Journal of Medicinal Plants Studies
www.PlantsJournal.com

ISSN (E): 2320-3862
ISSN (P): 2394-0530
www.plantsjournal.com
JMPS 2025; 13(2): 252-254

Received: 08-02-2025
Accepted: 16-03-2025

Abhijeet R Kasarkar
Department of Botany & Department of Biotechnology, Vivekanand College, Kolhapur, Maharashtra, India

Shweta V Jadhav
Department of Botany & Department of Biotechnology, Vivekanand College, Kolhapur, Maharashtra, India

Shrihari G Kulkarni
Department of Botany & Department of Biotechnology, Vivekanand College, Kolhapur, Maharashtra, India

Corresponding Author:
Abhijeet R Kasarkar
Department of Botany & Department of Biotechnology, Vivekanand College, Kolhapur, Maharashtra, India

Preliminary phytochemicals analysis of *Andrographis paniculata* (Burm. F.) Wall

Abhijeet R Kasarkar, Shweta V Jadhav and Shrihari G Kulkarni

DOI: https://www.doi.org/10.22271/plants.2025.v13.i2c.1828

Abstract
The phytochemicals present in plants act as potential source of useful drugs to improve the health status of humans. Phytochemicals analysis is the first step towards discovery of useful drugs. Plants are the richest resources of drugs and useful for the various biological activity. The present investigation includes the phytochemical screening of *Andrographis paniculata* (Burm.f.) Wall. was one of the highly used medicinal plants. Phytochemical tests were carried out specially for screening secondary metabolites of this plants. In our study we have investigated different phytochemicals from leaf of this plant by using different solvents for extraction. The plant shows the phytochemicals like saponins, tannins, terpenoid and steroids.

Keywords: *Andrographis paniculata* (Burm. f.) wall, phytochemicals, saponins, tannins, terpenoid, steroids

Introduction
Phytochemicals are produced by plants through primary or secondary metabolism. Generally they have biologically activity in the plant host and contribute to its development or protection by activating defense mechanisms and giving the plants colour, odour and flavor. (Molyneux *et.al* 2007) [11].
All the secondary metabolites are unique and complex structure. Many of these have been found to possess interesting biological activities and find applications such as pharmaceuticals, insecticides, dyes, flavors and fragrances. They can be used to treat chronic and infectious disease. (Duraipandiyan *et.al.*, 2006) [5].
Photochemical screening is the scientific process of analyzing, examining, extracting, experimenting and thus identifying different classes of phytoconstituents present in various parts of the plant for discovering of drugs, the active components could be further taken for investigation and research.
Andrographis paniculata (Burm.f.) Wall belonging to family acanthaceae. Erect, branched, annual herb, branches quadrangular, glabrous. Flowers solitary, distant in lax, terminal and axillary recemes or panicles. Corolla white with rose or pink throat, pubescent outside. Filaments hairs in upper part, anthers bearded at base. Capsules acute at both ends, glabrous. Seeds many, pitted, pale brown, glabrous. Flowering and fruiting in between August to February. (Yadav and Sardesai 2002) [16]. It is commonly known as “King of Bitter”.
Andrographis paniculata (Burm.f.) Wall was one of the highly used potential medicinal plants and it has been used to treat various illness conditions all over the world especially in Asia, Europe and Africa. (Mishra 2007) [10].
This plant shows a variety of biological properties such as antibacterial, antiviral, cold and fever, anticancer, urinary tract infection, anti-diabetic, cardiovascular, immune- modulater. (Bharatanaya 2023) [1]. *Andrographis paniculata* (Burm.f.) shows a variety of biological properties such as antibacterial, antiviral, cold and fever, anticancer, urinary tract infection, anti-diabetic, cardiovascular, immune-modulatory and anti-hepatotoxic. (Bhatnagar 2023) [3].
In traditional Indian medicine, this plant has been used for the treatments of dysentery and diabetic problems, skin and worm infections and against various ulcers. (Hossain *et.al.*,2014) [7]. The plant leaf is commonly used in fever, colic pain, common cold, cough, fever, mouth ulcers, bronchitis, gastro-intestinal disorder and sores. (Saxena *et.al.*,1998) [15].

Phytochemicals such as tannins shows strong activity against several plant pathogens and pest. (Pawar 2010) [13]. Saponin has insecticidal activity like repellent and deterrent activity. The use of plant compounds like essential oils, flavonoids, alkaloids, glycosides, esters and fatty acids having repellent effects.

Materials and Methods

Plant collection and identification

Collection of plant material like *Andrographis paniculata* (Burm.f.) Wall. These samples were free from disease. Plant materials were identified with stranded literature. Plant part like leaf was used for further studies.

Extraction of plant material

Preparation of aqueous extracts

Samples were weighed using an electronic balance and 10 gm of plant material were crushed in 100 ml of distilled water and filter through muscline cloth. These samples are used for phytochemical analysis. (Harbone 1973) [6].

