



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



NUTRITIONAL AND HEALTH BENEFITS OF COCONUT SAP SUGAR/SYRUP

**Trinidad P. Trinidad, Ph.D.
Scientist II**

**Food and Nutrition Research Institute
Department of Science and Technology**





FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



© Sidney Seacat

**unopened flower of
coconut tree**

COCONUT SAP



- **fresh oyster white liquid obtained from the tender unopened flower with neutral pH**
- **each tree can yield up to 1-3 liters of sap per day**



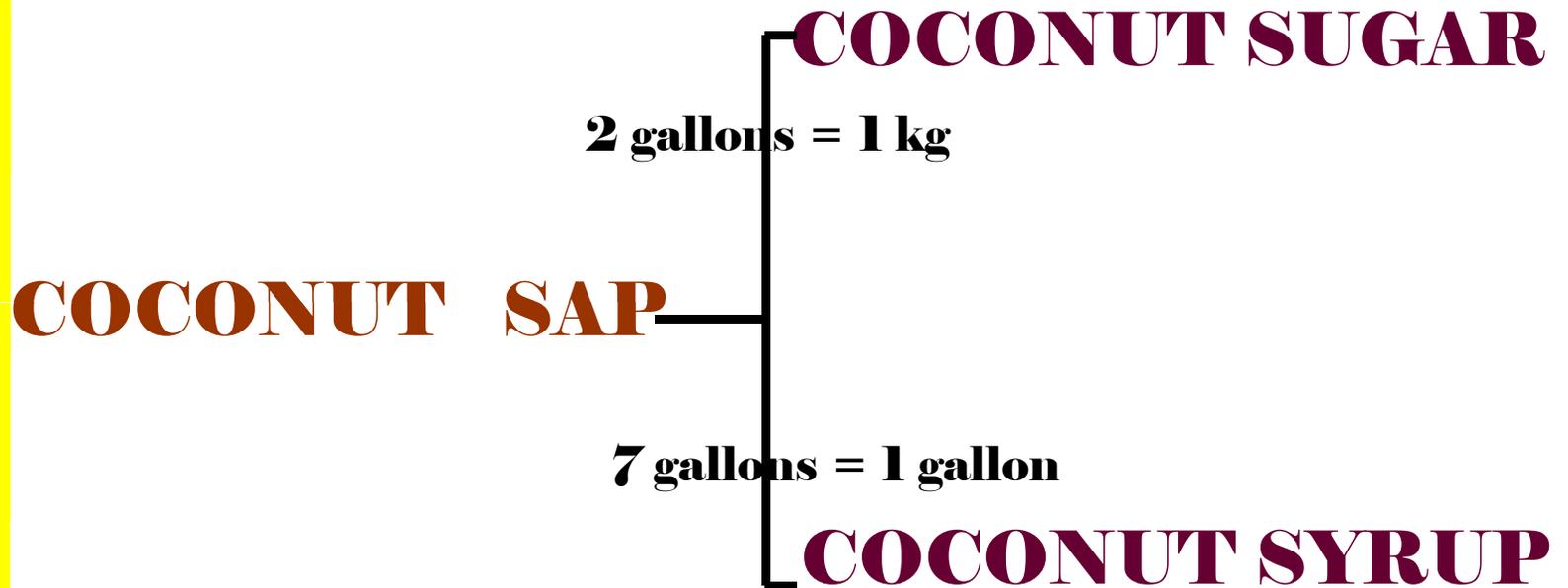
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY

Coconut sugar has great potential as a natural and cheaper alternative for synthetic sweeteners derived from natural ingredients

Data from PCA:



Present production from 2 hectares of coconut:

**300 hybrid coconut varieties = 3.5 metric tons coconut sugar
= 205 gallon of coconut honey**





FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



CHARACTERIZATION OF COCO SAP SUGAR AND SYRUP IN TERMS OF NUTRIENT AND NON-NUTRIENT (Phytonutrients) COMPOSITION



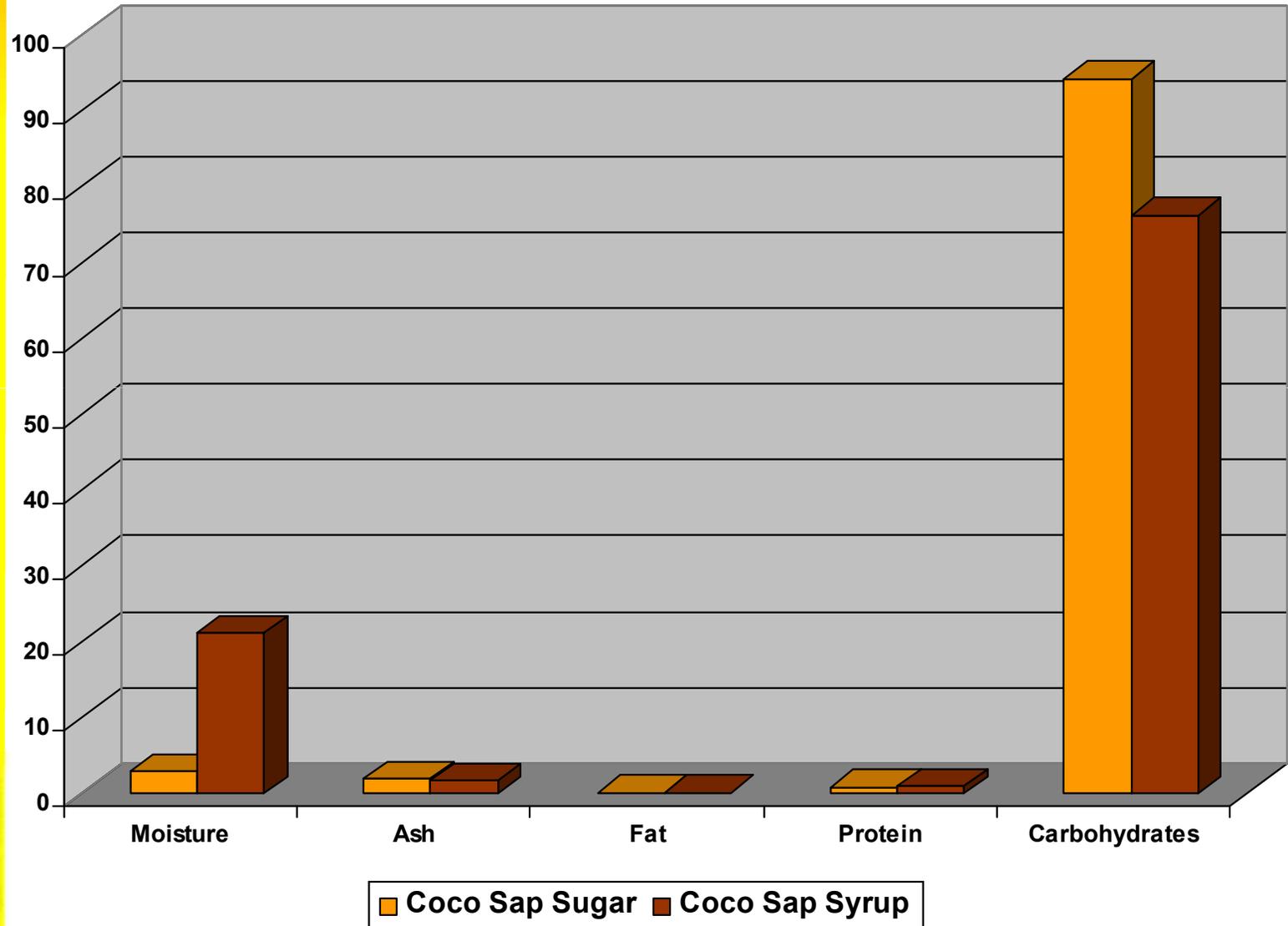
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



