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Review on Ayurvedic Plant Based Compounds to Cure the Neurological Disorders

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Abstract:
Nature is a compact of various resources that forms and evolutes different kind of organisms in our surrounding. The biggest resource our natural environment gave us is plants and its product. It is observed that day-to-day our environment gets changed due to pollution, caused by physical or chemical agents. Due to these changes human beings suffer with so many disorders, one of the disorders is neurological disorders. Neurological disorders includes Alzheimer's diseases, Parkinson's diseases, Schizophrenia, Huntington's disease, autism spectrum disorder (ASD). Through this article we want to highlight that there are certain plant's product that play important role in curing such disorders

Keywords: Plants, disorders, alzheimer's diseases, parkinson's diseases, schizophrenia, huntington's disease, autism spectrum disorder (ASD) and neurological diseases

Introduction
Neurological disorders are the foremost occurring diseases across the globe resulting in progressive dysfunction, loss of neuronal structure ultimately cell death. Therefore, attention has been drawn toward the natural resources for the search of neuroprotective agents. Plant-based food bio actives have emerged as potential neuroprotective agents for the treatment of neurodegenerative disorders. This comprehensive review primarily focuses on various plant food bioactive, mechanisms, therapeutic targets, in vitro and in vivo studies in the treatment of neurological disorders to explore whether they are boon or bane for neurological disorders. In addition, the clinical perspective of plant food bio actives in neurological disorders is also highlighted. Scientific evidences point toward the enormous therapeutic efficacy of plant food bio actives in the prevention or treatment of neurological disorders. Nevertheless, identification of food bioactive components accountable for the neuroprotective effects, mechanism, clinical trials, and consolidation of information flow are warranted. Plant food bio actives primarily act by mediating through various pathways including oxidative stress, neuron-inflammation, apoptosis, excitotoxicity, specific proteins, mitochondrial dysfunction, and reversing neuro degeneration and can be used for the prevention and therapy of neurodegenerative disorders. In conclusion, the plant-based food bio actives are boon for neurological disorders (Natural Product Research, vol. 27, no. 16, pp. 1463–1467, 2013) Use of plants for curing human ailments is an ancient practice. Recently there is revival of interest. Ethno botanical field surveys have been done from different parts of developing countries of the world. It reflects concern about the possible loss of valuable information on traditional medicine (International Journal of Pharmacy and Pharmaceutical Sciences, vol. 3, no. 5, pp. 524-528, 2011). Neurological disorders are often not considered common diseases. They are mental illness like epilepsy which is the most serious chronic disorder affecting millions of people. Other's like Parkinson's, Alzheimer's, Meningitis and Stroke. Nervous disorders also affect speaking, movement, breathing, mood and memory. Herbal medicines are a holistic medium. Growing of these important herbs will add to the terrestrial diversity of the ecosystem and help in conservation of Biodiversity. Centella asiatica, Avena sativa, Lagenaria siceraria, Cassia tora, Cassia fistula are some of the important

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plants used in nervous disorders. The different medicinal plant varieties can be studied with biochemical properties and a taxonomic classification canbe made based on medicinal uses and on the biochemical relationship drawn.

Tissue Culture studies along with molecular characterization can also be done. Important germplasm of the medicinal plants will add to the terrestrial biodiversity and the most effective medicinal plant used for nervous disorder can be obtained.

Fig1: Neurological system

Alzheimer's disease:

Alzheimer's disease originally defined as prsenile dementia, means an acquired organic mental disorder with loss of intellectual abilities of sufficient seviarity to interfere with social or occupational functioning. It is associated with brain shrinkage and localized loss of neurons, mainly in the hippocampus and basal fore brain. Two microscopic features are characteristic of the disease namely extra cellular amyloid plaques consisting of amorphous extracelluar deposits of β-amyloid protein and intranuronal neurofibrillary tangles, comprising filaments of phosphorilated form of a microtubule associated protein. This disease is also considered as a short term memory loss.

Parkinson's disease:

It is a progressive disorder of movement associated with continuous shivering that occurs mainly in the elderly. It is commonly associated with dementia. The symptoms include tremor at rest usually starting in the hands, muscle rigidity detectable as an increased resistance in passive limb movement, hypokinesis suppression of voluntary muscles. In this condition the neurotransmitter levels are decreased in brain, such as dopamine,5-HT, acetylcholine ,nor epinephrine. These neurotransmitters are decreased mainly in the substantianigra and carpus striatum of brain.

Depression:

Depression is the most common affective disorder which is accompanied by hallucination and delusions. It is a common affective disorder of mood rather than disturbances of thought or cognition. In this disease condition the neurotransmitters levels in brain is increased such as dopamine, acetylcholine, nor epinephrine etc. The symptoms of this disease are of two types- emotional symptoms: Feelings of guilt, loss of motivation, ugliness etc and biological symptoms: Retardation of thought, loss of libido, sleep disturbance and loss of appetite.

There are 2 types of depressive syndrome namely

1) Unipolar depression: In this mood swings are always in the same direction.

2) Bipolar depression: In which depression alternates with mania.

Epilepsy:

The characteristic event in epilepsy is seizure. This is associated with high frequency
discharge of impulses by group of neurons in the brain. It is divided into

1) Partial epilepsy: symptoms depend on the brain region or regions involved and

2) Generalized epilepsy: In which total brain is damaged, including reticular system.

Schizophrenia:

It is one of the most important forms of psychiatric (mental) illness. In this diseased condition patient don't know what is happening at present and he does not cooperate with the physician for treatment.

The symptoms of this disease are 2 types:

1) Positive symptoms: delusions (often paranoid in nature), Hallucination, thought disorders, abnormal behaviour.

2) Negative symptoms: withdrawal from social contact, flattening of emotional responses.

In this condition the level of neurotransmitter such as dopamine, 5HT, acetylcholine, nor epinephrine level is increased in the brain. Huntington's disease [HD]

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Huntington's disease is called as Huntington disease, Huntington's chorea, chorea major, or simply HD and is the most common genetic cause of chorea. Thiincurable,neurodegenerative disorder was named after the American physician George Huntington who accurately described it in 1872. Prevalence, per country, is up to 7 people in 100,000 (in populations of Western European inheritence), and can be much higher in localized regions.Onset of physical symptoms can begin at any age, although the mean age of onset is 35 to 44 years of age. Less commonly, onset is before the age of twenty, and the condition is classified as juvenile HD (also known as akinetic-rigid HD or Westphal variant HD) - which progresses faster with slightly different symptoms. In 1993 genetic testing was made possible with the discovery of a single causal gene, the first non-sexlinked dominant disease gene to be found,as such counselling for HD had to be developed and became a model for other dominant disorders. The test can be performed before the onset of symptoms, at any age - even pre-birth, which has raised various ethical issues and their debate is heated.The mechanism of the disease is not fully understood, but a number of factors have been identified. A mutation in the Huntingtin gene, causes the production of the mutant protein huntingtin, which in turn produces cell and macroscopical changes in the brain.There is no cure for HD, although there are treatments to relieve some of its symptoms. t movements called chorea. Rigidity and dystonia become evident as the disorder progresses, and gradually become the dominant physical symptoms.

Anxiety:

