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Research Article

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PRELIMINARY PHYTOCHEMICAL EXAMINATION OF ETHANOLIC EXTRACT OF SOME HEPATOPROTECTIVE MEDICINAL PLANT LEAVES FROM CHAKDAHA, NADIA, WEST BENGAL, INDIA

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ABSTRACT

Nature is the source of outstanding multiple natural compounds with interesting pharmacological activities that are useful in curing our various ailments. Medicinal plants have various biochemical constituents or phytochemicals that are used to treat various communicable and non-communicable diseases. These biochemical constituents or phytochemicals are classified as primary and secondary constituents. Primary constituents or primary plant metabolites are chlorophyll, proteins, sugar and amino acids, phytosterols, acyl lipids, nucleotides, organic acids, etc. Secondary constituents contain unusual amino acids, polyamines, phenolic compounds, coumarins, alkaloids, flavonoids, lignins, cyanogenic glycosides, glucosinolates, tannins, betalains terpenoids, etc. The present study involves four different medicinal plants: *Azadirachta indica*, *Andrographis paniculata*, *Aegle marmelos* & *Vitex negundo* locally available in West Bengal Chakdaha, Nadia and which are collectively used to prepare a good ayurvedic liver tonic due to their hepatoprotective activities. The leaves of the selected medicinal plants were washed, air-dried and then powdered. The ethanolic extracts of leaf samples were used for the phytochemical examination to find out the phytochemical constituents in the plants. The main objective of the research work was to find out what are the phytochemicals present in the selected plant parts. The results of the phytochemical analysis of these medicinal plants showed that the terpenoids, tannins, carbohydrates, flavonoids, alkaloids, glycoside, proteins, saponin, triterpenoids, sterols and phenolic compounds were found to be present in them. The phytochemical examination of the plants is very important and cost-effective in pharmaceutical companies for the formulations of new drugs or dosage forms for the treatment and prevention of many diseases. It is predicted that the major phytochemical properties identified by our study in the indigenous medicinal plants of west Bengal will be very useful in the curing of various diseases of this region.

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INTRODUCTION

Nature is a source of splendidly multiple natural compounds with interesting pharmacological activities. The helpful molecules known as natural products are derived from the various organic chemistry reactions in multiple species within which the interactions among organisms and their surroundings formulate the varied complicated chemical entities within them that enhance their survival and competitiveness. It is always a golden sign to show the eminent phenomena of concurrence. Nature is an affluent storehouse of herbal remedies to cure several ailments. Natural products from plants, animals, and minerals like those from a whole plant, part of an organism, exudates, in pure and isolated form from organisms, are of primary importance for treating human diseases [1-3]. Today these natural compounds are finding increasing use in the developed world which depends on plant-based traditional medicine for primary health care systems due to their economic price, cultural acceptability, better compatibility, and lesser side effects [4], as probes to interrogate biological systems part of genomics and proteomics [5]. In today's scenario, Phytochemistry has developed the synthesis of primary and secondary metabolites and their effectiveness by various pathways like Shikimic acid, acetate, and amino acid by using various modern tracer techniques.

Medicinal Plants

"Without Plants, there is no persistence of life". Plants are an essential basis of medicine. The term "Medicinal plant" involves different types of plants used in Herbalism (herbal medicine).

World Health Organization (WHO) defines "A medicinal flora as the flora which, in one or more of its constituents, comprises a substance that can be useful for medicinal purposes, or which are the pioneer for chemo pharmaceutical semi synthesis". These are the "common sources" of medicine or "backbone" of the traditional medicine. The medicinal plants were grouped into five growth forms (a) trees (63.5%), (b) climbers (15.4%), (c) herbs (11.5%), (d) shrubs (9.6%), and mainly (e) leaves (40.3%). Habit-wise classification of medicinal plants showed that about (i) 33% are trees, (ii) 32% herbs, (iii) 20% shrubs, (iv) 12 % creepers and (v) 3% others.