PROXIMATE COMPOSITION OF COCONUT SAP SUGAR AND SYRUP





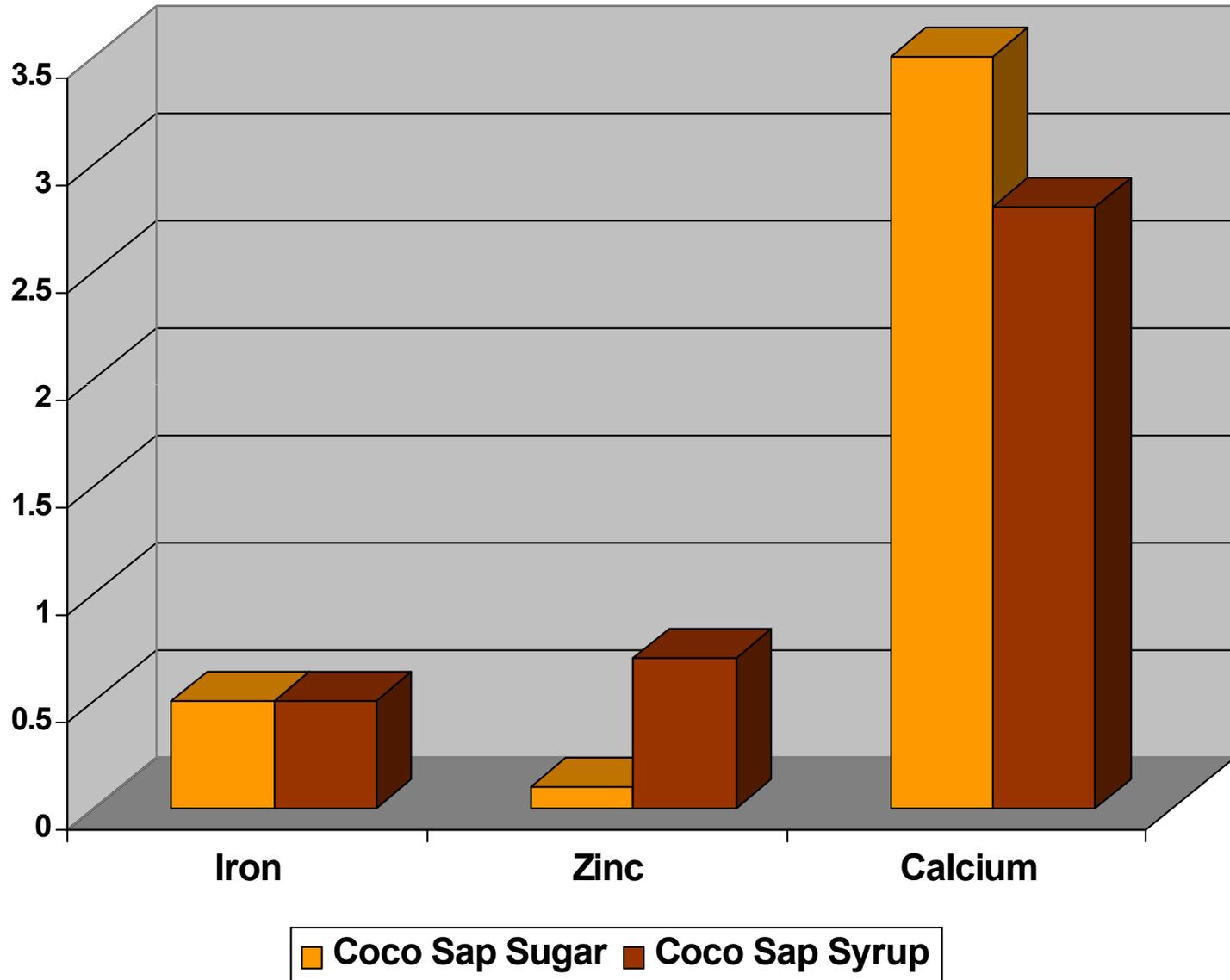
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



IRON, ZINC AND CALCIUM CONTENT OF COCONUT SAP SUGAR AND SYRUP





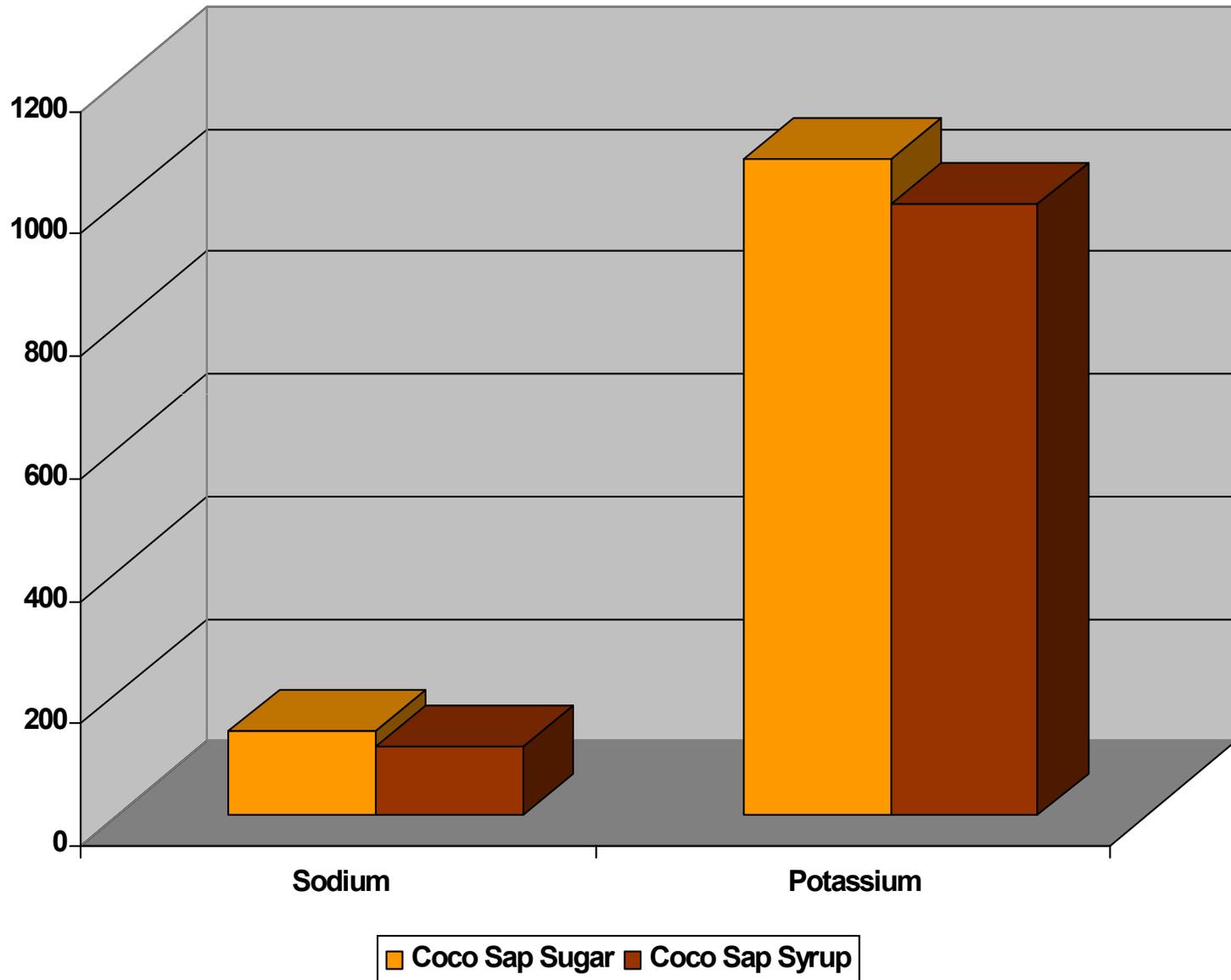
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



