



## PRELIMINARY PHYTOCHEMICAL ANALYSIS OF DIFFERENT SOLVENT EXTRACTS OF *ANDROGRAPHIS PANICULATA* (BURM. F.) WALL. EX NEES

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### ABSTRACT

Medicinal plants contain bioactive compounds which are used for treatment of various human diseases. Some herbs have been added to foods since ancient times, not only as flavoring agent, but also as food preservatives and to treat common ailments. This study focuses on the phytochemical analysis of *Andrographis paniculata* which belongs to the *Accanthaceae* family. The phytochemical analysis of total extracts in water, ethanol and methanol extracts of *Andrographis paniculata* were investigated. Phytochemical analysis revealed the presence of Phenols, Flavonoids, Carbohydrates, Proteins, Alkaloids, Saponins, Tanins, Anthroquinones, Terpenoids, Steroids, Glycosides, Cardic glycosides, Xanthoproteins in varying solvents.

### KEY WORDS

*Accanthaceae, Andrographis paniculata, Medicinal plants, Preliminary, Phytochemical analysis, Screening.*

### INTRODUCTION

Phytochemicals are chemical compounds that are naturally found in plants. Traditional folk remedies from plants have always guided scientists to search for new medications in order to maintain and promote healthy life for human and animals (Achterberg and Imagery, 2013). India has been identified as a major resourceful area in the traditional and alternative medicines globally. Medicinal plants constitute an important component of flora and are widely distributed in India. *Andrographis paniculata* Nees is one of the widely distributed medicinal plants in India and using since ancient times in traditional Ayurvedic systems of medicines. *Andrographis paniculata* Nees is a medicinal plant belonging to the family of *Acanthaceae*. The genus *Andrographis* consists of 28 species, only a few species are medicinal. It is an annual herb extremely bitter in taste. It is also known as Kalmegh or Kalamegha. It is commonly known as king of bitters. Diterpenoids and flavanoids are the main chemical

constituents of *A.paniculata* and these compounds are believed to be responsible for the biological activities of the plant (Tang *et.al.*, 1992; Saxena *et.al.*, 1998). *Andrographis paniculata* has an important place in the Indian Pharmacopoeia and is one of the most widely used plants in ayurvedic formulations (Hooker, 1885). Pharmacological and clinical studies suggest the potential for beneficial effects in diseases like Cancer (See 2002, Sheeja *et.al.*, 2007, Shi *et.al.*, 2008, Yang *et.al.*, 2009, Zhao *et.al.*, 2008) and HIV infections (Calabrese, *et.al.* 2000). The plant shows antimalarial (Mishra *et al.*, 2009), anti-inflammatory, antioxidant (Nees *et al.*, 2006), antihepatitic, antihelmintic (Singh *et al.*, 2001), antibacterial (Burm. F Kumar OA *et al.*, 2010) antipyretic (Chandra *et al.*, 2010) and anticancer activity (Kumar *et al.*, 2004). It is also prescribed for snake bite (Mills.S 2000, Duke JA 1985). The main objective of our research work was to analyze the presence or absence of different phytochemicals in different extractions of *Andrographis paniculata* leaf sample.

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**MATERIALS AND METHODS:**

*Andrographis paniculata* plant was collected from the herbal garden, Department of Botany, Osmania University, Hyderabad.

**Preparation of plant extract:**

The plant leaves were washed, shade dried and crushed to make the fine powder of the dried leaves. Extraction with different solvents like methanol, ethanol and distilled water were done using soxhlet apparatus. For every 200ml of each solvent, 25g of the fine powder of dried leaves was used. After extraction for 3 continuous days, the crude extract was placed in water bath at 55°C for the evaporation of excess solvent.

**Phytochemical Screening:**

The qualitative chemical analysis of methanolic, ethanolic and water extraction was carried out for the presence of Phenols, Flavonoids, Carbohydrates, Alkaloids, Saponins, Tannins, Anthraquinones, Terpenoids, Steroids, Glycosides, Cardiac glycosides and Xanthoproteins using standard procedures (Adetunji CO et al., 2011).

**Test for phenols:** To 1ml of plant extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of dark blue or green color indicates presence of phenols in the plant extract.

**Test for flavonoids:** To 2ml of plant extract, 1ml of 2N sodium hydroxide was added. Presence of yellow color indicates the presence of flavonoids in the plant extract.

**Test for carbohydrates:** To 2ml of plant extract, 1ml of Molisch's reagent and few drops of concentrated Sulphuric acid were added. Presence of purple or reddish color indicates the presence of carbohydrates in the plant extract.

**Test for proteins:** To 5ml of plant extract was mixed with 10% NaOH solution and added few drops of Copper sulphate to it. The formation of reddish violet colour indicates the presence of proteins in the plant extract.

**Test for Alkaloids:** To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added. Then few drops of Mayer's reagent were added. Presence of green color or white precipitate indicates the presence of alkaloids in the plant extract.

**Test for Saponins:** To 2mls of extract was added 6ml of water in a test tube. The mixture was shaken vigorously and observed for the formation of persistent foam that confirms the presence of saponins in the plant extract.

