The Bioscan 20(1): S.I (2): 1-7, 2025 www.thebioscan.com
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES

Pharmacognostic Studies on leaves of *Triumfetta rotundifolia* LAM

Chavhan V. N. and P. Y. Bhogaonkar

Department of Botany, Art's, Commerce and Science College, Maregaon Dist. Yavatmal 445303, India

Ex-Director, Govt. Vidarbha Institute of Science and Humanities, Amravati. 444 604 India

Email- **chavhanvinod8@gmail.com**

DOI: 10.63001/tbs.2025.v20.i01.S.I (2).pp1-7

KEYWORDS
Triumfetta rotundifolia, Pharmacognosy, Anatomy, Phytochemical Analysis, Mineral Profile.

Received on:
16-01-2025

Accepted on:
21-02-2025

Published on:
02-04-2025

ABSTRACT

Triumfetta rotundifolia Lam. (Malvaceae) is annual, erect, woody and hairy, under shrub found on gravely soil and on wasteland. Leaves were found to be medicinally used by Banjara Tribe of Vidarbha Region (M.S.) on eye infection, typhoid and in post-delivery problems. Anatomical and phytochemical studies of leaves were carried out. The phytochemical analysis was conducted to examine 16 types of bioactive molecules. The investigation revealed the presence of β-naphthol, flavones, flavanol, leucoanthocyanin, tannin, triterpenoids, steroids, cardiac glycosides, and digitoxose. Additionally, ash analysis was performed to assess minerals such as chromium, sodium, iron, zinc, calcium, aluminum, magnesium, manganese, copper, nickel, and potassium, both qualitatively and quantitatively.

INTRODUCTION

Triumfetta rotundifolia Lam. (Malvaceae) is annual, erect, woody, hairy, under shrub found on gravely soil and on wasteland. Root decoction used in joint pain and infusion given in acidity in Nandurbar district (Tayade and Patil, 2005). Leaves were found to be medicinally used on eye infection, typhoid and in post delivery problems by Banjara Tribe of Vidarbha Region (Bhogaonkar and Chavhan, 2013). Branches are used in gonorrhoea (Sumitra Chanda et al., 2013). A paste made from bark, when mixed with hot milk, was internally administered for the treatment of urinary infections (Silija V. P. et al., 2008). Pastes made from the leaves were consumed with pepper to alleviate dyspepsia (Pandikumar et al., 2007); paste was also used for the treatment of severe cold, cough, pain, and rheumatic fever (Rajadurai M. et. al., 2009).

The leaves of the plant are applied topically to boils, and abscesses. Additionally, the plant is beneficial in treating colds and eyes diseases. The leaves exhibit antioxidant properties, demonstrating activities such as free radical scavenging, superoxide anion scavenging, and hydrogen peroxide scavenging (Sanilkumar and Kottai, 2013). The fruit extracts showed antimicrobial activity (Sumitra Chanda, 2011). Sanilkumar and Kottai, (2013) has reported the whole plant as a very good source of antioxidant in streptozotocin-induced diabetic rats.

Material and Methods:

The plant was brought to the laboratory for identification and processed to create herbarium specimens, which have been stored at the Department of Botany, Government Vidarbha Institute of Science and Humanities, Amravati. For identification standard floras were referred. Nomenclature is as per https://powo.science.kew.org/taxon. The anatomy of the leaf was examined by studying fresh hand-cut sections under a microscope. Detailed tissue studies were conducted, and microphotographs captured using a CCD camera to aid in the analysis. Detection of bioactive compounds was carried out using standard prescribed methods. (Gupta & Varshney 1997, Anonymous, 1966, Johanson 1940, Evans 1997, Peach and Tracey 1979, Gibbs 1974, Harborne 1973, Thimmaiah 1999, Sadasivam, and Manickam 2005). The responses of various tests were indicated by +, ++, and +++ sign; representing weak, moderate, and strong reactions, respectively. The plant ash was prepared, qualitative analysis was conducted to identify different minerals, and quantitative estimation was carried out using an Atomic Absorption Spectrophotometer.

