

Short Term Effects of Coconut Water and Cocoa on Blood Pressure

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Trinidad & Tobago



Trinidad and Tobago

Carnival



Steel pan



Beautiful beaches



UWI St. Augustine, Trinidad



Background: Hypertension (high blood pressure)

- Definition: systolic blood pressure (BP) ≥ 140 mmHg, and /or diastolic BP ≥ 90 mmHg.
 - Endemic in black population globally and in Caribbean.

Globally PAHO estimates ¹

30% Adult Blacks of African Descent		
Caribbean	US	Africa (non-rural)

<u>Caribbean</u> ²
55% of population over 40 years are hypertensive

1. Zephirin et al. WHO/PAHO 1989

2. PAHO 2011

Additional BP problems for Blacks

Compared to Caucasians Blacks: ¹

- Are twice as likely to be affected > Have earlier age of onset
- Have more severe forms > More difficult to control
- Respond poorly to some treatments (e.g.: ACE inhibitors & Beta Blockers)

Poorly Controlled Hypertension Causes: ²

- | | |
|-----------------|----------|
| •Kidney Disease | > Stroke |
| •Heart Disease | > Death |

1. Wilson et al, Hypertension 1991; Prineas et al, Hypertension in Blacks 1985

2. PAHO 2011

Reasons for study

- Cost of prescription medication beyond many
- Dislike of life-long need for medication
- Many prefer traditional/folklore treatments

OBJECTIVE

To determine which, if any, folklore (traditional) treatments decreases blood pressure

Study 1- Method

Coconut water and Mauby



Water Coconuts
Cocos nucifera (Palmae)



Mauby Drink and Bark
Colubrina Arborescens (Rhamuaceae)

Considered Border-line hypertensive subjects:

- a) Not taking hypertensive drugs
- b) Taking hypertensive drugs but not well controlled
- c) Controls (Normal, non-hypertensive subjects)

Rejected:- diabetics; heart diseased; All chronically ill

Subjects
Received
300 ml:

- 1) Coconut water OR 2) Mauby OR
- 3) Mixture of coconut water & mauby OR
- 4) Drinking water (\pm brown dye) as a control



Coconut being washed



Bottles being sterilised



Bottles being filled

Used the OMRON HEM-737 Digital BP Monitor



**Machine approved for
Research by British Heart
Association**

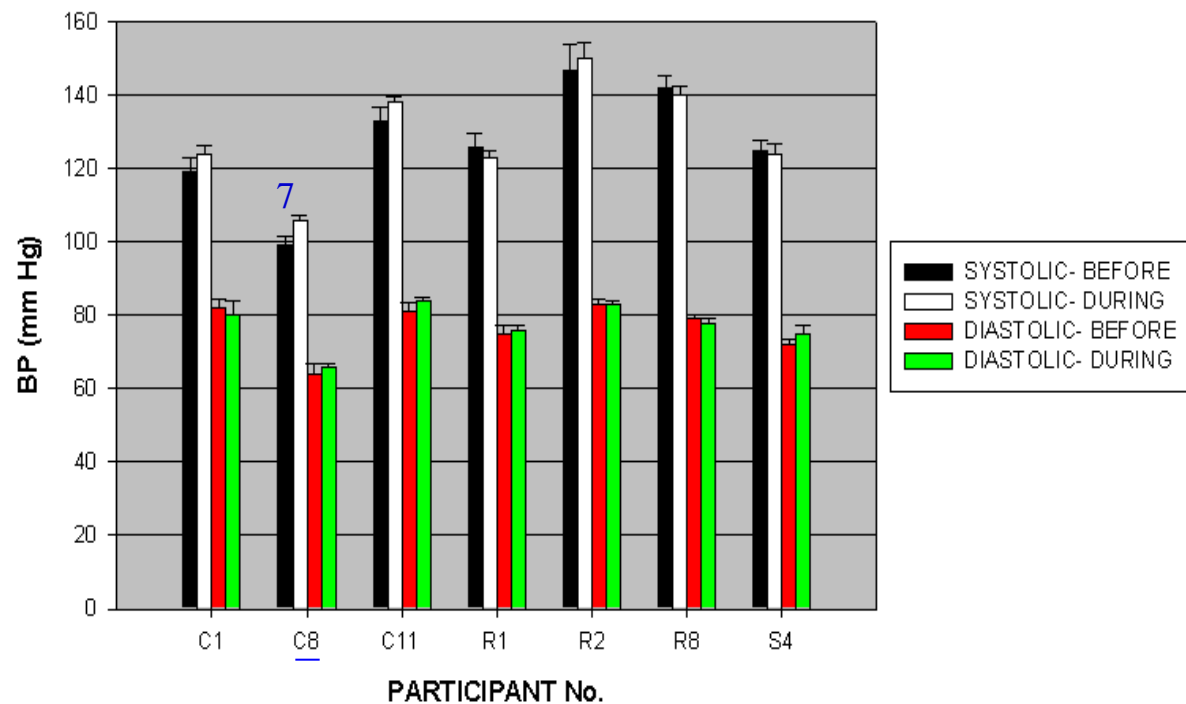
For each subject the Blood Pressure:

- Was taken by same person
- Taken for 2 weeks before & then 2 weeks during treatment/drinks
- Took a minimum of 5 readings in each 2 week period
- Always taken on same days of week & approx. same time
- Subjects rested for 15 mins. before each reading was taken

Results

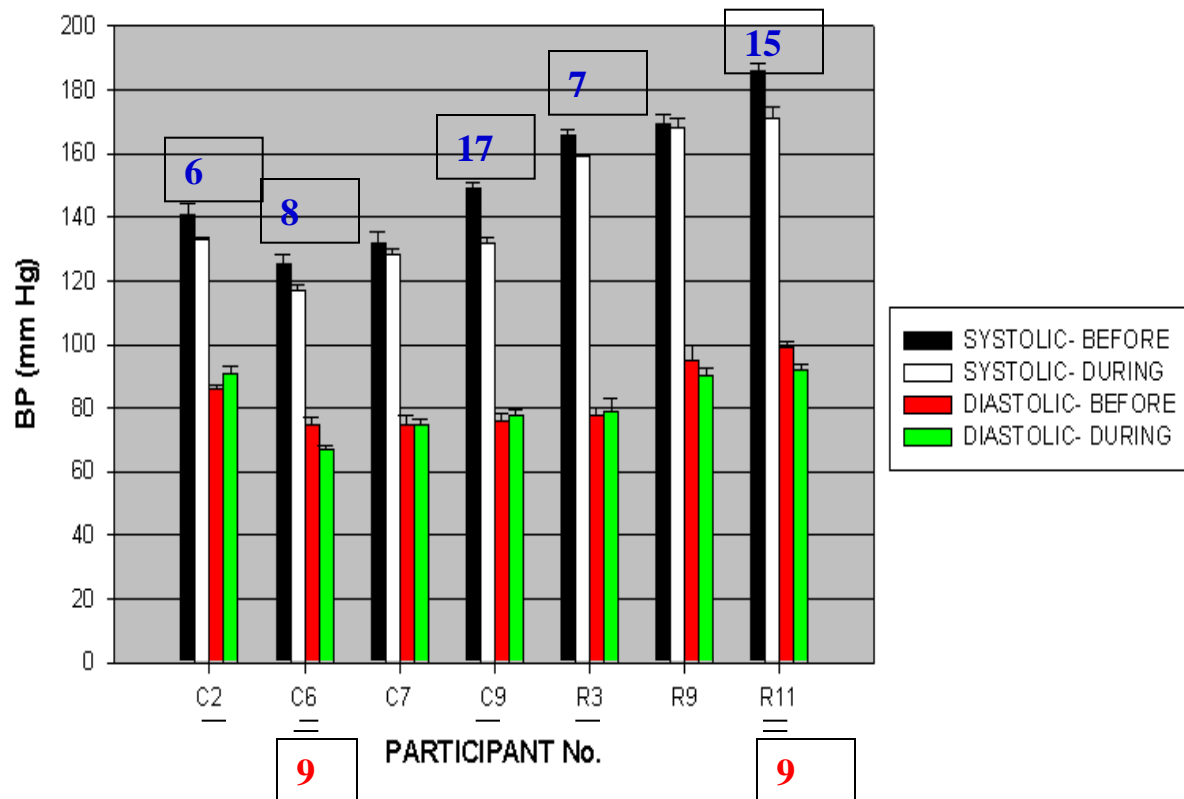
BOTTLED WATER

BLOOD PRESSURE (BP) BEFORE AND DURING CONSUMPTION OF BOTTLED WATER

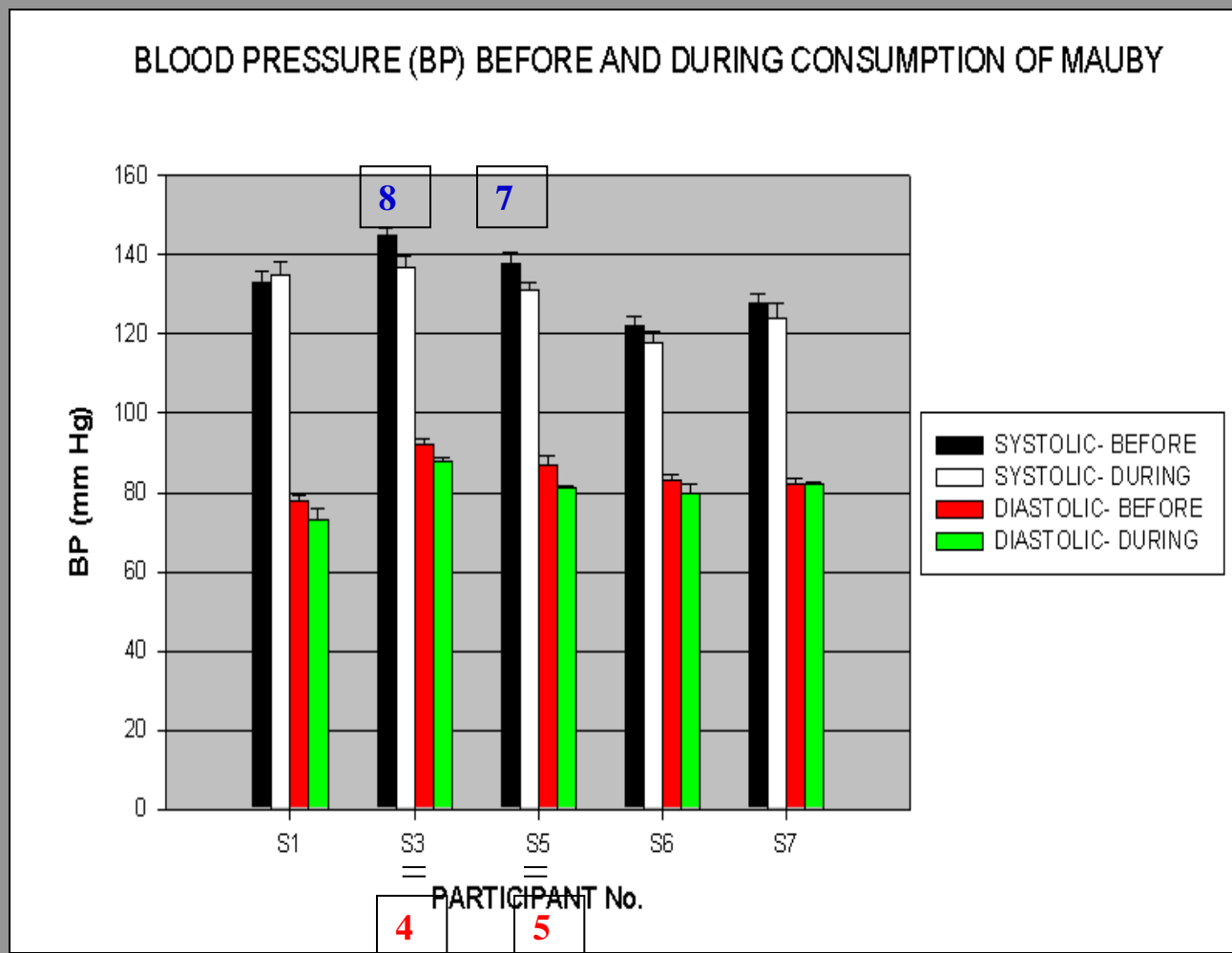


COCONUT WATER

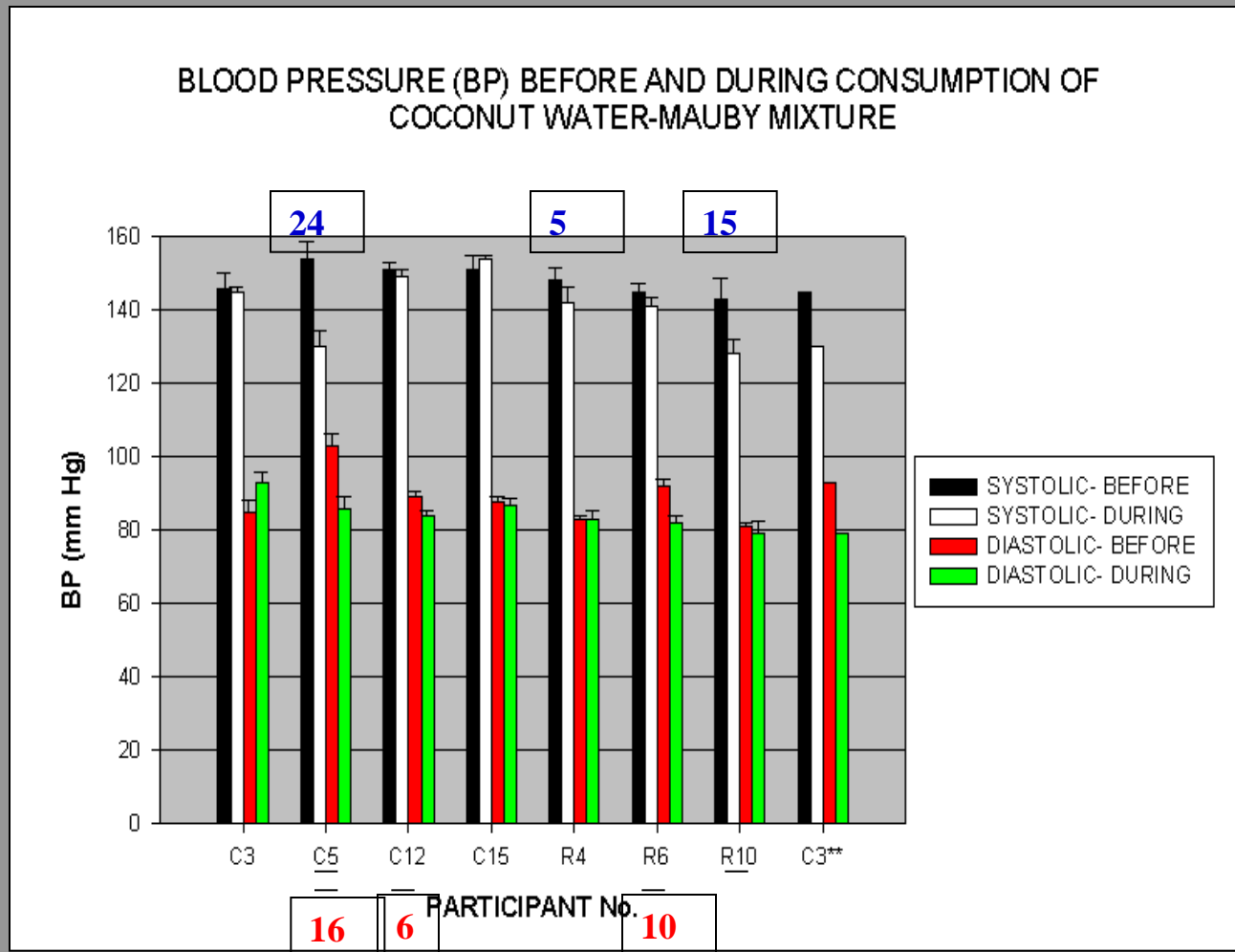
BLOOD PRESSURE (BP) BEFORE AND DURING CONSUMPTION OF COCONUT WATER



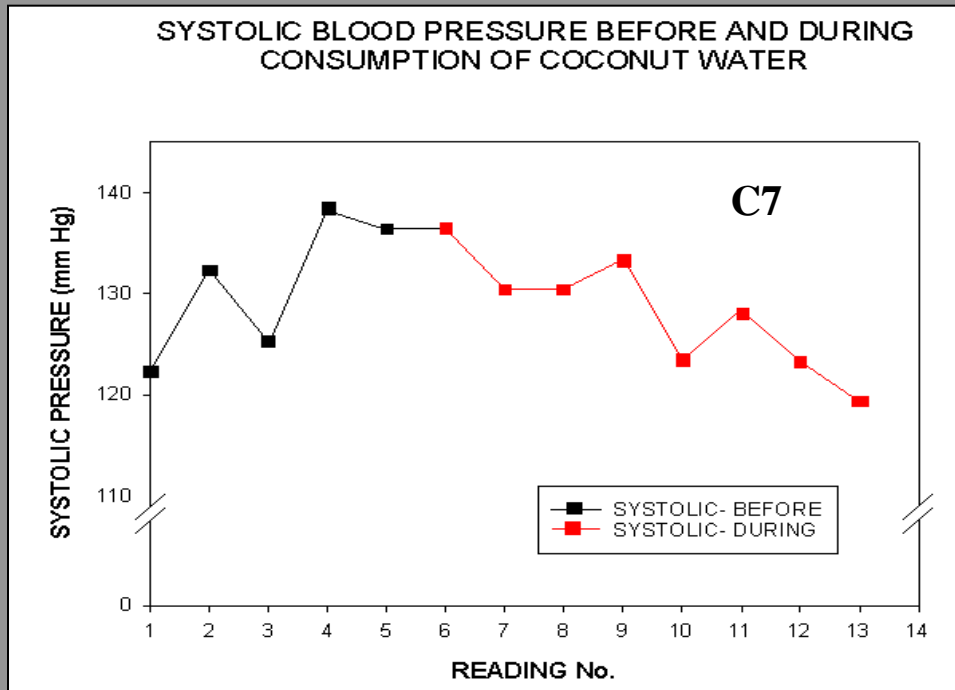
MAUBY



COCONUT WATER / MAUBY MIXTURE



Some Selected Subjects (i) C7: Changes Statistically insignificant BUT



Blood Pressure	Subject
	C7 (CW)
Highest Systolic Before	139
Highest Systolic During	134
