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Review Article

Aromatherapy And Beyond: The Pharmacological Profile of Chamomile- A Review

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ABSTRACT

Chamomile is among most usually utilized medicinal herbs, historically acknowledged for its soothing effects and wide application in aromatherapy. This review seeks to deliver a thorough summary of the pharmacological characteristics of chamomile, investigating its phytochemical makeup, therapeutic possibilities, and mechanisms of action. A variety of bioactive substances, including flavonoids (apigenin, luteolin) and essential oils (bisabolol, chamazulene), contribute to anti-inflammatory, antioxidant, antibacterial, and anxiolytic properties of chamomile. Recent research has also pointed to its usefulness in addressing issues like gastrointestinal disorders, skin irritations, and sleep problems. Additionally, its incorporation into aromatherapy has become increasingly popular due to its gentle sedative effects, reinforcing its traditional uses. This review critically analyzes the existing scientific literature concerning chamomile's pharmacological functions, safety profile, and clinical applications, highlighting its significance in complementary and alternative medicine. Future research avenues that focus on clinical effectiveness, dosage standardization, and potential interactions with standard medications are also addressed.

INTRODUCTION

An important medicinal herb, chamomile is native to eastern and southeastern Europe. Its arrival in India dates back to the Mughal Empire, The states of Jammu and Kashmir, Punjab, Uttar Pradesh, and Maharashtra are where it is grown. The plant life may be found in several parts of the world. When it comes to plant biomass, Hungary is where it's at. It raises lavishly on poor soils in Hungary as well, providing a means of subsistence for the rural poor. The oil distillation process involves sending blooms to Germany in large quantities. Jammu was first introduced to it in 1957 by Handa et al. Between 1964 and 1965, Chandra et al.

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initially introduced the plant to the alkaline soils of Lucknow.[4,5] The Indian market is not yet showing a strong interest in blue oil. The demand for chamomile flowers, nevertheless, is rather considerable. These days, the majority of chamomile flowers come from only two places: M/s German Remedies and New Delhi's M/s Ranbaxy Labs Limited. Ancient Egyptians, Greeks, and Romans all acknowledged chamomile's medicinal properties and used it in their herbal remedies. There are 26 countries that include the chamomile plant in their pharmacopoeia. Traditional, Unani, and homeopathic medicine all include it in some way or another. Patients with flatulence, colic, hysteria, or recurrent fever may benefit from its medical use. With a concentration ranging from 0.2% to 1.9%, the blue essential oil found in *Matricaria chamomilla* flowers has several uses. In addition to being antispasmodic, moderately diaphoretic, anti-inflammatory, and antibacterial, chamomile is most commonly used for its calming effects. Its main application is as a tisane, which is prepared by infusing one tablespoon of the herb with one liter of cold water without boiling. This is done to alleviate nausea, sluggish digestion, slow bowel movements, and painful periods. It is also used, albeit less frequently, to treat inflammation of the urinary system and painful periods. If you want to use it topically, you can dust some of the powder on slow-healing wounds, rashes, boils, shingles, hemorrhoids, and irascibility of mouth, throat, and eyes. In addition to its many therapeutic uses, the oil finds extensive application in cosmetics, aromatherapy, perfume, and food productions. [27,30-33] Perfumes, beautifying creams, hair care products, skin lotions, toothpaste, and luxury liquors all include azulene, according to research by Gowda et al., which is also found in the essential oil that is collected from the flower heads. For its many medicinal uses, including as a herbal tea, an oil for massaging infants, an agent to stimulate gastrointestinal contents, and a remedy for common colds and coughs, dried chamomile flowers are in great demand. Comfrey drinks made from herbs have helped 57% of babies with colic. This plant is in great demand across Europe and has substantial economic worth due to its vast pharmacological and medicinal properties. The main goal of this review is to deliver a thorough and critical assessment of the botanical traits, phytochemical makeup, pharmacological effects, therapeutic uses, and safety profile of chamomile (Matricaria chamomilla and Chamaemelum nobile). This paper intends to bring together current research outcomes, shine a light on both traditional and contemporary applications, and pinpoint areas where knowledge is lacking that require further exploration. By achieving this, it aims to enhance the understanding of chamomile's potential as a natural therapeutic agent in both traditional and evidence-based medicine.[1]

Fig 1: Chamomile Flowers

BOTANICAL DESCRIPTION

Taxonomy and Synonym

Matricaria chamomilla L., a member of the *Asteraceae* family and one of the most well-known medicinal plants worldwide, is frequently referred to as the "star among medicinal species." Traditional healers frequently use the name "*M.*

chamomilla" when referring to the plant that goes by several names: *Chamomilla recutita*, German chamomile, Roman chamomile, Hungarian chamomile, and so on. People sometimes mistake the real chamomile for the toxic *Anthemis cotula L.*, a member of the *Anthemis* genus that is notorious for its foul aroma.

