



Formulation and evaluation of papaya (*Carica papaya* L.) leaf based herbal tea

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Abstract

Carica papaya Linnaeus, (Papaya) belongs to the family of Caricaceae. Papaya is not a tree but an herbaceous succulent plants that possess self supporting stems. Papaya is a large perennial herb with a rapid growth rate. Tea is one of the most widely consumed beverages worldwide, second only to water. The study was conducted to find out the nutrient composition of the papaya leaf and to formulate a herbal tea. In the present study red leady papaya leaves were selected and collected (Matured, stage 4) from College of Agriculture Vellayani, Thiruvananthapuram. The leaves were dried using tray drier and different nutrients like moisture, protein, fiber, vitamin C, calcium, potassium and herbal tea was formulated using different adjuncts like dry ginger powder, cardamom powder, clove powder and lemongrass powder. Results indicate that the moisture content (3.4 %), Protein content (6.6gm), Crude fibre 0.61gm, Vitamin C (30.12 mg), Calcium (2.0%) and Potassium (0.95%). The sensory evaluation of the herbal tea revealed that the combination which has highest sensory acceptability contain 90% dried papaya leaf, 1% dry ginger powder and 9% cardamom powder. Hence it can be concluded that the papaya leaf which is an abundant source of nutrients can be incorporated in daily diet in the form of herbal tea.

Keywords: *Carica papaya*, nutrient composition, tray drier, herbal tea, sensory evaluation

Introduction

Carica papaya Linn belonging to family Caricaceae is commonly known as papaya in English, Papita in Hindi and Erandakarkati in Sanskrit. The plant is native to tropical America and was introduced to India in 16th century. The plant is recognised by its weak and usually unbranched soft stem yielding copious white latex and crowded by a terminal cluster of large and long stalked leaves, is rapidly growing and can grow up to 20m tall (Anjum *et al.*, 2013)^[1]. The plants are usually short-lived, but can produce fruit for more than 20year. The papaya (*Carica papaya* L) is a major fruit crop that is widely cultivated and consumed, both for its agreeable flavor as well as its many pharmacological properties. It is known by the following common names like papita, pepe, pappli or omakai (Lim, 2012)^[12]. Papaya is grown in nearly all countries. It is also cultivated in India, Sri Lanka, various Asian countries, as well as the Antilles and tropical Africa. There are numerous varieties of papaya around the world, there are 23 varieties in India and in Kerala the major varieties cultivated are Coorg Honey Dew, Coorg Green, Pusa Delicious & Pusa Nanha This species is typical of tropical and subtropical regions, require temperatures of between 21 and 33 °C and does not tolerate cold weather (less than 15 °C) (National Horticulture Board, 2002). The nutrients in papaya leaf extract include the minerals calcium, magnesium, sodium, potassium, iron, amino acids and vitamins A, C and B. Papaya leaves also contains vitamins (vitamin A, and B vitamins most especially B12), minerals (calcium, magnesium, sodium, potassium, iron) (Hettige *et al.*, 2015)^[9]. Compared with the seeds and pulp, the concentrations of vitamins and minerals are different in the leaves, the contents of magnesium, iron, potassium and calcium is higher in the leaves. Regarding vitamins, except for Vitamin C, the leaves possess a higher content of vitamins, the

leaves and seeds present a higher carbohydrate content, fiber, protein and it also possess high caloric value when compared with the fruit pulp. (Nwofia, 2012)^[16]

Tea is one of the most widely consumed beverages worldwide, second only to water. The tea beverage is defined as an infusion of dried leaves and buds of the evergreen shrub *Camellia sinensis*, a member of the Theaceae family and it is predominantly consumed due to its attractive aroma and taste as well its immense health benefit. Tea has been traditionally categorized into black tea, green tea, and oolong tea (Bener, 2006)^[4]. In the recent years, a fourth category called the “herb tea” has been growing popularity among consumers, herbal teas and medicinal plant formulations are produced from green and dried herbs, flowers, fruits, leaves, seeds, barks and roots of medicinal plants and sold in a loose form or packed in bags. The herbal teas and medicinal plant formulations are consumed in many parts of the world due to their therapeutic and healing properties (Nookabkaew *et al.*, 2006)^[14]. Unlike most other forms of tea, herbal teas do not contain caffeine. They also taste great and are easy to drink. Most herbal teas may consist of one main herbal ingredient or a blend of herbal ingredients, intended to bring about a specific purpose, such as relaxation, rejuvenation, relief from a specific condition Etc. (Chandrasekara and Shahidi, 2018)^[6]. This study aims to observe the nutritional composition of red leady papaya leaf and to formulate a herbal tea using it.

