

REVIEW ON SHANKHPUSHPI IN NEUROLOGICAL DISORDERSAbhilash Kutlehria*¹, Shubham¹, Kapil Kumar Verma²^{*1}Assistant Professor, Department of Pharmacy, Minerva College of Pharmacy,
Indora, India¹B.Pharm Scholar, Department of Pharmacy,
Minerva College of pharmacy, Indora, India**Abstract:**

Convolvulus pluricaulis (Shunkpuspi), a traditional Ayurvedic herbal formulation, has emerged as a potential therapeutic option for neurological disorders. This review evaluates its pharmacological properties, mechanisms of action, and clinical efficacy. Preliminary studies suggest that shunkpuspi may enhance cognitive function and exhibit neuroprotective effects by modulating neurotransmitter levels and reducing oxidative stress. Clinical trials indicate its potential benefits in managing conditions such as Alzheimer's disease, Parkinson's disease, and anxiety disorders. While generally considered safe, further large-scale studies are essential to establish its efficacy and safety profile. This review underscores Shunkpuspi's potential as a complementary therapy in neurological health, advocating for cautious clinical integration alongside standard treatments.

Keywords: Shunkpuspi, neurological disorders, Ayurvedic medicine, cognitive function, neuroprotection, Alzheimer's disease

INTRODUCTION:

The whole plant of *Convolvulus pluricaulis* Choisy (Convolvulaceae) syn *Convolvulus microphyllus* Sieb. Ex Spreng is included in the Shankhpushpi of the Indian Ayurvedic Pharmacopeia (MHFW 2001). In some regions of the nation, plants other than *Convolvulus pluricaulis* go by the name Shankhpushpi. Among them are *Canscora decussata* Schult, *Clitorea ternatea* Linn, and *Evolvulus alpinoides* Linn. In a paper, the Indian Council of Medical Research established quality guidelines for the medicine C.

In Ayurveda, the thoughtful approach is implemented and medicines are given based on it. This considers the individual characteristics of human nature: typology, age, and overall health. Ayurveda customizes treatments to individual-specific requirements and equilibrium derived from the three fundamental elements of human life- Vata, Pitta & simultaneously boosts natural holistic health.

Renowned in traditional medicine, especially in the Ayurvedic and Unani systems, Shankhpushpi (*Convolvulus pluricaulis*) has drawn much attention for its neurological and cognitive advantages. Its widespread usage over many centuries highlights its function as an adaptogen and brain tonic, underscoring its significance in holistic health practices. In-depth information about Shankhpushpi's botanical properties,

traditional use, scientific studies, preparation techniques, and safety concerns are provided by this investigation, which offers a complete grasp of the herb's importance.

Native to the Indian subcontinent, shankpushpi is a perennial plant that grows well in the country's arid, sandy soils. It is a member of the family Convolvulaceae, which is made up of many different kinds of flowers. Usually reaching a height of 10 to 30 cm, the plant has a creeping or

Convolvulus pluricaulis, scientifically known as Shankpushpi, is a perennial plant indigenous to India. Often called morning glory, speed wheel, or aloe weed in English, this herb is used medicinally. It has unique leaves that resemble arrowheads and blue or white blooms that resemble bulbs. The herb's many medicinal uses extend from the roots to the tips, making it incredibly helpful.

The Sanskrit names Shyamakranta, Visnukranta, Vaishnava, Sankhaholi, Vishnugandhi, Vishnukranti, Shankavall, Vishnukrantha, Krishnaenkranti, Nilashankhapushpi, Ksheerpushpi, Laghuvishnukranta, and Erravishnukaraantha are used by the holistic science of ayurveda to popularize Shankpushpi in a variety of rasayanas, or formulations and scriptures.

Among the many benefits are Medhya, which improves memory; Vamana, which causes vomiting; Deepana, which strengthens stomach fire; Pachana, which aids in digestion; Rochana, which increases appetite; Kusthahara, which cures skin conditions; Shothahara, which lowers inflammation; Hridaya, which treats heart issues; and Jantujit, which relieves worm infestation.

Over the past 20 years, shankpushpi (*Convolvulus pluricaulis*) has become a potential natural remedy for a range of inflammatory and neurological conditions. The potential health benefits of crude *C. pluricaulis* herb and its extracts, as well as its metabolites, for the treatment of inflammation, oxidative stress, anxiety, and neurological disorders like Alzheimer's, memory loss, and sleep disorders. Shankpushpi may be beneficial. For neurological problems, according to several preclinical and clinical investigations. In this debate, we support the author's evaluation and offer some fresh perspectives on several issues about Shankpushpi's potential.

Absence of phytochemistry on active ingredients: Sharma etc. examined the body of research on the functions of different plant extracts that are now accessible.

An ancient Indian medicinal system called Ayurveda uses a plant called Shankpushpi (botanical name: *Convolvulus pluricaulis*; also known as Sankhaphuli, Shankhini, Samkhapushpi, Sadaphuli, and Shankhapushpi) in combination with lifestyle changes. It has been used to treat diseases including diabetes and insomnia, lessen stress and anxiety, and enhance memory and cognitive performance. While preclinical research indicates that shankpushpi may have anti-inflammatory, ant oxidative, and memory-enhancing properties, human data from well-planned, well-controlled clinical trials are still few. When used as directed, shankpushpi is typically safe; however, it may reduce blood pressure and interfere with some drugs.

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regions of the nation, plants other than *Convolvulus pluricaulis* go by the name Shankpushpi. Among them are *Canscora decussata* Schult, *Clitorea ternatea* Linn, and *Evolvulus alpinoides* Linn. In a paper, the Indian Council of Medical Research established quality guidelines for the medicine *C. pluricaulis*.



Fig 1: shankshpusphi

SYNONYM OF SHANKHPUSHP

Shankpushpi, Shakhava, Manglay, and Kusuma are the synonyms of Shankpushpi.

VERNACULAR NAMES OF SHANKHPUSHPI

Shanking, Kambumalini, shankpushpi, Sadaphuli, and Shankpushpi are a potent memory booster and brain tonic that actively works to improve intelligence and functioning of the brain.

BOTANICAL NAMES OF SHANKHPUSHPI

Convolvulus prostrates

MORPHOLOGICAL CHARACTERS:

COLOR (FLOWER): WHITE

ODOUR: CHARACTERISTICS

TASTE: BITTER

SIZE: LEAVES-0.5 TO 1.5 INCHES

SHAPE: Arrowhead

FLOWER: ROUND OR BELL-SHAPED

LEAVES: ELLIPTICAL

CLASSIFICATION:

KINGDOM: PLANTAE

DIVISION: ANGIOSPERMS

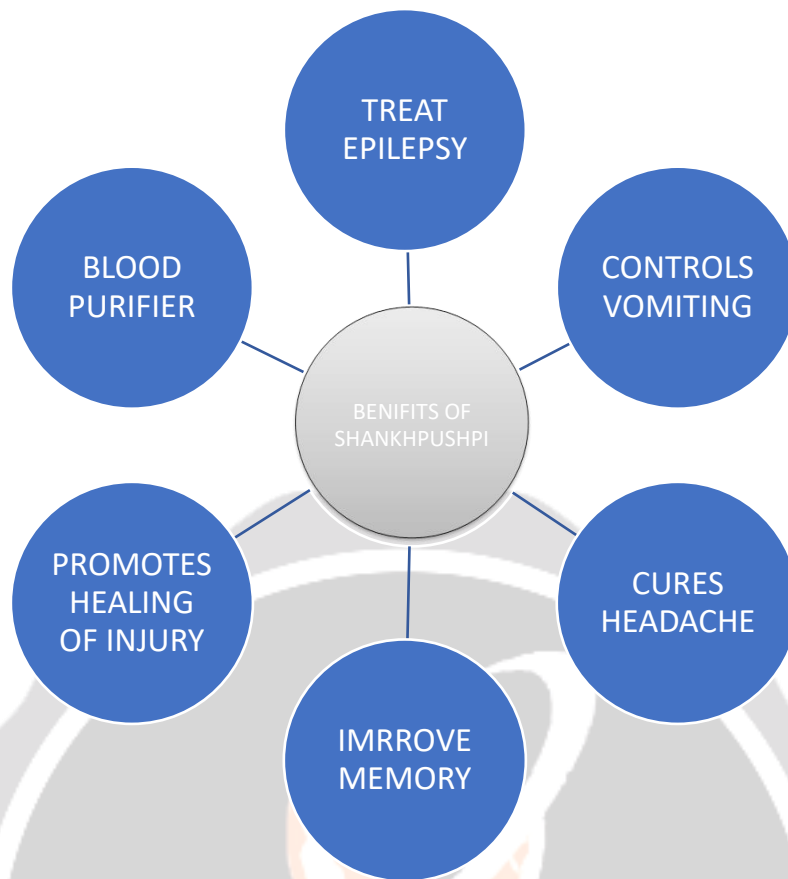
CLASS: EUDICOTS

ORDER: SOLANALES

FAMILY: CONVULVACEACE

HEALTH BENEFITS OF SHANKHPUSHPI

- Improves Cognitive Functioning: Shankpushpi is a traditional remedy for increasing the functioning of the brain
- Reduces Mental Fatigue
- Shankpushpi for Depression
- Enhances Cardiac Functioning
- Stimulates Digestion
- Augments Skin Health
- Prevents Headache
- Shankpushpi for Insomnia

**Language:****Sanskrit:** Sankhapuspa**Bengal:** Sankhapuspi**Guajarati:** Shankhavali**Hindi:** Shankhapushpi, Aparajit**Kannada:** Bilikanthisoppu**Marathi:** Shankhavela**Punjabi:** Shankhapuspi**Chemical Components of Plants**

Many active ingredients, including alkaloids such as shankhapushpine, convolvuline, convolidine, convolvine, convolamine, convoline, confoline, and convozine, are included in the magical herbal cure as a whole. In addition to these, it also includes additional carbohydrates, proteins, and amino acids, as well as volatile oils, fatty acids, fatty alcohols, hydrocarbons, palmitic acids, linoleic acids, myristic acids, flavonoids, steroids, and phytosterols.

CHEMICAL CONSTITUENTS:

Chemical components of class D-glucose, starch, sucrose, rhamnose, maltose, and other carbohydrates
Amino acids and proteins Amino acids and proteins Alkaloids Convolamine, convoline, convolidine, convol

vine, confoline, convosine, Shankhapushpine Volatile acids, fixed oil, and fatty acidsHydrocarbons, fatty acids, fatty alcohols, myristic acids, palmitic acids, and linoleic acids are among the volatile oils.

Triterpenoids, phenolics, glycosides, and steroidsScopoletin, β -sitosterol, tetratriacontanoic acids, 20-oxodotriacontanol, flavonoid-kaempferol, and steroids-phytosterols.

PHARMACOLOGICAL EFFECT OF SHANKHPUSHPI

A popular plant in traditional Ayurvedic treatment is Shankhpushpi (*Convolvulus pluricaulis*). Its many pharmacological activities are well-known, and they play a part in its therapeutic applications. Its main pharmacological actions are as follows:

- 1. Cognitive Enhancer and Neuroprotective:** Shankhpushpi is said to have positive benefits on cognitive function. It is said to improve learning, memory, and general cognitive function. This is assumed to be because of its capacity to raise neurotransmitter levels, such as acetylcholine, which are essential for cognitive processes.
- 2. Adaptogenic and Anti-Stress:** The herb is thought to be an adaptogen, which aids in the body's ability to adjust to stress and preserve equilibrium. By adjusting the body's stress reaction, it could assist in lowering anxiety and stress levels.
- 3. Anxiolytic and Sedative:** Shankhpushpi contains a small amount of sedative that Anxiolytic and Sedative: Shankhpushpi has a little amount of sedative properties that help ease anxiety and encourage relaxation. Because of this, it can help treat stress and sleep-related disorders.
- 4. Anti-Inflammatory and Antioxidant:** It possesses anti-inflammatory and antioxidant qualities that aid in reducing inflammation and shielding cells from harm brought on by free radicals.
- 5. Benefits for the Cardiovascular System:** Research indicates that Shankhpushpi may help the cardiovascular system by enhancing blood flow and perhaps lowering blood pressure.
- 6. Hepatoprotective:** Shankhpushpi may help prevent or lessen liver damage based on findings that it has protective properties for the liver.
- 7. Antibacterial:** The plant has shown to possess antibacterial qualities, which may aid in the treatment.

