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Nutrient analysis of Products Formulated from Tender Tamarind Leaves (*Tamarindus indica* L.) Powder

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ABSTRACT

One of the specific objective of this study is to analyze the nutrient content of products formulated from tender tamarind leaves powder. The products were formulated by incorporating the tender tamarind leaves powder. Among nine formulated products three best accepted product were finalized by 20 semi-trained membersby using 9-point hedonic scale, the best accepted products were roasted bengal gram chutney powder(RBCP-1), niger seed chutney powder (NSCP-1) and hurigalu (HG-2) these products were carried out for nutrient analysis. It has been found that (RBCP-1)had moisture, protein, fat, crude fibre, carbohydrate, energy and ash content were in the range of 9.0 per cent, 13.54 g, 10.2 g, 3.10 g, 60.0 g, 386 Kcal and 4.87 g/100 g respectively.(NSCP-1) had moisture (5.4 %), protein (15.34 g), fat (30.0 g), crude fibre (14.92 g), carbohydrate (31.14 g), energy (456 Kcal) and ash (3.2 g)/100g. The vitamins and minerals content in both the chutney powders were in appreciable quantity. (HG-2) had moisture, protein, fat, crude fibre, carbohydrate, energy and ash content were in the range of 2.4 per cent, 21.3 g, 9.65 g, 3.12 g, 59.53 g, 410 Kcal and 4.0 g/100 g respectively. Whereas β - carotene and vitamin C content were 143.2 µg and 23.6 mg per 100 g respectively. Iron and calcium were 3.44 mg and 116.1 mg per 100 g respectively. The formulated products were got good acceptability and also rich in all essentials micro and macronutrients, hence these products can be promoted for daily use.

Key words: *Tender tamarind leaves powder, Chutney powder, Formulated, Incorporating, Nutrient analysis*

INTRODUCTION

Tamarind (*Tamarindus indica* L.) Cultivated in subtropical and tropical areas of the world. In India *Tamarind indica* is considered as one of the cash trees. All parts of the tree got some use, but leaves are most useful parts, leaves can be consumed as vegetable and due to sourness of fruits, which can be used in preparation of sauces, souring curries, chutneys and certain beverages.

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Generally, traditional preparations like pickles and chutney powders play an important role in the eating habits. Pungency and sourness are the two important aspects of these products that have a major impact on sensory attributes. Tamarind fruit used in preparation of different products like tamarind juice concentrates, tamarind powder, pectin, tartrates, tamarind kernel powder, tamarind paste and alcohol1. Pickles based on raw tamarind fruit are in vogue. The spiced rice preparation (pulihora) which is based on tamarind fruit pulp is very popular in southern parts of India. The fruit pulp of tamarind is also used in several food preparations to provide acidity. The fruit contains 10 to 14% tartaric acid on dry weight basis[1].Canned beverages based on tamarind fruit pulp are very famous in the counties like Malaysia, Latin Americaand Thailand[2]. The extract from fruit pulp extensively used as a replacement for chemical acidulants like citric acid and phosphoric acid in soft drinks[3]. Information on fruit based products was available. Some reports were made regarding the utilization of tender tamarind leaves, raw pods, seedlings and flowers. Raw tamarind pods, tender leaves and seedlings consumed as vegetables[4].

However, not much work has been done on the utilization of tamarind leaves including the tender leaves even though it contains high amount of tartaric acid. There is 28 to 12 % decrease in tartaric acid content of leaves during May to December and free tartaric acid disappears in the first three months[5]. The tender leaves of tamarind are also used in various vegetarian and non-vegetarian in foods India. The leaf sap is also reported to have a diuretic effect[2]. Tender tamarind leaves being edible and it can be used for souring curries, sauces, chutneys and certain beverages. The tamarind leaves powder can be used in off seasons hence, the present study was undertaken to analyze the important nutrient present in products formulated from tender tamarind leaves powder.

MATERIALS AND METHODS

Sample preparation

Collection of tender tamarind leaves

Medium mature leaves of tamarind were collected from a fully grown tree in University of Agricultural Sciences, GKVK campus, Bengaluru, Karnataka, India, during the months of April-May 2015 for the study. The leaves were initially separated from the stalks and other extraneous matter was cleaned with brine and under running water.

Pre-treatment of the sample

The cleaned tender leaves were subjected to pre-treatment prior to dehydration. The tender leaves were blanched in hot water at 80^0C for one minute and rapidly cooled in chilled water finally these for the same temperature, after dehydrated in hot air oven at 60^0C after drying the tender leaves ground to powder and packed in aluminum foil covers.

Chutney powders preparation

Three products were prepared by incorporating the tender tamarind leaves powderby using standard procedure, the products are Roasted bengal gram chutney powder (RBCP), Niger seed chutney powder (NSCP) in both the chutney powder the tamarind leaves powder was incorporatedin the ratio of 20, 30 and 40gms in three variations whereas in Hurigalu (HU) (Mixed spicy pulses) 10, 20 and 30gms in three variations. The raw materials such as roasted bengal gram, niger seeds, groundnut, green gram, horse gram, soyabean, cumin seed, mint and amla powder, Chilli powder and salt were purchased from local market.