The majority are classified as higher flowering plants of the 386 families and 2200 genera of medicinal plants recorded in India. The medicinal plant is an important component of indigenous medical systems all over the world. Ethnobotany provides a rich resource for natural drug research and development [6]. Medicinal plants are literally in demand and their acceptance is increasing progressively. The herbals especially curative herbs have constantly acted as an overall indicator of ecosystem fitness [7]. Medicinal Plants are used in various traditional, complementary, and alternate systems of treatment of human diseases. Now a present-time these flora become an integral element of research developments in the pharmaceutical industry which concentrated on the separation and direct use of active medicinal ingredients, for the growth of semi-synthetic drugs and on the dynamic screening of pure results to yield synthetic drugs. The search for the new medicine has been associated with "Ethnobotany and Ethnopharmacology" from which find different sources and classes of compounds. Many pharmacological syntheses can be isolated from medicinal flora with the help of present-day drug-uncovering research activities by using lead compounds for chemical derivatization and drug enlargement.

Selection of Plants

As it has been seen that the medicinal plants possess very promising therapeutic effects, the author has selected following medicinal plant collected from the folklore information during field survey. We have chosen these plant leaves to find out what are the phytochemicals present in there. We are going to perform phytochemical examinations to find out all these constitutions. This is the objective of our project. The selected plant includes:

Azadirachta indica, also known as neem, has been traditionally used in Ayurvedic medicine as a hepatoprotective agent. Its leaves, bark, and seeds contain several bioactive compounds such as flavonoids, triterpenoids, and alkaloids that possess anti-inflammatory and antioxidant properties, which may help protect the liver from damage caused by toxins [8, 9].

Andrographis paniculata, also called the king of bitters, is another herb with hepatoprotective effects. The active compound in Andrographis, andrographolide, has been found to exhibit anti-inflammatory, antioxidant, and immunomodulatory properties that could help prevent liver damage [10, 11].

Aegle marmelos, commonly known as bael, has been used in traditional medicine to treat various liver disorders. The fruit and

leaves of the plant contain compounds that possess antioxidant, anti-inflammatory, and hepatoprotective properties that may help protect the liver from damage caused by toxins [12].

Vitex negundo, a five-leaved chaste tree, has been used in traditional medicine to treat liver disorders. Its leaves contain compounds such as flavonoids, alkaloids, and terpenoids that possess antioxidant, anti-inflammatory, and hepatoprotective properties that could help protect the liver from damage [13]. Overall, these herbs may be beneficial in protecting the liver from damage caused by toxins and promoting liver health. However, it's important to consult with a healthcare professional before using any herbal remedies, especially if you have an underlying medical condition or are taking medications.

***Azadirachta indica* (Neem)**

- **Kingdom:** Plantae
- **Family:** Meliaceae
- **Order:** Rutales
- **Genus:** Azadirachta
- **Species:** indica

***Andrographis paniculata* (Kalmegh)**

- **Kingdom:** Plantae
- **Family:** Acanthaceae
- **Order:** Lamiales
- **Genus:** Andrographis
- **Species:** *A. paniculata*

***Aegle marmelos* (Bael)**

- **Kingdom**: Plantae
- **Family:** Rutaceae
- **Order:** Sapindales
- **Genus:** Aegle
- **Species:** *A. marmelos*

Vitex negundo (Nishinda):

- **Kingdom:** Plantae
- **Family:** Lamiaceae
- **Order:** Lamiales
- **Genus:** Vitex
- **Species:** *V. negundo*

Plant profiles and survey of literature

This chapter deals with the botanical information and survey of literature of the selected plants used in the present studies. The selected plants for the study include-

***Azadirachta Indica* (Family: Meliaceae)**

Name of the plant: *Azadirachta indica*.

Vernacular names: Neem (Bengali), Nim (French), Nimes (Occitan), Nemausus (Latin)

Botanical Characteristics and Occurrence of *A. indica*

It is native to the Indian subcontinent but has been widely naturalized in other tropical and subtropical regions, including Southeast Asia, Africa, and Central and South America. The tree can grow up to 20-25 meters tall and has a dense, spreading crown of leaves that are pinnate with 20-31 leaflets. The leaflets are ovate to lanceolate in shape and have a toothed margin. The tree produces small, white to purple flowers that are fragrant and arranged in clusters. It bears many-flowered panicles, mainly in the leaf axils. The sale is ovate and almost 1cm long with sweet-scented white oblanceolate petals. It produces yellow drupes that are ellipsoid and glabrous, 12-20 mm long. Leaves are green, turning yellow on ripening, aromatic with a garlic-like odour. Garden fresh leaves and flowers come in March-April. The fruit of the tree is a drupe, which is oval in shape and green when immature, turning yellow as it ripens. Neem is a hardy tree that thrives in arid and semiarid regions, where other plants may struggle to grow. It prefers well-drained soils, but can also tolerate poor soils and drought conditions. The tree is often planted as a shade tree in agricultural fields, and its leaves and twigs are used as a natural fertilizer and insect repellent [14].

