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REVIEW ARTICLE

# MEDICINAL AND ANTIOXIDANT PROPERTIES OF SOME MEDICINAL PLANTS

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## ABSTRACT

Medicinal plants play very important role to preserve the human healthy life. The knowledge of their healing properties has been transmitted over the centuries within and among human communities. A large number of different biologically active and therapeutic potentially active constituents are drawn from plant kingdom. The utilization of these natural compounds (secondary metabolites) for human aliments as well as animals begins from time immemorial. In the present paper six plants (*Ocimum sanctum*, *Ipomea carnea*, *Delbergia sissoo*, *Lantana camara*, *Carissa carandas* and *Ricinus communis*) are reviewed for their chemical constituents, medicinal and antioxidant property which ultimately leads to tissue damage resulting in a number of degenerative diseases. Reactive oxygen species (ROS) are class of highly reactive molecules derived from the metabolism of oxygen reported to prevent oxidative damage caused by free radicals and may prevent the body from various disorders. In past few years, the search for effective and more reliable non-toxic natural compounds with antioxidant activity has been intensified. The present review undertakes a brief account of research report on plants with medicinal and antioxidant potential.

**Keywords:** Medicinal plants, Antioxidant activity, Free radicals, Chemical constituents

## INTRODUCTION

Medicinal plants play a significant role in the health care of ancient and modern cultures. Ayurveda, the Indian system of medicine mainly uses plant based formulations to treat various human diseases because they contain the components of therapeutic potential[1]. Plant based drugs are an important source of therapeutic agents because of their abundant availability, relatively cheaper cost and non-toxic nature when compared to modern medicine[2].The demand of medicinal plant products has been increased tremendously in recent years. More attention is being given to antioxidant property of plants and their associated health benefits. Many herbs contain antioxidant compounds which protects the cells from the damaging effects of free radicals.

It has been reported that oxidative stress is one of the major causative factors in inducing many chronic and degenerative ailments including atherosclerosis, ischemic heart disease, diabetes mellitus, cancer, immunosuppression and others[3]. Oxidative process provides important routes for generating free radicals in foods, drugs and even in living systems[4].

Free radicals, also known as reactive oxygen species (ROS), are atoms or group of atoms with unpaired electrons and can be formed when oxygen reacts with certain molecules. Free radicals are highly reactive, that's why they can initiate a chain reaction immediately once they are formed[5]. They have the capability to disrupt cellular components such as DNA, proteins, and the cell membranes with whom they react. Free radicals accumulation is mainly responsible for human aging where the use of antioxidants can help to prevent the aging process by deterring the progression of free radicals. Reactive oxygen species (ROS) formed *in vivo*, such as superoxide anion, hydroxyl radical and $H_2O_2$ are highly energetic and potentially damaging transient species. They are continuously produced in the human body, as they are necessary for energy supply, detoxification, chemical signalling and immune function. However, these free radicals produced by sunlight, ultraviolet light, ionizing radiation, chemical reactions and various metabolic processes have a wide variety of pathological effects and the most notorious among them is Alzheimer's disease[6,7,8]. Other neurodegenerative diseases associated with oxidative stress include multiple sclerosis, Creutzfeldt–Jacob disease and meningo-encephalitis. All these disorders are associated with significant increase in the specific and persistent lipid peroxidation marker F2-isoprostane[9].

According to most widely accepted free radical theory of aging, cells constantly produce free radicals through

 

normal metabolic processes, ultraviolet light, and environmental toxins which causes cellular degeneration. This is considered a major factor to the aging process[10]. Valko[11] have done an extensive review on the effect of free radicals and antioxidants in normal physiological functions and human disease.

Phenolic compounds obtained from medicinal plants possess strong antioxidant activity and may help protect the cells against the oxidative damage caused by reactive oxygen species[12]. They are generally known as radical scavengers, metal chelators, reducing agents, hydrogen donors, and singlet oxygen quenchers[13]. An antioxidant is a chemical species that reduces the rate of particular oxidation reactions in a specific manner. Antioxidants from plants terminate the action of free radicals thereby protecting the body from various diseases[14].

Recent studies revealed that a number of plant products including polyphenols, terpenes, alkaloids and various plant extracts exert an antioxidant action[15-18]. There is also a considerable amount of evidence regarding an association between individuals who have a diet rich in fresh fruits and vegetables, and the decreased risk of cardiovascular diseases and certain types of cancer[19,20]. There is currently immense interest in natural antioxidants and their vital role in human health and nutrition. Considerable amount of data have been obtained on antioxidant properties of food plants around the globe[21]. However, traditionally used medicinal plants await such screening. On the other hand, the medicinal properties of plants have also been investigated in the light of recent scientific advancements throughout the world, due to their potent pharmacological properties, low toxicity and economic viability.

