International Journal of Innovative Research in Technology and Science
ISSN: 2321-1156 www.ijirts.org Volume 12 Issue 2, March 2024

Phytochemical Analysis of Some Traditional Plants Occurring in the Local Area of SAM Global University Campus

Sarvar Jahan
School of Sciences, SAM Global University, Bhopal, India
sarvarjahan92@gmail.com

Selection and peer review of this article are under the responsibility of the scientific committee of the International Conference on Current Trends in Engineering, Science, and Management (ICCSTEM-2024) at SAM Global University, Bhopal.

Abstract- Bioactive substances found in medicinal plants are crucial in treating various human illnesses and facilitating healing. These substances consist of primary components, such as amino acids, proteins, sugars, and chlorophyll, as well as secondary components, including alkaloids and terpenoids. Medicinal plants exhibit antifungal, antibacterial, and anti-inflammatory properties. This study investigates ten medicinal plants - Achyranthes aspera L, Ricinus communis L, Pedalium murex L, Azadirachta indica Adr. Juss, Cissus quadrangularis L. Mart, Euphorbia cycthophora L, Amaranthus spinosus L, Psidium guajava L, Fagonia cretica, and Bauhinia variegata L - available locally on the Sam Global University campus in Bhopal. These plants were screened using standard methods, revealing the presence of tannins, flavonoids, phenolics, saponins, steroids, cardiac glycosides, and alkaloids. The leaves of selected medicinal plants were washed, air-dried, and powdered. Phytochemical analysis was performed on aqueous leaf extracts to identify the constituents. The primary objective was to determine the presence or absence of phytochemical constituents in the selected plants. Results indicated the presence of alkaloids, flavonoids, steroids, glycosides, terpenoids, phenols, tannins, saponins, gum, mucilage, lignin, and starch terpenoids in the aforementioned medicinal plants.

Keywords- Phytochemical, Secondary metabolites, Medicinal properties, Qualitative screening, Medicinal plants

1. INTRODUCTION

Medicinal plants are useful for healing and curing human diseases because of the presence of phytochemical constituents. Natural products, especially from plant sources, including species, have been investigated for their characteristics and health effects. Plants have designed the basis of classy traditional medicine practices used for thousands of years by people in China, India and many other countries (Sneader, 2005). Some of the earliest records of the usage of plants as drugs are found in the Artharvaveda, which is the basis for Ayurvedic medicine in India, the clay tablets in Mesopotamia (1700 BCE), and the Eber Papyrus in Egypt (1550 BCE) (Sneader, 2005). Plant chemicals are regarded as secondary metabolites because the plants that manufacture them may have little need for them. They are synthesised in all parts of the plant body: bark, leaves, stem, root, flower, fruits, seeds, etc., i.e. any part of the plant body may contain active components (Solomon Charles et al., 2013). Together with

fibres and nutrients, these compounds comprise an integrated component of the body's defence mechanism against various illnesses and stressors. (Thilagavathietal.,2015). These chemical substances are called secondary metabolites. The most important of these bioactive groups of plants are alkaloids, terpenoids, tannins, saponins and phenolic compounds (Edeogaet al., 2005). The correlation between the phytoconstituents and plants' bioactivity is desirable for synthesising compounds with specific activities to treat various health ailments and chronic diseases (Pandeyet al., 2013). Generally, different phytochemicals in crude plant extracts have been linked to the detrimental effects of leachates, root exudates or decomposing residues of such plants on other vegetation or succeeding crops (Mubashir and Wajaht, 2011). Owing to the significance in the above context, such preliminary phytochemical screening of plants is the need of the hour to discover and develop novel therapeutic agents with improved efficacy. Phytochemical analyses of several species of medicinal plants and allelopathic activities of the crude chemical compounds on crops and plants have yielded positive results (Fujiiet al., 2004). The present study revealed the qualitative phytochemistry of ten medicinal plants used at SGU Campus, Bhopal.

