HERBAL NOOTROPICS AS COGNITIVE ENHANCER FROM NATURAL SOURCES

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ABSTRACT:

"Plant-based nootropics" are a large category of natural drugs that, through a number of physiological mechanisms, can strengthen or improve cognitive abilities, especially when those skills are damaged. By increasing the elasticity and non-aggregation of erythrocytes, several nootropics change the rheological characteristics of blood and increase blood flow to the brain.Nootropics—also known as smart medications, memory enhancers, neuro enhancers, cognitive enhancers, and intelligence enhancers—comprise pharmaceuticals, nutraceuticals, supplements, and functional foods that are used to boost mental abilities such as motivation, focus, memory, and intellect.At the moment, learning and memory include multiple distinct brain systems in different combinations or attributes. Explicit and implicit memory phenomena are the two primary categories into which memory phenomena fall. The hippocampus–medial temporal lobe system mediates explicit memories for real-world experiences, whereas the amygdala, cerebellum, and other systems mediate implicit basic associative learning and remembering. Chronic neurological disorders represent a significant worldwide health concern.They affect a person's functioning, which affects social interactions, family life, and output in the workplace and classroom. Additionally, due to the complexity of these conditions, their variable response to treatment, and their side effects, research on and integration of the phytochemicals known as nootropics into an integrative treatment strategy are required.

KEYWORDS: *Nootropics, Nootropics Agents, Human Memory, Memory boosters Nootropics, Alzheimer's Disease*

1. INTRODUCTION:

The nootropics derived from a Greek terms "NOOS - Mind/thinking" and "Tropein - Turn/Bend" means nootrps a substance that enhance the cognition and memory and facilitates learning. They are also known as smart nutrients, memory boosters, cognitive enhancers, neuro enhancer, intelligence enhancer, suppliments nutraceutical and cerebroactive medicines. They are referred to as nootropics in science. These medications are a diverse category that was created to treat dementia and other brain

problems[1].Prof. Dr. Corneliu E. Giurgea coined the word "nootropic" in 1972/1973 to refer to drugs that mainly stimulate cognitive processes like learning and memory, particularly when these processes are compromised.[2] Since ancient times, mankind has utilised plant-based medications and treatments to prevent and treat illnesses as well as to support human mental health and plant species that are believed to improve or maintain cognitive function are known as natural nootropics, and they made up a sizable portion of the pharmacopoeia that ancient cultures and civilisations had access to[3]. The neurological system that regulates memory, thought, reason, judgement, consciousness, and emotion, is centred in the brain. Maintaining the health of the brain is essential to proper regulation and synchronisation of bodily functions. A multitude of dietary supplements are beneficial for maintaining brain function. [4] The natural medical system is discovering many amazing benefits from herbs that are used in many different contexts. One of those contexts is brain function, which involves enhancing mental performance, memory, attentiveness, and intelligence, among other things. Drugs, vitamins, nutraceuticals, and functional foods that improve memory and attention span are known as cognitive enhancers. Nootropics are very harmless or neuroprotective memory boosters [5] Nootropics may function by enhancing the brain's oxygen supply, promoting neurone growth, or changing the availability of the brain's supply of neurochemicals (hormones, neurotransmitters, and enzymes). The capacity to record sensory inputs, events, information, etc., store it for a short or long time, and retrieve it later when needed is known as memory[6] In today's demanding or requiring world, poor memory, poor retention, and delayed recall are frequent issues. A person's age, stress level, and emotions can all contribute to memory loss, amnesia, anxiety, hypertension, dementia, and even more serious disorders like schizophrenia and Alzheimer's disease. [7] Nootropics are the drugs that facilitate learning and enhance cognition, memory, and simplicity of recall. Another reference to nootropics is "acting on the mind." Nootropic plants and the components that that have been isolated into may benefit the customer in the form of nutraceuticals, supplements, and functional foods and beverages that enhance mental functioning and provide mood-boosting and cognitive advantages[8]. Nootropics can optimise self-healing and health by optimising the brain's function and restoring a sense of well-being and relaxation. Although nootropic products are still relatively new to the market, interest in them is growing as more individuals look for functional foods to manage their mood and overall well-being, especially the impact as the Covid-19 pandemic, as well as to increase their attention, focus and memory [8]. In addition to increasing the brain's supply of oxygen and glucose, nootropics provide antihypoxic qualities and protect brain tissue against neurotoxicity without functioning as neurotransmitters or receptor ligands. They also improve the metabolism of phospholipids in neurohormonal membranes and positively affect the production of proteins and nucleic acids in neurons. [9] It has been demonstrated that several nootropics improve erythrocyte flexibility, improve the elimination of oxygen free radicals, and have an anti-aggregation effect. This improves the blood's rheological properties and blood flow to the brain. Although these medications have metabolic activity, most nootropics require some time to become effective; most stop acting after just one dose.[10] Memory is the process of encoding the information

(understanding/ perceiving), consolidating it (storing), and retrieving (recovering) it whenever required[11].

2. OBJECTIVE:

1. safe and natural substitutes
2. less adverse effects than with synthetic medications
3. Encourage neuroprotection and general brain health
4. Enhance brain health and function at the same time.

