Hypolipidemic effect of *Coriandrum sativum* L. in triton-induced hyperlipidemic rats

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In the biphasic model of triton-induced hyperlipidemia, *C. sativum* at a dose of 1g/kg body weight reduced cholesterol and triglycerides levels in both synthesis and excretory phases in rats, and the results were comparable with that of Liponil, a commercially available herbal hypolipidemic drug. The results suggest that coriander decreases the uptake and enhances the breakdown of lipids. From the study it can be assumed that coriander has the potential to be popularized as a household herbal remedy with preventive and curative effect against hyperlipidemia.

Keywords: *Coriandrum sativum; Coriander; Hypolipidemia; Triton; Triton induced hyperlipidemia; Liponil*

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Atherosclerosis, referred to as a “silent killer”, is one of the leading causes of death in the developed countries and is on the rise in developing countries like India. The American Heart Association has identified the primary risk factor associated with atherosclerosis as elevated levels of cholesterol and triglycerides in the blood. Therefore therapists consider the treatment of hyperlipidemia to be one of the major approaches towards decelerating the atherogenic process. Allopathic hypolipidemic drugs are available at large in the market but the side-effects and contraindications of these drugs have marred their popularity. Recently herbal hypolipidemics have gained importance to fill the lacunae created by the allopathic drugs. Condiments like garlic, onion and coriander used in day-to-day preparation of food in Indian kitchens have been identified as hypolipidemics in Ayurveda. As compared to coriander the hypolipidemic properties, in particular the mode of action of garlic and onion have been extensively studied.

*Coriandrum sativum* L (Common name: Coriander), belonging to family Umbelliferae, is a herb that is widely cultivated in India and is recognized for its carminative and cooling properties. Both the leaves and seeds of the plant are used for medicinal purpose. Coriander contains many active principles, primarily isocoumarins and the most important one is coriandrin. In the field of alternative medicine, coriander has immense value for the treatment of abdominal problems, especially stomach ulcers. The hypotensive and hypoglycaemic properties of coriander have been documented. The ability of coriander to increase levels of antioxidant enzymes and to manipulate lipid metabolism also have been reported. In Ayurvedic literature, the regular use of the decoction of the seeds of coriander is considered to be effective in lowering blood lipid levels, but the therapeutic and prophylactic value of coriander for reducing hyperlipidemia is not fully understood. The present study has been carried out to evaluate the hypolipidemic effect of coriander for triton-induced hyperlipidemia (biphasic model) in Wistar rats.

Materials and Methods

Male Wistar rats (30) weighing 200-350 g body weight were divided into 6 groups of 5 animals each. The animals were maintained at 22±3°C and 30-70% RH with 12:12 hr L:D cycle. Animals were starved throughout the experimental period, but water was provided *ad libitum*.

Preparation of coriander suspension—Commercially available coriander powder was procured from...
the market. The powder was made into a fine suspension in distilled water prior to oral intubation.

Preparation of Liponil solution—A commercially available polyherbal hypolipidemic tablet, Liponil® (Cybele Herbal Laboratories, Cochin, India), was supplied as gratis. The tablets were powdered and made into a fine suspension in distilled water prior to oral intubation.

Preparation of Triton solution—A 20% (w/v) solution of Triton WR1339 (isooctyl-polyoxyethylene phenol-Sigma Chemicals Co, St Louis, USA) was prepared in phosphate buffer (pH 7.2; 0.05 M).

The experiment was performed in accordance with the methodology given by Vogel and Vogel\(^\text{11}\). Triton-induced hyperlipidemia occurs in 2 phases. The initial increase of lipid levels, the maximum reaching 24 hr after the administration of triton, is referred to as the synthesis phase. From the 24th hr, the lipid levels decrease, almost reaching normal levels by the end of 48th hr; this is referred to as the excretory phase.

Rats in Group 1 were maintained as the untreated control. Triton was administered, ip to the rats of groups 2-6, at a dose of 200 mg/kg body weight. Animals in group 2 and group 4 received coriander and Liponil respectively at a dose of 1 g/kg body weight by oral intubation immediately after the administration of triton (synthesis phase). Rats in groups 3 and 5 received coriander and Liponil respectively at a dose of 1 g/kg body weight, 22 hr after the administration of triton (excretory phase). Group 6 was left without dosing after triton administration. Blood was collected from the retro orbital sinus in heparinized vials 24 hr before the start of the experiment and then 24 and 48 hr after triton administration. Cholesterol and triglycerides were estimated in the blood using an autoanalyzer (Erba Smartlab, Transasia Biomedicals, Bombay, India). The animals were euthanized (intraperitoneal administration of thiopental sodium at a dose of 100 mg/kg body weight) following the last blood collection.

