Antidiabetic Activity of Alcoholic Extract of *Celosia argentea* Linnaeus. Seeds in Rats

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*Celosia argentea* Linnaeus, commonly known as “Cocks Comb” and its seeds are widely used in Indian folk medicine for the treatment of diabetes mellitus. This study was undertaken to evaluate the effect of an alcoholic extract of *Celosia argentea* seeds (ACAS) on blood glucose and body weight in alloxan-induced diabetic rats. ACAS was found to reduce the increase of blood glucose in alloxan-induced diabetic rats (27.8% at 250 mg/kg and 38.8% at 500 mg/kg body weight). Chronic administration of ACAS significantly (p<0.01) reduced the blood glucose in alloxan-induced diabetic rats for two weeks. Also the extract prevented a decrease in body weight in alloxan-induced diabetic rats. These results suggest that the ACAS possesses antidiabetic activity in alloxan-induced diabetic rats.

**Key words** *Celosia argentea*; anti-diabetic activity; alloxan diabetic rat; glucose; body weight

Diabetes mellitus (DM) is a metabolic disorder affecting carbohydrate, fat and protein metabolism. The worldwide survey reported that the DM is affecting nearly 10% of the population. The treatment of DM is based on oral anti-hyperglycemic agents and insulin. However, DM is also treated in Indian traditional medicine using anti-diabetic medicinal plants. The oral anti-hyperglycemic agents currently used in clinical practice have characteristic profiles of serious side effects. This leads to increasing demand for herbal products with anti-diabetic activity and less side effects.

*Celosia argentea* (Family-Amaranthaceae) grows as a weed during the rainy season throughout India and other tropical regions of the world, such as Sri Lanka, South Asia, Africa and America. An alcoholic extract of the seeds possess aphrodisiac, antipyretic, antispasmodic, anticancer, diuretic and antibacterial. Also they are reported to be useful in jaundice, inflammation, metrorrhagia, gonorrhoea, healing of wounds and injuries. In folklore practice, the decoction of *C. argentea* seeds have been reported to be useful in diabetes mellitus, but no systematic and scientific investigation has been conducted on this seeds for anti-diabetic activity. Hence, this study has been conducted to evaluate anti-diabetic activity and other beneficial effect of alcoholic extract of *Celosia argentea* seeds (ACAS) in diabetic rats.

**MATERIALS AND METHODS**

**Materials** Fresh whole herbs were up-rooted from fields of “ACMEC” trust Melmaruvathur, during the month of September 1999, when the plants were in full bloom. The plants were identified and authenticated with the available literatures and with an authentic herbarium specimen. The seeds were collected from the mature plants, shade dried and powdered (80 mesh). The powdered seed (253 g) was defatted with petroleum ether and later extracted (Soxhlet) using 50% ethanol. The solvent free alcoholic extract (10.97% w/w) was suspended in 0.75% sodium carboxy methyl cellulose (CMC) and employed for anti-diabetic activity. The alcoholic extract was also subjected to qualitative chemical tests for the detection of phytoconstituents. Alloxan monohydrate was obtained from LOBA Chemie, Mumbai (Batch No. 31924). All other chemicals used for this study were of analytical grade.

**Animals** Swiss adult albino male rats (150—180 g) were employed for the study. All the animals were procured from The King Institute of Preventive Medicine, Guindy, Chennai. They were housed in standard microlon boxes, allowed free access to tap water and pellet diet (Amrut lab animals feed, Sangli-416 436) and maintained at room temperature of 30 ± 2 °C.

**Effect of ACAS on Alloxan-Induced Diabetic Rats** The rats were made diabetic by a single i.p. injection of 150 mg/kg body weight of alloxan monohydrate (5% w/v in sterile water). After seven days, blood samples were drawn and glucose levels were determined to confirm development of diabetes (>350 mg/dl). The diabetic rats were divided into four groups consisting of six animals each. The rats in first group (control) were administered CMC orally. Second group was treated with 100 mg/kg of tobutamide, while CMC suspension of ACAS (250 and 500 mg/kg body weight) were given to third and fourth groups respectively. Blood samples were collected just prior to and 2, 4 and 6 h after drug administration.

**Continued Administration of ACAS on Blood Glucose Levels** The effect of ACAS was also observed after a longer duration of treatment. The rats were divided into four groups consisting of 8 animals each. First group was (CMC) served as normal and second group as the diabetic control, administered CMC alone. The rats in group 3 and 4 were received different concentration of ACAS (250 and 500 mg/kg body weight for 5 d). After five days treatment of ACAS, the rats of the diabetic control and treated groups (i.e. groups 2—4) were injected with alloxan monohydrate (150 mg/kg, i.p.). The administration of ACAS was continued for 15 more days after alloxan treatment. Blood samples were collected through sino-ocular puncture just prior to and on 5 and 15 d after the alloxan injection. The parameters measured were: (a) Blood glucose (b) Body weight of the animals. Blood glucose level was measured by glucose oxidase method. The results were expressed as mean±S.E.M. The differences were compared using one-way analysis of variance (ANOVA) followed by Dunnett’s test. p values < 0.05

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were considered as significant.

Acute Toxicity and Behavioural Pattern Studies To study any possible toxic effects and/or changes in behavioural pattern, rats were treated with different doses of ACAS (0.5—5 g/kg, p.o.) and kept under close observations for 12 h daily for a week. All symptoms including changes in awareness, mood, motor activity, posture, motor co-ordination, muscle tone and reflexes were recorded for 7 d. 17)

RESULTS

The preliminary phytochemical studies showed the presence of alkaloids, glycosides and saponins in ACAS. Hase et al. (1996) reported the structure of glycoside as celosian et.

