



Original Research Article

Preliminary Phytochemical Screening of the fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* – A Comparative study

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ABSTRACT

Keywords

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The qualitative analysis of phytochemicals profile of fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* have shown the presence of bioactive secondary metabolites. Preliminary phytochemical analysis of the fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* are collected from north Chennai were used for the study. In this study hydro-alcohol, ethanol, ethyl acetate and aqueous extracts were used. Of all the four solvents ethyl acetate extract gave the best results in both qualitative and quantitative phytochemicals analysis. Hence, further studies can be carried out using the ethyl acetate extract of *Garcinia cambogia* and *Bauhinia variegata*. This study suggests that environmental features do have variation in phytochemical content and accumulation in plants. This study provides scientific details to investigate the phytochemicals in the fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata*.

Introduction

Medicinal plants are an important source of producing valuable bioactive secondary metabolites which are great importance for the health of individuals and societies. The medicinal values of the plants are due to the chemical substances that produce a definite physiological action on human body. (Rauf *et al* 2012, Uddin *et al* 2011, Qaisar *et al* 2012). The extract is derived from the dried fruit of the *Garcinia*

cambogia tree which is found in the forests of south India and south Asia. The main active ingredient is Hydroxycitric acid (HCA). It prevents the metabolism of carbohydrates to fats i.e it inhibits lipogenesis. It burns excess fats in the body, suppresses appetite to avoid over eating and increase the production of glycogen in the liver. *Bauhinia variegata* plant possesses the property to overcome

hypertension, elimination of cholesterol helping the body to develop elasticity to arterial walls and always used as a folk medicine. *Bauhinia variegata* leaves belongs to the family *caesalpinaceae* and also known white orchid semi-tropical tree with smooth or slightly ridged grey bark grows in moist rich soil in mild climates. The large fragrant blooms ranges in color from snowy to creamy white. The plant is approximately 15 feet in height, evergreen, deciduous, smooth-textured and veined.

Plant part extracts are used to isolate specific compounds that are targeted to the use of mankind. The basis of reporting compounds in plants is investigated from the fact that these plants have been used in traditional, folk and herbal medication. Many plant parts have been used in culinary purposes. It is evident from studies that chemicals do not act alone but most of the time it is in a combination of complexes. This property of a medicinally active bio-compound and is helping in the treatment of ailments. Crude drug (Marjorie Murphy Cowan, 1999) and isolation of compounds, its purification and its clinical study have shown that these chemicals behave differently in invitro conditions. So, preliminary detection of phytochemicals in qualitative and quantitative traits should be analysed. The phytochemical investigation is related to the traditional knowledge of which plant part is used in crude drug administration (Rajasab, A.H.2004).

The plant *Garcinia cambogia* belongs to the family Guttiferae {Clusiaceae}. It is a wild sub tropical and tropical plant. The plants are shrubs or trees with yellow or greenish juice. The fruits of the plant are commercially important for its valuable chemical components like hydroxyl citric acid, tarteric acid, camogin, euxanthone,

gucinol, reducing sugars and fats. The plant is commercially important as their fruit extracts are used for various treatments such as astringent, demulcent, rheumatism, bowel complaints and purgative (Dmitriy Obolskiy *et al* 2009).

The plant *Bauhinia variegata* (Caesalpinaceae) commonly known as Mountain Ebony is a medium sized, deciduous tree, found throughout India. The various parts of the plant with flower, buds, stem, bark, leaves, seeds and roots are practiced in various indigenous system of groups in india for the cure of variety ailments. It has been used in dyspepsia, bronchitis, leprosy, ulcer, to prevent obesity, as an astringent tonic and an anthelmintic. In the present study the phytochemicals present in *Bauhinia variegata* and *Garcinia cambogia* have been investigated to study its role in obesity

Materials and Methods

Collection and processing of plant samples

The fruit rinds of *Garcinia cambogia* and leaves of *Bauhinia variegata* were collected from the local area during the month of December. The taxonomic identification of plant material was done by Prof. P. Jayaraman, National Institute of Herbal Science (PARC), Chennai. (Authentication No PARC/2013/468 & PARC/2013/1469).