Preliminary Photochemical Analysis

The individual extracts were used for the qualitative photochemical screening for the presence of some chemical constituents. Photochemical test were carried out adopting standard procedure.

Test for Alkaloids

A quantity (3 ml) of concentrated extract was taken into test tube, cooled and filter, the filtrate was used for following test.

Dragendroff'sTest: 2 drops of Dragendroff`s reagent were added to 1ml of the extract. The development of a creamy ppt was indicates that presence of alkaloids.

Test for Saponin

5 ml extract was mixed with 20 ml of distilled water then agitated in the graduated cylinder, wait for 15 min formation of foam indicates saponin present.

Test for Tannin

4ml of extract was treated with 4 ml $FeCl_3$ formation of green colour indicates that presence of condensed tannin.

Test for Proteins

Xanthoproteic Test: Extract was treated with few drops of concentrated HNO_3 formation of yellow colour indicates the presence of Proteins.

Test for Amino Acid

Ninhydrin Test: Take the 2 ml of extract and 2 ml on the Ninhydrin reagent was added and boil for few minutes, formation of blue colour indicates the presence of the amino acid.

Test for Flavonoids

Alkaline Reagent Test: Extract was treated with 10% of NaOH solution, formation of intense yellow colour indicates the presence of the flavonoids.

Test for Phytosterol

Salkowski's Test: Extract was treated with chloroform and filtered. The filtered was treated with few drops of concentrated H_2SO_4 and shake, allow the standing appearance of golden red indicates the positive test.

Test for Phenol

Ferric chloride Test: Test extract were treated with 4 drops of Alcoholic $FeCl_3$ solution. Formation of bluish black colour indicates the presence of phenols.

Test for Phlobatannins

Deposition of red ppt when aqueous extract of each plant sample is boiled with 10% aqueous HCl was taken evidence of presence of the phlobatannins.

Test for Cardial Glycosides

Killer-KillaniTest: Plant extract treated with glacial acetic acid containing a drop of $FeCl_3$. A brown coloured ring indicates the presence of the cardial glycosides.

Test for Carbohydrates

Iodine Test: Take 2 ml of extract were treated with 5 drops of Iodine solution, gives blue colour, indicates the positive test and presence of carbohydrates.

Test for Reducing Sugar

Benedict's Test: Filtrate were treated with the Benedict's reagent and heated gently, orange red ppt indicates the presence of reducing sugar.

Test for Terpenoid

1ml. of freshly prepared extract was firstly treated with 2 ml. of chloroform then with 3ml. of concentrated sulphuric acid to form a layer reddish brown coloration of interface shows presence of terpenoid.

Test for Steroid

2 ml. of plant extract was dissolved in 5 ml. chloroform and then 5 ml. of concentrated sulphuric acid was added. Formation of 2 layers (upper red and lower yellow with green fluorescence) indicates the presence of steroid.

Results and Discussion

Plants have pharmacological activities attributed to the secondary metabolites which are responsible for essential bioactivities. The results of the various phytochemical screening tests obtained during the experiment are shown in table-1.

Table 1: Phytochemical analysis of *Andrographis paniculata* (Burm.f.) Wall.

Sr. No.	Phytochemicals	Aqueous Extract	Methanol Extract	Chloroform Extract
1.	Alkaloids	+	-	-
2.	Carbohydrates	+	-	-
3.	Reducing Sugar	-	+	-
4.	Phytosterol	+	+	-
5.	Saponin	+	+	+
6.	Phenols	+	+	-
7.	Tannin	+	+	+
8.	Flavonoid	+	-	-
9.	Proteins	+	-	+
10.	Terpenoid	+	+	+
11.	Cardial Glycosides	+	+	-
12.	Steroids	+	+	+

Note: [(+)= Positive, (-)=Negative, (#) = Doubtful].

The present study was carried out to investigate the photochemical profile present in leaf of *Andrographis paniculata* (Burm.f.) Wall. The Phytochemicals like saponins, tannins, terpenoid and steroids are present in all the extracts and shown potent biological activity and medicinal property.

Aqueous extract revealed the presence of maximum phytochemicals such as alkaloids, carbohydrates, phytosterol, saponins, phenolic compounds, tannins, flavonoids, proteins, cardiac glycosides and steroids.

Methanol extract revealed the presence of photochemical such as reducing sugar, phytosterol, saponins, phenolic compounds, tannins, terpenoid, cardic glycosides and steroids.

Chloroform extract revealed the presence of phytochemical such as saponins, tannins, proteins, terpenoid and steroids.

Bhatnagar (2023) [4]. reported the presence of several active phytochemicals in methanol extract like phenols, flavonoids, alkaloids, phytosterols, tannins, saponins, glycosides, amino acids and terpenoids. In chloroform extract phenols, flavonoids, alkaloids, saponins, glycosides, amino acids, terpenoids are present. Aqueous extract consist of alkaloids and amino acids only.

