UNIVERSITI TEKNOLOGI MARA

EFFECTS OF MICROWAVE STERILIZATION PRE-TREATMENT CONDITIONS ON CRUDE PALM OIL QUALITY

JEREMY JUISENI

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Table of Contents

ABSTRACT

Microwave sterilization pre-treatment is one of the methods of obtaining palm oil product in palm-oil-based industries. However, this method is still not commonly applied by most producers due to the fact on its uncertainties on the parameters involved in acquiring a worth palm oil product of high yield production system. In reality, microwave sterilization pre-treatment conditions give direct effects to the crude palm oil quality. Its operating power and the ratio of water to the weight of palm fruit spikelets represent the variables that are being manipulated in this study. Extraction of oil from the fresh fruit bunch is basically the practice adapted for the result analysis to be obtained. Analyses of the samples are done through oil yield and Free Fatty Acid (FFA) consideration. In short, products of less FFA content and high oil product yield are a preferable attribute for quality productions. In this particular experimental study, the lowest FFA composition content and highest yield of oil produced are averagely of ratio 1:1 with 1000W operation power; with FFA content percentage based on palmitic acid only at amount of 0.3409 and oil yield of 0.0.4502 in g/g of feed and oil product compared to its highest FFA composition content of 0.4608 and oil yield of only 0.2429 mainly attributed from less ratio composition of 1:0 and 1:0.5 and low operating power averagely between 600-800W. These data results proved that conditions of the microwave sterilization pre-treatment indeed impact the quality of crude palm oil produced.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND PROBLEM STATEMENT

Products of palm oil industry based on the past-year records show a rapid growth in its wide market demand including food, cosmetics, hygienic products as well as biofuel through its residue processing (Jundika *et al.* 2016). It is one of the major fats and oils produced and traded in the world recently, contributed to 36.1% of the world's total oils and fats in 2007-2008 (Mielke, 2008). During the 1950s to the early 60s, the average palm oil production was roughly 1.26 million tonnes (Abdullah & Wahid, 2010). It increases to 5 million tonnes in 1980 and doubled to 11 million tonnes in 1990 (Abdullah & Sulaiman, 2013). Within 1995-2010, production of palm oil elevated to 46.7 million tonnes (Mahat,2012). From 2005, palm oil has replaced the soybean oil as the most consumed edible oil worldwidely (Sime Darby Plantation, 2014). The overwhelming demands are believed to be due to its affordable price, efficient production, and high oxidative stability (Jundika *et al.* 2016). Thus, the dramatic increase of market demand indeed needs to be feed with a better and more efficient palm oil product to guarantee its marketability, leading to a more advanced study of enhancing the palm oil quality in its production process.

In a general production of palm oil industry, the extraction properties of the desired final product quality are the major concern of most palm oil companies (Noerhidajat *et al.* 2016); producing palm oil at its maximum amount and purity with adequately minimum cost and energy involve through the production process. In other words, a matter of reducing the potential and profitable components to drain out as wastes of the entire production process. The effort however needs a significant study of optimizing its system to be able to obtain such efficient process where undesired wastes are recovered at its maximum efficiency.

For the particular case of palm oil quality preference, several aspects need to be taken into strong considerations as the business not only involves a huge amount of companies' finance and profitability, it also involves engineering-based knowledge support in its system contemplations. Thus, studies and modification on improving the existing conventional palm oil processing is best to be done in order to achieve palm oils of good quality; as to improve more on what had been done by past researchers to conquer the problems.

Several researchers have done their studies regarding this palm oil quality enhancement through different techniques and methodology, such as focussing on the sterilization aspects (Umudee *et al.* 2013), while others have other method by studying the effect of oil palm fruit chopping techniques (Fatin *et al.* 2014); and some even suggested to take a look on the parameters of the processing operation (Noerhidajat *et al.* 2016). There are lots of possibilities that may be considered of obtaining the desired higher quality palm oil extracts; particularly for this study, it is focussing on the microwave technique of sterilization pre-treatment conditions on the crude palm oil quality.

Figure 1.1 Typical fresh palm fruit as the source for palm oil processing

(Retrieved from: S.F. Cheng *et al.* / Industrial Crops and Products 34 (2011) 968)