Importance of herbal cognitive enhancer:

1. **Natural Enhancement of Cognitive Function:**
   Herbal nootropics are preferred by many because they offer a natural means of improving cognitive abilities including memory, focus, and mental clarity. This can help professionals, students, and anybody else trying to maximize their mental performance.[12]
2. **Reduced Chance of Adverse Reactions:**
   In general, herbal nootropics are thought to have fewer adverse effects than synthetic medications. Because of this, they are a safer choice for long-term use; nonetheless, it is still important to speak with a healthcare professional before beginning any new supplement regimen.[13]
   Reduction of Stress and Anxiety
   A number of herbal nootropics, including Rhodiola Rosea and Ashwagandha, show adaptogenic qualities. They support improved mental health and cognitive performance by assisting the body in managing stress, lowering anxiety, and elevating mood.[14]
3. **Antioxidant and Anti-Inflammatory Properties:**
   Certain herbal nootropics, such as Bacopa monnieri and ginkgo biloba, have potent anti-inflammatory and antioxidant properties. These characteristics may lower the risk of neurodegenerative illnesses by shielding the brain from inflammation and oxidative damage.[15]
4. **Research and Conventional Use:**
5. Many of these medications have been used for thousands of years in traditional medicinal systems like Ayurveda and Traditional Chinese Medicine. Some of these ancient usage are starting to be validated by modern research, which shows encouraging outcomes in terms of brain health and cognitive performance[16,17]

Neurocognitive and neuroprotective properties

Properties That Protect the Nerves

Herbal nootropics frequently include anti-inflammatory and antioxidant substances that help shield brain tissue from oxidative stress and inflammation-induced damage. As an example: There are flavonoids and terpenoids in ginkgo biloba that enhance blood flow to the brain and shield neurons from harm.[18] Bacopa monnieri: Contains bacosides and saponins that reduce neurotoxicity and improve cognitive function. An adaptogen that lowers stress and promotes neuronal health is ashwagandha.[19] Characteristics of Neurodegeneration Additionally, by supporting brain health and function, herbal nootropics can help reduce the course of neurodegenerative diseases:
It has been demonstrated that curcumin, which is

found in curcuma longa (turmeric), lowers the amyloid plaques linked to Alzheimer, Synthetic or natural nootropics have qualities that translate into improved mental or neurocognitive abilities. It has been discovered that vitamins, herbs, and even fungus can improve cognitive function naturally and with fewer negative consequences. [20]

3. METHOD AND MATERIALS

3.1 TYPES OF NOOTROPICS:

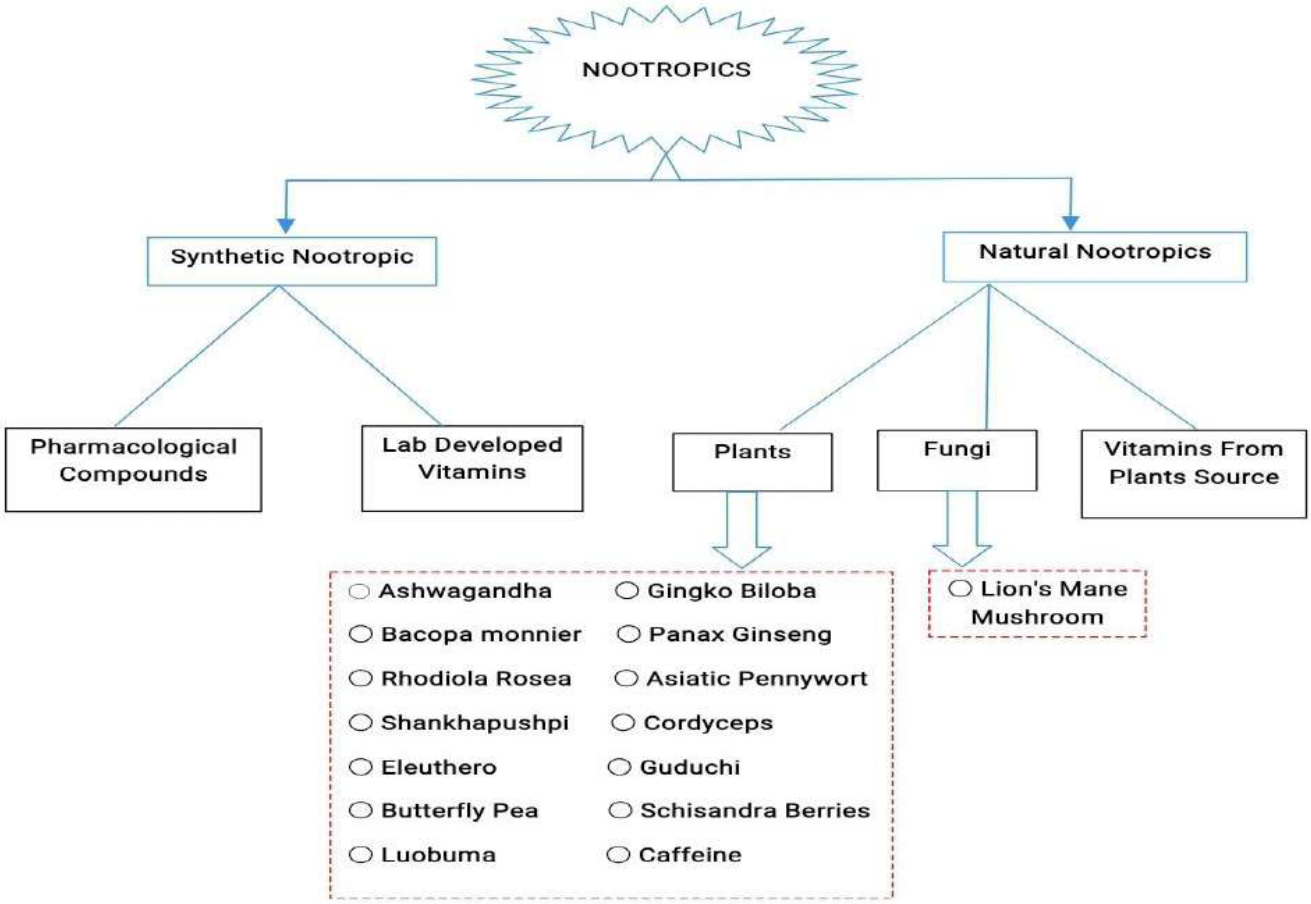

Fig 1 : Classification Of Nootropics [1, 8, 9, 11,21]

