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# STUDY OF BIOACTIVE COMPOUNDS AND THEIR PHARMACOLOGICAL ACTIVITY IN HERBAL EXTRACT OF *TRIDAX PROCUMBENS*

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## ABSTRACT

*Tridax procumbens*, a widely distributed weed with traditional medicinal uses, has gained attention for its potential pharmacological applications due to the presence of bioactive compounds. The current study aimed to investigate the phytochemical constituents and evaluate the antioxidant activity of the hydroalcoholic extract of *Tridax procumbens*. The plant extract was obtained through maceration using a hydroalcoholic solvent system, yielding 7.2% w/w. Preliminary phytochemical screening revealed the presence of various secondary metabolites such as alkaloids, flavonoids, phenols, glycosides, saponins, diterpenes, and proteins, whereas carbohydrates, tannins, and sterols were absent. Quantitative estimations demonstrated the presence of significant amounts of total phenol (0.253 mg/100 mg) and flavonoid (0.653 mg/100 mg) content, which are known to contribute to antioxidant potential. The antioxidant activity was assessed using the DPPH free radical scavenging method, showing concentration-dependent inhibition with an $IC_{50}$ value of 234.70 µg/mL for the extract, compared to 14.56 µg/mL for the standard antioxidant ascorbic acid. Although the extract exhibited lower antioxidant activity than the standard, the results confirm the presence of potent bioactive compounds that could be explored further for their therapeutic benefits. This study supports the traditional use of *Tridax procumbens* and encourages further investigation into its pharmacological properties, particularly as a natural antioxidant source.

**Keywords:** *Tridax procumbens*, medicinal plant, hydroalcoholic extract, phytochemical analysis, antioxidant activity, DPPH assay, phenol content, flavonoids, free radical scavenging, $IC_{50}$ value.

## INTRODUCTION

The increasing global reliance on traditional herbal remedies underscores the urgent need to scientifically validate the pharmacological properties of medicinal plants. Among these, *Tridax procumbens* L., a common weed belonging to the family Asteraceae, has garnered considerable interest for its diverse therapeutic potential. Commonly known as "coat buttons," this plant is native to tropical regions and widely distributed throughout India. Traditionally, it has been employed in Ayurvedic medicine for treating wounds, infections, skin disorders, and inflammation (Patil *et al.*, 2012).

Phytochemical investigations have revealed that *T. procumbens* contains a rich profile of bioactive constituents such as flavonoids, alkaloids, carotenoids, terpenoids, tannins, sterols, and essential oils, which are believed

to contribute to its wide spectrum of biological activities (Sagar *et al.,* 2005). Among these, flavonoids like quercetin and luteolin are particularly known for their antioxidant, anti-inflammatory, hepatoprotective, antimicrobial, and anticancer effects (Gupta *et al.,* 2010).

Numerous studies have highlighted the pharmacological potential of *T. procumbens* extracts, including antimicrobial activity against gram-positive and gram-negative bacteria, anti-inflammatory and analgesic actions in animal models, and significant wound-healing efficacy due to enhanced collagen synthesis and fibroblast proliferation (Ravikumar *et al.,* 2011). Its hepatoprotective activity has been demonstrated in $CCl_4$-induced hepatotoxic models, suggesting its ability to scavenge free radicals and modulate liver enzyme activity (Panda *et al.,* 2009).

Given the rising concerns about antibiotic resistance and the side effects of synthetic drugs, there is a compelling rationale to explore and harness the therapeutic properties of T. procumbens as a natural alternative. This study aims to isolate and identify the major bioactive compounds present in the herbal extract of *T. procumbens* and evaluate their pharmacological activities through in vitro and *in vivo* assays.

## MATERIALS AND METHODS

### Selection and collection of plant material

The plant has been selected on its availability and folk use of the plant. Every parts of the plant like bark, leaves, flowers, roots, fruits and seeds may contain active secondary metabolites. Aerial part of *Tridax procumbens* were collected from ruler area of Bhopal (M.P.) in the month of March, 2025.