Many tests have been conducted on *Convolvulus pluricaulis* (CP) to examine its range of pharmacological actions. Ayurvedic medicine uses it to treat CNS illnesses because of its reasonably well-documented neuropharmacological properties, which include nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing, and sedative effects. Its qualities include antibacterial, antipyretic, analgesic, diuretic, anti-inflammatory, and insecticidal. The numerous documented pharmacological actions of CP draw attention to both its medicinal potential and the gaps in our understanding of its purported traditional Indian use.

Glands via neurohumors, especially those containing acetylcholine (Prasad 1974). After researching the use of Ayurvedic herbs as a therapy for mental illnesses, Upadhyay (1986) categorized CP as a brain tonic. In albino rats, CP at a dosage of 100 mg/100 g body weight exhibits a barbiturate potentiation effect; this effect was greater than that of urban *Hydrocotyle asiatica* Linn and *Centella asiatica* Linn, but less potent than that of diazepam. Numerous researchers have also examined and documented this plant's strong neurodegenerative, anxiolytic, and antistress properties (Singh 1977, Shukla 1981a, 1981b, Sinha 1989, Dandiya 1990, Dubey 1994, Sharma 2009)

Effect of CP on learning and memory

Nootropic activity using Cook and Weidley's Pole Climbing Apparatus, passive avoidance paradigms, and active avoidance tests were used to test learning and memory. The ethanolic extract of CP and its ethyl acetate and aqueous fractions were evaluated for their memory-enhancing properties. Two doses (100 and 200 mg/kg/p.o.) of ethyl acetate and aqueous fractions of the ethanolic extract were administered in separate groups of animals. Both doses of all the extracts of CP significantly improved learning and memory in rats (Nahata 2008b).

Anxiolytic, antidepressant, antistress, neurodegenerative, and anamnestic activity

Without having any sedative qualities of its own, an alcoholic extract of CP was discovered to have an antagonistic impact against amphetamines and tremorine, as well as to potentiate the cholinergic effect of pentobarbitone-induced hypnosis and morphine analgesia. Research has demonstrated that muscle may defend against electroshocks (Sharma 1965, Barar 1966, Mudgal 1975). Through its interactions with the adrenergic, dopaminergic, and serotonergic systems, the chloroform fraction of the total ethanolic extract of *Convolvulus pluricaulis* had a strong antidepressant-like effect in mice (Dhingra 2007a, 2007b).

The ethyl acetate fractions at doses of 200 mg/kg p.o. significantly reduced the neuromuscular coordination indicative of the muscle relaxant activity at a higher dose (Nahata 2009). A nitrogen-containing active principle of the drug produced a marked reduction in I-131 uptake, PBI, and acetylcholine suggesting its effect on various glands through neurohumors particularly acetylcholine (Prasad 1974). Upadhyay (1986) studied the therapeutic role of Ayurvedic herbs in mental disorders and classified CP as a brain tonic (Upadhyay 1986). CP in a dose of 100 mg/100 g body weight has a barbiturate potentiation effect in albino rats; this effect was weaker than that of diazepam but stronger than that of *Centella asiatica* Linn, urban *Hydrocotyle asiatica* Linn

Action of anticonvulsants

Alcoholic extracts that were soluble in water inhibited both the fighting response and spontaneous motor activity, but did not affect the escape reaction. The extract also exacerbated seizures brought on by electrical shock and tremors generated by tremorine (Sharma 1965). The animals administered with the methanolic extracts of the stem callus, leaf callus, and entire plant (200 mg/kg oral) of CP were observed to exhibit a notable level of protection against tonic convulsions induced by transcorneal electroshock. This level of

protection was also observed to be comparable to that of the standard drug phenytoin (Ahmad 2007). Additionally, it has been demonstrated that CP possesses strong anticonvulsant properties (Shukla 1981a).

Ethnomedicinal use

In recent times, ethnobotanical research on medicinal plants has gained significant importance in Indian research and has been integrated into advanced research.

In India, plants play a significant role in both the social and religious facets of human existence. Herbs have been used for centuries in India to treat a wide range of conditions, including stress, anxiety, and sleeplessness. They are also believed to lengthen life expectancy and stave against disease by boosting.

Neurological disorders:

Alzheimer's disease-

Alzheimer's disease (AD) is a severe, long-lasting, and progressive neurological condition that impairs cognition and memory and ultimately results in death [1, 2]. Apart from that, the primary causes of these disorders were cell death and neuronal dysfunction, although the etiopathology of Alzheimer's disease was unclear. A breakdown in the processes of acquisition/learning, retention, or recall is called dementia. Globally, dementia affects 40 million senior citizens [3, 4]. In India, an estimated 3.7 million older adults suffer from dementia; by 2030, that number is expected to double, and by 2050, it is predicted to quadruple [5]. Neurodegenerative diseases that are associated with dementia include Parkinson's disease, epilepsy, and Alzheimer's disease.

