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Review Article

The Miracle Moringa Oleifera Tree: A Bibliometric Review of Its Neuroprotective Properties

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ABSTRACT

Introduction: With its anti-inflammatory and antioxidant capabilities, Moringa oleifera is gaining interest for its neuroprotective potential. This bibliometric analysis examines Moringa oleifera research trends, gaps, and future prospects, focusing on its function in cognitive deficits and neurodegenerative disorders like Alzheimer's. Topiramate and riluzole's neuroprotective effects are also discussed.; **Materials and methods:** Research trends in Moringa oleifera were examined using Scopus-indexed literature. The plant parts studied (leaves, seeds, roots), doses, and methods were key. The review included antiepileptic medication trials to complement their neuroprotective properties. **Results and discussion:** Antioxidant and phytochemical properties made Moringa oleifera a promising neuroprotectant, according to the review. However, dose reporting and plant part specification variations compromised findings' reliability and reproducibility. To maintain methodological consistency, dose-response studies, uniform reporting techniques, and interdisciplinary collaboration are future research topics. Antiepileptic medications like topiramate and riluzole modulate neurotransmitter systems and provide neuroprotection with natural products. **Conclusions:** This analysis emphasizes the necessity for rigorous research and standardized methods to enhance Moringa oleifera and related pharmacological compounds' therapeutic potential. Addressing these obstacles will improve findings' reliability and clinical application, enabling evidence-based neurological condition treatments. This research was conducted in January 2025.
Keywords: Moringa Oleifera, Neuroprotective, Brain, Therapy, Herb, Natural Agent.

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INTRODUCTION

Bibliometric analysis is a powerful tool for evaluating the research landscape within a specific domain, providing insights into trends, influential publications, and emerging topics. This study aims to conduct a comprehensive bibliometric analysis of literature pertaining to the neuroprotective effects of Moringa oleifera, published in Scopus-indexed journals. Moringa oleifera, commonly known as the drumstick tree or miracle tree, has been extensively used in traditional medicine for its diverse therapeutic properties, including anti-inflammatory, antioxidant, and neuroprotective effects.

Neurodegenerative diseases such as Alzheimer's, Parkinson's, and Huntington's diseases are characterized by the progressive loss of structure and function of neurons. These conditions are associated with oxidative stress, mitochondrial dysfunction, and neuroinflammation. Given the multifactorial nature of these diseases, there is a growing interest in exploring natural compounds with potential neuroprotective effects. Moringa oleifera has gained significant attention due to its rich phytochemical composition, including vitamins, minerals, flavonoids, and phenolic acids, which contribute to its therapeutic efficacy.

Despite the burgeoning interest in the pharmacological properties of Moringa oleifera, a systematic bibliometric analysis focusing on its neuroprotective effects has yet to be conducted. Such an analysis is crucial for identifying research gaps, guiding future research directions, and providing a holistic understanding of the scientific progress in this field. Previous studies have highlighted the antioxidant and anti-inflammatory properties of Moringa oleifera, which play a pivotal role in mitigating neurodegenerative processes.

Furthermore, the potential of Moringa oleifera to modulate signaling pathways involved in neuronal survival, apoptosis, and neuroinflammation underscores its therapeutic promise. For instance, studies have demonstrated that Moringa oleifera extract can inhibit the production of pro-inflammatory cytokines and reduce oxidative stress markers in neuronal cells. These findings suggest that Moringa oleifera could be a valuable adjunct in the management of neurodegenerative diseases.

This study's bibliometric analysis will examine publications from Scopus-indexed journals to provide a detailed overview of research trends, key contributors, and thematic evolution in the context of Moringa oleifera as a neuroprotective agent. By mapping the intellectual structure of this research field, we aim to identify influential studies, collaboration networks, and emerging research fronts. This analysis will also highlight areas that require further investigation and propose potential avenues for future research.

MATERIALS AND METHODS

Methods

Bibliometric research is a methodological approach that uses scientific publishing data to delineate and examine the evolution of a scientific discipline. This study focuses on the subject of "moringa oleifera" and "neuroprotective" and neuroprotection, using data from www.scopus.com, a prominent and

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trustworthy database.

To carry out bibliometric research, the steps to follow are as follows:

1. Identify search keywords. This research employs the terms "focused cognitive enhancer." The keywords are inputted into the search area on the www.scopus.com website by choosing the topic category (title, abstract, keywords).
2. Refine search outcomes. In this investigation, the data were not filtered.
3. Extract the data from the search results. This study entails the extraction of search result data in three specific formats,namely:

- CSV (comma-separated values) encompasses fundamental details regarding the document, including title, author, affiliation, year, source, abstract, and keywords.
- RIS (Research Information System), which encompasses comprehensive details regarding a document, including its cited references.

Data Collection

A search was conducted on the Scopus website using the specified terms, with the understanding that this platform encompasses research that is deemed to possess validity: TITLE – ABS – KEY ("moringa oleifera") AND TITLE – ABS – KEY (neuroprotective) AND TITLE – ABS – KEY (neuroprotection) are the titles of the products that are under consideration. One hundred twenty-nine documents were received by us. We then save the document from Scopus in the form of a file with the extension.csv following this step.

Data Analysis

Both the Biblioshiny and Vosviewer software packages were utilised in the analysis process.

Quantitative Analysis

Documents by Year

Figure 1 indicates a rise in the number of documents, culminating in 22 documents by 2024. The earliest document dates back to 2008 and entitled Alteration of brain monoamines & EEG wave pattern in rat model of Alzheimer's disease & protection by Moringa oleifera authored by Ganguly, R. , Guha, D., Pharmacological evaluation of Bangladeshi medicinal plants for antioxidant activity authored by Mazumder, M.E.H. , Rahman, S. and the latest document in 2025 entitled Investigation of In-vitro antioxidant and neuroprotective effects of Moringa oleifera root extract on SHSY5Y neuroblastoma cell line written by Chintalapati, M. , Margesan, T.

Most Relevant Sources

According to Figure 3. Most relevant source is Nutrients is an international, online-based journal, published twice a week since 2009. The Nutrients Journal has been indexed in Scopus since 2009. Nutrients is published by the Multidisciplinary Digital Publishing Institute (MDPI). Nutrients Journal has a SCImago Journal Rank (SJR) of 1.301 for the year 2023-2024. Nutrients accepts various types of manuscripts, including reviews, regular research papers, and short communications related to aspects of human nutrition. Manuscripts accepted cover topics such as macronutrients, micronutrients, essential nutrients, bioactive nutrients, nutrient requirements, nutrient sources, aspects of human nutrition, functional foods, nutraceuticals, health claims, public health, eating disorders, metabolic syndrome, malnutrition, nutritional supplements, sports nutrition, body composition, and more.

Next is Journal of Food Biochemistry is a scientific journal published by Wiley-Blackwell. This journal has been indexed in Scopus since 1977. This journal has an SJR value of 0.635. This journal accepts various types of manuscripts, including original research and reviews that have gone through a previous reviewer process. Frequently published topics include: Biochemistry of postharvest/postmortem and processing problems, Enzyme chemistry and technology, Membrane biology and chemistry, Cell biology, Biophysics, Genetic expression, Pharmacological properties of food ingredients with an emphasis on bioactive content in food.

Next is Journal of Ethnopharmacology is a scientific journal that publishes research on the traditional use of plants, fungi, animals, microorganisms, and minerals and their biological and pharmacological effects. This journal has been indexed in Scopus since 1979. This journal is published by Elsevier Ireland Ltd. The SJR SCImago Journal Rank of this journal is 0.936. This journal accepts various types of manuscripts, including research on the traditional use of plants and other natural materials for medicine, studies on pharmacological and toxicological effects, and research based on international conventions.

Factorial map of the most cited documents

According to Figure 3, The most cited document is Neuroprotective effect of natural products against Alzheimer's diseas. Authors: Essa MM, Vijayan RK, Castellano-Gonzalez G, Memon MA, Braidy N, Guillemin GJ. Research published in the journal: Neurochemical Research, Publication Year : 2012 Volume 37, Pages 1829-1842 DOI : 10.1007/s11064-012-0799-9.

The Neurochemical Research journal has been indexed in Scopus since 1996. This study evaluated the neuroprotective effects of various natural products against Alzheimer's disease (AD). Research suggests that natural compounds such as polyphenols found in fruits, vegetables,

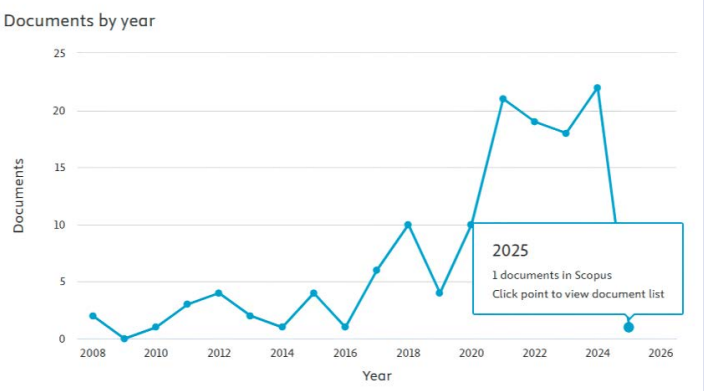

Figure 1. Documents by year

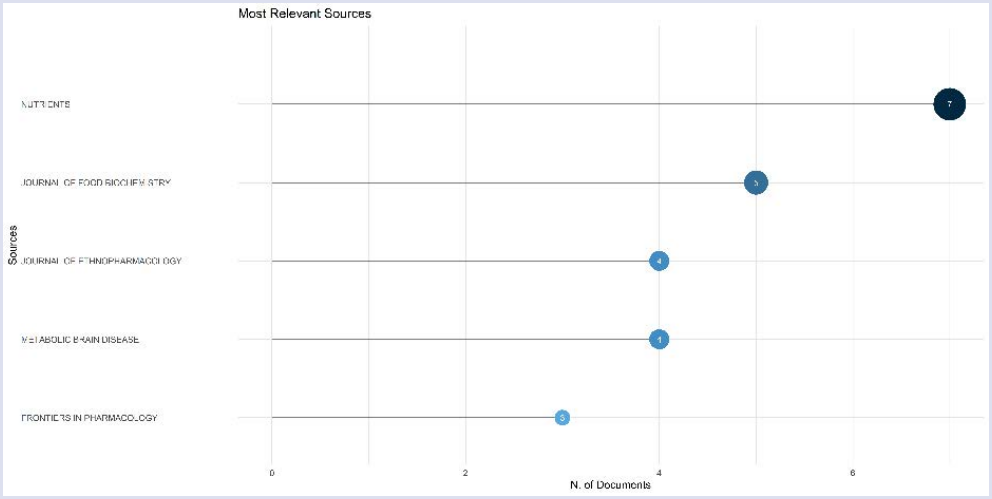

Figure 2. Most Relevant Sources

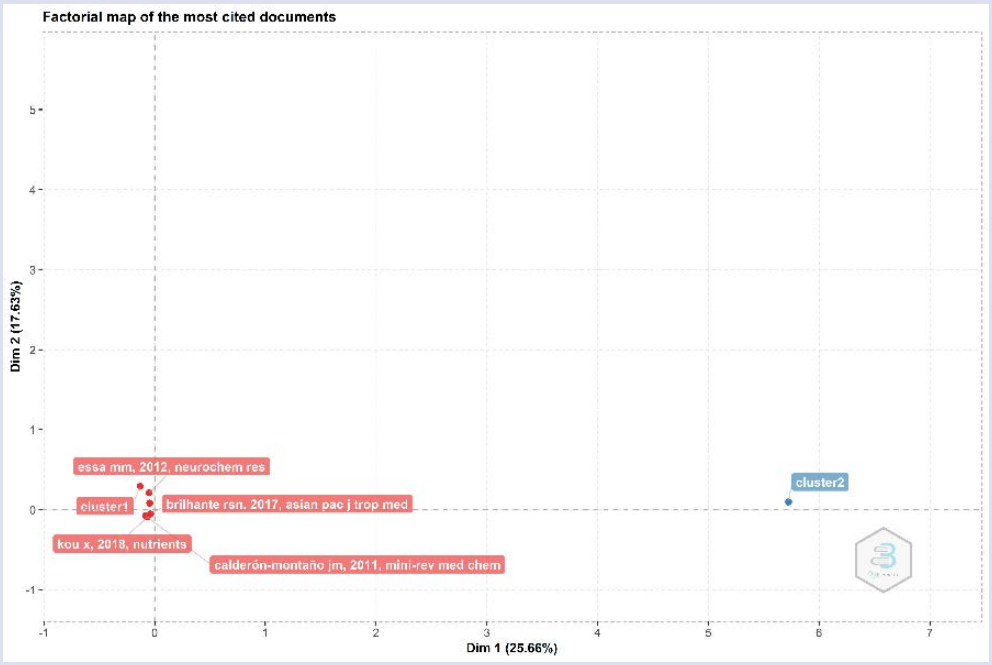

Figure 3. Factorial map of the most cited documents

herbs, and nuts may be able to inhibit neurodegeneration and improve memory and cognitive function. This study also sheds light on the molecular mechanisms behind the healing effects, which primarily rely on the action of phytonutrient compounds on various signaling pathways related to protein folding and neuroinflammation.

Factorial Map Of The Documents With The Highest Contributes

In Figure 4, The most contributed manuscript based on the title Pharmacological evaluation of Bangladeshi medicinal plants for antioxidant activity. by Mazumder MEH, Rahman S., published in Pharmaceutical Biology. Publication Year : 2008, Volume 46, Pages 704-709.

This study evaluated the antioxidant activity of 49 medicinal plants from Bangladesh representing 36 families. Research shows that these plants have strong antioxidant potential, which may be used to prevent and treat a variety of neurodegenerative diseases and inflammatory conditions associated with cellular oxidative damage. This study also highlights the potential of these medicinal plants as new sources for drug development.

