

IN VITRO ASSESSMENT OF ANTIOXIDANT ACTIVITY OF ETHANOLIC ROOT EXTRACT OF *ABUTILON CRISPUM*

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Article Received: 21 February 2026 | Article Revised: 14 March 2026 | Article Accepted: 3 April 2026

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DOI: <https://doi.org/10.5281/zenodo.19592952>

How to cite this Article: Dr. R. Thiruvengatasubramaniam, T. Jothika, R. Kalamani, R. S. Kamalesh, S. Kamali, Dr. B. Sangameswaran (2026) IN VITRO ASSESSMENT OF ANTIOXIDANT ACTIVITY OF ETHANOLIC ROOT EXTRACT OF *ABUTILON CRISPUM*. World Journal of Pharmaceutical Science and Research, 5(4), 547-554.



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ABSTRACT

The present study was aimed to evaluate the in vitro antioxidant activity of ethanolic root extract of *Abutilon crispum*. The roots were collected, authenticated, shade dried, powdered and extracted using ethanol by maceration extraction method. Antioxidant activity was assessed using the DPPH radical scavenging assay. The extract exhibited concentration- dependent antioxidant activity. The IC₅₀ value of the extract was found to be 352.88 µg/mL, indicating moderate antioxidant potential when compared to the standard ascorbic acid (IC₅₀: 36.05 µg/mL). The activity may be attributed to the presence of bioactive phytoconstituents such as flavonoids and phenolic compounds. This study provides scientific evidence supporting the traditional use of *Abutilon crispum* managing oxidative stress.

KEYWORDS: *Abutilon crispum*, DPPH assay, Antioxidant, IC₅₀.

1. INTRODUCTION

Herbal medicine is the oldest forms of healthcare known to mankind. Herbs have been employed by every society throughout history. It was an essential component of the evolution of modern civilization. The plant and its parts are the vital source which supplies nutrients, clothes, shelter and drugs. Most of the medicinal usage of plants appears to have evolved from observation and application in animals by trial and error. Over time, each tribe expanded its knowledge base to include the medical properties of the herbs in their area. Many medications available today are of herbal origin. Herbal medications are used in a wide range of medical applications, including the treatment for common colds to cancer. The herbal medicinal lore was passed down from generation to generation through word of mouth.^[2]

Antioxidants are chemicals that prevent oxidation. Oxidation is a chemical reaction that can produce free radicals, resulting in chain reactions that can harm cells in organisms. In laboratory trials, antioxidant molecules have been found to reduce oxidative stress. However, it is debatable if taking excessive doses of antioxidants in supplement form is beneficial to one's health. There is also some concern that taking antioxidant supplements in large doses could be dangerous. Fruits and vegetables are antioxidant-rich foods. No concerns have been raised about the safety of any number of antioxidants in food.

Antioxidants are commonly mentioned in discussions about maintaining good health and preventing disease. These strong chemicals, which are primarily found in fresh fruits and vegetables, inhibit the oxidation of other molecules in the body. Antioxidants are extremely beneficial to good health because if free radicals are not challenged, they can cause a variety of ailments and chronic diseases.

The human body naturally manufactures free radicals and antioxidants to combat their harmful effects. However, in most circumstances, free radicals significantly outnumber natural antioxidants. To maintain the equilibrium, a constant supply of exogenous oxidants is required in order to reap the full benefits of antioxidants. Antioxidants protect the body by neutralizing and eliminating free radicals from the bloodstream. Nature contains a diverse range of antioxidants, and because of this, different antioxidants help different sections of the body. For example, beta-carotene is highly useful for eye health; lycopene is beneficial for helping preserve prostate health; flavonoids are especially beneficial for heart health; and proanthocyanins are beneficial for urinary tract health.

Abutilon crispum (Linn) belonging to family **Malvaceae** is trailing, weak, sub shrub the stems flexuous, stellate-pubescent. The plant is used in the traditional system of medicine. The leaves are used to cure asthma, piles, ulcers, cough, jaundice and diabetics by tribal people of South Indians and fruits are used in the treatment of piles in Tamil Nadu. The various parts of the plant are reported to have numerous medicinal uses, the author has taken up the plant *Abutilon crispum* to give scientific evidence and so was evaluated for antioxidant activity.