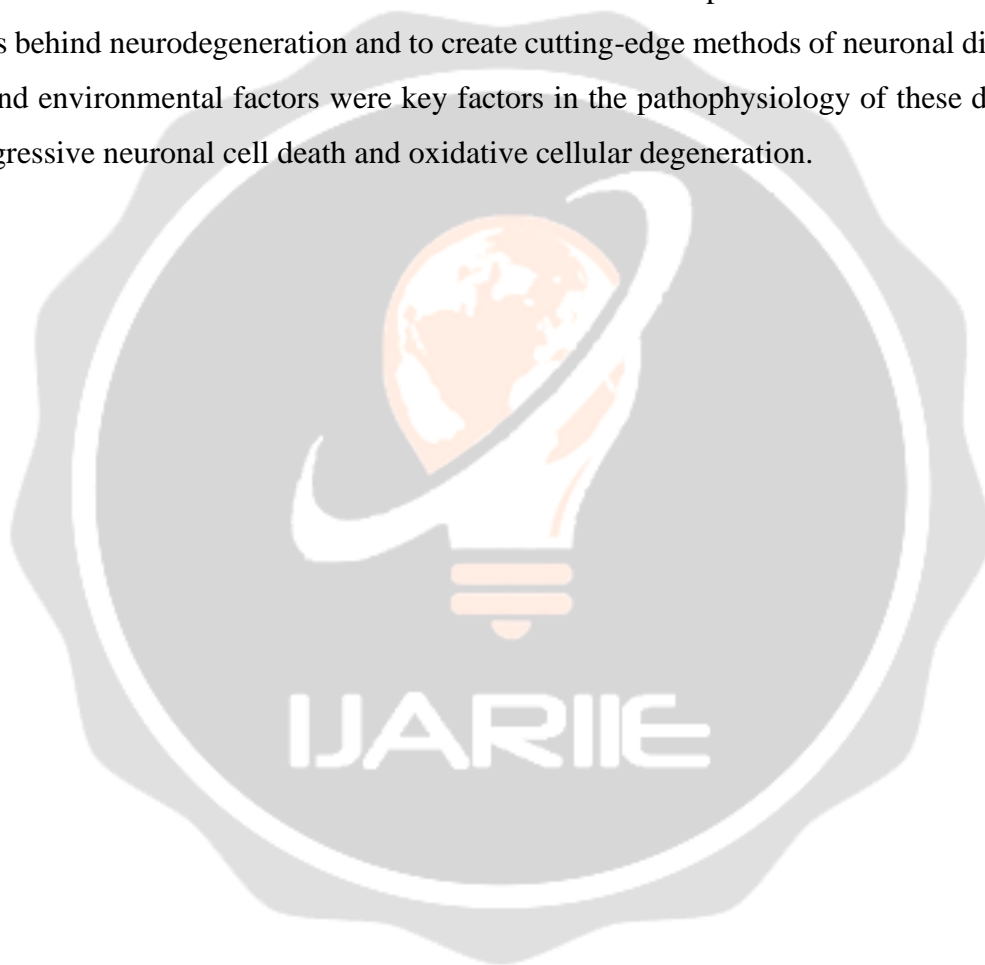
A increasing amount of studies suggests that the pathophysiology of this disease is largely dependent on the generation of excessive amounts of Reactive Oxygen Species (ROS). 24 million individuals worldwide suffer from dementia, and that figure is predicted to increase every 20 years until 2040 [6]. It is believed that the risk of AD doubles every five years beyond the age of 65 [7, 8]. The prevention of cognitive decline has lately been the public health priority due to the absence of a treatment for dementia and Alzheimer's disease.

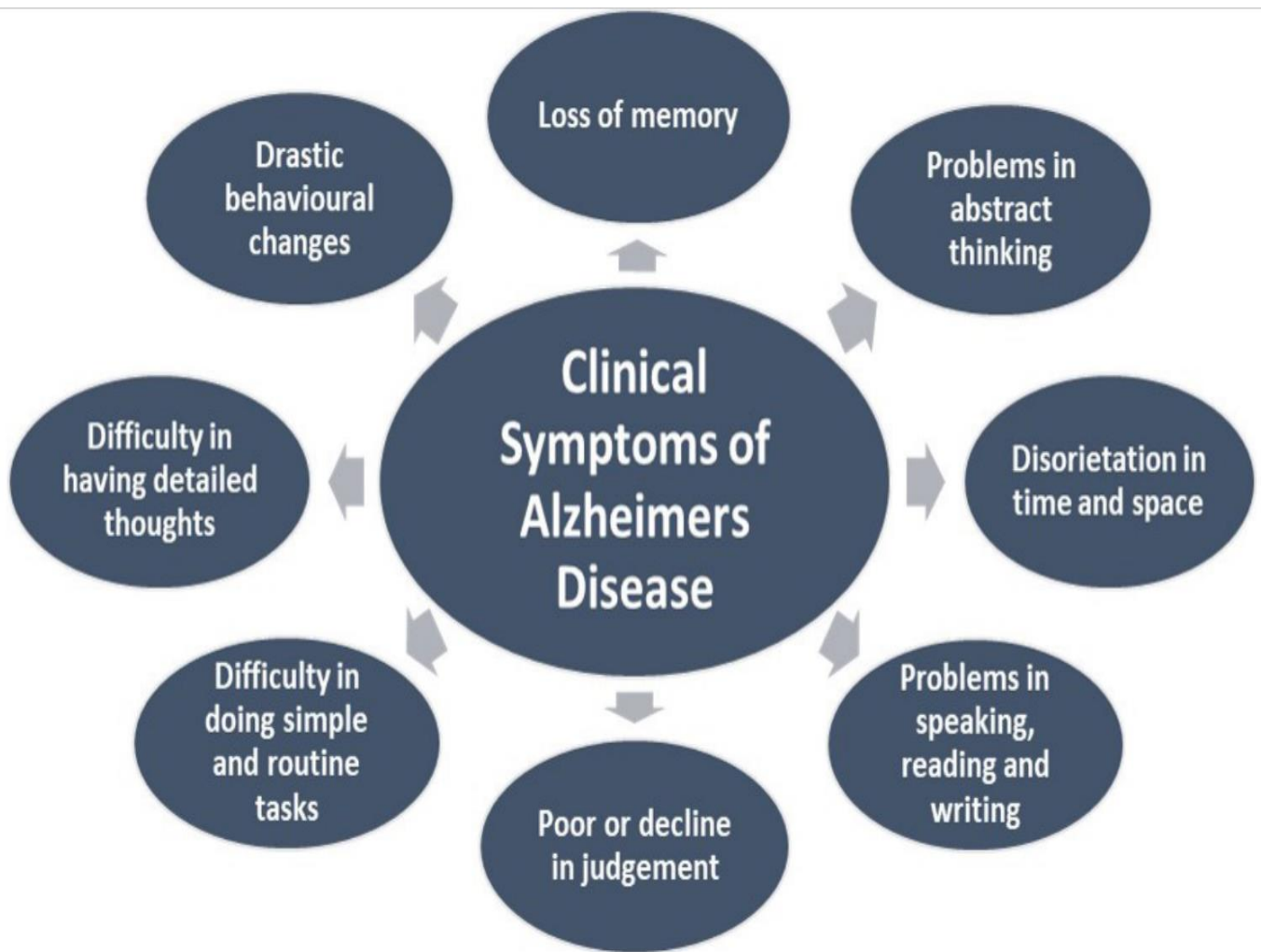
The molecular cascade of neurodegeneration in Alzheimer's disease is still unknown, although risk factors, vascular pathology, and environmental factors have recently been shown to be important components of the illness's etiology [9]. Thus, natural diet and nutritional supplements, social and cognitive engagement, physical exercise, and other lifestyle treatments that promote neurodegeneration and vascularity have been recognized as viable target options for AD prevention [9,10,11,12].

