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REVIEW ARTICLE

ANTIOXIDANT ACTIVITY OF HERBAL PLANTS: A RECENT REVIEW

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ABSTRACT

Antioxidants or inhibitors of oxidation are compounds which retard or prevent the oxidation and in general prolong the life of the oxidizable matter. Majority of the diseases/disorders are mainly linked to oxidative stress due to free radicals. The free radicals (oxidants) are species with very short half-life, high reactivity and damaging activity towards macromolecules like proteins, DNA and lipids. In general, the reactive oxygen species circulating in the body tend to react with the electron of other molecules in the body and these also effect various enzyme systems and cause damage which may further contribute to conditions such as cancer, ischemia, aging, adult respiratory distress syndromes, rheumatoid arthritis etc. A plant-based diet protects against chronic oxidative stress-related diseases. Dietary plants contain variable chemical families and amounts of antioxidants. It has been hypothesized that plant antioxidants may contribute to the beneficial health effects of dietary plants. This review presents some information about the antioxidant/antiradicals and their role in our body and also their presence in spices and herbs.

Key words: Antioxidants, Free radicals, Herbal Plants

INTRODUCTION:

The free radicals may be either Oxygen derived (ROS) or Nitrogen derived (RNS). The most common reactive oxygen species include superoxide anion (O2), hydrogen peroxide (H2O2), peroxyl radicals (ROO) and reactive hydroxyl radicals (OH). The nitrogen derived free radicals are nitric oxide (NO), peroxy nitrite anion (ONOO), Nitrogen dioxide (NO2) and Dinitrogen trioxide (N2O3).

The exogenous sources of ROS include electromagnetic radiation, cosmic radiation, UV-light, ozone, cigarette smoke and low wavelength electromagnetic radiations and endogenous sources are mitochondrial electron transport chain, β-oxidation of fat. Chemical compounds and reaction capable of generating potential toxic oxygen species/free radicals are referred to as 'pro-oxidants'. They attack macromolecules including protein, DNA and lipid causing to cellular/tissue damage on the other hand, compounds and reactions disposing of these species, scavenging them suppressing their formation or opposing their actions are called antioxidants. In a normal cell there is an appropriate pro-oxidant: antioxidant balance. However, this balance can be shifted towards the pro-oxidant when production of oxygen species is increased or when levels of antioxidants are diminished. This state is called 'oxidative stress' and can result in serious cell damage if the stress is massive or prolonged. Herbal antioxidants have been successfully employed as rejuvenators, for several centuries in the Indian systems of alternative medicine[1-3].

COMMONLY USED HERBAL ANTIOXIDANTS:

Cocculus hirsutus:

In a step in this direction we have evaluated antioxidant potency of the ethanol extract on the aerial parts of Cocculus hirsutus Diels. The extract was investigated for its free radical scavenging action to wards 1, 1-Diphenyl–2picryl hydrazyl, nitric oxide, superoxide and hydroxyl radicals and found that the ethanol extract shows promising free radical scavenging activity in dose dependent manner. This antioxidant potency may be related to the presence of antioxidant vitamins and

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phenolic compounds present in the extract. These results clearly indicate that Cocculus hirsutus Diels is effective against free radical mediated diseases[4].

Figure 1: ***Cocculus hirsutus***[5]

***Withania somnifera* (Ashwagandha):**

Ashwagndha *(Withania somnifera)* belongs to Solanaceae family and has been used for centuries in Indian systems of alternative medicine to treat various ailments. It is commonly known as Indian Ginseng because of its comparable medicinal value to ginseng which is acclaimed for its activity in alleviating stress induced illness. The medicinal properties of ashwagandha are mostly attributed to its tuberous roots whose extracts are widely marketed as an over the counter herbal supplement. Adaptogens, like ashwagandha, are believed to facilitate the maintenance of homeostasis by normalizing physiological as well as biochemical changes induced by stress. The anti-inflammatory, anticancer and immunomodulatory activities of ashwagandha rationalize its extensive use in promoting longevity. Ashwagandha's antioxidant activity suggests that a common molecular mechanism may be responsible for its diverse biological effects[6].

