Qualitative phytochemical screening of Indian witchweed: *Striga asiatica* (L.) O. Ktze - an unexplored medicinal parasitic plant

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**Abstract**

Many herbal remedies have been employed in various medical systems for the treatment of different diseases. The parasitic plant *Striga asiatica* (L.) O. Ktze commonly known as witch weed belongs to family Scrophulariaceae has been used in different system of traditional medicine for curing various diseases and ailments of human beings. The present study deals with the qualitative phytochemical screening of *Striga asiatica* (L.) O. Ktze of whole plant powder in six different extracts (i.e. petroleum ether, benzene, chloroform, acetone, ethanol and water). The extracts showed the prominently presence of phytoconstituents like carbohydrates, cardiac glycosides, alkaloids, flavonoids, tannin, phenolics, steroids, coumarins and saponin. However anthroquinone glycosides and quinone are totally absent in all extracts. Most of the phytoconstituents from *Striga asiatica* (L.) O. Ktze lacks the reports of pharmacological activities, which support its further pharmacological studies.

**Keywords:** *Striga asiatica*, phytochemical screening, medicinal and parasitic plant.

**INTRODUCTION**

Traditional knowledge regarding of medicinal plants and their use by indigenous cultures are not only useful for conservation of cultural traditions and biodiversity but also for community healthcare and drug development in the present and future. Therapy with synthetic tropical applications have most side effects and cannot be afford by the people due to import cost of the drug, to overcome this problem plants growing around us are utilized without scientific validation. The use of higher plants and their extracts to treat infections is an age-old practice. Traditional medicinal practice has been known for centuries in many parts of the world. Herbal medicines are gaining interest because of their cost effective and eco-friendly attributes (Trivedi, 2006).

Medicinal plants have been an integral part of the ethno-botanical aspects of the people. The modern medicine has evolved from folk medicine and traditional system only after thorough chemical and pharmaceutical screening. Thus, plants remain the major source of medicinal compounds. UNESCO (1998) estimated that 20,000 plant species are used for medicinal purposes (Koua, 2011).

For a long period of time, plants have been a valuable source of natural products for maintaining human health, especially in the last decade, with more intensive studies for natural therapies. According to World Health Organization (WHO), medicinal plants would be the best source to obtain a variety of drugs and more than 80% of the world’s population relies on traditional medicines for their primary health care needs (Hosamath, 2011). The medicinal value of plants lies in some chemical substances that produce a definite physiologic action on the human body. The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins and phenolic compounds. The phytochemical research based on ethno-pharmacological information is generally considered an effective approach in the discovery of new anti-infective agents from higher plants (Mukharjee, 2002).

A witch-weed, *Striga asiatica* (L.) O. Ktze is an herbaceous flowering root parasitic plant locally known as Talakh, Taulka and it is considered as a semi-parasitic plant. The plant *S. asiatica* belongs to the family Scrophulariaceae is deemed to be one of the most ubiquitous parasitic weed of food crops, e.g., rice (*Oryza sativa* L.), maize (*Zea mays* L.) and sorghum (*Sorghum bicolor* L. Moench) roots. *S. asiatica* plant beside its well-known devastating impacts on the most important food cereal crops in Africa, India, Asia, some parts of USA and is deemed to be one of the main factors that threatens the food security in these continents; but it does also have a beneficial side in the tradition medicine for the African people (Koua, 2011). *S. asiatica* has a wide range of medicinal uses; appetizer, hypertension, sexual heatiness, stimulant, breaks down of fats, strengthen body (Adirukmi, 1994, Anonymous, 1986 and Ong, 2011) and the pharmacological antifertility effect (Hiremath, 1997), antibacterial, antifungal and anthelmintic activity have been approved (Hiremath, 1994). The whole plant, crude drug has been used as a remedy for peevishness in unweaned infants and also for interhepatitis in China (Nakanishi, 1985).

