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SCREENING OF MEDICINAL PLANTS USED FOR PREVENTION AND TREATMENT NEURODEGENERATIVE DISEASES: A REVIEW

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ABSTRACT: Amyotrophic lateral sclerosis (ALS), Parkinson's disease, Alzheimer's disease, and Huntington's disease occur as a result of the neurodegeneration process. No specific treatment was found to reduce or stop neurodegenerative diseases. In conventional medicine, many plants have been used to treat neurodegenerative diseases. Natural products play an important role in the prevention and treatment of various neurodegenerative diseases, as well as neuronal dysfunction. Different studies suggest that natural products, such as polyphenolic and plant-separated alkaloids, may delay neurodegeneration and improve memory and cognitive function. Ethnopharmacological studies have provided data to identify potential new drugs in plant sources. Recently many drugs found in medicines have been isolated from plants or their origin, including anticholinesterase (Anti-ChE) isolated plant alkaloids that have been investigated in terms of their potential in the treatment of Alzheimer's disease (AD). The anti-inflammatory and antioxidant activities of plants and soluble components of plants are used to improve inflammation, anxiety, seizures, and more. Medicinal plants have beneficial properties due to the presence of complex chemical compounds to treat toxins in the nervous system. This review article explored the use of medicinal plants to treat neurodegenerative diseases.

INTRODUCTION: Neurodegeneration is the progressive loss of the neuron structure or functions in the brain. Neurons are the building blocks of the nervous system which include the brain and spinal cord. Neurons normally don't replicate or restore themselves, so when they become injured or die they cannot be replaced by the body. Many neurodegenerative diseases are caused by a genetic mutation, protein misfolding, protein degradation pathway, membrane damage, mitochondrial dysfunction.

Neurodegenerative diseases including amyotrophic lateral sclerosis (ALS), Parkinson's disease, Alzheimer's disease, and Huntington's disease (HD) occurs as a result of neurodegeneration process [1, 2]. Alzheimer's disease (AD) has been hypothesized to be a protein misfolding disease caused by an accumulation of abnormally folded A-beta and tau proteins in the brain characterized by loss of neurons and synapses in involving the basal forebrain cholinergic system, amygdala, hippo-campus, and several cortical areas.

Alzheimer's disease is the most common form of dementia. Alzheimer's disease develops differently for every individual. The most common symptoms are difficulty in remembering recent events, known as short-term memory loss. As the disease advances symptoms can include confusion, irritability,

aggression, mood swings trouble with language and long term memory loss progressively bodily functions are lost finally leading to death. Most of the autosomal dominant familial Alzheimer's disease can be attributed to mutations in one of three genes those encoding amyloid precursor protein (APP) presenilins [3]. Alzheimer's disease (AD) affects approximately 5.4 million people in the United States, with its prevalence expected to increase dramatically over the next 20 years.

Currently, about 34 million people worldwide have Alzheimer's disease, and lifestyle factors that are modifiable in principles, such as physical inactivity and obesity are associated with a heightened risk for Alzheimer's disease. There is no cure for Alzheimer's disease, and there are no accessible treatments that stop or reverse the succession of the disease [4]. Accessible treatments offer relatively small symptomatic advantage but remain palliative in nature. Donepezil, Calantamine, Tacrine, Rivastigmine, Memantine, Piracetam. etc., are some drugs available for the treatment of Alzheimer's disease. Some medicinal plants also available for it, having neuroprotective activity [5]. Huntington's disease (HD) is a rare inherited progressive neurodegenerative disorder resulting caused by a single mutation in the gene those codes for the protein Huntington. HD is primarily characterized by selective neuronal loss, primarily in the cortex and striatum, cognitive abnormality, psychiatric deterioration, and loss of medium spiny neurons. Nrf2 is the redox-sensitive transcription factor necessary for the synthesis of glutathione a natural antioxidant that play an imperative role in HD. BDNF also plays a significant role in the survival and activity of the neurons that die in Huntington's disease [6].

The incidence of HD is much higher in European populations than in East Asia. Presently, the Maracaibo region of Venezuela has the uppermost reported worldwide prevalence at 700 cases per 100,000 people. There is no cure for Huntington's disease but different symptomatic drugs are available for it. Hence enormous progress has been made in laboratories throughout the world. There are diverse drugs that may become treatments that can relieve some symptoms and, in some, improve the quality of life in Huntington's disease. Novel advancement also takes place as the use of genetically altered stem cells. Different models are available for Huntington's disease like excitotoxic models, genetic models, metabolic models [7, 8].

Parkinson's disease (PD) is the second most chronic progressive neurodegenerative disorder characterized by the clinical feature are resting tremor, bradykinesia, righty and postural instability caused by early prominent death of dopaminergic neurons in the *Substantia nigra* pars compacta (SNpc) and widespread occurrence of alpha-synuclein (aSyn), an intracellular protein. PD is also related to non-motor symptoms, which may lead to motor symptoms by more than a decade. These non-motor symptoms become difficult symptoms in the later stages of PD [9]. The incidence and prevalence of PD increase with advancing age, with a prevalence of 160/ 100000 in Europe rising to 4% of the population over 80. Currently, the mainstay of PD management is pharmacological therapy; however, these symptomatic therapies have the most important limitations in advanced disease. Numerous disabling features increase later in the course of the disease, including non-motor symptoms, dopamine resistant motor symptoms, and motor complications of long-term dopamine therapy. Although there have been significant advances in the medical and surgical treatment for PD, ultimate disease-modifying therapy is lacking. However, researchers are optimistic that they will be able to identify the potential targets for disease modification [10, 11].

Amyotrophic lateral sclerosis (ALS) is an adult-onset fatal devastating neurodegenerative disease that results in progressive obliteration of neurons of the spinal cord and motor neurons of the cortical brain leading to fatal paralysis. Patients typically die from respiratory failure within 3 years of symptom onset. The incidence of ALS in Europe is 2–3 cases per 100,000 individuals in the general population, and the generally lifetime risk of developing the disease is 1:400. ALS is familial in 5% of cases and shows a Mendelian pattern of inheritance [12]. ALS is recognized to overlap with front temporal dementia. Multiple cell types and mechanisms are likely involved in ALS pathogenesis, which makes the progress of conventional drug therapies difficult. The cause of ALS is not yet elucidated; however, mutations in genes SOD1, C9orf72, TDP-43, FUS/TLS,

angiogenin, and others have been associated with ALS. Riluzole remains the only efficient drug and extends the average survival of patients by 3–6 months. Optimal treatment is based on symptom organization and protection of the quality of life, provided in a multidisciplinary setting. The discovery of further successful disease-modifying therapies remains a critical need for patients with this devastating condition [13].
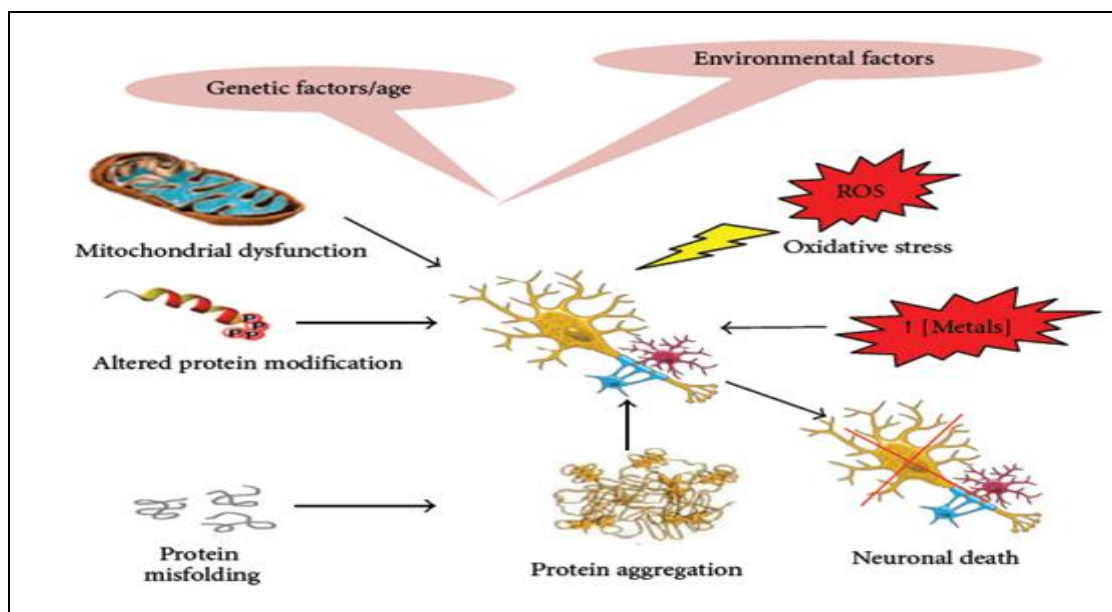

FIG. 1: DIFFERENT FACTOR ASSOCIATED WITH NEURODEGENERATIVE DISEASE

There is no drug to cure neurodegenerative diseases, but in Ayurveda, there are such remedies that slow down the disease. Ayurveda system is one of the world's oldest medical systems. It originates in India more than 3000 years ago and remains one of the country's traditional health care systems. Its concepts about health and disease are to promote the use of herbal compounds, to eliminate the root cause of the disease by restoring balance and also prevent the recurrence of the imbalance [14]. Herbal medicine has existed world with the long recorded history and they were used in ancient Chinese, Greek, Egyptian and Indian medicine for various therapies purposes. The world health organization (WHO) estimated that 80% of the world's population still uses herbal medicines for their health care. In Ayurveda, single or multiple herbs are used for the treatment. The Ayurveda literature „Sarangdhar Samhita‟ dominates the concept of polyherbalism to achieve greater therapeutic efficacy. According to Ayurveda, neuro-degenerative disease is an imbalance of Vata Pitta and Kapha [15].It was found that herbal medicinal drugs have great importance for the treatment of various diseases. It was also found that out of total medicinal drugs, 50% are natural in origin also, according to Ayurveda, there is great importance to natural drugs [16].In the present review study, it was aimed to highlight the following information of different plants are useful in the treatment of neurodegenerative diseases like AD, PD, HD and ALS.

