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Research Article

Phytochemical Screening Of Crude Drugs Of Zingiberaceae Family

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ABSTRACT

The phytochemical screening of drugs within the Zingiberaceae family, including notable members like Ginger (Zingiber officinale), Turmeric (Curcuma longa), and Cardamom (Elettaria cardamomum), reveals a rich array of bioactive constituents such as sugars, proteins, alkaloids, glycosides, tannins, phytosterols, and flavonoids. These compounds offer diverse medicinal properties, making them significant in the modern world. Ginger, renowned for its anti-inflammatory and digestive benefits, finds extensive use in traditional medicine and culinary practices globally. Turmeric, with its potent antioxidant and anti-inflammatory effects primarily attributed to curcumin, is increasingly recognized in modern medicine for conditions ranging from arthritis to cardiovascular health. Similarly, Cardamom, appreciated for its aromatic and digestive properties, is finding applications in alleviating gastrointestinal issues and enhancing overall wellness. The phytochemical insights into these Zingiberaceae family members not only deepen our understanding of their traditional uses but also highlight their potential for novel therapeutic interventions in contemporary healthcare.

INTRODUCTION

Plants have been used worldwide for centuries, and today's interests are turning to alternative medicine such as Ayurveda, naturopathy, homeopathy and herbal medicine. The roots of this date back thousands of years. Herbs have been used for approximately 5,000 years and have become a niche market as many people prefer herbs over synthetic drugs. [1-3] Herbs have many advantages compared to allopathic medicines, including cost-effectiveness and ease of purchase from health stores without a prescription. Herbs have also been found to be more effective than medications for certain ailments and also have fewer side effects. They can aid the body's detoxification process by using herbs such as Plantago psyllium seed, rhubarb juice powder, aloe vera, alfalfa juice, chlorella, carrots, and garlic to cleanse the intestines, improve food digestion, absorb nutrients, and increase attention. Digestive disorders such as indigestion, colic indigestion can be treated with herbal treatments.

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In addition, medicinal plants play a role in treating heart diseases and lowering cholesterol. It may also help with weight control and appetite control. Systems of medicine such as Ayurveda, Siddha and Unani have deep roots in ancient Indian scriptures such as the Vedas, have stood the test of time and continue to provide insight into healing. [4] Similarly, traditional medicine used around the world, including Traditional Chinese Medicine, Kampo Medicine, Korean Medicine, and Unani Medicine, utilize the power of natural products, although some may not be effective, and represent centuries of human experience. [5,6]

Herbal Medicines

Herbs have been used worldwide for over 5,000 years. Herbal medicine, this medicine contains substances derived from plants and used to maintain or improve health. These include herbs, herbal products, preparations and finished products containing essential ingredients derived from plants or other plant products, alone or in combination.[7,8] Additionally, plant-derived products or products with therapeutic or health promoting properties may contain raw or processed ingredients derived from one or more plants. Some traditions may use inorganic material or animals parts. Herbal medicine involves the use of plants for prevention, treatment, or general health, including the use of pills and tinctures. For example, ginger tincture can be used to relieve stomach pain. This practice is also called herbal medicine, phytotherapy or phytotherapy. [9]

Phytochemicals Present In Herbal Medicine

Phytochemicals found in plants are naturally occurring compounds produced by plants as secondary metabolites. Although these chemicals are not directly required for the plant's survival, they interact with the environment, including bacteria, herbivores, and insects, to enhance the plant's ability to thrive. The effects of phytochemicals on the human central nervous system may be related to their ecological role in plant life or to the molecular and biochemical similarities between plants and higher animals. Phytochemicals and extracts can be classified by their chemical properties, alkaloids (e.g. caffeine, nicotine), and potential secondary metabolites that are converted to terpenes (found in plants such as ginkgo biloba, ginseng, valerian, and lemon balm and sage) and phenolic compounds (e.g. curcumin, resveratrol, epigallocatechin-3-gallate, St. John's wort, perforin, and soy isoflavones). These secondary metabolites perform a variety of functions, including providing general protection against oxidation, free radicals, and ultraviolet radiation. It also protects plants from diseases such as bacteria, fungi, and viruses and acts as an allelopathic defense against competing plants by regulating interactions between plants. Some phytochemicals act on the central and peripheral nervous systems to prevent herbivores from suffering or becoming poisoned. [10,11]Phytochemicals are bioactive compounds derived from plants found in whole grains, fruits, vegetables, nuts, and herbs. To date, more than a thousand phytochemicals have been identified, including carotenoids, polyphenols, isoprenoids, phytosterols, saponins, dietary fiber, and some polysaccharides. This compound has powerful antioxidant properties and has antibacterial, antifungal, antibacterial, antifungal and antibacterial properties. It also regulates reproduction, improves communication between cells, boosts immunity, and protects against lung disease and cancer. [12-20]

