A review on Tagetes Erecta

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ABSTRACT

Medicinal plants have been of great importance to the health care needs of individuals and their communities. The use of herbal preparations made from medicinal plants is widespread in developing countries. This article discusses about the medicinal values of Tagetes erecta. The plant locally known as Genda Phul (marigold) belongs to the family Asteraceae. The plant Tagetes erecta has been shown to contain quercetagetin, a glucoside of quercetagetin, phenolics, syringic acid, methyl-3,5-dihydroxy-4-methoxy benzoate, quercetin, ethyl gallate, terpenes, and other important phytochemical constituents from the different part of the plant. Different parts of the plant is useful in fevers, astringent, carminative, stomachic, scabies and liver complaints and is also employed in diseases of the eyes, purify blood, bleeding piles and also used in rheumatism, colds and bronchitis. It shows different pharmacological activities like anti-nociceptive, anti-inflammatory, antioxidant, insecticidal, larvicidal, hepatoprotective, mosquitocidal, nematicidal, wound healing, antibacterial, antimicrobial, antiepileptic, fungitoxic and antimutagenic.

Keywords: Marigold, Tagetes erecta, Pharmacological Actions

INTRODUCTION

At the present time, the modern conventional healthcare is burdened with great problems of unsafe medicines, chronic diseases, resistant infections, auto immune disorders and degenerative disorders of ageing, despite great scientific advances. More than 70% of India’s 1.1 billion populations still use non-allopathic systems of medicine. [1]

Medicinal plants and derived medicine are widely used in traditional cultures all over the world and they are becoming increasingly popular in modern society as natural alternatives to synthetic chemicals. [2] Plants used medicinally in different countries are a source of many potent and powerful drugs. [3]

The beneficial medicinal effects of many plant materials typically results from the combinations of secondary metabolites present in the plant such as alkaloids, steroids, tannins, phenolic compounds, flavanoids, resins, fatty acids and gums which are capable of producing definite physiological action on the body. The reason of choosing herbs as antibacterial sources in the development of a drug resistance in human pathogens against commonly used antibiotics. [4, 5] In the last two decades there has been an exponential growth in the field of herbal medicine. It is getting popularized in different countries owing to its natural origin and lesser side effects. [6] India possesses almost 8% of the estimated biodiversity of the world with around 0.126% million species. [7]

The World Health Organization (WHO) estimated that approximately 80% of world population relies mainly on traditional medicines, mostly plant drugs in their health care. Today, Ayurveda coexists with modern system of medicine, and is still widely used and practiced. About 30% of the currently used therapeutics is of natural origin. [8]

Tagetes is a genus (family Asteraceae) containing about 50 species of annual or perennial herbageous plant. The plant Tagetes erecta Linn locally known as Genda Phul (Marigold). It is stout, branching herb, native to Mexico and other warmer parts of America and neutralized elsewhere in the tropics and subtropics including India and Bangladesh. [9]

These are rapid-growing annual flowering plants in height ranging from dwarfs of 6-8 inch, to medium and taller and erect-growing plants with heights from 10 in to 3ft, bearing large pompon-like double...
flower up to 5 in across and has a shorter flowering period from midsummer to frost. [10] It is very popular as a garden plant and yields a strongly aromatic essential oil (tagetes oil), which is mainly used for the compounding of high-grade perfumes. [11]

Scientific classification of Tagetes erecta

- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliopsida
- Order: Asterales
- Family: Asteraceae
- Genus: Tagetes

Figure 1: Flower of Tagetes erecta

Ethnomedicinal Uses: Different parts of this plant including flower are used in folk medicine to cure various diseases. Leaves are used as antiseptic, in kidney troubles, muscular pain, piles and applied to boils and carbuncles. The flower is useful in fevers, epileptic fits (Ayurveda), astringent, carminative, stomachic, scabies and liver complaints and is also employed in diseases of the eyes. They are said to purify blood and flower juice is given as a remedy for bleeding piles and also used in rheumatism, colds and bronchitis. [12, 13] Different species of Tagetes have been found to possess antimicrobial, anti-inflammatory, hepatoprotective, wound healing, insecticidal, analgesic activities. [14, 15, 16] The pharmacological activity of Tagetes erecta is related to the content of several secondary metabolites and the most important compounds are terpenes, essential oils, flavonoids, carotenoids and polyphenols. [17, 18, 19]

