

## RESEARCH ARTICLE

### PROXIMATE COMPOSITION, NUTRITIVE SUBSTANCE AND PHYTOCHEMICAL EVALUATION OF WILD EDIBLE FRUITS OF VELLIANGIRI HILLS OF COIMBATORE DISTRICT

Anusuya devi, R\*, K. Thenmozhi and H. Asha

PG and Research Department of Botany, Kongunadu Arts and Science College, Coimbatore-641 029, Tamil Nadu, India.

#### ABSTRACT

Fruits contribute significantly to the food security of the society especially in terms of vitamins and micronutrients. Numerous wild edible fruits from various families distributed in Poondi, Velliangiri hills, Coimbatore were assessed the Malasar tribal people consume these fruits as a natural source of food supplement. The five wild edible fruits viz., *Zizipus jujuba* Mill. *Zoenoplia* Mill. (Rhamnaceae), *Limonia acidissima* L. (Rutaceae), *Phyllanthus emblica* L. (Euphorbiaceae) and *Ficus racemosa* L. (Moraceae) were assessed for their mineral and phytochemical contents. In which the underutilized fruits possesses high nutritional and medicinal properties for the ethanolic extracts. The macro and micro elements and their constituents explored that Fe was abundant in all the edible fruit species. while *Z.jujuba* was observed to contain high Fe content than those of others. Qualitative phytochemical screening also revealed the presence of phenolics, alkaloids, flavanoids and terpenoids. In quantitative phytochemical estimations also phenolic and tannin concentration was found to be high in *F. racemosa* while *L.acidissima* fruit depicted maximum total flavonoid content. The nutritional and phytochemical composition of fruits indicates that, these neglected wild edible fruits can be a valuable source of nutrients under famine conditions and high levels of some vitamins can be used to prevent diseases.

**Keywords:** Edible fruits, minerals, nutrients, phytochemical, food.

#### 1. INTRODUCTION

Many wild plants serve as alternatives to staple foods during period of food deficit and are valuable supplements for a nutritionally balanced diet. Wild edible fruits are one of the primary alternative source of income for tribal communities and fundamentally used for domestication (1). Wild fruits are generally used as raw or processed, which help to compensate the day-to-day requirement of calories. Wild fruits play a significant role in human nutrition, especially as sources of carbohydrates, proteins, vitamins, minerals, dietary fiber and enormous medicinal potential (2-5). Natural products have high fiber content which serves as a source of defensive properties, because of their cell reinforcement action. In the most recent decades, unique consideration has been paid towards palatable plants, particularly those that are wealthy in optional metabolites. There has been an expanding enthusiasm for cancer preventinh action of such phytochemicals (6). Therefore investigation of wild palatable organic products is essential to recognize the potential sources which could be used as elective sustenance.

In present examination investigation on the dietary status of five wild organic products viz. *Zizipus jujuba* Mill. *Zoenoplia* Mill. (Rhamnaceae), *Limonia acidissima* L. (Rutaceae), *Phyllanthus*

*emblica* L. (Euphorbiaceae) and *Ficus racemosa* L. (Moraceae) evidently by the Malasar tribes individuals of Velliangiri hills, Western Ghats, Coimbatore. According to *Z. jujuba* is utilized generally as a tonic and now and again as sleep inducing narcotic. Moreover, there are ponders that had been done to test its anxiolytic, anticancer, hostile to hypersensitivity, subjective and wound mending properties (7,8). Likewise, *Zoenoplia* is one of the society home grown plants accepted to have some pharmacological properties as blood purifier, febrifuge, stomach torment executioner, and so forth.( 9,10). While, *Limonia* fruits are refrigerant, stomachic, stimulant, tonic to liver and lungs, fixes hack, hiccup and useful for asthma and leucorrhoea (11). The customary utilization of *P. emblica* is viewed as incredibly helpful in improving assimilation, decreasing clogging, diminishing fever, postponing maturing and expanding healthspan ( 12,13) just as *F. racemosa* utilized as a poultice in provocative bubbles and is respected to be powerful in the treatment of heaps, dysentery, asthma and urinary maladies (14). The principle focus of this exploration was to discover the healthful potential and phytochemical of these wild edible fruits.