3.2 NOOTROPICS AGENTS:

Using a variety of physiological pathways, plant-based nootropics are a broad class of natural medications that can enhance cognitive capacities, particularly when these capabilities are compromised or weak. Many times, nootropics improve blood's rheological characteristics and boost blood flow to the brain by enhancing erythrocyte flexibility and inhibiting aggregation.[22] Numerous of these formulations include antioxidant activity, which enhances the brain's oxygen supply and shields brain tissue against neurotoxicity. In order to build and repair neurohormonal membranes, they can stimulate the creation of phospholipids, nucleic acids, and neuronal proteins. There is a chance that many different types

of herbs, shrubs, trees, and even vines contain these natural substances.[23]

3.2.1 Ashwagandha: Ashwagandha is considered a nootropic because it can help improve mental performance, memory, and learning. Ashwagandha belongs to the Solanaceae family and can grow as a low shrub or perennial herb.

● Ashwagandha root: Contains high levels of withanolides, which are bioactive compounds that can improve cognitive function and stress levels.[24]

● Ashwagandha leaf extracts: Can protect neural cells from stressors that can impair brain function. Clinical studies: Studies have shown that Ashwagandha can help with:

1. Stress and sleep: Ashwagandha can help reduce stress and improve sleep quality.
2. Memory and focus: Ashwagandha can help improve memory and focus.
3. Psychological well-being: Ashwagandha can help improve psychological well-being.
4. Executive function: Ashwagandha can help improve executive function, including short-term memory and sustained attention. [25]

The plant has biologically active substances called sitoindosides, acylsterylglucosides, and alkaloids (isopelletierine, anaferine, anahygrine, withasomnine, cuscohygrine, ashwagandhine, and ashwagandhinine).ashwagandha is commonly used as an adaptogen and suggested as a natural treatment for neurological diseases and sleeplessness, the fruit is occasionally used as an emetics [26]

Diagram 1 : Ashwagandha and Ashwagandha dried Powder [15,16]

3.2.2 Gingko biloba: This plant's leaves are well known for boosting oxygen levels in the tissues and blood flow to the brain. This plant affects brain levels of amine neurotransmitter chemicals and enhances brain glucose metabolism. The seeds and leaves are the main plant elements that contain the active compounds.[27] To stop bacteria and fungi from growing, ginkgo seeds include minerals, flavonoids, triterpene lactones, phenolic compounds, ginkgotoxin (4-O-methylpyridoxine), ginkgolic acid, and ginnol.Leaf extracts are used in business settings. [28] The leaves of this plant have been used to treat thromboses, cancer, diabetes, ischaemic heart disease, memory loss, and cognitive impairments Ginkgo biloba is utilised to increase cerebral blood flow, which enhances mental energy. It is recognised to provide benefits for the brain and heart in addition to nootropic effects[29]. The particular neuroprotective benefits of Ginkgo biloba extract were demonstrated in an ex vivo rat experiment, and these results may have applications in the treatment of chronic cerebral hypoperfusion. The cholinergic system and

inflammatory mediators were modulated as part of the extract's pharmacological action.[30]

Diagram 2 : Gingko Biloba [17, 18,19]

3.2.3 Bacopa monnier: This herb has been used for many years as an ayurvedic cognitive enhancer. It protects the brain from the damaging effects of free radicals and promotes enhanced cognitive and learning abilities. It encourages enhanced cognitive and learning abilities. When used regularly, it helps to enhance concentration as well as memory and retention.[31] Brahmi oil is beneficial when used regularly for mental imbalances, emotional disorders, and the prevention and treatment of aging-related mental illnesses like Alzheimer's and amnesia. It's frequently used as a mental stimulant.Another disadvantage is that too much brahmi inhibits the blood's ability to oxidise fat, which causes lipids to build up in the blood and raises the risk of cardiovascular diseases[32]. Bacopa monnieri possesses a wide range of pharmacological properties, including as anti-inflammatory, anticonvulsant, cardiotonic, bronchodilator, and protection against peptic ulcers.Antioxidant properties of bacopa leaf powder have been demonstrated. Bacopa is thought to have cognitive-enhancing qualities because it contains a class of saponins known as bacosides. Bacopa alcoholic extract and pure bacosides A and B may improve memory, cognitive function, and learning capacity.[33] The principal pharmacological effects are protection against peptic ulcers, cardiotonic effects, anti-inflammatory, anticonvulsant, and antioxidants. Memory improvement, epilepsy, sleeplessness, and anxiolytics are among the many Ayurvedic medical indications for Brahmi use. Improving memory function has less of an impact on learning and more of an impact on reducing forgetfulness. Brahmi's Iron-Chelating and Antioxidant PropertiesOne of the main causes of ageing and age-related diseases is oxidative stress.[34]

Diagram 3 : Bacopa monnier(Brahmi) [20,21]