Materials and methods

Selection and Collection of leaves

Red leady papaya leaves were selected and collected (Matured, stage 4) from College of Agriculture Vellayani, Thiruvananthapuram. It was ensured that the papaya plants were not sprayed with any chemicals. The leaves were

thoroughly washed under running tap water to remove any particulate matter and rinsed carefully with deionised water to obtain clean leaves. (Fadzilah *et al.*, 2020) [8]. Leaves were dried in the tray dryer and it was powdered.

Nutritional Composition

The nutritional composition of the leaves are

1. Moisture

The moisture content of the sample was analysed according to the method described by AOAC (1990) [2]. Moisture content was calculated by the formula Moisture content (%) = $\{Ws - (W2 - W1)/Ws\} \times 100$ in which W1-Wt of dish, Ws-Wt of sample, W2- Wt of dish after drying.

2. Protein

The protein content of the sample was determined using the Bradford's method (1976) [5]. The absorbance was measured by blue colour at 595 nm, setting zero with first tube (blank).

3. Fiber

Fiber content was estimated using the procedure given by Rahul *et al.* (2010) [19]. The percentage weight of the crude fiber present was calculated with the formula, Weight of crude fiber = (Weight of fresh sample + crucible) - (Final weight of sample + crucible)

4. Vitamin C

Ascorbic acid content of the samples were determined by 2, 6-dichlorophenol indophenol (DCPIP) titration method described by Rao and Deshpande (2006). Ascorbic acid content present in the test samples were determined using the formula, Amount of ascorbic acid content (mg/100ml) =

$500 \times V2 \times 10 \times 100 \text{ mg} / 100\text{g} V1 \times 10 \times 0.1 \times 1000$. Where, 500 = μg of standard ascorbic acid taken for titration, V1 = Volume of dye consumed by 500 μg of standard ascorbic acid V2 = Volume of dye consumed by 5 mL of test sample, 10= Corresponds to total volume of the extract, 100 = Ascorbic acid content/100ml of the sample, 0.1= weight of sample taken for extraction, 10= Volume of the test liquid sample take.

5. Calcium

Dilute the calcium solution to 100ml in a volumetric flask with distilled water, shake well. Pipette 10ml of this solution into a 250ml conical flask and titrate with EDTA solution stirring continuously until the reddish tinge disappears and the colour becomes blue which is the end point

6. Potassium

Potassium of the sample was determined using flame photometry method. The standard and sample solutions were aspirated into the flame photometer and the stable values in the display were recorded.

Formulation of Blended Herbal Tea Powder

Drying of leaves

The leaves were dried using tray drier at 55-60°C for 6 hours.

Formulation of blended herbal tea powder

Different formulations were tried out for the leaf powder with various adjuncts *viz* Dry ginger powder, Cardamom powder, Clove powder and Lemongrass powder. The ingredients and their proportions used for the preparation of herbal tea are mentioned in Table 1

Table 1: Formulation of herbal tea powder using tray dried leaf powder

Sl no	Treatments	Ingredients	Quantity ratio
1	D1T1	Papaya leaf powder+ Dry ginger powder+ Cardamom powder	90:1:9
2	D1T2	Papaya leaf powder+ Dry ginger powder+ Clove powder	90:8:2
3	D1T3	Papaya leaf powder+ Dry ginger powder+ Lemongrass powder	90:5:5
4	D1T4	Papaya leaf powder+ Cardamom powder+ Clove powder	90:9:1
5	D1T5	Papaya leaf powder+ Cardamom powder+ Lemongrass powder	90:9:1
6	D1T6	Papaya leaf powder+ Clove powder+ Lemongrass powder	90:4:6
7	D1T7	Papaya leaf powder+ Cardamom powder+ Dry ginger powder+ Clove powder+ Lemongrass powder	90:7:1:1:1
8	D1T8	Papaya leaf powder	100

Preparation of Herbal Tea Infusion

The herbal teas were prepared by dipping the tea bag made using the formulated tea powders. Each tea bag contains 3gm of herbal tea powder and it was infused in 150 ml boiling water for 3 minutes according to the method suggested by (Horzic *et al.*, 2009) [10].

Sensory Evaluation

Sensory evaluation of the herbal tea was executed by 10 semi trained panel members. The sensory aspect of the developed herbal teas comprise of assessment of appearance, colour, flavor, aroma, taste and overall acceptability. A nine point hedonic rating scale was used to rate each treatments.