Anxiety is a psychological and physiological state characterized by cognitive, somatic, emotional, and behavioral components. These components combine to create an unpleasant feeling that is typically associated with uneasiness, fear, or worry. Anxiety is a generalized mood state that occurs without an identifiable triggering stimulus. As such, it is distinguished from fear, which occurs in the presence of an external threat. Additionally, fear is related to the specific behaviors of escape and avoidance, whereas anxiety is the result of threats that are to be uncontrollable or unavoidable Different types of herbs for anxiety Lavender is a herb with properties that is excellent for treating panic and anxiety. It affects the central nervous system in much the same way as some drugs without the negative side effects. Passion flower can help in high blood pressure and when used as herbs for anxiety it can beput in tea or food. It is also an ingredient in many herbal remedies. Ginseng has long been used for anxiety and is a natural immune booster. The Chinese have known this for a long time. Cannabis sativa is usually smoked but can be eaten and is a great anxiety reliever. Many are aware of this and people worldwide are abusing this remedy. Valerian is used throughout the world as a natural sedative and helps with insomnia and panic attacks. It is also a mild painkiller and is considered very safe for short term use. Kava Kava is a root used for anxiety and is also well known in the treatment of sleep disorders such as insomnia. Lemon balm is good for headaches and also for relieving stress and anxiety. It is a natural sedative and is good for easing tension.Chamomille is put into tea and has been a highly touted herb for anxiety17-21. Details of Plants having CNS activity

1. Hypericum perforatum(St.John’s wort):

It consist dried aerial parts and flowers of Hypericum perforatum Family Hypericaceae (Clusiaceae).Chemical constituents include anthraquinones mainly hypercin and pseudohypercin. The current use of St.John’s wort for the treatment of mild to moderate depression. The antidepressant activity of “hypercin” is attributed to inhibition of neuronal uptake of seratonin,nor epinephrine and dopamine like many other antidepressants and also inhibits GABA & glutamate uptake in brain22,23.

2. Piper methysticum(kava-kava):

It consists of dried root of Piper methysticum Family Piperaceae. It contains piperdine, kava pyrones. It is used as sedative, anxiolytic and hallucinogen. The active constituents kava pyrones have a variety of actions like inhibition of voltage dependent sodium channels, increasing neither GABA-A receptor density blocking nor epinephrine reuptake and suppressing the release of glutamate18.

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3. Valeriana walchii:

It consists of the dried rhizomes, stolons and roots of Valeriana walchii. Family Valerianaceae. It contains sesquiterpenes like balerenal; also contain esters like bornyl formate, euginyl isovalerate, and alcohols, eugenol. It comprises of acids, esters, ketones like faurinone. The mechanism of action of valerian tends to sedate by stimulating activity of the nerve transmitter GABA that dampens the brain arousal system.

4. Ginkgo (Maiden hair-tree):

Leaves are obtained from the dioeceous tree Ginkgobiloba family Ginkgoaceae. It is only living plant in this family containing flavonoid glycoside. It contains diterpine lactones like ginkgolides A,B,C,J,andM.

Compounds of plant that can use in treatment withania somnifera(Ashwagandha)

Withania somnifera also known as Ashwagandha is an Ayurvedic medicine which has been used for many decades for its anti-inflammatory, anti-oxidant, anti-stress and neuroprotection, immune boosting and memory power enhancing ability. W. somnifera to evaluate dose related tolerance, safety and activity and suggested that the average tolerance dose concentration was 750-1250 mg/day. The extract also possesses muscle strengthening and lipid lowering ability. The various Withanolides compounds of Ashwagandha was proven for its anti-proliferative activity in lung, central nervous system and breast cancer cell lines, moreover Withanolides when included in diet is said to inhibit tumor growth. Withania somnifera inhibited NADPH-d activity which is induced by stress, the mode of action of W. somnifera on NADPH-d by inhibiting the release of corticosterone and by activating cholineacetyltransferase which boost serotonin in hippocampus. The active components of W. somnifera such as withanolide A (first isolated withanolide from W. somnifera), withanolide IV, withanolide VI possess the ability of reconstructing the pre-synapses and post- synapses; and alsoinvolves in the regeneration of neuronal axons and dendrites. Many plant species are been used for treating various ailments in humans, the use of extract either as crude or semi-purified form is proved for its therapeutic effect. Bhattacharya and Muruganandam demonstrated the anti-stress activity of W. somnifera extracts treated on Wistar rats and the chronic stress which induced perturbations were inhibited by W. somnifera (International Journal of Mycobacteriology, vol. 4, no. 2, pp. 116-123, 2015).