3.2.4 Panax Ginseng: Commonly referred to as ginseng, Panax ginseng is an ancient component of East Asian materia medica. The name Panax means "the root of life" in Korean. In the early ninth century, it was brought to Europe.The thick root of ginseng, a perennial plant with a human-like resemblance, is typically separated into upper and lower sections.[35] Three to four petiolate and palmate-pinnate leaves, each with five somewhat serrated leaflets, emerge from the root on a stem that is 30 to 60 cm high. Ginseng root contains various biologically active substances, including polysaccharides (panaxan A-U), essential oils, amino acids (tyrosine, leucine, serine, and arginine), peptides, flavonoids, minerals, vitamins (B1, B2, B12, and C), triterpenoids (dammarane), and saponins known as ginsenosides.[36] The groups Panaxadiol and Panaxatriol are being researched for their ability to stimulate neurotransmitter release in the brain. Other ginsenosides alter the release of corticosterone and the absorption of dopamine, serotonin, and GABA.It is hypothesised that the high ratio of Panaxatriol to Panaxadiol is responsible for enhancing memory and cognitive properties.[37]

Diagram 4 : Panax ginseng [22, 23]

3.2.5 Rhodiola Rosea: Rhodiola, often known as golden root, is a woody perennial member of the Crassulaceae family that can withstand winter. The plant typically grows to a height of 25 to 30 cm, but in the right circumstances, it can reach 60 cm. In nature, rhodiola is a manganophilic (manganese-concentrating) plant that can be found up to 2,500 meters above sea level.It is a plant that has been shown to be useful in elevating mood and reducing depression. It lessens weariness and enhances both mental and physical performance[38] The effects of Rhodiola rosea may be mediated by modifications in serotonin and dopamine levels as a result of monoamine oxidase inhibition and its impact on opioid peptides, including beta$endorphins.It belongs to a group of plant derivatives called adaptogens, which are different from chemical stimulants like nicotine in that they don't have the same physiological effects.[39]

Diagram 5 : Rhodiola Rosea [24, 25]

3.2.6 Asiatic Pennywort: C. asiatica, sometimes referred to as gotu kola in China, is a significant medicinal herb that has been utilised for thousands of years in traditional Asian medicine. According to descriptions found in Indian literature, this plant has CNS effects that include stimulating, rejuvenating, sedative, tranquillizing, and intelligence-promoting qualities. This herb helps with vascular issues in the brain, nervous system illnesses, and lowers blood levels of adrenal corticosterone during stressful situations.[40] It is Known as a "Brain food" in India, Centella asiatica (L.) is a valuable medicinal plant that is a perennial creeper with a faint aromatic scent. It is one of the most important medicinal plants in the global medicinal plant trade and is used extensively for treating skin conditions, healing wounds, and reviving nerves and brain cells. Throughout India's 3000+ years of Ayurvedic medicine, it has been used to treat ailments like improving memory, healing wounds, acting as a mild diuretic, raising alertness and focus, and reducing tension and anxiety. Since ancient times, it has also been utilised to treat renal and liver issues.[41] Research on Centella asiatica has shown promise in improving the general ability, behaviour, and concentration power of children with mental retardation, both in pharmacological and therapeutic trials. According to the clinical research, the extract raises the IQ of mentally impaired children. Using Centella asiatica as one of the primary constituents in an Ayurvedic medication, researchers observed significant behavioural improvements in children in a clinical trial. There is evidence that it enhances learning and short-term memory.[42] The in vivo antioxidant activity of the plant's aqueous extract was linked to the improvement of cognitive function in rats. An aqueous leaf extract enhanced learning and memory by modulating the adrenergic, serotonic, and dopaminergic systems in vivo

Diagram 6 : Asiatic Pennywort [26, 27]

3.2.7 Shankhapushpi: Traditional medical systems employ Evolvulus alsinoides (Convolvulaceae) as a noortopic or brain tonic. Since ancient times, the entire "Shankhpushpi" herb has been used medicinally in the Ayurvedic school of medicine due to its sedative, anxiolytic, and memory-enhancing effects. Shankhpushpi is an Ayurvedic drug, widely used for its actions on the central nervous system, especially to improve intellect and boost memory.[43] Evolvulus alsinoides (EA), regarded as the Shankhpushpi of rodent learning and memory. Learning and memory were assessed using nootropic activities, Cook and Weidley's pole climbing equipment, passive avoidance paradigms, and active avoidance tests. The memory-improving qualities of EA's ethanol extract, ethyl acetate, and aqueous fractions were assessed.[44]

Diagram 7 : shankhapushpi [28, 29, 30, 31, 32]

4. MEMORY:

Memory is the capacity of an individual to store events, information, and sensory inputs for brief or extended periods of time, then retrieve them later when required. Among the many characteristics that set humans apart from other animals, memory is arguably the most important.The modern world is hectic and competitive, and poor memory, poor retention, and sluggish recall are frequent issues[46]. problems like age, stress, and emotions can cause memory loss, amnesia, anxiety, high blood pressure, dementia, and even more dangerous problems like schizophrenia and Alzheimer's disease. In these cases, the person is unable to fully realise their potential.[47] Short-term Memory: Short-term memory allows the brain to temporarily retain a little amount of information. Working memory lasts only a few seconds, making it the shortest type of memory. We employ this to store information in our minds during other cognitive functions[48] One way to practise this would be to commit the numbers that a new buddy says to memory while you go through the menus on your phone to create a contact. According to common psychological tests, a person's working memory capacity is one of the best indicators of their overall IQ. [49]

Long term memory: Explicit memory is one kind of long-term memory, as can be seen in the above diagram. Implicit, or unconscious memory, is the second type of long-term memory. In order to enable the brain to transfer information from short-term memory into long-term memory so that it may be retrieved and used later, practicing, or "rehearsing," the memory will take on more significance. However, there are various distinct forms of stable, long-term memory that make up "long-term" memory, which is not a single entity.[50] Explicit memory: When you intentionally commit anything to memory, like your

new zip code and home address or your social security number, it's called explicit memory. Implicit memory: Even though the precise elements of a memory are not consciously (or "explicitly") retained, implicit memory is an unconscious type of memory that can nonetheless influence thoughts and actions.[51]

