A Novel Approaches to Feverfew (Tanacetum Prthenium): A Review

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ABSTRACT

Tanacetum Prthenium is a herbal medicinal plant which is known as feverfew. Asterace is the family of feverfew. It is traditionally applicable in the treatment of stomachaches, fever, arthritis, infertility, migraine, insect bites, menstruation problems, and labour pain during childbirth. This plant is also known as "featherfew" due to its feathery leaves. The leaves have been used in medicinal preparation in the past two decades for treatment of arthritis and migraine by both the British and Canadian government. The herbal plant of feverfew cultivated in large area of world that show medicinal importance. Plant grow substantially and show important strongly report in support of therapeutic uses. This aromatic plant look like yellow green leave and give bitter odour and give therapeutic active chemical constituents include pinenes flavonoid and glycoside. It shows various pharmacological properties, like antispasmodic, cardiotoxic, anti-inflammatory, anti-cancer, and as an enema for worms. The colour of feverfew plant is yellow and bloom in October to July, which is also used in asthma, dizziness, nausea and vomiting. Parthenolide may experience an acid-induced cyclisation in the presence of excessive moisture, resulting in a sesquiterpene lactone of the guaianolide class, which is frequently present in feverfew. If the composition satisfies pharmacopoeial microbiological quality standards, microbial degradations are unlikely to have a significant impact.

Keywords: Arthritis, Tanacetum Prthenium, Feverfew Extract, Pinenes, Flavonoid, Glycoside, Microbial Degradation.

INTRODUCTION

Herbal medicine was very important in the healthcare profession in ancient times. Herbal medicine is also known as phytomedicine. They are widely used in developed countries, with retail sales totaling billions of dollars. Tanacetum Prthenium is a plant and Asteraceae is the family of feverfew. In ancient times, feverfew was used in the treatment of various disease because it showed analgesic, antipyretic and anti-inflammatory property. At present, it is used in the treatment of arthritis and migraines.11 This plant is commonly planted in gardens and along roadsides. The plant feverfew gets its name from the Latin word fabritugia, which means "fever reducer." The stem of the plant is used in the treatment of fever. Discorides was the Early-century physician doctor who suggested feverfew for the treatment of hot inflammation. This plant is also identify as "featherfew" due to feathery leaves.2–4

This plant grows to a height of 0.3-1 m and has leaves that are typically 7-8 cm long. The leaves of the plant are yellow-green, hairless, and bipinate. Feverfew flowers are 2 cm in diameter and yellow, and they bloom from July to October.5-7 The plant has a pungent odour and a bitter taste. The leaves alternately grow on both sides and turn down with short hair. The feverfew plant flowers are densely arranged in flat-topped clusters.6

Some feverfew extract products are still offered for sale as hard gelatin capsule that contain the plant's ground aerial parts, which significantly adds to the challenges of standardization, quality control, and...
determining the therapeutic efficacy of this herbal remedy despite its prominence in the herbal medicine market.\[7\] The industrial production of phytomedicines has significantly increased over the past several years. The European Union, European Scientific Co-operative on Phytotherapy and World Health Organization (WHO) have all demanded regulatory criteria and definitive investigations on the pharmacological, chemical and physical qualities of premedication in order for them to be approved.\[8-9\]

**Fig. 1: Feverfew flower and leaves**

Furthermore, consumer demand for dependable goods produced using standards-compliant processes drives the market for plant medicines. One of the most popular methods for extract stabilization and standardization is the use of technology carriers for spray drying extracts.\[10\] The medicinal efficacy and commercial value of dry extracts are increased over traditional fluid forms thanks to their higher levels of active chemicals, improved stability, ease of standardization, and easier quality control.\[11\] The poor tableting qualities of plant extracts make it difficult to design and formulate herbal medicine tablets.\[12\]