Table 1. Effect of ACAS on Alloxan-Induced Diabetic Rats

<table>
<thead>
<tr>
<th>Group (n=6)</th>
<th>Dose (mg/kg)</th>
<th>Blood glucose (mg/100 ml)</th>
<th>Fasting</th>
<th>2 h</th>
<th>4 h</th>
<th>6 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (0.75% CMC)</td>
<td>5 ml</td>
<td>371±17.4</td>
<td>372±18.1</td>
<td>371±17.1</td>
<td>372±19.5</td>
<td></td>
</tr>
<tr>
<td>Tolbutamide</td>
<td>100</td>
<td>385±20.6</td>
<td>296±18.4</td>
<td>264±15.4</td>
<td>235±14.7</td>
<td></td>
</tr>
<tr>
<td>ACAS</td>
<td>250</td>
<td>370±19.7</td>
<td>318±17.4</td>
<td>298±20.3</td>
<td>267±18.1</td>
<td></td>
</tr>
<tr>
<td>ACAS</td>
<td>500</td>
<td>374±18.6</td>
<td>294±18.2</td>
<td>270±17.5</td>
<td>229±20.2</td>
<td></td>
</tr>
<tr>
<td>One-way ANOVA</td>
<td></td>
<td></td>
<td>N.S.</td>
<td>p&lt;0.05</td>
<td>p&lt;0.01</td>
<td></td>
</tr>
</tbody>
</table>

The values are expressed as means±S.E.M. (n=6). a) p<0.01 vs. treated diabetic control. Degrees of freedom (3, 28); F=3.45.

Table 2. Effect of Continued Administration of ACAS on Blood Glucose and Changes in Body Weight in Normal and Diabetic Rats

<table>
<thead>
<tr>
<th>Group (n=8)</th>
<th>Dose (mg/kg)</th>
<th>Blood glucose (mg/100 ml)</th>
<th>Changes in body weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fasting</td>
<td>2 h</td>
</tr>
<tr>
<td>Normal (0.75% CMC)</td>
<td>5 ml</td>
<td>76±1.8</td>
<td>79±1.7</td>
</tr>
<tr>
<td>Diabetic control (0.75% CMC)</td>
<td>5 ml</td>
<td>79±1.8</td>
<td>374±22.2</td>
</tr>
<tr>
<td>ACAS</td>
<td>250</td>
<td>76±1.9</td>
<td>262±24.3</td>
</tr>
<tr>
<td>ACAS</td>
<td>500</td>
<td>78±1.8</td>
<td>233±25.4</td>
</tr>
<tr>
<td>One-way ANOVA</td>
<td></td>
<td>p&lt;0.05</td>
<td>p&lt;0.01</td>
</tr>
</tbody>
</table>

The values are expressed as means±S.E.M. (n=8). a) p<0.01 vs. untreated normal rats; b) p<0.01 vs. untreated diabetic control. Degrees of freedom (3, 28); F=4.03.

The blood glucose data obtained clearly indicate that the ACAS produced significant and consistent anti-hyperglycemic effect in alloxan-induced diabetic rats. The continuous treatment with ACAS for a period of 15 d produced a significant decrease in the blood glucose levels of diabetic rats, but not in the normal rats (data not shown). These results confirmed the uses of C. argentea seeds in folklore practice as an anti-diabetic. 18—20) Alloxan has been found to induce free radical generation and cause tissue injury. 21) The seed extract of C. argentea has earlier been reported to reduced the level of serum peroxides and confirmed the function of the extract on the protection of vital tissues including the pancreas. 22) The seeds of C. argentea have been traditionally used as a therapeutic drug for hepatic diseases in China and Japan. Since the seeds of C. argentea is a known hepatoprotective agent, improvement of liver function and subsequent increase in uptake of blood glucose and its utilization may be the mechanism of action of ACAS. The treatment with ACAS in the treated diabetic group resulted in an improvement in their body weight. The ability of ACAS to protect the body weight loss seems to be due to its anti-diabetic activity.

DISCUSSION

The preliminary acute toxicity studies have revealed no visible symptoms of toxicity at a dose as high as 5 g/kg. There were no signs of symptoms like restlessness, respiratory distress, diarrhoea, convulsions, coma, etc.

The results presented in the Table 2 showed similar anti-hyperglycemic effect by acute administration of ACAS. The blood glucose level of diabetic control significantly increased from 79 to 374 mg/dl on 5th day of alloxan injection. Continued administration of ACAS indicated significant (p<0.01) reduction of blood glucose and found to be anti-diabetic. The percentage reduction of blood glucose level on 15th day shows 48.9% at 250 mg/kg and 54.4% at 500 mg/kg. Also the Table 2 demonstrates the decrease in body weight (p<0.01) in alloxan-induced diabetic animals. But, in the animals administered with ACAS, the decrease in body weight was totally suppressed. None of the animals treated with ACAS showed any visible symptoms of toxicity at a dose as high as 5 g/kg. There were no signs of symptoms like restlessness, respiratory distress, diarrhoea, convulsions, coma, etc.
Acknowledgements  The authors are grateful to Dr. S. Kavimani, Dept. of Pharmacology, Division of Pharmacy, Mother Therasa Institute of Health Sciences, Pondicherry for valuable suggestions and Technical assistance. Also we thankful to His Holiness Arulthiru Bangaru Adigalar, President and Thirumathi Lakshmi Bangaru Adigalar, Vice-President “ACMEC” trust for providing all facilities.

REFERENCES