

SOME MEDICINAL PLANTS WITH ANTIOXIDANT ACTIVITY- A REVIEW

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ABSTRACT

A lot of medicinal plants, traditionally used for thousands of years, are present in a group of herbal preparations of the Indian traditional health care system (Ayurveda) named Rasayana proposed for their interesting antioxidant activities. Rasayanas are a group of non-toxic polyherbal drug preparation, which are immunostimulatory and thereby prevent the causation of disease and promote health and longevity. In the present paper seven plants (*Ocimum sanctum* L., *Camellia sinensis* L., *Withania somnifera* L., *Glycyrrhiza glabra* L., *Curcuma longa* L., *Zingiber officinale* Rosc., *Melia azedarach* L.) are viewed for their chemical constituents, medicinal and antioxidant property. Antioxidants have been reported to prevent oxidative damage caused by free radical and may prevent the body from various diseases. In recent years the search for effective non-toxic natural compounds with antioxidant activity has been intensified. The present review includes a brief account of research report on plants with antioxidant potential.

KEY WORDS

Phenolic compounds, antioxidant activity, free radical scavenging activity

INTRODUCTION

Antioxidants or inhibitors of oxidation are compounds which retard or prevent the oxidation and in general prolong the life of the oxidizable matter¹. The oxidants / free radicals are species with very short half life, high reactivity and damaging activity towards macromolecules like proteins, DNA and lipids. These species may be either Oxygen derived (ROS) or Nitrogen derived (RNS). The most common reactive oxygen species include superoxide anion (O_2^-), hydrogen peroxide (H_2O_2), peroxy radicals (ROO) and reactive hydroxyl radicals (OH). The nitrogen derived free radicals are nitric oxide (NO), peroxy nitrite anion (ONOO), Nitrogen dioxide (NO_2) and Dinitrogen trioxide (N_2O_3)^{2,3}

Free radicals are constantly generated resulting in extensive damage to tissues and biomolecules leading to various disease conditions. So the medicinal plants with antioxidant property are employed as an alternative source of medicine to mitigate the diseases associated with oxidative stress.^{4,5}

An antioxidant is a molecule capable of slowing or preventing the oxidation of other molecules. Oxidation is a chemical reaction that transfers electron from a substance to an oxidizing agent. Oxidation reactions can produce free radicals, which start chain reactions that damage cells. Antioxidants are the substances that inhibit oxidation and are capable of counteracting the damaging effects of oxidation in body tissue. They prevent damage caused by free radicals. Free radicals are very unstable molecules with an unpaired electron and are important intermediates in natural processes involving control of vascular tone, cytotoxicity and neurotransmission. Free radicals cause many human diseases like cancer, Alzheimer's disease, cardiac reperfusion abnormalities, kidney disease and fibrosis etc. Antioxidants play many vital functions in a cell and have many beneficial effects when present in foods.^{6,7}

Medicinal plant parts are commonly rich in phenolic compounds, such as flavonoids, phenolic acids, stilbenes, tannins, coumarins, lignans and lignins.

These compounds have multiple biological effects including antioxidant activity.⁶

Antioxidants are widely used in dietary supplements and have been investigated for the prevention of diseases such as cancer, coronary heart disease and even altitude sickness. Although initial studies suggested that antioxidant supplements might promote health⁸

On the basis of solubility anti-oxidants are of two types.³

(a). Hydrophilic antioxidants:- They are soluble in water. Water soluble antioxidants react with oxidants in the cell cytoplasm and blood plasma.

(b). Hydrophobic antioxidants:- They are soluble in lipids. Lipid soluble antioxidants protect cell membranes from lipid peroxidation.

Plants with medicinal and antioxidant property-

Ocimum sanctum Linn. (Tulsi, Sacred Basil)

Family - Lamiaceae

Chemical constituents:-Eugenol (an essential oil) and ursolic acid.⁹ volatile oil, Estragole, thymol.¹⁰

Medicinal and antioxidant property:-

Ocimum sanctum has anti-stress, antioxidant, hepatoprotective, immunomodulating, anti-inflammatory, antibacterial, antiviral, antifungal, antipyretic, antidiuretic, antidiabetic, antimalarial and hypolipidemic properties with a wide margin of safety. In Ayurvedic medicine, Tulsi is being used either alone or in combination with others in various clinical conditions like anxiety, chronic cough, bronchitis, fever, snake and scorpion bites⁹.