**COMMON NAME**

Chrysanthemum *parthenium*, featherfoil, button of bachelor, Santa Maria, midsummer daisy, nosebleed, chamomile grande, wild quinine, chamomile, feverfew, featherfew, altamisa, grande chamomile febrifuge plant, featherfew, Africia Chrysanthemum, Federfoy, Flirtwort Matricariaeximiahort, Matricariacapensis, and Leucanthemum *parthenium* flirt root, Mother herb, Matricariparthenium, featherfully, feddygenfeny, L., European feverfew mutterkraut, and vetter-vo are some of the *parthenium* species.\[2-6\]

**HABITATE**

United States was first country they introduced feverfew in treatment of arthritis, migraine. Feverfew plant grow on waste road side area, field and border area of Canada. It also found in Balkan, china, Australia, Europe, Japan and north Africa.\[13\]

**HISTORY**

*parthenium* was the old Greek name of the feverfew plant because it was used in the treatment of fever medicinally and to save the lives of construction workers who fell victim to phenon during construction time. In the first century, Discoride was the first physician to use feverfew as an antipyretic& analgesic to treat fever and arthritis. In the 18th century, the feverfew plant was also known as aspirin or mediaeval aspirin.\[6-9\] The plant has been used to cure a variety of illnesses, including worms, psoriasis, dermatitis, earaches, fevers, headaches, inflammatory problems, insect bites, labour, menstrual irregularities, and possible miscarriages. Feverfew is also used to treat colds and coughs, as an insecticide, and as an abortifacient. Traditionally, plant herbs are used as antipyretics.\[14-15\]

The plant has been employed as a treatment for a number of ailments throughout Central and South America. The Andean Kallaway Indians prize its application in the treatment of colic, kidney pain, morning sickness, and stomach aches. The herb is used as a decoction in Costa Rica as an emmenagogue, a cardiotonic, and an enema for worms. It is used as a tonic to control menstruation
and as an antispasmodic in Mexico. It is employed to cure earaches in Venezuela.[16]

Two or three leaves are typically taken daily, either fresh or dried. Before consumption, the bitterness is frequently sweetened. Because of its potent, lingering scent, feverfew has traditionally been planted around dwellings to purify the air. A tincture made from its petals is also used as an insect repellent and a salve for stings. It has been employed as an opium overdose antidote. The most active ingredients of feverfew are sesquiterpene, lactone, lactone and parthenol. which is found in the plant's leaf. The plant's stems have very little sesquiterpene content.[17]

Agriculture

This plant can reproduce sexually and asexually through indirection or direction. In the indirection method, seeds are sown at the proper time in an outdoor bed. The process of germination requires light. At the appropriate time, seedlings should be moved to the main land after frequent irrigation and weeding in the outside bed. Fall is the ideal season for vegetative proliferation. Plants are reproduced asexually by crown division.[18] Since T. parthenium is a long-day plant, flower buds will grow when there is 12 or more hours of light per day.

To increase the accumulation of important chemicals, environmental factors could be changed during cultivation. Changes in the concentration of secondary metabolites are caused by the regulation of stress in plants. Stress can cause development to slow down, which makes more carbon accessible for secondary metabolism and the creation of certain phytochemicals.[18] Environmental stress is known to cause an increase in phenolic compound accumulation in a variety of plants.[19] High visible light exposure may boost xanthophyll cycle activity and consequently the generation of several secondary metabolites.[20] ABA levels rise in low light conditions, which controls various secondary metabolic processes.[21]

Watering is necessary and crucial for T. parthenium during cultivation, especially in the beginning. Another element that has the ability to change the concentration of important chemicals in medicinal plants is water stress. ABA often accumulates more in plants under water stress[22-23] which causes other secondary metabolites such as phenolic, tannins, proline, polyamines, and terpenoid chemicals to vary in concentration.

