

STUDY ON THE EFFECT OF DIETARY FIBER FROM CORIANDRUM SATIVUM AND SOLANUM TORVUM ON FECAL BILE ACIDS IN RATS

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Abstract

The effect of dietary fibers in the form of Neutral Detergent Fiber (NDF) from *Coriandrum sativum* (CS NDF) and *Solanum torvum* (ST NDF) on fecal bile acids in rats was studied. The rats were fed with synthetic diet containing 10% NDF. From the study, it was evident that fibre fed rats showed increased excretion of bile acids including cholic and chenodeoxy cholic acids in the feces. Among the two fibres ,ST NDF fed rats showed higher fecal excretion of bile acids than CS NDF fed ones.

Keywords: *Coriandrum sativum*, *Solanum torvum* , Dietary fiber, Neutral detergent fiber, Bile acids

Introduction

Dietary fibre (DF) is that part of plant material in the diet which is resistant to enzymatic digestion. DF is mainly composed of cellulose, noncellulosic polysaccharides such as hemicellulose, pectic substances, gums, mucilages and a non-carbohydrate component lignin (Devinder Dhingra). Different systems are proposed to classify the components of dietary fibre based on their role in the plant, based on the type of polysaccharide, based on their simulated gastrointestinal solubility etc (Tungland and Meyer) . Anita and Abraham reported that dietary fibre is mainly classified into two categories such as water- insoluble/ less fermented fibres(cellulose, hemicellulose,

lignin) and the water- soluble/well fermented fibres:(pectin, gums and mucilages) . Many studies reported that consumption of DF reduces the chances of occurrences of many diseases like colon cancer, atherosclerosis, diabetes *etc*. Ghada A. Soliman (2019) reported that dietary fiber intake is associated with decreased risk of cardiovascular disease.. Foods rich in insoluble fibers such as whole grains and cereals are consistently associated with a reduced risk of developing Type 2 diabetes in observational studies (Parker *et al.*, 2013). Many reports indicate that dietary fibre reduce the level of lipids (Shufen Han *et al.*, 2019).

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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 rats were divided into 3 groups.

Group I - Isocaloric fiber free diet (FF)

Group II - 10% *Coriandrum sativum* NDF (CSNDF)

Group III - 10% *Solanum torvum* NDF (ST NDF)

The animals were fed with synthetic diet. 10g. of the NDF was added at the expense of CHO (CHO – equal parts of glucose, dextrin, sucrose & corn starch) in fiber diet fed groups. The caloric intake of all the groups was maintained unchanged by adjusting the food intake. The composition of diet is given below.

Composition of diet

Composition of diet	Fiber free (gm/100gm)	NDF (gm/100g m)
*CHO	65.00	55.00
Casein (Vitamin & Fat free)	20.00	20.00
Ground nut oil	10.00	10.00
Fiber	-	10.00
Salt mixture	4.00	4.00
Vitamin mixture	1.00	1.00

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

The experiment has 30 days duration. At the end of 30th day, animals were sacrificed by cervical dislocation.

Analytical methods

Fecal bile acids were determined according to the procedure of Snell and Snell . 24 hours fecal samples collected from individual rats were homogenized with equal weight of water and lyophilised to fine powder. 600mg of the stool sample was extracted with 10ml of 1N NaOH in 90% ethanol at 80^oC for 2 hrs. The mixture was cooled, centrifuged and the residue was again extracted with 10ml of 1N NaOH in 90% ethanol. The alkaline fecal extract was diluted with equal volume of water and was extracted with hexane. The solution left after the extraction with hexane was then acidified to pH 2.0 and

bile acids were extracted with ethyl acetate. The ethyl acetate layer was collected, washed with water and evaporated to dryness. The bile acids were dissolved in a known volume of ethyl acetate and aliquots were taken for the estimation of bile acids. From the aliquots bile acids were determined according to the procedure of Snell & Snell.

Results and Discussion

Table 1. Concentration of fecal bile acids

Groups	Cholic acid (mg/rat/day)	Chenodeoxycholic acid (mg/rat/day)
1. FF	11.70 ± 0.357	4.02 ± 0.120
2. CSNF	17.61 ± 0.616	5.79 ± 0.173
3. STNF	20.70 ± 0.496	6.23 ± 0.199

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

Results are recorded in table 1. Significantly elevated levels of cholic acid and chenodeoxycholic acid were found in the feces of CS/ST NDF fed rats as compared to fiber free diet fed control group. The increased excretion of bile acids was more in ST NDF fed group than in CS NDF fed ones.

The increased concentration of fecal bile acids in NDF fed groups may indicate increased hepatic degradation of cholesterol. Binding of bile acids by the fibre facilitates increased excretion. 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. reported that oat bran lowers serum cholesterol level in part by altering bile acid metabolism and fecal excretion of bile acids in man. It was also reported that soluble dietary fiber from psyllium inhibits cholesterol stone formation by reducing the biliary cholesterol saturation index in prairie dogs fed on cholesterol supplemented diet (Schwesinger WH, Kurtin WE et al). Kay, R. M et al reported that lignin is the most potent bile acid adsorbent and its binding is apparently influenced by molecular weight, pH, and the presence of methoxyl and carbonyl groups on the lignin molecule. Adsorption was maximum for the less polar, unconjugated dihydroxy bile acids and reduction of environmental pH enhanced binding especially of trihydroxy bile acids. This study suggests that among the two fibres, ST NDF fed rats showed higher fecal excretion of bile acids than CS NDF fed ones. This may be due to the high amount of lignin present in ST NDF.

Summary and Conclusion

The study indicated that feeding of NDF from *Coriandrum sativum* /*Solanum torvum* to rats at 10% level resulted significant elevation of the excretion of bile acids through feces. This may be due to the adsorption of bile acids by NDF. Increased excretion of bile acids results the degradation of more cholesterol from liver and thus lowers the cholesterol level. Among the two fibres, ST NDF fed ones showed more bile acid excretion than CS NDF fed ones.

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