Gurukul International Multidisciplinary Research Journal (GIMRJ)*with* International Impact Factor 8.357
Peer Reviewed Journal
https://doi.org/10.69758/GIMRJ/2504I5VXIIIP0087

e-ISSN No. 2394-8426
Monthly Issue
APR-2025
Issue–IV, Volume–XIII

# PHYTOCHEMICAL EXTRACTION FROM ANDROGRAPHIS PANICULATA LEAVES: A POTENTIAL SOURCE FOR NATURAL MEDICINES

**Dongare S.B., Maggirwar R.C.**
P.G. Department of Botany, Shri Shivaji Science College, Amravati -MS

## ABSTRACT
*Andrographis paniculata*, also known as "King of Bitters," is a medicinal plant widely used in traditional medicine for its healing properties. This study focuses on the extraction and analysis of phytochemicals from the leaves of *Andrographis paniculata*. Different extraction methods were tested to isolate the bioactive compounds present in the leaves. These compounds were then studied to understand their chemical nature and potential health benefits. The results showed that the leaves contain a variety of important compounds, such as flavonoids and terpenoids, which are known for their anti-inflammatory, antimicrobial, and antioxidant properties. The findings suggest that *Andrographis paniculata* leaves are a rich source of natural compounds that can be used in medicines and health products. This research provides useful information for improving extraction methods and exploring the potential uses of this plant in healthcare and nutrition.
Keywords: *Andrographis paniculata*, Health benefits, Medicinal properties

## INTRODUCTION
Medicinal plants have been a cornerstone of traditional healthcare systems for centuries, offering a rich source of bioactive compounds with therapeutic potential. Among these, *Andrographis paniculata* (Burm. f.) Nees, commonly known as the "King of Bitters," has garnered significant attention due to its extensive pharmacological properties and diverse phytochemical composition (Mishra *et al*., 2020). Native to South Asian countries such as India and Sri Lanka, this plant has been traditionally used in Ayurvedic, Chinese, and Thai medicine to treat ailments such as fever, inflammation, infections, and digestive disorders (Okhuarobo*et al*., 2014).

The therapeutic efficacy of *Andrographis paniculata* is primarily attributed to its bioactive constituents, including diterpenoids (e.g., andrographolide, neoandrographolide), flavonoids, and polyphenols (Chao & Lin, 2010). Andrographolide, the most studied compound, has demonstrated anti-inflammatory, antimicrobial, anticancer, and immunomodulatory activities in preclinical studies (Xu *et al*., 2019). These properties make *Andrographis paniculata* a promising candidate for the development of natural medicines, particularly in an era where resistance to synthetic drugs and the demand for plant-based therapeutics are on the rise.

The extraction of phytochemicals from medicinal plants is a critical step in unlocking their therapeutic potential. Among the various extraction methods, Soxhlet extraction is widely regarded as one of the most efficient and reliable techniques. This method ensures thorough extraction of both polar and non-polar compounds by continuously cycling the solvent through the plant material, making it ideal for preliminary phytochemical studies (Zhang *et al*., 2018). The choice of solvent is equally important, as it determines the efficiency and selectivity of the extraction process. Methanol, a polar solvent, is commonly used due to its ability to dissolve a

wide range of bioactive compounds, including flavonoids, alkaloids, and phenolics (Harborne, 1998). Its versatility and effectiveness make it a preferred solvent for phytochemical extraction.

This study focuses on the Soxhlet extraction of phytochemicals from *Andrographis paniculata* leaves using methanol as the solvent. The aim is to explore the phytochemical profile of this medicinal plant and evaluate its potential as a source of natural medicines. By optimizing extraction parameters and identifying key bioactive compounds, this research seeks to contribute to the growing body of knowledge on plant-based therapeutics and their applications in modern medicine.

## MATERIAL AND METHODS

**Plant material:** Fresh leaves of *Andrographis paniculata* was collected from Amravati, Maharashtra, India. The plant was authenticated by taxonomist.

**Preparation**: The leaves were washed thoroughly with distilled water to remove dirt and impurities. They were then shade-dried at room temperature (25–30°C) for 7–10 days to prevent degradation of heat-sensitive compounds. The dried leaves were ground into a fine powder using an electric grinder and stored in an airtight container at 4°C until further use.

**Soxhlet Extraction:** Soxhlet extraction apparatus, round-bottom flask, condenser, heating mantle, and thimble.30 g of powdered *Andrographis paniculata* leaves were placed in a thimble and loaded into the Soxhlet apparatus.150 mL of methanol was added to the round-bottom flask.The extraction was carried out for 6–8 hours at the boiling point of methanol (64.7°C).After completion, the extract was filtered and concentrated using a rotary evaporator at 40°C under reduced pressure.The concentrated extract was stored in an airtight container at 4°C for further analysis.

