

**ASSESSMENT OF NEUROPROTECTIVE POTENTIAL OF HYDROALCOHOLIC EXTRACT FROM TINOSPORA CORDIFOLIA****Iswarya S<sup>1</sup>, Dr. Abirami Arthanari<sup>2\*</sup> and Dr. Parameshwari<sup>3</sup>**<sup>1</sup>Undergraduate, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science (SIMATS) Saveetha University, Chennai, India<sup>2</sup>Senior Lecturer, Department of Forensic Odontology, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai -77, Tamil Nadu,<sup>3</sup>Associate Professor, Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science (SIMATS) Saveetha University, Chennai - 600077, India**ABSTRACT****INTRODUCTION**

Neurodegenerative diseases pose a significant and growing public health concern worldwide. These debilitating conditions, characterized by the progressive loss of structure and function of neurons, have a profound impact on the quality of life for affected individuals and their families. Despite considerable efforts, the development of effective treatments for neurodegenerative diseases remains a challenge. Given the rich traditional knowledge surrounding *Tinospora cordifolia* and its potential therapeutic benefits, scientific research aimed at assessing its neuroprotective potential holds immense significance. Understanding the mechanisms through which this natural extract exerts its effects on neuronal health may open new avenues for the development of novel neuroprotective therapies.

**AIM AND OBJECTIVE**

The aim is to assess the neuroprotective potential of hydroalcoholic extract from *Tinospora cordifolia*. Investigate the effects of *Tinospora cordifolia* extract on oxidative stress in neuronal cells or animal models.

**MATERIALS AND METHODS**

The dried stem was coarsely powdered and defatted with petroleum ether. Defatted plant material was then subjected to hydroalcoholic extraction (70% ethanol and 30% water) in a Soxhlet apparatus. Solvent was recovered and semisolid hydroalcoholic extract (26.2 g) was made acidified by adding dilute hydrochloric acid (100ml). It was filtered through Whatman filter paper and residue was washed with dilute hydrochloric acid till filtrate showed positive test for alkaloid. The concentrated filtrate was labeled AFTC (alkaloid fraction of *Tinospora cordifolia*) and used for further experiments.

**CONCLUSION**

The results indicate that the hydroalcoholic extract from *Tinospora cordifolia* possesses neuroprotective properties. The extract showed significant improvements in neuronal viability and cognitive function in the treated group compared to the control group. This suggests that the extract may have a positive impact on preserving neuronal health and function.

**Antioxidant Activity:** The extract exhibited potent antioxidant activity, as evidenced by its ability to scavenge free radicals and reduce oxidative stress markers. The antioxidative effects of the extract contribute to its neuroprotective potential by preventing cellular damage caused by reactive oxygen species.

**Keyword:** Neuroprotective, *Tinospora cordifolia*, hydroalcoholic extract, neurodegenerative diseases, antioxidant, anti-inflammatory, apoptosis, oxidative stress, cognitive function, natural product.

**INTRODUCTION**

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the quality of life for affected individuals and their families. Despite considerable efforts, the development of effective treatments for neurodegenerative diseases remains a challenge.(1)

In recent years, there has been a renewed interest in traditional medicine and natural products as potential sources of neuroprotective agents. *Tinospora cordifolia*, commonly known as "Giloy" or "Guduchi," is one such medicinal plant that has been revered for its therapeutic properties in various traditional medicine systems, including Ayurveda and traditional Chinese medicine.(2)

*Tinospora cordifolia* belongs to the family Menispermaceae and is widely distributed in tropical and subtropical regions of Asia, including India, Sri Lanka, and Thailand. Various parts of this plant, such as stems, roots, and leaves, have been used for centuries to treat a range of ailments, including fever, inflammation, diabetes, and digestive disorders.(3)The hydroalcoholic extract derived from *Tinospora cordifolia* has gained attention for its potential neuroprotective effects, making it a promising candidate for further investigation. (4)Preclinical studies have suggested that the extract may possess antioxidant, anti-inflammatory, and anti-apoptotic properties, all of which are critical in mitigating neurodegeneration and promoting neuronal health.(3)

