Studies on some psychopharmacological activities of *Ocimum sanctum* root extract

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The petroleum ether (60-80°C) extract of *Ocimum sanctum* root was tested for pentobarbitone induced hypnosis in mice. The root extract or vehicle was administered (i.p.) and after 30 minutes pentobarbitone sodium (35 mg/kg) was administered. The exploratory behaviour like Water Maze Test was studied by imparting training to mice in a rectangular tank having holes to escape, filled with water and the number of mistakes were recorded.

The extract was found to produce a significant alteration in general behavioural pattern by Water Maze Test. Besides this the extract also potentiated the pentobarbitone induced hypnosis in mice. The potentiation of pentobarbitone sodium induced hypnosis and reduction of mistakes to escape by Water Maze Test indicates that the extract may have some CNS depressant as well as tranquilizing activity.

**Keywords:*** Ocimum sanctum, Water Maze Test, pentobarbitone, sleeping time, CNS and tranquilizing activity.

*Ocimum sanctum* Linn. (Family—Lamiaceae) is a widespread aromatic plant distributed mainly in the tropical and subtropical regions of the world. In the traditional system of Ayurvedic medicine different parts of this plant have been used in the treatment of various ailments¹⁻³. The most ancient and fundamental books on the medicine in India namely “Charak Samhita” and “Sushruta Samhita” describe some curative effects of *Ocimum* species. Charak describes *O. sanctum* as curative of hiccups, cough, poison dyspnea and pluorodynea, promotive of ‘pitta’ and curative of ‘kapha’ and ‘vata’ and eliminative of ‘fetor’. The Indian Materia Medica⁴, which is a compilation of Unani and Ayurvedic system of medicine, also refers to *Ocimum* plants as highly medicinal. Pharmacological investigations carried out in *Ocimum* species have shown that most of them have insect repellant, insecticidal and antimicrobial properties. Gupta and Viswanathan⁵ reported that *O. sanctum* contains some antituberculous substance because the ether extract of the plant inhibited the
growth of *Mycobacterium tuberculosis*. Bhat and Broker reported that seeds of *O. sanctum* contain some anticoagulase factors. Gonopati reported that the plant contains alkaloids, glycosides, tannins and saponins.

Martinez reported that a possible oral hypoglycaemic factor can be isolated from *O. sanctum*. Saha and Kashinathan observed the antifertility effect of sacred basil in mammals. The ethanolic (50%) extract of *O. sanctum* leaves showed hypoglycaemic and antispasmodic activity against spasmogen induced spasm in isolated guinea pig ileum. Adaptogenic (antistress) activity of *O. sanctum* plant in rats and mice has been reported. The present study was undertaken to evaluate the various psychopharmacological actions of the root extract on different experimental models in animals.

**Materials and methods**

**Plant material**: Roots of *O. sanctum* were collected during the month of August-September from Midnapore district of West Bengal, India and were identified by the Botanical Survey of India, Shibpur, Howrah. A voucher specimen (H-08) has been kept in our laboratory for future reference.

**Preparation of root extract**: Dried powdered roots were extracted with methanol (90%) four times by cold percolation. The percentage of yield of methanol extract was 16.25% w/w. The methanol extract was concentrated in vacuo to 1/5th of its volume, diluted with same volume of water and was extracted three times with petroleum ether (60-80°C); each time 100 ml petroleum ether (60-80°C) was used. The petroleum ether extract was concentrated until a solid mass was obtained. The yield was 10.60% w/w. The solid mass was used for the experiment by dissolving it in physiological saline solution.

**Experimental animals**: Swiss albino mice (20-22g) were used for experiments. The animals were housed in standard metal cages and provided with food and water *ad libitum*.

**Effects on pentobarbitone sodium induced hypnosis in mice**: This experiment was performed following the method of Dandiya and Collumbine. In groups of 10 mice pentobarbitone sodium (35 mg/kg, ip) was injected 30 minutes after the injection of vehicle or root extract. The root extract was administered at a dose of 200 and 500 mg/kg, i.p., and normal saline 0.20 ml/20g i.p. Sleeping time in each animal was determined by noting the time interval between the loss and regaining of righting reflex.