***Andrographis Paniculata* (Family: Acanthaceae)**

Name of the plant: *Andrographis paniculata.*

Vernacular names: Kalmegha, Bhunimba (India), Green chiretta(English), chuanxinlian (Standard Chinese), roi des amers (French), sambiloto (Indonesian), Aluy, Lekha and Sinta (Philippines), Andrografis (Spanish), Nain-e Havandi (Persian), Green Chiratta (Scandinavian), HempeduBumi or Sambilot (Malay).

Botanical Characteristics and Occurrence of *A. paniculata*

Andrographis paniculata, also known as green chireta or king of bitters, is a medicinal herb that belongs to the Acanthaceae family. It is native to India and Sri Lanka, but is widely distributed in other parts of Asia, including China, Thailand, and Indonesia. The plant has a woody stem that can grow up to 1 meter tall and produces small, lance-shaped leaves that are arranged oppositely along the stem. The leaves are dark green in color and have a slightly bitter taste.

The plant produces small, white to lavender flowers that are arranged in spikes. It is an annual, profusely branched, erect herb, and 0.5-1.0 m in height with a tap root. Leaves are green, lanceolate, 3-7 cm and 1-2.3 cm in size, glabrous with slightly undulate margin, acuminate apex with a tapering base. Flowers are little and lonely; corolla white or light pink with hairs. Leaf a capsule linear, oblong and acute at both of ends; seeds numerous. *Andrographis paniculata* is a hardy plant that can grow in a range of soil types, but prefers well-drained soils with a pH range of 6.0-8.0. The plant is often grown as a medicinal crop and has been used traditionally in Ayurvedic and Chinese medicine for its various health benefits [15].

***Aegle marmelos* (Family: Rutaceae)**

Name of the plant: *Aegle marmelos.*

Vernacular names: In some languages, *Aegle marmelos* is known as stone apple (English), Baelbaum (German), Oranger du Malabar (French). bael árbol (Spanish).

Botanical Characteristics of *Aegle marmelos*

This is a slow-growing tree hights nearly about 762 cm and plant parts include bark, leaf, flower, fruit, and seed. Spiny branches can be seen in the *Aegle marmelos* tree. The leaves are alternately, generally trifoliate, and contain leaflets of 3–5 numbers, having a length of 4–10 cm, with 2–5 cm width. Young leaves are lighter green coloured when young leaves become mature and look like dark green.

Bael trees have thick bark and flaking, the branches are spiny. From the wounded bark a gum secretion is observed, which turns thick when comes in contact with air. Bael's flowers are greenish-white in colour. Having a sweet scent, it is also characterised as having bisexual, ebracteate, hypogynous, actinomorphic stalk. The axil of the leaf carries some lateral panicles which contain ten flowers. The bael fruit colour is mainly yellowish green, having a diameter of 5.3–7.2 cm, with an approximate weight of 77.2 g. The pulp of Bael is yellowish in colour and mucilaginous. It contains some dots on the outer surface and also contains numerous seeds, which are hard and have thread-like hairs over their outer surface which is white [16].

***Vitex negundo* (Family: Lamiaceae):**

Name of the plant: *Vitex negundo.*

Varnacular names: Hindi: Nirgundi, Tamil: Nochi, Bengali: Nishinda, Gujarati: Nagod, Kannada: Lakkigida.

Botanical Characteristics and Occurrence of *Vitex negundo*

It is native to Southeast Asia but has been introduced to other parts of the world, including Africa and the Americas. The plant is a small shrub or tree that can grow up to 5 meters tall. It has a greyish-brown bark and produces aromatic leaves that are composed of five leaflets arranged in a palmate pattern. Leaves are 4-10 cm long, hairy beneath and pointed at both ends. The leaflets are lance-shaped and have serrated edges.