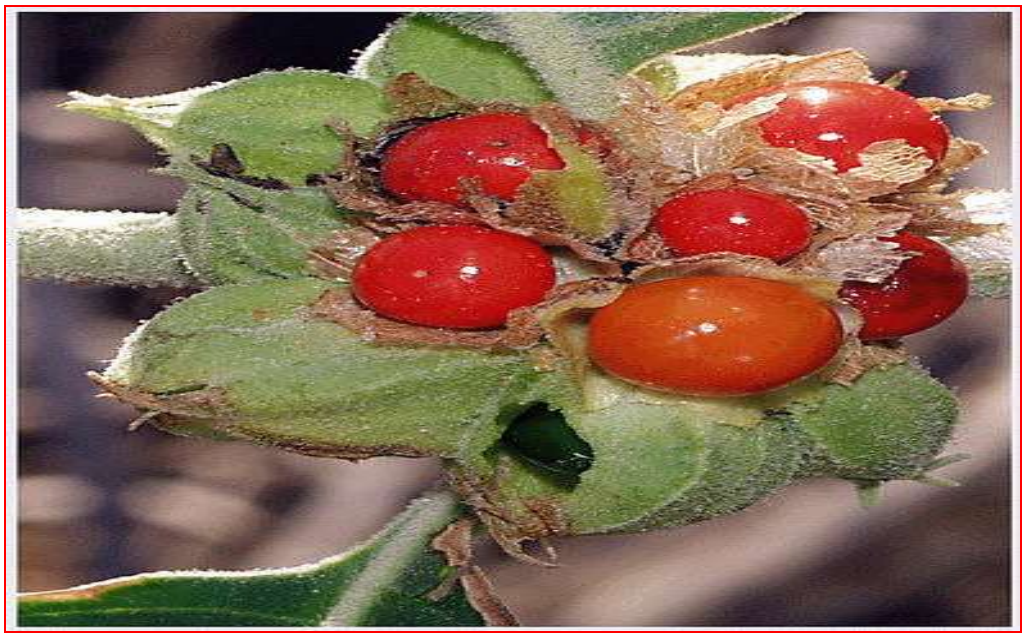

Figure 2: ***Withania somnifera***[7]

***Zingiber officinale* (Ginger):**

Ginger is a widely used herbal supplement, often used in a number of culinary preparations all around the world. It is a rhizome of the herb *Zingiber officinale*, which belongs to the family Zingiberaceae. Due to its diverse healing properties it is extensively used in alternative medicines such as Chinese medicine, Ayurveda, Siddha and Unani. The Indian systems of medicines recommend the use of ginger as a kaya karpam or rejuvenator. It is used both in fresh and dried form to treat nausea and vomiting, osteo and rheumatoid arthritis, diabetes mellitus, indigestion and some cardiovascular disorders. Various studies have demonstrated the anti-oxidant, anti-inflammatory, anti-cancer and anti-microbial properties of ginger. These multiple biological properties of ginger support its clinical application as an herbal rejuvenator[8, 9].

Figure 3: *Zingiber officinale* (Ginger)[11]

***Azardirachta indica* (Neem):**

Azardirachta indica, commonly known as neem, belongs to the family Meliaceae, is a large ever green tree with immense medicinal applications. Various parts of the neem tree such as leaves, flowers, seeds, roots and bark are used as traditional remedies for a number of ailments in the Indian systems of alternative medicine. However, the wide ranging medicinal value of the neem leaves stands out in comparison with other parts of the tree. Various studies have indicated that the neem leaves have anti-microbi, anti-inflammatory, analgesic, antidiabetic, immune-modulatory, anti-oxidant and anti-cancer properties. Due to its numerous pharmacological activities neem leaves are used as a kaya karpam to promote longevity[12, 13].

