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**Review Article**

# A review on Tagetes Erecta

Aarti Khulbe*

Assistant Professor, Department of Pharmacy, Invertis University, Bareilly, Uttar Pradesh, India

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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 gallat, terpines, 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 herbaceous 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

***Corresponding Author Address:** Aarti Khulbe, Assistant Professor, Department of Pharmacy, Invertis University, Bareilly, Uttar Pradesh, India; E-mail: aarti_khulbe25@yahoo.in*

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, antiinflammatory, 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 triterpeniods. [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-nalool 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 caretonoids 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-infammatory activity:** Shinde *et al.* reported antinociceptive and anti-infammatory activity of chloroform, methanol and ether fraction of *Tagetes erecta* using acetic acid-induced writhing in mice and carragenin 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, ß-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 ß-carotene-linoleic acid model system (ß-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 piperitenone (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 sylvestere* (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:** Rhama and Madhavan reported the anti-bacterial activity of different solvents of *Tagetes erecta* flowers against *Alcaligens faecalis, Bacillus cereus, Campylobacter coli, Escherchia 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-nitropyrene (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.

## REFERENCES


1. Paul T, Devasagayam A. Radiation Biology and Health Sciences Division, Bhabha Atomic Research Centre, Mumbai, 2006.
2. Vanwyk BE, Wink M. *Medicinal plants of the world*, 1st ed.; Briz Publication: South Africa, **2009**.
3. Srivastava J, Lambert J, Vietmeyer N. Medicinal plants: An expanding role in development. World Bank Technical 1996, Paper No. 320.
4. Erdogrul OT. Antibacterial activities of some plant extracts used in folk medicine. Pharm. Biol 2002; 40:269-73.
5. Bhakru HK. Nature cure and natural methods of treatment 1999.
6. Patel BV. A Report of the seminar on, *herbal drugs: Present status and future prospects*, Proceeding of the Predc centre, Ahmedabad, 2001.
7. Jain JB, Kumane SC, Bhattacharya S. Medicinal flora of Madhya Pradesh & Chhattisgarh. Indian J Tradit Know 2006; 5(2):237-42.
8. Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines"=, World Health Organization, Regional office for the Western Pacific, Manila, 1993; 1-2.
9. Nikkon F, Habib MR, Saud ZA, *et al.* Toxicological evaluation of chloroform fraction of flower of *Tagetes erecta* L. on Rats. Int J Drug Dev and Res 2009; 1(1):161-2.
10. Vijay KP, Laxman BC, Balasaheb SR, *et al.* Pharmacognostic, Physiochemical and Phytochemical Investigation of *Tagetes erecta* LINN flowers (Asteraceae). JBSO 2013; 1(1):21-4.
11. Manjunath MBL. *The Wealth of India*, CSIR: New Delhi, **1969**; pp.109-110.
12. Kirtikar KR, Basu BD. *Indian Medicinal Plants*, Lalit mohan Basu, Allahabad, India **1987**, pp 1385-1386.
13. Ghani A. *Medicinal plants of Bangladesh*. *Chemical constituents and uses*, 2nd ed., Asiatic Society of Bangladesh, Dhaka, **1998**; pp 301-302.
14. Rhama S, Madhavan S. Antibacterial activity of the flavonoid, patulitrin isolated from flowers of *Tagetes erecta* L. Int J PharmThech Res 2011; 3:1407-9.