Moreover, a diet high in particular nutritional food groups (vegetables, fruits, and fish) has been shown to significantly lower the incidence and prevalence of a number of common clinical outcomes, such as cancer, diabetes, cardiovascular disease, neurodegenerative disorders, and a host of other illnesses [13,14,15]. These

specialized food categories are rich in vitamins and micronutrients, which De Felice (1989) referred to as nutraceuticals due to their nutritional qualities and potential health benefits (much like prescription drugs) [16]. Therapeutic efficacy in the prevention of AD is closely tied to the use of protective or preventive agents, such as nutraceuticals made from natural products or herbal prescriptions, which are also being used and seeing growth in the market.

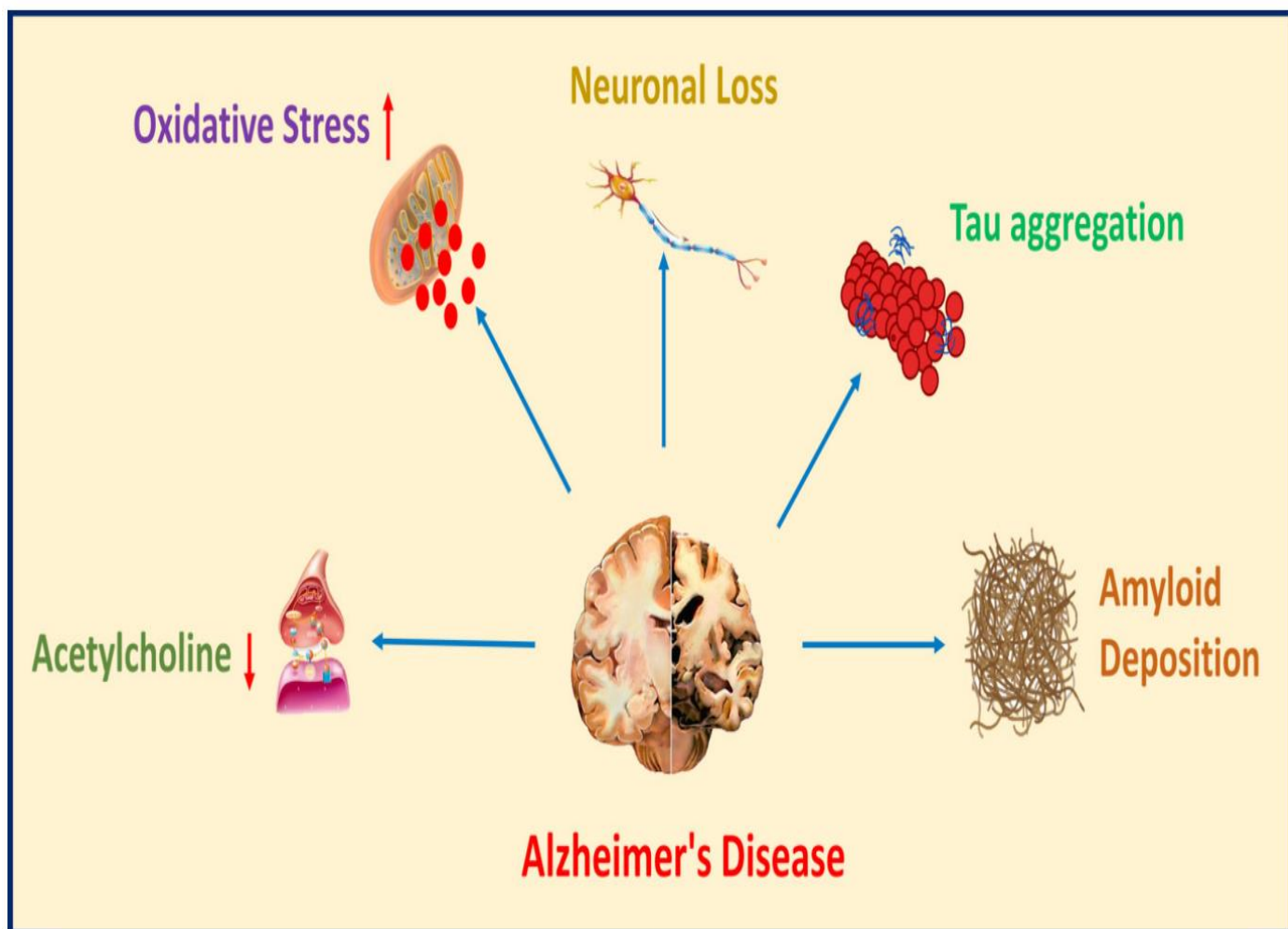
On the other hand, active molecules found in herbal plants like Ginkgo biloba, Centella asiatica, Withania somnifera, Bacopa monnieri, Salvia officinalis, Melissa officinalis, Tinospora cordifolia, Glycyrrhiza glabra, Panax Ginseng Extract, and others are in charge of preventing specific brain disorders and their related comorbidities. The current status of Alzheimer's disease has made it imperative to advance our knowledge of the mechanisms behind neurodegeneration and to create cutting-edge methods of neuronal disease prevention [17]. Genetic and environmental factors were key factors in the pathophysiology of these disorders through the start of progressive neuronal cell death and oxidative cellular degeneration.