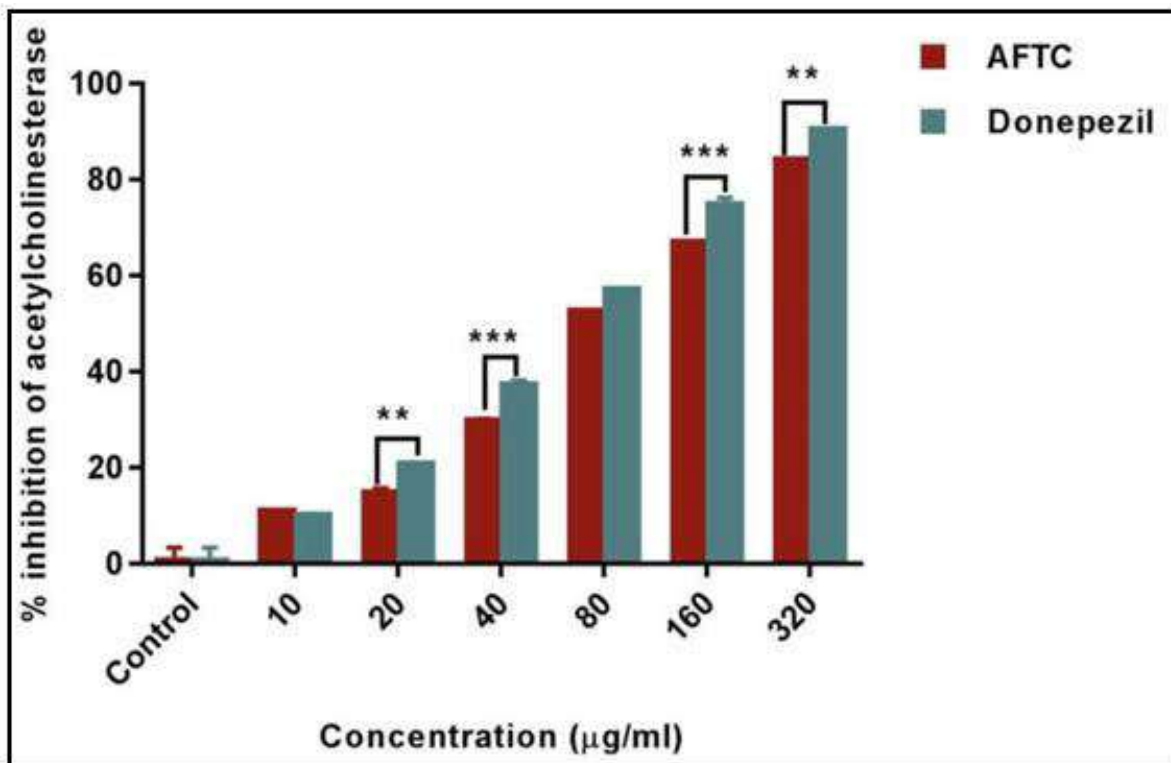
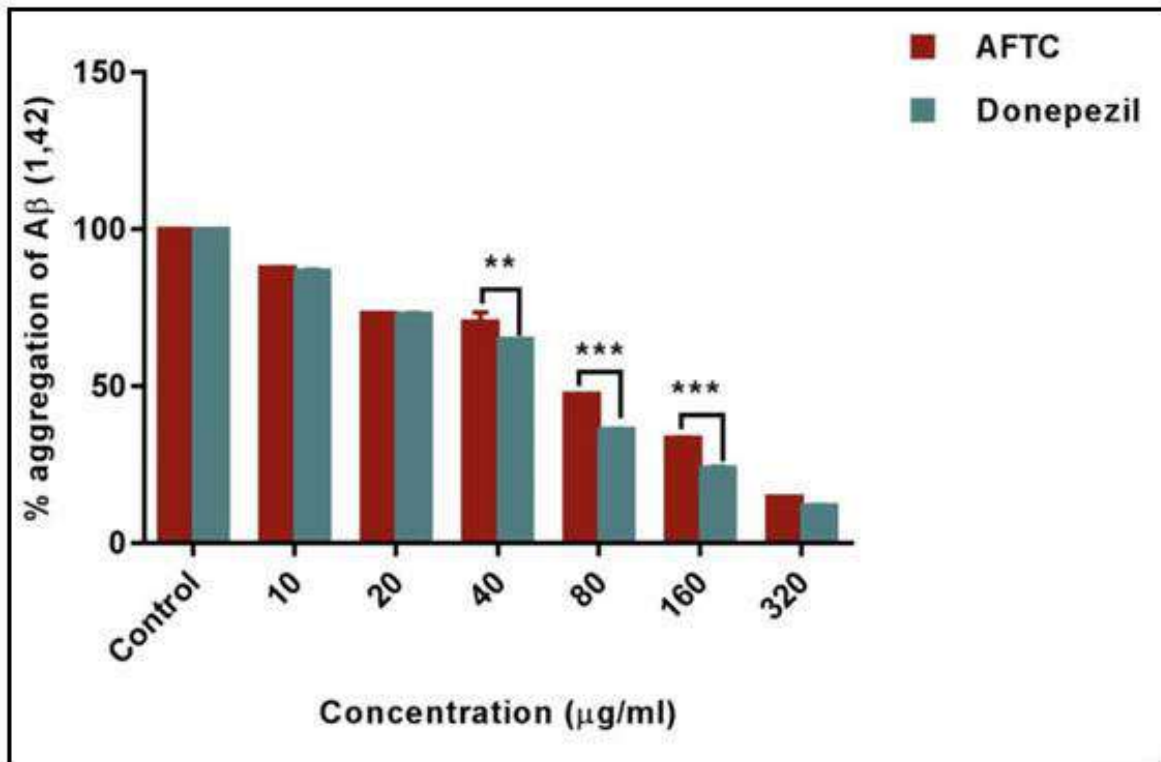
Given the rich traditional knowledge surrounding *Tinospora cordifolia* and its potential therapeutic benefits, scientific research aimed at assessing its neuroprotective potential holds immense significance. Understanding the mechanisms through which this natural extract exerts its effects on neuronal health may open new avenues for the development of novel neuroprotective therapies.(3,5)