Botanical and Ecological Discription

M. chamomilla is a yearly herb featuring slender, spindle-like roots. The upright stem, with all of its branches, can reach a height of 10-80 cm. A bi- or tripinnate form characterizes the long, narrow leaves. From 10 to 30 mm in diameter, Melaleuca's pedunculated, heterogamous, and solitary flower heads are present. The five-toothed, golden-yellow tubular florets usually terminate in a glandulous tube and are 1.5 to 2.5 mm in length. With a width of 3.5 mm and a length of 6-11 mm, the 11-27 white florets form a concentric pattern. From flat to conical, the receptacle's width ranges from 6 to 8 mm. The fruit has three or five weak ribs and looks like a cypsela with a yellowish-brown color [1,2]. Though it's best to keep *M. chamomilla* away from rich, heavy, and wet soils, it may grow in a variety of soil types. A yearly rainfall of 400 to 1400 mm each season is necessary for its flourishing, and its optimal temperature range is 7 to 26 °C. Although it can withstand low conditions, the plant will produce its essential oils to their fullest potential when grown in an environment with abundant sunshine, long summer days, and warm temperatures. The diploid organism known as *M. chamomilla* has allogamous traits, starts flowering in the second week of March, and exhibits significant variance in commercial crops.[2]

Figure 2. Plant fragments and habit of German chamomile

MATERIALS AND METHODS

Material

The dried chamomile flowers were supplied by The Organic Herb Trading Company of Somerset, UK. Organic chamomile flowers were cultivated in the Irish county of Roscommon. Sigma-Aldrich of St. Louis, Missouri, supplied the laboratory-grade gallic acid; Merck of Darmstadt, Germany, supplied the Folin-Ciocalteu reagent and sodium carbonate. Sodium phosphoric acid and acetonitrile of HPLC quality were purchased from Sigma-Aldrich. Sourced from Lyon, France's Extrasynthese, the apigenin 7-glucoside standard

Extraction kinetics

At each temperature, 2.5 g of chamomile flowers were submerged in 100 ml of distilled water for several independent time periods ($n > 10$). Celsius degrees of57,70,80,90, and 100 were used. Once the extraction process was complete, the liquid was filtered using Whatman No. 1 filter paper and then rapidly refrigerated on ice.

Drying conditions

In October 2006, chamomile flowers were plucked. After rapidly drying the flowers using various ways, they were divided into 250 g portions. The following methods were employed: (1) air drying at room temperature (about 21 °C), (2) drying in a 40 °C forced-convection oven (Model No. FD 115/E2, Binder, Tuttlingen, Germany), (3) drying in an 80 °C forced-convection oven, (4) freeze-drying the flowers by immersing them in liquid nitrogen (Edwards Super Modulyo freeze-drier, Crawley, Sussex, UK), and (5) immediate extraction from fresh flowers. When the chamomile flowers had been dried in an oven at 102 °C for at least 24 hours, or until they reached a constant weight, their dry weights were extracted. About 85% of the water content is in the freshly picked chamomile flowers.

Extraction of dried material

Extraction of 2.5 g of chamomile dried flowers in 100 ml water (90 °C for 20 minutes) allowed us to compare the color and phenolic composition of dried flowers that had been subjected to various drying processes. Triple extractions were performed for every therapy. [3]

Pharmacological Activity of chamomile

1. Anti-Inflammatory Activity

The human body regularly encounters both internal and external stresses that can harm biological membranes, leading to inflammation as a reparative response. Research on German chamomile (*Matricaria chamomilla*) has underscored its potential to reduce inflammation. In an animal model of atopic dermatitis, Lee et al. discovered that topical chamomile oil application reduced blood IgE and IgG1 levels. New research has demonstrated that chamomile, when combined with other plant extracts like Commiphora molmol and Coffea arabica, can inhibit production of pro-inflammatory cytokines with TNF-α, IL-6, and IL-8. Compounds including apigenin, luteolin, and matricin are believed to contribute to these effects, along with essential oil

2. Antioxidant Activity

The relationship between antioxidant and anti-inflammatory effects is significant, as oxidative stress can initiate inflammatory reactions by activating COX and LOX enzymes. Research indicates that chamomile has substantial antioxidant properties that help mitigate oxidative stress and the resulting inflammation. Hydroalcoholic extracts of chamomile also lowered ROS levels in HT29 cell lines, along with a significant reduction in 8-iso-PGF2α and PGE2, demonstrating both antioxidant and anti-inflammatory effects. These results point to chamomile's potential role in addressing inflammation related to oxidative stress, particularly in colorectal cancer.

3. Anti-Allergic Activity

The global rise in allergic diseases is notable, with mast cells being pivotal due to their release of histamine and other inflammatory substances. Research indicates that chamomile extract possesses anti-allergic properties by stabilizing mast cells and diminishing histamine release. For instance, compared to the standard medicine disodium chromoglycate, a methanolic chamomile extract (300 mg/kg) reduced mast cell degranulation by 73.3%. The fact that chamomile extract reduced histamine and nitric oxide levels further demonstrates its potent anti-allergic properties. The topical application of chamomile oil also significantly lowered serum levels of IgE, IgG1, and histamine in models of allergic dermatitis.

