

## Research Article

# Comparative Evaluation of Polyherbal Combination for Hypolipidemic Activity

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### ABSTRACT

Hyperlipidemia is defined as increase in the lipid content (group of fat or fat like substances along with their lipoprotein counterpart) in blood. The present study was undertaken to explore the antihyperlipidemic effect of ethanolic extract from Fenugreek and *Gymnema sylvestre* and hydro-alcoholic extract from *Curcuma longa* in cholesterol diet induced hyperlipidemia in rats. Oral administration of various extracts once in a day for two weeks significantly lowered the total cholesterol phospholipid, triglycerides, low density lipoproteins and increase the high density lipoprotein level. Present investigation shows that Curcumin caused more significant decrease in the total cholesterol level (1.36 %), serum level of triglyceride (1.32 %), and serum level of LDL (1.39 %) as compared to other groups in cholesterol diet induced hyperlipidemia and atherosclerosis. The study exhibited that elevated blood cholesterol; triglycerides, LDL, and decrease HDL which occur in Hyperlipidemia were significantly reduced by the administration of combination of Curcumin, *Gymnema sylvestre* and *Fenugreek*.

**Key words:** Atherosclerosis, hyperlipidemia, *Gymnema sylvestre*,

### INTRODUCTION

Hyperlipidemia is a highly predictive risk factor for atherosclerosis, coronary artery disease, and cerebral vascular diseases.<sup>[1]</sup> Atherosclerosis of arteries is a generalized disease of the arterial network known as progressive and silent killer disease characterized by the formation of lesions called atherosclerosis plaques in the walls of large and or medium sized coronary arteries and which reduces blood flow to the myocardium-called coronary artery disease.<sup>[2]</sup> Clinical trials showed conclusively that lowering serum cholesterol reduces morbidity and mortality from coronary artery disease in patients with established coronary artery disease and also reduces new coronary artery disease events and mortality in patients without established coronary artery disease.<sup>[3]</sup> Condiments, medicinal plants, fruits used in day-to-day preparation of food in Indian kitchens have been identified as hypolipidemic in ayurveda.<sup>[4]</sup>

*Curcuma longa*, a perennial herb, is a member of the *Zingiberaceae* (ginger) family. The plant grows to a height of three to five feet, and is cultivated extensively in Asia, India, China, and other countries with a tropical climate. It has oblong, pointed leaves and bears funnel-shaped yellow flowers. Extensive scientific research on curcuma have demonstrated a wide spectrum of therapeutic effects such as anti-inflammatory, antibacterial, antiviral, antifungal, and antitumor.<sup>[5-9]</sup>

*Gymnema sylvestre*, a herb belonging to family *Asclepiadaceae*, commonly known as Gurmar is a large woody, much branched climber with pubescent young parts in dry forest up to 600m height.<sup>[10]</sup> *Gymnema sylvestre* leaf has been widely used in Ayurvedic traditional medicine and is bitter, acrid, thermogenic, anti-inflammatory, anodyne, digestive and liver tonic.<sup>[11]</sup>

The plant *Trigonella foenum-graecum* belongs to family *leguminoceae*; commonly it is known as methi. It is cultivated in central and south Eastern Europe, Western Asia, India and Northern Africa. The plant is an erect, strongly aromatic, annual herb reaching 60 cm high. The leaves are small and yellowish white, born singly or in pairs in leaf axils. The plant traditionally shows antihyperglycemic, immunomodulatory and hypocholesterolaemic.<sup>[12]</sup>

### MATERIALS AND METHODS

#### Procurement and identification of plant material

For the present study suitable parts of different plants material were collected from the local market of Jhansi, and they were authenticated from N.B.R.I Lucknow.

#### Preparation of extracts

**Preparation of Fenugreek extract:** Powdered Fenugreek seeds were extracted for 10 h with hexane to remove lipids and were spread out for drying for 5 days at room temperature. The seeds were again extracted with ethyl alcohol for 24 h to remove saponins and again dried for 5 days. The remaining residue of the 5<sup>th</sup> day was used for the further study.<sup>[13]</sup>

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**Preparation of *Gymnema sylvestre* extract:** Dried powdered leaves were extracted with aqueous ethanol (50 % v/v) in soxhlet apparatus and precipitated with HCL. The precipitate was purified by recrystallisation from aqueous ethanol and kept at 4°C until used. [14]

**Preparation of *Curcuma longa* hydroalcoholic extract:** The rhizomes of *Curcuma longa* were powdered and macerated with hot water (80°C) for 4 h and the aqueous extract was evaporated under vacuum at 60°C for 2 h, filtered and evaporated under vacuum. The final extract was a 1:1 mixture of both the aqueous extract and the alcoholic extract re-dissolved with water and alcohol, respectively. [15]

**Animals**

Wister albino rats of about (180-200 g, purchased from DRDE, Gwalior) of either sex were used for the investigation. The animals were housed in control room under standard environmental conditions of temperature (25±2°C) humidity (55±10 %) and light (12:12 h light/dark cycle).

