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Memory potential herb: a review

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Abstract

Memory is an important aspect of cognition. For its health-promoting qualities, Ayurveda is gaining popularity and attention in many areas of the globe. Dementia is a condition in which a person's mental and cognitive abilities gradually deteriorate. Dementia has been related to a number of risk factors and circumstances, including inadequate cerebral blood flow, toxin exposure, mitochondrial malfunction, and oxidative damage, and it often coexists with other neurodegenerative diseases, such as Dementia and memory loss. As a consequence, the present research focuses on the many herbal ayurvedic medicinal plants and their connection to memory functions.

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Introduction

Dementia is a disease that causes a person's mental and cognitive skills to degrade progressively. An afflicted person's ability to operate independently deteriorates as the illness advances due to memory loss[1-2], gradual deficits in memory and learning capacity, cognitive abilities, behaviour, daily living activities, and quality of life. Globally, there are about 47.5 million individuals living with dementia, with 7.7 million new cases added each year [3]. Dementia is now Australia's second greatest cause of mortality, surpassing cerebrovascular disease and lung cancer [4]. The cognitive abilities most impaired in Alzheimer's patients include memory, executive functioning, language, visuospatial functioning, and attention. Several hypotheses have been suggested to explain the genesis of Alzheimer's disease. The cholinergic hypothesis, the earliest idea, cites acetylcholine (ACh) insufficiency as the causal component. This idea underlies the presently existing Alzheimer's disease treatments. The most compelling theory, the -amyloid hypothesis, serves as the basis for creating novel Alzheimer's disease treatment approaches [5-7].Despite significant advances in the production of synthetic medications to treat memory loss, there is a rising global demand for alternative or complementary medicine, which should be given special attention. In this paper, we examine the critical function of common medicinal herbs, which are extensively employed in numerous traditional medical systems as prospective prevention or therapy techniques for dementia [8].

Cognitive dysfunction

Cognitive dysfunction is one of the most functionally debilitating features of various neuropsychiatric and neurodegenerative disorders, such as dementia, schizophrenia, depression, seizure, cerebrovascular impairment, Parkinsonism, and head injury, and is a large-scale health issue in the twenty-first century. By decreasing LTP induction and synaptic plasticity, ageing is a significant contributor to cognitive impairment, i.e., age-related memory loss [9].

Enhancement of cognition

Several strategies are being developed to improve cognition. The majority of therapies target disease pathologies or procedures that disguise underlying cognition, notably synaptic plasticity. The following are the treatment approaches for memory and cognitive enhancement:

• Enhancement of the environment and exercise

- Nutrients
- Herbal medications
- Pharmaceutical medications.

The function of herbal medications in memory and cognitive enhancement has been examined in depth in this article using an evidence-based approach.

Pathogenesis of Dementia

Substance abuse, subdural hematomas, intracranial tumours, neuro-infections, amyotrophic lateral sclerosis, and other neurodegenerative diseases are all common causes of vascular dementia [10-11]. The most common type of dementia, Alzheimer's disease (AD), is marked by the accumulation of beta-amyloid (amyloid plaques) and gradual microtubule

disintegration, which results in synapse loss, impaired communication, and neuronal cell death. Furthermore,- amyloid plaques (insoluble proteins) accumulate between neurons and interact with cell membranes, causing oxidative stress and elevated free calcium levels, ultimately leading to neuronal cell death. Pesticides, air pollution, and industrial hazardous chemicals that cross the blood-brain barrier readily may cause oxidative stress, neuronal damage, and dementia [12-13]. A major intrinsic component linked to the early onset of AD is autosomal genetic mutation in the central nervous system (CNS). In the absence of a definitive and successful dementia treatment, lifestyle changes, phytopharmaceuticals, physical activity, and engaging in cognitive and social activities are considered helpful disease treatment and preventive methods. The aetiology of dementia is shown in Figure 01 [14].