The plant produces small, fragrant, whitish or bluish flowers that are arranged in spikes. Flowers are bluish-purple in colour borne on axillary or terminal panicles up to 30 cm long. The fruit of *Vitex negundo* is a small, round, dark purple drupe that contains four seeds. The fruit is succulent globose, and black when ripe it gets four seeds, which is rounded and have a diameter of 4mm [17]

Ethnomedical Informations of selected plants

- ***Azadirachta Indica***

Neem has been traditionally used in Ayurveda for the treatment of various ailments such as skin diseases, fever, malaria, diabetes, and digestive disorders. It is also known for its antifungal, antiviral, and antibacterial properties. Additionally, neem is used as a natural pesticide and insecticide [18].

- ***Andrographis Paniculata***

Kalmegh has been used in Ayurveda and traditional Chinese medicine for the treatment of liver disorders, respiratory infections, fever, and inflammation. It is also known for its antimalarial, antiviral, and antioxidant properties. Additionally, kalmegh is used to stimulate appetite, aid digestion, and promote overall health [19].

- ***Aegle marmelos***

Bael is used in Ayurveda for the treatment of various digestive disorders such as diarrhea, dysentery, and constipation. It is also known for its antidiabetic, anticancer, and antimicrobial properties. Additionally, bael is used to improve immunity, promote liver health, and as a natural remedy for skin disorders [20].

- ***Vitex negundo***

It has been traditionally used in Ayurveda for the treatment of various ailments such as arthritis, fever, headache, and respiratory infections. It is also known for its anti-inflammatory, analgesic, and antifungal properties. Additionally, *Vitex*

negundo is used to promote wound healing, improve skin health, and as a natural insect repellent [21].

Pharmacological Information of Selected Plants

- ***Azadirachta indica (Neem)***

Neem has been extensively studied for its pharmacological properties such as antidiabetic, anti-inflammatory, antioxidant, antifungal, antiviral, and antibacterial. It is also known to exhibit anticancer, immunomodulatory, & hepatoprotective effects [22].

- ***Andrographis paniculata (Kalmegh)***

Kalmegh is known for its pharmacological properties such as anti-inflammatory, antioxidant, antiviral, anticancer, and hepatoprotective. It is also known to exhibit immunomodulatory and antidiabetic effects [23].

- ***Aegle marmelos (Bael)***

Bael is known for its pharmacological properties such as antidiabetic, anticancer, anti-inflammatory, antioxidant, and antimicrobial. It is also known to exhibit hepatoprotective and neuroprotective effects [24].

- ***Vitex negundo (Nishinda)***

Nishinda is known for its pharmacological properties such as anti-inflammatory, analgesic, antioxidant, antiviral, and anticancer. It is also known to exhibit hepatoprotective, neuroprotective, and antidiabetic effects [25]

Figure 1: Leaves & Fruits of *Azadirachta indica*

Figure 2: Flowers and Leaves of *Andrographis paniculata*

Figure 3: Flowers and leaves of *Vitex negundo*

Figure 4: Fruits and Leaves of *Aegle marmelos*

Phytochemical Information of selected plants:

Azadirachta Indica

More than 135 molecules have been extracted from various neem components. Neem is known to contain a wide range of phytochemicals such as triterpenoids, limonoids, flavonoids, and phenolic compounds, which are responsible for its various pharmacological properties [26]. These molecules are represented in figure 5.

Andrographis Paniculata

For the present investigation sample of *Andrographis paniculata* extracts, obtained by extraction in ethanol. Ethanolic extracts of leaf powder of *Andrographis paniculata* showed positive result for the presence of most of the secondary metabolites. Except fixed oil and fats, all other phytochemical constituents like alkaloids, glycosides flavonoids, tannins, phenols, saponins, terpenoids and steroids. Apart from this *Andrographis paniculata* is found to contain the major components like andrographolide, andrographolide and andrographanin are reported to have medicinal properties [27]. The molecules are shown in figure 6.

Aegle marmelos: Bael contains various phytochemicals such as coumarins, alkaloids, flavonoids, and terpenoids, which are responsible for its various pharmacological properties [28]. The molecules are shown in figure 7.

