Sys Rev Pharm 2023; 14(6): 408-410
A multifaceted review journal in the field of pharmacy
E-ISSN 0976-2779 P-ISSN 0975-8453 / DOI: 10.31858/0975-8453.14.6.408-410

Research Article

Phytochemical Evaluation and Antimicrobial Activity of *Matricaria chamomilla* Leaves

Ruchi Singh*, Bansi Zalavadia, Priyanka Yadav, Suhani A Shah, Vaidehi M Gajjar

Department of Pharmacognosy, Shree Swaminarayan Sanskar Pharmacy College, Gujarat, India

Article History: *Submitted: 29.05.2023* *Accepted: 23.06.2023* *Published: 30.06.2023*

ABSTRACT

The purpose of the study was to evaluate the phytochemical manifestations and antimicrobial efficacy of *Matricaria chamomilla* (L.) belonging to the family-Asteraceae. The first step was aimed at studying the effect of different extraction solvents (water, chloroform and methanol). In the second phase of our study, the antimicrobial activity of the extracts was cut into six microbial subspecies such as *Staphylococcus aureus, Bacillus thuringiensis, Escherichia coli* and *Fusarium* sp. According to disc distribution method, blocking areas from 7 to 15 mm are provided. Therefore, the release had a moderate blocking function and they respond well to at least one microbial species tested other than the fungal flora. However, the methanolic extract of *M. chamomilla* reveals potent activity against *Pseudomonas* sp. with a limited block 22.5 mm.

Keywords: *Matricaria chamomilla*, Antimicrobial activity, Pruritus, Sinusitus

***Correspondence:** Ruchi Singh, Department of Pharmacognosy, Shree Swaminarayan Sanskar Pharmacy College, Gujarat, India, E-mail: pinkruchisingh48@gmail.com

INTRODUCTION

Matricaria chamomilla is widely known as chamomile. It belongs to Asteraceae family. Chamomilla word was derived from the Greek word "Chamaimelon" means "Earth Apple" as these plants have apple-like odour (Falleh H, *et al*., 2008). It is an annual herbal plant widely used for treating irritation and rashes of the skin. The leaves of *Matricaria chamomilla* are bipinnate or tripinnate, long and narrow. *Matricaria chamomilla* consist of powerful constituents effective against inflammation. It is a very popular medicinal plant. It may also referred as the "star species among medicinal plant" (El Rhaffari L and Zaid A, 2002). Recently, it is widely used as traditional plant in domestic as well as international market. It has a high rate of nutritional value, multiple therapeutic effects and it is also used in cosmetics. Various research and scientific use has been proved that mostly this plant is available all over the market in adulterated and substituted form. *Matricaria chamomilla* is a rich source of essential oil and it biosynthesizes various phytoconstituents. Their plant parts have various phytoconstituents and have various effective pharmacological effects (Cavallo JD, *et al*., 2006).

Matricaria chamomilla is indigenous to Europe. Whereas, now it is also cultivated in Asia, Australia, Russia, Hungary and France, etc. At the time of Mughal emperor, it was introduced and grown in India. At present, it is cultivated in Uttar Pradesh, Maharashtra and Punjab, etc. (Escribano-Bailon MT and Santos-Buelga C, 2003).

It is widely used as an antiseptic, anti-inflammatory and antispasmodic. Traditionally, *Matricaria chamomilla* have multi-therapeutic effect as it is widely used in multiple diseases like pruritus (i.e., very effective in treating the irritation of the skin), cold cough, headaches, conjunctivitis, dysmenorrhea, digestive disorders, hypertension, anxiety, hair loss, kidney stones, sinusitis etc. It is also effective in several ailments *viz*., shingles, boils, burns, wounds etc. It is very useful in Gastrointestinal Tract (GIT) disorders (ulcers, inflammation, flatulence, pharyngitis, bloating, spasm etc.).

Matricaria chamomilla may be mostly used in herbal preparations, may be taken as herbal tea, applied topically or inhaled and also taken as oral dosage form (capsules, tablets or drops) (Lemberkovics E, *et al*., 1998).

Traditional knowledge and cultural behavior are important aspects for the use of medicinal plants. Various researchers have proved that medicinal plants have different bioactive chemicals, components and antioxidant property (Ghaedi M, *et al*., 2015).