Fig2: withania somnifera(ashwagandha)

Ginseng

Ginseng is the root of plants in the genus Panax, such as South China ginseng (P. notoginseng), Korean ginseng (P. ginseng), and American ginseng (P. quinquefolius), characterized by the presence of ginsenosides and gintonin. Ginseng has been used in the traditional medicine of Korea and China for centuries, although there is no clinical evidence that it has any therapeutic effects. There is no substantial evidence that ginseng is effective for treating any medical condition and it has not been approved by the US Food and Drug Administration (FDA) to treat or prevent a disease or to provide a health benefit.Although ginseng is sold as a dietary supplement, inconsistent manufacturing practices for supplements have led to analyses of some ginseng products contaminated with unrelated filler compounds, and its excessive use may have adverse effects or untoward interactions with prescription drugs.One of the first written texts covering the use of ginseng as a medicinal herb was the Shen Nong Pharmacopoeia, written in China in 196 AD. In his Compendium of Materia Medica herbal of 1596, Li Shizhen described ginseng as a "superior tonic". However, the herb was not used as a "cure-all" medicine, but more specifically as a tonic for patients with chronic illnesses and those who were

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convalescing. Control over ginseng fields in China and Korea became an issue in the 16th century.

Fig3: A root of cultivated korean ginseng

Curcumin

Chemically, curcumin is a polyphenol, more particularly a diarylheptanoid, belonging to the group of curcuminoids, which are phenolic pigments responsible for the yellow color of turmeric. Extensive studies have consistently failed to show any medical value for curcumin. It is difficult to study because it is both unstable and poorly bioavailable. It is unlikely to produce useful leads for drug development as a lead compound.Curcumin is a bright yellow chemical produced by plants of the Curcuma longa species. It is the principal curcuminoid of turmeric Curcumin was named in 1815 when Henri Auguste Vogel and Pierre Joseph Pelletier reported the first isolation of a "yellow coloring-matter" from the rhizomes of turmeric.Later, it was found to be a mixture of resin and turmeric oil. In 1910, Milobedzka and Lampe reported the chemical structure of curcumin to be as diferuloylmethane. Later in 1913, the same group accomplished the synthesis of the compound. Although used in traditional medicine, the possible therapeutic properties of turmeric or curcumin remain undetermined. The most common applications are as an ingredient in dietary supplement, in cosmetics, as flavoring for foods, such as turmeric-flavored beverages in South and Southeast Asia, and as coloring for foods, such as curry powders, mustards, butters, and cheeses. As a food additive for orange-yellow coloring in prepared foods, its E number is E 100 in the European Union. It is also approved by the U.S. FDA to be used as a food coloring in US. (Curcuma longa), a member of the ginger family, Zingiberaceae. It is sold as an herbal supplement, cosmetics ingredient, food flavoring, and food coloring