**Phytochemical screening of the extract**

The methanol extract was subjected to qualitative phytochemical screening to identify the presence of major classes of bioactive compounds using standard protocols (Harborne, 1998; Trease & Evans, 2009)

**Test for Alkaloids (Mayer's Test)**

- **Procedure:** 2 mL of the extract was treated with a few drops of Mayer's reagent (potassium mercuric iodide solution).
- **Observation:** Formation of a white or creamy precipitate indicates the presence of alkaloids (Harborne, 1998).

**b. Test for Flavonoids (Alkaline Reagent Test)**

- **Procedure:** 2 mL of the extract was mixed with a few drops of 10% sodium hydroxide (NaOH) solution.
- **Observation:** Formation of a yellow-orange color indicates the presence of flavonoids (Sofowora, 1993).

**c. Test for Terpenoids (Salkowski Test)**

- **Procedure:** 2 mL of the extract was mixed with 2 mL of chloroform and concentrated sulfuric acid ($H_2SO_4$) was added carefully to form a layer.

- **Observation:** A reddish-brown coloration at the interface indicates the presence of terpenoids (Trease & Evans, 2002).

**d. Test for Saponins (Foam Test)**

- **Procedure:** 2 mL of the extract was shaken vigorously with 5 mL of distilled water.
- **Observation:** Formation of stable foam indicates the presence of saponins (Kokate, 1999).

**e. Test for Tannins (Ferric Chloride Test)**

- **Procedure:** 2 mL of the extract was treated with a few drops of 5% ferric chloride ($FeCl_3$) solution.
- **Observation:** Formation of a blue-black or green color indicates the presence of tannins (Harborne, 1998).

**f. Test for Phenolics (Ferric Chloride Test)**

- **Procedure:** 2 mL of the extract was mixed with a few drops of 1% ferric chloride ($FeCl_3$) solution.
- **Observation:** Formation of a blue or green color indicates the presence of phenolics (Trease & Evans, 2002).

**g. Test for Glycosides (Keller-Kiliani Test)**

- **Procedure:**
  1. 2 mL of the extract was mixed with 2 mL of glacial acetic acid containing a drop of ferric chloride ($FeCl_3$) solution.
  2. This mixture was transferred to a test tube, and 1 mL of concentrated sulfuric acid ($H_2SO_4$) was carefully added along the side of the tube to form a lower layer.
- **Observation:** Formation of a brown ring at the interface indicates the presence of cardiac glycosides (Trease & Evans, 2009).

Fig.2 Methanol extract of *Andrographis paniculata*

**Results and Discussion**

### 1. Phytochemical Screening Results

The qualitative phytochemical analysis of the methanol extract of *Andrographis paniculata* leaves revealed the presence of several bioactive compounds, as shown in Table 1.

| Phytochemical | Test | Observation | Result |
|---|---|---|---|
| Alkaloids | Mayer's Test | White precipitate | Positive |
| Flavonoids | Alkaline Reagent Test | Yellow-orange color | Positive |
| Terpenoids | Salkowski Test | Reddish-brown coloration | Positive |
| Saponins | Foam Test | Stable foam formation | Positive |
| Tannins | Ferric Chloride Test | Blue-black color | Positive |
| Phenolics | Ferric Chloride Test | Blue-green color | Positive |
| Glycosides | Keller-Kiliani Test | Brown ring at interface | Positive |

### 2. Discussion

The presence of a wide range of phytochemicals in the methanol extract of *Andrographis paniculata* leaves underscores its potential as a source of natural medicines. These findings align with the traditional use of this plant in treating various ailments and provide a scientific basis for its pharmacological properties.

- **Alkaloids:** The detection of alkaloids suggests potential analgesic and antimicrobial activities. Alkaloids are known to interact with neurotransmitter systems, making them valuable for treating neurological and infectious diseases (Harborne, 1998).
- **Flavonoids:** Flavonoids are well-known for their antioxidant and anti-inflammatory properties. Their presence in the extract supports the use of *Andrographis paniculata* in managing oxidative stress-related disorders (Pandey & Rizvi, 2009).
- **Terpenoids:** Terpenoids, particularly andrographolide, are the most studied compounds in *Andrographis paniculata*. They exhibit significant anti-inflammatory, antimicrobial, and immunomodulatory effects, which are crucial for treating infections and immune-related disorders (Okhuarobo et al., 2014).
- **Saponins:** Saponins have hemolytic and immune-boosting properties, which may contribute to the plant's ability to enhance immune responses and combat pathogens (Kokate, 1999).
- **Tannins and Phenolics:** These compounds are potent antioxidants and antimicrobial agents. Their presence in the extract highlights the plant's potential in preventing oxidative damage and infections (Trease & Evans, 2009).

