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# Chamomile an Ancient Aromatic Plant - A Review

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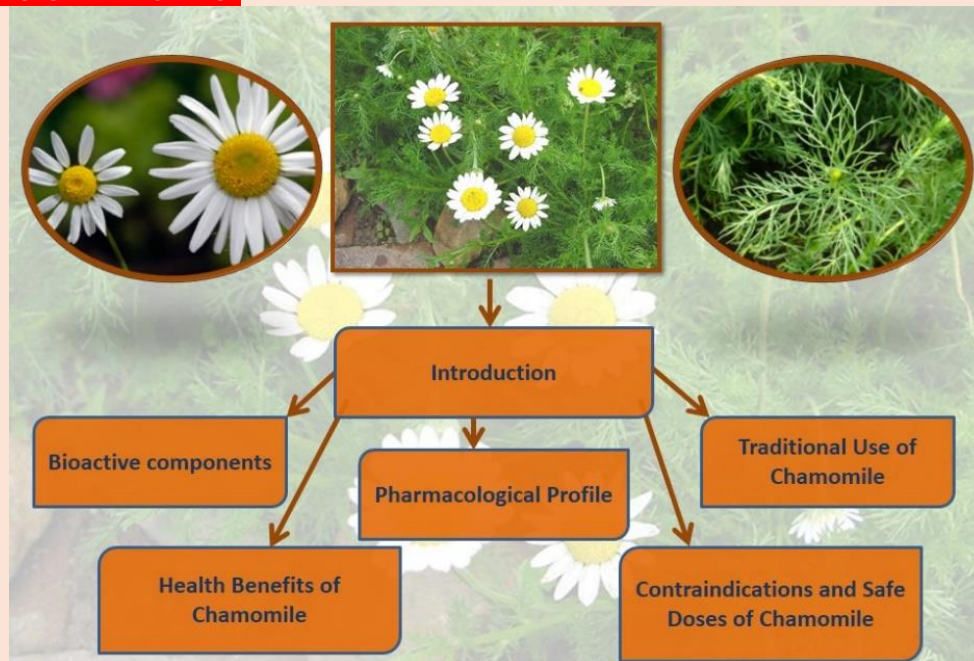
## ABSTRACT

**Introduction:** Chamomile is known as German chamomile *Matricaria recutita* and Roman chamomile *Chamaemelum nobile* a very famous daisy plant. Chamomile is metabolized into terpenoids and flavonoids. Chamomile is rich in different bioactive compounds, antioxidant and phytochemicals; carries many pharmacological and traditional properties. Leaves, flowers and stems of chamomile are used as antioxidant, analgesic, antiviral, anti-inflammatory, antiseptic, antidiabetic, anti-proliferative, antibacterial activities and many more diseases. **Conclusion:** This paper put a light on nutraceuticals properties of chamomile.

## KEYWORDS

Antioxidant, Chamomile, Herbal tea, Nutraceuticals

## PICTORIAL ABSTRACT



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## 1. Introduction

The word Chamomile comes from the Greek meaning "ground apple", probably because of its apple-like fragrance and also used in spells for money, peace, love, tranquility and purification. Chamomile may be the herb with the earliest recorded in history and a member of the daisy family. Ancient Egyptians used it cure the "ague" also known as acute fever. Chamomile (*Matricaria chamomilla* L.) is a medicinal herb native to southern and eastern Europe; belongs to the *Asteraceae* family (Table 1). Traditionally, chamomile has been used as an anti-inflammatory, anti-oxidant and a mild astringent. Chamomile can be applied topically to sites of eczema to relieve the itching and dry skin. Chamomile has been shown to be about 60 percent as effective as hydrocortisone cream when used for eczema. Finally when used as an aromatherapy it may help reduce anxiety and insomnia. The smell has been shown to have soothing effects<sup>[1]</sup>. Chamomile in Egypt related as gods of Sun used to cure malaria. Chamomile has traditionally been used as a digestive aid, breath freshener, boost immunity, good sleep and meditation, general-purpose tonic, alleviate allergy, women menstrual problems, bronchitis, worms and insect bites, and itching<sup>[2]</sup>. If we see it past we will found that since the time of Hippocrates, ancient Greeks, Egyptians, and Romans regularly used the chamomile flowers to treat

erythema and xerosis caused because of dry weather<sup>[3]</sup> and as a calming beverage in the form of tea or tisane<sup>[4]</sup>.

