# HERBAL REMEDIES FOR NEURODEGENERATION

**Abstract**

In recent years, there has been growing interest in exploring alternative therapeutic approaches, including the use of herbal remedies. This chapter offers a comprehensive review of the current understanding of herbal remedies for neurodegeneration. It examines the bioactive compounds found in various medicinal plants and their potential neuroprotective effects. Furthermore, the chapter delves into the intricate mechanisms of action through which these herbal compounds exert their beneficial effects on neurodegenerative processes, such as oxidative stress, inflammation, and protein misfolding. By synthesizing the available evidence, this chapter aims to provide insights into the therapeutic potential of herbal remedies for neurodegenerative diseases and stimulate further research in this promising area.

**Keywords:** Herbal remedies, Neurodegeneration, Therapeutic potential, Mechanisms of action, Bioactive compounds.

**Authors**

**Sahana K**
Department of Pharmacognosy
Sarada Vilas College of Pharmacy
Mysuru
Karnataka, India.
sahanakrish02@gmail.com

**Hanumanthachar Joshi K**
Department of Pharmacognosy
Sarada Vilas College of Pharmacy Mysuru
Karnataka, India.

## I. INTRODUCTION

Neurodegeneration refers to the progressive loss of structure and function of neurons, leading to the dysfunction and death of nerve cells in the Central Nervous System (CNS) or Peripheral Nervous System (PNS). It's a complex and debilitating process that underlies various neurological diseases, including Parkinson's complaint, Alzheimer's complaint, Huntington's complaint, Amyotrophic side sclerosis( ALS) and multiple sclerosis.

## II. DEFINITION

Neurodegeneration is a condition characterized by the accumulation of abnormal protein summations, oxidative stress, inflammation, mitochondrial dysfunction, bloodied neurotransmission, and neuronal death. These pathological processes contribute to the gradational decline in cognitive, motor, and sensitive functions associated with neurodegenerative conditions[1].

## III. TYPES AND CLASSIFICATION

Neurodegenerative conditions can be astronomically distributed grounded on the affected region of the CNS, the molecular mechanisms involved, or the predominant clinical symptoms. Some common types of neurodegenerative conditions include

1. **Parkinson's complaint:** It primarily affects the dopaminergic neurons in the substantial nigra of the brain, leading to motor symptoms similar as temblors, severity, bradykinesia, and postural insecurity.
2. **Alzheimer's complaint:** It is characterized by the accumulation of amyloid- beta pillars and neurofibrillary befuddlements in the brain, performing in memory loss, cognitive decline, and behavioural changes.
3. **Huntington's complaint:** It is caused by a inheritable mutation that leads to the progressive degeneration of neurons in the rudimentary ganglia and cerebral cortex. It manifests with motor symptoms, cognitive impairment, and psychiatric disturbances.
4. **Amyotrophic Lateral Sclerosis (ALS):** ALS affects the motor neurons, leading to muscle weakness, palsy, and ultimately respiratory failure. It can be classified as sporadic( without a known cause) or domestic( inherited).
5. **Multiple sclerosis (MS):** MS is an autoimmune complaint characterized by inflammation and demyelination of the CNS. It results in a wide range of symptoms, including fatigue, muscle weakness, difficulties with collaboration, and sensitive disturbances[2].

## IV. MECHANISMS OF NEURODEGENERATION

The exact mechanisms underpinning neurodegeneration are still not completely understood, and different conditions may involve distinct molecular pathways. But still, several common mechanisms have been linked .

1. **Protein misfolding and aggregation:** Abnormal folding of proteins, similar as nascence- synuclein, tau, amyloid- beta, and Huntington, leads to the conformation of protein summations or addition bodies that are poisonous to neurons.

 

2. **Oxidative stress:** Increased product of Reactive Oxygen Species( ROS) in neurons and disabled antioxidant defense mechanisms affect in oxidative damage to cellular factors, including proteins, lipids, and DNA.

3. **Mitochondrial dysfunction:** bloodied mitochondrial dysfunction and energy metabolism lead to the generation of ROS and the release of pro-apoptotic factors, ultimately causing cell death.

4. **Neuroinflammation:** Activation of vulnerable cells and the release of seditious intercessors, similar as cytokines and chemokines, contribute to habitual inflammation and farther neurodegeneration.

