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Phytochemical and pharmacological analysis of some selected traditional medicinal plants of Chhattisgarh

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Abstract
Numerous biologically active compounds exist in form of phytochemicals in plants which are generally employed as traditional plants by natives to aid in curing infection, dis-orders, and diseases and genetically inherited medical conditions. The research on phytochemicals is believed to be potentially beneficial for examining the application of plants for therapeutic uses. In this review we have shortlisted five plants which are native of Chhattisgarh and screen them to examine the bioactive constituents of the plants. The plants which were selected for this particular study are Aegle marmelos (bengal quince), Asparagus racemosus (Bottlebrush Asparagus), Curcuma amada, Euphorbia hirta (asthma plant), Semecarpus anacardium (Oriental cashew). The botanical, phytochemical, and pharmacology of the plants were studies in detail and presented in this review. We have also reviewed on the medical properties and their applications for numerous medical conditions. We have reviewed how the plants can be advantageous for improving the health of human beings and aid to combat disorders.

Keywords: Bioactive compounds, Phytochemicals, Pharmacology, Traditional medicines, Medicinal properties

1. Introduction

Chhattisgarh is a non-coastal state located in the east-central India. Even though the north and south parts of the state are hilly, the central part has very fertile soil. This state is recognized to have 3rd largest forest coverage in India. The state has forests, rivers, waterfalls and mountains and therefore various medicinal plants are known to grow here.Medicinal plants play a major role in lives of people living in the forest areas of Chhattisgarh. Medicinal plants are substitutes or alternatives at times when contemporary medicines are incompetent. Therefore these plants perform an essential role in everyday lives of people and this is related to various socio-economic and cultural trialswhich are allied with life, aging, sickness, and demise. Medicinal plants are effective in treatment of infections and diseases. Since ancient times medicinal plants are recognized to be abundant source of safe, effective and reliable medicines[1]. Traditional medicines were defined by World Health Organization (WHO) as a complete amalgamation of practices and knowledge which can be explained formally or used to prevent and eliminate imbalances related to physical, mental or social and rely on exclusive on practical experiences and has been passed on from generations either in writing -or verbally. Around 70-90% of people living in rural areas except for western countries depends only on the traditional medicines to take care of their health. Dependence on traditional medicines is not as people are not capable to afford to spend on modern expensive medicines but because traditional medicines are acceptable culturally and encounter the psychological needs [2].

Ethno medicines are trusted to have potential to be used as safe and effective medical treatments. Plants serve as a source of natural produces to develop therapeutic means. The Indian and Chinese traditional Ayurveda medicine systems have reported a range of plants that can serve as medicinal plants [3].As many as 75,000 plants starting from lichens to trees are seen to have potential to be

remedial for various diseases [4]. It was reported by WHO that around 21,000 plants have been used as source of medicinesas traditional medicines in rural areas. Also around 100 plant genera were employed as medicinal purposes are originated in India. This makes India the superior source of quality and quantity related to medicinal plants and stands in second position in exports. It also is one among the 12 mega biodiversity centers in the world having 16 agro-climatic conditions. 7000 plants among 45000 plants are identified to be medical plants[5]. Since natural medicines are used continuously their impact on global medicines and health care. Recently most of the developing countries are investigating natural drugs and hence it has become a necessary to broaden the interdisciplinary methods for developing novel drugs. In India, ancient texts such as Charaka and Sushruta Samhita, Atharva veda, and Rigveda illustrates the uses of herbs as medicines [6].

The use of plants as medicines is due to the presence of some important phytochemical. The important phytochemicals present in plants that can be employed as medicines are alkaloids, flavonoids, tannins, steroids, saponins, terpenoids, anthraquinones, reducing sugars and various others. Like other countries India widely uses traditional medicines in rural areas as well as urban areas. Various plant species are investigated by researchers around the world in India. India is comprised of population with various languages, cultures and philosophies making it rich and varied for practices and knowledge for investigating herbal medicines as remedies. Several literatures on investigations of Ethnobotanical and Ethnopharmacological applications of medicinal plants found in India are reported [7].

The healing power of medicinal plants depend on the phytochemical content of the plants, this will cause particular pharmacological action on the body. Besides the knowledge on identifying the detailed phytochemical composition of the medicinal plants is very significant to assist as the baseline information for development of effective medicines for various illnesses[8]. On the basis of the metabolic activity, phytochemicals are classified into two classes, primary and secondary. Primary class includes amino acids, proteins, sugars, chlorophyll and secondary class includes tannins, saponins, alkaloids, phenolics, flavonoids and few others [9]. The significant components in the medicinal plants can be extracted using various techniques specifically by use of solvents. Various solvents such as methanol, ethanol, hexane, acetone, chloroform, ethyl acetate and water were employed to extract phytochemical components from plants.However, reports on the phytochemical composition and its application for pharmaceutical uses are still scanty. Hence we have attempted to investigate on few medicinal plants that are available in Chhattisgarh, to classify the plants on basis of their phytochemical composition which will be important for researches working on such scientific researches. In this paper we have tried to overview first of the locally available plants such as Aegle marmelos (bengal quince), Asparagus racemosus (Bottlebrush Asparagus), Curcuma amada,Euphorbia hirta (asthma plant), Semecarpus anacardium (Oriental cashew)and investigated on the phytochemical properties of these plants. Table.1 shows the local name and image of the medicinal plants studied in this review.

Table 1 Local names and images of plants

SI.No	Scientific name of plant	Local name	Family name	Images
1	Aegle marmelos	Bengal quince	Rutaceae	
2	Asparagus racemosus	Bottlebrush Asparagus	Liliaceae	

3	Curcuma amada	Mango ginger	Zingiberaceae	
4	Euphorbia hirtaL	Asthma plant	Euphorbiaceae	
5	Semecarpus anacardium	Oriental cashew	Anacardiaceae	

2. Materials and methods

2.1 Materials

Five local plants of Chhattisgarh were identified i.e., Aegle marmelos (bengal quince), Bottlebrush Asparagus (Asparagus racemosus), Curcuma amada, Euphorbia hirta (asthma plant), Semecarpus anacardium(oriental cashew) and used for the present investigation. The scientific names, family names, and local names of the medicinal plants chosen for this study are given in Table 1. All chemicals used were purchase from standard dealers and used as received for the work. Deionized water was used for all purposes.

