

Systemic Review on Parthenium Hysterophorus

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ABSTRACT: Feverfew (*Parthenium Hysterophorus* L.) (Asteraceae) is a medicinal plant traditionally used for the treatment of fevers, migraine headaches, rheumatoid arthritis, stomach aches, toothaches, insect bites, infertility, and problems with menstruation and labor during childbirth. Greek and early European herbalists in particular have long used feverfew in traditional and folk medicine. Psoriasis, allergies, asthma, tinnitus, dizziness, nausea, and vomiting have all been treated with feverfew. Although the plant has several natural compounds, the active principles most likely comprise one or more of the recognised sesquiterpene lactones, such as parthenolide. Flavonoid glycosides and pinenes are other possibly active ingredients. It has several pharmacologic qualities, including antispasmodic, cardiotonic, anticancer, anti-inflammatory, emmenagogue, and worm enema. In order to understand and synthesise the topic of feverfew's potential image as a multifunctional medicinal agent, we have examined the plant's many facets and collated its extensive pharmacologic applications in this review. The plant is widely grown to enormous

Keywords: *Argyrochaeta bipinnatifida* Cav., *Argyrochaeta parviflora* Cav., *Parthenium glomeratum* Rollins, *Parthenium lobatum* Buckl.

INTRODUCTION

Parthenium hysterophorus is known to decrease crop yields and compete with pasture species worldwide, but the extent of yield loss and specific impacts on crops remain largely unquantified in many countries. In India, crop yields have been reported to decline by up to 40%, with forage production experiencing losses of as much as 90%

In India, *Parthenium hysterophorus* has emerged as a major issue, impacting various crops including cotton, groundnuts, potatoes, sorghum, okra, brinjal, chickpea, and sesame. It is also causing problems in various orchard crops, including vineyards, olives, cashews, coconuts, guavas, mangoes and papayas. Similar infestations have also been reported in Australian sugarcane and sunflower plantations in recent times.

In Brazil and Kenya, coffee is the primary crop affected.

In Ethiopia, *P. hysterophorus* has been observed growing in various crops, including maize, sorghum, cotton, finger millet, haricot bean, tef, vegetables, and fruit orchards, while in Pakistan, it has been reported in wheat, rice, sugarcane, sorghum, maize, squash, gourd, and watermelon. [Figure 1].



Figure: 1

PLANT PROFILE

Botanical classification

Kingdom: Plantae (Plants)

Subkingdom: Trachiobionta (Vascular plants)

Super division: Spermatophyta (Seed plants)

Division: Magnoliophyta (Flowering plants)

Class: Magnoliopsida (Dicotyledons)

Subclass: Asteridae

Order: Asterales

Family: Asteraceae (Aster family)

Genus: *Parthenium* (tansy)

Species: *Parthenium Hysterophorus* (feverfew)

International Common Names

English: barley flower; bastard feverfew; bitterweed; broomweed; carrot grass; congress grass; congress weed;

dog flea weed; false ragweed; featherfew; feverfew; mugwort; ragweed parthenium; Santa Maria feverfew; star weed; white top; white top weed; whiteheads; wild wormwood; wormwood

Spanish: ajenjo cimarron; amargosa; camalote; escobaamarga; hierbaamargosa; istafiate; requeson

French: faussecamomille; matricaire; parthenium matricaire

Portuguese: mentruz

Local Common Names

Belize: coriente; siiu; silantro

Brazil: coentro-do-mato; fazendeiro; losna-branca

Caribbean: feverfew

China: yin jiao ju

India: bhoothkeda; carrot weed; chatakchandani; Coimbatore chedi; congree grass; congress pacha; gajarghas; gazar ghas; keepageda; osadi

