

Phytochemical Profiling and Evaluation of Bioactive Constituents from *Boerhavia diffusa*, *Eclipta alba* and *Allium sativum*

MonikaYadav^{*1}, Aman Kansare²

^{*1}Research Scholar, Faculty of Pharmacy, Oriental University, Indore, Madhya Pradesh, India

²Associate Professor, Faculty of Pharmacy, Oriental University, Indore, Madhya Pradesh, India

***Corresponding author Email ID:** monikayadav7056@gmail.com

Abstract:

Medicinal plants are an important source of naturally occurring bioactive compounds with significant therapeutic potential. The present study aimed to comparatively investigate the phytochemical profiles of the aerial part of *Boerhavia diffusa*, leaves of *Eclipta alba*, and bulb of *Allium sativum* using different solvent extracts, including ethanol, petroleum ether, chloroform, water, and hydroalcoholic solvent. Preliminary phytochemical screening was performed using standard qualitative chemical tests for alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, steroids, terpenoids, carbohydrates, and proteins. The findings revealed the presence of diverse phytoconstituents in the investigated plant materials. Among the different solvent fractions, the hydroalcoholic extracts exhibited the broadest phytochemical profile, particularly showing prominent reactions for flavonoids, phenolic compounds, tannins, saponins, and carbohydrates. The results indicate that *B. diffusa*, *E. alba*, and *A. sativum* are promising sources of bioactive phytoconstituents. The study provides preliminary evidence supporting further quantitative phytochemical analysis, chromatographic profiling, and pharmacological evaluation of these medicinal plants.

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Introduction

Medicinal plants are an important source of biologically active compounds and have been widely used in traditional and modern healthcare. Phytochemical profiling helps identify secondary metabolites responsible for the therapeutic potential of medicinal plants. *Boerhavia diffusa* Linn. (Punarnava) contains flavonoids, rotenoids, phenolics, alkaloids, and terpenoids and is traditionally used for its anti-inflammatory, hepatoprotective, and antioxidant properties (Rawat et al., 2014). *Eclipta alba* (L.) Hassk. (Bhringraj) is rich in coumestans, particularly wedelolactone and demethylwedelolactone, along with flavonoids, saponins, and sterols (Jahan et al., 2014). *Allium sativum* L. (Garlic) contains characteristic organosulfur compounds such as alliin, allicin, ajoenes, and diallyl sulfides, which contribute to its diverse biological activities (Bayan et al., 2014; Shang et al., 2019).

The present study aims to profile the phytochemical constituents and evaluate the bioactive components present in the aerial part of *B. diffusa*, leaves of *E. alba*, and bulb of *A. sativum*, providing a comparative basis for their potential pharmaceutical applications.

2. Materials and method

2.1 Collection and Authentication of Plant Material

The aerial parts of *Boerhavia diffusa* Linn., leaves of *Eclipta alba* (L.) Hassk., and bulbs of *Allium sativum* L. were collected from local area of Indore. The plant materials were authenticated and voucher specimens

were preserved for future reference. The collected materials were washed thoroughly with water to remove adhering soil and foreign matter.

2.2 Preparation of Plant Material

The collected plant materials were shade-dried at room temperature until a constant weight was obtained. The dried materials were separately powdered using a mechanical grinder and passed through a suitable sieve. The powdered samples were stored in airtight containers until further analysis.

2.3 Preparation of Extracts

The powdered aerial part of *B. diffusa*, leaves of *E. alba*, and bulb of *A. sativum* were separately extracted using ethanol, petroleum ether, chloroform, water, hydroalcoholic. solvent system by Soxhlet extraction. The extracts were filtered and concentrated under reduced pressure at a controlled temperature. The percentage yield of each extract was calculated and the concentrated extracts were stored in airtight containers for further phytochemical investigation.

2.4 Preliminary Phytochemical Screening

The extracts were subjected to preliminary phytochemical screening using standard qualitative chemical tests to detect the presence of major groups of secondary metabolites, including alkaloids, flavonoids, phenolics, tannins, saponins, glycosides, steroids, terpenoids, carbohydrates, and proteins. The observations were recorded based on the characteristic colour changes or precipitate formation obtained with the respective reagents.

