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Effect of okra seed in reduction of cholesterol

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Abstract

The present study the effect of okra seed supplementation on serum lipid profile of hypercholesterolemia induced rat in Varanasi city at Banaras Hindu University Department of Zoology, Uttar Pradesh for a period of 42 days during year 2017. Okra seed (dry) were, grinded and administered at dose of 250grams and 500 grams as low dose and high dose. Administration of okra seed powder of 250 gm (low dose) and 500 grams (high dose) for 42 days produces significant ($P < 0.001$) reduction of serum LDL cholesterol and in body weight reduction in hyperlipidemia. The present study conform that okra seed powder is effective for lipid lowering.

Keywords: LDL, lipid, hyperlipidemia, hypercholesterolemia

Introduction

Lipid is the scientific term for the word “fat” in blood [1]. At proper levels, Lipids perform important functions in your body, but can cause health problems if they are present in excess [1]. Hyperlipidemia is a heterogeneous group disorder characterized by elevated lipid levels in blood stream than normal. There is an increased risk of atherogenesis and coronary artery disease with hyperlipidemia. Lipids do not dissolve in water. Being water insoluble, plasma lipids are transported in blood as several classes of lipoproteins [1].

Hyperlipidemia is a condition of elevated lipid level in blood. Hyperlipidemia is a major cause of atherosclerosis and atherosclerosis related conditions like coronary heart disease (CHD), ischemic cerebrovascular disease, peripheral vascular disease and pancreatitis-1-2 [2]. The increase in lipids like low density lipoproteins (LDL), cholesterol (esters derivatives) and triglycerides are mainly responsible for this condition [2].

A number of diseases are associated with non-optimal cholesterol levels [3]. Cholesterol is thought to amplify and accelerate atherosclerosis, and influence CHD and ischemic stroke events, but the exact mechanisms are unclear [3]. It has been proposed that cholesterol, particularly LDL cholesterol which accounts for about 60% of total cholesterol in the circulation, is taken up by macrophages [3]. When cholesterol levels are high, macrophages take up more cholesterol than they can metabolize and become “foam cells”. These cells are important in the early stages of athermanous plaque formation [3].

Low Density Lipoprotein (LDL) and High Density Lipoprotein (HDL) Cholesterol and triglycerides are the major lipids in the blood [4]. People with diabetes an impaired glucose tolerance (IGT) are at a risk of have in much LDL cholesterol in their blood, putting them at a high risk of developing heart disease and circulation problems [4]. Increase in levels of LDL-cholesterol and Triglycerides are usually treated with a combination of healthy eating and increasing physical activity. The doctor prescribes medication if high level persists [4]. The present study was conduct to check the effectivly of okra seed in reduction of LDL cholesterol.

Materials and Methods

Area of study

The present study was conducted in Varanasi city at Banaras Hindu University Department of Zoology, Uttar Pradesh. The study period is of 42 days in year 2017 (October – November).

Collection of raw materials

Dry okra seeds used was purchased from Local market of Lucknow City. The cleaning of okra seed was performed manually to remove damaged seeds, dust particles, seeds of other grains/crops and other impurities such as metals and weeds. The okra seed grains in the household mixer.

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Animals and experimental design

Animals and Maintenance: Male albino rats (180 – 200gm) were selected for the study. They were of the same age and weight. The rats were housed in polycarbonate clean cages under a 12 /12 h normal light/dark cycle. The animals were fed with standard diet and water *ad libitum*. After keeping in the laboratory condition for a week for acclimatization the experiment was initiated. The study protocol was approved by Institutional Ethical Committee, Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) Registration no. 1802/GO/ Re/S/15/CPCSEA of Faculty of Zoology, Banaras Hindu University, Varanasi.

Preparation of High fat Diet for Inducing Hypercholesterolemia

For the preparation of high fat diet 5 raw eggs were boiled and 30 grams of egg yolk was separated and mixed with 75gm of wheat flour. 30 gram of butter was added with the egg yolk and wheat flour mixture and water was added to the mixture to make pellets and dried in laboratory oven at 40 °C for overnight. The food prepared was kept in the refrigerator below 20 °C to prevent spoilage.

Induction of Hypercholesterolemia in Rats

The high fat diet prepared was given to the rats for the induction of cholesterol in rats. The high fat diet was distributed equally among test groups for a period of 30 days and the rats of each group were sacrificed at 31st day after overnight fasting for confirmation of hypercholesterolemia. Rats were sacrificed for confirmation of hypercholesterolemia. Further they were divided into following groups-

Group I: The rats were given normal diet and water *ad libitum*.

Group II: The rats were given high fat diet and water *ad libitum*.