**Test for tannins:** To 1ml of plant extract, 2ml of 5% ferric chloride was added. Formation of dark blue or greenish black indicates the presence of tannins in the plant extract.

**Anthraquinones:** To 1ml of plant extract few drops of 10% ammonia solution was added, appearance pink color precipitate indicates the presence of anthraquinones in the plant extract.

**Test for terpenoids:** To 0.5ml of extract, 2ml of chloroform was added and concentrated sulphuric acid was added carefully. Formation of red brown color at the interface indicates presence of terpenoids in the plant extract.

**Test for steroids:** To 10mg of each extract was taken and 1ml of concentrated H<sub>2</sub>SO<sub>4</sub> was added to the each by the side walls on the test tube. Appearance of dark reddish green colour conform the presence of steroids in the plant extract.

**Test for glycosides:** To 2ml of plant extract, 3ml of chloroform and 10% ammonia solution was added. Formation of pink color indicates presence of glycosides in the plant extract.

**Test for cardiac glycosides:** To 0.5ml of plant extract, 2ml of glacial acetic acid and few drops of 5% ferric chloride were added. This was under layered with 1 ml of concentrated sulphuric acid. Formation of brown ring at the interface indicates presence of cardiac glycosides in the plant extract.

**Test for Xanthoproteins:** To 2ml of each plant extract, treated with few drops of concentrated nitric acid formation of yellow colour indicates the presence of xanthoprotein in the plant extract.

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**RESULTS AND DISCUSSION:**

The present study was conducted with an objective to identify the best solvent for the extraction of the shade dried leaves of *Andrographis paniculata* plant, which can be used to extract the maximum amount of phytochemicals. In the present investigation, preliminary phytochemical analysis has been done in different extracts of *Andrographis paniculata* and the results are showed in the table. A remarkable variation in the presences of the above-mentioned phytochemical compounds in Methanol, Ethanol and Water. Water extracts revealed the presence of Phenols, Flavonoids, Proteins, Alkaloids, Saponins, Tannins, Anthraquinones, Steroids and Xanthoproteins. Whereas Ethanolic extract also showed the presences of

Carbohydrates, Terpenoids, glycosides and cardiac glycosides, which are absent in water extract. However, methanolic extract showed the absence of Glycosides

and Cardiac Glycosides. Among the three different extract evaluated, methanolic extract found to show the presence of maximum compounds.

**Table: Phytochemical constituents of *Andrographis paniculata* in various extracts**

S.No	Phytochemical constituents	Water	Methanol	Ethanol
1	phenols	+	+++	++
2	Flavonoids	+	+++	++
3	Corbohydrates	—	++	+
4	proteins	+	+++	+++
5	Alkaloids	+	+++	++
6	Saponins	+++	++	+
7	Tanins	+	+++	++
8	Anthroquinons	++	++++	++
9	Terpenoids	—	++	+
10	Steroids	+	+++	++
11	Glycosides	—	—	++
12	Cardiac Glycosides	—	—	++
13	Xanthoproteins	+	++	++

**Note:** - Negative, +++ High positive, ++ Moderate positive, + Slightly positive

This study on phytochemical analysis was very useful in finding chemical compounds in the plant material that leads to their quantitative estimation and finding in the pharmacognosy. These findings are in agreement with the studies made by Padmalochane and Dhana Rajan, 2014; Rajalakshmi and Cathrine, 2016; Adegboyega and Oyewole, 2013; Viseshni and Priya 2017; Toryali Arify et al 2018, Sanjay R, Biradar, D.S 2014, Navjot Kaur, Jeena Gupta 2017 with few exemptions. Several attempts were made in analyzing the qualitative phytochemical compounds in *Andrographis paniculata*. Similar studies were carried out by Chinnappan Alagesaboopathi, 2011, in *Andrographis alata* showing presences of phytochemicals in different extracts.

#### CONCLUSION:

*Andrographis paniculata* leaf extracts revealed the presences of different phytochemicals in water, methanol and ethanol. Each phytochemical boost different physiological functions which in turn helps in several defence mechanisms against pathogens. Further validation of the qualitative phytochemical analysis is very much required as there is minimum correlation between the similar studies made in *Andrographis paniculata*. The result of this study would also lead to further studies in quantitative analysis of various secondary metabolites.

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#### Conflicts of Interest:

The authors declare that there are no conflicts of interest.

#### REFERENCES:

1. Achterberg, J. Imagery in healing: Shamanism and modern medicine. Shambhala Publications. Boulder, Colo, USA (2013).
2. Adegboyega, A.M Oyewole, B.M. Phytochemical Screening and Antimicrobial Activities of Leaf Extracts of *Andrographis paniculata*. International Journal of Science and Research. 4(6). www.ijsr.net\_(2015).
3. Adetunji, C.O. Olaleye O.O, Adetunji J.B. et al., Studies on the antimicrobial properties and phytochemical screening of methanolic extracts of *Bambusa vulgaris* leaf. International Journal of Biochemistry.3(1):21-26(2011).
4. Burm, F. Kumar, O.A. Naidu, L.M. Rao, KG. International Journal of Pharm Tech Research. 2:1383-5(2010).

