

# Comparative Qualitative and Quantitative Profiling of Phytochemicals Present in Peel and Juice of *Citrus Medica* Linn Fruit

**B. Maria Regina Femi<sup>1</sup>, Dr. T. Renisheya Joy Jeba Malar<sup>2</sup>**

<sup>1,2</sup>PG & Research Department of Nutrition and Dietetics, Muslim Arts College, Affiliated to Manonmanium Sundaranar University, Tirunelveli

## ABSTRACT

Plant species are a reservoir of natural compounds that can potentially be used to treat different diseases. *Citrus medica* Linn., known as bijapura in Ayurvedic literature, is widely used in traditional system of medicine. *Citrus medica* (Citron) is an underutilized fruit plant having various bioactive components in all parts of the plant. The major bioactive compounds present are iso-limonene, citral, limonene, phenolics, flavonones, vitamin C, pectin, linalool and decanal, accounting for several health benefits. Pectin and heteropolysachcharides also play a major role as dietary fibers. The potential impact of citron and its bioactive components to prevent or reverse destructive deregulated processes responsible for certain diseases has attracted different research attention. The present study deals with the phyto-pharmacognostic and physicochemical analysis in the *C. medica* fruit extract. Macroscopy revealed the organoleptic properties of the fruit. The preliminary phytochemical investigations indicated the presence of carbohydrates, amino acids, flavonoids, tannins and phenolic derivatives, steroids etc. Qualitative investigation represented the presence of carbohydrates, flavonoids, phenols, tannins, steroids, cardioactive glycosides in peel and juice, while saponins, terpenoids, and anthraquinones are absent in all fraction of *C. medica*. On quantitative screening peel contain highest quantity of phytochemicals as compared to juice of *C. medica*.

**Keywords:** *Citrus medica*, Macroscopy, Phytochemical, pharmacognostic, organoleptic

## INTRODUCTION

*Citrus medica* L. is an indigenous small tree or shrub. Its seeds are as in the orange, but smaller upto 12 - 15 seeded in a one fruit (Patil and Patil, 2010). Various parts of Bijora are extensively used in Indian conventional system of medicine. In prehistoric literature citron was mentioned as an antidote of every type of poison (Beatriz and Luis, 2005). Both the leaves and juice of the citron are used by the community of South Eastern Nigeria for febrile sickness (Ajaiyeoba *et al.*, 2003). *Citrus medica* Linn., commonly known as a Citron in English and Bijora in Gujarati is member of rutaceae family (Kirtikar and Basu, 2007). It is a slow-growing shrub reaching up to 15 ft (4.5 m) in height with rigid branches, twigs and spines in the leaf axils. The flower buds are white or purplish and large. The peel is yellow, usually uneven, rough and very thick. The pulp is greenish or pale-yellow divided into as many as 14 or 15 segments, hard, not very juicy, acidic or sweet and contains many seeds (National tropical, [date unknown]). Citron is a small tree with yellowish orange round or oval fruit, size 8 - 12 cm in length. The

leaflets are evergreen, lemon fragrant, ovate – lanceolate or ovate – elliptic, 2.5 - 7 inch long, rough with short wingless or nearly wingless petioles. The flower buds are large with white or purplish on the outside, the fragrant flowers about 4cm wide, numerous, 4 - 5 petalled, raceme white, generally pinkish or purplish on the outside commonly unisexual with more no. of male flowers. Size alters greatly from 3.5 - 9 inch or even 1 ft in some varieties. Peel is dark green when immature and yellow when mature. The seeds were white colored with dark inner shell & red – purplish spot for the acidic varieties and colorless for the sweet ones (Morton, *et al.*, 1987). Many pharmacological studies have been carried out to establish the traditional claim of *Citrus medica* L. in an attempt to validate its use as a multi-purpose medicinal agent. *C. medica* leaves possesses estrogenic and anti-helminthic activities; fruit has antidiabetic, analgesic, antiulcer and anticancer activities; peel possesses many activities including hypoglycemic, hypolipidemic, antimicrobial, anticholinesterase, hypocholesterolemic, and anthelmintic; seed has antidiabetic, hypolipidemic, anticoagulant, hypocholesterolemic and estrogenic activities (Panara *et al.*, 2012) Several chemical studies have reported the volatile composition of peel from *C. medica*. The peel essential oil composition from various citron varieties has also been investigated: Etrog, Diamante, Rhobsel Arsa, Buddha's hand and Corsican (Fleisher Z, *et al.*, 1991 - Gabriele B, *et al.*, 2009). These studies showed quantitative differences with regard to the major constituents: limonene,  $\gamma$ -terpinene, geranial and neral. Thus, several chemical compositions of the same variety have been reported according to their geographical origins. Venturini *et al.*, 2010) reported the chemical compositions of peel and leaf oils from 17 citron cultivars. Pharmacognostic study gives the scientific information about the purity and quality of the plant drugs (Dhanabal *et al.*, 2005). The present research work deals with the preliminary phytochemical analysis, quantitative estimation and organoleptic studies of peel and juice extract of *C. medica*.