SODIUM AND POTASSIUM CONTENT OF COCONUT SAP SUGAR AND SYRUP





FNRI

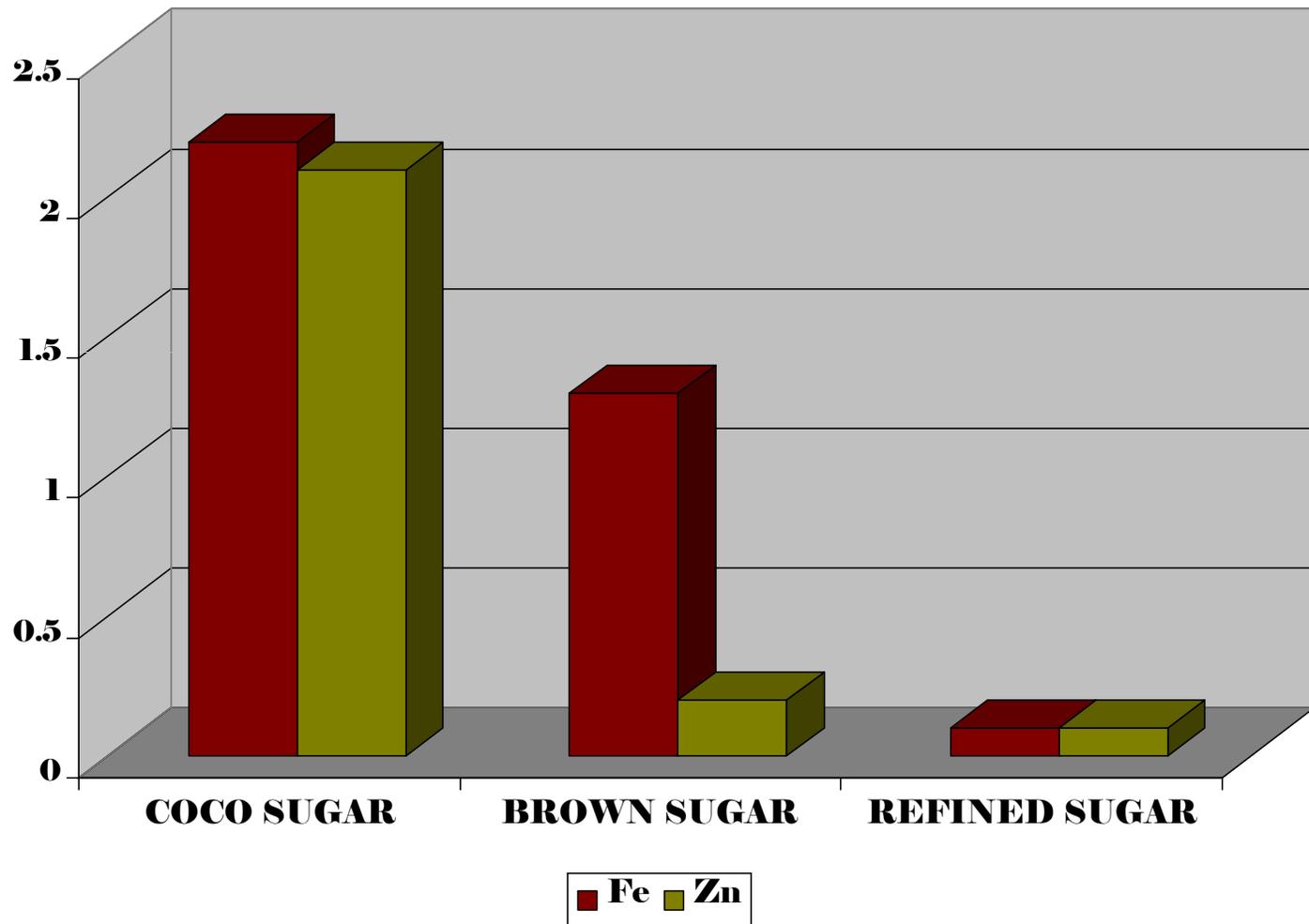
FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



IRON (Fe) AND ZINC (Zn) CONTENT OF SUGARS*

(mg/100 g Sample)



*Data from PCA



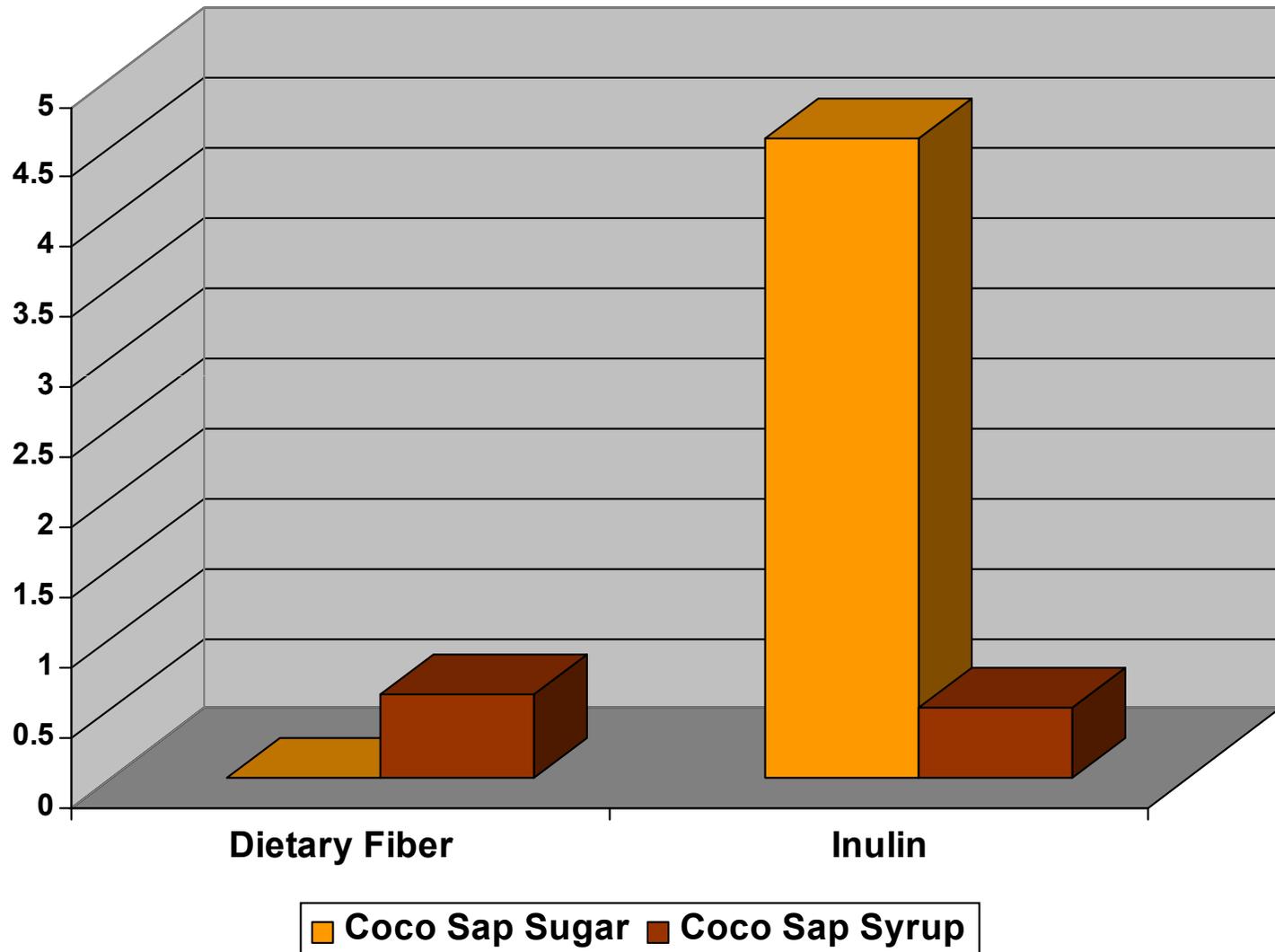
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



