Hypocholesterolemic Effect of the Hypoglycaemic Principle of Fenugreek (Trigonella Foenum Graecum) seeds

D. Puri, K.M. Prabhu AND P.S. Murthy
University College of Medical Science, Delhi - 110 095

ABSTRACT

A potent hypoglycaemic principle was isolated by us earlier from the seeds of fenugreek. We have now investigated its hypocholesterolemic effect. Hypercholesterolemia was induced in two groups of rabbits (5 each) by feeding orally cholesterol 100 mg/kg/day for one week. From 8th day group I animals (controls) received the same dose of cholesterol for 4 more weeks. Group II animals (treated) were given along with the same dose of cholesterol fenugreek principle at 50 mg/kg/day for 4 weeks. Fenugreek principle not only prevented the elevation of serum cholesterol, (LDL+VLDL)c, triacylglycerols and the ratios of total cholesterol/HDLc and (LDL+VLDL)c/HDLc, but also brought down most of these values. Blood glucose levels were normal. The study shows that the same hypoglycaemic principle has hypocholesterolemic effect also.

KEY WORDS : hypocholesterolemic principle, trigonella foenum graecum, fenugreek seeds, hypoglycaemic principle.

INTRODUCTION

In the Indian medicinal system, Ayurveda, many plants have been routinely used for the treatment of diabetes mellitus and heart diseases (1). Many such plants, their extracts and active principles were tested for their hypoglycaemic and hypolipidaemic activities in experimental animals by various investigators (2-7).

In our laboratory a highly potent hypoglycaemic principle was isolated from fenugreek seeds and purified to a homogenous state by us earlier. It was found to be different from trigonelline and nicotinic acid (7). The same experiments also pointed out that in alloxan induced (8) severely diabetic rabbits it also brought down serum cholesterol level and improved lipid profile. In this study we have shown that the same hypoglycaemic principle has hypocholesterolemic effect also.

MATERIALS AND METHODS

Chemicals

Cholesterol was purchased from Loba Chemie Indoaustral Co. Bombay and the kits for all the parameters of lipid profile were from Orthodiagnostics, Bombay.

Animals

Rabbits were purchased from M/s. All India Chemical and Scientific Company and acclimatized to laboratory conditions with Hindustan Lever rabbit food for 15 days.

Induction of hypercholesterolemia in rabbits

The method of Ratnakar and Murthy (9) was followed for inducing hypercholesterolemia because it ensured that every animal got the same dose of cholesterol. Cholesterol was suspended in groundnut oil. Volume corresponding to 100mg/kg/day was fed by gastric intubation using Ryle tube (No. 5)

Isolation of active principle

(TThe active principle was isolated on a large scale by the method of Moorrthy Radha et al (7).

Assessment of hypocholesterolemic effect

Both the groups were given single dose of cholesterol 100mg/kg/day, initially for one week to induce hypercholesterolemia partly. From 8th day and onwards group I animals, which served as controls, received the same dose of cholesterol upto five weeks, whereas group II animals, which served as fenugreek treated animals, were given the same dose of cholesterol alongwith the purified fenugreek principle (at a single dose of 50mg/kg/day) from 8th day upto 5 weeks. The animals were given food and water ad libitum. Blood samples from both the groups were drawn every week for analysis of serum cholesterol, HDL, LDL and VLDL cholesterol and triacylglycerols.

Estimation of various parameters of lipid profile

Cholesterol, HDL, LDL plus VLDL cholesterol and triacylglycerols were estimated using kits from Odrthodiagnostics.

RESULTS AND DISCUSSION

Since the aim of the present study was to assess the possible hypocholesterolemic effect of the hypoglycaemic compound isolated by us earlier from fenugreek seeds,

Address for corespondence
P.S. Murthy
Department of Biochemistry
University College of Medical Sciences & GTB Hospital
Shahdara, Delhi - 110095

