NUTRACEUTICAL STUDY OF WHITE AND PINK PULPED FRUITS OF CITRUS MAXIMA (Burm.) Osbeck.

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Abstract

Nutraceuticals help in bridging the gap between food and medicine. Consumption of junk food has increased manifold, which has led to a number of lifestyle diseases related to nutritional deficiencies. Nutraceuticals can play an important role in controlling them. The plant selected for the study is Citrus maxima (Burm.) Osbeck. The genus Citrus belongs to the family Rutaceae. Estimation of total energy, total carbohydrate, reducing sugar, lipids, fat, protein, aminoacids, citric acid, ascorbic acid, dietary fibre, total flavonoid, phenol, pectin, mineral components, and anti-oxidant properties were studied. As a rich source of phytochemicals, coupled with the presence of the essential vitamins and minerals, Citrus maxima fruits can be used as a potential source of useful nutraceutical food and flavouring agents. Key words: Citrus maxima, Nutraceutical, Antioxidant, Phytonutrients.

I. INTRODUCTION

The quality of life in terms of income, spending and life style has improved with economic development. However, it has also thrown up a major challenge in the form of lifestyle diseases. The first victim of this lifestyle change has been food habits. Consumption of junk food has increased manifold, which has led to a number of diseases related to nutritional deficiencies. Nutraceuticals can play an important role in controlling them. No wonder more and more people are turning to nutraceuticals (Pandey et al., 2010). The medicinal properties of plants could be based on the anti-oxidant, anti-microbial and anti-pyretic effects of the phytochemicals in them (Cowman, 1999 and Adesokan et al., 2008). Medicinal plants produce bioactive compounds that have several properties.

The term phytonutrients refer to plant nutrients with particular biological activities in supporting human health (Zhao, 2007). Phytonutrients are mainly natural bioactive compounds from plants with general benefits to human health. The secondary metabolites of plants provide humans with biologically active products, which have been used extensively as food additives, flavours, colours, insecticides, drugs, fragrances and other chemicals (Zhao, 2007). These secondary plant metabolites include several classes such as terpenoids, flavonoids and phenolic compounds having diverse chemical structures and biological activities and exist widely in Citrus fruits.

The plant selected for the study is Citrus maxima (Burm.) Osbeck. The genus Citrus belongs to the family Rutaceae (Gamble and Fischer, 1915-1936). This plant is widely cultivated throughout Kerala. This fruit play a significant role in providing medical or health benefits including prevention and treatment of diseases.

II. MATERIALS AND METHODS

Description of the Taxa
Citrus maxima
Local Names – Bamblimoos, Babloos, Kambilinaregam

Medium sized trees. Fruits large to very large, 9-25cm across, pyriform; pericarp light greenish to yellowish, glandular, smooth; mesocarp very thick, spongy, white segments firm, large;
pulp – vesicles numerous, firm but easily separable, pale green to pinkish, acidic or sweet; seeds large, wrinkled.

Collection and authentication

The white and pink coloured fruits of *Citrus maxima* were collected from different localities and the collected plant samples are authenticated from the Regional herbarium Kerala (RHK) in S. B. College, Changanacherry, Kerala.

Quantification of Phytochemical constituents

Fruits were hand squeezed to obtain juice. Juice was stored at -20° C until further use. Colorimetric estimation using standard protocols and instruments used were UV Spectrophotometer (Eli co India Ltd, model SL160) and Atomic absorption spectrometer (Eli co India Ltd, model SL194). Estimation of total energy, total carbohydrate, reducing sugar, lipids, fat, protein, aminoacids, citric acid, ascorbic acid, dietary fibre, total flavonoid, phenol, pectin, mineral components, and anti-oxidant properties were studied.