**Effects on exploratory behaviour pattern. Water Maze Test**: A rectangular tank made of galvanised tin (30” x 20” x 12”) was divided into six equal chambers by partition and was half filled with water. There was a hole in the mid point of partition of chamber except two chambers which are referred to as blind chambers. If the animals are introduced in one end of the tank they will swim and go to the platform fitted to the other end of the tank through holes.
But if the animals enter into the blind chambers, it is not possible to escape i.e. mistake will be there and the animals have to retrace the path. The animals were first trained in such a manner that they will recognize only the way of escaping from the tank. They went outside through the holes of the chamber and average no. of mistake of the group was recorded. 10 animals were trained and two different doses were tested on the same group of 10 animals at an interval of 10 days. 200 and 500 mg/kg, i.p. were administered and after 30 minutes they were allowed to escape from the tank through the holes. The number of mistakes (entering into the blind chambers) and the time taken to reach the destination was calculated.

Statistical analysis: The experimental results are expressed as the mean ± SEM and the statistical significance was evaluated by the Student’s t-test.

Results: Results of the effect of *O. sanctum* root extract and pentobarbitone sodium induced hypnosis are presented in Table 1. At lower dose (200 mg/kg, i.p.) the extract did not show significant increase in sleeping time but at higher dose level (500 mg/kg, i.p.) the extract significantly potentiated pentobarbitone induced hypnosis.

The results of the effect of *O. sanctum* roots extract on Water Maze Test in mice are presented in Table 2. It has been observed from the table that time taken to reach the destination and the number of mistake were less as compared to untreated control group. The results were analysed statistically.

Discussion: Petroleum ether extract was subjected to psychopharmacological investigation. It was found that the extract has a minimum lethal toxicity of 750 mg/kg, i.p. in mice as 20% mortality was noted in this dose. So repeated injection of the extract during the course of our studies showed that up to a dose of 500 mg/kg, i.p., it did not produce any death. Hence for our further experiment drug was used at varying doses from 50 to 500 mg/kg, i.p. At lower doses of 50 and 100 mg/kg the extract did not show any significant effect. But at higher doses of 200 and 500 mg/kg, i.p. the extract significantly increased the pentobarbitone sodium induced hypnosis in mice. It is well known that most of the tranquillizing, Central Nervous System (CNS) depressant agent potentiate the pentobarbitone induced hypnosis in mice. So the increase in sleeping time indicated that the root extract of *Ocimum sanctum* has central nervous system depressant effect in mice in a dose dependent fashion.

Accordingly, the effect of root extract was further investigated on certain other characteristic actions of CNS depressants e.g. exploratory behaviour pattern. Root extract of *O. sanctum* produced a significant decrease in exploratory behaviour pattern as evident from the Water Maze Test. The root extract produced significant results at a dose of 200 and 500 mg/kg and caused a significant decrease in Water – Maze entry behaviour compared with the
Table 1—Effect of the root extract of *Ocimum sanctum* on pentobarbitone sodium (35 mg/kg) - induced hypnosis in mice (n = 10)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Duration of sleep in minutes Mean ± SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Normal Saline)</td>
<td>0.2 ml</td>
<td>49 ± 2.95</td>
<td></td>
</tr>
<tr>
<td><em>O. sanctum</em> Root extract</td>
<td>200 mg/kg, i.p.</td>
<td>76 ± 1.97*</td>
<td>*P&lt;0.05</td>
</tr>
<tr>
<td><em>O. sanctum</em> Root extract</td>
<td>500 mg/kg, i.p.</td>
<td>110 ± 1.56*</td>
<td>*P&lt;0.001</td>
</tr>
</tbody>
</table>

*P < 0.01

P-value was calculated by comparing with control by Student’s t-test.

Table 2—Effect of *Ocimum sanctum* root extract on exploratory behaviour. Water Maze Test

<table>
<thead>
<tr>
<th>Group</th>
<th>Dose (i.p.)</th>
<th>No. of Error</th>
<th>Average time taken to reach the destination in Sec. ±SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (Normal Saline)</td>
<td>0.2 ml</td>
<td>9</td>
<td>18 ± 1.10</td>
</tr>
<tr>
<td><em>O. sanctum</em> Root extract</td>
<td>500 mg/kg</td>
<td>5</td>
<td>10 ± 2.1*</td>
</tr>
<tr>
<td><em>O. sanctum</em> Root extract</td>
<td>200 mg/kg</td>
<td>2</td>
<td>6 ± 1.8**</td>
</tr>
</tbody>
</table>

*P < 0.01; **P < 0.001

P-value was calculated by comparing with control by Student’s t-test.

control. Reduction in exploratory behaviour on treatment with the *O. sanctum* root extract is in conformity with the actions occurring with other CNS depressant drugs.

Thus from the current investigation it is concluded that the root extract of *O. sanctum* has a potent CNS depressant action. However it is difficult at the moment to indicate the precise nature and category of such CNS depressant action and requires further experimentation.

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