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Tannins Containing Medicinal Plants and It's Significance: An Overview

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Abstract: Tannin is very important chemical constituent present in various types of medicinal plants in different parts of world. Medicinal plants like Myrobalan, Ashoka, Arjuna, Pale catechu, Black catechu, Bahera, Amla, Pterocarpus, Amra, etc are showing different tannins types of chemical compositions. These medicinal plants are having those rich sources of tannins in their different parts such as bark, leaves, fruits, etc. Tannins containing medicinal plants exhibit various pharmacological activities like laxatives, purgatives, diuretics, cardiotonics, antioxidant, anti-diarrhoeal, sedatives, anti-diabetic, anti-rheumatism, astringent, anti-dysentery, anti-microbial, analgesic, anti-dyspepsia, etc. Some plants shows different properties to help the digestive disorders such as black catechu. Other kinds of tannin containing plants help to treat different skin disorders. Basically, three types of tannins such as hydrolysable condensed and pseudotannins are present in tannin containing medicinal plants. The current study correlates different medicinal plants containing tannin, tannin types, identification of tannins, chemical properties of tannin, tannin containing medicinal plants & its pharmacological actions.

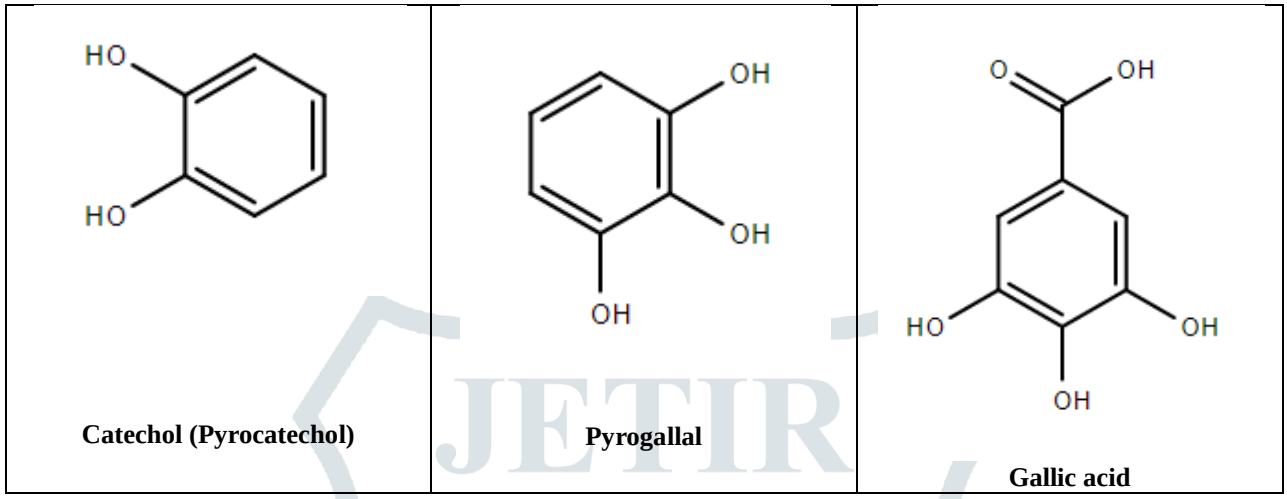
Keywords: Tannin, Medicinal plants, Hydrolysable tannins, Condensed tannins, Pseudotannins, Chemical properties, Pharmacological actions.

I. INTRODUCTION

The world is full composed of medicinal plants. Tannins are one of the most vital active chemical constituents find from various types of medicinal plants. Tannins show different pharmacological activities find from extraction of various parts of tannin containing medicinal plants. Gallic acids, Ellagic acid, Pyrogallal, Catechol and Glucogallin are the most important tannins obtained from natural sources [1-3]. This type of tannins show astringent, laxative, purgative, stomachic, anti-diarrhoeal, anti-diabetc, antioxidant, antiseptic, anti-ulcer, sedative and some other activities. These tannins are usually obtained from seeds, barks, rhizomes, fruits, roots, stems, leaves of plants. Tannins are also called as plant secondary metabolites. These are one of the most significant compound find from the medicinal plants [1, 3-4].