Documents by Author

According to Figure 5. Here are 3 authors with the most writings. The first is the writing of Arozal, W. with 5 documents. Here are some articles he wrote : Water Extracts of Moringa oleifera Leaves Alter Oxidative Stress-Induced Neurotoxicity in Human Neuroblastoma SH-SY5Y Cells, Comparative Neuroprotective Effects of Moringa oleifera Seed Oil and Aqueous Extract on Cognitive Functions on a High-Fat, High-Fructose Diet Mice: Focus on Senescence Markers, Neuroprotective And Antioxidant Activities Of Aqueous Extract Moringa Oleifera Leaves, Effects of Moringa oleifera in Two Independents Formulation and as Neuroprotective Agent Against Scopolamine-Induced Memory Impairment in Mice, and The Oil Formulation Derived from

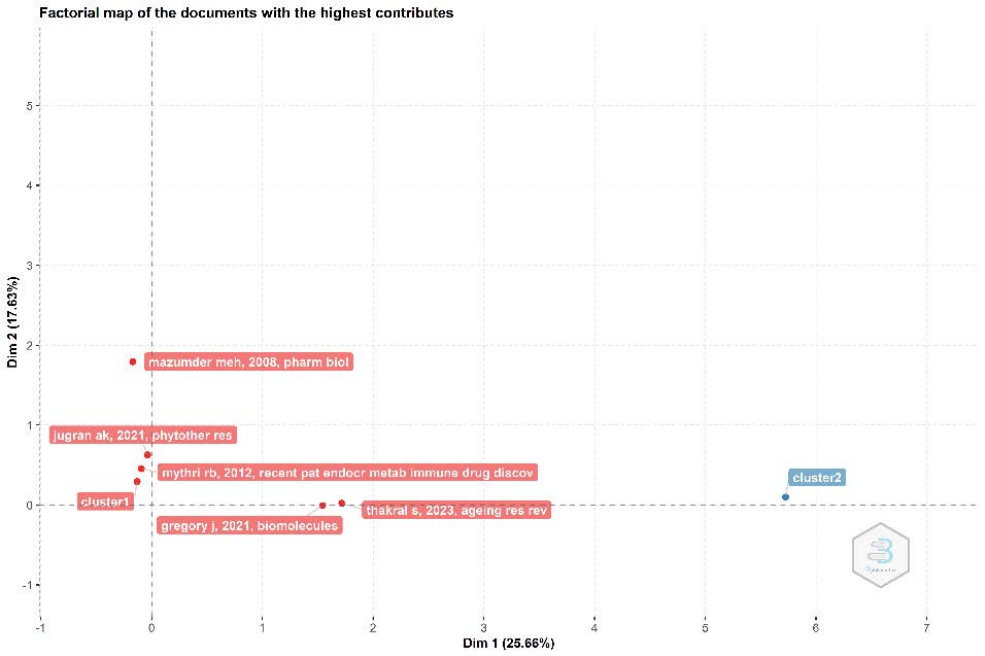

Figure 4. Factorial map of the documents with the highest contributes

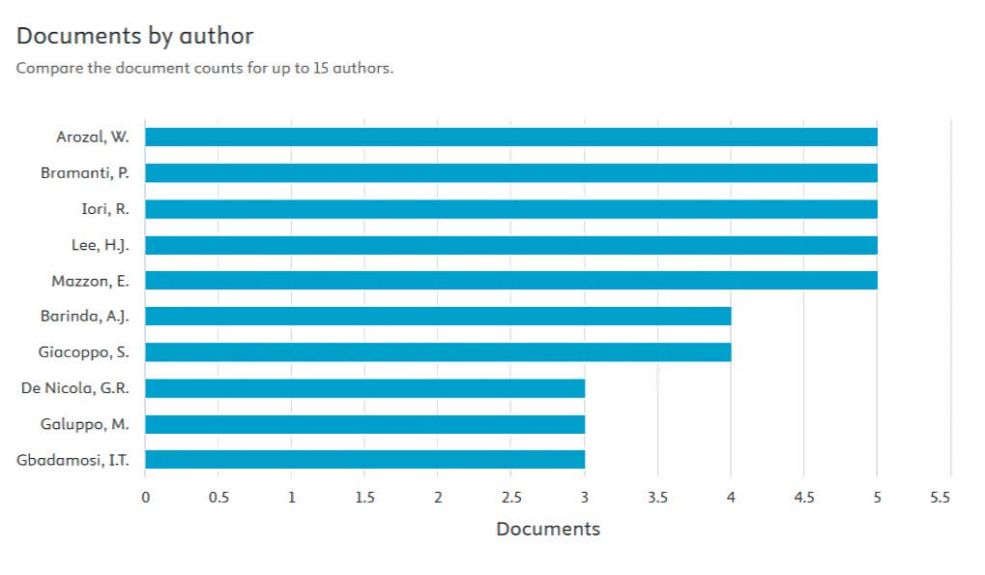

Figure 5. Documents by Author

Moringa Oleifera Seeds Ameliorates Behavioral Abnormalities in Waterimmersion Restraint Stress Mouse Model.

Next there is the author Bramanti, P., with 5 documents, Here are some articles he wrote: "The moringin/α-cd pretreatment induces neuroprotection in an in vitro model of alzheimer's disease: A transcriptomic study, The isothiocyanate isolated from moringa oleifera shows potent antiinflammatory activity in the treatment of murine subacute Parkinson's disease", "An overview on neuroprotective effects of isothiocyanates for the treatment of neurodegenerative diseases, 4(α-L-rhamnosyloxy)-benzyl isothiocyanate", "a bioactive phytochemical that defends cerebral tissue and prevents severe damage induced by focal ischemia/reperfusion, and 4(α-l-Rhamnosyloxy)-benzyl isothiocyanate, a bioactive phytochemical that attenuates secondary damage in an experimental model of spinal cord injury."

Next there is the author Iori, R., with 5 documents, Here are some articles he wrote: "The moringin/α-cd pretreatment induces neuroprotection in an in vitro model of alzheimer's disease: A transcriptomic study", "The isothiocyanate isolated from moringa oleifera shows potent antiinflammatory activity in the treatment of murine subacute Parkinson's disease", "An overview on neuroprotective effects of isothiocyanates for the treatment of neurodegenerative diseases, 4(α-L-rhamnosyloxy)-benzyl isothiocyanate", "a bioactive phytochemical that defends cerebral tissue and prevents severe damage induced by focal ischemia/reperfusion, and 4(α-l-Rhamnosyloxy)-benzyl isothiocyanate, a bioactive phytochemical that attenuates secondary damage in an experimental model of spinal cord injury".

Documents by Subject Area

According to Figure 6, dan buatkan kesimpulan

Based on the pie chart titled "Documents by subject area," we can conclude that the majority of the documents are concentrated in three main subject areas: Biochemistry, Genetics and Molecular Biology (23.2%), Pharmacology, Toxicology and Pharmaceuticals (22.4%), and Medicine (19.1%). These three areas alone account for nearly 65% of the total documents. The other subject areas, such as Agricultural and Biological Sciences (13.0%), Neuroscience (5.7%), Nursing (4.5%), and Chemistry (3.7%), also hold significant portions, but not as predominant as the top three. Smaller percentages are distributed across Environmental Science (2.8%), Multidisciplinary (1.6%), Immunology and Microbiology (0.8%), and Other (3.3%), indicating a broad but less intensive research interest in these fields..

Documents by affiliation

According to Figure 7, in first place, the producer of the most documents is affiliated with University of Ilorin with 6 documents; next in second place is affiliated with Kangwon National University, King Saud University, and Universitas Indonesia with each other 5 documents.

Documents by country or territory

According to Figure 8, The bar chart titled "Documents by country or territory" shows that the India has the highest number of documents, approximately 42 documents. This is significantly higher compared to other countries, with Nigeria at around 22 documents, China at about 16 documents, Italy and United States at 12 documents.

Network Visualization

Figure 8 indicates that the examined areas remain unassociated with other regions delineated by edges. The domain encompasses: curcuma longa, black pepper, ginger, glycyrrhiza glabra, camellia sinensis, traditional medicine, immunomodulation, wound healing, apigenin, antiviral activity, antifungal activity, myricetin, dietary supplement, antidiabetic activity, drug activity, calcium, potassium, iron, beta carotene, glucosinolate, isothiocyanic acid, isothiocyanic acid derivative, rhamnose, cell viability, animal cell, protein p53, enhancer binding, western blotting, immunoglobulin e, immunoglobulin g, interleukin 6, seeds, in vivo study, tumor necrosis factor, reactive oxygen metabolite, apoptosis, sodium chloride, alcohol, chemistry, glutathione, superoxide dismutase, acetylcholinesterase, neurodegeneration, neurotoxicity, phytotherapy, nerve degeneration, hippocampus, memory disorder,

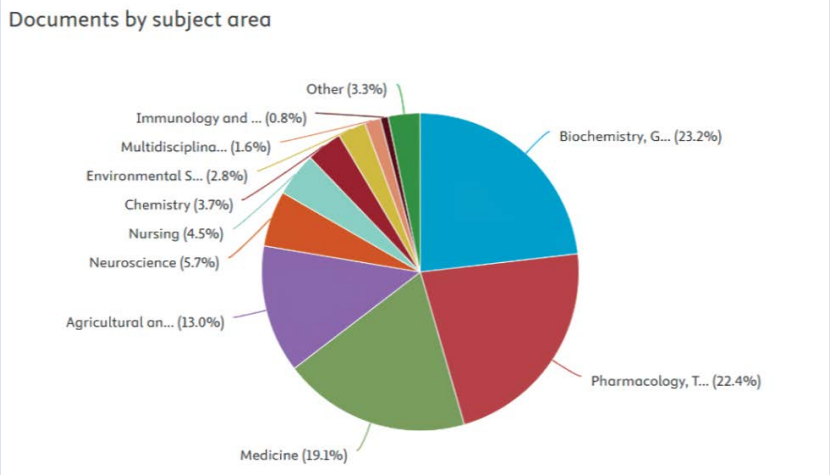

Figure 6. Documents by Subject Area

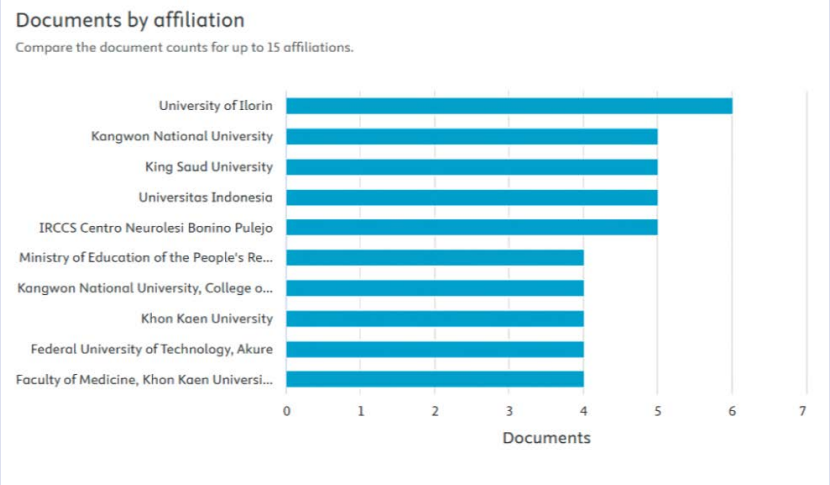

Figure 7. Documents by affiliation

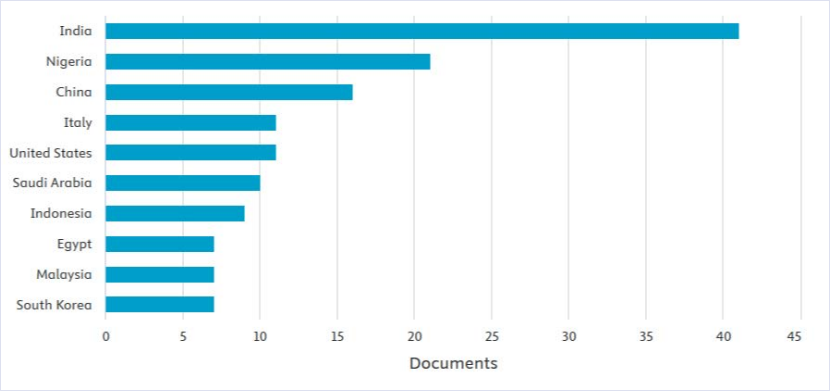

Figure 8. Documents by country or territory

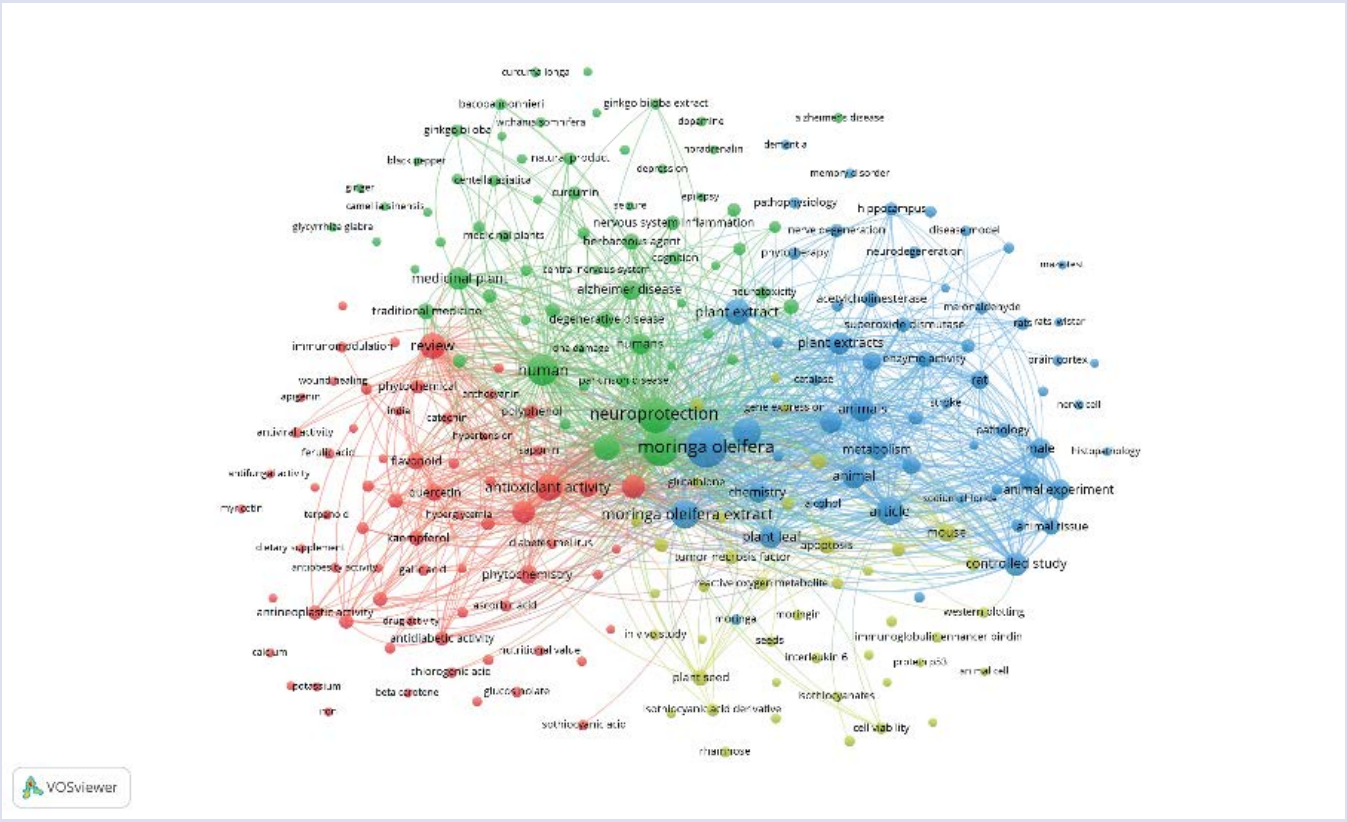

Figure 9. Network Visualization

noradrenaline, dopamine, withania somnifera, bacopa monnieri, ginkgo biloba extract, ginkgo biloba, medicinal plants, centella asiatica, curcumin

Overlay Visualization of Scopus, Database Using Vosviewer

According to Figure 10. In the overlay visualization, it appears that the keywords that are being researched a lot approaching 2022 are the parts colored yellow, namely : withania somnifera, centella asiatica, camellia sinensis, degenerative disease, wound healing, phytochemical, anthocyanin, saponin, terpenoid, antiviral activity, antiobesity activity, antidiabetic activity, calcium, potassium, iron, chlorogenic acid, in vivo study, interleukin 6, and neurotoxicity.

