

A Comprehensive Review On Neuroprotective Herbal Agent

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ABSTRACT: Plant secondary metabolites include an array of bioactive constituents from both medicinal and food plants able to improve human health. The exposure to these phytochemical, including phenylpropanoids, isoprenoids and alkaloids, through correct dietary habits, may promote health benefits, protecting against the long term degenerative disorders mainly seen in Western industrialized countries, such as cancer, cardiovascular and neurodegenerative diseases. Neuroprotective agents are helpful in neurodegenerative disorder. Because oxidative stress and neuro-inflammation resulting from neuroglial activation, at the level of neurons, microglial cells and astrocytes, are key factors in the etiopathogenesis of both neurodegenerative and neurological diseases, emphasis will be placed on the antioxidant and anti-inflammatory activity exerted by specific molecules present in food plants or in remedies prescribed by herbal medicines.

KEYWORDS: Ayurvedic medicine, Mediterranean diet, neurodegenerative diseases, nutritional therapy, phytotherapy, Traditional Chinese Medicine

INTRODUCTION

Neuroprotection refers to the strategies and relative mechanisms able to defend the central nervous system (CNS) against neuronal injury due to both acute (e.g. stroke or trauma) and chronic neurodegenerative disorders (e.g. Alzheimer's disease, AD, and Parkinson's disease, PD). Among these strategies, herbal medicine may represent a valuable resource in prevention rather than in therapy of some CNS diseases, in association with a healthy lifestyle including correct dietary habits and moderate physical activity. As complementary and alternative therapy, herbal medicine, or simply phytotherapy. Generally, herbal products contain complex mixtures of active components (phytochemicals), including phenylpropanoids, isoprenoids and alkaloids, and it is often difficult to determine which component(s) of the herb(s) has biological activity.¹⁻²

In this survey, we briefly introduce neurodegenerative diseases, AD and PD in particular, with emphasis on the preventive strategies represented by herbal medicine and nutritional therapy. We provide an ethnobiological approach, focusing on plant foods and medicinal herbs used by different traditional medicines and diets and relevant for some of their Neuroprotective components.¹⁻²

WHAT ARE NEUROPROTECTIVE AGENTS?

Neuroprotective agents are medications that can alter the course of metabolic events after the onset of ischemia and therefore have the potential to reduce stroke damage. Neuroprotection aims to: limit nerve death after a CNS injury, protect the CNS from premature degeneration and other causes of nerve cell death³ natural products, but primarily plants extracts, have been reported to be used in traditional medicine for Neuroprotective, memory enhancing, and antiageing purposes.³

The examples of Plants include

Crocus Sativus

Justicia adhatoda (Acanthaceae)

Ocimum Sanctum

Cedrus deodora

Ginkgo biloba

Hemorrhagic stroke: Blood vessel rupture in the brain that leads to bleeding and tissue damage. Ischemic stroke: Blockage of a blood vessel in the brain which interrupts blood supply to a part of the brain leading to cell death from lack of oxygen and nutrients. Transient ischemic attack: Brief blockage of blood supply to a part of the brain. Known as mini-strokes, transient ischemic attacks usually last just a few minutes, but are a warning sign for future ischemic strokes.

What is the mode of action for an ischemic stroke? A medication known as tissue plasminogen activator. Tissue plasminogen activator is an enzyme that helps dissolve the blood clot blocking the blood vessel. The medication is usually administered intravenously within the first three hours after symptoms of an ischemic stroke.⁴⁻⁵

NEED OF NEUROPROTECTIVE AGENT

Neurodegenerative diseases are leading causes of age related-morbidity and mortality. Extensive research suggests the therapeutic role of dietary phytochemicals for the treatment of neurological disorders is a major risk factor for a number of neurodegenerative disorders.¹²

In the traditional medicine, numerous plants have been used to treat cognitive disorders. Natural products play essential role in prevention and therapy of various neurodegenerative diseases, and neuronal dysfunctions. Different studies suggest that natural products, such as polyphenolic and alkaloids compounds that isolated from plants potentially delayed the neurodegeneration and also improve memory and cognitive function.¹²

PATIENTS OF NEUROPROTECTIVE AGENT

Areas covered: The present review considers: i) the role of leptin, adiponectin, ghrelin and NPY in patients with T2DM, and, ii) the effect of insulin as well as oral hypoglycemic, antihypertensive, hypolipidemic, antiobesity and antiplatelet agents on these peptides in patients with T2DM.³