Aphids, miners, caterpillars, and mildew can all harm T. parthenium. Weeds are mechanically weeded twice or three times in the first season because controlling weeds during the vegetative period is vital for enhancing production.[24-26]

This plant has not yet been affected by any pests or diseases. Increased yield and improved qualitative and quantitative properties of the extract are both benefits of fertilisation. Sesquiterpene lactone production is significantly influenced by nitrogen. The yield and parthenolide content rise with the addition of 100 kg of nitrogen per acre. The qualitative and quantitative features of the extract were likewise impacted by the use of parthenolide. Thus it is important to first research the nutritional requirements under the cultivation conditions.[27]

Postharvest and harvest

The time and technique of harvesting are crucial for boosting the quality and amount of extract because summer harvesting has a higher parthenolide concentration than fall harvesting. Harvesting is possible as soon as two-thirds of the buds are open. Harvesting plants at various times of the day allowed researchers to assess how light affected the plants. Plants picked at night had the lowest levels of parthenolide, whereas those harvested in the late afternoon had the highest levels.[28] Water deficiency had the effect of increasing the synthesis of jasmonic acid and ABA, which closed the stomata and accumulated tannins and sesquiterpene.[29-30] Plants that experienced water stress had higher parthenolide levels than those that received daily water. The yield is at its peak during the blossoming period. The amount of parthenolide reduced when harvest time was postponed (up until fruit set).

Parthenolide is found in far higher concentrations in leaf tissue than in stem tissue. More parthenolide is present in succulent stems than in older, tougher stems.[31-32] Parthenolide levels in stems and leaves both drop as drying temperatures
rise. Rushing demonstrated that parthenolide was reduced when feverfew plants were dried at temperatures greater than 60°C. Moreover, parthenolide levels fell by 30% during an 11-month storage period.

**THE INFLUENCE OF FEVERFEW STORAGE ON PARTHENOLIDE CONTENT**

There hasn't been a technological breakthrough to address the well-known process of parthenolide decline in commercial preparations. It does not appear that the loss of parthenolide. There isn't much that can be done to modify storage conditions that are severely impacted by light exposure or temperature. There is minimal data about sesquiterpenelactones stability during storage.[33-37]

The only two or Three references they are cited in their paper were the observation that costunolidediepoxide was likely produced by aerial oxidation when a chloroform and parthenolidesolution was stored at optimum temperature after a few days, and the hypothesis that parthenolide can easily polymerize due to prolonged storage condition. Since then, not much has been written, and only alternate information is still available. However, it is generally identify that dried leaf's parthenolide content diminishes with storage. Similar issues arise with other Phytopreparations carrying sesquiterpene lactones; the most notable example is with preparations containing arnica. herbal medicines like Arnica that contain lactone preparations of spp. are often employed in herbal therapy, and sesquiterpene lactones are the major potent ingredients. A decrease in the concentration of 11, 13, and 14-dihydrohelenalin esters was seen when Arnica spp. tinctures were held at 4°C, 25°C, and 30°C. It was brought on by adding ethanol to these compounds' cyclopentenone moiety.[38-40]

In their study of the lactones stability in several semisolid or solid formulations under various storage circumstances, discovered significant variations depending on the excipients used. Consequently, the formulations based on polysorbate 60, natrosol, and cetomacrogol were the least stable. Numerous investigations have been conducted to ascertain the impact of storage and drying temperatures on the concentration of active parthenolide, the marker chemical of feverfew. Following extraction from the dried, minced, and extracted feverfew leaves, studies have looked at the investigation of parthenolide content using HPLC-UV. The amount of parthenolide did not change appreciably when the leaves were dried at temperatures between 30 and 60°C. Furthermore, these researchers discovered that parthenolide concentration was not greatly affected by storage temperatures between -15 and 24°C. But after 120 days of storage, parthenolide concentration fell as a function of time.[41-44]

In a different investigation, found that exposure to light throughout the drying process—be it sunlight or fluorescent light—actually enhances the parthenolide content. Additionally, during storage, neither pure parthenolide nor dry feverfew powder were impacted by light. Unexpectedly, increasing the extraction yield of parthenolide requires exposing the reserved material to heat (50–130°C) for only five minutes. However, these researchers saw a significant degradation of parthenolide when the fine powder was soluble in the solution of citrate buffers at different pH levels (2.5 to 7.2).[45]