Statistical Analysis

The results obtained from the analysis were further analyzed using best suitable statistical analysis for the interpretation

of the results. The main tools achieved to calculate the significant difference in the treatment means were Kruskal-Wallis test.

Result and discussion

Nutritional Composition

The study was done to know the proximate value of red lady papaya leaf powder. The results (table 2) shows that the moisture content of the leaf powder was 3.4 % which was concurred with Raja *et al.* (2019) [20] the moisture content was ranged from 3.04% to 7.28%. Karuna *et al.* (2014) [11] also reported a similar result. Low protein content (6.6gm) was observed in the study and has been supported by Nwamarah *et al.* (2019) [15] as the study showed the protein content of dried leaves were 6.5gm and it may be due to the drying method even though protein is low it can be incorporated to other foods to increase the total protein

content. In case of crude fiber it was observed that 0.61 gm was seen in the sample. The value was lower than the value 5.700 reported by Olumide *et al.* (2022) [17] and 5.60 reported by Onyimonyi and Onu (2009) [18]. This may be due to the difference in the area and environment of plant and the nutritional content of the soil in which it is grown or it may be due to the difference in drying method. About 19.70 mg of vitamin C was seen in Olumide *et al.* (2022) [17] which is much lower than the value reported by the present study 30.12 mg and on the other hand Nwamarah *et al.* (2019) [15] reported a higher value of 68.59 mg. to know about the mineral composition of the leaves minerals like calcium and potassium were analyzed and the results showed a higher content of calcium 2.0% and 0.95% Of potassium which is aided by the studies of Ayoola and Adeyeye (2010) [3] calcium and potassium contents were 0.861% and 0.288%. the observations have high importance when the usefulness of such minerals like Ca and K in the *Carica papaya* leaves indicates the usefulness of the leaves in the coagulation of blood, the proper functioning of the heart and nervous system and the normal contraction of muscles (Claude and Paule,1979) [7].

Table 2: Nutritional composition of dried papaya leaves

Nutrients	Quantity
Moisture (%)	3.4
Protein (gm)	6.6
Crude fiber (gm)	0.61
Vitamin C (mg)	30.12
Calcium (%)	2.0
Potassium (%)	0.95

Sensory Evaluation of the herbal tea

The sensory evaluation of the herbal tea was done by 10 semi trained panel members from College of Agriculture, Vellayani. The scoreing was done using hedonic scale in which like extremely was given highest score and dislike extremely was given least score. The result showed (Table 3) the tea which has a code no of D₁T₁ has highest sensory acceptability regarding taste with mean value of 8.7 and overall acceptability with mean value of 7.68. In case of other attributes like appearance, colour, flavor and aroma all of the different combination of teas tried out was on par statistically. The combination which has highest sensory acceptability contain 90% dried papaya leaf, 1% dry ginger powder and 9% cardamom powder.

Table 3: Sensory evaluation of tray dried papaya leaf herbal tea

Treatment	Apperance	Colour	Aroma	Flavour	Taste	Overall acceptability
D ₁ T ₁	7.9	7.6	7.5	6.7	8.7 ^a	7.68
D ₁ T ₂	8.1	7.4	7.2	7	7 ^b	7.34
D ₁ T ₃	7.4	7.4	6.8	6.4	5.7 ^b	6.74
D ₁ T ₄	7.4	7.6	7.2	6.5	6.4 ^b	6.74
D ₁ T ₅	7.5	7.4	7.4	6.8	6.1 ^b	7.04
D ₁ T ₆	7.6	7.3	7	6.3	6.4 ^b	6.92
D ₁ T ₇	7.9	7.5	6.9	6.5	6.5 ^b	7.06
D ₁ T ₈	7.3	7.3	7.1	5.9	6.3 ^b	6.78
Control	8	7.5	6.5	6.5	6.5 ^b	7
χ^2	7.341	1.427	4.668	5.827	22.791	8.817
p_ value	0.50	0.994	0.792	0.667	0.004	0.358
p_ value	0.50	0.994	0.792	0.667	0.004	0.358

Conclusion

The study concluded that the leaf of red lady papaya contain nutrients like moisture, protein, fiber, vitamin C and it's an abundant source of minerals like calcium and potassium. Hence it can be incorporated into our diet to improve nutritional quality. The study also reveled that the herbal tea which has a combination of papaya leaf, dry ginger and cardamom powder has highest sensory acceptability and it indicate that the papaya leaf which is an abundant of nutrients can be incorporated in daily diet in the form of herbal tea.

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