**Figure 1. *Matricaria chamomilla***



Hippocrates described chamomile as a medicinal plant and chamomile tea was recommended by Galen and Asclepiades<sup>[5]</sup>. During the same period, Mathiolus/ Peter Ondej Mathioli described chamomile in his Latin herbarium<sup>[6]</sup>, where he listed the essential oil of chamomile as a remedy against spasms<sup>[5]</sup>. In Unani medicine it flowers is called *Gul-e-Babuna*<sup>[7]</sup>.

**Table 1. Classification of *Matricaria chamomilla***

Kingdom	Plantae - Plants
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Asteridae
Order	Asterales
Family	Asteraceae

## 2. Bioactive Components

Chamomile flowers include several phenolic compounds, primarily the flavonoids apigenin, quercetin, patuletin, luteolin and their glucosides. Coumarins and Dicycloethers also occur in the flowers. The principal components of the essential oil extracted from the flowers are the terpenoids  $\alpha$ -bisabolol and its oxides and azulenes, including chamazulene<sup>[8-9]</sup>. Bioactive phenolic composition coumarins: herniarin, umbelliferone; phenylpropanoids: chlorogenic acid, caffeic acid; flavones: apigenin, apigenin-7-O-glucoside. Luteolin, luteolin-7-O-glucoside; flavonols: quercetin, rutin and flavanone: naringenin are also present in chamomile extract<sup>[10]</sup>. Chamomile oil includes chamazulene, (1-15 %) chamazulene carboxylic acid and proazulenes<sup>[11]</sup>. The essential oil from chamomile showed specific inhibition toward aflatoxin G (1) (AFG (1)) production, and (E) - and (Z)-spiroethers were isolated as the active compounds from the oil<sup>[12]</sup>. The largest group of medically important compounds forming the essential oils are primarily bisabololoxides, bisabolonoxide A, trans- $\beta$ -farnesene,  $\alpha$ -farnesene, spathulenol and the cis/trans-en-in-dicycloethers<sup>[13]</sup>. Flavonoids, coumarins, mucilages, mono and oligosaccharides also have pharmacological effects<sup>[14]</sup>. Chamazulene carboxylic acid is a natural proven with anti-inflammatory activity and degradation product of proazulenic sesquiterpene lactones and matricin<sup>[10]</sup>. Chamomile is one of the richest dietary sources of apigenin 840 mg/100 gm of chamomile<sup>[8]</sup>.

## 3. Pharmacological Profile

Chamomile conventional used for hay fever, inflammation, muscle spasms, menstrual disorders<sup>[15]</sup>, ulcers, rheumatic pain and hemorrhoids<sup>[16]</sup>. Its extract has been used for mild sedative to calm nerves and reduce anxiety, to treat hysteria, nightmares, insomnia and other sleep problems<sup>[11]</sup>. Leaves, flowers and stems of chamomile are used as anti-oxidant, analgesic, anti-viral, anti-inflammatory, anti-septic, anti-diabetic, anti-proliferative, anti-bacterial, anti-leech effect<sup>[17]</sup>. Menstrual disorders, sedative and hepatoprotective activities<sup>[18]</sup> and acaricidal properties. Anti-oral mucositis<sup>[19]</sup>, anti-ulcer activity are also present in them. Dried flowers of chamomile are also used in herbal tea, baby massage oil, for promoting the gastric flow of secretion and for the treatment of cough and cold<sup>[20]</sup>.

### 3.1 Anti-inflammatory

The freeze-dried extracts of chamomile were found to suppress both the inflammatory effect and the leukocyte infiltration. Chamomile was assessed for its anti-inflammatory activity on intact rats by measuring the suppression of carrageenan-induced paw edema produced by 1/10 of the intra-peritoneal LD<sub>50</sub>dose for the 80 % ethanol extract. Results showed that the plant possessed good anti-inflammatory activity.

### 3.2 Antianxiety

179 participants received 12 weeks of open-label therapy with chamomile pharmaceutical grade extract 1500 mg (500 mg capsule 3 times daily) for Phase 1. Throughout Phase 2, treatment responders were randomized to either 26 weeks of continuation chamomile therapy. During follow-up, chamomile participants maintained significantly lower generalized anxiety disorder symptoms than placebo ( $P=0.0032$ ), with significant reductions in body weight ( $P=0.046$ ) and mean arterial blood pressure ( $P=0.0063$ ). Both treatments had similar low adverse event rates. Long-term chamomile was safe and significantly reduced moderate-to-severe

generalized anxiety disorder symptoms, but did not significantly reduce rate of relapse<sup>[21]</sup>.

