Learning & memory enhancing activity of Aerial parts of *Ervatamia coronaria* (L)

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**ARTICLE INFO**

**Article history**
Received 02/01/2013
Accepted 28/01/ 2013
Published online 01/03/2013

**Keywords**
Memory enhancing property, *Ervatamia coronaria*, Piracetam

**ABSTRACT**

Human brain is the most evolved complex structure in the body. Various neurodegenerative diseases like alzheimers disease, Dementia, attention deficit, were set as tough challenges in the medical field. The current medical research studies focuses on the potential usage of herbal drugs. The present study was carried out with an interest and contribution for herbal medicines as essential potent drugs. *Ervatamia coronaria* (Linn) is glabrous, evergreen tree commonly grown in gardens and various parts of the plant were used in the indigenous system of medicine for the treatment of various disorders. To validate the ethnotherapeutic claims of the plant for its use as a brain tonic, the Learning & memory enhancing activity of ethanolic and aqueous extracts of aerial parts of *Ervatamia coronaria* was evaluated by Elevated plus maze apparatus in mice. The effect of transfer latency (TL) due to extracts (ethanolic & aqueous at 200,400 mg/kg) and standard drug (Piracetam 200mg/kg) were compared to that of control and negative control (Diazepam 5mg/kg). The effect of herbal extracts was evaluated on elevated plus maze apparatus in Diazepam induced amnesia in mice. It is observed that the ethanolic & aqueous extracts at various doses(200 mg/kg) has significantly reduced the transfer latency in mice compared to control and negative control groups in a dose dependent manner and results were comparable to the standard Piracetam treated group. From the results obtained, it is evident that the traditional herbal extracts have significant learning and memory enhancing property.

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Please cite this article in press as: Deepak Bharadwaj PVP et.al. Learning & memory enhancing activity of Aerial parts of *Ervatamia coronaria* (L). *Indo American Journal of Pharm Research*.2013:3(3).
INTRODUCTION

*Ervatamia coronaria* Linn (Synonym: Tabernaemontana coronaria) belongs to the family Apocynaceae. It is a glabrous, ever green tree indigenous to India and is cultivated in gardens for its ornamental and fragrant flowers. This species has been extensively investigated and a number of chemical constituents such as alkaloids, triterpenoids, steroids, flavonoids, phenyl propanoids and phenolic acids were isolated from leaves, roots and stems of the plant. In Indian traditional system of medicine the plant is used for the anti-microbial, anti-oxidant ans as a brain-tonic. Furthermore, literature survey has no reported nootropic activity. Hence, the study was initiated.

Acute toxicity studies

The acute toxicity of aerial plant extracts of *Ervatamia coronaria* Linn was determined in albino mice of either sex weighing between 18-22 g those maintained under standard husbandry conditions and proceeded further after necessary permissions from IAEC. (I.D.No: IAE/SKIPS/2012/MAY08/I/06/Rats-72/Mice-36) The animals were fasted overnight prior to the experiment and “up and down” (OECD Guideline No. 420) method of CPCSEA was adopted for toxicity studies. All the animals were observed for long term toxicity (8days) and then 1/10th and 1/5th of the maximum dose were used throughout the experimental studies.

EXPERIMENTAL

Plant material

The plant *Erwatamia coronaria* was collected in March 2012 from the local areas of siddipet, Andhra pradesh, India. The plant material was taxonomically identified by the Botanical Survey of India, Hyderabad, India, and the Voucher specimen (No. BSI/DRC/11-12/TECH./33) was retained for future reference.

Preparation of extracts

The aerial parts of *Ervatamia coronaria* were collected and shade dried & coarsely powder. The dried powdered aerial parts were extracted by soxhlation process followed by maceration (aqueous extract) respectively. Preliminary phytochemical tests showed presence of triterpenoids, steroids, flavonoids, and carbohydrates.

PHARMACOLOGICAL EVALUATIONS:

1) Elevated plus maze test

The elevated plus maze was described as tool for testing memory by the investigators working in the field of psychopharmacology. Elevated plus maze served as exteroceptive behavioral model to evaluate learning and memory in rats. The elevated plus maze consisted of two open arms and two closed arms (50cmx10cmx40cm) with an open roof arranged so that the two arms are opposite to each other. The maze was elevated to a height of 50 cm.

A) Effect of extracts on Transfer ratio by using Elevated plus maze apparatus:

Mice were divided into 4 groups consisting of 6 animals per group. Group-1 treated with Normal control (Distilled water 10ml/kg, po) only once daily for 7 days, Group-2 treated with standard drug piracetam (200 mg/kg, p.o). Groups 3, and 4 were treated orally with different doses EEEC (400 mg/kg) and AEAC (400 mg/kg) respectively only once daily for 7 days. TL was recorded on EPM and retension (memory) of learned task was observed on first day. Transfer latency was time taken by the mice to move in to the covered arm with all its four paws, transfer latency was recorded. If the animals did not enter in to one of the covered arms with in
90 s, it was gently pushed in to one of the two covered arms and transfer latency was assigned as 90s. On the 7th day, 90 minutes of treatment of last dose, Transfer Latency is recorded.