Zingiberaceae Family

The Zingiberaceae Family, also known as the ginger family among flowering plants, stands as the largest family within the Zingiberales order. It comprises aromatic perennial herbs characterized by creeping horizontal or tuberous rhizomes. These fragrant herbs thrive in moist tropical and subtropical regions, including some areas prone to seasonal dryness, spanning across continents like

Africa, Asia, and the Americas. They yield a variety of valuable products such as food ingredients, spices, medicinal substances, dyes, and perfumes. [21] Notably, the ginger family encompasses 56 genera and exceeds 1,300 species. [23]India emerges as one of the most abundant and diverse regions for Zingiberaceae, boasting around 20 genera and over 200 species. [22]

Physical description

Plants belonging to the Zingiberaceae family are perennials with sympodial (forked) fleshy rhizomes, usually underground stems. They can reach a height of up to 6 meters (20 feet). Some species of this family display epiphytic tendencies. This means that they are supported by other plants and their aerial roots are exposed to a moist atmosphere. The curled bases of the leaves sometimes form short aerial stems. The sepals, which are usually green, have a different texture and color than the petals. The bracts, which are leaf-like structures, are arranged in a spiral, and the inflorescences are spiral and conical. Flowers of the Zingiberaceae family resemble orchids because of their sponges consisting of two or three fused stamens connected by a pair of petal-like sterile stamens. Nectar is present in thin floral tubes. These colorful flowers can only bloom for a few hours and are believed to be pollinated by insects. [23]

Plants belonging to Zingiberaceae Family

Turmeric (Curcuma longa) , Cardamom (Elettaria cardamomum) , Ginger (Zingiber officinale) , Shellflower (Alpinia) , Ginger lily (Hedychium) , Greater Galangal , Mango Ginger , Amomum Cardamom , Bitter ginger , Aromatic Ginger , True cardamom , Kaempferia , Curcuma zedoaria , Galangal , Globba , Grains of Paradise , Kaempferia rotund , Zingiber montanum , Red ginger , Etlingera elatior , Boesenbergia , Curcuma aromatic .
[23]

PLAN OF WORK

Collection

The rhizomes cultivated from farm are purchased from the local market .The rhizomes in market are harvested from field; the rhizomes are washed after scrapping them of dirt, roots and mould. The rhizomes are washed again and then dried under the sun. The rhizomes are turned after regular interval of time for their proper drying.

Drying

The rhizomes and fruits obtained from the Zingiberaceae family plants are placed under the shade for drying. By the drying process the moisture remaining in the crude drugs is evaporated then it is used for further processes. Drying period vary from days to week according to the moisture present in the said crude drug.

Extraction

The rhizomes and tubers were removed from the plant and dried in shade and then were powdered mechanically to get the coarse powder. Weighed quantity of coarse powder (1kg) was extracted with petroleum ether at 50° -60°C for 72 hrs. by hot percolation using a soxhlet apparatus. The marc left after the petroleum extract was dried and subsequently extracted with ethanol 95 % at 60°-70°C up to 72 hours in soxhlet apparatus. A brown residue was obtained after concentrating the alcoholic extract and kept in a desiccator.

Preliminary Phytochemical screening of ethanolic extracts.

The plants may be considered as biosynthetic laboratory for multitude of compounds like alkaloids, glycosides, volatile oils, tannins, saponins, flavonoids, sugar etc. that exerted physiological effect. These compounds are termed as secondary metabolites. To check the presence or absence of primary and secondary metabolites all the extracts were subjected to a various chemical tests. [24]

Test for Sugars

a. Molisch's Test

The Molisch's reagent was prepared by dissolving 10 g of alpha naphthol in 100 ml of 95 % alcohol. A few mg of the test residue was placed in a test tube containing 0.5 ml of water, and it was mixed with 2 drops of Molisch's reagent. To this solution, 1 ml of concentrated sulphuric acid was added from the side of the inclined test tube, so that the acid formed a layer beneath the aqueous solution, without mixing with it, red brown ring appeared at the common surface of the liquids indicated presence of sugars.

b. Fehling's Test

A Fehling's A and Fehling's B solution was mixed in equal volume immediately, 2 ml equal test extract was taken and a 2 ml of Fehling's solution was added to it. The mixture was then warmed, red precipitate of cupreous oxide was obtained, indicate reducing sugars present.

