PHYTOCHEMICAL SCREENING OF MEDICINAL PLANT - MIKANIA CORDIFOLIA AND DETERMINATION OF ITS CHARACTERISTICS.

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ABSTRACT

Objective: The traditional medicine involves the use of different plant extracts. This type of study provides the health service at affordable cost. Since, the plant possess many medicinal properties, the present study was designed to evaluate the phytochemicals in the extract of Mikania cordifolia leaves. Methods: The leaves were collected and extracted with ethanol. Phytochemical screening was carried out according to standard procedures. Results: Tannins, flavonoids, saponins and gums were found to be present in the extract. Various biological effects of this plant may be attributed to the phytoconstituents present in the extract.

Conclusion: The results obtained from this study suggest that the extract of Mikania cordifolia plant possess antioxidant, anti-inflammatory, antimicrobial, analgesic and antinociceptive properties.

Keywords: Mikania cordifolia, asteraceae, phytochemicals, tannins and flavonoids.

INTRODUCTION

Nature acts as a nice source of salvation for human being by providing different remedies from its plants, animals and other sources to treat all ailments of mankind [1]. From the ancient period of time, herbal medicines have been used for the welfare of mankind to cure the series of diseases. New drugs of plant derivation are so much crucial because they are cheap and have little side effects [2,3]. Now a day, it is well established that most of the medicinal plants serve as lead molecules in modern medicines and nutraceuticals because of their derived phyto-constituents [4]. Recently, focus on medicinal plant research has increased throughout the world and almost 13000 plants have been studied during the last five year period [5]. Medicinal plants have been used by human beings from ancient time for healing different ailments and this practice still continues smoothly even after the advent of modern allopathic medicine. Over three-quarters of the world population depends mainly on plants and plant extracts for health care [6]. So medicinal plants are one of the most important contributors to most of the medicinal preparations as raw plant materials, refined crude extracts and mixtures etc. Several thousands of plants have been identified and screened containing medicinal values and used for the treatment of different ailments in various cultures worldwide [7]. Even in this modern period, majority of the people are still relying on the traditional medicine due to their primary health care [8]. According to the World Health Organization, more than 80% of the world’s population is still depending on traditional plant-based medicines [9]. Fruits and herbs containing phytochemicals and non-nutritive may protect human from a host of diseases for their biological activities [10].

Mikania cordifolia is a medicinal plant belonging to the family asteraceae which is a large family of flowering plants containing more than 25000 species and 1000 genera [11]. Most of the species in this family are generally featured because of their anti-oxidant, anti-inflammatory, analgesic and antipyretic activity [11]. Mikania cordifolia may provide a important role in controlling and preventing sexually transmitted diseases [12]. The present study was designed to provide scientific evidence for its use as a traditional folk remedy by investigating the phytochemical screening. Phytochemical comes from the Greek word “phyto” which is used for plant and it refers to almost every naturally occurring chemical present in plants [13].

MATERIALS AND METHODS

Collection and Identification

For this present investigation the leaves of plant Mikania cordifolia L. were collected by the authors from the surrounding area of Noakhali, a coastal region of Bangladesh, in November, 2010. The plant was identified and authenticated by expert botanist of Bangladesh National Herbarium (DACB Accession no. 34527), Mirpur, Dhaka.

Drying and grinding

The collected plant parts (leaves) were separated from undesirable materials or plants or plant parts. They were sun-dried for one week. The plant parts were ground into a coarse powder with the help of a suitable grinder. The powder was stored in an airtight container and kept in a cool, dark and dry place until analysis commenced.

Cold extraction

500 gm of the dried and powdered sample was soaked in 2500 ml of 80% ethanol (Merck KGaA, Darmstadt, Germany) in clean, sterilized and flat-bottomed glass container. The container with its contents was sealed and kept for a period of 25 days accompanying occasional shaking and stirring. The whole mixture then underwent a coarse filtration by a piece of very clean, white cotton material and Whatman® filter paper no. 1. The resultant filtrate was then evaporated in water bath maintained 40°C to dryness and thus blackish (Mikania cordifolia) semisolid mass of the extract was obtained.