2.4 Preliminary Phytochemical Screening

The hydroalcoholic extracts of *Boerhavia diffusa* aerial parts, *Eclipta alba* leaves, and *Allium sativum* bulbs were subjected to preliminary phytochemical screening using standard qualitative chemical tests. Approximately 1 mL of each extract was used for individual tests. Preliminary phytochemical screening was performed to detect major classes of secondary metabolites based on characteristic colour reactions, precipitate formation, or other specific reactions (Harborne, 1998; Evans, 2009).

2.4.1 Test for Alkaloids

Dragendorff's Test:

About 1 mL of extract was acidified with dilute hydrochloric acid and filtered. A few drops of Dragendorff's reagent were added to the filtrate. The formation of an orange or reddish-brown precipitate indicated the presence of alkaloids (Evans, 2009).

Mayer's

Test:

To 1 mL of the extract, a few drops of Mayer's reagent were added. Formation of a cream or white precipitate indicated the presence of alkaloids (Harborne, 1998; Evans, 2009).

2.4.2 Test for Flavonoids

Alkaline

Reagent

Test:

About 1 mL of extract was treated with a few drops of sodium hydroxide solution. The development of an intense yellow colour, which disappeared upon addition of dilute acid, indicated the presence of flavonoids (Harborne, 1998).

2.4.3 Test for Phenolic Compounds

About 1 mL of extract was treated with a few drops of 5% ferric chloride solution. The development of a blue, green, or violet colour indicated the presence of phenolic compounds (Harborne, 1998; Evans, 2009).

2.4.4 Test for Tannins

About 1 mL of extract was diluted with distilled water and treated with a few drops of ferric chloride solution. Formation of a blue-black or greenish-black colour indicated the presence of tannins (Trease & Evans, 2009).

2.4.5 Test for Saponins

Foam

Test:

About 1 mL of extract was diluted with 5 mL of distilled water and vigorously shaken in a graduated cylinder for approximately 15–20 seconds. The formation of persistent froth indicated the presence of saponins (Evans, 2009).

2.4.6 Test for Glycosides

Keller–Killiani Test:

About 1 mL of extract was treated with glacial acetic acid containing a trace amount of ferric chloride. Concentrated sulfuric acid was carefully added along the side of the test tube to form a lower layer. Formation of a brown ring at the interface indicated the possible presence of cardiac glycosides (Trease & Evans, 2009).

2.4.7 Test for Steroids

Salkowski

Test:

About 1 mL of extract was dissolved in chloroform, followed by careful addition of concentrated sulfuric acid along the side of the test tube. Development of a reddish-brown colour at the interface indicated the presence of steroids (Harborne, 1998).

2.4.8 Test for Terpenoids

Salkowski

Test:

About 1 mL of extract was mixed with approximately 2 mL of chloroform, followed by careful addition of concentrated sulfuric acid. Formation of a reddish-brown coloration at the interface indicated the presence of terpenoids (Harborne, 1998; Evans, 2009).

2.4.9 Test for Carbohydrates

Molisch's

Test:

About 1 mL of extract was treated with a few drops of Molisch's reagent, followed by the careful addition of concentrated sulfuric acid along the wall of the test tube. Formation of a violet or purple ring at the interface indicated the presence of carbohydrates (Trease & Evans, 2009).

2.4.10 Test for Proteins

Biuret Test:

About 1 mL of extract was treated with sodium hydroxide solution followed by a few drops of dilute copper sulfate solution. Formation of a violet or purple colour indicated the presence of proteins (Evans, 2009).

3. Results and discussion

3.1 Phytochemical screening of *Boerhavia diffusa* Aerial Part Extracts

Table: 3.1 Preliminary Phytochemical Screening of *Boerhavia diffusa* Aerial Part Extracts

Phytochemical	Ethanol	Petroleum ether	Chloroform	Water	Hydroalcoholic
Alkaloids	+	–	+	+	++
Flavonoids	++	–	+	+	+++
Phenolic compounds	++	–	+	++	+++
Tannins	+	–	–	++	+++
Saponins	+	–	–	++	+++
Glycosides	+	–	+	+	++
Steroids	+	++	++	–	++
Terpenoids	+	++	++	–	++
Carbohydrates	+	–	–	++	+++

Proteins	+	-	-	++	++
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+++ = Strongly positive, ++ = moderately positive, + = weakly positive, - = Not detected