Test for proteins

a. Millon's Test

Aqueous solution of the extract was taken and to it 2 to 3 ml of Millon's reagent was added. The white precipitate turns to pink indicate presence of protein

b. Xanthoproteic Test

A little extract was taken with 2 ml of water and 0.5 ml of concentrated nitric acid to it. Yellow colour obtain indicate presence of proteins.

Test for amino acids Ninhydrin Test

The Ninhydrin reagent 0.1% w/v solution of Ninhydrin in n-butanol. A little of this reagent was added to the test extract. A violet or purple color develop indicate presence of amino acids.

Test for alkaloids

A few mg of the residue of each extract was taken separately in 5 ml of 1.5 % hydrochloric acid and filtered. These filtrates were then used for test of alkaloids.

a. Dragendorff's reagent

Dragendorff's reagent it was prepared by mixing solution a (17 g of bismuth sub nitrate + 200 g of tartaric acid + 800 ml distilled water) and Solution B (160 g potassium iodide + 400 ml distilled water) in 1: 1 v/v proportion. From this solution, working standard was prepared by taking 50 ml of this solution and adding 100 g of tartaric acid and making up to 500 ml with distilled water. Dragendorff's reagent was sprayed on Whatmann No. I filter paper then the paper was dried. The test filtrate after basification with dilute ammonia was extracted with chloroform and the chloroform extract was applied on the filter paper, impregnated with Dragendorff's reagent, with the help of a capillary tube. Development of an orange indicated the presence of alkaloids. color on the paper

b. **Mayer's Reagent (Potassium mercuric iodide reagent)**

1.36 g of mercuric chloride was dissolved in 60 ml of distilled water and 5 g potassium iodide dissolved in 10 ml of distilled water, both solutions were mixed and diluted to make up volume 100 ml. To a little of each extract taken in dilute hydrochloric acid in a watch glass, few drops of the reagent were added, formation of cream colored precipitate shows the presence of alkaloid.

c**. Wagner's Reagent (Iodine-potassium iodide)**

1.27 g of iodine and 2 g of potassium iodide were dissolved in 5 ml of water and the solution was diluted to 100 ml with water. When a few drops of this reagent were added to the test filtrate, a brown precipitate indicates the presence of alkaloids.

Test for Glycosides

Small quantity of extract were hydrolyzed with hydrochloric acid for two hours on a water bath and the hydrolysate was subjected to Legal's and Borntrager's test which detect the presence of cardiac and anthraquinone glycosides respectively.

a**. Legal's Test**

To the hydrolysate extract, I ml of pyridine and few drops of sodium. Nitroprusside solutions were

added, and then it was made alkaline with sodium hydroxide. Appearance of pink to yellow color was observed showed the presence of glycosides.

b. Borntrager's Test

Hydrolysate extract was treated with chloroform and the chloroform layer was separated. To this equal quantity of dilute ammonia solution was added. Appearance of a pink colour shows presence of glycosides.

Test for tannins

The test residue of each extract was taken separately in water, warmed and filtered. Tests were carried out with the filtrate using following reagents:

a. Ferric chloride test

A5% w/v solution of ferric chloride in 90 % alcohol was prepared. A few drops of this solution were added to a little of the above filtrate. Dark green or deep blue color obtain indicate presence of tannins.

b. Lead acetate test

A 10 % w/v solution of basic acetate in distilled water added to the test filtrate. Precipitate was obtain indicate presence of tannins.

c. Potassium dichromate test

On an addition of a solution of potassium dichromate in test filtrate, no dark color is develop indicate presence of tannins.

Test for Flavonoids (Shinoda test)

A small quantity of test extract was dissolved in 5 ml ethanol (95 % w/v) and treated
with a few drops of concentrated hydrochloric acid and 0.5 g of magnesium metal. A pink, crimson or magenta colour was developed within a minute or two, indicate presence of flavonoids.

Test for phytosterols

Small quantity of various extract was dissolved in 5 ml of chloroform separately and various tests were performed for the detection, of phytosterols.

a. Salkowaski test

To the 1 ml of above prepared chloroform solution few drop of concentrated sulfuric acid were added. Green colour produced, indicate presence of phytosterols.

Test for saponins

Foam Test

A few mg of the test extract was taken in a test tube and shaken vigorously with a small amount of sodium bicarbonate and water. A stable, characteristic honeycomb like froth obtained; indicate the presence saponins (Harborne et al., 1973).

