EVALUATION OF SKELETAL MUSCLE RELAXANT ACTIVITY OF AQUEOUS EXTRACT OF CORIANDER SATIVUM LINN. SEEDS ON WISTER RATS

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ABSTRACT
Coriander sativum Linn. family Umbelliferae is an Ayurvedic medicinal herb, commonly known as Dhaniya. The aim of the present study was to evaluate the skeletal muscle relaxant activity of Aqueous Extract of Coriander sativum seeds (AECS) using methocarbamol as a standard drug. AECS was administered orally at a dose of 100mg/kg and 200mg/kg to the wister rats and total fall off time for standard and test group was recorded. The aqueous extract at the dose of 100 mg/kg, p.o., significantly (**P<0.001) reduces the fall off time (motor coordination) at 30min of duration. Thus, the result suggested that the AECS possess skeletal muscle relaxant activity may be due to presence of alkaloids, carbohydrates, flavonoids and steroids in the extract.

KEYWORDS: Coriander sativum, Methocarbamol, Aqueous extract, Rota-rod, Muscle relaxation.

INTRODUCTION
Dhaniya consist of dried ripe fruit of Coriandrum Sativum Linn. Umbelliferae family. It is also known as “Coriander, Cilantro, and Chinese parsley”. It is an annual herb which grew to 1½ ft tall and contain open flower heads that are white to light pink in colour. New leaves are oval but aerial leaves are elongated. Fruit are round in shape. Flowering occurs in July and August. It is indigenously distributed in Italy, but in India it is chiefly found in Madhya Pradesh, Tamil Nadu, Andhra Pradesh. Major active constituents of Coriander sativum is essential oils and other minor active constituents are monoterpene hydrocarbons viz. α-pinene, limpene, γ-terpinene, p-cymene, borneol, citronellol, camphor, geraniol, coriandrin, dihydrocoriandrin, flavonoids, phenolic acids and sterols. The leaf oil contains mostly aromatic acids containing 2E-decenal (15.9%), decanal (14.3%), 2E-decen-1-ol (14.2%) and n-decanol (13.6%) and other constituents present are 2E-tridecen-1-al (6.75%), 2E-dodecenal (6.23%), dodecanal (4.36%), undecanol (3.37%), and undecanl (3.23%). Traditionally, the plant is reported to be used in the treatment of variety of ailments. Decoction of green coriander is useful in stomatitis. In conjunctivitis, either juice or decoction of green coriander is put in eyes. The paste of dry coriander is used in headache. Fresh juice of leaves is used as a gargle in sore throat and
Coriander tea is recommended for patients suffering from kidney problems. The volatile oil is carminative. Pharmacological studies have demonstrated Hypoglycemic, Hypolipidemic, Antimutagenic, Antihypertensive, Antioxidant, Antimicrobial and postcoital antifertility activity of coriander sativum. It has also been used in the heavy metal detoxification. The present study was designed to evaluate the skeletal muscle relaxant activity of the aqueous extract of seeds of *Coriander sativum*.

**MATERIALS AND METHODS**

**Collection of plant materials**

In the present study the seeds of *Coriander sativum* were collected from local supermarkets of Visakhapatnam district, India. It was taxonomically identified. The plant materials were shade dried and then separately pulverized in a mechanical grinder. The powder was sieved to 40 # mesh to obtain coarse powder and subjected to standardization with the different parameters.

**Preparation of aqueous extract**

The dried powdered material (150g) was extracted by maceration with distilled water at room temperature for 7 days with occasional stirring. The extract was passed through muslin cloth. The filtrate were concentrated with a vacuum pump and evaporated to dryness, stored in universal bottles, and refrigerated at 4°C prior to use.

**Preliminary Phytochemical Studies**

Qualitative tests for the presence of plant secondary metabolites such as carbohydrates, alkaloids, tannins, flavonoids, proteins, saponins, and glycosides were carried out using standard procedures.

**Animals used**

Adult wister albino rats (150-200g) of either sex were used for evaluation of pharmacological study viz., acute toxicity study and Skeletal muscle relaxant activity. The animals were housed for at least for one week in the laboratory animal room prior to testing in standard propylene cages at room temperatures of 34±2°C, at 60-65% relative humidity and light (12hrs light/12hrs dark cycle). Food and water were given *ad libitum* unless otherwise specified. The experimental protocols were duly approved by the Institutional Animal Ethical Committee (IAEC); Registration number 1430/PO/a/11/CPCSE dated 08-04-2011.

**Acute Toxicity study**

Acute toxicity studies were carried out following OECD guideline no. 425 to study the acute toxic effects and to determine the minimum lethal doses of the drug extract. Male wistar
rats 150-200 g was used for the study. The aqueous extract was administered orally to overnight fasted animals at a graded dose of 100-2000 mg/kg of body weight. After administration of the extracts, the animals were observed continuously for the first two hours, for any toxic manifestation. Thereafter, observations were made at regular intervals for 48 hours. Further the animals were under investigation up to a period of 2 week.

**Selection of dose for pharmacological screening**

The aqueous extract of *Coriandrum sativum* (AECS), was found to be non-toxic up to the dose of 2000mg/kg and did not cause any death, therefore it is considered as safe. Hence 1/10th of this dose i.e. 200mg/kg body weight and half the 1/10th i.e. 100mg/kg was used for the elucidation of this muscle relaxant activity.