II. TANNINS

Tannins are polyphenolic structure found in various parts of medicinal plants such as Arjuna, Amra, Ashoka, Myrobalan, etc. O-dihydroxy or O-trihydroxy groups present in the phenyl ring usually. These kinds of compounds are having high molecular weight and non nitrogenous in nature. Examples like Gallic acid, Glucogallin, Pyrogallal, Ellagic acid and Catechol are present in different parts of medicinal plants [1, 5-6].



Catechol (Pyrocatechol) **Pyrogallal** **Gallic acid**

Figure: Structure of Different Tannins [1]

III. CHEMICAL PROPERTIES OF TANNINS

1) Tannins show precipitation by treating with potassium dichromate solution.

2) Tannins also give precipitation through treating with chromic acid solution.

3) Tannins show Brownish green or blackish blue while treating with ferric chloride solution.

4) Tannins exhibit deep red color precipitation after treating with ammonia solution and potassium ferricyanide solution.

5) Tannins also show precipitation with the reactions of phenazone.

6) Tannins get precipitated by different salts of metals like copper, lead, tin, etc.

7) Tannins show brownish black color when intestinal membrane of ox is reacted with hydrochloric acid and distilled water in presence of tannins and ferrous sulphate solution for few minutes. It is known as Goldbeater's skin test. It is one of the major identification tests of tannins [1, 6-7].

IV. TYPES OF TANNINS

Different types of tannins are present in various parts of medicinal plants according to hydrolysis on dry distillation [1, 7-8].

1) Hydrolysable Tannins: These compounds are hydrolysable and hydrolyzed by enzymes, acid or alkali. The examples are galic acid, ellagic acid, pyrogallal. One such area like after distillation gallic acid is converted to pyrogallal. Different types of plants like Myrobalan are having hydrolysable tannins.

2) Condensed Tannins: They are non-hydrolysable tannins. They are not hydrolyzed by acid or any other compounds. They are very resistant to hydrolysis. Example like catechol in pale and black catechu is one of the condensed or non hydrolysable tannins.

3) Pseudotannins: These are another one classification under tannins. They are having low molecular weight and not reacted with Goldbeater's skin test. Cholorogenic acid in coffee is one of the examples in this category. The pseudotannins can be identified by treating the drug with ammonia solution and distilled water with air exposure. The pseudotannins show green color precipitation after performing the identification test.

V. ROLE OF TANNINS TO MANAGE DIFFERENT PHARMACOLOGICAL ACTIONS

Tannis are having different pharmacological roles in human body. Plant like Myrobalan or haritaki can exhibit laxative, anthelmintic, astringent, stomachic property. Another plant containing tannins Bahera show anti-diarrhoeal property. Arjuna plant exhibits cardiotonic and diuretic properties. Ashoka bark extract is used as sedative. Black catechu is used for skin eruptions. Mango is having anti-diarrhoeal and anti-rheumatism properties [1, 9-10].

VI. MEDICINAL PLANTS CONTAINING TANNINS

1) Myrobalan: It is commonly known as haritaki in bengali. It is basically obtained from the extraction of dried ripe fruits of *Terminalia chebula*. The plane family is *Combretaceae*. It is cultivated in West Bengal, Madhya pradesh, Assam, Maharashtra in India. It is also seen in south east Asia. The fruits are odorless, astringent in taste and yellowish brown in color. The fruits are ovate in size and shape. The fruits are very hard in nature. The fruits are also stony in nature. The fruits are having hydrolysable tannins like pyrogallal, chebulic acid, ellagic acid, gallic acid, chebulinic acids. The fruits also contain glucose and sorbitol. Haritaki is used as laxative, astringent and stomachic. It is used as anthelmintic for the treatment of worms. It is used also to stop bleeding. It is used in various ayurvedic formulations and also in dyeing industry. It is also used for the treatment of piles [1, 11].

2) Ashoka: The dried stem or bark is used. The scientific name is *Saraca indica*. The name of family is *Leguminosae*. It is cultivated in south Asia like India, Sri Lanka, Indonesia and Malaysia. The bark is dark blackish brown in color. The bark is odorless. The taste is astringent. The bark is having condensed tannins. It also contains leucocyanidin, leucopelargonidin, haematoxylin, saponin, ketosterol, minerals. It is used as sedative. It is also used as uterine tonic. It is applied for the treatment of menorrhagia. It is used to prevent uterine bleeding [1, 12].