Observations and Results

Morphology

Annual, erect, woody, hairy, undershrub, 30-50 cm tall. Leaves 1.5-4.5 x 1-4.5 cm, basal ones rhomboid-ovate, entire or 3-lobed, the upper leaves ovate-lanceolate, smaller, irregularly serrate, subacuminate, scabride hairy above, stellate tomentose beneath; petioles 2 - 30 mm long, pubescent; stipules are lanceolate, 2 - 3 mm long, ciliate. Flowers are 3 - 4 mm across, in leaf-opposed fascicles, arranged along terminal racemes; pedicels 2-3 mm long, hairy. Sepals hooded and horned at apex, four mm long, linear. Petals yellow oblanceolate, 3 mm long. Stamens are 5 - 6, distinct, filaments 2 - 3 mm long, yellow. Ovary pilose, globose; stigma bifid. Fruits 4-5 mm across, ovoid, echinate with straight spines which are hairy; seeds 4, pale brown, smooth, trigonous. Fls. and Frts.– September to October.

Anatomy:

Node trilacunar, 3 trace. Lateral traces branching to supply vasculature to the stipule.

Petiole receives three vascular bundles. It was observed that in some plants lateral bundles divide to form 5 bundles which get arranged in a ring; while in some only 3 bundles continue throughout the petiole. Vascular bundles capped on both sides by thick-walled cells; cap being more prominent on phloem side. At the base of lamina bundles come closer and are displaced more to the centre forming a ring of closely placed bundles with narrow medulla. In the medullary region large, lysigenous mucilage canals present. Ground tissue parenchymatous with sphaeraphides here and there. Hypodermis collenchymatous, 4-5 layered.

Lamina amphistomatous. Cells of upper epidermis much larger than the lower; cells of both epidermis shallowly sinuate, containing brownish pigment. Lower leaf surface with distinct grooves and ridges; stomata confined to the grooves, diacytic. Mesophyll homogeneous, consisting of all elongated palisade like cells; however, cells towards lower surface becoming somewhat shorter. In the region of ridges, mesophyll gets interrupted by large, thin-walled, non-chlorophyllose cells and large mucilage canals; in the region of grooves also, mesophyll gets interrupted by large air chambers; usually a single chamber runs from lower surface to upper surface.

Midrib with single 'C' shaped vascular bundle. Ground tissue parenchymatous embedded with few large mucilage canals; one large mucilage canal present opposite the vasculature.

Trichomes dense on lower lamina surface, mostly confined to the ridges, few on upper surface; stelate as well as unicellular simple and glandular. Glands few, shortly stalked, unicellular with distinct opening.

Phytochemistry:

Leaf tissue was screened for 16 bioactive compounds. Leaves were found to contain ß-naphthol (++), flavanol (++), flavones (++), flavonol (++), leucoanthocyanins (+), tannins (+), steroids (++), triterpenoids (+), cardiac glycosides (++) and digitoxose (+); while alkaloid, anthraquinones, anthracene glycosides, iridoids, flavanones, flavanonols, saponins, fatty acids, unsaturated steroid, emodins, polyoses and polyurenoids were found to be absent. The different values of ash obtained which are shown in the Table 1. The qualitative analysis revealed the presences of 14 minerals, out of which 12 were quantitatively measured (Table 2).

Phytochemical Profile:

Ash Analysis

Table 1: Ash values per gm dry tissue

a.	Ash yield from dry tissue	92.5 mg/gm
b.	Water soluble ash	26%
c.	Water insoluble ash	74%
d.	Acid soluble ash	76.4%
e.	Acid insoluble ash	23.6%
f.	Sulphated ash	66%

Table 2: Mineral Profile

S. N.	Mineral	Qualitative Estimation	Quantitative Estimation Dry Weight per 100 gm
a.	Sodium	+	67.815 mg/100gm
b.	Potassium	+++	187.589mg/100gm
c.	Calcium	+	28.656 mg/100gm
d.	Phosphorus	+	26.577 mg/100gm
e.	Iron - Test a - Test b -	++ ++	122.686 mg/100gm
f.	Sulphur	+	-----
g.	Magnesium	+	61.250 mg/100gm
h.	Chlorine	+++	-----
i.	Aluminum	+++	326.201 mg/100gm
j.	Manganese	+	4.345 mg/100gm
k.	Copper	+	0.933 mg/100gm
l.	Nickel	-	Absent
m.	Chromium	-	Absent
n.	Zinc	+	4.738 mg/100gm