III. RESULT AND DISCUSSIONS

From the result the *Citrus maxima* with white pulp shows the highest values in total caloric content (53.8 kcal), total carbohydrate (10.56 g/100g), total iron (3.78mg/100g), ascorbic acid (144.2 mg/100g), citric acid (4.68%), dietary fiber (5.62g/100g), total alkaloids (16.42 mg/g), total protein (1.78g/100g), DPPH Assay (48.12%), nitric oxide assay (64.26%), sodium (7.76mg/100g), essential oil (0.248mg/100g), aminoacid (4.56 g/100g), total sugar (4.86 g/100g), total flavonoid (1.68 mg/g), total pectin (9.38 g/100g), and total tannins (0.3 mg/g), total terpenoids (3.12%). These parameters are significantly different from Citrus maxima with pink pulp.

The results revealed the presence of medicinally important constituents in these fruits. Many evidences gathered in earlier studies which confirmed the identified phytochemicals to be bioactive. Several studies confirmed the presence of these phytochemicals contribute medicinal as well as physiological properties to the plants studied in the prevention of different diseases. Therefore, these Citrus fruits could be recommended as nutraceutical. Phytochemicals are already a part of our diet through vegetables and fruits. *Citrus* fruits are found to be rich in phytoconstituents (Crowell, 1999). *Citrus* fruit and juice have long been considered a valuable part of a healthy and nutritious diet and it is well established that some of the nutrients in *Citrus* promote health and provide protection against chronic diseases. *Citrus* possess bioactivities such as anti-oxidant, anti-inflammatory, anti-microbial and is suggested to be responsible for the prevention of cancer and degenerative diseases. These bioactivities of *Citrus* are due to the presence of bioactive compounds such as phenolics, flavonoids, essential oils and vitamins (Karimi *et al*., 2012). The health promoting effects of *Citrus* have been mainly associated with its anti-oxidant vitamin C and flavonoid contents. Flavonoids are important secondary plant metabolite, wide spread in the entire plant kingdom, but there are several compounds (e.g., flavanone, flavanone glycosides and polymethoxylated flavones) unique to *Citrus*, which are relatively rare in other plants (Asami *et al*., 2003). *Citrus* fruits are recognized as an important component of the human diet, providing a variety of constituents important to human nutrition, including vitamin C, folic acid, potassium, flavonoids, pectin, and dietary fibers. *Citrus* also contains significant amounts of highly oxygenated triterpenoid compounds (limonoids), particularly in underutilized by-products of Citrus juice production. Citrus limonoids inhibit the formation of chemically induced neoplasia in the oral cavity, forestomach, small intestine, colon, lung, and skin of laboratory animals (Lam *et al*., 2000, Miller *et al*., 2000). In this aspect the quantification of these bioactive compounds is necessary.

### TABLE:1

| Sl. No | Parameters                     | *C. maxima* pink pulp | *C. maxima* white pulp |
|-------|--------------------------------|-----------------------|------------------------|
| 1     | Total Caloric content(kcal)    | 31.44±0.089           | 53.8±1.303             |
| 2     | Total carbohydrate (g/100g)    | 7.01±0.0045           | 10.56±0.134            |
| 3     | Cholesterol                    | nil                   | nil                    |
| 4     | Fat(g/100g)                    | 0.038±0.005           | 0.12±0.045             |
The comparative study of white and pink coloured fruits revealed that *Citrus maxima* with white pulp possess highest values in 19 parameters than pink pulp. These parameters provides beneficial effect to the body. *Citrus maxima* with white pulp also contain high amount of Vitamin C (144.2mg/100g), Antioxidant property (Nitric Oxide Asssay (64.26%), and DPPH Radical scavenging Activity (48.12%). The result suggested that the antioxidant property was not likely to be ascribed to the property of an individual compound but rather to the synergistic action of several phytochemicals. This indicates that the fruit juice *Citrus maxima* with white pulp possess antioxidant and free radical scavenging properties and thus continual consumption of these bioactive components, however, is not as effective as when they are consumed in fresh fruits (Silalahi, 2002). As a rich source of phytochemicals, coupled with the presence of the essential vitamins and minerals, *Citrus maxima* fruits can be used as a potential source of useful nutraceutical food and flavouring agents.

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