Treatment of infectious diseases is based primarily on the use of antibiotics. From the discovery of penicillin by Alexander Fleming in 1929 to this day antibiotics are used especially against bacterial infections. As a result of this overuse, antimicrobial resistance has increased against most antibiotics (Jones WP and Kinghorn AD, 2008; Koffi E, *et al*., 2010). For a long time, natural remedies and above all medicinal plants have been a major step in the medicine of past generation. Despite the important advances in the pharmaceutical industry, it has allowed modern medicine to cure lot of common ailments (Nissen HP, *et al*., 1988). About 80%, the world's population benefits from traditional medicine, recognizing false knowledge to our ancestors (Madhavi DL and Salunkhe DK, 1995). In this regard, it is necessary to direct our research into new therapies as well especially towards plants that have always been a source of inspiration for new medicines from products of secondary metabolism (Li BB, *et al*., 2006). It is often used as a medicinal plant due to anti-inflammatory, antimicrobial, anti-allergic, anti-hyperglycemic and antispasmodic effects (Gurib-Fakim A, 2006). It is also used in several food industries, cosmetics and pharmaceuticals. Among the first major properties of plants is their ability to produce a wide variety of ecosystems things. In fact, along with common basic metabolites, carbohydrates, proteins, lipids, too usually accumulates secondary metabolites (Macheix JJ, *et al*., 2005). The latter represents an important source of that molecule can be used by people in various fields such as pharmacology or agri-food (Hakima OM, *et al*., 2016). Phenolic compounds are metabolites of these crops. From a medical point of view, these molecules forms the basis of the practical principles found in medicinal plants (Paris R and Nothis A, 1978). Extraction of active ingredients with a high value added from plant materials, in particular case of phenolic content, which currently attracts many people because of their antimicrobial properties and antioxidant power, a very important step in isolation and phenolic detection combinations. As a result, many authors have investigated the impact of different output conditions in the

extraction products of plant-based phenolic compounds (Ponce AG, *et al*., 2003). The solubility of phenolic compounds depends on their chemical composition of the plant, which varies from one to other simple compounds in highly polymerized. Vegetable substances can contain various amounts of phenolic acids, phenylpropanoids, anthocyanins, and tannins. This structural diversity is responsible for the wide variety of physicochemical structures that influence the release of secondary metabolites. The purpose of this work is to examine microbial agents that deal with specific human and plant diseases to confirm the plant's medicinal properties and phytopharmaceutical preparations and cosmetics.

MATERIALS AND METHODS

Collection of plant material

The leaves of *Matricaria chamomilla* were collected from the campus of Shree Swaminarayan Sanskar Pharmacy College, Zundal, Gujarat, India. The leaves have been dried by air in a well-ventilated area until the humidity decreases to a minimum to be digested.

Extract preparation

100 g of *Matricaria chamomilla* was extracted sequentially with petroleum ether, ethyl acetate and methanol using the Soxhlet extractor apparatus. Then, liquid evaporated under reduced pressure using the evaporator material rotates and is allowed to dry in the middle (Vinha AF, *et al*., 2012). The incubator is completely dried. Then, dried extract are reconstituted by 10% Dimethyl Sulphoxide (DMSO) for final concentration 100 mg/ml from each extract. The 10% of DMSO is antibacterial.

Phytochemical analysis

Appropriate phytochemical testing of other bio-active systems is performed using standard method (Revilla E, *et al*., 2001).

Cultural adaptation of bacteria

1 ml of aliquots for 24 h custom test, broth organic matter is added aseptically to the agar of nutrients slopes and incubated at 37°C for 24 hours. Bacteria tested contained two gram positives (*Staphylococcus aureus* ATCC 25923, *Bacillus subtilis* NCTC 8236) as well two gram negatives (*Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853). Bacterial growth was harvested, washed and removed by adding ordinary sterile salt. By using normal saline, the harvested germs were diluted into a suspension in such a way that approximately 10^8-10^9 units for each colony (CFU/ml) are formed. The suspension was stored in a refrigerator at 4°C until used. Number of active organic compunds per ml of stock suspension was determined by the performance of the area method of calculation (da Silva JA, 2004).

Anti-bacterial activity

The cup-plate agar method was used with minor modifications to check the antibacterial activity of extracts. 1 ml suspension of bacterial stock (10^8-10^9 CFU/ml) was well mixed with 100 ml of sterilized agar agar stored at 45°C. 20 ml aliquots for nutritious agar were distributed to it in sterile Petri-dishes. Agar is left to settle and enter plate were cut into 4 cups (10 mm wide) using sterile cork seed (No. 4), and agar discs removed. Another cup was filled with a sample of 0.1 ml of each extract and allowed disperse at room temperature for two hours. The plates were then incubated for 18 hours at 37°C. After alternating in incubation, the growth block areas were measured and re-measured median values of two duplicates were recorded. Available Ampicillin and Gentamicin (10 µg/disc) discs were used as fine control, while the discs are full by 10% DMSO was used as a negative controller (Trease GE and Evans WC, 1989).

