

Development of a Supplementary Food Capsule From *Annona muricata* (Soursop)

By

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Declaration

The work describe in this thesis was carried out by me under the supervision of Prof. Arthur Bamunuarachchi and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree /Deploma.



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“I certify that the above statement made by the candidate is true and that thesis is suitable for submission to the university for the purpose of evaluation. “



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Abstract

Importance of the disease prevention ability of plants, is increasing day by day as the occurrence of non communicable diseases is increased rapidly. Many people think that the consumption of fresh plant parts are the best choice. But due to many reasons it is not feasible for every one.

Annona muricata (Soursop) is a plant which is endemic to Latin American countries, and it has been used for many medicinal purposes by locals. Modern scientific studies have also been revealed that *A.muricata* has many medicinal uses; especially it has the cancer prevention / curing ability due to the presence of special group of chemicals called Annonaceous acetogenins.

In this research, main aim was to produce a supplementary food capsule using Soursop, which has all the critical nutritional and medicinal values as the fresh fruit. Proximate analysis was done to determine the nutritional quality of the product and phytochemical analysis was performed for fresh fruit, dried powder, leaf extract and bark extracts to analyze the medicinal importance. Also as the preliminary in vitro analysis of anticancer properties, potato disc assay was done. Raman spectrums of ethanol, Methanol and water extract of fresh fruit and dried powder was compared to determine the similarities.

Test results have revealed that most of the nutritional factors of fresh Soursop, was similar to that of dried powder with some exceptions such as, Vitamin C content of the dried powder was 0.22 mg per 100g of dry matter while fresh fruit has 82mg to 148mg per 100g dry matter. Also the minerals, Fe, K, Ca, Mg and P were detected in higher amounts, than the that of fresh fruit. But only Na were present in lower amount in dried powder. All the phytochemicals were similar, in raw fruit and dreid powder, except for Anthocyanin, which was absent in dried powder. Potato disc assay also showed statistically similar tumor inhibition ability in raw and dried products.

The phytochemical analysis done for the bark and leaf extracts, revealed that they also have same phytochemicals which present in fruit extracts.

Chapter 1

Introduction

Even people with very good understanding about nutritional aspects of a food and a capability of achieving such food, may not get all the required nutrition and bioactive compounds in adequate amounts, for longer period of time. In that context food supplements are very important to fulfill that gap.

There are different categories of food supplements and in broader aspect, it can be divided into two; Synthetic food supplements (Vitamins, minerals etc.) and natural herbal food supplements and their derivatives. Although synthetic food supplements are capable of addressing the particular gap between required nutrition and achieved nutrition, there are many drawbacks such as taking too much of some supplements, such as vitamin A, vitamin D, Vitamin E and iron can be toxic, using supplements with medicines can cause negative interactions and people with special physiological status such as pregnant and elderly people have to be concerned and consult a physician before using synthetic food supplements. On the other hand herbal food supplements have many positive benefits over synthetic ones. And the main advantage is that the possibility of being overdosed is very minimum as natural compounds are easily removed from the body.

On the other hand herbal supplements have a variety of nutrients, not like the synthetic one and more importantly they have phytochemical and other bioactive compounds which will help / prevent the occurrence of chronic diseases such as cancers, chronic heart diseases, chronic respiratory diseases, hypertension, diabetic mellitus etc.

According to the Global Status Report on Non-communicable Diseases 2010, millions of people die due to Non-Communicable diseases and the numbers are continuously rising. Situation in Sri Lanka is worse and according to the "cancer incidence data 2001 - 2005" published by WHO, number of cancer incidences as well as the mortality rate is being continuously increasing from 1985 to 2005.

A. muricata (Soursop) is a native plant in Latin American countries such as Peru, Mexico, Cuba etc. and is a small, upright evergreen tree, 5–6 m high, with large, glossy tree with dark green leaves and it produces a dark green, spiny aggregate fruits made up of berries

fused together with associated flower parts. The oval or heart-shaped and frequently irregular lopsided composite soursop fruit is derived from the fusion of many fruitlets and can weigh more than 4 kg . From a long time ago soursop being consumed as juice blends, ice creams, sherberts, nectars, syrups, shakes, jams, jellies, preserves, yoghurts, and ice creams. (Watson. R., et al).

There are many research projects that have proved that a special group of bioactive chemicals present in soursop called, **Annonaceous acetogenins**. (Taylor. L.,et al 2005), which can specifically attack cancer cells and destroy them. There are published clinical studies on this regards. (Zeng, L., et al.1196, Rieser, M. J., et al. 1996, Wu, F. E., et al 1995 , Rieser, M. J., et al 1996). Apart from anticancer properties, there are many other medicinal uses of different parts of the soursop tree, fruit, leves, baek and flowers.

Apart from the health benifitial aspects, Soursop is also important in nutritional regards, especially it has important carbohydrates and 100g of fresh fruit fulfill 6% of carbohydrate requirement and 3.55 of the energy requirement. Also it provides 3.8% of the fiber requiment and the other important minerals such as Ca, Mg, P, K and Fe. Soursop has very law amount of Na and therefore contribution to hypertension is minimum. When considering the vitamins it is rich in Ascorbic acid (Vitamin C), Thiamine, Riboflavin and Niacin. Being a fruit with very low fat content is also an additional advantage.

Obviously one would think that the fresh fruit has all the above mentioned advantages while processed supplement such as a capsule with soursop powder doesn't have all these positives.

In this research, Soursop fruit was processed by drying at low temperature, after removing seeds and peel. The reduction of water activity which is key to the microbial activity and enzymatic activity is controlled to achieve the stability of the product.

Preparation of a processed food from Soursop is very important due to many reasons. Main reason is that the production of Soursop is limited to tropical countries where they have high temperature and high humidity. Temperatures below 5 °C will cause damage to leaves and small branches, and temperatures below 3 °C can be fatal to the soursop trees.

(Alias K H B M 2009). It is hard to distribute the fruit to the other part of the world, due to its high perishable nature.

Also the majority of the production is being wasted during the season, in the production sites, due to non availability of sufficient storage, transportation and processing facilities.

There is another aspect of making processed food supplement, using Soursop. It is the nutritional and health aspect. The critical components present in Soursop, phytochemicals, other bioactive components like Annonaceous acetogenins and fibers won't store in the body and even if we consumed larger portion of the fruit, excess will be removed from the body with urine. Therefore frequent consumption of fruit is very imported in a nutritional and a health point of view.

Therefore considering those factors, preparation of supplementary food which is easily accessible to everyone and has similar properties to the natural fruit is very important. Accordingly this research has the following objectives;

- To identify best drying temperature for the preparation of Soursop powder.
- To prepare a supplementary food capsule using *A.muricata* (Soursop) with similar nutritional and medicinal value to the natural fruit.
- To analyze the important bioactive chemical components present in the fruit leaf and bark extracts.