

## Review Article

### An Extensive Review on *Tagetes erecta* Linn

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#### ABSTRACT

Worldwide, medicinal plant extracts and secondary metabolites are gaining popularity as a natural substitute for artificially manufactured chemicals in both allopathic and traditional medical systems. Since ancient times, people have recognized the therapeutic benefits of traditional herbal remedies. The knowledge of native medicinal plants is accessible to around 65% of the global population. India is the largest source of traditional knowledge. This article studies the various physical, medicinal, phytochemical, pharmacognostical and pharmacological characters of traditional plant *Tagetes erecta* Linn also known as Genda Phul (Marigold). Marigold has various pharmacological properties from flowers to roots. It has a variety of pharmacological properties, including wound healing, antibacterial, antimicrobial, antiepileptic, antifungal, insecticidal, larvicidal, hepatoprotective, and antipyretic properties. This article aims in reviewing these properties of the plant and its uses in the medical field.

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#### Introduction:

India has a wide variety of rich flora that is found all over the nation. In traditional medical practices like Ayurveda, Unani, and Siddha, herbal medicines have served as the foundation for the treatment and cure of an extensive range of diseases and physiological conditions. Both conventional and western medicine use medicinal plant components extensively. For a decade, medications derived from plants have been a part of the development of human healthcare[ K. F. Khattak, 2014]. China and India were big users of plant-based medications. These days, a significant number of medications that are effective against a variety of diseases are made from plants. Most of these involve

separating out the chemical compound that is the active ingredient from a specific medicinal plant and then modifying it[ N. Talukdar et al 2023].



**Fig.1. *Tagetes erecta* Linn Plant**

Various traditional medicine systems have acknowledged the therapeutic value of *Tagetes erecta*, also referred to as marigold, for the mitigation of various human ailments. The genus *Tagetes* (family Compositae/Asteraceae) comprises approximately 50 species of herbaceous plants, either annual or perennial. Locals refer to *Tagetes erecta* L. (Fig. 1.4) as "Marigold" or "Genda Phool." Indian marigold is a native spice. Marigold has been widely used as a spice and medicinal in Indian, China and Indonesia. Most Indian curries are made with marigold, a spice that improves food flavor[ Pankaj Chaudhary,2023][ P. Vasudevan, et al 1997].

The use of marigold in curries dates back over 5,000 years. This robust, branching herb is indigenous to Mexico and other tropical regions of America. It has been neutralized in other tropical and subtropical regions, such as Bangladesh and India. These are annual flowering plants that grow quickly, reaching heights of 7 to 9 inches for dwarfs and 10 to 3 feet for medium-sized, tall, erect plants. They have a shorter flowering season, blooming from midsummer to frost, and produce large, double flowers that resemble pompons and can reach up to 5 inches across[ B. Tripathi, et al, 2012]. It produces *Tagetes* oil, a potent essential oil that is mostly used in the formulation of premium perfumes, and is a highly prized garden plant. It produces *Tagetes* oil, a potent essential oil that is mostly used in the formulation of premium perfumes, and is a highly prized garden plant[ S. Hardik, et al 2014]. Folk medicine uses various parts of this plant, including the flowers, to treat many kinds of illnesses. Leaves are applied topically to boils and carbuncles, and are also used as an antiseptic for piles, muscle aches, and kidney problems. The florescence is used in Ayurvedic medicine to treat high temperatures, epileptic fits, stomachic complaints, scabies, liver complaints, astringent, carminative, and eye diseases[ Y. Singh, et al, 2020][ K. F. Khattak, 2014].

This plant is indigenous to India, Central America, Mexican city, Colombia, etc. Because of its religious application, it has social significance. *Tagetes* is a resilient material that is used in India to adorn idols for festivals. *Tagetes erecta* is used as a culinary coloring in African nations due to its high carotenoid concentration. About 50 species of plants, mostly annual or perennial herbaceous plants, make up the genus *Tagetes* in the family Asteraceae. Marigold, or Genda Phool, is the local name for this plant. It was first imported to Europe in the sixteenth century from Central America, particularly Mexico. Historically, China, India, and Indonesia have utilized marigold as a spice and medicinal. Originally from Mexico and other warmer parts of America, this plant grows vigorous and branches out. Views of it have been reported from Bangladesh and India, among other tropical and

subtropical locations. These plants grow swiftly and are annual flowerers. Small plants, measuring 6 to 8 inches in height, to medium-sized, tall, erect plants, measuring 10 to 3 feet in height, are all within their range of heights. For a brief period, from midsummer until frost, they yield huge, pompon-like double blooms, up to 5 inches wide. It is a popular garden plant that yields *Tagetes* oil, a strong-smelling essential oil that is usually used to make high-end fragrances[ N. Singh, 2019].

