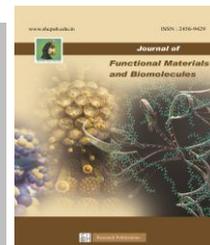




SACRED HEART RESEARCH PUBLICATIONS

Journal of Functional Materials and Biomolecules

Journal homepage: www.shcpub.edu.in



ISSN: 2456-9429

PHYTOCHEMICAL ANALYSIS, ANTIOXIDANT & ANTI-INFLAMMATORY PROPERTIES ALOE BARBADENSIS MILLER EXTRACT

Vignesh. P¹ and Sheela. K^{1*}

Received on 05 October 2025, accepted on 15 November 2025,

Published online on December 2025

Abstract

The medicinal plants represent an enormous reservoir of potential phytochemical compounds that could be useful as an alternative to allopathic drugs and are being used to develop Pharma drugs. Aloe vera has medicinal properties for the effective management of several ailments including Hepatitis. This present investigation of a review on evaluated the phytochemistry, antioxidant, and anti-inflammatory potential of Aloe vera extract. The methanol extract of plant was subjected to phytochemical analysis, which revealed the presence of various phytochemicals such as carbohydrates, tannins, saponins, alkaloids, flavonoids, quinones, and glycosides, with the exception of steroids, terpenoid, and phenols. In the DPPH test, the methanolic Aloe vera extract demonstrated a notable level of antioxidant properties. When comparison to the common medication Diclofenac, the methanolic Aloe vera displayed good anti-inflammatory properties using the Albumin denatured state method. From the review of all the results of report showed good activity.

Keywords: Aloe vera, anti-oxidant, anti-inflammatory, diclofenac.

1. Introduction

Aloe vera is rich in bioactive components [1-2], such as phenolic compounds, chalcones, flavonoids, flavanones, anthocyanosides, proanthocyanidins, and terpenoids. These minute levels of bioactive compounds have numer-

ous beneficial physiological and immunological impacts. They possess antioxidant, anti-bacterial, anticancer, and anthelmintic properties, among many other attributes. Phytochemicals possessing anti-bacterial properties, as reported by many researchers [3], damage cell membranes, impede the microbial metabolic process, and modify the signalling transduction pathway. Antioxidant phytochemicals reduce inflammation by blocking the formation of prostaglandins [4-6]. Plant-based medicines have been used extensively to treat a wide range of diseases since the beginning of human civilization. Typically, 5-15 m tall and 25-30 cm thick trees bear the pear-shaped plant, which is 3.5-4 cm length and 4.5-5.4 centimeter wide has 4 fleshy calyxes and 0-2 spores. You can eat the plants raw or cooked. Several components of Aloe vera have been found to have potential medicinal benefits.

Several cytotoxic and antioxidant compounds were found in the extract of methanol of the pulp and seeds of Aloe

*Corresponding author: E-mail Sheela@shcpt.edu

¹Department of Biochemistry, Sacred Heart College (Autonomous), Tirupattur-635 601, TamilNadu, India.

vera. People with type II diabetes may benefit from plant from source. Antioxidants are substances that can stop and undo harm from too many free radicals. To enhance the quality of sleep and the functioning of the brain, Aloe vera are commonly used in alternative medicine. New research reveals that these effects may be caused by their special antioxidants. Aloe vera may improve immune function and inhibit the spread of cancerous cells. Reduced levels of free radicals and inflammation can aid in the prevention of chronic conditions like type 2 diabetes. The vitamin C-rich Aloe vera plant is also known to have potent anticancer effects. Aloe vera plant is delicious and tiny. They taste like dates when dried and have a chewy texture. Although loquats are frequently grown from seeds, commercial plantings typically use grafted trees of superior types. Shield budding and cleft grafting are the two methods used to reproduce the tree; loquat seedlings or quince rootstocks grown from cuttings can be used, the latter if a miniature tree is required [7-9].

The blossoms are relatively vulnerable to fire blight, but the trees are resistant to the majority of illnesses and insect pests. Hence, considering the above facts in view, this study evaluated the phytoconstituents of Aloe vera plant extracts with reference to their antioxidant, and anti-inflammatory potential.

