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PHARMACOGNOSTIC PROFILE AND PHYTOCHEMICAL ANALYSIS OF *CINNAMONUM ZEYLANICUM* BARK EXTRACTS.

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Abstract

Plants are still an independent source of medication in the contemporary health care delivery system. Their role is twofold in the development of medicines and served as a natural blue print for the development of new drugs, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. Knowledge of herbs has been handed down from generation to generation for thousands of years. Herbal drugs constitute a major part in all traditional systems of medicines. The medicinal plants find application in pharmaceutical, cosmetic, agricultural and food industry. In last few decades, *Cinnamonum zeylanicum* is extensively studied for its medicinal properties by advanced scientific techniques and a variety of bioactive compounds have been isolated from the different parts of the plant and were analysed pharmacologically. In our present investigation, pharmacognostic profile and phytochemical analysis of *Cinnamonum zeylanicum* bark has been evaluated for the presence of bioactive compounds. The study revealed the presence of alkaloids, flavonoids, proteins, terpenoids, phenolic compounds, sterols, carbohydrates, glycosides and tannins. The results suggest that methanolic extract of *Cinnamonum zeylanicum* bark has promising therapeutic potential, its pharmacological properties which if proper harness can be used in the management of various diseases. Further, extensive study will provide a good source of medicinally important drugs in future and can serve as a base for the development of novel potent drug in ethomedicine.

INTRODUCTION

India has a rich culture of medicinal herbs and spices, which includes about more than 2000 species and has a vast geographical area with high potential abilities for Ayurveda, Unani, Siddha, traditional medicines but only very few have been studied chemically and pharmacologically for their potential medicinal value[1,2]. Plants above all other agents have been used for medicine from time immemorial because they have fitted the immediate personal need and are easily accessible and inexpensive[3]. An impressive number of modern drugs have been World Health Organization medicinal plants would be the best source to obtain a variety of drugs[5]. Recently, much attention has directed towards extracts and biologically active compounds isolated from popular plant species. In the present era of drug development and discovery of newer drug molecules & many plant products are evaluated on the basis of their traditional uses[6].

Cinnamon (*Cinnamomum verum*, synonym *C. zeylanicum*) is a small evergreen

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tree, 10-15 meters (32.8-49.2 feet) tall, belonging to the family Lauraceae, native to Sri Lanka and South India. The flowers, which are arranged in panicles, have a greenish colour and have a distinct odour. The fruit is a purple one-centimeter berry containing a single seed. Its flavour is due to an aromatic essential oil which makes up 0.5 to 1% of its composition[7]. The bark of various cinnamon species is one of the most important and popular spices used worldwide not only for cooking but also in traditional and modern medicines. Overall, approximately 250 species have been identified among the cinnamon genus, with trees being scattered all over the world[8,9].

C. zeylanicum has many biological properties as analgesic, antiseptic, antispasmodic, insecticidal and parasiticide, astringent, anti-inflammatory, antioxidant, antidiabetic, anticancer agent[10]. Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes, and medicinal products. The most important constituents of cinnamon are cinnamaldehyde and trans-cinnamaldehyde (Cin), which are present in the essential oil, thus contributing to the fragrance and to the various biological activities observed with cinnamon[11]. Cinnamon bark contains procyanidins and catechins. The components of procyanidins include both procyanidin A-type and B-type linkages. These procyanidins extracted from cinnamon and berries also possess antioxidant activities[12-14].

Phytochemicals are natural and non-nutritive bioactive compounds produced by plants that act as protective agents against external stress and pathogenic attack[15]. Plants are rich in a wide variety of secondary metabolites (phytochemicals), such as tannins, terpenoids, alkaloids, and flavonoids, which have been found *in vitro* to have antimicrobial properties. In many cases, these substances serve as plant defense mechanisms against predation by microorganisms, insects, and herbivores. Some, such as terpenoids, give plants their odors; others (quinones and tannins) are responsible for plant pigment. Based on their biosynthetic origin, phytochemicals can be divided into several categories: phenolics, alkaloids, steroids, terpenes, saponins, etc. Phytochemicals could also exhibit other bioactivities such as antimutagenic, anticarcinogenic, antioxidant, antimicrobial, and anti-inflammatory properties[16]. To promote the proper use of herbal medicine and to determine their potential as sources of new drugs, it is essential to study the medicinal plants which have folklore reputation in a more intensified way[17]. In response to the mounting importance of phytochemicals, the present study was carried out in order to reveal the pharmacognostic profile and bioactive compounds present in the bark extracts of *C. zeylanicum*.