5. Calabrese, C. Berman S.H, Babish, J.G. et al. A phase I trial of andrographolide in HIV positive patients and normal volunteers. *Phytother. Res.* 14:333-338(2000).
6. Chandra, R. Kumarappan, C.T. Kumar, J. Mandal, S.C, *Global J. Pharmacol.* 4 (1):45-47(2010).
7. Chinnappan Alagesaboopathi. Antimicrobial activity and Phytochemical analysis of *Andrographis alata* Nees from Southern India *International Journal of Pharm Tech Research.* Vol.3, No.3, pp 1322-1328(2011).
8. Duke, J.A. Ayensu, E.S. *Medicinal plants of China.* Algonac: Reference Publication; Inc., Michigan, 1: 705(1985).
9. Hooker, J.D. *Flora of British India*, Vol. IV, L. Reeve & Co. Ltd. Ashford, Kent (1885).
10. Padmalochana, K. and Dhana Rajan, M.S. Phytochemical analysis and antimicrobial activity of king of bitter *Andrographis paniculata* against pathogenic microbes. *International Journal of Institutional Pharmacy and Life Sciences* 4(6): 135-143. (2014).
11. Kumar R.A, Sridevi K, Kumar N.V, Nanduri S, Rajagopal S. *J Ethnopharmacol*; 92:291-5(2004).
12. Mills', S. and Bone, K. *Principles and practice of phototherapy.* Churchill Livingstone, Edinburgh; 262-268.23(2000).
13. Mishra, K. Dash, A.P. Swain, B.K. Dey, N. Anti-malarial activities of *Andrographis paniculata* and *Hedyotis corymbosa* extracts and their combination with curcumin. [available at <http://www.malariajournal.com/content/8/1/26>] *Malar J.*, 8:26(2009).
14. Navjot Kaur, Jeena Gupta comparison of phytochemical extraction solvents for *Andrographis paniculata*. *Research journal of pharmacy and technology.* 10(5): 1271-1276(2017).
15. Nees, K. Sheeja, P.K, Shihab G.K. *Immunopharmacol Immunotoxicol.* 28:129-40(2006).
16. Sanjay, R. Biradar, D.S. et al. qualitative analysis of *Andrographis paniculata* nees. *International science journal.* 1(4) (2014).
17. Saxena, S. Jain, D.C. Bhakuni, R.S. and Sharma R.P. *Indian Drugs.* 35: 458-467(1998).
18. See, D. Mason, S. and Roshan R. Increased tumor necrosis factor alpha (TNF-alpha) and natural killer cell (NK) function using an integrative approach in late stage cancers. *Immunol Invest.* 31:137-153(2002)
19. Sheeja, K. Guruvayoorappan, C. and Kuttan, G. Antiangiogenic activity of *Andrographis paniculata* extract and andrographolide. *Int. Immunopharmacol.* 7:211-221. (2007).
20. Shi, M.D. Lin, H.H. Lee, Y.C. et al. Inhibition of cell-cycle progression in human colorectal carcinoma Lovo cells by andrographolide. *Chem. Biol. Interact.* 174:201-210(2008).
21. Singh, R.P, Banerjee, S. Rao, A.R. *Phytother Res* 15:382-90(2001).
22. Tang, W. and Eisenbrand, G. *Chinese Drugs of Plant Origin, Chemistry, Pharmacology and use in Traditional and Modern Medicine*, Springer Verlag, Berlin, 97-103(1992).
23. Toryali Arify, S. Ezhilvalavan, A. Varun et al., 2018. *International Journal of Chemical Studies* Qualitative phytochemical analysis of garlic (*Allium sativum*) and nilavembu (*Andrographis paniculata*) 6(3): 1635-1638(2018).
24. Rajalakshmi, V. Cathrine L.Dr. Phytochemical screening and antimicrobial activity of ethanolic extract of *Andrographis paniculata*. *Journal of Pharmacognosy and Phytochemistry.* 5(2): 175-177(2016).
25. Viseshni, R. Priya, R screening of antidiabetic and anticancer activity in *Andrographis paniculata*(nilavembu). *World journal of pharmacy and pharmaceutical sciences.* 6(8), (2017).
26. Yang, L. Wu, D. Luo K. et al. . Andrographolide enhances 5-fluorouracil-induced apoptosis via caspase-8-dependent mitochondrial pathway involving p53 participation in hepatocellular carcinoma (SMMC-7721) cells. *Cancer Lett.* 276:180-188(2009).
27. Zhang XF, Tan BK. *Clin Exp Pharmacol Physiol* ; 27:3. 58-63(2000).
28. Zhao, F. He, EQ. Wang, L. and Liu, K. Anti-tumor activities of andrographolide, a diterpene from *Andrographis paniculata*, by inducing apoptosis and inhibiting VEGF level. *J. Asian Nat. Prod. Res.* 10:467-473(2008).

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