PROCESS DESIGN FOR INDUSTRIAL SCALE PRODUCTION OF NATURALLY FERMENTED CARICA PAPAYA (C. Papaya) LEAF AND GARCINIA MANGOSTANA (G. Mangostana) PERICARP

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ABSTRACT

Naturally fermented Carica Papaya Leaf and Garcinia Mangostana Pericarp is a value product in the medicinal industry, namely alternative medicine and phytochemical industry. It comprises of both traditional and natural elements that constitutes to its value proposition. Traditionally, the way this two raw materials is being treated by just the act of boiling and blending it to make into some sort of juice out of it. The full essence of the Carica Papaya Leaf and Garcinia Mangostana Pericarp has not been fully extracted efficiently. Thus, the objective of this work is to design an economically viable production scheme for a locally developed Carica Papaya Leaf and Garcinia Mangostana Pericarp through naturally fermented production process that increases the efficiency of extraction rate of the essence of the two product. This work features the modelling and optimization process of Carica Papaya Leaf and Garcinia Mangostana Pericarp through Naturally fermented production through SuperPro Designer, a commercial batch process simulator. It is assume that 1000 kg of raw material from Carica Papaya Leaf and Garcinia Mangostana Pericarp was used in this simulation process. The final alternative that has been choosen collects its annual revenue amounted to 8 407 000 $ (USD) and its gross margin rate is at 31.25%. Beside the Return on Investment (ROI) rate is at 112.69% and it Internal Rate of Return (IRR) after taxes deduction is at 46.33%. The Payback Period was estimated to complete within 0.89 years.

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INTROUCTION

1.1 RESEARCH BACKGROUND

Garcina mangostana & Carica papaya

As alternative medicine develops in notoriety, individuals are starting to look for natural, well-advancing nourishments, and supplements. It appears to be clear that organic medicine or supplements transcends ordinary in keeping up a healthy body. In this report, observation of the work can be done by looking into the two main elements which is Garcina mangostana (pericarp) and Carica papaya.

Garcina mangostana, named after the French Laurent Garcin (1683-1751) or commonly known as Mangosteen is a tropical fruit commonly found in certain parts tropical Asia and is can be found native in Southeast Asia. Mangosteen fruits weigh from 70-150g and they are for the most part thought to be one of the finest enhanced organic products with unique taste on the planet, outranking all other tropical fruits.

This fruit has commonly been used in traditional Asian medicine scene due to its natural health benefits through its strong antioxidants activity and medicinal properties of xanthones in its pericarp (mangosteen by-product) which is assumed to be life-enhancing, thus deserves the title as “Queen of Fruits”. A recent research through a laboratory test known as ORAC proves that an ounce of Mangosteen juice provides 20 to 30 times more capacity or ability to absorb free radicals than an ounce of most fruits and vegetables. Mangosteen consists of two xanthones, a

subset of a polyphenol compound. Basically, xanthones serves as a multiple purpose of health benefits which they prove to be effective in reducing inflammation thus helps people with inflammatory disorders. Other than that, through its properties, xanthones can be seen to be very helpful for people suffering from arthritis. Besides contributing in reducing the risk of cardiovascular disease, xanthones also help to fight, bacteria, funguses and viruses. Next, mangosteen pericarp (by-product), Xanthones, Characterization of the extracts by HPLC/LC-ESI-MS and antioxidant activity by DPPH, Inhibition of lipid peroxidation, antioxidant activity, neuroprotective and inhibitor of HIV-1 protease. (Zarena and Udaya Sankar **2009**). Thus, mangostene is known to be an immunostimulant which helps the immune system fight infection. It stabilizes blood sugar and lowers blood pressure. Aside of containing as much as 43 of the more than 200 Xanthones found in nature, it also contains a high concentration of vitamin C. It provides 12% out of the suggested daily value per 100 grams. As all know, vitamin C plays an important role in strengthening the immune system and fighting flu and other diseases. Therefore, eating food rich in vitamin C such as mangosteen is essential in order to keep staying healthy.

Now, mangosteen can be found in capsule or drink-based product that act as a supplemental product that captures all of the natural benefits and also provides a convenient and easy way to digest. In recent years, however, international markets have shown a renewed interest in the mangosteen and futher attempts are now being made to study this crop in more detail to further explore the potential os thif fruit other than its usual environment which has been popularly used in food supplement and herbal cosmetics.

On the contrary, the plant Carica papaya, or commonly known as papaya, papaw or pawpaw is an oblong smooth-skinned melon-like fruit that is believed to be originating from tropical American countries namely Central America and Southern Mexico. Now, papaya is cultivated in most tropical and subtropical countries and regions worldwide. In cultivation, papaya grows rapidly, fruiting within three years. But, it is also known to be highly frost-sensitive, limiting its production to tropical climates. This fruit is one of the 22 accepted species in the genus Carica of the family Caricaceae.