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Pharmacological Potential of *Matricaria recutita*-A Review

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ABSTRACT
Matricaria recutita, once it has been called as *Marticaria chamomilla*, *Chamomilla recutita*, and *Chamomilum nobile* family *Asteraceae*. The main constituents of this plant include the terpenoids α-bisabolol and its oxides and azulenes, including chamazulene. *Matricaria recutita* shows different pharmacological activities like anti-inflammatory, anti- cancer, treatment of stress and depression, anti-allergic etc. This review focuses on the detailed chemical constituents, pharmacological activities of different parts of this plant.

Keywords: Marticaria chamomilla, terpenoids, chamazulene.

INTRODUCTION

Matricaria recutita, once it has been called as Marticaria chamomilla, Chamomilla recutita, and Chamomilum nobile family *Asteraceae* and commonly it is known as German chamomile, Roman chamomile, English chamomile, Camomilla, and Flos Chamomile. [1-2]

It mainly grows indigenously in Europe, NW. Asia, N. Africa, and cultivated in N. America and in many parts of the world. [1, 3] This herb has been used as herbal remedies for thousands of years. This herb has been believed by Anglo-Saxons as one of nine sacred herbs given to humans by the lord. [4] One of the most commonly consumed single ingredient herbal tea is chamomile, prepared with dried flowers from *Matricaria recutita* L. The composite flower is white in color with a yellowish orange center. [1] Infusions and essential oils from fresh or dried flower heads have aromatic, flavoring and coloring properties. Both are used in a number of commercial products including soaps, detergents, perfumes, lotions, ointments, hair products, baked goods, confections, alcoholic beverages and herbal teas. Chamomile flowers contain 0.24- to 2.0 percent volatile oil that is blue in color. [1, 3] European Pharmacopoeia recommends chamomile contains no less than 4 mL/kg of blue essential oil. [5]

CHEMICAL CONSTITUENTS

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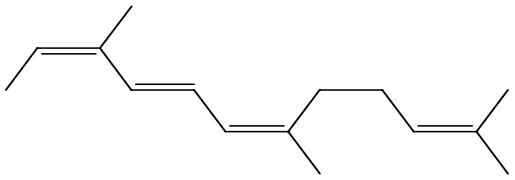
Over 120 constituents have been identified in chamomile flowers. [6] The main constituents of the oil include the terpenoids α-bisabolol and its oxides (≤ 78 %) and azulenes, including chamazulene (1-15 %). [7-11]

Chamazulene carboxylic acid and proazulenes occur in chamomile. [12] Precocenes were isolated from the essential oils of *Matricaria recutita.* [13] The essential oil of German 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. [14] Farnesene (12-28 %), spathulenol and spiroethers, including the *cis*/*trans*-en-yn-dicycloethers (8-20 %), are also present in the volatile oil. [15-17] Eleven bioactive phenolic compounds (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 found in chamomile extract. The main constituents of the 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. Chamomile (*Matricaria chamomilla*) in the above-ground organs synthesizes and accumulates (Z) - and (E)-2-beta-D: -glucopyranosyloxy-4-methoxy cinnamic acids (GMCA), the precursors of phytoanticipin herniarin (7-methoxycoumarin). [18-26] The largest group of medically important compounds forming the essential oils are primarily chamazulene, (-)-alpha-bisabolol, bisabololoxides, bisabolonoxide A, trans-