TABLE 1: LIST OF MEDICINAL PLANT USE IN TREATMENT OF NEURODEGENERATIVE DISEASES

S. no.	Plant Name	Family	Part Used	Use in neurodegenerative diseases	Ref.
1	*Acanthopanax senticosus Harms*	Araliaceae	Leaves	PD, AD	17, 18
2	*Acorus Calamus*	Acoraceae	Dried Rhizome	AD, PD	19,20
3	*Aframomumn melegueta K. Schum*	Zingiberaceae	Seed	AD	21
4	*Allium sativum*	Amaryllidaceae	Rhizome	PD	22
5	*Alpinia Officinarum*	Zingiberaceae	Rhizome	AD	22
6	*Alpinia galangal*	Zingiberaceae	Rhizomes	AD	24
7	*Angelica sinensis*	Umbelliferae	Root	AD, PD	25, 26, 27
8	*Artemisia vulgaris*	Asteraceae	Leaves	AD	28
9	*Bacopa Floribunda wetts.*	Scrophuliaceae	Aerial parts	AD	29, 30, 31

10	*Bacopa Monnieri*	Plantaginaceae	Aerial parts	HD, PD AD	32, 33, 34
11	*Bergenia ciliata*	Saxifragaceae	Rhizome	AD	35, 36
12	*Calendula Officinalis*	Asteraceae	flower	HD, AD	37,38
13	*Camellia sinensis Kuntze*	Theaceae	Leaves	HD, AD, PD	39, 40
14	*Carica papaya Linn*	Caricaceae	Leaves and root	AD	41
15	*Cassia obtusifolia*	Fabaceae	Seed	PD, AD	42, 43
16	*Cassica occidentalis*	Fabaceae	Seed	HD, AD	44, 45
17	*Celastrus Paniculatus*	Celastraceae	Seed Oil	HD, AD	46, 47
18	*Centella Asiatica*	Appiaceae	Aerial Parts	AD, HD	48, 49
19	*Chaenomeles speciosa*	Rosaceae	Fruit juice	PD, AD	50, 51
20	*Chrysanthemum morifolium Ramat*	Asteraceae	Flower	PD	52
21	*Citrus sinensis*	Rutaceae	Fruit	PD, AD	53
22	*Cocos nucifera Linn*	Arecaceae	Fiber	AD	54, 55
23	*Coffee Arabica L.*	Rubiaceae	Seeds	AD, PD	56, 57, 58
24	*Cola acuminata*	Sterculiaceae	seeds	AD	59, 60
25	*Convolvulus pluricaulis*	Convolvulaceae	Root	AD, HD	61, 62
26	*Crataegus pinnatifida*	Rosaceae	Fruits	AD, PD	63, 64
27	*Crocus Sativus*	Iridaceae	Dried stigma and Part of the style	AD, PD	65, 66
28	*Curcuma longa*	Zingiberaceae	Rhizome	AD, PD	67, 68, 69
29	*Dalbergia Sissoo*	Fabaceae	Leaves	HD, AD	70, 71
30	*Detarium Microcarpum Guill*	Caesalpiniaceae	Fruits	AD	72, 73
31	*Elaeis guineensis Jacq.*	Arecaceae	Fruits	AD	74
32	*Elettaria cardamomum*	Zingiberaceae	Dried seeds, Oil	AD	75
33	*Evolvulus Alsinoideslin*	Convolvulaceae	Whole plant	AD	76, 77
34	*Ficus capensis Thunb*	Moraceae	Leaves	AD	78,79
35	*Ficus religiosa Linn*	Moraceae	Leaves	HD, PD, AD	80, 81, 82
36	*Galanthus nivalis*	Amaryllidaceae	Crude drug	AD	83
37	*Garcinia kola Heckel*	Clusiaceae	Seed	HD, AD, PD	84, 85, 86
38	*Gastrodia elata blume*	Orchidaceae	Root	AD, PD	87, 88
39	*Ginkgo Biloba*	Ginkgoaceae	Leaves	AD, PD	89, 90
40	*Huperzia serrata*	Lycopodiaceae	moss	AD, PD	91, 92
41	*Hypericum perforatum*	Clusiaceae	Root	AD, PD	93, 94
42	*Ilex paraguariensis*	Aquifoliaceae	Leaves	AD, PD	95, 96, 97
43	*Indigo naturalis*	Apiaceae	Plant based powder	AD	98
44	*Lavandula angustifolia*	Lamiaceae	Aerial part, Oil	PD, AD	99, 100
45	*Lawsonia inermis Linn.*	Lythraceae	Leaves	AD	101
46	*Lipidium Meyenii Walp.*	Brassicaceae	Dried Hypocotyls	AD, PD	102, 103
47	*Luehea Divaricata Mart.*	Malvaceae	Leaves	HD, AD	104, 105
48	*Lycium Barbarum*	Solanaceae	Berries	AD, PD	106, 107
49	*Lycopersicon esculentum*	Solanaceae	fruits	PD, AD	108, 109
50	*Lycoris chejuensis*	Amaryllidacea	Whole plant	AD	110
51	*Lycoris longituba Linn.*	Amaryllidaceae	Whole plant	AD	111
52	*Magnolia Officinalis Rehd*	Magnoliaceae	Bark	AD, PD	112, 113, 114
53	*Melissa officinalis*	Lamiaceae	Aerial part	PD, AD	115, 116
54	*Monordica Charantia*	Cucurbitaceae	Fruits	HD, PD, AD	117,118,119
55	*Morinda Citrifolia*	Rubiaceae	Fruits	HD, AD	120,121
56	*Morus alba*	Moraceae	Whole Plant	PD, AD	122,123
57	*Mucuna pruriens*	Fabaceae	Seeds	PD, AD	124, 125
58	*Musa Sapientum linn.*	Musaceae	Stem	AD	126, 127
59	*Myristica fragrans*	Myristicaceae	Seed kernel	AD	128
60	*Narcissus confuses*	Amaryllidacea	Crude drug	AD	129
61	*Nardostachys jatamansi*	Valerianaceae	Whole plant	AD, PD	130, 131
62	*Nicotiana tabaccum*	Solanaceae	Leaves	AD, PD	132, 133
63	*Nigella sativa*	Ranunculaceae	Seed Oil	PD, AD	134, 135, 136
64	*Panax ginseng*	Araliaceae	Roots	AD, HD, PD	137, 138, 139, 140
65	*Petroselinum crispum*	Umbelliferae	Leaves, root, stem	AD	141, 142
66	*Physostigma vennosam Balf*	Leguminosae	Beans	AD	143
67	*Picralima nitida* Staff	Apocynaceae	Fruits and seeds	AD	144
68	*Piper betel Linn*	Piperaceae	Leaf	AD,	145
69	*Piper methysticum frost*	Piperaceae	Whole plant	AD, PD	146, 147, 148

70	*Plumbago scandens*	Plumbaginaceae	Whole plant	PD	149
71	*Polygala tenuifolia wild*	Polygalaceae	Rhizome	AD, PD	150, 151
72	*Polygonum cuspidatum*	Polygonaceae	Roots	PD, AD	152, 153
73	*Portulaca oleracea*	Portulacaceae	Seed	PD, AD	154, 155
74	*Prunus dulcis*	Rosaceae	Nuts	PD, AD	156, 157
75	*Psoralea corylifolia*	Fabaceae	Fruits	HD, AD	158,159
76	*Pueraria thomsonii*	Fabaceae	Roots	PD, AD	160, 161
77	*Puwraria tuberose Roxb.*	Fabaceae	Tubers	AD	162
78	*Quassia undulata*	Simaroubaceae	Leaves	AD	163
79	*Rhizoma acori tatarinowii*	Araceae	Leaf	AD, PD	164, 165
80	*Rice Bran*	Poaceae	Oil	HD, PD, AD	166, 167, 168
81	*Ricinus communis Kinn.*	Euphorbiaceae	Beans	AD	169
82	*Rosa Canina*	Rosaceae	Berries	AD	170, 171
83	*Rosmarinus officinalis*	Lamiaceae	Leaves	AD, PD	172, 173, 174
84	*Rubus Idaeus*	Rosaceae	Berries	AD	175,176
85	*Saffron crocus*	Iridaceae	Stigmas	AD, PD	177, 178
86	*Salvia Officinalis*	Lamiaceae	Leaves	AD	179
87	*Salvia miltiorrhiza Bunge*	Lamiaceae	Rhizome	AD, PD	180, 181
88	*Schisandra chinensis (Turcz.)*	Schisandraceae	Fruit	AD, PD	182, 183
89	*Scoparia dulcis L*	Scrophulariaceae	Leaves	AD	184, 185
90	*Scutellaria baicalensis* Georgi	Lamiaceae	Roots	AD, PD	186, 187
91	*Senecio abyssinicus*	Asteraceae	Aerial parts	AD	188
92	*Sesame indicum*	Pedaliaceae	Seeds	PD	189, 190
93	*Silybum Marianum*	Asteraceae	Seeds	AD, PD	191,192
94	*Solanum incanum L*	Solanaceae	Leaves, Fruits	AD	193
95	*Solanum xanthocarpum*	Solanaceae	Fruits	ME, AD	193
96	*Spondias mombin L*	Anacardiaceae	Leaves	AD	194
97	*Terminalia chebula linn*	Combretaceae	Rhizome	AD	119
98	*Tetrapleura Tetraptera*	Mimosaceae	Fruits	AD	195
99	*Thuja orientalis*	Cupressaceae	Fruits	PD, AD	196, 197
100	*Tinospora Cordifolia*	Menispermaceae	Whole plant	AD, PD	198, 199
101	*Trifolium pretense*	Leguminosae	Flower heads	PD, AD	200, 201
102	*Tripterygium Wilfordii Hook F*	Celastraceae	Whole plant	PD, AD	202, 203
103	*Uncaria rhynchophylla*	Rubiaceae	Whole plant	PD, AD	204, 205
104	*Uncaria tomentosa Willd*	Rubiaceae	Aerial parts	PD, AD	206
105	*Uraria Picta (Jacq.)*	Leguminosae,	Stem	AD	207
106	*Vanilla planifolia*	Orchidaceae	Seed	AD, PD, HD	208
107	*Vicia faba*	Fabaceae	Seed	PD	209, 210, 211
108	*Vinca minor*	Apocynaceae	Aerial part	AD	212
109	*Vitis Vinifera*	Vitaceae	Fruit	AD, PD	213, 214
110	*Vitis vinifera Linn.*	Vitaceae	Seed	AD	215
111	*Withania Somnifera*	Solanaceae	Roots	HD, PD	216, 217, 218, 219, 220,
112	*Zingibar Officinale Roscoe*	Zingiberaceae	Rhizomes	AD, HD, PD	

Note: - AD – Alzheimer's disease, PD - Parkinson's disease, HD- Huntington's disease

CONCLUSION: Neurodegenerative diseases appear to share several common multifactorial degenerative processes that contribute to neuronal death, leading to functional impairments in the fields of AD, PD, HD, and ALS. No treatment is available to slow or stop neurodegenerative diseases like AD, PD, HD, and ALS. The Food and Drug Administration has approved five drugs that temporarily improve symptoms. The effectiveness of these drugs varies crossways the population. None of the treatments available today alters the underlying path of this terminal disease. Plant-derived bioactive compounds, also of directly being developed as drugs. Natural products will continue to be enormously significant as sources of medicinal agents. Thus natural products have emerged as promising hope in the drug discovery programs in neurodegenerative diseases. In the future, more emphasis should be given to finding new targets for neurodegenerative disease therapies. Targets for new neurodegenerative diseases therapies to be emphasized include preventing building up of amyloid plaques, preventing building up of paired helical segments and preventing brain cell dysfunction and death. In this paper, we reviewed various medicinal plants which show the use of neurodegenerative diseases treatment were collected from the different investigations and were reported above as we can say these medicinal plants are responsible for

treating neurodegenerative diseases like AD, PD, HD, and ALS under several investigators studied.

