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ARTICLE

A Study on the Effect of Dietary Fibre on Gastro-Intestinal Motility in Rats.

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Abstract

A study on the effect of dietary fiber in the form of Neutral Detergent Fiber(NDF) from Coriandrum sativum and Solanum torvum on intestinal motility in rats was studied. The rats were fed with synthetic diet containing 10%. NDF.. The feed was administered as charcoal meal suspension. After 20 minutes they were dissected and the percentage of intestinal motility was measured. It was found that rats fed with fiber diet showed significant enhancement in intestinal motility than fiber free diet fed ones. Among the two fibers, Solanum torvum fed rats exhibited higher motility than Coriandrum sativum fed ones.

Keywords: *Coriandrum sativum*, Dietary fiber, Intestinal motility, Neutral detergent fiber, Solanum torvum

Introduction

Dietary fiber (DF) is principally composed of plant cell walls and other components obtained from the cell walls. Dietary fiber has complex and highly variable composition (Harris, P.J.and Ferguson, L.R.1993). Chemically DF is a heterogeneous group of carbohydrate materials (namely cellulose, hemicellulose, pectin, lignin etc.) with different physicochemical characteristics. Once DF was considered as a physiologically inert component and its contribution to whole body metabolism remained virtually insignificant. But dietary feeding patterns in very diverse societies has suggested an epidemiological link between the consumption of DF and the occurrence or absence of such diseases as colon cancer, atherosclerosis, diabetes etc. Basically fiber is a nutritional constituent that is resistant to digestion by the normal secretary and digestive mechanisms present in the human gut. 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 E.D., Liu S., Van Horn L.,et ai. 2013).

Dietary fiber reduces gastrointestinal (GI) transit time. Dietary fiber with different physical characteristics may alter the GI motility in different ways. Clinical treatment of GI disorders showed that addition of fibers such as pectin and wheat bran altered the distribution of the baked bean meal with the faster accumulation at the distal and caecal areas (Brown, N.J. ,Greenburgh,A and Tomlin, J .1994) . The GI effects of three different DF sources such as wheat bran, oat bran and pea fiber were studied. All fiber containing diets reduced apparent digestibility of dry matter, energy and protein significantly. The mean GI transit time was lower in wheat bran and pea fiber and in oat bran fiber it was same as that of the control (Hansen et al.1992). Dietary fibers have a major role in regulating Gastrointestinal transit time and may be an important determinant of glucose homeostasis (Mattea Müller et al.2018)

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Materials and Methods

Male albino rats of Sprague – Dawley strain weighing 80-120 g bred and maintained in the animal house under standard laboratory conditions were used for the study. 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 (STNDF)

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

	Fiber 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
Fiber	-----	10.00
Salt mixture	4.00	4.00
Vitamin mixture	1.00	1.00

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

After overnight fasting ,the rats were fed with a charcoal meal suspension. Charcoal meal suspension was prepared by mixing 10% charcoal and 5% gum acacia with 85% of the respective diet (Ghosh,M.N.1984). 5gm of charcoal meal suspension was administered to the corresponding groups. 20 min. after the feeding of charcoal meal suspension, the animals were sacrificed under ether anesthesia. The total intestinal length and the distance traversed by the charcoal meal suspension were measured. The GI transit of charcoal was expressed as the percentage of the intestinal length traversed divided by the total intestinal length.

Table 1. Gastro-intestinal motility

Groups	Percentage of GI motilty
1. FF	38.89 ± 0.94
2. CSNF	55.55 ± 2.00
3. STNF	60.10 ± 1.90

Values ae ± SEM fom six rats in each group

Groups with common superscripts are not signifcantly derent at P< 0.05

Groups without superscripts are signifcantly derent at P< 0.05

Results and Discussion

Results are given table 1, ANOVA in 1A and in Figure 1. significant enhancement being noted in the gastrointestinal motility of rats fed on CS/ST NDF with respect to FF control group. This trend was more pronounced in ST NDF fed rats than CS NDF fed ones.