Expert opinion: Patients with T2DM have either lower or similar leptin levels, decreased adiponectin and ghrelin levels, and increased NPY circulating levels compared with nondiabetic controls. Treatment with insulin, oral hypoglycemic, antihypertensive, hypolipidemic, antiobesity and antiplatelet drugs may influence the levels of these peptides. It is not widely appreciated that several

drugs commonly administered to patients with T2DM can influence adipokine levels. The clinical relevance of these effects needs to be evaluated.³

SOME HERBAL NEUROPROTECTIVE AGENTS

JUSTICIA ADHATODA

OCIMUM SANCTUM

CASSIA FISTULA

CROCUS SATIVUS

GINKGO BILOBA

JUSTICIA ADHATODA

Adhatodavastica (family Acanthaceae, AV) is a shrub, used by Asian and European medical practitioners. This plant has been used in the Indian traditional system of medicine. Numerous in vitro, in vivo, and clinical studies have acknowledged AV as an important natural agent for many medical illnesses. AV has an anti-inflammatory action on the respiratory tract and is effective in respiratory tract infection. The alkaloids vasicinone and vasicine have potent bronchodilator and anti-allergic activity. Owing to these activities, AV is effective in acute asthma conditions. AV has been proven to have antitussive activity as effective as codeine in irritant aerosols and citric acid-induced cough models.¹⁴

USES OF THE *JUSTICIA ADHATODA*.

The leaves, roots, flowers, and bark of this plant have been used in the treatments of cough, colds, asthma, to liquefy sputum, as a bronchodilator, bronchial catarrh, bronchitis, and tuberculosis. A number of parts of the plant are commonly used in the forms of decoctions or powders.⁸

To find immediately applicable drug for the treatment of COVID-19 positive patients, a plausible life cycle of this virus is proposed from the analysis of few case reports. On the basis of this proposal and symptomatic similarities few common drug-molecules are tested as protease inhibitor and replicase inhibitor of COVID-19 virus using COVID-19 Docking Server. It is observed that anisotine and vasicoline of *Justicia adhatoda* and Pemirolast are very good inhibitors.



Figure 1; *Justicia Adhatoda*

OCIMUM SANCTUM

Tulsi" redirects here. For the Hindu goddess, see Tulsi in Hinduism. For the American politician, see Tulsi Gabbard. For other uses, see Tulsi (disambiguation). "Tulasi" redirects here. For the 2007 Indian film, see Tulasi (film). For the Indian actress, see Tulasi (actress). "Holy Basil" redirects here. Not to be confused with holy herb (*Verbena officinalis*).

TULSI MEDICINAL USES & BENEFITS

Indian mythology attaches a great significance to Basil by recognizing it as a holy herb. Perhaps, such significance comes from the actual health applications of the herb. Its use is recommended as a first aid in the treatment of respiratory, digestive and skin diseases. Apart from these common ailments, Ayurveda also recognizes its use for the diseases ranging up to tumorous growths. Experimental studies identify it to be a highly promising immunomodulator, cytoprotective and anticancer agent.⁹

USE OF OCIMUM SANCTUM

In traditional system of medicine, different parts (leaves, stem, flower, root, seeds and even whole plant) of *Ocimum sanctum* Linn. have been recommended for the treatment of bronchitis, malaria, diarrhea, dysentery, skin disease, arthritis, eye diseases, insect bites and so on. *Ocimum tenuiflorum*, commonly known as holy basil, tulsi or tulasi, is an aromatic perennial plant in the family Lamiaceae. It is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropic. Tulsi is cultivated for religious and traditional medicine purposes, and also for its essential oil. It is widely used as a herbal tea, commonly used in Ayurveda, and has a place within the Vaishnava tradition of Hinduism, in which devotees perform worship involving holy basil plants or leaves.⁶



Figure 2: *Ocimum sanctum*

CASSIA FISTULA

Cassia fistula, commonly known as golden shower, purging cassia, Indian laburnum or pudding-pipe tree, is a flowering plant in the family Fabaceae. The species is native to the Indian subcontinent and adjacent regions of Southeast Asia, from southern Pakistan through India and Sri Lanka to Bangladesh, Myanmar and Thailand. It is a popular ornamental plant and is also used in herbal medicine.

