

## Hypolipidemic Effect Of Fenugreek And Garlic On Experimentally Induced Hyperlipidemia In Rabbits: A Randomized Control Trial

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**Abstract:** Background: Hyperlipidemia is very common in especially with the Indian diet context. So efforts are done time to time to find out the hypolipidemic ingredients in Indian diet itself, so with the use of those ingredients can neutralize the hyperlipidemia caused by a lot of fats used for cooking in India Objective: To assess and compare the hypolipidemic effect of Garlic and fenugreek. Method: A randomized control trial was conducted on hyperlipidemia induced rabbits in Department of Physiology, Dr S N Medical College, Jodhpur (Rajasthan) India. In all rabbits experimental hyperlipidemia was induced by feeding cholesterol 500mg/kg body weight. Then they were divided randomly into three groups v.i.z. Group (1) who was given grass hay diet, Group (2) and Group (3) who was given fenugreek extract and garlic extract as supplement respectively for four weeks. Mean changes of lipid profile from pre-intervention to post-intervention of each group were assessed and compared with Anova and Tukey-Kramer test. Result: It was observed that garlic as well as fenugreek group was having significant ( $P < 0.001$ ) hypolipidemia in comparison to control group. It was also seen that garlic has significantly more ( $P < 0.05$ ) hypolipidemic effect than fenugreek. Conclusion: Both garlic and fenugreeks have hypolipidemic effect. Garlic is having more hypolipidemic effect than fenugreek.

**Key words:** Fenugreek, Garlic, Lipid Profile, Hypolipidemia

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**Introduction:** Atherosclerosis remains the major cause of death and premature disability. Hyperlipidemia is the most firmly established and best understood risk factor for atherosclerosis<sup>1</sup>. Nowadays, major drugs used for treatment of hyperlipidemia have several adverse effects. Modern lipid lowering agents i.e. statins (atorvastatin, simvastatin, rosuvastatin etc.) are not only expensive but also have side effects like: hepatic dysfunction, renal insufficiency, hypothyroidism, advanced age and serious infections<sup>2</sup>. On the above they have limitations of the use in many conditions like pregnancy and lactations etc.<sup>3</sup>

Herbal medications such as garlic (*Allium sativa*), fenugreek, and guggular are in use as lipid lowering agents from very ancient times. Garlic contains a variety of organosulfur compounds, amino acids, vitamins and minerals<sup>4</sup>. Some of the sulfur compounds present in garlic such as allicin, ajoene, S-allylcysteine (SAC), diallyldisulfide (DADS), S-methylcysteinesulfoxide, and S-allylcysteinesulfoxide may be responsible for the therapeutic properties of garlic<sup>5</sup>. Fenugreek seeds are rich source of trigonelline, lysine and l-tryptophan and they also contain a large

amount of steroidal saponins and fibers. Steroidal saponins inhibit cholesterol synthesis and its absorption, while fiber may help lowering sugar levels<sup>6, 7</sup>. Studies have shown that fenugreek helped in lowering cholesterol and blood sugar levels in patients suffering from diabetes<sup>8-11</sup>. In the context of Indian diet it becomes much more difficult to avoid fat, so from the ingredients used in Indian kitchen lipid lowering ingredients can be found out to neutralize the hyperlipidemia caused by a lot of fats used for cooking in India. So the proposed study was intended to assess and compare the hypolipidemic effect of garlic and fenugreek.

**Material and Method:** A randomized control trial was conducted on hyperlipidemia induced rabbits in Department of Physiology, Dr S N Medical College, Jodhpur (Rajasthan) India after getting approved in the college research review board.

Stage I: Ninety rabbits of European rabbits (Order – lagomorpha, Family – laporidae, Genus – orictolagus, Species – cuniculus) weighing 1 Kg to 2 Kg of either sex were included in the study. Lipid profile\* of all rabbits was assessed before inducing hyperlipidemia.