3) Arjuna: The scientific name of the tree is *Terminalia arjuna*. The family of the plant is *Combreataceae*. The parts used in dried bark or stem. The tree is usually seen in south east Asia like India's various places such as Madhya pradesh, Uttarakhand, Dehradun. It is found in forest. The bark is greyish brown in color. The barks are odorless. The taste is astringent. The barks are flat in shape. It contains hydrolysable tannins. It also contains ellagic acid, saponins, arjunolic acid, arjunic acid, arjungenin, arjunetine, arjunine, β-sitosterol, minerals [1, 13-15]. It is used for the treatment of dysentery. It is used as cardiotonic. It is also used as febrifugel. It is showing, vasodialation, hypotension, diuretic properties. It decreases heart rate. The bark especially with ethereal extract shows pink color under UV light [1, 15-17].

4) Bahera: It is also known as Baheda. The scientific name is *Terminalia belerica*. The plant is under *Combreataceae* family member. It is seen in forest of India. It is found in Madhya pradesh, Uttar pradesh, Punjab in India. It is also cultivated in south Asia like Malaysia, Sri Lanka. The fruit is having hardy seeds. The seeds are stony in nature. The fruits are dark blackish brown. Basically the fruits are used. The fruits are odorless. The taste is astringent types. The fruits are globular in shape and size. It contains water soluble tannins. It contains gallic acid, phyllemblin, ellagic acid, galloyl glucose, ethyl gallate [1, 18-19]. It is applied for the treatment of diarrhoea and dyspepsia. It is used as astringent, purgative and demulcent. The bahera oil is used for the preparation of soap [1, 20-21].

5) Amla: Amla is having a synonym Indian goose berry. The part used is dried or fresh fruits. The scientific name is *Emblica officinalis*. It is showing *Euphorbiaceae* family. It is cultivated in India, Myanmar and Sri Lanka. It is commonly seen in forest. The fruits are hard and yellowish green in color. The fruits are astringent types taste and amla is odorless. Amla is having tannins, fat, minerals, phyllemblin and vitamin C [1, 22-23]. It is having antioxidant activities. It is used as diuretic, laxative, refrigerant. It is also used for the treatment of diarrhoea cum dysentery. It acts as anti-aging. It is used in different ayurvedic formulations. It is applied as acrid. It also acts as in the treatment of jaundice and anaemia. It is given in dyspepsia. It is also used in the treatment of bronchitis and asthma. It is also given in different cosmetics like shampoo and oil [1, 24-25].

6) Amra: It is very commonly found in India. The synonym is Mango or aam. The part used is dried stem or bark. The tree is having scientific name *Magnifera indica*. The tree is representing the *Anacardiaceae* family. The bark is showing dark greyish brown in color. The taste is astringent. The odor is pleasant. The surface of bark is very rough and thick in size cum shape. It is having tannins like protocatechuic acid, catechin, other constituents like glycine, shikimic acid, alanin, magniferin, aminobutyric acid [1, 26-29]. Amra is showing antioxidant and anti-microbial properties. Amra is used as astringent. It is also used in the treatment of diarrhoea, rheumatism, dysentery. Amra fruits are very rich sources of vitamins and nutrients [1, 30-36].

7) Pterocarpus: It is known as Indian kino tree. The juice is used. The juice is basically obtained from the extraction of the dried stem bark of the plant. The plant has scientific name *Pterocarpus marsupium*. It is belonging to *Leguminosae* family members. It is cultivated in India especially in Kerala, Gujrat, Uttar pradesh, Madhya pradesh, Bihar, Assam, West bengal, Orissa. The color of bark is red. The bark is odorless. The bark is astringent in taste. Pterocarpus contains kinotannic acid, k-pyrocatechin, gallic acid, kinoin, kino-red [1, 37-40]. It is used as astringent. It is also used as anti-dysentery and anti-diarrhoeal agent. It is used in diabetes. It is applied in toothache. It is given in dyeing industry [1, 41-42].

