

# A Review on: Plant Based Antioxidant

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## ABSTRACT:

Plants produce a lot of antioxidants to control the oxidative stress caused by sunbeams and oxygen, they can represent a source of new compounds with antioxidant activity. Antioxidants are the group of neutraceutical parameters which works on regulate the prevent oxidative damage of body cause due to free radicals. Natural antioxidants play an important role scavenge harmful free radicals from our body obtained naturally from plants .they are present in various parts of plants as Ascorbic acid , vitamin E , and phenolic compounds .Antioxidants exert their mode of action by suppressing the formation of reactive oxygen species either by inhibition of enzymes or by chelating trace elements. Free radicals are the chemical species that have an unpaired electron and play very important role in human health and beneficial in combating against several diseases like cardiovascular disorders, lung damage, inflammation etc. These can damage cell membranes and other vital cell components, such as genetic material in the cell nucleus, and can inactivate enzymes. Damage to body cells and molecules by oxygen containing free radicals has been implicated in a wide variety of diseases. DPPH is widely used to evaluate the free radical scavenging effect of natural antioxidant. Antioxidants in different parts of plants such as ascorbic acid, vitamin E and phenolic compounds possess the ability to reduce the oxidative damage associated with many diseases including cancer, cardiovascular diseases, cataracts, atherosclerosis, diabetes, arthritis, immune deficiency diseases and ageing.

**KEYWORDS:**Antioxidants, advantages, principle, classification, applications, and plants shows antioxidant activity.

## Introduction:

Antioxidants are the substances which can be commonly derived from naturally from the plants .it is most important neutraceutical parameter which helps in regulating normal body. antioxidant are the group of compound which having capacity to decrease the harm result in body by the various mechanism like exert their mode of action by suppressing the formation of reactive oxygen species either by inhibition of enzymes or by chelating trace elements.[1]

Free radicals are the species with short half life high reactivity and damaging activity towards macromolecules like proteins, DNA, Lipids. These can damage cell membranes and other vital cell components, such as genetic material in the cell nucleus, and can inactivate enzymes.

The free radicals may be either Oxygen derived (ROS) or Nitrogen derived (RNS). The most common reactive oxygen species include superoxide anion (O<sub>2</sub><sup>-</sup>), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), peroxy

radicals (ROO) and reactive hydroxyl radicals (OH). The nitrogen derived free radicals are nitric oxide (NO), peroxy nitrite anion (ONOO), Nitrogen dioxide (NO<sub>2</sub>) and Dinitrogen trioxide (N<sub>2</sub>O<sub>3</sub>). 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,  $\beta$ -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 antioxidant.(2)

The human body has a complex system of natural enzymatic and non-enzymatic antioxidant defences which protect the body from the harmful effects of free radicals and other oxidants. Free radicals are responsible for causing a large number of diseases including cancer , cardiovascular disease , neural disorder , Alzheimer's disease , mild cognitive impairment, Parkinson's disease , alcohol induced liver diseases, ulcerative colitis , aging and atherosclerosis . Protection against free radicals can be enhanced by ample intake of dietary antioxidants. (3)

## **ADVANTAGES**

### **1. Reduce oxidative stress**

Oxidative stress is a form of physiological stress caused by an imbalance between the production and accumulation of oxygen-reactive species in the cells and tissue. This can result in a gap in a system's ability to detoxify reactive products.

### **2. Reduction in disease condition**

Reducing oxidative stress, antioxidants can support normal cellular function and offer additional protection against diseases. Antioxidants are substances that can be use to lower rates of cancer, tumors, diabetes, atherosclerosis, cardiovascular diseases and metabolic disorders in many cases.

### **3. Enhances the eye health**

It mainly works onslowing the progression of age-related macular degeneration. Beta-carotene and vitamin E are also quite well known for these properties.