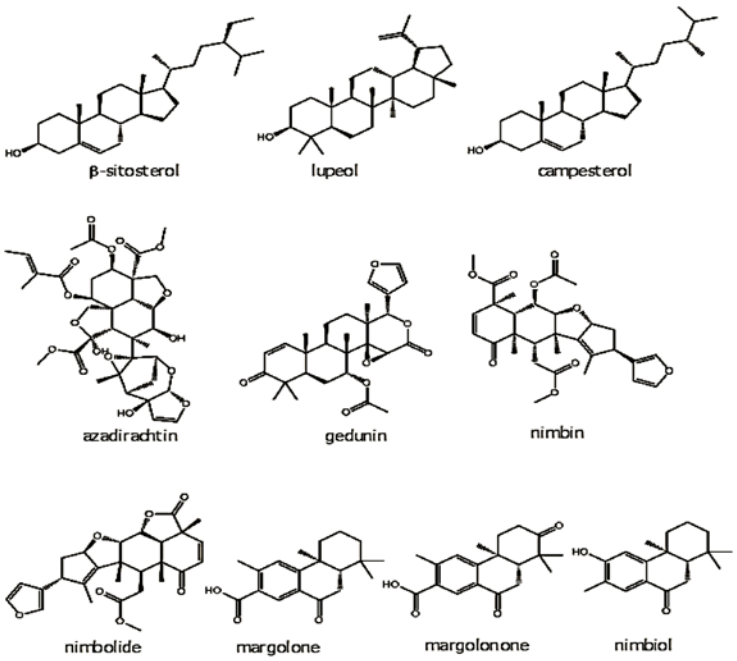

Figure 5: Structure of major compounds from *A. indica*

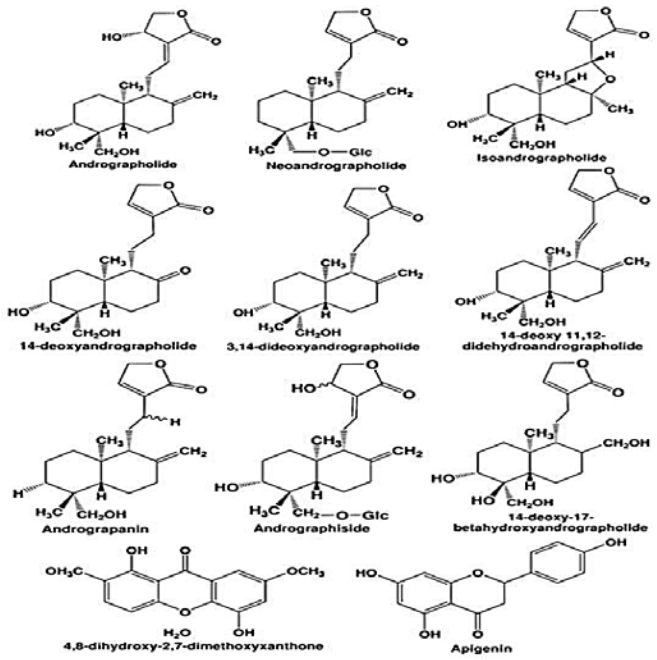

Figure 6: Structure of major compounds from *A. paniculate*

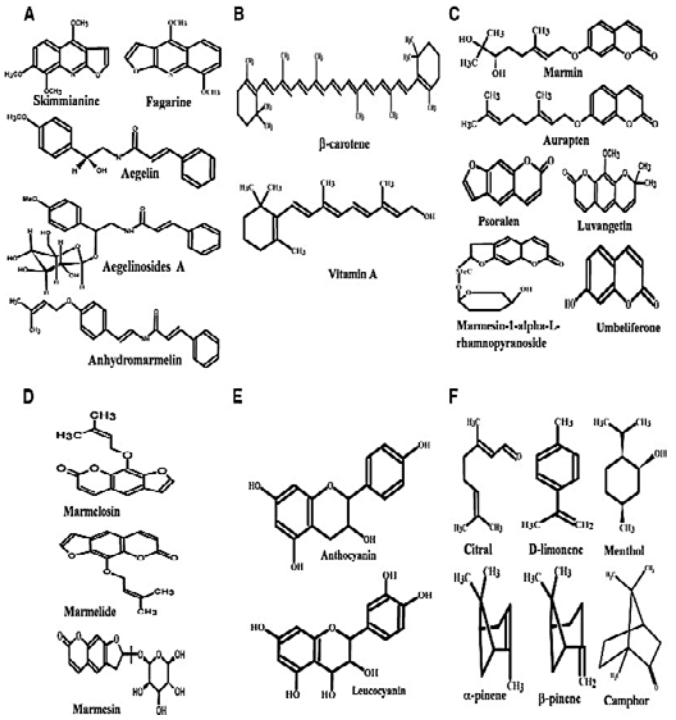

Figure 7: Structure of major compounds from *A. marmelos*

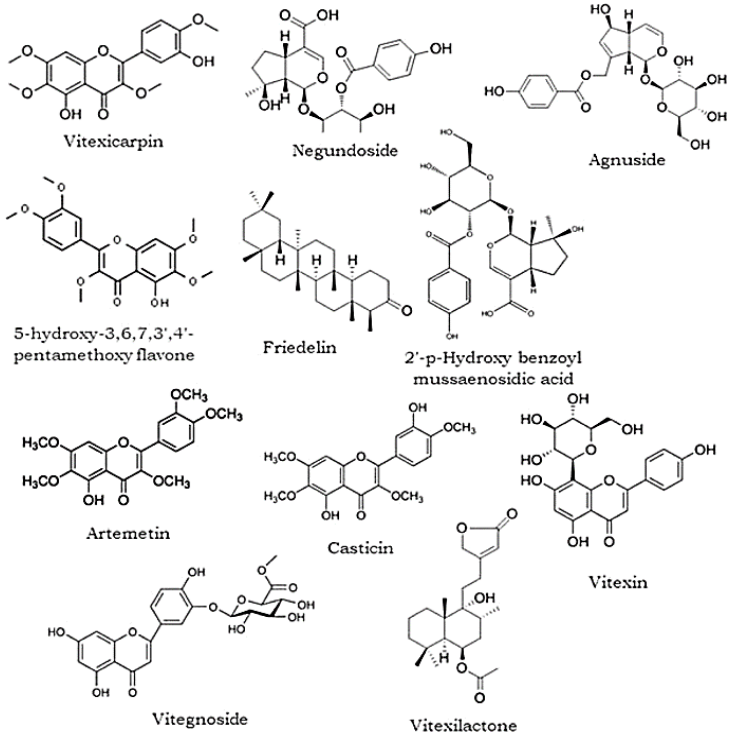

Figure 8: Structure of major compounds from *V. negundo*

MATERIALS AND METHODS

Plant Materials

The *A. indica*, *A. paniculata*, *A. marmelos* & *V. negund*o leaves were collected during Feb-March 2022 from rural areas of Nadia district of West Bengal, India.

Chemicals used

All the chemicals used in the present dissertation were of analytical grade or laboratory grade supplied by standard manufacturers. Mayer's reagent, Wagner's reagent, Dragendorff's reagent, Hager's reagent, HCl, ferric chloride,

NaOH, chloroform, Ethanol, acetic anhydride,metallic tin, lead acetate, Millon's reagent, $NaNO_2$, HNO_3, , Conc. H_2SO_4, α-napthol (5%) in ethanol [freshly prepare], 0.2% anthrone solution in Conc. H_2SO_4

Fehiling's solution A: Dissolve 35 g of $CuSO_4$ $5H_2O$ in water and make the volume to 500 ml.

Fehiling's solution B: Dissolve 120 g of NaOH and 173 g of Na-K tartrate (Rochelle salts) in water and make the volume to 500 ml.

