

# ANTIOXIDANT FROM MEDICINAL PLANT PRODUCTS

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## ABSTRACT

Antioxidants are substances that inhibit oxidation (the loss of electrons), which results in the formation of free radicals, which are electron hungry entities. Antioxidants transfer electrons to reactive species, preventing the body from producing detrimental effects from environmental stress and conditions. Antioxidants can be found naturally in plants as polyphenols, flavonoids, and so on, or they can be obtained artificially as supplements. Each antioxidant-containing molecule has a unique role and performs a distinct function. Antioxidant does not specifically relate to a compound, but rather to a category of many diverse compounds that possess antioxidant properties. Herbs and spices are historically described as any fragment of a plant that is utilized or incorporated in the diet for its fragrant characteristics but has little or little nutritional value. In contrast, herbs along with spices have lately been found as originator of non-identical phytochemicals, innumerable ones have overwhelming antioxidant activity. Thus, herbs and spices may contribute and played a major role in antioxidant defence and redox signalling.

**Keywords:** Antioxidants; phytochemicals; compounds; nutritional.

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## INTRODUCTION

Alternative medicine is becoming more popular as a result of its low cost and increased trust in herbal therapy. Allopathic medication has the ability to heal a broad range of disorders; but, its expensive pricing and adverse consequences which may leads to innumerable people to turn to herbal remedies, which have less negative repercussions. Indigenous peoples still maintain and orally transmit a large quantity of long established accomplishment regarding the usage of restorative plant species [1, 2]. In accordance with World Health Organization (WHO), traditional medicine serves as a main health care provider for up to 80% of the world's population. A range of pharmacological effects are related to phytochemical elements of medicinal plants. Extinction and fast deterioration of therapeutically significant medicinal plant species are concerns aggravated by the plant's excessive and incorrect utilization in its natural environment. Uttarakhand has recorded the most medicinal plant species, accompanied by Sikkim and North Bengal. The Trans-Himalaya, on other hand, supports around 337 medicinal plant species which is low in comparison to other regions of the Himalayas due to the different geology and sustainable insignificant surroundings [3-5]. Additionally, plant species (90%) deploy or make use in the industries (herbal) are extricate from the wild, and around 70% of Indian Himalaya restorative plants are subjected to devastating

harvesting, and numerous plants are native to the Himalaya's sub-alpine and alpine regions of international organizations such as the World Wildlife Fund (WWF) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO) are supporting ethno-botanical knowledge study and the integration of people's perspectives as part of their people and plants project.

Medicinal and aromatic plants are fundamental foundations of Ayurveda and have significant importance in the production of pharmaceuticals in both traditional and modern medicine. Plants prolong to do especially in the health care systems of people living in rural and isolated places. Indigenous remedies give significant economic advantages to the local population. In accordance with WHO, around present day medications (25 %) are derived from traditional plant origin, while exploration on long established restorative herbal plants results in the recognition of herbal (plant derived) medicines (75%) Local inhabitants learn about the remunerative and therapeutic characteristics of numerous plants through necessity, surveillance, monitoring, consideration, and started passing information from elder people. Knowledge is frequently concentrated in the hands of skilled healers [6-8]. The majority of diseases treated by local herbalists are common ailments like respiratory infections, spasm and discomfort, abrasion, and musculoskeletal disorders. People frequently usage of these native medicinal herbs without seeking any counselling or recommendation from orthodox healers because they have been using them for centuries. This apprehension, understanding and realization of these herbs can be proceed from generation to generation by word of mouth or transmitted through medico-spiritual writings.

### **ANTIOXIDANT ACTIVITY**

In the pathophysiology of many chronic diseases, oxidative stress is a major risk factor. Free radicals and other reactive oxygen species are known to play a significant role for causing diseases like asthma, inflammatory diabetes, stroke, Parkinson's and Alzheimer's disease, cancer, and hypertension. Human ageing is also considered to be caused by reactive oxygen species. There is a balance in the human body linking the proportion of free radicals generated and antioxidants. However, it is important to supplement the diet with antioxidants to help the body in reducing oxidative damage.