Nowadays, a great deal of effort being expanded to find effective and valuable antioxidants for the treatment or prevention of free radical-mediated deleterious effects. This review gives good information on some medicinal plants with antioxidant potential.

## PLANTS WITH MEDICINAL AND ANTIOXIDANT PROPERTIES

### *Ocimum sanctum* Linn. (Tulsi, Sacred Basil)

Family: Lamiaceae

Order: Lamiales

Genus: *Ocimum*

Species: *sanctum*

### Chemical constituents:

Phytochemically, *Ocimum sanctum* contains a wide variety of chemical constituents such as

α- Thujene, Octane, Nonane, Benzene, (Z)-3-hexanol, Ethyl 2- methyl butyrate, α-pinene, β-pinene, Toluene, citronellal, Camphene, Sabinene, Dimethyl benzene, Myrecene, Ethyl benzene, Limocene, 1,8,-cineole, cis-β-ocimene, p-cymene, Terpiniolene, Allo-oc-imene, Butyl-benzene, α-cubebene, Linalool, Eugenol, β-elemene, (E)-cinnamy, Lactate, Isocaryophyllene, β-caryophyllene, Iso-eugenol, α- guaiene, α-amorphene, α-humulene, γ - humulene, 4,11- seinadiene, α-terpeneol, Isoborneol, Carvacrol, germacrene-D, α—selinene, β-selinene, α- murolene, cadinene, δ - Cuparene, Calamene, Geraneol, Nerolidol, Caryophyllene oxide, Iedol, Humulene oxide, α- guaiol, τ - cadinol, α-bisbolol, (EZ)-famesol, Cissesquisainene hydrate, Elemol, Tetradecanal, Selin-11-en-4- α-ol, 14-hydroxy-α-humulene. Alcohalic extract of leaves / aerial parts. Urosolic acid, Apigenin, Luteolin, Apigenin-7-Oglucuronide, Luteolin-7-O-glucuronide, Isorientin, Orientin, Molludistin, Stigmasterol, Vicenin-2, Vitexin, Isovitexin, Aesculetin, Aesculin, Chlorgenic acid, Galuteolin, Circineol, Gallic acid, gallic acid methyl ester, Procatechuic acid, Vallinin acid, 4-hydroxybenzoic acid, Caffiec acid, Chlorogenic acid, Phenylpropane glucosides, β- Stigmasterol, urosolic acid[22-27].

### Medicinal and antioxidant properties:

*Ocimum sanctum* possess anti-stress, hepatoprotective, immunomodulating, anti-inflammatory, antibacterial, antiviral, antifungal, antipyretic, antidiuretic, and antioxidant properties with a wide margin of safety[28.] The fresh leaves of *O. sanctum* has been shown to enhance the immunity and also to have anti-carcinogenic properties in experimental animals[29]. Besides above, *O. sanctum* has also been demonstrated to exhibit rejuvenating properties, anti-septic and anti-allergic effects[30]. Tulsi has many beneficial properties with negligible toxicity, and is generally considered as an ideal antistress/adaptogenic herb. *O. sanctum* extract increased antioxidant like reduced glutathione (GSH) levels in plasma and liver, lung, kidney and brain of rat[31]. Tulsi has been found to exhibit therapeutic potential as antidiabetic, hypolipidemic, and antioxidant medicine. Oral feeding also provides noticable liver and aortic tissue protection from hypercholestrolemia-induced peroxidative damage[32].

### *Ipomoea carnea* Linn. (Beshram, Morning glory)

Family: Convolvulaceae

Order: Solanales

Genus: *Ipomoea*

Species: *carnea*

### Chemical constituents:

The plant possess various bioactive compounds such as glycosides, alkaloids, reducing sugars, flavonoids, fatty acid, esters, alcohol1 and tannins[33]. The leaves of this plant revealed the presence of thirteen compounds which include hexadecanoic acid, stearic acid, 1, 2 diethyl phthalate, n-octadecanol, octacosane, hexatriacontane, tetracontane, 3-diethylamino-1- propanol[34,35]. The *I. carnea* benzene and chloroform extracts yielded the compounds such as neophyadiene, 1-decanol, tetradecanoic acid, pentadecane, 1-iodo-2-methylundecane, trans-caryophyllene, eicosane, 2-butenoic acid and cholestan-3-one[36].