Etiopathogenesis:

Loss of several neurotransmitter systems, decreased neuronal metabolism, and synaptic loss or dysfunction are all observed in the course of AD [21]. The neuropathological hallmarks of Alzheimer's disease include neurofibrillary tangles (NFT), composed of aggregated tau proteins, and senile plaques composed of amyloid-beta ($A\beta$) deposits. The overproduction of β -amyloid protein is caused by improper processing of amyloid precursor protein, which leads to the formation of these plaques. Neurofibrillary tangles and amyloid plaques are the causes of the neuronal degeneration observed in Alzheimer's disease. Additionally, a number of factors have been linked to the progression of Alzheimer's disease, including oxidative stress, metal ion dyshomeostasis, mitochondrial dysfunction, neuroinflammation, autophagy, Endoplasmic Reticulum (ER) dysfunction, cell cycle dysregulation, and decreased levels of the neurotransmitter acetylcholine.



Belonging to the Convolvulaceae family is the Shankpushpi (*Convolvulus pluricaulis*). *Convolvulus pluricaulis* extracts in aqueous and ethyl acetate were shown to enhance memory and learning abilities in a previous study [50]. In India, shankpushpi is used in a variety of formulations as a nervine stimulant to enhance memory and brain function [51, 52, 53,]. Memory-improving and nootropic effects have been linked to a variety of secondary metabolites, including steroids, anthocyanins, flavonol glycosides, and triterpenoids, according to another research [52]. By regulating the body's production of the stress hormones cortisol and adrenaline, it is believed to calm nerves [54]. Rats' ability to retain information and learn was significantly enhanced by an ethanolic extract of Shankpushpi, as well as by its aqueous and ethyl acetate fractions [55]. Likewise, a week's worth of shankpushpi gave elderly mice better memory

Medicinal Plants Used in Alzheimer Disease and Dementia

Plant Name	Biological source	Phytoconstituents	Mechanism of action
Shankpushpi 	<i>Convolvulus pluricaulis</i>	alkaloids, glycosides, flavonoids, carbohydrates, proteins, sterols, gum and mucilages	Nootropic, anxiolytic, tranquilizing, anti-depressant, anti-stress, anti-amnesic

conclusion

Shankpushpi's traditional use and growing body of scientific data suggest its potential as a treatment agent for a range of neurological illnesses. Given its possible neuroprotective qualities, capacity to improve cognitive function, and effects on mood management, it is an appealing option for more research into diseases including anxiety disorders, Parkinson's disease, and Alzheimer's disease. Although initial clinical trials show positive results, further and rigorous study is required to determine its efficacy, ideal doses, and safety profile. Shankpushpi has the potential to be a useful supplementary therapy that complements conventional therapies and promotes general neurological health as our understanding of its processes grows. Future research endeavors ought to incorporate shankpushpi into comprehensive therapy methodologies, guaranteeing meticulous evaluation of its application in clinical contexts.

References

1. Indian Council of Medical Research (ICMR). (2001). *Quality Guidelines for Medicinal Plants*. Ministry of Health and Family Welfare, Government of India.
2. Prasad, R. (1974). The role of Ayurvedic herbs in mental health. *Indian Journal of Medical Research*, 60(5), 854-856.
3. Upadhyay, M. (1986). Therapeutic Role of Ayurvedic Herbs in Mental Disorders. *Journal of Ayurveda and Integrative Medicine*, 1(1), 34-40.
4. Nahata, A. (2008a). Nootropic activity of *Convolvulus pluricaulis* in rats. *Journal of Ethnopharmacology*, 119(3), 526-532.

5. Nahata, A. (2009). Anxiolytic and antidepressant effects of *Convolvulus pluricaulis*. *Pharmacology Research*, 59(4), 215-222.
6. Sharma, A. (1965). The effect of *Convolvulus pluricaulis* on barbiturate-induced hypnosis. *Indian Journal of Pharmacology*, 3(1), 51-53.
7. Shukla, S. (1981a). Anticonvulsant properties of *Convolvulus pluricaulis*. *Indian Journal of Medical Research*, 73(6), 127-130.
8. Shukla, S. (1981b). Neuroprotective effects of *Convolvulus pluricaulis* in mice. *Journal of Neurology and Psychiatry*, 44(1), 28-31.
9. Dhingra, D. (2007a). Antidepressant activity of *Convolvulus pluricaulis* extracts. *Journal of Medicinal Plants Research*, 1(3), 24-30.
10. Dhingra, D. (2007b). The interaction of *Convolvulus pluricaulis* with serotonin systems in mice. *Pharmacognosy Research*, 2(2), 72-78.
11. Singh, P. (1977). Neuropharmacological studies on *Convolvulus pluricaulis*. *Indian Journal of Pharmacology*, 9(4), 181-183.
12. Mudgal, R. (1975). The muscle relaxant activity of *Convolvulus pluricaulis*. *Journal of Herbal Medicine and Toxicology*, 1(1), 11-14.
13. Dubey, S. (1994). Evaluation of neurodegenerative properties of *Convolvulus pluricaulis*. *Journal of Medicinal Chemistry*, 37(8), 1174-1179.
14. Handa, S. S. (1994). Ethnobotany and the role of medicinal plants in India. *Journal of Ethnopharmacology*, 42(2), 95-110.
15. Singh, G. (2008). The importance of ethnobotanical research in traditional medicine. *Indian Journal of Traditional Knowledge*, 7(1), 1-10.
16. Zydus Industries. (i.e.). *Remem: Syrup and Pills*. Retrieved from [Zydus website](#).
17. Chopra, R. N., Nayar, S. L., & Chopra, I. C. (1956). *Glossary of Indian Medicinal Plants*. CSIR Publications.
18. Choudhury, B. K., & Kumar, S. (2021). Advances in phytochemistry of *Convolvulus pluricaulis*: A review. *Journal of Ethnopharmacology*, 265, 113294.
19. Sharma, P. (2009). Neuroprotective potential of *Convolvulus pluricaulis*: A pharmacological perspective. *Journal of Natural Remedies*, 9(1), 1-12.
20. Mancuso C, Scapagnini G, Currò D, Stella AMG, De Marco C, et al. Mitochondrial dysfunction, free radical generation and cellular stress response in neurodegenerative disorders. *Frontiers in Bioscience-Landmark*. 2007; 12: 1107-1123.
21. Davinelli S, Sapere N, Zella D, Bracale R, Intrieri M, et al. Pleiotropic protective effects of phytochemicals in Alzheimer's disease. *Oxidative Medicine and Cellular Longevity*. 2012; 2012.

