

Role of Medicinal Plants in Fighting against Neurodegenerative Diseases

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Abstract

A current article has been developed for analyzing the role of medicinal plants in fighting against degenerative disease. The worldwide impact of increasing degenerative disease concern has been noticed and rates of increasing affecting for upcoming years have been identified. Degenerative disease is the state in which neuron degraded functions have been developed. Neuron dysfunction consequences have been developed from protein aggregation and many other potential causes. Here in the current research Alzheimer's disease and Parkinson's disease have been selected as analysis areas.

Alzheimer's disease is the state that has been developed from brain shrinkage that ultimately develops brain death and around 5.8 million people have been affected in the USA. Specific medicinal plants that include *Withania somnifera*, *Bacopa monnieri*, *Ginkgo biloba*, and many more have been analyzed for specific benefits identification. On the other hand, Parkinson's disease which is a disorder of the central nervous system has been analyzed to understand the role of specific medicinal plants in fighting against purposes. *Mucuna pruriens*, *Camellia sinensis*, *Panax giseng*, and other plants for fighting against Parkinson's disease prevention efficiency have been analyzed here. During this selection of determination of medicinal plant efficiency accurate techniques and strategy have been discussed properly.

I. INTRODUCTION

Observing the increased life expectancy rate of the population enhances the chances of having neurodegenerative disease chances become higher. Different types of neurodegenerative diseases including Alzheimer's disease, Parkinson's disease, and dementia have been growing over the population. If the medical aspect of nerve disorder has been analyzed then some consequences that include impaired movement, memory loss, and impaired speaking have been noticed. Observing the global impact of neurodegenerative disease it has been detected that around € 130 billion has been spent on the European population treatment. From the 2015 medical report, it has been detected that near about 40 million people have had Alzheimer's

disease which is expected to grow up to 130 million within 2030 (GMBH. 2022). Population aged over 85 years has been noticed to suffer most from these health consequences. The Economic burden of 50% has been noticed in the USA because of the growing impact of neurodegenerative disease.

II. CONCEPT OF NEURODEGENERATIVE DISEASE AND DIFFERENT TYPES

Neurodegenerative disease is a health state that has been developed from decreasing motor control and the deficits of cognitive functions along with reparations of mood disorders. From the term of this indication has been made for the neuron function degenerations. As per Hanssan (2020) neuron is a type of nerve cell that does not

replicate and is mainly present in the brain and spinal cord. If it gets damaged then the chances of recovery are null which is resulted in developing brain dysfunctions and higher chances of an incurable disease. If the process of developing neurodegenerative disease has been observed the formation of amyloid fibrils and plaque development due to protein aggregation has been noticed. From these protein aggregation steps, neuron cells and brain tissues both get damaged.

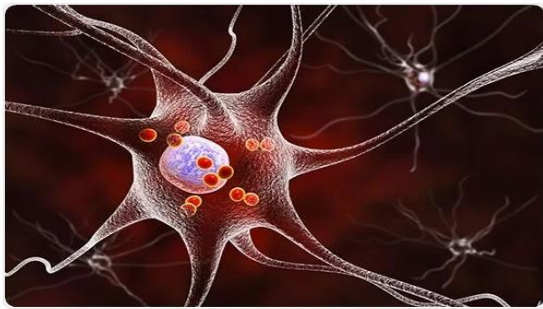


Figure 1: Degeneration of Nerve Cells
(Source: GMBH. 2022)

Protein aggregation processes need to be understood first before planning for patient treatment. During this aggregation soluble protein converts into insoluble protein as a result of which high protein aggregation and plaques formation have been noticed. The process of large protein aggregation transition has been started with prefibrillar species (Soto et al.2018). Apart from this aggregation process neuronal cell death is another part of this developing concern for the adult population. During the degenerative disease cell death leads to the consequences of brain function loss. If the observation has been developed for the potential causes of developing this cell death then oxidative damage of mitochondria and sometimes membrane damage.

2.1 Alzheimer's disease

Alzheimer's disease is the state of a neurological disorder that causes brain shrinkage and leads to brain death. From this neurological disorder individuals' ability to function independently gets affected and declining functions of personal and social behavior have been noticed. Breijyeh

and Karaman (2020) stated that from the medical report of the USA it has been detected that around 5.8 million people have been suffering from this disease and most of the affected persons are above 75 years old. To a world medical report, it has been noticed that 50 million people have dementia among which 70% have Alzheimer's disease. As a developing consequence of this disease recent event memory loss and progression memory impairment have been noticed in the affected patients.

After knowing the consequences and worldwide impact of Alzheimer's disease, the causes of developing this state have been identified. Abnormality in protein build-up has been noticed as the cause that remains around brain cells. Amyloid is one of the involved protein depositions which develop plaque formation around the brain cells. Tau is another protein that has been noticed for developing tangles of brain cells that later develop Alzheimer's disease.