Phytochemical screening

Reagents used for the different chemical group test

The following reagents were used for the different chemical group test [14]:

Mayer’s reagent

1.36 gm mercuric iodide in 60 ml of water was mixed with a solution contains 5 gm of potassium iodide in 20 ml of water.
Dragendorff's Reagent
1.7 gm basic bismuth nitrate and 20 gm tartaric acid were dissolved in 80 ml water. This solution was mixed with a solution contains 16 gm potassium iodide and 40 ml water.

Fehling’s solution A
34.64 gm copper sulphate was dissolved in a mixture of 0.50 ml of sulfuric acid and sufficient water to produce 500 ml.

Fehling’s solution B
176 gm of sodium potassium tartrate and 77 gm of sodium hydroxide were dissolved in sufficient water to produce 500 ml. Equal volume of above solution were mixed at the time of use.

Benedict’s Reagent
1.73 gm cupric sulphate, 1.73 gm sodium citrate and 10 gm anhydrous sodium carbonate were dissolved in water and the volume was made up to 100 ml with water.

Molish Reagent
2.5 gm of pure α-naphthol was dissolved in 25 ml of ethanol.

Libermann-Burchard Reagent
5 ml acetic anhydride was carefully mixed under cooling with 5ml concentrated sulfuric acid. This mixture was added cautiously to 50 ml absolute ethanol with cooling.

Tests procedure for identifying different chemical groups
The following tests were performed for identifying different chemical groups [14,15].

Tests for reducing sugar

Benedict’s Test
0.5 ml of aqueous extract of the plant material was taken in a test tube. 5ml of benedict’s solution was added to the test tube, boiled for 5 minutes and allowed to cool spontaneously. A red color precipitate of cuprous oxide was formed in the presence of a reducing sugar.

Fehling’s Test (Standard Test)
2ml of an aqueous extract of the plant material was added 1ml of a mixture of equal volumes of Fehling’s solutions A and B. Boiled for few minutes. A red or brick red color precipitate was formed in the presence of a reducing sugar.

Alpha Naphthol Solution test
5 ml solution of extract added with 2 drops of 5% alpha-Naphthol solution (Freshly prepared) and added 1 ml of sulfuric acid on the sides of the test tube. Violet colored ring was formed at the junction of two liquids in the presence of reducing sugars.

Tests for tannins

Ferric Chloride Test
5 ml solution of the extract was taken in a test tube. Then 1 ml of 5% Ferric chloride solution was added. Greenish black precipitate was formed and indicated the presence of tannins.

Potassium dichromate test
5 ml solution of the extract was taken in a test tube. Then 1 ml of 10% Potassium dichromate solution was added. A yellow precipitate was formed in the presence of tannins.

Test for Flavonoids
Added a few drops of concentrated hydrochloric acid to a small amount of an alcoholic extract of the plant material. Immediate development of a red color indicates the presence of Flavonoids.

Test for Saponins
1 ml solution of the extract was diluted with distilled water to 20 ml and shaken in a graduated cylinder for 15 minutes. One-centimeter layer of foam indicates the presence of saponins.

Test for gums
5 ml solution of the extract was taken and then molish reagent and sulphuric acid were added. Red violet ring produced at the junction of two liquids indicates the presence of gums and carbohydrate.

Test for Steroids

Libermann-Burchard test
1ml solution of chloroform extract was taken and then added 2 ml Libermann-Burchard reagent. Reddish purple color indicates the presence of steroid.

Sulphuric acid test
1 ml solution of chloroform extract was taken and then added1ml Sulphuric acid. Red color indicates the presence of steroid.

Test for alkaloids

Mayer’s test
2 ml solution of the extract and 0.2 ml of dilute hydrochloric acid were taken in a test tube. Then 1 ml of Mayer’s reagent was added. Yellow color precipitate was formed and that was indicated as the presence of alkaloids.