4.1 Classifications Of Human Memory

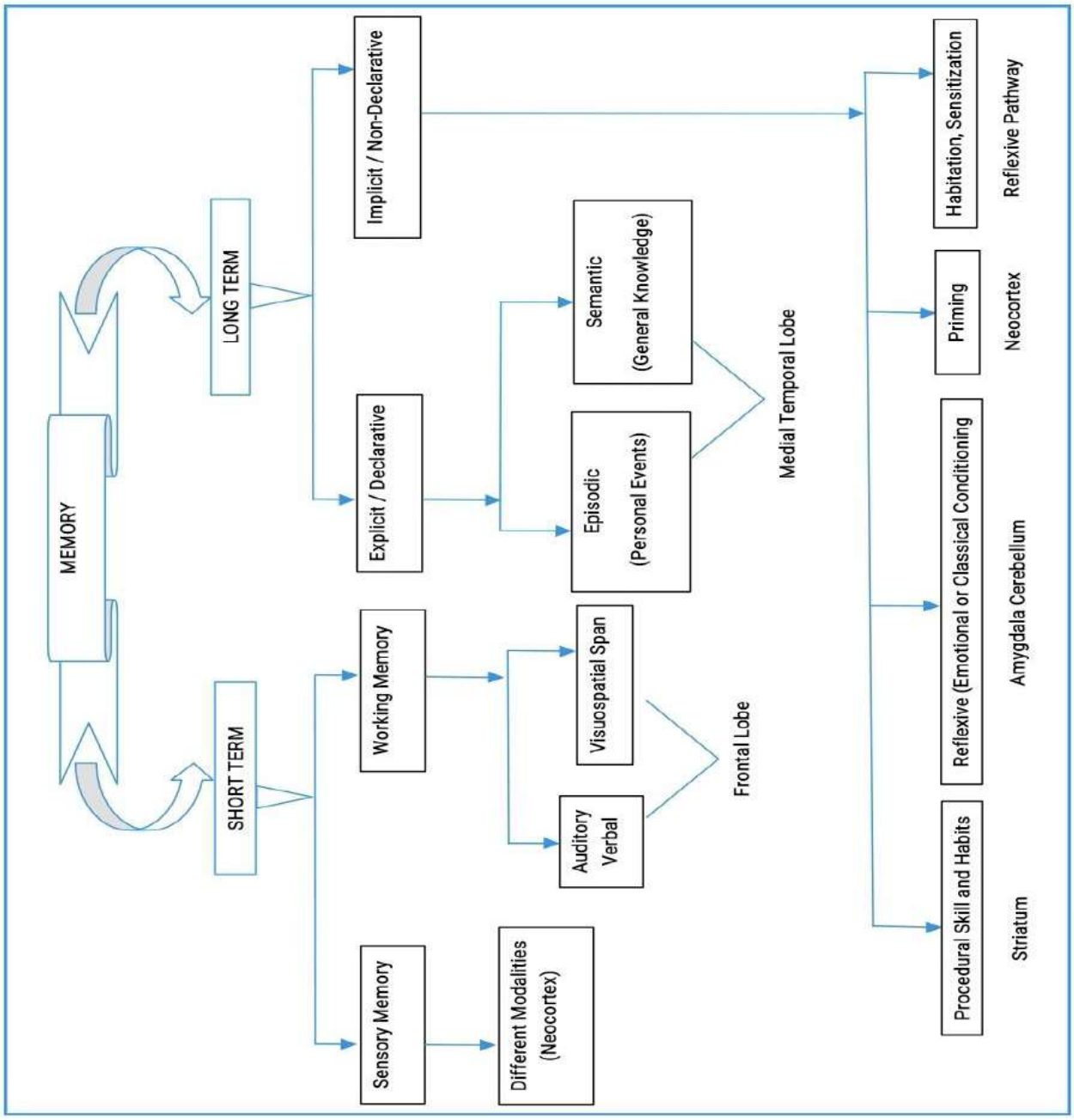

Fig : 2 Classification Of Memory [35,36,37]

4.2 Herbal Formulations For Memory Enhancers:

Sr.No.	Herbal Formulations	Biological effects and targets	Reference
1	Brahmi Ghrita	Potential memory booster Potentially beneficial for treating memory impairment	38
2	Abana	Abana significantly reduces cholinesterase activity, which raises the amount of acetylcholine in the brain. enhances the memory of mice of all ages possesses the capacity to control Alzheimer's	39
3	YMJD	YMJD improves memory retention and cognitive functions in stressed mice by promoting neurogenesis in the dentate area of the hippocampal region. Reverses rats' amnesia brought on by scopolamine and pchloroamphetamine YMJD, which includes Lycii fructus, improves memory retention by shielding neural cells from reactive oxygen damage.	40
4	Chyavanprash	shields against memory loss Reduce the production of free radicals and increase their scavenging	41, 42
5	OSS	Impact on memory impairment and improvement Boost PSD-95 and synaptophysin. promoting the release of acetylcholine and synaptic development	43
6	Mentat	Decreased transfer latency in mice produced by scopolamine Reduced ECS-induced acute and persistent retrograde amnesia enhances memory quotient across various age groups lengthens the memory increases children's capacity for learning	44, 45
7	PJBH	Boost mental health and recall lengthen life span Increased glutathione peroxidase and catalase activity in H O-induced 2 2 damage in PC12	46
8	Memofit	Possibly a helpful treatment for Alzheimer's disease Improves memory; lessens tension and exhaustion	47
9	PMCMT	notable reduction in escape latency in the MWM test; defence against the neurological and cognitive damage caused by ischaemia	47, 49

