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RESEARCH ARTICLE
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THE SAVIOUR SAGE: UNVEILING IT'S MULTIFACETED MARVELS- A COMPREHENSIVE EXPLORATION OF IT'S ANTI-INFLAMMATORY, MOOD &MEMORY MODULATING, ANTI-SWEATING, AND HOT FLASHES RELIEVING PROPERTIES

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Abstract
In ancient times, herbs were highly esteemed for their intrinsic health benefits and medicinal properties, making them integral to healing practices. Among these revered herbs, Sage, a member of the Salvia species, stands out. The term "Sage" originates from the Latin word 'Salvere,' signifying "to save," thus aptly earning its reputation as a 'Saviour' herb. Sage, belonging to the aromatic Lamiaceae family, commonly referred to as the mint family, holds a significant place. Numerous research endeavors have underscored the potential of sage species for drug development due to their noteworthy pharmacological attributes and therapeutic efficacy with marveling properties such as Anti-inflammation, Mood and Memory modulation, Anti-sweating and relief in Hot Flashes experienced by menopausal women. This plant, globally recognized, goes by various names, including Common Sage, Culinary Sage, and Garden Sage in English, Salvia in Hindi, Bui Tulasi in Bengali, Dharba in Telugu, Kamarkas in Marathi, and Sathi in Punjabi. This multicultural nomenclature underscores the widespread acknowledgment of sage's significance across diverse regions and cultures. Evidently, sage's historical reverence persists, as it continues to be a subject of study and exploration for its diverse health-promoting properties. Its enduring legacy as a 'Saviour' herb echoes its integral role in traditional and contemporary wellness practices.

Keywords: Sage, Salvere, *Lamiaceae,* Saviour, anti-inflammation, Mood and memory modulation, Anti-sweating, hot Flashes.

INTRODUCTION

Sage, belonging to the Salvia genus, stands as the largest member of the Lamiaceae family, commonly known as the mint family. These perennial plants are distinguished by their diverse flower colors and are found across the globe. With over 900 species, the Lamiaceae family is substantial. The term 'salvia' translates to "to be saved," underscoring sage's reputation as a valuable herb with properties that have historically been proven effective in treating various ailments. Most Salvia species flourish in the Mediterranean Region. Traditional medicine frequently employs sage, utilizing its above-ground parts as both a flavour enhancer and culinary ingredient [1]

Sage boasts efficacy in addressing a spectrum of conditions including excessive sweating, mild indigestion, skin and throat inflammation, high blood sugar, paralysis, seizures, ulcers, rheumatism, and tremors. Recent years have seen numerous scientific studies conducted on sage, aiming to uncover new biological effects. These studies have unveiled a wide array of pharmacological activities associated with sage, including its role in reducing blood sugar and lipid levels, combating microbial agents, countering dementia, alleviating inflammation, acting as an antioxidant, mitigating genetic mutations, fighting cancer, and providing pain relief. [2]

Throughout the past decade, sage has been harnessed for its health benefits in various forms. For instance, sage tea has gained popularity for addressing circulatory, respiratory, and digestive issues, as well as depression, mental disorders, and skin problems. Notably, Salvia essential oil is a common sage derivative. This oil is employed to manage disorders of the nervous and cardiovascular systems, metabolic imbalances, and endocrine disruptions. Sage oil boasts its own qualities, such as carminative, antispasmodic, antiseptic, and astringent attributes. Nevertheless, due to a lack of safety data, sage is not recommended for those under 18. This review's objective is to comprehensively recognize the attributes of *Salvia officinalis* and its role as a distinguished herb in the realm of medicinal treatment. [3]

1. COMMON NAMES

Salvia officinalis possesses multiple commonly used names, encompassing terms like sage, common sage, garden sage, kitchen sage, golden sage, true sage, culinary sage, dalmatian sage, and broadleaf sage. Among the cultivated types of sage, there exist specific variations such as purple sage and red sage. [4]

2. PHYSICAL ATTRIBUTES

Sage stands as a sturdy and enduring perennial plant, present all year round, and capable of growing to heights of around 2 feet. Its elongated leaves are supported by square-shaped stems and possess a unique coarse or creased surface that usually faces downward. The color of these leaves varies from grayish-green to whitish-green, with typical lengths ranging from 2 to 3 inches. In some sage variants, the leaves are adorned with hair-like projections, lending them a velvety texture. Sage's flowers emerge in clusters along spikes and sport tubular, two-lipped corollas that draw a diverse array of pollinators. These flowers exhibit a lively spectrum of colors, encompassing shades like purple, pink, white, and red, eventually producing small nutlet fruits. [4]

3. IDENTIFYING CHARACTERS

These plants are known for their perennial nature, meaning they live for more than two years. They exhibit a bushy and spreading growth pattern, with their branches and stems expanding outwards. While they possess a semi-woody texture, suggesting some degree of firmness and structure, they are not entirely woody like trees or shrubs. Despite their relatively short lifespan, they manage to maintain their green leaves throughout the year, earning them the label of "evergreen." This is despite the fact that they don't live as long as some other types of plants. Additionally, these plants are herbaceous, implying that their stems are not as rigid as those of woody plants, and they don't develop significant secondary growth like a tree's trunk. Lastly, they are recognized for emitting a pleasant and aromatic fragrance, which can vary based on the specific species or variety. [4]

