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Effects of bulb extract of *Allium sativum* on serum lipid levels in normal and ethanol fed rats

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ABSTRACT

The present study is designed to evaluate the effect of aqueous bulb extract of *Allium sativum* on serum lipid levels and some biochemical parameters in normal and alcohol fed rats. The aqueous bulb extract of *Allium sativum* was administered orally (100mg/kg b.w.) and the effect of the extract on blood glucose, total protein, albumin, and the levels of lipid profiles (Triglyceride, cholesterol, LDL-Cholesterol, HDL cholesterol) were estimated in normal and ethanol fed rats. A significant increase in the activities of blood glucose, cholesterol, LDL cholesterol and HDL cholesterol in 30% ethanol fed rats (Group II), whereas it normalised with the treatment of bulb extract (100mg/kg b.w) (Group I). There is no significant alteration in the protein profile. These findings suggest a possible antihyperlipidaemic role of *Allium sativum* bulb extract that may be used for therapeutic purposes.

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KEYWORDS

Garlic;
Lipid profile;
Protein;
Hypolipidemic activity.

INTRODUCTION

Following the call by the World Health Organization on the need for developing countries to use medicinal plants in their health care system, Munir and Abdulaziz^[1] intensified research on various locally available plants especially those used in traditional medicine. Examples of such plants include *Allium sativum*, *Zingiber officinale* and *Adansonia digitata* amongst others^[2]. *Allium sativum*, known in English as Garlic, is cultivated all over India.

No other herb has served as many culinary and medicinal roles in as many cultures as garlic. Traditionally, the fresh cloves, garlic tea, syrup, tincture, and other preparations have been used as an aphro-

disiac; to treat colds, fever, flu symptoms, coughs, earache, bronchitis, shortness of breath, sinus congestion, headache, stomach ache, high blood pressure, atherosclerosis, hypertension, diarrhea, dysentery, gout, rheumatism, whooping cough, pinworms, old ulcers, and snakebites; and for numerous other ailments, conditions, and applications^[3].

Recent interest has focused on the potential and use of garlic for the treatment of high blood pressure, atherosclerosis, hypoglycemia, digestive ailments, colds, flu, bronchitis, plus its antibacterial, antifungal, serum cholesterol-lowering and anti-thrombotic activity^[4]. Garlic has also been used as an adjunct therapy in the treatment of leprosy, significantly altering the bacteria index, while improving the clinical picture of the patients^[5].

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A study by Joshi et al.^[6] indicated that garlic oil may act as a potent relaxant of the smooth muscle of the gastrointestinal tract. Block et al.^[7] characterized a compound from fresh garlic (termed ajoene) that was found to be the most active component with anti-thrombotic activity. As an anti-clotting agent, ajoene is at least as potent as aspirin. The platelet aggregation inhibiting activity may be responsible for the potential utility of garlic as a useful protective agent in atherosclerosis, coronary thrombosis and stroke^[7].

In India, the bulb of this plant forms the major part of their delicacies or meal, because of its relative abundance and the concept that it lowers the risk of coronary heart diseases such as atherosclerosis and other ailments. The purpose of this study is to examine the possible hypolipidemic activity of the aqueous bulb extract of *Allium sativum* on normal and ethanol fed rats.

MATERIALS AND METHODS

Collection of the plant

The bulb of *Allium sativum* was obtained from local market, Namakkal, Tamilnadu. The extract was then dried and 4 g of it were dissolved in 40 ml of distilled water. After gentle heating the supernatant was decanted using syringe and needle.

Chemicals

All chemicals used were of analytical grade purchased from Loba Chemie pvt. Ltd, Mumbai, India

Animals

Albino rats of Wister strain weighing about 150-200gms were used in the study. Animals were obtained from Animal house, Bharathidasan University, Tamilnadu and kept under standard laboratory conditions in 12h light/dark cycles at 25-28°C and 60-80% relative humidity. Animals were reared with robust health by providing pellet diet (Lipton, India) and water *ad libitum*. Six rats were housed per cage, to provide them sufficient space and to avoid unnecessary morbidity and mortality. All studies were conducted in accordance with the National Institute of Health guide. The study was approved by the ethics committee CPCSEA and ethical norms were strictly followed during all experimental procedures.

Experimental design

Twenty four male Albino wistar strain Rats weighing 200-240g were divided into four groups of 6 rats each according to the schedule below

- Group I : The animals in this group were fed 3mls of 30% ethanol and 100mg/kg body weight of the extract intragastrically for two weeks
- Group II : The animals in this group were fed with 3mls of 30% ethanol and normal standard feed only for 2 weeks.
- Group III : The animals here were fed 100mg extract / kg body weight of rats and normal diet only for 2 weeks.
- Group IV : The animals were fed with the normal standard diet for 2 weeks.

All the rats were allowed water *ad libitum* for the entire period of the experiment. The total number of rats in each group stood at 6. The 24 rats were then fasted for 24 h before their blood samples were taken for analysis.

Biochemical analysis

The parameters analyzed were total-cholesterol triglycerides, LDL-cholesterol, HDL-cholesterol, glucose^[8] by glucose oxidase method as reported by Kaplan et al.^[9] albumin by the method as described by Silverman et al.^[10] and total protein^[11].

Statistical analysis

Results of the biochemical estimation are reported as Mean \pm S.D. Inter group comparisons were done using Duncan's Multiple Range Test (DMRT) with 95% confidence intervals. The SPSS package was used for analysis.

RESULTS

The lipid profile of the rats fed 3 ml of 30% ethanol and 100mg of extract/ kg body weight of rats for 2 weeks averaged; total cholesterol (2.18 \pm 0.31 mmol/L), Triglycerides (1.00 \pm 0.09mmol/L), LDL-cholesterol (0.23 \pm 0.07mmol/L) and HDL-cholesterol (0.86 \pm 1.9 mmol/L) while the corresponding values of the lipid levels in rats fed with 3 ml of 30% ethanol for the same period averaged thus; total cholesterol (2.91 \pm 0.17

mmol/L), Triglycerides (1.06 ± 0.06 mmol/L), LDL-cholesterol (0.62 ± 0.26 mmol/L) and HDL (0.86 ± 0.17 mmol/L). As such there was a non significant lowering of the lipid levels in experimental rats fed with the extract. When given only 100mg of extract/kg body weight of rats in addition to their normal feed, the lipids profile of the experimental rats stood at; cholesterol (2.91 ± 0.25 mmol/L), triglycerides (0.96 ± 0.01 mmol/L), LDL-cholesterol (0.85 ± 0.18 mmol/L) and HDL-cholesterol (1.01 ± 0.12 mmol/L).

The corresponding lipid profile in normal rats fed with the normal diet only averaged at cholesterol (3.15 ± 0.12 mmol/L), Triglycerides (1.36 ± 0.09 mmol/L), LDL-cholesterol (0.83 ± 0.08 mmol/L) and HDL-Cholesterol (1.36 ± 0.16 mmol/L). When the two groups were compared the extract was found to lower significantly the level of cholesterol and Triglycerides in the experimental rats while lowering effect on LDL cholesterol and HDL-cholesterol was non significant.

DISCUSSION

While the significant increase in the level of glucose

may be due to the administration of alcohol in the group, the level of albumin and total protein remain fairly constant. The results of this study thus show that the aqueous bulb extract of *Allium sativum* exhibit hypolipidaemic effect in both normal and ethanol fed rats. The mechanism involved could be attributed to the presence of saponins and fibre in the bulb extract. Balmer and Zilver Smith^[12] have shown that fibre significantly binds to cholesterol hence aiding its excretion. Also saponins have also been shown to possess high degree of hypolipidaemic activity. The combine activity of these active components of the extract brings about the reduction in plasma concentration of cholesterol and other lipids^[13]. Thus it is reducing the possible occurrence of coronary heart disease such as atherosclerosis.

Comparison was done between the groups and values with different superscript on the same vertical column are significantly different ($P < 0.05$). In conclusion the results of this study suggest that the administration of the aqueous bulb extract of *Allium sativum* may be effective in decreasing the hyperlipidemic effects of alcohol and high fat diets, thus reducing the possible occurrence of heart diseases.

TABLE 1 : Effects of aqueous bulb extract of *Allium sativum* on serum lipid levels and some biochemical parameters in normal and alcohol fed rats

Groups	Glucose (mmol/L)	Total protein (g/L)	Albumin (g/L)	Triglyceride (mmol/L)	Cholesterol (mmol/L)	LDL-Cholesterol (mmol/L)	HDL Cholesterol (mmol/L)
Group I	2.76 ± 0.47	68.66 ± 1.19	26.63 ± 0.52^a	1.00 ± 0.09	2.18 ± 0.31^a	0.23 ± 0.07^a	0.86 ± 0.17^a
Group II	4.40 ± 0.98^b	69.50 ± 3.56	29.33 ± 0.79^b	1.08 ± 0.06	2.91 ± 0.17^b	0.63 ± 0.26^b	1.15 ± 0.23^b
Group III	3.16 ± 0.28	67.83 ± 1.68	29.00 ± 0.56^b	0.98 ± 0.10	2.91 ± 0.25^b	0.85 ± 0.18^c	1.01 ± 0.12^b
Group IV	2.50 ± 0.27	64.66 ± 1.82	33.83 ± 0.52^b	1.36 ± 0.09^a	3.55 ± 0.12^c	0.83 ± 0.08^c	1.35 ± 0.16^c

Values are given as Mean \pm SD for groups of six animals each. Values not sharing a common superscript differ significantly at $P < 0.05$, Duncan's Multiple Range Test (DMRT)

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