

ANALYSIS OF HYPOCHOLESTEROLAEMIC PLANT
CONSTITUENTS OF SOME COMMON FOOD ARTICLES
AND THE EFFECT OF A SELECTED FEW
ON THE BLOOD CHOLESTEROL

By

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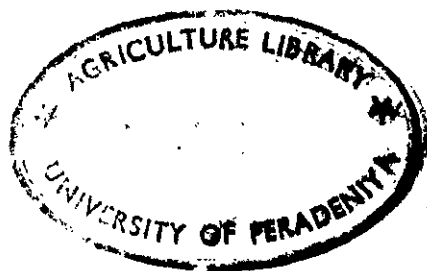
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ABSTRACT

Ischaemic Heart Disease (IHD) is a major cause of mortality among the middle aged population in Sri Lanka; and hyperlipidaemia has been identified as a common risk factor involved. Since cholesterol and its esters have the greatest atherogenic potential, dietary and therapeutic agents capable of reducing serum cholesterol, especially in non-HDL lipoprotein fractions, are of importance in the prevention of IHD. Because of the close connection between cardiovascular disease and serum cholesterol, assessment of lipoproteins can be used in the calculation of cholesterol risk ratios.

To lower blood cholesterol, one could make use of foods containing high fiber content mainly Soluble Dietary Fiber (SDF), protein and other dietary components like saponins, isoflavones and sitosterols. Dietary Fiber (DF) is equivalent to non starch polysaccharides (NSPs) and lignin. The composition and properties of plant fiber vary greatly according to source, species of plant, and physiological stage of growth.

The lack of meaningful analytical methods has been one of the main reasons for both the slow progress and the persistent confusion in the field of DF. As the protective role of DF against a number of diseases of modern societies, the nutritional importance has become increasingly recognized, the amount of fiber, type, origin, and history of technological treatments are important.

Methods were tried out to estimate the different fiber fractions. Sitosterols and proteins in 15 selected foods of plant origin. Of these, Hellendoorn's enzymatic and gravimetric method was used for fiber assay and Kjeldhal digestion method for protein estimation. Although Sitosterol was measurable at 560 nm after extracting with a 9:1 mixture of Dichloroethane-Methanol, the pigments present in the extract made it impossible. Several simple chromatographic procedures used failed to separate interfering plant pigments. Percentage fiber fractions and protein values on dry weight basis were calculated.

Leafy vegetables had the highest mean Total Dietary Fiber (69.30 to 54.95) with pulses having intermediate values (51.61 to 24.60) and pumpkin and garlic having the lowest values (18.85 and 12.15). Soluble Dietary Fiber was highest in carrot, brinjal, snake gourd, bitter gourd and

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radish and these ranged from 24.85 to 14.30 and these were used in the in vivo experiment done in rats. Pulses had high amount of protein and soyabean had the highest. Next to pulses, leafy vegetables had high amount of protein. Ambarella had the least amount of protein among the vegetables investigated. Carrot also had lower protein content than other vegetables investigated. In addition to the amount of protein, the amino acid composition relative to the structure of intact protein is needed to see the effect of amino acid mixtures on plasma cholesterol level which necessitates the need for an ideal hydrolytic procedure for protein.

The results were analysed for any significant difference in fiber, protein values and cholesterol lowering effect using Duncan's Multiple Range Test (DMRT).

The cholesterol lowering ability of the selected dried vegetables were tested in vitro using a two stage digestion procedure in a dialysis tubing, simulating digestion and absorption in the human intestine. Since the micelles produced during digestion of lipids were larger than the available pore sizes of the dialysis tubing, this experiment couldn't be accomplished.

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An in vivo study was undertaken to see the effect of vegetables on the serum cholesterol level of male Sprague Dawley rats. As an initial study five selected vegetables with high soluble fiber contents, viz. carrot, brinjal, snake gourd, bitter gourd and radish were investigated. The test and control groups comprising 3 months old male Sprag Dawley rats of weight 170 to 200 g, in group of three were fed with 'Prima' broiler feed with and without an oven dried food article (25%), supplemented with cholesterol (1%) and cholic acid (0.2%). After 3 weeks, the animals were bled following a 14 hr. fast, and sera were analysed for total and HDL cholesterol using Randox kits based on the enzymatic method.

The total and HDL cholesterol levels of the control group were 78.59 ± 7.55 and 35.17 ± 2.34 mg/dl, respectively. (Total:HDL = 2.23). Test groups fed with carrot, brinjal, snake gourd and radish gave similar results as control group (Total:HDL = 2.00-3.19), while that fed with Bitter gourd (Total:HDL = 1.90) displayed a significant decrease in Non HDL serum cholesterol at 0.10 probability level and Total Cholesterol at 0.05 probability level. These results show that bitter gourd had the best cholesterol lowering potential when compared to the other vegetables tested.

It appears that fiber can't be seen in isolation from the rest of the dietary factors. In addition to the amount and type of fiber, the cholesterol lowering effect may be due to the presence or absence of other dietary factors that influence cholesterol metabolism. Even some water soluble fibers do not show the hypocholesterolemic property because of their differing viscosity. To make the results significant at 0.05 probability level, enough replicates should be necessary in experiments.

Therefore when dietary intervention is considered in lowering plasma cholesterol, in addition to fiber, other dietary factors like amino acid composition, phytosterols, saponins, isoflavones etc. should also be taken into consideration and further investigations are needed to come to definite conclusions.