DIETARY FIBER AND INULIN CONTENT OF COCONUT SAP SUGAR AND SYRUP





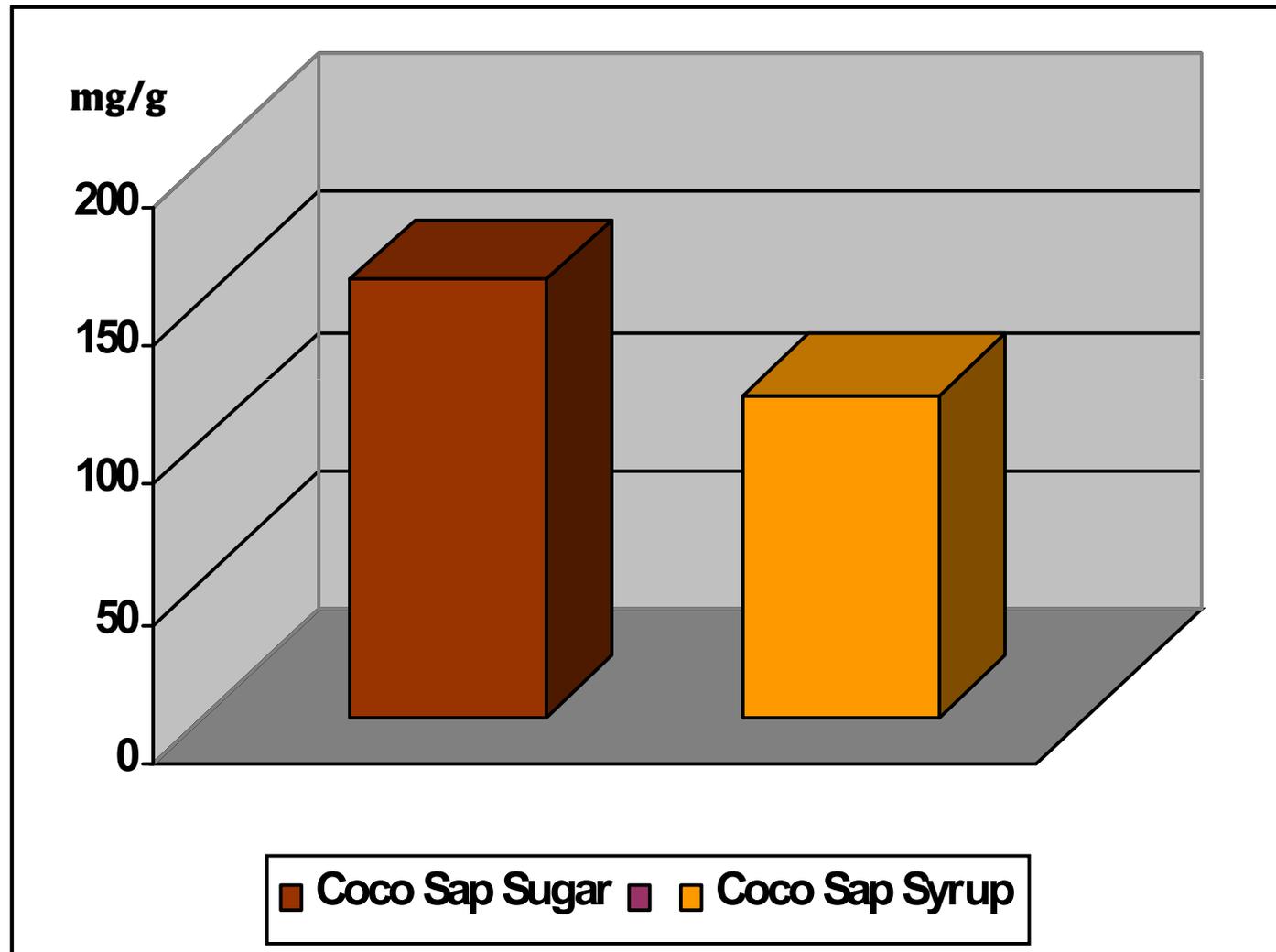
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



TOTAL SHORT CHAIN FATTY ACIDS FROM COCO SAP SUGAR AND SYRUP





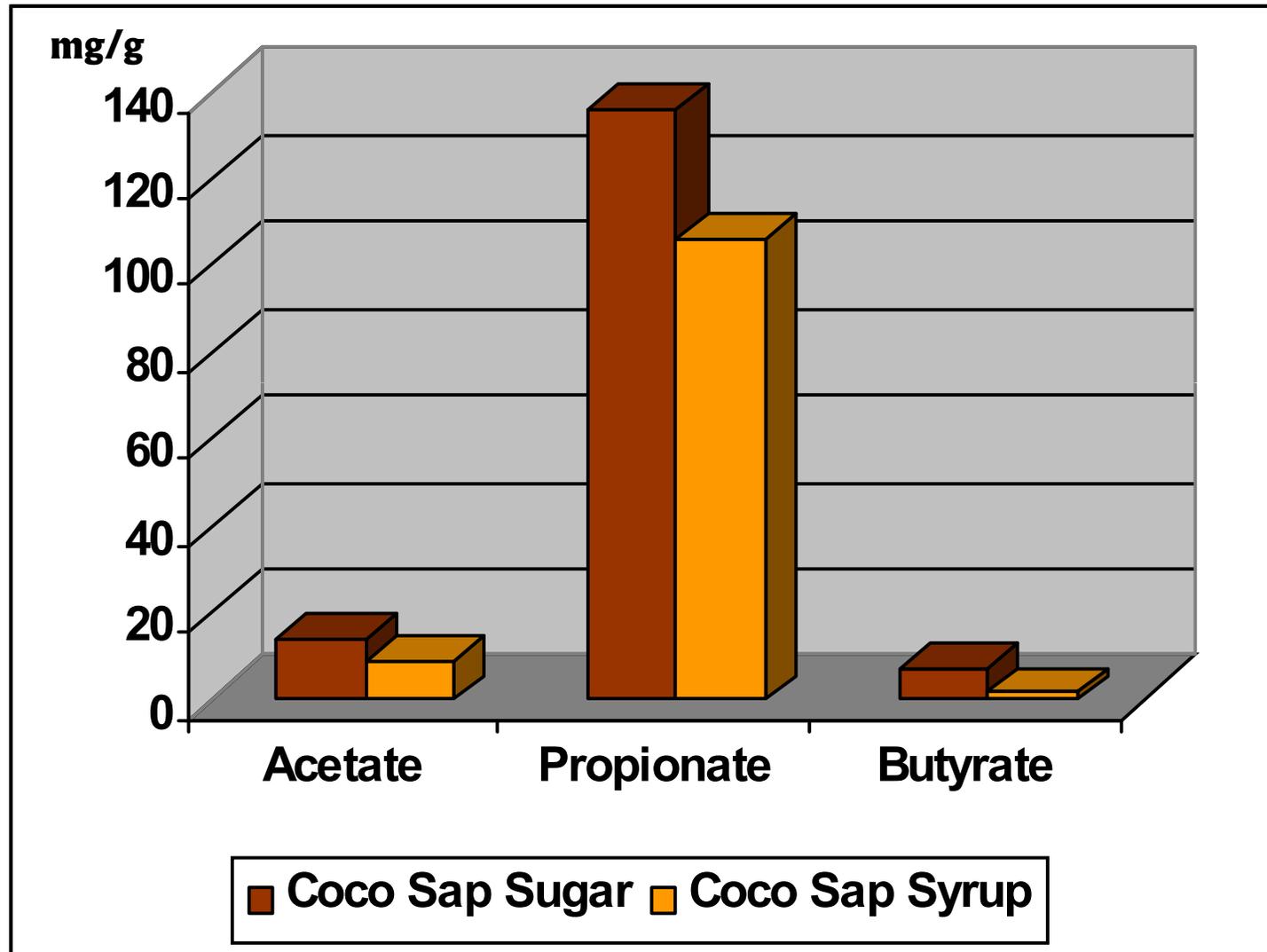
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