Figure 4: *Azardirachta indica* (Neem)

Benincasa hispida:

The crude extracts of *Benincasa hispida* i.e. Methanolic extract (M.E.) and aqueous extract (A.E.) were studied for the presence and detection of phytochemical such as alkaloids, saponins, steroids, carbohydrates and flavonoids using standard procedures. On the basis of the results, the extracts were further used for in vitro evaluation of antioxidant activity. The present study was designed to study the phytochemical screening and to investigate the free radical scavenging potential of aqueous and methanolic extract of dried ripe peels of *Benincasa hispida*. The free radical scavenging potential was evaluated by DPPH(1.1,-diphenyl-2-picrylhydrazyl)[15].

Figure 5: *Benincasa hispida*[16]

Sonchus asper:

Evaluation of phenolic contents and antioxidant activity of various solvent extracts of Sonchus asper (L.) Hill. The SA extracts presented a remarkable capacity to scavenge all the tested reactive species with IC50 values being found at the µg / ml level. The SAME was shown to have the highest TPCs while lowest IC50 values for the DPPH• , ABTS •+radical scavenging capacities and iron chelating scavenging efficiency, moreover, SAME had best activities in scavenging of superoxide radicals and hydrogen peroxide as well as potently scavenged the hydroxyl radicals. These results suggest the potential of S. asper as a medicine against free radical-associated oxidative damage[17].

Figure 6: *Sonchus asper*[18]

Moringa oleifera:

To assess the phytochemical constituents, total phenolic content, cytotoxicity and in-vitro antioxidant activity of stem bark extracts of Moringa oleifera (M. oleifera) (Moringaceae). Brine shrimp lethality (BSL) bioassay was used to investigate the cytotoxic effects. DPPH and nitric oxide radical scavenging activity was used to demonstrate antioxidant activity[19].

Figure 7: ***Moringa oleifera***[20]

Momordica charantia:

The aim of the present study was to investigate the in vitro antioxidant activity of aqueous and methanol extracts of Momordica charantia leaves. The antioxidant activity of the plant extract was also determined by DPPH and ABTS methods using ascorbic acid and gallic acid as standards respectively[21].

Figure 8: ***Momordica charantia***[22]

Asparagus racemosus:

It shows antioxidant activity through the free radical scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging, nitric oxide scavenging, metal chelation, reduction power and inhibition of lipid peroxidation in rats. Its chemical constituents are saponins (Shatavarin I-V), alkaloids, polyphenols, flavonoids, vitamin C[23].

Figure 9: ***Asparagus racemosus***[24]

Glycyrrhiza glabra:

It is popular as licorice 'yastimadhu'. Its extract was tested by studying the inhibition of radiation induced lipid peroxidation in rat liver microsomes. Chemical constituents are glycyrrhizin, flavones, coumarins. It shows its activity through free radical scavenging property. Its other actions are diuretic, demulcent, tonic etc[25].

Figure 10: ***Glycyrrhiza glabra***[26]

Origanum dictamnus:

The aqueous extract scavenges free radicals generated by the fenton reaction and reducing oxygen consumption of a methyl linoleate emulsion. The active components of herb are phenolic compounds, mainly flavonoids and phenolic acids[27].

Figure 11: ***Origanum dictamnus***[28]

Annona squamosal:

It is popular as 'Custard apple or Sitaphal'. Streptozotocin induced diabetic rats were used. It reduces the lipid peroxidation and increases the activity of antioxidant enzymes and strong super oxide radicals and singlet oxygen quenchers. Chemical constituents are flavonoids[29].

Figure 12: ***Annona squamosa***[30]

CONCLUSION:

Current research reveals the different potential application of antioxidant/free radical manipulations in prevention or control of diseases. Natural products from dietary components such as Indian species and medicinal plants are known to possess antioxidant activity. Increasing intake of dietary antioxidants may help to maintain an adequate antioxidant status and, therefore, the normal physiological function of a living system. To protect the cells and organ systems of the body against reactive oxygen species, humans have evolved a highly sophisticated and complex antioxidant protection system.

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