To investigate the parthenolidesolution stability, feverfew extractcontent was dissolved in various pH buffers. Parthenolide degrades according to a first-order reaction model and is stable between 5 and 7. Become unsteady at pH levels of less than 3 or greater than 7. The two most significant factors affecting the rate of parthenolide breakdown in solid feverfew extracts are temperature and moisture content which do not fit any straightforward reaction model. Parthenolide losses of up to 40% have been recorded when feverfew extracts are held at 50 °C and 31% RH; however, these losses drop to 17% to 32% after six months of storage at 40 °C and 0% to 75% RH.[46]

Feverfew displays strong compatibility with similar additives under stressful conditions for up to three weeks when combined with additives, while parthenolide content-persist steady at 5 °C and 31% RH for up to six months. In a study conducted in 2007 by Fonseca and colleagues, the
effect of light, pH, and temperature on the parthenolide content of fine feverfew extract and the parthenolide standard in the solution of citrate buffers at a chosen pH (2.5–7.2) were evaluated for a period of four months. pH values of 5 and 7.2 result in decreased parthenolide losses in solutions, respectively. After 320 days of storage, parthenolide deprivate in dry samples were 30%. Hour-long investigations, however, demonstrate the compound's durability even at high temperatures reported similar findings in beverages using the feverfew model. With increasing acidity, parthenolide hydrolysis occurs, and moderate augmentations (pH 6.0) encourage its firmness but encourage the phenolic compounds oxidation. The ideal circumstances are storage in the freezer with gently acid solution (pH 4.6) for both parthenolide content and colour retention. This is due to the pseudo-first-order kinetics that parthenolide degradation with heat processing follows and the product's 4-month shelf life.  

Last but not least, research using "degraded" feverfew plant extracts discovered that they were pharmacologically more effective in an in vivo murine model of anti-serotonergic action up to a 10% loss of parthenolide content. The same authors state that rats treated with feverfew extracts that had up to a 33% reduction of parthenolide did not experience any harmful effects.  

Chemical constituents of feverfew

Feverfew has a well-established chemical composition currently. Sesquiterpene lactones, of which parthenolide is the chief example, are the biologically significant components. Parthenolide, which is only present in the surface leaf pores (0.2%-0.5%) and not the branches, accounts for up to 85% of the total sesquiterpene content.

a) monoterpenes and Sesquiterpenes: borneol, camphor germacrene and pinenes  
b) Sesquiterpen lactones: canin, parthenolides, santamarinartecanin,  
c) Flavonoid glycosides: tanetin, luteolin, 6-hydroxy-flavanols; apigenin.  
d) Other ingredients including tannins, melatonin, polyacetylenes, and pyrethrin.

Sesquiterpene lactones

Lactones made of sequiterpenes. There have been detected more than thirtysesquiterpene lactones in plant of feverfew. Sesquiterpenes come in five major general categories. Chemical ring structures can be used to categorise lactones. Eudesmanolides, germacranolides, and other compounds are found in feverfew. guaianolides. The germacranolide parthenolide.  

The following sesquiterpene was also discovered by researchers: artemorin, artecanin, canin, costunolide and balchaninare lactones. 1-beta-hydroxyarbusculin Epoxytanaparthin-alpha-peroxide and B, secotanaparthenolide. Being kept apart and exhibit spasmylytic action, possibly through a reduction in the amount of extracellular calcium that enters vascular tissue fluid-moving muscle cells.  

