



Research Paper

Phytochemical Screening of *Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata*

Aparna Guha¹, Shampa Jain² and Madhuri Sharma^{3*}

¹Department of Zoology, Government Science College, R.D.V.V. Jabalpur, Madhya Pradesh, India

²Department of Zoology and Biotechnology, Government Science College, Jabalpur, Madhya Pradesh, India.

³Department of Fisheries Resource Management, College of Fishery Science, Jabalpur, Madhya Pradesh, India

*Corresponding author email: drmadhurig8@yahoo.co.in

Received: 06/09/2026

Revised: 18/09/2026

Accepted: 23/09/2026

Abstract: In the present study, the phytochemical studies of the leaves of *Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata* have been carried out. The hydroalcoholic extract (HAE) of *Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata* were prepared with 75% of ethyl alcohol. Different chemical tests in *Nelumbo nucifera* HAE showed the presence of various active principles (phytoconstituents), viz., Alkaloids, Phenols. Flavonoids, Saponins, Tannins and Glycosides similarly HAE of *Eichhornia crassipes* and *Hydrilla verticillata* showed the presence of various active principles, viz., Alkaloids, Phenols. Flavonoids, Saponins, Tannins and Glycosides.

Keywords: Aquatic plants, phytochemical screening, Antibacterial

Introduction:

Several indigenous plants are active against various diseases, and their phytochemical and pharmacological studies and uses have been reported (Chopra *et al.*, 2002; Prajapati *et al.*, 2003). The medicinal activities of herbal drugs / medicinal plants are due to the presence of different active principles, e.g., alkaloids, glycosides, reducing sugars, tannins, saponins, resins, phytosterols, organic acids, essential oils, fixed oils, etc. These active principles can be extracted with different solvents, viz., petroleum ether, alcohol, benzene, chloroform and distilled water.

Aquatic macrophytes are an interesting and little-exploited source of biologically active compounds of high nutritional, pharmaceutical, and environmental value (Márquez-Rangel *et al.*, 2026). Aquatic plants grow profusely in lakes and

waterways all over the world and have become weedy in many lakes and ponds. These may be categorized as floating submerged and emergent aquatic plants. For centuries, aquatic plants have been perceived as a nuisance rather than resource with its eradication proved almost impossible and even reasonable control is difficult (Adelakun et al., 2016). Plants have been an important source of pharmaceuticals for maintaining human health, According to World Health Organization (WHO) medicinal plants would be the best source to obtain a variety of drugs. Nature has been a source of medicinal agents 1000 of years and an impressive number of modern drugs have been isolated from natural sources and many of these isolations were based on the uses of the agents in traditional medicine. (Kirstos et al., 2018). *N. nucifera* contains various bioactive secondary metabolites including phenolics, flavonoids, alkaloids, tannins, terpenoids, and steroids, which are responsible for its antioxidant, antimicrobial, anti-inflammatory and cytotoxic properties (Vijayan et al., 2025).

Nelumbo nucifera is a large aquatic rhizomatous herb consisting of slender,

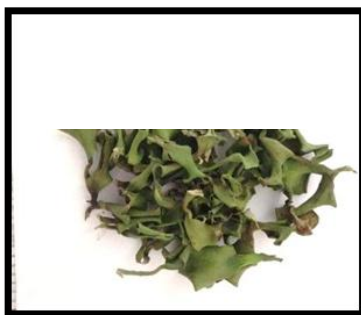
elongated, creeping stem with nodal roots. Lotus is perennial plant with both aerial and floating orbicular leaves. (Paudel et al., 2015). Leaves, flowers, rhizomes, and seeds of *N. nucifera* have been widely used as herbs to treat inflammation, microbial infections, oxidative stress-induced diseases, and metabolic diseases. (Shams, et al, 2026) The fresh water aquatic plant *Eichhornia crassipes*, commonly known as water hyacinth is a member of the family Pontederiaceae. This fast growing, free-floating, perennial plant is indigenous to Brazil, Amazon basin and Ecuador region (Swathy et al., 2019). *Hydrilla verticillata* is a non-native, aggressive, slender, submerged, aquatic weed which belongs to the family Hydrocharitaceae (Pandi et al., 2015)

Materials and Methods:

Collection of Aquatic Plants Material – Fresh Leaves of *Nelumbo nucifera* *Eichhornia crassipes* and *Hydrilla verticillata* were collected from Adhartal Pond, Jabalpur, Madhya Pradesh. Healthy and disease- free plants without any visible external damage were selected for the study



Nelumbo nucifera



Eichhornia crassipes



Hydrilla verticillata

Figure 1: Aquatic Plants

Preparation of Aquatic Plants Alcoholic Extract

The aquatic plants (*Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata*) will be thoroughly washed with tap water to remove any debris and dirt. After chopping, the plant material will be dried in hot air oven at 60°C for 12 hours. The dried leaves will be made into fine powder by using a grinder. 20 g of powdered were extracted using 200ml of 75% ethyl alcohol (ethanol) as solvent in a Soxhlet apparatus for 16 hours. Leaves extract kept in capped bottles and stored at 4°C.

Qualitative Detection of Phytochemical Constituents:

Various chemical tests were performed for the presence of bioactive constituents in each fraction of both plants by using standard procedures. (Tyagi, 2017).

Detection for Alkaloids:

0.4 gm of every fraction was combined with 8 ml of 1% HCl, warmed and filtered. (Harborne, 1973)

Mayer's Test: A fraction of extract was treated with Mayer's reagent (1.36 gm of $\text{HgCl}_2 + 5\text{g KI}$ in 100 ml of water). Formation of cream coloured precipitate confirms the presence of alkaloids.

Dragendroff's Reagent: A fraction of extract was treated with 1ml Dragendroff's Reagent (0.17gm Bismuth nitrate in 2ml alcohol in 8ml of water add 4 gm of potassium iodide into another beaker, in 10 ml alcohol and 20 ml water and stirred until KI is completely dissolved). On mixing of the two solutions, formation of orange or Red coloured precipitate confirms the presence of alkaloids.

Detection for Phenols

Ferric Chloride Test: Extracts were treated with 3-4 drops of ferric chloride solution.

Formation of bluish black colour indicates the presence of phenols.

Lead Acetate Test: Plant extract is dissolved in 5 ml distilled water then add 3 ml of 10% lead acetate solution. White precipitate indicates the presence of phenols.

Detection for Flavonoids

1. NaOH Tests: Take 2-3 ml of extract, add few drops of sodium hydroxide (NaOH) solution into a test tube. Formation of intense yellow colour that became colourless on addition of few drops of dilute HCl indicates the presence of flavonoids.

2. H_2SO_4 test: A fraction of extract was treated with concentrated H_2SO_4 and observed for the formation of orange colour.

Detection for Saponins

Foam Test: In this method 20 mg fraction was boiled, filtered and combined with few ml of olive oil, formation of foam revealed saponin (Harborne, 1973).

Detection for Tannins

Braymer's Test: 50 mg of each fraction was boiled in distilled water and was filtered. A few drops of 0.1% FeCl_3 was mixed and observed for colour change, the presence of brownish green coloration showed the occurrence of tannins.

Detection for Glycosides

Brontrager's Test: Take 1g of plant extract and add 5-10 ml of dilute HCl. Boil the extract in a water bath for 10 min. Filter and extract of filtrate with CCl_4 or benzene. Observed for the formation of blood red colour.

Results and Discussion:

Different chemical tests revealed the presence of various active principles or phytoconstituents, viz., Alkaloids, Phenols, Flavonoids, Saponins, Tannins and Glycosides in the HAE of *Nelumbo nucifera*, *Eichhornia crassipes*, and *Hydrilla verticillata* leaves (Table 1). Phytochemical

analysis of *Nelumbo nucifera*, *Eichhornia crassipes*, and *Hydrilla verticillata* showed positive reactions for various secondary metabolites, including Alkaloids, Phenols, Flavonoids, Saponins, Tannins and Glycosides. The ethanolic extracts of *Nelumbo nucifera* and *Eichhornia crassipes* leaves showed the presence of all six phytoconstituents, whereas *Hydrilla verticillata* showed the presence of comparatively fewer phytoconstituents. The

presence of phytoconstituents as seen in these plants have also been reported (Chopra *et al.*, 2002; Prajapati *et al.*, 2003) in many medicinal plants, which confirms the findings of the present study. *N. nucifera* contains various bioactive secondary metabolites including phenolics, flavonoids, alkaloids, tannins, terpenoids, and steroids, which are responsible for its antioxidant, antimicrobial, anti-inflammatory and cytotoxic properties (Vijayan *et al.*, 2025).