**Screening for hypolipidemic activity**

For the present investigation cholesterol diet induced hyperlipidemia animal model was used.

Animals were known to be susceptible to hypercholesterolemia after excessive cholesterol feeding. This approach is widely applicable to study the effects of potential hypolipidemic drugs. [15] Animals were divided according to the diets which were given to them for the induction purpose.

(A) Normal pellet diet group received normal pellet.

(B) High fat diet group contain pellets which contain 68 % powdered pellet, 30% dalda and 2 % extra pure cholesterol for 2 weeks.

**Experimental protocol**

The experimental protocol was divided in to two parts.

**A.** Experiment design to observe the hypolipidemic and hypocholesterolimic effects of Gurmar (G) extract, Curcumin (C) and fenugreek seed (F.S.) extract in albino rats.

Animals were divided in to six groups, each group consisting of six animals. Animals in group I received normal pellet diet whereas group II, III, IV, V, VI were given a high fat diet containing 68% powdered pellet, 30 % dalda and 2 % extra pure cholesterol for two weeks.

Group-I: Control (Normal pellet diet) without any drug treatment

Group-II: High Fat Diet (HFD) Control given without any drug treatment

Group-III: (HFD + standard lipid lowering agent Clofibrate at dose of 100mg/kg once daily) for two weeks.

Group-IV: HFD + Gurmar extract (GE) Gurmar extract at the dose of 25 mg/kg body weight once in a day for two weeks.

Group-V: HFD + Curcumin (C) Curcumin at the dose of 100 mg/kg body weight once in a day for two weeks.

Group-VI: HFD +Fenugreek seed (F.S.) Fenugreek at the dose of 41.6 mg/kg body weight once in a day for two weeks.

The entire drug sample was prepared by using 2% gum acacia suspension change in body weight of animal recorded weekly. After 2 weeks of experiment, twenty four hour after the last gavage, the animals were anesthetized with ether and 1.2 ml of blood was collected using heparinised micro capillaries by retro orbital puncture. The blood was centrifuged for 2 min and then was placed in an incubator,

after some time the serum was separated and used for the assessment of total cholesterol (T.C.), triglycerides (T.G.), low density lipoprotein (LDL), and high density lipoprotein (HDL).

**B.** Experiment design to observe the hypolipidemic and hypocholesterolimic effects of different combination of herbal drugs (Gurmar (G), Curcumin C), Fenugreek (F.S.) in albino rats. Animals were divided in to seven groups, each group consisting of six animals. Animals in group I received normal pellet diet whereas group II, III, IV, V, VI, were given a high fat diet containing 68% powdered pellet,30% dalda and 2% extra pure cholesterol for two weeks.

Group I: Control (Normal pellet diet, without any drug treatment).

Group II: High fat diet (HFD) control (HFD given without any drug treatment)

Group II: HFD + Standard lipid lowering agent Clofibrate at a dose of 100mg/kg body weight once daily for 2 weeks.

Group IV: HFD + Gurmar(G) + Fenugreek (F.S.) Gurmar 25mg/kg body weight once daily, Fenugreek 41.6 mg/kg body weight once daily.

Group V: HFD + Fenugreek seed + Curcumin. Fenugreek at a dose of 41.6 mg/kg body weight once daily and Curcumin at the dose of 100 mg/kg body weight once daily

Group VI: HFD + Curcumin + Gurmar. Curcumin at the dose of 100 mg/kg body weight once daily and Gurmar 25 mg/kg body weight once daily.

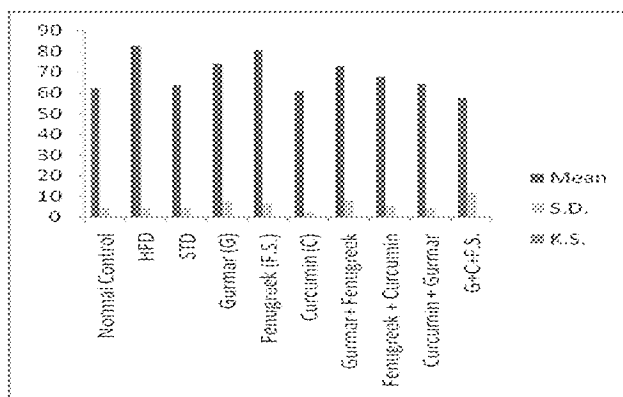
Group VII: HFD + Gurmar + Curcumin + Fenugreek seed. Gurmar 25 mg/kg body weight once daily, Curcumin at the dose of 100 mg/kg body weight once daily and Fenugreek at a dose of 41.6 mg/kg body weight once daily

All the drug samples were prepared by using 2 % gum acacia suspension. Change in the body weight of animals recorded weekly.