FIG 1. *Salvia officinalis*

FIG 2. Sage flowers

FIG 3. Sage leaves

4. SOME VARIANTS OF SALVIA

(a) Scarlet Sage: *Salvia spendens*

The Scarlet Sage, known as the "red sage" as well, is a plant with a tropical origin that maintains its perennial status, allowing it to grow continuously year after year. As its name suggests, its defining feature is its red or scarlet-hued blossoms. Originating from Brazil, it has the natural habitat of a tropical climate. When cultivated, this plant can reach heights ranging from 12 to 24 inches. It's adaptable in terms of its sunlight needs, thriving equally well in locations with full sunlight exposure or partial sunlight. [5]

Medicinal uses:

- used in the treatment of diabetes mellitus
- leaves are used for dressing wounds, treating cold and cough
- seeds are used as an emetic, for dysentery, colic, hemorrhoids

FIG 4. Scarlet Sage

(b) Mealycup Sage: *Salvia farinacea*

Exhibiting a captivating array of hues including lavender, purple, and blue, the Mealycup Salvia stands as a symbol of versatility. Its blossoming period outlasts that of the Scarlet Sage, adding an enduring allure to its profile. With its roots tracing back to the landscapes of Texas and Mexico, this distinctive plant establishes a unique connection to these regions. Reaching heights of 1 to 3 feet, it commands attention within outdoor settings, while its ability to flourish under varying degrees of sunlight underscores its adaptability. Overall, the Mealycup Salvia presents an opportunity to infuse gardens with a dynamic and visually striking element.

Medicinal uses:

- Natural antibiotic
- Bactericidal
- Antiseptic

FIG 5. Mealycup Sage

(c) Texas Sage: *Salvia coccinea*

Texas Sage, a perennial belonging to the Salvia genus, presents an elegant stature, growing to a height of 1-2 feet. Its origins trace back to the landscapes of the United States and Mexico, where it graces the environment with its striking red, pink, and coral-hued blossoms. To unlock its full potential, Texas Sage thrives when bathed in sunlight, specifically requiring a habitat of full or partial exposure to ensure its optimal growth and vibrant presence.

Medicinal uses:

- Anti-microbial
- Decongestion
- Cough remedy

FIG 6. Texas Sage

(d) Woodland Sage: *Salvia numerosa*

The Woodland Sage, also known as violet sage, is a captivating perennial plant adorned with exquisite purple and lavender blossoms. Its distinctive lance-shaped leaves facilitate easy recognition, and it commonly flourishes from June through September. Hailing from the regions of Europe and West-Central Asia, this plant displays an impressive stature, growing to heights ranging from 8 to 24 inches. For its thriving development, providing ample exposure to full sunlight is essential. This ensures the Woodland Sage's vibrant growth and flourishing presence in its chosen environment. [6]

Medicinal uses:

- Treatment of blood diseases
- Airway swelling
- Bronchitis

FIG 7. Woodland Sage

(e) Autumn Sage: *Salvia greggii*

The Autumn Sage, a sought-after shrubby salvia variety, bursts forth with dazzling sizzling hot pink flowers. This perennial plant acts as a magnet, attracting butterflies and bees, and graces landscapes with its blooms from the heart of summer until early fall. Emerging from the rugged terrains of Texas and northern Mexico, it thrives harmoniously in growing zones 6-9, and its growth can attain an impressive stature, standing 2-3 feet tall.

Medicinal uses:

- To treat digestive diseases
- Oral problems
- To combat central nervous system disorders

FIG 8. Autumn Sage

(f) Wood Sage: *Salvia x sylvestris*

Wood sage, a hybrid salvia stemming from the fusion of *S. nemorosa* and *S. pratensis*, unveils a captivating botanical blend. Among its celebrated hybrids, "May Night" shines, boasting elegant blue-violet blooms gracing the landscape from May to June. This plant traces its origins to Europe and Western Asia, finding its niche in growing zones 4-8. Its stature ranges from 18 to 25 inches, lending versatility to its presence. To flourish optimally, wood sage beckons for a habitat of full sun exposure, allowing it to exhibit its remarkable natural beauty. [7]

Medicinal uses:

- Throat spasms
- High blood pressure
- Liver problems

FIG 9. Wood Sage

(g) Pineapple Sage: *Salvia elegans*

Pineapple Sage, a shrubby perennial, releases a delightful pineapple fragrance when its leaves are crushed. Its vibrant scarlet flowers grace the landscape from late summer through mid-fall. Flourishing under the embrace of full sunlight, this plant thrives particularly well in zones 8-10. With its roots stemming from Mexico and Guatemala, Pineapple Sage stands tall, reaching heights of 3-4 feet. A key factor for its success lies in its warm-climate habitat, essential for nurturing its growth to its full potential. [8]