**Skeletal muscle relaxant activity (motor coordination)**

Rats were divided into four groups consisting of six animals each. Group I served as control which received distilled water 10ml/kg. Group II received the standard drug Methocarbamol at a dose of 60mg/kg. Group III and IV received the aqueous extract of *Corinder sativum* orally at a dose of 100 mg/kg and 200 mg/kg. Animals remaining on Rota-rod (22 rpm) 5min or more after low successive trials are included in the study. After the administration of control, standard and test drug the fall off time from the rotating rod was noted after 30mins. The difference in the fall off time from the rotating rod between the control and treated rats was taken as an index of muscle relaxation.

**Statistical analysis**

All the grouped data were statistically evaluated with Microsoft excel. Hypothesis testing methods include one way analysis of variance (ANOVA) followed by Dunnett’s multiple comparision using Prism Software Version 6. ***P<0.001*** were considered to indicate statistical significance. All the results were expressed as Mean ± SEM for six animals in each group.

**RESULTS**

**Extractive value**

The colour, consistency and extractive values of aqueous extracts of the *Coriander sativum* are reported in Table 1.

<table>
<thead>
<tr>
<th>Solvent extract</th>
<th>Colour</th>
<th>Consistency</th>
<th>%w/w Extractive value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous</td>
<td>Light brown</td>
<td>Sticky</td>
<td>29.68</td>
</tr>
</tbody>
</table>
Preliminary phytochemical studies

The preliminary phytochemical screening of *Coriander sativum* of seed powder revealed the presence of carbohydrates, alkaloids, steroids, flavonoids, are reported in Table 2.

Table 2: Preliminary phytochemical Screening of AECS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Chemical Constituent</th>
<th>Chemical Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrates</td>
<td>Molisch’s test</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fehling’s test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benedict’s test</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Saponins</td>
<td>Foam test</td>
<td>-ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bromine water test</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Alkaloids</td>
<td>Mayer’s test</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wagner’s test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dragendroff’s test</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Phenols and Tannins</td>
<td>Gelatin test</td>
<td>-ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ferric Chloride test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lead acetate test</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Proteins</td>
<td>Millon’s test</td>
<td>-ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biuret test</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Flavonoids</td>
<td>Sodium hydroxide test</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sulphuric acid test</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shinoda’s test</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Steroids</td>
<td>Salkowski test</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lieberman Burchard test</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Glycosides</td>
<td>Borntrager’s test</td>
<td>-ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modified Borntrager’s test</td>
<td></td>
</tr>
</tbody>
</table>

(+) = positive; (-) = negative

Acute Toxicity study

When orally administered to rats in graded doses from 100 to 2000 mg/kg, p.o., and the aqueous extract produced sedation, purgation and analgesia at all tested doses. However, there was no mortality at any of the tested doses till the end of 14 days of experiment.

Skeletal Muscle Relaxat Activity

In this test, AECS (100 mg / kg, and 200 mg / kg) showed highly significant reduction in the time spent by the animals on the revolving rod when compared to the control \((P< 0.01)\). The standard drug (methocarbamol) also showed a highly significant effect when compared to the control \((P< 0.01)\). Treatment with extract at a dose of (100 mg/kg, 200mg/kg) and methacarbamol at a dose 60mg/kg decreased fall off time showed a highly significant effect.
A reduction in the motor coordination was observed in the test drug (100mg/kg). Aqueous extract of *C. sativum* showed better muscle relaxant effect as compared to standard drug (*P < 0.05*). The result from the Rota-rod test (Table 3) showed that the extract significantly reduced the motor coordination of the tested animals.

**Table 3: Effect of AECS on skeletal muscle relaxant activity on Rota-rod**

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Dose(mg/kg)</th>
<th>Time spent on Rota-rod (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Control</td>
<td>10</td>
<td>191.75±7.94</td>
</tr>
<tr>
<td>II</td>
<td>Methocarbamol</td>
<td>60</td>
<td>139.75±6.90***</td>
</tr>
<tr>
<td>III</td>
<td>AECS</td>
<td>100</td>
<td>80.25±7.43***</td>
</tr>
<tr>
<td>IV</td>
<td>AECS</td>
<td>200</td>
<td>67.50±4.17**</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± S.E. M (n =6).

All columns are significant using ANOVA;

*P<0.05, ***P<0.001 when compared to control

**DISCUSSION**

In the present work attempts were made to study detail phytochemical investigation and pharmacological action, particularly skeletal muscle relaxant activity of AECS. The preliminary phytochemical screening of *C. sativum* of seed powder revealed presence of carbohydrates, alkaloids, steroids, flavonoids which are probably responsible for the actions. For evaluating this skeletal muscle relaxant activity wister rats and rota-rod apparatus is used. The test is used to evaluate the activity of drugs interfering with motor coordination. Maximum muscle relaxation was observed at a dose 100 mg / kg which is highly significant and showed better muscle relaxant effect compared to standard drug. In 1956, Dunham and Miya suggested that the skeletal muscle relaxation induced by a test compound could be evaluated by testing the ability of mice or rats to remain on a revolving rod. This forced motor activity has subsequently been used by many investigators. The dose which impairs the ability of 50% of the rats to remain on the revolving rod is considered the endpoint.

**CONCLUSION**

Throughout history, humans have found that some plants and herbs can be not only to enhance the flavor of foods but also to restore health. Numerous phytochemical and
pharmacological studies have been conducted on different parts of *Coriander sativum*. and the literature review supports that *Coriander sativum* as a medicinal tree. The AECS shows presence of carbohydrates, alkaloids, steroids, flavonoids etc. In the present study, the effect of aqueous extract of *Coriander sativum* on muscle relaxation has been evaluated. The Rota-rod test showed highly significant reduction in the time spent by the animals on the revolving rod when compared to the controls. In conclusion, our data indicates that AECS possesses sedative and skeletal muscle relaxant activities. Further studies are in progress to isolate the active constituents responsible for this activity.

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