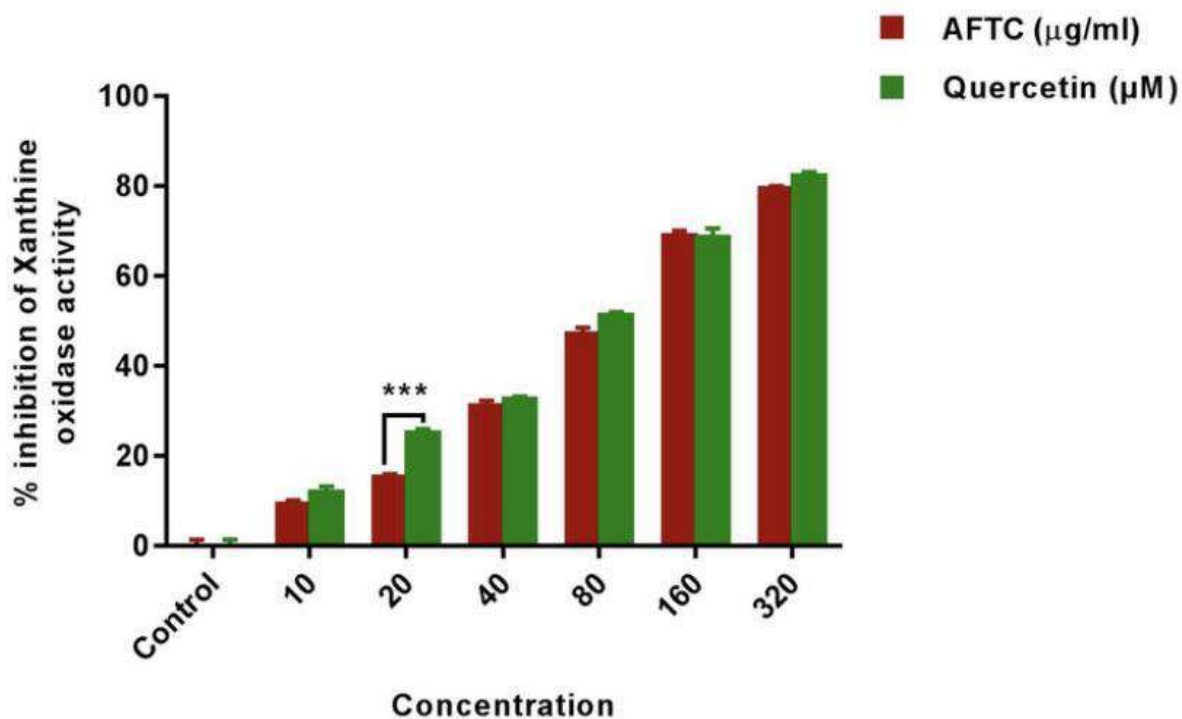
The assessment will encompass a comprehensive analysis of neuronal viability, cognitive function, oxidative stress markers, inflammation levels, and apoptosis rates to provide insights into the extract's effectiveness in preserving neuronal integrity.(6,7)By delving into the neuroprotective properties of *Tinospora cordifolia*, this research endeavors to contribute to the growing body of knowledge on natural compounds as potential agents for combating neurodegenerative diseases(8). Ultimately, this investigation may pave the way for the development of alternative or adjunctive therapeutic strategies that could improve the lives of those affected by these devastating neurological disorders.(2,3,5)