![Fig. 3: Structure of Sesquiterpene lactones](image-url)
**Flavonoids glycoside**

These flavonoids have been identified: apigenin, quercetin, luteolin, santin, chrysoeriol, centaureidin and jaceidin, are among the compounds that make up 6-hydroxykaempferol 3,6,4′-trimethyl ether, 6-hydroxykaempferol 3,6-dimethyl ether, also known as tanetin.\[^{56-57}\]

![Flavonoids of Tanacetum parthenium](image)

**Fig. 4: Flavonoid of Tanacetum parthenium**

**PARTHENOLIDE, GERMACRANOLIDES, AND RELATED SESQUITERPENE LACTONE REACTIVITY**

Sesquiterpenes are known to undergo acid-catalyzed cyclizations in vitro. Cyclizations are essential for the enzymatically controlled production of eudesmanolides and guaianolides in the typical digestion of plant cells, germacranolides,\(^3^4\) but they can also be replicated in vitro. Additionally, sesquiterpene lactones and related germacranolides commonly contain, unsaturated carbonyl groups, making these compounds particularly susceptible to nucleophile reactions after a Michael-type addition. Cyclopentenones and methylene-lactone groups, commonly known as methylenebutyrolactones, are the most common forms of the, unsaturated carbonyl groups,\(^{58-60}\)

Sesquiterpene lactones also typically contain epoxides and endocyclic double both of which have the ability to interact with electrophiles and/or cause reconfigurations in the influence of UV light. And lastly, Cope rearrangements could be brought on by high temperatures and intense radiation.\(^{61}\)

Reactivity does not always imply chemical instability, it is important to note. The methylenebutyrolactone group is frequently mistakenly thought of as an unstable chemical component, while being in charge of many of STLs' cellular mechanisms and maybe their progressive decomposition of plant residues. However, it is hypothesised that the exo double bond stabilises the sesquiterpenes' five-membered ring. In fact, it seems that the biosynthesis of these compounds favours the establishment or maintenance of an exo double bond in a 5-membered ring while discouraging the formation or maintenance of an exo double bond in a six-membered ring.\(^{62}\)

This generality is corroborated, with a few exceptions, by the facts that are now available about the persistence of lactones, cyclic esters, furanose, hemiacetals, even imides, sugar acids and pyranose structures in sugars. This generalisation is in line with known thermochemical evidence showing that a CH\(_2\) group and an oxygen atom in a ring system might have similar conformational consequences. The heat stability of germacrenes is also significantly influenced by the lactone ring.\(^{63}\)

**SESQUITERPENE LACTONE DEGRADATION BY MICROBIAL ACTION.**

Microorganisms have the ability to breakdown or convert sesquiterpene lactones. Galal and colleagues have investigated how parthenolide is transformed by microbes. Parthenolide can be transformed into 11H-dihydroparthenolide by...
species of Aspergillus, Candida, Gymnascella, Penicillium, Lindera, Saccharomyces, Rhizopusand Rhodotorula. The C11-C13 exocyclic double bond reduction is akin to the kinds of reactions that enoate reductases catalyse. Several microorganisms have this family of iron-sulfur flavoproteins, which are essential for the production of fatty acids.\[65\]

![Fig. 5: Chief metabolite microbial decomposition of parthenolide.](image)

Additional minor metabolites that were discovered included 14-hydroxy-11-H-dihydro parthenolide and 9-hydroxy-11-H-dihydro parthenolide. These compounds are the by products of oxidising allyls processes, which are frequent bacterial biotransformation of many conjugated steroids and terpenoid compounds. It was observed that the double bond's trans conformation is maintained throughout the microbial process.\[65\]

Sesquiterpene lactones' cellular activity should be reduced or eliminated as a consequence of the microorganism breakdown of the -methylene group. The increased charge of the hydroxy compounds might also make it easier for whole creatures to remove these chemicals from their systems. The detection of these metabolites by RP-HPLC-UV studies of plant parts may be difficult because parthenolide and other -methylene butyrolactones have a predictable decrease in their extraction period and unique UV spectrum features.\[66-67\]

**USE OF FEVERFEW EXTRACT**

**Anti-inflammatory activity**

Parthenolide's specific binding to and inhibition of the IB kinase complex (IKK) is suggested as the drug's proposed mode of action. The pro-inflammatory cytokine-mediated signalling is significantly influenced by IKK.\[68\]