SHORT CHAIN FATTY ACIDS PRODUCED FROM COCO SAP SUGAR AND SYRUP



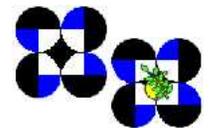
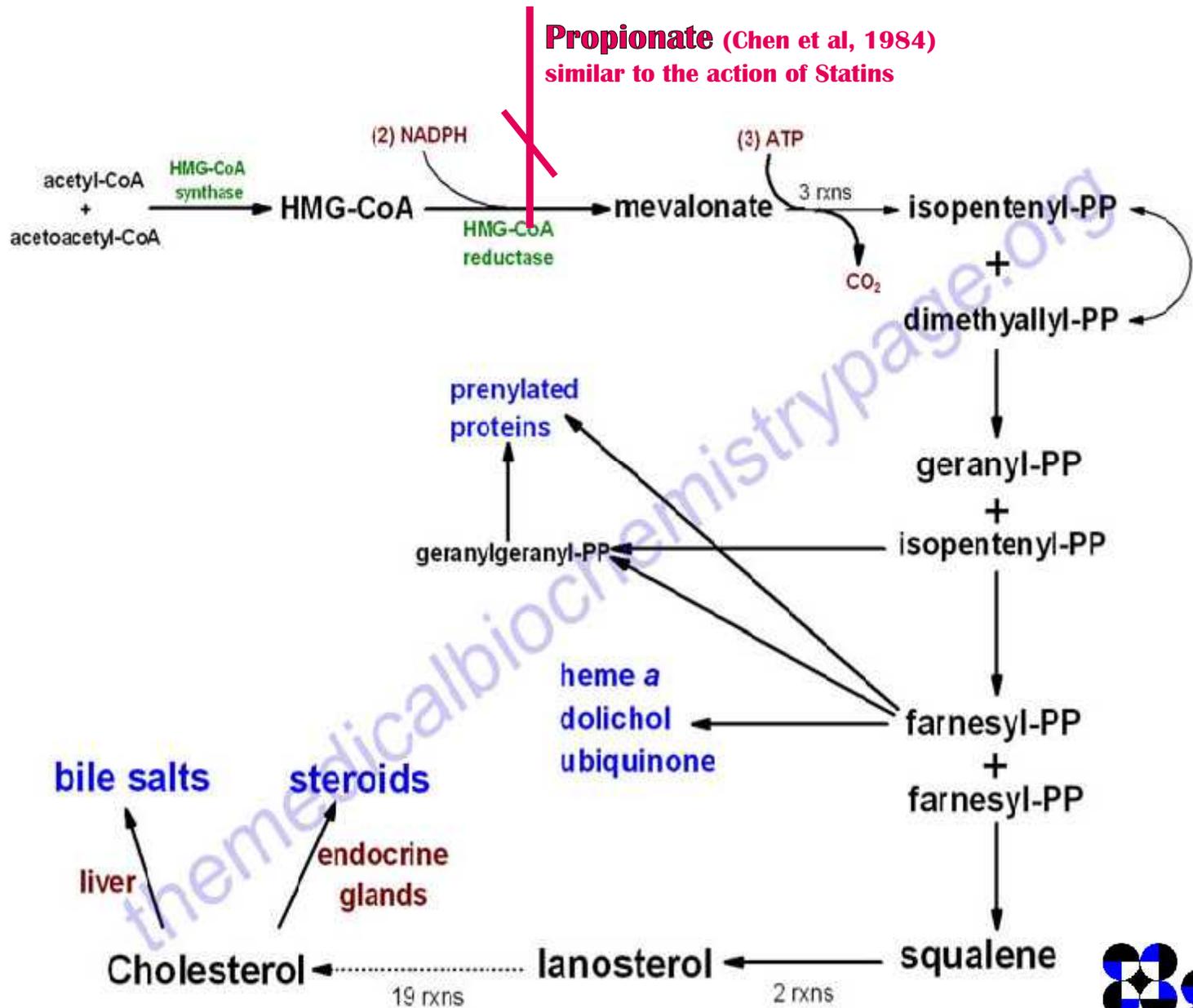
CHOLESTEROL SYNTHESIS



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY





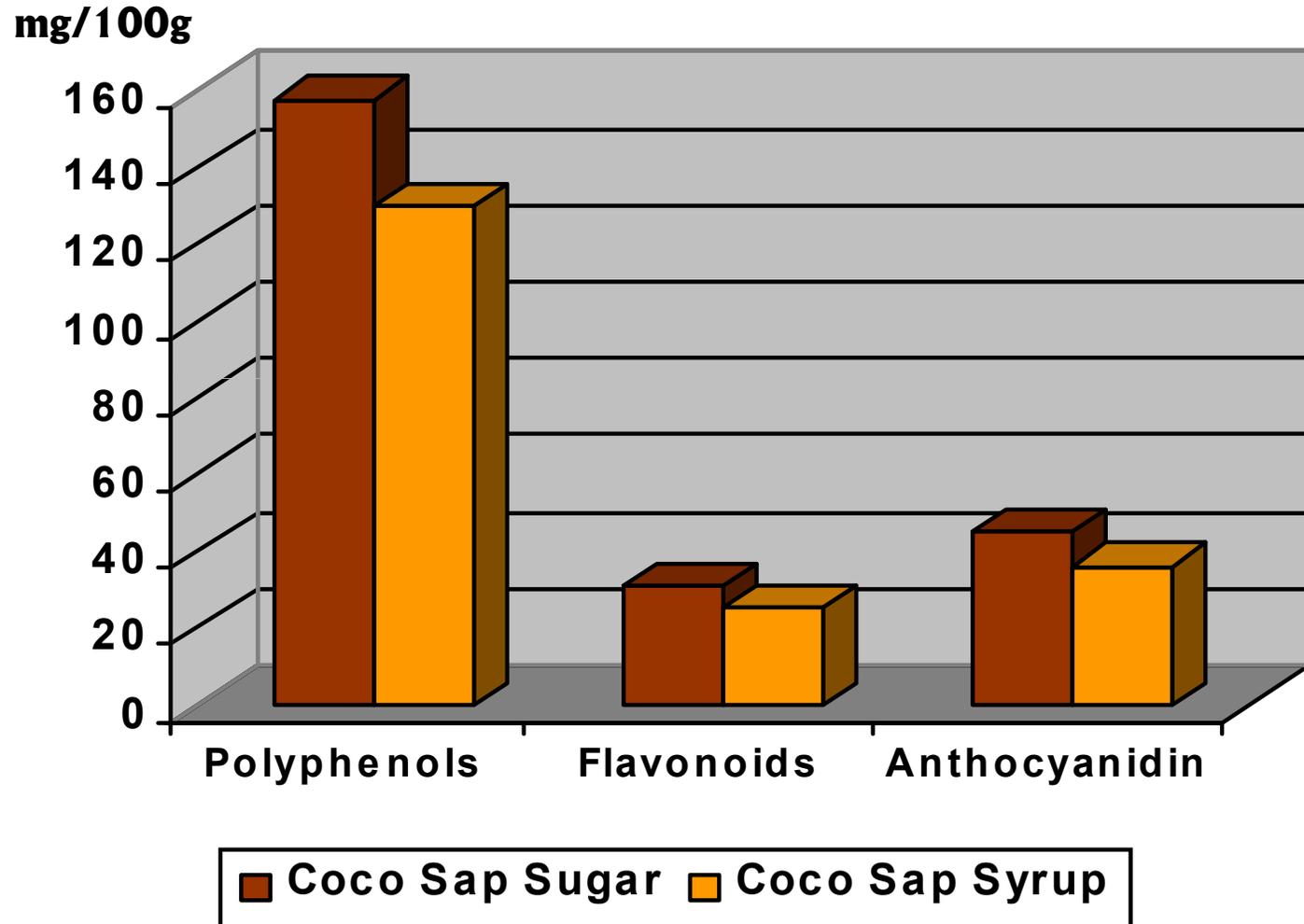
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