2. Experimental

AgNPs were synthesized using different techniques, such as physical, chemical, and biological means. Synthesis typically involves reducing silver ions (Ag^+) to metallic silver (Ag), which is followed by nucleation and growth process-

es that determine the shape, size, and morphology of the nanoparticles. The synthesis method used may also impart Different properties to the nanoparticles.

2.1. Physical Methods

Metal Nanoparticles like AgNPs can be synthesized from bulk materials with the application of External forces. These external forces can be conventional Processes like crushing, grinding, and milling, or advanced Processes like arc discharge, laser abrasion, or vapor Condensation. The so-formed AgNPs are of uniform size and exhibit more or less uniform morphological properties and High purity. The size of these nanoparticles can range from 10 to 100 nm.

2.1. Preparation of aqueous and solvent Aloe vera plant extracts:

The stored plant powder of Aloe vera (10 g) was extracted with 100 ml of methanol. After the extraction process, the solvents were removed by soxhlet method and evaporated by open air at 40°C to obtain crude extract and stored in a beaker [10].

2.2. Phytochemical screening of plant extracts:

Extracts Phytochemical screening of Aloe vera plant extracts was assessed by standard method.

Test for Tannins: 1 ml. of the plant extract was added to 1 ml. 5% ferric Chloride Formation of dark blue or greenish black indicates the presence of tannins.

Test for Quinones: 1 ml of the plant extract was added to 1 ml. conc. Sulphuric acid. Formation of red colour indicates the presence of quinones.

Test for Flavonoids: 1 ml of the plant extract was added to 1 ml. 2N sodium hydroxide. Formation of yellow colour indicates the presence of Flavonoids.

Test for Alkaloids: 1 mL of the plant extract was added to 2 ml conc. HCl. Then, few drops of Mayer's reagent were added. Presence of green colour or white precipitate indicates the presence of alkaloids.

Test for Glycosides: 1 mL of the plant extract was added to 3 mL Chloroform and 10% ammonium solution. Formation of pink colour indicates the presence of glycosides.

Test for Terpenoids: 1 mL of the plant extract was added to 2 mL Chloroform along with cone, sulphuric acid. Formation of red brown Colour at the interface indicates the presence of terpenoids.

Test for Phenols: 1 mL of the plant extract was added to 2 ml. distilled Water followed by few drops of 10% FeCl₃. Formation of blue/green colour indicates the presence of phenols.

Test for Steroids: 1 mL of the plant extract was added to 2 ml. chloroform and 1 mL of sulphuric acid. Formation of reddish brown ring at the interface indicates the presence of steroids.

2.3. Antioxidant activity of Aloe vera plant extracts:

The antioxidant activity of methanolic extract of Aloe vera was determined by following and Shi et al. About 100 µL of plant extracts of Aloe vera were taken in the microtiter plate, 100 µL of 0.1% methanolic DPPH was added over the samples and incubated for 30 minutes in dark condition. The samples were then observed for dis-

coloration; from purple to yellow and pale pink were considered as strong and weak positive respectively. The antioxidant positive samples were subjected for further quantitative analysis. [12]

2.3.1 Free radical scavenging activity of Aloe vera plant extract:

The antioxidant activities were determined using DPPH, (Sigma-Aldrich) as a free radical. Plant extract of 100 µL were mixed with 2.7 mL methanol and then 200 µL of 0.1% methanolic DPPH was added. The suspension was incubated for 30 minutes in dark condition. Initially, absorption of blank sample containing the same amount of methanol and DPPH solution was prepared and measured as a control (13). Subsequently, at every 5-minute interval, the absorption maxima of the solution were measured using a UV double beam spectra scan at 517 nm.

Free radical scavenging activity was calculated by the following formula:

% DPPH radical scavenging = $\frac{[(\text{Abs. of control} - \text{Abs. of test Sample}) / (\text{Abs. of control})] \times 100}{100}$.