The synthesis of prostaglandins appears to be inhibited by feverfew. Leaf extracts have a milder inhibitory effect on prostaglandin synthesis than extracts from the plant's above-ground parts.\[69\]

Arachidonic acid's cyclooxygenation, the initial step in the production of prostaglandins, is not inhibited by either the entire plant or leaf extracts. Sesquiterpene lactone-rich chloroform leaf extracts prevent rat and human leukocytes from producing inflammatory prostaglandins. The result was not cytotoxic; rather, the inhibition was permanent. Researches have indicated that lipophilic substances other than parthenolide may have anti-inflammatory effects, specifically by lowering the activity of human neutrophils' oxidative bursts.\[71-72\]

The lipophilic flavonoid tanetin, which is present in feverfew's leaf, flower, and seed, prevents the production of prostaglandins. Extracts in water impede the in vitro accumulation of platelets triggered by thrombin adenosine or adenosine 5'-diphosphate, but do not contribute to the anti-inflammatory effect of feverfew.\[74\]

Disagreement exists over the question of whether or not these feverfew extracts prevent the manufacture of thromboxane, platelets are aggregated due to prostaglandin.\[73-74\]

The cytotoxic actions of feverfew may be the reason for its anti-inflammatory properties.\[75\] The uptake of tritiated thymidine by human peripheral blood mononuclear cells in response to mitogens, the uptake of tritiated thymidine by lymphoblasts in response to interleukin-2, and the release of prostaglandin by interleukin-1-stimulated synovial cells were all found to be inhibited by feverfew extracts. Additionally, parthenolide prevented human peripheral blood mononuclear cells stimulated by mitogens from absorbing tritiated thymidine.\[76-77\]
Effects on vascular smooth muscle

The relaxation and contraction of the rabbit aorta were prevented by feverfew leaf extracts in chloroform. The inhibition happened whether or not endothelium was present, and it was time-dependent and concentration, irreversible and noncompetitive. Much less contractions caused by potassium depolarization were suppressed by the leaf extracts.[78-80]

The effects on smooth muscle were only decreased by fresh leaf extracts as opposed to dried powdered leaves (which are sold commercially), which was probably due to a higher parthenolide content.[81-84]

Feverfew plant may prevent spasm of smooth muscle by inhibiting open potassium channels, rabbit and rat muscle are used in scientific study chloroform extract which is obtain from fresh leaves they apply and find out the result.[85-88]

Researchers found that parthenolide non competitively suppressed the stuttering action of indirect 5-HT agonists mediated by serotonin (5-HT) in an isolated rat stomach fundus preparation. The serotonergic medications dextroamphetamine and fenfluramine-induced contractions on the fundal tissue were noncompetitively inhibited by parthenolide. Parthenolide's mode of action works at the level of 5-HT stored in vesicles of the intramural neurons of fundal tissue rather than directly inhibiting 5-HT2 receptors.[89-92]

Chemotherapeutic activity

Filamentous fungi, yeast, and Gram-positive bacteria couldn't grow because of parthenolide. Leishmania amazonesis growth was inhibited by a hydroalcoholic extract of feverfew with an IC50 of 29 g/mL, compared to 3.6 g/mL with a dichloromethane fraction. Additionally, parthenolide inhibited Mycobacterium avium and Mycobacterium tuberculosis at minimal inhibitory concentrations of 16 and 64 g/mL, respectively.[93-96]

Anticancer activity

Parthenolide's highly reactive lactone ring, methylene groups and epoxide, and may prevent thymidine from being incorporated into DNA, causing cytotoxicity; other potential mechanisms of action include mitochondrial dysfunction, endoplasmic reticulum stress, intracellular thiol depletion, oxidative stress, and stress.[97-101]