Nonetheless, there are also dwarf or short variants. The foliage has acute teeth and deep incisions. Single, tall stalks with thickened tips adorn the flower heads. Bright yellow, orange, or brownish-yellow blooms are seen[ G. Gopi, 2012].

## Taxonomical Classification

Table 1. Taxonomical classification

| Kingdom   | Plantae        |
|-----------|----------------|
| Order     | Asterales      |
| Family    | Asteraceae     |
| Subfamily | Asteroideae    |
| Class     | Magnoliopsida  |
| Division  | Magnoliophyta  |
| Genus     | <i>Tagetes</i> |
| Species   | <i>Erecta</i>  |

## Chemical Constituents

Marigold's aerial parts are a rich source of essential oils (EOs). Notwithstanding the high lutein content of the flower, the roots are known to contain  $\alpha$ -terthineyl ( $\alpha$ -T), substituted acetylenes, and thiophenes. In one investigation, *Tagetone* was shown to be a substantial component of steam-distilled *Tagetes patula* [I. Wobst *et al.*, 2017]. The main constituents identified in *T. patula* essential oil were further identified as l-limonene,  $\delta$ -cadinene, dl- $\square$ cadinol,  $\alpha$ -terpinolene, piperitone, ocimene, caryophyllene, piperitone, piperitenone, and *tagetone*. Limonene (6.2%), dihydro*tagetone* (6.2%), (E)-*tagetone* (2.5%), p-cymene-8-ol (11.0%), piperitone (10.6%), piperitenone (8.1%), and (E)-sesquisabinene hydrate (12.5%) were found to be the main constituents in an alternative study. Interestingly, headspace investigations of harvested and living capitula at different periods have yielded different volatile compositions. Additionally, it is projected that 22 compounds are present in *T. minuta* capitula EO (0.09% yield)[ G. Gopi, 2012][ B. Tripathi, et al, 2012].

*T. erecta* has been shown to contain vinyl, methyl-3, syringic acid, vinyl oxide, 5-dihydroxy-4-methoxy benzoate, ethyl gallate, phenolics, quercetin, and quercetagenin. The compound lutein, also referred to as xanthophyll, possesses two cyclic last groups (one beta

and one alpha-ionone ring) in addition to the fundamental C-40 isoprenoid structure that all carotenoids share. It is one of the main pigments and constituents of *Tagetes erecta*. The chemical structures of syringic acid, quercetagenin, and lutein are depicted in the accompanying figure [Y. Singh, et al, 2020].

**Table.2. Native Names of Plant**

| Language | Names               |
|----------|---------------------|
| Hindi    | Genda Phool         |
| English  | Marigold            |
| Chinese  | Wan Shou Ju         |
| German   | Hohe Studentenblume |
| French   | Tagete rose D'Inde  |
| Japanese | Senju-giku          |
| Spanish  | Flor de muerto      |

### Time for Cultivation

Luxuriant development and flowering require mild climate conditions between 18 and 35 °C; temperatures above 35 °C limit plant growth, which reduces blossom size and quantity. It grows well in sandy loam soil with a pH of 5.6 to 6.5 [S. U. Haq 2016].

### Therapeutic Activities of Plant

The plant is very active pharmacologically. It shows various therapeutic activities and is of great importance as an herbal medicine in various ailments.

### Wound Healing Activity

Numerous phases of wound healing, including collagen production, wound contraction, and fibroplasias, are improved by *Tagetes erecta* hydro ethanol extract treatment. Healing occurs more quickly as a result. In comparison to the control group, the crude *Tagetes erecta* extract dramatically increased the incision wound's breaking strength and wound contraction while also raising the dry granulation weight. (S. Chatterjee and others, 2011). The potential of carbopol gels derived from hydroalcoholic extracts of *Tagetes erecta* Linn. (TE) to heal excision wounds and burn models in albino mice. While combined gel indicated quicker wound healing activity, probably as a consequence of synergism, TE-treated animals in excision and burn wound models revealed a significant decrease in the time necessary for wound contraction and epithelization. This proves that *Tagetes erecta* can be used for wound healing [Y. Singh, et al, 2020] [N. Talukdar et al 2023].