4. Anti-Microbial Activity

Chamomile has shown significant antimicrobial and antiviral properties, largely due to its constituent α-bisabolol. For instance, Kazemian et al. found that wound healing occurred more rapidly with chamomile than with tetracycline. Additionally, chamomile extracts demonstrated a synergistic effect when used alongside antibiotics such as tetracycline and penicillin V. Moreover, chamomile essential oil revealed strong antiviral properties against the Herpes simplex virus, achieving up to 99.9% plaque reduction, and even helped alleviate symptoms in patients with COVID-19. These results underline chamomile's potential as a multifunctional antimicrobial agent.[4]

5. Antidepressive activity

An investigation into the potential benefits of chamomile tea for postpartum depression and sleep disorders found that it reduced feelings of sadness and improved sleep quality in women who participated in the trial.[5]

6. Angiogenesis activity

It was determined whether chamomile extracts had any antiangiogenic effects. The results demonstrated that the methanolic extract's effectiveness is due in large part to the chemicals apigenin and luteolin, which have the greatest potential for promoting the formation of new blood vessels. [6]

7. Hepatoprotective effect

Subacute pre-treatment with chamomile (Matricaria recutita L.) decoction extract (CDE) was investigated for its chemical composition, antioxidant activities, and liver-protective effects in rats that had been treated to ethanol (EtOH)-induced oxidative stress. The results demonstrated that CDE may aid the liver in coping with oxidative stress caused by EtOH by having a negative effect on the components of the Fenton reaction, namely, free iron and H(2)O(2). By interfering with intracellular calcium homeostasis, these components are recognized to induce cytotoxicity.[7]

8. Antidiarrheal activities

The capacity of chamomile extract to shield rats against oxidative stress and diarrhea was investigated in an experimental research. Castor oil causes diarrhea and fluid buildup in the intestines, however the antidiarrheal and antioxidant effects of this plant's extracts worked dose-dependently. [8]

9. Premenstrual syndrome

After comparing the effects of chamomile extract with those of mefenamic acid on the intensity of premenstrual syndrome symptoms, researchers concluded that chamomile was superior.[9]

Other Aspects

Adverse Reactions

Based on available records, interactions between chamomile and certain plants or medications could lead to negative reactions. Theoretically, the risk of bleeding might be increased by utilizing drugs that affect platelet aggregation as they disturb coagulation mechanisms. Additionally, consuming high quantities of chamomile poses a risk of teratogenic effects, can disrupt the menstrual cycle, and may lead to vomiting.[10]

Toxicity Studies

Chamomile has been linked to the spread of Clostridium botulinum spores, according to certain reports. the eleventh The genotoxic effects of

Chamomile in mice were established by Kalantari et al. using an ultra-viable micronucleus test on reticulocytes. [12] However, as Wang et al. noted, mice are unaffected by the plant's alcoholic and watery extracts. The highest safe dose of these extracts, according to clinical trials, is 535 times the typical adult dosage and 425 times the average dosage for children. Additional study is required to confirm the safety of chamomile consumption, as its toxicity has only been evaluated in a small number of trials thus far.[13]

DISCUSSION

The pharmacological characteristics of chamomile reveal a wide array of therapeutic possibilities, including anti-inflammatory, antioxidant, antimicrobial, and anxiolytic effects, primarily due to its abundant flavonoids (like apigenin) and essential oils (such as α-bisabolol). These traits endorse its traditional application in aromatherapy and herbal remedies, especially for addressing anxiety, gastrointestinal issues, and skin ailments. Nonetheless, obstacles persist in applying these benefits to clinical settings because of inconsistencies in plant species, extraction techniques, and dosages among various studies. Standardized formulations and rigorously designed clinical trials are necessary to verify its effectiveness and safety. Furthermore, while chamomile is typically regarded as safe, the possibility of allergic reactions and drug interactions should be taken into account. In summary, chamomile shows potential as a complementary treatment, but additional research is required to fully leverage its therapeutic capabilities and integrate it into contemporary medical practices.

CONCLUSION

Chamomile is a well-regarded and scientifically validated medicinal herb recognized for its wide-ranging pharmacological effects, which include anti-inflammatory, antioxidant, antimicrobial, and anxiolytic properties. Its historical applications in aromatherapy and herbal medicine are increasingly supported by contemporary research; however, significant issues—such as the inconsistency in extract composition, the need for dosage standardization, and the necessity for thorough clinical validation—remain to be resolved. In summary, chamomile shows considerable potential as a safe and effective complementary treatment. Future studies should emphasize high-quality clinical trials, standardized formulations, and safety evaluations to facilitate the integration of chamomile into evidence-based medical practices.

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