MATERIALS AND METHODS

Collection and identification of plant material

The specimen was collected from Idukki, Kerala and authenticated by Botanical Survey of India, Coimbatore, India. The bark of *C. zeylanicum* were washed thoroughly 2-3 times with running tap water and once with sterile distilled water, air dried at room temperature on a sterile blotter. After complete drying, barks were powdered well using a mixer. Then the powdered material was weighed and kept in air tight container and stored in a refrigerator for future use. About 10g of this powdered sample was refluxed with methanol and aqueous in the ratio of 1:10 (w/v). The crude extracts were collected in amber coloured sample bottles and stored. All chemicals and reagents used including the solvents were of analytical grade.

Pharmacognostic Profile

Physico-chemical evaluation

Ash Values

The determination of various physicochemical parameters such total ash, water-soluble ash, alkalinity of water soluble and acid insoluble ash values of the powdered

material was determined as per the Indian Pharmacopoeia[18].

Extractive values

Extract of the powdered bark were prepared with different solvents for the study of extractive values[19].

Fluorescence Analysis

A small quantity of dried and finely powdered material was placed in a clean grease-free microscopic slide, treated with 1-2 drops of the freshly prepared reagent solution, mixed gently by tilting the slide and waited for 2-4 minutes. The slide was then viewed day light and ultraviolet radiations (365nm). The colours observed on application of different reagents in different radiations were recorded[20].

Phytochemical Analysis

Chemical analysis was carried out in methanolic and water extracts of the bark of *C. zeylanicum* using standard procedures to identify constituents, as described by Trease and Evans (1979), Harborne (1984), Sofowara (1993) and Raaman (2008)[21-24].

Test for alkaloids

Dragendroff's test

To 5 mL of the extract few drops of Dragendroff's reagent was added for the formation of orange coloured precipitate.

Wagner's test

To 5 mL of the extract few drops of Wagner's reagent was added for the formation of reddish brown coloured precipitate.

Test for flavonoids

To 3 mL of the extract few magnesium ribbons are dipped and conc. HCl was added over them and observed for the formation of magenta (brick red) colour indicating the presence of flavonoids.

Test for proteins

Biuret test

To 3 mL of the extract few drops of 10% sodium chloride and 1% copper sulphate was added for the formation of violet or purple color. On addition of alkali, it becomes dark violet.

Millon's test

To 3 mL of the extract few drops of Millon's reagent was added for the formation of red colour.

Test for carbohydrates

Molisch's test

To a small amount of the extract few drops of Molisch's reagent was added followed by the addition of conc. H_2SO_4 along the sides of the test tube. The mixture was then allowed to stand for 2 min and then diluted with 5 mL of distilled water. Formation of red or dull violet colour at the inter phase of two layers indicates the presence of carbohydrates.

Fehling's test

The extract was treated with 5 ml of Fehling's solution (A and B) and kept in boiling water bath. The formation of yellow or red color precipitate indicates the presence of reducing sugar.

Test for tannins

A fraction of the extract was dissolved in water and then it was subjected to water bath at 37°C for 1 hour and treated with ferric chloride solution and observed for the formation of dark green colour.

Test for sterols

Liebermann-Burchard test

To a small amount of the extract few drops of chloroform, acetic anhydride and H_2SO_4 was added along the sides of the test tube to observe the formation of dark red or pink colour.

Test for glycosides

Baljet's Test

To 5 mL of the extract few drops of sodium picrate was added to observe yellow to orange colour.

Keller-Killiani test

To 5 mL of the extract few drops of ferric chloride solution was added and mixed, then sulphuric acid containing ferric chloride solution was added, it forms two layer showed reddish brown while upper layer turns bluish green indicates the presence of glycosides.

Test for phenols

Ferric chloride test

A fraction of the extract was treated with 5% ferric chloride solution and observed for the formation of deep blue or black colour.

Test for saponins

Foam test

To a small amount of the extract few drops of distilled water was added and shaken vigorously until persistent foam was observed.

Test for terpenoids

Chloroform test

To 5 mL of the extract few drops of chloroform and conc. H_2SO_4 was added carefully along the sides of the test tube to form a layer and observed for the presence of reddish brown colour.