REFERENCES:

1. Barnham KJ, Masters CL and Bush AI: Neurodegenerative diseases and oxidative stress. Nature reviews. Drug Discovery 2004; 3(3): 205-14.
2. Prusiner SB: "Neurodegenerative diseases and prions." New England Journal of Medicine 2001; 344(20): 1516-26.
3. Mielke MM, Vemuri P and Rocca WA: Clinical epidemiology of Alzheimer's disease: assessing sex and gender differences. Clinical Epidemiology 2014; 6: 37.
4. Roberts JS, McLaughlin SJ and Connell CM: Public beliefs and knowledge about risk and protective factors for Alzheimer's disease. Alzheimer's & Dementia 2014; S381-9.
5. Povova J, Ambroz P, Bar M, Pavukova V, Sery O, Tomaskova H and Janout V: Epidemiological of and risk factors for Alzheimer's disease: a review. Biomedical Papers of the Medical Faculty of Palacky University in Olomouc 2012; 156(2).
6. McColgan P and Tabrizi SJ: Huntington's disease: a clinical review. European Journal of Neurology 2018; 25(1): 24-34.
7. Mestre T, Ferreira J, Coelho MM, Rosa M and Sampaio C: Therapeutic interventions for symptomatic treatment in Huntington's disease. Cochrane Database of Systematic Reviews 2009(3).
8. Dumas EM, Van Den Bogaard SJ, Middelkoop HA and Roos RA: A review of cognition in Huntington's disease. Front Biosci (Schol Ed) 2013; 5: 1-8.
9. Connolly BS and Lang AE: Pharmacological treatment of Parkinson disease: a review. Jama 2014; 311(16): 1670-83.
10. Mega MS, Cummings JL, Fiorello T and Gornbein J: The spectrum of behavioral changes in Alzheimer's disease. Neurology 1996; 46(1): 130-5.
11. Zarei S, Carr K, Reiley L, Diaz K, Guerra O, Altamirano PF, Pagani W, Lodin D, Orozco G and Chinea A: A comprehensive review of amyotrophic lateral sclerosis. Surgical neurology international 2015; 6.
12. Chiò A, Logroscino G, Traynor BJ, Collins J, Simeone JC, Goldstein LA and White LA: Global epidemiology of amyotrophic lateral sclerosis: a systematic review of the published literature. Neuroepidemiology 2013; 41(2): 118-30.
13. Parasuraman S, Thing GS and Dhanaraj SA: Polyherbal formulation: concept of ayurveda. Pharmacognosy Reviews 2014; 8(16): 73.
14. Saraf MK, Prabhakar S, Khanduja KL and Anand A: *Bacopa monniera* attenuates scopolamine-induced impairment of spatial memory in mice. Evidence-Based Complementary and Alternative Medicine 2011; 2011.
15. Singh N, Pandey BR and Verma P: An overview of phytotherapeutic approach in prevention and treatment of Alzheimer's syndrome & dementia. International Journal of Pharmaceutical Sciences and Drug Research 2011; 3(3): 162-72.
16. Fujikawa T, Miguchi S, Kanada N, Nakai N, Ogata M, Suzuki I and Nakashima K: *Acanthopanax senticosus* Harms as a prophylactic for MPTP-induced Parkinson's disease in rats. Journal of Ethnopharmacology 2005; 97(2): 375-81.
17. Zhang XD, Liu XQ, Kim YH and Whang WK: Chemical constituents and their acetyl cholinesterase inhibitory and antioxidant activities from leaves of *Acanthopanax henryi*: potential complementary source against Alzheimer's disease. Archives of Pharmacal Research 2014; 37(5): 606-16.
18. Rabadia J, Hirani U, Dadhaniya M and Bhensdadiya S: Neuroprotective effect of *Acorus calamus* on a rat model of parkinson's disease induced by 6-hydroxydopamine. Asian J of Pharmacolo and Toxicology 2014; 2(03): 16-24.
19. Mukherjee PK, Kumar V, Mal M and Houghton PJ: *In-vitro* acetylcholinesterase inhibitory activity of the essential oil from *Acorus calamus* and its main constituents. Planta Medica 2007; 73(03): 283-5.
20. Kumar A, Kennedy-Boone D, Weisz HA, Capra BA, Uchida T, Jennings K, Micci MA, Parsley M, DeWitt DS, Prough DS and Hellmich HL: Neuroprotective effects of aframomum melegueta extract after experimental traumatic brain injury. Natural Products Chemistry & Research 2015.
21. Rojas P, Serrano-García N, Medina-Campos ON, Pedraza-Chaverri J, Maldonado PD and Ruiz-Sánchez E: S-Allylcysteine, a garlic compound, protects against oxidative stress in 1-methyl-4-phenylpyridinium-induced Parkinsonism in mice. The Journal of Nutritional Biochemistry 2011; 22(10): 937-44.
22. Singh JH, Alagarsamy V, Diwan PV, Kumar SS, Nisha JC and Reddy YN: Neuroprotective effect of *Alpinia galanga* (L.) fractions on Aβ (25–35) induced amnesia in mice. Journal of Ethnopharmacology 2011; 138(1): 85-91.
23. Fu RH, Harn HJ, Liu SP, Chen CS, Chang WL, Chen YM, Huang JE, Li RJ, Tsai SY, Hung HS and Shyu WC: n-Butylidenephthalide protects against dopaminergic neuron degeneration and α-Synuclein accumulation in caenorhabditis elegans models of Parkinson's disease. PLOS One 2014; 9(1).
24. Huang SH, Lin CM and Chiang BH: Protective effects of Angelica sinensis extract on amyloid β-peptide-induced neurotoxicity. Phytomedicine 2008; 15(9): 710-21.
25. Ho CC, Kumaran A and Hwang LS: Bio-assay guided isolation and identification of anti-Alzheimer active compounds from the root of *Angelica sinensis*. Food Chemistry 2009; 114(1): 246-52.
26. Howes MJ, Perry NS and Houghton PJ: Plants with traditional uses and activities, relevant to the management of Alzheimer's disease and other cognitive disorders. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives 2003; 17(1): 1-8.
27. Ishola IO, Afolayan GO, Popoola TD, Ugoanyanwu VI and Adeyemi OO: Protective effect of ethanolic leaf extract of *Bacopa floribunda* (r. br.) Wettst on scopolamine induced memory impairment in rodents: A behavioural and biochemical study. West African Journal of Pharmacology and Drug Research 2015; 30(1): 1-9.
28. Olatunji BP, Fasola TR, Onasanwo SA, Akinyemi AJ, Adeniy PA and Ishola AO: Neuronal alterations and antioxidant status of lipopolysaccharide induced neuronal damage in mice: efficacy of three medicinal plants. Journal of Applied Pharmaceutical Science 2017; 7(12).
29. Omotola MH, Oni and Owoyele B: Assessment of the mechanism of actions of *Bacopa floribunda* on amyloid beta 1-42-induced Alzheimer's disease in male wistar rats. In Journal of Neurochemistry, 150: 132-132. 111 River St, Hoboken 07030-5774, Nj Usa: Wiley, 2019.

30. Saraf MK, Prabhakar S, Khanduja KL and Anand A: *Bacopa monniera* attenuates scopolamine-induced impairment of spatial memory in mice. Evidence-Based Complementary and Alternative Medicine 2011.

31. Shinomol GK and Bharath MS: Neuromodulatory propensity of *Bacopa monnieri* leaf extract against 3-nitropropionic acid-induced oxidative stress: *in-vitro* and *in-vivo* evidences. Neurotoxicity Research 2012; 22(2): 102-14.

32. Shobana C, Kumar RR and Sumathi T: Alcoholic extract of *Bacopa monniera* Linn. protects against 6-hydroxydopamine-induced changes in behavioural and biochemical aspects: a pilot study. Cellular and Molecular Neurobiology 2012; 32(7): 1099-12.

33. Barai P, Raval N, Acharya S and Acharya N: Neuroprotective effects of *Bergenia ciliata* on NMDA induced injury in SH-SY5Y cells and attenuation of cognitive deficits in scopolamine induced amnesia in rats. Biomedicine & Pharmacotherapy 2018; 108: 374-90.

34. Barai P, Raval N, Acharya S, Borisa A, Bhatt H and Acharya N: Neuroprotective effects of bergenin in Alzheimer's disease: Investigation through molecular docking, *in-vitro* and *in-vivo* studies. Behavioural Brain Research 2019; 356: 18-40.

35. Ercetin T, Senol FS, Orhan IE and Toker G: Comparative assessment of antioxidant and cholinesterase inhibitory properties of the marigold extracts from *Calendula arvensis* L. and *Calendula officinalis* L. Industrial Crops and Products 2012; 36(1): 203-8.

36. Shivasharan BD, Nagakannan P, Thippeswamy BS, Veerapur VP, Bansal P and Unnikrishnan MK: Protective effect of *Calendula officinalis* Linn. flowers against 3-nitropropionic acid induced experimental Huntington's disease in rats. Drug and Chemical Toxicology 2013; 36(4): 466-73.