 

### Medicinal and antioxidant properties:

*Ipomoea carnea* is medicinally important plant reported in literature for its antimicrobial, anticancer, anti-inflammatory and for many other medicinal properties[37]. Roots of *I. carnea* are used as tonic, alternatively used in rheumatism and disorders of the nervous system. Seeds show noticable effects on hypotension and have spasmolytic activity. Evaluation of antioxidant activities, total flavonoids, and total phenolics from *I. batata* have also been reported[38] . *I. carnea* is also reported for wound healing activity. Preliminary qualitative phytochemical screening of *I. carnea* revealed the presence of phenolic compounds, terpenoids, flavonoids, lignins and steroids. Some of them have exhibit antioxidant and antimicrobial activities[39].

### *Delbergia sissu* (Shisham ,Sissu ,Sissai , Sisam)

Family: Fabaceae

Order: Fabales

Genus: *Dalbergia*

Species: *sissoo*

### Chemical Constituents:

The plant is rich in isoflavones irisolidone, biochanin-A, muningin, tectorigenin, prunetin, genestein, sissotrin and prunetin-4-Ogalactoside. The flavone norartocarpotin and F3-amyrin, F3- sitosterol and stigmasterol were isolated and identified from the green branches of aerial parts of *D. sissoo*.Amino acids like glycine, alanine, threonine, isolucine, phenylalanine are also reported[40].

### Medicinal and antioxidant properties:

Wood and bark of *Dalbergia sissoo* is considered as abortifacient, anithelmintic, antipyretic, aphrodisiac, expectorant, and refrigerant. The wood is regarded useful for blood disorders, burning sensations, eye and nose disorders, scabies, scalding urine, stomach problems, and syphilis. Other various parts such as roots, bark, leaves and seeds are being used as remedy in many ailments including skin diseases, blood diseases, syphilis, stomach problems, dysentery, nausea, eye and nose disorders, aphrodisiac, expectorant[41]. Butein isolated from *Dalburgia* have shown to inhibit the iron-induced lipid peroxidation in rat brain homogenate in concentration dependant manner with an IC 50 value 3.3±0.4µm. It was equivalent to α-tocopherol in reducing the stable free radical diphenyl-2-picarylhydryl (DPPH). Butein scavenged the peroxyl radical derived from 2,2-azobis (2-amidinopropane) dihydrochloride (AAPH) in an aqueous phase. Butein has also shown to inhibit copper-catalyzed oxidation of human low density lipoprotein (LDL) in a concentration dependent manner[42].

### *Lantana camara* (Big-sage, Booti)

Family: Verbenaceae

Order: Lamiales

Genus: *Lantana*

Species: *camara*

### Chemical constituents:

The main constituents in oil of Indian Lantana include germacene D, 3-elemene, β-caryophyllene, β-elemene, α-copane and α-cadinene. The other major componentsalso reported are caryophyllene, α-caryophyllene, germacrene D, γ-muurolene, γ-elemene. In addition there were δ-cadinene, γ-terpinene, copaene, eucalyptol, 3-carene, β-pinene, sabinene, limonene, o-cymene, borneol, germacrene D-4-ol. It is worth mentioning that there is a great variation in the chemical composition of *L. camara* oils reported up to now from the different parts of the world[43-46].

### Medicinal and anti oxidant properties:

It has been reported that a steroid, lancamarone, from the leaves *L. camara*, exhibited cardio tonic properties and that lantamine, an alkaloid from the stem, bark and roots exhibited antipyretic and antispasmodic properties comparable to those of quinine[47]. In India, the leaves of this plant are boiled for tea and the decoction is a remedy against cough and also used as a lotion for wounds and pounded leaves are applied to cuts, ulcers and swellings[48]. Antioxidant activity of the leaves of *L. camara* was reported by reducing power activity and 1, 1- diphenyl- 2- picrylhydrazyl (DPPH) radical scavenging method. Leaf extract exhibited high antioxidant effects, however younger leaves exhibited strong antioxidant activity than the older or matured leaves. Ethanolic extract of *L. camara* revealed significant antioxidant activity in *in vivo* studies. The extract treatment declined the extent of lipid peroxidation in the kidneys of urolithic rats[49].

### *Carissa carandas* (Karonda, Garnu, Crane berry)

Family: Apocynaceae

Order: Gentianales

Genus: *Carissa*

Species: *carandas*

### Chemical constituents:

Volatile oil of fresh flowers of *Carissa carandas* yields myrcene, limonene, camphene, carene, dipentene, farnesol, nerolidol, α-terpeneol, citronellal, β-ionone, nerylacetate, linalol and geranyl acetate .Fruits yield a mixture of volatile chemical constituents suc as 2-phenyl ethanol, linalool, ß- caryophyllene, iso amyl alcohol, benzyl acetate, lupeol, oxalic, tartaric, citric, malic, malonic and glycolic acids, glycine, alaline, phenyl alaline, cerine, glucose, galactose and a novel triterpenic alcohol (carissol -an epimer of α-amyrin[50]. The roots of this plant have yielded a number of volatile principles including 2-acetyl phenol[51,52]. The fresh leaves were reported to have triterpenoid constitutes well as tannins, and a new isomer of urosolic acid namely carissic acid was also isolated[53,54].

