Assessment of Phytochemical and Anthelmintic Activity of Some Selected Ethnomedicinal Plants from Barak Valley Region of Assam

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Since ancient times it has been observed that the ethnomedicinal knowledge is backbone of rural healthcare. The traditional healers of Barak Valley region of Assam used traditional medicine for the treatment of various diseases including helminths infection. Hence the current study was planned to explore the traditional medicines namely Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia used as anthelmintic activity by the local people of Barak Valley region of Assam. The decoction of leaves of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia were prepared for the phytochemical studies and anthelmintic activity. The phytochemical study demonstrated the presence of flavonoids, tannins, phenolic compounds, alkaloids and glycosides in Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia. The Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia showed significant anthelmintic activity by inducing mortality of earthworm Pheritima posthuma. The above findings confirmed the ethnobotanical uses of these plants as an anthelmintic by local people of Barak Valley area of Assam.

Keywords: Anthelmintic activity, Phytochemical, Justicia adhatoda, Vernonia amygdalina, Mikania micrantha, Momordica charantia.

Helminthiases are parasitic worm that cause infections to human. This parasitic infections mostly infected to children and also touching a large proportion of the world’s population in developing countries. The malnutrition, pneumonia and anemia is the major cause of the worm infections. The Helminths infection became major challenges in developing countries due to their constant contamination of the environment with their eggs and larvae. Further, the parasitic infection are mostly neglected by the health ministry of developing countries. There are numbers of allopathic Anthelmintic drugs are available in the market but these drugs associated with side effects and sometime caused problems in the liver and kidney1-3. Hence it is necessary to develop certain alternative therapies against the parasitic infection. The natural products are found
to be effective against the Helminths infection with minimum side effects.

The nature has gifted more than 350,000 medicinal plants to the globe. The Indian traditional system of medicines inspired the researchers to explore scientific study on plants which are used as a source of medicines for the treatment of the various diseases.4

The Barak valley of Assam has rich flora and fauna. This particular area has numerous medicinal plants and used as drugs against many health complications namely diabetes, jaundice, inflammation, cancer, malaria, kidney failure, cardiovascular disease, respiratory tract infection etc. The herbs comprises of different types of phytochemical which are responsible for their pharmacological activity. The medicinal uses of plant by traditional healers of Barak Valley and and their scientific validation continue developing because of its numerous clinical significances and minimum side-effects. The data of ethnopharmacology study in this area demonstrate the limited number of plants have been scientifically explored for their phytochemical and anthelmintic studies.5,6 Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia are the most frequently used by the traditional healers of Barak Valley for the treatment of different diseases.

MATERIAL AND METHODS

Collection of plant material

The leaves of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia were collected from the Barak Valley area of Assam. The plant parts were shade dried, reduced to coarse powder and stored in airtight container till further use.

Preparation of decoction

20 g of powdered crude drugs of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia were separately mixed with 150 ml of distilled water and macerated at ambient temperature for 24 h. After 24 h the drug macerate was boiled for 45 min and filtered through muslin cloth to get a decoction. The volume of the decoction was adjusted such that 20 g of mixture gave 50 ml of the decoction.

Qualitative phytochemical study

The phytochemical study was conducted for the decoction of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia. The flavonoids, alkaloids, saponins, flavonoids, diterpenes, polyphenols, mikanolide, dihydromikanolide, sesquiterpene lactones etc are present in Vernonia amygdalina. The different pharmacological activities of Momordica charantia has been scientifically documented namely antiviral, immunomodulation, antimutagenic, antihyperglycemic, antihyperglycemic, antiulcer, liver protective, antitumor, antifertility etc. Phytochemical studies established the existence of saponin, flavonoids, sterols, alkaloids, polypeptide, triterpenoids etc in Momordica charantia.7 Looking on significant medicinal properties, the current study was aimed to explore the phytochemical and anthelmintic activity of the leaves of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia collected from the Barak Valley Region of Assam.
posthuma was used for the proposed anthelmintic study. The each group comprised six worms of each type. The two different concentration i.e. higher (without dilution) and lower concentration (dilution 1:1 with distilled water) of decoction of each plant were used for anthelmintic evaluation. The ten different groups were used to evaluate the anthelmintic activity and are mentioned below: Group A were the control group worms placed in normal saline Groups B were treated with 20 ml decoction (dilution 1:1 with distilled water) of Justicia adhatoda Groups C were treated with 20 ml decoction (No dilution) of Justicia adhatoda Groups D were treated with 20 ml decoction (dilution 1:1 with distilled water) of Vernonia amygdalina Groups E were treated with 20 ml decoction (No dilution) of Vernonia amygdalina Groups F were treated with 20 ml decoction (dilution 1:1 with distilled water) of Mikania micrantha Groups G were treated with 20 ml decoction (No dilution) of Mikania micrantha Groups H were treated with 20 ml decoction (dilution 1:1 with distilled water) of Momordica charantia Groups I were treated with 20 ml decoction (No dilution) of Momordica charantia Group J were treated with Albendazole (20 mg/ml) in normal saline