### Extraction procedure using maceration

Following procedure was adopted for the preparation of extract from the shade dried and powdered herbs (Mukherjee, 2007). Dried powdered (30 gm) of *Tridax procumbens* has been extracted with hydroalcoholic solvent (methanol: water; 80:20v/v) using maceration process for 48 hrs filtered and dried using vacuum evaporator at 40ºC.

### Determination of percentage yield

The extraction yield is evaluate of the solvent's efficiency to extracts bioactive components from the selected natural plant samples and it was defined as quantity of plant extracts recovered in mass after solvent extraction compared with the initial quantity of plant samples. After extraction, yield of the plant extracts obtained were calculated in grams and then converted it into percentage. Following formula was adopted for determination of percentage yield of selected plant materials. The percentage yield of each extract was calculated by using following formula:

$$\textbf{Percentage Yield} = \frac{Weight\ of\ Extract}{Weight\ of\ Powder\ drug\ taken} x\ 100$$

### Phytochemical screening

Medicinal plants are resources of traditional medicines and many of the modern medicines are produced indirectly from plants. Phytochemical constituents are of two type primary bioactive constituents (chlorophyll, proteins, amino acids, sugar etc.) and secondary bioactive constituents include (alkaloids, terpenoids, phenols, flavonoids etc.). Phytochemical examinations were carried out for all the extracts as per the standard methods (Kokate, 1994).

**Quantitative estimation of bioactive compounds**

**Total phenolic content estimation**

The total phenolic content of the extract was determined by the modified folin-ciocalteu method. 10 mg Gallic acid was dissolved in 10 ml methanol, various aliquots of 10-50µg/ml was prepared in methanol. 10 mg of dried extract was dissolved in 10 ml methanol and filter. Two ml (1mg/ml) of this extract was for the estimation of phenol. 2 ml of extract and each standard was mixed with 1 ml of folin-ciocalteu reagent (previously diluted with distilled water 1:10 v/v) and 1 ml (7.5g/l) of sodium carbonate. The mixture was vortexed for 15s and allowed to stand for 10min for colour development. The absorbance was measured at 765 nm using a spectrophotometer (Mishra *et al.,* 2017).

**Total flavonoids content estimation**

Determination of total flavonoids content was based on aluminium chloride method. 10 mg quercetin was dissolved in 10 ml methanol, and various aliquots of 10-50µg/ml were prepared in methanol. 10 mg of dried extract was dissolved in 10 ml methanol and filter. Three ml (1mg/ml) of this extract was for the estimation of flavonoids. 1 ml of 2% $AlCl_3$ solution was added to 3 ml of extract or each standard and allowed to stand for 15min at room temperature; absorbance was measured at 420 nm (Mishra *et al.,* 2017).

***In-vitro* antioxidant activity using DPPH method**

Total free radical scavenging capacity of extract from *Tridax procumbens* estimated according to the previously reported method with slight modification (Parkhe and Jain, 2018). Solution of DPPH (6 mg in 100ml methanol) was prepared and stored in dark place. Different concentration of standard and test (10- 100 µg/ml) was prepared. 1.5 ml of DPPH and 1.5 ml of each standard and test was taken in separate test tube; absorbance of this solution was taken immediately at 517nm. 1.5 ml of DPPH and 1.5 ml of the methanol was taken as control absorbance at 517nm.

The percentage inhibition of free radical DPPH was calculated from the following equation: % inhibition = [(absorbance of control - absorbance of sample)/absorbance of control] × 100%.

**RESULTS AND DISCUSSION**

The hydroalcoholic extraction of *Tridax procumbens* yielded a moderate percentage yield of 7.2% (w/w) (Table 1), indicating an appreciable recovery of phytoconstituents from the plant material. The extractive value reflects the solubility and abundance of bioactive compounds that can be extracted using a polar solvent system, supporting the use of hydroalcoholic solvent for maximum phytochemical extraction.

Phytochemical screening (Table 2) revealed the presence of several secondary metabolites in the hydroalcoholic extract. The extract tested positive for alkaloids, glycosides, flavonoids, saponins, phenols, proteins, and diterpenes, which are known to possess various pharmacological properties such as antioxidant, anti-inflammatory, and antimicrobial effects. However, the tests for carbohydrates, tannins, and sterols were negative. The presence of flavonoids and phenolic compounds is particularly noteworthy, as they contribute significantly to the antioxidant potential of herbal formulations.