## MATERIALS AND METHODS

### Collection, Authentication and Drying of the plant material

Fruits of *Citrus medica* L. were purchased from local market of Monday market, kanniyakumari. *Citrus medica* fruits were properly cleaned, cut in to small pieces and dried in shade to remove excess of moisture. The dried material was then subjected to fine powder and passed the powder through sieve.

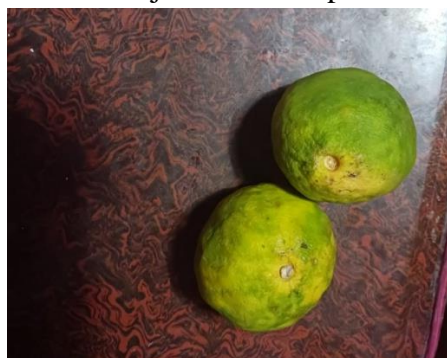


Figure : 1

### Macroscopic Characteristics

The organoleptic characters of fruits such as shape, size, odour, color, surface, taste etc. were studied for morphological evaluation (Dutta, 2007; Handbook of Ayurvedic Pharmacopoeia, 2001).

## Phytochemical screening

### Qualitative phytochemical screening

The ethyl acetate, ethanol 80% peel extracts and juice of *C. medica* were analysed for the presence of carbohydrates, alkaloids, flavonoids, phenols, tannins, saponins, steroids, terpenoids, aminoacids, coumarin, anthraquinones, cardioactive glycosides by standard procedures (Tiwari *et al.*, 2011; Sofowra, 1993).

### Quantitative phytochemical screening

#### Estimation of Total Phenolic content

The total phenolic content was determined by the spectrophotometric method (Kim *et al.*, 2003) with slight modification.

#### Estimation of Total Flavonoids content

The total flavonoids content of *Citrus medica* peel and juice was estimated by method described by (Zhishen *et al.*, 1999) with slight modification.

#### Estimation of Total Tannins content

The tannin content was determined using Folin-Ciocalteu assay (Tamilselvi *et al.*, 2012)

## RESULTS

### 1. Organoleptic analysis of *C. medica* fruit powder

The organoleptic characteristics of *C. medica* fruit powder revealed fine fibrous texture, brown colour, acidic to slightly sweet and lemon flavor. The organoleptic analysis results were represented in Table. 1.

**Table.1. Organoleptic characters of powder of *Citrus medica* fruits**

Parameters	Observations
Texture	Fine fibrous powder
Color	Brown
Taste	Acidic to slightly sweet
Odour	Lemon flavor

### 2. Preliminary phytochemical analysis

The phytochemical characteristics of peel extracts and juice of *C. medica* studied were summarized in Table 2). The results revealed the presence of carbohydrates, flavonoids, phenols, tannins, steroids, cardio active glycosides in peel extracts and juice, while saponins, terpenoids, and anthraquinones were absent in all fractions of *Citrus medica*.

Alkaloids were present in ethyl acetate and ethanolic extract of *C. medica* peel extract and absent in fresh *C. medica* juice, Amino acids were present in fresh juice and 80% ethanol fraction of peel and absent in ethyl acetate extract of *C. medica*. Coumarin was present in ethyl acetate and 80 % ethanol fraction of peel of *C. medica* and absent in fresh juice of *C. medica*.