### **4. Enhances the brain functioning**

Antioxidants have the potential to increase various forms of cognitive decline, like memory loss. It is also use to decreases the oxidative stress, which can contribute to alzheimer disease other forms of memory loss and decline in cognitive function also.

### **5. Use to reduce the inflammation**

Antioxidants prevent inflammation by protecting the cells from damage, they can prevent those unwanted inflammatory responses from occurring at all.

## 6. Use helps in skin damages

They work by helping to fight free radical damage, antioxidants can offer extra protection for the skin. Not only can the prevention of inflammation help to reduce the redness, puffiness, and premature aging, but antioxidants can also protect against UV sun damage (which causes premature aging and wrinkles). The most commonly used and effective antioxidants for skin care is vitamin C. (4)

### Principle for Antioxidant Activity:

As with the chemical antioxidants, cells are protected against oxidative stress by an interacting network of antioxidant enzymes. Here, the superoxide released by processes such as oxidative phosphorylation is first converted to hydrogen peroxide and then further reduced to give water. This detoxification pathway is the result of multiple enzymes, with superoxide dismutase's catalysing the first step and then catalyses and various peroxidases removing hydrogen peroxide. As with antioxidant metabolites, the contributions of these enzymes to antioxidant defences can be hard to separate from one another, but the generation of transgenic mice lacking just one antioxidant can be informative.

A chain breaking mechanism through which the primary antioxidant contributes an electron to the free radical present in the system. The removal of ROS/ reactive nitrogen species initiators (secondary antioxidants) by quenching chain-initiating catalyst is involved in the second mechanism.

Other mechanisms of antioxidants are effective on biological systems like metal ion chelation, electron donation, co-antioxidants or by gene expression regulation mechanisms (5,8)

## CLASSIFICATION OF ANTIOXIDANTS

### A . Classification on the basis of occurrences

1. Natural
2. Synthetics

### B .Classification on the basis of their solubility.

- |                         |                  |
|-------------------------|------------------|
| 1 .water soluble        | 2. Lipid soluble |
| Eg. Albumin –flavonoids | eg.tocopherol    |
| Ascorbate-cysteine      | carotenoids      |

### C. On the basis of the source and origin

- |           |               |
|-----------|---------------|
| Enzymatic | non enzymatic |
|-----------|---------------|

### Application of an antioxidants

1. Dietary antioxidant vitamins A, C, and E are essential and required in specific daily amounts to prevent diseases.
2. Antioxidants which act's nutrients such as carotenoids, ascorbic acid (vitamin C), tocopherols and tocotrienols (Vitamin E), and other low molecular weight compounds including glutathione and lipid acid.
3. Enzymatic antioxidants, that are catalyze free radical quenching reactions including glutathione peroxidase, superoxide dismutase, and glutathione reductase.
4. Proteins that bind metals that seizes free iron and copper ions that are capable of catalyzing

5. Oxidative reactions, such as lactoferrin, ferritin, albumin, and ceruloplasmin.
6. In the wide varieties of food A number of other antioxidant phytonutrients present (7,8)

### The role of Natural antioxidant as compare to synthetic

The use of synthetic and natural food antioxidants regularly in medicine and foods particularly those having fats and oils to shield the food from oxidation. Butylatedhydroxytoluene (BHT) and butylatedhydroxyanisole (BHA) are the synthetic and natural food antioxidants which have been used extensively in cosmetic, food and therapeutic industries.

Natural antioxidants plays an important role while synthetic owing high instability at high temperature, high volatility, some synthetics antioxidants shows carcinogenic behaviours there for the to avoid above instabilities issues it preferable to the use natural type of instead of synthetics antioxidant(8)

### Some medicinal plants having potential of antioxidant activity

#### 1. TURMERIC-

common name –Haldi.

biological source –It is obtained from the rizomes of *Curcuma longa* plant .