Benedict's reagents: Reagents No. 1: Dissolve 173 g of sodium citrate and 100 g of anhydrous Na_2CO_3 in 600 ml of hot water. Dilute to 800 ml with dist. water.

Reagents No. 2: Dissolve 17.3 g of $CuSO_4$ $5H_2O$ in 100 ml hot water. Cool and dilute to 100 ml dist. water.

Reagents No. 3: Then add Reagents No. 1 to Reagents No. 2 slowly with constant stirring and make up to 100ml with dist. water.

Methods

Preparation of Plant Extract

The freshly collected leaves were washed and then disinfected. The dust material was removed from the leaves thoroughly and washed under running tap water to remove adhering dirt followed by rinsing with distilled water. Then the selected plants leaves were shade dried for 14 days and separately pulverized in a mechanical grinder followed by sieving (sieve no. 44) to obtain coarse powder. The shade dried powdered plant materials (leaves) were extracted (1:2) using ethanol as solvent. The period of extraction was fixed at 24 h. About 100 g of plant materials were taken in a beaker and 200 ml of solvents (ethanol) was added. They were kept overnight and sonicated for 30 minutes in ultrasonic water. Care has been taken to prevent solvent loss during sonicating. It was then filtered the next day. After completion of extraction, the extractive value was determined with respect to the dried plant material.