Natural antioxidants from various herbs and infusions (e.g. seeds along with oil, cereals, vegetables, fruits, leaves, roots, and spices) have recently been reported to play a role in healthcare [9-11]. Any material that hampers or intercept the oxidative devastate to a desire molecule can be classified as an antioxidant. The ability of an antioxidant to trap free radicals is its most important feature. Antioxidant substances such as phenolic acids, polyphenols, and flavonoids scavenge free radicals including peroxide, hydro peroxide, and lipid peroxy, inhibiting the oxidative pathways that cause degenerative diseases. During prehistoric times, herbal plants have been recognized and investigated as satisfactory and acceptable antioxidants. Phenolic component and flavonoids are the secondary plant metabolite that contain the aromatic ring having at least one hydroxyl group. Additionally, phenolic compounds (n >80,000) have been identified as naturally materialize substances in plants [12, 13].

Both flavonoids and many other phenolic components have been reported on their effective antioxidants, anticancer, antibacterial, cardio protective agents, anti-inflammation, immuno-

stimulant and skin protection from UV radiation and interesting candidate for pharmaceutical and medical application. To learn more about antioxidants, the main source of cell damage is free radicals. Large macromolecules such as carbohydrates, nucleic acids, and proteins are harmed by free radicals. Free radicals are produced as a result of human-caused environmental pollution, ultraviolet radiation caused by ozone layer depletion, chemicals used by farmers in food and plants to kill insects (pesticides and insecticides), consumption of drugs found in medicines for specific diseases, and continuous smoking [8-11].

## CLASSIFICATION OF ANTIOXIDANTS

### 1. Enzymatic Antioxidants

- **Primary Enzymes:** SOD, catalase, glutathione peroxidase
- **Secondary Enzymes:** glutathione reductase; glucose 6-phosphate dehydrogenase

### 2. Non-enzymatic Antioxidants

- **Minerals:** Zinc, Selenium
- **Vitamins:** Vitamins (A, C, E and K)
- **Carotenols:** B-Carotene, lycopene, zeaxanthin
- **Organosulfur compounds:** allyl sulfide, indoles
- **Low Molecular Weight Antioxidants:** glutathione, uric acid
- **Antioxidant cofactors:** Coenzyme Q10
- **Polyphenols:**
  - Flavonoids
  - Phenolic acids

## COMMONLY KNOWN ANTIOXIDANT PLANTS

In literature, several plants were reported and functioning as antioxidant properties. Some of the antioxidant from medicinal plants are described in **Table 1**.

**Table 1. SOME PLANTS WITH ANTIOXIDANT PROPERTIES ARE LISTED BELOW**

Plant/Scientific name/Family	Clinical uses
Cumin, <i>Cuminum cyminum</i> , <i>Apiaceae</i>	Due to their unique flavour and scent, seeds are used as a spice.
Turmeric, <i>Curcuma longa</i> , <i>Zingiberaceae</i>	Diabetes, pancreatitis
Ginseng, <i>Panax ginseng</i> , <i>P. quinquefolius</i> , <i>Araliaceae</i>	Diseases affecting the respiratory system, general health, influenza, the central nervous system, and tissues of gonadal system.
Lemongrass, <i>Cymbopogon nardus</i> , <i>Poaceae</i>	Geraniol and citronellol belongs to the category of antiseptics. They are consequently included in soaps and disinfectants for the home.
Garlic, <i>Allium sativum</i> , <i>Amaryllidaceae</i>	Cancer, hypertension, atherosclerosis, and high cholesterol. lower lipidemia and platelet aggregation
Beans, <i>Phaseolus Vulgaris</i> , <i>Leguminosae</i>	Quality of life, influenza, or patients: respiratory conditions
Peanut, <i>Arachis hypogaea</i> , <i>Fabaceae</i>	Antioxidants

Bearberry, <i>Arctostaphylosalpine</i> , <i>Berberriaceae</i>	nausea, vomiting, fever, chills, severe back pain, and tinnitus. It shouldn't be used in youngsters, pregnant women, nursing mothers, or those who have renal illness.
Black pepper, <i>Piper nigrum</i> , <i>Piperaceae</i>	Antioxidant qualities, anti-carcinogenic effects
Oats, <i>Avena sativa</i> , <i>Poaceae</i>	cycle of menses, urinary tract infections, osteoporosis, and dysmenorrhea
Tea, <i>Camellia sinensis</i> , <i>Theaceae</i>	Neuroprotective and anti-inflammatory effects
Mint, <i>Mentha spicata</i> , <i>Lamiaceae</i>	Mouthwash, toothpaste, chewing gum, desserts, and sweets with antiseptic properties
Spinach, <i>Spinacia oleracea</i> , <i>Amaranthaceae</i>	Should not be used in pregnant women, nursing mothers, children, or anyone with renal illness.
Rice, <i>Oryza sativa</i> , <i>Gramineae</i>	effects on viruses, bacteria, and fungi discomfort from arthritis, thin blood, or high cholesterol
Ginger, <i>Zingiber officinale</i> , <i>Zingiberaceae</i>	Morning sickness and seasickness-related nausea
Oregano, <i>Origanum vulgare</i> , <i>Lamiaceae</i>	increased antioxidant capacity
Coriander, <i>Coriandrum sativum</i> , <i>Apiaceae</i> .	Carminative, diuretic, and antioxidant
Olive, <i>Olea europaea</i> , <i>Oleaceae</i> ,	Vitamins, diuretics