8) Pale catechu: It is known as Gambier or Gambir. It is basically dried aqueous extract. The extraction is obtained from the young shoots and leaves of *Uncaria gambier*. The family belongs to *Rubiaceae*. It is seen in south east Asia like Malaysia, Indonesia, Singapore. Pale catechu is reddish brown in color. The taste is astringent. It has no odor. It contains tannins like catechin, catechu red, catechutannic acid. It also contains quercerin. It is used in dyeing industry. It is used for the treatment of diarrhoea and also used as astringent [1, 43-44].

9) Black catechu: It is also called as Kattha or cutch. It is very commonly dried aqueous extract of the *Acacia catechu*. The extraction is usually held from the heartwood of the plant. The plant is generally *Leguminosae* family member. Black catechu is brownish black in color. It is odorless. It is astringent in taste. It is cube in shape. Black catechu is porous. Black catechu contains acacatechin, catechutannic acid, catechin, catechol [1, 45-48]. It also contains quercerin, quercitrin. It is used for the treatment of diarrhoea, ulcers and cough. It has astringent properties. It is used in dyeing industry. It is also used for the treatment of skin eruptions [1, 49-51].

10) Coffee: Coffee is very common in World as well as India. Coffee is extracted from the dried cum ripe seeds of *Coffea arabica*. The tree is belonging to the family *Rubiaceae*. The tree is found in India, Brazil, Mexico, Indonesia, Vietnam, Sri Lanka, Ethiopia. Coffee seeds are spheroidal in shape. The seeds are dark brown in color. It contains tannins like caffeotannic acid, chlorogenic acid. It is also having caffeine, proteins, sugars, fixed oil. It is used as diuretic and stimulant [1, 52-54].

11) Tea: Tea is extracted from leaf buds as well as leaves of *Thea sinensis*. The family is belonging to *Theaceae*. It is found in India, China, Sri Lanka, Japan, Indonesia. It is two types. One is black tea. Another one is green tea. It is small plant. The leaves are dark green in color. The odor is characteristics. The taste is bitter. It is having a rich source of tannins like gallotannic acid. It also contains caffeine, theobromine, theophylline. It is used as diuretic as well as CNS stimulant [1, 55-59].

12) Cinchona: It is also known as Peruvian bark. The part used is dried bark. The plant (Scientific name: *Cinchona calisaya*) is belonging to *Rubiaceae* family. It is found in India, Sri Lanka, Indonesia, Columbia, Peru, Bolivia, Tanzania, Ecuador. It is cultivated in West Bengal, Tamilnadu in India. The bark is curved in shape. The bark is having characteristic odor and the taste is bitter cum astringent in nature. The bark is brownish grey in color. The bark has tannins like cinchotannic acid, phlobatannin. It also contains quinic acid, quinine, cinchonine, quinidine, cinchonidine, quinicine, cinchonicine, hydrocinchonidine, hydroquinine, cupreine, homocinchonidine, quinovin. It is used as antipyretics, stomachis, anti-malarials. It is also used for the treatment of arrhythmia, atrial fibrillation and tachycardia [1, 60-63].

13) Ipecacuanha: The parts used are dried roots and rhizomes. The scientific plant naming *Cephaelis ipecacuanha* is belonging to the *Rubiaceae* family. It is found in India, Brazil, Malaysia, Mayanmar. It has dark brownish red color root and rhizome. The odor is faint and the taste is bitter. The rhizome is cylindrical in shape. It contains tannins. It has ipecacuanhic acid. It also contains starch, emetine, psychotrine, cephaeline, emetamine, emetamine, calcium oxalate, o-methyl psychotriene. It is showing anti-tumor, anti-protozoal and anti-dysentery properties [1, 64-65].

14) Cinnamon: Cinnamon is known as Kalmi dalchini commonly. Basically the dried bark of the shoot is used. The scientific name of family is *Cinnamon verum* under *Lauraceae* family. The bark is yellowish brown in color. It has sweet taste. It has fragrant odor. The bark contains phlobatannins. It also contains calcium oxalate, mucilage, starch, eugenol, cuminaldehyde, benzaldehyde, cymene, pinene, caryophyllene and phellandrene [1, 66-69]. It is used as carminative, astringent, stomachic, stimulant, condiment, antiseptic, spice, flavoring agent. It is also used for the preparation of perfumes and candy [1, 70-72].