2.2 Extraction of plant matter

The plants obtained were rinsed with water to remove dirt and dried. The dried plant matter was crushed to powder using an electric grinder and stored in labelled polyethylene bottles. 10 g of each plant powder was weight and added to 50 ml of sterilized water in water bath and boiled for 30 min at temperature of 50 ºC to ensure the removal of any microbes present. The solution was then filtered through filter paper (Whatman) and was centrifuged for time period of 20 min at 2500 RPM. This extract was dried and stored in labelled bottles and stored at temperatures of 4 ºC to 8 ºC until further used.

2.3 Phytochemical analysis of the plant extract

2.3.1 Determining alkaloids in the plant sample

For determining the existence of alkaloids, 5 g of the sample of every plant was weighed and added to a beaker. 20% acetic acid was prepared by dissolution in ethanol and 200 ml of ethanol was added to the beaker containing the plant extract and allowed to settle for 4 h.After soaking for 4 h the extract was filtered and washed with water. 200 ml water was added to this filtrate and heated and allowed to evaporate until one quarter solution was evaporated. The solution was cooled and ammonium solution was added dropwise until precipitate was obtained. The precipitate was allowed to settle and then filtrated, dried and weighed [10].

2.3.2 Determining total phenols in the plant sample

For determining the phenols present in the plant extract, 5 g of every sample was weighed and transferred to titration bottle. 100 ml of n-hexane was added and allowed to settle for 4 h, subsequently 100 ml of n-hexane was added again and allowed to settle for 4 h. This solution was filtrated and filtrate was discarded. 50 ml of diethyl ether was added to the resulting solution and heated for 15 min. Following this, 50 ml of diethyl ether was again added to the resulting solution and heated for 15 min. The solution was cooled and filtered; the filtrate was collected in a separating

funnel. To this 50 ml of NaOH (10%) was added and the flask was shaken well until two different layers i.e., the aqueous layer and organic layer were observed. The solution was washed with water 3 times with deionized water. This aqueous solution was then acidified with HCL (10%) until the pH was 4. To this 50 ml of dichloromethane (DCM) was added for acidifying the aqueous layer. Following this the organic layer was separated, dried and weighed.

2.3.3 Determining flavonoids in the plant sample

For determining the flavonoids present in the plant extract, 5 g of every plant sample was weighed and transferred in the beaker. To this 100 ml of aqueous methanol (80%) was added and shaked for 4 h using shaker. The solution was then filtered using Whatman filter paper for two times. The obtained filtrate was transferred to a crucible and dried, this was then weighed and stored in a bottle for further use [11]

2.3.4 Determining the saponins present in the sample

For determining the saponin's present in the sample, 5 g of every plant sample was weighed and transferred to a container. To this 100 ml of ethanol (20%) was added and allowed to dispersed. This suspension was transferred to a water bath and allowed to be heated at a temperature of 55 ^{o}C for time period of 4 h along with stirring. The filtrate as well as the residue was re-extracted by addition of 100 ml ethanol (20%). The extracts together were evaporated to 40 ml in the water bath in which the temperature was maintained at 90 ^{o}C. This concentrated solution was then transferred to a separating funnel, to this 20 ml of diethyl ether was added and the solution was vigorously shaken. Two separate layers were obtained in the separating funnel, the organic layer was discarded and the aqueous layer was collected. Purification was repeated by addition of 30 ml n-butanol. This solution was washed with 10 ml NaCI (5%) and the resultant was heated to evaporate the sample. The precipitate was dried and weight until constant weight was observed. Then the saponin value was estimated by calculation [10].

2.3.5 Determining the riboflavin present in the sample

For determining the riboflavin present in the sample, 5 g of every sample was taken in a container. To this 100 ml of ethanol (50%) was added and shaken for 1 h, and the solution was filtered.10 ml of the extract was transferred to 50 ml flask and 10 ml potassium permanganate (5%) and 10 ml H_2O_2 (30%) was added to this and heated for time period of 30 min in water bath. Following this 2 ml sodium sulphate (40%) was added and made up to 50 ml. The absorbance of this solution was analyzed at wavelength of 510 nm by UV-Vis-Spectrophotometer[12]

2.3.6 Determining ascorbic acid present in the sample

1 g of every plant sample was taken in a beaker and 10 ml of solution containing 0.05 M oxalic acid and 0.02 M was added to each sample. The samples were allowed to stand for 24 h. The sample was filtered after 24 h and 2.5 ml of every sample was transferred volumetric flask. To this 2.5 ml of solution containing 0.05 M oxalic acid and 0.02 Mwas added. Following this meta phosphoric acid, 0.5 ml acetic acid, 1 ml H_2SO_4(5%), and 2 ml ammonium molybdate was added and made up to 25 ml by addition of distilled water. Absorbance of this solution was measured at a wavelength of 760 nm using UV-Vis-Spectrophotometer [13]–[15].

2.3.7 Determining the niacin present in the plant sample

For determining the niacin present in the sample, 5 g of every sample were added to 50 ml of H_2SO_4 (1N) and treated by shaking for 30 min in flask shaker. To this, 3 drops of ammonium solution was added dropwise and the sample was filtered. 10 ml of this filtrate was added to a flask containing 5 ml of H_2SO_4 (0.02N) and the absorbance of the sample was determined using spectrophotometer at wavelength of 470nm[12].

2.3.8 Determining pectin present in the plant sample

For determining the pectin present in the sample, 5 g of every sample was dissolved in 40 ml of water and allowed to be heated for about an hour. The solution was then diluted to 50 ml using deionized water. This flask was shaken vigorously and 10 ml of filtrate was transferred to beaker, 30 ml of deionized water and 1 ml of NaOH was added with stirring. The solution was allowed to settle throughout the night. 5 ml of acetic acid (1N) was then added to the previously prepared solution and

allowed to rest for 5 min, following this 2.5 ml $CaCl_2$was added to the solution and allowed to settling for about an hour and then heated for a minute. This solution was filtered and washed with hot water to remove the chlorides present in the sample. This residue was weighed and heated in a water bath at 100 ^oC until constant weight was observed

2.3.9 Determining the protein present in the plant sample

For determining proteins present in every plant sample, the samples were analyzed by KJELDAHL'S method[16].