2.2 Parkinson's disease

It is another type of neurodegenerative disease that causes disorder of the central nervous system which affects the normal movement of the body and shaking, stiffness, and balancing disturbances have been noticed in the affected person. Compared with gender-wise Parkinson's disease developing potential men have a 50% greater probability than women (Armstrong and Okun 2020). Now the general negligence of having this disease concern or early diagnosis development has been noticed by assuming symptoms of Parkinson's disease as aging complications. For Parkinson's disease age is an important factor because it leads to the symptoms of mental and behavioral changes, fatigue and sometimes sleeping problems, and many more.

During the process of this disease progression dopamine is produced slowly and gets destroyed and develops four types of disease chances. Loss of nerve cells which are termed substantia nigra is the potential cause of having Parkinson's disease. Dopamine is an essential factor for transporting messages between the brain and nervous system and in this disease dopamine

starts to produce slows and destruction then the scope of dysfunctioning has been raised. Damage or destruction of nerve cells causes a reduction of dopamine in the brain. It showed that brain capability of function controlling has been affected by this disease.

2.3 Dementia

Dementia is a degenerative disease that has been developed from damaging or loss of nerve cells that are connected with brain functioning. The developing pattern of dementia depends on the area of brain cell damage in a particular person. In this disease some identified risk factors that stimulate the chances of having more susceptibility to dementia (Zucchella et al. 2018). It includes age, family history, and down syndrome. Different complications are there for having this neurodegenerative disease including poor nutrition, pneumonia, and safety issues, and having these complications increases the chances of developing dementia for individuals.

III. ENZYME TARGET OF THE DISEASE

Macromolecules have been considered the target enzyme that has been analyzed for better neurodegenerative disease treatment. Dopamine reduction has already been noticed for neurodegenerative disease and from the internal neuron location observation, it has been detected that dopaminergic neuron is presented in the midbrain, and olfactory bulb and is modulated

with the presence of tyrosine hydroxylase. Ribeiro et al. (2018) mentioned that modulated enzyme is released by catecholamine synthesis and has been considered as the matter of TH levels in Parkinson's disease. Dopamine has been considered a neurotransmitter that is responsible for the rewarding and motivating process. Hyperactivity and psychotic syndrome have been noticed due to the mesolimbic dopaminergic projection.

A negative cognitive system has been developed due to mesocortical dopaminergic projection in the prefrontal cortex. During the treatment of Parkinson's disease dopamine D2 receptor and D1 antagonists have been considered as the need for extracellular fluid management. Consequences of developing depression have been noticed just because of the reduction of dopaminergic neurotransmission. Along with depression, the probability of Parkinson's disease and other types of neurodegenerative disease susceptibility has been noticed as increased (James and Bennett 2019). Monoamine oxidase is another enzyme that is involved in oxidizing neurotransmitters along with xenobiotics for producing hydrogen peroxide along with different percentages of aldehydes, ammonia, and amines. From the observation of enzyme activity, it has been detected that Monoamine oxidase B is responsible for degrading dopamine.

IV. ROLE OF MEDICINAL PLANT FOR NEURODEGENERATIVE DISEASE PREVENTION

4.1 Medicinal Plants for Treating Alzheimer's Disease

| Name of the Plant | Useful Compounds | Benefits for degenerative disease |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Withania somnifera</i> | Phytochemicals that include A to Y all types of with asomidienone. With asomniferin A and dehydro with anolide R, A to C with somniferols, also contain phytosterols sitoindosides VII to X. Some amount of irons and | Provide free radical scavenging activity along with an antioxidant activity to develop immune functions. Calming effects of these medicinal plants help to treat the conditions of Alzheimer's patients. |

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| | amino acids and alkaloids have been noticed in these plant-containing compounds (Roy 2018). | Containing compounds withanamides A and C helps the scope of binding with β -amyloid for which prevention of fibril formation is produced. |
| <i>Bacopa monnieri</i> | Bacosides A and B, bacosides III to V, and also contain bacosaponins A, B, and C, beutelic acids, and some amount of sterols, and alkaloids have been noticed. Polyphenols and sulfhydryl compounds have been noticed in this plant. | From a treatment perspective it has been used as a nerve tonic, and diuretic. Provide the solutions for treating insomnia, epilepsy, and other associated diseases (Gregory et al. 2021). Neuropharmacological contribution of this medicinal plant has been noticed. It enhances kinase activity that speeds up benefits for memory enhancement. Benefits of revised cognitive deficits have been noticed. |
| <i>Centella asiatica</i> | The bioactive compound has been contained in this medicinal plant. Apart from these triterpenes, asiaticosides and sapogenins, and vellarin, centellosides have been detected. Some amount of madecassic acid, glycosides, and adecassoside has been present in this plant. | As per Bazzari and Bazzari (2018) reduction in cell death due to hydrogen peroxide-induced has been noticed. Free radicals' availability deciling has been noticed from this plant. Inhibition of β -amyloid death inhibition scope of this plant used as the treatment of Alzheimer's disease. The importance of this plant for brain and nerve cells has been noticed that improve memory. |
| <i>Ginkgo biloba</i> | Around 24% of flavonoid compounds have been identified in these plants and terpene lactones contain nearly 6%. | Benefits for treating blood circulations and any types of associated complications have been noticed. The involvement of this plant in molecular and cellular neuroprotective functions has been detected. Inhibition of β -amyloid aggregations and anti-inflammatory effects have been noticed from these plant-producing benefits. |