37. Cam ME and Taşkin T: *Camellia sinensis* Leaves Hydroalcoholic extract improves the alzheimer's disease-like alterations induced by type 2 diabetes in rats. clinical and experimental health sciences 1-1.

38. Bitu Pinto N, da Silva Alexandre B, Neves KR, Silva AH, Leal LK and Viana GS: Neuroprotective properties of the standardized extract from *Camellia sinensis* (green tea) and its main bioactive components, epicatechin and epigallocatechin gallate, in the 6-OHDA model of Parkinson's disease. Evidence-Based Complementary and Alternative Medicine 2015.

39. Barbagallo M, Marotta F and Dominguez LJ: Oxidative stress in patients with Alzheimer's disease: effect of extracts of fermented papaya powder. Mediators of Inflammation 2015.

40. Yi JH, Park HJ, Lee S, Jung JW, Kim BC, Lee YC, Ryu JH and Kim DH: *Cassia obtusifolia* seed ameliorates amyloid β-induced synaptic dysfunction through anti-inflammatory and Akt/GSK-3β pathways. Journal of Ethnopharmacology 2016; 178: 50-7.

41. Levites Y, Weinreb O, Maor G, Youdim MB and Mandel S: Green tea polyphenol (–)-epigallocatechin-3-gallate prevents N-methyl-4-phenyl-1, 2, 3, 6-tetrahydro-pyridine-induced dopaminergic neuro-degeneration. Journal of Neurochemistry 2001; 78(5): 1073-82.

42. Yi JH, Park HJ, Lee S, Jung JW, Kim BC, Lee YC, Ryu JH and Kim DH: *Cassia obtusifolia* seed ameliorates amyloid β-induced synaptic dysfunction through anti-inflammatory and Akt/GSK-3β pathways. Journal of Ethnopharmacology 2016; 178: 50-7.

43. Silva J, Costa-Silva JH, Linard-Medeiros CF, Wanderley AG and Lafayette SS: Neuroprotective effect of *Cassia occidentalis* against 3-Nitropropionic Acid-Induced Neurotoxicity In Rats. Int Res J Pharm App Sci 2014; 4: 40-7.

44. Lekha G, Kumar BP, Rao SN, Arockiasamy I and Mohan K: Cognitive enhancement and neuroprotective effect of *Celastrus paniculatus* Willd. seed oil (Jyothismati oil) on male Wistar rats. Journal of Pharmaceutical Science and Technology 2010; 2(2): 130-8.

45. Malik J, Karan M and Dogra R: Ameliorating effect of *Celastrus paniculatus* standardized extract and its fractions on 3-nitropropionic acid induced neuronal damage in rats: possible antioxidant mechanism. Pharmaceutical Biology 2017; 55(1): 980-90.

46. Kumar A, Dogra S and Prakash A: Neuroprotective effects of *Centella asiatica* against intracerebroventricular colchicine-induced cognitive impairment and oxidative stress. International Journal of Alzheimer's disease 2009.

47. Shinomol GK: Prophylactic neuroprotective property of *Centella asiatica* against 3-nitropropionic acid induced oxidative stress and mitochondrial dysfunctions in brain regions of prepubertal mice. Neurotoxicology 2008; 29(6): 948-57.

48. Turkiewicz IP, Wojdyło A, Tkacz K, Nowicka P, Golis T and Bąbelewski P: ABTS on-line antioxidant, α-amylase, α-glucosidase, pancreatic lipase, acetyl-and butyrylcholinesterase inhibition activity of chaenomeles fruits determined by polyphenols and other chemical compounds. Antioxidants 2020; 9(1): 60.

49. Suh WS, Park KJ, Kim DH, Subedi L, Kim SY, Choi SU and Lee KR: A biphenyl derivative from the twigs of *Chaenomeles speciosa*. Bioorganic Chemistry 2017; 72: 156-60.

50. Kim IS, Koppula S, Park PJ, Kim EH, Kim CG, Choi WS, Lee KH and Choi DK: *Chrysanthemum morifolium* Ramat (CM) extract protects human neuroblastoma SH-SY5Y cells against MPP+-induced cytotoxicity. Journal of Ethnopharmacology 2009; 126(3): 447-54.

51. Braidy N, Behzad S, Habtemariam S, Ahmed T, Daglia M, Mohammad Nabavi S, Sobarzo-Sanchez E and Fazel Nabavi S: Neuroprotective effects of citrus fruit-derived flavonoids, nobiletin and tangeretin in alzheimer's and parkinson's disease. CNS & Neurological Disorders-Drug Targets (Formerly Current Drug Targets-CNS & Neurological Disorders) 2017; 16(4): 387-97.

52. Lima EB, de Sousa CN, Vasconcelos GS, Meneses LN, Ximenes NC, Júnior MA, Matos NC, Brito R, Miron D, Leal LK and Macêdo D: Antidepressant, antioxidant and neurotrophic properties of the standardized extract of *Cocos nucifera* husk fiber in mice. Journal of natural medicines. 2016; 70(3): 510-21.

53. Iranshahi M and Javadi B: Diet therapy for the treatment of Alzheimer's disease in view of traditional Persian medicine: A review. Iranian Journal of Basic Medical Sciences. 2019; 22(10): 1102-17.

54. Anggreani E and Lee CY: Neuroprotective effect of chlorogenic acids against Alzheimer's disease. Int J Food Sci Nutr Diet 2017; (6): 330-37.

55. Elsaid FG, Shati AA and Hafez EE: The protective role of *Coffea arabica* L. and *Crocus sativus* L. against the neurotoxicity induced by chronic administration of aluminium chloride. J Pharmacol Toxicol 2011; 6: 647-3.

56. Nakayama T and Oishi K: Influence of coffee (*Coffea arabica*) and galacto-oligosaccharide consumption on intestinal microbiota and the host responses. FEMS Microbiology Letters 2013; 343(2): 161-8.

57. Oboh G, Akinyemi AJ, Omojokun OS and Oyeleye IS: Anticholinesterase and antioxidative properties of aqueous

extract of *Cola acuminata* seed *in-vitro*. International Journal of Alzheimer's Disease 2014.

58. Ishola IO, Ikuomola BO and Adeyemi OO: Protective role of *Spondias mombin* leaf and *Cola acuminata* seed extracts against scopolamineinduced cognitive dysfunction. Alexandria Journal of Medicine 2018; 54(1): 27-39.

59. Bihaqi SW, Sharma M, Singh AP and Tiwari M: Neuroprotective role of *Convolvulus pluricaulis* on aluminium induced neurotoxicity in rat brain. Journal of Ethnopharmacology 2009; 124(3): 409-15.

60. Kaur M, Prakash A and Kalia AN: Neuroprotective potential of antioxidant potent fractions from *Convolvulus pluricaulis* Chois. in 3-nitropropionic acid challenged rats. Nutritional Neuroscience 2016; 19(2): 70-8.

61. Hu M, Li F and Wang W: Vitexin protects dopaminergic neurons in MPTP-induced Parkinson's disease through PI3K/Akt signaling pathway. Drug Design, Development and Therapy 2018; 12: 565.

62. Lee J, Cho E, Kwon H, Jeon J, Jung CJ, Moon M, Jeon M, Lee YC, Kim DH and Jung JW: The fruit of *Crataegus pinnatifida* ameliorates memory deficits in β-amyloid protein-induced Alzheimer's disease mouse model. Journal of Ethnopharmacology 2019; 243: 112107.

63. Tamegart L, Abbaoui A, Makbal R, Zroudi M, Bouizgarne B, Bouyatas MM and Gamrani H: *Crocus sativus* restores dopaminergic and noradrenergic damages induced by lead in Meriones shawi: A possible link with Parkinson's disease. Acta Histochemica 2019; 121(2): 171-81.

64. Linardaki ZI, Orkoula MG, Kokkosis AG, Lamari FN and Margarity M: Investigation of the neuroprotective action of saffron (*Crocus sativus* L.) in aluminum-exposed adult mice through behavioural and neurobiochemical assessment. Food and Chemical Toxicol 2013; 52: 163-70.

65. Chin D, Huebbe P, Pallauf K and Rimbach G: Neuroprotective properties of curcumin in Alzheimer's disease-merits and limitations. Current Medicinal Chemistry 2013; 20(32): 3955-85.

66. Douichene S, Djebli N, Ahmed M and Zerrouki K: Neuroprotective effect of curcumin with a fixator of absorption against both aluminium neurotoxicity and Alzheimer's disease (experimental studies in mice). J Alzheimers Dis Parkinsonism. 2012; 2(107): 2161-60.

67. Zbarsky V, Datla KP, Parkar S, Rai DK, Aruoma OI and Dexter DT: Neuroprotective properties of the natural phenolic antioxidants curcumin and naringenin but not quercetin and fisetin in a 6-OHDA model of Parkinson's disease. Free Radical Research 2005; 39(10): 1119-25.

68. Swaroop TV, Handral M and Mitul P: Neuroprotective evaluation of *Dalbergia sissoo* roxb. Leaves against cerebral Ischemia/Reperfusion (I/R) induced oxidative stress in rats. Indo American Journal of Pharmaceutical Research 2013; 3(5): 3689-01.

69. Thonda VS, Kumar SH, Handral M and Sonowal A: Neuroprotective evaluation of ethanolic leaf extract of *Dalbergia sissoo* in monosodium glutamate induced neurotoxicity in rats. International Journal of Pharmaceutical Sciences and Research 2014; 5(3): 829.

70. Martins N, Heleno SA and Ferreira IC: An upcoming approach to alzheimer's disease: ethnopharmacological potential of plant bioactive molecules. Current Medicinal Chemistry 2020.

71. Adewusi EA, Moodley N and Steenkamp V: Antioxidant and acetylcholinesterase inhibitory activity of selected southern African medicinal plants. South African Journal of Botany 2011; 77(3): 638-44.

72. Rosni N, Noor ZM and Zain MM: Palm Puree: Potential Neuroprotective Effect from *Elaeis guineensis* Jacq. Fresh Fruit Bunch. In2011 International Conference on Environmental, Biomedical and Biotechnology (IPCBEE) 2011: 16.