SCIENTIFIC CLASSIFICATION OF *Abutilon crispum*



Figure 1: (*Abutilon crispum* plant).

Kingdom: Plantae

Clade: Tracheophytes

Clade: Angiosperms

Clade: Eudicots

Clade: Rosids

Order: Malvales

Family: Malvaceae

Genus: Herissantia

Species: *H. crispa*

Binomial name: *Herissantia crispa* (L)

Brizicky synonyms: *Abutilon crispum*, *Gayoides crispum*.

2. MATERIALS AND METHODS

2.1 Identification, collection and authentication of the selected plant

The plant material was authenticated by **Dr. P. RADHA Research Officer (botany) Sci II & I/c; Siddha Medicinal Plants Garden / Mettur Dam, Tamil Nadu-636401** Authentication Number: **A250825082C**.

2.2 Procurement of plant materials

For the present investigation, *Abutilon crispum* plants were collected from **EDAPPADI**. Fresh roots were washed with water and dried at room temperature, powdered with laboratory mixer, sieved and further studies were performed.

2.3 Prepration of Extract

The air-dried powdered root of *Abutilon crispum* were extracted with ethanol by maceration process.

3. Evaluate the antioxidant potential: DPPH radical scavenging assay

The radical scavenging activity of different samples was determined by using DPPH assay according to Changet al [2001]. The decrease in the absorption of the DPPH solution after the addition of an antioxidant was measured at 517nm. Ascorbic acid (10 mg/ml in DMSO) was used as reference.

Principle

1,1-diphenyl-2-picryl hydrazyl is a stable free radical with pink colour which turns yellow when scavenged. The DPPH assay uses this character to show free radical scavenging activity. The scavenging reaction between (DPPH) and an antioxidant (H-A) can be written as,



Antioxidant react with DPPH and reduce it to DPPH-H and as consequence the absorbance decreases. The degree of discoloration indicates the scavenging potential of the antioxidant compounds or extracts in terms of hydrogen donating ability.

Reagent Prepration

0.1mm DPPH solution was prepared by dissolving 4 mg of DPPH in 100 ml of methanol.

Procedure

Different concentration of sample and standard such as 12.5µg/mL- 200µg/mL from stock solution were prepared. It was then made up to a final volume of 20µl with DMSO. Following the addition of 1.48ml DPPH (0.1mM) solution, the reaction mixture was incubated in dark at room temperature for 20 minutes. Similarly, a control with an equivalent amount of DMSO was taken in place of test compound. After 20 minutes, the absorbance of the mixture was read at 517nm (SHIMADZU(UV-1900i) UV-VIS spectrophotometer).^[28]

Calculation

$$\text{Percentage of inhibition} = \frac{\text{control-test}}{\text{control}} \times 100$$

4. RESULTS AND DISCUSSION**4.1 Collection and authentication and extraction of *Abutilon crispum* (L.) extract**

The plant material was carefully collected from its natural habitat in Edappadi Tamil Nadu, ensuring that the collected specimens were healthy, undamaged and free from disease. The botanical of the plant was rigorously authenticated by Dr.P. Radha, an expert taxonomist affiliated with the siddha medicinal plants garden, central council for research in siddha (CCRS), ministry of Ayush, Tamil Nadu. The deposition of a voucher specimen (A250825082C) adds scientific validity to the study by ensuring future traceability and reproducibility. Once, authenticated, the roots were shade-dried under ambient conditions (25-30°C) for 10-15 days to prevent degradation of thermolabile constituents, a crucial step in maintaining the chemical integrity of plant material.

Post drying, the roots were pulverized into a coarse powder to increase the surface area for solvent interaction. The maceration process was carried out by soaking 89.1gm of this powder in 1litre of ethanol. Maceration was intentionally chosen over more aggressive techniques to preserve delicate compounds that could degrade under high temperatures or mechanical stress. Ethanol was selected as a solvent due to its well-established ability to extract a wide polarity range of phytoconstituents while remaining safe for human use and compatible with the traditionally medicine systems like siddha and ayurveda. The intermittent shaking during maceration helped maintain dynamic equilibrium and promoted the dissolution of active compounds into the solvent. After extraction, the solution was filtered using Whatman No:1 filter paper the filtrate was concentrated and a stable extract is suitable for storage and further pharmacological investigations.