## 2. MATERIALS AND METHODS

### 2.1. The Malasar in Velliangiri hills

Previously described ecosystems and aboriginal communities for area of study. The Malasars (etymology in tamil – mala = hill; saras = people who live in and depend on the hills) are an aboriginal community who reside in the forest of the Velliangiri holy hills (15,16). They are traditionally hunter gathers. In the Velliangiri hills their settlements were situated near Poondi. The Malasars are considered the 'lords of the hills' (17, 18) stated that there is no information regarding the origin and early history of the Malasars.

### 2.2. Study area

The Velliangiri hills forms a major range in the Western Ghats that is rich in biodiversity and largely untouched by development because of its cultural and religious importance (19). In a floristic investigation that revealed considerable diversity 1715 species of angiosperms including 439 endemics within the Velliangiri hills (15, 16). The study site (longitude 6° 40' to 7° 10' E and latitude 10° 55' to 11° 10' N) is located within the Velliangiri holy hills, which forms a major range in the Western Ghats in the Nilgiri Biosphere Reserve. The research was conducted among seven hills with altitudes ranging from 520 m – 1840 m, which is bordered by the Palghat district of Kerala on the western boundary, the plains of Coimbatore district to the east, the Nilgiri Mountains to the north, and the Siruvani hills on the southern boundary. The annual rainfall is quite variable in the hills (500 mm– 7000 mm) with temperatures ranging from 0°C during winter to 41°C in the summer (20).

### 2.3. Plant materials

Five medicinal wild edible fruits namely viz. *Zizipus jujuba* Mill. *Zoenoplia* Mill. (Rhamnaceae), *Limonia acidissima* L. (Rutaceae), *Phyllanthus emblica* L. (Euphorbiaceae) and *Ficus racemosa* L. (Moraceae) were collected from Velliangiri slopes, Western Ghats, Coimbatore. Botanical identification and authentication were performed at Department of Botany, Kongunadu Arts and Science College. The identification and the medicinal uses of the fruits were shown in Figure 1.

### 2.4. Powder preparation

The different edible fruits were collected, washed thoroughly with fresh running water, dried under shade with room temperature (25±1) °C for a few weeks and coarsely powdered in a blender. The

powdered fruit samples were separately kept in an airtight container until use (21).

### 2.5. Estimation of minerals in fruit material

For mineral content estimation 100 g of fine powdered sample of each fruit was digested using concentrated HNO<sub>3</sub> and HClO<sub>4</sub>. The digested samples were used for elemental analysis. Iron (Fe), phosphorus (P), Magnesium (Mg) and Zinc (Zn) were determined using Atomic Absorption Spectrophotometer and powdered form of fruit sample was used for estimation of Potassium (K) and Calcium (Ca) using Flame photometer (22).

## 3. IN VITRO STUDIES

### 3.1. Preliminary qualitative phytochemical analysis

Preliminary qualitative phytochemical analysis was carried out to identify the secondary metabolites present in various solvent extracts of leaf, stem, flower and fruit parts of *E.munronii* and *E.tuberculatus* (23,24).

### 3.2. Quantitative phytochemical analysis Total phenolics and tannins

The total phenolic content of plant extracts was determined using Folin-ciocalteu reagent according to the procedure described by (25). In this method, 20 µg of the extract (dissolved in the respective solvent) was taken in a test tube and made up to the volume of 1.0 mL with distilled water. Then 0.5 mL of freshly prepared Folin-ciocalteu phenol reagent (1:1 with water) and 2.5 mL of 20% sodium carbonate solution were added sequentially in each tube. The mixtures were agitated and left in the dark at laboratory temperature for 40 min for the development of colour. The absorbance was recorded at 725 nm against the reagent blank using a Shimadzu – UV-160 spectrophotometer (Japan). A calibration curve of gallic acid was constructed, and linearity was obtained in the range of 10-50 µg/ mL. Using the standard curve, the total phenol content of the extract was calculated and expressed as gallic acid equivalent (GAE) mg/ g extract. Using the same extract, tannin content was estimated after treatment with polyvinyl polypyrrolidone (PVPP) as described by (26). One hundred milligrams of PVPP was weighed in a 100 ×12 mm test tube and to this, 1.0 mL distilled water and 1.0 mL of tannin containing phenolic extract was added. The contents were vortexed and kept at 4°C for 15 min. Then the sample was centrifuged (5000 rpm for 10 min at laboratory temperature) and the supernatant was collected. This supernatant has

only simple phenolics other than tannins (the tannins would have been precipitated along with the PVPP). The phenolic content of the supernatant was measured, as monitored above and expressed as the content of free phenolics on a dry matter basis. From the above results, the tannin content of the extract was calculated as follows:

Tannin (mg GAE/ g extract) = Total phenolics (mg GAE/ g extract) - Free phenolics (mg GAE/ g extract)

### 3.3. Total flavonoid content

The total flavonoid content was determined spectrophotometrically using the method adopted by (27). 0.5 mL of appropriately diluted extract solution was mixed with 2.0 mL of distilled water and subsequently with 0.15 mL of 5% sodium nitrite solution and maintained for 6 min. Then, 0.15 mL of 10% aluminium chloride solution was added and allowed to stand for 6 min, and finally 2.0 mL of 4% sodium hydroxide solution was added. Final volume of the contents was made up to 5.0 mL with distilled water and were mixed thoroughly. After 15 min of incubation at laboratory temperature, the absorbance was determined against blank at 510 nm. The total flavonoid content was determined using a standard curve with rutin. The mean of the three values were expressed as milligrams of rutin equivalents (mg RE)/ g extract on a dry weight basis.

## 4. STATISTICAL ANALYSIS

The results were expressed as the averages of three replications. The data was subjected to ANOVA. The graphs were drawn by Microsoft excel 2010.



A). *Ziziphus jujuba* Mill. (Rhamnaceae) B). *Ziziphus oenoplia* Mill. (Rhamnaceae)



C). *Limonia acidissima* L. (Rutaceae) D). *Phyllanthus emblica* L. (Euphorbiaceae)



E). *Ficus racemosa* L. (Moraceae)

## 5. Results and Discussion

### 5.1. Minerals quantification

The mineral creations of condiments appeared Table 1. The consequences of the investigations were built up to give supplement esteems per 100 grams of utilized bit of dried weight. Mineral components were found to fluctuate broadly relying upon the diverse flavors. As indicated by results, Ca, K, Mg and Fe substance were high in all the wild consumable edible fruits. In addition of P and Zn components were found in a comparable range for all organic products. As per (28 ) assurance of overwhelming metals in ecological, natural and nourishment tests has drawn a noteworthy consideration due to the lethal and wholesome impacts of these components or their compounds.

In this work, Fe was plenteous in all edible fruit species. Then again the dimension of Fe in *Z. jujuba* was observed to be higher than those of others (7.11 mg/100 g). The largest amounts of Fe were additionally found in *P. emblica*, *F. racemosa*, *Z. oenoplia* and *L. acidissima* to be 4.26 mg/100 g, 2.68 mg/100 g, 0.823 mg/100 g and 0.32 mg/100 g separately. P substance of *P. emblica* (0.019 mg/100 g) was observed to be fundamentally the same as those of different fruit species. These distinctions may be because of development conditions, hereditary elements, land varieties and logical strategies (29,28).

### 5.2. Qualitative phytochemical analysis

Phytochemicals are the bioactive principles produced by fruits in its various species. These phytochemicals have great potentialities in drug discovery for various diseases (30). The phytochemicals like alkaloid, phenols, flavonoids, steroids and tannins compounds are remedy to cure diseases and fight against different kinds of pathogens, as medicine (31). In the current investigation, the qualitative phytochemical screening was conducted for the different fruits and

ethanolic extracts of viz. *Zizipus jujuba* Mill. *Z.oenoplia* Mill. (Rhamnaceae), *Limonia acidissima* L. (Rutaceae), *Phyllanthus emblica* L. (Euphorbiaceae) and *Ficus racemosa* L. (Moraceae) and it revealed the presence of a diverse class of phytochemical constituents, including alkaloids, flavonoids, phenols, tannins, triterpinoids and steroids (Table 2). However, alkaloids and phenols were found to be present in trace amount while phenols, tannins, triterpinoids, steroids and flavanoids were completely low in all the studied fruit species.