The fruit rinds of *Garcinia cambogia* and leaves of *Bauhinia variegata* were washed with water, shade dried at room temperature and powdered coarsely. Exactly 10g of the course powder of fruit rinds and leaves were taken in 100ml various solvents such as ethanol, hydro

alcohol, aqueous and ethyl acetate. The extracts were refrigerated for 72 hours and filtered through Whatmann filter paper No.1. Qualitative tests were conducted on these extracts. Powder analysis were conducted in ethyl acetate extract of these plants. Fluorescent characteristics features of fruit rinds and leaves in ethyl acetate extracts were conducted under UV light at 360nm.

Phytochemical screening procedure

Qualitative tests for alkaloids, flavonoids, carbohydrates, glycosides, saponins, tannins, Terpenoids, Proteins and Anthraquinone were performed according to the procedure described by Harborne *et al* (1973). Mayers test, Wagner s test for Alkaloids, Shinodas test for flavonoids, Benedicts test, Molisch s test for carbohydrates, Keller-Killani test for cardiac glycosides, Froth test for saponins, Lead acetate test for tannins, Salkowski test for terpenoids, Ninhydrin test and Biuret test for protein and Ammonia test for anthraquinone were performed.

Alkaloids: To 1ml of extract, add 2ml of Con.HCL then few drops of Mayer's reagent was added. Positive test shows green colour or white precipitate.

Tannins: To 1ml of extracts, add 2ml of 0.1% Ferric chloride. Positive test shows brownish green or blue black colouration.

Saponins: To 1ml of extract, add 2ml of distilled water and shaken vigorously and allowed to stand for 10 min. There is the development of foam on the surface of the mixture. Then shake for 10 minutes, it indicates the presence of saponins.

Anthraquinones: To 1ml of the extract, add 10ml of benzene, filter and add 5ml of

10% (v/v) ammonia to the extracts and shake well. Development of pinkish coloured solution indicates the presence of anthraquinones.

Phenolic flavonoids: To 1ml of extracts add 5ml of Folin's ciocalteau reagent 4ml of sodium carbonate Appearance of blue colour shows the presence of phenol.

Flavonoids: To 1ml of extract add 2ml of 1% aluminium solution. Appearance of yellow colour indicates the presence of flavonoids.

Carbohydrates: a) To 1ml of extract, add 5ml of Benedicts reagent and boil for 5 minutes. Bluish green colour indicates the presence of carbohydrates. b) To 1ml of extract add few drops of Molisch's reagent and few drops of concentrated sulphuric acid which gives purple colour.

Amino acids: To 1ml of filterate, few drops of 0.2% ninhydrin was added and heated for 5 minutes. Formation of blue colour indicates the presence of aminoacid.

Steroids: To 1ml of the filterate add 10ml of Chloroform and 10ml of sulphuric acid slowly by the sides of the test tube. Positive indication if upper layer turns red and sulphuric acid layer showed the yellow colour with green fluorescent.

Terpenoids: Take 1ml of filterate add 2ml of chloroform and carefully add few drops of concentrated sulphuric acid. An interface with a reddish brown colouration is formed showing presence of terpenoids.

Cardiac glycosides: To 1ml of extract, add 1ml of Ferric chloride reagent and few drops of concentrated sulphuric acid. Greenish blue colour appears within few

minutes indicating presence of cardiac glycosides.

Phlobatannins: To 1ml of extract, add few drops of 1% aqueous hydrochloric acid. A red precipitate is formed indicating the presence of phlobatannins.

Results and Discussion

Phytochemical Screening

Table.1 shows the qualitative analysis of various extracts of *Garcinia cambogia*. It is observed from table 1 that the ethyl acetate and ethanolic extracts contain high amounts of flavonoids, phenols, terpenoids and saponins. Table 2 shows the phytochemicals present in various extracts of *Bauhinia variegata*. It is noticed from the table that ethyl acetate extract contain high amount of flavonoids, terpenoids, phenols, carbohydrates, saponins and sterols than of the three extracts.