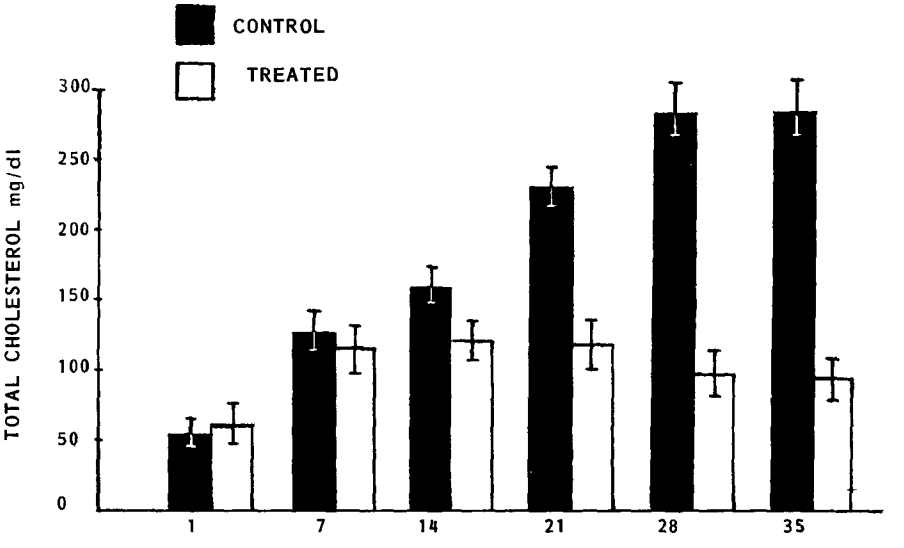

FIG 1 EFFECT OF THE PRINCIPLE ON TOTAL CHOLESTEROL LEVELS

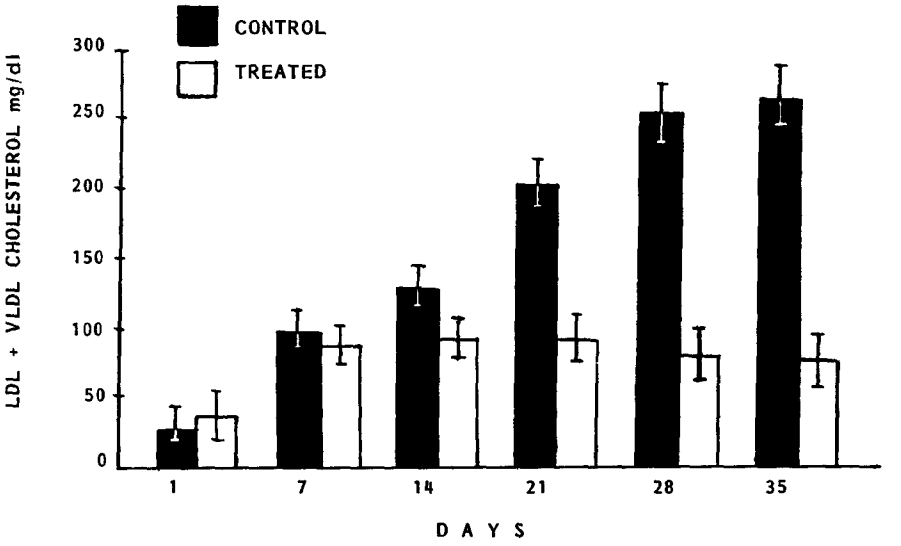

FIG 2 EFFECT OF THE PRINCIPLE ON LDL+VLDL CHOLESTEROL LEVELS

Hypercholesterolemia was first induced in rabbits of both group I and II by feeding cholesterol (100mg/kg/day) orally. In the conventional way of testing, cholesterol would be withdrawn in both the groups and the drug would be given to the test group. However, this method suffers from the disadvantage that the cholesterol level would fall down sometimes rapidly also even in the untreated controls. Therefore, the present experiment was designed as developed by Ratnakar and Murthy in our laboratory (9).

It can be seen that at the end of the first week the animals in both the groups showed signs of hypercholesterolemia becaus cholesterol levels increased from 54±7.0 to 123±11.8 mg/dl in group I and 59±15.1 to 114±11.6 mg/dl in group II animals. Likewise there was considerable increase in the level of LDL+VLDL cholesterol and triacylglycerols. This ensured that the degree of hypercholesterolemia was same in both the groups.

The total cholesterol level continued to rise gradually upto a very high value of 285mg/dl (428% increase) in the control group. On the contrary in the fenugreek treated group it came down to 97± 11.2 mg/dl ie 15% fall from day 7 value (Fig. 1) : When compared with day 1 normal values

Table I

Effect of the principle from fenugreek seeds on some parameters of serum lipid profile in control and treated rabbits.