C. fistula is generally an evergreen tree, although in certain parts of India it remains leafless for a very short period in the dry pre-monsoon summer. The new leaves normally appear during March- July in India. The flowers appear mainly from April to July, although some trees flower as late as October, especially during dry years. The long cylindrical pods develop rapidly and reach their full length by October and they ripen during December-March. The ripe pods start falling during May.¹⁰ In Ayurvedic medicine, the golden shower tree is known as aragvadhā, meaning "disease killer". The fruit pulp is considered a purgative, and self-medication or any use without medical supervision is strongly advised against in Ayurvedic texts. Though it has been used in herbalism for millennia, little research has been conducted in modern times, although it is an ingredient in some mass-produced herbal laxatives. When used as such, it is known as "cassia pods". In India, a cathartic made from the pulp is sometimes added to tobacco. A paste of the flowers is used as an ointment for pimples.¹⁰



Figure 3: *Cassia fistula*

SAFFRON

Crocus sativus, commonly known as saffron crocus, is a delicate-looking lavender plant that produces stigmas. When harvested and dried, these stigmas create saffron. Saffron has been widely used as a medicinal plant for promoting human health since ancient times, especially in Asian and Middle Eastern countries. Most of the saffron extract belongs to the category of carotenoids including crocin and croce-tin. The median lethal dose (LD₅₀) of saffron is 200 mg/mL in-vitro and 20.7 g/kg in an animal model. It has been suggested that saffron and its extracts were being effective in the treatment of a wide range of disorders including coronary artery diseases, hypertension, stomach disorder, dysmenorrhea, learning, and memory impairment.

***In-Vitro* NEUROPROTECTIVE FUNCTIONS OF SAFFRON**

Saffron Extract Crocin Prevents Oxidative Stress and PC-12 Cell Apoptosis by Increasing Intracellular Antioxidant Glutathione (GSH) in Serum-/Glucose-Free Media. Oxidative stress is a state of imbalanced free radicals and antioxidants in the cell which can lead to cell and tissue damage by oxidative stress. Our body's cells produce free radicals and reactive oxygen species (ROS) during normal metabolic processes.¹³⁻¹⁷



Figure 4: Saffron

Saffron Promotes Neurogenesis through Regulation of Sleep. As sleep is not a continuous process but a circular process with different stages (rapid eye movement and no rapid eye movement), the effect of sleep on neurogenesis might be dependent on different stages of sleep. It is well known that saffron and traditional Japanese Kampo medicine promote the sleep activity in patients with a mental disorder.¹⁷⁻²²

GINKGO BILOBA

Biology and Chemistry of Ginkgo Biloba:

Ginkgo biloba has been existing on earth since 200 million years and is considered as a "living fossil". It is among the most sold medicinal plants in the world. A number of secondary metabolites representing terpenoids, polyphenols, allyl phenols, organic acids, carbohydrates, fatty acids and lipids, inorganic salts, amino acids have been isolated from the plant.¹⁴

objective Ginkgo biloba may have a role in treating impairments in memory, cognitive speed, activities of daily living (ADL), edema, inflammation, and free-radical toxicity associated with traumatic brain injury (TBI), Alzheimer's dementia, stroke, vasoocclusive disorders, and aging. The purpose of this review is to provide a synthesis of the mechanisms of action. Neuroprotective effects of Ginkgo biloba extract Ginkgo biloba extract has been therapeutically used for several decades to increase peripheral and cerebral blood flow as well as for the treatment of dementia. The extract contains multiple compounds such as flavonoids and terpenoids that are thought to contribute to its Neuroprotective and vasotropic effects. In this review, we summarize the experimental results on the mechanism of neuroprotection induced by standardized extract of Ginkgo biloba leaves and its constituents. The effects described mostly in animals include those on cerebral blood flow, neurotransmitter systems, cellular redox state and nitric oxide level. Furthermore, we discuss the current status of clinical trials as well as undeveloped properties of EGb, in several in vitro systems. The interaction of EGb 761 superoxide and hydroxyl radicals generated by using the water radiolysis method is presented in the chapter the method of radiolysis is useful because it specifically generates superoxide and hydroxyl²³⁻³⁰.



Figure 5: Ginkgo biloba

CONCLUSION:

From the above we can conclude that the different herbal plants act as Neuroprotective agents and help in various neurodegenerative disorders like Parkinson, Alzheimer, schizophrenia and various mental disorders. Now a day, in a developing world there is a need to increase the use of herbal Neuroprotective agents in various neurodegenerative disorders. Herbal Neuroprotective agents are extracted from various plants therefore they have a less side effect, more useful and easily obtained.

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