Table 1: Phytochemical Screening of *Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata*

S. No.	Name of the Phytochemical	Name of the Test	Observation	<i>Nelumbo nucifera</i>	<i>Eichhornia crassipes</i>	<i>Hydrilla verticillata</i>
1	Alkaloids	Mayer's test	Cream colour ppt	+	+	+
		Dragenoff's reagent test	Orange ppt	+	+	+
2	Phenols	Ferric chloride test	Deep Blue colour	+	+	+
		Lead acetate test	White precipitate	+	+	+
3	Flavonoids	Ammonia Test	A yellow colour	+	+	+
4	Saponins	Foam Test	Foam formation	+	+	+
5	Tannins	Braymer's Test	Brownish green colour	+	+	—
6	Glycosides	Brontrager's Test	A rose pink to blood red coloured solution	+	+	—

Key

+ Present
- Absent

Conclusions:

The results obtained indicated the presence of phytoconstituents viz., Alkaloids, Phenols, Flavonoids, Saponins, Tannins and Glycosides in HAE of leaves of *Nelumbo nucifera*, *Eichhornia crassipes* and *Hydrilla verticillata*. Further studies are required to identify and characterize the active compounds and to evaluate their possible applications in healthcare.

References:

Chopra, R. N., Nayar, S. L. and Chopra, I. C. (2002) Glossary of Indian Medicinal Plants. CSIR, New Delhi.
 Prajapati, N. D., Purohit, S. S., Sharma, A. K. and Kumar, T. (2003) *A Hand Book of Medicinal Plants*, 1st Edn. Agrobios (India).
 Márquez-Rangel, I., Cruz, M., Ruiz, H. A., Rodríguez-Jasso, R. M., Loredó-Treviño, A., Castillo- Olvera, G., & Belmares, R. (2026) Bioactive molecules from Agave salmiana bagasse: Study of their antioxidant, prebiotic potential, and cytotoxicity. Food Research International, 118782.
 Adelakun, K. M., Kehinde, A. S., Amali, R. P., Ogundiwin D. I. and Omotayo, O. L. (2016) Nutritional and Phytochemical Quality of Some Tropical Aquatic Plants. Poultry, Fisheries & Wildlife Sciences vol 2,4.
 Kiristos, T. G., Kebede A., Chaithanya, K. K. and Teku, M. Z. (2018) Evaluation of in vitro antibacterial potential of *Eichhornia crassipes* leaf extracts. Drug Invention Today, 10, 3824-3831.

Vijayan, R., Sivakumar, V. S., Hazir, Kumar, A. R. and Raja, R. K. (2025) Phytochemical and Antioxidant Analysis of Bioactive Compound Extract from *Nelumbo nucifera* against Cancer Proteins: In Silico Spectroscopic Approach Applied Biochemistry and Biotechnology.
 Paudel, K. R. and Panth, N. (2015) Phytochemical Profile and Biological Activity of *Nelumbo nucifera*, Hindawi Publishing Corporation.
 Shams, H., Fahad, S., Iqbal, M., Ullah, A., Hussain, M.S. and Ashraf, N. (2026) Assessment of antioxidant, antimicrobial, antiparasitic, and anti-inflammatory properties of dried *Nelumbo nucifera*. Pakistan Journal of Medical & Cardiological Review, 5(1), 3007-3031.
 Swathy, D., Shajahan, A., Jayamohan, D., Sharanya, S. H. and Rajesh, B. R. (2019) Comparative phytochemical screening and bioactive properties of two aquatic weeds- *Pistia stratiotes* and *Eichhornia crassipes*. International Journal of Advanced Research in biological Sciences, 6(8), 66-74.
 Pandi, P. S. and Rajkumar, J. (2015). Phytochemical screening and bioactive potential of *Hydrilla verticillata*. Journal of Chemical and Pharmaceutical Research, 7(3), 1809- 1815.
 Tyagi, T. (2017) Phytochemical Screening of Active Metabolites Present in *Eichhornia Crassipes* (Mart.) Solms and *Pistia Stratiotes* (L.):Role in Ethanomedicine. Asian Journal of Pharmaceutical Education and Research 6(4), 40-56
 Harborne, J. B. (1973) Phytochemical Methods. London: Chapman and Hall, Ltd. pp 49-188.