73. Auti ST and Kulkarni YA: neuroprotective effect of cardamom oil against aluminum induced neurotoxicity in rats. Frontiers in neurology. 2019; 10.

74. Andrade C: The Herbal Treatment of Parkinson's disease: A Possible Role for BR-16A (Mentat). Ind J Psychol Med 1996; (19): 82-88.

75. Yadav MK, Singh SK, Singh M, Mishra SS, Singh AK, Tripathi JS and Tripathi YB: Neuroprotective Activity of *Evolvulus alsinoides* & *Centella asiatica* Ethanolic Extracts in scopolamine-induced amnesia in swiss albino mice. Open access Macedonian Journal of Medical Sciences 2019; 7(7): 1059.

76. Yellamma K: *Evolvulus alsinoides* (Eae) plant extract as a modulator of cholinergic system with reference to alzheimer's disease. International Journal of Pharmaceutical Sciences and Research 2017; 8(5): 2090-9.

77. Ferreira A, Proença C, Serralheiro ML and Araujo ME: The *in-vitro* screening for acetylcholinesterase inhibition and antioxidant activity of medicinal plants from Portugal. Journal of Ethnopharmacology 2006; 108(1): 31-7.

78. Masondo NA, Stafford GI, Aremu AO and Makunga NP: Acetylcholinesterase inhibitors from southern African plants: An overview of ethnobotanical, pharmacological potential and phytochemical research including and beyond Alzheimer's disease treatment. South African Journal of Botany 2019; 120: 39-64.

79. Bhangale JO, Acharya SR: Anti-Parkinson activity of petroleum ether extract of *Ficus religiosa* (L.) leaves. Advances in Pharmacological Sciences 2016.

80. Bhangale JO, Acharya NS and Acharya SR: Neuro-protective effect of pet ether extract of *Ficus religiosa* (L.) leaves in 3-nitropropionic acid induced Huntington. International J of PharmTech Research 2015; 8(10): 57-69.

81. Siwach P and Gill AR: Micropropagation of *Ficus religiosa* L. *via* leaf explants and comparative evaluation of acetylcholinesterase inhibitory activity in the micro-propagated and conventionally grown plants. 3 Biotech 2014; 4(5): 477-91.

82. Cortes N, Posada-Duque RA, Alvarez R, Alzate F, Berkov S, Cardona-Gómez GP and Osorio E: Neuroprotective activity and acetylcholinesterase inhibition of five Amaryllidaceae species: A comparative study. Life Sciences 2015; 122: 42-50.

83. Antala BV, Patel MS, Bhuva SV, Gupta S, Rabadiya S and Lahkar M: Protective effect of methanolic extract of Garcinia indica fruits in 6-OHDA rat model of Parkinson's disease. Indian Journal of Pharmacology 2012; 44(6): 683.

84. Dey A and De JN: Neuroprotective therapeutics from botanicals and phytochemicals against Huntington's disease and related neurodegenerative disorders. Journal of Herbal Medicine 2015; 5(1): 1-9.

85. Ishola IO, Adamson FM and Adeyemi OO: Ameliorative effect of kolaviron, a biflavonoid complex from Garcinia kola seeds against scopolamine-induced memory impairment in rats: role of antioxidant defense system. Metabolic Brain Disease 2017; 32(1): 235-45.

86. Huang GB, Zhao T, Muna SS, Jin HM, Park JI, Jo KS, Lee BH, Chae SW, Kim SY, Park SH and Park EO: Therapeutic potential of *Gastrodia elata* Blume for the treatment of Alzheimer's disease. Neural Regeneration Research 2013; 8(12): 1061.

87. An H, Kim IS, Koppula S, Kim BW, Park PJ, Lim BO, Choi WS, Lee KH and Choi DK: Protective effects of Gastrodia elata Blume on MPP+-induced cytotoxicity in

human dopaminergic SH-SY5Y cells. Journal of Ethnopharmacology 2010; 130(2): 290-8.

88. Mak YT, Wai MS and Yew DT: The neuroprotective effect of *Ginkgo biloba* leaf extract and its possible mechanism. Central Nervous System Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Central Nervous System Agents) 2007; 7(4): 230-5.

89. Kim MS, Lee JI, Lee WY and Kim SE: Neuroprotective effect of *Ginkgo biloba* L. extract in a rat model of Parkinson's disease. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxico Evalu of Nat Prod Derivatives 2004; 18(8): 663-6.

90. Chen LW, Wang YQ, Wei LC, Shi M and Chan YS: Chinese herbs and herbal extracts for neuroprotection of dopaminergic neurons and potential therapeutic treatment of Parkinson's disease. CNS & Neurological Disorders-Drug Targets (Formerly Current Drug Targets-CNS & Neurological Disorders) 2007; 6(4): 273-81.

91. Park SY, Kim HS, Hong SS, Sul D, Hwang KW and Lee D: The neuroprotective effects of traditional oriental herbal medicines against β-amyloid-induced toxicity. Pharmaceutical Biology 2009; 47(10): 976-81.

92. Cao Z, Wang F, Xiu C, Zhang J and Li Y: *Hypericum perforatum* extract attenuates behavioural, biochemical, and neurochemical abnormalities in aluminum chloride-induced Alzheimer's disease rats. Biomedicine & Pharmacotherapy 2017; 91: 931-7.

93. Mohanasundari M, Srinivasan MS, Sethupathy S and Sabesan M: Enhanced neuroprotective effect by combination of bromocriptine and *Hypericum perforatum* extract against MPTP-induced neurotoxicity in mice. Journal of the Neurological Sciences 2006; 249(2): 140-4.

94. Milioli EM, Cologni P, Santos CC, Marcos TD, Yunes VM, Fernandes MS, Schoenfelder T and Costa-Campos L: Effect of acute administration of hydroalcohol extract of Ilex paraguariensis St Hilaire (Aquifoliaceae) in animal models of Parkinson's disease. Phytotherapy Research 2007; 21(8): 771-6.

95. Machado ML, Arantes LP, da Silveira TL, Zamberlan DC, Cordeiro LM, Obetine FB, da Silva AF, da Cruz IB, Soares FA and Oliveira RD: Ilex paraguariensis extract provides increased resistance against oxidative stress and protection against Amyloid beta-induced toxicity compared to caffeine in *Caenorhabditis elegans*. Nutritional Neuroscience 2019; 1-3.

96. Silva CH: Caracterização química de extrato de Ilex paraguariensis A. St. Hilaire e avaliação das atividades antioxidante *in-vitro* e antiparkinsoniana *in-vivo* 2017.

97. Xi YF, Zhou L, Bai M, Wang J, Lin B, Wang XB, Huang XX and Song SJ: N-acylanthranilic acid derivatives with anti-Aβ1–42 aggregation activity from the leaves of *Isatis indigotica* fortune. Fitoterapia 2018; 128: 169-74.

98. Hancianu M, Cioanca O, Mihasan M and Hritcu L: Neuroprotective effects of inhaled lavender oil on scopolamine-induced dementia *via* anti-oxidative activities in rats. Phytomedicine 2013; 20(5): 446-52.

99. Zali H, Zamanian-Azodi M, Tavirani MR and Baghban AA: Protein drug targets of *Lavandula angustifolia* on treatment of rat Alzheimer's disease. Iranian Journal of Pharmaceutical Research: IJPR 2015; 14(1): 291.

100. Rajesh V, Riju T, Venkatesh S and Babu G: Memory enhancing activity of *Lawsonia inermis* Linn. leaves against scopolamine induced memory impairment in Swiss albino mice. Oriental Pharmacy and Experimental Medicine 2017; 17(2): 127-42.

101. Chavez-Perez JA, Gonzales-Arimborgo C, Rodriguez-Huaman A, Gonzales GF, Casimiro-Gonzales S, Cisneros-Fernandez R and Aguilar-Mendoza LA: Antioxidant and neuroprotector effect of *Lepidium meyenii* (maca) methanol leaf extract against 6-hydroxy dopamine (6-OHDA)-induced toxicity in PC12 cells.

102. Rubio J, Dang H, Gong M, Liu X, Chen SL and Gonzales GF: Aqueous and hydroalcoholic extracts of Black Maca (*Lepidium meyenii*) improve scopolamine-induced memory impairment in mice. Food and Chemical Toxicology 2007; 45(10): 1882-90.

103. Arantes LP, Colle D, Machado ML, Zamberlan DC, Tassi CL, da Cruz RC, Manfron MP, Athayde ML and Soares FA: *Luehea divaricata* Mart. anticholinesterase and antioxidant activity in a *Caenorhabditis elegans* model system. Industrial Crops and Products 2014; 62: 265-71.

104. Courtes AA, Arantes LP, Barcelos RP, da Silva IK, Boligon AA, Athayde ML, Puntel RL and Soares FA: Protective effects of aqueous extract of *Luehea divaricata* against behavioural and oxidative changes induced by 3-nitropropionic acid in rats. Evidence-Based Complementary and Alternative Medicine 2015.

105. Gao K, Liu M, Cao J, Yao M, Lu Y, Li J, Zhu X, Yang Z and Wen A: Protective effects of *Lycium barbarum* polysaccharide on 6-OHDA-induced apoptosis in PC12 cells through the ROS-NO pathway. Molecules 2015; 20(1): 293-08.

106. Yu MS, Leung SK, Lai SW, Che CM, Zee SY, So KF, Yuen WH and Chang RC: Neuroprotective effects of anti-aging oriental medicine *Lycium barbarum* against β-amyloid peptide neurotoxicity. Experimental gerontology. 2005; 40(8-9): 716-27.

107. Oboh G, Bakare OO, Ademosun AO, Akinyemi AJ and Olasehinde TA: Inhibition of cholinesterases and some pro-oxidant induced oxidative stress in rats brain by two tomato (*Lycopersicon esculentum*) varieties. International journal of Biomedical Science: IJBS 2015; 11(1): 48.

108. Suganuma H, Hirano T, Arimoto Y and Inakuma T: Effect of tomato intake on striatal monoamine level in a mouse model of experimental Parkinson's disease. Journal of Nutritional Science and Vitaminology 2002; 48(3): 251-4.

109. Zhu YY, Li X, Yu HY, Xiong YF, Zhang P, Pi HF and Ruan HL: Alkaloids from the bulbs of *Lycoris longituba* and their neuroprotective and acetylcholinesterase inhibitory activities. Archives of Pharmacal Research 2015; 38(5): 604-13.