Alkaloids are used medicinally. They provide information to determine lead structures of novel synthetic drugs. These compounds have antimicrobial activity by inhibiting DNA topoisomerases (Bonjean *et al* 1998). Saponins present in plants have been suggested as possible anticarcinogens. However, the anticarcinogenic effects of saponins from commonly consumed plant foods have not been studied (Rao *et al* 1995). It shows beneficial effects on blood cholesterol levels, cancer, bone health and stimulation of the immune system. Flavonoids are a large family of low molecular weight polyphenolic compounds which include flavones, flavonones, isoflavones, flavonols, flavon-3-ols and anthocyanins. It is widely distributed in plants fulfilling many functions. Flavonoids are generally non-nutritive agents. They possess remarkable

antioxidant activities and inhibit enzyme activities like lipoxygenase, cyclooxygenase and prostaglandin synthase. Flavonoid compounds have proved of greater general interest to the plant taxonomist, both in respect of general angiosperm taxonomy and for detailed studies of gene flow at the specific and intra-specific levels. Extraction, separation and identification of these substances need to be assessed (Mabry *et al* 1970). Phenols are found in the natural world, especially in the plant kingdom. The antioxidant activity of phenol is mainly due to their redox properties, hydrogen donor and singlet oxygen quenchers. Some phenols are proved to have hypotensive effects and antioxidant properties. Phenolic compounds are one of the largest and most ubiquitous groups of plant metabolites (Singh *et al* 2007). Naturally antioxidant in plants is in the form of phenolic compounds such as flavonoids, phenolic acids, tocopherols etc (Ali *et al* 2008). Biological activities of phenolic compounds involves free radical scavenging in cells (Rice-Evans *et al* 1995), (Cespedes *et al* 2008) (Reddy *et al* 2008).

Tannins are a group of natural products widely distributed in plants. They are currently investigated for human medicinal use (Augustin Scalbert 1991) to help reduce the risk of coronary heart diseases (Janaky Ranjithkumar 2010). They are divided into two basic groups such as hydrolysable and condensed type. Hydrolysable tannins are normally recommended for treatment of inflammation, ulceration and tropical application for skin diseases. Tannins play an effective role in protecting the kidneys. Tannins have shown potential antiviral, antibacterial and antiparasitic effects.

Table.1 Qualitative analysis of phytochemicals present in the extracts of *Garcinia cambogia*

S.No	Compounds	Ethyl acetate Extract	Ethanollic Extract	Hydroalcoholic Extract	Aqueous Extract
1.	Flavonoids	+++	+++	++	-
2.	Terpenoids	+++	+++	+	-
3.	Phenols	+++	+++	++	+
4.	Tannins	+++	++	-	-
5.	Cardiac glycosides	++	++	+	-
6.	Carbohydrates	++	++	+	-
7.	Saponin	+++	++	+	+
8.	Amino acids	+	+	+	-
9.	Phlobatannin	+	++	-	-
10.	Sterols	++	++	+	-
11.	Coumarin	++	+	-	+

+++ = Present in higher amounts + = Present
 ++ = Moderately present - = Absent

Table.2 Qualitative Analysis of Phytochemicals Present in the extracts of *Bauhinia variegata*

S.No	Compounds	Ethyl acetate Extract	Ethanollic Extract	Hydroalcoholic Extract	Aqueous Extract
1.	Flavonoids	+++	+++	++	++
2.	Terpenoids	+++	++	++	-
3.	Phenols	+++	++	++	+
4.	Tannins	++	+	++	-
5.	Cardiac glycosides	++	++	++	+
6.	Carbohydrates	+++	++	++	+
7.	Saponin	+++	++	+	+
8.	Amino acids	+	+	+	-
9.	Phlobatannin	-	-	-	-
10.	Sterols	+++	++	++	-
11.	Coumarin	++	++	+	+

+++ = Present in higher amounts + = Present
 ++ = Moderately present - = absent

Table.3 Powder analysis of *Garcinia cambogia* and *Bauhinia variegata* with chemical agents

Reagents	Color observed	
	<i>Garcinia cambogia</i>	<i>Bahunia variegata</i>
Plant Extract as such	Brownish black	Green
Plant Extract + Concentrated HCL	Green	Green
Plant Extract + Concentrated H ₂ SO ₄	Brownish black	Black
Plant Extract + 5% Sodium hydroxide solution	Yellow	Green
Plant Extract + 5% KOH solution	Yellowish green	Yellowish green
Plant Extract + Concentrated HNO ₃	Yellow	Yellow
Plant Extract + Picric acid	Yellowish green	Yellowish green
Plant Extract + Ammonia	Yellow	Light green