Analysis nutrients of the products

The Nutrient composition of the best products were analyzed for macro and micro nutrients such as moisture, carbohydrates, energy, protein, fat, crude fiber, β-carotene, vitamin C, iron and calcium using standard methods[6]

Moisture content estimation of the sample

Moisture content was determined by taking 10 g of sample in petridish and followed by drying carried out in an hot air oven at 60^0 C temperature, then cooled and weighed sample.

$$\text{Moisture content (\%)} = \frac{\text{Initial Wt. (g)} - \text{Final Wt. (g)}}{\text{Wt. of the sample}} \times 100$$

Protein content estimation of the sample

Protein content of the products was calculated as per cent total nitrogen by the kjeldhal method[8].

$$\text{Fat content (g/100g)} = \frac{\text{Weight of the ether extract}}{\text{Weight of the sample taken}} \times 100$$

Crude fiber content estimation of the sample

The estimation of crude fiber was carried out by using moisture and fat free samples and expressed as g/100g of sample[7].

$$\text{Per cent of crude fiber (g/100g)} = \frac{\text{Loss in weight on ignition}}{\text{Weight of sample used (g)}} \times 100$$

$$\frac{(W2 - W1) - (W3 - W1)}{\text{Weight of the sample (g)}} \times 100$$

Vitamin C content estimation of the sample

Ascorbic acid content was determined calorimetrically. Ascorbic acid was first dehydrogenated by bromination. The dehydroascorbic acid was then reacted with 2, 4 dinitrophenyl hydrazine to form osazone and dissolved in sulphuric acid to give an orange-red coloursolution which was measured at 540 nano meter[9].

Beta-carotene content estimation of the sample

The beta-carotene analysis was done by following procedure 5 to 10 g of sample was taken and acetone about 25 ml was added into it, then the mixture was transferred to an empty beaker grinding was done and allowed to stand for few minutes then filtration was carried out. The residue was subjected to decanting and later it was subjected to acetone extraction process. Then 100 ml of 5 % Na2SO4 solution and petroleum ether about 15 milliliter were added to extract. Then along with petroleum ether volume was made up to the quantity of 50 ml and 452 nm absorbance was used to measure beta-carotene content.

Ash content estimation of the sample

5 grams of sample was taken in crucible. Then the charring carried out slowly in an muffle furnace for about 240 to 300 min at 600^0C temperature. Later the sample was taken out cooled and weighing has done to know the ash content of the sample[7].

$$\text{Ash content (g/100g sample)} = \frac{\text{Weight of the ash}}{\text{Weight of the sample}} \times 100$$

Preparation of mineral solution

Ash obtained from muffle furnace and dilute hydrochloric acid dissolved together to obtain mineral solution.

Calcium content estimation of the sample

Calcium oxalate and the solution of oxalate in dilute acid against standard potassium permanganate precipitation were done to estimate the calcium content of the sample.

Iron content estimation of the sample

Atomic absorption spectrophotometer was used to determine the Iron content of the sample and results were expressed in mg/100 g of sample.

Composition of carbohydrates

Differential method was adopted to calculate Carbohydrates content of the sample[7].

CHO (g/100 g) = 100 – [Protein (g) +Fat (g) +Ash (g) + Fibre (g) +Moisture (%)]

Composition of energy

The composition of energy was computed for all the samples.

Energy (Kcal) = Protein (g) × 4 + Fat (g) × 9 + Carbohydrate (g) × 4

Formulations of products.

Formulations of the products were carried out to know the acceptability at different level of incorporationin which the following products were prepared are chutney powders and hurigalu based on standard recipe[9].

Table 1: Roasted Bengal gram chutney powder (RBCP)

Ingredients	**RBCP-1 Quantity (g)**	**RBCP-2 Quantity (g)**	**RBCP-3 Quantity (g)**
Roasted Bengal gram	60	50	40
Tender tamarind leaves powder	20	30	40
Curry leaves powder	10	10	10
Cumin seeds	5	5	5
Chilli powder	4	4	4
Salt	1	1	1
Total	100	100	100

RBCP-1**:** Roasted bengal gram chutney powder-1,
RBCP-2**:** Roasted bengal gram chutney powder- 2,
RBCP-3**:** Roasted Bengal gram chutney powder-3.

Table 2: Niger seed chutney powder (NSCP)

Ingredients	**NSCP-1 Quantity (g)**	**NSCP-2 Quantity (g)**	**NSCP-3 Quantity (g)**
Niger seed	60	50	40
Tender tamarind leaves powder	20	30	40
Curry leaves powder	10	10	10
Cumin seeds	5	5	5
Chilli powder	4	4	4
Salt	1	1	1
Total	100	100	100

NSCP-1:Niger seed chutney powder -1,
NSCP-2: Niger seed chutney powder- 2,
NSCP-3: Niger seed chutney powder- 3.