110. Ho YS, Yu MS, Lai CS, So KF, Yuen WH and Chang RC: Characterizing the neuroprotective effects of alkaline extract of *Lycium barbarum* on β-amyloid peptide neurotoxicity. Brain Research 2007; 1158: 123-34.

111. Li Y, Wu Z, Gao X, Zhu Q, Jin Y, Wu A and Huang AC: Anchanling reduces pathology in a lactacystin-induced Parkinson's disease model. Neural Regeneration Research 2012; 7(3): 165.

112. Zhu YY, Li X, Yu HY, Xiong YF, Zhang P, Pi HF and Ruan HL: Alkaloids from the bulbs of *Lycoris longituba* and their neuroprotective and acetylcholinesterase inhibitory activities. Archives of Pharmacal Research 2015; 38(5): 604-13.

113. Kim J, Park Y, Chun YS, Cha JW, Kwon HC, Oh MS, Chung S and Yang HO: Effect of *Lycoris chejuensis* and its active components on experimental models of Alzheimer's disease. Journal of Agricultural and Food Chemistry 2015; 63(31): 6979-88.

114. Salami M, Malekmohammadi R, Banitaba SM and Roghani M: *Melissa officinalis* aqueous extract ameliorates 6-hydroxydopamine-induced neurotoxicity in hemi-parkinsonian rat. Journal of Basic and Clinical Pathophysiology 2013; 2(1): 23-7.

115. Bayat M, Tameh AA, Ghahremani MH, Akbari M, Mehr SE, Khanavi M and Hassanzadeh G: Neuroprotective properties of *Melissa officinalis* after hypoxic-ischemic injury both *in-vitro* and *in-vivo*. DARU Journal of Pharmaceutical Sciences 2012; 20(1): 42.

116. Ghanta MK: Neuroprotective effects of *Momordica charantia* extract in 1 methyl 4 phenyl 1 2 3 6 tetrahydropyridine mptp induced apoptosis of striatal neurons in mice model of Parkinsonism.

117. Valarmathi N, Sree RS and Rajan TS: Neuroprotective effects of Momordica charantia: A review from preclinical studies. International Journal of Research in Pharmaceutical Sciences 2020; 11(2): 1902-7.

118. Pathakota R, Chunduru S, Damu U and Pitta L: Neuroprotective effects of *Momordica charantia* on scopolamine induced Alzheimer's disease. World J Pharm Pharm Sci 2017; 2141-55.

119. Praveen K and Yellamma K: Insilco identification of suitable acetuylcholinesterase inhibitors from *Morinda citrifolia* Linn. with reference to Alzheimer's disease. International Journal of Pharmaceutical Sciences and Research 2014; 5(12): 5474.

120. Chen J, Shi X, Chen Y, Liang H, Cheng C and He Q: Neuroprotective effects of chloroform and aqueous fractions of noni juice against t-Butyl hydroperoxide-induced oxidative damage in SH-SY5Y cells. Food & Nutrition Research 2018; 62.

121. Paudel P, Seong SH, Zhou Y, Ha MT, Min BS, Jung HA and Choi JS: Arylbenzofurans from the root bark of *Morus alba* as triple inhibitors of cholinesterase, β-site amyloid precursor protein cleaving enzyme 1, and glycogen synthase kinase-3β: Relevance to Alzheimer's disease. ACS Omega 2019; 4(4): 6283-94.

122. Kim HG, Ju MS, Shim JS, Kim MC, Lee SH, Huh Y, Kim SY and Oh MS: Mulberry fruit protects dopaminergic neurons in toxin-induced Parkinson's disease models. British Journal of Nutrition 2010; 104(1): 8-16.

123. Nayak VS, Kumar N, Dsouza AS, Nayak SS and Pai KS: Modulatory Role of Mucuna Pruriens against Aluminium Fluoride Induced Neuronal and Behavioural Alterations in Rats. Journal of Clinical & Diagnostic Research 2018; 12(4).

124. Hussian G and Manyam BV: *Mucuna pruriens* proves more effective than L-DOPA in Parkinson's disease animal model. Phytotherapy Research: An International Journal Devoted to Medical and Scientific Research on Plants and Plant Products 1997; 11(6): 419-23.

125. Ayoola IO, Gueye B, Sonibare MA and Abberton MT: Antioxidant activity and acetylcholinesterase inhibition of field and *in-vitro* grown Musa L. species. Journal of Food Measurement and Characterization 2017; 11(2): 488-99.

126. Akram M and Nawaz A: Effects of medicinal plants on Alzheimer's disease and memory deficits. Neural Regeneration Research 2017; (4): 660.

127. Al-Quraishy S, Dkhil MA, Abdel-Gaber R, Zrieq R, Hafez TA, Mubaraki MA and Moneim AE: *Myristica fragrans* seed extract reverses scopolamine-induced cortical injury *via* stimulation of HO-1 expression in male rats. Environmental Science and Pollution Research 2020: 1-0.

128. Bhattacharjee A: Anticholinesterase potential of phytoextracts and their bioactive compounds: a promising therapeutic agent against Alzheimer's disorder. MOJ Tumor Res 2018; (2): 84-88.

129. Liu QF, Lee JH, Kim YM, Lee S, Hong YK, Hwang S, Oh Y, Lee K, Yun HS, Lee IS, Jeon S: *In-vivo* screening of traditional medicinal plants for neuroprotective activity against Aβ42 cytotoxicity by using Drosophila models of Alzheimer's disease. Biological and Pharmaceutical Bulletin 2015: b15-00459.

130. Ahmad M, Yousuf S, Khan MB, Hoda MN, Ahmad AS, Ansari MA, Ishrat T, Agrawal AK and Islam F: Attenuation by Nardostachys jatamansi of 6-hydroxy-dopamine-induced parkinsonism in rats: behavioral, neurochemical, and immunohistochemical studies. Pharmacology Biochemistry and Behaviour 2006; 83(1): 150-60.

131. Soto-Otero R, Méndez-Álvarez E, Hermida-Ameijeiras Á, López-Real AM and Labandeira-García JL: Effects of (−)-nicotine and (−)-cotinine on 6-hydroxydopamine-induced oxidative stress and neurotoxicity: relevance for Parkinson's disease. Biochemical Pharmacology 2002; 64(1): 125-35.

132. Russo P, Frustaci A, Del Bufalo A, Fini M and Cesario A: From traditional European medicine to discovery of new drug candidates for the treatment of dementia and Alzheimer's disease: acetylcholinesterase inhibitors. Current Medicinal Chemistry 2013; 20(8):976-83.

133. Hosseini M, Mohammadpour T, Karami R, Rajaei Z, Sadeghnia HR and Soukhtanloo M: Effects of the hydro-alcoholic extract of Nigella sativa on scopolamine-induced spatial memory impairment in rats and its possible mechanism. Chinese J of Integ Medi 2015; 21(6): 438-44.

134. Cascella M, Bimonte S, Barbieri A, Del Vecchio V, Muzio MR, Vitale A, Benincasa G, Ferriello AB, Azzariti A, Arra C and Cuomo A: Dissecting the potential roles of *Nigella sativa* and its constituent thymoquinone on the prevention and on the progression of alzheimer's disease. Frontiers in aging Neuroscience 2018; 10: 16.

135. Sedaghat R, Roghani M and Khalili M: Neuroprotective effect of thymoquinone, the *Nigella sativa* bioactive compound, in 6-hydroxydopamine-induced hemi-parkinsonian rat model. Iranian Journal of Pharmaceutical Research: IJPR 2014; 13(1): 227.

136. Luo H, Hu J, Wang Y, Chen Y, Zhu D, Jiang R and Qiu Z: *In-vivo* and *in-vitro* neuroprotective effects of Panax ginseng glycoproteins. International Journal of Biological Macromolecules 2018; 113: 607-15.

137. Li H, Kang T, Qi B, Kong L, Jiao Y, Cao Y, Zhang J and Yang J: Neuroprotective effects of ginseng protein on PI3K/Akt signaling pathway in the hippocampus of D-galactose/AlCl₃ inducing rats model of Alzheimer's disease. Journal of Ethnopharmacology 2016; 179: 162-9.

138. Jang M, Lee MJ, Kim CS and Cho IH: Korean Red Ginseng extract attenuates 3-nitropropionic acid-induced Huntington's-like symptoms. Evidence-Based Complementary and Alternative Medicine 2013.

139. Van Kampen JM, Baranowski DB, Shaw CA and Kay DG: *Panax ginseng* is neuroprotective in a novel progressive model of Parkinson's disease. Experimental gerontology. 2014; 50: 95-105.

140. Adsersen, Anne, Bente Gauguin, Gudiksen L and Jäger AK: Screening of plants used in Danish folk medicine to treat memory dysfunction for acetylcholinesterase inhibitory activity. Journal of Ethnopharmacology 2006; 104(3): 418-422.

141. Mahmood S, Hussain S, Malik F. Critique of medicinal conspicuousness of Parsley (Petroselinum crispum): a culinary herb of Mediterranean region. Pak J Pharm Sci 2014; 27(1): 193-202.

142. Mehta, Mona, Adem A and Sabbagh M: New acetylcholinesterase inhibitors for Alzheimer's disease. International Journal of Alzheimer's disease 2012.

143. Dey A and Mukherjee A: Plant-derived alkaloids: a promising window for neuroprotective drug discovery. In

Discovery and Development of Neuroprotective Agents from Natural Products Elsevier 2018; 237-20.

144. Dalai, Manoj K, Santanu B, Bandyopadhyay A and Mukherjee PK: Evaluation of anti-cholinesterase activity of the standardized extract of *Piper betel* L. leaf. Oriental Pharmacy and Experimental Medicine 2014; 14(1): 31-35.

145. Schmidt N and Ferger B: Neuroprotective effects of (±)-kavain in the MPTP mouse model of Parkinson's disease. Synapse 2001; 40(1): 47-54.

146. Singhal AK, Naithani V and Bangar OP: Medicinal plants with a potential to treat Alzheimer and associated symptoms. International Journal of Nutrition, Pharmacology, Neurological Diseases 2012; 2(2): 84.

147. Salleh, Wan WMNH, Hashim NA, Ahmad F and Yen KH: "Anticholinesterase and antityrosinase activities of ten Piper species from Malaysia." Advanced Pharmaceutical bulletin 4, no. 2014; (2): 527.

