

THE EFFECT OF DIETARY FIBRE FROM *CORIANDRUM SATIVUM* L. AND *SOLANUM TORVUM* ON CHOLESTEROL LEVEL IN RATS

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Abstract

Dietary fibre in the form of Neutral Detergent Fibre (NDF) from *Coriandrum sativum* (CS NDF) and *Solanum torvum* (STNDF) were isolated and their effect on cholesterol level in rats was studied. The rats were fed with synthetic diet containing 10% NDF. From the study, it was evident that CSNDF and ST NDF significantly reduced the levels of cholesterol, in liver, kidney and serum. Among the two fibres, STNDF fed rats exhibited higher cholesterol lowering effect than CSNDF fed ones.

Key Words: *Coriandrum sativum*, *Solanum torvum*, Dietary fibre, Neutral detergent fibre

Introduction

Dietary fibres are generally resistant to digestion by the normal secretory and digestive mechanisms present in the human gut. Dietary fibre has complex and highly variable composition (Harris, P.J. and Ferguson, L.R. 1993). Chemically DF is a heterogeneous group of carbohydrate materials like cellulose, hemicellulose, pectin, lignin etc. Foods rich in insoluble fibres such as whole grains and cereals are consistently associated with a reduced risk of developing Type 2 diabetes in observational studies (Parker E.D., Liu S., Van Horn L., *et al.*, 2013). Many reports shows that dietary fibre reduce the level of lipids (Shufen Han, Wei, Zhang, Ru, Zhang, *et al.*, 2019).

Materials and methods

For the study male albino rats of Sprague - Dawley strain weighing 80-120 g bred and maintained in the animal house were used. The experiment was done according to the approval of the ethics committee of the department. The

rats were divided into 3 groups.

Group I -Fed with Isocaloric fibre free diet (FF)

Group II-Fed with *Coriandrum sativum* NDF (CSNDF)

Group III-Fed with *Solanum torvum* NDF (STNDF)

The feed was synthetic one. 10g. of the NDF was added at the expense of CHO (CHO - equal parts of glucose, dextrin, and sucrose & corn starch) The composition of diet is given in Table 1:

The experiment has a duration of 30 days. At the end of 30th day, animals were killed by cervical dislocation. Blood was collected from which the serum was separated. Tissues such as liver and kidney for the analysis were immediately collected and washed in 0.9% cold saline and stored in ice cold containers.

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Table1. Composition of diet selected for Experiment

Composition	Fibre free (gm/ 100gm)	NDF (gm/100gm)
*CHO	65.00	55.00
Casein (Vitamin & Fat free)	20.00	20.00
Ground nut oil	10.00	10.00
fibre	-----	10.00
Salt mixture	4.00	4.00
Vitamin mixture	1.00	1.00

*CHO - Equal parts of glucose, dextrin, sucrose & Corn starch

Analytical methods

The procedure adopted for serum extraction was that of Folch *et al.* (1957). The tissues were homogenized in chloroform: methanol (1:1). 0.25 gram of tissue corresponds to 25ml of extract. Total cholesterol was estimated by the method of Abell *et al.* An aliquot from the lipid extract was pipetted out into a glass stoppered centrifuge tube and evaporated to dryness. Into this was added 5ml of ethanolic KOH. The tube was stoppered and shaken well. It was then warmed in a water bath at 37°C-40°C for 55 minutes. After cooling to room temperature 10ml of petroleum ether (60-80) was added and mixed. Then 5ml of water was added to this and shaken vigorously for one minute. It was centrifuged at low speed for 5 minutes. 4ml of petroleum ether layer was pipetted out into the test tube and evaporated to dryness at 60°C. A standard (2mg cholesterol/ml) was also treated in the same manner. 6ml of colour reagent was added to each tube and kept at 25°C after thorough shaking. 6ml of colour reagent was taken as the blank. After 30-35 minutes the optical density was measured at 620nm.

Results and Discussion

Results are presented in Table 2 and ANOVA in Table 2A Feeding of NDF from CS/ST resulted significant decrease in the level of cholesterol in liver, kidney and serum. The cholesterol lowering effect was significantly higher in rats fed on ST NDF. This study showed that supplementation of the diet with NDF from CS and ST produced significant alterations in the level of cholesterol. Low cholesterol concentration in the serum and tissues of NDF diet fed groups was observed. Some amount of cholesterol is degraded in the liver and one of the degradation products is bile acids. NDF has greater ability to bind with bile acids and this will be excreted through faeces. The amount of cholesterol degraded in liver depends on a feedback mechanism. Some amount of bile acids excreted from liver is reabsorbed in the intestine and reaches the liver through enterohepatic circulation. If more bile acids reach the liver, only less cholesterol is degraded and vice versa. The bile acid binding and their consequent removal from the gut resulted in less bile acids reaching the liver by enterohepatic circulation. Thus the feedback inhibition of bile acid synthesis by bile acids is less and more cholesterol is degraded to bile acids. In this connection, Marlett *et al.* (1994) reported that oat bran lowers serum cholesterol level in part by altering bile acid metabolism and faecal excretion of bile acids in man. It was also reported that soluble dietary fibre from psyllium inhibits cholesterol stone formation by reducing the biliary cholesterol saturation index in prairie dogs fed on cholesterol supplemented diet (Schwesinger *et al.*, 1999). Jose Brum *et al.* (2018) reported that statin given patients supplemented with psyllium fibre reduced the level of cholesterol. Fukushima *et al.* (1999) reported that fermentation products of rice bran such as propionic acid and butyric acid -

Table 2. Cholesterol in Liver, Kidney and serum

Groups	Liver (mg/100gm)	Kidney (mg/100gm)	Serum (mg/ 100gm)
1. FF	348.5 ± 9.18	320.00 ± 7.70	85.55 ± 2.57
2. CSNDF	322.3 ± 11.30	300.69 ± 9.00	79.91 ± 2.37
3. STNDF	307.6 ± 10.0	281.33 ± 7.50	70.90 ± 1.93

Values are ± SEM form six rats in each group

Groups with common superscripts are not significantly different at P< 0.05

Groups without superscripts are significantly different at P< 0.05

Table 2A. One way ANOVA for Cholesterol in Liver, Kidney and serum

Variables	Groups	Between Groups		Within groups		F-ratio	Significance of F
		MS	DF	MS	DF		
Liver	1,2,3	1597.11	2	56.7	15	28.12	.000
Kidney	1,2,3	1651.10	2	41.0	15	40.17	.000
Serum	1,2,3	322.72	2	11.1	15	29.05	.0000

DF-Degree of Freedom, MS-Mean Square

are effective in lowering cholesterol in rats. Hara et al observed that the lowered plasma cholesterol in sugar beet fibre fed rats may be due to the short chain fatty acid production with increased bile acid synthesis. Kay *et al.* (1979) reported that lignin is the most potent bile acid adsorbent This study suggests that among the two fibres, ST NDF is having higher cholesterol lowering effect than CS NDF. This may be due to the high amount of lignin present in ST NDF.

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