

THE EFFECT OF POTENTIAL BIOCONTROL AGENTS ISOLATED FROM FOOD
SOURCES ON FUNGAL CONTAMINATION OF COPRA AND FRESH
COCONUT AND ON QUALITY OF COCONUT OIL

A THESIS PRESENTED

BY

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to the

POSTGRADUATE INSTITUTE OF SCIENCE

In partial fulfilment of the requirement

for the award of the degree of

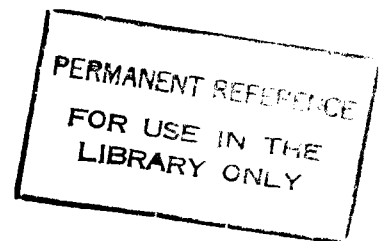
MASTER OF PHILOSOPHY

of the

UNIVERSITY OF PERADENIYA

SRI LANKA

March 2002



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ABSTRACT

The present study was a preliminary investigation to determine fungal organisms growing on coconut kernel and copra. Succession of fungal invasion on fresh coconut kernels was investigated in two distinct seasons; June to Sept., 1996, and December 1996 to April 1997. The temperature ranges and the relative humidities of the two seasons were 25-27 °C and 28-32 °C, respectively, and 67-77 % and 55-65 %, respectively. Among the organisms isolated were potential mycotoxin producers, *Aspergillus* spp. *Penicillium* spp. and *Fusarium* sp. Of these, the following were used as test fungi; *Aspergillus flavus* (coconut), *Aspergillus niger* (coconut), *Aspergillus clavatus* (coconut), *Fusarium* sp. (coconut), and *Penicillium* sp. (copra) to determine their response to microbial antagonists. Potential antagonists to control these fungi were isolated from several food sources. Initially, 13 microorganisms were isolated which consisted of 4 yeasts (from coconut water, black gram paste, curd and Kampucha tea mushroom) 9 bacteria (from coconut water, rice flour slurry, black gram paste, yoghurt starter culture, curd, Kampucha tea mushroom and gingelly paste). Of these antagonists, one yeast (*Candida lusitanae*, from coconut water), and four bacteria (*Pantoea agglomerans*, *Flavobacterium* sp. and *Bacillus macerans* from rice flour, and *Enterobacter* sp. from coconut water) inhibited growth of all test fungi in culture plates. Therefore they were selected for further investigations. Different techniques were used to screen the

antagonists. They were growth inhibition on culture plates, conidial germination assays, and mycelial growth reduction in broth cultures. Their effect on fresh coconut was investigated by using pieces of coconut and scraped coconut as the substrate. There was evidence that all five antagonists produced antibiotic compounds into the substrate. Both live cells and cell-free culture filtrates of antagonists were effective in controlling the test fungi.

Out of the five antagonists *Bacillus macerans* was selected to evaluate the effect of quality of coconut oil obtained from fresh coconut and copra treated with this antagonist. Both laboratory experiments and field based experiments were performed. There was no evidence that the treatment affected the quality of coconut oil. The quality parameters observed were density, free fatty acid, refractive index, matter volatile, impurities, mineral acidity and acid value. None of these were significantly different ($P=0.05$) from the respective controls, and they were within the range specified by the Sri Lanka Standards Institute. An attempt was made to characterize the antifungal compounds produced by *Bacillus macerans* by using Gas-chromatography-mass spectroscopy. These investigations suggested that the compounds may be a derivative of 1,2-Benzenedicarboxylic acid and diphenyl ether or Benzenedicarboxylic acid.