beta-farnesene, alpha-farnesene, spathulenol and the cis/trans-en-in-dicycloethers. Flavonoids, coumarins, mucilages, mono- and oligosaccharides also have pharmacological effects. [27-28] Fractionation of the aqueous extract of this plant led to the detection of several fractions with significant affinity for the central benzodiazepine receptor and to the isolation and identification of 5, 7, 4'-trihydroxyflavone (apigenin) in one of them. [29-30] The essential oil of German 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. [14] The major flavonoids in the white florets of chamomile (*Chamomilla recutita* [L.] Rauschert) were rapidly purified using a combination of polyamide solid-phase extraction and preparative HPLC. From the combined LC/MS, LC/MS/MS, and NMR data the apigenin glucosides were identified as apigenin 7-O-glucoside (Ap-7-Glc), Ap-7-(6"-malonyl-Glc), Ap-7-(6"-acetyl-Glc), Ap-7-(6"-caffeoyl-Glc), Ap-7-(4"-acetyl-Glc), Ap-7-(4"-acetyl,6"-malonyl-Glc), and a partially characterized apigenin-7-(mono-acetyl/mono-malonylglucoside) isomer. [31] Precocenes were isolated from the essential oils of *Matricaria recutita.* [13] We screened various isoprenoids to search for inducers of apoptosis-like cell death ("apoptosis") in the shoot primordia of *Matricaria chamomilla* and found that geraniol has the most potent apoptosis-inducing activity among terpenoids. [32] Chamazulene carboxylic acid is a natural profen with anti-inflammatory activity and a degradation product of proazulenic sesquiterpene lactones, e.g., matricin. Both 1 and proazulenes occur in chamomile (*Matricaria recutita*). [33] A Flavone 7-O-Glucoside-Specific Glucosidase from Ligulate Florets of Chamomilla recutita is also found. [34]



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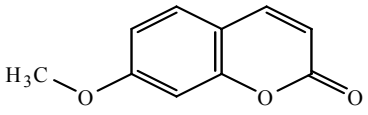

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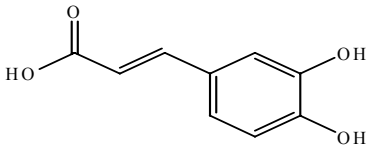

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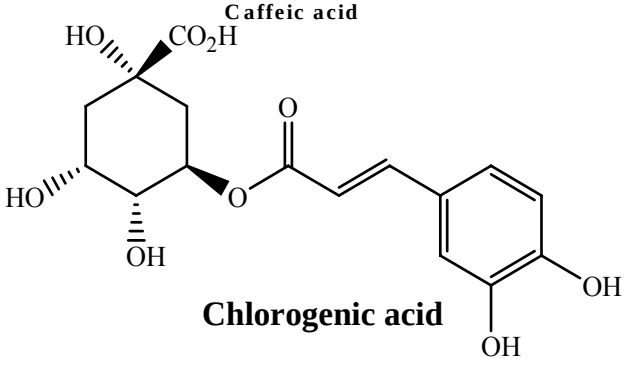
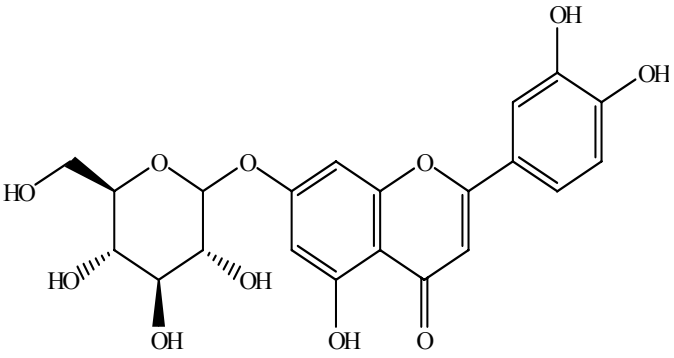
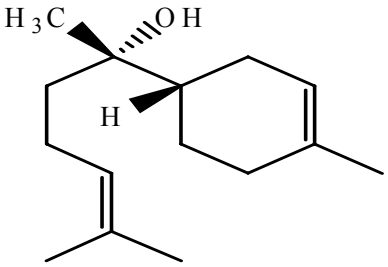


Chlorogenic acid



Luteolin-7-O-glucoside



***alfa*-Bisabolol**

GENERAL PHARMACOLOGICAL ACTIVITIES

Anti-inflammatory

The freeze-dried extracts of camomile (*Matricaria chamomilla* L.) and was found to suppress both the inflammatory effect and the leukocyte infiltration. Matricaria chamomilla 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 intraperitoneal LD_{50} dose for the 80 % ethanol extract. Results showed that the plant possessed good anti-inflammatory activity. [35-36]

