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A SYSTEMIC REVIEW ON NEUROPROTECTIVE POTENTIAL OF CUCURBITA PEPO ON NEUROLOGICAL DISEASE

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Abstract

Neurodegeneration has become a very serious issue in all over the world and in order to curb the same, it is better to opt for natural therapy to prevent future occurrence and retrogression of the disease. The Pharma-market is outflown with various chemical derived drugs with long term side-effects and no assurance for complete cure. Alternative to this would be herbal treatment which may be underrated yet have high prospective for preventing progression or stagnation of the disease. This review highlights the therapeutic potential of various parts of *Cucurbita pepo* (*C.pepo*) for treating different neurodegenerative related symptoms and disorders by exhibiting various biological activity as neuroprotectant, antioxidant, nootropic, anti-depressant and anti-parkinsonian agent.

Keywords: Neurodegeneration, *Cucurbita pepo*, Neuroprotectant, Antioxidant, Nootropics.

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Introduction

Being in modern times with most advanced and sophisticated instruments, still more than half of the population are undiagnosed and unfamiliar about neurodegenerative disease. Accordingto Shengdi Chen and Jialin C. Zheng [2022] [1], in the developed world the cases of dementia is predicted to increase from 13.3 million in 2000 to 20.2 million in 2025, and to 36.5 million in 2050. On detecting the disease, patients are directly prescribed with chemical treatment, but with less or no focus on long term prevention by Ayurveda or Yoga or Dietary changes. Study by Seema Patel [2], estimated that *Cucurbita pepo* generally regarded as agro-industrial wastes and discarded are rich in polyunsaturated fatty acids, phytosterols, proteins fibres etc that have therapeutic effect on many neuro-disorders and regarded as nutraceutical in current times. *Cucurbita pepo* is associated to the Cucurbitaceae family are widely cultivated all across the world as a vegetable. Indian populations are quite accustomed to eating variety of pumpkin preparations ranging from roasted seeds with pinch of spices to Kaddu ki sabji (a preparation of pumpkin). Recently, scientific studies accentuated on the antioxidative, neuroprotective and anti-inflammatory properties of *Cucurbita pepo* whose possible mechanism of action enables progression of health status.

Methods

Cucurbita Pepo on Neurological Disorders

Anti-Parkinsonian Activity by C.pepo seeds *Cucurbita pepo* seeds (C.pepo) contributes a significant importance in Parkinson's Disease. A study conducted by Uzma Saleem et al [3]. designed to probe the methanolic extract of *Cucurbita pepo* seeds (MECP) in Parkinson induced by Haloperidol rat model. Groups treated with MECP exhibited significant reversal of cataleptic scores. Treatment with MECP caused lower levels of serotonin and dopamine in comparison to group treated with haloperidol. Also, there was increase in the biochemical markers like catalase, glutathione levels, superoxide dismutase whereas there was a decrease in nitrite levels and malondialdehyde. Michael Murkovic et al.[4]estimated that seeds have Omega 3 and 6 fatty acids, Gamma-tocopherol(Vitamin E) and L- tryptophan which are responsible for ameliorating the parkinsonian symptoms.

Ameliorative effect of Cucurbita pepo seeds on CUMS

Chronic Unpredictable Mild Stress (CUMS) was induced in the rats to aggravate at different time intervals for a period of 4 weeks. Nasra Ayuob et al [5]. conducted the

study determining the efficiency of *C.pepo* extract in parallel with standard anti-depressant drug, Fluoxetine in CUMS-exposed rats. Elevation of IL-6 and TNF-alpha are leading factors to depression was observed in this study. On Administration it exhibited progress in depressive symptoms by reducing immobility time and longer stay-time in open arm as noted from forced swim test andelevated plus maze respectively. K. M. Christian et al [6]. reported that chronic stress is the aetiology for atrophy of CA3 neurons. The herbal drug extract highlighted its cytoprotective effect on hippocampal neurons along increased expression of GFAP in the hippocampal DG and CA3 and with reduction of caspase-3, thereby factualizing the efficiency of herbal extractin treatment of depressive symptoms.

Alzheimer's Therapy by Cucurbita pepo seeds in Aluminium chloride-induced Sprague Dawley rat model Pathogenesis of Alzheimer's Disease (AD) originates formerly of showing any symptoms. A study supervised under Vijetha Shenoy Belle et al [7]. Examined the ability of ethanolic extractof *C.pepo* seed in reducing progression of Alzheimer's disease induced in Sprague Dawley ratmodel by Aluminium chloride.