3. Results and discussions

3.1 Phytochemical analysis

Medicines which are made by traditional methods are recognized to be of great for health care in various countries and the plants that have medical value contribute significantly to these medical practices. For this study we have chosen five local plants of Chhattisgarh which were i.e., Aegle marmelos (bengal quince), Bottlebrush Asparagus (Asparagus racemosus), Curcuma amada, Euphorbia hirta (asthma plant), Semecarpus anacardium (Oriental cashew) and used to analyze the phytochemical properties. Table 2 shows the phytochemical screeningof the plants

Table 1: Preliminary examination of photochemical analysis of plants

SI. No	Phytochemicals	Aegle marmelos (bengal quince)	Bottlebrush Asparagus (Asparagus racemosus)	Curcuma amada	Euphorbia hirta (asthma plant)	Semecarpus anacardium (Oriental cashew)
1	Alkaloids	+	+	+	-	+
2	Phenolic Compounds	+	+	-	+	+
3	Flavonoids	+	+	+	+	+
4	Saponins	+	+	+	+	+
5	Ascorbic acid	+	+	-		+
6	Riboflavin	+	-	-		+
7	Niacin	+	+	-		+
8	Pectin	+	-	-		-
9	Proteins	+	+	+		+
10	Tannins	+	-	+	+	+
	References	[17]–[19]	[20]–[23]	[24]–[26]	[27]–[30]	[31]–[33]

When the qualitative phytochemical exploration in connection with the medicinal plants was carried out it was seen that variety of phytochemicals are presents which include alkaloids, phenols, saponins, tannins, ascorbic acid, proteins, tannins, flavonoids, vitamins and various others. Investigations on phytochemical properties of medicinal plants have revealed that a number of biologically active compounds and organic complexes were present in plants.

Analyzing the phytochemical characteristics of medicinal plants can be useful to understanding and isolating the valuable content, compounds and components from the plant. Therefore it is important to analyze the phytochemical properties of plants in order to make then useful. Also, the exceptional biological activities of the plants can be classified based on the phytochemicals present in plant. The parts of plants used for analyzing the phytochemicals can be roots, stem, fruits, bark, flowers etc. Various solvents such as water, ethyl acetate, acetone, chloroform, hexane, methanol, ethanol, ether can be used to extract the phytochemicals from parts of plant. Table 2 gives us information on the phytochemicals present in the plant, "+" indicates the particular phytochemical is present and "–" indicates the particular phytochemical is absent.

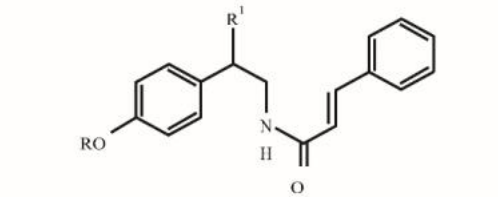
Alkaloids are one among the chief and macro components that plants produce and they constitute the metabolic byproducts that are extracted from amino acids [34]. According to the literature published. Alkaloids can be extracted from different parts of plants by used of solvents.
Flavonoids can be said to be a huge collection of polyphenols that have structure of benzoyl-γ-pyrone structure and can be universally existent in plants. They can be synthesized by use of pathway of phenylpropanoid. Literature shows the secondary metabolites has nature of phenols which include flavonoids and are the reason for pharmacological behavior[35], [36]. Basically flavonoids are phenolic's that are hydroxylated and are reported to be produced by plants as a result of microbial infections[37]. It was also investigated that the flavonoids present in plants can be extracted from using specific solvents and all solvents were not suitable for extracting flavonoids.
Tannins is the stint that represents a complicated and huge biomolecule of polyphenol which consists of numerous hydroxyls and other groups similar to carboxyl that form sturdy complexes with a number of macromolecules [38]. In this paper tannins were identified in most of the plants. Generally, tannins are employed for process of tanning and widely employed for Tannins are generally used a remedial for burns, fissures, inflammation etc[39].
Saponins are known to be broad collections of secondary metabolites of plants that are abundantly available in the plant dominion. These phytochemicals are majorly present in beans, herbs and many other vegetables [40]. Saponins were present in all of the medicinal plants that were investigated in this study as seen in Table 1.
Phenolics are also secondary metabolites of plants and they are known to be produced from the acids and pentose phosphates of plants via a metabolism called phenylpropanoid. In this paper phenolics were present in most of the plants shortlisted for this investigation[41].
Ascorbic acids

3.2 Phytochemistry, pharmacology and medicinal uses of medicinal plants

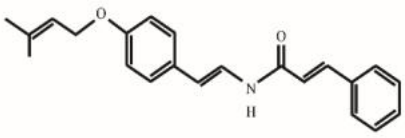
3.2.1 Aegle marmelos (bengal quince)

Aegle marmelosis commonly known as Bengal quince, Bael, Indian quince, and golden apple. It belongs to the family Rutaceae and is of the genus Aegle. It is a subtropical shrub and grows slowly. The tree grows to a height of 10 to 15 m, and is capable of growing in dry and harsh climates and can grow even when the water content of soil is minimum.The leaves of the tree are shallow and pointed and the branches are prickly.The tree contains fruits and flowers, the fruits are edible and round in shape whereas the flowers have good fragrance. The fruits are covered with a wood shell which has a color varying between gray and green, as the fruit ripens the color changes to yellow. The pulp of the fruit is orange in color; it has a sweet taste and has a good aroma. The fruits have numerous seeds within the fruit, and they are usually covered with mucilage which is transparent and can become solid on drying[42], [43].
Investigations on studying the phytochemicals in Aegle marmelos showed that the plant contained considerable amounts of alkaloids, phenols, carotenoids, flavonoids, tannins, pectins, coumarins as well as terpenoids. Also a number of bioactive compounds have been isolated and classified. Some of the important bioactive compounds are 1-hydroxy-5,7-dimethoxy-2-naphthalene-carboxaldehyde,6-methyl-4-chromanone,1-methyl2-(3'-methyl-but-2'-enyloxy)-anthraquinone, umbelliferone β-D-galactopyranoside,butylated hydroxyanisole,butyl p-tolyl sulfide,anhydromarmeline,malondialdehyde (MDA),lupeol,xanthoarnol,xanthorrhizol,halfordinol,imperatoin,marmelide,marmelosin,marmelin,aegelinosides,aegelenine,aegeline, and many other. The detailed structure of the constituents present in aegelmarmelos is shown in Figure1.