5. **Excitotoxicity:** inordinate activation of glutamate receptors, particularly NMDA receptors, leads to an affluence of calcium ions into neurons, causing excitotoxicity and cell death[3].

6. **Symptoms:**The symptoms of neurodegenerative conditions vary depending on the affected region of the CNS and the specific complaint. Common symptoms include

   - Cognitive decline (e.g., memory loss, bloodied thinking, confusion)
   - Motor impairments (e.g., temblors, muscle weakness, collaboration problems, gait disturbances)
   - Sensitive abnormalities (e.g., vision or hail loss, altered sensations)
   - Behavioural and mood changes (e.g., depression, anxiety, personality changes)
   - Autonomic dysfunction (e.g., bladder or bowel problems, orthostatic hypotension)[4].

7. **Causes**

   - The topmost threat factor for neurodegenerative conditions is growing. Mitochondrial DNA mutations as well as oxidative stress both contribute to aging.
   - Numerous of these conditions are late- onset, meaning there's some factor that changes as a person periods for each complaint. One constant factor is that in each complaint, neurons gradationally lose function as the complaint progresses with age. It has been proposed that DNA damage accumulation provides the underpinning causative link between aging and neurodegenerative complaint[5].

## V. TREATMENT

At most of the neurodegenerative conditions have no cure, and treatment primarily focuses on managing symptoms and decelerating complaint progression. But still, colorful approaches are being explored for implicit remedial interventions .

### 1. Pharmacological Interventions

- Dopamine agonists (e.g., levodopa) for Parkinson's complaint to palliate motor symptoms.

 

- Cholinesterase impediments (e.g., donepezil, rivastigmine) for Alzheimer's complaint to enhance cognition.
- Immune modulators (e.g., interferon- beta, monoclonal antibodies) for multiple sclerosis to reduce inflammation and vulnerable- mediated damage.

2. **Gene remedy:** Gene- grounded curatives aim to correct or replace imperfect genes responsible for certain neurodegenerative conditions. For case, gene silencing ways like RNA hindrance are being delved for treating Huntington's complaint.

3. **Stem Cell Transplantation:** Stem cells have the eventuality to separate into colorful cell types, including neurons. Broadcasting stem cells or their derivations into the damaged areas of the CNS holds pledge for replacing damaged or lost neurons.

4. **Targeting Protein Aggregation:** Strategies to help or clear abnormal protein summations include immunotherapy, small patch impediments, and gene curatives aimed at breaking down or precluding the conformation of poisonous protein summations.

5. **Life variations:** Regular exercise, a balanced diet, and internal stimulation by yoga and contemplation will help reduce the threat of neurodegenerative conditions and slow complaint progression. These life interventions promote overall brain health[(6)].

Neurodegenerative conditions are characterized by the progressive decline of the structure and function of the nervous system. While ultramodern drug offers colorful treatment options, the use of herbal remedies has gained significant attention due to their implicit efficacity and smaller side goods. In this chapter, we explore some herbal medicines that have been traditionally used and studied for their eventuality in managing neurode generative conditions.

| Sl.No | Common Name | Botanical Name | Family | Mechanism of action | References |
|---|---|---|---|---|---|
| 1. | Ginkgo | *Ginkgo biloba* | Ginkgoaceae | Antioxidant property, improves blood circulation and provides neuroprotective effects | (7) |
| 2. | Ashwagandha | *Withania somnifera* | Solanaceae | Anti-inflammatory properties and aids in stress reduction, potentially beneficial in Alzheimer's disease. | (8) |
| 3. | Turmeric | *Curcuma longa* | Zingiberaceae | Antioxidant and anti-inflammatory properties and may help combat neurodegenerative diseases | (9) |