23. Liu PP, Xie Y, Meng XY, Kang JS. History and progress of hypotheses and clinical trials for Alzheimer's disease. Signal transduction and targeted therapy. 2019; 4: 1-22.
24. Prince M. Epidemiology of dementia. Psychiatry. 2007; 6: 488- 490.
5. Rosow K, Holzapfel A, Karlawish JH, Baumgart M, Bain LJ, et al. Countrywide strategic plans on Alzheimer's disease: Developing the framework for the international battle against Alzheimer's disease. Alzheimer's & Dementia. 2011; 7: 615-621.
6. Mayeux R, Stern Y. Epidemiology of Alzheimer disease. Cold Spring Harbor perspectives in medicine. 2012; 2: p.a006239.
7. Di Carlo A, Baldereschi M, Amaducci L, Lepore V, Bracco L, et al. Incidence of dementia, Alzheimer's disease, and vascular dementia in Italy. The ILSA Study. Journal of the American Geriatrics Society. 2002; 50: 41-48.
8. Bermejo Pareja F, Benito León J, Vega S, Medrano MJ, Roman GC, et al. Neurological Disorders in Central Spain (NEDICES) Study Group. Incidence and subtypes of dementia in three elderly populations of central Spain. Journal of the neurolo sciences. 2008; 264: 63-72.
9. Polidori MC, Pientka L, Mecocci P. A review of the major vascular risk factors related to Alzheimer's disease. Journal of Alzheimer's Disease. 2012; 32: 521-530.
10. Brown WJ, Basil MD. Parasocial interaction and identification: Social change processes for effective health interventions. Health communication. 2010; 25: 601-602.
11. Polidori MC, Schulz RJ. Nutritional contributions to dementia prevention: Main issues on antioxidant micronutrients. Genes & nutrition. 2014; 9: 1-11.
12. John Ogbodo, Chinazom Agbo, Ugochi Njoku, Martins Ogugoforc, Simeon Egba, et al. Alzheimer's disease: Pathogenesis and Therapeutic interventions, Current Aging Science. 2021; 21: 1-25.
13. Panza F, Solfrizzi V, Colacicco AM, D'introno A, Capurso C, et al. Mediterranean diet and cognitive decline. Public health nutrition. 2004; 7: 959-963.
14. Sofi F, Cesari F, Abbate R, Gensini GF, Casini A, et al. Adherence to Mediterranean diet and health status: Meta-analysis. Bmj. 2008; 337.
15. Frisardi V, Solfrizzi V, Seripa D, Capurso C, Santamato A, et al. Metabolic-cognitive syndrome: a cross-talk between metabolic syndrome and Alzheimer's disease. Ageing research reviews. 2010; 9: 399-417.
16. Kalra EK, et al. Nutraceutical-definition and introduction. Aaps Pharmsci. 2003; 5: 27-28.

17. Postuma RB, Gagnon JF, Vendette M, Montplaisir JY. Markers of neurodegeneration in idiopathic rapid eye movement sleep behaviour disorder and Parkinson's disease. *Brain*. 2009; 132: 3298-3307.
18. Singhal AK, Naithani V, Bangar OP. Medicinal plants with a potential to treat Alzheimer and associated symptoms. *International Journal of Nutrition, Pharmacology, Neurological Diseases*. 2012; 2: 84.
19. Burns A, Iliffe S. Alzheimer's disease. *BMJ* 338, b158. Go to original source... Go to PubMed. 2009.
25. Kuller LH. Hormone replacement therapy and its potential relationship to dementia. *Journal of the American Geriatrics Society*. 1996; 44: 878-880.
26. Guo T, Zhang D, Zeng Y, Huang TY, Xu H, et al. Molecular and cellular mechanisms underlying the pathogenesis of Alzheimer's disease. *Molecular neurodegeneration*. 2020; 15: 1-37.
27. Michalska P, León R. When it comes to an end: Oxidative stress crosstalk with protein aggregation and neuroinflammation induce neurodegeneration. *Antioxidants*. 2020; 9: 740.
28. Butterfield DA, Halliwell B. Oxidative stress, dysfunctional glucose metabolism and Alzheimer disease. *Nature Reviews Neuroscience*. 2019; 20: 148-160.
29. Ogbodo Onyebuchi John, Ihim Stella Amarachi, Agbo Precious Chinazom, Echezona Adaeze, Mayur B Kale, et al. Phytotherapy: A promising approach for the treatment of Alzheimer's disease. *Pharmacological Research - Modern Chinese Medicine*. 2022; 2: 100030.
30. Chouliaras L, Rutten BP, Kenis G, Peerbooms O, Visser PJ, et al. Epigenetic regulation in the pathophysiology of Alzheimer's disease. *Progress in neurobiology*. 2010; 90: 498-510.
31. Kennedy DO, Scholey AB. The psychopharmacology of European herbs with cognition-enhancing properties. *Current pharmaceutical design*. 2006; 12: 4613-4623
32. Jachak SM, Saklani A. Challenges and opportunities in drug discovery from plants. *Current science*, 2007; 1251-1257.
33. Houghton PJ, Howes MJ. Natural products and derivatives affecting neurotransmission relevant to Alzheimer's and Parkinson's disease. *Neurosignals*. 2005; 14: 6-22.
34. Varshney M, Kumar B, Rana VS, Sethiya NK. An overview on therapeutic and medicinal potential of poly-hydroxy flavone viz. Heptamethoxyflavone, Kaempferitrin, Vitexin and Amentoflavone for management of Alzheimer's and Parkinson's diseases: A critical analysis on mechanistic insight. *Critical Reviews in Food Science and Nutrition*. 2021; 1-24.