2.4. Anti-inflammatory activity by egg albumin denaturation assay:

Inhibition of egg albumin denaturation was determined using the method prescribed by Chandra et al. (17). Phosphate buffer saline (pH 6.4), 8 g of sodium chloride (NaCl), 0.2 g of potassium chloride (KCl), 1.44 g of disodium hydrogen phosphate (Na₂HPO₄), and 0.24 g of potassium dihydrogen phosphate (KH₂PO₄) were dissolved in 800 ml of distilled water was prepared. The pH was adjusted to 6.4 using 1N hydrochloric acid (HCl) and made

the volume to 1000 mL with distilled water. About 2.8 mL of phosphate buffer (pH 6.4) and 0.2 mL of egg albumin were incubated with various concentrations (10, 20, 30, 40 and 50 µg/mL) of test samples and standard drug Diclofenac sodium (10, 20, 30, 40 and 50 µg/mL) and the samples were incubated at 37°C for 15 minutes and heated at 70°C for 5 minutes. [14-16] After cooling, the absorbance of the above solutions was measured using ultraviolet visible spectrophotometer at 660 nm. The percentage inhibition of protein denaturation was calculated using the following formula.

$$\text{Percentage inhibition} = (\text{Abs control} - \text{Abs sample}) / \text{Abs control} \times 100$$

3. Results and Discussion

3.1. Phytochemical screening of Aloe vera plant extract:

For the sake of human health, secondary metabolites provide essential medicinal qualities. In particular, some of these compounds appear to be capable of preventing and suppressing many types of cancer. Compounds belonging to the carbohydrate, alkaloids, quinones, and steroid families are utilized as medications or dietary supplements to treat or prevent various disorders. Aloe vera plant were gathered from Tirupattur for this investigation. The plants were thoroughly cleaned in distilled water after being washed with running tap water, and they were then allowed to dry in the open air for about a month at room temperature. In order to be used later, the dried plant material was thoroughly pulverized into powder and stored in a sterile container. Aloe vera plant powder

that had been stored was extracted using 100 mL of each of the two solvents, methanol and chloroform. To get crude extract, the solvents were eliminated following the extraction procedure using air drying and an evaporator

Table 1. Phytochemical screening of Aloe vera

S.No.	Phytochemicals	Solvent (Methanol)
1.	Alkaloids	+
2.	Carbohydrates	+
3.	Flavonoids	+
4.	Glycosides	+
5.	Phenols	-
6.	Quinones	+
7.	Saponins	+
8.	Steroids	-
9.	Tannins	+
10.	Terpenoids	-

' - Present; '-' - Absent.

set at 40°C. [17] The methanol extract of plant from Plant was subjected to phytochemical analysis, which revealed the presence of various phytochemicals such as carbohydrates, tannins, saponins, alkaloids, flavonoids, quinones, and glycosides, with the exception of steroids, terpenoid, and phenols. The phytochemical components of the methanolic extracts of Plant are listed in Table 1.

3.2. Antioxidant activity of Aloe vera plant extract:

Antioxidants are substances that can stop the chain reactions caused by free radicals. Recently, increased focus has been placed on the therapeutic potential of medicinal plants as antioxidants and re-antioxidants in avoiding tissue damage brought on by oxidative stress. It has been demonstrated that they can bind heavy metal ions, remove free radicals and active oxygen species, and stop lipid peroxidation by inhibiting lipoxygenase. Recently, in-

creased focus has been placed on the therapeutic potential of medicinal plants as antioxidants and re-antioxidants in avoiding tissue damage brought on by oxidative stress. The antioxidant activity was assessed using the DPPH assay. The methanol extract of the Aloe vera plant was shown to have a higher level of free radical scavenging activity, suggesting that it has a greater antioxidant potential. According to the DPPH assay, a decreased power potential was shown by an increase in absorbance with concentration. [18] The methanol extract demonstrated strong reducing power used in the investigation; the reported inhibition percentage increased as the concentration increased (Figure 1).

