

STUDIES ON SELECTED BIOACTIVITIES IN
Gymnema lactiferum LEAF AND
HYPOCHOLESTEROLAEMIC EFFECT OF
Canthium coromandelicum LEAF AND PALMYRAH
PINNATU

By



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DECLARATION BY CANDIDATE

The work described in this thesis was carried out by me under the supervision of Prof. E.R. Jansz and Dr. S. Ekanayake (Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura) and Prof. K. Balasubramaniam (Biotech Pvt. Ltd. Jaffna) and a report on this has not been submitted in whole or in part to any University for another Degree/Diploma.

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ABBREVIATIONS

WHO	World Health Organization
PFP	Palmyrah Fruit Pulp
MW	Molecular Weight
DM	Diabetes Mellitus
GIT	Gastro Intestinal Tract
LDL	Low-density lipoprotein
HDL	High-density lipoprotein
VLDL	Very low - density lipoprotein
SDF	Soluble Dietary Fibre
GA	Gymnemic Acid
F-I	Flabelliferin-I
F-II	Flabelliferin-II
F-B	Flabelliferin-B
F-C	Flabelliferin-C
F-D	Flabelliferin-D
F-E	Flabelliferin-E
F-F	Flabelliferin-F
F-G	Flabelliferin-G
F-N	Flabelliferin-N
D.W.	Dry weight
PDB	Palmyrah Development Board
FBS	Fasting blood sugar
TG	Triglycerides

HPLC	High Performance Liquid Chromatography
POD	Peroxidase
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
HbA _{1C}	Hemoglobin A _{1C}
MRI	Medical Research Institute
BIRDEM	Bangladesh Institute for the Research and Rehabilitation of Diabetes Endocrine and Metabolic disorders
OPD	Out-Patient Department
IDF	Insoluble Dietary Fibre
ITI	Industrial Technology Institute
STZ	Streptozotocin
TCA	Trichloroacetic acid
PBS	Phosphate buffered saline
SD	Standard Deviation
SEM	Standard Error of Mean

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ABSTRACT

In the first part of this study, some bioactivities of *Gymnema lactiferum* var. *lactiferum* were studied. Normo-glycaemic Wistar rats showed no hypoglycaemic (unlike *Gymnema sylvestre*) or hypocholesterolaemic effects. *In-vitro* studies showed that this leaf extract activated pancreatic α -amylase activity and the extent was nearly identical to the effect of introduced 0.05mM Ca^{2+} . Studies on Streptozotocin induced type 2 diabetic Long Evans rats showed a significant hypoglycaemic ($p<0.001$) and hypocholesterolaemic effect ($p<0.05$), but no effect on serum insulin and glycogen content unlike *Gymnema sylvestre*. Gut perfusion experiment showed a significant reduction ($p<0.05$) in glucose absorption in the upper part of the small intestine in comparison to the control. Serum creatinine and ALT tests showed no indication of toxicity. Studies of the effect of *Gymnema lactiferum* leaf powder on type 2 diabetic patients showed beneficial effects on their glycaemic and lipidemic status. Further the chronic consumption of the leaf powder did not indicate any toxic effect on humans as determined by serum levels of creatinine and ALT levels.

In the second part of this study the effect of *Canthium coromandelicum* leaf on Wistar rats showed a significant decline ($p<0.05$) in serum total cholesterol levels. Isolated pectin

from the leaf maintained the decline ($p < 0.05$). The leaf was found to contain 21.0 to 45.2% pectin (of soluble dietary fibre) and the Sepharose gel chromatography of isolated soluble dietary fibre indicated a high molecular weight up to 2 million Daltons. It is clear that high molecular weight pectins are at least partly responsible for the hypocholesterolaemic effect. Both *G. lactiferum* and *C. coromandelicum* show useful characteristics as functional foods.

In the third part of the study the effect of dried palmyrah fruit pulp (called *pinnatu*) was tested for hypocholesterolaemic effect. Initial experiments gave a negative effect. Sepharose gel chromatography showed an increase for the eluent volume of pectin (indicating hydrolysis). *Pinnatu* showed exopectinase activity. Treatment of palmyrah fruit pulp at 70-80°C for 15 min at pH 2.5 and readjusting pH to 4.6 prior to *pinnatu* manufacturing resulted in no loss of molecular weight of pectin. However *pinnatu* did not show any hypocholesterolaemic effect on Wistar rats. It is proposed that the hypocholesterolaemic effect of fresh palmyrah fruit pulp is due to still unknown factors that are destroyed in the *pinnatu* manufacturing process. Pectin appears not to be a major factor.