Stage II: These rabbits were given cholesterol in doses of 500mg/kg body weight to induce experimental hyperlipidemia for 4 weeks to induce hyperlipidemia. After inducing hyperlipidemia lipid profile of all rabbits was again assessed (pre-intervention levels).

Stage III: Cholesterol diet was discontinued then these rabbits were divided randomly into three groups v.i.z. Group (1) who was given normal grass hay diet, Group (2) and Group (3) who were given fenugreek extract\*\* and garlic extract\*\*\* as normal diet supplement respectively for four weeks. After 4 weeks of this diet again lipid profile of each of rabbit from each of group was assessed i.e. stage III or Post interventional lipid profile. Pre-intervention lipid profile of each of rabbit was compared with its Post-intervention lipid profile.

**Statistical Analysis:** Change in mean level of lipid profile from stage I to stage II in each of three groups was assessed to find found level of hyperlipidemia. Change in mean level of lipid profile from pre-intervention to post-intervention in each of three groups was assessed to find out the effect of intervention. This Mean change of effect on lipid profile level of each group was compared with ANOVA and then it was further compared in various combinations with Post-hoc-Tukey-Kramer test.

\*Lipid Profile: It includes Serum Cholesterol, Serum Triglyceride, Serum Low Density Lipoprotein, (LDL), Serum Very Low Density Lipoprotein (VLDL) and Serum High Density Lipoprotein (HDL) level

\*\*Fenugreek extract preparation: 250 gms of fenugreek seed were grinded to make powder. This powder was dissolved in water in a dose of 500mg /kg body weight/day and this emulsion was pushed directly into the stomach of rabbit by infant feeding tube.

\*\*\*Garlic extracts preparation: 200gms of garlic cloves were crushed in a grinder and kept

overnight at room temperature in a beaker containing distilled water to obtain garlic emulsion. This emulsion was filtered through muslin cloth and then filtrate is evaporated in desiccators to get final extract of garlic. About 100 ml garlic extract was prepared in this way (since 1ml of garlic extract is drawn from 2gm of garlic). 2ml of garlic extract was given daily.

**Result:** In the present study significantly higher levels of Serum Cholesterol, Triglyceride, HDL, LDL and VLDL levels were induced with cholesterol diet given to all the 90 rabbits included in study.

In 1st stage of this study after receiving cholesterol diet mean Serum Cholesterol, Triglyceride, HDL, LDL and VLDL levels were significantly ( $P < 0.001$ ) raised in rabbits.

After giving Grass to group (1), Fenugreek to group (2) and garlic to group (3) rabbits i.e. 30 in each group, it was observed in the present study that difference in mean change from pre-intervention level to post-intervention level of Serum Cholesterol in all the three groups i.e. control group, Fenugreek group and Garlic group were having highly significant ( $P < 0.001$ ) variation.

Likewise, when the difference in mean serum Triglyceride, HDL, LDL and VLDL levels in all the three groups i.e. control group (Gp 1), Fenugreek group (Gp 2) and Garlic group (Gp 3) were observed in the present study, it was also found with highly significant ( $P < 0.001$ ) variation in serum Triglyceride, HDL, LDL and VLDL levels.

It was also observed in this study that fenugreek significantly ( $P < 0.05$ ) lowered Serum Cholesterol, Triglyceride and LDL levels than the control group. But fenugreek significantly ( $P < 0.05$ ) raised the HDL level. In case of VLDL this change was not significant ( $P > 0.05$ )

It was also observed in this study that garlic significantly ( $P < 0.05$ ) lowered Serum Cholesterol, Triglyceride, LDL and VLDL levels than the control group. But fenugreek significantly ( $P < 0.05$ ) raised the HDL level.

It was also observed in this study that mean change in Serum Cholesterol, Triglyceride, LDL and VLDL levels were significantly more with

garlic than fenugreek. Likewise mean change in Serum HDL levels was significantly less with garlic than fenugreek.

