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A Comparative Phytochemical Study and Evaluation of Alkaloid Content of Four Exotic Fruits and Five Fruits Native to Kerala

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Abstract: ***The study was done to evaluate and compare the phytochemical properties of selected native and exotic fruits. Earlier, only native fruits were available in any place but now, fruits from throughout the world can be procured from any place. Hence in order to compare the change in alkaloid if any, this work was designed. The fruits selected for investigation were five native fruits (Artocarpus heterophyllus, Mangifera indica L., Flacourtia jangomas, Carica papaya L., Syzygium jambos) and four exotic fruits (Hylocereus polyrhizus, Actinidia deliciosa, Psidium guajava, Dimocarpus longon). The result showed the presence of alkaloid in all the nine fruit varieties selected for the study. Native fruits were found to have a high representation of alkaloid content and exotic fruits also showed significant concentrations. Native fruit lovi-lovi has the highest peak (1002.74 µg/g) and longon has the lowest (434.25 µg/g)for alkaloids. Alkaloid content of other fruits are dragon fruit (780.55 µg/g), kiwi(589.04 µg/g), Thai guava (435.62 µg/g), papaya (524.93 µg/g), jack fruit (779.45 µg/g), rose apple (554.79 µg/g), and mango (850.96 µg/g). Alkaloids are responsible for the protection of plants from grazing animals. So the all the fruits contain micro quantities of alkaloid. The phytochemicals present in the fruits provide essential health benefits and protection from a series of natural health defects. To reach a conclusion, all fruits in the nature whether native or exotic were beneficiary to human health.***

Keywords: Native fruits, Exotic fruits, phytochemicals, Alkaloid, Artocarpus heterophyllus, Mangifera indica L., Flacourtia jangomas, Carica papaya L., Syzygium jambos, Hylocereus polyrhizus, Actinidia deliciosa, Psidium guajava, Dimocarpus longon.

I. INTRODUCTION

Fruits are the nature's marvellous gift to the humankind. Eating fruits regularly benefits our body as they are natural sources of vitamins and minerals. The benefits of fruits are innumerable, they are consumed widely for the common cold, wound healing, healthy skin, teeth, gums, and to keep the lymphatic system healthy. Eating fruits and vegetables may promote emotional well-being among healthy young adults and the good mood may lead to a greater preference for health.

Kerala, the agro-biodiversity paradise is rich with numerous plants and trees. Native fruits are those originated and evolved over centuries in Kerala. Indigenous fruit trees are able to withstand hot, dry conditions when the fruits provide an essential food source. The fruits are harvested and eaten at home, sold at the market or processed into jams and juices to add additional value. Some of such fruits are Jack fruit, Papaya etc., which are suitable to be consumed in the locality they are found. Many fruits are still not treated with any chemical fertilizer or insecticide sprays and can be safely purchased from the local farm owners. Organic fruits tend to be smaller and expensive; however they are endowed with a special flavor rich in vitamins and minerals and stuffed with numerous health benefiting antioxidants.

"The king of fruits" mango is a very common fruit plant in India. It is known for its strong aroma, intense peel colouration, delicious taste and high nutritive value, (Tharanathan, 2007). Mango flesh is consumed in varied forms in both ripe and unripe stages. Mango fruit has numerous varieties different to one another depending on the flavor and aroma, shape, and agricultural properties. *A. heterophyllus* (Jack fruit) is native to India and belongs to the family Moraceae. It is known as the "poor man's fruit" because it is a major part of diet as a vegetable and nutritious dish. Jackfruit is well known for its nutritional and therapeutic qualities since many years, (Reddy *et al*., 2016). The fruits are of dietary use and are an important source of carbohydrate, protein, fat, minerals and vitamins, and it possesses anti-oxidant, anti-inflammatory, anti-bacterial, anti-carcinogenic, anti-fungal, hypoglycemic, wound healing effects, (Shrinath *et al.*, 2011).

Flacourtia jangomas commonly known as lubica or lovlolika, is very common in southern India especially in Kerala. They have a mild sour and tangy taste. A work by Alakolanga *et al.*, (2015) conclude that the fruits were found to be rich in phenolics and anthocyanins.

Carica papaya Linnaeus (paw paw) belongs to the family Caricaceae. The ripe fruit of the papaya is usually eaten raw, without skin and seeds. Raw papaya pulp contains 88% water, 11% carbohydrates and negligible fat and protein. According to Chukwuka *et al.*,(2013) a 100 gram amount, papaya fruit provides 43 kilocalories and is a significant source of vitamin C and a moderate source of folate.

Rose apple fruits is also known as the wax jambu, water apple and also belt fruit. The fruit is crispy has a wooly texture and taste like an apple, (Bolarin *et al*, 2016). Consumption of rose apple provides the body with vitamin A, C, E, fiber, potassium, copper, and iron. Rose apple is a good source of all nutritional components and has potentials as a good raw material for both fruit juice and wine production.

Exotic fruits are those which are not native and that are cultivated elsewhere. They are also known for their health promoting properties. Some of them are super tasty and some equally weird ones right in the comfort of our city. They have various bioactive components with potential health benefits, including anti-diabetic, anti-obese, anti-oxidant and anti-inflammatory, (Devalaraja *et al.*, 2011).

Dragon fruit or Pitaya is one of the tropical fruits under cactus family and are native to the tropical forest regions of Mexico and central and South America. The fruit hold great promise, especially for arid lands, due to their greater conservation of water, (Felker *et al.*, 1997). There is a wide variety of antioxidant compounds in fruits, among the most abundant antioxidant compounds are carotenoids, phenolics and betalains, (Nurliyana *et al.*, 2010).

Kiwi fruit or chinese gooseberry is the edible berries in the genus Actinidia, which is native to eastern China. It is a fuzzy fruit with vibrant green interior and tiny black seeds. Kiwi have several health benefits, it is one of the richest sources of vitamin C. A single cup of Kiwi offers nearly 275% of the amount of vitamin C. It also contains phytonutrients, vitamins and minerals making it nutrient-dense fruit, (prakasan, 2017). Nutritionally relevant levels of dietary fibre, potassium, vitamin E and folate as well as various bioactive components including wide range of antioxidants, phytonutrients and enzymes provide functional and metabolic benefits to the fruit, (Richardson *et al.*, 2017).

Longan also known as “dragons eye” is a tropical tree commonly associated with lychee, and both belong to the soapberry family. Longon is said to be native of South Asia. The fruit is sweet, juicy and succulent and have a drier sweetness. Longon fruit enhances learning and memory and appears to be useful in preventing or treating central nervous system neurodegenerative diseases, including parkinsonism.

Guava is the most frequently eaten species and is typical Myrtoideae. Thai guava is different from others. These are generally the size of a soft ball with apple green skin. Thai guavas are only mildly sweet and have very little fragrance. The crunchy flesh and hard seeds both are edible. The fruits contain phytochemicals like polyphenoles. Guavas are abundant in dietary fiber and vitamin C with moderate levels of folic acid, (Kumari, 2016).

Fruits and vegetables are some of the better sources phytochemicals. Phytochemicals are naturally occurring plant chemicals (phyto means plant in Greek), which provide plants with colour, odour and flavour. Phytochemicals have numerous roles in organisms like stimulating the immune system, blocking substances we eat, drink and breathe from becoming carcinogens, preventing DNA damage and help with DNA repair, reducing the kind of inflammation that makes cancer growth etc. There are several main groups of health promoting phytochemicals, flavanoids, phenols, terpenoids, tannins etc.

Alkaloids are the basic nitrogenous plant products found in all vegetables. Among all elements, alkaloids are the most powerful as well as very effective in plants. They are present in plant tissues as water soluble salts of organic acids, esters or sugars. Besides being toxic the primary function of the alkaloids in all vegetation appears to be to protect them from grazing animals and herbivorous insects, (Robinson, 1974). Many alkaloids possess potent pharmacologic effects.

II. MATERIALS AND METHODS

A. Collection Of Plant Materials

Two groups were used for the study, native fruits and exotic fruits.

