OPTIMIZING THE HARVESTING TIME OF PALMYRAH (*Borassus flabellifer*) HAUSTORIUM TO RETAIN ITS NUTRIENT CONTENT WITHOUT AFFECTING THE DEVELOPMENT OF TUBER

By

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DECLARATION

The work described in this thesis was carried out by me under the supervisions of Prof. P.Navaratnam and Dr.Champa D.Jayaweera and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree.

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We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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Optimizing the harvesting time of palmyrah (*Borassus flabellifer*) haustorium to retain its nutrient content without affecting the development of tuber

By

S.Srivijeindran

ABSTRACT

Palmyrah palm (*Borrasus flabellifer*) belongs to the Family palmae, grows well in the arid zone where rain fall is generally low that covers North, East and Down Southern area of Sri Lanka. It is tolerant to high heat, it is found to grow naturally and extensively in Jaffna, Mannar, Batticaloa and in certain area of Hambantota. Naturally it is dioecius in gender. Both palms reach a mature state in around 15 years to give inflorescences where female produce fruits (more or less 80 fruits /tree). On maturation the ripened fruits automatically reach the ground. Few fruits are collected by people to extract the pasty mesocarp and mix with water to produce a diluted pulp to get a sun-dried flat sheet. The seeds along with the the remaining fruits are heaped up for a short period and then beds are made with 3 or 4 tiers of seeds and its moisture level is maintained properly. Traditionally tubers are pulled out on their maturation after about four months. But the tubers are collected and eaten while the seeds are left for fire wood. Some of the seeds are cut into two by small children to eat the haustorium. Lots of haustorium are not consumed and are left as waste with the shell. Therefore fruitful steps shall be taken in future to create the awareness among the people about the nutritional value of the palmyrah haustorium through proper scientific approaches. The main aim is to carry out a research on palmyrah haustorim to cultivate it to attain the best development state to retain more nutrients for the better health of the humans.

At this age all four samples consisted of an appreciable amount of protein but Island (P1) and Vadamaradchi (P3) showed a higher amount (7.9%) than the other two. Fat and antioxidant activity including ash content were almost same in the four samples. Considering the nutritional content of both haustorium and the tuber, it was concluded that harvesting should be done at the age of 12^{th} week.

CHAPTER 01

INTRODUCTION

1.1 Background

Palmyrah (*Borassus flabellifer*) tubers are harvested at their fully maturity stage and the remainder in the seed bed after harvesting is thrown to nature though it has more benefits for humans. The remainder majorly includes haustorium which is a delicious and nutritious part of the seed. However, the haustorium now harvested at the final stage after digging up the tubers is watery and has no taste. More over, the tubers develop sugars and the starch content get reduced much which results in poor quality for further processing. Therefore analysing the haustorium for its nutrients and palatability is very helpful to determine the proper harvesting time for both haustorium and tubers of palmyrah to retain actual deliciousness of both and to get all their nutrients at optimal level without affecting the development of the tuber. Analysis of the tuber for its important nutrients at different maturity levels will also help to avoid the damage and wastage of these resources.

Therefore the present research on "Optimizing the harvesting time of palmyrah (*Borassus flabellifer*) haustorium to retain its nutrient content without affecting the development of tubers" concerns explorations aimed at producing delicious and nutritious haustorium of palmyrah to considering the attractive market for it. The study approaches the proposed idea through an effort to determining the proper harvesting period for haustorium with possible higher nutrient content and for making the most consumer acceptable preserved food and exploring the market for it and thereby to increase the utilization of an under utilized resource existing abundant in Sri Lanka.

The study will give a positive impact on the livelihood development of the dependents on palmyrah development.

Today, consumers' perception towards the high quality, healthy foods which provide additional health benefits beyond the basic nutritional requirements is becoming greater than ever. Therefore, with increased awareness of a healthy lifestyle based on consumption of functional foods or other functional ingredients has become more important than on the artificial foods and this makes scientists to search for plant resources to fulfill the requirements of the consumers. Very recently palmyrah palm has become a considerably important subject in the research field though it has traditionally been important in the people's life. Palmyrah palm is known for its immense use fullness for human beings in countless ways. It grows extensively in the arid zones of India, Sri Lanka, Burma, Thailand, Vietnam and Malaysia and in some parts of Indonesia including the tropical regions of Africa. It is referred to differently by their local names in these regions and some of which are as follows: Tamils – Panai; Sinhalese – Taal (Tal); Hindi – Taad; Thai – Tan (Taan); Nepalese – Taal, Taadi; Chinese – Shan ye shu touzing; English – Plamyra palm; Toddy palm; French – Borasse; German – Borrasuspalmae, Lontaro.

It grows naturally in about 40,000 acres in the Northern and the Eastern provinces and some areas in the South of Sri Lanka. From the root to the crown of the palm, each and every part of it is very useful. Figuring in the history, literature, and folklore of the area, it is exploited for food from the fruit to the tuberous seedlings; beverage and sugar from the sap; fiber from the leaf and leaf base for brushes, cordage, weaving, and plaiting; trunk wood for construction and fuel; and numerous minor products.

Folk stories say that about 800 products could be produced using palmyrah though it is seasonal and our ancestors knew the therapeutic, medicinal and nutritional aspects of the products though they lacked a scientific background. Since ancient times, people have been using palmyrah based products as a source of food, medicines and many other necessities of life. Though the people are making use of the palm in many traditional ways in their day to day life, its potentialities were never exploited properly and nutritious resources are wasted.

The haustorium of palmyrah seed which develops during germination transfers the nutrients to the embryo. It is very delicious and people in rural area consume it raw and fresh. It has been proved through scientific investigations that an increased consumption of these, have several health promoting as well as disease preventing benefits because of certain substances known as phytochemicals which include polyphenols. Secondary metabolites are concentrated at different parts of the plant. Most of the secondary metabolites, from these palms are commercially exploitable as they find application as the active pharmaceutical ingredients for new medicines and responsible for the antioxidant, anti-inflammatory functions, anti-allergic, anti-microbial, anti-mutagenic, anti-carcinogenic, anti-platelet and vascodilatory functions of these species (Scalbert et al., 2005).

Polyphenol compounds are one of the important group of secondary metabolites and bioactive compounds of plants (Kim et al., 2003). They are low molecular weight compounds (mol. wt. <2000 amu) universally existing in all tissues of higher plants and play an important role during the development of a plant.