Density Visualization

As illustrated in Figure 11. In the visual circulation density, it appears that the part that is already saturated with research is yellow, while the part that is not yet saturated is slightly yellow and dominantly green, namely keywords : curcuma longa, black pepper, ginger, glycyrrhiza glabra, camellia sinensis, traditional medicine, immunomodulation, wound healing, apigenin, antiviral activity, antifungal activity, myricetin, dietary supplement, antidiabetic activity, drug activity, calcium, potassium, iron, beta carotene, glucosinolate, isothiocyanic acid, isothiocyanic acid derivative, rhamnose, cell viability, animal cell, protein p53, enhancer binding, western blotting, immunoglobulin e,

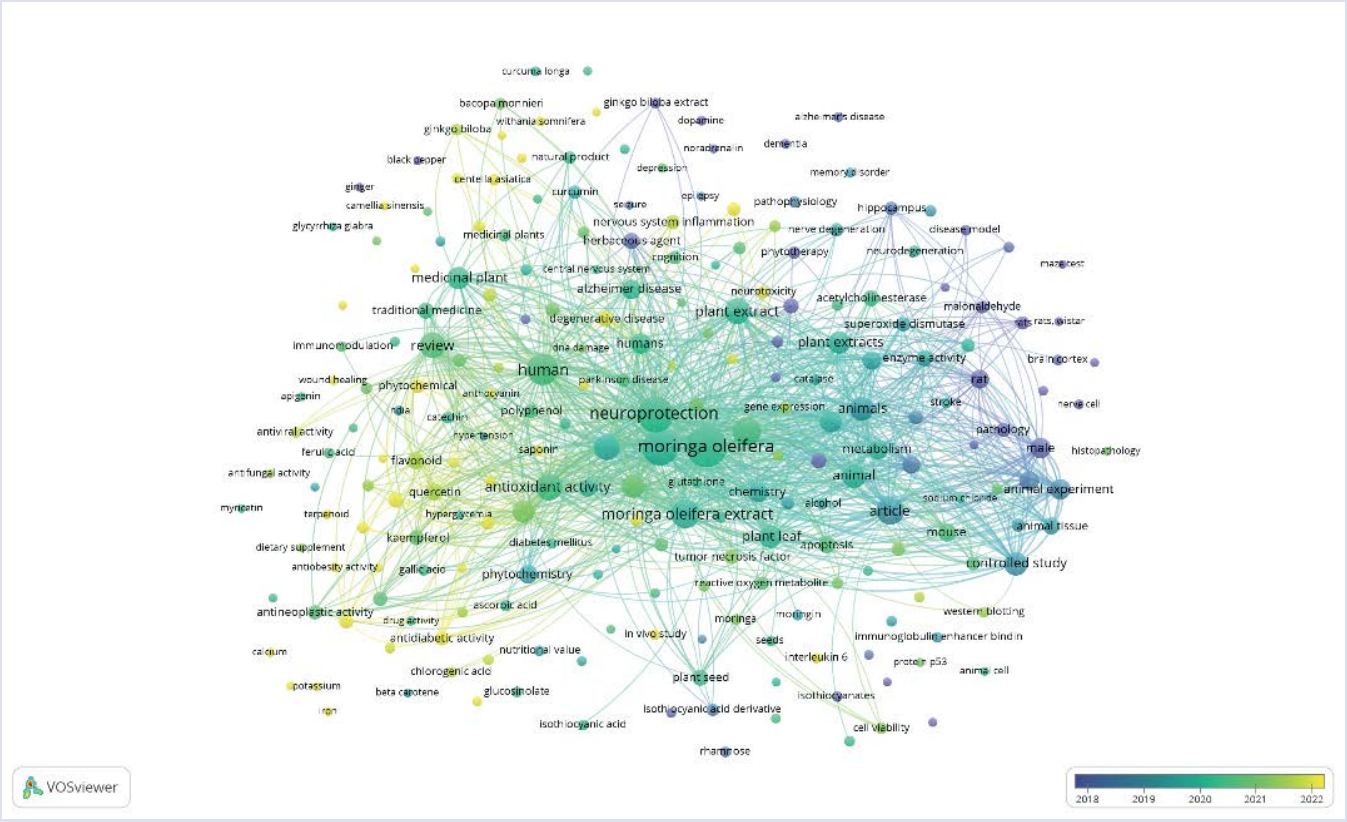

Figure 10. Overlay visualization of scopus, database using Vosviewer

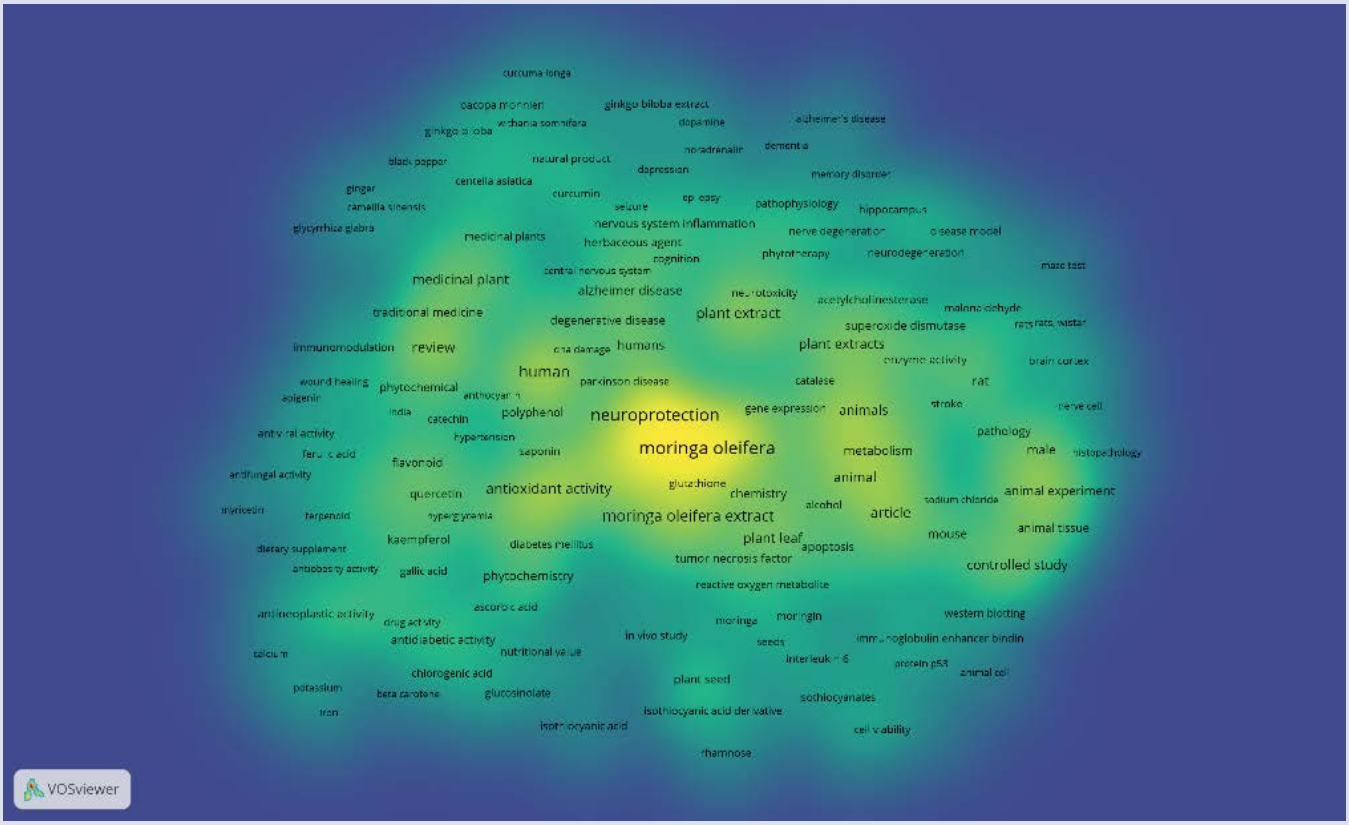

Figure 11. Density visualization

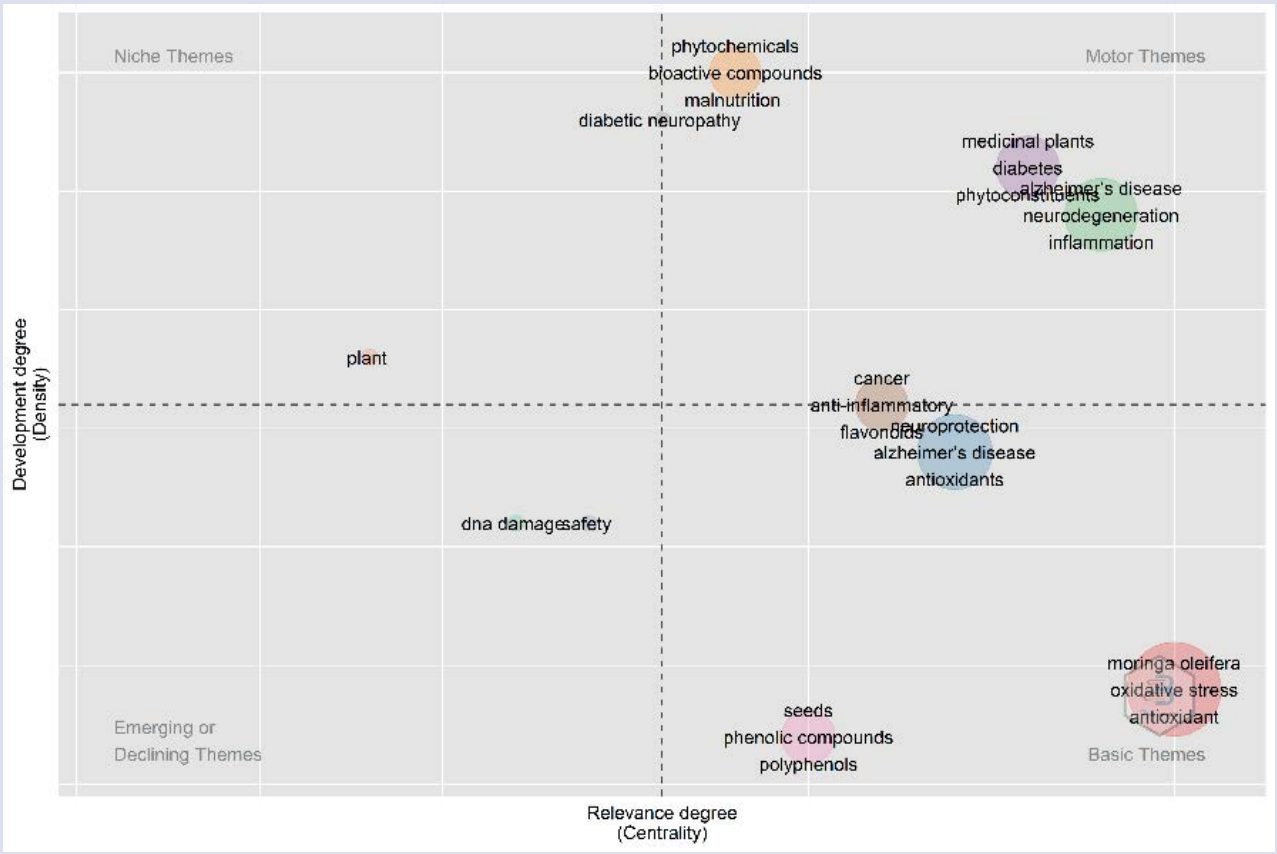

Figure 12. Thematic map

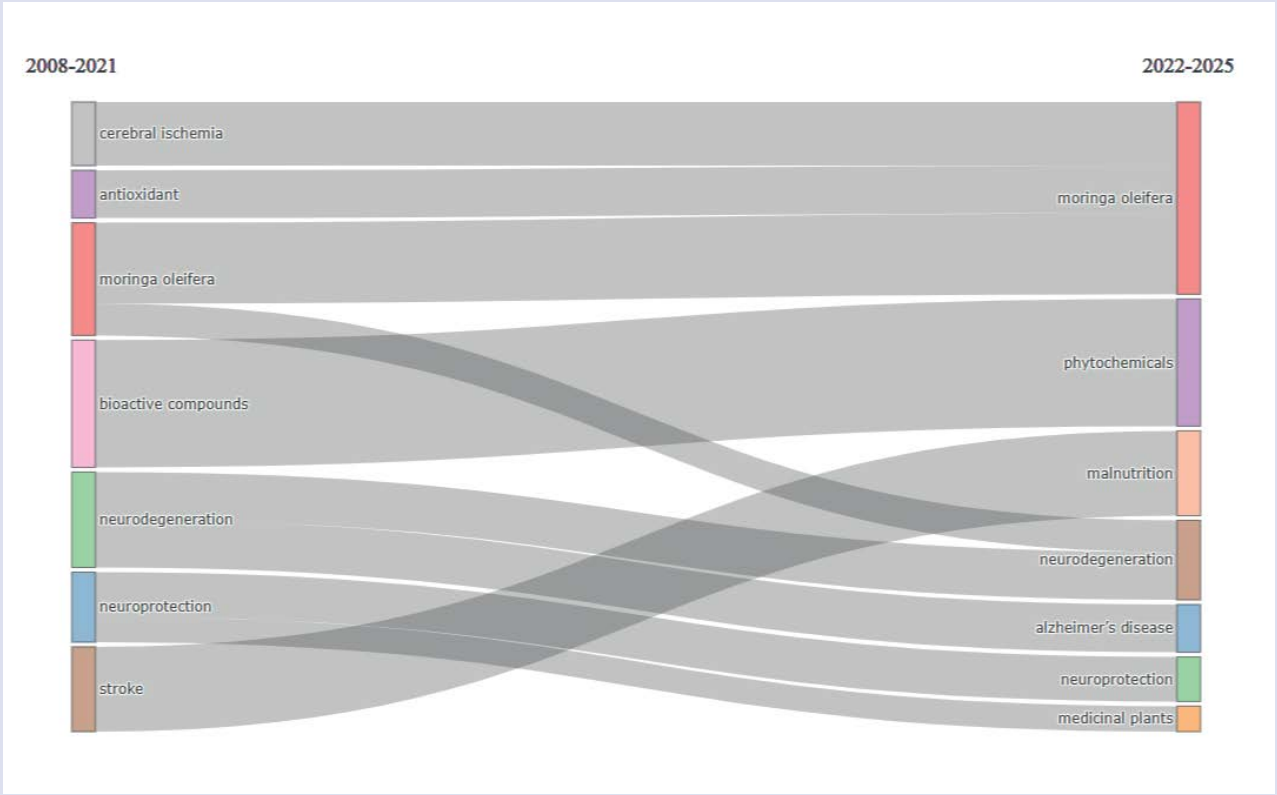

Figure 13. Thematic Evolution

immunoglobulin g, interleukin 6, seeds, in vivo study, tumor necrosis factor, reactive oxygen metabolite, apoptosis, sodium chloride, alcohol, chemistry, glutathione, superoxide dismutase, acetylcholinesterase, neurodegeneration, neurotoxicity, phytotherapy, nerve degeneration, hippocampus, memory disorder, noradrenaline, dopamine, withania somnifera, bacopa monnieri, ginkgo biloba extract, ginkgo biloba, medicinal plants, centella asiatica and curcumin.