PHYTONUTRIENT CONTENT OF COCO SAP SUGAR AND SYRUP





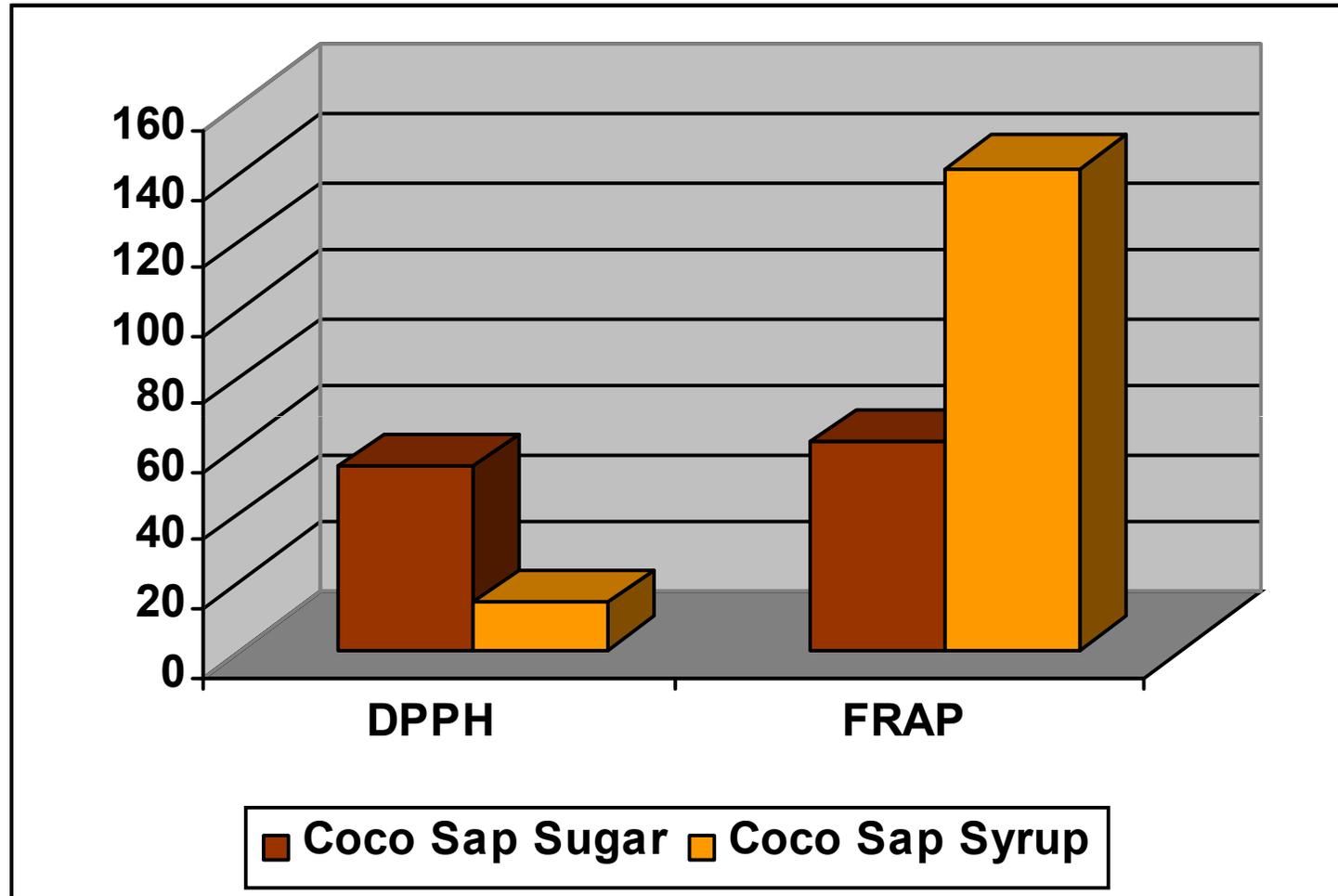
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



ANTIOXIDANT ACTIVITY OF COCONUT SAP SUGAR AND SYRUP



DPPH measures % inhibition

FRAP measures reducing power expressed in mg Trolox/100g



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



SUB-CLINICAL TEST:

GLYCEMIC INDEX OF COCO SAP SUGAR AND SYRUP



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



*increme

GLYCEMIC INDEX

is a classification of food based on the blood glucose response of a food relative to a standard glucose solution or a starchy food e.g. white bread.

IT IS WIDELY RECOGNIZED AS A RELIABLE, PHYSIOLOGICALLY BASED CLASSIFICATION OF FOODS ACCORDING TO THEIR POST-PRANDIAL GLYCEMIC EFFECT

(Foster-Powell et al, 2002; FAO/WHO Joint Expert Consultation, 1997)



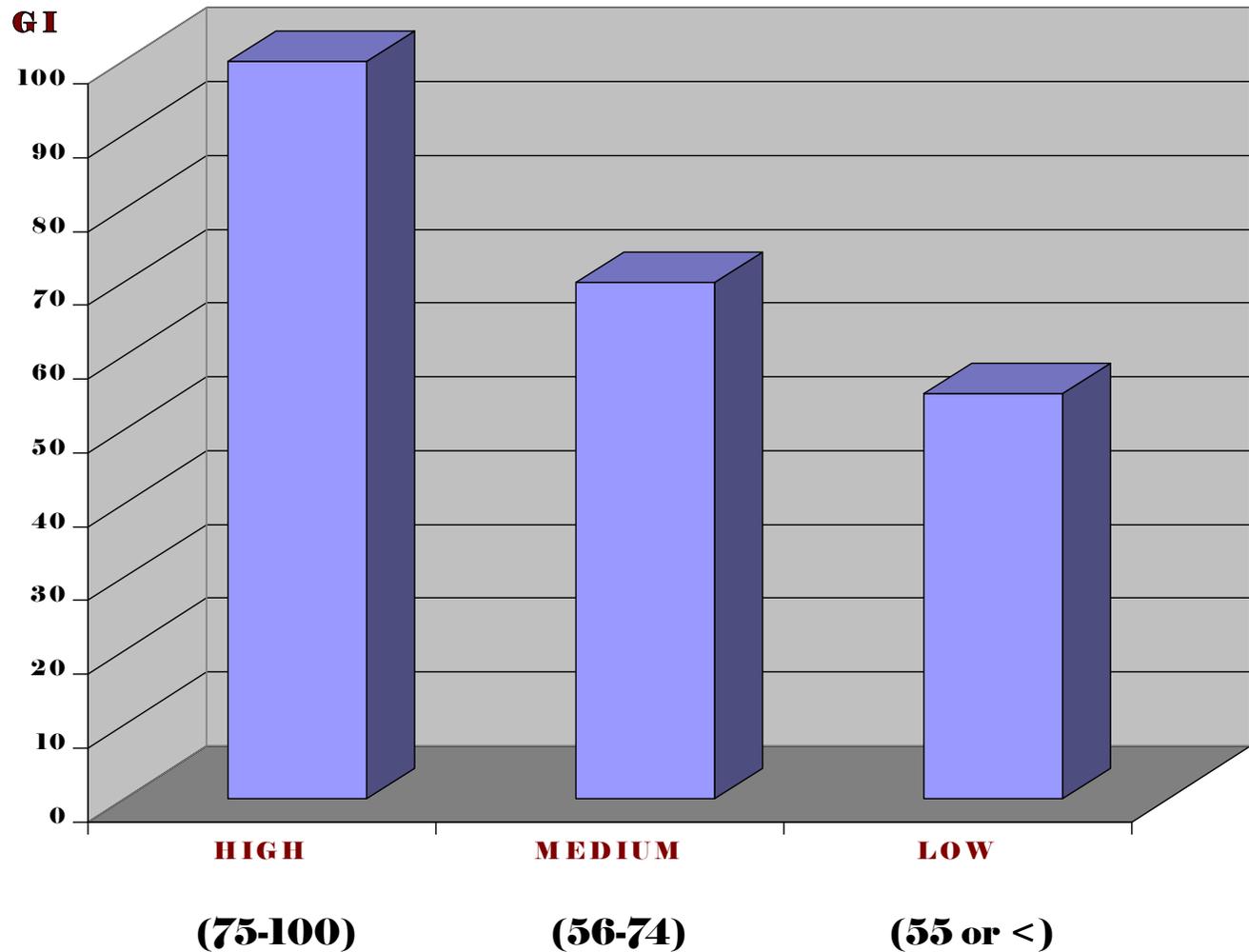
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