The aqueous extract decreased LPO formation (thiobarbituric acid reactive substances TBARS) and increased antioxidant enzymes like superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX), glutathione transferases (GT). It also increased antioxidant like reduced glutathione (GSH) levels in plasma and liver, lung, kidney and brain of rat^{9, 11}. Tulsi has been found to have therapeutic potential as antidiabetic, hypolipidemic, and antioxidant medicine.



Daucus carota Linn. (Carrot)

Family :- Apiaceae

Chemical Constituents:- Seed oil of *Daucus carota* contain Carotol, daucol, terbenolene, sabinene, carotenoid, carotene, flavonoids, sugars.^{12,10} Alanine, α tocopherol, ascorbic acid, camphene, γ -terpinene, histidine Antitoxin.⁹

Medicinal and antioxidant property:- Used in bronchitis, chest troubles, urinary complaints, piles, leprosy, tumours, jaundice. Seeds useful in diseases of kidney and in dropsy.

Antioxidant and radical scavenging activities are much higher in carrot peel than phloem and xylem tissue. Phenolic acids and flavonoids made greater contribution to the total antioxidant capacity. The quality of the antioxidants in the extracts is determined by the IC50 values. A low IC50 indicates strong antioxidant activity.¹³



Camellia sinensis (Green tea)

Family: - Theaceae

Chemical Constituents: Polyphenols constitute the most interesting group of green tea leaf components, and in consequence, green tea can be considered an important dietary source of polyphenols, particularly flavonoids.^{14,15} The United States Department of Agriculture (USDA) has recently published a Database

for the Flavonoid Content of Selected Foods.¹⁶ The main flavonoids present in green tea include catechins (flavan-3-ols). The four major catechins are (-)- epigallocatechin-3-gallate (EGCG), that represents approximately 59% of the total of catechins; (-)-epigallocatechin (EGC) (19% approximately); (-)-epicatechin-3-gallate (ECG) (13.6% approximately); and (-)-epicatechin (EC) (6.4% approximately)^{17,15}. Green tea also contains gallic acid (GA) and other phenolic acids such as chlorogenic acid and caffeic acid, and flavonols such as kaempferol, myricetin and quercetin.

Medicinal and antioxidant property: Green tea shows several medicinal activity like Anti-Aging, Neurodegenerative Diseases such as Anti Alzheimer, Antiparkinson, Antistroke, Cardiovascular Diseases, Anticancer, Antidiabetic, Anticaries, Skin Disorders, Obesity and Weight Loss.¹⁵

In Green tea catechin, EGCG is a powerful antioxidant that is capable of protecting erythrocyte membrane bound ATPases against oxidative stress, a significant increase in plasma antioxidant capacity in humans after consumption of moderate amounts (1–6 cups/day) and enhanced blood antioxidant potential leads to reduced oxidative damage in macromolecules such as DNA and lipids.¹⁸

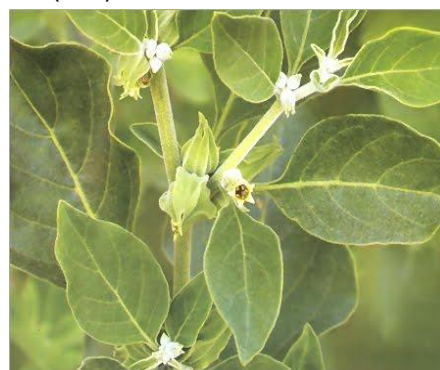


***Withania somnifera* (Ashwagandh)**

Family :- Solanaceae

Chemical Constituents: Ascorbic acid, α -tocopherol and reduced glutathione, phenolics, alkaloids, withaferin, superoxide dismutase, ascorbate peroxidase, catalase, peroxidase & polyphenol oxidase^{10,12}.

