

Aqueous extract of *Anethum graveolens* L. seeds decrease LDL-C:HDL-C ratio in over weight rats

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Abstract: Cardio vascular diseases are the most common cause of death in both eastern and western countries. Dyslipidemia and hypertension are included in cardiac risk assessment. Lipoprotein disorders in human may lead to coronary heart disease. The LDL-C/HDL-C ratio is more indicative of cardiovascular diseases than total cholesterol. High density lipoproteins have inverse relation with coronary heart disease. The present work illustrates, that five weeks oral administration of *Anethum graveolens* seeds aqueous extract has highly significant (0.01) reduction in body weight, TC (total Cholesterol), TG (Triglyceride), LDL-C (low-density lipoprotein), LDL-C/HDL-C ratio and increase in HDL-C (high-density lipoprotein) in over weight rats as compare to control rats.

Keywords: Aqueous extract of *Anethum graveolens* seeds (AEAG), Atherogenic index (AI), LDL-C/HDL-C ratio (low-density lipoprotein: high density lipoprotein).

Received: September 10, 2012 **Accepted:** December 21, 2012

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INTRODUCTION

Atherosclerosis is a disorder of lipid transport and metabolism, in this cholesterol by-product forms thick, tough deposit called plaque on the inner wall of the arteries, stiffening them and then starving the heart from blood, creating choke point where a clot can stop the flow entirely¹.

Dyslipidemia is another condition that arises as a result of abnormalities in the blood lipids profile. These abnormalities can be quantitative, qualitative or both. Quantitatively, dyslipidemia is characterized by elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG) and decrease in high-density lipoprotein cholesterol (HDL-C) levels. This profile is typically associated with the metabolic syndrome and type 2 diabetes mellitus. Linear relationship probably exists between lipid levels and cardiovascular risk. Dyslipidemia contributes to the development of atherosclerosis².

Now a days Information about the total cholesterol subtraction has become more important than simple total cholesterol level in blood. Decrease in HDL-C increase the risk for coronary heart disease³.

The LDL-C/HDL-C ratio provides valuable information regarding coronary heart disease risk and a better predictor for risk of heart disease than LDL-C alone⁴.

Over the last few years, many studies have focused on plants with therapeutic properties. *Anethum graveolens* L (Umbelliferae), known as dill. The major constituents of plants are tannins, terpenoids, cardiac glycosides and flavonoids⁵. Dill is widely used as a traditional medicinal plant to treat gastrointestinal disorders⁶, it decreases serum total cholesterol, LDL cholesterol,

triglycerides, serum glucose and increases HDL⁷. It is also used as an antibacterial agent⁹.

The aim of present research is to study the effect of AEAG lipid profile and LDL-C/HDL-C ratio in over weight rats.

MATERIALS AND METHODS

Preparation of extract

Anethum graveolens seeds purchased from local market. Identification was provided by experienced Botanist from the scientific institute Agriculture Department of Karachi University. The 50 gm seeds were crushed in blender. The powder of seeds was soaked in 200ml of water and left for 24 hour at 4°C. The mixture was filtered and the filtrate was stored until ready to use.

Experimental protocol

The experiment conducted on 24 Albino Wistar male rats whose weights were between 280-320 grams. All the rats were housed in separate cages, under 12 h light-dark cycle and control room temperature (23±2°C) with free access to food and normal tap water for one week, prior to starting the experiment so that rats could adopt themselves to new condition.

All experiments were conducted according to a protocol approved by Local Animal Care Committee. Rats were divided into two groups. The test group received aqueous extract of herb. The control group received normal water equivalent to that of aqueous extract of *Anethum graveolens* seeds. Rats were decapitated when 15-19% body weight reduction was observed in treated rats. Blood samples were obtained and preserved at -70°C for biochemical estimations. Biochemical estimations were performed by using standard kits on auto analyzer.

Statistical analysis

The significance differences between the mean of the treated and untreated groups were analyzed by student's *t*-test. $p < 0.05$ were considered as significant values. Data expressed in figures as mean \pm standard deviation (SD).

RESULTS

Five week oral administration of AEAG show Significant decrease ($p < 0.01$) TC, TG, LDL (Figure 1), LDL-C/HDL-C ratio (Figure 2), increase in HDL-C (Figure 1) and decrease in body weight (Figure 3) in treated rats as compare to control.

Atherogenic index (AI)

Accurate predictor of Cardio vesicular diseases (AI) can be defined in term of LDL-C/HDL-C ratio. The HDL/LDL ratio is the ratio of good cholesterol (HDL) to bad cholesterol (LDL).

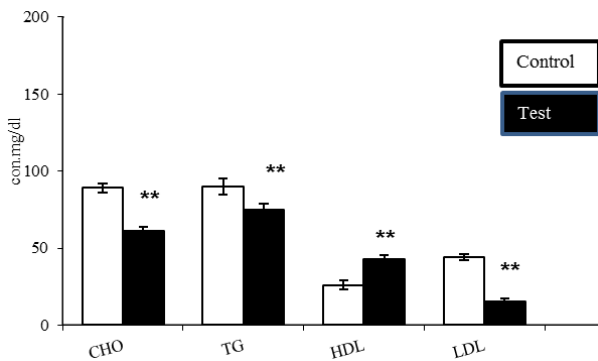


Figure 1: Effect of oral administration of AEAG on serum lipid profile in over weight rats. Values are mean \pm SD (n=12) significant difference by Student *t*-test** $p < 0.01$ from respective controls.

