

To Study Phytochemical Screening to Identify Major Bioactive Constituents *Alangium Salvifolium*

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Abstract—The phytochemical examination of leaf extracts from *Alangium salvifolium* revealed the existence of several biologically active compounds. The leaf extract of *Alangium salvifolium* contains a biologically active compound that exhibits antidiabetic properties. Consequently, an effort was undertaken to isolate the fractions that contain active chemical compounds through column chromatography. The findings demonstrated that during the chromatographic separation, the concentration of active compounds increased due to the elimination of undesirable substances; thus, the fractions exhibited significant inhibitory effects at lower concentrations. The initial phytochemical analysis of leaf extracts from *Alangium salvifolium* indicated the presence of alkaloids, saponins, and tannins. Therefore, based on the Rf values, it can be inferred that the active fractions may encompass these bioactive compounds that are responsible for the antidiabetic activity.

I. INTRODUCTION

In many phytochemical studies, sequential extraction using solvents of increasing polarity such as petroleum ether, chloroform, ethyl acetate, methanol, ethanol, and distilled water is employed to obtain a broader spectrum of phytochemicals (Harborne, 1998). Non-polar solvents such as petroleum ether are useful for removing lipids, fats, and waxes, whereas polar solvents such as ethanol and water are effective in extracting phenolic compounds, flavonoids, and glycosides, which are often responsible for the therapeutic activities of medicinal plants.

For the present investigation, ethanol was used as the extraction solvent in the Soxhlet extraction method

for all four plants. The use of ethanol facilitated the efficient extraction of bioactive compounds associated with antidiabetic and antioxidant activities. After completion of the extraction process, the solvent was removed under reduced pressure using a rotary vacuum evaporator to obtain concentrated extracts. The dried extracts were stored in airtight containers and used for further formulation and pharmacological studies.

The extraction of bioactive compounds from medicinal plants is a crucial step in phytochemical and pharmacological investigations. The choice of solvent plays a significant role in determining the efficiency and selectivity of the extraction process. Different solvents possess different polarities and therefore dissolve different classes of phytochemicals present in plant materials. The appropriate selection of solvent helps in maximizing the yield of desired phytoconstituents while minimizing the extraction of unwanted components (Harborne, 1998; Evans, 2009).

Medicinal plants contain a wide variety of chemical constituents such as alkaloids, flavonoids, phenolic compounds, tannins, glycosides, saponins, and terpenoids. These compounds differ in their chemical structure and polarity, and therefore require suitable solvents for efficient extraction. Non-polar solvents such as petroleum ether are generally used to extract lipids, fats, waxes, and other non-polar constituents. Moderately polar solvents such as chloroform and ethyl acetate are useful for extracting compounds like certain alkaloids and terpenoids. Polar solvents such as methanol, ethanol, and water are commonly used to extract phenolic compounds, flavonoids,

glycosides, and tannins, which are often responsible for the therapeutic activities of medicinal plants (Harborne, 1998).

Among the various solvents used for plant extraction, ethanol is widely preferred in phytochemical studies due to its ability to extract a broad range of phytoconstituents. Ethanol is considered relatively safe, less toxic, and environmentally friendly compared to many other organic solvents. It is also capable of dissolving both polar and moderately non-polar compounds, making it suitable for the extraction of biologically active components from medicinal plants (Evans, 2009).

In the present study, ethanol was selected as the extraction solvent for the medicinal plants *Alangium Salvi folium*, *Tinospora cordifolia*, *Terminalia chebula*, and *Pavonia zeylanica*. The use of ethanol facilitated efficient extraction of phytochemicals such as flavonoids, phenolic compounds, alkaloids, and glycosides, which are known to contribute to the antidiabetic, antioxidant, and antihyperlipidemic activities of these plants. Therefore, ethanol was considered an appropriate solvent for obtaining extracts rich in therapeutically active compounds.

The main objectives of the present research work are:

1. To collect and authenticate the plant material of *Alangium salvifolium*.
2. To prepare extracts of the plant using suitable solvents by successive solvent extraction method.
3. To carry out preliminary phytochemical screening of the obtained extracts to identify major phytochemical constituents.
4. Extraction of bioactive constituents from powdered plant materials will be carried out using successive solvent extraction with solvents of increasing polarity such as petroleum ether, chloroform, ethanol, and distilled water.

The extraction will be performed using the Soxhlet extraction method. The extracts obtained will be filtered using Whatman filter paper and concentrated using a rotary vacuum evaporator under reduced pressure. The percentage yield of the extracts will also be calculated.