### Antimicrobial Activity

The antimicrobial activity of several *Tagetes erecta* extracts has been the subject of numerous investigations by researchers. Using hexane, toluene, ethyl acetate, acetone, methanol, and water, extracted the flowers of *T. erecta*.

Eight gram positive bacteria, eight gram negative bacteria, and four fungus strains were tested for the extracts' antibacterial properties. *E. aerogenes*, *P. pseudoalcaligenes*, and *P. moranii* were all effectively inhibited by the aqueous extract. The majority of gram-negative bacterial strains were inhibited by the polar solvents methanol and acetone. Maximum activity against *K. pneumoniae* was generated by hexane extract. Etheral acetate and acetone showed the most antibacterial action against *B. cereus* and *L. monocytogenes* when applied to gram-positive bacteria. For *C. rubrum* and *B. cereus*, the same is true for hexane extract. Between all eight grammes of positive and eight grams of negative, with the exception of the aqueous extract, all solvent extracts suppressed the negative strains of *K. pneumoniae* and *B. cereus*. Their study suggested that the extract of *Tagetes erecta* could be proven as an effective antimicrobial agent [Y. Singh, et al, 2020] [H. A. Hemeg 2020].

### Anti-oxidant Activity

The presence of certain chemicals, including flavonoids, carotenoids, and phenolic acids, is primarily responsible for *Tagetes erecta*'s antioxidant qualities. These substances function by scavenging free radicals and counteracting their harmful effects. The ethanolic extract of *Tagetes erecta* flowers was subjected to antioxidant testing by Chivde et al. using three different assays: DPPH, reducing power, and superoxide radical scavenging activity. While super oxide anion scavenging activity and DPPH antioxidant activity were less successful in all three tests, *Tagetes erecta* showed higher reducing power than the reference standard (ascorbic acid). All in vitro models, however, demonstrated antioxidant activities in the *Tagetes erecta* ethanolic extract [K. F. Khattak, 2014] [M. J. Rodríguez - Yoldi, 2021].

### Anti-inflammatory Activity

Using acetic acid-induced writhing in mice and carrageenan-induced paw oedema in rats, the anti-inflammatory effect of the chloroform, methanol, and ether fraction of *Tagetes erecta* was observed. *Tagetes erecta* leaf hydroalcoholic extract's antinociceptive and anti-inflammatory properties were demonstrated in mice by acetic acid-induced writhing and the hot plate technique, and in rats by carrageenan-induced paw oedema. The plant extract can be used as an anti-inflammatory agent [M. J. Rodríguez-Yoldi, 2021] [I. Wobst et al., 2017].

### Larvicidal Activity

*Tagetes erecta* essential oil exhibited 14 delta-methylonene and piperitenone when subjected to gas chromatography/mass spectrometry analysis after steam distillation, demonstrating its larvicidal action against *Aedes aegypti* third instars. With an LC<sub>50</sub> of 79.78

µg/ml and an LC90 of 100.84 µg/ml, the essential oil was found in active *Aedes aegypti* larvae. An examination using high-performance liquid chromatography showed that the roots and blooms had greater larvicidal thiophene concentrations. Therefore, an excellent source of several chemicals with larvicidal action against *Aedes aegypti* is *Tagetes erecta*[ D. Priyanka, et al 2013][ C. Kamaraj *et al.*, 2011].

### Anticancer Activity

For several therapeutic purposes, marigold has long been utilized as a medicinal plant. The cytotoxic potential of marigold flower extracts in ethanol and ethyl acetate, as well as their ability to inhibit the enzymes tyrosinase and elastase, were examined. The H460 lung cancer and the CaCO<sub>2</sub> colon cancer cell lines were used in an experiment to gauge how cytotoxic these two extracts were[ G. Kumar, et al 2019].

### Hepatoprotective Activity

Using a hepatopathy model generated by carbon tetrachloride, Bose et al. found the hepatoprotective efficacy of *Tagetes erecta* flowers. Elevations of serum ALT, AST, ALP, and bilirubin were seen in the ethanolic extract.