2. MATERIALS AND METHODS

Fresh plant samples were collected from three plants on the SGU Campus, Bhopal. Wagner's test was conducted by adding about 1ml of leaf extract to 1ml of Wagner's reagent (dilute iodine solution) and observing the formation of reddish-brown precipitates to indicate the presence of alkaloids. Various chemicals and solutions were utilised, including Fehling solution A, Fehling solution B, ethanol, distilled water, aqueous HCl, methanol, chloroform, concentrated sulphuric acid, ammonia solution, picric acid, and hexane. The leaves of selected plants were washed under running tap water to remove dust, air-dried for a few days, crushed into powder, and stored in polythene bags. Test tubes containing plant powder were filled with distilled water, shaken well, and filtered to obtain the extract for further phytochemical analysis. Preliminary qualitative phytochemical screening involved several methods. The fourth test required boiling 2g of powdered sample with 20 ml of distilled water, filtering, mixing 10 ml of the filtrate with 5 ml of distilled water, shaking vigorously, and observing stable frothing with the addition of olive oil. The Shinoda test involved adding concentrated HCl and magnesium powder to 1ml of extract, boiling it, and observing red colouration for flavonoids. Libermann-Burchard test required mixing the extract with acetic anhydride and concentrated H2SO4 to detect steroids. Keller-Killani test involved treating the extract with glacial acetic acid, ferric chloride solution, and concentrated sulphuric acid to detect cardiac glycosides. Salkowski test detected terpenoids by adding chloroform and concentrated H2SO4 to the extract. Liebermann's test involved adding sodium nitrite, diluted sulphuric acid, and NaOH to detect phenols—The modified Prussian blue test detected tannins by mixing the extract with potassium ferricyanide and FeCl3. Saponins were detected by observing honeycomb froth after vigorous shaking with distilled water. Gum and mucilage were detected by adding absolute alcohol to the extract and observing swelling. Klason lignin was detected by observing red colouration on the xylem and phloem tissue fibres after treatment with phloroglucinol and concentrated HCl. Finally, a 50% iodine solution was used to observe blue-black spots.

Table 1: Preliminary qualitative phytochemical analysis of some traditional medicinal plants, SGU campus, Bhopal

	Phytochemicals										
PlantName	Al	Fl	St	Gly	Ter	Ph	Tan	Sap	G and M	Lig	St
AchyranthesasperaL.	+	-	-	-	-	-	+	-	-	+	+
AmaranthusspinosusL.	+	+	-	-	-	+	+	+	-	-	-
AzadirachtaindicaAdr.Juss.	+	+	-	-	+	+	+	+	-	-	-
CissusquadrangularisL.Mart.	-	+	+	-	-	+	+	+	+	-	+
EuphorbiacycthophoraL.	+	+	-	+	+	-	-	+	-	-	-
Pedaliummurex L.	+	+	+	+	-	-	-	-	-	-	-
Psidiumgujauva	+	+	+	-	+	+	+	-	-	+	-
Fagoniacretica	-	+	+	+	+	+	+	-	-	-	-
Bauhinia variegate	-	+	+	-	-	+	-	+	-	-	-
RicinuscommunisL.	+	+	+	-	-	+	+	+	-	-	+

'+' indicates the presence of phytochemicals, and '-' indicates the absence, Al=Alkaloids, Fl=Flavonoids, St=Steriods, Gly=Glycosides, Ter=Terpenoids, Ph=Phenols, Tan=Tannins, Sap=Saponins, G and M=Gum and Mucilage, Lig= Lignin, St=Starch

3. RESULTS AND DISCUSSION

Preliminary qualitative phytochemical screening of the crude powder from 10 plants was conducted to assess the presence of bioactive components. The screening revealed the presence of alkaloids, flavonoids, tannins, phenols, steroids, glycosides, terpenoids, and saponins (Table 1). Among these compounds, alkaloids, phenols, flavonoids, saponins, and tannins are crucial secondary metabolites responsible for the medicinal values of the respective plants. Terpenoids were found in 4 of the 10 selected medicinal plants and are associated with analgesic and anti-inflammatory activities. Additionally, tannins contribute to the property of astringency, facilitating the faster healing of wounds and inflamed mucous membranes (Okwu and Josiah, 2006). Steroidal compounds were detected in 6 of the 10 medicinal plants, and their significance lies in their relationship with sex hormones, which is of interest in pharmacy (Anubha Arora, 2013). The phytochemical screening demonstrated the presence of various types of phytocompounds, such as alkaloids, saponins, flavonoids, steroids, and tannins, which could account for the diverse pharmacological properties observed. These phytochemical constituents, including tannins, flavonoids, alkaloids, and other aromatic compounds or secondary metabolites of plants, serve as defence mechanisms against predation by microorganisms, insects, and herbivores. The therapeutic properties of medicinal plants are likely attributed to various secondary metabolites such as alkaloids, flavonoids, glycosides, phenols, saponins, and steroids (Anubha Arora, 2013). Saponins naturally ward off microbes, making them suitable for treating fungal and yeast infections. These compounds act as natural antibiotics, aiding the body in fighting infections and microbial invasions (Santhi et al., 2011). Besides their antioxidant properties, Flavonoids protect against allergies, inflammation, free radicals, platelet aggregation, microbes, ulcers, hepatoxins, viruses, and tumours (Barakat et al., 1993). Cardiac glycosides were found in the methanol extract. These glycosides have been utilised for over two centuries as stimulants in cases of cardiac failure (Trease and Evans, 1998;