The presence of secondary metabolites in plants is influenced by several environmental factors. The presence of saponins are responsible for the bitter taste and a well known for their hemolytic effect on red blood cells. (Prohp *et.al.*, 2012) [14]. The saponins content of plants also helps in fighting pathogens and boosting the immune system. Additionally cytotoxic qualities, anti-bacterial, anti-viral properties are posses due to the presence of saponin. (Bailly and Vergoten 2020) [2].

Tannin possesses an anticancer property. (Mazni *et.al.*, 2016) [9]. The presence of terpenoids and steroid have a great importance in synthesizing sex hormones synthetic compounds. (Okwu *et.al.*,2001) [12]. Cardiac glycosides posses an effective and direct action on the cardiac system, supporting the strength of the heart and the rate of contraction when failing. (Iwu 1983) [8].

Conclusion

The phytochemicals observed in this study shows these plants have a potency for use in producing pharmaceutical bioactive compounds for therapeutic drugs. Further studies should be carried out on these in order to isolate, identify the bioactive compounds and determine their mechanism in action. The presence of phytochemicals make the plant useful for treating different disease and have a potential for providing a drug for human use.

Phytochemicals analysis showed rich contain of bioactive molecules in *Andrographis paniculata* (Burm.f.) Wall. due to the presence of saponin, tannin, terpenoid and steroid. Aqueous extract showed more bioactive constituents followed by methanol and chloroform. Thus this plant may be used for the production of herbal drugs.

Acknowledgement: Authors are highly thankful to Principal, Vivekanand College, Kolhapur (An Empowered Autonomous Institute) for laboratory facilities and Dr. D. K. Kulkarni for continuous support.

References

1. Bharatanayam A. A comprehensive review of Kalmegh's biological activities (*Andrographis paniculata*). Int J Pharm Pharm Sci. 2023 Feb;15(2):1-7.
2. Bailly C, Vergoten G. Esculentosides: Insights into the potential health benefits, mechanism of action and molecular target. Phytomedicine. 2020 Sep;79:153333. DOI: 10.1016/j.phymed.2020.153333.
3. Bhatnagar A. Phytochemical screening of *Andrographis paniculata* (Burm.f.) leaf and stem extract. J Pharmacogn Phytochem. 2023;12(4):5-8.
4. Duraipandiyan V, Ayyanar M, Ignacimuthu S. Antimicrobial activity of some ethnobotanical plants used by Paliyar tribe from Tamil Nadu, India. BMC Complement Altern Med. 2006 Oct 24;6:35.
5. Harborne JB. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. London: Chapman and Hall Ltd.; 1973. p. 44-188.
6. Hossain MS, Urbi Z, Abubakar S, Rahman KMH. *Andrographis paniculata* (Burm. F.) Wall. Ex. Nees., A review of Ethnobotany Phytochemistry and Pharmacology. Sci World J. 2014 Mar 2;2014:274905.
7. Iwu MM. Hypoglycemic properties of *Bridelia ferruginea* leaves. Fitoterapia. 1983;54(6):243-248.
8. Tambe BD, Pedhekar P, Harshali P. Phytochemical screening and antibacterial activity of *Syzygium cumini* (L.) (*Myrtaceae*) leaves extracts. Asian J Pharm Res Dev. 2021 Sep;9(5):50-54.
9. Garba L, Lawan HS, Yusuf A, Abdullahi MM, Mukhtar MD, Puma HU. Phytochemical Screening and *in vitro* Bacteriostatic Effects of *Syzygium aromaticum* (Clove) Extracts on Clinical Bacterial Isolates. J Biochem Microbiol Biotechnol. 2019;7(1):5-9.
10. Momoh H, Dambata MB, Ibrahim B, Oladosu PO. *Lannea humilis* (Oliv.) Leave Extracts Inhibits Bacteria, Fungi and *Mycobacterium bovis*. World J Pharm Med Res. 2017;3(6):58-63.
11. Molyneux RJ, Lee ST, Gardener LE, Panter KE. Phytochemicals: The good, the bad and the ugly. Phytochemistry. 2007 Nov;68(22-24):2973-2985.
12. Okwu DE. Evaluation of the chemical composition of indigenous species and flavoring agents. Glob J Pure Appl Sci. 2001 Jul;7(3):455-459.
13. Pawar V, Chavan AM. Incidence of powdery mildew on Cucurbit plants and its ecofriendly management. J Ecobiotechnol. 2010;2(6):29-43.
14. Prohp TP, Onoagbe IO. Determination of phytochemical composition of the stem bark of *Triplochiton scleroxylon* K. Schum. (*Sterculiaceae*). Int J Appl Biol Pharm Technol. 2012 Apr;3(2):68-76.
15. Saxena S, Jain DC, Bhakuni RS, Sharma RP. Chemistry and Pharmacology of *Andrographis* species. Indian Drugs. 1998 Sep;35(9):458-467.
16. Yadav SR, Sardesai MM. Flora of Kolhapur district. Kolhapur: Shivaji University; c2002. p. 352.