Medicinal uses :

- Anti-anxiety
- Anti-depressant
- General tonic

FIG 10. Pineapple Sage

(h) Mexican Bush Sage: *Salvia leucantha*

This particular Salvia variation displays an evergreen perennial nature, often adopting a shrubby growth pattern. It showcases the beauty of purple blooms along with white-and-purple combinations, adorning the landscape from late summer through winter, effectively enticing butterflies and hummingbirds. With roots tracing back to Central America and Mexico, it finds its prime in growing zones 8-10. Standing at heights of 2-3 feet, this plant thrives optimally when basking in full sunlight, ensuring its vibrant and healthy presence. [9]

Medicinal uses:

- Anti-spasmodic
- Carminative
- Reduces blood sugar

FIG 11. Mexican Bush Sage

(i) Divinor's Sage: *Salvia divinorum*

Diviner's sage might not be immediately recognized for its ornamental qualities, yet it proudly showcases captivating purple flowers that are bound to leave an impression. With its roots stemming from Southern Mexico, this sage finds its home within growing zones 3-9, gracefully reaching heights spanning 3-5 feet. It's noteworthy that the leaves of this sage contain a substance that can sporadically lead to hallucinations. To cultivate it successfully, optimal conditions call for ample exposure to full sunlight, allowing diviner's sage to thrive vibrantly. [10][11]

Medicinal uses:

- Hallucinogen
- Rheumatism
- Bowel movement

FIG 12. Divinor's Sage

(j) Baby Sage: *Salvia microphylla*

The red velvet sage, commonly referred to as baby sage, presents an enchanting botanical specimen with its striking display of vivid red blooms. Its flowering period extends from the onset of early summer until the arrival of frost, making it a magnet for a diverse array of pollinators including bees, butterflies, and other insects. With its origins tracing back to Arizona and Mexico, this plant finds its niche within growing zones 7-12. For optimal growth, it demands a habitat of full sun exposure, allowing it to flourish and attain heights ranging from 2 to 4 feet. [12]

Medicinal uses:

- Treatment of fever
- Treatment of cough
- Indigestion

FIG 13. Baby Sage

(k) Russian Sage: *Perovskia atripliciffolia*

The Russian sage, a perennial herb, showcases exquisite lilac-blue flowers and exudes a delightful fragrance, rendering it a prime candidate for pollinator gardens. Its flowering season typically spans from mid to late summer, providing a rich source of nourishment for pollinators. Flourishing across zones 4-9, these plants can attain heights ranging from 3 to 4 feet. The secret to their optimal growth lies in placing them in locations that receive full sun exposure, allowing the Russian sage to flourish and radiate its charm. [13]

Medicinal uses:

- Relief from indigestion and stomach pain
- Flu
- Treat fever

FIG 14. Russian Sage

(l) Meadow Sage: *Salvia pratensis*

Meadow sage, a variety of perennial plant, typically reaches heights of 16 to 24 inches and graces the landscape with its blooms from May through August. With roots tracing back to the Mediterranean region of Europe, this sage variety thrives when embraced by full sunlight. Its blossoms come to life in shades spanning from serene blue-violet to delicate pink or white. Its growth pattern is characterized by loosely branched stems, adding to its natural charm and allure. [14]

Medicinal uses:

- Reduce redness due to inflammation
- Treat skin diseases
- Gargle for sore throats

FIG 15. Meadow Sage

(m) Azure Blue Sage: *Salvia azurea*

Azure blue sage, a perennial plant, thrives in flatwoods and sandhills environments. Its blooming spectacle unfolds from August to November, beckoning an array of pollinators including bees, butterflies, and hummingbirds. Sporting sky-blue flowers, this sage variety is a visual delight. It uniquely features stem leaves only, with no basal leaves. Flourishing in very dry and well-drained soils, it finds its prime within growing zones 8-9. With the warmth of full sun exposure, it can ascend to heights of 2 to 4 feet, displaying its natural splendor to its fullest. [15]

Medicinal uses:

- Anti-spasmodic
- Indigestion
- Wound and burn remedy

FIG 16. Azure Blue Sage

5. CHEMICAL COMPOSITION

The principle components of *Salvia officinalis* were found to be camphor, 1,8-cineole (12.7%), alpha-thujone (22.92%), beta- thujone (8.86%), viridiflorol and borneol. [16][17]

CHEMICAL COMPONENTS	PERCENTAGE COMPOSITION
Alpha-pinene	3.70
Beta-pinene	6.00
Camphene	2.60
Beta-myrcene	3.00
1,8-cineole	62.00
Gamma-terpenine	0.30
P-cymene	0.60
Alpha-thujone	1.38
Beta-thujone	0.72
Camphor	8.00
Linalool	0.80
Linalyl acetate	0.60
Caryophyllene	2.00
Monoterpene	1.26
Borneol	5.00
Alpha-terpeniol	0.20
Geranyl acetate	0.30
Geraniol	0.10
Phytol	0.18
Thymol	0.80
Carvacrol	0.20
Farnesol	0.20
T-farnesol	0.06

