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Review Article

AN OVER RVIEW OF TRIDAX PROCUMBENMiss. Panta kranthi¹, Mr.V. Yogeeswara Rao², Mr. M. Gurava Reddy³, Dr. K. VenuGopal⁴

¹Final year B Pharmacy, Krishna Teja Pharmacy College, Tirupati- 517506., ²Associate Professor, Department of Pharmaceutical Analysis, Krishna Teja Pharmacy College, Tirupati- 517506., ³Associate Professor, Department of Pharmaceutical Chemistry, Krishna Teja Pharmacy College, Tirupati- 517506., ⁴Professor and Krishna Teja Pharmacy College, Tirupathi- 517506.

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Abstract:

Tridax procumbens, known as coatbuttons or tridax daisy, is a flowering plant from the Asteraceae family, native to Central America but now widely distributed. While it is classified as a noxious weed in several regions, it holds significant therapeutic potential recognized in traditional and modern medicine. The plant exhibits diverse pharmacological properties, including anti-inflammatory, antibacterial, antioxidant, and wound-healing effects, attributed to its rich phytochemical profile containing flavonoids, alkaloids, and terpenoids. Morphologically, *T. procumbens* features creeping stems, yellow and white flowers, and distinctive foliage. It thrives in tropical and subtropical habitats, rapidly reproducing through achenes. Traditional uses encompass treating wounds, infections, diabetes, and various ailments, highlighting its importance in herbal medicine. Various extraction methods, such as solvent extraction and Soxhlet extraction, enable the isolation of its bioactive compounds, enhancing its therapeutic applications. Despite its invasive nature, the potential health benefits of *Tridax procumbens* underscore its relevance in natural remedies and pharmacology, positioning it as a valuable resource for future research and development in the field of herbal medicine.

Corresponding author:

Panta kranthi,
Final year B Pharmacy,
Krishna Teja Pharmacy College,
Tirupati- 517506

QR code



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INTRODUCTION:

Tridax procumbens is a species of flowering plant in the Asteraceae family. It is often referred to as coatbuttons or tridax daisy. Its most well-known use is as a common weed and pest plant. Although it originated in Mexico and the tropical Americas, it has spread to tropical, subtropical, and mildly temperate locations across the globe. In nine states, it is considered a nuisance and is classified as a noxious weed in the US.

Tridax procumbens, commonly referred to as Coat Button or Kansari, is a Central American native that is now widely grown in India, particularly in the states of

Maharashtra, Madhya Pradesh, and Chhattisgarh. It is a member of the Asteraceae family of medicine. With long stalked yellow blooms and hairy foliage, this annual or perennial weed looks great. Known for its ability to cure wounds, the plant's leaves and seeds are both employed in Ayurveda. The entire plant is considered therapeutic. It is significant in both conventional and modern medicine because of its diverse pharmacological properties, which include antibacterial, anti-inflammatory, and antioxidant actions that are ascribed to secondary metabolites including flavonoids and alkaloids.

**Scientific classification:**

- Kingdom - Plantae,
- Subkingdom - Tracheobionta,
- Division - Magnoliophyta,
- Class - Magnoliopsida,
- Subclass - Asteridae,
- Order - Asterales,
- Family - Asteraceae,
- Genus - *Tridax* Species - *Tridax procumbens*

Synonyms for *tridax procumbens*:

- *Chrysanthemum procumbens*
- *Balbisia cinescens*
- *Balbisia divericata*
- *Balbisia pedunculata*
- *Tridax procumbens* var. *canecenes*
- *Tridax procumbens* var. *ovatifolia*

History of *tridax procumbens*:

Tridax procumbens, also known as Coconut-leaf Flower or Tridax, is a tropical plant species native to Central and South America.

Pre-Columbian Era

- Used by indigenous cultures for medicinal purposes, particularly for wound healing and fever reduction.
- Employed in traditional rituals and ceremonies.

16th-19th Centuries:

- Introduced to Asia by Spanish and Portuguese colonizers.
- Adapted for medicinal use in Ayurvedic and Unani medicine.
- Utilized in folk medicine for various ailments.

20th Century:

- Scientific studies began to investigate *Tridax procumbens*' pharmacological properties.
- Identified as a rich source of flavonoids, phenolic acids, and terpenoids.
- Research focused on anti-inflammatory, antioxidant, and antimicrobial activities.

Modern Era:

- *Tridax procumbens* extract is used in pharmaceuticals, cosmetics, and food supplements. Cultivated commercially in tropical regions for its medicinal value.
- Continues to be researched for potential therapeutic applications.

PLANT MORPHOLOGY:**HABITAT:**

Tridax procumbens is an annual or perennial herbaceous weed that grows primarily during the rainy season in

meadows, croplands, disturbed areas, lawns, roadside (Figure 2), or settled areas in tropical and subtropical regions of the world. This therapeutic plant demonstrates a common trait of a use fulweed

APPEARANCE:

Tridax procumbens is a perennial herb that has a creeping stem which can reach from to 8-30 inches (20-75 cm) long.

FOLIAGE:

The leaves of *Tridax procumbens* are opposite, pinnate, oblong to ovate, and 1-2 inches (2.5-5 cm) long with cuneate bases, coarsely serrate margins, and acute apexes.

GROWTH:

Plants grow in patches and are either prostrate or erect , with the flowering axis measuring 15 to 35 cm high.

FLOWERS:

Tridax procumbens flowers have white rays and yellow disk flowers. They are about 0.4-0.6 inches (1-1.5 cm) wide, and held on a 4-12 inches (10-30 cm) long stalk. Flowering occurs in spring. The plant flowers are looking like daisy. The flower is tubular, yellow centered white or yellow flowers with three-toothed ray florets. Inflorescence is capitulum. It has two types of flowers: ray florets and disc florets with basal palcentation. Sometimes the flowers are 3 lobed with long, penduncled heads. Achene's black narrowly obconical, 2.0-2.5 mm long with feathery pappus. Flowering-Fruiting throughout the year.



FRUITS:

The fruits are achenes, which are rectangular, dark brown to black in colour, and are 0.08 inches (2 mm) in length. The length of the pappus bristles on each fruit varies, ranging from 0.12-0.24 inches (3-6 mm). Fruit consists of a firm achene with feathery hairs covering it. It features a white papapus-like plume at one end. One reason the plant is invasive is that it produces a large number of achenes, each of which has the ability to catch wind in its pappus and travel a considerable distance.

SEEDS:

The seeds of *Tridax procumbens* germinate at higher temperatures (35/25 and 30/20) with 58–78% light. They are extremely sensitive to water stress and salt concentration. The gametes have 36 (diploid) and 18 (haploid) chromosomes. The production process involves spreading steam and seed production.



CALYX:

It is represented by scales or reduced to pappus.

LEAVES:

Leaves often have an arrowhead form and are unevenly toothed. They are 3-7 cm and are simple, ovate, opposite, exstipulate, and lanceolate. basal leaf with a wedge form, small petioles, and hairs on both surfaces.



STEM AND ROOTS:

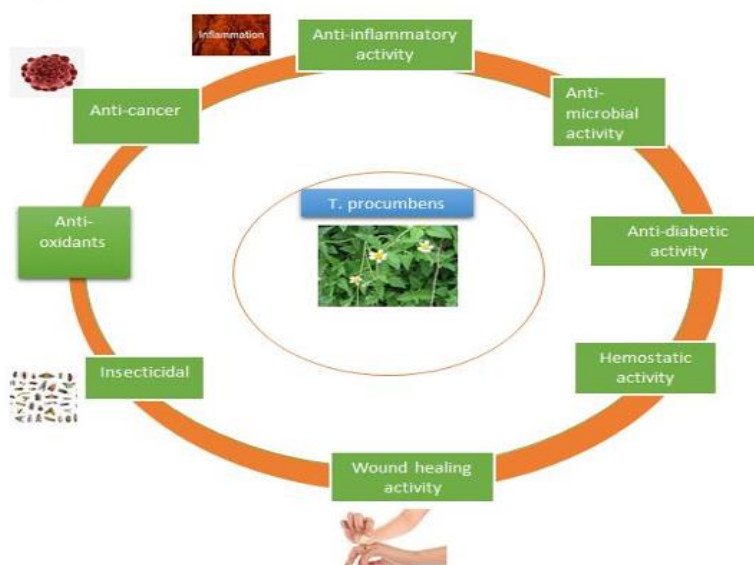
Hispid, cylindrical stems with multicellular hairs measuring mm are coated with tuberculation at the base, where a robust taproot system is present. The plant stem is branching, sparsely hairy, ascending 30 to 50 cm in height, and roots at nodes.