Despite the intense uses of *S. asiatica* as medicinal plant and the researches concerning the agricultural importance of this plant, the thorough phytochemistry knowledge still scarce (Frick et al., 1996). However no phytochemical report on this plant in India has previously been made. So, in the present study an attempt has been made the laboratory evaluations to assess the analytical and phytochemical screening of *Striga asiatica* (L.) O. Ktze.
Preliminary phytochemical screening

It involves testing of different classes of compounds. The methods used for detection of various phytochemicals were followed by qualitative chemical test to give general idea regarding the nature of constituents present in crude drug (Kokate, 2005; Harborne, 1998; Sadashivan and Manickam, 2005 and Wallis, 1990).

Tests for carbohydrates
Fehling’s Test

1 ml Fehling’s A solution and 1 ml of Fehling’s B solution were mixed and boiled for one minute. Now the equal volume of test solution was added to the above mixture. The solution was heated in boiling water bath for 5-10 minutes. First a yellow, then brick red precipitate was observed.

Benedict’s test

Equal volumes of Benedict’s reagent and test solution were mixed in a test tube. The mixture was heated in boiling water bath for 5 minutes. Solution appeared green showing the presence of reducing sugar.

Molisch’s test

Equal volumes of Molisch’s reagent and test solution were mixed in a test tube. The mixture was heated in boiling water bath for 5 minutes. Appearance of violet or purple colour ring showing the presence of reducing sugar.

Tests for proteins
Biurrét Test

To the small quantity of extract 1-2 drops of Biurrét reagent was added. Formation of violet colour precipitate showed presence of proteins.

Million’s Test

To the small quantity of extract 1-2 drops of Million’s reagent was added. Formation of white colour precipitate showed presence of proteins.

Tests for Anthraquinone glycosides: Borntrager’s Test

To the 3ml of extract, dil. H₂SO₄ was added. The solution was then boiled and filtered. The filtrate was cooled and to it equal volume of benzene was added. The solution was shaken well and the organic layer was separated. Equal volume of dilute ammonia solution was added to the organic layer. The ammonia layer turned pink showing the presence of glycosides.

Tests for Cardiac glycosides (Keller- Killiani Test)

To the 5ml of extract, 1ml of conc. H₂SO₄, 2ml of Glacial acetic acid and 1 drop of FeCl₃ solution was added. Appearance of Brown ring shows the presence of cardiac glycosides.

Tests for Coumarins
To the 2ml of extract 10% NaOH was added and shake well for 5 min shows the yellow colour.

**Tests for Quinone**

To the 2ml of extract conc. H₂SO₄ was added and shake well for 5 min shows the Red colour.

**Test for steroids**

*Salkowski Test*

To 2 ml of extract, 2 ml of chloroform and 2 ml of conc. H₂SO₄ was added. The solution was shaken well. As a result chloroform layer turned red and acid layer showed greenish yellow fluorescence.

**Tests for alkaloids**

*Hager's Test*

To the 2-3 ml of filtrate, 1ml of dil. HCl and Hager's reagent was added and shake well. Yellow precipitate was formed showing the presence of alkaloids.

*Mayer's Test*

To the 2-3 ml of filtrate, 1ml of dil. HCl and Mayer's reagent was added and shake well. Formation of yellow precipitate showed the presence of alkaloids.

*Dragendroff's Test*

To the 2-3 ml of filtrate, 1ml of dil. HCl and Dragendroff's reagent was added and shake well. Formation of orange-brown precipitate showed the presence of alkaloids.

**Tests for flavonoids**

*Shinoda Test*

To the extract, added 5 ml of 95% ethanol and few drops of conc. HCl. To this solution 0.5 g of magnesium turnings were added. Observance of pink coloration indicated the presence of flavonoids.

*With Lead Acetate*

To the small quantity of extract lead acetate solution was added. Formation of yellow precipitate showed the presence of flavonoids.

**Tests for Tannins and Phenolic compounds**

*FeCl₃ Solution Test*

On addition of 5% FeCl₃ solution to the extract, deep blue black colour appeared.

*Lead Acetate Test*

On addition of lead acetate solution to the extract white precipitate appeared.

*Test for Saponin: Foam Test*

To 1ml extract 20ml distilled water was added and shakes well in measuring cylinder for 15 min. Then 1cm layer of foam was formed.