The native fruits Papaya, Rose apple, Lovi-lovi, Mango and Jack fruit were collected from the house hold plants of Uchakkada and Kulathoor areas in Trivandrum district. Exotic fruits like Dragon fruit, Kiwi, Thai guava and Longon were purchased from the super markets of Trivandrum city.

B. Preparation Of Fruit Extract

After cleaning the fruits under tap water for 2 -3 times, the fruit juice was collected by filtering through a muslin cloth for identification of nutrients and phytochemicals and for further analysis

For estimation studies the extracts were prepared as per standard procedures. Various solvents were used for study such as solvents like ethanol, chloroform, petroleum ether etc.

Analyses were divided in to qualitative detection and quantitative estimation. The procedures for these are given below.

1) Qualitative Analysis

a) TEST FOR ALKALOIDS: The addition of 2 mL of concentrated hydrochloric acid to 2 mL extract, followed by the addition of few drops of Mayer's reagent if gives a white precipitate, it indicate the presence of alkaloids, (Prasad et al., 2015).

2) Quantitative Estimation

*b) Estimation Of Alkaloids***:** 5 mL pH 4.7 phosphate buffer, 5 mL BCG solution, 4 mL of chloroform was used for alkaloid estimation as per Madhu et al., (2016). The absorbance was measured at 470 nm and Atropine is used as a standard.

The total alkaloid content in the sample was calculated by the formula

$$\frac{\text{Concentration of standard}}{\text{OD of standard}} \times \frac{\text{OD of sample}}{\text{volume of sample pipetted}}$$

III. RESULTS AND DISCUSSION

Fruits are the integral part of human diet. India has much to offer in terms of fruit diversity with a varying climate that ranges from Himalayan to tropical. The supermarkets today have an array of fruits not only from India but from across the world. This study aimed at analyzing, estimating and comparing alkaloid content in some native and exotic fruits.

The native fruits selected for the study were Papaya, Jack fruit, Rose apple, Lovi-lovi and Mango and the exotic fruits were Kiwi, Dragon fruit, Thai guava and Longon. The factors studied were alkaloid. Both identification and estimation studies were done for the analysis. Since the identification tests were done in fresh fruit juice and estimation is in different solvents as per the procedures, the results shows small difference in both tests. The results of identification and estimation studies of alkaloids were showed in table 1 and 2 respectively.

A. Identification Test

The results of the analysis for alkaloids are given in table 1.

	Alkaloid
Dragon fruit	+
Kiwi	+
Longon	+
Thai guava	-
Papaya	+
Jack fruit	+
Rose apple	-
Lovi lovi	+
Mango	+

Table 1: Results of screening for alkaloid

+ (Presence of phytochemical)

- (Absence of phytochemical

Fruits are known to have a variety of phytochemicals. These are beneficial as they impart high antioxidant activity.

B. Estimation Of Alkaloid

The results of the estimation for alkaloids are given in table 1.

	Alkaloids µg/g
Dragon fruit	780.546
Kiwi	589.039
Longon	434.245
Thai guava	435.615
Papaya	524.93
Jack fruit	779.45
Rose apple	554.793
Lovi lovi	1002.737
Mango	850.957

Table 2. Results of estimation for alkaloids

The estimation of alkaloid content of the fruits were done and the results are as follows. When the alkaloid content of 9 varieties of fruits were compared, (Graph 1.) lovi-lovi has the highest peak (1002.74 µg/g) and longon has the lowest (434.25 µg/g). Alkaloid content of other fruits are dragon fruit (780.55 µg/g), kiwi(589.04 µg/g), Thai guava (435.62 µg/g), papaya (524.93 µg/g), jack fruit (779.45 µg/g), rose apple (554.79 µg/g), and mango (850.96 µg/g). Alkaloids are responsible for the protection of plants from grazing animals. So the all the fruits contain micro quantities of alkaloid.

Besides being toxic the primary function of the alkaloids in all vegetation appears to be to protect them from grazing animals and herbivorous insects, (Robinson, 1974). As the exotic and native fruits are compared, the native ones had the highest values and exotic fruits had comparatively lesser values. This can be due to the fact that native ones need a protection from the grazing animals because of being grown in open areas. But exotic fruits are grown in protected areas because of its high cost and benefits. Many alkaloids possess some pharmacologic effects. They are considered as reserve substances for the supply of nitrogen.