Thematic Map

According to Figure 11, On the thematic map based on the author keyword, the following is an explanation for each keyword in each quadrant in the thematic map resulting from bibliometric. Here is an explanation of the meaning of each quadrant in the thematic map and examples of document titles relevant to keywords in each quadrant.

Niche themes are highly specialized topics with a high level of maturity, but low impact and low relevance to the broader domain. Plants: Examples of related research include studies on “the use of specific plant extracts in traditional medicine” or “the bioactive potential of specific plants in laboratory studies.”

Emerging or Declining Themes

Emerging or declining themes are themes that are in the early stages of development or are in the process of declining in relevance. DNA Damage: Examples of research might include “mechanisms of UV-induced DNA damage” or “cell responses to DNA damage.” Safety: Research that might fall into this category might include “safety assessment of chemicals in consumer products” or “evaluation of health risks from exposure to environmental pollutants.”

Motor Themes

Motor themes are themes that are highly developed and have high impact in a specific field. They demonstrate high maturity and are involved in a lot of research. Phytochemicals: Examples of research might include “the role of phytochemicals in cancer prevention” or “phytochemicals in medicinal plants.” Bioactive Compounds: Research such as "bioactive compounds in superfoods" or "effects of bioactive compounds on human health" falls under this theme. Malnutrition: Examples of research include "impact of malnutrition on child development" or "management of malnutrition in vulnerable populations". Diabetic Neuropathy: Research such as "effect of diabetes on the peripheral nervous system" or "treatment strategies for diabetic neuropathy". Medicinal Plants: Research such as "use of plant medicines in traditional medicine" or "discovery of new compounds from medicinal plants". Diabetes: Research related to "dietary prevention of diabetes" or "treatment of type 2 diabetes". Alzheimer's Disease: Research examples include "role of genetic factors in Alzheimer's disease" or "nutritional interventions for Alzheimer's prevention". Neurodegeneration: Research such as "mechanisms of neurodegeneration in Parkinson's disease" or "novel therapies to inhibit neurodegeneration". Inflammation: Research examples include "role of inflammation in chronic diseases" or "natural anti-inflammatory treatments". Cancer: Research such as "mechanisms of cancer cell growth" or "novel treatments for cancer". Anti-inflammatory: Research such as "anti-inflammatory effects of herbal compounds" or "development of new anti-inflammatory drugs".

Basic Themes

Basic themes are basic themes that have high significance and broad relevance, usually forming the basis for further research. Flavonoids: Examples of research are "the role of flavonoids in cardiovascular health" or "antioxidant effects of flavonoids". Neuroprotection: Research such as "the effect of neuroprotective compounds on neuronal damage" or "neuroprotection strategies in neurodegenerative diseases". Alzheimer's disease: Research such as "biomarkers for early diagnosis of Alzheimer's" or "strategies for prevention of Alzheimer's". Antioxidants: Research such as "the role of antioxidants in the prevention of chronic diseases" or "natural antioxidants in the diet". Seeds: Research such as "nutrition and health benefits of seeds" or "bioactive potential of seed extracts". Phenolic Compounds: Research such as "health effects of phenolic compounds in food" or "phenolics in medicinal plants". Polyphenols: Research such as "the role of polyphenols in cancer prevention" or "polyphenols in green tea". Moringa Oleifera : Research such as "health benefits of Moringa Oleifera" or "antioxidant potential of Moringa Oleifera". Oxidative Stress : Research such as "role of oxidative stress in chronic diseases" or "strategies to reduce oxidative stress". Antioxidants : Research such as "antioxidant activity of herbal compounds" or "role of antioxidants in slowing aging".

Thematic Evolution

According to Figure 13, There was an evolution of changes in themes in research in 2008–2021 with the keywords cerebral ischemia, antioxidant, moringa oleiferam bioactive compunds, neurodegeneration, neuroprotection, and stroke. The theme then changed in 2022–2025 to moringa oleiferam phytochemicals, malnutrition, neurodegeneration, Alzheimer’s disease, neuroprotection, and medicinal plants.

RESULTS AND DISCUSSION

The bibliometric analysis of Moringa oleifera, with a specific focus on its neuroprotective properties, has revealed intriguing trends and insights. The analysis of documents sourced from Scopus indicates growing interest and research in the neuroprotective potential of Moringa oleifera. However, significant gaps and inconsistencies in the research warrant further discussion.

Firstly, the parts of the Moringa oleifera plant used for therapeutic purposes vary widely across studies. Commonly utilized parts include leaves, seeds, and roots, with each part demonstrating different levels of neuroprotective efficacy. For instance, the leaves are often noted for their high antioxidant content, contributing significantly to their neuroprotective properties(129). Conversely, studies such as Gharsallah et al. highlight the neuroprotective potential of seeds due to their unique phytochemical composition. Despite these findings, a significant portion of the research does not specify the dosages used, making it challenging to draw concrete conclusions about the efficacy of different plant parts(130). For example, Pareek et al. mention the use of Moringa oleifera leaves but fail to provide dosage information, thereby limiting the reproducibility of the study's findings. This lack of dosage data is a recurring issue that undermines the reliability and applicability of research outcomes(131).

Moreover, some studies do not clearly identify which parts of the Moringa oleifera plant were used, further complicating the analysis. For instance, Worku et al. discuss the neuroprotective effects of Moringa oleifera extracts but do not specify whether the extracts were derived from leaves, seeds, or roots(129). Such omissions hinder the ability to compare and synthesize findings across different studies. To address these challenges, the inconsistent reporting of dosages emerges as a significant obstacle to the advancement of Moringa oleifera research. Standardization is essential for guaranteeing repeatability, comparability, and therapeutic significance of results.

Formation of Dose-Response Studies Future research should emphasize dose-response investigations to determine optimal concentrations with neuroprotective benefits. These studies should account for variables such as age, weight, health conditions, and the specific neurodegenerative models employed. Establishment of Reporting Protocols Journals and institutions should promote adherence to detailed reporting criteria, including: Specification of the exact plant

Tabel 1. Qualitative analysis of moringas from each study used in neuroprotective.

No.	Drugs used in neuroprotector	Moringa oleifera dosage used in therapy	The part of Moringa oleifera that is used for therapy	Reference no
	Moringa is used for Alzheimer's disease therapy by inhibiting Acetylcholinesterase (AChE) and showing neuroprotective effects against Beta amyloid-induced cytotoxicity.	Methanolic extract: 95.21 µg/ml, Ethyl acetate extract: 117.19 µg/ml.	Moringa oleifera root extracts	(1)
	Moringa oleifera is studied for its anti-inflammatory, antioxidant, and enzyme inhibitory properties. The hexane extract shows good anti-inflammatory activity and moderate antioxidant activity without cytotoxic effects on macrophages.	Hexane extract: no significant cytotoxicity at 1 µg/mL concentration.	Moringa oleifera leaves	(2)
	Moringa oleifera is used for treating skin infections, anemia, and blood impurities. It thrives in diverse climates and addresses over 300 ailments with its rich phytochemicals and bioactive compounds.		Moringa oleifera plant parts	(3)
	Moringa oleifera is used for treating Parkinson's disease by reducing motor dysfunction and neurodegeneration through its antioxidant properties.	Aqueous and ethanolic extract doses: 200 mg/kg each for 28 days.	Moringa oleifera seed extracts	(4)
	Moringa oleifera is used for treating neurodegenerative diseases like Alzheimer's, Parkinson's, Huntington's, and epilepsy due to its neuroprotective, antioxidant, and anti-inflammatory properties.	Aqueous: 400 mg/kg Ethanolic: 0.25-4 mg/mL Moringin isothiocyanate: 10 mg/kg	Leaf, Seed, and Flowers	(5)
	Moringa oleifera is used for preventing aluminum-induced neurodegeneration by improving cognitive performance, reducing oxidative/nitrosative stress, and decreasing inflammatory cytokines.	Moringa oleifera extract: 28 days, oral, Wistar rats	Moringa oleifera extract	(6)
	Moringa is used for anti-inflammatory, anticancer, antibacterial, antidiabetic, neuroprotective, pain relief, and anti-obesity due to its bioactive components like Moringa isothiocyanates (MITC).	Moringa isothiocyanates (MITC): 100 mg/kg BW/day	Moringa oleifera seeds or leaves utilized for MITC extraction	(7)
	Moringa oleifera is used for improving neuroplasticity and neuroprotection after cerebral ischemic reperfusion injury (stroke).		Moringa oleifera phytochemicals	(8)
	Moringa oleifera is used for neuroprotection against oxidative stress in neuroblastoma cells by enhancing antioxidant activity and modifying neuronal signaling pathways.	Moringa oleifera extract: 1-100 µg/mL for cell viability assay in SH-SY5Y cells.	Moringa oleifera leaves extract	(9)
	Moringa oleifera is used for neuroprotection in neurodegenerative disorders by enhancing antioxidant defense, reducing inflammation, and modulating neurotransmitter levels.		Moringa oleifera leaves, pods, roots, bark, gum, flowers, seeds used.	(10)
	Moringa oleifera is used for neuroprotection against ethanol-induced neurotoxicity by reducing lipoperoxidation, increasing protein sulfhydryl groups, and preserving brain and cerebellar tissue.	Moringa oleifera seed suspension: 200 mg/kg and 600 mg/kg for 15 days.	Moringa oleifera seeds	(11)
	Moringa oleifera is used for inhibiting BACE1 to manage Alzheimer's Disease by preventing beta-amyloid plaque formation.		Moringa oleifera compounds	(12)
	Moringa oleifera is used for treating neurological diseases including Alzheimer's, Parkinson's, Huntington's, epilepsy, and neurotoxicity due to its neuroprotective and antioxidant properties.			(13)
	Moringa oleifera is used for treating Alzheimer's disease by enhancing memory, providing neuroprotection, and exhibiting antioxidant and antiapoptotic properties.			(14)
	Moringa oleifera is used for neuroprotection against CPF-induced cerebral and ocular toxicity by reducing oxidative stress and normalizing pro-inflammatory markers.	Moringa seed extract doses: 50 mg/kg and 100 mg/kg, 1 week, Wistar mice.	Moringa oleifera seeds	(15)
	Moringa oleifera is used for preventing brain impairment in a high-fat, high-fructose diet by enhancing cognitive function and inhibiting brain senescence.	Moringa oleifera extract: 500 mg/kg BW, seed oil: 2 mL/kg BW, HFFD mice.	Moringa oleifera leaves extract, seed oil	(16)
	Moringa oleifera is used for treating Alzheimer's Disease by reducing oxidative stress and apoptosis through Akt activation and anti-apoptotic properties.	Moringa oleifera leaf extract: 25, 50, 100 µg/m	Moringa oleifera leaf extract	(17)
	Moringa oleifera is used for its antioxidant, hepatoprotective, anti-inflammatory, and antimicrobial properties, enhancing overall health and promoting wellness.	Moringa oleifera ethanol extract: 200 mg/kg, tested with 10 mg/kg fluoxetine.	Moringa oleifera leaves, seed oil, bark, fruits, flowers, root	(18)
	Moringa oleifera is used for neuroprotective effects against chemotherapy-induced peripheral neuropathy (CIPN) by targeting TRPV1 with its secondary metabolites like quercetin, ellagic acid, lutein, luteolin, rhamnetin, and 3-O-beta-D-Glucopyranosyl sitosterol.		Moringa oleifera metabolites from leaves and seeds	(19)
	Moringa oleifera is used for modulating mitochondrial dysfunction in Parkinson's disease by providing neuroprotective effects in both in silico and in vivo models.			(20)
	Moringa oleifera is used for mitigating Parkinson's disease symptoms by inhibiting PARP1 hyper-activation, reducing α-synuclein toxicity, and improving mitochondrial function and neurobehavioral deficits.	Moringa oleifera extract: 400 mg/kg	Moringa oleifera leaves	(21)