### Table 3: Qualitative phytochemical screening of various extract of *Striga asiatica* (L.) O. Ktze.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Constituents</th>
<th>Chemical Tests</th>
<th>Petroleum ether</th>
<th>Benzene</th>
<th>Chloroform</th>
<th>Acetone</th>
<th>Ethanol</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>Hager’s Test</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Carbohydrates &amp; Glycosides</td>
<td>Feiling’s Test</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Steroids</td>
<td>Salkowski Test</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Saponin</td>
<td>Foam Test</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Phenolics &amp; Tannin</td>
<td>FeCl₃ Sol. Test</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Fixed oil &amp; Fats</td>
<td>Spot Test</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Proteins</td>
<td>Bierlet Test</td>
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<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
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<tr>
<td>8</td>
<td>Anthraquinone glycosides</td>
<td>Borringer’s Test</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Cardiac glycosides</td>
<td>Keller-Killien Test</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>Flavonoids</td>
<td>Shinoda Test</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<tr>
<td>11</td>
<td>Quinone</td>
<td>Lead Acetate Test</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Coumarins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Note:** + = Present and - = Absent.

**RESULTS AND DISCUSSION**

In the present investigation, organoleptic evaluation plays an important role in judging the censoring acceptability or rejection of crude drug in the market. The Organoleptic evaluation of *Striga*
asiatica (L.) O. Ktze shown in (Table 1).

However on the basis of polarity of solvents, successive solvent extractive values of Striga asiatica (L.) O. Ktze in various organic solvents was observed as Petroleum ether 1.8%, Benzene 2.4%, Chloroform 16.2%, Acetone 20.2%, ethanol 19% and water 20.56% respectively (Table-2).

The qualitative phytochemical screening of Striga asiatica (L.) O. Ktze in six different extracts i.e. petroleum ether, benzene; chloroform, acetone, ethanal and water showed that there is presence of carbohydrates, glycosides, proteins, alkaloids, saponin, coumarins, tannins, phenols, and quinone. However anthraquinone glycosides and quinone were totally absent in all extracts. Ethanol extract of Striga asiatica was accounted for the presence of carbohydrates, glycosides, alkaloids, saponin, proteins, flavonoids, phenol, and tannin. While, Acetone and Water extract shows the presence of carbohydrates, glycosides, alkaloids, saponin, coumarins, tannins, phenols compounds. All the six extracts have flavonoids, Carbohydrates and glycosides compounds (Table-3). This could make this plant useful for treating different ailments as having a potential of providing useful drugs of human use. This is because of pharmacological activity of any plant is usually traced to a particular compound. Earlier studies have shown that drugs containing flavonoids are known to have an antifeertility activity (Hiremath, 1997). So, the present study suggests that Striga asiatica (L.) O. Ktze is a potential resource of flavonoids, proteins, phenols, tannins, sterols, saponin compound and may be useful for the identification and preparation of a monograph of the plant. Thus, this type of qualitative phytochemical screening is the first step towards understanding the nature of active principles in medicinal plants and this type of study will be helpful for further detailed research.

CONCLUSION

The genus Striga is the most economically important member of Scrophulariaceae family of parasitic plants, which attacks several crops particularly Sorghum, Pearl, Millet, Rice, Maize and Sugarcane in Africa, India, Asia, Australia and some part of the USA that threatening the food security in these continents. But it does also have a beneficial side in the traditional medicine for the African people (Koua, 2011). Nevertheless, Koua 2011 stated that several articles concerning the pharmacological application of genus Striga in some part of the Africa and India have been released. But the information about the phytochemicals and its pharmacologic effect are still scarce.

The present phytochemical screening of S. asiatica plant reveals that it contains rich amount of phytoconstituents like carbohydrates, cardiac glycosides, alkaloids, flavonoids, tannin, phenolics, steroids, coumarins and saponin having the major applications in medical as well as pharmaceutical sciences. Most of the phytoconstituents from Striga asiatica (L.) O. Ktze lacks the reports of pharmacological activities, which support its further pharmacological studies. So, more comprehensive research is very required to conclude thoroughly on the intense use of S. asiatica plant in the traditional medicine and explore its maximum potential in the field of medical and pharmaceutical sciences. The latter is also a place of prospective researches to be done for more appraisals.

REFERENCES