**Table 1: Mean change in total lipid profile of animals before and after intervention**

Lipid Profile Variables	Group 1 (n=30) (Control Gp)	Group 2 (n=30) (Fenugreek Gp)	Group 3 (n=30) (Garlic Gp)	ANOVA	P Value LS
Cholesterol(gm/dl)	204.±10.8	289.19±22.78	337.15±31.55	125.48	<0.001 HS
Triglyceride(mg/dl)	34±9.1	53.42±10.45	148.4±23.56	225.73	<0.001 HS
HDL(mg/dl)	5.07±1.08	-8.84±3.21	-16±2.15	320.96	<0.001 HS
LDL(mg/dl)	191.85±12.1	287.3±33.28	323.16±42.15	68.4	<0.001 HS
VLDL(mg/dl)	7.42±1.17	10.7±2.07	30.2±8.67	84.44	<0.001 HS

@Mean Change = Mean of (Pre-interventional level - Post-interventional level)

**Table 2 : Significance In Difference In @Mean Change Of Total Lipid Profile In Various Groups Of Animals**

Lipid Profile Variables	Gp 1 V/s Gp 2 (grass hay/fenugreek)	Gp 1 V/s Gp 3 (grass hay/garlic)	Gp 2 V/s Gp 3 (fenugreek/garlic)
Cholesterol(gm/dl)	P<0.05 S	P<0.05 S	P<0.05 S
Triglyceride(mg/dl)	P<0.05 S	P<0.05 S	P<0.05 S
HDL(mg/dl)	P<0.05 S	P<0.05 S	P<0.05 S
LDL(mg/dl)	P<0.05 S	P<0.05 S	P<0.05 S
VLDL(mg/dl)	P>0.05 NS	P<0.05 S	P<0.05 S

\* through Tukey Test of significance for multiple comparison  
 @Mean Change = Mean of (Pre-interventional level - Post-interventional level)

Stevenson C. et al.<sup>12</sup> investigated the effect of garlic on total cholesterol level in persons who had hypercholesterolemia. They reported that garlic can reduce total cholesterol levels. RahmanK.<sup>13</sup> reviewed historical perspective of garlic on cardiovascular diseases, who reported that garlic extract (kyolic) had hypolipidemic effect in reducing serum cholesterol and triglycerides in hyper-lipidemic patients. In a randomized, double-blind and placebo – controlled study Yu-Yan Yeh and Lijuan Liu<sup>14</sup> showed that aged garlic extract (AGE) supplementation was effective in lowering plasma concentration of total cholesterol by 7% in individuals with hypercholesterolemia. Banerjee K. S. et al<sup>15</sup> also reviewed the effect of garlic on cardiovascular disorders and found that garlic consumers had lowered the total cholesterol and LDL. Javedkojuriet al<sup>16</sup> also observed that garlic administration in hyperlipidemic patients can significantly decrease the total cholesterol and LDL.

Furthermore in present study it was also revealed that fenugreek also has hypolipidemic effect. This observation was also well supported with findings of other authors.<sup>17-20</sup>

AbuSaleh M<sup>17</sup> reported that administration of fenugreek seed of 25gm orally twice daily for three weeks and six weeks produces significant reduction (P<.001) of total serum cholesterol triglyceride and LDL cholesterol in hypercholesterolemia group. Annida B et al<sup>18</sup> observed the effect of supplementation of fenugreek leaves in streptozocin induced diabetic rats who had elevated blood glucose and serum and tissue lipids. They observed that ingestion of fenugreeks leaves significantly lowered the blood glucose and serum and tissue lipids.

PunnaRamaluet al<sup>19</sup> also reported the hypolipidemic effect of a soluble dietary fiber isolated from fenugreek seeds. In addition to this present study also revealed that garlic had

significantly more hypolipidemic effect than fenugreek.