Chemical constituents: Phytochemical studies of its different parts have resulted in the isolation of various chemical constituents such as thiophenes, flavonoids, carotenoids and triterpenoids. [20] The plant Tagetes erecta has been shown to contain quercetagetin, a glucoside of quercetagetin, phenolics, syringic acid, methyl-3, 5-dihydroxy-4-methoxy benzoate, quercetin, thienyl and ethyl gallat. [13] The steam distillation of fresh leaves offer 0.3% of essential oil with a strong, sweet lasting odor and contains d-limonene, ocimene, l-linalyl acetate, l-li-nalol tagetone, n-nonyl aldehyde, lutein. [21] The fresh ground root of Tagetes erecta contains α-terthienyl and bithienyls. Twenty seven terpenoids are identified in Tagetes erecta leaf oil by GC/MS. [22]

The major components detected are terpinolene, E-ß-ocimene, piperitone, limonene. [23] Methanolic extract of Tagetes erecta (flowers and leaves) contains quercetagin monoglucoside (0.1%) and tagetin. Flower extract also contains quercetagin (0.4%), while seeds are found to have quercetagetin and quercetagetrin. [24, 25] Lutein (64-80%) and smaller amounts of antheraxanthin, zeaxanthin, crytoxanthin, β-carotene and about fourteen other carotenoids are present in the plant. [26] Volatile oil from flower heads of Tagetes erecta majorly contains tagetone, dihydrotagetone, cis-tagetone, cis-ocimenone, trans-ocimenone, limonene, valeric acid and ocimene.
Pharmacological studies on Tagetes erecta
Antinociceptive and anti-inflammatory activity:
Shinde et al. reported antinociceptive and anti-inflammatory activity of chloroform, methanol and ether fraction of Tagetes erecta using acetic acid-induced writhing in mice and carrageenan induced paw edema in rat. [27] Chatterjee et al. reported anti-nociceptive and anti-inflammatory activity of hydroalcoholic extract of leaves of Tagetes erecta using acetic acid induced writhing and hot plate method in mice and carrageenan induced paw edema in rat. [28] Charaborthy et al. reported anti-nociceptive activity of methanolic extract of Tagetes erecta using acetic acid induced writhing and tail immersion method in mice. [29] Natarajan et al. reported anti-nociceptive and anti-inflammatory activity of Tagetes erecta. [30]

Anti-oxidant activity: Chivde et al. reported the antioxidant studies on the ethanolic extract of Tagetes erecta flowers by three different assays like DPPH, reducing power and super oxide radical scavenging activity at different concentrations were used. In all the three assay, Tagetes erecta showed better reducing power than the standard (i.e. ascorbic acid), and super oxide anion scavenging activity and DPPH antioxidant activity showed less than standard. However, ethanolic extract of Tagetes erecta demonstrated antioxidant property in all the in vitro models. [31] Bashir and Gilani also reported in vitro antioxidant and in vivo analgesic activity using acetic-acid-induced writhing models of Tagetes erecta. [32] Martha et al. reported in vitro antioxidant action of essential oil of flowers of Tagetes erecta using DPPH, thiocyanate, β-carotene bleaching, free radical scavenging activity and oxidation of deoxyribose assay. [33] Wang Mingchen et al. reported antioxidant activity of lutein isolated from Tagetes erecta when examined by photochemiluminescence (PCL) assay and β-carotene-linoleic acid model system (β-CLAMS). In the same study lutein showed mutagenicity and antimutagenicity when examined using the standard Ames test. Clastogenicity and anticlastogenicity of lutein was examined using Chinese hamster ovary cells. Lutein was found not only to be non-clastogenic at all doses, but also showed an anticlastogenic effect in a dose dependent manner. [34]

Insecticidal activity: Nikkon et al. also reported insecticidal activity of Tagetes erecta against stored product insect pest, Tribolium castaneum (Herbst). The chloroform fraction showed highest toxicity against both the larvae and adults of Tribolium castaneum followed by petroleum ether fraction and ethanol extract. [35] Sarin reported insecticidal activity by maintaining callus tissue of Tagetes erecta on revised Murashige and Skoog’s medium (RT) as static culture showed the presence of insecticidal pyrethrins. [36]

Larvicidal activity: Marques et al. reported the larvicidal activity of essential oil from Tagetes erecta against 3rd instars of Aedes aegypti and to determine the amounts of larvicidal thiophenes in all plant tissues. The oil obtained by steam distillation and analyzed by gas chromatography/mass spectrometry showed 14 compounds. The main compounds were piperitone (45.72%), d-limonene (9.67%), and pipiteritenone (5.89%). The essential oil was active against larvae of Aedes aegypti, with LC50 of 79.78 μg/ml and LC90 of 100.84μg/ml. The larvicidal thiophene contents were higher in the roots and flowers as demonstrated by high-performance liquid chromatography analysis. Thus, Tagetes erecta constitutes a good source of varied compounds showing larvicidal activity against Aedes aegypti. [37]

