Review On Medicinal Plants For Alzheimer's Disease

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ABSTRACT

Alzheimer's disease is an age-associated, irreversible, progressive neurodegenerative disease that is characterized by severe memory loss, unusual behavior, personality changes, and a decline in cognitive function. Alzheimer's disease damages vital brain cells, affecting thinking, memory, and behavior to levels where it difficulties with social interactions, career opportunities, and lifelong hobbies. Since many of the medications now used to treat the condition, such donepezil, have undesirable side effects, medical professionals are excited to discover alternatives. There is no cure for Alzheimer's disease but drugs designed to slow disease progression are available. The use of several ayurvedic medicinal plants and their ingredients for the treatment of Alzheimer's disease has been established in multiple scientific investigations. During ancient times several medicinal plants and herbal preparation are used for memory and cognition enhancer. Most of the ayurvedic medicinal plants are used to slow down the brain age and promote memory. This review includes studies on a variety of medicinal plants that have shown the ability to treating the pathology associated with Alzheimer's disease

KEYWORDS: Turmeric, Aswagandha, liquorice, bramhi, shankpushpi, gotu kola, giloy.

INTRODUCTION

Alzheimer's disease is a neurological condition that results in unusual behavior, personality changes,a reduction in mental capacity, and severe memory loss in those who are affected.[1]
A germen psychiatrist in 1906, and neuropathologist (Alois Alzheimer), first identify the neurodegenerative disease, Alzheimer's Disease.[2] The most severe kind of neurodegenerative disease that affects the brain is Alzheimer's disease (AD), whose symptoms get worse with time that primarily affects the elderly population of over 65 years of age, and is estimated to account for 50 – 60% of the dementia cases.[3]
The disease's onset is linked to aging and is rarely observed in younger individuals.[4] It is generally seen in people around the age of 65 or more.[5] Research indicate that plaques and tangles in the brain are linked to Alzheimer's disease. Dementia is a syndrome associated with progressive impairments in memory and learning ability, memory loss, confusion, cognitive skills, disorientation, recent memory loss, and mood

changes, forgetfulness, behavior, insomnia, anxiety, depression, disruptive behavior, and hallucinations, activities of daily living, and quality of life. Alzheimer's disease is a progressive neurological disorder that causes loss of neuron in distinct brain areas. Early symptoms of the condition include mood swings, difficulty finding words, forgetting names, short-term memory loss, difficulty learning new knowledge, and item loss. Patients with AD frequently display anger, irritation, and frustration as emotional traits. In extreme situations, patients lose all memory, become totally incontinent, and lose all sense of place and time. Patients eventually require comprehensive care when they become completely dependent on others. Several studies have found evidence that Alzheimer's disease is a disease that is caused by the decreased metabolic activity in the brain. It is possible to increase the level of this transmitter in the brain by inhibiting the activity of the enzyme acetyl cholinesterase, which splits or breaks down the transmitter substance. Natural antioxidants including vitamin E, vitamin C, and beta-carotene have been shown in numerous studies to potentially aid in the recycling of free radicals produced during the onset and course of this disease.[6] Medication that prevents the messenger or transmitter acetylcholine from breaking down slows down the progression of the illness. Etiology of neurodegenerative disorders is linked to genetic defect that is 10–15% of total cases.[7] In Alzheimer's disease, loss of neurons appears in subcortical structure, cortex and hippocampus. Various compounds have been identified by phytochemical studies such as alkaloids, sterols, tri terpenes, polyphenols, tannins, flavonoids and lignins that have pharmacological activities including anticholinesterase and anti-amyloidogenic .As we know, no permanent treatment for Alzheimer's disease exists; only symptomatic treatment is found in allopathic drugs.[8] It has been established in initial studies that ayurvedic medicinal herbs will have the best option without any adverse effects for the treatment of Alzheimer's condition, with the fact that over a hundred new compounds are currently in clinical trials.[9] AD diagnosis mostly comprises of cognitive testing, apart from the regular blood tests and medical imaging.[5] However, the definite diagnosis of AD relies upon a clear brain tissue examination. Although studies suggest that the risk of AD can be reduced by performing physical and mental exercises to reduce obesity, there are no such specific therapies limited to risk reduction for AD.[10]