Group III: There were 20 rats taken in this group. They were also fed with high cholesterol and fat rich diet and water *ad libitum*. The group was further divided into two subgroups (n=10) in each group as low okra seed group (given 250 mg of flaxseed/kg body weight/rat/day) and high flaxseed group (given 500 mg of flaxseed/kg body weight/rat/day) for a period of 42 days.

Biochemical analysis

Body weights were recorded biweekly and at the end of the stipulated period, the animals were kept for overnight fasting and sacrificed. The blood was collected from heart. About 2-3 ml of blood sample was collected and centrifuged at 2500 rpm for 25 minutes to separate serum. The serum was stored at - 20°C until the analysis. From the collected blood serum, the biochemical marker such as Low Density Lipoprotein (LDL) was determined by using ENZOPAK reagent kit [5].

Statistical analysis

Statistical analysis was done by SPSS Version 20. Results were expressed as Means±SD and the difference between the groups were tested by one-way analysis of variance (ANOVA) and the significance level was calculated. The $p < 0.001$ were considered as statistically very highly significant.

Results

Administration of high fat diet causes significant increase in blood LDL cholesterol level and body weight. However, after the treatment of hyperlipidemic rats with 250mg/kg b.w and 500mg/kg b.w of okra seed for 42 days, the blood LDL cholesterol level significantly decreases and body weight also reduced compared with the levels of untreated rats as shown in Table 1 & 2. Administration of okra seed results in the reduction of LDL cholesterol as well as body weight.

On 14th day after intervention, negative control group had significantly lower mean value as compared to all the other groups. The order of body weight at this interval was as follows:

Negative Control > High dose ~ Low Dose ~ Positive Control
On 28th day after intervention, all the between group differences were significant. The order of body weight at this interval was as follows:

Positive Control > Negative control > Low Dose > High dose
On between group comparison of LDL levels mean difference was found to be maximum between Positive controls and High dose and minimum between Negative control and high dose groups. All the between group differences except that between negative controls and high dose groups were significant statistically ($p < 0.001$). On the basis of above evaluation, the following order of blood LDL levels was observed:

Table 1: Comparisons of body weight in different groups for hypercholesterolemic.

Time Interval	Negative Control (N=10) (Mean±SD)	Positive Control (N=10) (Mean±SD)	Low dose (N=10) (Mean±SD)	High dose (N=10) (Mean±SD)	ANOVA	
					F value	P value
Before	184.1±5.1	282.8±6.5	289.8±7.1	287.4±5.3	719.1	0.967
At 14th Day	198.4±4.8	299.7±6.8	181.1±4.4	293.3±4.8	1380	<0.001
At 28th Day	212.9±5.0	319.0±4.3	224.2±17.4	296.9±4.1	315.1	<0.001
At 42nd Day	224.6±4.2	335.4±4.0	200.9±18.4	299.1±5.9	405.1	<0.001

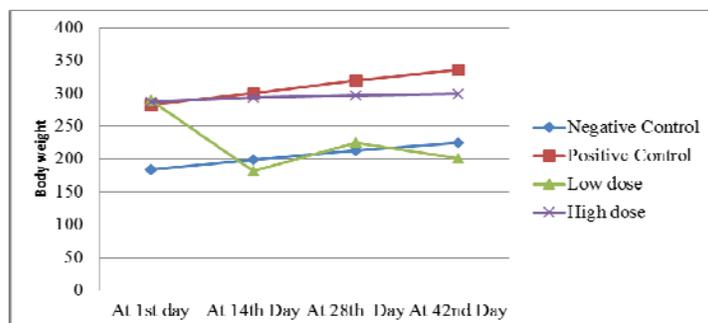


Fig 1: Comparisons of body weight in different groups for hypercholesterolemic.

Table 1 also showed comparison if intra group performance of studied subjects. Here, negative control (ranged 184.1±5.1 to 224.6±4.2), positive control (282.8±6.5 to 335.4±4.0) and high dose (287.4±5.3 to 299.1±5.9) group showed a similar

increasing performance whereas low dose (181.1±4.4 to 224.2±17.4) group showed different pattern as compared to other groups. However the difference among intra-groups found to be highly statistically significant. ($p < 0.001$)

Table 2: Effect of okra seed on hypercholesterolemic rat (LDL Cholesterol (mg/dl)).