Lowest Systolic Before	123
Lowest Systolic During	120
Highest Diastolic Before	81
Highest Diastolic During	81
Lowest Diastolic Before	66
Lowest Diastolic During	67

S6; R4; R9

Behave similarly.

CONCLUSIONS

- Both coconut water and mauby were effective in lowering BP (40-70% of subjects)
- BP decreases were larger when the two were administered as a mixture
- Indication that the effective dose is related to weight of the subject
- But what is the Mechanism of Action?

Preliminary ideas of The Mechanism

1. When the volume of coconut water was doubled (600 ml per day) Subjects complained of a LARGE increase in the amount of urine passed. The placebo (600 ml) did not have this effect.

Coconut water could be/contains a diuretic

2. Preliminary studies detected increase serum potassium in group taking coconut water.

Coconut water could be/contains a potassium sparing diuretic

3. More Preliminary Studies: Found that the BP of normal subjects returned to base line levels 30-60 min after exercise BUT Not so for hypertensives.

If coconut water was consumed before exercise then the BP of hypertensives also returned to base line.

WHY???

Short Term Effects of Cocoa Consumption on Blood Pressure

- Regular/ Long term (2 weeks or more) use of Cocoa/cocoa based products lower B.P¹
- Attributed to flavonoid content²
- But flavonoid content varies with processing.

2 Objectives:

- Compare the flavonoid content of 7 popular brands of cocoa/cocoa based products.
- Determine whether one drink of such products has any short term effects on the blood pressure of hypertensive patients.

1. Taubert et al, JAMA 2007

2. Heis et al, JAMA 2003

Flavonoid Content

7 Top selling brands of cocoa/cocoa based commercial products were selected:

Cadbury

Chief

Milo

Nesquik

Ovaltine

Roma

Richmond Valley

Flavonoid Extraction¹:

Shake 0.5g of each product with 25ml Methanol-water, 50:50 v/v
Then with 25ml Acetone-water 70:30 v/v.

Deduce Flavonoid content from absorbance of extracts at 750nm against a Gallic acid Standard curve.

Flavonoid Content

BRAND	Total Flavonoid (ppm)
A	372.399 ^a ±0.4
B	334.609 ^a ±0.3
C	294.315 ^{ab} ±0.5
D	186.021 ^{bc} ±0.2
E	98.463 ^{cd} ±0.2
F	84.376 ^{cd} ±0.1
G	67.429 ^d ±0.1

Conclusion

Found: All 7 brands tested contained flavonoids.

This suggests all brands have potential health benefits

Four Brands had approximately 2-4 times the flavonoid content of the others tested.