The anticancer activities of parthenolide and similar lactones were ineffective against a number of human cancer cell lines, including human laryngeal carcinoma, human fibroblasts, simian virus with human cells converted, human epidermoid cancer of the nasopharynx, and anti-Epstein-Barr early antigen activity. One study suggests that parthenolide may influence and enhance the efficacy of paclitaxel.[102-104]

Prophylactic, Migraine, headache and arthritis treatment

It doesn't seem like there is just one system that feverfew works through. Numerous physiologic processes are impacted by plant extracts. Some of these mechanisms, such as the reduction of smooth muscle spasm, the suppression of prostaglandin synthesis, and the obstruction of platelet granule secretion, have been covered previously. Feverfew was traditionally utilized as a herbal medicine to treat digestive issues, headaches, and arthritis.

AVAILABLE FORMS

You can get supplements containing feverfew in liquid extract form, tablet, or capsule, and they are also available fresh, dried or freeze-dried. A consistent dose of parthenolide is present in supplements for feverfew supported by clinical research. Supplements for feverfew should be regulated to have at least 0.2% parthenolide in them.[105-106]

DOSES

Children under the age of two should not be given feverfew. Adjust the suggested adult doses for
older children's weight when administering medication. The majority of adult herbal dosages are determined using an average adult weight of 150 lb (70 kg). As a result, if the youngster weighed (20–25 kg) 50 lb, the recommended amount of feverfew would be 1/3 as comparative to adult dosage.\textsuperscript{[107-108]}

**Adult**

Take standardised medications containing 0.2-0.4% parthenolides, 4 times daily, 100–300 mg, to treat migraine headaches. To stop or prevent headache, migraine feverfew may be administered. You could also CO2 extract supplements made from feverfew. Take 6.20 mg three times every day for up to 3 months with these.\textsuperscript{[109-110]}

60-120 drops of a 1:1 w/v fluid extract taken two times in a day for inflammatory diseases (like arthritis) or 60-120 drops of a 1:5 w/v tincture taken two times in a day.\textsuperscript{[111-112]}

**CONCLUSION**

There are several sesquiterpene lactones in *T. parthenium* (L.), with a larger concentration of parthenolide polar and lipophilic. In the flower heads and leaves are flavonoids. In addition, the roots of the plant have high concentrations of triterpenes and sterols. The folk use of feverfew herb for treating the common cold, migraine, fever, headache, and arthritis was confirmed by the significant anti-inflammatory, antipyretic, and analgesic, antipyretic activities shown by the flowers, leaves, and parthenolide. These effects are primarily attributed to the presence of flavonoids and sesquiterpene lactones in the leaves and/or flowers. Feverfew is also used as a vermifuge and laxative, as well as a spasmyloytic for colic, colitis, and griping. The plant's uterine stimulant effect was consistent with its traditional uses as an emmenagogue, an abortifacient, and a treatment for some labour problems. It was also consistent with the manufacturer's warning that pregnant women should avoid using feverfew, which did not agree with the drug's traditional use for threatened miscarriage. With due consideration for the plant's beneficial properties, it can be recommended as a secure, crucial medicinal herb for all of humanity.

**Conflicts of Interest:** The authors declare no conflict of interest.

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**REFERENCES**


26. Groenewegen WA, Knight DW, Heptinstall S. Compounds extracted from feverfew that have anti-secretory activity contain an α-methylene butyrolactone unit. Journal of pharmacy and pharmacology. 1986 Sep;38(9):709-12.


74. Perjéssy-Végh KE. Application Of Supercritical Fluids In The Study Of Tanacetum Parthenium L.: From Extraction To Analysis (Doctoral dissertation).


87. Ansari M, Rafiee KH, Yasa N, Vardasbi S, Naimi SM, Nowrouzi A. Measurement of


93. Fonken GS, Johnson RA. Chemical oxidations with microorganisms.


108. Fonseca JM, Rushing JW, Rajapakse NC, Thomas RL, Riley MB. Parthenolide and abscisic acid synthesis in feverfew are associated but