15. Kiranmai M, Ibrahim M. Antibacterial potential of different extracts of *Tagetes erecta* Linn. Int J Pharm 2012; 2:90-6.
16. Gopi G, Elumalai A, Jayasri P. A concise review on *Tagetes erecta*. Int J Phytopharmacy Res 2012; 3:16-19.
17. Marotti M, Piccaglia R, Biavati B, *et al.* Characterization and yield evaluation of essential oils from different *Tagetes species***.** J Essential Oil Res 2004; 16:440-4.
18. Xu LW, Wang GY, Shi YP. Chemical constituents from *Tagetes erecta* flowers. Chem Nat compd 2011; 47(2):281-83.
19. Hadden WL, Watkins RH, Levy LW, *et al.* Carotenoid composition of marigold (*Tagetes erecta*) flower extract used as nutritional supplement. J Agric Food Chem 1999; 47:4189-94.
20. Faizi S, Naz A. Palmitoleate (9Z-Hexadeca-9-enoate) esters of oleanane triterpenoids from the golden flowers of *Tagetes erecta*: isolation and autoxidation products. Helv Chim Acta 2004; 87: 46-56.
21. Ghosh T, Bose A, Dash GK, *et al.* Wound Healing Activity of *Tagetes erecta* Linn Leaves. http://www. Pharmainfo.net/exclusive/reviews. (Accessed **2004**)
22. Bohlmann F and Herbst P. The constituents of *Tagetes* species. Ibid 1963; 58:2945-55.
23. Machado M, Siva MG, Matos FJA, *et al.* The presence of indole as minor constituent of *Tagetes erecta* leaf oil. J Essent Oil Res 1994; 62:203-05.
24. Morita N. Flavonoids of the flowers and leaves of *Tagetes erecta*. J Pharm Soc Jpn 1957; 77:31-33.
25. Sankara SS and Marayana SM. Flavonoids of the flowers of Gauazuma tomentosa and Delonix elata. Curr Sci 1963; 32:308-10.
26. Benk E, Trieber H, and Bergmann R. Detection of *Tagetes* extract in orange concentrates considering raw materials and beverages. Riechst Aromen and koerpe 1976; 26:220-21.
27. Shinde NV, Kanase KG, Shilimkar VC, *et al.* Antinocicentive and anti-inflammatory effects of solvent extracts of *Tagetes erectus* Linn (Asteraceae). Trop J Pharm Res 2009; 8:325-9.
28. Chatterjee S, Rajaranjan S, Sharma UR and Ramesh K. Evaluation of anti-nociceptive and anti-inflammatory activities of *Tagetes erecta*. Arch Pharm sci and Res 2009; 1:207-11.
29. Charaborthy GS, Badujar RS and Pardeshi CR. Analgesic activity of methanolic extract of *Tagetes erectus*. J Pharm Res 2009; 2:1379-80.
30. Natarajan AN, Cork N, Boomathi R, Pandi S, and Velavan G. Studies on the antioxidant and analgesic activities of Aztec marigold. Dhakshnamoorthy Crop production 2006; 25:1210-3.
31. Chivde BV, Biradar KV, Shiramane RS, *et al. In vitro* antioxidant activity studies of the flowers of *Tagetes erecta L.* (Compositae). Int J Pharm. Bio. Sci. 2011; 2(3):223-9.
32. Bashir S, Gilani AH. Studies on the antioxidant and analgesic activities of Aztec marigold (*Tagetes erecta*) flowers. Phytother Res 2008; 22(12):1692-4.
33. Martha R, Gutierrez P, Luna HH, *et al.* Antioxidant activity of *Tagetes erecta* essential oil. J Chilean Chem Soc 2006; 51:883-6.
34. Wang M, Tsao R, Zhang S, *et al.* Antioxidant activity, mutagenicity/antimutagenicity and clastogenicity/anticlastogenicity of lutein from marigold flowers. Food Chem Tox 2006; 4:1522-9.
35. Nikkon F, Habib MR, Frdousi Z *et al.* Insecticidal activity of flower of *Tagetes erecta* against *Tribolium castaneum* (Herbst). Res J of Agric Biol Sci 2009; 5(5):748-53.
36. Sarin R. Insecticidal activity of callus culture of *Tagetes erecta*. Fitoterapia 2004; 75:62-4.
37. Márcia M, Marques M, Selene M, *et al.* Larvicidal activity of *Tagetes erecta* against *Aedes aegypti.* J Am Mosq Control Assoc 2011; 27(2):156-8.
38. Giri RK, Bose A, Mishra SK. Hepatoprotective Activity of *Tagetes erecta* against carbon tetrachloride-induced hepatic damage in rats. Acta Poloniae Pharmaceutica n Drug Research 2011; 68(6):999-1003.
39. Nikkon FM, Habib MR, Saud ZA *et al. Tagetes Erecta* Linn and its Mosquitocidal Potency Against *Culex Quinquefasciatus.* Asian Pac J Trop Biomed 2011; 186-8.
40. Hussain MA, Mukhtar T, Kayani MZ. Efficacy Evaluation Of Azadirachta Indica, Calotropis Procera, Datura Stramonium and *Tagetes Erecta* Against Root-Knot Nematodes Meloidogyne Incognita. Pak. J. Bot 2011; 43:197-204.
41. Ibrahim M, Kazim SM, Kiranmai M. Combined wound healing activity of Gymnema sylvestere and *Tagetes erecta* Linn. Int J Pharm Appl 2011; 2(2):135-140.
42. Patrick Ruddock S, Marijo Charland, Sandra Ramirez, *et al.* Antimicrobial Activity of flavonoids from *Piper lanceaefolium* and other colombian medicinal plants against antibiotic susceptible and resistant strains of *Neisseria gonorrhoeae*. Sexually transmitted diseases 2011; 38(2):81-88.
43. Shetty LJ, Harikiran H, Fernandes J. Pharmacological evaluation of ethanolic extract of flower of *Tagetes erecta* on epilepsy. J Pharm Res 2009; 2:1035-38.
44. Kishore N, Dwivedi RS. Fungitoxicity of the essential oil of *Tagetes erecta* against Pythium aphanidermatum fitz. the damping of the pathogen. Flav Frag J 2006; 6:291-4.
45. Majia EGD, Pina GL, Gomex MR. Antimutagenicity of xanthophylls present in Aztec marigold (*Tagetes erecta*) against 1-nitropyrene. Mutation research/Genetic Toxicology and environmental Mutagenesis 1997; 389:219-26.