**Table1: Changes of total cholesterol in various groups by different drugs (Individual+ combined)**

GROUPS	MEAN	S.D.	K.S.	REMARKS
Normal Control	62.25	4.33	0.15	Yes
HFD	82.39	4.00	0.17	Yes
STD	63.73	4.43	0.20	Yes
Gurmar	73.96	7.35	0.22	Yes
Fenugreek	80.48	6.23	0.26	Yes
Curcumin	60.57	2.46	0.32	No
Gurmar+Fenugreek	72.80	7.727	0.24	Yes
Fenugreek+Curcumin	67.8	4.97	0.16	Yes
Curcumin+Gurmar	64.2	4.65	0.21	Yes
G+C+FS	57.4	11.55	0.18	Yes

P. value < 0.10

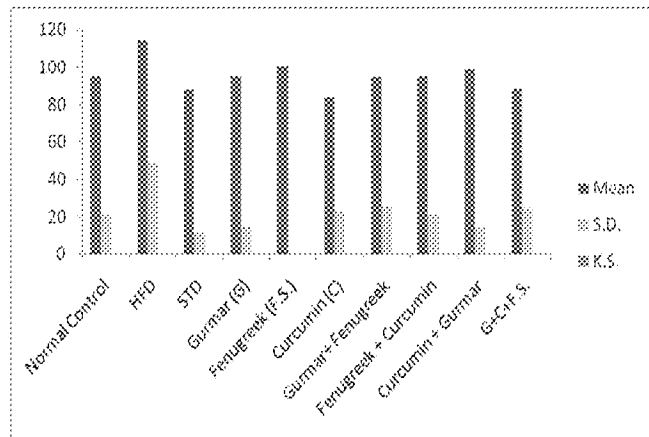


**Fig. 1: Significant changes in total cholesterol in various groups by different drugs (Individual + Combined)**

**Table 2: Significant changes of triglycerides in various groups by different drugs (Individual+ combined)**

GROUPS	MEAN	S.D.	K.S.	REMARKS
Normal Control	95.34	20.868	0.1887	Yes
HFD	114.17	48.864	0.353	Yes
STD	87.76	11.119	0.384	Yes
Gurmar	95.39	14.396	0.228	Yes
Fenugreek	100.18	15.946	0.228	Yes
Curcumin	83.596	22.685	0.273	Yes
Gurmar+Fenugreek	94.8	7.727	0.319	Yes
Fenugreek+Curcumin	95.2	4.97	0.160	Yes
Curcumin+Gurmar	98.6	4.65	0.282	Yes
G+C+FS	88.6	11.55	0.210	Yes

P.value < 0.10

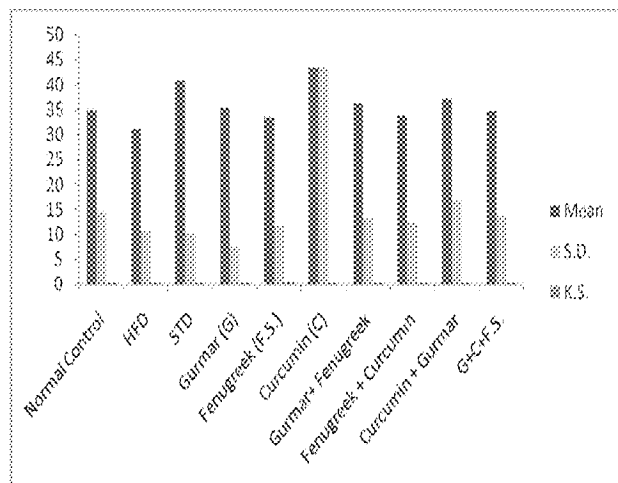


**Fig. 2: Significant changes in triglyceride in various groups by different drugs (Individual + Combined)**

**Table3: Significant changes in HDL in various groups by different drugs (Individual+ combined)**

GROUPS	MEAN	S.D.	K.S.	REMARKS
Normal Control	34.95	14.42	0.243	Yes
HFD	31.04	10.46	0.234	Yes
STD	40.78	10.10	0.312	Yes
Gurmar	35.28	7.348	0.295	Yes
Fenugreek	33.36	11.68	0.329	Yes
Curcumin	43.28	43.28	0.247	Yes
Gurmar+Fenugreek	36.20	13.21	0.28	Yes
Fenugreek+Curcumin	33.80	12.33	0.29	Yes
Curcumin+Gurmar	37.00	16.64	0.28	Yes
G+C+FS	34.60	13.68	0.23	Yes