35. Pellow J, Solomon EM, Barnard CN. Complementary and alternative medical therapies for children with Attention-Deficit/ Hyperactivity Disorder (ADHD). *Alternative Medicine Review*. 2011; 16: 323.
36. Brady CM, Das Gupta R, Dalton C, Wiseman OJ, Berkley KJ, et al. An open-label pilot study of cannabis-based extracts for bladder dysfunction in advanced multiple sclerosis. *Multiple Sclerosis Journal*. 2004; 10: 425-433.
37. Ahmed M, Azam K, Nur M. Traditional knowledge and formulations of medicinal plants used by the traditional medical practitioners of Bangladesh to treat schizophrenia like psychosis. *Schizophrenia Research and Treatment*. 2014; 2014.
38. Chun HS, Kim JM, Choi EH, Chang N. Neuroprotective effects of several korean medicinal plants traditionally used for stroke remedy. *Journal of Medicinal food*. 2008; 11: 246-251.
39. Schliebs R, Liebmann A, Bhattacharya SK, Kumar A, Ghosal S, et al. Systemic administration of defined extracts from *Withaniasomnifera* (Indian Ginseng) and *Shilajit* differentially affects cholinergic but not glutamatergic and GABAergic markers in rat brain. *Neurochemistry International*. 1997; 30: 181-190.
40. Jayaprakasam B, Padmanabhan K, Nair MG. Withanamides in *Withaniasomnifera* fruit protect PC 12 cells from β amyloid responsible for Alzheimer's disease. *Phytotherapy Research*. 2010; 24: 859-863.
41. Dhuley JN. Effect of ashwagandha on lipid peroxidation in stressinduced animals. *Journal of ethnopharmacology*. 1998; 60: 173- 178.
42. Parihar MS, Hemnani T. Phenolic antioxidants attenuate hippocampal neuronal cell damage against kainic acid induced excitotoxicity. *Journal of biosciences*. 2003; 28: 121-128.
43. Kuboyama T, Tohda C, Zhao J, Nakamura N, Hattori M, et al. Axon-or dendrite-predominant outgrowth induced by constituents from *Ashwagandha*. *Neuroreport*. 2002; 13: 1715-1720.
44. Sehgal A, Kumar M, Jain M, Dhawan DK. Piperine as an adjuvant increases the efficacy of curcumin in mitigating benzo (a) pyrene toxicity. *Human & experimental toxicology*. 2012; 31: 473-482.
45. Abbas SS, Singh N. *Anti-stress Agents (Herbs) of Indian Origin Herbal Drugs, A twenty first century perspective*. Delhi: Institute of Nuclear Medicine and Allied Sciences, Defence Research and Development Organization (DRDO), Govt. of India. 2006; 578- 591.
46. Ven Murthy MR, Ranjekar KP, Ramassamy C, Deshpande M. Scientific basis for the use of Indian ayurvedic medicinal plants in the treatment of neurodegenerative disorders: 1. *Ashwagandha*. *Central Nervous System Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Central Nervous System Agents)*. 2010; 10: 238-246
47. Shytle RD, Bickford PC, Rezai zadeh K, Hou L, Zeng J, Tan J, et al. Optimized turmeric extracts have potent anti-amyloidogenic effects. *Current Alzheimer*

48. Mishra S, Palanivelu K. The effect of curcumin (turmeric) on Alzheimer's disease: An overview. *Annals of Indian Academy of Neurology*. 2008; 11: 13.
49. Yang F, Lim GP, Begum AN, Ubeda OJ, Simmons MR, Ambegaokar SS, et al. Curcumin inhibits formation of amyloid β oligomers and fibrils, binds plaques, and reduces amyloid in vivo. *Journal of Biological Chemistry*. 2005; 280: 5892-5901.
50. Reinke AA, Gestwicki JE. Structure-activity Relationships of amyloid beta aggregation inhibitors based on curcumin: Influence of linker length and flexibility. *Chemical biology & drug design*. 2007; 70: 206-215.
51. Frautschy SA, Hu W, Kim P, Miller SA, Chu T, et al. Phenolic antiinflammatory antioxidant reversal of A β -induced cognitive deficits and neuropathology. *Neurobiology of aging*. 2001; 22: 993- 1005.
52. Tokuda T, Calero M, Matsubara E, Vidal R, Kumar A, et al. Lipidation of apolipoprotein E influences its isoform-specific interaction with Alzheimer's amyloid β peptides. *Biochemical Journal*. 2000; 348: 359-365.
53. Soni K, Kutian R. Effect of oral curcumin administration on serum peroxides and cholesterol levels in human volunteers. *Indian J Physiol Pharmacol*. 1992; 36: 273-275.
54. Bihagi SW, Singh AP, Tiwari M. In vivo investigation of the neuroprotective property of *Convolvulus pluricaulis* in scopolamine-induced cognitive impairments in Wistar rats. *Indian journal of pharmacology*. 2011; 43: 520.
55. Kumar V, Potential medicinal plants for CNS disorders: An overview. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*. 2006; 20: 1023-1035.
56. Malik J, Karan M, Vasisht K. Nootropic, anxiolytic and CNS-depressant studies on different plant sources of shankpushpi. *Pharmaceutical biology*. 2011; 49: 1234-1242.
57. Singh RH, Narsimhamurthy K, Singh G. Neuronutrient impact of Ayurvedic Rasayana therapy in brain aging. *Biogerontology*. 2008; 9: 369-374.
58. Sethiya NK, Nahata A, Mishra SH, Dixit VK. An update on Shankpushpi, a cognition-boosting Ayurvedic medicine. *Zhong xi yijie he xuebao= Journal of Chinese integrative medicine*. 2009; 7: 1001-1022.
59. Nahata A, Patil UK, Dixit VK. Effect of *Convolvuluspluricaulis* Choisy. On learning behaviour and memory enhancement activity in rodents. *Natural product research*. 2008