Evaluation Of Phytochemical Compounds Present in Some Medicinal Plants

Prof. Manoj Kumar

Department Of Botany, College of Commerce, Arts and Science
Patliputra University, Patna

ABSTRACT

Medicinal plants are widely used in the treatment of several diseases. This is because of diverse pharmacological activities, shown by these plants such as antimicrobial, antidiabetic, antihypertensive, antidiarrheal, anthelmintic and several other therapeutic effects shown by these plants. The therapeutic potential of medicinal plants is determined by their phytochemical composition, either individually or in combination. Alkaloids, phenolics, tannins, steroids, glycosides and terpenes are important phytochemicals. The pharmacological properties of plants can be evaluated through the identification of these phytochemicals. Although modern analytical techniques are now available for phytochemical analysis, traditional qualitative tests continue to be widely used for preliminary phytochemical screening of medicinal plants.

Keywords : ***Medicinal Plants, Phytochemical compounds, Qualitative tests, Secondary metabolites.***
Received : 19/10/2025 **Acceptance : 25/11/2025**

Introduction:

Medicinal plants are now getting attention because they show many benefits especially in the field of medicine and pharmacology. Phytochemicals are natural bioactive compounds found in plants such as vegetables, fruits, flowers, leaves, roots and medicinal herbs. These phytochemicals work with food and fiber as antioxidants and as a defense mechanism against diseases (Kumar et. al., 2021). Phytochemical screening and antioxidant potential of selected medicinal plants using different solvents. Plant Sci. Today, 8(4): 824–832. Phytochemicals are divided into primary and secondary constituents based on their function in plant metabolism. The main components are common sugars, amino acids, protein and chlorophyll, the secondary components are alkaloids, terpenoids and phenolic compounds and many others.

The medicinal value of these plants is in its bioactive phytochemical constitution, which has a physiological effect on the human body (Akinmoladuh et al., 2007; Ahmad et. al., 2021). Most important and common phytoconstituents are flavonoids, alkaloids, tannins, terpenoids, Saponins, Phenolic, compound. These natural compounds are the basis of modern medicine prescribed nowadays (Edenga et. al., 2005).

Five important medicinal plants available in the Botanical garden of COCAS, Patliputra University were studied. Catharanthus roseus, Hibiscus rosa-sinesis, Moringa oleifera, Nycthanthes arbor-tritis, Phyllanthus amarus were the experimental plants. These were easily available and reports say that they are being utilized in traditional medicine. By characterizing the phytochemicals present in these plants they can be analysed and utilised by common men for medicine and mass propagation.

Materials and Methods:

Collection of plant samples: The plant materials were available in the Botanical garden of COCAS. Some materials were also brought from local markets and planted in the Botanical garden for studies.

The plant parts were properly washed in tap

water and then rinsed in distilled water. These were then air dried in shade. The plant material was grinded in a mixer and the powder was kept in air tight containers. These were labelled and protected from direct sunlight until analysed.

Preparation of aqueous extract of plant samples

The aqueous extract of each plant sample was prepared by soaking 10 g of powdered samples in 200 ml of distilled water for 12 h. The extracts were then filtered with Whatman filter paper.

Phytochemical analysis:

Chemical tests were conducted on the aqueous extract of each plant sample, as well as of the stored powdered form of the plant samples using standard methods Edeoga et. al. (2005).

Qualitative Phytochemical analysis

Detection of Alkaloids:

Extracts were dissolved individually in dilute hydrochloric acid and filtered. The filtrates were used to test the presence of alkaloids. Two tests were done for alkaloid detection.

Mayer's test : Filtrates were treated with Mayer's reagent. Formation of a yellow cream precipitate indicates the presence of alkaloids.

Wagner's test : Filtrates were treated with Wagner's reagent. Formation of brown/reddish brown precipitate indicates the presence of alkaloids.