The evaluated yield of 12.16% signifies an efficient extraction process and reflex the abundance of extractable metabolites in *abutilon crispum* root. This high extractive value suggest that the root of *abutilon crispum* is which in ethanol soluble phytochemicals such as flavonoids, alkaloids, tannins, phenolics, glycosides and saponins compounds typically associated with a broad range of pharmacological activities. It ensures that a relatively small amount of raw material can produce sufficient extract for bioassays, standardization studies, and potential formulation development. Additionally, such a high extractive value reduces the environment foot print and resource demand for scaling up the production.in the broader context.

This outcome highlights *abutilon crispum* has a promising source of bioactive compounds and supports its traditional use in ethnomedicine. The result validates the methodological rigor of the extraction protocol and provide a strong foundation for subsequent analyses, including phytochemical screening (to identify major constituents like flavonoids, saponins, sterols, etc.), biological activity testing (eg: anti- inflammatory and analgesics assays) and chromatographic profiling. Furthermore, the success of this extraction process contributes to the standardization of abutilon crispum as a phytotherapeutic agent, which is essential for its integration into evidence-based complementary medicine.^[29]

5. IN- VITRO ANTIOXIDANTAL ACTIVITY

5.1 In- vitro DPPH radical scavenging assay

The anti-oxidant activity of the sample extract (*Abutilon crispum*) was evaluated using the DPPH radical scavenging method. Ascorbic acid was used as standard antioxidant for comparison. The percentage inhibition value for different concentrations (12.5-200 $\mu\text{g/ml}$) of both standard and the sample were calculated from the absorbance readings.

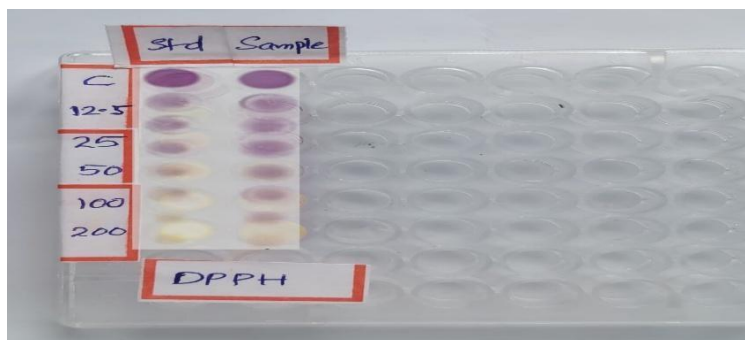


Figure 2: DPPH free radical scavenging assay performed using standard and sample at different concentrations (12.5-200 $\mu\text{g/mL}$).

6. RESULTS

Table 1: DPPH radical scavenging activity of standard (ascorbic acid) and sample (*Abutilon crispum*)

Concentrations ($\mu\text{g/mL}$)	Absorbance	Percentage of Inhibition (%)
Control	0.639	0.0000
Standard- Ascorbic acid		
12.5	0.485	24.1002
25	0.362	43.3490
50	0.241	62.2848
100	0.129	79.8122
200	0.054	91.5493
SampleCode-Abutilon Crispum		
12.5	0.584	8.6072
25	0.532	16.7449
50	0.489	23.4742
100	0.451	29.4210
200	0.399	37.5587

- IC 50 Value: standard – Ascorbic acid-36.0529 $\mu\text{g/MI}$ (Calculated using ED 50 PLUS V1.0 Software)
- IC 50 Value: Sample- Abutilon Crispum- 352.8846 $\mu\text{g/mL}$ (Calculated using ED 50 PLUS V1.0 Software)

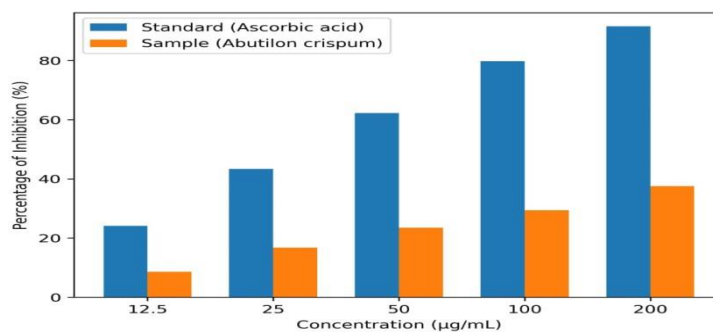


Figure 3: DPPH radical scavenging activity of standard (Ascorbic acid) and sample (Abutilon crispum).

