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Malabar Tamarind (*Garcinia cambogia*) : Nutritional Analysis and its Importance in Daily Consumption

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Abstract

The study was conducted to know the nutritional composition of *G. cambogia* and its usage in regular consumption. Malabar Tamarind is widely used in the preparation of refreshing drinks, for curing fishes and sour curries. It has proven its medicinal effects in treating flatulence, oedema, chronic alcoholism, dysentery, diarrhea, obesity etc. The nutraceutical effect of cambogia is due to the presence of an acid known as Hydroxy citric acid (HCA) in it. In this regard, the information related to its usage in daily consumption was collected using standardized questionnaire among the consumers (N=30) and the nutritional analysis of fresh and dry fruit rind was conducted. The results showed that, 47 per cent of the respondents were using Malabar tamarind for the culinary purpose as a tendering and souring agent, followed by 40 per cent of them were using for weight reduction. Malabar tamarind dry fruit rind was found to be superior in micronutrients such as Calcium (90.42 mg/100g) and Potassium (64.70 mg/100g) compared to the fresh rind. Dry rind was also found to be significantly high in Anti oxidant component i.e. HCA content (27.30%) and antioxidant activity (90.60 mg GAE/100g) than in fresh rind (6.70%) and (81.44 mg GAE/100g) respectively. The fruit rind proved its potency of antioxidant property due the presence of HCA, Garcinol, Polyphenols and Anthocyanins. This potential anti-oxidant property of Malabar Tamarind opens new venue for further studies.

Keywords: Malabar tamarind, Nutritional composition, Antioxidant, Hydroxy citric acid

Fruits are nature's wonderful gift to mankind; indeed, the edible fruits are life enhancing medicines packed with vitamins, minerals, antioxidants and many phyto-nutrients. They are an absolute feast to our sight, not just because of their color and flavor but for their unique nutrition profile that helps to keep human body healthy.

Most of the medicinal fruit plants are also used as herbal medicines in the treatment of several health issues since pre-historic period. Indian Vedas have proved its usage as medicine for more than 4000 years. According to WHO, around 21,000 plant species have identified as medicinal plants in prevention of several metabolic disorders (Swami *et al.,* 2014). In spite of that, there are several species which need to exploit for their nutritional and therapeutic properties. One such medicinal plant is *Garcinia cambogia.*

Garcinia cambogia commonly known as Malabar Tamarind is a native to Asia. It is one of the most medicinally important member of the Clusiaceae family. It is a small or medium size tree up to 12 meter tall with a round crown and drooping branches. Flowering occurs during the March-May, while fruiting occurs during the rainy season (June–September).The ovoid fruits are yellow, orange or red in colour when ripen and has 6 to 8 seeds which is surrounded by a succulent aril. It has a limited native global distribution, being restricted to India, Nepal and Sri Lanka. In Kannada it is known as Uppage or Murugalu. Dried fruits used to sell to the dealers / Co-operative society in Chickmagalur, Udupi, Shimogga and Sirsi regions of Karnataka (Geeta and Umadevi, 2010).

The Malabar tamarind fruits, bark, leaves and stem have proved their anti-obesity, anti-cancerous, anti-inflammation, anti-oxidant and anti-microbial properties.

The fruit rind is commonly used as food preservative agent or tendering agent or flavouring agent or food-bulking agent for culinary purpose. It has received considerable positive media attention due to the

presence of its principle component HCA (Hydroxy Citric Acid), which has proved to reduce obesity by increasing serotonin hormone levels and restricts food intake (Heymsfield *et al.,* 2012)

With this background, the study was conducted to analyze the nutritional composition of Malabar Tamarind and to know the knowledge about its usage among the consumers in daily consumption.

Material and Methods

The fruits were procured from the Zonal Agriculture and Horticulture Research Station, Mudigere, Chickmagalur district. Healthy fruits were selected and washed using running tap water. Then the fruits were dissected and pulp was scooped out and discarded. The 2 mm thick rind was dehydrated by using Hot air oven at 60°C for 6.68 hours. The dehydrated rind and fresh rinds were analyzed for nutrients such as P^H, moisture, protein, fat, total ash, crude fiber, carbohydrates, energy, minerals such as calcium, potassium, magnesium, phosphorous, sodium, potassium, zinc, iron copper and vitamin such as Ascorbic acid. Analysis was done in triplicates using analytical grade chemicals and results were expressed in both dry and wet weight basis in international standard units.

Further thirty subjects from Mudigere town were randomly selected for the consumer acceptance of the Malabar Tamarind, from those who were consuming the Malabar Tamarind products either through local market or homemade. The general questionnaire was developed in two parts for conducting household survey on acceptability of Malabar Tamarind products. This questionnaire consists Socio economic profile (age, sex, education, occupation and locality) of the consumers and information on Malabar Tamarind usage in daily consumption such as form of the product, purpose of consumption, frequency and quantity of consumption, type of product, knowledge and opinion about Malabar Tamarind products were collected.