Crude drugs of Zingiberaceae family

a. Ginger
b. Turmeric
c. Cardamom

GINGER

Scientific name of Ginger is Zingiber officinale . Ginger is obtained from the sun-dried rhizomes of Zingiber officinale and Roscose, and belongs to Family of Zingiberaceae.Country of origin: Ginger is produced in Jamaica, South India (Cochin), Africa and Japan.Ginger, its rhizome, ginger root or ginger root is a flowering plant widely used as a spice and in folk medicine. It is a perennial herbaceous plant with narrow leaves that grows up to one meter high on annual pseudo-stems.In folk medicine, it is used for indigestion, high blood pressure, arthritis, stomach and throat, vomiting, nausea, pneumonia, cold, cough, pain, inflammation, diarrhea, nausea, etc.[25- -27] Ginger is widely used in almost all South Asian cuisines. In India, it is used as a spice in cooking almost all vegetables and pulses. It can be pickled or used to make honey tea. It is also often called Adrak in India .

TURMERIC

Turmeric, scientifically known as Curcuma longa, is obtained from the dried and fresh rhizomes of Curcuma longa. It is native to regions such as West Pakistan, India, Malaysia and China, and is widely grown in the Indian states of Maharashtra, Tamil Nadu, West Bengal, Uttar Pradesh and Punjab. This perennial rhizomatous plant thrives

in temperatures between 20 and 30 Â°C (68 and 86 Â°F) and requires adequate rainfall each year. Harvest is done annually, with some rhizomes kept for display and some for consumption. The rhizome is used fresh or boiled and dried, then ground into a bright orange-yellow powder. This powder is used as a beautiful color and flavor in many Asian cuisines, especially in curries, and can also be used for dyeing purposes due to the curcumin (an important ingredient of turmeric) it contains. Turmeric powder imparts a warm, bitter taste reminiscent of black pepper, with an earthy mustard flavor. Curcumin is a yellow pigment found in turmeric and is accepted as a food supplement by the World Health Organization. It reduces swelling, pain and inflammation and is often used in Indian families to treat conditions such as osteoarthritis, hay fever, depression, high cholesterol, hepatitis, pruritus, wound healing and sore throat[28]. Turmeric is also sometimes called Indian saffron.

CARDAMOM

Cardamom, scientifically known as : Elettaria cardamomum , is obtained from the dry, mature seeds of the cardamom plant in the Zingiberaceae family. By region, cardamom cultivation is dominant in regions such as Ceylon, Sri Lanka and Myanmar. , Malaysia and India, especially Mysore and Kerala. Cardamom plant is an annual plant with a reed-like structure that can reach a height of 3-4 meters, and its fruits are usually seen on three to four year old plants. The fruits are arranged in clusters and bloom and bear fruit regularly throughout the year. The fruits are harvested when they approach maturity. Plants have many uses such as aromatic, carminative, sweetening, stimulant, digestive aid, expectorant and treating headaches, diarrhea and colds[29]. Its unique aroma and taste make it a popular sweetener in many Indian desserts, and it is especially used in chai tea. Also cardamom is often called "Elaichi''.

RESULT OF PHYTOCHEMICAL SCREENING OF CRUDE DRUGS OF ZINGIBERACEAE FAMILY.

Name of Test	Ginger	Turmeric	Cardamon
For Sugars	Present	Present	Present
A. Molisch Test			
B. Fehling's Test	Present	Present	Present
For Proteins			
A. Millions Test			
B. Xanthoproteic Test	Present	Present	Present
For Amino Acids	Absent	Absent	Absent
A. Ninhydrin Test			
For Alkaloids	Present	Present	Present
A. Dragondorff's Reagents			
B. Mayers Reagent	Present	Present	Present
C. Wagner's Reagent	Present	Present	Present
For Glycosides	Present	Absent	Present
A. Legals Test			
B. Borntrager's Test	Absent	Absent	Absent
For Tannins	Absent	Present	Absent
A. Ferric Chloride Test			
B. Lead Acetate Test	Present	Present	Present
C. Potassium Dichromate Test	Present	Present	Present
For Flavonoids	Present	Present	Present

A. Shinoda Test			
For Phytosterols A. Salkowaski Test	Present	Present	Present
For Saponins A. Foam Test	Absent	Absent	Absent

CONCLUSION

In conclusion, the phytochemical screenings of Ginger (Zingiber officinale), Turmeric (Curcuma longa), and Cardamom (Elettaria cardamomum) reveal the presence of various chemical constituents in their respective drugs. In Ginger, constituents such as sugar, protein, alkaloid, glycosides, tannins, phytosterols, and flavonoids are observed. Similarly, Turmeric exhibits the presence of sugar, protein, alkaloid, tannins, phytosterols, and flavonoids. In Cardamom, the screening indicates the existence of sugar, alkaloids, glycosides, tannins, and phytosterols. These findings underscore the diverse array of bioactive compounds present in these botanicals, which contribute to their medicinal and therapeutic properties.

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