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| | | <p>· Enhancing intellectual property for Alzheimer's patients has been noticed from this plant. Acetylcholinesterase activity repressing has been noticed from this plant-induced benefits. From the containing compounds, the scope of a better treatment plan for Alzheimer's patients can be understood.</p> |
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4.2 Medicinal Plants for Treating Parkinson's Disease

| Name of the Plant | Useful Compounds | Benefits for degenerative disease |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Camellia sinensis</i> | Epigallocatechin-3-gallate, polyphenols, and some amounts of iron have also been noticed to be contained in this medicinal plant. Epicatechin is also present in this medicinal plant. | <p>It provides neuroprotection in Parkinson's disease and the polyphenols compound of this medicinal plant improves the redox status and provides the benefits of inhibiting ROS-NO pathways (Banjari et al. 2018).</p> <p>· Scavenging of balancing free radicals has been noticed. Midbrain and stratum treatment with this plan extraction has been noticed. The scope of reducing oxidative stress in Parkinson's disease has been developed.</p> |
| <i>Cassia obtusifolia L</i> | It contains small amounts of neurotoxins metabolites, CSE supplement, and Some amounts of MPP ⁺ and MPTP's neurotoxic metabolites. | <p>It provides the scope of prevention of neuronal degradation. The presence of CSE provides the benefits of cell damage reduction and improved scope of ROS generation.</p> <p>Depolarization of the membrane has been noticed from the providing benefits of this medicinal plant.</p> <p>Inhibition of neuronal loss has been developed by this medicinal plant by the process</p> |

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| | | <p>of reduction of respiratory complex activity. It provides the scope of a better treatment plan for Parkinson's disease management.</p> |
| <p><i>Curcuma longa</i></p> | <p>It only contains curcumins</p> | <p>Improved the defense activity against neuronal anomalies of the brain. Improved the SOD and GPx. Increasing functions for memory performances have been noticed in this plant which has been recognized as useful for Parkinson's disease treatment (Peterson 2020). Capacity of the mitochondrial membrane has been developed from this plant's benefits. Apoptosis reduction is noticed from the plant extracted benefits for Parkinson's disease treatment. Improved membrane capacity and incorporating memory generating functions help to solve the complexity of Parkinson's disease impact on individuals.</p> |

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| <i>Mucuna pruriens</i> | It contains glycoside, some amount of Gallic acid, glutathione, and levodopa. | <ul style="list-style-type: none"> · From the containing compounds of this medicinal plant it helps to improve locomotors functions along with behaviors functions management. · From the identified benefits it has been noticed that alleviation of oxidative stress is found. Improvement of functions that include metal chelation has been noticed. The scope of increasing mitochondrial and synaptic functions has been noticed in this medicinal plant. · Better TH expression has been identified from the treatment plan with this medicinal plant. |
| <i>Panax giseng</i> | Containing compound of this plant is ginsenosides | <ul style="list-style-type: none"> · It provides the scope of fighting against degeneration impact on dopaminergic neurons. Improved shield against neurotoxicity. |

V. PLANT SELECTION PROCESS AND ROLE DETERMINATION

Plant selection is an essential part that needs a standard strategy due to extracting accurate benefits for degenerative disease management. Random selection over the 500.00 plants with different fruits, flowers, and roots compositions seems to be difficult. Chemical, seasonal and geographical differences of these medicinal plants need to be searched properly to extract the accuracy for using them for degenerative disease treatment. Traditional knowledge and knowing the abundance of sources for regional medicinal plants need to be known while planning for use in medicinal purposes. Traditional knowledge and trustworthy sources have been considered the priority for improving the isolations of compounds for medicine extraction purposes.

In the process of using crude extract purification standards determining the role of accuracy for degenerative disease prevention. Application of modern techniques of isolation and purifications has been used to the need for large-scale production of medicinal plant remedies for degenerative disease prevention. According to Chandran and Abrahamse (2020), chromatographic separation has been considered the most efficient technique for the isolation and purifications of target phytochemicals of medicinal plants. Structural determination has been done by nuclear magnetic resonance, and infrared process, and for better understanding of the organic chemistry of the extracted materials has been developed by the electromagnetic spectrum.

VI. CONCLUSION

From the above research, it has been detected that the growing pressure of degenerative disease on the country's economy and population's need of fighting against the disease's impact and susceptibility has been noticed. Brain cell damage and neuron destruction and the increasing vulnerability for individual independent functions have been noticed. Alzheimer's disease and Parkinson's disease have been considered the main part of the discussion. Different medicinal plants have been specified for fighting against degenerative disease and their ingredients and the specific benefits for treating disease have been presented in the current research. Extracting ingredients from the selected medicinal plants and ways of accuracy built up in the selection and determination process have been discussed in the standard way of mentioning. Without a strategy of suitable plant selection chances of extracting potential benefits from the used plant as medicinal sources of degenerative disease prevention.

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