Amount of dietary fiber which escapes digestion in the small intestine is a major determinant of gastrointestinal function. Dietary fiber controls gastric emptying, gastrointestinal motility and absorption of protein, vitamins, minerals etc in the gut. Although resistant to the action of human gastrointestinal enzymes, many components of fiber are susceptible to bacterial enzymes of the colon(Edoardo Capuano,.2017). Fiber degradation in the colon is dependent on the nature of the colonic bacterial flora, the transit time through the colon and the physical and chemical components of fiber (Hannah D. Holscher 2017) . The micro organisms involved in fiber degradation are present in the ascending colon and the caecum . Considerable bacterial degradation occurs as it passes through the distal portion of the colon. Lignin is excreted unaltered in the stool. Cell wall polysaccharides and other sugars are fermented by colonic bacterial enzymes with the production of short chain fatty acids. Incomplete metabolism of dietary fiber causes faster intestinal ·transit (Johnson W.McRorie.2017) . Non metabolizing components of NDF are mostly cellulose,cutin and silica. So NDF having higher amount of cellulose, cutin and silica resulted increased motility. Decreased intestinal transit time in wheat bran and pea fiber fed rats was reported (Hansen, L.,Knudsen,K.E and Eggum, B.0.1992). Among the two NDFs studied, ST NDF exhibited increased gastrointestinal motility than CS NDF. Study on digestibility also showed that ST NDF is less digestible than CSNDF. More amounts of cellulose, cutin and silica present in ST NDF may be responsible for the increased percentage of gastrointestinal motility exhibited by these rats. This may result in decreased GI transit time in ST NDF fed rats.

Table 2. One way ANOVA Gastrointestinal motility

Variables	Groups	Between Groups		With in groups		F-ratio	Significance of F
		MS	DF	MS	DF		
GI Motility	1,2,3	748.12	2	3.927	15	190.46	0000

DF-Degree of Freedom, MS-Mean Square

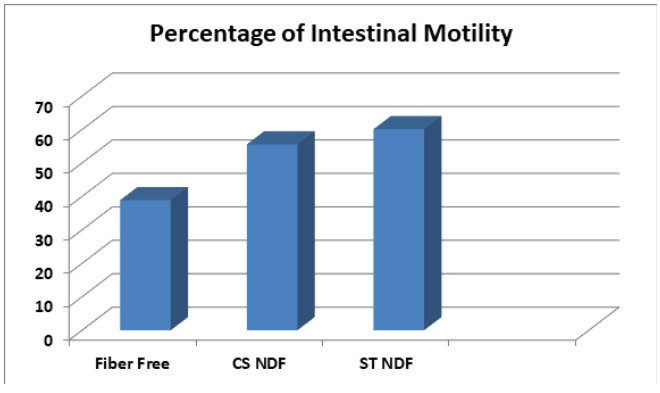

Figure 1- Percentage of intestinal motility.

Conclusion

One of the important physiological aspects of dietary fiber is its reduced intestinal transit time. This will reduce the chances of constipation and many diseases including colon cancer. From the present study it was observed that Neutral Detergent Fiber from Coriandrum sativam and Solanum torvum significantly reduced Gastro- Intestinal transit time

when compared to Fiber free diet fed rats.

References

1. Brown, N.J. Greenburgh,A and Tomlin, J, (1994) The effects of pectin and wheat bran, British J. of Nutrition,,2(2) : 289-97.
2. Edoardo Capuano (2017) The behavior of dietary fiber in the gastrointestinal tract determines its physiological effect, Journal Critical Reviews in Food Science and Nutrition, Vol 57, Issue 16 :3543-3564
3. Gnosh.M.N (1984) Fundamentals of Experimental Pharmacology, Scientific Book Agency, Culcutta, India.
4. Hannah D. Holscher .(2017)Dietary fiber and prebiotics and the gastrointestinal microbiota , Gut Microbes; 8(2): 172–184
5. Hansen, L.,Knudsen,K.E and Eggum, B.0.(1992) Gastro intestinal implications of wheat bran, oat bran and pea fibre British J. of Nutr.,68(2): 451-62.
6. Harris, P.J.and Ferguson, L.R.(1993) Dietary fibre: its composition and role in protection against colorectal cancer,Mutation Research.,290(1): 97-110.
7. Johnson W.McRorieJr.PhDNicola M.McKeownPhD(2017) Understanding the Physics of Functional Fibers in the Gastrointestinal Tract: An Evidence-Based Approach to Resolving Enduring Misconceptions about Insoluble and Soluble Fiber, J.of Academy of Nutritionand Dietetics. vol.117,issue 22017 :.251-264
8. Mattea Müller, Emanuel E. Canfora, and Ellen E. Blaak.(2018) Gastrointestinal Transit Time, Glucose Homeostasis and Metabolic Health: Modulation by Dietary Fibers, Nutrients. 10(3): 275.
9. Parker E.D., Liu S., Van Horn L., Tinker L.F., Shikany J.M., Eaton C.B., Margolis K.L. (2013)The association of whole grain consumption with incident type 2 diabetes: The women's health initiative observational study. Ann. Epidemiol. 23:321–327.