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| 4. | Sage | *Salvia officinalis* | Lamiaceae | Enhance memory and cognitive abilities. | (10) |
| 5. | Rosemary | *Salvia rosmarinus* | Lamiaceae | Antioxidant and anti-inflammatory properties, potentially protecting against neurodegeneration | (11) |
| 6. | Lemon Balm | *Melissa officinalis* | Lamiaceae | Neuroprotective effects and improves cognitive function. | (12) |
| 7. | Green Tea | *Camellia sinensis* | Theaceae | Antioxidants, it protects against oxidative stress and neurodegeneration | (13) |
| 8. | St. John's Wort | *Hypericum perforatum* | Hypericaceae | Elevate symptoms of depression and anxiety in neurodegenerative diseases. | (14) |
| 9. | Ginseng | *Panax ginseng* | Araliaceae | Neuroprotective effects | (15) |
| 10. | Licorice root | *Glycyrrhiza glabra* | Leguminosae | Calming effects and potential protection against neurodegeneration. | (16) |
| 11. | Brahmi | *Bacopa monnieri* | Plantaginaceae | Enhances cognitive performance and improves memory and learning abilities. | (17) |
| 12. | Lions Mane Mushroom | *Hericium erinaceus* | Hericiaceae | Stimulate nerve growth factor production, aiding in the regeneration and repair of damaged neurons | (18) |
| 13. | Gotu Kola | *Centella asiatica* | Apiaceae | Supports cognitive function and may improve memory, attention, and mood | (19) |
| 14. | Peony | *Paeonia lactiflora* | Paeoniaceae | Neuroprotective and anti-inflammatory properties | (20) |
| 15. | roseroot | *Rhodiola rosea* | Crassulaceae | Supports cognitive function and reduces fatigue | (21) |
| 16. | Chamomile | *Matricaria recutita* | Asteraceae | Reduces inflammation and stress | (22) |
| 17. | Huperzine | *Huperzia bernh* | Lycopodiaceae | Improve memory and cognitive function | (23) |
| 18. | Passionflower | *Passiflora edulis* | Passifloraceae | Calming properties and aids in reducing anxiety and stress | (24) |
| 19. | Sagebrush | *Artemisia tridentata* | Asteraceae | Improve cognitive abilities and memory. | (25) |

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| 20. | Peppermint | *Mentha piperita* | Lamiaceae | Exhibits antioxidant and anti-inflammatory effects, potentially beneficial in neurodegeneration. | (26) |
| 21. | Holy Basil | *Ocimum tenuiflorum* | Lamiaceae | Reduces stress and supports cognitive health | (27) |
| 22. | Astragalus | *Astragalus membranaceus* | Fabaceae | Shows neuroprotective effects and enhances brain functions | (28) |
| 23. | Skullcap | *Scutellaria lateriflora* | Lamiaceae | Potentially reduces anxiety and promotes relaxation | (29) |
| 24. | Kava Kava | *Piper methysticum* | Piperaceae | Relieves stress and anxiety, and promotes relaxation | (30) |
| 25. | Hawthorn | *Crataegus monogyna* | Rosaceae | Improves blood circulation and provides antioxidant effects | (31) |
| 26. | Moringa | *Moringa oleifera* | Moringaceae | Contains antioxidants and anti-inflammatory compounds, potentially beneficial in neurodegenerative diseases | (32) |
| 27. | Oat Straw | *Avena sativa* | Poaceae | Supports cognitive function and may enhance memory and attention | (33) |
| 28. | Reishi Mushroom | *Ganoderma lucidum* | Ganodermataceae | Exhibits neuroprotective effects and boosts the immune system | (34) |
| 29. | Valerian Root | *Valeriana officinalis* | Caprifoliaceae | Calming herb that aids in reducing anxiety and improving sleep | (35) |
| 30. | Lemon Verbena | *Aloysia citrodora* | Verbenaceae | Provides antioxidants and may have neuroprotective effects | (36) |
| 31. | Yerba Mate | *Ilex paraguariensis* | Aquifoliaceae | Conatain caffeine and antioxidants, promoting alertness and providing neuroprotective effects. | (37) |
| 32. | Nettle Leaf: | *Urtica dioica* | Urticaceae | Shows antioxidant and anti-inflammatory properties, potentially beneficial in | (38) |