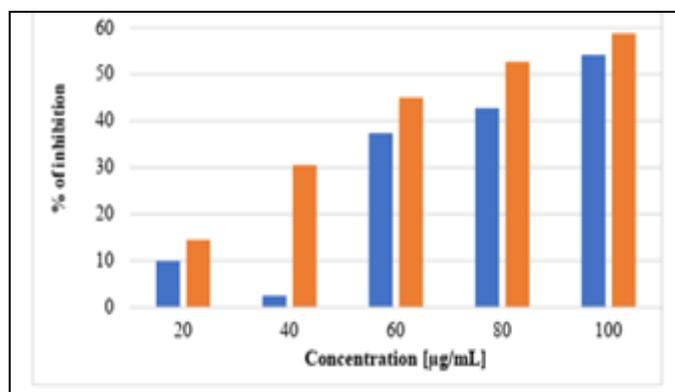


Fig. 1. Anti-oxidant activity Aloe vera

3.3. Anti-inflammatory activity of Aloe vera plant extract:

The inhibition of egg albumin denaturation was assessed spectrophotometrically at 660 nm for Aloe vera concentrations between 100-500 µg/mL, Diclofenac, and their interactions. Aloe vera, lowest a dose of 10 g, reduced the denaturation of egg albumin protein. There was a progressively rising percentage of denaturation inhibition as Aloe vera concentration increased. [19] At various con-

centrations, diclofenac was found to have a denaturation-inhibiting effect on egg albumin, whereas the Aloe vera plant had an identical impact (Figure 2).

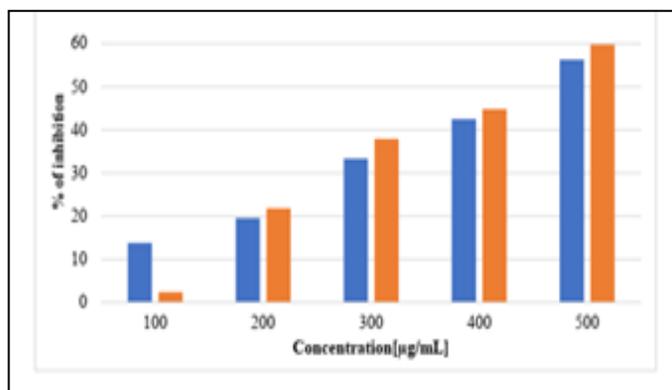


Fig. 2. Anti-inflammatory activity of Aloe vera

4. Conclusion

The methanol extract of plant was subjected to phytochemical analysis, which revealed the presence of various phytochemicals such as carbohydrates, tannins, saponins, alkaloids, flavonoids, quinones, and glycosides, with the exception of steroids, terpenoid, and phenols. In the DPPH test, the methanolic Aloe vera extract demonstrated a notable level of antioxidant properties. When compared to the common medication Diclofenac, the methanolic Aloe vera displayed good anti-inflammatory properties using the Albumin denatured state method.

Acknowledgements

This work was supported by Sacred Heart College, Tirupattur - 635601, Tirupattur District, Tamilnadu, India, through Sacred Heart Fellowship [Ref: SHC/SH Fellowship/2025-2026/18]. We would like to show our gratitude to the Principal and Management of Sacred Heart College, Tirupattur - 635601, Tirupattur District, Tamilnadu, India for supporting their research.