The data were subjected to Bartlett’s test of homogeneity followed by one-way ANOVA. Students Newman Keul’s test was used for post hoc comparison.

Results

Synthesis phase—Groups 1, 2, 4 and 6 were compared in the synthesis phase of the experiment. At 24 hr a decrease of cholesterol and triglycerides was observed in both the coriander (Group 2) as well as the Liponil (Group 4) treated groups when compared to the triton only dosed group 6. By the end of 48 hr, all levels of cholesterol in the coriander and the Liponil treated groups were lower than the triton only dose group 6. For triglycerides, there was a reduction in the Liponil treated group when compared to the triton only dosed group, but the level in the coriander treated group, although reduced, was not statistical different from the triton only dosed group (Table 1).

Excretory phase—Groups 1, 3, 5 and 6 were compared in the excretory phase of the experiment. At 2 hr, a decrease in the levels of cholesterol and triglycerides was observed in the coriander as well as triton Liponil treated groups when compared to the triton only dosed group. By the end of 48 hr, cholesterol level decreased in all the triton dosed groups (group 3, 5 and 6) compared to their respective 24 hr value but were higher compared to the control (Group 1). The triglycerides, by the end of 48 hr, were statistically similar among the groups (Table 1).

Discussion

The biphasic nature of triton-induced hyperlipidemia is helpful in understanding the mode of action of the hypolipidemic agents. Drugs interfering with lipogenesis or uptake will be active in the synthesis phase, while drugs interfering with lipid excretion and metabolism will be active in the excretory phase. In the present study, coriander reduced the cholesterol and triglycerides in a manner similar to the reduc tive facilitated by Liponil. The hypolipidemic activities of Liponil and coriander were evident in both synthesis and excretory phases of triton-induced hyperlipidemia in rats. Triton induces hyperlipidemia by increasing the hepatic synthesis of cholesterol and triglycerides. So, it can be assumed that coriander inhibi ts the biosynthesis of cholesterol and triglycerides and therefore can be used for the prevention (prophylactic) of hyperlipidemia. In a similar study, the prophy lactic activity of Probucol was evident as it was effective in controlling cholesterol in the synthesis phase of triton-induced hypercholesterolaemia.

In the excretory phase of triton-induced hyperlipidemia, the breakdown of lipids occurs. Coriander, like Liponil was effective in the excretory phase and could be assumed that it increases the metabolism of excretion of lipids. In rats fed high cholesterol die coriander reduced the lipid levels by virtue of increased bile acid synthesis and increased degradation of cholesterol to fecal bile acids and neutral sterols.
Table 1: Effect of C. sativum on the synthesis and excretion phases of triton-induced hyperlipidemia in rats

<table>
<thead>
<tr>
<th>Groups</th>
<th>Cholesterol (mg/dl)</th>
<th>Triglycerides (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 hr</td>
<td>48 hr</td>
</tr>
<tr>
<td>1. Triton control</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Triton + Liponil (60 hr)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Coriander + Liponil (60 hr)</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
<tr>
<td>4. Coriander + Liponil (24 hr)</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
<tr>
<td>5. Coriander - Liponil (0 hr)</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
<tr>
<td>6. Triton</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
<tr>
<td>7. Coriander + Liponil (10 hr)</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
<tr>
<td>8. Coriander - Liponil (0 hr)</td>
<td>14.7 ± 3.75</td>
<td>45.8 ± 5.79</td>
</tr>
</tbody>
</table>

Values are mean ± SE

Similar reasons could be attributed to the mode of action (in the excretory phase) of coriander in the present study. Thus coriander also has therapeutic effect as it can reduce high levels of lipids by increasing their metabolism (catabolism) and eventual excretion.

The present study confirms the hypolipidemic potential of coriander, and the efficacy was comparable to the commercially available herbal hypolipidemic drug, Liponil. Although economical and of short duration, use of the triton-based animal model has limitations and can only be used for preliminary screening. The method of hyperlipidemia induction using triton is artificial and not very similar to hyperlipidemia in humans, especially hypertriglyceridemia. Further studies have to be carried out in dietary models of hyperlipidemia, particularly in rabbits, before the exact mode of action and antiatherosclerotic properties of coriander can be fully explained.

References