Jamaica: dog-flea weed; whitetop

Mexico: altamisa; altamisacimarrona; altamisa del campo; altamisilla; arrocillo; artaniza; chaile; cicutilla; cola de ardilla; confitillo; falsa altamisa; hauay; hierbaamargosa; hierba del burro; hierba del gusano; huachichole; jihuitemargo; manzanilla del campo; romerillo; tzail-cuet; tzaile; yerba de la oveja; zacate amargo

New Caledonia: faussecamomille

Nicaragua: manzanilla monterá

Pakistan: babyflower; gandhibooti; lewanai bhang

Puerto Rico: ajenjocimarrón; artemisacimarrona; yerba amarga

Saint Lucia: matnitjen; whitehead

South Africa: famine weed

Sweden: Flikparthenium

USA: false ragweed; quinine-weed; ragweed parthenium .

Hosts/Species Affected

Parthenium hysterophorus is known to reduce the yield of various crops and to compete with pasture species in various countries. However, the yield loss and specific effects on the crops have not been quantified in all countries.

In India, the yield losses are reported as up to 40% in several crops and a 90% reduction of forage production. *Parthenium hysterophorus* is now being reported from India as a serious problem in cotton, groundnuts, potatoes and sorghum, as well as in more

traditional crops such as okra (*Abelmoschus esculentus*), brinjal (*Solanum melongena*), chickpea and sesame, and is also proving to be problematic in a range of orchard crops, including vineyards, olives, cashew, coconut, guava, mango and papaya). Similar infestations of sugarcane and sunflower plantations have recently been noted in Australia. whilst in Brazil and Kenya, the principal crop affected is coffee.

In Ethiopia, *P. hysterophorus* was observed to grow in maize, sorghum, cotton, finger millet (*Eleusine coracana*), haricot bean (*Phaseolus vulgaris*), tef (*Eragrostis tef*), vegetables (potato, tomato, onion, carrot) and fruit orchards (citrus, mango, papaya and banana). In Pakistan, the weed has been reported from number of crops, including wheat, rice, sugarcane, sorghum, maize, squash, gourd and water melon.

CHEMICAL CONSTITUENTS

The chemistry of feverfew is now well understood, with sesquiterpene lactones, primarily parthenolide, being the most significant biologically active compounds. Parthenolide is found in the superficial leaf glands at a concentration of 0.2%–0.5%, but not in the stems, and accounts for up to 85% of the total sesquiterpene content.

Sesquiterpene lactones :

Feverfew contains over 30 sesquiterpene lactones, which are categorized into five main types based on their chemical ring structures. These include eudesmanolides, germacranolides, and guaianolides, with parthenolide being a germacranolide. Researchers have isolated various sesquiterpene lactones from feverfew, such as artecanin, artemorin, balchanin, canin, costunolide, and others. Some of these compounds have been found to possess spasmolytic activity, possibly by inhibiting the influx of extracellular calcium into vascular smooth muscle cells.

Flavonoids :

Several flavonoids have been isolated from the plant, including 6-hydroxykaempferol 3,6-dimethyl ether, tanetin, quercetagenin 3,6-dimethyl ether, quercetagenin 3,6,3'-trimethyl ether, quercetin, apigenin, luteolin, chrysoeriol, santin, jaceidin, and centaureidin..

Volatile oils :

Twenty-three compounds, making up at least 90.1% of the volatile oils in feverfew, have been identified, with the primary components being camphor, camphene, p-cymene, and bornyl acetate, accompanied by other identified components including tricyclene, α -thujene, α -pinene, β -pinene, α -phellandrene, α -terpinene, γ -terpinene, chrysantheone, pinocarvone, borneol, terpinen-4-ol, p-cymen-8-ol, α -terpineol, myrtenal, carvacrol, eugenol, trans-myrtanol acetate, isobornyl 2-methyl butanoate, and caryophyllene oxide.

Other chemical constituents :

sofraxidin, a coumarin compound, and 9-epipectachol B, an isofraxidin dimethyl ether, have been isolated from the roots of the plant, along with (2-glyceryl)-O-coniferaldehyde.

USES AND PHARMACOLOGY

Anti-inflammatory activity :

Parthenolide's proposed mechanism of action involves binding to and inhibiting the I κ B kinase complex (IKK) β , a crucial component in pro-inflammatory cytokine-mediated signaling. Feverfew also inhibits prostaglandin synthesis, with extracts from the above-ground plant parts suppressing prostaglandin production. Leaf extracts have a similar effect, albeit to a lesser extent. However, neither whole plant nor leaf extracts inhibit cyclooxygenation of arachidonic acid, the initial step in prostaglandin synthesis. Furthermore, chloroform leaf extracts rich in sesquiterpenelactones have been shown to inhibit the production of inflammatory prostaglandins in rat and human leukocytes.

Anticancer activity :

Parthenolide's mechanisms of action may involve cytotoxic effects due to the interruption of DNA replication by its reactive lactone ring, epoxide, and methylene groups, as well as oxidative stress, thiol depletion, endoplasmic reticulum stress, and mitochondrial dysfunction, and has shown anticancer activity against various human cancer cell lines, including fibroblasts, laryngeal carcinoma, and epidermoid cancer cells, and may also enhance the effectiveness of paclitaxel.

Migraine headache, prophylactic treatment :

Feverfew's mechanism of action is multifaceted, influencing various physiological processes, including the inhibition of prostaglandin synthesis, relaxation of vascular smooth muscle spasms, and blockade of platelet granule secretion..

Effects on vascular smooth muscle :

Feverfew extracts, particularly those from fresh leaves, were found to inhibit the contraction and relaxation of rabbit aorta in a concentration and time-dependent manner, regardless of the presence of endothelium. This inhibition was likely due to the higher concentrations of parthenolide in the fresh leaf extracts. The experiments suggest that feverfew may inhibit smooth muscle spasms by blocking open potassium channels.

Researchers have found that parthenolide prevents the stomach contractions caused by serotonin (5-HT) in rat stomach tissue, but it does not directly block 5-HT receptors. Instead, parthenolide works by inhibiting the release of 5-HT from storage vesicles in the stomach's nerve cells, thereby countering the contractions triggered by serotonergic drugs like fenfluramine and dextroamphetamine.

Inhibition of histamine release :

A chloroform extract of feverfew has been shown to inhibit histamine release from rat peritoneal mast cells through a mechanism that is different from that of known mast cell inhibitors, such as cromoglycate and quercetin, although the precise mechanism of action remains unclear and may be related to calcium entry into mast cells.

DOSAGE

Pediatric :

Children under 2 years of age should not be given feverfew. For children over 2 years, the adult dose should be adjusted based on their weight, using the dose for a 150 lb (70 kg) adult as a reference point. As an example, a child weighing 50 lb (20–25 kg) should receive one-third of the adult dose.

Adult :

For migraine headaches: Take 100–300 mg, up to 4 times daily, standardized to contain 0.2–0.4% parthenolides. Feverfew may be used to prevent or to stop a migraine headache. Feverfew supple-

ments may also be CO extracted. For these, take 6.25 mg, 3 times daily, for up to 16 weeks.

For inflammatory conditions (such as arthritis): 60-120 drops, 2 times daily of a 1:1 w/v fluid extract, or 60-120 drops twice a day of 1:5 w/v tincture.

CONCLUSION

Parthenium Hysterophorus is a rich source of sesquiterpene lactones, flavonoids, and volatile oils in its leaves and flowerheads, and sterols and triterpenes in its roots. Studies have demonstrated significant anti-inflammatory, anti-cancer, and prophylactic properties in its flowers, leaves, and parthenolide, validating its traditional use in treating migraine headaches. These benefits are largely attributed to the presence of sesquiterpene lactones and flavonoids. Given its numerous health benefits, Parthenium Hysterophorus can be considered a valuable medicinal plant for human health, warranting further research to uncover more active constituents.

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