P.value < 0.10

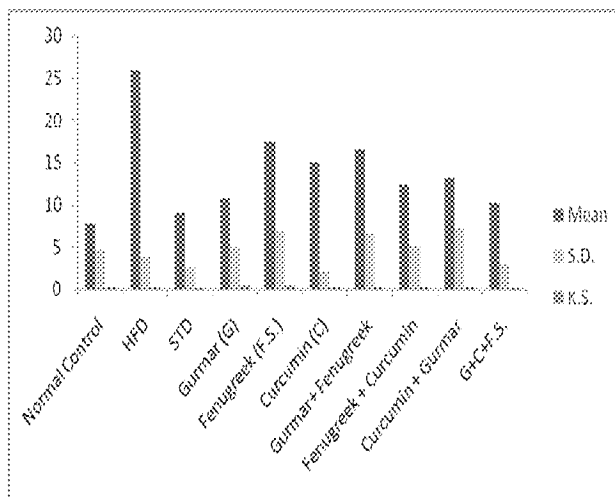


**Fig. 3: Significant changes in HDL in various groups by different drugs (Individual + Combined)**

**Table 4: Significant changes in LDL in various groups by different drugs (Individual+ combined)**

GROUPS	MEAN	S.D.	K.S.	REMARKS
Normal Control	7.77	4.6	0.284	Yes
HFD	25.9	3.7	0.199	Yes
STD	9.010	2.6	0.154	Yes
Gurmar	10.74	4.9	0.407	Yes
Fenugreek	17.46	6.9	0.330	Yes
Curcumin	15	2.1	0.208	Yes
Gurmar+Fenugreek	16.6	6.58	0.29	Yes
Fenugreek+Curcumin	12.4	5.12	0.28	Yes
Curcumin+Gurmar	13.2	7.29	0.26	Yes
G+C+FS	10.2	3.033	0.14	Yes

P.value < 0.10



**Fig. 4: Significant changes in LDL in various groups by different drugs (Individual + Combined)**

**RESULTS:**

After the administration of different herbal drug extract (individual and in combination), significant changes in total cholesterol level, high density lipoprotein, triglycerides and low density lipoprotein have been monitored.

The significant decrease in total cholesterol values can be given in the following order (Table-1 and Fig. 1). Curcumin > Gurmar > Fenugreek 1.36% > 1.125% > 1.02%. Gurmar + Curcumin + fenugreek seed > Gurmar + Curcumin > Fenugreek seed + Curcumin > Gurmar + fenugreek seed. 1.40% > 1.25% > 1.18% > 1.11%.

The significant decrease in total triglyceride values can be given in the following order (Table-2 and Fig. 2). Curcumin > STD (Clofibrate) > Gurmar > Fenugreek. 1.36% > 1.30% > 1.19% > 1.13%. STD (Clofibrate) > Gurmar + Curcumin + Fenugreek > Gurmar + fenugreek > Curcumin + Fenugreek > Curcumin + Gurmar. 1.3% > 1.29% > 1.2% > 1.19% > 1.15%.

The changes in HDL values can be given in the following order (Table-3 and Figure-3). STD (Clofibrate) > Curcumin + Gurmar > Gurmar + Fenugreek > Gurmar + Curcumin + Fenugreek.

The changes in LDL values can be given in the following order (Table-4 and Figure-4). Gurmar+Fenugreek>STD(Clofibrate)>Gurmar+Curcumin+fenugreekseed>Gurmar>Fenugreekseed+Curcumin>Curcumin >Fenugreek seed.

Present investigation shows that Curcumin caused more significant decrease in the total cholesterol level (1.36 %), serum level of triglyceride (1.32 %), and serum level of LDL (1.39 %) as compared to other groups in cholesterol diet induced hyperlipidemia and atherosclerosis. The study exhibited that elevated blood cholesterol; triglycerides, LDL, and decrease HDL which occur in Hyperlipidemia were significantly reduced by the administration of combination of Curcumin, Gurmar and Fenugreek.

#### DISCUSSION

The present study was undertaken in order to evaluate the antihyperlipidemic activity of *Curcuma longa*, Fenugreek seed, and *Gymnema sylvestre*. The study revealed that the elevated blood cholesterol, triglycerides, LDL and decreased HDL which usually occurs in hyperlipidemia was significantly reduced by the administration of different herbal extract in different combinations. These finding provides some biochemical basis for the use of herbal extract in the management of patient with hyperlipidemia. This also helps to place the above mentioned herbal drugs among the list of anti hyperlipidemic agents and also having potential to be popularized as household remedy with preventive and curative effects against hyperlipidemia and its consequences.

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