II. METHODOLOGY

Extraction and analysis: Fresh flowers and leaves were washed and weighed (10 g each). The materials

were then macerated in 10 ml of water, methanol, acetone and benzene separately and then kept for 6 hr at room temperature. The mixtures were then filtered through sterile Whatmann filter paper No.1. The filtrates obtained were then centrifuged at 5000 rpm for 5 min. The supernatants were collected in a beaker and the solvents were allowed to evaporate. Then the dry extracts were stored at 4°C. These extracts were dissolved in 1-3 ml (w/v) of dimethyl sulfoxide (DMSO) (Priya and Ganjewala, 2007). The samples were further extracted by passing through the column of cotton, silica gel, activated charcoal and again silica gel in ratio 1:2:1 to obtain the extracts. The collected extract was passed into the column, number of times, to obtain the pure compound. Phytochemical screening: Specific qualitative tests were performed for detection of metabolites in leaf and flower extracts. Alkaloids were estimated from previously published procedures (Clarke and Williams, 1955). The presence of sterols was confirmed by the addition of 2 ml of acetic anhydride to 0.5 g of dried ethyl acetate extract with 2 ml of concentrated sulphuric acid. For the identification of phenolics, 1 ml of neutral ferric chloride was added to 1 ml of the extract. For the identification of terpenes, the extracts were treated with tin and thionyl chloride. For the identification of flavones, 10 % sodium hydroxide was added. To reveal the presence of tannins, 0.5 g of the dried powder of the leaves and flowers were boiled with 5 ml of water in a test tube and then filtered. To the filtrate, ferric chloride was added and kept undisturbed for the observation. Phospholipids and glycolipids were estimated based on previously published procedures (Roughan and Batt, 1969; Lowry and Tinsley, 1976). To reveal the presence of fixed oils, small quantity of petroleum ether and benzene extract was pressed separately between two filter papers.

III. RESULT AND DISCUSSION

Test for Alkaloids (Mayer's Test): A small amount of plant extract was treated with Mayer's reagent. The formation of a cream or pale-yellow precipitate indicated the presence of alkaloids.

Test for Flavonoids (Shinoda Test): The extract was mixed with magnesium ribbon and concentrated hydrochloric acid. The appearance of a pink or

reddish coloration indicated the presence of flavonoids.

Test for Phenolic Compounds: few drops of ferric chloride solution were added to the extract. The formation of a dark blue or green color confirmed the presence of phenolic compounds.

Test for Tannins: The extract was treated with ferric chloride solution. A blue-black or greenish coloration indicated the presence of tannins.

Test for Glycosides: The extract was treated with Benedict's reagent and heated gently. The formation of a colored precipitate indicated the presence of glycosides.

Test for Saponins (Foam Test): The extract was shaken vigorously with distilled water. Persistent foam formation indicated the presence of saponins.

Test for Terpenoids (Salkowski Test): The extract was treated with chloroform and concentrated sulfuric acid. The formation of a reddish-brown coloration at the interface indicated the presence of terpenoids.

Phytochemical	<i>Alangium salvifolium</i>
Alkaloids	+
Flavonoids	+
Phenolics	+
Tannins	+
Glycosides	+
Saponins	-
Terpenoids	+

According to the International Diabetes Federation (IDF), millions of people worldwide are affected by diabetes mellitus, and the number is expected to increase significantly in the coming years. India is considered one of the countries with the highest number of diabetic patients. The growing burden of diabetes not only affects the quality of life of patients but also places a significant economic burden on healthcare systems.

Conventional pharmacological therapies for diabetes mellitus include insulin therapy and oral hypoglycemic agents such as sulfonylureas, biguanides, thiazolidinediones, and alpha-glucosidase inhibitors. Although these drugs are effective in controlling blood glucose levels, their long-term use may produce several adverse effects including hypoglycemia, gastrointestinal disturbances, weight gain, and hepatotoxicity. Furthermore, these drugs often fail to prevent diabetes-related complications.

Another important metabolic disorder commonly associated with diabetes mellitus is hyperlipidaemia. In diabetic patients, abnormalities in lipid metabolism result in increased levels of total cholesterol, triglycerides, low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL), along with decreased levels of high-density lipoprotein (HDL). These lipid abnormalities significantly increase the risk of cardiovascular diseases, which are one of the leading causes of mortality among diabetic patients.

Due to the limitations of conventional drugs, there has been growing interest in exploring medicinal plants as alternative therapeutic agents for the management of diabetes mellitus and associated metabolic disorders. Medicinal plants have been used for centuries in traditional systems of medicine such as Ayurveda, Siddha, and Unani. These plants contain a wide variety of bioactive compounds that exhibit significant pharmacological activities.

Plant-derived phytochemicals such as flavonoids, phenolic compounds, alkaloids, tannins, glycosides, and terpenoids have been reported to possess strong antidiabetic, antioxidant, and antihyperlipidemic properties. These compounds may exert their therapeutic effects through various mechanisms including stimulation of insulin secretion, enhancement of insulin sensitivity, inhibition of carbohydrate digestion enzymes, and reduction of oxidative stress.

In the present study, a polyherbal formulation was developed using extracts of four medicinal plants: *Alangium Salvi folium*, *Tinospora cordifolia*, *Terminalia chebula*, and *Pavonia zeylanica*. These plants were selected based on their traditional use in the treatment of metabolic disorders and their reported pharmacological activities.

The aim of this research work was to investigate the antidiabetic, antihyperlipidemic, and antioxidant potential of the developed polyherbal formulation

through phytochemical investigation, formulation development, and pharmacological evaluation.

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