Immunomodulatory activity

Intragastric and parenteral administration of heteropolysaccharides of *Matricaria chamomilla L.* is found to normalize developing of the immune response upon air cooling and enhance (but do not normalize) this process upon immersion cooling. The immunomodulating effect of the heteropolysaccharides upon cooling is attributed to initiation of immunostimulating properties of heavy erythrocytes (macrocytes), activization of immunoregulation cells of peripheral blood, and increased sensitivity of effector cells to helper signals. [37]

Arcaricadal property

Arcaricidal properties of decoctions, infusions and macerates of dried flower heads of camomile, *Matricaria chamomilla* L. were tested in vitro against the mite Psoroptes cuniculi Delafond (Parasitiformes: Psoroptidae). 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. [38]

Antihyperglycemic

Matricaria chamomilla L. ethanolic extract treatment protected the majority of the pancreatic islet cells, with respect to the control group. As a result, *Matricaria*

chamomilla L. ethanolic extract exhibited significant antihyperglycemic effect and protected beta-cells in STZ-diabetic rats, in a dose-dependent manner, and diminished the hyperglycemia-related oxidative stress. [39]

Anti-cancer activity

The aqueous and methanolic extracts of chamomile showed differential apoptosis in cancer cells but not in normal cells at similar doses. [40]

Antipruritic effect

The single per oral administration of the ethyl acetate extract or essential oil of German chamomile (Matricaria recutita L.) showed remarkable antipruritic effects in the compound 48/80-induced itch-scratching test in ddY mice. [41]

Wound healing property

The aqueous extract of *M. recutita* (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 *M. chamomilla* 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. [42-45]

Treatment of oral mucositis

Methotrexate-induced oral mucositis in a patient with rheumatoid arthritis was successfully treated with Wild chamomile mouthwashes. [46]

Intracanal irrigant

Chamomile or tea tree oil was effective in removal of the smear layer. [47]

Treatment of infant botulism

Chamomile (principally, unwrapped chamomile) is a potencial vehicle of *C. botulinum* spores, and ingestion of chamomile tea could represent a risk for infant botulism. [48]

Lousicidal, ovicidal and repellent property

Matricaria chamomilla essential oil has lousicidal, ovicidal and repellant efficacy against lice and flies infesting water buffaloes. [49]

Virucidal agent

Camomile 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. [50]

Treatment of gastrointestinal disorders

Methanol extracts of *Matricaria recutita* (flowers) and *Ginkgo biloba* (leaves) had a MIC > 100 microg/mL against the gram-negative bacterium Helicobacter pylori (HP). [51]

Antimicrobial activity

The essential oil from and *M. chamomila* were active against 3 strains of S. aureus and the Candida strains and can be used in the treatment of acute otitis externa. [52]

Antiulcer activity

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, STW 5 (Iberogast). All extracts produced a dose dependent anti-ulcerogenic activity associated with a reduced acid output and an increased mucin secretion, an increase in prostaglandin E2 release and a decrease in leukotrienes. [53]

Treatment of stress and depression

Chamomilla 6cH is related to the recovery of basal behavioral conditions in mice subjected to stressful conditions. [54]

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. [55]

Anti-allergic activity

The inhibitory effects of the dietary intake of the German chamomile extracts on compound 48/80-induced itch-scratch response were comparable to oxatomide (10 mg/kg, p.o.), an anti-allergic agent. [56]

Antisolar agent

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. [57]

Inhibition of poliovirus replication

Hydroalcoholic extract of *Matricaria chamomilla* added during the early stage of Poliovirus development inhibits cellular and viral RNA synthesis. [58]

Anxiolytic agent

A significant reduction in mean total total Hamilton Anxiety Rating (HAM-A) scores was observed during chamomile versus placebo therapy (P = 0.047). [59]

Prevent osteoporosis

The aqueous extracts derived from *Marticaria chamomilla* may form the basis to design "functional foods" for the prevention of osteoporosis. [60]

M. chamomila is a popular medicinal plant useful in various ailments. A number of old ayurvedic texts have mentioned tremendous and a variety of uses of *Matricaria recutita*. Today evidence based studies are needed to establish these facts so that these wonder drugs with multifarious therapeutic activities can be put to human use.

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