**Table 2: Preliminary phytochemical screening of peel and juice of *Citrus medica*.**

Phytochemicals	<i>Citrus medica</i> peel		<i>Citrus medica</i> juice
	Ethyl acetate	Ethanol 80%	
Carbohydrates	Positive (+)	Positive (+)	Positive (+)
Alkaloids	Positive (+)	Positive (+)	<b>Negative (-)</b>
Flavonoids	Positive (+)	Positive (+)	Positive (+)
Phenols	Positive (+)	Positive (+)	Positive (+)
Tannins	Positive (+)	Positive (+)	Positive (+)
Saponins	<b>Negative (-)</b>	<b>Negative (-)</b>	<b>Negative (-)</b>
Steroids	Positive (+)	Positive (+)	Positive (+)
Terpenoids	<b>Negative (-)</b>	<b>Negative (-)</b>	<b>Negative (-)</b>
Amino acids	<b>Negative (-)</b>	Positive (+)	Positive (+)
Coumarin	Positive (+)	Positive (+)	<b>Negative (-)</b>
Anthraquinones	<b>Negative (-)</b>	<b>Negative (-)</b>	<b>Negative (-)</b>

### 3. Quantitative phytochemical analysis of *C. medica* Juice and peel

The quantitative phytochemical analysis of peel extract and juice of *C. medica* revealed the amount of phenol, flavanoid and tannin content mg/g of dry extract. In the analysis the phenolic content was higher in the peel extract of 21.18 mg/g compared to juice of *C. medica* (9.38 mg/g). The flavonoid content was higher in peel extract of 4.59 mg/g compared to juice extract of 1.44mg/g. The tannin content was higher in peel extract of 32.20mg/g compared to juice extract of 8.3mg/g. Overall the quantitative estimation revealed that higher concentration of the phytochemicals were present in peel extract compared to the juice extract of *C. medica*. The results of Quantitative estimation of peel and juice extract of *C. medica* was displayed in Table .3.

**Table 3: Quantitative phytochemical analysis in peel and juice extract of *Citrus medica*.**

Phytochemicals (mg/g of dry extract)	Peel Juice (mg/g)	Juice (mg/g)
Total phenolic content	21.18	9.38
Total flavonoid content	4.59	1.44
Total tannin content	32.20	8.3

## DISCUSSION

Nutrition and health care are strongly interconnected and many plants have been consumed both as food and medicine (Pieroni, 2000). The consumption of edible plants plays a central role in the diet, but very few ethanopharmacological and phytopharmacological studies have dealt exhaustively with the

potential health benefits of such diets. On the other hand, studies on the antioxidant properties of specific plant foods and their phenolic constituents have become very impressive (Iorizzi *et al.*, 2001 and Martinez-Tome *et al.*, 2001). The *Citrus medica* (Citron) is a plant with fragrant fruit and leaves. It is a prominent member in the genus *Citrus* belonging to the Rutaceae or Rue family. It is also seen in Assam, central India and Western Ghats of India and more commonly present in the Mediterranean region and central and southern parts of America (Satishkumar *et al.*, 2014) The fruit juice of *Citrus medica* exerts antimutagenicity and anticancer effect (Taha *et al.*, 2012). Its aqueous and alcoholic extracts were found to be active as anti-helminthic with reference to both the paralysis and death times as compared to the piperazine citrate. Manisha V Kalariya *et al.* (2019) reported the Macroscopic, microscopic, phytochemical screening and thin layer chromatography analysis on different extract of *C. medica* fruit extract. Macroscopic study revealed the organoleptic properties of the fruit and microscopic study showed the presence of oil glands and vessels. Thin layer chromatography of methanolic extract of *C. medica* has been carried out and results were mentioned as Rf value. The preliminary phytochemical investigations indicated the presence of carbohydrates, amino acids, flavonoids, tannins and phenolic derivatives, steroids etc. Kabra *et al.*, 2012; Chan *et al.*, 2010 represented the presence of carbohydrates, flavonoids, phenols, steroids and absence of saponins, anthraquinones, coumarin in *C. medica*. In the present study, the preliminary phytochemical and quantitative estimation of peel and fruit extract of *C. medica* was analyzed and the result reported that peel extract of *C. medica* recognized higher quantity of phytochemicals compared to the juice extract of *C. medica*. Thus the peel extract of *C. medica* had better antioxidant and pharmacological compared to the raw juice extract.

## CONCLUSION

*Citrus medica* L. is the most ancient wild crop of citrus family known to have various pharmacological and nutraceutical properties. The results demonstrated the presence of bioactive constituents in peel and juice of *Citrus medica* including phenols, tannins, flavonoids, cardioactive glycosides, alkaloids, steroids, and coumarins. Phenols, tannins, alkaloids plays a major role in the antioxidant drug development, Thus the present phytochemical studies gives a start up for the pharmacological analysis of *C. medica*. These studies can also help the manufacturers for identification and selection of the raw material for drug production.

## Conflict of Interest

The Authors declare no conflict of Interest

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