Table No: 1. Nootropic effect of aerial parts *E. coronaria* in mice with EPM model.

| Group No. | Treatment     | Dose (per Kg) | Transfer Latency  
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st day</td>
</tr>
<tr>
<td>I</td>
<td>Normal control</td>
<td>10 (ml,po)</td>
<td>56.83±3.25</td>
</tr>
<tr>
<td>II</td>
<td>Piracetam</td>
<td>200 (mg, po)</td>
<td>21.50±2.72</td>
</tr>
<tr>
<td>III</td>
<td>EEEC</td>
<td>400 (mg, po)</td>
<td>52.42±2.12</td>
</tr>
<tr>
<td>IV</td>
<td>AEEC</td>
<td>400 (mg, po)</td>
<td>62.33±2.02</td>
</tr>
</tbody>
</table>

(Values are mean ± SEM from 6 animals in each group)

Table No: 2. Nootropic effect of aerial parts *E. coronaria* in mice by Diazepam induced amnesia model.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Treatment</th>
<th>Dose (per Kg)</th>
<th>Transfer Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>14th day</td>
</tr>
<tr>
<td>I</td>
<td>Normal control</td>
<td>10 (ml,po)</td>
<td>36.83±3.25</td>
</tr>
<tr>
<td>II</td>
<td>Piracetam</td>
<td>200 (mg, po)</td>
<td>21.50±2.72</td>
</tr>
<tr>
<td>III</td>
<td>Diazepam</td>
<td>5 mg/kg</td>
<td>53.83±2.60</td>
</tr>
<tr>
<td>IV</td>
<td>EEEC</td>
<td>200 (mg, po)</td>
<td>23.33±2.02</td>
</tr>
<tr>
<td>V</td>
<td>EEEC</td>
<td>400 (mg, po)</td>
<td>43.33±1.78</td>
</tr>
<tr>
<td>VI</td>
<td>AEEC</td>
<td>200 (mg, po)</td>
<td>26.52±1.97</td>
</tr>
<tr>
<td>VII</td>
<td>AEEC</td>
<td>400 (mg, po)</td>
<td>45.16±3.65</td>
</tr>
</tbody>
</table>

(Values are mean ± SEM from 6 animals in each group)

B) Effect of extracts on Transfer ratio in Diazepam induced amnesia

Mice were divided into 7 groups consisting of 6 animals per group. Group-1 treated with Normal control (Distilled water 10ml/kg, po) only once daily for 14 days, Group-2 treated with Diazepam (5mg/kg,ip) alone on first day only and after 45 mins, TL was recorded on EPM and retention (memory) of learned task was observed 24 hrs later. Transfer latency was time taken by the mice to move in to the covered arm with all its four paws, transfer latency was recorded. If the animals did not enter in to one of the covered arms with in 90 s, it was gently pushed in to one of the two covered arms and transfer latency was assigned as 90s. Group-3 treated with standard drug piracetam (200 mg/kg, p.o). Groups 3, 4 and 5, 6 were treated orally with different doses EEEC (200 &400 mg/kg) and AEEC (200 &400 mg/kg) respectively only once daily for 14 days.

On the 14th day, 90 minutes of treatment of last dose, amnesic agent Diazepam was administered to Piracetam, EEEC &AEEC groups. After 45 mins of administration of diazepam, Transfer Latency is recorded Twenty four hours later i.e. on 15th day transfer latency was recorded.

RESULTS:

1) Effect of extracts on Transfer ratio by using Elevated plus maze apparatus:

The Transfer latency of standard group was found to be 49.50±2.72, 10.33±2.02** on the 1st and 7th days, whereas the TL of ethanolic and aqueous groups at 400 mg/kg was, 52.42±2.12, 23.66±1.97 & 55.33±2.02, 28.83±1.887** on 1 & 7th days respectively. The results were elaborated in the table. The results
show the decrease in Transfer latency of both the extracts compared to control groups and were comparable with standard.

2) Effect of extracts on Transfer ratio in Diazepam induced amnesia

The Transfer latency of standard group was found to be 21.50±2.72 & 10.33±2.02 on 14 & 15th days, whereas the TL of ethanolic group at 200 & 400 mg/kg was 23.33±2.02, 14.83±1.88** & 43.33±1.78 25.83±1.86* on 14 &15 days respectively. The results were elaborated in the table. The results show the decrease in Transfer latency of both the extracts compared to control and negative control groups and were comparable with standard.

DISCUSSION:

Elevated plus maze was used to measure the anxiety state in animals, however transfer latency was markedly shortened if the animal had previous experience in entering open and closed arms, and this shortened transfer latency has been shown to be related with memory processes. In elevated plus maze, acquisition (learning) can be considered as transfer latency on first day trials and the retention/consolidation (memory) is examined 24 h later. In our study, pretreatment with *E.coronaria* and piracetam for 14 days protected the animals from learning and memory impairment produced by interoceptive stimuli (Diazepam). The finding suggested the possible neuroprotective role of extracts of *E.coronaria*.

It has been reported that diazepam impairs retrieval memory of rats and such amnesia is associated with elevated MDA and reduced GSH levels. Since oxidative stress has been implicated in the pathophysiology of dementia, and also scopolamine has been reported to elevate rat brain oxidative stress, diazepam-induced amnesia in rats could be used as a valid model to screen drugs with potential therapeutic benefit in dementia.

CONCLUSION

The phytochemical tests of extracts of *E.coronaria* showed the presence of various phytoconstituents like Flavonoids, tannins, saponins, alkaloids, glycosides and proteins. It is known that saponins compound have nootropic activities which may attribute to learning and memory enhancing activity. Further studies are warranted to isolate the nootropic compound and to elucidate their mechanism of action.

REFERENCES: