

***Canthium coromandelicum* leaf as a functional food**

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Abstract

Canthium coromandelicum (Sinhala-Kara) leaf is consumed in the form of a 'Sambal' and 'Malluma' mixed with coconut. It shows a hypocholesterolaemic effect on Wistar rats which is due to high molecular weight pectin (up to 2 million Daltons) as determined by Sepharose (2B) gel chromatography and present in a content of 1.8-3.4% on dry weight. Together with its mild hypoglycaemic effect reported previously its hypocholesterolaemic effect is now hypothesized to be due to the effect of high molecular weight pectin. It is postulated that the leaf would make a good functional food.

Key words: *Canthium coromandelicum*, Hypocholesterolaemic effect, Pectin

Introduction

Canthium coromandelicum (Sinhala-Kara) leaf is recommended by some indigenous medical practitioners as an aid to lowering hypertension. During the Second World War, during time of scarcity of food, the leaves under the tree were swept up mixed with coconut and used as a food. It is still used as such. Very little has been published about the plant. Widanagamage and coworker (Widanagamage and Ekanayake, 2005) reported that it had a mild hypoglycaemic effect only on glucose challenge and stated that it had hard tough pectin.

The objectives of this study were to determine (i) if consuming the leaf lowered cholesterol and (ii) if the effect was due to pectin.

Materials and Methods

Leaf and Analysis

Edible leaves of the plant were collected from Belihuloya in the Sabaragamuwa province of Sri Lanka and moisture content determined and were oven dried at 65-70°C for 4-5 hours. The dried leaves were ground into a fine powder. The powder was used to determine insoluble dietary fibre, soluble dietary fibre by the method of Asp *et al.* (1983) and modified method of Asp without the incinerating step. The leaf was also analyzed for ash (AOAC, 1999) and protein (AOAC, 1984).

Pectin content: Pectin content was determined by the carbazole reaction (Dekker and Richards, 1972).

Animal model:

Wistar rats obtained from the Medical Research Institute, age = 11 weeks, mean body weight = 262 g, were caged in stainless steel cages, one rat per cage. Water and food were available *ad libitum*. Feed intake and weight gain, were measured daily and weekly respectively. Details of the animal study were as reported before (Ariyasena, 2002). Feed for control was WHO recommended rat and mouse breeding feed (Sabourdy, 1988). The test contained in addition leaf powder (20g fresh leaves/kg B.W. / rat) and polished rice in place of grass powder and brown rice to balance the insoluble fibre and calories.

Cholesterol measurements: This was conducted by the method of Allain *et al.* (1974) using CHOD PAP kit from BIOLABO, France.

Sepharose gel chromatography

The standard method was followed (Pathberiya, 2005) using gel Sepharose™ CL-2B from Amersham Bio Sciences, Sweden on a column of 21 cm length and 1.3 cm diameter. Void volume as determined by the blue dextran was 8 ml. SDF added to the column was 35 mg. Fractions (2ml) were collected and the profile of SDF was determined gravimetrically and pectin was analyzed using a modified carbazole reaction (Dekker and Richards, 1972) where primary hydrolysis was conducted by dissolving the freeze dried fractions in 0.3ml of 72% H₂SO₄ (instead of 0.9ml) followed by the secondary hydrolysis after diluting the primary hydrolyzed samples in 9.33ml distilled water (instead of 28ml).

Statistical calculations Significance was determined using the Student's t-test.

Results

Table 1: Chemical composition of *Canthium coromandelicum* leaf & leaf powder

Analysis	% Dry Wt.
Moisture	3.4-6.2(leaf powder) 66.5 (fresh leaves)
Ash	6.3
Insoluble dietary fibre	67.2
* Soluble dietary fibre ²	3.2
Soluble dietary fibre-modif method	3.0 – 7.6
*Pectin	45.2% SDF
Protein	10.2

* Leaves and pectin of above sample were used for animal study

Depending on the sample a high variation in pectin content was observed (21-45.2%SDF).

Food intake and weight gain

Food intake was similar in test and control groups. In the test it was 14.8g/day whereas in control 14.0g/day over the first five weeks. However the weight gain was significantly lowered by 14.6% (p=0.028) in the test group over a period of 34 days and was reduced up to 25.3% after 7 weeks.

Table 2: Effect of *Canthium coromandelicum* leaf powder and isolated SDF of it on serum total cholesterol levels of Wistar rats.

	Cholesterol (mg/ dl)		
	Test	Control	p value
D ₀	82.37 ± 8.01	82.87 ± 7.04	0.917
D ₃₁	66.46 ± 4.87	70.40 ± 6.62	0.268
After 7 weeks	61.93 ± 8.62	72.69 ± 8.06	0.049
After 11 weeks*	76.37 ± 5.62	91.75 ± 13.17	0.025

*During the last 4 weeks the test rats were fed with SDF (pectin) extracted from the same amount of *Canthium coromandelicum* leaf powder.

The results showed a significant (24.8%) decline of the total serum cholesterol levels on ingestion of leaf powder over a period of 7 weeks. During the last four weeks test rats were fed with SDF isolated from the leaf powder and this further maintained the significant reduction ($p=0.025$) of the serum cholesterol levels.

Sepharose (2B) Gel Chromatography

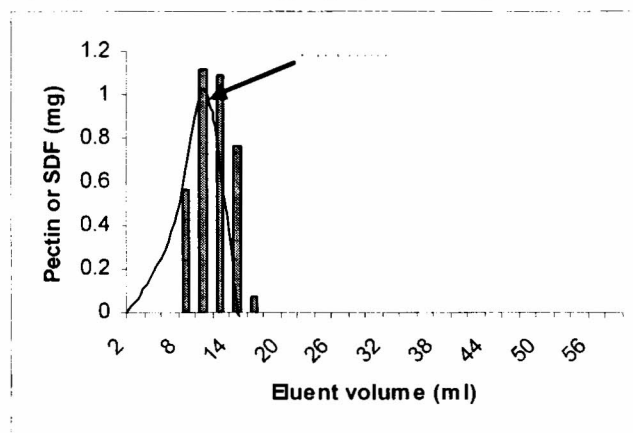


Figure: 1 Molecular weight profile of pectin

Results show that the molecular weight of pectin is high with a mean, mode and median of 11.3ml, 10.0ml and 12.0ml.

Discussion

A significant reduction ($p=0.049$) in the total serum cholesterol levels could be observed on the ingestion of *Canthium coromandelicum* leaf powder for seven weeks. Continuing diet with SDF instead of leaf powder for another four weeks maintained the above significant reduction in cholesterol levels ($p=0.025$).

The pectin content of the leaf was found to be high (1.8-3.4%) on dry weight. This pectin had a higher molecular weight than Palmyrah fruit pulp. The latter also exerts a hypocholesterolaemic effect (Pathberiya, 2005) on ICR mice. High molecular weight pectin is a media for efficiently binding cholesterol, bile salts (Judd and Truswell, 1985) and thereby reducing the bile salt pool and consequently serum cholesterol (Judd and Truswell, 1985).

It is postulated that the mild hypoglycaemic effect observed previously (Widanagamage and Ekanayake, 2005) on glucose challenge but not on fasting blood sugar is probably due to the effect of pectin on the uptake of glucose as the material has no effect on fasting blood sugar in long and short term studies (Widanagamage and Ekanayake, 2005). This is probably responsible

for the significant lowering of weight gain. It is concluded that this leaf, which is consumed, can be termed a functional food.

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