7. DISCUSSION

At the lowest concentration of 12.5µg/ml, the standard ascorbic acid showed 24.10% inhibition, which steadily increased to 91.54% at 200µg/ml. This clearly demonstrates the strong antioxidant nature of ascorbic acid.

The ethanolic extracts of *abutilon crispum* also exhibited dose-dependent free radical scavenging activity, beginning with 8.60% inhibition at 12.5µg/ml and reaching 37.55% at 200µg/ml. although the activity is lower compare to the standard, the consistent increase with increasing concentration indicates the presence of antioxidant phytochemicals in the extract.

The mechanism of DPPH inhibition is based on the reduction of DPPH radical (a stable free radical with a deep violet color) in the presence of an antioxidant. Upon interaction with antioxidant compounds, the DPPH radical accepts an electron a hydrogen atom and gets reduced to yellow colored diphenyl picrylhydrazine, resulting in a decreasing absorbance. The degree of discoloration reflexes the scavenging potential of the test sample.

The IC₅₀ value of 352.88µg/ml obtained for the *abutilon crispum* extract is higher than that standard ascorbic acid (36.05µg/ml). Although the extract source lower potency compared to the standard, the IC₅₀ value still contains that the plant possesses moderate antioxidant activity. This activity may be attributed to the presence of flavonoids, phenolic compounds and other phytochemicals reported in *abutilon crispum*.

These bioactive constituents are well known for the ability to donate hydrogen atoms or electrons to stabilize free radicals, thereby preventing oxidative damage through resonance stabilization mechanisms. The absorbed antioxidant potential of *abutilon crispum* supports its traditional uses and suggest its possible therapeutic application in preventing oxidative stress relative disorders such as cardiovascular diseases, neuro degenerative conditions and inflammations. a foundation for further investigations, including bioassay- guided fractionation to isolate the most active constituents and structure- activity relationship (SAR) studies to better understand the inhibitory mechanism.

8. SUMMARY AND CONCLUSION

Medicinal plants are widely explored as safer alternatives to synthetic drugs due to their antioxidant potential. *Abutilon crispum* is a traditionally used medicinal plant, but scientific validation of its pharmacological is still emerging this activity is limited.

The present study focuses on the in vitro evaluation of antioxidant activity of the ethanolic root extract of *Abutilon crispum*. The roots were extracted using ethanol to obtain phytoconstituents such as flavonoids, phenolic, tannis, and alkaloids. Antioxidant activity was assessed using standard in vitro assays such as DPPH radical scavenging and hydrogen peroxide scavenging methods.

The result demonstrated that the ethanolic root extract showed significant antioxidant activity by effectively scavenging free radicals. These findings posse. These finding support the traditional use of *Abutilon crispum* in the management of oxidative stress-related disorders.

The present in vitro study concludes that the ethanolic root extract of *Abutilon crispum* possesses promising antioxidant activity. The observed pharmacological effects may be attributed to the presence of bioactive phytochemicals, particularly phenolic compounds and flavonoids.

The observed antioxidant potential indicates that the plant may help plant's ability to reduce oxidative stress. Overall, *Abutilon crispum* can be considered a potential natural source for the development of antioxidant agents. However, further in vivo studies, toxicity evaluation, and isolation of active compounds are necessary to confirm its therapeutic efficacy and safety.