DISCUSSION AND CONCLUSION

Petiole vasculature of Malvaceae is very variable. **Triumfetta rotundifolia** exhibits a simple vasculature consisting of a ring of 3 or 5 bundles. Anomocytic stomata are recorded earlier for the family, however, here diacytic stomata were observed. Homogeneous mesophyll consisting wholly of palisade cells is in confirmation with the family character, but lower surface with prominent grooves and ridges is being reported for the first time. Presence of mucilage canals in midrib is earlier recorded for *Grewia polygama*. Various types of crystals reported for family; spearaphides were found to be present from *T. rotundifolia* leaves.

T. rotundifolia leaves examined in this study were found to contain triterpenoids, ß-naphthol, steroids, flavanols, flavones, tannin, leucoanthocyanin and cardenolides. The plant is used against eye infection, typhoid and in post delivery problems which arise because of unhygienic condition. Presence of flavonoids makes it antibacterial, antifungal and antiviral.

The ß-naphthol has various roles, including serving as an antinematodal drug, a genotoxin, a human xenobiotic metabolite, a human urinary metabolite, a mouse metabolite, and a radical scavenger. (https://pubchem.ncbi.nlm.nih.gov/compound).

A dietary supplement rich in flavanols, when given to elderly adults, was found to increase activity in brain regions linked to age-related cognitive decline (specifically, the dentate gyrus, as

assessed by functional MRI) and to enhance performance in cognitive tests (Brickman et al., 2014).

Tannins have been reported to have various physiological effects, including accelerating blood clotting, reducing serum lipid levels, lowering blood pressure, modulating immune responses, and causing liver necrosis (https://pubmed.ncbi.nlm.nih.gov/9759559/).

Steroids play a critical role in growth, development, reproduction, and sexual differentiation (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5838783/).

Triterpenes show promise as agents for preventing diabetic complications. They exhibit strong antioxidant activity and can inhibit the formation of advanced glycation end products, which are implicated in the development of diabetic nephropathy, neuropathy, embryopathy, or impaired wound healing. (https://www.ncbi.nlm.nih.gov/pmc/articles/).

Cardenolide saponins are a group of compounds that include important cardiac glycosides used in the treatment of abnormal heart rhythms and heart failure (https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecularbiology/cardenolide)

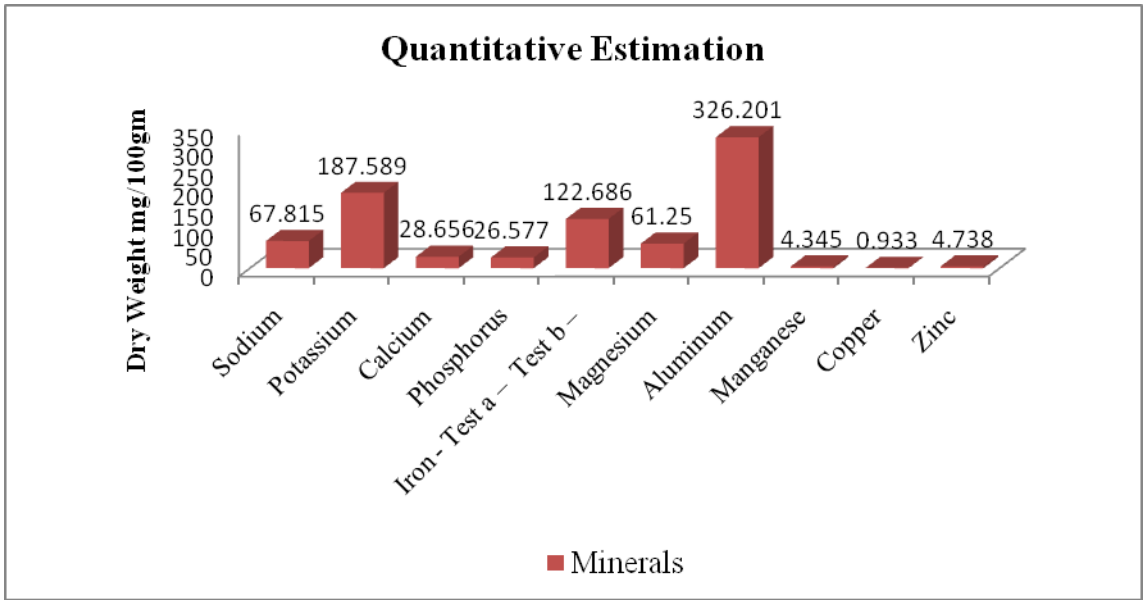
Ash values provide important pharmacognostic character. Different ash values for *T. rotundifolia* leaves are shown in Table 1. Minerals have numerous essential functions in maintaining overall body health. During present work 14 minerals were studied out of which 10 were quantitatively estimated (Table 2). As far as mineral profile is concerned out of ten minerals estimated quantitatively, seven are present in maximum concentration in *Triumfetta*. Aluminum content was found to be highest (326.201mg/100 gm).