SIGN AND SYMPTOMS

Alzheimer's disease begins with relatively minor symptoms, such as partial memory loss, and gradually progresses to cause severe dementia and other behavioral abnormalities. One of the most common symptoms of Alzheimer's disease is memory loss, which is characterized by repetitive questions, missing appointments, being away from home, and misplacing possessions.

Alzheimer's disease symptoms include restlessness, anxiety, depression, disruptive behavior, and hallucinations in addition to memory problems. Several studies and data point to Alzheimer's disease as the cause or aggravation of the decline in brain metabolic activity.[11] Cognitive enhancement and neuro protective effects of Bacopa monnieri in Alzheimer's disease. Disease symptoms include confusion, amnesia, disorientation, injury to recent memories, and altered behavior. Most of these symptoms have been present for the past two to four years. [12]

Fig.1: Symptoms of AD

CAUSES & RISK FACTORS

Numerous researchers are trying to accomplish different approaches to investigate the causes of Alzheimer's disease. It has been discovered that Alzheimer's disease is caused by multiple genetic factors.[13]

The origin of Alzheimer's disease is caused by a disruption of bio-metal homeostasis (Cu, Zn, Fe) and oxidative stress in brain cells.[14]

Aluminum was discovered as a possible Alzheimer's disease cause in the 1960s and 1970s. This assumption gave rise to worries about aluminum contamination in common products like foil, antacids, cooking pots, beverage   cans,   and   antiperspirants.[15]

Nevertheless, a number of investigations have indicated that there is no proof that aluminum played a causal role in the development of Alzheimer's disease. Few scientists, meanwhile, believe that Alzheimer's disease is seriously threatened by prolonged exposure to aluminum sources. Certain chronic conditions like diabetes, hypertension, high cholesterol, and stroke are still thought by some scientists to be risk factors for dementia and Alzheimer's disease.[16]

MEDICINAL PLANTS USED IN THE TRATMENT OF AD

TURMERIC

Fig.2: Curcuma longa

Biological Name: Curcuma longa (C. longa) Linn,

Family: Zingiberaceae

Biological Source: It comes from the rhizome of the plant and is commonly used in Indian cuisine as a coloring and flavoring component.[17]

Mecanism of Action:

Studies proved that curcumin possesses antioxidant and anti-inflammatory properties, which aid in the treatment of Alzheimer's disease .The main bioactive ingredients in turmeric are curcumin and curcuminoids, which are made up of curcumin, demethoxycurcumin, and bisdemethoxycurcumin—three chemical components with similar structures. shown that curcumin has anti-inflammatory properties and can influence several pathogenic targets linked to dementia by scavenging reactive oxygen species, reactive nitrogen species, and lipid peroxidation. It can also block NF-kB activation. Additionally, it has been proposed that curcumin aids in the treatment of dementia by directly binding tiny beta-amyloid species to prevent aggregation and fibril production. Through its anti-inflammatory and antioxidant properties, curcumin provides protection against vascular dementia consequently, eating curry that contains turmeric has been linked to better cognitive performance.[18]

ASWAGANDHA

Fig.3 Withania somnifera

Biological Name: Withania somnifera,

Family: Solanaceae

Biological Source: The herb is sometimes referred to as ashwagandha, winter cherry, or Indian ginseng. It bears around centimeter-long, greenish or yellowish blooms.