9. REFERENCES

1. Ansari, Essential of pharmacognosy, second edition, Birla publication, 575-596.
2. Patwardhan, B, A.D.B. Vaidya and M. Chorghade, Curr.Sci, 2004; 86: 789-799.
3. Balick M.J, Cox, P.A.R., The science of ethanobotany, Scientific American Library, New York USA, 219, 1996.
4. Krishnaraju, A.V., T.V.N. Rao, D. Sundararaju, M. Vanisree, H.S. Tsay. and G.V. Subbaraju, International of applied science and engineering, 2005; 3(2): 125-134.
5. Laloo RC, Kharlukhi L, Jeeva S and Mishra B P, current science, 2006; 90: 225-232.
6. The Wealth of Inb-An Encyclonpedia of India Raw Material Resources.
7. Fransworth N. R and Morris R W. (1976). Higher plants: the sleeping giant of drug development.Am.J.pharm.46.
8. Duraipandiyan V, Ayyanar M, Ignacimuthu S., BMC Comp.Alt.Med., 2006; 6: 35-41.
9. Dimayuga RE and Garcia SK., J. Ethnopharmacol, 1991; 31: 181-182.
10. Pamplona-Roger G.D, Encyclonpedia of Medicinal plants vol.1 and 2, Education & Health. Library, The European union, U.K., 1999; 128-150.
11. World Health Organization (WHO). National Policy on Traditional Medicine and Regulation of Herbal Medicines. Geneva: 2005. Report of WHO global survey.
12. False tenets of paraherbalism. Varro E. Tyler (31 Aug 1999). Quackwatch. Retrived 29 October 2016.
13. Presering Ayurvedic herbal formulations by vaidays. Kala Chandra Prakash (jan 2006).
14. Guidelines for the appropriate use of herbal medicines (page 1-5) by World Health Organization Regional office for the western pacific. Manila (1998).
15. De Smet PAGM, Should herbal medicines-like product be licensed as medicines? BMJ, 1995; 310: 1023-4.
16. Chattopadhyay MK, Herbal medicines- some more reports. Current Science, 1997; 72: 6.
17. Vickers A and Zollman C, ABC of complementary medicine: herbal medicine B9MJ, 1999; 319: 1050-3.
18. Tyler VE, Phytomedicine: Back to the Future. J Nat Prod, 1999; 62: 1589-1592.
19. Lele RD, Ayurveda (Ancient Indian System of Medicine) and modern molecular medicine. J Assoc Physicians India, 1999; 47: 625-8.
20. Kamboj VP, Herbal Medicine. Current Science, 2000; 78: 35-9.
21. Sukanya MK, Shimi, Aruna SR. Phytochemical Analysis Antimicrobial careening and Anthelmintic properties of Phyllanthusemblica. International Journal of Pharma and Bio Sciences, 2013; 4(4): 55-64.
22. Bhandari PR, Kamdol MA. Emblicaofficinalis (Amla): A review of potential therapeutic applications, 2012; 6(4): 257-269.
23. NAIK B.et al., Noval drug delivery system: potential in improving topical delivery of antiacne agents. Skin Pharmacol physiol, 2006; 19(1): 2-16.
24. Debjit Bhowmik, et al., Recent advances in novel topical delivery system journal, 2012; 1(9).
25. Sreedevi Adikay et al., In vitro antioxidant studies of ethanol extract of roots of *Abutilon indicum*. Annals of Plant Sciences (2013).

26. Sunil et al., Phytochemical analysis and antioxidant evaluation of the ethanolic Extract of the leaves of *Abutilon indicum*. *Cureus*, 2023; 15(10): e47703 (2023). DOI:10.7759/cureus.47703.
27. Kuchi Manjeera, R., et al., In vitro antioxidant and antidiabetic activities of *Abutilon crispum* and *Ficus dalhousiae*. *Journal of applied Pharmaceutical sciences*, 2023; 13(1): 123-131.
28. Chang ST, Wu JH, Wang SY, Kang PL, Yang NS, Shyur LF. Antioxidant activity of extracts from *Acacia confuses* bark and heartwood. *J Agric Food Chem*, 2001; 49: 3420-3424.
29. Morata A, Gonzalez C, Tesfaye W, Loira I, Suarez-Lepe JA. Maceration and fermentation: New technologies to increase extraction. In: *Red Wine Technology*. Academic Press; 2019; 35-49.
30. Sebaugh, J. L., Guidelince for accurate EC50/IC50 estimation. *Pharmaceutical Statistics*, 2011; 10(2): 128 -134.
31. Kirtikar, K.R., & Basu, B.D., *Indian Medical Plants* (Vol. 1). International book Distibutors, 1991.