Observations were made for the time taken to set paralysis and death of the individual worms. Mean time for the paralysis in min was noted when no movement of any sort could be observed, except when the worm was shaken vigorously; time of death in min was recorded after ascertaining the worms neither moved when shaken vigorously nor when dipped in warm water (50 °C). Further, the Albendazole (20 mg/ml) were included as standard compound20-22.

**Statistical analysis**

All the values of findings are presented as mean ± standard error mean (SEM).

## RESULTS

**Phytochemical screening**

The qualitative phytochemical screening was performed on decoction to assess the phytochemical present in the Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia. The findings of phytochemical screening expressed the presence of flavonoids, tannins, phenolic compounds, alkaloids and glycosides in Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia (Table 1).

**Anthelmintic activity**

Table 2 demonstrated the decoction of different concentration of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia showed significant anthelmintic activity. The lower concentration of decoction of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia induces paralysis of earthworm at 20.32±0.49, 17.48±0.08, 31.21±0.76 and 20.32±0.49 min, respectively, while higher concentration of decoction showed paralysis at 15.28±0.51, 12.15±0.41, 25.36±0.32 and

<table>
<thead>
<tr>
<th>Table 1. Phytochemicals present in decoction of various plants</th>
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<tbody>
<tr>
<td><strong>Phytoconstituent</strong></td>
</tr>
<tr>
<td>Alkaloids</td>
</tr>
<tr>
<td>Glycosides</td>
</tr>
<tr>
<td>Carbohydrates</td>
</tr>
<tr>
<td>Tannins and Phenolic compound</td>
</tr>
<tr>
<td>Flavonoids</td>
</tr>
<tr>
<td>Steroid test</td>
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<tr>
<td>Protein</td>
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<td>Fat and oil test</td>
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</tbody>
</table>

+ = Present, - = Absent
Table 2. Anthelmintic activity of decoction of various plants

<table>
<thead>
<tr>
<th>Group</th>
<th>Time taken for paralysis (min)</th>
<th>Time taken for death (min)</th>
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</thead>
<tbody>
<tr>
<td>A (Control)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>20.32±0.49</td>
<td>93.14±0.16</td>
</tr>
<tr>
<td>C</td>
<td>15.28±0.51</td>
<td>78.63±0.93</td>
</tr>
<tr>
<td>D</td>
<td>17.48±0.08</td>
<td>72.44±0.62</td>
</tr>
<tr>
<td>E</td>
<td>12.15±0.41</td>
<td>53.29±0.57</td>
</tr>
<tr>
<td>F</td>
<td>31.21±0.76</td>
<td>61.36±0.59</td>
</tr>
<tr>
<td>G</td>
<td>25.36±0.32</td>
<td>49.39±0.47</td>
</tr>
<tr>
<td>H</td>
<td>20.32±0.49</td>
<td>78.63±0.93</td>
</tr>
<tr>
<td>I</td>
<td>15.28±0.51</td>
<td>78.63±0.93</td>
</tr>
<tr>
<td>J (Standard drug)</td>
<td>10.23±0.74</td>
<td>46.18±0.38</td>
</tr>
</tbody>
</table>

Results are expressed as Mean ± SEM from six observations; Control worms were alive up to 24 hrs of observation.

15.28±0.51 min, respectively. Consequently, lower concentration of decoction of *Justicia adhatoda*, *Vernonia amygdalina*, *Mikania micrantha* and *Momordica charantia* persuades mortality of earthworm at 93.14±0.16, 72.44±0.62, 61.36±0.59 and 93.14±0.16 min, respectively, while higher concentration of decoction displayed death at 78.63±0.93, 53.29±0.57, 49.39±0.47 and 78.63±0.93 min, respectively. The findings were comparable with the standard drugs Albendazole, at 20 mg/ml concentration. It was observed that the higher concentration of decoction of plants showed dose dependent anthelmintic activity.