15) Nux vomica: It is commonly known as Crow fig. The scientific name of plant is *Strychnos nux vomica*. The family is belonging to *Loganiaceae* family members. The dried ripe seeds are used. It is found in forest of India, Sri Lanka, Australia. In India, the plant is especially found in Tamil nadu, Kerala. The color is greenish brown. No odor is found. The taste is bitter. The seeds are disc types in shape. Lignified trichomes are found on the epidermis of the seeds. It contains tannins like chlorogenic acid. It also contains isoatrychnine, bruchine, strychine, loganin, fixed oil, N-oxystrychnine, novacine, protostrychnine,α-colubrine, β-colubrine. It is used as stomachic and CNS stimulant [1, 73-76]. It is used for the treatment of cardiac failure as it increases blood pressure. Besides, it also simulates CVS and respiratory systems [1, 77-80].

16) Rhuberb: It is also called as Revandchini. It is belonging to the *Polygonaceae* family. The dried rhizome of the plant is used. The scientific name is *Rheum emodi*. It is cultivated in India, Korea, and Tibet. Especially it is found in Sikkim and Kashmir of India. It is also grown in Europe. The drugs are usually extracted from 6-10 years old plants. The rhizome is longitudinal in shape. The plant contains gallic acid, catechin, glucogallin, epicatechin, starch, rheinolic acid, chrysophanol, fat, rhein, pectin, calcium oxalate, aloe-emodin, physcion, emodin, palmidin A, palmidin B, palmidin C. It is used as purgative, stomachic and anti-diarrhoeal agent [1, 81-85].

17) Clove: Clove is Caryophyllum. It is the synonym of clove. The scientific name is *Eugenia Caryophyllus*. The plant is belonging to *Myrtaceae* family member. It is found in India, Madagascar, Sri Lanka etc. It is cultivated in Kerala and Tamilnadu especially. The dried flower buds are used. The color is dark brown. The taste is pungent. It is aromatic in odor. Clove epidermis is attached with cuticle. Clove contains tannins like gallotannic acid. It also contains chromone, resin, eugenin, eugenol [1, 86-90]. It is used as dental analgesic, stimulant, carminative, spice, flavoring agent. It is also used for the preparation of cigarettes. Clove is available in oil formulation. The clove oil is used for the preparation of vanilin. It is used in perfume making industry [1, 87-94].

18) Oak: It is also commonly known as oak galls. It is belonging to *Fagaceae* family members. It is basically obtained from the extraction of fermented oak galls. The part used is growing young twigs of *Quircus infectoria*. It is astringent in taste and odorless. It is usually having tannic acid (hydrolysable tannin). It is used as astringent. It is also used for the treatment of piles and sore throat. It is also applied as antidote for heavy metals poisoning [1, 95-99].

19) Areca nut: Areca nut is also betel nut. It is basically dried ripe seeds. The scientific name is *Areca catechu*. It is belonging to the *Palmae* family. It is found in India, Sri Lanka, Philippines, Africa. It is deep brown in color. It is astringent in taste. The seeds are very hard and nut type. It contains condensed tannins. It also contains lipid, gums, volatile oil, alkaloids like arecoline, guvacine, arecaidine, guvacoline. It is used as sialogogue and parasympathomimetic [1, 100-102].

20) Cocoa: Cocoa is basically known as cocoa bean. It is isolated from the seeds of the plant *Theobroma cocoa* (scientific name). The plant is belonging to the *Sterculiaceae* family member. It is found in Java, Sri Lanka, Ecuador, Brazil, etc. It contains condensed tannins. It has polyphenols, caffeine, theobrom, theobromine [1, 103-105]. It is used as diuretic, nutritive and stimulant [1, 106-108].

VII. CONCLUSION

Medicinal plants are exhibiting different pharmacological activities all over the world. Tannins are one of the important chemical compositions of medicinal plants. Tannins are present in large categories of the plant. Tannins like ellagic acid, gallic acid, pyrogallal, catechol, glucogallin, etc are extracted from bark, seed, leaves, fruit, and stem of the plant. Tannins are more potent and safe for treating various diseases. Most of the tannins are showing astringent, purgatives, cardiotonic, diuretic, anti-diarrhoeal, anti-diabetic, sedative, antiseptic, laxatives, anti-rheumatism, anthelmintic and stomachic properties.

Conflict of Interest: Nil

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