## MECHANISM OF ACTIONS OF ANTIOXIANTS

A compound that decreases radicals in vitro does not always act as an antioxidant in vivo. This is due to the fact that free radicals are easily diffused and propagated. Some have extremely short life spans, on the range of nanoseconds, making it impossible for the antioxidant to be present at the moment and location where oxidative damage is being created. Furthermore, the interactions between antioxidants and free radicals are second order reactions. As a result, they are reliant not only on the quantity of antioxidants and free radicals, but also on parameters relating to the chemical structure of both reagents, the medium, and the reaction circumstances.

**\*Antioxidant and macrophages-** Reactive oxygen and nitrogen species, as well as peroxynitrite produced by the so-called respiratory burst, are mostly produced by activated macrophages. The overproduction of reactive oxygen and nitrogen species by macrophages is caused by constitutively produced proinflammatory cytokines, particularly tumour necrosis factor-, which also activates nuclear Factor-B and activator protein-1 translocation. Chronic illnesses are triggered by epigenetic changes brought on by the stimulation of transcription factors in enduring macrophages (tissue-resident) and/or monocyte-derived macrophages.

Long-established methods for inactivating macrophages include the use of nutraceuticals such as lipid raft structure disruption agents, cholesterol depletion agents, inhibitors of farnesyltransferase, nuclear Factor-B blockers (-unsaturated carbonyl compounds), agonists of glucocorticoid receptor, and peroxisome proliferator-activated receptor-agonists. The anti-inflammatory properties may be due to the inhibitory effects on the production of nitric oxide, superoxide, and nitrite peroxide.

Through a multiple targets approach, activated macrophage models might be utilised to determine the key ingredients in the creation of functional meals [12-15].

**\*Antioxidants and nitric acid-** Under conditions of elevated local NO concentrations, several reactive nitrogen oxide species, including  $N_2O_3$  and  $ONOO^-$ , can change important cellular components. Although reactive oxygen species like  $H_2O_2$  and  $O_2$  are the main agents in oxidation chemistry, NO may also inhibit this chemistry when Nitric Oxide levels are physiological.  $H_2O_2$ , alkylhydroperoxides, and xanthine oxidase-mediated cell death are prevented by NO in addition to the antioxidant chemistry. One of the main molecular ways by which NO may limit oxidative damage to human cells is the attenuation of metal/peroxide oxidative chemistry and lipid peroxidation. In addition to these chemical and biochemical qualities, NO has the ability to control physiological and cellular processes in order to prevent or reduce oxidative damage, including leukocyte adhesion [12-15].

#### **\*Antioxidants and DPPH**

The assay is based on the evaluation of the antioxidants' ability to scavenge it. By obtaining a hydrogen atom from antioxidants and converting it to the equivalent hydrazine, the odd electron of the nitrogen atom in DPPH is lowered. Due to the spare electron's delocalization throughout the whole molecule, which prevents it from dimerizing like the majority of other free radicals, DPPH is classified as a stable free radical [12-15].

#### **CONCLUSION**

Free radicals are created not just externally but also naturally by excessive activity (exercise) and inflammation induced by any allergic reaction. If consumed in the proper dosage, antioxidants are necessary for good health. In fruits like watermelon, strawberries, and grapefruit as well as vegetables like broccoli, cauliflower, tomatoes, boiled spinach, pumpkin, etc., there is naturally occurring antioxidant activity. Antioxidants have some unfavourable side effects. The health of people may be endangered in a number of ways by excessive antioxidant supplementation. Television was one of several sectors to use antioxidant supplements to address skin and body issues. Vitamins, carotenoids, and minerals included in antioxidant supplements, as opposed to organic fruits and vegetables, are mostly responsible for the damage. - Supplements with carotene raise the risk of lung cancer among smokers. However, a diet heavy in plants might cause an iron and calcium shortage due to an excess of phytic acid

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