TABLE 1. Chemical Composition of *Salvia officinalis*

Sage species exhibit a noteworthy abundance of polyphenols, with over 160 distinct polyphenols having been identified. These encompass an array of phenolic acids and flavonoids. Notable phenolic compounds within this spectrum encompass derivatives of caffeic acid, salvionic acid, sagecoumarin, sagernic acid, and rosemarinic acid. Moreover, these species also contain diterpenes and triterpenes. Certain studies suggest that the logP values of these diterpenes indicate their potential to traverse the blood-brain barrier (BBB). [18]

	POLYPHENOLS	CONCENTRATION (mcg/g)
1.	Gallic acid	0.85
2.	Chlorogenic acid	0.50
3.	Caffeic acid	1.91
4.	Rutin	1.30
5.	Coumaric acid	4.50
6.	Ferrulic acid	1.21
7.	Rosmarinic acid	17.25
8.	Myricetin	1.45
9.	Quercetin	2.80

TABLE 2. Concentration of phenols in Salvia

5. Nutritional benefits of Sage

Sage is replete with a diverse range of vitamins, including vitamin A, vitamin C, vitamin E, vitamin K, riboflavin, and folates. The mineral profile is equally impressive, boasting essential elements like

calcium, copper, iron, manganese, magnesium, and zinc. Additionally, sage encompasses valuable phytonutrients such as carotenes, further contributing to its nutritional richness.

6. Properties

6.1 ANTI-INFLAMMATORY PROPERTY

As previously mentioned, sage has gained significant recognition for its role in addressing inflammation. Notably, it finds specific application in treating throat inflammation through the form of gargles. The subsequent studies were conducted with the aim of investigating the anti-inflammatory attributes of salvia:

6.1.1 Investigation 1:

Researchers delved into the anti-inflammatory potential of *Salvia officinalis L*. leaves from various plant populations, revealing noteworthy insights. Extracts obtained through n-hexane and chloroform methods demonstrated effectiveness in reducing Croton oil-induced ear swelling in mice. Among these, the chloroform extract exhibited the highest potency, while the methanol extracts and essential oil exhibited minimal impact. In a more detailed analysis of the potent chloroform extract, sourced from a sage population thriving in Slovenia's sub-Mediterranean climate, the compound ursolic acid emerged as the primary contributor to the anti-inflammatory effects observed. Remarkably, ursolic acid displayed double the efficacy of indomethacin, a commonly used non-steroidal anti-inflammatory drug.

As a result, it is strongly advocated that the content of ursolic acid in sage and its derivative treatments be monitored for quality assurance in the management of inflammatory conditions. [20]

6.1.2 Investigation 2:

In a study led by Kolac, the antioxidant and anti-inflammatory potential of *S. officinalis* was investigated using a lipopolysaccharide (LPS)-induced inflammation model. The group administered with *S. officinalis* exhibited notably elevated levels of superoxide dismutase, catalase, and glutathione peroxidase activities in comparison to the inflammation-induced group. Conversely, the inflammation group displayed heightened levels of nitric oxide (NO), tumor necrosis factor-α (TNF-α), and nuclear factor NF-κB. Remarkably, *S. officinalis* showcased promising impacts on LPS-induced inflammation and oxidative stress in the rat subjects.

The beneficial effects of *S. officinalis* can be attributed to its terpenes and polyphenols, particularly flavonoids. These components are likely contributors to the herb's anti-nociceptive and anti-inflammatory properties. Notably, flavonoids isolated from *S. officinalis* have demonstrated efficacy in reducing inflammation in the mouse carrageenan model while also exerting analgesic effects. Prior research by Osakabe highlighted that rosmarinic acid, a prominent compound characterizing the *S. officinalis* phytocomplex, exhibited topical inhibition of epidermal inflammation. [21]

6.2 MEMORY MODULATOR

Scientific evidence has validated that the regular consumption of sage herbal tea yields tangible benefits in terms of enhancing brain function and augmenting memory retention. In-depth investigations encompassing in vitro and animal studies have underscored the potential of diverse active compounds found in various Salvia species to notably elevate cognitive performance while offering protection against neurodegenerative conditions. A dedicated study was undertaken to meticulously gauge the effectiveness of sage as a memory-enhancing agent. [22][23]

Objective: Sage leaves (*Salvia officinalis L., Lamiaceae*) exhibit a diverse range of impactful biological activities. These include noteworthy properties such as antibacterial, fungistatic, virustatic, astringent, eupeptic, and anti-hydrotic effects. In a bid to unravel their influence on memory retention,

a study was meticulously carried out on rats. The focal point of this investigation revolved around comprehending the effects of an ethanolic extract derived from sage leaves and its interplay with the cholinergic system in the context of passive avoidance learning.

Methods: Throughout all the conducted experiments, the injections were administered subsequent to the training phase via the intra-cerebroventricular (i.c.v.) pathway. The exception to this was the administration of the ethanolic extract, which was delivered intra-peritoneally (i.p.).