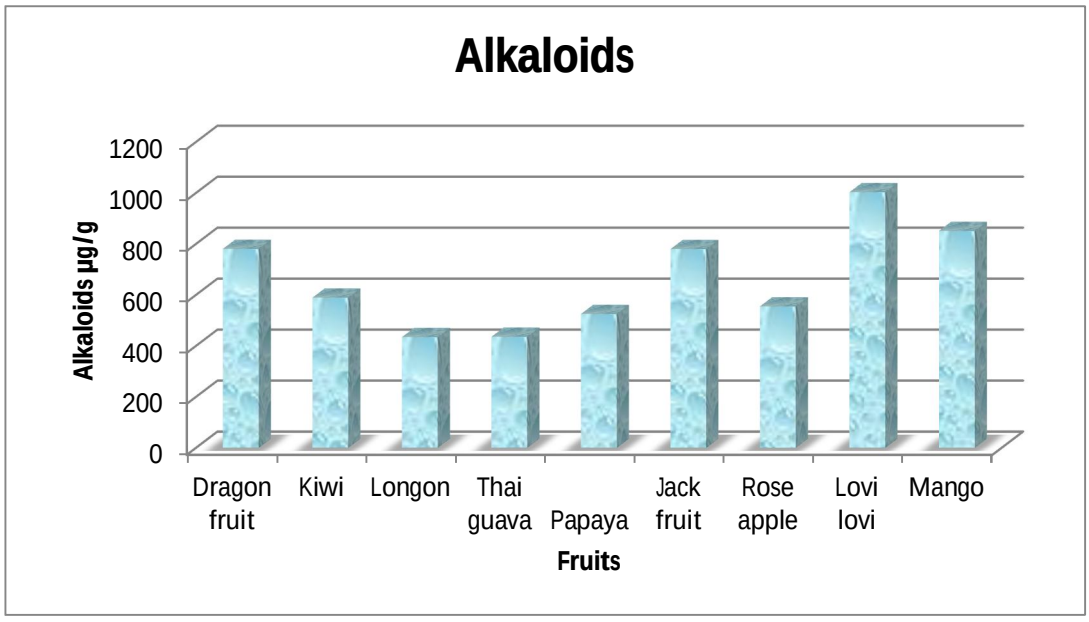

Fig 1. Alkaloid content of fruits

IV. SUMMARY AND CONCLUSION

Fruits have served human beings as a natural source for nutrients from ancient times. While selecting fruits, there can be confusion on its benefits and nutritional quality. Organic fruits are to be preferred to inorganic produce to avail maximum fruit nutrition benefits, they are endowed with a special flavour rich in vitamins and minerals. Nowadays exotic fruits are in demand in local markets as well as for export purposes. They are also known for their health promoting properties. In the current study a comparison on alkaloid content of 4 selective exotic and 5 native fruits available in Kerala was done. The results of quantitative and qualitative analysis of those fruits show the differences in distribution of alkaloid in the fruit varieties selected for the study.

In this study, an attempt was made to estimate the presence and quantity of alkaloid content in selected five native fruits (Artocarpus heterophyllus, Mangifera indica L., Flacourtia jangomas, Carica papaya L., Syzygium jambos) and four exotic fruits (Hylocereus polyrhizus, Actinidia deliciosa, Psidium guajava, Dimocarpus longon). The quantitative analysis showed that most of the phytochemicals were seen in all fruit samples even in a micro quantity. Those fruits showed negative result in identification test also estimated some quantities of phytochemical in it. Estimated quantity of various alkaloid content in present study is summarised below. Among 9 varieties of fruit lovi-lovi has the highest value (1002.737µg/g) and longon has the lowest value (434.245µg/g). Alkaloid content of other fruits are dragon fruit (780.546µg/g), kiwi(589.039µg/g), Thai guava (435.615µg/g), papaya (524.930µg/g), jack fruit (779.450µg/g), rose apple (554.793µg/g), and mango (850.957µg/g).