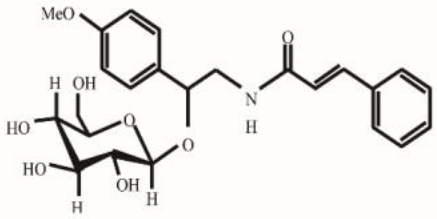
A



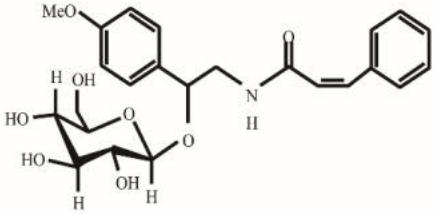
R	R^1	Chemical names
-Me	-OH	Aegeline
$-CH_2CH=CMe_2$	-H	Marmeline



Anhydromarmeline

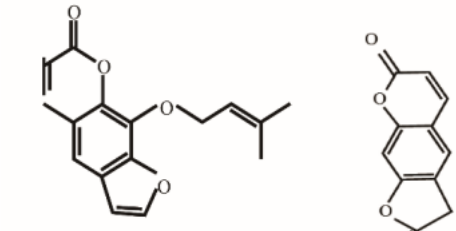


Aegelinosides A

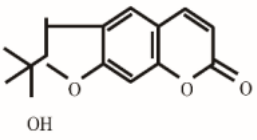


Aegelinosides B

B



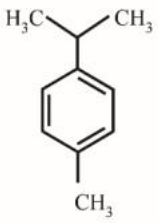
Marmelosin



Marmesin

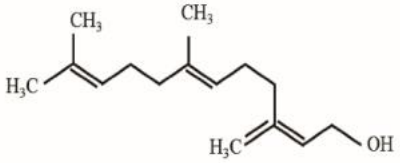
Mermesi

C



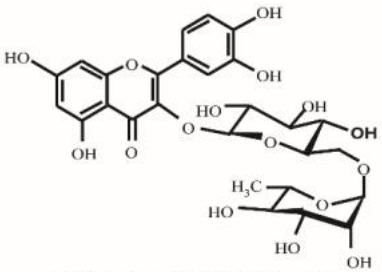
p-Cymene

Linalool



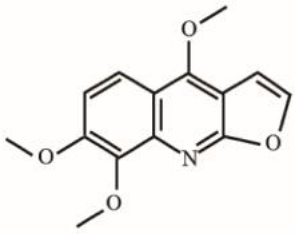
(2Z,6E)Farnesol

D



Rutin (quercetin-3-O-rutinoside)

E



Skimmianine (4,7,8-trimethoxyfuro-quinolone)

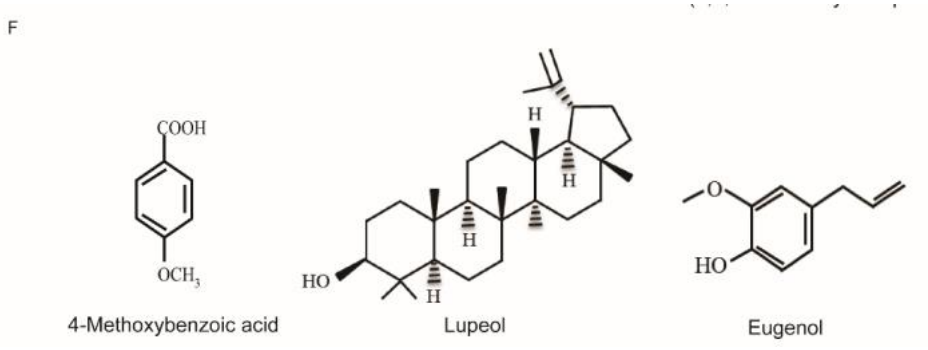


Figure 1 Constituents present in aegelmarmelos (A) alkaloids; (B) coumarins; (C) essential oils; (D) flavonoids; (E) : tannis; (F) miscellaneous compounds [18]

Anti-oxidant activity: It is a fact that the reactive oxygen species (ROS) that are related to initiation in the diseases which includes cancers and vascular disorders. The polyphenols or antioxidants that are seen in these plants are capable of inhibiting the disorders [44]. The fruit of Aegle marmelos on extraction with chloroform exhibited free radical scavenging and could inhibit lipoxygenase at various concentrations[45].The fruit of the plant contained a protein called arabinogalactan could form a complex with β-lactoglobulin which was soluble in water, this has an effective anti-oxidant property [46].

A study was performed to extract the fruit with methanol this exhibited good anti-oxidant effect in rats by declining the enzymes and non-enzymes [47]. Another investigation to study the potential of Aegle marmelos the free radical scavenging was done in which the plant was extracted with alcohol and it was seen that the extract had good activity against radical of 2,2-diphenyl-1-picrylhydrazyl and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid)[46]. The extracts from the bark and leaves of Aegle marmelos showed there was increase in the level of anti-oxidant marker and thus showed good antioxidant effect [48], [49].

Activity against cognitive function and neurological disorders: In a examine probing the healing potential of antioxidants in Aegle marmelos leaf extract fortreatment of Alzheimer's ailment, it became discovered that the ethyl acetate fraction markedlydecreased brain lipid peroxidation [50]. In another investigation the ache pathways, the use of themethanol extract from Aegle marmelos showed a dose-based analgesic activity. Evaluating thepharmacological rationale behind using Aegle marmelos fruit as a pain relieving agent was also carried out [51].