Mecanism of Action

The roots produce anti-inflammatory and antioxidative effects by limiting the production of A β. They also aid in the inhibition of nuclear factor (NF-B) and regulate the expression of genes involved in inflammatory mediators and oxidative stress parameters. It aids in the reduction of apoptosis and the restoration of synaptic function. It promotes the migration of nuclear factor related to E2-related factor 2 (Nrf2) to the nucleus, which raises the expression of antioxidant enzymes and neuro protective proteins like hemoglobin oxygenase-1. These antioxidant effects are helpful in the management and prevention of AD.[19]

LIQUORICE

Fig.4 Glycyrrhiza glabra

Biological Name: Glycyrrhiza glabra

Family: Fabaceae

Biological Source: Native to the Mediterranean and central and south-western Asia, Glycyrrhiza glabra is grown throughout the world in temperate and subtropical climates. Its dried roots taste sweet and have a distinct smell.

It contain a variety of bioactive substances, such as tannin, glycyrrhizin, furfuryl formate, methyl ethyl ketone, butanediol, geraniol, benzoic acid, terpinen, tetra methyl pyrazine, propionic acid, and ethyl linolenate.[20]

Mecanism of Action

This plant has been shown to improve memory in scopolamine-induced dementia. The contents that provide the anti-Alzheimer action are linalool oxide, geraniol, glycyrrhizin, tannin, tri methyl pyrazine, and tri methyl.

Glycyrrhiza glabra was also discovered for improving mice's memory during the investigation.During the course of the trial, three dosages of the extract were administered at 75, 150, and 300 mg/kg for seven days. It was found that the 150 mg/kg dose was the most effective of all the doses.Consequently, administering the right dosage may be helpful in the treatment of Alzheimer's disease.[21]

BRAHMI

Fig.5 Bacopa monnieri

Biological Name: Bacopa monnieri

Family: Scrophulariaceae

Biological Source: Bacopa monnieri, also known as B. monniera, is a small, evergreen creeping herb that has several branches, oblong leaves, and white or somewhat purple flowers that belong to the Scrophulariaceae family.It is commonly referred to as "Brahmi" in India and has nootropic and revitalizing effects. It also enhances mental clarity and intellectual capacity. For thousands of years, practitioners of traditional Indian medicine have used it to treat a variety of illnesses.

Mecanism of Action

 It is widely used in Ayurvedic medicine and functions as a diuretic, cardio tonic, nerve tonic, and a treatment for rheumatism, asthma, sleeplessness, and epilepsy. Bacopa monnieri, also known as B. monniera, is a small, evergreen creeping herb with many branches, oblong leaves, and somewhat purple flowers. It is sometimes referred to as "Brahmi" in India and is utilized for its nootropic and revitalizing effects; it also improves mental clarity and intelligence. For thousands of years, practitioners of traditional Indian medicine have used it to treat a variety of illnesses. In traditional Ayurvedic medicine, it is frequently used as a nerve tonic. In addition to this action, it also demonstrates actions such as anti-asthma, diuretic, cardio tonic, rheumatism therapy, insomnia, and epilepsy.sterols, alkaloids, polyphenols, and sulfhydryl compounds; sterols, alkaloids, polyphenols, and sulfhydryl compounds; sterols, alkaloids, polyphenols, and sulfhydryl compounds; sterols, alkaloids, polyphenols, and sulfhydryl compounds; sterols, alkaloids, polyphenols, and sulfhydryl compounds; likewise, sterols, alkaloids, polyphenols, and sulfhydryl compounds; and, all of them. Traditionally, B. monnieri has been this vitamin supports cognitive function and memory.

Numerous studies have been conducted on the neuro pharmacological and nootropic properties of B. monnieri extracts. The hippocampus's increased protein kinase activity is one of monnieri's memory-improving properties. The rat models demonstrate how beneficial B. monnieri is for the prevention of cholinergic degradation and improved cognition.[22]

SHANKPUSHPI

Fig.6 Convolvulus pluricaulis

Biological Name: Convolvulus pluricaulis

Family: Convulvulaceae

Biological Source: The species Convolvulus pluricaulis belongs to the Convolvulus genus. Native to Northern India, choisy is a perennial wild herb that grows prostrate. It is sometimes referred to as Shankhpushpi and is active as a brain and memory tonic.[23]