Genetics:

The chromosomes number of tridax procumbens has been registered as $2n=36$.

PHARMACOLOGICAL ACTIVITIES:



Anti-inflammatory activity:

Tridax procumbens has been the subject of much research due to its rich phytochemical content, which is thought to be responsible for its anti-inflammatory properties. Numerous studies have shown that plants can reduce inflammation via a variety of methods. T. procumbens contains flavonoids, alkaloids, and phenolics that have strong anti-inflammatory qualities. These components work by blocking pro-inflammatory mediators and enzymes like lipoxygenase (Lox) and cyclooxygenase (Cox), which lowers the synthesis of inflammatory prostaglandins and leukotrienes. Furthermore, it has been demonstrated that T. procumbens extracts inhibit the expression of inflammatory cytokines. For the treatment of a variety of inflammatory disorders, T. procumbens is a natural anti-inflammatory medication.

Antibacterial activity:

Many investigations have shown that T. procumbens possesses strong antibacterial activity. Bioactive compounds including terpenoids, alkaloids, and flavonoids are thought to be responsible for the plant's antibacterial properties. A variety of harmful microorganisms, such as bacteria, fungus, and viruses, have been demonstrated to be inhibited by Tridax procumbens extract. The method of action includes critical enzyme activity suppression and destruction of microbial cell membranes. Many bacterial species have been demonstrated to be susceptible to the antibacterial properties of the whole Tridax plant. A plant's juice can be extracted by putting the entire plant between two hands. Fresh plant juice applied twice daily for three to four days is an effective treatment for cuts and wounds. The antibacterial activity of the T. procumbens whole plant extract was limited to *Pseudomonas aeruginosa*. We evaluated the antibacterial activity using the disc diffusion method. The experiment employed four bacterial strains: two gramme positive strains of *Pseudomonas aeruginosa* 10, two gramme negative strains of *Escherichia coli*, and two gramme positive strains of *Bacillus subtilis*.

Antidiabetic activity:

Research indicates that Tridax procumbens extracts may have hypoglycemic properties, which could lower blood glucose levels. It will take further research to fully understand its mechanisms of action and effectiveness in managing diabetes. Significant reductions in blood glucose were observed upon oral administration of leaf extract at doses of 200 mg kg⁻¹. This made it possible to do additional research on the active components of these anti-diabetic plants that give them their hypoglycemic benefits. Adequately extracted from this plant, oleanolic acid demonstrated potential as an anti-diabetic medication when tested against alpha-glucosidase.

Wound Healing activity:

Wound healing is a complicated and dynamic process has ability to restore the cellular structures and tissue layers. The whole plant extract of T. procumbens L. has the ability to improve immunocompromised as well as normal wound healing in rats. The possibility of Tridax procumbens aiding in wound healing has been studied. According to studies, T. procumbens extracts may have the ability to cure wounds because of their anti-inflammatory, anti-microbial, and antioxidant qualities. These characteristics may aid in enhancing tissue regeneration, lowering inflammation, preventing infection, and promoting wound closure. The capacity of various T. procumbens extracts to encourage wound healing in vivo and in vitro has been investigated.

Anticancer activity:

The anti-cancer efficacy of the traditional plant T. procumbens flower crude aqueous and acetone extract was investigated over the prostrate epithelial malignant cell PC3 by assessing cell viability using the MTT assay.

Antioxidant activity:

Tridax procumbens has been discovered to display antioxidant activity because of the high concentration of phenolic compounds, flavonoids, and other antioxidants in its leaves. With their ability to reduce oxidative stress and prevent cellular damage, these chemicals assist the body's defence mechanism against harmful free radicals. Empirical research has demonstrated that T. procumbens extracts exhibit scavenging action against a range of reactive oxygen species (ROS), potentially adding to its potential health benefits as an antioxidant.

Insecticidal activity:

The plant has chemicals that have been found to have insecticidal activity against a variety of pests. Research has looked into its potential as a natural pesticide substitute in agriculture and pest control. Extracts from T. procumbens may or may not be useful against a particular kind of bug.