Antidiabetic/anti-obesity activity: The extracts from the fruit of Aegle marmeloswas found to have antidiabetic and anti-obesity effect. A study conducted on the investigating the antidiabetic effect of the extract was conducted on rats and it was seen to the extract had the potential to regulate the plasma glucose in rats thus showing good antidiabetic effect [52], [53]. Numerous investigation were conducted to understand the potential of Aegle marmelos for analyzing the anti-obese and anti-diabetic activity and all the reports confirmed the plant had great potential [54]–[58].

Cardioprotective activity: The activity of Aegle marmelos to understand effectivity against diseases related to heart and blood were studied. It was seen that the extracts from Aegle marmelos was capable of decreases the levels of lipo-proteins and thus inhibit peroxidation of lipids [59], [60]. Also the plant was reported to have a tendency to act as a protector in case of myocardial damages.

Antipyretic/anti-inflammatory activity: The extracts from the leaves of Aegle marmelos was seen to have great anti-inflammation characteristics. Investigations on the extracts showed good analgesic and antipyretic properties of leaves[61]. An interdisciplinary investigations on the efficiency of plant showed the fabrication of nickel particles with the leaves of Aegel marmelosdisplayed good larvicidal as well as anti-inflammatory activity[62].

Antimicrobial activity: Essential oils were extracted from the flowers of Aegel marmelosand on investigating it to understand the microbial activity revealed that the essential oil was capable of

inhibiting the growth of spores of around 8 fungal strains which confirmed its antimicrobial activity[63]. On extraction using methanol the extract had good activity in inhibiting good activity against Salmonella typhi which was seen to be resistant to most of the drugs[64]. Another study showed that when the plant was extracted using chloroform the extract had good inhibiting activity against pathogenic bacteria Vibrio cholera, E.coli and Shigella spp. Numerous investigation were carried out to examine the activity of Aegel marmelosto understand its antimicrobial activity and it was seen to have good potential in inhibiting the growth of various strains thus ensuring its antimicrobial activity[65], [66].

Anti-cancer and anti-ulcer activity:

3.2.2Bottlebrush Asparagus (Asparagus racemosus)

Bottlebrush Racemosus belong to a family of Liliaceae. It usually grows to a height of 1 to 2 m and has thorns. The leaves are small and in the shape of needles. The roots of the plants have like ginger, the plant also has white flowers and has a bitter taste [67], [68].

The plant has a variety of chemicals that are investigated and classified. The main constituents of the plant are steroidal saponins, which are referred to as shatvarins (I to VI). The plant contains alkaloids such as Aspargamine, Isoflavones such as 4-trihydroxy isoflavone-7-0-beta-D-glucopyranoside,Isoflavones-8-methoxy-5. It has hydrocarbons with cyclic structure such as dihydrophenanthrene,racemosol.It has carbohydrates such as Polysaccharides; Flavonoids such as rutin, quercetin, and hyperoside. IT also contains trace minerals such as zinc, copper, manganese, cobalt,magnesium, selenium, calcium, potassium zinc. The plant also had fatty acids such as linoleinic acid, vitamin A.[69], [69]–[75]

Galactagogue activity: The plant on extraction with alcohol was referred as Shatavari and it had a great influence on the lactating properties of parent, it showed a good improvement in growth of mammary gland, acini and alveolar tissues and hence improve the secretion of milk [76], [77].

Antiulcer Activity: Ulcer is triggered due to imbalance amongst competitive factors, in particular gastric acid and pepsin and shielding factors including gastric mucosa, bicarbonate and prostaglandin. Shatavari is antiulcerogenic agent whose interest can in comparison with that of ranitidine hydrochloride. It reasons an inhibitory effect on release of gastric hydrochloric acid and protects gastric mucosal harm [78], [78], [79].

Antitussive Effect: Shatavari is utilized in treatment of cough and in minor infections of upper breathing tract. In the experimental setup to study the activity in opposition to Sulphur precipitated cough in mice[80].

Gastrointestinal Effects: Shatavari is used for constipation, and stomach ulcers. it may be also used for anxiety, cancer, diarrhoea, bronchitis, TB, and diabetes [81]–[85].

Molluscicidal Activity: Aqueous and ethanolic extract of shatavari show a high mortality fee (a hundred%) in opposition to Biomhalaria pfeifferi and lymnaea natalensis. The LC50 turned into noticed to be 0.1, 5, 10 and 50 mg/mL for Biomphalaria pfeifferi and 0.5, 5, 1, 10 mg/mL for Lymnaea natalensis. The motion became attributed to the presence of terpenoids, steroids and saponins within the extract[86].

Antihepatotoxic Activity: Alcoholic extract of Asparagus Racemosus significantly reduces the multiplied levels of alanine transakinase, alkaline phosphate in CCI4 prompted hepatic damage in rats[87], [88].

Antineoplastic Activity: Alcoholic extract of root of Shatavari has been shown remarkably to lessen the elevated stages of alanine transakinase, aspartate transaminase and alkaline phosphate in CCl4 triggered heptic damagein rats indicating antihepatotoxic potential of Asparagus racemosus [89]–[91].

Cardiovascular Effect: Alcoholic extract of roots of shatavari produces positive ionotropic and chronotropic results on frog heart with decrease doses and cardiac arrest with better doses. The extract produces hypotension in cats and displays no effect on intrarenal management in rabbits[92].

Effect on CNS: Shatavari did no longer produce catalepsy in experimental animals consisting of rats even massive oral doses are given [85], [93].