Some companies may wish to review their production methods

Cocoa: Short term Effect on BP

Study Design: A cross over study

Using Brand A Or Placebo

To determine if/how soon after cocoa consumption BP is lowered: By how much and for how long.

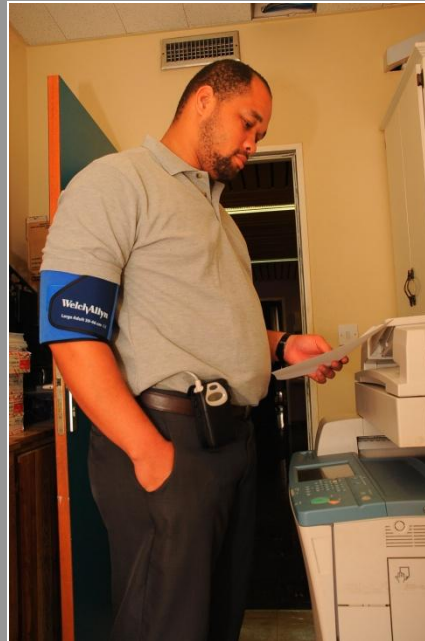
- 29 subjects were selected (15 female and 14 male) between the ages of 35-60 years
- Of these: 15 classified as hypertensive and 14 classified as normal

Patient monitoring

- Each patient was fitted with a Welch Allyn automatic blood pressure monitor for 12-hour periods for two or three days.

Exclusion criteria:

- Smokers
- Terminally ill persons
- Alcoholics
- Diabetics
- HIV positive persons
- Persons with CVD



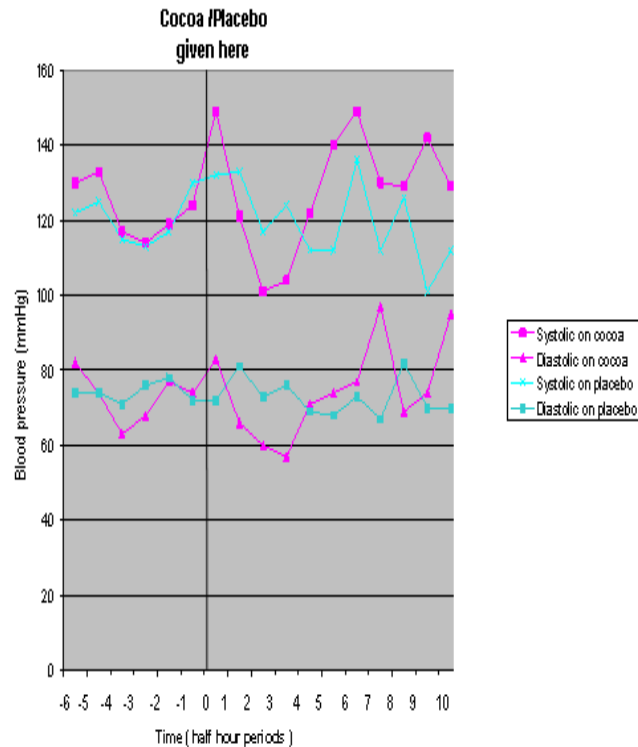
Patient Monitoring (12hrs)

- Measurements taken every 30 min. for 12 hrs from 8 am.
- Cocoa or placebo were taken 3 hrs after 1st reading
- Placebo (water with green food dye)