Table.4 Fluorescent characteristic features of the *Garcinia cambogia* and *Bauhinia variegata*

Reagents	Color observed	
	<i>Garcinia cambogia</i>	<i>Bauhinia variegata</i>
Plant Extract as such	Brownish black	Green
Plant Extract + 1N NaOH in Methanol	Brown	Green
Plant Extract + 1N NaOH in water	Brownish Green	Yellowish green
Plant Extract + 50% HCl	Light green	Yellowish Green
Plant Extract + 50% Sulphuric acid	Brown	Black green
Plant Extract + 50% Concentrated HNO ₃	Yellow	Brown
Plant Extract + Petroleum ether	Brown	Light green
Plant Extract + Chloroform	Brown	Dark green
Plant Extract + Picric acid	Yellowish Green	Yellowish Green
Plant Extract + Ferric chloride	Yellow	Yellowish Green
Plant Extract + Methanol	Yellow	Light green
Plant Extract + HNO ₃ + NH ₃	Yellow	Red

Phlobatannins have diuretic property. Ethyl acetate extract and ethanolic extract shows the presence of phlobatannins. Benedict's test shows that high amounts of carbohydrates are present in the leaves from all region. Ethyl acetate, ethanolic extract and hydroalcoholic extracts showed positive results for carbohydrates. *Garcinia cambogia* and *Bauhinia variegata* showed the presence of amino acids in ethyl acetate, ethanolic extract and

hydroalcoholic extracts. *Garcinia cambogia* and *Bauhinia variegata* showed the presence of sterols in ethyl acetate, ethanolic extract and hydroalcoholic extracts. Steroids have their potential in pharmaceutical research. Steroids have been targeted as anti-inflammatory and analgesic agents.

Garcinia cambogia and *Bauhinia variegata* shows the presence of cardiac

glycosides and very less amount in hydroalcoholic extracts in *Garcinia cambogia*. *Garcinia cambogia* shows the presence of coumarin in ethyl acetate extract, ethanolic and aqueous extract. Whereas in *Bauhinia variegata* it was present in all the extracts. Powder analysis of fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* are shown in table 3 and fluorescent characteristic features of fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* are shown in table 4.

Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. They often have pharmacological effects and are used as medications and recreational drugs (Rhoades, 1979). Flavonoids enhance the effects of Vitamin C and function as antioxidants. They are also known to be biologically active against liver toxins, tumors, viruses and other microbes (Korkina et al., 1997). Plant terpenoids are used extensively for their aromatic qualities. Tannins have shown potential Antiviral, Antibacterial and Antiparasitic effects. Saponins cause hemolysis of red blood cells (Winter et al., 1993). Cardiac glycosides are drugs used in the treatment of congestive heart failure and cardiac arrhythmia. Most phytochemicals have antioxidant activity and protect our cells against oxidative damage and reduce the risk of developing certain types of cancer.

Phytochemical screening of the plants showed the presence of flavonoids, terpenoids, saponins, tannins and reducing sugars. Most phytochemicals have antioxidant activity and protect our cells against oxidative damage and reduce the risk of developing diseases. The powder analysis of fruit rind of *Garcinia cambogia* and *Bauhinia variegata* were

carried out in ethyl acetate extract to observe the reaction of various phytochemicals with acids and alkalies. The fluorescent characteristics features of fruit rind of *Garcinia cambogia* and leaves of *Bauhinia variegata* in ethyl acetate extract were conducted under UV light at 360nm.

The phytochemical evaluation can be used for further assessment of secondary metabolites. This investigation will help in further extraction analysis of compounds from various parts of *Garcinia cambogia*. The present study reveals that all the extracts have significant amount of phytochemical properties. The major phytochemical constituents in *Garcinia cambogia* is Hydroxy citric acid. This principle acid has been found to suppress the fatty acid synthesis, lipogenesis, food intake and promote glycogenesis, gluconeogenesis and induced weight loss. The leaves of *Bauhinia variegata* of these extracts might be attributed to its phytochemical constituents. Thus it has a greater importance as therapeutic agent in weight loss by inhibiting fat production and suppressing appetite. The extract of the leaves of *Bauhinia Variegata* shows the presence of many bioactive secondary metabolites.

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