Immunomodulatory Activities: Dried roots of shatavari modulate the motion of immune device. It induces immunity system to fight against immune deficiencies like AIDS, infections and cancer. It additionally enables to gain higher protective antibodies towards unique vaccinations, which reaction towards diverse bacterial, viral and different diseases[94], [95].
Antioxidant Action: Antioxidants are moieties which are worried in prevention of cell damage. In an investigation the methanolic extract of roots possess significant antioxidant residences while administered via the oral root [96].
Anti-inflammatory activity:ACE inhibited topical edema within the mouse ear administered at 200 mg/kg (I.P.), main to enormous discounts in skin thickness and tissue weight, inflammatorycytokine manufacturing, neutrophil-mediated myeloperoxidase pastime, various histopathological signs[96], [97].
Anti-stress Activity: Shatavari is used within the Indian traditional medicine machine to beautify widespread country of fitness and for stress related immune issues. The action of methanol and aqueous extract of roots of shatavari changed into studied in experimental mouse strain model precipitated by way of swimming[98].
Versatile Female syrup: In Ayurveda, shatavari is taken into consideration as a female tonic. It is versatile and useful in woman infertility because it increases libido, healing procedures inflammation of sexual organs. It moistens dry tissue of sexual organs. It works aspost-partum tonic by growing lactation. Normalize uterus & converting hormones [99].
Cytotoxicity, analgesic and antidiarrhoeal Activities: Ethanol extracts of Asparagus racemosus changed into investigated for biological movement. The test for analgesic movement of the crude ethanol extract becomes completed using acetic acid brought on writhing model in mice[100][101].
Anticancer Activity and Antidiabetic effect: In an investigation the extract of Asparagus racemosus IV with AR - 2B having 5.05% shatavarin IV show robust cytotoxicity. This shows increase in non - feasible cellular remember while in comparison to untreat groups of mice in observe[22][102].In remedy of DM the extract of shatavari has been observed to lessen blood glucose levels in the rats and rabbits [102].

3.2.3Curcuma amada (Mango ginger)

Curcuma amada belongs to the family of Zingiberaceae and genus Curcuma. The morphology of the plant rhizomes look like ginger and tastes similar to mango. So they are also known as mango ginger.
The plant is anherb which has semi-erect structure. The rhizome is usually branched and has a large structure and pale brown color. The inner flesh of the rhizome has yellow color and has the fragrance of un-ripened mango. The tubers of the plant are thick and fleshy, they are like cylindrical fingers. The leaves of the plant are large, and are petiolate. The plant contains flowers which are large and has color of pink and purple. The plant may grow upto a height of 60-90 cm above ground[103]–[105].
The bioactive compounds of Curcuma amada were seen to consist of alkaloids, phenols, flavonoids, tannins, saponins, terpenoids, carbohydrates and few others. The analysis on Curcuma amada confirmed that around 83 compounds were present in the plant among which2,6,11,15-Tetramethyl-hexadeca2,6,8,10,14-pentaene, β-pinene, α-acaridial, epicurzeronone, β-Myrcene, aromadandrene and squalene were dominant[106]. The rhizome had variety of pharmacology which is discussed below.
Antibacterial and antifungal activity:A natural and novel compound was isolated from Curcuma amada which revealed great anti-bacterial effect against a wide range of gram positive, gram negative and other bacteria's. In another study, difurocumenonol, a compound which was extracted from the rhizome was found to have good activity against food spoiling bacteria and food pathogens and was used in food preservation applications [106], [107]. Curcuma amada on combining with turmeric and ginger was boosted with great antibacterial activity against E. coli, S. aureus and B. subtilis[108].On using organic solvents for extracting Curcuma amada, the extracts showed good inhibition against growth of bacteria[108]. Essential oils could be extracted from the ribosomes of Curcuma amada that show restrictions in growth and survival of various strains of bacteria's. Numerous investigations carried out on Curcuma amada showed the plant to be useful for applications that need antibacterial activity[109]–[112].

Antioxidant properties: Investigations have been carried out to understand the anti-oxidant behavior of Curcuma amada. When the plant was extracted using methanol, the extract showed good reactivity of free radicals which showed the extracts can be used as dietary agents [113]. The leaves of the plant also showed good anti-oxidant effect [114].

Effects on lipids, triglycerides and cholesterol: The plant was investigated to understand the activities on controlling the lipids and triglycerides in rats, it was seen that the extract caused significant decrease in the levels of triglycerides and lipids in liver[115]. In another study when the Curcuma amada extracts were fed to rats for 4 weeks, lower triglycerides, and serum in liver [116]. The extracts of plant were seen to be highly effective in reducing the overall cholesterol level in blood and organs (Pachauri and Mukherjee,1970). Numerous investigations on Curcuma amada confirmed the efficacy against controlling the lipids, triglycerides and cholesterol [117].

Skin allergy: The effectivity of Curcuma amada for applications on skin to treat allergies and infection were investigated. Herbal formulations, anti-allergy formulations of Curcuma amada were prepared and tested [118]. The anti-inflammatory action of the extract of rhizome was tested on rats and was seen to be satisfactory Mujumdaret al., 2000). The plant had chemicals such as carbonyl, esters, hydroxyls and olefins which were useful in enhancing the anti-inflammatory properties of the extract [119], [120].

Bio-pesticide: Curcuma amada was seen to be employed as for controlling pests and insects as per studies. The herb had antioviposition, ovicidal, and insecticidal properties which contributed greatly to improve the properties in pest control[120].Among the various plants investigated, Curcuma amada reported 100% activity of oviposition even at minute concentrations. The essential oils extracted from Curcuma amada had repellent and toxic effect against house flies and showed 100% activity [121]. Studies on analyzing the biochemical properties of essential oils extracted from Curcuma amada were seen to be effective and promising repellents[122].

3.2.4 Euphorbia hirta (asthma plant)

Euphorbia hirtaalso known as asthma plant is from family of Euphorbiaceae and belong to genus Euphorbia. It usually is a plant that has is a thin stem, and has many branches that start branching from the base, the plant is hairy and grows to a height of around 40 cm and has usually red or purple color leaves[123]. Numerous investigations have been carried out on understanding the medicinal properties and values of the plant. The active constituents of the plant are isolated using a suitable solvent. The active constituents of the plants are reported to be Afzelin,myricitrin and quercitrin. The plant is also investigated to possess chemicals such as rutin, euphorbin- (A, B, C and D), gallic acid,kaempferol, protocatechuic acid, quercetin, 1,3,4,6-tetra-O-galloyl-β-D-glucose, 2,4,6-tri-O-galloyl-β-D-glucose. Euphorbia hirta also contains constituents such as derivatives of quercitol which contain chtolphenolic acid and rhamnose, shikmic acid, β-amyrin,heptacosane,nnonacosane,24-methylenecycloartenol, β-sitosterol, camphol,choline, and tinyatoxin[124], [125]. The detailed structure of constituents present in Euphorbia hirta is presented in Figure 1.