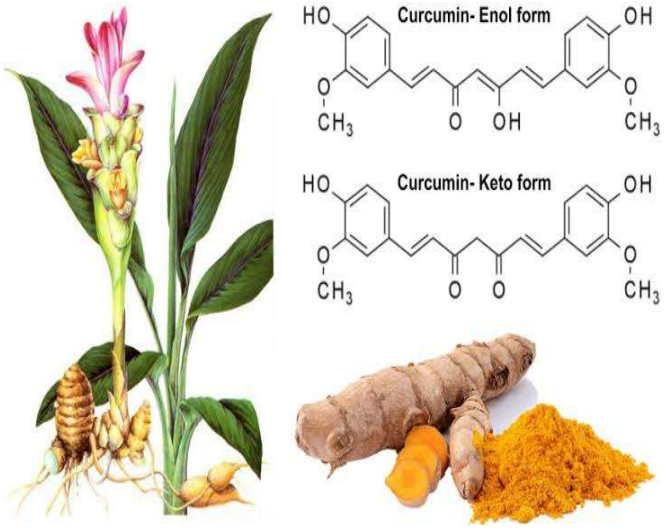

Fig4: Curcumin

Discussions

Mental and neurological disorders remain a major public health concern. The disease burden is even more prominent in the developing world, including Ghana. Recent discoveries and clinical usage of the anticancer agent taxol and the antimalarial artemisinin derived from plants have boosted interest in natural products as templates for the development of novel drug scaffolds. TAMs are widely accepted in African communities and there appears to be an increasing reliance on these products. In Ghana, TAMs are used as the main treatment paradigm for a variety of diseases, but they are also used as complements to other medicines or as dietary supplements. However, thorough examination and documentation of the medicinal properties of these products against mental and neurological disorders is lacking. In the present study, several plant species (32 species) used by local TMPs to treat mental and neurological disorders were reported, with most species belonging to the families Asteraceae, Apocynaceae, and Meliaceae. These are large and widespread plant families with several species. In particular, the Asteraceae family is of great importance due to its high numbers of medicinal species used in the

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treatment of a wide array of diseases including tuberculosis, malaria, and inflammatory disorders. Members of the Asteraceae family are also known for their wide range of economically important products including cooking oils and phytochemicals such as sesquiterpene lactones, alkaloids, and tannins. The family Apocynaceae also has a wide range of species that are of pharmacological importance, with some members synthesizing alkaloids useful against high blood pressure and inflammation and others synthesizing cardiac glycosides that affect heart function. The family Meliaceae, on the other hand, is known for its species that are processed into important products including vegetable oil, as well as phytochemicals with anti-inflammatory, antioxidant, hepatoprotective, and cognitive-enhancing properties.

Conclusion

The natural products identified in this study are a valuable collection of resources that may provide leads for drug discovery and development. However, a potential criticism of the traditional approach being employed by the TMPs in relation to the pharmaceutical industry approach to drug discovery is that whole plant extracts may contain several bioactive components, making it difficult to attribute therapeutic benefits and mechanism(s) of action to particular compounds. Moreover, some plant extract components may be negative modulators of active drug ingredients, with adverse implications for drug potential. A feasible means to refine, extend, and enhance the beneficial effects of the plant products identified in this study is to isolate, screen, and characterize bioactive compounds responsible for the positive disease-modifying effects reported. On the other hand, it is possible that components of the different plant extracts used in combination may produce positive interactions leading to complementarity in observed therapeutic effects that are more effective than single components administered at equal doses. In such a case, plant extracts whose benefits are observed when used as combinations by the traditional healers should be explored further to identify their possible synergistic activities. For example, the antimalarial drugs Quinimax (a combination of quinone, cinchonine, and quinidine) and Malarone (proguanil and avoquone) are produced and marketed as synergistic complementary drugs. Further drug discovery and development research should be conducted on the reported plant products to identify lead compounds whose in vivo therapeutic capacities would be revealed in preclinical and clinical studies. This would enable the industrial-scale production and marketing of successful drug candidates following drug authority approval. The high cost of the drug discovery and development process would, however, require strengthening academia-industry collaborative research and better provision of research funding and infrastructure. The cause of many neurodegenerative diseases still remains a mystery. The use of herbal medicine has gained a lot of interest for their therapeutic potential for many decades. In future, the use of phytochemicals will be a promising approach for neurodegenerative disorders due to their anti-inflammatory, anti-oxidative and anticholinesterase activities. The neurodegenerative disorders such as AD, PD, Huntington's, and others share common features at cellular and subcellular levels as well as sharing mostly common molecular signaling pathways that may lead to apoptosis, necroptosis, and inflammation. Overall use of herbal medicine provides promising alternatives to currenttherapies for neurodegenerative disorders.However, the potential of herbal medicine/natural compounds is immensely hindered by its poor pharmacokinetic properties. In order to overcome these limitations, the herbal medicine has been incorporated into various drug delivery formulations. Natural components have the answers of neurological disorder prevention and control up to stable health conditions.

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