

Fibre components of some commonly consumed foodstuffs and the effect of processing on fibre of cereals and pulses

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There is paucity of knowledge regarding the dietary fibre content of Indian Foods. Available knowledge in regard to crude fibre is considerably low as compared to actual fibre content. Similarly the quantity of fibre in foods present after being subjected to processes like sieving, cooking, sprouting is not known. Sample of different food stuffs were obtained from the general market and were ground into fine powder in a grinder and estimated for ADF and NDF. Flour sample was estimated for fibre before and after sieving. Rice and green gram were cooked separately by boiling till the grain became soft, the wet samples were then dried in shade and ground into fine powder and estimated for ADF and NDF. Bengal gram and green gram whole were sprouted separately to see the effect of sprouting on dietary fibre content and components. Pulses, specially the husk of bengal gram and green gram had highest ADF and NDF followed by fruits, vegetables and cereals. Sieving, cooking by boiling and sprouting lowered the fibre content of wheat flour, rice and gram. Sprouting lowered the fibre content as much cooking by boiling of gram.

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INTRODUCTION

Fibre once an orphan child of nutritional science, has during last decade generated considerable interest. Several studies have substantiated that dietary fibre is neither inert not innocuous and does play an important role in relation to human nutrition and disease, (Eastwood and Passmore, 1983; Editorial, high carbohydrate, high fibre diets for diabetes Mellitus, 1983; Heaton, 1972). One of the major action of dietary fibre is through its effect on absorptive function of intestines.

Dietary fibre is a very complex substance consisting of cellulose of which there are different physical varieties, hemicelluloses or pentosans and great mixture of polysaccharides, also pectin and finally lignin which are not polysaccharides. Further methodology followed for food fibre estimation destroys certain amount of some components of fibre, resulting in the underestimation of their intake. It is,

therefore, necessary that fibre content of various Indian foods commonly consumed be estimated with regard to different components like cellulolignin and hemicellulose since the beneficial or adverse effect of dietary fibre is dependent on them.

Components of dietary fibre are expressed as 'acid detergent fibre' and 'neutral detergent fibre.' The former includes fibrous portion containing lignocellulose complex and latter hemicellulose in addition to lignocellulose complex. The difference in the two will show the level of unavailable hemicellulose.

Fibre foods are mostly not taken in their natural form. Sieving of bran, polishing of rice grain, removing of husk from pulses, fruits taken as juice or after removal of skin and also cooking and sprouting may affect its fibre content.

It will, therefore, be of interest to know the effect of these processes on the fibre content and composition in the food stuffs. No study to this effect is available in the literature.

METHODOLOGY

Samples of different foodstuffs were obtained from the

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market and were ground into fine powder in a grinder, and estimated for acid detergent and neutral detergent fibre (ADF and NDF) by the method of Soest (1963). The following samples were collected for analysis.

Cereals	- wheat, wheat bran, rice
Pulses	- greengram whole, greengram dhal, greengram husk, bengal-gram, bengal gram dhal and bengal gram husk
Vegetables	- cauliflower, carrot, spinach,
Tuber	- potato
Fruits	- apple, banana, mango
Condiments	- turmeric powder

Wheat flour sample was estimated for fibre before and after sieving. Rice and green gram were cooked separately by boiling till the grain became soft. The wet samples were then dried in shade and ground into fine powder. Bengal gram and green gram whole were sprouted separately by the method of Rajlaxmi (1974) to see the effect of sprouting on dietary fibre content and components.

OBSERVATIONS AND ASSESSMENT

Table 1 and 2 show the value of ADF, NDF and ADF as percentage of NDF in the food articles selected for the study. It was observed that the acid detergent fibre and neutral detergent

fibre of pulses is highest followed by fruits, vegetables and cereals in that order. The maximum value was obtained for Bengal gram husk and green gram husk 57.7 and 68.9; 49.9 and 54.6 per cent, ADF and NDF, respectively.

Table 3 shows the effect of processing on fibre components in pulses and cereals. It was observed that processes like sieving, cooking and sprouting reduced both, ADF and NDF considerably. Sprouting almost as much as cooking reduced the fibre content.