### 3.3 Immunomodulatory

Intra gastric and parenteral administration of hetero polysaccharides of chamomile is found to normalize developing of the immune response upon air cooling and enhance this process upon immersion cooling. The immune-modulating effect of the hetero polysaccharides upon cooling is attributed to initiation of immune-stimulating properties of heavy erythrocytes, activation of immune regulation cells of peripheral blood and increased sensitivity of effectors cells to helper signals<sup>[20]</sup>.

### 3.4 Anticancer

The aqueous and methanol extracts of chamomile showed differential apoptosis in cancer cells but not in normal cells at similar doses. There have been numerous studies evaluating the possible effects of chamomile to treat side effects of chemotherapy. Studies have shown that while chamomile does not increase the efficacy of chemotherapy or affect the mortality of the patient, it did improve morbidity and quality of life<sup>[22]</sup>.

### 3.5 Antiulcer

Extracts from the plants *Iberis amara*, *Melissa officinalis*, *Matricaria recutita*, *Carum carvi*, *Mentha x piperita*, *Glycyrrhiza glabra*, *Angelica archangelica*, *Silybum marianum* and *Chelidonium majus*, singly and combined in the form of a commercial preparation for anti-ulcerogenic activity. This is associated with a reduced acid output and an increased mucin secretion, an increase in prostaglandin E2 release and a decrease in leukotrienes<sup>[23]</sup>.

### 3.6 Hyperglycemic

Chamomile ethanol extract treatment protected the majority of the pancreatic islet cells, with respect to the control group. As a result, Chamomile ethanol extract exhibited significant anti-hyperglycemic effect and protected beta-cells in STZ-diabetic rats, in a dose-dependent manner, and diminished the hyperglycemia-related oxidative stress<sup>[24-25]</sup>.

### 3.7 Anti-allergic

The inhibitory effects of the dietary intake of the German chamomile extracts on compound 48/80-induced itch-scratch response were comparable to oxatamide (10 mg/kg), an anti-allergic agent<sup>[26]</sup>.

### 3.8 Anti-solar

Liquid and dry extracts of *Hamamelis virginiana*, *Matricaria recutita*, *Aesculus hippocastanum*, *Rhamnus purshiana* and *Cinnamomum zeylanicum* were prepared by repercolation, maceration and microwave oven extraction. The solar protection factors (SPF) of these preparations were determined by a spectrophotometric method. The results showed that after incorporation to a 2 % solution of the synthetic sunscreen octylmethoxycinnamate, the extracts showed intensification in SPF values, suggesting that this can be an interesting method to intensify SPF.

### 3.9 Anti-microbial

The essential oil from and chamomile were active against 3 strains of *S. aureus* and the *Candida* strains and can be used in the treatment of acute otitis external<sup>[27]</sup>.

### 3.10 Chikungunya

Natural compounds with a 5,7-dihydroxyflavones structure, such as apigenin, were found to suppress activities of Enhanced Green Fluorescent Protein (EGFP) and Renilla Luciferase (Rluc) marker genes expressed by the chikungunya virus replicon<sup>[28,29,66]</sup>.

### 3.11 Acaricidal

Acaricidal properties of decoctions, infusions and macerates of dried flower heads of chamomile were tested in vitro against the mite

*Psoroptes cuniculi* Delafon. This mite species is responsible for otoacariasis in domestic animals. Mites were exposed to the extracts for 24, 48 or 72 h. All the extracts tested showed highly significant acaricidal activity when compared with controls. Among them, a decoction of 10% was the only formulation which gave 100% activity at all the three observations times<sup>[30]</sup>.

### 3.12 Wound healing

The aqueous extract of chamomile (120 mg/kg/day) showed increased rate of wound contraction, together with the increased wound-breaking strength, hydroxyproline content. The chamomile extract in the form of rubbing oil had a good potential for acceleration of burn wound healing in rats. The extract of chamomile administered topically has wound healing potential in linear incisional wound model in rats. Animals treated with chamomile presented significantly faster wound healing in comparison to those treated with corticosteroids<sup>[31-36]</sup>.

### 3.13 Anti-diabetic

Results of antidiabetic study clearly showed that chamomile extract produced a significant hypoglycemic action. At 25 mg/kg dose, the activity of chamomile extract in lowering the serum glucose and promoting glycogen storage was found to be higher than the standard drug. The possible mechanism for this action might be due to the inhibition of the enzyme glycogen phosphorylase, an enzyme that catalyzes the process of glycogenolysis thereby inhibiting glucagon which on feedback inhibition favors the production of insulin. Chamomile extract has beneficial effects on blood glucose and lipid abnormalities. It has the potential to impart therapeutic effect in diabetes<sup>[37]</sup>.