Table: 1 : Herbal Formulations For Memory Enhancers:

5. ALZHEIMER'S DISEASE (AD):

The detection of Alzheimer's disease (AD) goes back more than a century.1. It is a form of brain degeneration that accounts for 60–80% of cases of late-life cognitive failure and is the most prevalent cause of dementia in older adults. [54] Large areas of the cerebral cortex and hippocampus are damaged in Alzheimer's disease, a neurodegenerative illness. It moves slowly forward and never stops. Abnormalities in the brain are typically first detected in the temporal and frontal lobes, and then gradually extend to other parts of the neocortex at rates that vary widely from person to person. The accumulation of tau microtubule protein in neurofibrillary tangles in neurons and insoluble forms of amyloid-β (Aβ) in plaques in extracellular spaces and blood vessel walls are associated with Alzheimer's disease. [55] This degenerative neurological disease, which is the most common kind of dementia, is typically characterized by early memory loss and cognitive decline that can later impact speech, behavior, motor function, and visuospatial orientation. There are pathological subgroups of Alzheimer's disease, and the classic presentation of variant syndromes with early localized atrophy is not always followed.[56] Research institutes that can assess the amyloid and tau burden in living persons are challenging the long-standing paradigm that a post-mortem neuropathologic evaluation is necessary for a definitive diagnosis of clinical Alzheimer's disease dementia. Alzheimer's disease has a lengthy asymptomatic preclinical phase and can even impact cognitively normal individuals. Alzheimer's disease was created by Dr. Alois Alzheimer. In 1906, Dr. Alzheimer noticed changes in the brain tissue of a woman who had died of a rare mental illness. Her symptoms included linguistic problems, memory loss, and unpredictable behavior.[57] After she died, he examined her brain and found twisted fiber bundles called neurofibrillary, or tau, tangles, and a number of abnormal groupings that are now known as amyloid plaques. These plaques and tangles in the brain are still thought to be some of the main signs of Alzheimer's. Another feature is the brain's loss of neural connections. Neurones are responsible for sending messages from the brain to the body's muscles and organs as well as within the brain itself [58]

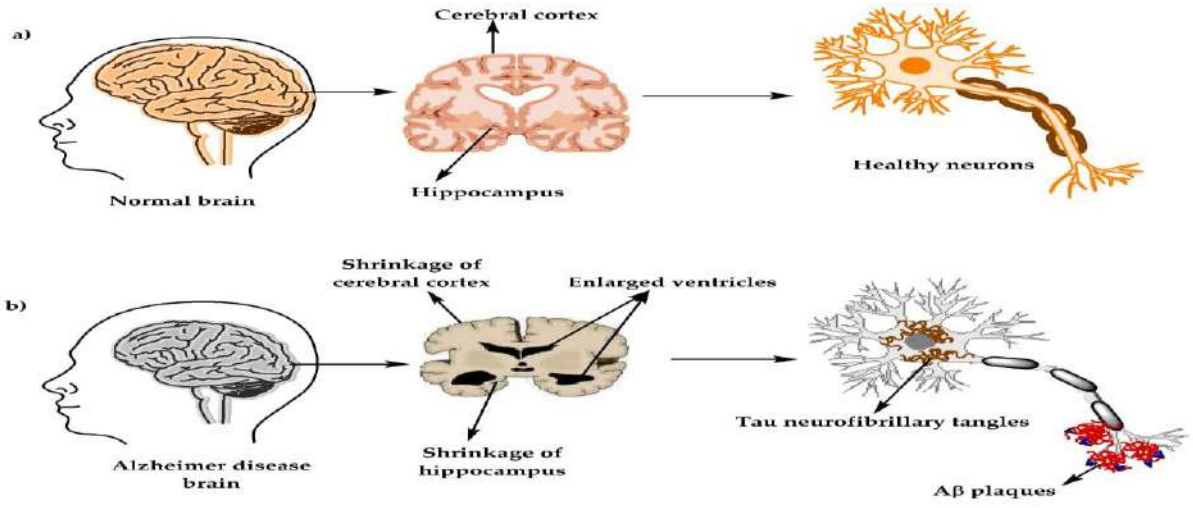

Diagram A : [52,56,57]

