

# CHARACTERIZATION OF PECTIN PRODUCTION FROM COCOA PEELS

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### STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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## ABSTRACT

### CHARACTERIZATION OF PECTIN PRODUCTION FROM COCOA PEELS

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Cocoa is a crop grown in tropical countries and is an important crop for chocolate producing. The potential of wet fruit peel waste from a cocoa processing plant in Indonesia is estimated around 15-22 m<sup>3</sup>/hectares/year. An effort to suppress the negative effects of cocoa waste is to process the waste into a high economic value product such as pectin. Pectins are polysaccharides consisting of a mixture of galacturonic methyl ester, arabinose, and galactose or colloidal galacturonic acids which are usually called pectic acid. In this study, cocoa peel was selected to be extracted in order to produce pectin because cocoa peel caused abundance of waste. Cocoa peel was soaked in HCl solution with pH 2.0 and ratio 1:30 (w/v) at extraction temperature of 85-100 °C for 40-100 minutes. Pectin was precipitated through alcohol precipitation 1:2 (v/v). The solid mass of pectin extracted from cocoa peel was taken by centrifuge method at 8000 rpm, 10 minutes, 4 °C. The yield of pectin extracted was 6.75 – 16.62 %. The characteristic parameters measured were ash content, equivalent weight, and methoxyl content. Cocoa peel pectin extracted through this method has the composition of 1.7 – 3.6 % ash content, 634.6 – 1269.8 g/ml equivalent weight, and 1.9 – 3.4 % methoxyl content.

*Keywords: Cocoa peel, Pectin, Extraction, Yield, Ash content, Equivalent weight, Methoxyl content.*



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## **DEDICATION**

I dedicate this works for the future of the country that I loved: Indonesia, to my father Ganda Ganda, my mother Soemarni, my brother Joni Ganda, my girlfriend Paramitta Darmaya, and all of my families and friends.



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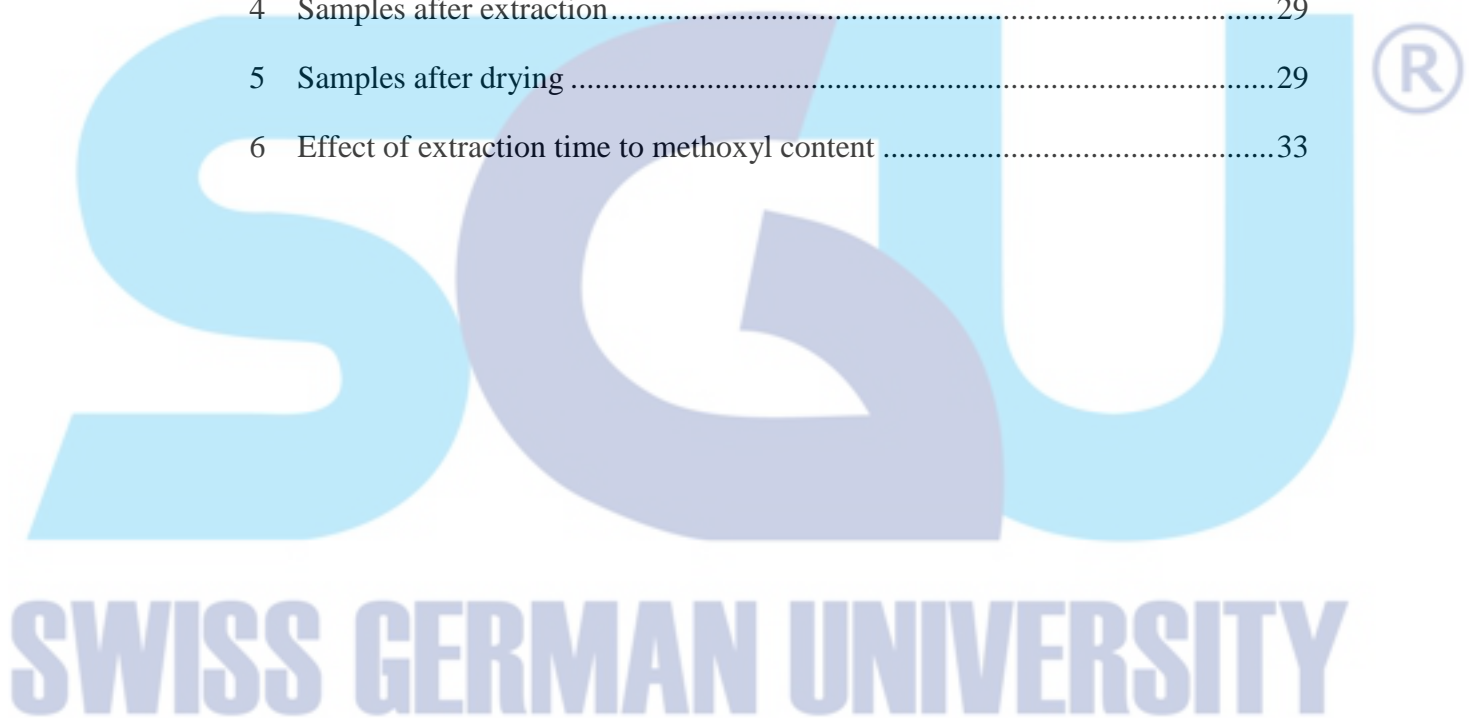
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## CHAPTER 1 - INTRODUCTION

### 1.1 Background

Cocoa is a crop grown in tropical countries and is an important crop for chocolate producing. When ripe, pods are harvested from the trees and opened to extract the wet beans. After fermentation of surrounding pulp, the beans are dried and bagged, constituting the cocoa of commerce. Indonesia is the world's third largest cocoa producer, with a production of 480,000 tons in 2012 (ICCO, 2012). Cocoa fruit consists of 70-80% wet fruit peel; 21-24% wet seed, and 2-2.5% of placenta (Widyotomo et al, 2004; Adomoko, 1972; Menon, 1982; Shepherd and Ngan, 1984; Haryati and Harjosuwito, 1984).

Cocoa fruit peels have a pH content of 6.1-7 (Menon, 1982). From 89.5% of dry cocoa peels, there are 26.38% of lignins, 24.24% of cellulose, 8.72% of hemicellulose, 10.02% ash content, and 1.12% of nitrogen (Tuah and Orskov, 1988). Opoke (1984) stated that from 42.25% of dry cocoa peels contain 0.1% of theobromine, 0.15% of fat, 0.18% of sucrose, 1.16% of glucose, 9.69% of crude protein, 33.9% crude fibre, and 6-30% of pectin substance.

During the extraction of cocoa beans, cocoa peels are thrown away and may cause an environmental problem when dumped around the processing plants. In addition to foul odours due to decomposition, unused cocoa parts may be a significant source of inoculum disease, such as: black pod, witches' broom, and frosty pod rot. Frosty pod rot is a very damaging disease caused by *Moniliophthora roreri*, where it gives the cacao pods a frosty appearance which destroys not only the pod but also the seeds inside it. Several species of *Phytophthora*, a fungus like microorganism, causes the black pod disease. Black pod is the most widespread and destructive disease of cacao worldwide.

The potential of wet fruit peel waste from a cocoa processing plant in Indonesia is estimated around 15-22 m<sup>3</sup>/hectares/year (Mulato et al., 2005). In cocoa producer