

Phytotherapeutic Potential of Verbena officinalis, Melissa officinalis, and Hypericum perforatum in Multiple Sclerosis :

Immunological and Biochemical Insights

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Abstract

Multiple sclerosis (MS) is a chronic autoimmune and neurodegenerative disorder characterized by demyelination, neuroinflammation, and progressive neurological dysfunction. Conventional therapies are often costly and associated with adverse effects.¹ This study explores the phytotherapeutic potential of *Verbena officinalis*, *Melissa officinalis*, and *Hypericum perforatum* as complementary interventions in MS management¹¹. Integrating biochemical, immunological, and clinical evidence, as well as insights from a biotechnology startup developing herbal formulations, we demonstrate that these herbs exhibit antioxidant, anti-inflammatory, and neuroprotective properties, modulate pro- and anti-inflammatory cytokines, and support remyelination². These findings highlight their potential as adjunct therapies in MS, though further randomized controlled trials are required to confirm efficacy and safety.

Key words

- Multiple Sclerosis (MS), Phytotherapy, *Verbena officinalis*, *Melissa officinalis*, *Hypericum perforatum*, Neuroprotection, Immunomodulation,

Cytokine regulation, Oxidative stress, Remyelination, Herbal medicine¹⁹, Neuroinflammation, Complementary therapy.

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Introduction

Multiple sclerosis (MS) affects over 2.8 million people worldwide, making it one of the most prevalent neuroinflammatory disorders¹¹. The disease involves autoreactive T and B lymphocytes attacking myelin sheaths in the central nervous system (CNS), resulting in impaired neuronal conduction. Current disease-modifying therapies (DMTs) such as interferon-beta, natalizumab, and fingolimod improve clinical outcomes but remain expensive and carry adverse effects including hepatotoxicity, immune suppression, and cardiovascular risks. Herbal medicine has emerged as a complementary approach, particularly in resource-limited settings⁴. Traditional medicinal plants contain polyphenols, flavonoids, and terpenoids with strong immunomodulatory and neuroprotective effects. This paper evaluates *Verbena officinalis*, *Melissa officinalis*, and *Hypericum perforatum* for their potential role in MS management.

1. Literature Review

2.1. *Verbena officinalis* : (vervain) is widely used in European and North African folk medicine. It is rich in iridoid glycosides (verbascoside, aucubin), flavonoids, and phenolic acids. Studies indicate anti-inflammatory, antioxidant, and anxiolytic effects, including inhibition of NF- κ B signaling and reduction of TNF- α and IL-6. This suggests a possible role in modulating microglial activation in MS³.

2.2. *Melissa officinalis* : (lemon balm) exhibits calming, neuroprotective, and antioxidant properties. Its key compounds—rosmarinic acid, caffeic acid, luteolin—have been shown to inhibit acetylcholinesterase and reduce oxidative stress in neuronal tissues. Experimental studies suggest that lemon balm extracts decrease glutamate-induced¹⁸ excitotoxicity, a central mechanism in MS neurodegeneration.

2.3. *Hypericum perforatum* : (St. John's wort) contains hypericin, hyperforin, and flavonoids with antidepressant and neuroprotective activity. Preclinical models indicate suppression¹⁷ of microglial activation,

reduction of demyelination, and mitigation of depression and anxiety commonly associated with MS.

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