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| | | | | neurodegenerative diseases | |
| 33. | Cat's Claw | *Uncaria tomentosa* | Bignoniaceae | Exhibits antioxidant and anti-inflammatory effects, potentially protecting against neurodegeneration | (39) |
| 34. | Milk Thistle | *Silybum marianum* | Asteraceae | Contains antioxidant and anti-inflammatory compounds, potentially supporting brain health. | (40) |
| 35. | Dandelion Root | *Taraxacum officinale* | Asteraceae | Rich in antioxidants, it may protect against oxidative stress in the brain | (41) |
| 36. | Black Cohosh | *Cimicifuga racemosa* | Ranunculaceae | Traditionally used for its calming effects, potentially beneficial in managing neurodegenerative diseases | (42) |
| 37. | baikal | *Scutellaria Baicalensis* | Lamiaceae | Exhibits potential neuroprotective effects and reduces inflammation in the brain. | (43) |
| 38. | Poria Mushroom | *Wolfiporia extensa* | Polyporaceae | Possesses antioxidant and anti-inflammatory effects, potentially protecting against neurodegeneration | (44) |
| 39. | Dong Quai | *Angelica sinensis* | Apiaceae | Traditionally used for its calming and cognitive-enhancing properties | (45) |
| 40. | White Willow Bark | *Salix alba* | Salicaceae | Exhibits potential anti-inflammatory effects, potentially aiding in neurodegenerative diseases | (46) |
| 41. | Oregano | *Origanum vulgare)* | Lamiaceae | Rich in antioxidants, it may protect against oxidative stress in the brain | (47) |
| 42. | Marshmallow Root | *Althaea officinalis* | Malvaceae | Shows anti-inflammatory effects and potentially supports cognitive health | (48) |

It's essential to note that herbal remedies should always be used under proper guidance, and consulting with a healthcare professional is advised before incorporating them into any treatment plan.

## VI. BRAHMI

- **Botanical name:** Bacopa monnieri( Linn.)
- **Common name:** water hyssop, waterhyssop, brahmi, thyme- thumbed gratiola, condiment of grace, and Indian pennywort.
- **Family:** Scrophulariaceae

1. **Description:** Bacopa monnieri is a imperishable, creeping condiment native to the washes of southern and Eastern India, Australia, Europe, Africa, Asia, and North and South America. Bacopa monnieri is anon-aromatic condiment. The leaves of this factory are succulent, oblong, and 4 – 6 mm(0.16 –0.24 in) thick. Leaves are oblanceolate and are arranged unequally on the stem. The flowers are small, actinomorphic and white, with four to five petals. It can indeed grow in slightly brackish conditions. Propagation is frequently achieved through slices

2. **Chemical ingredients:** The stylish characterized phytochemicals in Bacopa monnieri are dammarane- type triterpenoid saponins known as bacosides, with jujubogenin orpseudo-jujubogenin halves as aglycone units. The alkaloids brahmine, nicotine, and herpestine have been entered, along with D- mannitol, apigenin, hersaponin, monnierasides I – III, cucurbitacin and plantainoside B[49].

## VII. JATAMANSI

- **Botanical name:** Nardostachys jatamansi( Linn.)
- **Common name:** Spikenard, nard, nardin, or muskroot.
- **Family:** Caprifoliaceae

 

1. **Description:** Nardostachys jatamansi is a flowering factory of the valerian family that grows in the Himalayas. The factory grows 10 – 50 cm( 4 – 20 in) in height and has pink, bell- shaped flowers.( 4) It's set up at an altitude of 3,000 – 5,000 m( 9,800 – 16,400 ft). Rhizomes( underground stems) can be crushed and distilled into an intensively sweet amber- colored essential oil painting, which is veritably thick in thickness. Nard oil painting is used as a incense, an incense, a opiate, and a herbal drug said to fight wakefulness, birth difficulties, and other minor affections.

2. **Chemical ingredients**

- Acaciin
- Ursolic Acid
- Octacosanol
- Kanshone A
- Nardosinonediol
- Nardosinone
- Aristolen- 9beta- Ol
- Oleanolic Acid
- Beta- Sitosterol[50].

## VIII. TULSI

- **Botanical name:** Ocimum tenuiflorum( Linn.)
- **Family:** Lamiaceae
- **Common name:** holy basil, tulsi or tulasi, and tamole, damole, or domole

1. **Description:** Ocimum tenuiflorum, generally known as in Fiji, is an sweet imperishable factory in the family Lamiaceae. It's native to tropical and tropical regions of Australia, Malesia, Asia, and the western Pacific.( 3) It's extensively cultivated throughout the Southeast Asian tropics. basil is an standing, numerous- fanned subshrub, 30 – 60 cm( 12 – 24 in) altitudinous with hairy stems. Leaves are green or grandiloquent; they're simple, petioled, with an elliptical blade up to 5 cm( 2 in) long, which generally has a slightly toothed periphery; they're explosively scented and have a decussate phyllotaxy. The purplish flowers are placed in close curls on stretched racemes.