RESULTS AND DISCUSSION

As shown in *Table 1*, phytochemical research reveals many combinations of bio-active structures. *Matricaria chamomilla* has been revealed presence of sterols, triterpens, flavonoids, saponins, tannins and alkaloids. Ethanol, methanol and petroleum ether for *Matricaria chamomilla* had shown different levels of antibacterial activities against bacteria understudy, whereas, ethyl acetate did not show any clear antibacterial functions (Babu PS, *et al*., 2007). This may be due to the nature of phytochemical components of experimental plants, which showed different parts (*Table 2*).

Table 1: Results of phytochemical screening of *Matricaria chamomilla* leaves

Phytochemical Constituents	Existence
Flavonoids	+++
Alkaloids	++
Sterols	++
Triterpenes	+++
Saponins	+
Tannins	++
Note: + Traces, ++ Moderate, +++ High	

Table 2: Antibacterial activity of following extracts of *Matricaria chamomilla* leaves

Test	Concentration	Standard tested organism			
		S. aureus	*E. coli*	*B. subtillis*	*P. aeruginosa*
Methanol extract	100 mg/ml	-	-	-	-
Ethanol extract	100 mg/ml	22 ± 2.5	25 ± 4.0	23 ± 3.5	22 ± 2.5
Chloroform extract	100 mg/ml	22 ± 2.5	25 ± 4.0	23 ± 3.5	22 ± 2.5
Petroleum ether extract	100 mg/ml	23 ± 3.0	25 ± 4.0	25 ± 2.0	23.5 ± 2.0
Ethyl acetate extract	100 mg/ml	22 ± 2.5	25 ± 4.0	23 ± 3.5	22 ± 2.5
Dimethyl Sulfoxide (DMSO)	10%	-	-	-	-
Gentamicin	10 µg/ml	12 ± 1.5	20 ± 3.0	-	13 ± 2.5
Ampicillin	10 µg/ml	20 ± 1.0	30 ± 3.0	18 ± 3.5	21 ± 1.0

A phytochemical value analysis and a split quote for both plants were available, required for antibacterial testing were very efficient. Negative control, DMSO (10%) did not show any antibacterial effect, while good control-ampicillin as well as gentamicin (10 µg/disc) had shown antibacterial properties function. However, gentamicin was very effective. Previously, many studies from different countries reported that these plant extracts has a certain antibacterial activity against different types of germs. According to various reports, water *Matricaria chamomilla* extract showed strength preventive effect against *Staphylococcus aureus, Bacillus cereus, Pseudomonas aeruginosa* and *Escherichia coli* (Tumbas VT, *et al*., 2010).

Performed Phytochemical experiments showed the richness of *Matricaria chamomilla* in total tannins, gallic tannins, reversible tannins, saponosides, alkaloids, flavonoids, mucilages and glucosides, as well as the complete absence of starch and anthocyanins. In terms of dose level, the total phenolic value calculated by the Folin-Ciocalteu method revealed the presence of

moderate phenolic concentrations in the leaves of *Matricaria chamomilla* plant (Wong CC, *et al*., 2006). The extraction of phenolic compounds is an important step in making these active ingredients effective, it depends on the method and the appropriate solvent that keeps their organisms (Kato A, *et al*., 2008; Zhang D and Hamauzu Y, 2003).

CONCLUSION

From this study, it appeared that aqueous decoction and maceration with methanol were the best ways to remove phenolic. A study of the anti-microbial activity of chloroformic extract showed a moderate inhibitory effect against *Bacillus* sp. and *P. aeruginosa*. The failure of methanolic and chloroformic extraction may be due to the extraction method used. The results described in this paper have shown an abundance of phenolic compounds in the leaves of *Matricaria chamomilla* indicating the importance of their use in local medicine as antimicrobial agents. Future research should focus on the effect of other bioactive molecules associated with this plant such as alkaloids and tests for antimicrobial activity in a variety of bacteria. *Matricaria chamomilla* are good sources of antibacterial agents and current research provides a scientific evidence of the use of these plants in Traditional medicine worldwide.