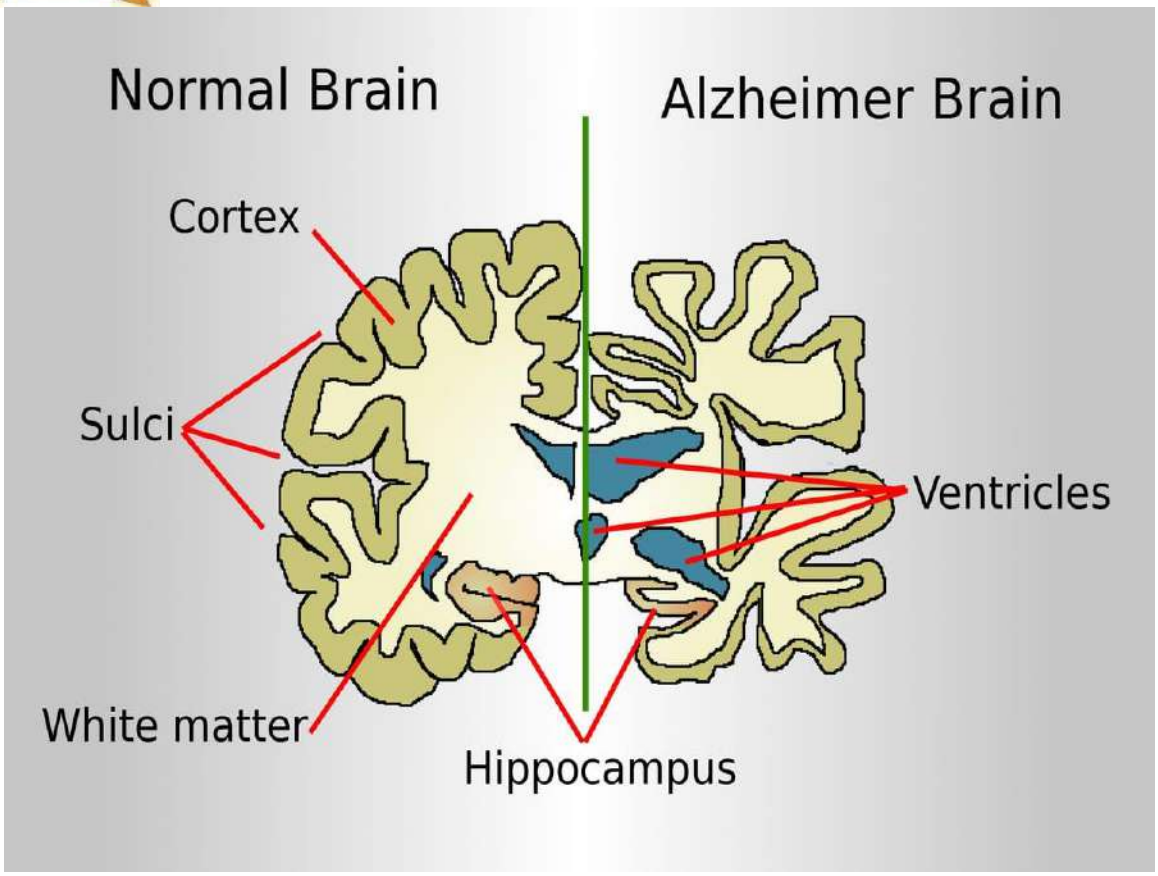

Diagram B : [52,56, 57]

5.1 Causes and Risk Factors of Alzheimer's Disease: According to Following Factors AD is a complex disease that is influenced by a number of risk factors, including ageing, genetics, head trauma, vascular disorders, infections, and environmental variables (such as heavy and trace metals). It is currently unknown what causes the pathogenic alterations (Aβ, NFTs, and synaptic loss) associated with Alzheimer's disease[61Although several ideas have been proposed to explain AD, just two are considered to be the main ones: one holds that cholinergic dysfunction is a significant risk factor, while another claims that alterations in the synthesis and processing of amyloid β-protein are the main cause of AD. But as of the now, no recognised explanation can account for the AD pathogenesis [62]

- Age and gender
- Genetic Factors
- Infection
- Environmental Factors
- Head Injuries
- Cardiovascular Diseases
- Lifestyle
- Other Obesity, Diabetes ect.

Pathophysiology Of Alzheimer's Disease (AD): [63]