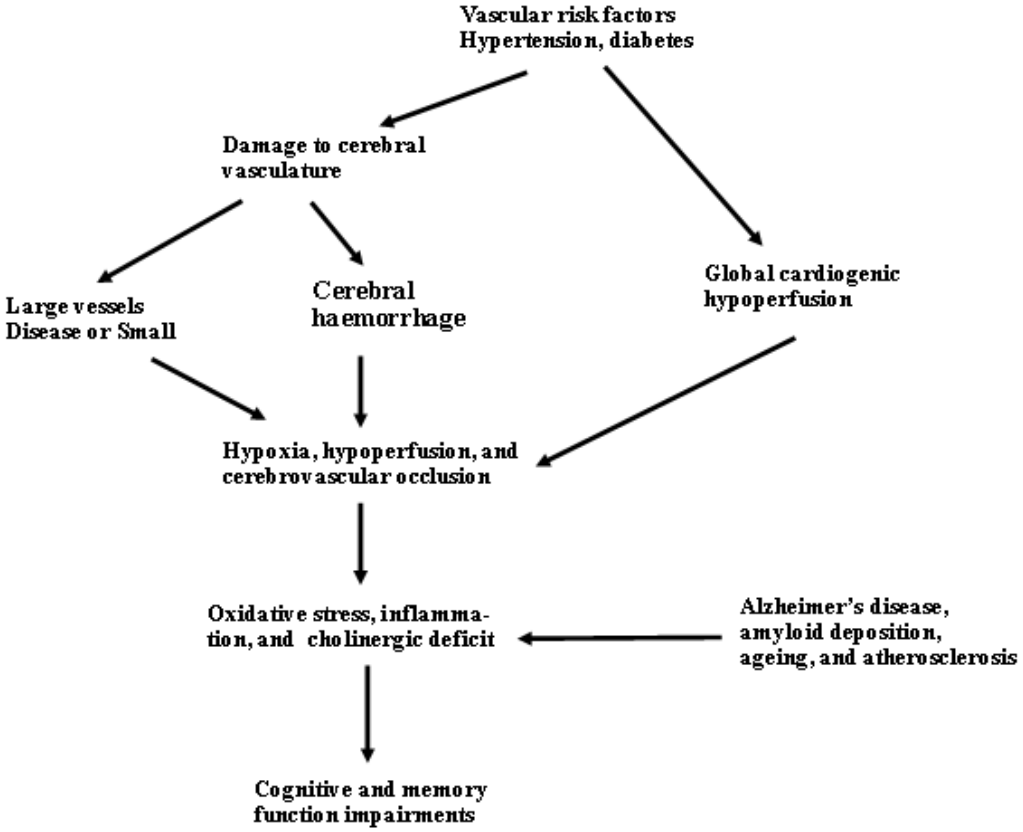

Figure 1: Pathogenesis of dementia

Convolvulus pluricaulis (*Shankhapushpi*)

It's a plant with a lengthy life span. Shankhapushpin, microphylic acid, and 3, 4-dihydroxycinnamic acid are the primary active components of this plant, and they have neuroprotective effects, protecting the brain from oxidative damage, free radical damage, and neurotoxicity, as well as serving as a cognitive enhancer. In the CA1 region with AS and the CA3 region with Shankhapushpi extract treatment, the hippocampus area, which is linked with learning and memory processes, there is a dose-dependent increase in AChE activity. The mechanism of action of Shankhapushpi contributes to its antioxidant, neuroprotective, and cholinergic properties [15].

Emblica officinalis (*Amalaki*)

The fruits (fresh and dried), flowers, seeds, roots, leaves, and barks of Amalaki (Phyllanthaceae) have therapeutic properties.Amalaki is well recognised as vayasthapana and is suggested to be used in routine dietary treatment [16].

Bacopa monnieri (*Brahmi*)

Brahmi is the most often used nootropic (Scrophulariaceae).The plant extract acts as a sedative, a scavenger of reactive oxygen species (ROS), and a cognitive and memory booster.Saponin and bacosides, which are responsible for the nootropic properties of brahmi extract (alcoholic), are abundant.In the treatment of amnesia, brahmi extract may be a potent memory analeptic medication. Brahmi reduces the chances of forgetting what you've learned [17-18].

***Terminalia chebula* (*Hareetaki*)**

This helps with asthma, fevers, coughs, worms, urinary problems, and piles, as well as diarrhoea and chronic memory enhancement.Phytochemical components found include tannic acid, gallic acid, ethyl gallate, chebulagic acid, ascorbic acid, mannitol, tannin, polyphenols, flavonoids, saponins, and alkaloids [19].

Curcuma longa (*Haridra*)

Haridra (Zingiberaceae) rhizomes are extensively used as culinary colourants in a broad range of dishes, and they also have medicinal qualities.It's anti-diabetic, anti-toxic, and skin-friendly.It also possesses anti-epileptic, anti-asthmatic, and anti-diabetic wound-healing effects, as well as neuroprotective and antioxidant characteristics[20].

***Tinospora cordifolia* (*Guduchi*)**

Guduchi (Menispermaceae) is cultivated across India.Guduchi extract (whole plant) has medicinal properties similar to Medhya.The roots of the plant are antimalarial and antileprotic.Glycosides, alkaloids, steroids, phenolics, sesquiterpenoid, and polysaccharides are some of the plant's main chemical components.[21] is maintained by the presence of zinc and copper (trace elements) in the plant.