Group	N	Mean	SD	SE	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Negative Control	10	122.8	4.2	1.3	119.8	125.7	116	128
Positive control	10	152.1	8.9	2.8	145.7	158.4	140	167
Low dose	10	140.2	7.8	2.4	134.6	145.7	128	149
High dose	10	122.8	2.8	0.89	120.7	124.8	119	128
Total	40	134.4	5.9	1.8	130.2	138.6	116	167

F value =49.6, P value =<0.001

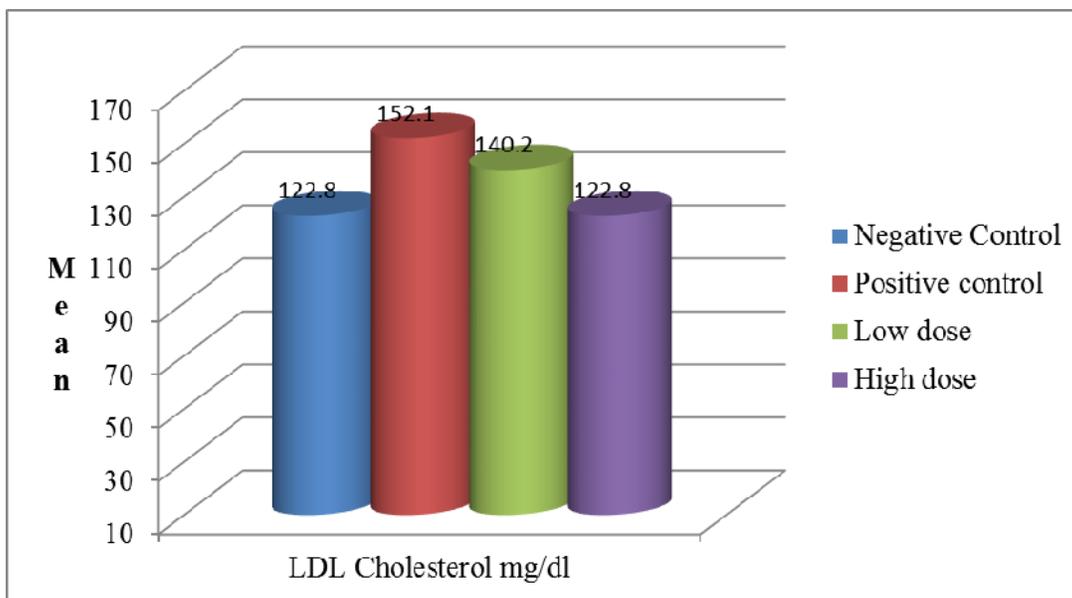


Fig 2: Effect of okra seed on hypercholesterolemic rat (LDL Cholesterol (mg/dl)).

Table 2 indicated that in hypercholesterolemic rat (LDL Cholesterol (mg/dl)) among groups ranged 122.8±2.8 mg/dl to 152.1±8.9 mg/dl. Mean LDL Cholesterol levels were minimum in High dose (122.8±2.8 mg/dl) followed by negative control (122.8±4.2 mg/dl), Low dose (140±7.8 mg/dl) and maximum in positive control (152.1±8.9 mg/dl). The difference among groups was found to be significant. ($p < 0.001$)

Discussion

The results obtained in this study reveal that feeding the rats with food supplemented with 250 and 500 mg of okra seed feed considerably lesser Percentage increase in average serum LDL and average body weight less when compared with the rats those fed with food supplemented. According to theoretical considerations K, Na, Mg and Ca are the principal elements in pods, which contain about 17% seeds; the presence of Fe, Zn, Mn and Ni also has been reported.^[6] Fresh pods are low in calories (20 per 100 g), practically no fat, high in fiber, and have several valuable nutrients, including about 30% of the recommended levels of vitamin C (16 to 29 mg), 10 to 20% of folate (46 to 88 g) and about 5% of vitamin A (14 to 20 RAE).^[7] Dried okra sauce (pods mixed with other ingredients and regularly consumed in West Africa) does not provide any beta carotene (vitamin A) or retinol.^[8] However, fresh okra pods are the most important vegetable source of viscous fiber, an important dietary component to lower

cholesterol^[9]. *A. esculentus* was found to have hypolipidemic activity in in vivo tested rat model^[10] and in mice^[11]. Okra polysaccharide lowers the cholesterol level in blood and may prevent cancer by its ability to bind bile acids^[12]. Tomoda et al^[13]. (1989) reported that okra polysaccharide possesses anticomplementary and hypoglycemic activity in normal mice. *A. esculentus* was found to have hypolipidemic activity in in vivo tested rat model^[14] and in mice. Okra polysaccharide lowers the cholesterol level in blood and may prevent cancer by its ability to bind bile acids^[15]. Cholesterol levels decreased 56.45%, 55.65%, 41.13%, 40.50% and 53.63% respectively in mice groups orally administered with dichloromethane okra plant extract, methanol okra plant extract, dichloromethane okra fruit extract, methanol okra fruit extract and simvastatin as compared to the tyloxapol injected group^[16].

Conclusion

The results obtained reveal that supplementation of *okra seed* significantly controlled the hyperlipidemic condition including the body weight reduction. Consumption off okra seed probably decrease the probability of cardiovascular disease as it decrease the LDL level. The results show that lipid profile of okra seed fed rats is comparable with normal diet fed rats. Results also indicate that okra seed is effective for LDL reduction. However further research work is to be carried out to come to final conclusion.

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