Results and Discussion

Table 1 represents the Socio Economic profile of the consumers who were included to conduct household survey on usage of Malabar Tamarind (N=30). Thirty subjects were selected randomly to conduct house hold

Table 1

Socio Economic profile of household survey conducted for Malabar Tamarind consumers (N=30)

Characteristics	Categories	Respondents	
		No.	Per centage
Age (years)	<25	04	13
	25-45	10	33
	45-65	13	44
	>65	03	10
Sex	Male	07	23
	Female	23	77
Location	Mudigere (local)	24	80
	Non-Mudigere (Migrated)	06	20
Qualification	Illiterate	00	00
	Primary	03	10
	High School	08	27
	Graduation	13	43
	Post -graduation	06	20
Occupation	Student	00	00
	House wife	04	13
	Govt. Employee	03	10
	Self Employee	03	10
	Agriculturists	20	67
Income (Rs.)	<10,000	01	03
	10,000-25,000	05	17
	25,000-50,000	08	27
	>50,000	16	53
Type of family	Nuclear	24	80
	Joint	06	20
Activity involved	Sedentary	11	37
	Moderate	15	50
	Heavy	04	13
Type of diet	Vegetarian	01	03
	Non-Vegetarian	24	80
	Ovo- Vegetarian	05	17

survey to know the usage of Malabar Tamarind in Mudigere by using developed questionnaire.

It is evident from the findings that 44 per cent of the respondents were identified in the age group of 45-65 years of age followed by 33 percent found in the age group of 25-45 years. The results indicated that, more than half of the respondents were females. About 80 per cent of the subjects included in the survey were localites (Mudigere) and remaining 20 per cent were non- localites (Shimogga, Davanagere, Hassan, Udupi). This shows that, Malabar Tamarind was available in their backyard and also being grown as border crop in their plantation area. The results indicated that, 80 per cent of the respondents were non- vegetarians and only 3 per cent of them were vegetarians. Most of the Malnad region populations are non-vegetarians and they use Malabar tamarind as culinary agent in marinating chicken, fish and pork to enhance taste, flavor and keeping quality of food and also to reduce fat content in non vegetarian dishes.

Table 2 depicts, the information on Malabar Tamarind usage in daily life among consumers (N=30). It was observed from the study that, majority of the respondents knew about Malabar Tamarind through the local area availability of fruits (63 %), followed by through friends (20 %). Ninety per cent of the respondents were using Malabar Tamarind in the form of concentrate, followed by 10 per cent of them were using dry rind as such. To enhance the keeping quality of the products respondents were using in the form of concentrate rather than other form of Malabar Tamarind. From the study it was found that, 47 per cent of the respondents were consuming Malabar Tamarind since their childhood, followed by 26 per cent of them from more than 20 years. This shows that due to the potential availability of this fruits in Malnad region respondents were using from their ancestors, which was not new to them.

Majority of the respondents (47 %) were consuming Malabar Tamarind for culinary purpose, followed by weight reduction (40 %). The results were on par with the findings of Geeta and Umadevi (2010). Who reported that, majority (36 per cent) of the respondents

TABLE 2

Information on Malabar Tamarind in daily consumption (N=30)

Characteristics	Categories	Respondents	
		No.	Per centage
Knowledge on Mass media		02	07
Murugalu	Ayurvedic	03	10
through the	Location/ area	19	63
influence of	Through friends	06	20
Form of the	Dry rind	3	10
product	Fresh rind	0	0
	Concentrate	27	90
	Juice	0	0
	Any other form	0	0
Duration of	Since child hood	14	47
using Malabar	From last few months	02	07
tamarind	1- 10 years	02	07
	10-20 years	4	13
	> 20 years	8	26
Purpose of	Weight reduction	12	40
consumption	Acidity	4	13
	Head ache	0	0
	Migraine head ache	0	0
	To control heat	0	0
	Diabetes	0	0
	Hypertension	0	0
	Any other (culinary purpose to enhance taste)	14	47
Type of the	Market	6	20
Malabar	Home made	24	80
tamarind products used			
Frequency of	Daily	0	0
consumption	Weekly	18	60
	Once in 15 days	4	13
	Monthly	2	07
	Seasonally	4	13
	Occasionally	2	07
Quantity of	30-60ml	18	60
consumption	60-100ml	9	30
	>100ml	3	10
Consumption	Before Food	3	10
preferred	After Food	0	0
	Any time	0	0
	With food	27	90
Regular	Yes	7	23
medication	No	23	77

were using *G. indica* for weight reduction and also found strong association between the form of the product and the purpose. The HCA, a potential organic acid present majorly in Malabar Tamarind, acts as a miracle anti-obesity agent by reducing the denovo lipid synthesis and increases the fat metabolism. This also proven to regulate Serotonin hormone which restricts the food intake.

Most of the respondents were using homemade Malabar Tamarind products rather than market products *i.e.,* 80 per cent and 20 per cent respectively. Majority of the respondents (60%) were consuming Malabar Tamarind product weekly, followed by once in 15 days (13%) and seasonally (13%). Due to the high cost of Malabar Tamarind products and also to maintain hygienicity in the products, respondents preferred homemade products rather than market products.