Fibre from different plants are not really the same and vary from one species to another in their constituents specially with respect to lignocelluloses and hemicellulose content. Additional quantitative changes may take place during processing, sprouting and cooking. Earlier reports on fibre content of dietary food stuffs related only to crude fibre content and there is no report in literature regarding the extent of effect of processing of food on fibre content in the form in which they are ingested. This is important because the effect of dietary fibre on the absorption function of gastrointestinal tract is dependent both on the quantity and quality of its components. The present study thus is, a first attempt in this direction.

It was observed that acid detergent and neutral detergent fibre content of pulses, specially husk of Bengal gram and green gram was the highest followed by fruits and vegetables

Table 1. Unavailable carbohydrate in some commonly consumed cereals and pulses

Food	Acid detergent fibre g. percentage	Neutral detergent fibre g. percentage	Percentage ADF present in NDF
Green gram whole <i>Phaseolus aureus</i>	12.0	19.72	60.85
Green gram dhal <i>Phaseolus aureus</i>	5.4	12.8	42.19
Green gram husk <i>Phaseolus aureus</i>	49.9	54.6	91.39
Bengal gram whole <i>Cicer arietinum</i>	18.7	26.1	71.65
Bengal gram dhal <i>Cicer arietinum</i>	7.8	13.6	57.35
Bengal gram husk <i>Cicer arietinum</i>	57.7	68.9	83.74
Wheat <i>Triticum aestivum</i>	7.5	17.3	43.35
Wheat bran (Coarse) <i>Triticum aestivum</i>	15.0	24.4	61.48
Wheat bran (fine) <i>Triticum aestivum</i>	9.6	20.3	47.29
Rice (milled) <i>Oryza sativa</i>	0.6	4.95	63.16
Rice (Unpolished) <i>Oryza sativa</i>	6.1	9.7	62.89

Table 2. Unavailable carbohydrate in some commonly consumed vegetables and fruits

Food	Moisture content g. percentage	Acid detergent fibre g. percentage	Neutral detergent fibre g. percentage	Percentage ADF present in NDF g. percentage
Cauliflower <i>Brassica oleracea</i>	89.9	9.6	11.5	83.48
Carrot <i>Daucua carota</i>	87.7	9.5	13.6	69.85
Potato <i>Solanum tuberosum</i>	76.3	2.2	4.5	49.44
Spinach <i>Spinacia oleracea</i>	91.2	4.1	5.9	69.49
Apple <i>Malus sylvestris</i>	85.1	10.0	13.0	71.94
Banana <i>Musa paradisiace</i>	70.4	1.9	2.8	67.86
Mango <i>Mangifera indica</i>	81.2	2.1	2.7	77.78
Turmeric powder <i>Curcuma domestica</i>	12.8	6.0	7.8	76.92

Table 3. Effect of processing on fibre components in pulses and cereals

Method of processing	Food	Acid detergent fibre g. percentage	Neutral detergent fibre g. percentage
Sieving	Wheat flour (unsieved)	7.5	17.30
	Wheat flour (sieved)	6.4	15.80
Cooking	Rice milled (raw)	0.6	0.95
	Rice milled (cooked)	0.0	0.00
	Green gram whole (raw)	12.0	19.72
	Green gram whole (cooked)	8.2	10.60
Sprouting	Green gram whole (unsprouted)	12.0	19.72
	Green gram whole (sprouted)	7.2	9.30
	Bengal gram whole (Unsprouted)	18.7	26.10
	Bengal gram whole (sprouted)	13.6	18.40

and cereals in that order. The crude fibre, however, does not represent the actual unavailable fibre in the gastrointestinal tract and there is no mention of the pure fibre content of these dietary constituents.

The present study analyzed the effect of sieving, cooking and sprouting on the fibre content of wheat flour, rice and gram. It was observed that these processes considerably lowered the ADF and NDF of these food substances. Sprouting as much lowered the fibre content as cooking of gram. An estimate of the fibre content of any food without taking into account the process for which it is subjected before it enters the gastrointestinal tract will be fallacious.

Conclusion:

Dietary fibre components (Acid and Neutral Detergent Fibre) of some of the common food stuffs have been studied as also the effect of processes like sieving, cooking and sprouting on initial fibre content. Both ADF and NDF were

maximum in gram husk, followed by fruits, vegetables and cereals in that order. Sieving, cooking and sprouting reduced the fibre content. Sprouting of gram as much lowered fibre content as cooking.

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