### 3.14 Anti-pruritic

The single per oral administration of the ethyl acetate extract or essential oil of chamomile showed remarkable anti-pruritic effects in the compound 48/80-induced itch-scratching test in ddY mice<sup>[38-41]</sup>.

### 3.15 Lousicidal, ovicidal and repellent

Chamomile essential oil has lousicidal, ovicidal and repellent efficacy against lice and flies infesting water buffaloes<sup>[19]</sup>.

### 3.16 Anti-stress and depression Property

Chamomile 6cH is related to the recovery of basal behavioral conditions in mice subjected to stressful conditions<sup>[42]</sup>.

### 3.17 Gastrointestinal disorders

The major advantage of chamomile is its noted anti-inflammatory action. This makes it valuable for a wide range of gastrointestinal (GI) tract disorders. It should be considered whenever the GI tract is either cramping or irritated due to anxiety or stress. Chamomile also heals and calms the GI tract following a bout of diarrhea. Use chamomile as a supportive in treatment of irritable bowel syndrome, indigestion, infant colic, gastritis, peptic ulcer disease, cramping secondary to diarrhea and spastic colon. One study found that a tea that combined chamomile, vervain, licorice, fennel and lemon balm was effective in relieving colic in infants. The dose of tea used in the study was approximately 1/2 cup (150 milliliters) given during each colic episode for a maximum of three times per day<sup>[43]</sup>.

### 3.18 Infant botulism

Chamomile is a potential vehicle of *C. botulinum* spores, and ingestion of chamomile tea could represent a risk for infant botulism<sup>[44]</sup>.

### 3.19 Anti-oral mucositis

Methotrexate-induced oral mucositis in a patient with rheumatoid arthritis was successfully treated with Wild chamomile mouthwashes<sup>[22]</sup>.

### 3.20 Osteoporosis

The aqueous extracts derived from chamomile may form the basis to design "functional foods" for the prevention of osteoporosis<sup>[45]</sup>.

### 3.21 Anxiolytic

A significant reduction in mean total Hamilton Anxiety Rating (HAM-A) scores was observed during chamomile versus placebo therapy<sup>[46]</sup>.

### 3.22 Virucidal

Chamomile oil exhibited a high selectivity index and seems to be a promising candidate for topical therapeutic application as virucidal agents for treatment of herpes genitalis<sup>[47]</sup>.

### 3.23 Uterotonic

Water extracts (infusions) from a group of medicinal plants were studied in terms of their activity enhancing the uterine tonus in a series of experiments with a preparation of an isolated rabbit and guinea pig uterine horn.

### 3.24 Intracanal irrigant

Chamomile or tea tree oil was effective in removal of the smear layer<sup>[48]</sup>.

## 4. Traditional Uses

Traditionally, chamomile has been used for centuries as a mild astringent and healing medicine. As a traditional medicine, it is used to treat wounds, ulcers, eczema, gout, skin irritations, bruises, burns, canker sores, neuralgia, sciatica, rheumatic pain, hemorrhoids, migraine, headache, mastitis and other ailments<sup>[49-50]</sup>. Externally, chamomile has been used to treat diaper rash, cracked nipples, chicken pox, ear and eye infections, disorders of eyes including blocked tear ducts, conjunctivitis, nasal inflammation and poison ivy. Chamomile is widely used to treat inflammations of the skin and mucous membranes, and for various bacterial infections of the skin, oral cavity and gums, and respiratory tract<sup>[51]</sup>. Chamomile in the form of an aqueous extract has been frequently used as a mild sedative to calm nerves and reduce anxiety, to treat hysteria, nightmares, insomnia and other sleep problems<sup>[52]</sup>. Chamomile has been valued as a digestive relaxant and has been used to treat various gastrointestinal disturbances including flatulence, indigestion, diarrhea, anorexia, motion sickness, nausea and vomiting. Chamomile has also been used to treat colic, croup and fevers in children<sup>[52]</sup>. It has been used as an emmenagogue and a uterine tonic in women. It is also effective in arthritis, back pain, brain tonic, bedsores and stomach cramps<sup>[53-54]</sup>.