Anti-obesity activity:

In a study, the animal treated with the plant decoctions showed significant reductions in total cholesterol, triglycerides, free fatty acids, and total protein, as well as an increase in high density lipoprotein cholesterol.

Antifungal activity:

Tridax procumbens demonstrates potent antifungal characteristics. An aspergillus Niger phytopathogenic fungus was controlled with whole plant extracts, while *Fusarium oxysporum* was controlled with a leaf extract that produced encouraging results. *Candida albicans* was shown to be significantly inhibited by the Tridax

procumbens methanol extract, which was derived from the plant's leaf, stem, flower, and root.

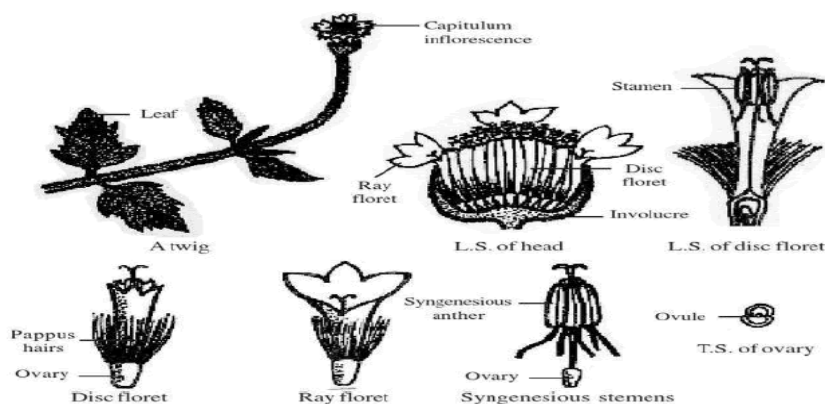
Hepatoprotective activity:

This plant's aerial sections have hepatoprotective function. Plants have a notable ability to mitigate hepatocellular injury generated by D-galactosamine/lipopolysaccharide (DGaIN/LPS).

Antihyperlipidemic activity:

The extract from *T. procumbens* leaves considerably reduced the buildup of lipid content. Because antioxidant components were present in the extract, HepG2 cells were employed to test its antihyperlipidemic effectiveness. Non-Alcoholic Fatty Liver Disease (NAFLD) is caused by oxidative stress and hepatic lipid accumulation. Based on this, we concluded that *Tridax procumbens*'s antihyperlipidemic qualities might lessen the incidence of NAFLD.

CHEMICAL CONSTITUENTS:



The leaves are opposite, oblong to ovate in shape, 3-6 cm long and 1-4 cm wide, hairy, and frequently deeply lobed with an unevenly toothed edge and an acute apex. There were two varieties of flowers: disc flowers, which had an 8 mm long, bright yellow corolla that was narrow-campanulate and hairy at the top, with pappus of plumose hairs spreading throughout. Female ray flowers number five or six, with a thin corolla tube and a brown ligulate limb that might be white or pale yellow. Fruit and flowers are produced all year round. The stem was branching, herbaceous, cylindrical, and decumbent. Tap root system in *Tridax procumbens*

PHYTOCHEMICALS:

Phytochemicals are bioactive compounds found in plants, contributing to their color, flavor, and disease resistance. They also play crucial roles in human health by acting as

antioxidants, anti-inflammatory agents, or immune boosters. The study of these compounds in specific plants like *Tridax procumbens* (commonly known as coatbuttons or tridax daisy) is important because it's traditionally used in herbal medicine.

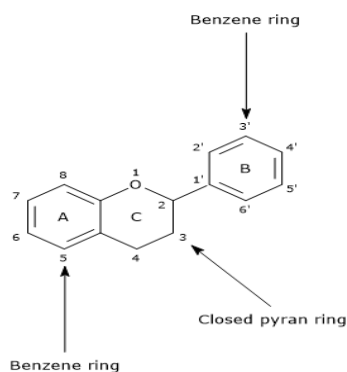
Common Phytochemicals Found in *Tridax procumbens*:

Flavonoids:

These are polyphenolic compounds with antioxidant properties. Flavonoids can protect cells from oxidative stress.

Example structure:

General flavonoid structure includes two benzene rings (A and B) connected by a three-carbon chain that forms a closed pyran ring (C).