Detection of Terpenoids:

Salkowski's Test : 5 mg of the extract of the leaves, flowers and seeds was mixed with 2 ml of chloroform and concentrated H_2SO_4 (3ml) was carefully added to form a layer. An appearance of reddish brown colour in the inner face indicated the presence of terpenoids.

Detection of Phenols:

Ferric chloride test : 10 mg extracts were treated with few drops of ferric chloride solution. Formation of bluish black colour indicates the presence of phenol.

Lead acetate test : 10 mg extracts was treated with few drops of lead acetate solution. Formation of yellow colour precipitate indicates the presence of phenol.

Detection of Tannins:

A small quantity of extract was mixed with water and heated in a water bath. The mixture was filtered and ferric chloride was added to the filtrate. A dark green colour was formed. It indicates the presence of tannins.

Plants	Phenols	Tannin	Alkaloids	Saponins	Terpenoids
Catharanthus roseus	+	-	+	-	+
H. rosa-sinesis	+	+	+	+	+
Moringa oleifera	+	+	+	+	+
Nycthanthes arbor-tristis	+	+	+	+	+
Phyllanthus amarus	+	+	+	+	+

Table-1. Qualitative analysis of phytochemical constituents. (Presence of phytochemical constituents: +; Absence of phytochemical constituents : -)

Results And Discussion:

Qualitative Analysis : Qualitative analysis carried out on these plants showed the presence of phytochemical constituents. Table-1. shows that Phenols, Alkaloids and Terpenoids are present in all these plants. Catharanthus roseus shows the absence of tannins and saponins. H rosa-sinesis, Moringa oleifera, Nycthanthes arbor- tristis and Phyllanthus amarus shows the presence of tannins and saponins along with phenols, alkaloids and terpinoids.

The present analysis of phytochemicals in Catharanthus roseus, Hibiscus rosa-sinensis, Moringa oleifera, Nyctanthes arbor-tristis, and Phyllanthus amarus highlights the medicinal

significance of these plants and supports their traditional and modern therapeutic applications. The detection of diverse bioactive constituents such as alkaloids, phenolics, flavonoids, tannins, saponins, glycosides, and terpenoids confirms their role as potential sources of pharmacologically active compounds, as previously emphasized by several researchers (Farnsworth and Morris, 1976; Gordon and David, 2001; Foye et al., 2008).

The findings are compatible with earlier studies reporting that the biological activity of medicinal plants is closely linked to their phytochemical composition (Harborne, 1973; Evans, 1966; Kokate et al., 2004). The choice of extraction solvent significantly influences the recovery of phytochemicals, as solvents differ in polarity and extraction efficiency This is a fact well documented in pharmacognostic literature (Brain and Turner, 1975; Krishnaiah et al., 2009). Similarly, the application of appropriate qualitative tests is essential for reliable phytochemical screening, and the use of more than one test enhances accuracy and reproducibility of results (Harborne, 1973; Kokate et al., 2004).

Furthermore, preliminary phytochemical screening serves as a scientific foundation for the targeted isolation, characterization, and validation of bioactive compounds, thereby facilitating advanced pharmacological and biochemical investigations (Geissman, 1963; Gordon and David, 2001). The present study also reinforces the importance of medicinal plants in drug discovery and public health, as recognized by the World Health Organization (WHO, 1985), (World Health Organization, 2019) and supports continued research into plant-based therapeutics.

Overall, the phytochemical evaluation of these selected medicinal plants not only validates their traditional use but also provides a strong basis for future studies aimed at developing novel plant-derived drugs with improved efficacy and safety.

Conclusion :

The analysis of phytochemicals in Catharanthus roseus, H. rosa-sinesis, Moringa oleifera, Nycthanthes arbor- tristis, Phyllanthus amarus is very important and the possible medicinal utilities of the plant. It is also helpful to determine the active principles responsible for the known biological activities exhibited by the plants. Further, it provides the base for targeted isolation of compounds and to perform more precise investigations. Extraction of a phytochemical from the plant material is mainly dependent on the type of solvents used. Similarly, the test applied for phytochemical analysis determines the presence or absence of a phytochemical in the sample. Hence, two or more different tests should be performed for more accurate results.