Results: In rats, the administration of a 50 mg/kg ethanolic extract, pilocarpine at 0.5 and 1 mg per rat (a muscarinic cholinoceptor agonist), and nicotine at 0.1 and 1 microg per rat led to an increase in memory retention. Conversely, mecamylamine at 1 and 5 microg per rat (a muscarinic cholinoceptor antagonist) and mecamylamine at 0.01 and 0.1 microg per rat (a nicotine cholinoceptor antagonist) resulted in a decrease in memory retention. The activation of muscarinic cholinoceptors by pilocarpine enhanced the effects of the ethanolic extract, with the pharmacological inhibition of scopolamine reducing this potentiating effect.

Similarly, nicotine activation of nicotinic cholinoceptors also amplified the response to the ethanolic extract. However, blocking the nicotinic cholinoceptor using mecamylamine diminished the response to the ethanolic extract.

Inference: Indeed, research has solidly demonstrated that the ethanolic extract derived from Salvia officinalis holds the capacity to elevate memory retention. This phenomenon is achieved through its intricate interaction with the muscarinic and nicotinic cholinergic systems, pivotal players in the intricate mechanism of memory retention. Consequently, the evidence underscores *Salvia officinalis* as a potent and commendable memory enhancer, as substantiated by scientific inquiry.

HUMAN TRIALS ON THE BRAIN-ENHANCING EFFECTS OF SALVIA

Multiple human trials have undertaken the exploration of cognitive-enhancing effects within the genus Salvia. Notably, two distinct studies were focused on individuals afflicted with Alzheimer's disease, both yielding promising outcomes. [24]

In the context of an open-label pilot study, 11 probable Alzheimer's patients were administered capsules containing 50 µL of *S. lavandulaefolia* essential oil, ranging from 1 to 3 times daily over a span of 3 weeks. The tolerance of capsule intake was satisfactory, albeit two patients with a history of hypertension exhibited elevated blood pressure at the highest dose. Encouragingly, a notable decrease in caregiver-rated neuropsychiatric symptoms was observed, accompanied by enhancements in attention across the 6-week period. However, these results are bounded by the open-label nature of the study, absence of a placebo arm, and a relatively small sample size.

On a different note, a randomized, double-blind, placebo-controlled study embarked upon assessing the effectiveness of an ethanolic extract from *S. officinalis* among Alzheimer's disease patients. In this investigation, participants receiving the active drug condition (60 drops of *S. officinalis* daily) showcased marked advancements in cognitive function, as quantified by the Alzheimer's Disease Assessment Scale and the Clinical Dementia Rating Scale, over the course of 4 months. The administration of *S. officinalis* was well tolerated, with no discernible discrepancies in adverse effects between the active and placebo conditions.

Numerous studies have delved into the cognitive-enhancing potential of administering various Salvia species in a single dose. A total of six studies were conducted, with five of them adopting randomized, double-blind, placebo-controlled designs. These investigations centered around evaluating the efficacy of different Salvia plants, with five studies targeting healthy young adults and one focusing on healthy older-age volunteers. [25]

Remarkably positive outcomes were unveiled among healthy adults who were provided with diverse dosages of essential oil sourced from *S. lavandulaefolia*. The observed improvements spanned across multiple domains, including secondary memory, attention, word recall, and speed of memory, along with bolstered alertness, calmness, and contentedness.

Similarly, the administration of *S. officinalis* extract to healthy young adults echoed these positive effects by enhancing mood and cognition parameters such as alertness, contentedness, and calmness. Equally compelling results were noted when *S. officinalis* was administered to healthy older-age adults, unveiling enhancements in memory and attention.

Collectively, these findings underscore the potential cognitive and mood-enhancing attributes harbored within different Salvia species, reinforcing their role as agents with promising effects on cognitive well-being.
In Moss's comprehensive study, involving randomized participants and concealed treatment allocation, a resounding outcome emerged: the fragrances of both *S. officinalis and S. lavandulaefolia* exhibit a remarkable capacity to positively influence mood and cognitive abilities. This unequivocal finding lends strong support to the notion that specific Salvia species hold the potential to augment both mood and cognitive function. While these results are indeed promising, it is imperative to note that further research is warranted to validate and consolidate these findings, contributing to a more comprehensive understanding of the extent of Salvia's impact on mood and cognition. [26]

