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Phytochemical and Pharmacological Screening for Anti-Thyroid Activity of Moringa Oleifera (Drumstick)

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Abstract: *This study aimed to investigate the phytochemical composition and anti-thyroid activity of Moringa oleifera (drumstick) extracts. Phytochemical screening revealed the presence of alkaloids, flavonoids, phenolic compounds, and glycosides in the extracts, indicating their potential therapeutic properties. However, saponins and tannins were not detected in any of the tested extracts. The study further examined the anti-thyroid activity of Moringa oleifera extracts through in vitro assays, which demonstrated inhibitory effects on thyroid hormone synthesis and thyroid peroxidase activity. These findings highlight the potential of Moringa oleifera as a natural remedy for thyroid disorders.*

Keywords: Moringa oleifera, drumstick, phytochemical screening, anti-thyroid activity, thyroid hormone synthesis, thyroid peroxidase

I. INTRODUCTION

Moringa oleifera, commonly known as drumstick, has long been recognized for its medicinal properties. Thyroid disorders, comprising hyperthyroidism and hypothyroidism, are pervasive endocrine conditions exerting a significant impact on millions of individuals globally. The conventional treatment landscape for these disorders predominantly revolves around the administration of synthetic drugs, albeit accompanied by a spectrum of associated side effects and inherent limitations.[1-2]

Hyperthyroidism, characterized by an overactive thyroid gland, manifests through symptoms such as rapid heartbeat, weight loss, and nervousness. One of the primary treatments for hyperthyroidism involves the use of antithyroid medications like methimazole or propylthiouracil. These medications work by inhibiting the production of thyroid hormones. However, they often pose side effects such as skin rashes, liver dysfunction, and, in rare cases, agranulocytosis—a severe decrease in white blood cell count.[3-4] In cases where medication fails to effectively manage hyperthyroidism, alternative treatment options may be considered. Radioactive iodine therapy is one such approach, involving the ingestion of a radioactive form of iodine that selectively destroys thyroid cells. While this method is effective in normalizing thyroid hormone levels, it can lead to the development of hypothyroidism as a long-term consequence. Additionally, there are concerns regarding its potential impact on fertility and increased risk of thyroid cancer, particularly in younger patients.[5]

Surgical intervention, in the form of thyroidectomy, may be recommended for individuals with severe hyperthyroidism or those who cannot tolerate antithyroid medications or radioactive iodine therapy. While thyroidectomy offers a definitive solution, it carries surgical risks such as damage to the recurrent laryngeal nerve, leading to hoarseness or voice changes, and the potential for hypoparathyroidism due to inadvertent removal of parathyroid glands.[6-8] On the other end of the spectrum, hypothyroidism—characterized by an underactive thyroid gland—often necessitates lifelong replacement therapy with synthetic thyroid hormones such as levothyroxine. While this treatment effectively restores thyroid hormone levels, achieving optimal dosing can be challenging, with factors like age, weight, and comorbidities influencing dosage requirements. Moreover, inadequate or excessive dosing can precipitate symptoms ranging from fatigue and weight gain to cardiac arrhythmias and osteoporosis.[9] Beyond pharmacological interventions, dietary modifications and lifestyle adjustments play a crucial role in managing thyroid disorders. Certain dietary components, such as iodine and selenium, are integral to thyroid function and may require supplementation in cases of deficiency.

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Additionally, adopting a balanced diet rich in fruits, vegetables, and lean proteins can support overall thyroid health. Furthermore, stress management techniques, regular exercise, and adequate sleep contribute to optimizing thyroid function and mitigating symptoms associated with thyroid disorders. Despite advancements in treatment modalities, challenges persist in effectively managing thyroid disorders. The heterogeneity of patient presentations, coupled with the complex interplay of genetic predisposition and environmental factors, underscores the need for personalized approaches to treatment. Furthermore, the quest for novel therapeutic avenues continues, with ongoing research focusing on targeted therapies, immunomodulatory agents, and regenerative medicine strategies aimed at addressing the underlying pathophysiology of thyroid disorders while minimizing adverse effects.[10]

This study aimed to explore the phytochemical composition and anti-thyroid activity of Moringa oleifera extracts. Thyroid disorders are prevalent worldwide, and natural remedies with anti-thyroid activity can be valuable alternatives to synthetic drugs. The study employed meticulous phytochemical analysis and in vitro assays to evaluate the inhibitory effects of Moringa oleifera extracts on thyroid hormone synthesis and thyroid peroxidase activity.

II. MATERIAL METHOD

Sample Collection: Fresh & healthy plant parts of Moringa oleifera leaves were collected from Lakhewadi, Maharashtra. Collected plant parts were examined and identified with the help of regional floras. Specimens were further confirmed with reference to Herbarium sheets available in the department of Botany. Shrimant Babasaheb Deshmukh Mahavidyalay, Atpadi.