REFERENCES

1. Falleh H, Ksouri R, Chaieb K, Karray-Bouraoui N, Trabelsi N, Boulaaba M, *et al*. Phenolic composition of *Cynara cardunculus* L. organs, and their biological activities. C R Biol. 2008; 331(5): 372-379.
2. El Rhaffari L, Zaid A. Phytotherapy practice in south-eastern Morocco (Tafilalet): Empirical knowledge for a renovated pharmacopoeia. From Knowledge Sources to Future Medicines. 2002: 293-318.
3. Cavallo JD, Chardon H, Chidias C, Choutel P, Courvalin P. Communique of the French committee of antibiogram. French Society of Microbiology. 2006: 65-145.
4. Escribano-Bailon MT, Santos-Buelga C. Polyphenols extraction from foods. Methods in Polyphenol Analysis. 2003; 5: 1-16.
5. Lemberkovics E, Kéry A, Marczal G, Simándi B, Szöke E. Phytochemical evaluation of essential oils, medicinal plants and their preparations. Acta Pharm Hung. 1998; 68(3): 141-149.
6. Ghaedi M, Naghiha R, Jannesar R, Mirtamizdoust B. Antibacterial and antifungal activity of flower extracts of *Urtica dioica, Chamaemelum nobile* and *Salvia officinalis*: Effects of Zn $[OH]_2$ nanoparticles and Hp-2-minh on their property. J Ind Eng Chem. 2015; 32: 353-359.
7. Jones WP, Kinghorn AD. Extraction of plant secondary metabolites. Methods Mol Biol. 2005; 20(2): 323-351.
8. Koffi E, Sea T, Dodehe Y, Soro S. Effect of solvent type on extraction of polyphenols from twenty three Ivorian plants. J Anim Plant Sci. 2010; 5(3): 550-558.
9. Nissen HP, Biltz H, Kreysel HW. Profilometry, a method for the assessment of the therapeutic effectiveness of Kamillosan ointment. Z Hautkr. 1988; 63(3): 184-190.
10. Madhavi DL, Salunkhe DK. Toxicological aspects of food antioxidants. Food Antioxidants. 1995: 267-360.
11. Li BB, Smith B, Hossain MM. Extraction of phenolics from citrus peels: I. Solvent extraction method. Sep Purif Technol. 2006; 48(2): 182-188.
12. Gurib-Fakim A. Medicinal plants: Traditions of yesterday and drugs of tomorrow. Mol Aspects Med. 2006; 27(1): 1-93.
13. Macheix JJ, Fleuriet A, Jay-Allemand C. Phenolic compounds in plants: An example of economically important secondary metabolites. Polytechnic presses and universities. 2005: 4-5.
14. Hakima OM, Sabrina AK, Nassima BB. Phytochemical study and evaluation of antimicrobial, antioxidant and insecticidal activity of essential oils and polyphenols of bitter orange (*Citrus aurantium* L.). Int J Adv Chem Eng Biol Sci. 2016; 3(1): 163-167.
15. Paris R, Nothis A. Medicinal plant. Phytotérapie. 1978: 102-107.
16. Ponce AG, Fritz R, del Valle C, Roura SI. Antimicrobial activity of essential oils on the native microflora of organic Swiss chard. LWT-Food Sci Technol. 2003; 36(7): 679-684.
17. Vinha AF, Soares MO, Castro A, Santos A, Oliveira MB, Machado M. Phytochemical characterization and radical scavenging activity of aqueous extracts of medicinal plants from Portugal. Eur J Med Plants. 2012; 2(4): 335-347.
18. Revilla E, García-Beneytez E, Cabello F, Martín-Ortega G, Ryan JM. Value of high-performance liquid chromatographic analysis of anthocyanins in the differentiation of red grape cultivars and red wines made from them. J Chromatogr A. 2001; 915(1-2): 53-60.
19. da Silva JA. Mining the essential oils of the Anthemideae. Afr J Biotechnol. 2004; 3(12): 706-720.
20. Trease GE, Evans WC. Pharmacognsy. Brailliar Tiridel Can. 1989.
21. Babu PS, Prabuseenivasan S, Ignacimuthu S. Cinnamaldehyde-a potential antidiabetic agent. Phytomedicine. 2007; 14(1): 15-22.
22. Tumbas VT, Ćetković GS, Đilas SM, Čanadanović-Brunet JM, Vulić JJ, Knez Ž, *et al*. Antioxidant activity of mandarin (*Citrus reticulata*) peel. Acta Period Technol. 2010; 41: 195-203.
23. Wong CC, Li HB, Cheng KW, Chen F. A systematic survey of antioxidant activity of 30 Chinese medicinal plants using the ferric reducing antioxidant power assay. Food Chem. 2006; 97(4): 705-711.
24. Kato A, Minoshima Y, Yamamoto J, Adachi I, Watson AA, Nash RJ. Protective effects of dietary chamomile tea on diabetic complications. J Agric Food Chem. 2008; 56(17): 8206-8211.
25. Zhang D, Hamauzu Y. Phenolic compounds, ascorbic acid, carotenoids and antioxidant properties of green, red and yellow bell peppers. J Food Agric Environ. 2003; 1(2): 22-27.