6.3 MOOD MODULATOR

In preceding research, the remarkable potential of Sage (*Salvia officinalis*) was unveiled, demonstrating its cholinesterase inhibiting properties and its capacity to enhance mood and memory among healthy young individuals. This rigorous study adopted a double-blind, placebo-controlled, crossover design involving 30 participants of sound health. Over the course of three separate days, spaced 7 days apart, each participant received distinct treatments in a counterbalanced sequence: placebo, 300mg, and 600mg of dried sage leaf.
Comprehensive mood assessments were conducted before and after treatment intake, alongside evaluations at 1 and 4 hours' post-treatment. These assessments encompassed the Bond-Lader mood scales and the State Trait Anxiety Inventory (STAI). Participants also engaged in a 20-minute session of the Defined Intensity Stress Simulator (DISS) computerized multitasking battery. The study further encompassed an examination of the extract of sage leaf's in vitro inhibition of acetylcholinesterase and butyrylcholinesterase.
Results unequivocally revealed that both dosages of sage led to heightened mood ratings in non-stressful conditions. The lower dose notably alleviated anxiety, whereas the higher dose augmented alertness, calmness, and contentedness as measured by the Bond-Lader mood scales. However, the lower dose exhibited reduced alertness during DISS performance and negated the anxiety reduction effect post-DISS. The higher dose significantly bolstered task performance within the DISS battery during both post-treatment sessions, while task performance with the lower dose decreased during the later testing session.
Overall, this study affirms prior observations concerning the cholinesterase inhibiting attributes of *S. officinalis*. Additionally, it underscores the tangible enhancement of mood and cognitive performance through single-dose administration among healthy young individuals. [27]

Anxiety/Mood/Performance Assessment

Participants

The study encompassed a cohort of 17 male and 13 female participants, with an average age of 24.4 years (SD=4.4). Ethics approval was secured from the Ethics Committee of Northumbria University's

Psychology Division, in strict accordance with the principles outlined in the Declaration of Helsinki. Prior to engagement, each participant provided informed consent and completed a comprehensive medical health questionnaire.

The participants adhered to specific criteria: they were non-smokers, demonstrated good overall health, refrained from both recreational and prescription drugs (except for oral contraceptive pills), and abstained from caffeine consumption for a minimum of 2 hours as well as alcohol for at least 12 hours preceding each testing session. These stringent parameters were diligently maintained to ensure the robustness and reliability of the study's outcomes.

Treatments

For this study, MedicHerb UK Ltd contributed dried leaves of *S. officinalis*, along with an inert placebo for comparison purposes. To ensure parity, the capsules that encapsulated the treatments were uniformly opaque and indistinguishable. The sequence of treatments administered to participants was determined using a randomized Latin square design, carefully counterbalanced.

To eliminate any potential biases, a neutral third party was entrusted with the task of prepackaging and labeling all containers containing the daily treatments before the commencement of the study. This meticulous process, in which each participant's treatment was coded for anonymity, was integral to maintaining impartiality and the integrity of the research.

During the study, participants received four visually identical capsules. These capsules could either house a placebo or contain 150mg of dried leaf sourced from the *S. officinalis* plant. The specific dosage of *S. officinalis* within each capsule was contingent on the assigned condition for that day, potentially amounting to 0mg (placebo), 300mg, or 600mg. After each testing session, participants were queried about any impressions or thoughts they might have had concerning the treatment they had received on that particular day. [27]

6.4 ANTI-SWEATING

Background: Deodorant products play a crucial role in curbing the growth and activity of bacteria in the underarm region, effectively combating unpleasant body odor. However, widely used antibacterial agents like triclosan and aluminum salts raise concerns due to their potential links to severe health conditions such as Alzheimer's disease, breast cancer, prostate cancer, and contact dermatitis. In light of these risks, the utilization of plant extracts possessing antibacterial attributes becomes paramount. In this study, a comprehensive assessment was undertaken to scrutinize the antimicrobial capabilities of diverse sage extracts against two bacterial strains responsible for body odor. Additionally, the deodorant efficacy of a silicon-based stick containing varying concentrations of sage extracts was tested on human participants.

Materials and methods: The study encompassed the evaluation of antibacterial properties within distinct fractions of the methanolic extract derived from Salvia officinalis, commonly known as sage. This assessment was conducted using an agar microdilution antimicrobial assay on the skin surface of volunteers. The most potent antibacterial fraction was subsequently chosen for a randomized, double-blind, placebo-controlled clinical trial involving 45 healthy female participants.

These volunteers were categorized into four groups, each consisting of 15 individuals. Participants in each group received a single dose of either Group 1 (200 μg/mL), Group 2 (400 μg/mL), or Group 3 (600 μg/mL) of dichloromethane sage extract. A separate group received a placebo without the sage extract. The primary objective was to ascertain the deodorant efficacy, and this was accomplished through a standard sensory evaluation method. This assessment was conducted prior to application and at two hours, four hours, and eight hours post-application of the deodorant or placebo.

The evaluation method was rooted in the ASTM E 1207-87 Standard Practice for the Sensory Evaluation of Axillary Deodorancy, ensuring a comprehensive and standardized approach to the assessment of deodorant performance.

Results: The analysis of data hinged on two key factors: densities and time. Notably, noteworthy distinctions surfaced within a cohort of 45 participants, boasting a mean age of 61.5±11.8 years, both prior to and post deodorant treatment. A discernible pattern emerged as Group 1, Group 2, and Group 3 exhibited markedly lower odor scores in comparison to the placebo group after durations of two, four, and eight hours ($P < 0.001$).