Family - *zingiberiaceae*

Chemical constituents responsible for antioxidant activity is –curcumin ( 9,10)



#### 2. BRAHMI-

- Synonyms: Guj- Barmhi Ben- Tholkuri; Hin- Brahmamanduki; Tam- allarei.
- Biological source: Brahmi consists of the fresh and dried leaves and stem of *Bacopa monnieri*
- Family: *Umbelliferae /scrophulariaceae*  
Chemical constituents responsible for antioxidant activity –Becoside A ,and Becoside B (12)



### 3 .BASIL

Basil (*Ocimumbasilicum* L.) is an annual

Biological sources –it is obtained from the the leaves of *Ocimumbasilicum*

FAMILY –IT belongs to family Lamiaceae (13)



### 4.TULSI –

BIOLOGICAL SOURCE – it is obtained from dried leaves of *Ocimumsantum*

Fmily -itbelonging to family lamiaceae

CHEMICAL CONSTITUENTThe free radicals 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 ( $N_2O_3$ ). 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,  $\beta$ -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 antioxidant.(1)



<https://www.google.com/>

#### 5 .ALOVE VERA –

Biological source- it is obtained from leaves of Alovevera

Family - it Belonging to family Asphodelaceae /xanthorroeeaceae

Cemical constituents responsible for antioxidant activity –

Palmitic acid (25.99), Dibutylphathalate (30.93)



<https://www.goodhousekeeping.com/home/gardening/g19682442/aloe-plant-care/>

## 6. ALBIZIA AMARA

BIOLOGICAL SOURCE – It is obtained from the leaves of Albizia amara

Family – it belonging to family Fabaceae



It shows 96% antioxidant activity

## 7 .AVARAM / SEENA AVRICULATA –

BIOLOGICAL SOURCE – It is obtained from Cassia auriculata

FAMILY – Fabaceae

It contains about 89% of antioxidant activity ,the potency of protective effect of A.amara was about 4 times greater than synthetic antioxidant butylatedhydroxytoluene



## 8. ASHWGANDHA

It is commonly known as Indian Ginseng.

Biological source : it is obtained from tuberous roots of Withania somnifera

Family: belongs to Solanaceae family

Ashwagandha's antioxidant activity shows that a common molecular mechanism may be recommended for its diverse biological effects



## 9. ORANGO

Biological source : it is obtained from *Origanum dictamnus* Family : it belonging to family Lamiaceae

The aqueous extract scavenges free radicals generated by the fenton reaction and reducing oxygen consumption of a methyl linoleate emulsion.

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<sup>2</sup>



## 10 GINGER

Biological source : it is obtained from rhizome of the herb *Zingiber officinale*.

Family : which belongs to the family Zingiberaceae.

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.





## 11. NEEM

commonly known as neem.

Biological source: it is obtained from the fresh leaves of *Azadirachta indica*.

FAMILY : commonly known as neem, belongs to the family Meliaceae.

Chemical constituent : Azadirachtin and Nimbolide are the play an imp role in antioxidant activity in the neem; also shows concentration dependent antiradical scavenging activity and reductive potential



**Miraculous Benefits of Neem Leaves**

## 12. *Momordica charantia*

Biological source : it is obtained from the fruit and leaves of *Momordica charantia*.

Family : It comes under the family Cucurbitaceae.

by DPPH and ABTS methods using ascorbic acid and gallic acid as standards respectively antioxidant activity of plant extract was determined



### 13. ARJUNA

Biological sources : it is obtained from leaves and flower of Terminalia arjuna

Family: it is belongs to family Combretaceae

Chemical constituent responsible for antioxidant activity is largely due to flavonoids



### 14 SONCHUS ASPER-

Biological source: it is obtained from leaves of Sonchus asper

Family: it belongs to family Asteraceae

The plant Sonchus asper has been used for the cure of skin ailments and many other disease conditions



15. *Annona squamosa*:

Biological source :it is obtained from leaves and fruit and seeds of *Annona squamosa*

Family: Annonaceae

Phenolic compounds in these plants shows anioxident activity



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