Moringa oleifera is used for treating epilepsy by reducing seizures, cognitive impairment, and oxidative stress in combination with curcumin.	Moringa oleifera ethanol extract: 250 mg/kg and 500 mg/kg	Moringa oleifera leaves combined with curcumin	(22)
Moringa oleifera is used for cardiovascular health by providing anti-inflammatory, antimicrobial, neuroprotective, hepatoprotective, and cardioprotective effects against hypertension, cardiac dysfunction, and diabetic cardiomyopathy.			(23)
Moringa oleifera is used for treating Alzheimer's disease by modulating neurotransmission, reducing oxidative stress, and targeting amyloid β plaques and tau proteins.		Moringa oleifera's parts include leaves, seeds, and extracts	(24)
Moringa oleifera is used for neuroprotection against neurodegenerative diseases through its antioxidant, anti-inflammatory, and anti-apoptotic properties in experimental models.	Moringa oleifera seed ethanol extract: 250 or 500 mg/kg, orally for 7-14 days.	Moringa oleifera seed extracts	(25)
Moringa oleifera is used for reducing infarct volume and oxidative stress in ischemic stroke by increasing antioxidant enzymes like superoxide dismutase, glutathione peroxidase, and catalase.	Moringa oleifera extract: 100, 200, 400, 125, 250, 500 mg/kg, studied durations varied.	Moringa oleifera oil/ extract	(26)
Moringa oleifera is used for neuroprotective effects in epilepsy by utilizing its bioactive compound quercetin and its derivatives to provide anticonvulsant properties and prevent seizures.		Moringa oleifera leave	(27)
Moringa oleifera is used for treating neurodegenerative diseases like Parkinson's, Alzheimer's, multiple sclerosis, and Huntington's due to its neuroprotective and anti-neuroinflammatory properties.	Moringa oleifera leaf ethanol extract: 250 mg/kg and 500 mg/kg	Moringa oleifera leaves, seeds, extracts	(28)
Moringa oleifera is used for preventing brain damage caused by aging and neurodegenerative diseases through its antioxidative and anti-inflammatory properties.		Moringa oleifera leaves, seeds, Roots	(29)
Moringa oleifera is used for treating neurodegenerative diseases like Parkinson's, Alzheimer's, multiple sclerosis, and Huntington's due to its neuroprotective and anti-neuroinflammatory properties.		Moringa oleifera leaves, seeds	(30)
Moringa oleifera is used for preventing and treating Alzheimer's disease by interfering with molecular cascades involved in its pathogenesis and protecting neurons from functional loss.	Moringa oleifera seeds: 250 or 500 mg/kg	Moringa oleifera seeds	(31)
Moringa oleifera is used for treating neurological disorders like depression, Alzheimer's, Huntington's, and neuroinflammatory disorders due to its antioxidant, anti-inflammatory, and neuroprotective activities.			(32)
Moringa oleifera is used for treating infections, diabetes, asthma, inflammation, cancer, fertility issues, allergies, fever, wounds, pain, and liver diseases.		Moringa oleifera fruits, leaves used.	(33)
Moringa oleifera is used for boosting the immune system due to its antioxidant, immunomodulatory, anti-inflammatory, neuroprotective, hepatoprotective, cardioprotective, and antiviral properties.		Moringa oleifera leaves, seeds	(34)
Moringa oleifera is used for antioxidant, anti-inflammatory, immunomodulatory, anticancer, antibacterial, antiviral, and neuroprotective activities due to its rich phytochemical content.	Moringa oleifera seed extract: 50–500 mg/kg	Moringa oleifera seeds	(35)
Moringa oleifera is used for treating ischemic stroke by reducing reactive oxygen species, enhancing antioxidant enzymes, and restoring brain injury.	Polyphenol from Moringa oleifera seeds: dosage increased neuroprotective properties in rats.	Moringa oleifera seeds	(36)
Moringa oleifera is used for preventing or treating chronic diseases due to its rich phytochemical components and various biological activities.		Moringa oleifera leaves, seeds	(37)
Moringa oleifera is used for treating anxiety and depression caused by chronic stress by improving behavioral disorders, reducing oxidative stress, and increasing BDNF expression.	Moringa oleifera extract: 800 mg/kg for 23 days	Moringa oleifera leaves	(38)
Moringa oleifera is used for neuroprotective effects against oxygen-glucose deprivation/reperfusion injury by regulating NF-κB and Nrf2 with its pyrrole-2-carbaldehydes.		Moringa oleifera seeds	(39)
Moringa oleifera is used for treating neurological disorders like Parkinson's, Alzheimer's, Huntington's, and ALS due to its neuroprotective properties.		Moringa oleifera leaves	(40)
Moringa oleifera is used for antioxidant, antidiabetic, hepatoprotective, antinociceptive, antiageing, anti-inflammatory, neuroprotective, and cardioprotective activities.		Moringa oleifera leaves, seeds	(41)
Moringa oleifera is used for treating Alzheimer's disease by improving behavioral deficits, reducing Aβ burden, and enhancing synaptic plasticity and neuroprotection.	Moringa oleifera extract: 400 mg/kg/day for four months in mice.	Moringa oleifera leaves	(42)
Moringa oleifera is used for treating cadmium-induced neurotoxicity by providing neuroprotective, neuroregenerative, anti-AD, anti-inflammatory, and anticancer effects.	MO11 from Moringa oleifera: 15 mg/kg bodyweight	Moringa oleifera leaves	(43)
Moringa oleifera is used for malnutrition eradication and as a nutritional supplement due to its rich nutrient content and medicinal properties.	Moringa oleifera extract: 50–200 mg/kg	Moringa oleifera leaves, seed	(44)
Moringa oleifera is used for treating diabetes, obesity, asthma, cardiac, liver, gastrointestinal, infectious, and brain disorders with antioxidant, anti-inflammatory, and antimicrobial properties.	Moringa oleifera extract: 50–500 mg/kg	Moringa oleifera leaves, seeds	(45)

Moringa oleifera is used for treating Alzheimer's disease by providing neuroprotective effects through its natural compounds and multitarget approach, with fewer side effects than synthetic drugs.		Moringa oleifera leaves	(46)
Moringa oleifera is used for managing chronic inflammatory and neuropathic pain by modulating inflammatory responses and oxidative stress pathways.			(47)
Moringa oleifera is used for improving brain function and treating Alzheimer's disease due to its neuroprotective and antioxidant properties.		Moringa oleifera leaves	(48)
Moringa oleifera is used for ameliorating memory impairment caused by scopolamine through its neuroprotective effects involving AChE and NF-κB inhibition and TrkB modulation.	Moringa oleifera seed oil: 2 ml/kg bodyweight; leaf extract: 500 mg/kg for 28 days.	Moringa oleifera seed oil, leaves	(49)
Moringa oleifera is used for neuroprotective activities against oxidative stress-induced damage due to its rich polyphenol content.		Moringa oleifera leaves	(50)
Moringa oleifera is used for treating asthma, bacterial infections, cancer, diabetes, fungal infections, inflammation, viral infections, liver, and neurological disorders.		Moringa oleifera seeds, leaves, flowers	(51)
Moringa oleifera is used for ameliorating behavioral abnormalities like anxiety, depression, and memory impairment in chronic stress models by enhancing BDNF expression and inhibiting AChE activity.	Moringa oleifera seed oil: 1–2 mL/kg bodyweight for 23 days.	Moringa oleifera seed oil	(52)
Moringa oleifera is used for treating neurodegenerative diseases like Parkinson's, Alzheimer's, and Huntington's due to its antioxidant-rich plant extracts that combat oxidative stress.			(53)
Moringa oleifera is used for improving sleep by regulating GABAA-ergic systems with its ethanol seed extracts.	Moringa oleifera seed ethanol extract: 1-2 g/kg for 14 days.	Moringa oleifera seeds	(54)
Moringa oleifera is used for neuroprotection, treating Alzheimer's, dementia, Parkinson's, stroke, and neurotoxicity-related symptoms, along with its extensive pharmacological activities.		Moringa oleifera leaves	(55)
Moringa oleifera is used for neuroprotective effects against dementia, reducing malondialdehyde, cholinesterase, nitric oxide, and amyloid β levels, and increasing glutathione levels.	Moringa oleifera seeds: 250 mg/kg/day for 15 days.	Moringa oleifera seeds used	(56)
Moringa oleifera is used for treating oxidative stress, liver disease, neurological disease, hyperglycemia, and cancer due to its phenolic compounds and protective characteristics.		Moringa oleifera leaves	(57)
Moringa oleifera is used for preventing loss of neuronal cells and managing Alzheimer's disease by ameliorating oxido-inflammatory stress and restoring cholinergic transmission.	Moringa oleifera-supplemented diet: 1%, 5%, and 10% for 7-14 days.	Moringa oleifera leaves	(58)
Moringa oleifera is used for neuroprotection against oxidative stress-induced damage due to its rich polyphenol content.	Moringa oleifera extract: 25 µg/mL	Moringa oleifera parts used: Roots, Leaves, Seeds, Flowers	(59)
Moringa oleifera is used for protecting against oxidative stress in ischemia-reperfusion injury by maintaining antioxidant enzyme levels and vital signs in animal models.	Moringa oleifera leaves extract: 400 mg/kg, 3 times daily for 2 weeks.	Moringa oleifera leaves	(60)
Moringa oleifera is used for treating inflammation, diabetes, cancer, and neuroprotection due to its rich nutrient and bioactive compound content.		Moringa oleifera leaves	(61)
Moringa oleifera is used for anti-aging by reducing age-associated problems and treating diseases like cancer, diabetes, immunosuppression, hepatic damage, and neurodegenerative disorders through its bioactive compounds.		Moringa oleifera leaves	(62)
Moringa oleifera is used for neuroprotection against oxidative stress-induced damage by enhancing antioxidant activity, reducing free radicals, and preventing mitochondrial dysfunction in human neuroblastoma cells.	Moringa oleifera methanol extract: 25 µg/mL	Moringa oleifera leaves	(63)
Moringa oleifera is used for protecting retinal ganglion cells against glutamate-induced DNA damage in retinal and neurological disorders.	Moringa oleifera seed extract: 5, 10, 50, 100 µg/ml	Moringa oleifera seeds	(64)
Moringa oleifera is used for preventing Alzheimer's disease progression by reducing gene expression involved in senescence, autophagy, and mitophagy, and promoting neuronal repair.	Moringin (MOR) conjugated with α-cyclodextrin: 0.5 µM	Moringa oleifera leaves, seeds	(65)
Moringa oleifera is used for neuroprotection against oxidative stress-induced damage by increasing antioxidant activity, reducing free radicals, and preventing mitochondrial dysfunction in human neuroblastoma cells.	Moringa oleifera seeds: 25 mg/kg for 16 days.	Moringa oleifera seeds	(66)
Moringa oleifera is used for neuroprotection against oxidative stress in human neuroblastoma cells, with high O2– scavenging and ROS scavenging properties.	Moringa oleifera leaf extract: 2.7 mg/mL	Moringa oleifera leaves	(67)
Moringa oleifera is used for treating virility, oxidative stress, inflammation, cancer, epilepsy, diabetes, cardiovascular issues, fertility, liver health, infections, kidney stones, and asthma.		Moringa oleifera leaves, stem, pods, seed, bark	(68)
Moringa oleifera is used for protecting against oxidative stress and apoptosis in neuroblastoma cells, by lowering ROS formation, restoring mitochondrial activities, and modulating vitagene expression.	Moringa oleifera extract: 10-150 µg/mL	Moringa oleifera leaves	(69)
Moringa oleifera is used for maintaining cell viability and modulating cholinergic and purinergic enzymes in microglial cells.	Moringa oleifera extract: 0.1-100 µg/mL	Moringa oleifera leaves	(70)

Moringa oleifera is used for improving neurological disorders associated with diabetes by increasing antioxidant activity, reducing inflammation and neurotoxicity, and enhancing neurotransmitter levels.		Moringa oleifera seeds	(71)
Moringa oleifera is used for antioxidant, antidiabetic, and neuroprotective effects in sucrose-induced diabetes without alteration from mistletoe infestation.		Moringa oleifera leaves	(72)
Moringa oleifera is used for treating Alzheimer's disease and cognitive decline due to its anti-inflammatory, antioxidant, and cognitive-enhancing effects.			(73)
Moringa oleifera is used for protecting against lead-induced neurotoxicity by attenuating oxidative stress, inflammation, and apoptosis in the brain cortex of rats.	Moringa oleifera extract: 250 mg/kg for 14 days	Moringa oleifera extract	(74)
Moringa oleifera is used for antidiabetic effects due to its natural extracts and bioactive compounds that help in diabetes management and reduction of complications.			(75)
Moringa oleifera is used for antioxidant, anti-aging, and anti-neurodegenerative properties in Caenorhabditis elegans by extending life span, improving physiological functions, and reducing oxidative stress.		Moringa oleifera leaves	(76)
Moringa oleifera is used for neuroprotection due to its antioxidative, anti-inflammatory, and antiapoptotic effects, with potential for treating ischemic stroke.		Moringa oleifera leaf	(77)
Moringa oleifera is used for neuroprotection and dopaminergic neuron preservation in Parkinson's disease, enhancing dopamine levels and improving motor system health.			(78)
Moringa oleifera is used for hepatoprotection, antioxidant, neuroprotection, antitumour, anti-inflammatory, anti-diabetic, and anti-cancer effects due to its rich phytochemical content.		Moringa oleifera leaves	(79)
Moringa oleifera is used for enhancing concentration capability in adolescents through administration of M. oleifera leaf cookies.	Moringa oleifera leaf cookies: 5 g or 10 g for 14 days.	Moringa oleifera leaves	(80)
Moringa oleifera is used for antioxidant, anticancer, hepatoprotective, antimicrobial, antiviral, anti-inflammatory, and neuroprotective effects due to its rich nutritional and phytochemical content.		Moringa oleifera seeds	(81)
Moringa oleifera is used for neuroprotection and neuro-regeneration in sodium arsenite-induced neurotoxicity by reversing downregulation of Acetylcholinesterase concentrations.	Moringa oleifera extract: 5.0-7.5 mg/kg bodyweight	Moringa oleifera leaves	(82)
Moringa oleifera is used for improving cardiac functions and survival rates in myocardial infarction (MI) mice by suppressing oxidative stress, apoptosis, and cardiac fibrosis.		Moringa oleifera seeds	(83)
Moringa oleifera is used for neuroprotective, antimicrobial, antiasthmatic, anti-malaria, cardioprotective, antidiabetic, antiobesity, hepatoprotective, and cytotoxic effects due to its rich phytochemical content. Studies have shown it to be safe with no adverse effects reported.		Moringa oleifera leaves, seed, bark	(84)
Moringa oleifera is used for managing diabetes mellitus and its neurological complications by exhibiting antihyperglycaemic and central nervous system effects.			(85)
Moringa oleifera is used for abrogating oxidative stress-induced neurodegeneration by increasing detoxifying markers and Nrf2/NF-kB pathway proteins, with GMG-ITC isolated from Moringa seeds.		Moringa oleifera seeds	(86)
Moringa oleifera is used for neuroprotection in ischemic stroke by improving survival, reversing cognitive impairment, promoting hippocampal neurogenesis, and enhancing cholinergic function.	Moringa oleifera seed extract: 500 mg/kg	Moringa oleifera seed extract	(87)
Moringa oleifera is used for reducing neuroinflammation by inhibiting nitric oxide production and suppressing cytokine expression in microglial cells.	Moringa oleifera leaf extract: 25-300 µg/mL	Moringa oleifera leaves	(88)
Moringa oleifera is used for preventing nicotine-induced neurotoxicity by enhancing neuroplasticity, cognitive function, modulating energy metabolism, and reducing oxidative stress in laboratory animals.	Moringa oleifera: 200 mg/kg for 28 days	Moringa oleifera plant	(89)
Moringa oleifera is used for preventing and treating chronic diseases such as diabetes, heart disease, hypertension, and cancer.		Moringa oleifera leaves, pods, seeds, flowers	(90)
Moringa oleifera is used for treating diabetes and cancer due to its neuroprotective, hepatoprotective, antitumor, antimicrobial, and antidiabetic potential.			(91)
Moringa oleifera is used for reducing oxidative brain damages caused by subchronic chlorpyrifos (CPF) intoxication through its antioxidant and neuroprotective effects.	Moringa oleifera extract: 250-500 mg/kg	Moringa oleifera leaves	(92)
Moringa oleifera is used for ameliorating cuprizone-induced oxidative and nitrosative stress, memory decline, and neuronal deficits in the prefrontal cortex and hippocampus.		Moringa oleifera plant	(93)
Moringa oleifera is used for mitigating oxidative stress-induced neuronal cell death and protecting neuronal integrity through GMG-ITC.	GMG-ITC: 0.313–10 µg/ml	Moringa oleifera seeds	(94)
Moringa oleifera is used for preventing cognitive dysfunction in streptozotocin-induced diabetic rats through its modulatory effects on biomolecules associated with cognitive function.	Moringa oleifera leaf and seed: 2-4% diet supplementation for 14 days.	Moringa oleifera leaf, seed	(95)

