Short communication

Hypocholesterolaemic effect of ethanolic extract of fresh leaves of *Cymbopogon citratus* (lemongrass)

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Hypocholesterolaemic effect of ethanolic extract of fresh leaves of *Cymbopogon citratus* (lemongrass) was investigated using albino rats. Hypercholesterolaemia was induced in the animals by feeding with egg yolk fortified diet for 14 days. The plant extract was administered orally to two groups, doses of 200 and 100 mg/kg body weight respectively for 7 days. Physical activities, food and water intake and body weight increased before the administration of extract. These parameters, however, decreased after administration of extract. The elevated cholesterol concentration were significantly (P<05) lowered in the animals given the plant extract. This reduction was found to be dose dependent. This result shows that the extract possesses hypocholesterolaemic potential. This may explain its efficacy in the management of heart diseases.

**Key words:** *Cymbopogon citratus* and hypocholesterolemia, rat serum.

INTRODUCTION

*Cymbopogon citratus* (lemongrass) belonging to the family *Gramineae* (Simon et al., 1984) is a perennial tall grass with rhizomes and densely tufted fibrous roots. The fresh stalks and leaves have green colour and a lemon-like odour. The plant is a native of South India (but present in many parts of the world) growing in dense clumps (Simon et al., 1984). *C. citratus* is used in different parts of the world in the treatment of digestive disorders, fevers, menstrual disorder, rheumatism and other joint pains (Simon et al., 1984). The essential oil of the plant is used for the treatment of skin diseases (Balch and Phyllis, 1990). Traditional medicine practitioners in the Eastern part of Nigeria use the plant’s preparation in the form of tincture (solution of plant extract in local alcohol) for treating coronary heart disease and related conditions, such as cardiovascular disorders.

Cholesterol is the major sterol in animal tissues and its amphipathic nature enables it to occur in cell membranes (Nelson and Cox, 2000). It is abundant in the brain, liver, adrenal glands and nervous system (Osmund, 2001). Dietary cholesterol is obtained from animal products. The maximum dietary cholesterol required in a day by an adult is 300 mg. The liver produces sufficient cholesterol (in the absence of enough dietary cholesterol) for all normal body functions. Higher cholesterol levels are found in males and older people. It is carried in the blood in the form of lipoproteins (Osmund, 2001).

High cholesterol in the blood (hypercholesterolaemia) is associated with an increased risk of various disorders, such as coronary heart disease and stroke (Hornstra et al., 1988). These disorders are caused by blood vessels becoming narrowed with fatty deposits (which cholesterol is part of), leading to reduced blood flow (or total blockage of blood flow) to vital organs, like brain. Artherosclerosis is caused by hardening and narrowing of arteries (Sundram et al., 1995). Factors that facilitate development of the disorders of hypercholesterolaemia include smoking, lack of proper exercise, emotional stress, diets rich in saturated fatty acids, coffee drinking, diabetes and heredity (Osmund, 2001).

The leaves of *C. citratus* are widely used in the Eastern Nigeria to treat various heart disorders. Thus, it is imperative to investigate if this could be based on reduction of blood cholesterol level.

**MATERIALS AND METHODS**

**Animals**

Twenty adult albino rats weighing between were purchased from
The Zoological Garden of the University of Nigeria, Nsukka, and transported down to the Animal House of the Department of Biochemistry/Biotechnology, Ebonyi state University Abakaliki. They were acclimatized, placed in groups of five animals per cage. Food and water was given ad libitum throughout the duration of the experiment.

Table 1. Weight changes and serum cholesterol levels in rats given high egg yolk diet.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Egg yolk diet</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
</tr>
<tr>
<td>Initial Weight (g)</td>
<td>82.50±8.09</td>
<td>87.50±10.4</td>
</tr>
<tr>
<td>Final weight (g)</td>
<td>135.00±7.07</td>
<td>156.25±10.31</td>
</tr>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>205.50±10.61</td>
<td>207.75±14.50</td>
</tr>
</tbody>
</table>

Values are mean ± SD.
Values in the same row bearing different letter vary significantly (P≤ 0.05); n = 5.

RESULTS AND DISCUSSION
Percentage yield of the crude ethanolic extract of fresh leaves of *C. citratus* was 23.5±1.25. This indicates that substantial fraction of the constituents is freely soluble in ethanol.

A general increase in physical activities, food and water intake were observed for all the animals during the feeding experiment. The animal on the high egg yolk diet recorded significant (P ≤ 0.05) weight gains compared to the animals on the normal rat chow (Table 1). The increase in weight of the animals suggests that they accumulated calories in the form of fats from the egg yolk diet. This result agrees with the report of Wells et al. (1987) which suggests that accumulation of fats from diets such as egg yolk and liver might increase body weight. This suggestion is further corroborated by the significant increase (P ≤ 0.05) in the serum cholesterol level of animals on the egg yolk diet (Table 1). This observation tallies with the report of Laakso et al. (1988) that egg yolk supply significant amount of cholesterol to human diet which could be accumulated in the body and may lead to hypercholesterolaemia.

A different picture emerged following the administration of the crude ethanolic extract of fresh leaves of *C. citratus* on the animals given the egg yolk diet for seven days. The animals exhibited reduced physical activity and also consumed less food and water compared to the untreated animals. These treated animals also recorded significant (P ≤ 0.05) decreases in weight and lower serum cholesterol levels relative to untreated animals (Table 2). These reductions in serum cholesterol level were dose dependent. The serum cholesterol level in the animals given the higher dose (200 mg/kg) of *C. citratus* ethanol extract was almost at par with those of the animals that were never given the egg yolk diet.

The mechanism underlying these observations especially the loss of appetite is not clear. However, there is evidence of metabolic upset. Studies aimed at understanding these events are going on in our laboratory. The cholesterol-lowering potential of the extract many be ascribed to modification of cholesterol uptake from the intestine, conversion of cholesterol to bile acids and increasing excretion of bile acids by extracts of *C. citratus*.
Table 2. Weight changes and serum cholesterol levels in rats fed high egg yolk diet and treated with ethanol extract of *C. citratus*.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>(Group A₁) Egg yolk + 200 mg/kg extract</th>
<th>(Group A₂) Egg yolk + 100 mg/kg extract</th>
<th>(Group B) Egg yolk + distilled water</th>
<th>(Group C, control) Rat chow + distilled water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight (g)</td>
<td>132.50±3.54 b</td>
<td>132.50±0.70 b</td>
<td>155.00±9.82 b</td>
<td>106.75±2.02 a</td>
</tr>
<tr>
<td>Final weight (g)</td>
<td>102.50±3.00 a</td>
<td>122.50±0.68 a</td>
<td>152.50±8.99 b</td>
<td>105.60±2.01 a</td>
</tr>
<tr>
<td>Cholesterol (mg/dl)</td>
<td>105.25±1.77 a</td>
<td>160.00±2.83 b</td>
<td>205.50±12.02 c</td>
<td>104.00±2.12 a</td>
</tr>
</tbody>
</table>

Values are mean ± SD. Values in a row bearing different alphabets differ significantly (P ≤ 0.05); n = 5.

and curcumin plants as reported (National cholesterol Education programme Expert panel, 1988). Our result therefore seems to confirm the anti-hypercholesterolaemic potentials of ethanolic extracts of fresh leaves of *C. citratus* which may explain its use in management of heart disease in ethnomedicine.

REFERENCES