Aluminum is known to be highly neurotoxic and can have detrimental effects on both prenatal and postnatal brain development in humans as well as in experimental animals (Yumoto et al., 2001). During youth, the brain could be the organ most sensitive to aluminum exposure. **The precaution has taken that, leaves are not given to New born babies.**

Potassium content

was found to be highest (187.589mg/100 gm). It is especially important in regulating the activity of muscles and nerves (Groff et.al, 1995). This also supports the antirheumatic use of the plant. Iron content of the leaves is also good (122.686mg/100gm). Magnesium content is also found in good amount (61.250 mg/100gm).

Magnesium is vital for the body, participating in over 300 biochemical reactions. It helps maintain normal nerve and muscle function, promotes strong bones, supports a healthy immune system, and regulates heartbeat rhythm. Additionally, magnesium helps to adjust blood glucose levels, contributes to the production of energy and assists in protein synthesis. (https://medlineplus.gov/ency/article/00242).



REFERENCES

- Anonymous, 1948. *The Wealth of India* – Raw Materials. Vol. I A 2003 (Rpr.), Supplement A – Ci 2000, Vol. II – B 1988, Supplement Cl – Cy 2004 (Rpr.), Vol. III Ca - Ci 1992, Vol.IV F – G 2002 (Rpr.), Vol.V H – K-1959, Supplement R – Z 2004, Vol. VII N – Pe 2001(Rpr.), Vol. VIII Ph – Re 2003 (Rpr.) Council of Scientific and Industrial Research. New Delhi.
- Bhogaonkar P. Y. and V. N. Chavhan. Traditional Banjara Herbal Medicine of Vidarbha, M.S., India. *Lap Lambert Academic Publishing*, Germany, 2013.
- Cowan M.M., 2009. Clinical Microbiology Revisions; 14: 564-584.
- Evans W. C., 1997. *Trease and Evans Pharmacognosy*. 14th Edn. W. B. Saunders Company Limited, Singapore.
- Gibbs R. D. 1974. *Chemotaxonomy of Flowering Plants*. Mc Gill Queen's University Press. Montreal.
- Gupta A. K. and M. L. Varshney, 1997 (IInd Edn.). *Practical Manual on Agricultural Chemistry*, Kalyani Publishers, New Delhi.
- Harborne J. B., 1973. *Phytochemical Methods*. Chapman and Hall Limited, London.
- Johanson D. A., 1940. *Plant Microtechnique*. Tata Mc-Grawhill Publishing Company, Ltd. New Delhi.
- Pandikumar P, Ayyanar M and Ignacimuthu S, 2007. Indian J Trad Knowledge; 6: 579-82.
- Peach K. and M. V. Tracey, 1979. *Modern methods of plant analysis*. (Rep. Edn.) Vol.I-VII. Narosa Publication, New Delhi.
- Rajadurai M, Vidhya VG, Ramya M and Bhaskar A, 2009. Indian J Ethnobiol Ethnomed; 3: 39-41.
- Sadasivam S. and A. Manickam, 2005. *Biochemical Methods*. IInd Edition. New Age International (P) Limited, Publishers. New Delhi.
- Sanilkumar R. and Kottai M. A., 2013. Evaluation of *in-vivo* Antioxidant Activity of Methanolic Extract of *Triumfetta rotundifolia (Linn.)* on Streptozotocin induced Oxidative stress in Wistar Rats. *Journal of Pharmaceutical Sciences & Researches* Vol. 5 (12): 249 - 253
- Sanilkumar R. and Kottai M. A., 2013. *In Vitro* Antioxidant Activities of Methanolic Extract of *Triumfetta rotundifolia* (Linn.) Family (Tiliaceae).