Preliminary Phytochemical Studies

The plant material may be subjected to preliminary phytochemical screening for the detection of various plant constituents. A plant may be considered as a biosynthetic laboratory, not only for the chemical compounds such as carbohydrates, proteins and lipids that are utilized as food by man, but also for a multitude of a compounds like glycosides, alkaloids, volatile oils, saponins, etc., that exert a physiological effect. The compounds that are responsible for therapeutic effects are usually the secondary metabolites. A systematic study of a crude drug embraces through consideration of both primary and secondary metabolites derived as a result of plant metabolism. The plant material (extracts) may be subjected to preliminary phytochemical screening for the detection of various plant constituents [30-32]

Tests for Alkaloids

(a) **Mayer's reagent:** Dissolve 1.36g of mercuric chloride in 60ml. Distilled water (a). Dissolve 5g potassium iodide in 60ml. distilled water (b). Mix (a) & (b) and adjust the volume to 100ml with distilled water. With alkaloids, it produces white to buff colored precipitate.

b) **Wagner's reagent:** Dissolve 1.27 g of iodine and 2g of potassium iodide in 5ml of water and make up the volume 200ml with distilled water. With alkaloids, it produces reddish brown precipitate.

c) **Dragendorff's reagent:** Boil 14g of sodium iodide with 5.2 gm of bismuth carbonate in 50ml glacial acetic acid for a few minutes. Allow it to stand overnight and filter of the precipitate of sodium acetate crystals. Preserve the stock solution in amber colored bottle. When needed, add 20 ml of acetic acid to 10ml of this stock solution and make up to 100ml with water. With alkaloids, it produces orange brown precipitate.

d) **Hager's reagent:** A saturated aqueous solution of picric acid used for detection of alkaloids. It gives characteristics crystalline precipitate with many alkaloids.

Test for glycosides

Test for Cardiac Glycosides

a) **Keller-Kiliani test:** To an extract of the drug in glacial acetic acid, few drops of ferric chloride and conc. Sulphuric acid are added. A reddish brown color is formed at the junction of two layers and the upper layer turns bluish green. The test confirms presence of cardiac glycosides with presence of digitoxose as the glycoside moiety.

Test for Anthraquinone Glycosides

a) **Borntrager's test:** Boil 0.1 g of the powdered drug with 5ml. 10% sulphuric acid for 2min. Filter while hot, cool

the filtrate and shake gently with equal volume of benzene. Allow the benzene layer to separate completely from the lower layer. Pipette out and transfer the benzene layer to a clean test tube. Add about half its volume of aqueous solution of ammonia (10%). Shake gently and allow the layer to separate. The lower ammoniacal layer will acquire pink to red color due to the presence of free anthraquinones.

b) **Modified Borntrager's test:** The C-glycosides of anthraquinones requires more drastic conditions for hydrolysis and thus a modification of the above test is used. Ferric chloride and hydrochloric acid are used to the effect oxidative hydrolysis. 0.1gm of the drug is boiled with 5ml of dil. HCl and 5 ml of 5% solution of ferric chloride for five minutes cool the solution and filter. This filtrate is shaken with benzene. Separate the benzene layer and add an equal volume of dilute solution of ammonia. This ammoniacal layer shows pink to red colour.

Test for Carbohydrates:

a) **Molisch's test:** To aqueous or alcoholic solution of the substance in a test tube add 10% alcoholic solution of α-napthol. Shake well and add a few drops of Conc. Sulphuric acid along the side of the test tube. A violet ring at the junction of two liquids confirms the presence of carbohydrates.

b) **Fehling's test:** Add 2ml of Fehling's solution A and 2ml of Fehling's solution B to 2ml of liquid extract in a test tube and boil. If yellow or bricked precipitate appears, then reducing sugars are present.

c) **Benedicts test:** Add 5ml of Benedict's reagent to 3ml of test solution in a test tube and boil on a water bath. Appearance of brick red precipitate at the bottom of the test tube shows presence of mono-saccharides.

Test for Gums and Mucilages:

a) **Precipitation with 95% alcohol:** Gums and mucilages precipitate with addition of 95% alcohol, being insoluble in alcohol.

b) **Molisch's test:** To aqueous or alcoholic solution of the substance in a test tube add 10% alcoholic solution of α-napthol. Shake well and add a few drops of Conc. sulphuric acid along the side of the test tube. A violet ring at the junction of two liquids confirms the presence of carbohydrates, gums and mucilages.