From this study we can conclude that the native ones had the highest values of alkaloid and exotic fruits had comparatively lesser values. But both native and exotic fruits are beneficial to human health, we can consume both exotic and native fruits for nutrient needs.

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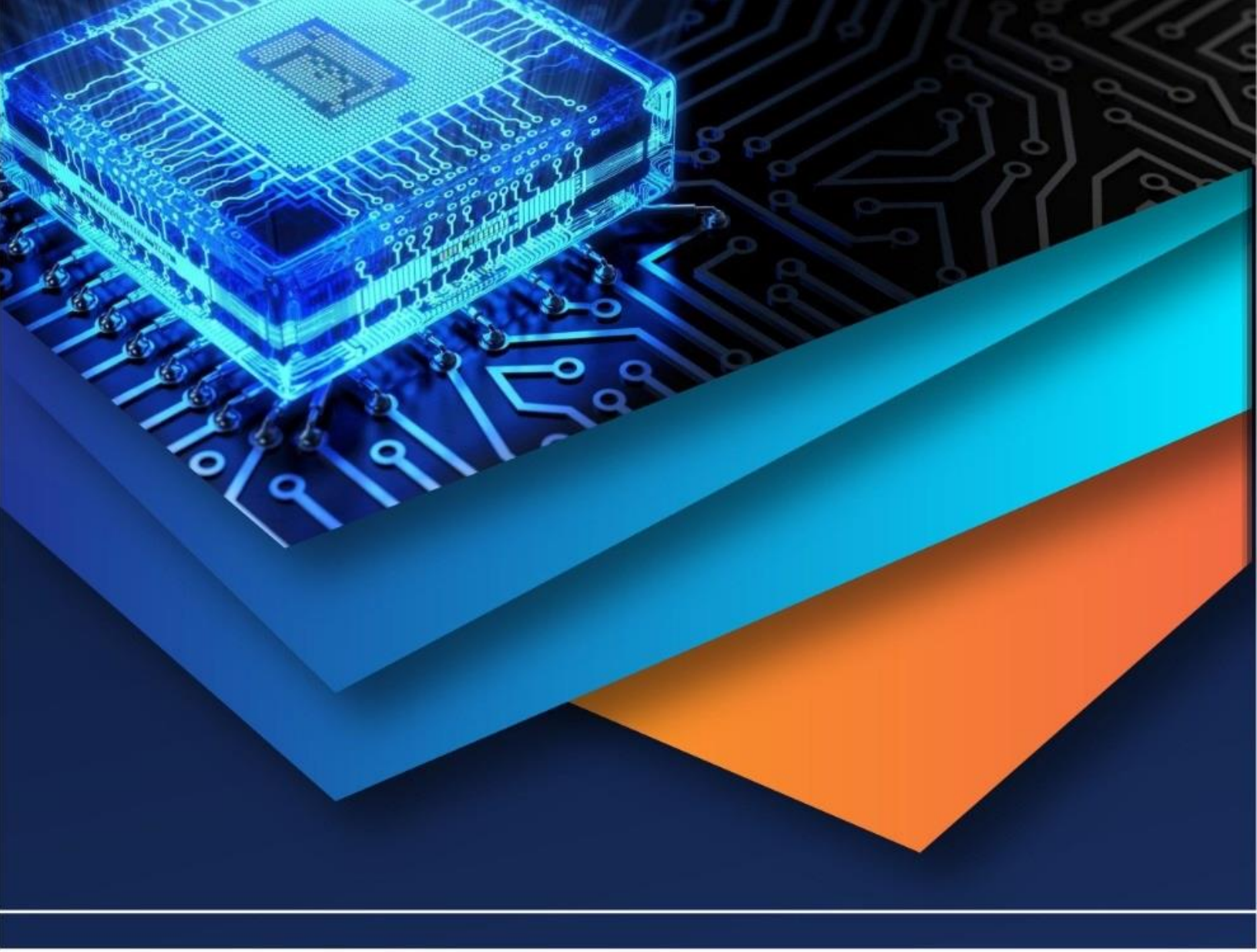

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