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Hypocholesterolemic Effect of *Aloe vera* (L.) Extract on High Cholesterol Fed *Calotes versicolor* Daudin

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Abstract : High blood cholesterol is a major risk factor for heart disease and stroke. Daily supplementation with *Aloe vera* (L) stimulates immune system and improves wound healing. Study on the effect of *Aloe vera* (L) extract on the serum cholesterol level on male *Calotes versicolor* Daudin was carried out in the present study. *Calotes versicolor* Daudin were made hypercholesterolemic by oral administration of cholesterol (100 mg/kg body weight/day) suspended in ground nut oil using dropper. In one month cholesterol feeding experiment, the serum cholesterol level in normal controls (not given cholesterol) was 321.333 ± 16.621mg/dl and in cholesterol fed animals 437.333 ±8.066 mg/dl. To such animals when different doses of raw extracts of *Aloe vera*(L.)leaves were given along with cholesterol, there was significant decrease in serum cholesterol level. Four groups of *Calotes* were administered *Aloe vera* (L) extract in four different doses (3 mg/kg, 4 mg/kg, 5 mg/kg and 6 mg/kg/day) for 21 days. There was a significant increase in serum cholesterol levels at 1% level after feeding with high cholesterol diet. There was a significant decrease in serum cholesterol levels in all the *Aloe vera* (L) treated groups. Significance level is 5% for a dose of 6 mg/kg and other doses i.e. of 3 mg/kg, of 4 mg/kg & of 5 mg/kg show significant decrease at 0.1%, 0.5% and 0.2% level, respectively.

Key words : *Aloe vera(L.),* Animal model *Calotes versicolor* Daudin, Hypercholesterolemia, Hypocholesterolemic effect.

Introduction

Cardiovascular diseases with an incidence of approximately 50% are the main cause of death in most advanced countries (Murray and Lopez, 1997). Most people would benefit from lowering their blood pressure and cholesterol level. The underlying primary cause of cardiovascular disease is believed to be arteriosclerosis, a progressive multifactorial disease of the arterial wall (McDermott, 1999); Navab et al., 1995). Central to the pathogenesis of arteriosclerosis is deposition of cholesterol in the arterial wall (Ross, 1996).

Aloe vera (L) has a long history of both as an ornamental plant and for herbal medicine. *Aloe vera*(L) has been used externally to treat various skin conditions such as cuts, burns and eczema. Even though there are some promising results, clinical effectiveness of oral or topical *Aloe vera*(L) remains unclear at present.*Aloe vera* (L) juice may help some people with ulcerative colitis, an inflammatory bowel disease. Side effects can occur and consulting a doctor before ingesting any form of *Aloe vera*, including *Aloe vera* juice, is highly recommended. The lower leaf of the plant is used for medicinal purpose. If the lower leaf is sliced open, *Aloe vera* (L.) latex—the yellow substance that comes from the inner side of the skin , the gel obtained can be applied on the affected area of the skin. Some people who have reported adverse effects from *Aloe vera* (L.) may be ingesting

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or applying this latex (http://en.wikipedia.org/wiki/Aloe_vera). A study on the effect of *Aloe vera* (L) on the serum cholesterol level was carried out in the present study.

In the most commonly used method for testing the hypocholesterolemic effect of unknown compounds, the experimental animals are made hypercholesterolemic by feeding them with cholesterol mixed with the diet (Jain, 1975; Kritchevsky, 1975). This method suffers from one drawback that the amount of diet and consequently the amount of cholesterol taken by each animal is not uniform. therefore developed an alternate method for inducing hypercholesterolemia in *Calotes versicolor* Daudin. i.e. direct feeding cholesterol to the animal model (Ratnakar and Murthy, 1998).Then the cholesterol lowering property with a different doses of *Aloe vera*(L) extract, if any is compared.

Material and Methods

Animals:

Healthy, male of *Calotes versicolor* Daudin Common Name: Garden lizard Size: Between 13" and 16", weighing 25-30 gms. were used for the study. The animals were collected from the garden and caged in wooden boxes with nets on two sides (Box size of 3'x2'x12"). Layer of soil and tiny stones on the floor of the box and a bulb was used to heat the vivarium. Sticks were placed inside the box for the *Calotes* to climb. The animals were given standard insect diet and water throughout the study (http://www.aqualandpetsplus).

Material samples

A. *Aloe vera* (L) was identified and lower leaves were collected from the Botanical Garden of the Institute . *Aloe vera* (L) extract was used.

B. Cholesterol extra pure used for feeding purpose was from Loba Chemie. Groundnut oil was used as a vehicle for cholesterol feeding.

Experimental Procedure

All the animals were weighed and divided into six groups of six each .

Group I. Normal control fed on insect diet.

Group II. Cholesterol control. Animals of this group were fed cholesterol at a dose of 100 mg/kg/day body weight for 21 days and insect diet.

Group III. Animals of this group were fed cholesterol as in group II and *Aloe vera* (L) extract at a dose of 3 mg/kg body weight for 21 days and insect diet.

Group IV. Animals of this group were fed cholesterol as in group II and *Aloe vera* (L) extract at a dose of 4 mg/kg body weight for 21 days and insect diet.

Group V. Animals of this group were fed cholesterol as in group II and *Aloe vera* (L) extract at a dose of 5 mg/kg body weight for 21 days and insect diet.

Group VI. Animals of this group were fed cholesterol as in group II and *Aloe vera* (L) extract at a dose of 6 mg/kg body weight for 21 days and insect diet.

Cholesterol was suspended in groundnut oil. Calculated amount (100 mg/kg body wt.) was given to the animal by dropper. Gastric incubation method was not used because it damages the alimentary canal of the animal. To the controls, same volume of groundnut oil was given; remaining experimental groups were given cholesterol and different doses of *Aloe vera* (L) extract. The animals were anesthesized on 22nd day using anesthetic ether. Then animals were sacrificed by cutting the jugular vein. The blood samples were collected from the jugular vein. Cholesterol was estimated with kits from Ortho Diagnostics, Mumbai.

Statistical Analysis

Students t-test (MS Excel) was used. A p-value < 0.05 was taken as statistically significant. The serum cholesterol, levels were

compared to the levels of the normal control and the change was calculated (Zarr Jerrold, 2005).

Results

The plasma cholesterol values and percentage differences of each group with level of significance are given in table 1. On day 22 normal *Calotes* had a mean ± SD serum cholesterol level of 321.333 ± 16.621 mg/dl. In the cholesterol feed control group (group II), the value on 22nd day was 437.333 ±8.066 mg/dl showing a significant elevation of 36 % percent from the normal value. In the experimental group 3 (group III), the value on 22nd day was 387.666±3.3862 mg/dl showing a significant decrease of 11.5% from the value observed in cholesterol feed control (group II). In the experimental group IV, the value on 22nd day was 350.666 ±10.481 mg/dl showing a significant decrease of 20 % from the value observed in cholesterol feed control group II. In the experimental group V, the value on 22nd day was 310 ±6.449 mg/dl showing a significant decrease of 31.5 % from the value observed in cholesterol feed control group II as well as from normal control group I with a 3.5 percent . In the experimental group VI, the value on 22nd day was 265.666 ±5.955 mg/dl showing a significant decrease of 39.5 percent from the value observed in cholesterol feed control group II as well as from normal control group I with 17.5 percent.

Discussion

There was a significant increase in serum cholesterol levels at 1% level after feeding with high cholesterol diet for 21 days. There was a significant decrease in serum cholesterol levels in all the *Aloe vera* (L) treated groups. Significance level is 5% for a dose of 6 mg/kg and other doses i.e. of 3 mg/kg, of 4 mg/kg & of 5 mg/kg show significant decrease at 0.1%, 0.5% & 0.2% level respectively. However the fall in serum cholesterol was very high i.e. below normal cholesterol level when the dose

Table 1 : Serum cholesterol level after 21 days feeding of *Aloe vera* extract to cholesterol feed *Calotes versicolor*, Daudin.

Groups	Cholesterol level mg/dl Mean ± S.D.	% of rise or fall from cholesterol feed Control Group II	% of rise or fall from normal Control Group I
Group I. Normal Control	321.333 ± 16.621mg/dl	----------	---------
Group II. Cholesterol feed control	437.333 ±8.066 mg/dl	----------	36 % rise
Group III. Cholesterol and *Aloe vera* extract at a dose of 3 mg/kg	387.666 ±3.3862 mg/dl	11.5 % fall	20.5 % rise
Group IV. Cholesterol and *Aloe vera* extract at a dose of 4 mg/kg	350.666 ±10.481 mg/dl	20 % fall	9 % rise
Group V. Cholesterol and *Aloe vera* extract at a dose of 5 mg/kg	310 ±6.449 mg/dl	31.5 % fall	3.5 % fall
Group VI. Cholesterol and *Aloe vera* extract at a dose of 6 mg/kg	265.666 ±5.955 mg/dl	39.5% fall	17.5 % fall

is of 6 mg/kg. As the dose of *Aloe vera* (L.) increased there was sharp fall in the serum cholesterol level. Although *Aloe vera* (L.) has been used in some countries as a hypocholesterolemic agent, there are no published reports in English, of its action on lipid profile (McDermott, 1999). Therefore, it was not possible to compare the results of present study with previous works.

Probucol, a hypolipidemic drug is a potent lipophilic antioxidant and the ability to inhibit atherosclerosis has been attributed to its antioxidant properties (Witztum, 1996). The flavonoids present in *Aloe vera* (L.) may be responsible for its antioxidant as well as hypolipidemic action. *Aloe vera* (L.), according to reports from the literature has not been used clinically as a cholesterol-lowering agent.

Conclusion

The deleterious effects of high blood cholesterol and the beneficial effects of lowering blood cholesterol in reducing morbidity and mortality from cardiovascular diseases are well established. Non-pharmacological measures like dietary restriction and exercise may help in lowering blood cholesterol levels. When such therapy fails in patients with abnormally high blood cholesterol levels, drug therapy is indicated. The available drugs like statins and nicotinic acid, though very effective, have a spectrum of adverse effects and are costly. The reason for interest in *Aloe vera* (L.) was its low toxicity and the hope that it might be additive in action with other cholesterol lowering regimes.

The results of this study showed significant lowering of serum cholesterol in *Aloe vera* (L.) treated animals. But the dose needs a careful evaluation.

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