THE HYPOLIPIDEMIC EFFECT OF ONION (ALLIUM CEPA LINN) IN SUCRose FED RABBITS

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Summary: Long term administration of sucrose significantly increased triglyceride levels in normal rabbits. Effects of an aqueous extract of onion on the sucrose fed rabbits have been investigated. Administration of onion extract significantly reduced serum, liver and aorta triglycerides and serum and liver proteins. On the other hand liver free amino acids have been significantly increased in the onion treated group as compared to the sucrose fed control. The effects of onion have been ascribed to its sulfur containing principles which oxidize thiol compounds either present free or combined in a protein and NADPH which are necessary for lipid synthesis.

Key words: sucrose, triglyceride, sufoxide, onion (Allium cepa Linn), protein, free amino acids, hypolipidemic effect.

INTRODUCTION

The hypoglycemic and hypolipidemic effects of onion (Allium cepa Linn) principles have been reported by many workers (4,6,12,13,15,18) and this vegetable commonly used for many ailments is claimed to have beneficial effects even in fibrinolysis (5) heart disease and arteriosclerosis (20). Hyperlipidaemia may lead to ischaemic heart disease (2,8) and the correction of this abnormality is very essential. Sucrose is known to have a moderate hyperlipidemic and hyperlipoproteinemic effect both in normal and diabetic animals (7,21). Onion is a vegetable liked by most people and if it could counteract the hyperlipidemic effects of sucrose it may become a good choice to serve as a preventive medicine against hyperlipidaemia due to excessive sweet intake. As a trial for the assessment of the hypolipidemic effect of onion, a study of the effect of its extract on the lipid raising action of sucrose in normal rabbits was planned and carried out in this paper.

MATERIALS AND METHODS

An aqueous extract of onion was prepared as described previously (4) and it was used in the feeding of rabbits. Young albino rabbits of average weight 500 g were selected. They were fed ad libitum with laboratory rabbit feed. The animals were divided into three groups and one group was kept as control and were fed ad libitum with the normal diet, a second
group received daily an oral dose of sucrose, 10 g/kg in distilled water and a third group received daily an oral dose of onion extract 10 ml/kg and 10 g sucrose/kg in distilled water. All the groups were fed ad libitum with the normal diet. After two months, the animals in all groups were weighed and their fasting blood sugar was estimated by the method of Asatoor and King (3) using alkaline copper reagent (23). The animals were then killed by decapitation, the blood was collected in a test tube and the following parameters were also determined by standard methods. In serum, protein (Lowry's method using Folin Ciocalteu reagent) (11,16), Cholesterol (9), triglycerides (24) and phospholipids (1). In liver glycogen (10), protein (16,11), free amino acids (19), cholesterol (9), triglycerides (24) and phospholipids (1). In aorta phospholipids (1), cholesterol (9) and triglycerides (24).

RESULTS

Long term administration of sucrose increased serum and aorta triglycerides levels significantly (P< 0.001 and P< 0.05 respectively), but it did not change liver triglyceride values or other parameters measured in this study. Administration of onion extract together with sucrose reduced serum and liver proteins and serum, liver and aorta triglycerides significantly. However, onion extract did not affect fasting blood sugar, liver glycogen, serum and liver cholesterol and serum, liver and aorta phospholipids, but it raised free amino acids in liver. There was not much variation in the increase in body weights of the three groups. The results which are significant are given in Table I.

TABLE I: Hypolipidemic effect of onion in sucrose fed rabbits. Values are the mean ± S.E. of 5 rabbits.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Serum protein g/100 ml</th>
<th>Liver protein g/100 g</th>
<th>Serum triglyceride mg/100 ml</th>
<th>Liver triglyceride mg/100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>6.7 ± 0.2</td>
<td>16.8 ± 0.6</td>
<td>7.2 ± 0.3</td>
<td>521 ± 20.0</td>
</tr>
<tr>
<td>Sucrose</td>
<td>6.8 ± 0.15</td>
<td>17.5 ± 0.5</td>
<td>11.2 ± 0.2 3 †</td>
<td>539 ± 15.0</td>
</tr>
<tr>
<td>Sucrose + onion extract</td>
<td>6.0 ± 0.10*</td>
<td>13.2 ± 0.3*</td>
<td>8.3 ± 0.3*</td>
<td>347 ± 10*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aorta triglyceride glycerol mg/100 g</td>
<td>Liver free amino acids mg/100 g</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>747 ± 20</td>
<td>8.1 ± 0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose</td>
<td>815 ± 19†</td>
<td>7.5 ± 0.1†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose + onion extract</td>
<td>231 ± 8.0*</td>
<td>10.0 ± 0.2**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Student's t-test. In sucrose fed groups the triglycerides are significantly higher († p < 0.06, † p < 0.001) and amino acids are significantly lower († p < 0.05) than the normal values. The values marked * of onion treated group are significantly lower (p < 0.001) than that of the sucrose fed group. The value marked ** is significantly higher (p < 0.001) than that of the sucrose fed group.
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led water and a third group sucrose/kg in distilled water,  
two months, the animals in all  
treated by the method of Asatoor  
and then killed by decapitation  
parameters were also determined  
using Folin Ciocalteu reagents.  

In liver glycogen triglycerides (24) and phospho-

triglycerides (24).  

and aorta triglycerides levels  
not change liver triglyceride  
concentration of onion extract together  
and aorta triglycerides signifi-  


garcia, liver glycogen, serum and  
[521 ± 20.0]  

Serum triglyceride g/100 ml  
Liver triglyceride mg/100 g  

7.2 ± 0.3  
11.2 ± 0.2  
8.3 ± 0.3*  
6.1 ± 0.2  
7.5 ± 0.1†  
10.0 ± 0.2**  

[0.05, * p < 0.001] and amino  
acid concentration are  
marked ** is significantly higher (p <  

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DISCUSSION  
The atherogenic effect of sucrose is ascribed to its lipid raising effect on prolonged  
use (21). As observed in the present study: in the studies of other workers also (7,21),  
sucrose feeding produced only hypertriglyceridemia and not hypercholesterolemia in normal  
animals. Hence the pathogenicity of sucrose may be due to its triglyceride raising effect.  
The adverse effects of hypercholesterolemia and hypertriglyceridemia in precipitating  
ischaemic heart disease are known (2,8). In the present study protein and triglyceride lowering  
effects together with amino acid raising effects of onion are observed. The increase in  
free amino acid concentrations may be due to the reduction in protein synthesis or increased  
break down. Onion contains many organic disulphides and sulfoxides which could react  
with sulphur containing amino acids (17). Such reactions e.g. thiol-disulphide exchange  
reactions, oxidation of thiols by sulfoxides, might have taken place between onion principles  
and sulfur amino acids either present free or as parts of proteins and might explain some of  
the above results. In addition to the sulfoxide, thial and disulphide groups, onion principles  
contain many unsaturated side chains like allyl and propyl groups also (14). These unsatu-

rated chains and sulfoxide and disulphide groups could oxidize reduced NADP (NADPH)  
(22). As NADPH is necessary for fatty acid synthesis, its oxidation by onion principles might  
also account for the hypolipidemic action of onions. The present findings high light the  
medicinal value of onion. However, the protein lowering effect of onion might limit its  
excessive use. The triglyceride lowering effects of onion warrants further study.