2. **Chemical ingredients:** The factory and its oil painting contain different phytochemicals, including tannins, flavonoids, eugenol, caryophyllenes, carvacrol, linalool, camphor, and cinnamyl acetate, among others.( 9)( 10) One study reported that the factory contains an eponymous family of 10 neolignan composites called tulsinolA-J[( 51).]

## IX. FENNEL

- **Botanical name:** Foeniculum vulgare( Linn.)
- **Common name:** Saunf
- **Family:** Apiaceae

1. **Description:** Fennel( Foeniculum vulgare) is a flowering factory species in the carrot family. It's a hardy, imperishable condiment( 3) with unheroic flowers and featherlight

 

leaves. It's indigenous to the props of the Mediterranean but has come extensively naturalized in numerous corridor of the world, especially on dry soils near the ocean-seacoast and onriverbanks.It's a largely scrumptious condiment used in cooking.

2. **Chemical ingredients:** The sweet character of fennel fruits derives from unpredictable canvases conducting mixed aromas, including trans- anethole and estragole( suggesting liquorice), fenchone( mint and camphor), limonene, 1- octen-3-ol( mushroom). Other phytochemicals set up in fennel fruits include polyphenols, similar as rosmarinic acid and luteolin, among others in minor content[52].

## X. HIBISCUS

- **Botanical name:** Hibiscus rosasinensis( Linn.)
- **Common name:** rose mallow, hardy hibiscus, rose of sharon, and tropical hibiscus
- **Family:** Malvaceae

1. **Description:** Hibiscus is a rubric of unfolding shops in the mallow family, Malvaceae. The rubric is relatively large, comprising several hundred species that are native to warm temperate, tropical and tropical regions throughout the world. Member species are famed for their large, grabby flowers and those species are generally known simply as" hibiscus", or lower extensively known as. The leaves are alternate, ovate to lanceolate, frequently with a toothed or lobed periphery( dentate). The flowers are large, conspicuous, trumpet- shaped, with five or further petals, colour from white to pink, red, blue, orange, peach,( 7) unheroic or grandiloquent,( 8) and from 4 – 18 cm broad.

2. **Chemical constituents:** Flavonoids, anthocyanins, terpenoids, steroids, polysaccharides, alkaloids, amino acids, lipids, sesquiterpene, quinones, and naphthalene groups[53].

## XI. PEPPER

- **Botanical name:** Piper nigrum( Linn.)
- **Common name:** Black pepper
- **Family:** Piperaceae

 

1. **Description:** The pepper factory is a imperishable woody vine growing up to 4 m( 13 ft) in height on supporting trees, poles, or casinos. It's a spreading vine, lodging readily where running stems touch the ground. The leaves are alternate, entire, 5 to 10 cm(2.0 to3.9 in) long and 3 to 6 cm(1.2 to2.4 in) across. The flowers are small, produced on pendulous harpoons 4 to 8 cm(1.6 to3.1 in) long at the splint bumps, the harpoons dragging up to 7 to 15 cm(2.8 to5.9 in) as the fruit matures.

2. **Chemical ingredients:** Black pepper contains about 5 – 9 of the alkaloids Piperine and Piperettine and about1.2 – 5 of unpredictableoil.It contains a variety of chemical ingredients, similar as Piperolides, Propenylphenols, Amides, Neolignans, Llignans, Flavonoids, Terpenes, and Steroids[( 54).]

## XII. GINGER

- **Botanical name:** Zingiber officinale( Linn.)
- **Common name:** Ginger, Zingiber
- **Family:** Zingiberaceae

1. **Description:** gusto( Zingiber officinale) is a flowering factory whose rhizome, gusto root or gusto, is extensively used as a spice and a folk drug.( 2) It's a herbaceous imperishable which grows periodic pseudostems( false stems made of the rolled bases of leaves) about one cadence altitudinous, bearing narrow splint blades. The inflorescences bear flowers having pale unheroic petals with grandiloquent edges, and arise directly from the rhizome on separate shoots .

2. **Chemical ingredients:** The characteristic scent and flavor of gusto result from unpredictable canvases that compose 1 – 3 of the weight of fresh gusto, primarily conforming of sesquiterpenes, similar as beta- bisabolene and zingiberene, zingerone,

 

shogaols, and gingerols with( 6)- gingerol( 1-( 4'- hydroxy- 3'- methoxyphenyl)-5-hydroxy-3-decanone) as the major pungent emulsion[55].

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