Dragendroff’s test
2 ml solution of the extract and 0.2 ml of dilute hydrochloric acid were taken in a test tube. Then 1 ml of Dragendroff’s reagent was added. Orange brown precipitate was formed and that was indicated as the presence of alkaloids.

Wagner’s test
2 ml solution of the extract and 0.2 ml of dilute hydrochloric acid were taken in a test tube. Then 1 ml of iodine solution (Wagner’s reagent) was added. Reddish brown precipitate was formed and that was indicated as the presence of alkaloids.

Hager’s test
2 ml solution of the extract and 0.2 ml of dilute hydrochloric acid were taken in a test tube. Then 1 ml of picric acid solution (Hager’s reagent) was added. Yellowish precipitate was formed and that was indicated as the presence of alkaloids.

RESULTS
Phytochemical screening of the crude extract of leaves of Mikania cordifolia indicated the presence of tannin flavonoids saponins and gums. The results are shown in Table-1.

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>Chemical constituents</th>
<th>Test</th>
<th>Extract</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Test for Reducing Sugar</td>
<td>Benedict’s Test</td>
<td>Ethanolic</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fehling’s Test</td>
<td>Ethanolic</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alpha Naphthol Solution Test</td>
<td>Ethanolic</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Test for Tannins</td>
<td>Ferric Chloride Test</td>
<td>Ethanolic</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potassium dichromate Test</td>
<td>Ethanolic</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>Test for Flavonoids</td>
<td>Hydrochloric Acid Test</td>
<td>Ethanolic</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>Test for Saponins</td>
<td>Foam Test</td>
<td>Ethanolic</td>
<td>+</td>
</tr>
<tr>
<td>5.</td>
<td>Test for Gums</td>
<td>Molisch Test</td>
<td>Ethanolic</td>
<td>+</td>
</tr>
</tbody>
</table>
DISCUSSION AND CONCLUSION

The history of medicinal plants being used for medicinal purpose is as old as the history of mankind [16]. Because these plants contain various types of phytochemicals and these phytoconstituents are well known to show a variety of pharmacological actions in human body [17]. In our study, preliminary phytochemical screening revealed the presence of various phytochemicals. Polyphenolic compounds like flavonoids, tannins, and phenolic acids, commonly found in such plants which contain various biological effects including antioxidant activity [18-21]. Mainly, phenolic compounds are very important for the free-radical scavenging and antioxidant activities of plants because these compounds react as hydrogen donors and thus neutralize the free-radicals [22,23]. Specially phenols are important components which may contribute directly to antioxidant effects of the system [24]. Natural antioxidants such as phenolic compounds are strongly associated with a reduced risk of chronic inflammation, cancer and cardiovascular diseases [25]. Flavonoids as antioxidants are also known to have anti-inflammatory properties due to their inhibitory effects on enzymes involved in the production of chemical mediator of inflammation [26]. Flavonoids, steroids and terpenes have also been shown to possess anti-inflammatory and analgesic activity [27] and tannins are also found to have a significant contribution in antinociceptive activity [28]. Phytochemicals like alkaloids, flavonoids, isoflavonoids, tannins, coumarins, glycosides, terpenes and phenolic compounds have antimicrobial properties [29]. Many pure alkaloids and their synthetic derivatives being used as basic medicinal agents for their analgesic, anti-spasmodic and bactericidal effects [30]. The importance of alkaloids, saponins and tannins in various antibiotics used in treating common pathogenic strains [31]. Steroids specially glucocorticoids, known to reduce inflammation by binding to glucocorticoid receptors localized in the cytoplasm of target cells [32].

In an overview of the data, obtained from the current investigation, it can be highlighted that the tested extracts have many phytochemicals. By observing the results of the present study it can be suggested that the extract of Mikania cordifolia plant contains antioxidant, anti-inflammatory, antimicrobial, analgesic and anti-nociceptive properties. Moreover, further studies are required to confirm its possible benefits in human beings.

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REFERENCES