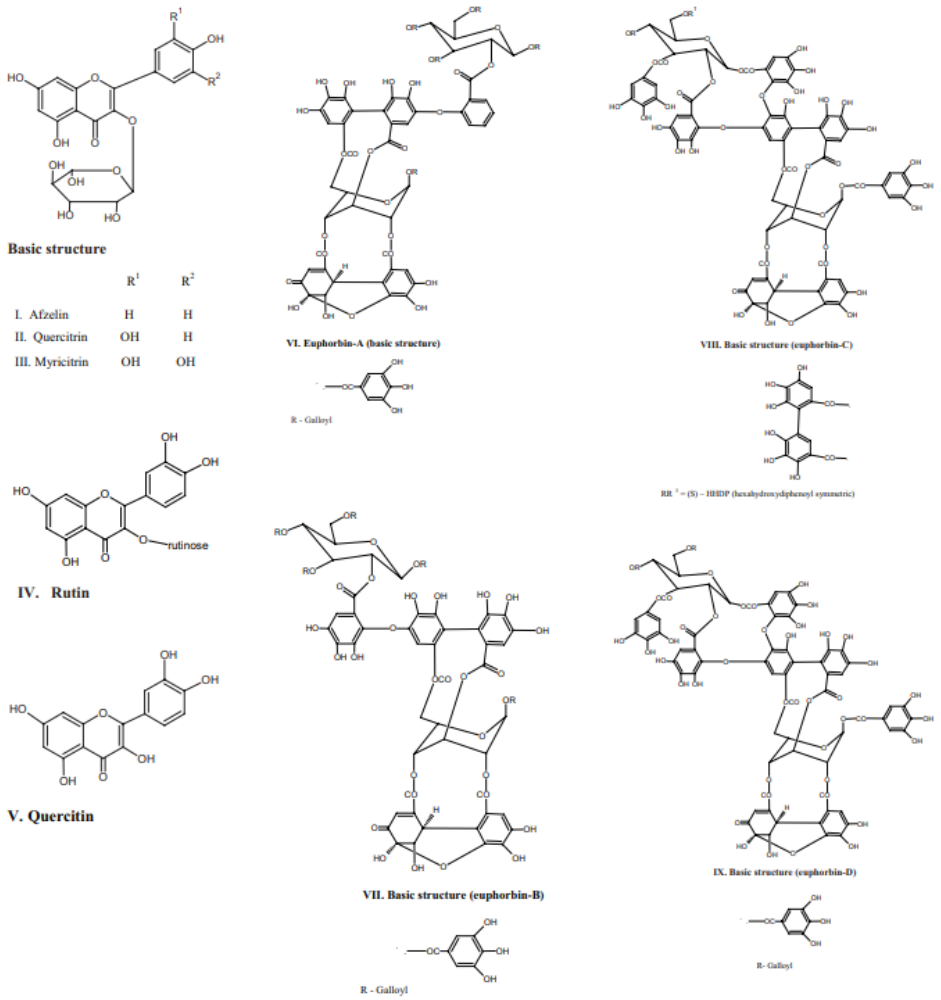


Figure 1 Constituents present in Euphorbia hirta

Antibacterial activity: The extract of the plant Euphorbia hirtawith a suitable solvent was reported and the activity against a wide range of micro-organisms was investigated. It was seen that the Euphorbia hirtahas good inhibition activity on growth of E. coli, S. aureus, P. aeruginosa, andB. subtili[126]. The leaves of Euphorbia hirta showed good activity against Klebsiellapneumonia. Also the extract showed good antibacterial activity as well as non-cytotoxicity [127].

Antimalarial activity: The aerial parts of Euphorbia hirtawere extracted and the activity against P. falciparum parasites was investigated. It was seen that the main activity was inhibited upto 90% when the concentration of the organism was 5 µg/ml[124].

Anti-inflammatory activity: Also the aerial parts of the plantEuphorbia hirta were extracted with hexane and were investigated for anti-inflammatory properties. It was seen that the exhibited activity in ear inflammation of rat which was induced by phorbol acetate and it was dependent on the dose [128], [129].

Galactogenic activity: The activity of powdered sample of Euphorbia hirtawas tested in guinea pigs for galactogenic activity and a good activity in growth of themammary glands and secretion were observed [130]

Antiasthmatic, Antidiarrheal, Anti-oxidant, and anti-amoebic activity: The plant extracts of Euphorbia hirta has been investigated to analyze its activity against various effects. It was seen that the plant had the capacity to relax the tubes of bronchia and cause a depression on the respiratory action[131].The herb was also investigated to observe it's antidiarrheal effect in mices. The plant extracts demonstrated good control on diarrhea which was induced by prostaglandin, arachidonic acid

and castor oil. Also the presence of flavonoids which were isolated from Euphorbia hirta were seen to be effective against diarrhea [132].The extracts from the plant had good anti-oxidant effect and free radical sifting activity. In an investigation that was done to estimate the anti-oxidant activity it was seen that the plant had good power for reducing the ferric content [133]. The polyphenols that were extracted from plant had a good potential to inhibit the growth and survival of Entamoeba histolytica even an small concentrations [134].

Effect on urine output and electrolytes: The extracts of Euphorbia hirtawere extracted using ethanol and tested its potential to restrict diuresis in rats. The activity was considerably good. Also the extracts from plant using aqueous solutions caused an increase in the Na^+, K^+ and HCO^{3-} concentrations in urine and increased excretion. Whereas, the extract using ethanol showed a considerable decrease in loss of K^+. However both the extracts caused a significant increase in the urine output [135].

Antifertility activity: The plant Euphorbia hirta had the potential to reduce the motality of sperms, density of epididymal and suspend the testis sperm considerably [136].

Antifungal activity: The extracts of E. hirta were obtained using ethanol as solvent, on investigating this extract for antifungal activity it was seen that the plant had good activity against pathogens in plants such as Fusarium pallidoroseum,Colletotrichum capsici, Phomopsis caricae-papayae,Botryodiplodia theobromae, and Aspergillus niger[137].