Quantitative estimation (Table 3) further confirmed the richness of the extract in

polyphenolic compounds. The total phenolic content was found to be 0.253 mg/100 mg of dried extract, and the total flavonoid content was higher, at 0.653 mg/100 mg of dried extract. These compounds are well-documented for their ability to neutralize free radicals and reduce oxidative stress.

To assess antioxidant activity, a DPPH radical scavenging assay was performed (Table 4), comparing the extract's performance with that of standard ascorbic acid. The hydroalcoholic extract exhibited concentration-dependent scavenging activity, with maximum inhibition of 42.51% at 100 µg/mL**,** which was lower than ascorbic acid's 91.24% at the same concentration**.** The $IC_{50}$ value for the extract was 234.70 µg/mL**,** which is higher than that of ascorbic acid **(**14.56 µg/mL**),** indicating that while the extract possesses antioxidant potential, its efficacy is comparatively moderate.

In summary, the hydroalcoholic extract of *Tridax procumbens* demonstrated the presence of multiple bioactive constituents with appreciable antioxidant potential. The presence of flavonoids and phenolic compounds correlates with the observed antioxidant activity, although the extract was less potent than the standard. These findings support the traditional use of *T. procumbens* and provide a foundation for its further evaluation in pharmacological studies targeting oxidative stress-related disorders.

**Table 1: % Yield of *Tridax procumbens***

| S. No. | Extract | % Yield (w/w) |
|---|---|---|
| 1. | Hydroalcoholic | 7.2% |

**Table 2: Result of phytochemical screening of Hydroalcoholic extract of *Tridax procumbens***

| S. No. | Constituents | Hydroalcoholic extract |
|---|---|---|
| 1. | **Alkaloids**<br>Hager's Test: | <br>+Ve |
| 2. | **Glycosides**<br>Conc. $H_2SO_4$ Test | <br>+Ve |
| 3. | **Flavonoids**<br>Alkaline Reagent Test:<br>Lead acetate Test: | <br>+Ve<br>+Ve |
| 4. | **Saponins**<br>Froth Test: | <br>+Ve |
| 5. | **Phenol**<br>Ferric Chloride Test: | <br>+Ve |
| 6. | **Proteins**<br>Xanthoproteic Test: | <br>+Ve |
| 7. | **Carbohydrate**<br>Benedict's Test: | <br>-Ve |
| 8. | **Diterpenes** | |

| | | |
|---|---|---|
| | Copper acetate Test: | +Ve |
| 9. | **Tanins**<br>Gelatin Test | -Ve |
| 10. | **Sterols**<br>Salkowski Test | -Ve |

[+Ve= Positive; -Ve= Negative]

**Table 3: Estimation of total phenol and flavonoids content of Hydroalcoholic extract of *Tridax procumbens***

| S. No. | Total phenol content | Total flavonoids content |
|---|---|---|
| 1. | **mg/100mg of dried extract** | |
| | 0.253 | 0.653 |

**Table 4: % Inhibition of ascorbic acid and Hydroalcoholic extract of *Tridax procumbens* using DPPH method**

| S. No. | Concentration (µg/ml) | % Inhibition | |
|---|---|---|---|
| | | Ascorbic acid | Hydroalcoholic extract |
| 1 | 10 | 45.77 | 42.07 |
| 2 | 20 | 52.98 | 30.64 |
| 3 | 40 | 66.02 | 32.14 |
| 4 | 60 | 70.73 | 37.67 |
| 5 | 80 | 84.69 | 40.43 |
| 6 | 100 | 91.24 | 42.51 |
| **IC 50 value** | | **14.56** | **234.70** |

## CONCLUSION

The hydroalcoholic extract of *Tridax procumbens* showed good yield and was rich in phytochemicals like flavonoids, alkaloids, and phenols. It exhibited moderate antioxidant activity with an $IC_{50}$ of 234.70 µg/mL. These findings support its traditional medicinal use and highlight its potential for developing herbal antioxidant formulations.

## DECLARATION OF INTEREST

The authors declare no conflicts of interests. The authors alone are responsible for the content and writing of this article.

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