Interestingly, while the interaction effect was not statistically significant between deodorant densities of 200 and 400 μg/mL, it did show significance between 200 and 600 μg/mL as well as between 400 and 600 μg/mL of sage extract sticks ($P < 0.001$), particularly when scrutinizing varying deodorant concentrations. It is crucial to note that a rabbit skin patch test was conducted prior to the sensory evaluation of the deodorant sticks on participants. This preliminary test was undertaken to confirm the absence of irritants within the formulation, affirming its safety for use.

Inference: When subjected to testing on healthy participants, a stick deodorant infused with dichloromethane sage extract at varying concentrations of 200, 400, or 600 μg/mL demonstrated remarkable effectiveness in significantly diminishing levels of axillary malodor. This positive outcome stood in stark contrast to the control group, underscoring the tangible deodorant prowess of the sage extract-infused formulation.[28]

6.RELIEF IN HOT FLASHES IN MENOPAUSAL WOMEN

For centuries, Sage has held a role as a natural remedy to alleviate the discomfort of hot flashes, a common experience during menopause. These sudden surges of warmth, often felt in the face, neck, and chest, coupled with profuse sweating, are a hallmark of this transitional phase in women's lives. Menopause triggers a decrease in ovarian activity, resulting in reduced production and regulation of hormones like estrogen and progesterone, manifesting as these hot flashes.

A recent clinical investigation sheds light on the potential of *Salvia officinalis* tincture to mitigate the frequency and intensity of these hot flashes. The study aimed to delve into the mechanisms driving the anti-hot flush properties of *Salvia officinalis*. Through an in vitro analysis, the 66% ethanolic tincture, along with n-hexane, $CHCl_3$, and aqueous ethanolic subextracts, was scrutinized for estrogenic and selective serotonin reuptake inhibition activities. Given the heightened risk of Alzheimer's disease development in menopausal women, an in vitro acetylcholinesterase inhibition assay was also undertaken. [29]

Results unveiled no activity in the selective serotonin reuptake inhibition or acetylcholinesterase inhibition assays, even at the highest concentrations tested. The tincture exhibited no estrogenic effects. However, the aqueous ethanolic subextract demonstrated estrogenicity, with an EC_{50} value of 64 μg/mL in the ERLUX assay. Further fractionation of the aqueous ethanolic subextract led to the identification of luteolin-7-O-glucuronide and luteolin-7-O-glucoside as the active components within the vacuum liquid chromatography fractions.

This study suggests that *Salvia officinalis* harbors commonly found estrogenic flavonoids that could potentially offer relief from menopausal hot flashes. This promising avenue opens up new possibilities for natural interventions during this phase of women's lives.[30]

INVESTIGATIONS PERFORMED ON THE TOLERABILITY AND EFFICACY OF SAGE IN MENOPAUSAL WOMEN WITH HOT FLUSHES

Investigation 1:

Background: The objective of this study was to evaluate the effectiveness of a newly developed sage treatment in alleviating menopausal symptoms, including hot flashes. Sage, scientifically known as *Salvia officinalis*, has a historical reputation as a natural remedy for managing sweating and hot flashes during menopause, as well as for improving overall well-being by addressing related symptoms. Despite its traditional use, limited scientific investigation has been carried out to substantiate the efficacy of sage in mitigating menopausal discomforts.

Methods: A clinical trial was conducted across eight medical practices in Switzerland, involving 71 female participants aged at least 56.4 years. These women were in menopause for over a year and experienced a minimum of five daily hot flushes. During the eight-week trial, participants were administered a fresh sage leaf tablet once daily, following an initial baseline week.
The study's primary focus was to assess the alteration in both the intensity and frequency of hot flushes. This evaluation was facilitated through the implementation of a diary protocol, meticulously tracking these aspects over the two-month treatment period. Additionally, the total score of the mean number of intensity-rated hot flushes (TSIRHF) was calculated.
Furthermore, the Menopause Rating Scale (MRS) was employed as an assessment tool. Baseline and two-month evaluations of the MRS were conducted by the treating physician. This comprehensive approach aimed to gauge the impact of the fresh sage leaf tablet on menopausal symptoms, particularly focusing on hot flushes and their associated intensity and frequency.

Results: During the study duration, participants exhibited a noteworthy reduction in the total score of mean number of intensity-rated hot flushes (TSIRHF) at both the 4-week mark (50% reduction) and the 8-week mark (64% reduction) ($P<0.0001$). This reduction in TSIRHF was accompanied by a consistent decline in the average daily count of hot flushes, with a gradual decrease observed from the first to the eighth week.
Interestingly, the reduction was even more pronounced when considering the severity of hot flushes. Over the course of the 8-week study, the number of mild, moderate, severe, and very severe flushes diminished by 46%, 62%, 79%, and 100%, respectively.

Furthermore, the Menopause Rating Scale (MRS), along with its somato-vegetative, psychological, and urogenital subscales, exhibited significant reductions. These reductions amounted to 43%, 43%, 47%, and 20%, respectively.
Crucially, the treatment was well-tolerated by the participants, underlining its potential as a viable approach to managing menopausal symptoms, particularly hot flushes, and garnering positive effects on overall well-being.