Research Journal of Pharmaceutical, Biological and Chemical Sciences, Vol. 4 (2): 1499-1506.

- Silija VP, SamithaVarma K and Mohanan KV, 2008. Indian J Trad Knowledge; 7: 612-14.
- Sumitra Chanda, Dilip Bhayani and Dishant Desai, 2013. "Polyphenols and Flavonoids of Twelve Indian Medicinal Plants". *The Bioscan: an International Quarterly Journal of Life Sciences*, vol. 8(2): 595-601.
- Sumitra Chanda, Mital Kaneria and Yogesh Kumar Vaghasiya, 2011. "Evaluation of antimicrobial potential of some Indian medicinal plants against some pathogenic microbes." *Indian Journal of Natural Products and Resources*, Vol. 2(2): 225-228.
- Tayade S. K. and D. A. Patil, 2005. Ethnomedicinal wisdoms of tribals of Nandurbar district (Maharashtra). *Natural Product Radiance*, Vol. 5(1): 64-69.
- Thimmaiah S. R., 1999. *Standard Methods of Biochemical analysis*. Kalyani Publishers. New Delhi.
- Brickman, A., Khan, U., Provenzano, F., Yeung L., Suzuki W., Schroeter H., Wall M., Sloan R. and Scott A Small, 2014. "Enhancing dentate gyrus function with dietary flavanols improves cognition in older adults". *Nature Neuroscience* 17, 1798–1803.

Some website Referred

1. (https://pubchem.ncbi.nlm.nih.gov/compound)
2. (https://pubmed.ncbi.nlm.nih.gov/9759559/)
3. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5838783/)
4. (https://www.ncbi.nlm.nih.gov/pmc/articles/)
5. (https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecularbiology/ cardenolide)
6. (https://medlineplus.gov/ency/article/00242)

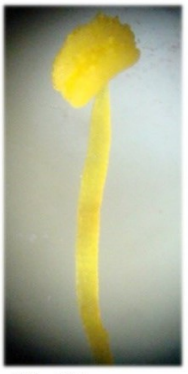
Plate I

Triumfetta rotundifolia Lam.

A. Habit

B. Leaf

C. Flower



D. Stamen

E. Gyneocium

F. Fruit

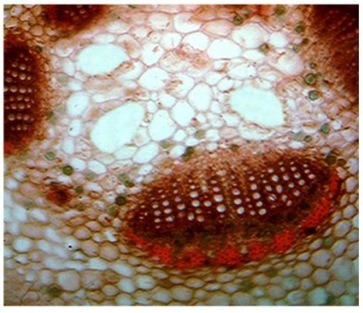
Plate II

Triumfetta rotundifolia Lam.

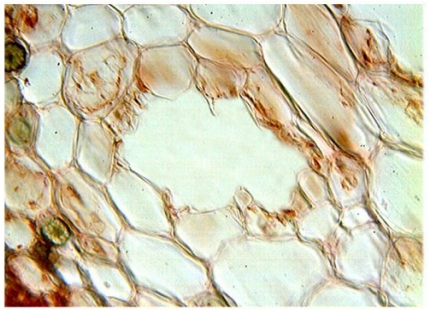
Leaf

1. T.S. Leaf base

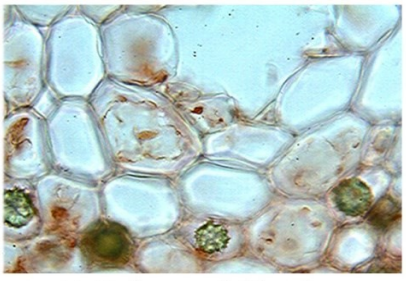
2. Single V. B.