	Days						
	Day 1	Day 7	Day 14	Day 21	Day 28	Day 35	% Change (compared with day 7 value)
Test Group :							
HDLc (mg %)	24±5.2	24±6.4	24±6.1	24±5.1	25±5.1	25±4.8	+4.1
TC/HDLc	2.5	4.6	4.8	4.8	4.0	3.8	-17%
(LDL + VLDL) c HDLc	1.4	3.8	3.9	3.9	3.0	2.9	-23.7%
Control Group :							
HDLc (mg %)	26±2.3	26±2.6	26±2.4	28±2.1	27±2.9	28 ± 3.1	+7.7
TC/HDLc	2.1	4.7	6.0	7.9	10.4	10.2	+117%
(LDL + VLDL) c HDLc	1.07	3.7	5.0	7.2	9.2	9.2	+117%

n = 5 in each group; The value represent mean ± SD

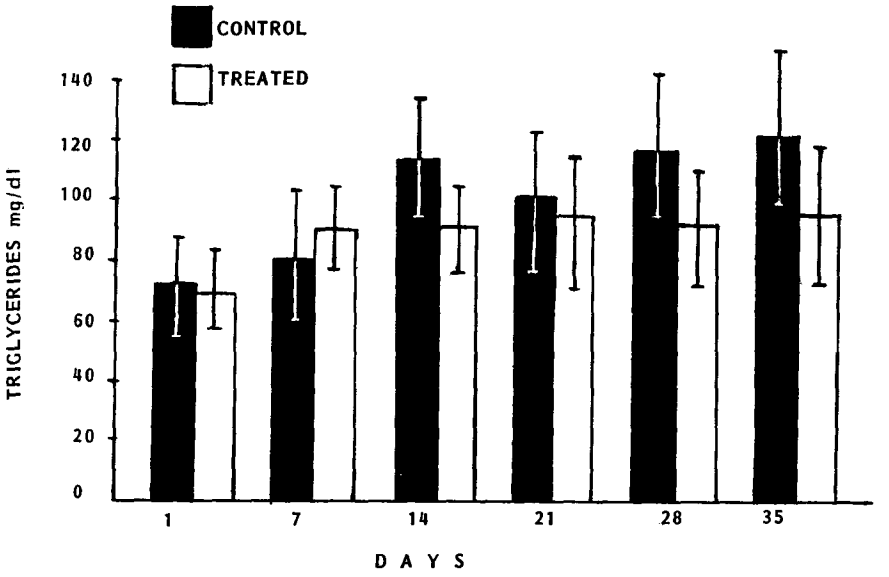

FIG 3 EFFECT OF THE PRINCIPLE ON TRIGLYCERIDES LEVELS

the cholesterol value showed only 64% increase in treated group in contrast to 428% increase in untreated animals. Likewise (LDL+VLDL)c showed a fall from 90±10.1 mg/dl at the end of first week to 72±10.6 mg/dl by the end of 5th week in the treated group, whereas in the control group there was marked increase in LDL+VLDL cholesterol from 97 ±10.8 mg/dl on 7th day to 257±14.2 mg/dl by the end of 5th week (Fig2). Thus the active principle not only countered the elevating effect of cholesterol feeding on total cholesterol and VLDL+LDL cholesterol but also brought down the final values. Even the ratios of total cholesterol/ HDLc and (VLDL+LDL) c/HDLc showed remarkable improvement following the treatment (Table I). There was no significant change in HDLc levels either in the untreated or fenugreek treated animals. This supports our earlier findings that cholesterol feeding does not affect HDLc (9). Awtade and Srivastava (10) have observed a slight but non significant increase in HDLc in coconut oil fed rats.

Triacylglycerols (TAG) also showed an increase in the

hypercholesterolemic rabbits after a week in both the groups. In the next four weeks there was considerable increase in TAG levels in the control group but in the treated group the increase was only marginal. This shows that the active principle prevented the rise of TAG levels (Fig 3). In both the groups, the fasting blood glucose values were in the normal range throughout the 5 week period. This shows that the fenugreek principle shows hypoglynot hypoglycaemic effect only under the condition of hyperglycaemia but not under normal conditions. This is also an advantage.

Thus the above results show that 5 weeks feeding of cholesterol at a dose of 100mg/kg/day induced hypercholesterolemia and hypertriacylglycerolemia in the rabbits. Simultaneous administration of the active principle from fenugreek seeds not only checked the development of hypercholesterolemia and hypertriacylglycerolemia, but also brought about considerable improvement in all the lipid parameters except HDLc. These results also point out that the same principle which showed hypoglycaemic effect in our earlier studies has hypocholesterolemic, and hypotriacylglycerolemic effects also. Since our earlier studies have shown that the hypoglycaemic principle increases the level of serum insulin following glucose load, the favourable effect may be mediated through insulin. Studies are necessary to find out whether or not this principle has any direct inhibitory effect on the concerned enzymes of cholesterol and triacylglycerol biosynthesis and on lipoprotein metabolism includng receptors and apoproteins. This compound from a dietary article exhibiting both hypoglycaemic and hypocholesterolemic effects is a definite advantage because hyperglycaemia and hypercholesterolemia co-exist often.

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