CLASSIFICATION OF GLYCEMIC INDEX (GI) OF FOODS





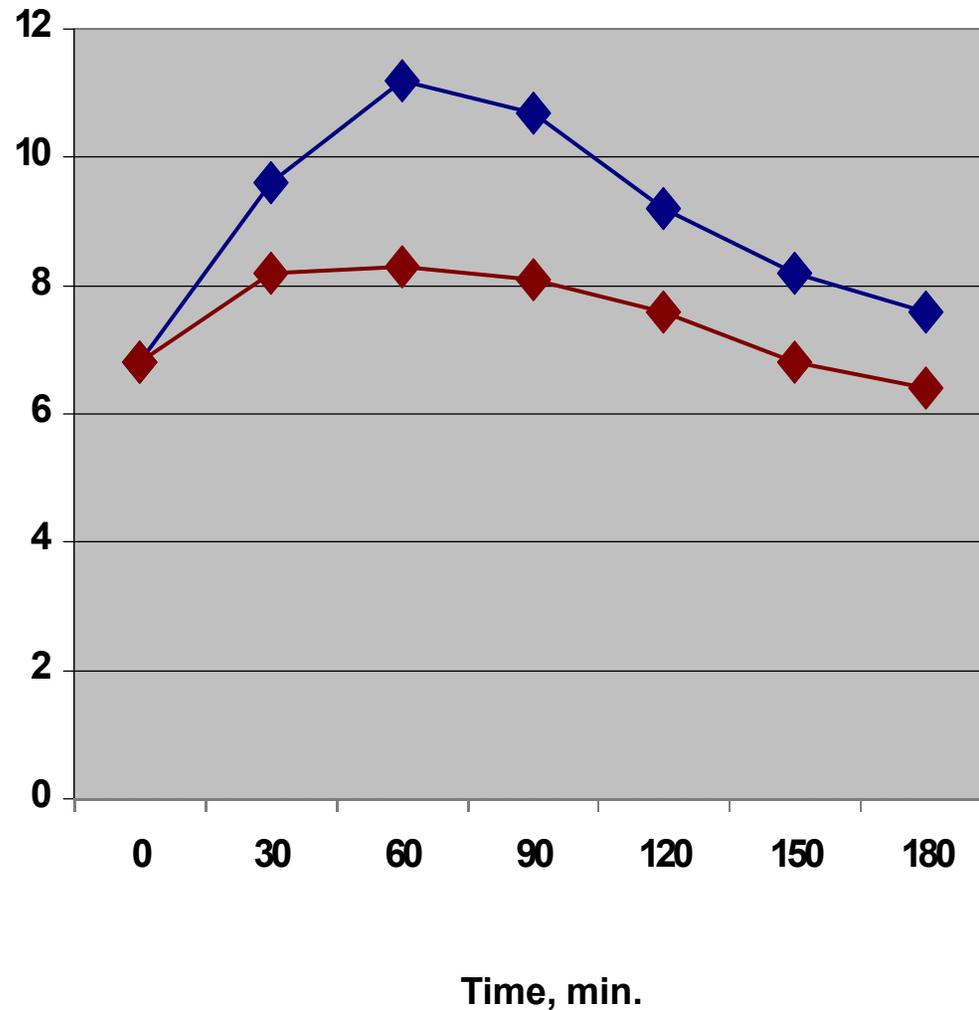
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

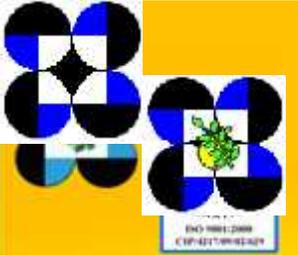
DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



Blood Glucose
(mmol/L)



The glucose response of white bread (no dietary fiber) and macaroon containing 25% dietary fiber from coconut flour (*Trinidad et al, 2003*).



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



FAO/WHO endorsed the use of GI method for classifying carbohydrate-rich foods and recommend that GI values of food can be used in conjunction with food composition tables to guide food choices (Joint FAO/WHO Expert Consultation, 1997).

It also advocate the consumption of high-carbohydrate (CHO) diet ($\geq 55\%$ of energy from CHO), with the bulk of CHO-containing foods being rich in non-starch polysaccharides e.g. dietary fiber, with low GI (≤ 60).



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



LOW GI FOOD HAS BEEN SHOWN TO REDUCE POSTPRANDIAL GLUCOSE AND INSULIN RESPONSES AND IMPROVE THE OVERALL BLOOD GLUCOSE AND LIPID CONCENTRATION IN NORMAL SUBJECTS AND PATIENTS WITH DIABETES MELLITUS.

(Jenkins et al, 1987; Wolever et al, 1992; Brand et al, 1991; Collier et al, 1988; Fontevielle et al, 1988)



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY

July Seminar
Series



METHODS

Study Participants:

10 Apparently Healthy Human Adults

Inclusion Criteria:

- ***Fasting blood glucose***
 $\leq 6.2 \text{ mmol/L}$
but not less than 3.5 mmol/L
- ***BMI: 20-25 kg/m²***
- ***Age: 30-65 years***
- ***No medication for glucose***
- ***Non smokers***



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



PROTOCOL OF THE STUDY

A 50-gram available CHO of **coco sugar and standard glucose solution were given to subjects on separate occasions after an overnight fast**

Blood samples were collected at 0, 15, 30, 45, 60, 90 and 120 min

Blood was separated from serum and read in a Clinical Chemistry Analyzer

The Incremental Area Under the Curve of **coco sugar and standard glucose solution was calculated to determine the glycemic index of coco sugar**



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY

July Seminar
Series



**Feeding of
test foods**



**Blood collection were
at 0, 15, 30, 45, 60, 90
and 120 mins**



**Clinical Chemistry
Analyzer**



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY

July Seminar
Series



CALCULATION OF GI OF FOOD

$$\text{GI of food} = \frac{\text{IAUC* of test food}}{\text{IAUC of control food}} \times 100$$