148. Morais LC, Quintans-Júnior LJ, Franco CI, Almeida JR and Almeida RN: Antiparkinsonian-like effects of *Plumbago scandens* on tremorine-induced tremors methodology. Pharmacology Biochemistry and Behaviour 2004; 79(4): 745-9.

149. Wang L, Jin GF, Yu HH, Lu XH, Zou ZH, Liang JQ and Yang H: Protective effects of tenuifolin isolated from *Polygala tenuifolia* Willd roots on neuronal apoptosis and learning and memory deficits in mice with Alzheimer's disease. Food & Function 2019; 10(11): 7453-60.

150. Choi JG, Kim HG, Kim MC, Yang WM, Huh Y, Kim SY and Oh MS: Polygalae radix inhibits toxin-induced neuronal death in the Parkinson's disease models. Journal of Ethnopharmacology 2011; 134(2): 414-21.

151. Ayaz M, Junaid M, Ullah F, Sadiq A, Khan MA, Ahmad W, Shah MR, Imran M and Ahmad S: Comparative chemical profiling, cholinesterase inhibitions and anti-radicals properties of essential oils from *Polygonum hydropiper* L: A Preliminary anti-Alzheimer's study. Lipids in Health and Disease 2015; 14(1): 141.

152. Wang Y, Xu H, Fu Q, Ma R and Xiang J: Protective effect of resveratrol derived from *Polygonum cuspidatum* and its liposomal form on nigral cells in Parkinsonian rats. Journal of the Neurological Sciences 2011; 304(1-2): 29-34.

153. Martins WB, Rodrigues SA, Silva HK, Dantas CG, Júnior WD, Cardoso JC and Gomes MZ: Neuroprotective effect of *Portulaca oleracea* extracts against 6-hydroxy-dopamine-induced lesion of dopaminergic neurons. Anais da Academia Brasileira de Ciências 2016; 88(3): 1439-50.

154. Yan-Xi Z, Hai-Liang X, Rahman K, Su-Juan W, Cheng P and Zhang H: *Portulaca oleracea* L.: a review of phytochemistry and pharmacological effects. BioMed Research International 2015.

155. Kulkarni KS, Kasture SB and Mengi SA: Efficacy study of Prunus amygdalus (almond) nuts in scopolamine-induced amnesia in rats. Indian Journal of Pharmacology 2010; 42(3): 168.

156. Andrade C: The Herbal Treatment of Parkinson's disease: A Possible Role for BR-16A (Mentat). Ind J Psychol 1996; 19, (2): 82-88.

157. Chen ZJ, Yang YF, Zhang YT and Yang DH: Dietary total prenylflavonoids from the fruits of *Psoralea corylifolia* L. prevents age-related cognitive deficits and down-regulates Alzheimer's markers in SAMP8 mice. Molecules 2018; 23(1): 196.

158. Im AR, Chae SW, jun Zhang G and Lee MY: Neuroprotective effects of *Psoralea corylifolia* Linn seed extracts on mitochondrial dysfunction induced by 3-nitropropionic acid. BMC Complementary and Alternative Medicine 2014; 14(1): 370.

159. Lin CM, Lin RD, Chen ST, Lin YP, Chiu WT, Lin JW, Hsu FL and Lee MH: Neurocytoprotective effects of the bioactive constituents of *Pueraria thomsonii* in 6-hydroxydopamine (6-OHDA)-treated nerve growth factor (NGF)-differentiated PC12 cells. Phytochemistry 2010; 71(17-18): 2147-56.

160. Xing G, Dong M, Li X, Zou Y, Fan L, Wang X, Cai D, Li C, Zhou L, Liu J and Niu Y: Neuroprotective effects of puerarin against beta-amyloid-induced neurotoxicity in PC12 cells *via* a PI3K-dependent signaling pathway. Brain Research Bulletin 2011; 85(3-4): 212-8.

161. Rao NV, Pujar B, Nimbal SK, Shantakumar SM and Satyanarayana S: Nootropic activity of tuber extract of *Pueraria tuberosa* (Roxb). nopr.niscair.res.in. 2008.

162. Odubanjo VO, Oboh G, Oyeleye SI and Adefegha SA: Anticholinesterase activity and phenolic profile of two medicinal plants (*Quassia undulata* and *Senecio abyssinicus*) used in managing cognitive dysfunction in Nigeria. Journal of Food Biochemistry 2018; 42(4): e12497.

163. Song Z, Yin F, Xiang B, Lan B and Cheng S: Systems pharmacological approach to investigate the mechanism of acori tatarinowii rhizoma for alzheimer's disease. Evidence-Based Complementary and Alternative Medicine 2018.

164. Yan L, Mahady G, Qian Y, Song P, Jian T, Ding X, Guan F, Shan Y and Wei M: The Essential Oil from Acori Tatarinowii Rhizome (the Dried Rhizome of Acorus tatarinowii Schott) Prevents Hydrogen Peroxide-Induced Cell Injury in PC12 Cells: A Signaling Triggered by CREB/PGC-1α Activation. Evidence-Based Complementary and Alternative Medicine 2020.

165. Kaur N, Jamwal S, Deshmukh R, Gauttam V and Kumar P: Beneficial effect of rice bran extract against 3-nitropropionic acid induced experimental Huntington's disease in rats. Toxicology Reports 2015; 2: 1222-32.

166. Araujo SM, de Paula MT, Poetini MR, Meichtry L, Bortolotto VC, Zarzecki MS, Jesse CR and Prigol M: Effectiveness of γ-oryzanol in reducing neuromotor deficits, dopamine depletion and oxidative stress in a *Drosophila melanogaster* model of Parkinson's disease induced by rotenone. Neurotoxicology 2015; 51: 96-105.

167. Hagl S, Grewal R, Ciobanu I, Helal A, Khayyal MT, Muller WE and Eckert GP: Rice bran extract compensates mitochondrial dysfunction in a cellular model of early Alzheimer's disease. Journal of Alzheimer's Disease 2015; 43(3): 927-38.

168. Attanayake AP and Jayatilaka KA: Acetylcholinesterase inhibitory activity and antioxidant activity of selected medicinal plant extracts used against cognitive dysfunction and memory loss in sri lankan traditional medicine. Asian Journal of Pharmaceutical Research and Development 2018; 6(5): 16-25.

169. Salari M, Kalantaripour TP, Esmaeilpour K, Masoumi-Ardakani Y, Oloumi H and Asadi-Shekaari M: Investigating the effects of *Rosa canina* L. fruit extract in animal model of alzheimer's disease. Journal of Research in Medical and Dental Science 2018; 6(6): 141-6.

170. Daneshmand P, Saliminejad K, Shasaltaneh MD, Kamali K, Riazi GH, Nazari R, Azimzadeh P and Khorshid HR: Neuroprotective effects of herbal extract (*Rosa canina*, *Tanacetum vulgare* and *Urtica dioica*) on rat model of sporadic Alzheimer's disease. Avicenna Journal of Medical Biotechnology 2016; 8(3): 120.

171. Park SE, Kim S, Sapkota K and Kim SJ: Neuroprotective effect of *Rosmarinus officinalis* extract on human

dopaminergic cell line, SH-SY5Y. Cellular and Molecular Neurobiology 2010; 30(5): 759-67.

172. Azad N, Rasoolijazi H, Joghataie MT and Soleimani S: Neuroprotective effects of carnosic acid in an experimental model of Alzheimer's disease in rats. Cell Journal (Yakhteh). 2011; 13(1): 39.

173. Essa MM, Vijayan RK, Castellano-Gonzalez G, Memon MA, Braidy N and Guillemin GJ: Neuroprotective effect of natural products against Alzheimer's disease. Neurochemical Research 2012; 37(9): 1829-42.

174. Zhou L, Lou LL, Wang W, Lin B, Chen JN, Wang XB, Huang XX and Song SJ: Enantiomeric 8-O-4′ type neolignans from red raspberry as potential inhibitors of β-amyloid aggregation. Journal of Functional Foods 2017; 37: 322-9.

175. Singh R: Current Alzheimer's management with berries fruits therapy. J pub health catalog. 2018; 1 (2): 17-24. J pub health catalog 2018; (1)2018: 2.

176. Purushothuman S, Nandasena C, Peoples CL, El Massri N, Johnstone DM, Mitrofanis J and Stone J: Saffron pre-treatment offers neuroprotection to nigral and retinal dopaminergic cells of MPTP-treated mice. Journal of Parkinson's Disease 2013; 3(1): 77-83.

177. Akhondzadeh S, Sabet MS, Harirchian MH, Togha M, Cheraghmakani H, Razeghi S, Hejazi SS, Yousefi MH, Alimardani R, Jamshidi A and Zare F: Saffron in the treatment of patients with mild to moderate Alzheimer's disease: a 16-week, randomized and placebo-controlled trial. J of Clinical Pharma and Therape 2010; 35(5): 581-8.

178. Akhondzadeh S, Noroozian M, Mohammadi M, Ohadinia S, Jamshidi AH and Khani M: *Salvia officinalis* extract in the treatment of patients with mild to moderate Alzheimer's disease: a double blind, randomized and placebo-controlled trial. Journal of Clinical Pharmacy and Therapeutics 2003; 28(1):53-9.

179. Ren B, Zhang YX, Zhou HX, Sun FW, Zhang ZF, Wei ZF, Zhang CY and Si DW: Tanshinone IIA prevents the loss of nigrostriatal dopaminergic neurons by inhibiting NADPH oxidase and iNOS in the MPTP model of Parkinson's disease. Journal of the Neurological Sciences 2015; 348(1-2): 142-52.

180. Zhang XZ, Qian SS, Zhang YJ and Wang RQ: *Salvia miltiorrhiza*: a source for anti-Alzheimer's disease drugs. Pharmaceutical Biology 2016; 54(1): 18-24.

181. Poudel S and Lee Y: Impaired taste associative memory and memory enhancement by feeding Omija in Parkinson's Disease fly model. Molecules and Cells 2018; 41(7): 646.

182. Song JX, Lin X, Wong RN, Sze SC, Tong Y, Shaw PC and Zhang YB: Protective effects of *dibenzocyclooctadiene lignans* from *Schisandra chinensis* against beta-amyloid and homocysteine neurotoxicity in PC12 cells. Phytotherapy Research 2011; 25(3): 435-43.