Benincasa hispida (*Kushmanda*)

The "winter melon" is also known as Kushmanda (Cucurbitaceae).It's a crawling herb with a wide range of uses that may be found all across India.The plant produces huge waxy cylindrical fruits with a waxy coating.Steroids, flavonoids, saponins, and alkaloids are the major phytochemical components of Kushmanda [22].

Mucuna pruriens (*Kapikacchu*)

In Ayurveda, many components of the plant (roots, seeds, leaves, and hairs) are widely acknowledged to be used as nervine, aphrodisiac, and rejuvenating tonic.It is an excellent source of L-3, 4-dihydroxyphenyl alanine, and thus it is helpful in the treatment of Parkinson's disease [23].

Centella asiatica (C. asiatica),

Centella asiatica (C. asiatica), a small, annual plant in the Apiceae family that is commonly known as mandukparni or jalbrahmi, is widespread throughout India.The aqueous leaf extract of C. asiatica enhanced learning and memory in rats and changed the dopamine, 5-hydroxytryptamine (5-HT), and noradrenaline systems in the rat brain in vivo.The leaf extract also showed sedative, antidepressant, and cholinomimetic effects, suggesting that it could be utilised to treat disease-related cognitive impairment, depression, and anxiety.The leaf extract stimulated neuronal cell dendrites in the rat brain, enhanced neurite elongation in human SH-SY-5Y cells, and accelerated axonal regeneration in rats [24-25].

Clitoria ternatea (C. ternatea)

It is a perennial tropical climber plant with thin downy stems that grows wild and in gardens throughout India's tropical regions, producing white or blue flowers.C. ternatea is a member of the Fabaceae family, which is often known as the "butterfly family. "The effect of C. ternatea root extract on learning and memory in rats during the growth spurt phase.They intubated 7-day-old neonatal rats and fed them 50 and 100 mg/kg of C. ternatea aqueous root extract for 30 days.

The extract improved passive avoidance task memory and spatial performance in the T-maze test 30-day post-treatment assessment showed that the behavioural changes were long lasting [26]. **Withania somnifera (W. somnifera)**

This is a little woody shrub that belongs to the Solanaceae family and is frequently found in India.

W. somnifera, often known as Indian ginseng, winter cherry, or Ashwagandha, utilised an antioxidant mechanism to prevent memory loss induced by STZ.By reducing stress-induced degeneration in the hippocampus of rats' brains, the root preparation has been shown to have neuroprotective benefits in neurodegenerative diseases.An extract containing sitoindosides VII–X and withaferin A (50 mg/kg p.o. for two weeks) reversed ibotenic acid-induced cognitive impairment in rats and reduced cholinergic markers (e.g., ACh and ChAT)[27-28].

Celastrus paniculatus (C. paniculatus)

It belongs to the Celastraceae family and is a large climber.It may be found all throughout India, but especially on the sub-Himalayan slopes and in the hilly areas of Punjab and South India.

It's also known as jyotismati, which comes from the Sanskrit words "jyoti teja" or "mind fire" and "mati," which means "intelligence."The effects of C. paniculatus seed extracts in aqueous, methanolic, chloroform, and petroleum ether extracts on cognitive function in rats were investigated.The aqueous extract substantially enhanced cognitive function at doses of 200 and 300 mg/kg, p.o. for 14 days.Methanolic extract was shown to enhance memory in rats at doses of 100, 200, and 400 mg/kg in another study [29].

Evolvulus alsinoides L.

Dwarf morning glory (E. alsionoides) is a perennial Convolvulaceae plant with a short woody and branched rootstock.E. alsionoides is a weed that grows mostly in marshy regions in tropical and subtropical climates.The ethanolic extract, ethyl acetate, and aqueous fractions of the extract enhanced learning and memory in rats.The ethanolic extract (100 mg/kg p.o.) also prevented rats from developing dementia caused by scopolamine.In adult male Swiss mice, three days of oral E. alsionoides (100 mg/kg) treatment was successful in decreasing scopolamine-induced deficit [30-31].

Desmodium gangeticum

(D. gangeticum), a member of the Fabaceae family, is commonly known in Hindi as Salpani and is distributed across India. Aqueous extract of D. gangeticum administered orally for seven days at dosages of 50, 100, and 200 mg/kg improved memory in rats.Pretreatment with D. gangeticum aqueous extract prevented scopolamine and age-related amnesias in rats [32-33].

Eclipta alba (L.)

Hassk (E. alba) is an annual erect or prostrate plant of the Asteraceae family.The ethanolic extract of E. alba enhanced rats' learning and memory capabilities in the passive avoidance and elevated plus maze tests after both acute and chronic therapy [34].