**Conclusion:** Garlic and fenugreek both have hypolipidemic effect and able to reduce Serum Cholesterol, Triglyceride, LDL and VLDL and able to raise HDL. Hypolipidemic effect of garlic is better than fenugreek.

**References:**

1. Libby P. Prevention and treatment of atherosclerosis. In: *Harrison's principles of internal medicine*. McGraw Hill. 2005:1430.
2. Stancu C, Sima A. Statin: mechanism of action and effects. "Nicolae Simionescu" Institute of Cellular Biology and Pathology, Bucharest, Romania, 2001.
3. James H. Atrovastatin reduces remnant lipoproteins and small, dense low-density lipoproteins regardless of the baseline lipid pattern. *PrevCardiol* 2004; 7: 154-60
4. Block E: The chemistry of garlic and onion. *Sci Am* 1985; 252:114-119.
5. ChiMS: Effects of garlic products on lipid metabolism in cholesterol-fed rats. *Proc Soc Exp Biol Med* 1982; 171:174-17..
6. Sharma RDA n evaluation of hypocholesterolaemic factor of fenugreek (*T.foenumgraecum*) in rats. *Nutr Rep Int* 1986;33:669-77.
7. Sauvaire Y, Ribes G, Baccou JC, Loubatieres-Mariani MM. Implication of steroid saponins and saponinins in the hypocholesterolemic effect of fenugreek. *Lipids* 1991;26:191-197.
8. Bordia A, Verma SK, Srivastava KC. Effect of ginger (*Zingiber officinale* Rosc) and fenugreek (*Trigonella foenumgraecum*) on blood lipids, blood sugar, and platelet aggregation in patients with coronary artery disease. *Prostaglandin and Leukotrienes. Essential Fatty Acids* 1997;56:379-384.
9. Sharma RD, Raghuram TC, Rao NS. Effect of fenugreek seeds on blood glucose and serum

lipids in type I diabetes. *Eur J Clin Nutr* 1990;44:301-306.

10. Raghuram TC et al. Effect of fenugreek seeds on intravenous glucose disposition in non-insulin dependent diabetic patients. *Phytother Res* 1994;8:83-86.
11. Sharma RD et al. Hypolipidemic effect of fenugreek seeds: A chronic study in non-insulin dependent diabetic patients. *Phytother Res* 1996;10:332-334
12. Stevinson C, Pittler MH and Ernst E .Garlic for treating hypercholesterolemia. A meta-analysis of randomized clinical trials. *Ann Intern Med*; 133: 420-429.
13. Rahman K. Historical Perspective on garlic and cardiovascular disease. *J Nutr* 2001; 131: 9775-9795.
14. Yu-Yan Yeh and Lijuan Liu. Cholesterol-Lowering Effect of Garlic Extracts and Organosulfur Compounds: Human and Animal Studies. *J of Nutrition*. 2001; 131:989s-993s.
15. Banerjee KS and Maulik SK. Effect of garlic on cardiovascular disorders: a review. *Nutr J*. 2002 Nov 19;1:4.
16. Javad Kojuri, Amir R Vosoughi and Majid Akrami. *Pharmacological Research* 1999; Volume 39, issue 2: 157-58.
17. Abu Saleh M. Moosa, Mammu Ur Rashid, et al. Hypolipidemic effects of fenugreek seed powder in hypercholesterolemic type 2 diabetic patients. *Bangladesh J Pharmacol* 2006; 1:64-67.
18. Annida B et al. Supplementation of fenugreek leaves lower lipid profile in streptozotocin-induced diabetic rats. *J Med Food* 2004; Summer 7(2):153-6
19. Punna Ramulu et al. Hypolipidemic effect of soluble dietary fiber (galactomannan) isolated from fenugreek seeds in WNIN (GR-Ob) obese rats. *Journal of Medicinal Plants Research* 2011; Vol. 5(19): 4804-4813.

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