Table 3: Hurigalu (HG). (Mixed spicy pulses)

Ingredients	HG-1 Quantity (g)	HG-2 Quantity (g)	HG-3 Quantity (g)
Ground nut	15	20	20
Green gram	20	10	5
Horse gram	20	10	5
Soya bean	5	10	10
Roasted Bengal gram	15	15	15
Tender tamarind leaves powder	10	20	30
Mint + Amla powder	8+2	6+4	4+6
Chilli powder	4	4	4
Salt	1	1	1
Total	100	100	100

HG-1: Hurigalu-1, HG-2: Hurigalu-2, HG-3: Hurigalu -3.

RESULTS AND DISCUSSION

The present study was undertaken to know the nutrient composition of thebest accepted products formulated from tender tamarind leaves powder, the best accepted products among 9 variations are roasted bengal gram chutney powder-1 (RBCP-1), niger seed chutney powder-1 (NSCP-1) and hurigalu-2 (HG-2).

Nutrient composition of roasted Bengal gram chutney powder (RBCP-1)

Table 4. Represents the nutrient composition of roasted Bengal gram chutney powder-1 (RBCP-1). It has been found that chutney powder had moisture, protein, fat, crudefibre, carbohydrate, energy and ash were in the range of 9.0 per cent, 13.54 g, 10.2 g,3.10 g, 60.0 g, 386 Kcal and 4.87 g respectively. Whereas β-carotene content of the chutney powder was 913.7 µg per 100 g and vitamin C content of the chutney powder is 3.05 mg per 100 g. The mineral such as iron content was found to be 4.53 mg and calcium content of the chutney powder was 185.4 mg per 100 g. The bengal gram chutney powder is rich in protein as it made with pulse helps in the muscle development.

Table 4: Nutrient composition of roasted bengal gram chutney powder (RBCP-1)

Proximates	Content per 100 g
Moisture (%)	9.0
Protein (g)	13.54
Fat (g)	10.2
Crude fibre (g)	3.10
Carbohydrate (g)	60.0
Energy (Kcal)	386
Ash (g)	4.87
β-carotene (µg)	913.7
Vitamin C (mg)	4.03
Iron (mg)	4.53
Calcium (mg)	185.4

Table 5: Nutrient composition of Niger seed chutney powder-1 (NSCP-1)

Proximates	**Content per 100 g**
Moisture (%)	5.4
Protein (g)	15.34
Fat (g)	30.0
Crude fibre (g)	14.92
Carbohydrate (g)	31.14
Energy (Kcal)	456
Ash (g)	3.2
β-carotene (µg)	839.6
Vitamin C (mg)	2.97
Iron (mg)	29.57
Calcium (mg)	330.6

Nutrient composition of niger seed chutney powder-1 (NSCP-1)

Table 5. Depicts the nutrient composition of niger seed chutney powder-1 (NSCP-1) had moisture (5.4 %), protein (15.34 g), fat (30.0 g), crude fibre (14.92 g),carbohydrate (31.14 g), energy (456 Kcal) and ash (3.2 g) per 100g. Whereas vitamins such asβ-carotene and vitamin C content were found to be (839.6 µg) and (2.97 mg) per 100 g respectively. The mineral such as iron and calcium content were found to be (29.57 mg) and (330.6 mg) per 100 g respectively. The results revealed that the niger seed chutney powder is good source of β-carotene and vitamin C as well as fair sources of minerals such as calcium and iron these will help in bone development and in blood formation.

Nutrient composition of Nutrient composition of hurigalu (HG-2) (mixed spicy pulses)

Table 6. Represents the nutrient composition of hurigalu-2 (HG-2). The moisture, protein, fat, crude fibre, carbohydrate, energy and ash content were in the range of 2.4 per cent, 21.3 g, 9.65 g, 3.12 g, 59.53 g, 410 Kcal and 4.0 g per 100 g respectively. Whereas β-carotene and vitamin C content of hurigalu-2 (HG-2) was 143.2 µg and 23.6 mg per100 g respectively. The minerals such as iron and calcium were found to be 3.44 mg and 116.1 mg per 100 g respectively. As hurigalu (Mixed spicy pulses) made with combination of different pulses and oil seeds hence it is rich in protein. As well as rich in vitamins such as β-carotene and vitamin C, also mineral like calcium and iron.

Table 6: Nutrient composition of Nutrient composition of hurigalu-2 (HG-2) (Mixed spicy pulses)

Proximates	**Content per 100 g**
Moisture (%)	2.4
Protein (g)	21.3
Fat (g)	9.65
Crude fibre (g)	3.12
Carbohydrate (g)	59.53
Energy (Kcal)	410
Ash (g)	4.0
β-carotene (µg)	143.2
Vitamin C (mg)	23.6
Iron (mg)	3.44
Calcium (mg)	116.1

Roasted bengal gram chutney powder (RBCP-1)

Niger seed chutney (HG-2) powder-1 (NSCP-1)

Hurigalu-2

Fig. 1: Best accepted products

CONCLUSION

The above study revealed the products formulated from that tender tamarind leaves powder contained appreciable quantity of nutrients and tamarind leaves being edible, the products has got good acceptability hence the products can be promoted for regular use and also the tamarind leaves powder can be used in off seasonsfor souring curries, sauces and chutneys.

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