Moringa oleifera is used for anti-inflammatory, antioxidant, anti-cancer, hepatoprotective, neuroprotective, hypoglycemic, and blood lipid-reducing functions due to its rich phytochemical content.	Moringa oleifera: 100-400 mg/kg	Moringa oleifera leaves	(96)
Moringa oleifera is used for preventing nicotine-induced cerebellar injury by reducing chromatolysis, distortion of cerebellar cortical cells, and neurobehavioural deficits.	Moringa oleifera: 200 mg/kg for 28 days;	Moringa oleifera leaves	(97)
Moringa oleifera is used for treating asthma, dysentery, intestinal cancer, and heavy metal detoxification due to its phytochemical content and medicinal properties.		Moringa oleifera leaves, seeds, bark, gum	(98)
Moringa oleifera is used for treating Alzheimer's disease (AD) by preventing and rescuing oxidative stress, cognitive impairments, tau hyperphosphorylation, and Aβ pathology.	Moringa oleifera extract: 200 mg/ml for various pharmacological studies	Moringa oleifera leaves	(99)
Moringa oleifera is used for treating painful diabetic neuropathy in alloxan-induced diabetic mice due to its antinociception, glycemic control, and neuroprotective properties.	Moringa oleifera seeds: 40-80 mg/kg	Moringa oleifera seeds	(100)
Moringa oleifera is used for protecting against aluminium-induced neurotoxicity by reducing degenerative features and preserving neuronal integrity in the temporal cortex.	Moringa oleifera extract: 300 mg/kg for 28 days	Moringa oleifera leaf extract	(101)
Moringa oleifera is used for nutritional support, pharmacological benefits, water and effluent treatment, and improving water quality due to its rich chemical constituents and medicinal properties.	Moringa oleifera leaf powder: 8 g daily for 40 days	Moringa oleifera seeds	(102)
Moringa oleifera is used for treating neurological and psychological disorders by indigenous communities with ethno-phyto therapeutics.			(103)
Moringa oleifera is used for treating or preventing Parkinson's disease (PD) by modulating inflammatory, oxidative stress, and apoptotic pathways with glucomoringin (GMG) and its bioactive form, moringin.	Moringin (GMG-ITC): 10 mg/kg + 5 µL	Moringa oleifera seeds	(104)
In this study, Moringa oleifera is used for treating cognitive dysfunction by inhibiting AChE, BChE, MAO, and oxidative stress.	Moringa oleifera seeds: 0.14-0.27 mg/mL	Moringa oleifera seeds	(105)
Moringa oleifera is used for combatting neurodegenerative diseases due to its rich phytochemical content, including minerals, vitamins, and antioxidants.		Moringa oleifera leaves	(106)
Moringa oleifera is used for preventing and treating neurodegenerative diseases by exerting neuroprotective properties through isothiocyanates (ITCs) that activate the Nrf2/ARE pathway.		Moringa oleifera seeds	(107)
Moringa oleifera is used for preventing and treating cerebral ischemia/reperfusion (CIR) damage by counteracting oxidative stress and inflammation through GMG-ITC.	Glucomoringin isothiocyanate (GMG-ITC): 3.5 mg/ml with 30 µl enzyme.	Moringa oleifera seeds	(108)
Moringa oleifera is used for managing dementia by improving cholinergic status, reducing lipid peroxidation, and oxidative stress in scopolamine-induced rats.	Moringa oleifera aqueous extract: 2500 mg/kg for 15 days.	Moringa oleifera leaves	(109)
In this study, Moringa oleifera is used for treating spinal cord injury by reducing inflammatory response, oxidative stress, and neuronal cell death through GMG-ITC.	Moringa oleifera (GMG-ITC): 10 mg/kg + 5 µl myrosinase daily in mice.	Moringa oleifera seeds	(110)
Moringa oleifera is used for promoting axodendritic maturation and neuroprotection by enhancing neurite outgrowth, synaptogenesis, and neuronal survival in primary hippocampal neurons.	Moringa oleifera ethanol extract (MOE): optimal concentration of 30 µg/mL.	Moringa oleifera leaves	(111)
Moringa oleifera is used for protecting against brain damage and oxidative stress in ischemic stroke by decreasing infarction volume and oxidative stress.	Moringa oleifera leaf extract: 100, 200, 400 mg/kg for 5 weeks.	Moringa oleifera leaves	(112)
Moringa oleifera is used for enhancing spatial memory and neuroprotection in age-related dementia by reducing oxidative stress and improving cholinergic function.	Moringa oleifera leaf extract: 100, 200, 400 mg/kg for 14 days.	Moringa oleifera leaves extract	(113)
Moringa oleifera is used for neuroprotective support and therapeutic utility in Parkinson's disease (PD) through its phytochemicals and bioactive ingredients.			(114)
In this study, Moringa oleifera is used for preventing epilepsy by reducing free radical damage and regulating protective neurotransmitters.	Moringa oleifera root extract: 350 mg/kg orally for epilepsy prevention.	Moringa oleifera root extract	(115)
In this study, Moringa oleifera is used for protecting against focal cerebral ischemia by reducing brain infarct volume and oxidative stress damage.	Moringa oleifera leaf extract: 100, 200, 400 mg/kg for 2 weeks in rats.	Moringa oleifera leaves	(116)
In this study, Moringa oleifera is used for preventing and treating neurodegenerative diseases by hindering neurodegeneration and improving memory and cognitive function.			(117)
In this study, Moringa oleifera is used for preventing epilepsy due to its anticonvulsant properties and potential as a phytomedicine.			(118)
In this study, Moringa oleifera is used for preventing and treating various disorders by leveraging its bioactive constituent, kaempferol, which has a wide range of pharmacological activities.		Moringa oleifera plant	(119)
In this study, Moringa oleifera is used for ameliorating Alzheimer's disease (AD) symptoms by inhibiting acetylcholinesterase (AChE), modifying monoamines, preventing amyloid aggregation, and providing antioxidant activity.		Moringa oleifera leaf extract	(120)

Moringa oleifera is used for protecting against chronic stress-induced brain lipid peroxidation by reducing malondialdehyde (MDA) levels through its glycosides, phytosterols, and polyphenols.		Moringa oleifera ethanolic and methanolic extracts	(121)
Moringa oleifera is used for protecting against Alzheimer's disease (AD) by altering brain monoamines and electrical activity	Moringa oleifera leaf extract: 250 mg/kg for Alzheimer's disease.	Moringa oleifera leaf extract	(122)
Moringa oleifera is used for preventing and treating neurodegenerative and inflammatory disorders by leveraging its strong antioxidant properties		Moringa oleifera edible parts	(123)
Does not specifically discuss moringa			(124-128)

parts utilized (e.g., leaves, seeds, roots) Preparation methods (e.g., raw, aqueous extracts, ethanol-based solutions). Dosage forms (e.g., mg/kg for animal models or equivalent doses for human studies).

Cross-Disciplinary Collaboration among pharmacologists, botanists, and clinicians is key to establishing consensus on effective dosage ranges and standardized units of measurement. This strategy ensures alignment between preclinical and clinical research methodologies. Dosage Conversion for Clinical Relevance Researchers must include dose translation from preclinical (animal models) to clinical (human studies) applications using standardized scaling methodologies. This step is crucial for ensuring the clinical relevance of findings.

Implementation of Standardized Protocols and Open Data Resources Internationally harmonized protocols should be developed to foster methodological consistency. Additionally, open-access databases could store validated dosage information, serving as valuable resources for the scientific community. By implementing these guidelines, future research on Moringa oleifera can achieve greater methodological rigor, enabling the development of evidence-based applications and further enhancing its therapeutic potential.

CONCLUSIONS

The bibliometric examination of Moringa oleifera shows its antioxidant and phytochemical content makes it a promising neuroprotective agent. However, variations in dosage reporting, lack of plant component specificity, and different techniques hinder study progress. Due to dose-response research, precise reporting standards, interdisciplinary collaboration, clinical dosage translation, and harmonized methodology, standardization is essential. Future research can improve reliability, comparability, and application by addressing these problems and standardizing techniques. This progress will enable evidence-based medicinal applications and uncover Moringa oleifera's neuroprotective potential.

DATA AVAILABILITY STATEMENT

No Data Associated with this manuscript.

EXTENDED DATA

Figshare: The Miracle Moringa Oleifera Tree : A Bibliometric Review of Its Neuroprotective Properties

DOI:

Reporting guidelines:Figshare: The Miracle Moringa Oleifera Tree : A Bibliometric Review of Its Neuroprotective Properties.

DOI:

The project contains the following reporting guidelines:

- PRISMA_2020_checklist_AYS
- PRISMA_2020_flow_diagram_new_AYS

SOFTWARE AVAILABILITY

VOSviewer software is an open-access program that serves as an economical option for scientometric analysis. Biblioshiny

AUTHOR CONTRIBUTION

AYS conducts research, gathers data, performs statistical analysis, and produces discussions and conclusions, DAYS, RV and TDS editing.

REFERENCES

1. Chintalapati M, Margesan T. Investigation of In-vitro antioxidant and neuroprotective effects of Moringa oleifera root extract on SH-SY5Y neuroblastoma cell line. Journal of Medicinal and Pharmaceutical Chemistry Research. 2025;7(3):516-33.
2. Fahmy NM, Fayez S, Mohamed RW, Elissawy AM, Eldahshan OA, Zengin G, et al. Moringa oleifera flowers: insights into their aroma chemistry, anti-inflammatory, antioxidant, and enzyme inhibitory properties. BMC Complementary Medicine and Therapies. 2024;24(1).
3. Mahaveerchand H, Abdul Salam AA. Environmental, industrial, and health benefits of Moringa oleifera. Phytochemistry Reviews. 2024;23(5):1497-556.
4. Raza C, Mohsin S, Faheem M, Hanif U, Alkhathlan HZ, Shaik MR, et al. In Vivo Study of Moringa oleifera Seed Extracts as Potential Sources of Neuroprotection against Rotenone-Induced Neurotoxicity. Plants. 2024;13(11).
5. Srivastava G, Ganjewala D. An update on the emerging neuroprotective potential of Moringa oleifera and its prospects in complimentary neurotherapy. Phytomedicine Plus. 2024;4(2).
6. Hindawy RF, Manawy SM, Nafea OE, Abdelhameed AA, Hendawi FF. Moringa oleifera leaves ethanolic extract counteracts cortical neurodegeneration induced by aluminum chloride in rats. Toxicology Research. 2024;13(2).
7. Wu Q, Zhou HJ, Sheng J, Su LY, Tian Y. Extraction, structural properties, and bioactivities of Moringa (Moringa oleifera Lam.) isothiocyanates: A review. Food Bioscience. 2024;57.
8. Bangar A, Khan H, Kaur A, Dua K, Singh TG. Understanding mechanistic aspect of the therapeutic role of herbal agents on neuroplasticity in cerebral ischemic-reperfusion injury. Journal of Ethnopharmacology. 2024;319.
9. Barinda AJ, Arozal W, Hardi H, Dewi YR, Safutra MS, Lee HJ. Water Extracts of Moringa oleifera Leaves Alter Oxidative Stress-Induced Neurotoxicity in Human Neuroblastoma SH-SY5Y Cells. TheScientificWorldJournal. 2024;2024:7652217.
10. Worku B, Tolossa N. A Review on the Neuroprotective Effect of Moringa oleifera. Oxidative medicine and cellular longevity. 2024;2024:7694516.
11. Flores Castro LM, Pinto Gonza JH, Huamán Gutiérrez OG. Effect of Moringa oleifera Lam seed suspension against ethanol-induced neurotoxicity in mice. Nutricion Clinica y Dietetica Hospitalaria. 2024;44(4):38-46.

12. Premkumar T, Sajitha Lulu S. Targeting key players in Alzheimer's disease: bioactive compounds from Moringa oleifera, Desmodium gangeticum, and Centella asiatica as potential therapeutics. Journal of Biomolecular Structure and Dynamics. 2024.
13. Ganjewala D, Srivastava G, Bansal H, Srivastava N. Status Review of Emerging Neuroprotective Potential of Moringa Oleifera and Desmodium Gangeticum. Medicinal Plants for the Management of Neurodegenerative Diseases2024. p. 150-68.
14. Wadhawan S, Biswkarma VK, Chaudhary A, Masand P. A Critical Review Based on Preclinical Studies of Medicinal Plants for the Management of Alzheimer's Disease. Current Bioactive Compounds. 2024;20(4):45-61.
15. Alanazi IS, Altyar AE, Zaazouee MS, Elshanbary AA, Abdel-Fattah AFM, Kamel M, et al. Effect of moringa seed extract in chlorpyrifos-induced cerebral and ocular toxicity in mice. Frontiers in Veterinary Science. 2024;11.
16. Arozal W, Safutra MS, Barinda AJ, Hardi H, Dwita NC, Lee HJ. Comparative Neuroprotective Effects of Moringa oleifera Seed Oil and Aqueous Extract on Cognitive Functions on a High-Fat, High-Fructose Diet Mice: Focus on Senescence Markers. Scientific World Journal. 2024;2024.
17. Balit T, Thonabulsombat C, Dharmasaroja P. Moringa oleifera leaf extract suppresses TIMM23 and NDUFS3 expression and alleviates oxidative stress induced by Aβ1-42 in neuronal cells via activation of Akt. Research in Pharmaceutical Sciences. 2024;19(1):105-20.
18. Klimek-Szczykutowicz M, Gaweł-Bęben K, Rutka A, Blicharska E, Tatarczak-Michalewska M, Kulik-Siarek K, et al. Moringa oleifera (drumstick tree)—nutraceutical, cosmetological and medicinal importance: a review. Frontiers in Pharmacology. 2024;15.
19. Aliyah AN, Ardianto C, Samirah S, Nurhan AD, Marhaeny HD, Ming LC, et al. In silico molecular docking study from Moringa oleifera and Caesalpinia sappan L. secondary metabolites as antagonist TRPV1. Journal of Medicinal and Pharmaceutical Chemistry Research. 2023;5(10):885-94.
20. Ahmed M. A Glimpse into the Diverse Horizons of Pharmacological Research: Insights From the Latest Issue. Journal of Pharmacology and Pharmacotherapeutics. 2023;14(3):169-70.
21. Singh S, Keshri PK, Mishra VN, Singh SP. Moringa oleifera Modulates MPTP-induced Mitochondrial Dysfunction in Parkinson's Mouse Model: An in silico and in vivo Analysis. Journal of Pharmacology and Pharmacotherapeutics. 2023;14(3):187-200.
22. Alam MN, Singh L, Khan NA, Asiri YI, Hassan MZ, Afzal O, et al. Ameliorative Effect of Ethanolic Extract of Moringa oleifera Leaves in Combination with Curcumin against PTZ-Induced Kindled Epilepsy in Rats: In Vivo and In Silico. Pharmaceuticals. 2023;16(9).
23. Oluranti OI. Potential of moringa oleifera for the prevention of cardiovascular diseases in animal models. Curative and Preventive Properties of Medicinal Plants: Research on Disease Management and Animal Model Studies2023. p. 53-64.
24. Thakral S, Yadav A, Singh V, Kumar M, Kumar P, Narang R, et al. Alzheimer's disease: Molecular aspects and treatment opportunities using herbal drugs. Ageing Research Reviews. 2023;88.
25. Duarte GM, de Araújo FEA, da Rocha JMC, Idalina Neta F, do Rego ACM, Araújo Filho I, et al. Neuroprotective Potential of Seed Extracts: Review of In Vitro and In Vivo Studies. Nutrients. 2023;15(11).
26. Cuschieri A, Camilleri E, Blundell R. Cerebroprotective effects of Moringa oleifera derivatives extracts against MCAO ischemic stroke: A systematic review and meta-analysis. Heliyon. 2023;9(6).
27. Prakash C, Tyagi J, Rabidas SS, Kumar V, Sharma D. Therapeutic Potential of Quercetin and its Derivatives in Epilepsy: Evidence from Preclinical Studies. NeuroMolecular Medicine. 2023;25(2):163-78.
28. Azlan UK, Khairul Annuar NA, Mediani A, Aizat WM, Damanhuri HA, Tong X, et al. An insight into the neuroprotective and anti-neuroinflammatory effects and mechanisms of Moringa oleifera. Frontiers in Pharmacology. 2023;13.
29. Agil M, Kusumawati I, Muslikh FA, Ma'arif B. Neuroprotective activity of Indonesian traditional herbal medicine: A systematic review. Journal of Applied Pharmaceutical Science. 2023;13(10):14-30.
30. Teraiya N, Agrawal K, Patel TM, Patel A, Patel S, Shah U, et al. A Review of the Therapeutic Importance of Indole Scaffold in Drug Discovery. Current Drug Discovery Technologies. 2023;20(6):9-37.
31. Khan F, Joshi A, Devkota HP, Subramaniyan V, Kumarasamy V, Arora J. Dietary glucosinolates derived isothiocyanates: chemical properties, metabolism and their potential in prevention of Alzheimer's disease. Frontiers in Pharmacology. 2023;14.
32. Jayaraman M, Dutta P, Krishnan S, Arora K, Sivakumar D, Raghavendran HRB. Emerging Promise of Phytochemicals in Ameliorating Neurological Disorders. CNS and Neurological Disorders - Drug Targets. 2023;22(9):1275-301.
33. Singh S, Dubey S, Rana N. Phytochemistry and Pharmacological Profile of Drumstick Tree "Moringa oleifera Lam": An Overview. Current Nutrition and Food Science. 2023;19(5):529-48.
34. Frazzoli C, Grasso G, Husaini DC, Ajibo DN, Orish FC, Orisakwe OE. Immune System and Epidemics: The Role of African Indigenous Bioactive Substances. Nutrients. 2023;15(2).
35. Sławińska N, Olas B. Selected Seeds as Sources of Bioactive Compounds with Diverse Biological Activities. Nutrients. 2023;15(1).
36. Manikandan P, Al-Baradie R, Abdelhadi A, Al Othaim A, Vijayakumar R, Ibrahim R, et al. Neuroprotective effect of endophytic fungal antioxidant polyphenols on cerebral ischemic stroke-induced Albino rats; memory impairments, brain damage, and upregulation of metabolic proteins. Journal of King Saud University - Science. 2023;35(1).
37. Ade FY, Supratman U, Sianipar NF, Gunadi JW, Radhiyanti PT, Lesmana R. A Review of the Phytochemical, Usability Component, and Molecular Mechanisms of Moringa oleifera. Tropical Journal of Natural Product Research. 2022;6(12):1906-13.
38. Purwoningsih E, Arozal W, Lee HJ, Munim A. NEUROPROTECTIVE AND ANTIOXIDANT ACTIVITIES OF AQUEOUS EXTRACT MORINGA OLEIFERA LEAVES. International Journal of Applied Pharmaceutics. 2022;14(Special Issue 5):127-31.
39. Jiang Y, Liu R, Li J, Huang Q, Liu S, He J. Pyrrole-2-carbaldehydes with neuroprotective activities from Moringa oleifera seeds. Phytochemistry. 2022;204.
40. Mundkar M, Bijalwan A, Soni D, Kumar P. Neuroprotective potential of Moringa oleifera mediated by NF-kB/Nrf2/HO-1 signaling pathway: A review. Journal of Food Biochemistry. 2022;46(12).
41. Nirmala C, Shahar B, Dolma N, Santosh O. Promising underutilized wild plants of cold desert Ladakh, India for nutritional security and health benefits. Applied Food Research. 2022;2(2).
42. Mahaman YAR, Feng J, Huang F, Salissou MTM, Wang J, Liu R, et al. Moringa Oleifera Alleviates Aβ Burden and Improves Synaptic Plasticity and Cognitive Impairments in APP/PS1 Mice. Nutrients. 2022;14(20).
43. Akinlolu A, Ameen M, Ebito G, Asogwa N, Akindele R, Fagbounka B, et al. MO11 and MS06 ameliorated cadmium chloride-induced neuro-inflammation, hyperplasia and apoptosis via NF-kB/Caspase-3/p53 pathway and down-regulated sVEGFR in rats. European Journal of Anatomy. 2022;26(5):495-508.

44. Patil SV, Mohite BV, Marathe KR, Salunkhe NS, Marathe V, Patil VS. Moringa Tree, Gift of Nature: a Review on Nutritional and Industrial Potential. Current Pharmacology Reports. 2022;8(4):262-80.

45. Sonewane K, Chouhan SS, Rajan M, Chauhan NS, Rout OP, Kumar A, et al. Pharmacological, ethnomedicinal, and evidence-based comparative review of Moringa oleifera Lam. (Shigru) and its potential role in the management of malnutrition in Tribal Regions of India, especially Chhattisgarh. World Journal of Traditional Chinese Medicine. 2022;8(3):314-38.

46. Bhat BA, Almilaibary A, Mir RA, Aljarallah BM, Mir WR, Ahmad F, et al. Natural Therapeutics in Aid of Treating Alzheimer's Disease: A Green Gateway Toward Ending Quest for Treating Neurological Disorders. Frontiers in Neuroscience. 2022;16.

47. Lucarini E, Micheli L, Di Cesare Mannelli L, Ghelardini C. Naturally occurring glucosinolates and isothiocyanates as a weapon against chronic pain: potentials and limits. Phytochemistry Reviews. 2022;21(2):647-65.

48. John OO, Amarachi IS, Chinazom AP, Adaeze E, Kale MB, Umare MD, et al. Phytotherapy: A promising approach for the treatment of Alzheimer's disease. Pharmacological Research - Modern Chinese Medicine. 2022;2.

49. Arozal W, Purwoningsih E, Lee HJ, Barinda AJ, Munim A. Effects of Moringa oleifera in Two Independents Formulation and as Neuroprotective Agent Against Scopolamine-Induced Memory Impairment in Mice. Frontiers in Nutrition. 2022;9.

50. Gao Q, Wei Z, Liu Y, Wang F, Zhang S, Serrano C, et al. Characterization, Large-Scale HSCCC Separation and Neuroprotective Effects of Polyphenols from Moringa oleifera Leaves. Molecules. 2022;27(3).

51. Oyeyinka SA, Abiodun OA, Oyeyinka AT, Dauda AO, Grassby T, Ade-Omowaye BIO. Role of Moringa oleifera in nutraceuticals and functional foods. Herbs, Spices and Their Roles in Nutraceuticals and Functional Foods2022. p. 69-94.

52. Purwoningsih E, Arozal W, Lee HJ, Barinda AJ, Sani Y, Munim A. The Oil Formulation Derived from Moringa Oleifera Seeds Ameliorates Behavioral Abnormalities in Water-immersion Restraint Stress Mouse Model. Journal of Experimental Pharmacology. 2022;14:395-407.

53. Mayookha VP, Geetha V, Das M, Suresh Kumar G. Neurodegenerative Disease: Prevention and Treatment Through Plant Extracts Therapy. Frontiers in Clinical Drug Research - CNS and Neurological Disorders. 102022. p. 1-59.

54. Liu WL, Wu BF, Shang JH, Wang XF, Zhao YL, Huang AX. Moringa oleifera seed ethanol extract and its active component kaempferol potentiate pentobarbital-induced sleeping behaviours in mice via a GABAergic mechanism. Pharmaceutical Biology. 2022;60(1):810-24.

55. Ghimire S, Subedi L, Acharya N, Gaire BP. Moringa oleifera: A Tree of Life as a Promising Medicinal Plant for Neurodegenerative Diseases. Journal of Agricultural and Food Chemistry. 2021;69(48):14358-71.

56. Abdelsayed EM, Medhat D, Mandour YM, Hanafi RS, Motaal AA. Niazimicin: A thiocarbamate glycoside from Moringa oleifera Lam. seeds with a novel neuroprotective activity. Journal of Food Biochemistry. 2021;45(12).

57. Hassan MA, Xu T, Tian Y, Zhong Y, Ali FAZ, Yang X, et al. Health benefits and phenolic compounds of Moringa oleifera leaves: A comprehensive review. Phytomedicine. 2021;93.

58. Onasanwo SA, Adamaigbo VO, Adebayo OG, Eleazer SE. Moringa oleifera-supplemented diet protect against cortico-hippocampal neuronal degeneration in scopolamine-induced spatial memory deficit in mice: role of oxido-inflammatory and cholinergic neurotransmission pathway. Metabolic Brain Disease. 2021;36(8):2445-60.

59. González-Burgos E, Gómez-Serranillos MP. Effect of phenolic compounds on human health. Nutrients. 2021;13(11).

60. Mutar YS, Al-Rawi KF, Mohammed MT. Protecive effect of Moringa Oleifera extract on oxidative stress through ischemia/ reperfusion in rat brain. Egyptian Journal of Chemistry. 2021;64(11):6465-71.

61. Rubio-Sanz L, Dorca-Fornell C, Fornos M, Navarro-León E, Jaizme-Vega MC. Phytochemical characterization of Moringa oleifera leaves. Herba Polonica. 2021;67(3):19-26.

62. Bhattacharya T, Dey PS, Akter R, Kabir T, Rahman H, Rauf A. Effect of natural leaf extracts as phytomedicine in curing geriatrics. Experimental Gerontology. 2021;150.

63. González-Burgos E, Ureña-Vacas I, Sánchez M, Gómez-Serranillos MP. Nutritional value of moringa oleifera Lam. Leaf powder extracts and their neuroprotective effects via antioxidative and mitochondrial regulation. Nutrients. 2021;13(7).

64. Amina M, Bhat RS, Al-Dbass AM, Musayeib NM, Fahmy R, Alhadlaq L, et al. The protective effect of Moringa oleifera plant extract against glutamate-induced DNA damage and reduced cell viability in a primary retinal ganglion cell line. PeerJ. 2021.

65. Silvestro S, Chiricosta L, Gugliandolo A, Iori R, Rollin P, Perenzoni D, et al. The moringin/α-cd pretreatment induces neuroprotection in an in vitro model of alzheimer's disease: A transcriptomic study. Current Issues in Molecular Biology. 2021;43(1):197-214.

66. Li D, Yang J, Yang Y, Liu J, Li H, Li R, et al. A Timely Review of Cross-Kingdom Regulation of Plant-Derived MicroRNAs. Frontiers in Genetics. 2021;12.

67. Hashim FJ, Vichitphan S, Boonsiri P, Vichitphan K. Neuroprotective assessment of moringa oleifera leaves extract against oxidative-stress-induced cytotoxicity in shsy5y neuroblastoma cells. Plants. 2021;10(5).

68. Sundararajan R, Mendie EL, Mittal L, Varadarajan G, Camarillo IG, Srinivasan H. Medicinal and nutritional wonders of miracle Moringa oleifera Lam.: Another look. Indian Journal of Pharmaceutical Education and Research. 2021;55(2):s345-s52.

69. Amara I, Ontario ML, Scuto M, Lo Dico GM, Sciuto S, Greco V, et al. Moringa oleifera protects sh-sy5ycells from dehp-induced endoplasmic reticulum stress and apoptosis. Antioxidants. 2021;10(4).

70. Adefegha SA, Assmann CE, Schetinger MRC, de Andrade CM, Emanuelli T. Moringa oleifera modulates cholinergic and purinergic enzymes activity in BV-2 microglial cells. Metabolic Brain Disease. 2021;36(4):627-38.

71. Khazaei H, Pesce M, Patruno A, Aneva IY, Farzaei MH. Medicinal plants for diabetes associated neurodegenerative diseases: A systematic review of preclinical studies. Phytotherapy Research. 2021;35(4):1697-718.

72. Oyeniran OH, Ademiluyi AO, Oboh G. Modulatory effects of moringa (Moringa oleifera L.) leaves infested with African mistletoe (Tapinanthus bangwensis L.) on the antioxidant, antidiabetic, and neurochemical indices in high sucrose diet-induced diabetic-like phenotype in fruit flies (Drosophila melanogaster M.). Journal of Food Biochemistry. 2021;45(3).

73. Gregory J, Vengalasetti YV, Bredesen DE, Rao RV. Neuroprotective herbs for the management of alzheimer's disease. Biomolecules. 2021;11(4).

74. Alqahtani WS, Albasher G. Moringa oleifera Lam. extract rescues lead-induced oxidative stress, inflammation, and apoptosis in the rat cerebral cortex. Journal of Food Biochemistry. 2021;45(1).

75. Jugran AK, Rawat S, Devkota HP, Bhatt ID, Rawal RS. Diabetes and plant-derived natural products: From ethnopharmacological approaches to their potential for modern drug discovery and development. Phytotherapy Research. 2021;35(1):223-45.

76. Chauhan AP, Chaubey MG, Patel SN, Madamwar D, Singh NK. Extension of life span and stress tolerance modulated by DAF-16 in Caenorhabditis elegans under the treatment of Moringa oleifera extract. 3 Biotech. 2020;10(12).

77. Tao T, Liu M, Chen M, Luo Y, Wang C, Xu T, et al. Natural medicine in neuroprotection for ischemic stroke: Challenges and prospective. Pharmacology and Therapeutics. 2020;216.

78. Chang YM, Manoj Kumar M, Lu CY, Te Tsai C, Tsai CC, Liao PH, et al. Parkinson's disease a futile entangle of Mankind's credence on an herbal remedy: A review. Life Sciences. 2020;257.

79. Soin D, Gupta D. Recent Advances in Health Benefits of Moringa Oleifera. International Journal of Pharmaceutical Sciences and Nanotechnology. 2020;13(3):4870-5.

80. Adiputra FB, Santoso S, Wiboworini B. Moringa Oleifera Leaves Cookies as New Supplementary Food Enhancing Concentration Ability among Adolescents. International Journal of Nutrition Sciences. 2020;5(1):33-7.

81. Singh AK, Rana HK, Tshabalala T, Kumar R, Gupta A, Ndhlala AR, et al. Phytochemical, nutraceutical and pharmacological attributes of a functional crop Moringa oleifera Lam: An overview. South African Journal of Botany. 2020;129:209-20.

82. Akinlolu A, Ameen M, Quadri T, Odubela K, Omotoso G, Yahya R, et al. Extraction, isolation and evaluation of anti-toxic principles from Moringa oleifera (MOF6) and Myristica fragrans (Trimyristin) upregulated Acetylcholinesterase concentrations in Sodium arsenite-induced neurotoxicity in rats. Journal of Phytomedicine and Therapeutics. 2020;19(2):466-82.

83. Li YJ, Ji QQ, Wang Z, Shen LH, He B. Moringa oleifera seeds mitigate myocardial injury and prevent ventricular failure induced by myocardial infarction. American Journal of Translational Research. 2020;12(8):4511-21.

84. Popoola JO, Aworunse OS, Oyesola OL, Akinnola OO, Obembe OO. A systematic review of pharmacological activities and safety of Moringa oleifera. Journal of HerbMed Pharmacology. 2020;9(3):174-90.

85. Onaolapo AY, Onaolapo OJ. African plants with antidiabetic potentials: Beyond glycaemic control to central nervous system benefits. Current Diabetes Reviews. 2020;16(5):419-37.

86. Jaafaru MS, Nordin N, Rosli R, Shaari K, Bako HY, Saad N, et al. Neuroprotective effects of glucomoringin-isothiocyanate against H2O2-Induced cytotoxicity in neuroblastoma (SH-SY5Y) cells. NeuroToxicology. 2019;75:89-104.

87. Zeng K, Li Y, Yang W, Ge Y, Xu L, Ren T, et al. Moringa oleifera seed extract protects against brain damage in both the acute and delayed stages of ischemic stroke. Experimental Gerontology. 2019;122:99-108.

88. Sivaprakasam G, Ganesan P, Muniandy K, Park SY, Cho DY, Kim JS, et al. Attenuation of lipopolysaccharide-induced neuroinflammatory events in BV-2 microglial cells by Moringa oleifera leaf extract. Asian Pacific Journal of Tropical Biomedicine. 2019;9(3):109-15.

89. Gbadamosi IT, Omotoso GO, Arogundade TT, Alabi AS, Balogun RB, Yawson EO. Moringa regimen corrects nicotine-induced deficits in behaviour, altered energy metabolism and neurotransmitter processing in Rat Brain. Journal of Krishna Institute of Medical Sciences University. 2019;8(1):1-13.

90. Matic I, Guidi A, Kenzo M, Mattei M, Galgani A. Investigation of medicinal adietaryplantsreviewtraditionallysupplements: On moringausedoleiferaas. Journal of Public Health in Africa. 2018;9(3):191-9.

91. Riyaz B, Bose S, Sharma S, Khatik GL. Nanotechnology-based phytopharmaceuticals in disease management: An update. Drug Invention Today. 2018;10(8):1450-4.

92. Idoga ES, Ambali SF, Ayo JO, Mohammed A. Assessment of antioxidant and neuroprotective activities of methanol extract of Moringa oleifera Lam. leaves in subchronic chlorpyrifos-intoxicated rats. Comparative Clinical Pathology. 2018;27(4):917-25.

93. Omotoso GO, Gbadamosi IT, Afolabi TT, Abdulwahab AB, Akinlolu AA. Ameliorative effects of Moringa on cuprizoneinduced memory decline in rat model of multiple sclerosis. Anatomy and Cell Biology. 2018;51(2):119-27.

94. Jaafaru MS, Nordin N, Shaari K, Rosli R, Abdull Razis AF. Isothiocyanate from Moringa oleifera seeds mitigates hydrogen peroxide-induced cytotoxicity and preserved morphological features of human neuronal cells. PLoS ONE. 2018;13(5).

95. Oboh G, Oyeleye SI, Akintemi OA, Olasehinde TA. Moringa oleifera supplemented diet modulates nootropic-related biomolecules in the brain of STZ-induced diabetic rats treated with acarbose. Metabolic Brain Disease. 2018;33(2):457-66.

96. Kou X, Li B, Olayanju JB, Drake JM, Chen N. Nutraceutical or pharmacological potential of Moringa oleifera Lam. Nutrients. 2018;10(3).

97. Omotoso GO, Gbadamosi IT, Olajide OJ, Dada-Habeeb SO, Arogundade TT, Yawson EO. Moringa oleifera phytochemicals protect the brain against experimental nicotine-induced neurobehavioral disturbances and cerebellar degeneration. Pathophysiology. 2018;25(1):57-62.

98. Gupta S, Jain R, Kachhwaha S, Kothari SL. Nutritional and medicinal applications of Moringa oleifera Lam.—Review of current status and future possibilities. Journal of Herbal Medicine. 2018;11:1-11.

99. Mahaman YAR, Huang F, Wu M, Wang Y, Wei Z, Bao J, et al. Moringa Oleifera Alleviates Homocysteine-Induced Alzheimer's Disease-Like Pathology and Cognitive Impairments. Journal of Alzheimer's Disease. 2018;63(3):1141-59.

100. Raafat K, Hdaib F. Neuroprotective effects of Moringa oleifera: Bio-guided GC-MS identification of active compounds in diabetic neuropathic pain model. Chinese Journal of Integrative Medicine. 2017:1-10.

101. Ekong MB, Ekpo MM, Akpanyung EO, Nwaokonko DU. Neuroprotective effect of Moringa oleifera leaf extract on aluminium-induced temporal cortical degeneration. Metabolic Brain Disease. 2017;32(5):1437-47.

102. Brilhante RSN, Sales JA, Pereira VS, Castelo-Branco DDSCM, Cordeiro RDA, de Souza Sampaio CM, et al. Research advances on the multiple uses of Moringa oleifera: A sustainable alternative for socially neglected population. Asian Pacific Journal of Tropical Medicine. 2017;10(7):621-30.

103. Dey A, Gorai P, Mukherjee A, Dhan R, Modak BK. Ethnobiological treatments of neurological conditions in the Chota Nagpur Plateau, India. Journal of Ethnopharmacology. 2017;198:33-44.

104. Giacoppo S, Rajan TS, De Nicola GR, Iori R, Rollin P, Bramanti P, et al. The isothiocyanate isolated from moringa oleifera shows potent anti-inflammatory activity in the treatment of murine subacute Parkinson's disease. Rejuvenation Research. 2017;20(1):50-63.

105. Adefegha SA, Oboh G, Oyeleye SI, Dada FA, Ejakpovi I, Boligon AA. Cognitive Enhancing and Antioxidative Potentials of Velvet Beans (Mucuna pruriens) and Horseradish (Moringa oleifera) Seeds Extracts: A Comparative Study. Journal of Food Biochemistry. 2017;41(1).

106. Igado OO, Olopade JO. A review on the possible neuroprotective effects of Moringa oleifera leaf extract. Nigerian Journal of Physiological Sciences. 2016;31(2):183-7.

107. Giacoppo S, Galuppo M, Montaut S, Iori R, Rollin P, Bramanti P, et al. An overview on neuroprotective effects of isothiocyanates for the treatment of neurodegenerative diseases. Fitoterapia. 2015;106:12-21.

108. Galuppo M, Giacoppo S, Iori R, De Nicola GR, Milardi D, Bramanti P, et al. 4(α-L-rhamnosyloxy)-benzyl isothiocyanate, a bioactive phytochemical that defends cerebral tissue and prevents severe damage induced by focal ischemia/reperfusion. Journal of Biological Regulators and Homeostatic Agents. 2015;29(2):343-56.

109. Rahmath A, Rajan N, Ahamed Shahal M, Seena TP, Sreekumaran E. Neuroprotective effect of moringa oleifera in scopolamine induced cognitive impairment and oxidative stress in Wistar Albino rats. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2015;6(4):1736-44.

110. Giacoppo S, Galuppo M, De Nicola GR, Iori R, Bramanti P, Mazzon E. 4(α-l-Rhamnosyloxy)-benzyl isothiocyanate, a bioactive phytochemical that attenuates secondary damage in an experimental model of spinal cord injury. Bioorganic and Medicinal Chemistry. 2015;23(1):80-8.

111. Hannan MA, Kang JY, Mohibbullah M, Hong YK, Lee H, Choi JS, et al. Moringa oleifera with promising neuronal survival and neurite outgrowth promoting potentials. Journal of Ethnopharmacology. 2014;152(1):142-50.

112. Kirisattayakul W, Wattanathorn J, Tong-Un T, Muchimapura S, Wannanon P, Jittiwat J. Cerebroprotective effect of Moringa oleifera against focal ischemic stroke induced by middle cerebral artery occlusion. Oxidative Medicine and Cellular Longevity. 2013.

113. Sutalangka C, Wattanathorn J, Muchimapura S, Thukham-Mee W. Moringa oleifera mitigates memory impairment and neurodegeneration in animal model of age-related dementia. Oxidative Medicine and Cellular Longevity. 2013.

114. Mythri RB, Harish G, Bharath MM. Therapeutic potential of natural products in parkinson's disease. Recent Patents on Endocrine, Metabolic and Immune Drug Discovery. 2012;6(3):181-200.

115. Ray K, Dutta A, Hazra R, Guha D. Anticonvulsive and antioxidant activity of aqueous root extract of Moringa oieifera in ferric chloride-induced epileptic rats. International Journal of Phytomedicine. 2012;4(4):486-95.

116. Kirisattayakul W, Wattanathorn J, Tong-Un T, Muchimapura S, Wannanon P. Moringa Oleifera Lam mitigates oxidative damage and brain infarct volume in focal cerebral ischemia. American Journal of Applied Sciences. 2012;9(9):1457-63.

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

118. Raj AJ, Dorairaj S, Gopalakrishnan VK. Phytomedicine: Indian medicinal plants as a source of anticonvulsant. International Journal of Pharmaceutical Sciences Review and Research. 2011;11(2):94-9.

119. Calderón-Montaño JM, Burgos-Morón E, Pérez-Guerrero C, López-Lázaro M. A review on the dietary flavonoid kaempferol. Mini-Reviews in Medicinal Chemistry. 2011;11(4):298-344.

120. Obulesu M, Rao DM. Effect of plant extracts on Alzheimer's disease: An insight into therapeutic avenues. Journal of Neurosciences in Rural Practice. 2011;2(1):56-61.

121. Pasha S, Khaleel M, Som S. Effect of Moringa oleifera on stress induced brain lipid peroxidation in rats. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2010;1(3):336-42.

122. Ganguly R, Guha D. Alteration of brain monoamines & EEG wave pattern in rat model of Alzheimer's disease & protection by Moringa oleifera. Indian Journal of Medical Research. 2008;128(6):744-51.

123. Mazumder MEH, Rahman S. Pharmacological evaluation of Bangladeshi medicinal plants for antioxidant activity. Pharmaceutical Biology. 2008;46(10-11):704-9.

124. Frenț OD, Stefan L, Morgovan CM, Duteanu N, Dejeu IL, Marian E, et al. A Systematic Review: Quercetin—Secondary Metabolite of the Flavonol Class, with Multiple Health Benefits and Low Bioavailability. International Journal of Molecular Sciences. 2024;25(22).

125. Calabrese V, Osakabe N, Siracusa R, Modafferi S, Di Paola R, Cuzzocrea S, et al. Transgenerational hormesis in healthy aging and antiaging medicine from bench to clinics: Role of food components. Mechanisms of Ageing and Development. 2024;220.

126. He X, Chen X, Yang Y, Xie Y, Liu Y. Medicinal plants for epileptic seizures: Phytoconstituents, pharmacology and mechanisms revisited. Journal of Ethnopharmacology. 2024;320.

127. Nasir A, Afridi OK, Ullah S, Khan H, Bai Q. Mitigation of sciatica injury-induced neuropathic pain through active metabolites derived from medicinal plants. Pharmacological Research. 2024;200.

128. Das M, Goswami M, Nath R, Nath D, Das Talukdar A. Future road map in neurodegenerative disease management with natural product: Roadmap 2024. Annual Reports in Medicinal Chemistry. 622024. p. 141-75.

129. Worku B, Tolossa N. A Review on the Neuroprotective Effect of Moringa oleifera. Oxidative Medicine and Cellular Longevity. 2024;2024(1):7694516.

130. Gharsallah K, Rezig L, Shahid M, Riaz Rajoka MS, Mehwish HM, Ali MA, et al. Moringa oleifera: Processing, phytochemical composition, and industrial application. South African Journal of Botany. 2023;160.

131. Pareek A, Pant M, Gupta MM, Kashania P, Ratan Y, Jain V, et al. Moringa oleifera: An Updated Comprehensive Review of Its Pharmacological Activities, Ethnomedicinal, Phytopharmaceutical Formulation, Clinical, Phytochemical, and Toxicological Aspects. Int J Mol Sci. 2023;24(3).

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