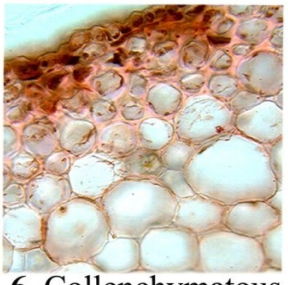
3. Mucilage canals



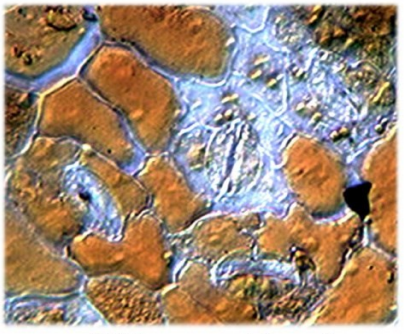
4. Single mucilage canal



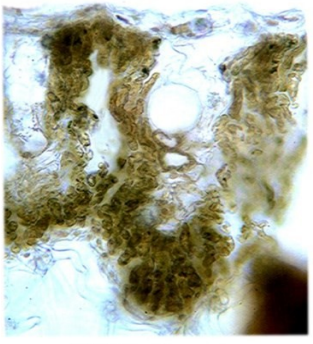
5. Sphaeraphides in ground tissue



6. Collenchymatous hypodermis



7.Upper epidermis with single stroma

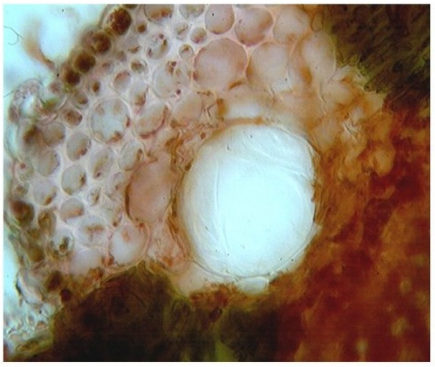


8.T.S. Lamina

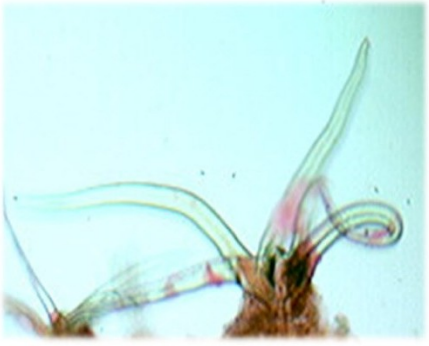
Plate III

Triumfetta rotundifolia Lam.
Leaf

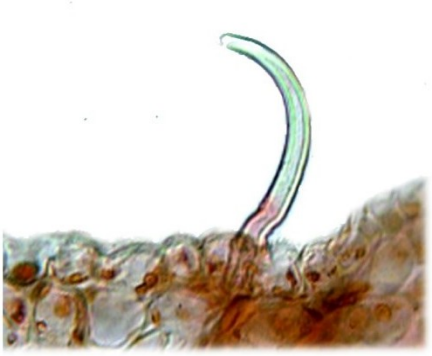
9. T.S. Midrib



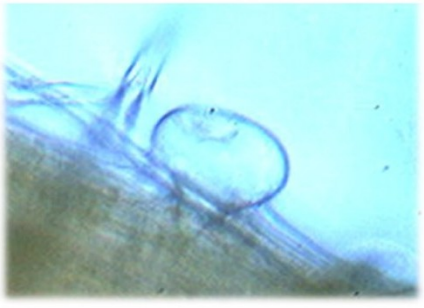
10. Mucilage Canal in Midrib



11. Stellate Trichome



12. Simple Trichome



13. a.

13. b.

13. Glandular Trichomes