Inference: Clinical studies have revealed the remarkable effectiveness of a newly discovered treatment in addressing menopausal symptoms, notably hot flashes and related discomforts. [31]

Investigation 2:

Background: Hot flashes are a prevalent and disruptive symptom for women during menopause, impacting their daily routines and work productivity. Encouragingly, research indicates that *Salvia officinalis*, a plant containing phytoestrogens, holds promise in mitigating menopausal symptoms. Phytoestrogens function as anti-dopaminergics, contributing to the reduction of hot flashes. This study aims to consolidate insights from clinical trials, offering a comprehensive overview of the effects of *Salvia officinalis* on postmenopausal women grappling with hot flashes.

Methods: In this comprehensive review, an exhaustive search encompassing several databases including Pubmed, Web of Science, Cochrane library, Scopus, SID, and Magiran was meticulously conducted. The search strategy involved employing keywords such as "menopause," "hot flashes," "*Salvia officinalis*," and "herbal medicines," combining them using logical operators "OR" and "AND" in diverse configurations. The quality of the identified articles was assessed utilizing Cochrane's Risk of Bias tools, ensuring a rigorous evaluation of their validity and reliability.

Results: Initially, a pool of 148 articles was identified, which underwent meticulous curation involving duplicate removal and the exclusion of irrelevant entries. This process led to the scrutiny of 4 studies encompassing a collective sample of 310 individuals. Among these studies, 3 out of 4 investigated the influence of *Salvia officinalis* on hot flash frequency, 3 out of 4 assessed the severity of hot flashes, and only 1 out of 4 probed the impact on hot flash duration.
Remarkably, the collective findings from all 4 studies consistently demonstrated that *Salvia officinalis* effectively reduces both the frequency and severity of hot flashes in postmenopausal women. An ensuing meta-analysis unveiled a statistically significant decrease in hot flash frequency in postmenopausal women using *Salvia officinalis* compared to a placebo [Effect Size (ES) = -1.12 (%95 CI: -2.37; 0.14), I2 = 71%]. Nevertheless, the effect on hot flash severity was not deemed statistically significant [ES = -2.05 (%95 CI: -6.53; 2.43), I2 = 70%].

Inference: Following comprehensive research to validate its efficacy, the strong recommendation emerges for the widespread utilization of *Salvia officinalis* as a viable approach to mitigate the frequency of menopausal hot flashes. This herbal remedy holds considerable promise and should be actively advocated for use. [31]

SIDE EFFECTS OF SAGE:

Excessive consumption of sage is cautioned against due to the presence of the toxic compound thujone. Overindulgence can result in adverse effects. While clinical evidence is lacking, there's a belief that sage's thujone content might potentially reduce breast milk production. As a precautionary measure, it's recommended to avoid consuming substantial amounts of sage tea, especially during pregnancy or breastfeeding. Additionally, if considering regular consumption of sage tea alongside medication, it's vital to inform your healthcare provider, as interactions with certain drugs may occur. [32]

CONCLUSION

This paper undertakes a comprehensive exploration of the recent advancements that pertain to the use of sage, specifically from the Salvia species, within the realm of phytotherapy, while also delving into its potential as a therapeutic agent. In recent times, there has been growing attention directed towards the potential medicinal applications of sage, with notable emphasis on its safety, effectiveness, and natural origin. A range of Salvia species, notably *Salvia officinalis*, has shown promising results across various domains, including but not limited to anti-inflammatory effects, mood modulation, memory enhancement, reduction of excessive sweating, and alleviation of hot flashes often experienced during menopause.

Furthermore, these studies have unveiled sage's rich repository of properties, encompassing antibacterial attributes, potent antioxidant activity, efficient scavenging of free radicals, and even demonstrating potential anti-tumor effects. As a consequence, sage and its derivatives have emerged as compelling candidates for the development of new natural drugs that hold promise in addressing both minor health concerns and more serious diseases like diabetes, Alzheimer's, and certain types of cancer.

However, it's worth exercising prudence when it comes to the utilization of sage, particularly *Salvia officinalis*. While the potential benefits are promising, a cautious approach is warranted until more comprehensive studies ascertain the safety, quality, and true efficacy of this natural remedy. To progress in a meaningful manner, future research endeavors should place a substantial emphasis on robust pharmacological investigations, in-depth chemical analyses, and augmented human metabolic studies. By conducting such comprehensive research, we can unlock the full spectrum of potential that *Salvia officinalis* holds, potentially leading to the development of novel therapeutic drugs that could have a transformative impact on healthcare.

In summation, Salvia species, notably *Salvia officinalis*, represent a compelling avenue in the realm of natural, safe, and effective treatment for various diseases and their associated symptoms. However, while the outlook is promising, it's essential to further explore and substantiate these findings through extensive research, thereby laying a foundation for the development of innovative therapeutic agents derived from medicinal plants like sage.

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