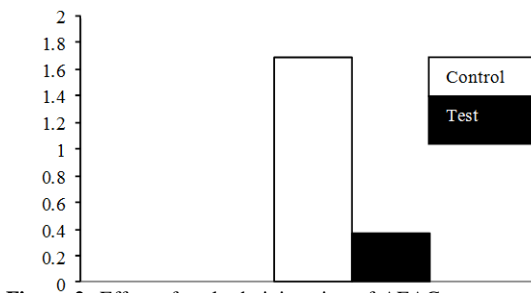


Figure 2: Effect of oral administration of AEAG on serum LDL-C/HDL-C ratio in over weight rats.

DISCUSSION

Numerous studies have provided the evidence that hyperlipidemia exerts direct effect on the myocardium in addition to the development of atherosclerosis¹⁰⁻¹¹. The commonly used lipid lowering drugs (fibrates, statins, bile acid sequestrants, etc.) regulate the lipid metabolism by different mechanisms, but also have many side effects in patient¹².

In this study administration of AEAG to overweight significantly decreases body weight, TC, TG, LDL, LDL-C / HDL-C and increases HDL-C in test animal. These results confirmed by javad k, et al.,¹³ who reported that *Anethum graveolens* reduces TG and total cholesterol in patient.

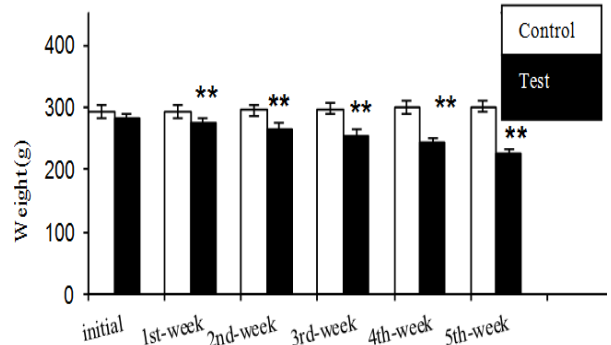


Figure 3: Effect of oral administration of AEAG on body weight in over weight rats. Values are mean \pm SD (n=12) significant difference by Student *t*-test** $p < 0.01$ from respective controls.

Several studies have shown hypolipidaemic and hypocholesterolemic activities of AEAG^{7, 14-15}. The possible mechanism of lowering cholesterol level is thought to be by depressing the hepatic activities of lipogenic and cholesterogenic enzymes such as malic enzymes, fatty acid synthase, glucose 6-phosphate dehydrogenase¹⁶⁻¹⁷ and HMGCoA (3-hydroxy-3-methyl glutaryl CoA) reductase¹⁸⁻¹⁹. Both LDL and HDL cholesterol levels are important factors in determining the risk for coronary artery disease. An increase in coronary artery disease is associated with increased LDL and decreased HDL cholesterol levels. Epidemiological study shows that HDL-C levels can potentially contribute to anti-atherogenesis, including inhibition of LDL-C oxidation to protect endothelial cells from cytotoxic effects of oxidized²⁰⁻²¹. LDL is a main portion of the total cholesterol and is directly related to coronary heart complication as a major atherogenic lipoprotein and hence, appears to be the main target of anyhypolipidemic drugs²². HDL-C is essential in the transport of cholesterol from cells and arteries to the liver where it is Catabolized and modulates inflammation. It is also considered to have anti-atherogenic properties, since there is an inverse relationship between HDL-C²³⁻²⁵.

Our study shown significant decrease in body weight of overweight rat's. It could be possibly related to inhibition of synthesis of lipid and increase the rate of lipolysis. Our present research shows that AEAG is capable to improve in dyslipidemia and decrease in LDL-C: HDL-C ratio in treated rats.

Several clinical trials have documented beneficial modification of LDL-C/HDL-C ratio after intake of

flavonoid containing food products²⁶. Improvement in lipid profile in our research might be possibly related to presence of phenolic compound specially flavonoids in *A. graveolens*²⁷⁻³⁰.

The AEAG decrease LDL-C/HDL-C ratio compared to the overweight rats. LDL-C/HDL-C ratio is thought to be a stronger index of atherogenicity of lipoproteins rather than the lipid profile of the individual lipoprotein fraction. Lower the ratio, the lesser the atherogenic lipoprotein profile³⁰. Therefore the decrease in the atherogenic index of the AEAG may suggest that it got beneficial effects on the cardiovascular systems³¹⁻³².

CONCLUSION

Balancing cholesterol subsets is an important avenue to modify overall cardiovascular risk. Atherogenic index (AI) to be a more accurate predictor of risk than LDL-C alone and currently is the most practical approach available. Increasing HDL and decreasing LDL has been shown to decrease this risk. Decrease in atherogenic index of the AEAG may suggest it has beneficial effects on the cardio system. AEAG could be use for decreasing AI ratio and as well as use for reduction in body weight.

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