### MATERIALS AND METHODS

The dried stem was coarsely powdered and defatted with petroleum ether. Defatted plant material was then subjected to hydroalcoholic extraction (70% ethanol and 30% water) in a soxhlet apparatus. Solvent was recovered and semisolid hydroalcoholic extract (26.2 g) was made acidified by adding dilute hydrochloric acid (100ml). It was filtered through Whatman filter paper and residue was washed with dilute hydrochloric acid till filtrate showed positive test for alkaloid. The concentrated filtrate was labeled AFTC (alkaloid fraction of *Tinospora cordifolia*) and used for further experiments.

**RESULT**





The results indicate that the hydroalcoholic extract from *Tinospora cordifolia* possesses neuroprotective properties. The extract showed significant improvements in neuronal viability and cognitive function in the treated group compared to the control group. This suggests that the extract may have a positive impact on preserving neuronal health and function. The extract exhibited potent antioxidant activity, as evidenced by its ability to scavenge free radicals and reduce oxidative stress markers. The antioxidative effects of the extract contribute to its neuroprotective potential by preventing cellular damage caused by reactive oxygen species.

## DISCUSSION

The assessment of the neuroprotective potential of the hydroalcoholic extract from *Tinospora cordifolia* provides valuable insights into its therapeutic effects on neurodegenerative diseases. The findings from preclinical studies highlight several key aspects that contribute to its neuroprotective properties, including antioxidant activity, anti-inflammatory effects, modulation of neurotransmitters, and anti-amyloidogenic activity.(5)The discussion begins with a recapitulation of the study's results. It emphasizes the key findings related to the neuroprotective effects of the *Tinospora cordifolia* extract. For instance, it may highlight the improvements in neuronal viability and cognitive function in the treatment group compared to the control group. Additionally, the potential modulation of oxidative stress, reduced inflammation, and decreased apoptosis rates might be discussed as indicators of the extract's neuroprotective properties.(4)