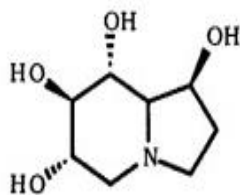


Alkaloids:

These nitrogen-containing compounds often have pharmacological effects such as anti-inflammatory and analgesic properties.

Example structure:

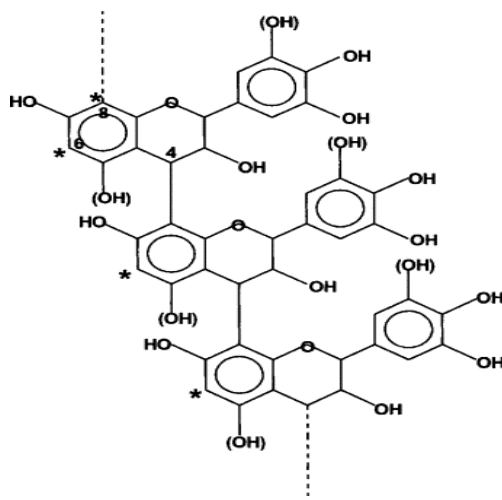
Alkaloids can vary significantly, but a common structural feature is the presence of nitrogen in a heterocyclic ring.



Tannins:

Tannins are polyphenolic compounds known for their antioxidant properties and ability to inhibit microbial growth.

Example structure:



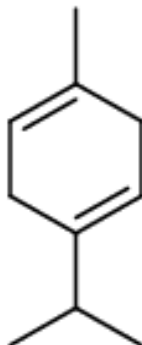
Tannins have complex structures, often featuring multiple hydroxyl groups attached to aromatic rings.

Terpenoids:

Terpenoids have diverse biological functions, including anti-inflammatory and antimicrobial effects. They are also responsible for the fragrance in plants.

Example structure:

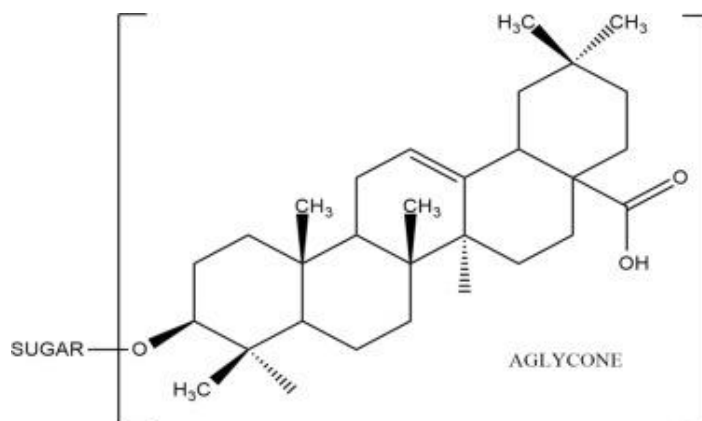
Terpenoids are made of isoprene units (C_5H_8)_n, leading to a vast array of structures, from simple to highly complex molecules.

**Saponins:**

These compounds are known for their surfactant properties and ability to boost the immune system.

Example structure:

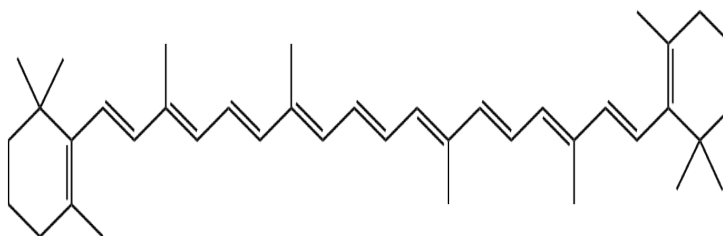
Saponins typically consist of a hydrophobic aglycone (triterpene or steroid) attached to a hydrophilic sugar chain.

**Carotenoids:**

These pigments are responsible for the bright yellow, orange, or red colors in plants and are powerful antioxidants.

Example structure:

Carotenoids are composed of isoprene units arranged to form a long chain, often with alternating single and double bonds (conjugated system).



Advantages:

1. Relieves symptoms: Effectively reduces pain, swelling, and itching associated with haemorrhoids and varicose veins.
2. Anti-inflammatory: Decreases inflammation and edema.
3. Improves circulation: Enhances venous tone and reduces blood stagnation.
4. Easy to apply: Topical application makes it convenient for patients.
5. Fast-acting: Provides quick relief from discomfort.

