* and *b* are 3.014 and 2.78 kcal/mol respectively. The rate constants for chlorophyll *a* and *b* at different temperatures are also obtained.