## 5. Health Benefits

4.1.1 In order to cure peptic ulcer, make a cup of thick tea of chamomile (4 teaspoons of chamomile in a glass of boiled water or 4 tea bags of chamomile in a glass of boiled water) and drink it in breakfast and then lie supinely and sleep after 4 minutes. Of course you can have your breakfast after 15 minutes. Follow this procedure for two weeks until peptic ulcer is cured completely. It also cure diarrhea specially the viral one and remove stomach and bowel worm.

5.1.2 Use peppermint, chamomile or ginger tea to help calm your stomach.

5.1.3 Infuse sage and chamomile in water and use as a mouthwash four to six times daily.

5.1.4 This plant enhances milk secretion of mothers who foster children.

5.1.5 Using the chamomile would crush and remove bladder rock and disorder of urinary dribbling.

5.1.6 Chewing the chamomile is effective to heal wounds of mouth.

5.1.7 Drink a cup of chamomile tea 10 minutes before going to bed you will have a peaceful and comfortable sleep.

- 5.1.8 Chamomile tea cures anemia and anorexia.
- 5.1.9 Chamomile alleviates menstrual period pains.
- 5.1.10 It is an effective cure for xanthochromia.
- 5.1.11 Chamomile bath has reinforcing effect. To this end pour little drops of chamomile in bathtub and lie in it for 15 minutes.
- 5.1.12 To alleviate pain mingle little drops of chamomile essence with a spoon of almond oil and then rub it into painful positions it will reduce pain, backache, arthritis and gout.
- 5.1.13 Its essence mixed with almond oil is an effective cure for skin diseases such as eczema, hives and itching.
- 5.1.14 To reduce earache and amblyocousia drip one drop of chamomile oil into ear.
- 5.1.15 Its essence has emetic effect; it is used in dealing with food poisoning.
- 5.1.16 If you wash blonde hair with the chamomile tea, they will be more clear and brighter.
- 5.1.17 Those women who have gone through the menopause would do better to drink chamomile tea, because it reduces menopausal disorders and painful period and cure for inflammation of vagina.
- 5.1.18 Harnessing bacterium and fungus growth.
- 5.1.19 Prevention from inflammation of the position of the baby's caused by urine.
- 5.1.20 As anti-inflammatory of gingival and reducer of the formation of microbial plaques on teeth.
- 5.1.21 In throat infections and gingivitis chamomile accelerates recuperation.
- 5.1.22 In respiratory infections it brings reduction of respiratory ducts inflammation. In sinusitis it brings reduction need to antibiotic by reduction of the inflammation and antibacterial effects, so chamomile speed up healing.
- 5.1.23 It accelerates recovery and reduces outbreak of wound abnormality in chronic wounds specially shin.
- 5.1.24 In homeopathy it is used to treat childhood toothaches, earaches, colic and headaches<sup>[55-60]</sup>.

## 6. Contraindications and Safe Doses

Moderately low proportions of people are sensitive to chamomile and develop allergic reactions. It is possible that some reports of allergic reactions to chamomile may be due to contamination of chamomile by "dog chamomile" a extremely allergenic and bad-tasting plant of related to chamomile<sup>[61-62]</sup>. A fact of cross-reactivity of chamomile with other drugs is not well accepted and further research of this issue is needed prior to reaching to a conclusion<sup>[63]</sup>. Safety in young children, pregnant or nursing women or those with liver or kidney disease has not been established. There has not been any believable information of toxicity caused by chamomile tea<sup>[64]</sup>. Chamomile safe doses are recommended as 3 to 4 g of tea 3 times per day and 270 mg twice per day as medicine<sup>[65]</sup>. Chamomile is generally safe for consumption, although patients with hypersensitivity to ragweed and other members of the composite family should use with caution. Allergic reactions to chamomile are rare and no potentially toxic compounds have been reported<sup>[66]</sup>.

## 7. Conclusion

Chamomile has been used as an herbal medication since antique. There is a need for sustain hard work that spotlight on pre-clinical studies with chamomile linking animal and human models on different diseases. This may then be as a result validated in clinical trials that will help in developing chamomile as a promising therapeutic agent. Without such confirmation, it will remain unclear that these can be medical treatments are truly beneficial or not. Chamomile preparations could be safe and provide therapeutic benefits.

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**CONFLICT OF INTEREST** Authors declare no conflict of Interest

## CONTRIBUTORS

Aishwarya Jaya contributed to the conceptualization of the topic, intellectual content, data acquisition, design and literature study. Dr Ekta Singh Chauhan contributed to the manuscript editing.

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