Medicinal and antioxidant property: Ashwagandh shows Hepatoprotective, analgesic activity also increase immunity. The free radical scavenging and antioxidant activity of the extract of *Withania somnifera* was measured in terms of hydrogen donating or radical scavenging ability using the stable free radical DPPH(2, 2, diphenyl 1-picrylhydrazyl) Glycowithanolides (WSG) consisting of sitoindosides VII to X and withaferin. Major oxidative free radical scavenging enzymes are superoxide dismutase (SOD), Catalase (CAT) and glutathione peroxidase (GPX).¹⁹



***Glycyrrhiza glabra* - (Licorice, Mulathi)**

Family: - Leguminosae.

Chemical constituents : Glycyrrhizin, flavones, coumarins, saponin, aroma of licorice is due to mixture of estragole, anethole, eugenole, indole, and cumic alcohol^{3, 10, 12, 13}.

Medicinal and antioxidant property: Its medicinal uses are in acute case of conjunctivitis, diuretic, demulcent, anti-inflammatory, in peptic ulcer, vomiting, asthma, bronchitis, in curing wounds, tonic¹⁰, genitourinary diseases, cough and sore throat. Its extract was tested by studying the inhibition of radiation induced lipid peroxidation in rat liver microsomes. It shows its activity through free radical scavenging property.³



Curcuma longa (Turmeric)

Family:- Zingiberaceae

Chemical constituents:- Rhizome contains pigments curcumin, beta-pipene, camphene, Eugenol.¹⁰

Medicinal and antioxidant property: Turmeric is used in India to treat anorexia, liver disorders, cough, diabetic wounds, rheumatism, and sinusitis, antifungal, antibacterial, insecticide.^{20,21}

curcumin is a potent antioxidant, it may scavenge the epoxides and prevent binding to macromolecules. In other words, this spice's cell-protective properties are similar to nutrient antioxidants, vitamins C and E, which inhibit free radical reactions.^{20,21}



Zingiber officinale (Ginger)

Family:- Zingiberaceae

Chemical constituents:- zingiberene, the main terpenoid and 6-gingerol, the pungent principle, volatile oil, starch, acrid resinous matter, shagoals, zingerone, peradols etc.³

Medicinal and antioxidant property:- prevent nausea, vomiting, coughs and asthma, anti-inflammatory, laxative and digestive, appetiser, relief

in diarrhoea, headache, toothache and elephantiasis.¹² Ginger extracts possess strong antioxidant radical activities as evidenced by the ABTS assay. Both aqueous and ethanol extracts of ginger have significant natural antioxidant activity. Therefore, consumption of ginger might be helpful in combating the progression of various diseases with oxidative stress components such as atherosclerosis, diabetes mellitus among others.²²



Melia azedarach L. (Margosa)

Family - Meliaceae

Chemical constituents:- Azaridine, sterols, tannins, paraisine, rutin, seeds are rich in fatty oil consisting of palmitic, oleic, linoleic acid.¹²

Medicinal and antioxidant Property :- Root bark is used in ascariasis, skin disease, eczema, leucoderma, malarial fever, wounds, diabetes, insecticidal, intestinal worms.¹²

Antioxidant activity is evaluated by DPPH radical scavenging assay and free radical scavenging ability of the extracts. The result showed that the extract of Melia azedarach., which contains highest amount of phenolic compounds exhibited the greatest antioxidant activity. The high scavenging property may be due to hydroxyl groups existing in the phenolic compounds chemical structure that can provide the necessary components as a radical scavenger. IC₅₀ value and the total polyphenol content indicating that increasing the polyphenol content strengthens the antioxidant activity.²³



CONCLUSIONS

All plants discussed in this review exhibited significant, phenolic compounds, such as flavonoids, phenolic acids, tannins, lignins. These compounds have multiple biological effects including antioxidant activity. The present investigation suggests that medicinal plants which possess good antioxidant potential are the best supplements for the diseases associated with oxidative stress.

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