



1 INTRODUCTION

1.1 Background

Cinnamon (*Cinnamomum Zeylanicum*) is an endemic plant popularly known as “Kurundu” in Sri Lanka. Cinnamon is mostly used in cooking and baking and can be added to any food item such as salads, confectionaries, beverages, soups, stews and sauces. Cinnamon yields mainly cinnamon leaf oil and cinnamon bark oil. Cinnamon bark oil which has a light yellow colour is used in food and pharmaceutical industries. Cinnamon leaf oil is cheaper than bark oil and is used in the flavor industry. Cinnamon bark oil is produced by processing dry cinnamon chips.

1.2 Drying of Cinnamon Chips

Fresh cinnamon chips contain very high amount of moisture; up to about 60% (w/w wet basis). Drying is the most common and fundamental method for post-harvest preservation of medicinal plants, vegetables and spices to inhibit microorganism growth and prevent degradation due to biochemical reactions. Nevertheless, a series of physical and chemical alterations that may have an adverse effect on quality may take place during drying. Such alterations include changes in appearance, as well as in aroma, caused by the loss of volatile organic compounds or the formation of other, new components as a consequence of oxidation reactions, esterification reactions, etc. (Diaz-Maroto, et al.,2002c). Traditional drying methods (e.g. sun and solar drying) have many drawbacks due to the inability to handle the large throughput of mechanical harvesters and to achieve the high-quality standards required for medicinal plants. High ambient air temperature and relative humidity during the harvesting and drying season promote the insect and mould development in harvested crops. Furthermore, the intensive solar radiation causes several quality reductions like vitamin losses or color changes in dried crops. Thus, the traditional natural drying in the shade does not meet the particular requirements of the related standards. To overcome these problems, producers mostly adopt the heated-air batch dryers or continuous conveyor dryers (Oztekin et al., 1999).



General to the Sri Lankan spice industry, improper drying has been identified as the main reason for losses such as presence of high moisture content, semi-dry and mould developed conditions. A study done by Economics Research Unit of Department of Export Agriculture, reports that around 70% of the producers use sun drying on home yard having no brick or cemented floor which has a high potential to moisture retention and microbial contamination. More than 69% of the producers who had been interviewed in this study claimed that their drying process was disturbed by occasional rain.

1.3 Justification of Research

Sri Lanka is the major cinnamon producing, country in the world and it controls over 60% of the world cinnamon trade. Sri Lanka produces the best quality cinnamon bark, mainly as quills, while quilling, featherings, chips, ground cinnamon, cinnamon powder, leaf oil and bark oil are the other products. It also produces annually around 120 T leaf oil and 4–5 MT bark oil. Cinnamon bark oil is very high value oil due to the presence of high amount of cinnamaldehyde and other valuable aromatic compounds and Sri Lanka is the main supplier of this commodity (Parthasarathy, et al., 2008). World trade in Sri Lankan cinnamon is centered on London and Dutch ports of Amsterdam and Rotterdam, which are the main transshipment points for the leading buyers such as Mexico, US, UK, Germany, Holland, Colombia, etc.

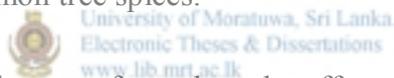
A growing demand for cinnamon in future can be expected with the increasing of concern on health hazards associated with synthetic flavoring agents used in food industry and increasing preference for natural flavors all over the world. As a pioneering cinnamon supplier to the international market, Sri Lanka holds a major responsibility in developing methods to increase the cinnamon harvest and extract more oil yield per hectare by minimizing the pre and post harvesting losses along the cinnamon supply chain while conserving its existing quality.

Due to the increasing demand for cinnamon oil in global market, there is an urgent need for increased investment in research and product development for value



addition in cinnamon. Investigation of the current supply chain of cinnamon oil production, identification of the drawbacks and adapting necessary technological input has been a timely need which results in value adding to the industry. This research is an effort of exploring of such a value adding technological contribution which can be practically substituted to the current oil production process.

Cinnamon has a vast research area to explore. Only limited numbers of R&D efforts have contributed to the progress of cinnamon research and most of them were initiated from Sri Lanka. Publications by Ceylon Institute of Scientific and Industrial Research and by the Department of Export Agriculture hold some of these research efforts and they were mainly concentrated on cinnamon chemistry, quality assessment, developing agro-technology for cultivation and post-harvest processing. Thihagoda, Sri Lanka is the only dedicated cinnamon research station in the world which also works for dissemination of R&D results to farmers, interested institutions and industries. In addition to Sri Lanka, Research Station at Calicut, Kozhikode under the Central Plantation Crops Research Institute, Kerala in India has done some R&D efforts on cinnamon tree spices.



Various studies have been performed on the effect of drying on the volatile organic compounds of different spices. However no studies have been performed to investigate the effect of drying on the volatile organic compounds of cinnamon bark and leaf oil.

Considering the observations made with respect to cinnamon bark oil production industry, the need for optimization of drying temperature has been identified as the most affecting parameter for the cinnamon bark oil production in this research.

1.4 Objectives of the Research

Composition of cinnamon bark oil varies due to many factors including the type and quality of cinnamon chips. Good quality cinnamon chips can be produced by uniform drying. Present study has examined the influence of five different air drying



temperatures, ambient temperature, 35 °C, 40 °C, 45 °C and 50 °C on the volatile compounds in cinnamon bark.

1.5 Outline of the Thesis

This thesis is consisted with five chapters. In the first chapter, research objectives are mentioned and justified with the introduction to the research area. A literature review on cinnamon bark and available extraction methods of cinnamon bark oil, methods of oil analysis and effect of drying on volatile organic compounds of essential oil has been presented in the second chapter. In the third chapter, all the materials used to conduct the study and the methodology followed to fulfil the research objectives are described. Data analysis using IBM SPSS Statistics 19 are mentioned in fourth chapter. The results obtained during the present study are presented and discussed in the fifth chapter. The last and sixth chapter contains the conclusion of the study.



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