Mechanism of Action

This plant has a number of extensively reported neuro pharmacological functions, including nootropic, ant stress, antidepressant, anxyiolytic, anticonvulsant, and sedative properties.[24] Also, it has antimicrobial, anticatatonic, antiamnesic, antiulcer, immune modulatory, and cardiovascular properties.[25] A study found that ethyl acetate and the aqueous extract of Convolvulus pluricaulis increase memory and learning abilities. By controlling the body's levels of stress hormones like cortisol and adrenaline, this plant is shown to help people stay calm. It was found that administering ethanolic extract to rats improved their degree of learning and memory during the studies.

Administering Convolvulus pluricaulis increased acetyl cholinesterase activity in the CA1 and CA3 regions of the hippocampus, which are related to memory and learning abilities.[26] At doses of 100 and 200 mg/kg, p.o., the ethanolic extract of C. pluricaulis, along with its ethyl acetate and aqueous fraction, proved memory-enhancing effects in Cook and Weidley's Pole Climbing apparatus, passive avoidance paradigms, and active avoidance tests.[27]

Convolvine, a chemical component of C. pluricaulis, improves cognitive dysfunction in AD and increased the effects of arecoline, a memory enhancer.[28]

GOTU KOLA

Fig. 7 Centella asiatica

Biological Name: Centella asiatica

Family: Apiaceae

Biological Source: India is home to Centella asiaticas, popularly known as jalbrahmi ormandukparni. It has small, oval-shaped fruits, green leaves with fan like shape and the flowers are white or light purple and can also be pink.[29] An Ayurvedic medical system has been discovered to use the leaves of the mandukparni plant to improve memory.[30] Its use in traditional Chinese medicine and the African medical system has also been documented. It can improve memory when taken with milk and is recommended to prevent memory-related problems and ageing.[31]

Mechanism of Action

It is commonly used to treat high blood pressure, improve memory, lengthen life, and purify blood. Tea is made up from gotu kola which is helpful for relieving tension, relaxing the mind and soothing anxiety.[32] It is composed of a variety of bioactive substances, such as vellarin, centelloside, sapogenins, glycosides, asiatic acid, asiaticoside, and adecassoside.[33] Asiatic acid and asiaticoside showed a decrease in free radical concentration, a reduction in hydrogen peroxide-induced cell death, and an inhibition of β-amyloid cell death in vitro, all of which suggested a potential role in the treatment of Alzheimer's disease and the toxicity of β-amyloid prevention.[34] Extracts of Centella asiatica reversed the β-amyloid pathology in mice brains and modulated oxidative stress response components.[35] It is an essential plant for brain and nerve cells and considers that it is possible to improve intelligence, memory, and endurance.[36]

GILOY

Fig. 8 Tinospora cordifolia

Biological Name: Tinospora cordifolia

Family: Menispermaceae

Biological Source: It consist of dried, developed pieces of Tinospora cordifolia miers stem

Mechanism of Action:

It has been demonstrated to enhance memory in both healthy and mentally challenged animals. It is a choline supplement that enhances mental function through improving the defense mechanism and increasing acetylcholine production. Tinospora cordifolia is a learning and memory booster according to Ayurveda and aqueous extract plant roots enhanced logical memory and verbal learning. [37]

CONCLUSION

Since ancient times, alternative medicine systems have been in use, and several herbal formulations and extracts from medicinal plants have shown promise for treatment in AD. The increasing efficiency and decreasing adverse effects of herbal medications are contributing to their growing popularity. There are numerous potentially bioactive compounds found in medicinal plants, making it possible to use them to treat Alzheimer's disease. Numerous plants exhibit neuronal activity and may be used to treat AD. The plants and phyto constituents from them that are discussed in this review have the potential to treat a number of different conditions in addition to Alzheimer's memory loss. Even though the initial research has only been done on small animals, more research with a wider population perspective is needed to improve the findings and establish medicinal plants as a source of medications for the treatment of Alzheimer's disease.

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