183. Olatunji BP, Fasola TR, Onasanwo SA, Akinyemi AJ, Adeniy PA and Ishola AO: Neuronal alterations and antioxidant status of lipopolysaccharide induced neuronal damage in mice: eff icacy of three medicinal plants. Journal of Applied Pharmaceutical Science 2017; 7(12).

184. Syad AN and Devi KP: Botanics: a potential source of new therapies for Alzheimer's disease. Botanics: Targets Therapy 2014; 4:11-26.

185. Heo, Hwon, Shin Y, Cho W, Choi YS, Kim H and Kwon YK: "Memory improvement in ibotenic acid induced model rats by extracts of *Scutellaria baicalensis*." Journal of ethnopharmacology 2009; 122(1): 20-27.

186. Gao, Zhonghong, Huang K and Xu H: "Protective effects of flavonoids in the roots of *Scutellaria baicalensis* Georgi

against hydrogen peroxide-induced oxidative stress in HS-SY5Y cells." Pharmacological Research 2001; 43(2): 173-78.

187. Odubanjo VO, Oboh G, Oyeleye SI and Adefegha SA: Anticholinesterase activity and phenolic profile of two medicinal plants (*Quassia undulata* and *Senecio abyssinicus*) used in managing cognitive dysfunction in Nigeria. Journal of Food Biochemistry 2018; 42(4): e12497.

188. Park HJ, Zhao TT, Lee KS, Lee SH, Shin KS, Park KH, Choi HS and Lee MK: Effects of (-)-sesamin on 6-hydroxydopamine-induced neurotoxicity in PC12 cells and dopaminergic neuronal cells of Parkinson's disease rat models. Neurochemistry International 2015; 83: 19-27.

189. Talabi J, Adeyemi S, Awopetu S, Ajiboye BO and Ojo OA: Inhibitory effect of aqueous extracts of raw and roasted *Sesamum indicum* L. seeds on key enzymes linked to type-2 diabetes (α-amylase and α-glucosidase) and Alzheimer's disease (acetylcholinesterase and butyrylcholinesterase). Potravinarstvo 2018; 12(1).

190. Pérez-H J, Carrillo-S C, García E, Ruiz-Mar G, Pérez-Tamayo R and Chavarría A: Neuroprotective effect of silymarin in a MPTP mouse model of Parkinson's disease. Toxicology 2014; 319: 38-43.

191. Hirayama K, Oshima H, Yamashita A, Sakatani K, Yoshino A and Katayama Y: Neuroprotective effects of silymarin on ischemia-induced delayed neuronal cell death in rat hippocampus. Brain Research 2016; 1646: 297-03.

192. Shal B, Ding W, Ali H, Kim YS and Khan S: Anti-neuroinflammatory potential of natural products in attenuation of Alzheimer's disease. Frontiers in Pharmacology 2018; 9: 548.

193. Ojo OA, Afon AA, Ojo AB, Ajiboye BO, Okesola MA, Aruleba RT, Adekiya TA and Oyinloye BE: *Spondias mombim* L.(Anacardiaceae): Chemical fingerprints, inhibitory activities, and molecular docking on key enzymes relevant to erectile dysfunction and Alzheimer's diseases. Journal of Food Biochemistry 2019; 43(3): e12772.

194. Sancheti S, Um BH and Seo SY: 1, 2, 3, 4, 6-penta-O-galloyl-β-D-glucose: A cholinesterase inhibitor from Terminalia chebula. South African Journal of Botany 2010; 76(2): 285-8.

195. Lee GY, Lee C, Park GH and Jang JH: Amelioration of scopolamine-induced learning and memory impairment by α-pinene in C57BL/6 mice. Evidence-Based Complementary and Alternative Medicine 2017.

196. Ju MS, Lee P, Kim HG, Lee KY, Hur J, Cho SH, Sung SH and Oh MS: Protective effects of standardized *Thuja orientalis* leaves against 6-hydroxydopamine-induced neurotoxicity in SH-SY5Y cells. Toxicology *in-vitro*. 2010; 24(3): 759-65.

197. Kosaraju J, Chinni S, Roy PD, Kannan E, Antony AS and Kumar MS: Neuroprotective effect of *Tinospora cordifolia* ethanol extract on 6-hydroxy dopamine induced Parkinsonism. Indian Journal of Pharmacology 2014; 46(2): 176.

198. Malve HO: Comparative evaluation of the effects of *Tinospora cordifolia* and *Phyllanthus emblica* combination on learning and memory performance of mice exploring Bhavana samskara effects. http://www.jaim.in June 08, 2015, IP: 203.115.113.34

199. Chen HQ, Wang XJ, Jin ZY, Xu XM, Zhao JW and Xie ZJ: Protective effect of isoflavones from *Trifolium pratense* on dopaminergic neurons. Neuroscience research. 2008; 62(2): 123-30.

200. Yu HL, Li L, Zhang XH, Xiang L, Zhang J, Feng JF and Xiao R: Neuroprotective effects of genistein and folic acid on apoptosis of rat cultured cortical neurons induced by β-amyloid 31-35. British J of Nutri 2009; 102(5): 655-62.

201. Liu Y, Chen HL and Yang G: Extract of *Tripterygium wilfordii* Hook F protect dopaminergic neurons against lipopolysaccharide-induced inflammatory damage. The American J of Chinese Medicine 2010; 38(04): 801-14.

202. Nie J, Zhou M, Lü C, Hu X, Wan B, Yang B and Li Y: Effects of triptolide on the synaptophysin expression of hippocampal neurons in the AD cellular model. International Immunopharmacology 2012; 13(2): 175-80.

203. Fujiwara H, Iwasaki K, Furukawa K, Seki T, He M, Maruyama M, Tomita N, Kudo Y, Higuchi M, Saido TC and Maeda S: *Uncaria rhynchophylla*, a Chinese medicinal herb, has potent antiaggregation effects on Alzheimer's β-amyloid proteins. Journal of Neuroscience Research 2006; 84(2): 427-33.

204. Shim JS, Kim HG, Ju MS, Choi JG, Jeong SY and Oh MS: Effects of the hook of *Uncaria rhynchophylla* on neurotoxicity in the 6-hydroxydopamine model of Parkinson's disease. Journal of Ethno 2009; 126(2): 361-5.

205. Shi Z, Lu Z, Zhao Y, Wang Y, Zhao-Wilson X, Guan P, Duan X, Chang YZ and Zhao B: Neuroprotective effects of aqueous extracts of *Uncaria tomentosa*: Insights from 6-OHDA induced cell damage and transgenic *Caenorhabditis elegans* model. Neurochemistry International 2013; 62(7): 940-7.

206. Odubanjo VO, Oboh G and Ibukun EO: Antioxidant and anticholinesterase activities of aqueous extract of *Uraria picta* (Jacq.) DC. African J Pharm Pharmacol 2013; 7: 2768-73.

207. Anand A, Khurana R, Wahal N, Mahajan S, Mehta M, Satija S, Sharma N, Vyas M and Khurana N: Vanillin: A Comprehensive Review of Pharmacological Activities. Plant Archives 2019; 19(2): 1000-4.

208. Yi M, Yi H, Li H and Wu L: Aluminum induces chromosome aberrations, micronuclei and cell cycle dysfunction in root cells of *Vicia faba*. Environmental Toxicology: An International Journal 2010; 25(2): 124-9.

209. Carrera I and Cacabelos R: Current drugs and potential future neuroprotective compounds for parkinson's disease. Current Neuropharmacology 2019; 17(3): 295-06.

210. Shetty K, Randhir R and Sarkar D: Bioprocessing Strategies to Enhance L-DOPA and Phenolic Bioactives in the Fava Bean (*Vicia faba*). Functional Foods and Biotechnology: Sources of Functional Foods and Ingredients 2019.

211. R Howes MJ and J Houghton P: Ethnobotanical treatment strategies against Alzheimer's disease. Current Alzheimer Research 2012; 9(1): 67-85.

212. Lakshmi BV, Sudhakar M and Anisha M: Neuroprotective role of hydroalcoholic extract of *Vitis vinifera* against aluminium-induced oxidative stress in rat brain. Neurotoxicology 2014; 41: 73-9.

213. Long J, Gao H, Sun L, Liu J and Zhao-Wilson X: Grape extract protects mitochondria from oxidative damage and improves locomotor dysfunction and extends lifespan in a Drosophila Parkinson's disease model. Rejuvenation Research 2009; 12(5):321-31.

214. Wang CK, Chen LG, Wen CL, Hou WC, Hung LF, Yen SJ, Shen YJ, Lin SY and Liang YC: Neuroprotective activity of *Vitis thunbergii* var. taiwaniana extracts *in-vitro* and *in-vivo*. Journal of Medicinal Food 2010; 13(1):170-8.

215. Bhattacharya SK, Kumar A, Ghosal S. Effects of glycowithanolides from *Withania somnifera* on an animal model of Alzheimer's disease and perturbed central cholinergic markers of cognition in rats. Phytotherapy Research 1995; 9(2):110-3.

216. RajaSankar S, Manivasagam T, Sankar V, Prakash S, Muthusamy R, Krishnamurti A and Surendran S: *Withania somnifera* root extract improves catecholamines and physiological abnormalities seen in a Parkinson's disease model mouse. Journal of Ethnopharmacology 2009; 125(3): 369-73.

217. Kumar P and Kumar A: Possible neuroprotective effect of *Withania somnifera* root extract against 3-nitropropionic acid-induced behavioural, biochemical and mitochondrial dysfunction in an animal model of Huntington's disease. Journal of Medicinal Food 2009; 12(3): 591-600.

218. Mathew, Maya and Subramanian S: "*In-vitro* evaluation of anti-Alzheimer effects of dry ginger (*Zingiber officinale* Roscoe) extract" 2014.

219. Tung BT, Thu DK, Thu NT and Hai NT: Antioxidant and acetylcholinesterase inhibitory activities of ginger root (*Zingiber officinale* Roscoe) extract. Journal of Complementary and Integrative Medicine 2017; 14(4).

220. Park G, Kim HG, Ju MS, Ha SK, Park Y, Kim SY and Oh MS: 6-Shogaol, an active compound of ginger, protects dopaminergic neurons in Parkinson's disease models *via* anti-neuroinflammation. Acta Pharmacologica Sinica 2013; 34(9): 1131-9.