***Incremental Area Under the Curve**



FNRI

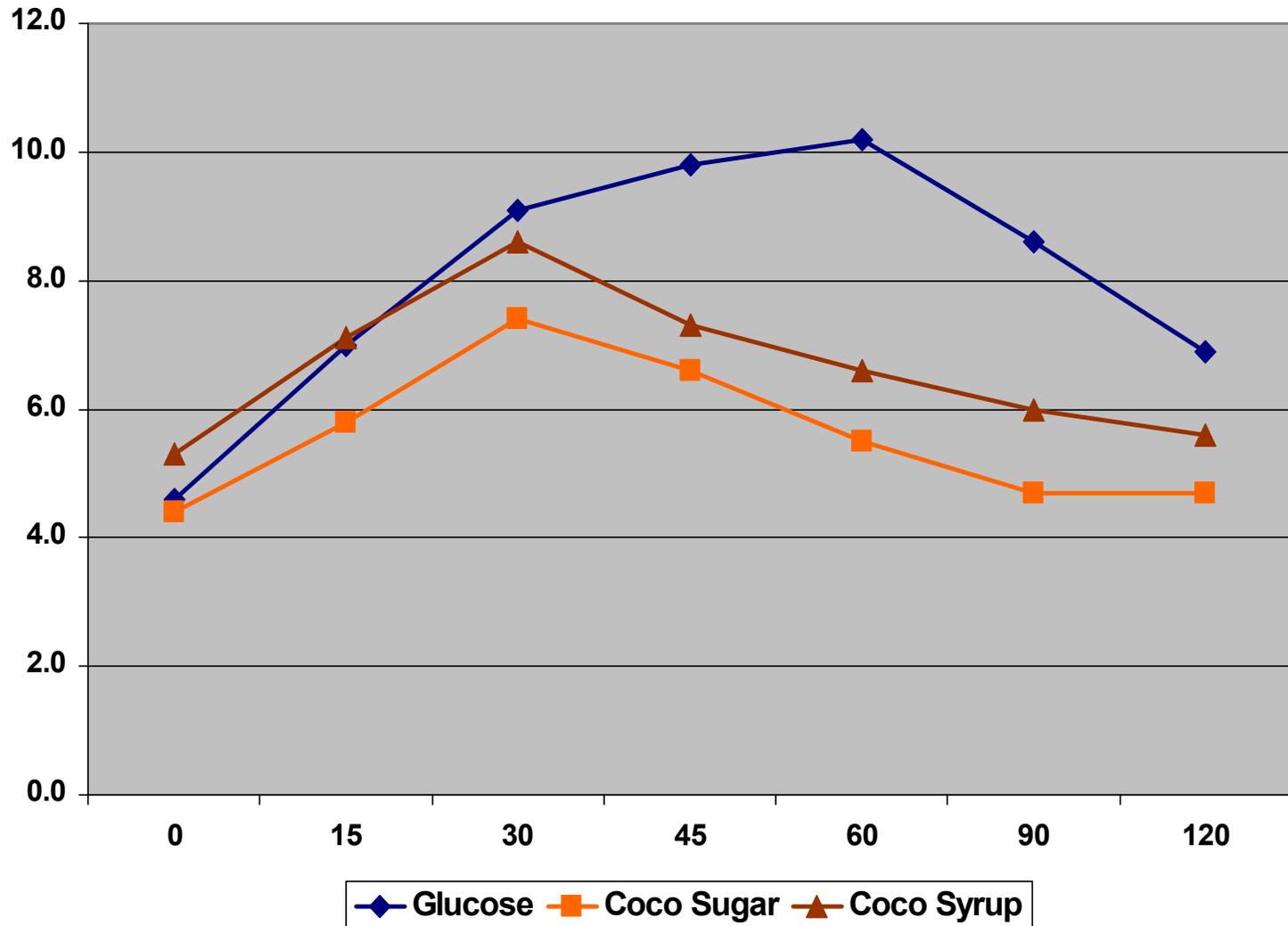
FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



RESULTS

GLUCOSE RESPONSE OF COCO SUGAR/SYRUP AGAINST A STANDARD GLUCOSE SOLUTION





FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



GI OF COCO SUGAR = 35 ± 4
GI OF COCO SYRUP = 39 ± 4



**LOW
GLYCEMIC INDEX
FOOD**



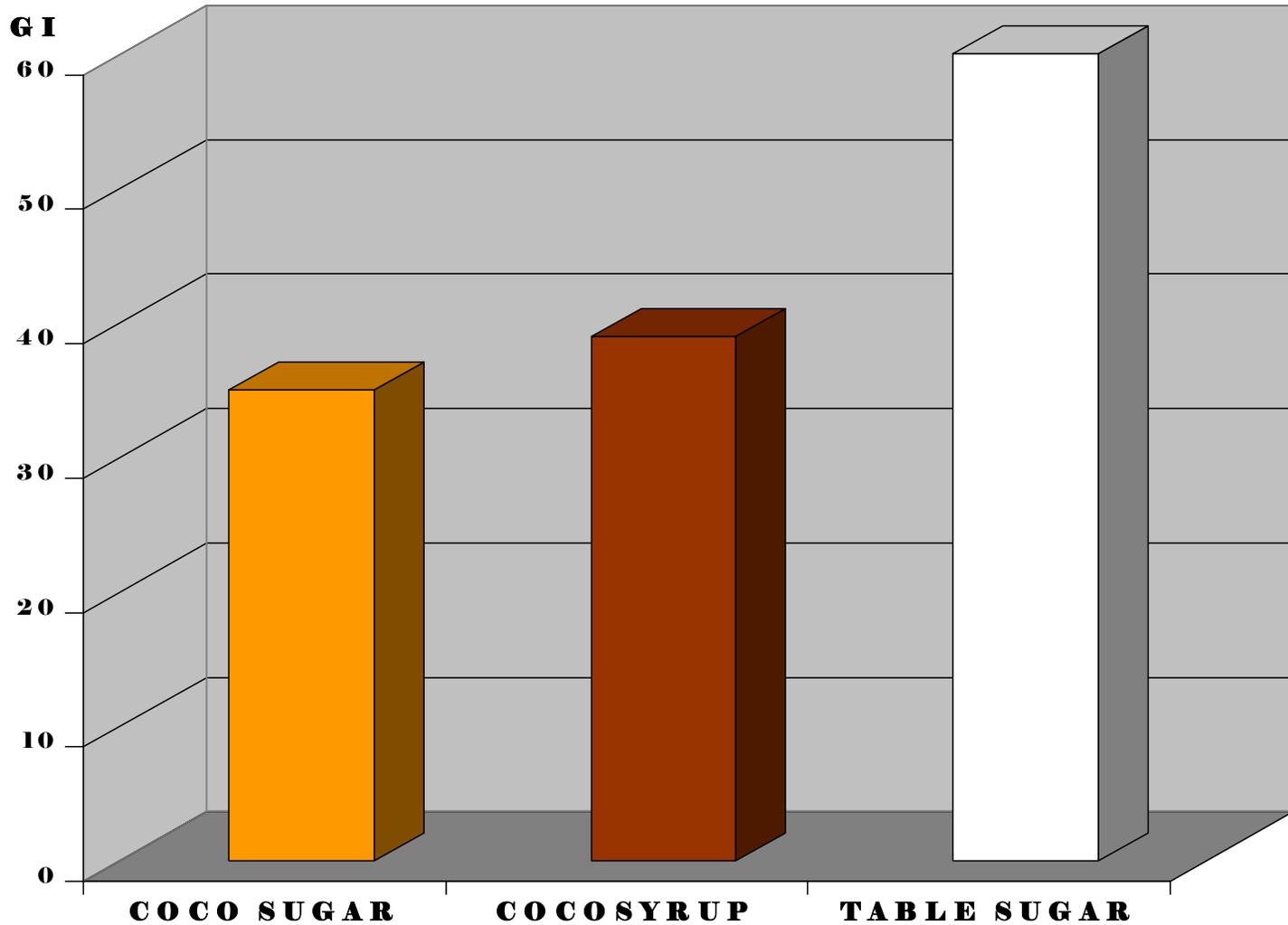
FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



COMPARATIVE GIs OF SUGARS





FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



CONCLUSION AND RECOMMENDATION

- **Coco sugar/syrup is a promising sugar for diabetics**
- **It can be a better substitute for synthetic sugars**
- **Coco sugar/syrup is a conventional food and may not have adverse effect in comparison to synthetic sugars**

A long-term nutrition intervention study should be conducted to validate the results obtained from this study



FNRI

FOOD AND
NUTRITION
RESEARCH
INSTITUTE

DEPARTMENT
OF
SCIENCE AND
TECHNOLOGY



THANK YOU