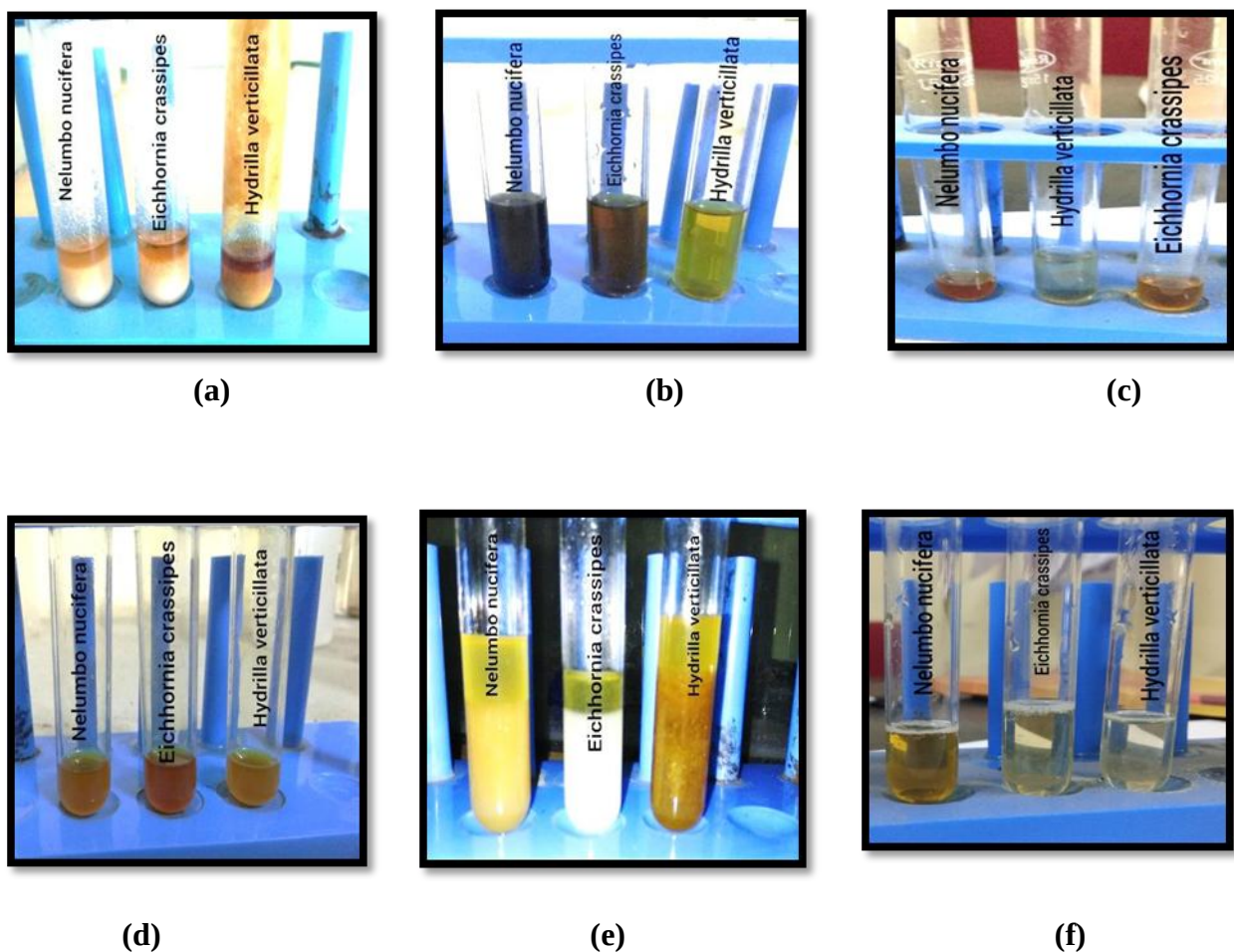


Figure 2: Result of phytochemical screening of Aquatic plants (a). Confirmation test for Alkaloids by Mayer's test (b). Confirmation test for Phenols by Lead acetate test (c). Confirmation test for Flavonoids (d). confirmation test for Saponins (e). Confirmation test for Tannins (f). Confirmation test for Glycosides