Comparing the ethyl acetate fraction of *T. erecta* (EATE) to the CCl<sub>4</sub>-intoxicated group, the EATE dosage of 400 mg/kg orally dramatically reduced the increased levels of bilirubin and blood marker enzymes, bringing them virtually to normal. With the exception of cytoplasmic vascular degenerations around portal tracts, moderate inflammation, and foci of lobular inflammation, the histological alterations in the livers of rats treated with 400 mg/kg of EATE extract and CCl<sub>4</sub> demonstrated a remarkable recovery. The hepatoprotective effect that has been seen is caused by phytoconstituents such as steroids, terpenoids, and flavonoids[ T. Hassan, et al 2019].

### Antidiabetic Activity

The anti-diabetic properties of *Tagetes erecta* hydro-alcoholic extract have been investigated. A single intraperitoneal dose of streptozotocin (60 mg/kg b.w.) caused diabetes. When using the usual medication glibenclamide, blood glucose levels increased for 30 minutes before falling for another 120 minutes. The injection of extracts from *Tagetes erecta* was shown to raise glucose levels after 30 minutes, and the hypoglycemic impact was not noticed until 120 minutes later[ Pankaj Chaudhary,2023][ K. Kumar, et al 2021].

### Fungicidal Activity

At 2000 ppm, the damping-off pathogen *Pythium aphanidermatum*'s development was completely inhibited by the essential oil of *Tagetes erecta* leaves in

terms of their fungitoxic action[ P. Vasudevan, et al 1997][ J. Singh, et al 2019].

### Other Uses

A variety of ailments are traditionally treated with traditional medicine using various components of the *Tagetes erecta* plant, including the flower. Plant leaves are administered topically to boils and carbuncles, and they are used as an antiseptic for muscle aches, renal problems, and piles. According to Ayurveda, the flower petals are beneficial for fevers, epileptic fits, stomachic ailments, scabies, liver problems, astringents, carminatives, and eye illnesses. The flower juice is used to treat bleeding piles, rheumatism, colds, and bronchitis. They are also said to cleanse the blood.

Some flower kinds allow for the consumption of their petals. Kids eat from the fresh container. When coloring and flavoring food, a yellow dye made from the flowers can be used in place of saffron. The plant has condiment-like uses. (This is most likely referring to the edible dye made from the blooms.)

The soil is treated with secretions from the roots of developing plants, which have an insecticidal impact on nematodes and, to a lesser extent, keeled slugs. Approximately 3–4 months after seeding, these secretions are formed. Nematocidal qualities also exist in the petals of the flowers. Tomatoes and potatoes may be cultivated alongside the spreading plant, which is also reported to ward off insects. Through the petals, a yellow dye is extracted[ N. Talukdar et al 2023][ S. Tm and H. Sahare, 2021].

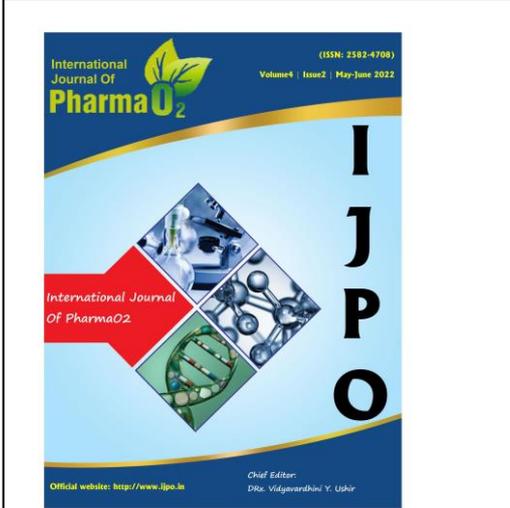
### Conclusion

The above study depicts the various pharmacological and phytochemical aspects of the plant *Tagetes erecta* Linn. The plant has various activities like Wound Healing, antimicrobial, antidiabetic, anticancer, anti-inflammatory, antioxidant, Larvicidal, hepatoprotective and fungicidal. The plant can also be used for various other purposes like spice, condiment, dye, antiseptic, antipyretic, analgesic, etc. It can be concluded from the above study that *Tagetes erecta* Linn has various traditional, pharmacological and other uses.

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