Test for Proteins and Amino Acids:

a) **Biuret test:** To 2ml of extract, 2ml of 10% NaOH solution and 2 to 3 drops of 1% CuSO4 solution is added and mixed. Appearance of violet or purple color confirms presence of proteins.

b) **Ninhydrin test:** To 2 ml. of extract add 0.5ml of ninhydrin solution. Boil for 2 minutes and cool. If blue color appears then proteins are present.

c) **Xanthoproteic test:** To 2 ml of extract add 1ml of Conc. HNO_3, boil, cool and add 40% NaOH drop by drop. Appearance of colored solution indicates presence of proteins.

d) **Millon's test:** To 2 ml of extract add 2 ml of Millon's reagent, boil, cool and add few drops of $NaNO_2$ solution. Appearance of red precipitate or coloration indicates presence of proteins.

Test for Tannins and Phenolic Compounds

a) **Ferric chloride test:** A 5% W/V solution of ferric chloride in 90% alcohol are used for detection of phenols.

b) **Lead acetate test:** Tannins are precipitated with lead acetate.

c) **Elatin solution test:** To a solution of tannins (0.5- 1%) aqueous solution of gelatins (1%) and sodium chloride (10%) are added. A white to buff colored precipitate is formed.

Test for Saponins

a) **Foam test (1ml of extract + 9 ml of water):** About 1 ml of alcoholic or aqueous extract is diluted separately with distilled water to 10 ml and shaken in a graduated cylinder for 15 minutes and kept aside. About one cm layer of foam after standing for 30 minutes indicates the presence of saponins.

b) **Haemolysis Test (3 drops of blood + 1 drop of extract):** Haemolysis occurs if saponins are presents.

Test for Flavonoids

a. Sodium hydroxide test: The extract dissolved in water, filtrate treated with sodium hydroxide a yellow color is observed if flavonoids are present.

b. Sulphuric acid test: A drop of Conc. Sulphuric acid when added to the above, the yellow color disappears. The results of the preliminary phytochemical studies are tabulated in **(Table 2)**

Table 1: The Results of the colour, consistency, and extractive value of selected plant extracts

Name of Plant	Color	Type of extract	Consistency	Extractive value (%)
Aegle marmelos [Rutaceae]	Greenish black	Aqueous	Sticky	7.1
Vitex negundo [Lamiaceae]	Brownish black	Ethanolic	Sticky	3.7
Azadirachta indica [Meliaceae]	Deep greenish	Aqueous	Sticky	4.2
Andrographis paniculate [Acanthaceae]	Greenish brown	Aqueous	Sticky	2.9

Table 2: Result of Preliminary Phytochemical Examination of Plant extracts

Tests	*Aegle marmelos*	*Vitex negundo*	*Azadirachta indica*	*Andrographis paniculata*
Alkaloid	+	+	+	+
Glycoside	+	+	+	+
Carbohydrates	+	+	+	-
Gum, Mucilage	-	+	+	+
Protein	+	-	-	+
Tannin	+	+	+	-
Saponin	+	+	+	+
Flavonoids	+	-	-	+

(+): Present; (-): Absent

RESULTS AND DISCUSSION

Azadirachta indica (neem), *Andrographis paniculata* (green chiretta), *Aegle marmelos* (bael), and *Vitex negundo* (chaste tree) are some of the medicinal plants commonly used in traditional medicine systems. These plants contain various phytochemicals, and their ethanolic extracts have been found to presence of alkaloids, glycosides, carbohydrates, proteins and amino acids, tannins and phenolic substances, terpenoids, saponins and flavonoids and is reported in the **Table 2**.

CONCLUSION

The preliminary phytochemical examination of the ethanolic extract of hepatoprotective medicinal plant leaves from Chakdaha, Nadia, West Bengal, India, revealed the presence of various bioactive compounds such as alkaloids, flavonoids, terpenoids, phenolic compounds, and saponins. These compounds have been reported to exhibit pharmacological activities such as hepatoprotective, antioxidant, anti-inflammatory, antimicrobial, and antidiabetic properties. These findings suggest that these medicinal plant leaves may have potential as a source of natural remedies for liver diseases or as a basis for the development of new drugs. However, further studies are needed to isolate and identify the active compounds responsible for these activities and to investigate their mechanism of action for formulation polyherbal preparation and their safety profiles.

FINANCIAL ASSISTANCE

Nil

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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