1. Amyloid Precursor Protein (APP)
2. Tau Protein
3. The Amyloid Cascade
4. Tau-related Hypotheses

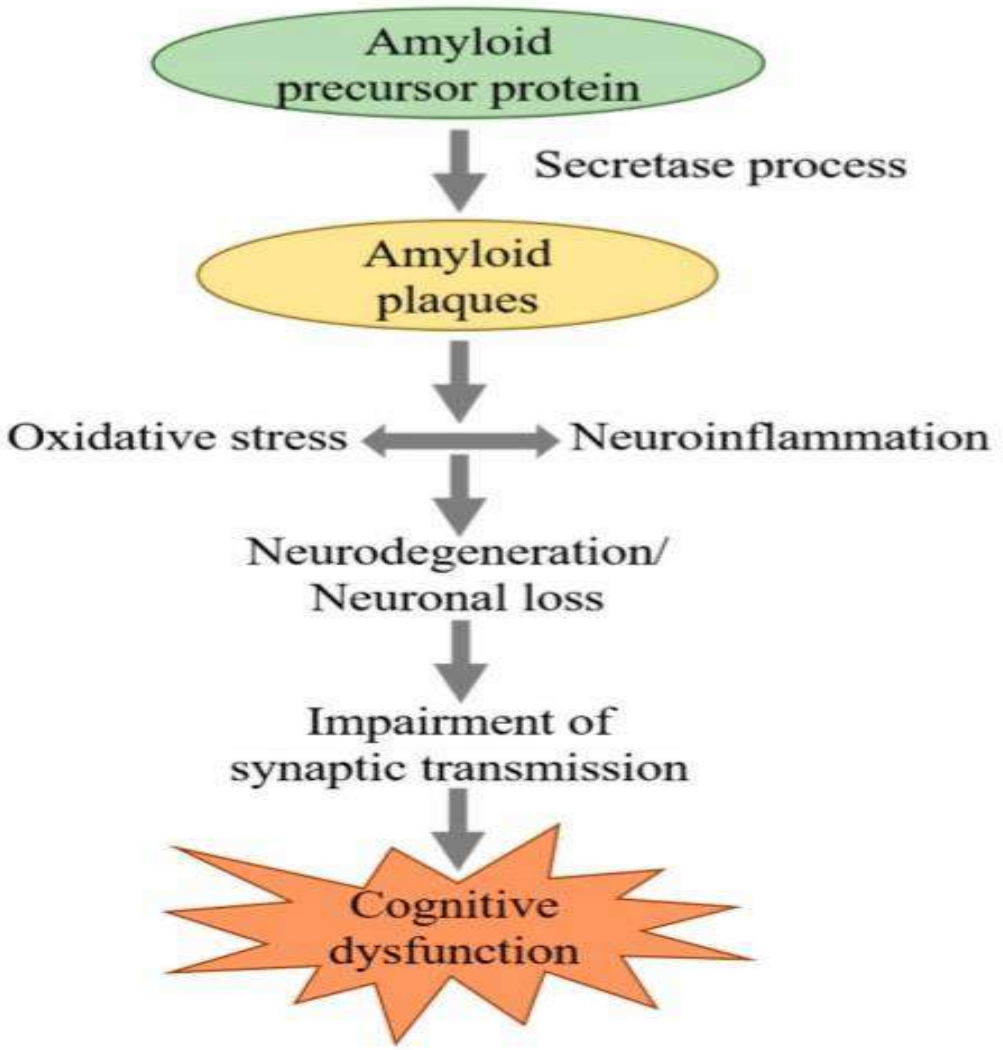

Fig : 3 General Pathogenesis Of Alzheimer's Disease [64,65]

5.2 Nootropics Mechanism of Action on Alzheimer's Disease:

1. Reduction of Amyloidogenicity: Minimise the production of amyloid-β plaques Prevent the processing of amyloid precursor protein (APP) Natural nootropics made from herbs: Curcumin, or Curcuma longa, with Ginkgo biloba Camellia sinensis green tea with ashwagandha [66]

2. Tau Pathology: Reduced tau hyperphosphorylation - Inhibited tau protein aggregation - Herbal nootropics: Ginkgo biloba, Bacopa monnieri, Rhodiola rosea, and Curcuma longa (curcumin).

3. Reduced Neuroinflammation: IL-1β and TNF-α are pro-inflammatory cytokines; IL-10 is an anti-inflammatory cytokine. Natural nootropics made from herbs: Curcuma longa, or curcumin; ashwagandha Ginkgo biloba - Verdant Tea[67]

4. Inhibitory Properties: Diminish oxidative stress - Counteract reactive oxygen species (ROS) Natural nootropics made from herbs: Green tea, ashwagandha, ginkgo biloba, and curcuma longa (curcumin)

5.Cholinergic Stimulation: Increased release of acetylcholine; inhibition of acetylcholinesterase. Natural nootropics made from herbs: Ashwagandha, Rhodiola rosea, Ginkgo biloba, and Bacopa monnieri[68]

6. The Protection and Regeneration of Neurones: Prevent damage to neurones - Encourage the growth and differentiation of neurones Nootropics made of herbs: - Rhodiola rosea - Ginkgo biloba - Bacopa monnieri - Ashwagandha 7. Enhanced Circulatory Blood Flow: Promote better blood and oxygenation - Assist with cognitive function Nootropics made of herbs: Rhodiola rosea, Ginkgo biloba, Bacopa monnieri, and green tea Modification of Apoptosis

8 Control mechanisms of cell death: Avoid excessive loss of neurones Nootropics made of herbs: Shilajito (Curcuma longa) - Ashwagandha - Tea leaves - Ginkgo biloba [69]

Benefits:

1. Improving recall and education.
2. Better clarity of thought and processing speed
3. Increased focus, attention, and concentration Improved critical thinking and decision-making
4. Increased creativity and problem-solving
5. Less tension and nervousness
6. Enhanced emotional stability and mood
7. Greater quality of slumber
8. Resistance to neurological conditions (Parkinson's, Alzheimer's)
9. Diminished inflammatory and oxidative strain
10. Improved adaptation and neuroplasticity
11. Encouragement of ageing and brain health
12. Better heart health
13. Reduction of inflammation and antioxidants Support for immunity system
14. Possible advantage against ageing

6. FUTURE DIRECTION: To make nootropics more accessible and simple to include into daily routines, future products may be available in a variety of delivery formats, including capsules, teas, functional meals, or even transdermal patches. Novel formulations may enhance these items' efficacy, convenience, and flavor.To make nootropics more accessible and simple to include into daily routines, future products may be available in a variety of delivery formats, including capsules, teas, functional meals, or even transdermal patches. Novel formulations may enhance these items' efficacy, convenience, and flavor.

7. CONCLUSION: The wide variety of nootropic herbs utilised in traditional medicine includes specimens from every plant family. Natural plant extracts, as opposed to synthetic nootropics, offer a variety of phytochemical compositions that can work in concert to influence the CNS's neuronal metabolism and enhance cognitive performance, particularly in situations where there has been neuronal degeneration or injury. They are used as supportive treatments for individuals with senile dementia, Alzheimer's disease, and Parkinson's disease, as well as for acute, subacute, and chronic problems of consciousness, memory, and learning. Over the past 35 years, researchers studying AD have focused a great deal of effort on nootropics, which has increased our understanding of how both synthetic and natural nootropics work. By functioning as glycine antagonists, antioxidants, AChEI, serotonergic, dopaminergic, and glutamic acid receptor antagonists, as well as Ca-channel blockers, nootropics enhance memory and learning. Furthermore, by lowering the burden of Aβ buildup, apoptosis, inflammation, oxidative stress, and synaptic dysfunction, nootropics demonstrate neuroprotective

potentials. Undoubtedly, some of the results are encouraging, based on the literature that has been found on the pre-clinical and clinical effects of nootropics in AD.

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