### Medicinal and antioxidant properties:

*Carissa carandas* has been utilised in many ethno medicines and traditionally used as stomachic, antidiarrhoeal and anthelmintic. Stems are used to

 

strengthen tendons; fruits in skin infections and leaves are remedy for fevers, earache, rheumatism, biliary dysfunction and syphilitic pain. It is also being consumed by the people as the raw or mature fruits are the most suitable for making pickle, jelly and candy[55]. The pharmacological properties of *C. carandas* have been extensively studied, and the plant is reported to show anticonvulsant, analgesic, anti-inflammatory, antipyretic, antibacterial, antifungal, hepatoprotective, antioxidant, acute hypotensive and anti-cancer activities. More prominent pharmacological studies were conducted with roots, fruits and bark, whereas leaves are less explored. These studies investigated the phytochemical composition and antioxidant properties of *C. carandas* leaves and revealed its ability to inhibit free radical-mediated DNA damage[56-60].

### *Ricinus communis* Linn. (Castor bean, Castor-oil plant, Eranda)

Family: Euphorbiaceae

Order: Malpighiales

Genus: *Ricinus*

Species: *communis*

### Chemical constituents:

The Preliminary phytochemical studies of *R. communis* revealed the presence of steroids, saponins, alkaloids, flavonoids, and glycosides. The roots and dried leaves of *R. communis* showed the presence of Indole-3-acetic acid, alkaloids, ricinine, quercetin xylopyranoside, quercetin-3-O-β-D-glucopyranoside, kaempferol O-β-rutinoside and quercetin-3-O-β- monoterpenoids (1, 8-cineole, camphor and α sesquiterpenoid (β-caryophyllene), gallic acid, quercetin, gentisic acid, rutin, epicatechin and ellagic acid are the major phenolic compounds isolated from leaves. The seeds of this plant contain consist of glycosides of ricinoleic, isoricinoleic, stearic and dihydroxystearic acids and also lipases and a ricinine[61,62,63].

### Medicinal and antioxidant properties:

The castor oil obtained from the seeds of this plant is widely used traditionally and herbally as a medicine. The main use of castor oil is as a purgative, laxative, anticancer and ulcer healing. It is also used being as a lubricant, lamp fuel, a component of cosmetics, and in the ink, plastics, fibres, varnishes, paints, textile dyes, leather finishes, adhesives, waxes, and fungicides. In India, the leaves are generally used as food for silk worms and the stalks are used as fuel[64,65]. *R. communis* possess wound healing activity due to the active constituent of castor oil which produce antioxidant activity and inhibit lipid per oxidation. The agents which inhibit lipid per oxidation are supposed to enhance the viability of collagen fibrils by increasing the strength of collagen fibres, increasing the circulation, preventing the cell damage and by promoting the DNA synthesis. The DPPH (1,1-diphenyl-2- picrylhydrazyl)-mediated *in vitro* study reveals the presence of gallic acid, quercetin, gentisic acid, rutin, epicatechin and ellagic acid are the major phenolic compounds responsible for the antioxidant activity of the dry leaves of *Ricinus communis*[66].

## CONCLUSION

Since time immemorial people have tried to find alternatives to alleviate pain and cure various illnesses. In every successive century from the development of humankind and advanced civilizations, the healing properties of many medicinal plants were identified, noted, and conveyed to the next generations. The benefits of one society were passed on to another, which upgraded the old properties, discovered new ones, till present days. From the above discussion, it has been revealed that the plants are excellent source of curing various ailments. Antioxidants play vital role in preventing the risk of so many diseases by interacting with free radicals. A number of active chemical constituents including phenolic compounds, such as flavonoids, phenolic acids, tannins, lignins, and alkaloids, vitamins etc., serve as useful antioxidants. The present review suggests that medicinal plants which possess considerable antioxidant potential are the best supplements for the diseases associated with oxidative stress. The literature review presented in this paper strongly approved the medicinal and antioxidant properties of all the mentioned plant species. The finding that these medicinal plants possess antioxidant and therapeutic activities implies that making these plants as an integral part of daily consumption may prevent various diseases.

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## CONFLICT OF INTEREST

The authors hereby declare that there is no conflict of interest.

 

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