### 5.3. Quantitative phytochemical analysis

Diets rich in fruits have been considered as excellent sources of antioxidants (32). The TPC concentration and the antioxidant capacity of the edible fruits depicted (Figure.2). The TPC was evaluated using the Folin-Ciocalteu assay, which is considered a fast and reliable way to quantify phenolics in foods (33). The highest TPC concentration was found in *F. racemosa* (85 mg GAE/g), followed by *P. emblica* (72 mg GAE/g)

*Z.oenoplia* (65 mg GAE/g) *L.acidissima* (52 mg GAE/g) and *Z.jujuba* (47 mg GAE/g) which presented the lowest TPC. The phenolic content generally correlates with antioxidant capacity for various types of fruits (34, 35). In this study, the amount of tannin content was determined and it was found that the wild edible fruit species manifested significant content (Fig.2). In the quantification of tannin content of *F. racemosa* fruit provided highest tannin content of 32 mg GAE/g whereas lowest content was determined by of *Z.jujuba* (15 mg GAE/g). However, (36) the recent findings indicate that the major effect of tannins was not due to their inhibition on food consumption or digestion but rather the decreased efficiency in converting the absorbed nutrients to new body substances. Apart from this, *L.acidissima* fruit depicted maximum total flavonoid content (61 mg RE/g) while, the edible fruit of *F. racemosa* registered very low content (12 mg RE/g). While, (37) flavonoids are also abundantly found in foods and beverages of plant origin, such fruits hence they are termed as dietary flavonoids.

**Table 1. Proximate composition of various wild edible fruits.**

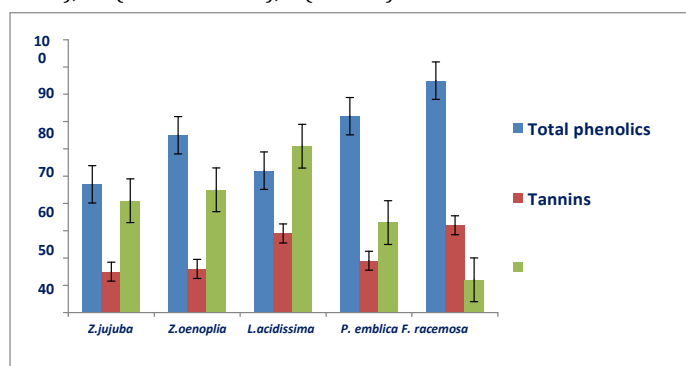
Samples	K	Ca	Mg	Fe	Zn	P
<i>Z.jujuba</i>	0.012	0.151	0.039	7.11	0.105	0.049
<i>Z.oenoplia</i>	0.023	0.103	0.192	0.823	0.067	0.025
<i>L.acidissima</i>	0.185	0.096	0.147	0.32	0.072	0.054
<i>P. emblica</i>	0.104	0.176	0.154	4.26	0.056	0.019
<i>F. racemosa</i>	0.278	0.119	0.09	2.68	0.126	0.095

\*Values were expressed as mg/g dried samples.

**Table 2. Qualitative phytochemical analysis of ethanolic extracts of different wild edible fruits.**

Tests	<i>Z.jujuba</i>	<i>Z.oenoplia</i>	<i>L.acidissima</i>	<i>P.emblica</i>	<i>F.racemosa</i>
Alkaloids	+++	+++	+++	+++	+++
Flavonoids	+++	+++	+	+++	+
Phenols	+++	+++	+++	+++	+++
Terpinoids	++	++	++	+++	+
Tannins	++	++	+	++	+
Steroids	++	+	+++	++	++

\*Legend: +++ (Much abundant), ++ (less abundant), + (minute)



**Fig 2. Total phenolics, tannins and flavonoid content in ethanolic extracts of wild edible fruits.**

## 6. CONCLUSION

The results of this study demonstrated significant differences found in total phenolic, tannins and flavonoid content of different wild edible fruit species, and also in terms of mineral compounds. This study is meant to be a contribution to the characterization of chemical extracts of wild flora fruits that are traditionally used for medicinal applications. Fruits that were studied may have great potential for food production as sources of bioactive compounds such as phenolic compounds and minerals, and also for food supplements or functional foods.

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