Moringa oleifera

In the Moringaceae family, this is the most extensively dispersed species.By maintaining monoamine levels in the brain, oleifera, at a dose of 250 mg/kg orally, corrected hypoxia-induced memory impairment in rats.For 14 days, a 250 mg/kg p.o. dose of ethanolic leaf extract provided protection against cognitive impairment induced by ICV–colchicine.Colchicine's effects on norepinephrine, serotonin, and dopamine levels in the brain were reversed [35].

Bramhi Ghrita

It contains Bacopa monnieri (40 percent w/w), Evolvulus alsinoids (20 percent w/w), Acorus calamus (20 percent w/w), Saussurea lappa (20 percent w/w), and cow's ghee in a polyherbal Ayurvedic composition (750 mL).It has long been used to help with memory [36].

Ginkgo biloba L.

Ginkgo has a long history of use in the treatment of various cerebral dysfunctions linked with neurodegenerative dementia and brain ageing.Gingko extract has been shown to enhance cognitive and behavioural skills in old individuals and Parkinson's disease patients in many animal experiments [37].

Lepidium meyenii

A 35-day study looked at the effects of various doses of aqueous and hydroalcoholic maca extract on learning and memory deficits caused by scopolamine (1 mg/kg) in rats.Maca improved passive avoidance learning and memory deficits as well as spatial learning and memory deficiencies.Scopolamine was discovered to increase AChE activity in the brains of mice by 1.5 times.Maca extract reduced brain AChE activity by 45 percent as compared to scopolamine alone [38].

Prunella vulgaris (P. vulgaris)

In rats given scopolamine in the shuttle box test, P. vulgaris extract (25 and 50 mg) reduced delay.

In the Y-maze test, the extract of P. vulgaris alleviated scopolamine-induced problems.The beneficial benefits of this plant are due to its mimicry of the cholinergic action.In vivo, P.vulgaris has no effect on AChE activity. Because the memory-enhancing effects of P. vulgaris do not work through inhibiting AChE, they are acquired through an indirect impact on cholinergic signalling in ex vivo conditions.P. vulgaris improves memory and learning via increasing cholinergic neurotransmitters and signalling at the methyl-D-aspartate receptor [39].

Cyperus rotundus (C. rotundus)

According to studies, the severity of dementia in Alzheimer's disease is determined by a reduction in the number of neurons in the Meynert nucleus, which is followed by a significant reduction in the quantity of acetylcholine transferee's enzymes in the cortex and amygdala, resulting in decreased learning [40].

Zizyphus jujube

This plant contains compounds that inhibit histamine release as well as the actions of AChE and cyclooxygenases I and II, according to studies.This plant also improves biological compatibility and has cytotoxic effects.Jujube seeds are high in mucilage, malic acid, citric acid, sugar, protein, organic minerals, and vitamin C[41].

Salvia officinalis (S. officinalis)

S. officinalis has a long history of usage for memory enhancement.It has a lot of advantages for the head and brain.Anti-inflammatory and antioxidant properties, as well as a moderate AChE inhibitory activity, are among the herb's potential pharmacological advantages, which may be related to illness.The antioxidative properties of S. officinalis L. (sage) leaves have long been known.A [42] produced reactive oxygen species, lipid peroxidation, DNA breakage, caspase-3 activation, and tau protein hyperphosphorylation, which were all reduced by rosmarinic acid (the main active ingredient in S. officinalis).

Melissa officinalis (M. officinalis)

Every morning, take M. officinal is essential oil with canary wine to rejuvenate freshness and enhance the brain. After 16 weeks of therapy, patients with mild to severe disease who received M. officinal is extract had substantial improvements in cognition. officinal is exhibits acetylcholine receptor activation in the central nervous system and influences mood and cognitive function after acute treatment [43].

Morinda citrifolia (M. citrifolia)

An ethyl acetate extract of M. citrifolia decreased amyloid beta peptide-induced memory loss and oxidative stress in mice. In the brains of scopolamine-treated mice, M. citrifolia extracts in chloroform, ethyl acetate, and butanol reduced AChE enzyme activity in a dose-dependent manner [44].

Conclusion

This article discusses the most common medicinal plants used in different traditional systems of medicine, as well as the underlying processes and effects on dementia. Pharmacologically active phytoconstituents should be extracted, identified, and thoroughly investigated. To confirm the efficacy of these herbal medicines alone or in the form of formulations for the treatment of dementia, multicenter clinical studies should be conducted. The overwhelming body of data from clinical trials and animal research supports the inherent value of medicinal herbs as a dementia prevention or therapy approach. More study on plants used in various ethnomedicinal practises and traditional medicine may result in the development of new dementia therapies.

Disclosure Statement

There are no conflicts of interest.

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