Conflict of Interest: Nil

References

- [1] Lima, T. K. (2014). *Edible Medicinal and Non-Medicinal Plants: Volume 8, Flowers*. Springer.
- [2] Ferrão, A. C. P. L. F., Ferrão, A. A., & Santos, R. F. (2008). Traditional medicine and pharmacopoeia: contribution to the biodiversity conservation of the Cerrado. *Rev. Bras. Farmacogn.*, 18(2), 382–401.
- [3] Shrestha, S. K., Sangroula, M. P., & Shah, S. K. (2020). Phytochemical, pharmacological, and pharmacognostic overview of Aloe vera: A review. *Pharmacogn. J.*, 12(4), 870–874.
- [4] Putra, S. S., Sudiana, I. M., & Siagian, L. O. (2021). Utilization of Java apple (Aloe vera) peel extract as an anti-microbial agent for the preservation of chicken nuggets. *IOP Conf. Ser. Earth Environ. Sci.*, 658(1), 012057.
- [5] Lima, C. T., Brito, R. M. M., & Silva, R. V. F. (2015). Chemical composition and biological activities of the essential oil from leaves of Aloe vera. *Nat. Prod. Commun.*, 10(10), 1837–1840.
- [6] Maruthappan, H. B., & Mohan, K. (2016). Antioxidant and anticancer activities of Aloe vera aqueous leaf extract. *J. Young Pharm.*, 8(2), 67–73.
- [7] Barbosa, M. A. F., Lira, J. L. C., & Oliveira, A. C. V. (2021). Evaluation of the toxicity and antioxidant activity of Aloe vera (Blume) Merrill & Perry plant. *J. Pharm. Pharmacogn. Res.*, 9(4), 514–521.
- [8] Arambewela, C., Kumara, G. R. A. K., & Dissanayake, S. U. (2020). Aloe vera: A review of the traditional uses, phytochemistry, pharmacology, and toxicology. *J. Complement. Integr. Med.*, 17(2).
- [9] Lee, S. H., Jeon, N. J., & Park, J. Y. (2018). Antioxidant activity and anti-inflammatory effects of anthocyanin-rich Aloe vera plant extract. *J. Appl. Biol. Chem.*, 61(1), 43–48.
- [10] Chew, S. H., Ng, L. K., & Ng, H. M. (2019). Phytochemical constituents and pharmacological properties of Aloe vera: A review. *J. Appl. Pharm. Sci.*, 9(1), 113–120.
- [11] Jayasinghe, J. C., & Perera, R. P. (2016). Chemical composition, bioactive properties and anti-proliferative activity of the plant peel essential oil of Aloe vera. *Ind. Crops Prod.*, 94, 233–239.
- [12] da Silva, L. R., do Nascimento, C. J., & Barbosa, M. A. F. (2016). Chemical composition and antioxidant potential of hydroalcoholic extracts of Aloe vera leaves. *Rev. Bras. Farmacogn.*, 26(4), 514–518.
- [13] Barbosa, M. A. F., Pereira, R. H. N., & Lira, J. L. C. (2021). Evaluation of the hypoglycemic potential of Aloe vera (Blume) Merrill & Perry plant. *J. Pharm. Pharma-cogn. Res.*, 9(4), 522–529.
- [14] Dias, A. D., Guedes, R. T. C., & Wurlitzer, R. A. L. (2017). Chemical composition, antifungal and cytotoxic activities of essential oil from the leaves of Aloe vera. *Arab. J. Chem.*, 10(2), S1193–S1198.
- [15] Costa, A. S. S., Silva, T. V., & Lima, R. R. S. (2021). Effect of Aloe vera (Blume) Merrill & Perry plant in the prevention and treatment of obesity in rats. *J. Pharm. Pharmacogn. Res.*, 9(4), 535–546.

- [16] Gayathri, A., Jayaprakash, A, (2023). Phytoconstituents of *Ziziphus jujuba* Plant Extracts and their Anti-oxidant, Anti-inflammatory and Anti-bacterial Potential. *J. Funct. Mat. Biomol.* 7(1): 603-607.
- [17] Cushnie TPT, Cushnie B, Lamb AJ, 2014. Alkaloids: an overview of their antibacterial, antibiotic-enhancing and antivirulence activities. *Int J Antimicrob. Agents*, 44(5): 377-386.
- [18] Shi QQ, Zhang Z, Su JJ, et al., (2018). Comparative analysis of pigments, phenolics, and antioxidant activity of Chinese jujube (*Ziziphus ju-juba* Mill.) during plant development. *Molecules*, 23(8): 1917.
- [19] Al-Reza, S. M., Yoon, J. I., Kim, H. J., Kim, J. S., and Kang, S. C. (2010). Anti-inflammatory activity of seed essential oil from *Ziziphus jujuba*. *Food Chem. Toxicol.* 48, 639–643.