Neuroprotective activity of Cucurbita pepo flesh and peel extract in LPS-induced oxidative stress and CCl4 intoxication rat model

An investigation carried by Chao Zhang and Pengli Hui et al. [8] determined in vivo- neuroprotective scope of *Cucurbita pepo* (*C.pepo*) against oxidative stress induced by LPS, neuroinflammation and microglia activation in C57BL/6 mice. LPS induction engender redox imbalance and elevated expressions of proinflammatory genes accelerating to neuroinflammation. Aqueous extract of *C.pepo* (AECP) attenuates the deformity in brain parenchymal histology, reinstate the inflammatory niche along with normalcy of nitric oxide(NO) production. Researchers in this study observed Iba-1, a cytoplasmic protein associated with microglia activation and neuroinflammation is controlled on treatment with AECP observed as abridged scar region in brain tissue histology. Hence, this study confirms the therapeutic efficacy of herbals as neuroprotective agent in clinical use. A study conducted by Muhammad Rashid Khan and Sania Zaib [9] analysed the neurotoxicity exhibited by carbontetrachloride (CCl4) in rats which can be reversed by potential *Cucurbita pepo* peel extract. CCl4 intoxication is a potent experimental model to evaluate oxidative stress in response to various aetiology. Following study reported the mechanism behind CCl4 intoxication, emphasizing lipid peroxidation of the membranous system and incoordination of free radical detoxification. The study reported CCl4 intoxication led to notable reduction in superoxide dismutase (SOD), catalase (CAT) and peroxidases which on treatment with MECP depicts significant restoration.

Cucurbita pepo seeds alleviate spatial memory impairment

Progressive memory loss signals various neuro-related disorders which on neglect will stand to cognitive decline. Researcher Parminder Nain et al [10]. carried out a study to evaluate the ameliorative potential of *Cucurbita pepo* seeds in treating dementia induced by scopolamine. Dementia is mediated by cholinergic deficit through neuroinflammation, and oxidative stress associated with altered levels of antioxidant enzymes. Scopolamine-challenged rat brain homogenate showed increase Acetylcholine esterase (AChE) level, indication to cognitive impairment. Treatment with ethanolic extract of *Cucurbita pepo* seeds (EECPS) displayed not only neuroprotective action by antioxidative defence mechanism but also dwindle the AChE level and provide balance to Acetylcholine neurotransmitter. This study concluded that treatment with EECPS significantly reduced the activity SOD, GSH reductase and catalase and dwindle lipid peroxidation activity in hippocampus region.

Table 1- Possible Mechanism of action of Cucurbita pepo for Neurodegenerativedisorders

Sr. no.	Plant part used	Biological activity	Model	Mechanism of action	References
1	*Cucurbita pepo* seeds	Antiparkinsonian Activity	Haloperidol Induced Parkinson Rat Model	The seeds restore the diminished levels of dopamine and serotoninand displays Anticholinesterase Activity which depicts health progression.	Uzma Saleemet al., 2021
2	*Cucurbita pepo* seeds	Anti-Depressant Activity	CUMS-model	Increased expression of GFAP in the hippocampal DG andCA3 along with reduction in caspase-3 exhibited progress in depressive symptoms.	Nasra Ayuobet al., 2021
3	*Cucurbita pepo* seeds	Alzheimer's Disease	Alzheimer's disease induced in Sprague Dawley Rat Model by Aluminium chloride	Decreased Acetylcholine (Ach), neurotransmitter essential for memoryand learning leads toAlzheimer's. C.pepo seeds enables balance in Ach level and maintainoxidative stress.	Vijetha Shenoy Belleet al.

4	*Cucurbita pepo* flesh	Neuroprotective Activity	Lipopolysaccharide induced toxicity in C57BL/6 Mice	C.pepo extract enablesreduction of microglia activation and, neuroinflammation. It also depicts,Neuroprotective action.	Chao Zhang and Pengli Hui et al., 2021
5	Fruit peel of *Cucurbita pepo*	Neuroprotective Activity	Neurotoxicity inducedby CCl4 in rats	On metabolism of CCl4,it produces free reactiveradicals like Trichloromethyl peroxyl radicals that causes lipid peroxidation. Followingherbal extract acts as radical scavengers that neutralizes theseperoxyl radicals. Hence,preventing alteration of permeability of themembranous syste and maintaining homeostasis.	Muhammad Rashid Khanand Sania Zaib, 2014
6.	*Cucurbita pepo* seeds	Nootropics Activity	Scopolamine-Induced Model of Dementia inRats	Scopolamine- challenged rats displayloss of cholinergicneurons and reduce choline acetyltransferase activity in hippocampusregion leading to dementia and cognitive impairment.	Parminder Nain et al.,2021

Discussion

This review paper discusses about the importance of *Cucurbita pepo* for various neurological disorders. Although considered as agricultural waste, but the importance of this vegetable is apar. People usually regard this to be a natural substance with minimal effect on the body but the current review provides a detailed explanation about the many neuro-disorders that can be ameliorated and helps in prevention of the disease. *Cucurbita pepo* seeds enables regulation of diminished levels of dopamine and serotonin which depicts health progression, thus playing role of anti-parkinsonian agent. It is also reported to possess anti-depressant, neuroprotective and nootropic activity. Thus, underestimating the efficacy and use of *Cucurbita pepo* in neuro-disorders is inadmissible.

Conclusion

Aforementioned literatures, delineates *Cucurbita pepo* holds imperative medicinal and therapeutic importance. Phytochemical analysis of *Cucurbita pepo* projects high nutritional values in health amelioration. Hence, this herbal therapy has earned appreciable importance as nutraceutical in the mainstream medicine. That being the case phytomedicine is slowly but steadily introducing great revolution in the orthodox mindset of consumers and its universal recognition is highly appreciated.

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Conflict of Interest

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