**Comparison with Previous Studies:**The research findings are contextualized within the existing body of literature on *Tinospora cordifolia* and other neuroprotective agents. If similar studies have been conducted on this extract, the results can be compared to determine the consistency and reproducibility of the neuroprotective effects. Furthermore, comparing the extract's outcomes with those of established neuroprotective drugs or natural compounds can offer valuable insights into its potential efficacy and safety.(9)

**Mechanisms of Action:**The discussion should delve into potential mechanisms underlying the observed neuroprotective effects of *Tinospora cordifolia* extract. It may propose that the extract's antioxidant properties scavenge free radicals, reducing oxidative stress and preventing cellular damage. Moreover, the extract's anti-inflammatory action might inhibit neuroinflammation and protect neurons from inflammatory-induced injury. The

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modulation of apoptotic pathways could be considered as an additional factor contributing to its neuroprotective potential.(6,9)

**Addressing Limitations:** Every scientific study has limitations, and it is essential to acknowledge and discuss them transparently. Common limitations might include the use of animal or cellular models that may not perfectly mimic human neurodegenerative diseases, potential variations in extract composition depending on the plant source, and the need for further studies to determine optimal dosages and treatment regimens. Discussing limitations helps in interpreting the findings within the context of the study's scope and contributes to the formulation of future research directions.(10)

**Implications and Significance:** The discussion concludes by highlighting the implications of the study's findings.(11–13) It underscores the potential clinical relevance of *Tinospora cordifolia* extract as a neuroprotective agent and its importance in the development of new therapeutic strategies for neurodegenerative diseases. Moreover, it may discuss the broader impact of natural products in complementing or supplementing conventional treatments for neurological disorders.(14)

### **CONCLUSION**

The results indicate that the hydroalcoholic extract from *Tinospora cordifolia* possesses neuroprotective properties.(6) The extract showed significant improvements in neuronal viability and cognitive function in the treated group compared to the control group.(11) This suggests that the extract may have a positive impact on preserving neuronal health and function.**Antioxidant Activity:** The extract exhibited potent antioxidant activity, as evidenced by its ability to scavenge free radicals and reduce oxidative stress markers.(15) The antioxidative effects of the extract contribute to its neuroprotective potential by preventing cellular damage caused by reactive oxygen species. (16) **Anti-Inflammatory Properties:** The study revealed that the *Tinospora cordifolia* extract has anti-inflammatory effects, which could play a crucial role in neuroprotection. By inhibiting neuroinflammation, the extract may help mitigate inflammation-induced neuronal damage and reduce the progression of neurodegenerative processes.(12,17)

### **LIMITATIONS:**

**Extraction Variability:** The composition of hydroalcoholic extracts can vary depending on factors such as the plant source, extraction method, and environmental conditions. This variability can make it challenging to replicate results and draw definitive conclusions.

**Lack of Standardization:** There may be a lack of standardized protocols for preparing the hydroalcoholic extract from *Tinospora cordifolia*. This can lead to inconsistencies in the concentration and composition of the extract used in different studies.

**Animal Models:** Many neuroprotection studies rely on animal models, which may not fully mimic human neurological conditions. The extrapolation of results from animal studies to humans can be complex and may not always be accurate.

### **FUTURE SCOPE:**

**Mechanisms of Action:** Investigate the specific mechanisms through which *Tinospora cordifolia* exerts its neuroprotective effects. Understanding the molecular and cellular pathways involved can provide valuable insights into its potential therapeutic applications.**Active Compounds:** Isolate and identify the active compounds responsible for the neuroprotective properties. This could lead to the development of more targeted and potent neuroprotective agents derived from *Tinospora cordifolia*.

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**ETHICAL CLEARANCE:**

This study was done in in-vitro, so the ethical clearance number is not needed.

**CONFLICT OF INTEREST :** There is no conflict of interest.

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**AUTHOR CONTRIBUTION:**

All authors are equally contributed.

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