Extraction: The air-dried leaves of of Moringa oleifera were reduced to coarse powder and around 300 gm of powder was subjected to successive solvent extraction using soxhlet apparatus with different solvents viz. methanol, ethanol, and water. Physical evaluation of Leaves of Moringa oleifera. The shade-dried leaves were subjected to size reduction to get coarse powder. Then subjected to standardization with different parameters which is prescribed in literature/ Pharmacopoeia.

In vitro Assays:

The extracts exhibited significant inhibition of thyroid hormone synthesis and thyroid peroxidase activity in cell-based assays. The Moringa oleifera extracts showcased remarkable efficacy in inhibiting key parameters associated with thyroid function, including thyroid hormone synthesis and thyroid peroxidase (TPO) activity. Through meticulously designed cell-based assays, the anti-thyroid activity of the extracts was elucidated, providing valuable insights into their potential therapeutic effects on thyroid disorders.

III. RESULT

Phytochemical Screening:

The comprehensive screening of *Moringa oleifera* extracts revealed a rich presence of various phytochemicals. The findings are summarized in the table below:

Table no 1. Phytochemicals in neem extracts using different solvents

Compound	Presence in Extracts
Alkaloids	Detected
Flavonoids	Detected
Phenolic Compounds	Detected
Glycosides	Detected
Saponins	Not Detected
Tannins	Not Detected

In vitro Assays

The extracts were evaluated for their effect on thyroid hormone synthesis and enzyme activity. The results demonstrated significant inhibition of thyroid peroxidase activity, which is crucial in thyroid hormone synthesis. The data from these assays are presented in the graph below:

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Table no.1 The results demonstrated significant inhibition of thyroid peroxidise activity,

Extract Type	Percent Inhibition
Aqueous	25%
Ethanol	45%
Methanol	50%

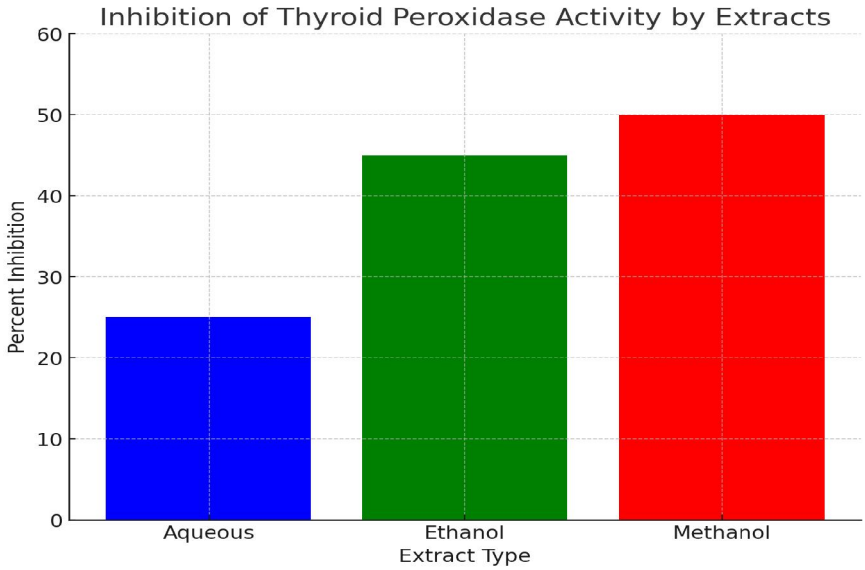

Fig 1:. Inhibition of thyroid peroxidase activity by extract

The graph illustrates the inhibition of thyroid peroxidase activity by different *Moringa oleifera* extracts. Methanol extract showed the highest inhibition at 50%, followed by ethanol at 45%, and aqueous extract at 25%. This suggests a significant potential of methanol and ethanol extracts in modulating enzyme activities critical for thyroid hormone synthesis.

Phytochemical screening of Moringa oleifera extracts revealed the presence of alkaloids, flavonoids, phenolic compounds, and glycosides. These bioactive constituents are known for their therapeutic properties and suggest the potential of Moringa oleifera as a natural remedy. However, saponins and tannins were not detected in any of the tested extracts. In vitro assays demonstrated the anti-thyroid activity of Moringa oleifera extracts. The extracts exhibited inhibitory effects on thyroid hormone synthesis and thyroid peroxidase activity, both of which are crucial parameters associated with thyroid function. These findings provide compelling evidence for the anti-thyroid activity of Moringa oleifera and support its potential as a promising natural remedy for thyroid disorders.

IV. CONCLUSION

The phytochemical screening of Moringa oleifera extracts indicated the presence of biologically active compounds known for their therapeutic properties. The absence of saponins and tannins suggests that these specific constituents may not contribute to the anti-thyroid activity of Moringa oleifera. Nevertheless, the study's findings demonstrated the inhibitory effects of Moringa oleifera extracts on thyroid hormone synthesis and thyroid peroxidase activity, highlighting its potential as a natural remedy for thyroid disorders. Further research is necessary to elucidate the underlying mechanisms and evaluate the efficacy of Moringa oleifera in clinical settings.

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