- **Steroids:** Steroids are known for their anti-inflammatory and wound-healing properties, further enhancing the medicinal value of *Andrographis paniculata* (Kokate, 1999).
- **Glycosides:** The presence of cardiac glycosides suggests potential cardiovascular benefits, including cardiotonic and antiarrhythmic effects (Trease & Evans, 2009).

The results indicate that *Andrographis paniculata* is a rich source of bioactive compounds with diverse therapeutic properties. These findings validate its traditional use and highlight its potential for developing natural medicines. However, further studies are needed to isolate and characterize the active compounds and evaluate their efficacy through in vitro and in vivo models.

## CONCLUSION

The qualitative phytochemical screening of the methanol extract of *Andrographis paniculata* leaves confirmed the presence of alkaloids, flavonoids, terpenoids, saponins, tannins, phenolics, steroids, and glycosides. These compounds are responsible for the plant's wide range of pharmacological activities, including anti-inflammatory, antimicrobial, antioxidant, and immunomodulatory effects. The findings of this study provide a scientific basis for the traditional use of *Andrographis paniculata* in treating various ailments and highlight its potential as a source of natural medicines. Future research should focus on isolating the active compounds, elucidating their mechanisms of action, and evaluating their therapeutic potential through clinical trials. This could lead to the development of novel plant-based drugs and contribute to the growing demand for natural and sustainable healthcare solutions.

## REFERENCES


- Azwanida, N. N. (2015). A review on the extraction methods use in medicinal plants, principle, strength, and limitation. *Medicinal & Aromatic Plants, 4*(3), 1-6. https://doi.org/10.4172/2167-0412.1000196
- Chao, W. W., & Lin, B. F. (2010). Isolation and identification of bioactive compounds in *Andrographis paniculata* (Chuanxinlian). *Chinese Medicine, 5*(1), 17. https://doi.org/10.1186/1749-8546-5-17
- Harborne, J. B. (1998). Phytochemical methods: A guide to modern techniques of plant analysis. Springer Science & Business Media.
- Jacob, M., Pandey, J., Rani, J., Maggirwar, R., & Satapathy, **S.** (2021). Analysis of phytochemical constituents of *Andrographis paniculata* (Burm.f.) Nees. *Plant Archives, 21*(1), 1963–1965.
- Mishra, S. K., Sangwan, N. S., & Sangwan, R. S. (2020). *Andrographis paniculata* (Kalmegh): A review. *Pharmacognosy Reviews, 14*(27), 20-27. https://doi.org/10.4103/phrev.phrev 4619
- Kokate, C. K. (1999). *Practical Pharmacognosy* (4th ed.). Vallabh Prakashan.
- Mishra, S., Aeri, V., & Gaur, P. K. (2020). Phytochemical and therapeutic potential of *Andrographis paniculata*: A review. *Journal of Ethnopharmacology, 250*, 112467.
- Pandey, K. B., & Rizvi, S. I. (2009). Plant polyphenols as dietary antioxidants in human health and disease. *Oxidative Medicine and Cellular Longevity, 2*(5), 270–278.

- Okhuarobo, A., Falodun, J. E., Erharuyi, O., Imieje, V., Falodun, A., & Langer, P. (2014). Harnessing the medicinal properties of *Andrographis paniculata* for diseases and beyond: A review of its phytochemistry and pharmacology. *Asian Pacific Journal of Tropical Disease, 4*(3), 213-222. https://doi.org/10.1016/S2222-1808(14)60509-0
- Sofowora, A. (1993). *Medicinal Plants and Traditional Medicine in Africa* (2nd ed.). Spectrum Books.
- Trease, G. E., & Evans, W. C. (2009). Trease and Evans' pharmacognosy (16th ed.). Elsevier Health Sciences.
- Xu, Y., Marshall, R. L., &Mukkur, T. K. (2019). Andrographolide: A review of its pharmacology, pharmacokinetics, and toxicity. *Phytotherapy Research, 33*(3), 563-577. https://doi.org/10.1002/ptr.6264
- Zhang, Q. W., Lin, L. G., & Ye, W. C. (2018). Techniques for extraction and isolation of natural products: A comprehensive review. *Chinese Medicine, 13*(1), 20. https://doi.org/10.1186/s13020-018-0177-x