**DISCUSSIONS**

The Helminths infection induce severe morbidity by affecting population in autochthonous region with chief economic and social consequences. The numerous studies documented the extracts of natural products exhibited anthelmintic activity. Hence for the present study earthworm *Pheritima posthuma* were selected as a model for the anthelmintic activity.

The biological activities of the medicinal plant are due to the presence of secondary metabolites. The production of novel therapeutic drugs from plants are based on the reconnoitered of the phytoconstituents. The secondary metabolites demonstrated various health benefits like antidiabetic, anticancer, anthelmintic, antibacterial, CNS depressant, etc. The flavonoids and polyphenol have strong antioxidants, which scavenged the free radicals and inhibitors of lipid peroxidation. Hence flavonoids and polyphenol have chief role for the therapeutic efficacy of medicinal plants, and researchers are more focused to explore their biological activities. The findings of phytochemical studies demonstrate the presence of flavonoids, tannins and polyphenol compounds along with other chemical constituents. Swargiary et al. presented the similar studies on different medicinal plants exhibiting the presence of similar kind of phytoconstituents. Zhou et al found higher quantity of flavonoid and polyphenol in *Cyclocarya paliurus* leaves and expressed its maximum antioxidant capacity. It suggested that the presence of large quantity of flavonoid and polyphenol might be interconnected with greater antioxidant property of the plant. The findings of antioxidant activity of *Cassia tora*, *Portulaca oleracea*, *Alternanthera sessilis*, *Ipomoea aquatica*, *Basella alba*, *Digeria muricata*, *Leucas cephalotes* and *Solanum nigrum* indicates that with higher phenolic and flavonoid contents could be a significant source of natural antioxidants. The crude saponins of *Achillea wilhelmsii* and *Teucrium stocksianum* demonstrated significant anthelmintic activity by inducing mortality of earthworms. Further, it was reported a prominent anthelmintic activity against gastrointestinal nematodes from donkey and goats for *Medicago sativa* saponin mixtures. Pratap et al. reported that presence of alkaloids, phenols and tannins in methanol extract of *Mimosa pudica* responsible for significant anthelmintic activity. The medicinal plant having secondary metabolites like alkaloids, polyphenol, flavonoids, tannins and saponins reported significant anthelmintic activity in previous studies. The outcomes of the phytochemical studies revealed the presence of alkaloids, polyphenol, flavonoids, tannins and saponins as a chief component in *Justicia adhatoda*, *Vernonia amygdalina*, *Mikania micrantha* and *Momordica charantia* which support that these plants might be produce anthelmintic activity.

The researchers are giving more attention toward the medicinal plant for the development of anthelmintic drug because it give new bioactive compounds with no or little side effects and easily accessible to the peoples of developing
countries. Moreover, the medicinal plants have the best compatibility with human physiology than allopathic medicines. The anthelmintic activity of decoction of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia were evaluated by perceiving the time required to paralysis and death of each worm. The standard drug Albendazole showed anthelmintic activity due to inhibitory action on microtubular function of earthworm. The decoction of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia displayed paralysis and death of the earthworm. The findings of studies suggest that the Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia retain prominent anthelmintic activity.

The presence of alkaloids, polyphenol, flavonoids, tannins and saponins in plants may be responsible for the anthelmintic activity. The alkaloids induce paralysis in earthworm by its inhibitory action on the central nervous system. Consequently, tannins and polyphenol selectively bind to free proteins present in the gastrointestinal tract of host parasite or glycoprotein on the cuticle of the parasite and thereby cause deaths cause mortality. In addition, these chemical constituents meddle with the energy generation by uncoupling the oxidative phosphorylation which meddle with the glycoprotein of cell surface prompts parasite demise.

The prepared herbal formulation has prominent anthelmintic activity, but for safety purpose of formulation, toxicological studies will conduct in future.

CONCLUSION

From the findings of present study, it was concluded that the traditional use of Justicia adhatoda, Vernonia amygdalina, Mikania micrantha and Momordica charantia as an anthelmintic by local people of Barak Valley area of Assam has been scientifically confirmed as they demonstrated anthelmintic activity against the earthworms. According to reported literature, the phytoconstituents like alkaloids, polyphenol, flavonoids, tannins and saponins present in these plants may be responsible for the anthelmintic activity. Further more research is required to found the mechanism of action of anthelmintic activity for these plants, and their toxicity.

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Conflict of interest

None

REFERENCES

8. Correa GM, Alcantara AFDC. Chemical constituents and biological activities of species of...