References:

1. Ahmad, I., M. Ahmad, A. Hussain and S. Khan, 2021. Phytochemical screening and biological activities of medicinal plants: A review. J. Pharm. and Phytochem., 10(3): 128–135.
2. Akinyeye, A.J., E.O. Solanke and I.O. Adebiyi, 2014. Phytochemical and antimicrobial evaluation of leaf and seed of Moringa olifera extracts. Int. J. of Res. In Med. and Health Sciences., 4(6): 2307-2083.
3. Anbazhakan, S., R. Dhandapani., P. Anandha kumar and S. Balu, 2007. Traditional medicinal knowledge on Moringa concanensis Nimmo of perambalur District, Tamilnadu, Anc. Sci. of life., 24(4): 42-45.
4. Brain, K.R., and T.D. Turner, 1975. The practical evaluation of phytopharmaceuticals, Wright science technical, 1st Ed , Bristol Britain., 144.
5. Evans,W.C.,1966.TreaseEvans Pharmacognosy., 14th Ed, London: WB Saunders Ltd, 119 159.
6. Feroz, M., R. Ahmad., S.T.A.K. Sindhu and A.M. Shahbaz, 1993. Antifungal activities of saponin from indigenous plant roots. Pak. Vet. J., 13: 44.

7. Foye, W.O., T.L. Lemke and D.A. Williams, 2008. Foye's Principles of Medicinal Chemistry. 6th Ed Lippincott Williams and Wilkins. Philadelphia., 44-45.

8. Fransworth, N.R., and R.W. Morris, 1976. Higher plants, The sleeping Giant of Drug Development. Am. J. Pharm., 148: 46-52.

9. Geisssman, T.A., 1963. Flavonoid compounds, Tannins, Lignins and related compounds, In M. Florkin and Stotz (Ed), Pyrrole Pigments, Isoprenoid compounds and phenolic plant constituents Vol. 9. 265.

10. Gordon, M.C., and J.N. David, 2001. Natural product drug discovery in the next millennium. Pharm. Biol. 39 Suppl., 1: 8-17.

11. Grieve, M., 1931. A Modern Herbal. New York: Dover Publications. Harbone, J.B., 1973. Phytochemical methods. London. Chapman and Hall, Ltd., 49-188.

12. Jain, S.K., 1989. Methods and Approaches in Ethnobotany, (Ed) Society of Ethnobotanists, CDRI. Lucknow.

13. Kokate, C.K., Purohit, A.P., and Gokhale, S.B. 2004. Practical Pharmacognosy, 2nd edition. Vallabh Prakashan, New Delhi, 466-470.

14. Krishnaiah, D., T. Devi, A. Bono and R. Sarbatly, 2009. Studies on phytochemical constituents of six Malaysian medicinal plants. J. Med. Plants. Res. 3(2): 67-72.

15. Krishnaveni, S., B. Theymoli., S. Sadasivam, 1984. Phenol Sulphuric acid method. Food chain., 15: 229.

16. Kumar, S., R. Pandey and A. Singh, 2021. Phytochemical screening and antioxidant potential of selected medicinal plants using different solvents. Plant Sci. Today, 8(4): 824–832.

17. Manickam murugan., Veerabahu Ramasamy Mohan, 2014. Phytochemical, FT-IR and antibacterial activity of whole plant extract of Aerva lanata (L.) Juss. Ex. Schult. J. of Med. Plants Studies, 2(3): 51-57.

18. Sneh verma., Tandra Mohan., T. Revathy., K. Suthindhiran and M.A. Jayasri, 2013. Phytochemical and pharmacological evaluation of selected plants. Am. J. of Biochem. and Biotechnol, 9(3): 291-299.

19. World Health Organization, 1985. Chronicle., 39:51.

20. World Health Organization, 2019. WHO Global Report on Traditional and Complementary Medicine. Geneva, Switzerland.