Olayinki et al., 1992). Earlier reports have primarily focused on alkaloids and steroidal sapogenins (saponins) as major chemical substances of interest; however, diverse groups of naturally occurring phytochemicals such as flavonoids, tannins, unsaturated sterols, triterpenoids, essential oils, etc., have also been documented (Farnsworth et al., 1966). In this study, all plant samples exhibited the presence of alkaloids, flavonoids, tannins, and saponins.

4. CONCLUSION

The ten selected medicinal plants serve as rich sources of secondary metabolites, including alkaloids, flavonoids, terpenoids, steroids, glycosides, phenols, tannins, saponins, gum and mucilage, lignin, and starch. These plants play a crucial role in preventing various diseases owing to their antidiuretic, anti-inflammatory, analgesic, anticancer, antiviral, antimalarial, antibacterial, and antifungal activities attributed to these secondary metabolites. Medicinal plants are instrumental in discovering and screening phytochemical constituents, which are valuable for developing new drugs. Both previous and present phytochemical analyses yield similar results due to the consistent presence of these constituents. The analysis of phytochemicals in medicinal plants holds significant commercial interest for research institutes and pharmaceutical companies, as it aids in developing new drugs for treating various diseases. We anticipate that the important phytochemical properties identified in our study of local plants at SGU will be beneficial in addressing different diseases prevalent in this region. This study paves the way for further research involving isolating and identifying active compounds from the selected plants using chromatographic and spectroscopic techniques. Such endeavours will advance our understanding of medicinal plants and their therapeutic potential.

REFERENCES

[1]. Arora, Anubha. “Phytochemical analysis of methanolic extracts of leaves of some medicinal plants.” Biol Forum – An Int J., vol. 5, no. 2, 2013, pp. 91-93.

[2]. Barakat, M.Z., et al. “Determination of ascorbic acid from plants.” Annal of Biochem., vol. 53, 1993, pp. 225-245.

[3]. Edeoga, H.O., et al. “Phytochemical constituents of some Nigerian medicinal plants.” Afr J Biotech., vol. 4, 2005, pp. 685-688.

[4]. Farnsworth, N.R., et al. “Biological and phytochemical evaluation of plants. Biological test procedures and results from two hundred accessions.” Lloydia, vol. 29, 1966, pp. 01-122.

[5]. Fujii, Y., et al. “Assessment methods for allelopathic effect from leaf litter leachates.” Weed BiolManag., vol. 4, 2004, pp. 19-23.

[6]. Mubashir, S., and Wajaht, A.S. “Phytochemical and Pharmacological Review Profile of Adiantumvenustum.” Int J Pharm Tech Res., vol. 3, 2011, pp. 827-830.

[7]. Okwu, D.E., and Josiah, C. “Evaluation of the chemical composition of two Nigerian medicinal plants.” Afr J Biotech., vol. 5, 2006, pp. 357-361.

[8]. Olayinki, A.O., et al. “Cardiovascular effects of the methanolic extract of the stem bark of Khayasengaensis.” Phy Res., vol. 6, no. 5, 1992, pp. 282-284.

[9]. Pandey, P., et al. “Physico-chemical and preliminary phytochemical screening of Psoraleacorylifolia.” Arch ApplSci Res., vol. 5, 2013, pp. 261-265.

[10]. Santhi, R. et al. "Phytochemical screening of Nerium oleander leaves and Momordicachrantia leaves." Inter Res J Pharm., vol. 2, 2011, pp. 131-135.
[11]. Shanmugam, S., et al. Laboratory handbook on Biochemistry. PHI Learning Private Limited Delhi, 2010.
[12]. Sneader, W. Drug Discovery: a History. Wiley, Chichester, 2005; UK.
[13]. Solomon, Charles Ugochukwu, et al. "Preliminary phytochemical screening of different solvent extracts of stem bark and roots of Dennetiatripetala."