Hepatoprotective activity: Bose et al. reported the hepatoprotective activity in flowers of Tagetes erecta by carbon tetra chloride induced hepatopathy model. The ethanolic extract showed the increase in serum ALT, AST, ALP and bilirubin levels. Ethyl acetate fraction of Tagetes erecta (EATE) at the dose of 400 mg/kg orally significantly decreased the elevated serum marker enzymes and level of bilirubin almost to the normal level compared to CCl4-intoxicated group. Histological changes in the liver of rats treated with 400 mg/kg of EATE extract and CCl4 showed a significant recovery except cytoplasmic vascular degenerations around portal tracts, mild inflammation and foci of lobular inflammation. Phytoconstituents such as flavonoids, terpenoids and steroids are responsible for the observed hepatoprotective activity. [38]

Mosquitocidal activity: Nikkon et al. reported the mosquitocidal activity in ethanolic, chloroform and petroleum ether extracts of Tagetes erecta flowers against different instars of Cx.quinquefasciatus. Among the tested samples the chloroform soluble fractions showed the highest toxicity and consequently the LC50 values (14.14μg/mL, 17.06μg/mL, 36.88μg/mL and 75.48μg/mL) for all instar larvae of Cx.quinquefasciatus. The larvae showed comparative tolerance in the course of increasing age and time. From this they concluded the flowers of Tagetes erecta having good mosquitocidal activity. [39]

Nematicidal activity: Husain et al. reported the nematicidal efficacy of four medicinal plants viz. Azadirachta indica, Calotropis procera, Datura stramonium and Tagetes erecta was ascertained for
the control of M. incognita. All leaf amendments at different dosages significantly improved the plant growth characteristics of okra and reduced root-knot infections compared with the untreated control. [40]

**Wound healing activity:** Ibrahim et al. reported the wound healing activity of carbopol gels prepared from hydro alcoholic extracts of Gymnema sylvestre (GE) and Tagetes erecta Linn. (TE) in excision wound model and burn wound models in albino mice. In excision and burn wound models, the GE and TE treated animals showed significant reduction in period of epithelization and wound contraction and combined gel showed accelerated wound healing activity may be because of synergism. The enhanced wound healing activity of hydro alcoholic extracts may be due to free radical scavenging action and the phytoconstituents (flavonoids) present in it which either due to their individual or additive effect fastens the process of wound healing. [41]

**Anti-Bacterial Activity:** Rhma and Madhavan reported the anti-bacterial activity of different solvents of Tagetes erecta flowers against Alcalgens faeacalis, Bacillus subtilis, Campylobacter coli, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus vulgaris, Streptococcus mutans and Streptococcus pyogenes. The flavonoid possesses anti-bacterial activity against all the tested strains and shows maximum zone of inhibition for Klebsiella pneumoniae (29.50 mm). The flavonoid-Patulitrin is one of the potential elements for its anti-bacterial activity. [14]

**Antimicrobial Activity:** Ruddock et al. reported the anti microbial activity in 19 plants used in Colombian traditional medicine for cutaneous infections, were screened against Neisseria gonorrhoeae (NG) by disc susceptibility assay. In all, 71% of the crude extracts exhibited antibacterial activity against the antibiotic susceptible NG strain, whereas 10% of the extracts inhibited penicillinase-producing NG strain GC1–182. The *Tagetes erecta* flower parts showed maximum inhibitory action against NG strain. [42]

**Antiepileptic Activity:** Shetty et al. reported central nervous system (CNS) stimulatory activity of ethanolic extract of flowers of *Tagetes erecta* in rats. The findings suggested that ethanolic extract may reduce the seizure threshold in epileptic patients. [43]

**Fungitoxic activity:** Kishore and Dwivedi reported fungitoxic activity of the essential oil of leaves of *Tagetes erecta* exhibited complete inhibition of the growth *Pythium aphanidermatum* Fitz., the damping-off pathogen, at a concentration of 2000 ppm.[44]

**Antimutagenic activity:** Majia et al. reported antimutagenic activity of xanthophylls extracted from Aztec Marigold (*Tagetes erecta*) on 1-nitopyrene (1-NP) mutagenicity using the Salmonella typhimurium tester strain YG1024 in the plate-incorporation test. [45]

**CONCLUSION**

The extensive literature survey revealed that *Tagetes erecta* is important medicinal plant with diverse pharmacological spectrum. The plant shows the presence of many chemical constituents which are responsible for various medicinal properties, which can be used for welfare of the mankind.

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