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PHYTOTHERAPEUTIC APPLICATIONS OF *PIPER LONGUM* FOR THYROID DYSFUNCTION: A REVIEW OF MECHANISMS AND POTENTIAL

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Abstract: Hypothyroidism is a significant global endocrine disorder resulting from insufficient thyroid hormone production, leading to widespread metabolic dysregulation with symptoms like fatigue, weight gain, and cold intolerance. While synthetic levothyroxine constitutes the primary treatment, there is increasing interest in adjunctive therapies from traditional medicine. This review investigates the potential of Piper longum (Pippali), a revered herb in Ayurveda, as a complementary agent for managing hypothyroidism. The therapeutic efficacy of Piper longum is primarily attributed to its bioactive alkaloid, piperine, which functions as a bio-enhancer to improve the absorption of selenium a critical cofactor for the deiodinase enzymes that convert thyroxine (T4) to the active triiodothyronine (T3). Furthermore, its documented anti-inflammatory, antioxidant, and metabolic-regulating properties may help alleviate the systemic symptoms and secondary complications associated with the condition. While its long-standing use in traditional systems provides a strong ethnobotanical basis, there is a distinct lack of robust clinical trials to validate these effects in hypothyroid patients. This review highlights the promising, multifactorial role of Piper longum in supporting thyroid function while underscoring the urgent need for rigorous scientific investigation to confirm its efficacy and establish its place in modern integrative care.

Keywords: Hypothyroidism, *Piper longum*, Ayurveda, Piperine, Selenium, Bioavailability

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DUAL-METHOD QUANTIFICATION OF COPPER OXYCHLORIDE RESIDUES IN AGRICULTURAL SOILS: A COMPARATIVE STUDY OF TITRATION AND ATOMIC ABSORPTION SPECTROSCOPY ANALYSIS

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Abstract: Copper oxychloride (COC) is extensively utilized in agriculture, but its accumulation in soil can threaten soil health and productivity. This research evaluated two analytical techniques—titration and atomic absorption spectroscopy (AAS)—to measure copper levels in soils from COC-treated and control areas in four districts of Kerala, India. A total of 64 samples were examined on the 15^{th} and 30^{th} days following COC application. Both methods consistently found low copper concentrations in control soils (<0.4 ppm), whereas treated soils exhibited significantly higher levels, ranging from 70.08±0.03 ppm to 132.00±1.10 ppm on day 15^{th} and decreasing to 61.85±1.60 ppm to 104.90±0.85 ppm by day 30^{th} in titration tests. AAS reported slightly higher values, demonstrating its superior sensitivity and precision. Both methods showed a 15–30% reduction in copper levels over time, indicating environmental dissipation. While titration is economical for routine assessments, AAS offers more dependable results for accurately monitoring copper contamination in agricultural soils.

Keywords: Copper oxychloride, Atomic absorption spectroscopy, Fungicide

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ASSESSING THE IMPACT OF IMPROVED FARM TOOLS ON DRUDGERY REDUCTION AND OPERATIONAL EFFICIENCY OF FARM WOMEN IN GROUNDNUT PRODUCTION

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Abstract: The present study aimed to assess the impact of improved farm tools on drudgery reduction and operational efficiency of farm women engaged in groundnut cultivation. Demonstrations of a groundnut decorticator for pod dehulling and a hand wheel hoe one-lane weeder for weeding were conducted by Krishi Vigyan Kendra, Banasthali Vidyapith, in selected villages of Tonk district. The performance of these tools was compared with traditional practices involving manual dehulling by hand and mouth and weeding using *kudali*. The results revealed a significant reduction in time and energy expenditure while performing dehulling and weeding operations with improved tools. Farm women reported enhanced ease of operation, reduced physical strain, and improved work comfort compared to conventional methods. The total drudgery index of farm women was notably lower with the use of improved implements, indicating their effectiveness in reducing workload and enhancing operational efficiency. The study highlights the potential of gender-friendly farm tools in improving the occupational well-being of farm women in groundnut production.

Keywords: Groundnut, Drudgery, Farm women, Groundnut decorticator, Cono weeder

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EFFECT OF ENDOPHYTIC BACTERIAL INOCULATION ON GROWTH AND BIOMASS OF SOYBEAN (*GLYCINE MAX* L.)

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Abstract: Endophytic bacteria from medicinal plants represent a valuable resource for novel bioinoculants for enhancing crop productivity. This study evaluated the effect of selected endophytic bacterial isolates (A4 and A6) from *Adhatoda vasica* on the growth and biomass of soybean (*Glycine max* L.) under pot conditions. Healthy soybean seeds were inoculated with individual isolates, and growth parameters including shoot length, root length, and fresh and dry biomass were recorded at 35 and 60 days after sowing. Inoculated plants exhibited significant improvement in all measured parameters compared to uninoculated controls. Inoculation with isolate A4 resulted in more significant enhancement of overall plant growth. This highly potent isolate was identified via 16S rRNA gene sequencing as *Brevibacillus formosus* strain JFI-4. These findings highlight the potential of selected endophytic bacteria as eco-friendly bioinoculants for sustainable soybean cultivation.

Keywords: *Adhatoda vasica*, Biocontrol, Endophytic bacteria, Plant Growth Promotion (PGP), *Fusarium sp.*

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ETHNOMEDICINAL IMPORTANCE, TAXONOMIC CHARACTERIZATION, AND CONSERVATION PERSPECTIVES OF *HYGROPHILA AURICULATA* (SCHUMACH.) HEINE

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Abstract: *Hygrophila auriculata* (Schumach.) Heine, a prominent member of the family Acanthaceae, is a well-known medicinal plant widely used in traditional healthcare systems across India. The species is valued for its therapeutic applications in treating ailments such as rheumatism, jaundice, urinary disorders, and reproductive problems. The present study integrates ethnomedicinal documentation, taxonomic evaluation, and conservation perspectives of *H. auriculata* to provide a comprehensive understanding of its significance. Field surveys and interviews with local healers and traditional practitioners were conducted to record indigenous knowledge related to its usage, preparation methods and cultural importance. Detailed morphological characterization was performed to confirm species identification and to identify its key taxonomic features. The conservation assessment showed that habitat degradation, overexploitation, and poor regeneration are the main threats to the species' natural populations. The study emphasizes the need for community-based conservation strategies, sustainable harvesting practices, and ex situ propagation to safeguard *Hygrophila auriculata* for future generations. This integrative approach highlights the importance of combining traditional wisdom with scientific evaluation to ensure the long-term conservation and sustainable utilization of this valuable ethnomedicinal plant.

Keywords: Ethnomedicinal plant, Taxonomy, Conservation, *Hygrophila auriculata*