RESULTS AND DISCUSSION

Indigenous herbs are used as remedies against various diseases in the traditional system of medicine or in ethnomedical practices. The uses of different parts of several plants are in vogue from ancient times[25].

Ash values

The powdered material was evaluated for its physico-chemical parameters like Ash values, Water soluble ash, Acid Insoluble ash and the results are shown in Table 1.

Types of Ash value	Observation (% w/w)
Total ash	2.74
Water soluble ash	5.81
Acid insoluble ash	1.36

Table 1 - Physico-chemical studies of *C. zeylanicum* bark

Extractive values

Extractive values of the successive extracts of bark of *C. zeylanicum* are given in Table 2.

Solvents	Extract values (% w/w)
Methanol	18.23
Water	10.57

Table 2 - Percentage of successive extracts of *C. zeylanicum* bark

Fluorescence analysis

The powdered sample of *C. zeylanicum* bark was subjected to fluorescence analysis, results are tabulated in Table 3.

Plant sample	Day light	UV light (365nm)
Powder	Dark Brown	Greenish
Powder + NaOH	Reddish Yellow	Brown Blackish
Powder + Acetone	Brown Brownish	Yellow Blue
Powder + HCl	Yellow	Dark Brown
Powder + HNO_3	Reddish Brown	Blackish Blackish
Powder + Acetic acid	Brown Yellowish	Brown Brown
Powder + $CHCl_3$	Brown Brownish	Brownish
Powder + Iodine	Black Reddish Black	Black Bluish
Powder + H_2SO_4		

Table 3 - Fluorescence analysis of *C. zeylanicum* bark

Phytochemical Analysis

Powdered *C. zeylanicum* bark were subjected to various qualitative tests for the identification of phytochemical constituents includes tests for alkaloids (Dragendroff's test, Hager's test, Wagner's test), saponins, glycosides (Baljet's test, Kellar-Killiani test), carbohydrates (Molisch's test, Fehling's test), proteins (Biuret test, Millon's test), tests for tannins, flavonoids, steroids (Liebermann-burchard test), phenols,

terpenoids were performed using specific reagents and results are tabulated in Table 3. Phytochemical screening results of the powdered sample of *C. zeylanicum* bark extracted in aqueous showed the presence of tannins, flavonoids, glycosides Phenols, whereas the methanolic extract showed the presence of many bioactive compounds such as proteins, carbohydrates, tannins, flavonoids, steroids, phenols, terpenoids, saponins.

Phytochemicals	Aqueous	Methanol
Alkaloids	-	+
Flavonoids	+	+
Proteins	-	+
Carbohydrates	+	+
Tannins	+	+
Sterols	-	-
Glycosides	+	+
Phenols	+	+
Saponins	-	+
Terpenoids	-	+

'+' present, '-'absent

Table 4 - Phytochemical screening of *C. zeylanicum* bark in various extracts

The various phytochemical compounds found in plant are known to have beneficial medicinal importance. Saponins have the property of precipitating and coagulating red blood cells. Some of the characteristics of saponin include formation of foams in aqueous solutions, hemolytic activity, cholesterol binding properties[26,27]. Flavonoids have been referred to as nature's biological response modifiers, because of their inherent ability to modify the body's reaction to allergies and virus[28]. Tannins bind to proline rich protein and interfere with protein synthesis[29]. Chemical investigation on the different parts of the plant has resulted in the isolation of a large number of novel and interesting metabolites[30].

CONCLUSION

The millenarian use of *C. zeylanicum* in folk medicine suggests that they represent an economic and safe alternative to treat various diseases. Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants. Therefore, such plants should be investigated to better understand their properties, safety and efficiency. In our prospective study, the methanolic extract of the bark of *C. zeylanicum* has revealed the presence of alkaloids, flavonoids, proteins, glycosides, phenols, terpenoids, tannins and carbohydrates. The use of traditional medicine is widespread and plants still present a large source of novel active biological compounds with different activities, including anti-inflammatory and cardioprotective activities. Pharmacologists are increasingly turning their attention to folk medicine, as the current drugs in the market have several side effects and an effective means to sustain is still a challenge. Several studies have to be conducted with new or modified versions of existing drugs. As the pharmacologists are looking forward to develop new drugs from natural sources, development of modern drugs from *C. zeylanicum* can be intended for their better monetary and therapeutic utilization. Hence, the present study confirms the credible of the plant rich source of therapeutic value.

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CONFLICTS OF INTEREST

None declared.

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