3.2.5Semecarpus anacardium (Oriental cashew)

Semecarpus anacardium is a common medicinal plant that is employed for traditional medicines such as Ayurveda and Sidda. It contains numerous medicinal properties and widely investigated due to its anti-cancerous nature. It is also recognized as oriental cashew or marking nut and has a lot of therapeutic applications in Indian medicines. Since ancient times it has found be extra-ordinary for indigenous medicines. It has been widely investigated to find the scientific value of the medicine and understand its use in medicine. The phytochemical properties have been listed in Table 3 below.

Table 3 Phytochemical analysis of Semecarpus anacardium[32]

Proximate principles (g / 100 g)		Minerals and vitamins (mg / 100 g)		Essential amino acids (mg / g protein)	
Moisture	3.8	Iron	6.1	Arginine	9.6
Protein	26.4	Phosphorous	836	Histidine	1.8
Fat	36.4	Calcium	295	Lysine	4.1
Fiber	1.4	Thiamine	0.38	Leucine	7.3
Minerals	3.6	Riboflavin	0.17	Isoleucine	4.4
Carbohydrates	28.4	Nicotinic acid	1.06	Methionone	1.5
Calories	5.87			Threonine	2.1
				Phenylalanine	2.5
				Valine	4.7
				Tryptophan	1.1

A variety of diseases and disorders are believed to be treated with the use of Semecarpus anacardium.A number of pharmacological and clinical trials have been reported. Semecarpus anacardium has seen to have numerous medicinal properties which include anti-inflammatory, anti-bacterial, anti-cancerous and the like.

Anti-inflammatory activity:The extracted nut displayed a considerable potential for anti-inflammatory activity for both acute and chronic inflammations. The response showed similar activity as that of the modern medicine for inflammation which is indomethacin. The drug had the potential to reduce the formation of edema which arises due to inhibition to the release of mediators which include histamine and serotonin. Also the flavonoids present in the plant could help in activating anti-inflammation [138].

Anti-arthritic effect:The plant Semecarpus anacardium was seen to have an effective action against arthritis as seen in clinical trials[139]. The plant extract was also found to restrict reaction of acute

tubulin in rats[140]. The arthritis which is associated with peroxidation of augmented lipid and drug administration acts as an anti-arthritic therapy. This is by retardation in the peroxidation of lipids which cause a modulation in anti-oxidant defense scheme. Also the flavonoids present in the extract can cause an inhibition in the peroxidation of lipid. A detailed investigation on the different phytochemicals, their activity and clinical trials suggested Semecarpus anacardium to be a competent therapeutic agent for arthritis[141], [142].

Antitumour, Antineoplastic, Cytotoxic and Cytostatic activity:Investigation of Semecarpus anacardium to understand its use for anti-tumor behavior were performed. Many combinations of nut of Semecarpus anacardium were experimented and the results were positive. It research on use of Semecarpus anacardium showed high potential for inhibiting cancers of liver, esophagus, urinary bladder [143]. Also, the flavonoids present in the extract had the potential to restrict and prevent cancers of various organs. Clinical trials reported the Semecarpus anacardium had anti-cancerous activity against AFBI mediated carcinoma. The activity of Semecarpus anacardium was reported to be highly effective and can be used as a substitute medicine for treatment of breast cancer and prostate cancer[144], [145].

Contraceptive agent: The aerial part of the Semecarpus anacardium was extracted using aqueous solutions and the extract on investigation displayed good spermicidal activity. Clinical trials on rats showed that on extraction of plant phytochemicals with ethanol there was good arrest in spermatogonic in albino rats. Considerable reduction in the density and motility was seen. The extracts from fruit were also investigated as an edible medicine and it was seen that there was reduction in the presence of primary and secondary spermatocytes andspermatids. Various research and investigations of Semecarpus anacardium showed that the plant had good activity of anti-spermatogon[146]. And it was also reported that Semecarpus anacardium can be used as an effective oral drug for contraception[147], [147]–[149].

Antimicrobial activity: The antimicrobial activity of extracts of Semecarpus anacardium was studied and it was seen that the extract exhibited good activity against both gram positive and negative bacteria[150]. The plant exhibited good activity against micro-organism that caused tetanus[151]. The extract of plant had good activity against Aspergillus fumigates and Candida albicans fungus which showed the plant had good fungal activity[152].

Anti-stress activity: Restricted stress was reported to cause degeneration of neurons. The extracts of Semecarpus anacardium were effective in reducing stress; this is because the plant had activity of neuroprotective which can act as an anti-stress agent in humans.
(Shukula et al., 2000).

Other significant properties: The plant extract had various other properties such as anti-depressant, antagonism to the effects of spasmogen such asPitocin, barium chloride and histamine[153]. Also an effect which delayed hypersensitivity was also exhibited by the plant extract. A potency of immune-module in different types of carcinoma was also reported[154].Immunomodulatorypotency of the nut extract in hepatocellular carcinoma was also reported[155]

Even though a lot of information is present on a lot of medicinal plants available in Chhattisgarh, yet a lot of plants and their qualitative and quantitative analysis is yet to be done. The lag may be due to lack of modern facilities and technology that is required for extraction and synthesis that is essential for developing novel drugs and medicinal products.

4. Conclusions

In conclusion, this review has identified five native plants that are available in Chhattisgarh that have medicinal uses.While there is affluence in indigenous transfer of knowledge about the useful medical properties of plants this has seen to be declining with generations due to lack of transmission orally. Humansall around the globe has been spending their lives in an attempt to discover novel drugs that can diagnose prevent and aid in treating variety of diseases. In order to safeguard lives of people from life threatening diseases there is a need to research and develop powerful medications that can be synthesized from different parts of plant.

In an attempt to develop novel drugs for synthesizing and extracting the biologically active constituents those are present in plants. Phytochemical analysis performed on different types of medicinal plants have shown that there are several bioactive compounds such as flavonoids, saponins, alkaloids, phenols, proteins, vitamins, minerals, tannins, steroids and many others. As per the literature available, in this review we have analyzed as reported the different phytochemicals that are present in the shortlisted plants. We have tried to study the different phytochemicals, pharmacology and reviewed their properties for different medical conditions. Further studies can incorporate studies on other plants that are locally present in Chhattisgarh

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