Disadvantages:

1. Local reactions: May cause skin irritation, redness, or allergic reactions.
2. Limited systemic absorption: May require repeated applications.
3. Interactions: Potential interactions with oral anticoagulants and antiplatelet medications.
4. Contraindications: Not recommended for pregnant or breastfeeding women, or those with severe kidney or liver impairment.
5. Dependence: Long-term use may lead to dependence on the medication.

Common side effects:

1. Skin rash
2. Pruritus (itching)
3. Erythema (redness)
4. Burning sensation

Rare side effects:

1. Hypersensitivity reactions
2. Anaphylaxis
3. Increased bleeding

Precautions:

1. Use as directed.
2. Avoid contact with eyes or mucous membranes.
3. Monitor for signs of skin irritation.
4. Consult a healthcare professional if symptoms persist or worsen.

Alternatives:

1. Witch hazel
2. Hydrocortisone cream
3. Sclerotherapy
4. Laser therapy

EXTRACTION PROCESS:

Tridax procumbens, commonly known as coat buttons or tridax daisy, is a plant widely used in traditional medicine for its therapeutic properties. The extraction process from this plant is aimed at isolating bioactive compounds, which have antioxidant, antimicrobial, anti-inflammatory, and wound-healing properties. The extraction methods can vary depending on the target compound, but commonly used techniques include:

1. Solvent Extraction:**Procedure:**

- Dry the leaves, stems, or flowers of *Tridax procumbens*.
- Grind the plant material into a fine powder.
- Soak the powder in solvents such as methanol, ethanol, chloroform, or water for a specific period (24-48 hours).
- Filter the extract using Whatman filter paper or a similar method.
- The solvent is evaporated using a rotary evaporator or under reduced pressure to obtain the concentrated extract.

Common Solvents:

- Ethanol: Used to extract flavonoids, alkaloids, and phenolic compounds.
- Methanol: Often employed to isolate polyphenols and other antioxidant compounds.
- Aqueous: For polar compounds like proteins and polysaccharides.

Soxhlet Extraction:

This method is suitable for extracting non-volatile and semi-volatile compounds.

Procedure:

- Dry and grind the plant material.
- Place the powder in a Soxhlet apparatus and use solvents like ethanol or methanol.
- The solvent continuously passes through the plant material, extracting the desired compounds over several hours.

Ultrasonic-Assisted Extraction:

This technique utilizes ultrasonic waves to enhance the extraction process by breaking cell walls, which releases the bioactive compounds more efficiently.

Procedure:

- Dry and grind the plant material.
- Mix the powder with a solvent (like ethanol or water) in a sonicator bath or probe.
- Sonicate for a specific time (e.g., 30-60 minutes), then filter and concentrate the extract.

Supercritical Fluid Extraction (SFE):

Supercritical carbon dioxide (CO₂) is used to extract non-polar bioactive compounds.

Procedure:

- The plant material is placed in a high-pressure chamber.
- Supercritical CO₂ acts as a solvent to extract oils and other non-polar compounds.
- This method is effective for preserving sensitive compounds, such as essential oils, with high purity.

Maceration:

This is a simpler method but takes longer.

Procedure:

- The plant material is soaked in a solvent (e.g., ethanol, methanol, or water) for days or weeks, allowing the compounds to diffuse into the solvent.
- Afterward, the solvent is filtered, and the remaining liquid is concentrated.

CONCLUSION:

Tridax procumbens, or coat buttons, is a versatile flowering plant from the Asteraceae family, recognized for its therapeutic potential despite being categorized as a noxious weed in some regions. Native to Central America, it is now widespread, particularly in tropical and subtropical areas. The plant exhibits a range of pharmacological properties, including anti-inflammatory, antibacterial, antioxidant, and wound-healing effects, largely attributed to its rich phytochemical profile, which includes flavonoids, alkaloids, and terpenoids. Traditional and modern medicine utilizes *T. procumbens* for various ailments, from wounds to diabetes. Its morphological characteristics include creeping stems and distinctive yellow and white flowers, while its rapid reproduction through achenes contributes to its invasive nature. Various extraction methods can isolate its bioactive compounds, enhancing its potential as a natural remedy. Future research could further elucidate its health benefits and applications in herbal medicine, emphasizing its importance as a valuable resource.

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