It was observed that, most of the respondents (60%) preferred to consume 30-60ml of product, followed by 30 per cent using 60-100ml. Whereas, 10 per cent of the respondents preferred more than 100 ml of the product. Ninety per cent of the respondents preferred to consume Malabar Tamarind along with food or in

TABLE 3

Nutritional composition of *G. cambogia* fresh and dry fruit rind

	Fresh Malabar Tamarind fruit (per 100g fresh weight)	Dehydrated Malabar Tamarind fruit (per 100g dry weight)	t test	
pH	2.54	2.07	1.07	NS
Moisture (g)	86.47	10.24	64.85	*
Protein (g)	2.15	7.60	6.04	*
Fat (g)	0.93	3.92	5.05	*
Total Ash (g)	1.45	5.58	6.32	*
Crude fiber (g)	1.92	10.98	10.91	*
Carbohydrates (g)	7.08	61.68	34.81	*
Energy (Kcal)	96.89	537.04	54.95	*
Minerals (mg/100g)				
Calcium (mg)	12.42	90.42	28.53	*
Potassium (mg)	24.70	64.70	6.09	*
Magnesium (mg)	14.10	29.10	9.78	*
Phosphorous (mg)	05.15	68.15	18.36	*
Sodium (mg)	02.51	23.20	6.89	*
Zinc (mg)	23.40	38.76	16.75	*
Iron (mg)	8.25	44.17	18.54	*
Copper (mg)	05.10	11.18	4.40	*
Vitamins (mg/100g)				
Vitamin C (mg/100g)	13.62	4.31	11.33	*
Phyto chemical				
Hydroxy Citric Acid (%)	6.70	27.30	38.87	*
Antioxidant (DPPH) activity (mg GAE/100g)				
Standard gallic acid (81.90)	81.44	90.60	A*B 1.07	

food preparation, rather than before food (10%). Due to its high acidic and astringency taste, majority of the respondents preferred to consume in a lesser quantity.

It was found from the study that, 77 per cent of the respondents were not on any medication, whereas 23 per cent of them were on medication. The results were on par with the Geeta and Umadevi (2010).

Table 3 indicates the nutritional composition of Malabar Tamarind fruit rind. It was found that, among the proximate nutrients, dry rind consists 10.98 g of crude fibre than in fresh rind (1.92g) per 100g of dry and fresh weight respectively. Among the micro nutrients Calcium, Potassium and Zinc were found to be high in dry rind (90.42 mg, 64.70 mg and 38.76 mg respectively), followed by fresh rind that is 12.42 mg, 24.70 mg and 23.40 mg respectively. The presence of Calcium and Potassium salts proved their potential role in reducing weight by Yamada *et al*., 2007.

Malabar tamarind dry fruit rind is found to be low in vitamin C content than in fresh rind. Similar results were found evident in the study conducted by Krishnamurthy *et al*., 2007, Geeta and Umadevi (2010). Vitamin C was highly water-soluble and sensitive to heat, which lead to the loss of vitamin C in dry rind. Due to the loss of water during dehydration process, reduction in physical size concentrates and the sugars dramatically, protein gets denatured and concentration of the nutrients will increase. Hence, dried fruits may be six times higher in energy than their fresh equivalents and other proximate nutrients were also found to be high in dehydrated than in fresh *cambogia* rind.

Anti oxidant activity (Free radical scavenging activity) by 1,1dipheny 1,2 picrylhydrazyl (DPPH) method was found high in dry rind (90.60 %), than in fresh rind (81.44%) (Table 3) compared to the standard Gallic acid value 81.90% at the concentration of 60mg of fresh and dry rind. This may be due to the presence of Garcinol a potential antioxidant, which proves its role in scavenging alkyl-peroxyl radicals to suppress and prevents several degenerative disorders by causing apoptosis of the carcinogenic cells (Kamal *et al.,* 2011 and Mishra *et al.,* 2014).

HCA content was found to be high in dry rind (27.30%), than in fresh rind (6.70%). The results were on par with the study by Swami *et al*., (2014). They found that, 25 per cent and 5.2 per cent HCA in dry and fresh rind respectively. HCA is an potential phytochemical present in fruit rinds, which has proved significant reduction in body weight and lowers lipid accumulation by increasing serotonin hormone level, HCA restricts further food intake and it has the capacity of reducing fat synthesis up to 40-70 per cent and also triggers fatty acid oxidation in liver (Kamal *et al.,* 2011).

Malabar Tamarind (*Garcinia cambogia*) found to be a good source of nutrients, apart from its medicinal properties. The principle component *i.e.,* Hydroxy citric acid (HCA) may act as an anti obesity agent by regulating the serotonin hormone level synthesis and thereby regulates food intake. Since, Malabar Tamarind fruits are also rich in Anti-oxidant (Garcinol) activity it may play as a potential role in preventing several metabolic disorders. In addition to these properties, it may be used for culinary purpose as a substitute of souring and tendering agent to Tamarind. Since it is already being used by the consumers as a culinary agent, it creates a new venue to exploit several value added products to maintain general health of the public.

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