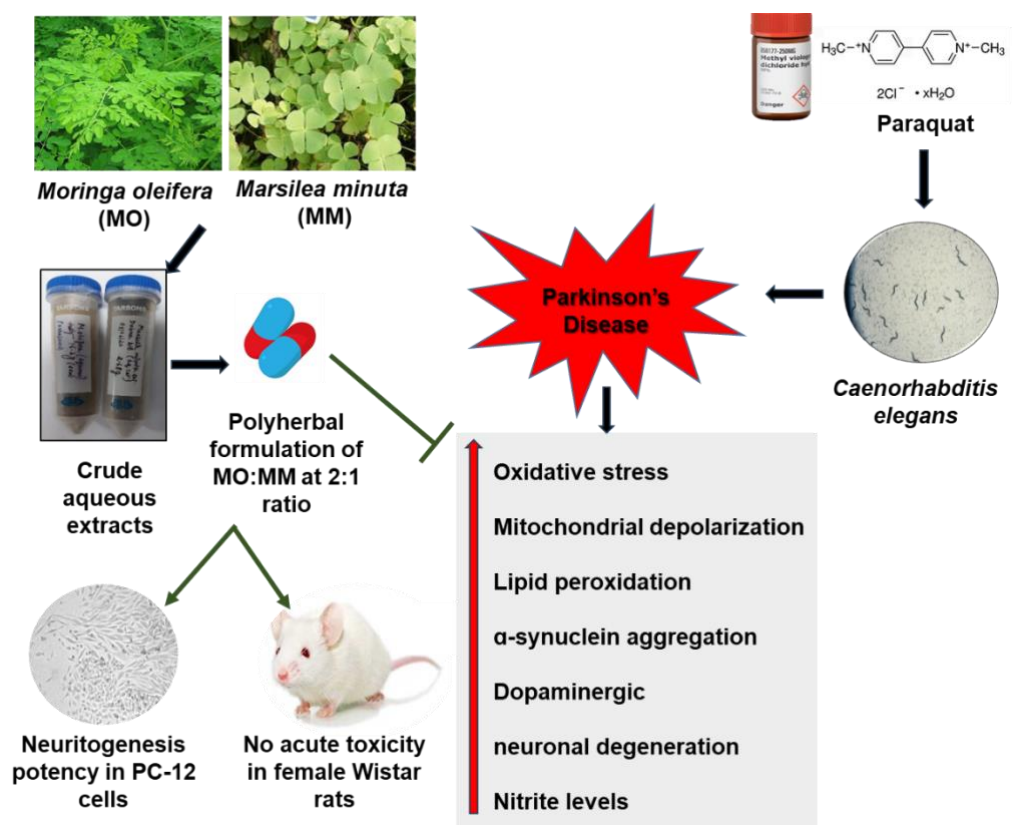


A POLYHERBAL FORMULATION FOR THE PREVENTION OF TOXIC CHEMICALS-INDUCED NEURODEGENERATIVE DISEASES

Graphical image



Brief description of the technology

The present invention falls within the domain of herbal medicine, particularly a polyherbal formulation comprising aqueous leaf extracts of *Moringa oleifera* and *Marsilea minuta* for mitigating neurodegenerative diseases such as Parkinson's disease.

Details of the technology

Neurodegenerative disorders (NDs), particularly Parkinson's disease (PD), is one of the second most common NDs causing global concerns, with rising prevalence and limited treatment options. PD is marked by the progressive deterioration of dopaminergic neurons, primarily due to several pathological factors, including the accumulation and aggregation of α -synuclein proteins, resulting in symptoms such as tremors, rigidity, bradykinesia, and postural instability. PD severely impacts quality of life and

currently lacks a definitive cure. Existing pharmacological interventions, such as levodopa, a dopamine precursor, provide only temporary relief and often lead to debilitating side effects and reduced efficacy over time. Addressing this critical gap, this invention is focused on the development of a novel polyherbal formulation comprising of a synergistic blend of aqueous leaf extracts from *Moringa oleifera* (MO), commonly known as “Sajina,” and *Marsilea minuta* (MM), locally known as “Sunisanakka.” MO is a widely used medicinal plant native to India, is known for its high nutritional value and potent pharmacological properties. It offers protection against oxidative stress, cardiovascular, and neurological health. Similarly, MM is found abundantly in moist lowland regions, is traditionally used in treating digestive issues, respiratory diseases, hypertension, and sleep disorders. While both plants are individually mentioned in traditional medicine for their wide-ranging therapeutic effects, their combination for combating neurodegeneration, particularly Parkinson's disease, has never been explored until now.

The true novelty lies in the synergistic interaction between the two plants (MO and MM), which when combined in an optimal ratio 2:1 (MO:MM), their combined efficacy significantly surpasses their individual effects, resulting in an enhanced neuroprotection by effectively mitigating the chemically-induced Parkinsonism pathologies, such as those triggered by exposure to paraquat (PT), a herbicide widely linked to PD onset.

Extensive experimental studies have validated the efficacy of the formulation by inducing neuriteogenesis potency in PC-12 cells (derived from rat pheochromocytoma) even at low concentrations (125 ng/mL), highlighting its ability to support neuronal outgrowth and repair.

Furthermore, in *Caenorhabditis elegans*, it significantly reduced paraquat-induced oxidative stress, a major contributor to neuronal degeneration, and restored mitochondrial membrane potential and reduced mitochondrial depolarization, thereby supporting overall cell health.

More impressively, the polyherbal blend effectively suppressed the abnormal accumulation of α -synuclein, a pathological hallmark of PD, and protects dopaminergic neurons from degeneration. Additionally, it significantly reduced nitrite levels in the brain, indicating its efficacy in preventing the overproduction of reactive nitrogen species (RNS), and increased the lipid droplet contents by lowering the lipid peroxidation, the two key processes involved in neuroinflammation and oxidative damage, offering a holistic protective shield for brain cells. Also, the formulation revealed no adverse effects in

female Wistar rats at a dose of 2000 mg/kg, when administered orally, highlighting its safety profile and potential clinical applications.

Another standout feature is the long-term usability of the formulation as it is a plant-based approach. Unlike conventional PD drugs that lose efficacy over time, this herbal formulation maintains its potency and does not produce side effects, making it suitable for chronic use.

Summarizing all together, to date, there has been no reported use of *Moringa oleifera* and *Marsilea minuta* individually or in combination for the treatment or prevention of Parkinson's disease or related neurodegenerative conditions. This patent bridges that gap with compelling evidence and offers a first-of-its-kind polyherbal solution rooted in both traditional wisdom and modern science, by introducing an innovative, safe, and highly effective alternative to existing therapeutic interventions.

Applicability of the technology

The present invention effectively addresses the long-awaited challenges of treating and preventing NDs, particularly Parkinson's disease, using a safe, sustainable and natural therapeutic approach. As discussed above about the demerits of the current or existing pharmacological interventions, this invention focused to solve the problem by introducing a novel polyherbal formulation derived from *Moringa oleifera* and *Marsilea minuta*. The highlights of the applicability of this technology are:

- I. Protection against environmental toxin-induced neuronal damage, especially in populations with high exposure to pesticides like paraquat.
- II. Development of herbal supplements to support existing treatment.
- III. Neuroregenerative and neuroprotective formulations for the aging population and individuals at risk of cognitive decline.

Patent status

Under examination

Contact details

Ashis K. Mukherjee (akm@tezu.ernet.in)

Aparup Patra (patra.aparup@gmail.com)

Bhagya Lakhmi Rajbongshi (bhagyalakhmirajbongshi@gmail.com)