3.2 Phytochemical screening of *Eclipta alba* Leaves Extracts

Table: 3.1 Preliminary Phytochemical Screening of *Eclipta alba* Leaves Extracts

Phytochemical	Ethanol	Petroleum ether	Chloroform	Water	Hydroalcoholic
Alkaloids	+	-	+	+	++
Flavonoids	++	-	+	++	+++
Phenolic compounds	++	-	+	++	+++
Tannins	+	-	-	++	+++
Saponins	++	-	-	++	+++
Glycosides	+	-	+	+	++
Steroids	+	++	++	-	++
Terpenoids	+	++	++	-	++
Carbohydrates	+	-	-	++	+++
Proteins	+	-	-	++	++

+++ = Strongly positive, ++ = moderately positive, + = weakly positive, - = Not detected

3.3 Phytochemical screening of *Allium sativum* Bulb Extracts

Table 3.3. Preliminary Phytochemical Screening of *Allium sativum* Bulb Extracts

Phytochemical	Ethanol	Petroleum ether	Chloroform	Water	Hydroalcoholic
Alkaloids	+	-	+	+	++
Flavonoids	++	-	+	++	+++
Phenolic compounds	++	-	+	++	+++
Tannins	+	-	-	+	++
Saponins	++	-	-	++	+++
Glycosides	+	-	+	+	++
Steroids	+	++	++	-	++
Terpenoids	+	++	++	-	++

Carbohydrates	++	-	-	++	+++
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+++ = Strongly positive, ++ = moderately positive, + = weakly positive, - = Not detected

Preliminary phytochemical screening of the three plant extracts showed the presence of diverse phytoconstituents in different solvent fractions. The hydroalcoholic extracts exhibited the broadest phytochemical profile, particularly for flavonoids, phenolic compounds, tannins, saponins, and carbohydrates. Non-polar solvents such as petroleum ether and chloroform mainly extracted steroidal and terpenoid constituents. These findings indicate that the hydroalcoholic extracts of *Boerhavia diffusa*, *Eclipta alba*, and *Allium sativum* are promising for further evaluation of their bioactive constituents and pharmacological potential.

4. Conclusion

The present study demonstrated that the aerial part of *Boerhavia diffusa*, leaves of *Eclipta alba*, and bulb of *Allium sativum* contain a diverse range of phytoconstituents. Among the different solvents investigated, hydroalcoholic extracts showed the most comprehensive phytochemical profile, particularly for flavonoids, phenolics, tannins, saponins, and carbohydrates. The findings support the potential of these plants as sources of bioactive constituents and provide a preliminary basis for further quantitative phytochemical analysis, chromatographic profiling, and evaluation of their pharmacological activities.

5. References

1. Evans, W. C. (2009). *Trease and Evans' pharmacognosy* (16th ed.). Saunders/Elsevier.
2. Harborne, J. B. (1998). *Phytochemical methods: A guide to modern techniques of plant analysis* (3rd ed.). Chapman & Hall.
3. Trease, G. E., & Evans, W. C. (2009). *Trease and Evans' pharmacognosy* (16th ed.). Saunders Elsevier.
4. Bayan, L., Koulivand, P. H., & Gorji, A. (2014). Garlic: A review of potential therapeutic effects. *Avicenna Journal of Phytomedicine*, 4(1), 1-14.
5. Jahan, R., Al-Nahain, A., Majumder, S., & Rahmatullah, M. (2014). Ethnopharmacological significance of *Eclipta alba* (L.) Hassk. (Asteraceae). *International Scholarly Research Notices*, 2014, 385969. <https://doi.org/10.1155/2014/385969>
6. Rawat, A. K. S., Mehrotra, S., Tripathi, S. C., & Shome, U. (2014). *Boerhaavia diffusa*: A review of its phytochemical and pharmacological

potential. *BioMed Research International*, 2014, 100963. <https://doi.org/10.1155/2014/100963>

7. Shang, A., Cao, S. Y., Xu, X. Y., Gan, R. Y., Tang, G. Y., Corke, H., Mavumengwana, V., & Li, H. B. (2019). Bioactive compounds and biological functions of garlic (*Allium sativum* L.). *Foods*, 8(7), 246. <https://doi.org/10.3390/foods8070246>