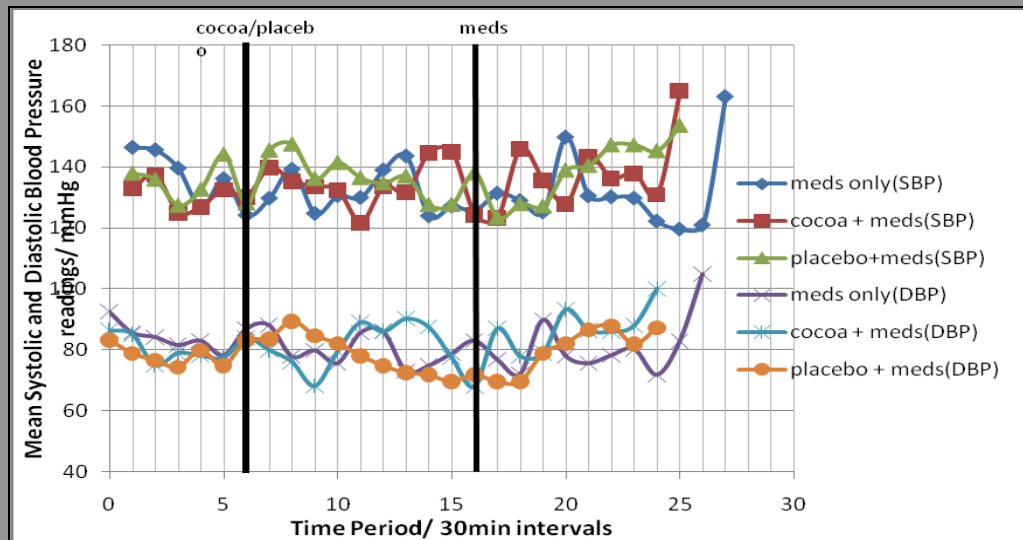
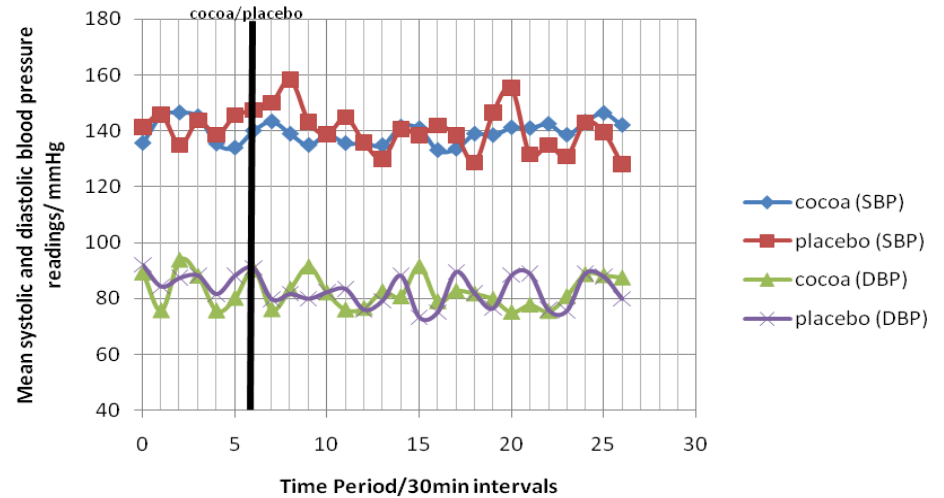
Patient category	Day 1	Day 2	Day 3
Hypertensives Taking Prescribed medication	Prescribed medication at 11 am.	Cocoa/placebo at 11 am.	Placebo/cocoa at 11 am.
Hypertensives not taking medication	Cocoa/placebo at 11 am	Placebo/cocoa at 11 am	—
Non hypertensives	Cocoa/placebo at 11 am	Placebo/cocoa at 11 am	—

RESULTS

Variation in blood pressure patient 1



A typical hypertensive subject



Mean BP values

Conclusions

- A single cocoa drink lowered the blood pressure in hypertensives who normally took medication AND in those who did not take medication.
- A single drink did not appear to lower the blood pressure in non hypertensive subjects.
- Therefore cocoa has both a short term (an immediate) effect AND (from previous studies) a cumulative long term effect on BP. Most probably two different mechanisms are involved.

Thank you



The Cocoa team- Then year 2 Medical Students

Now All Young Doctors

Steelpan- Trinidad and Tobago's National Instrument



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Extraction Method

7 brands of cocoa were selected:

Cadbury	Chief	Milo	Nesquik
Ovaltine	Richmond Valley	Roma	

1. 0.5g of each brand and add 25ml methyl-water (50:50 v/v)
2. shake for 1 hr. at 25 C; centrifuge for 15 min at 3000 x g; keep Supernatant

Extraction method cont'd

3. Add 25 ml acetone-water (70:30 v/v) to pellet and repeat 'step 2'
4. Combined supernatants of steps 2 & 3 and treat with Folin's Reagent
5. Deduce concentration by comparing absorbances against a gallic acid standard curve at 750 nm.

Methods contd.



Coconuts

- Wash
- Empty into 10L plastic containers via strainers
- Dispense into 300ml reusable bottles (sterilised before use)

Mauby

- 180ml commercial mauby / 5L commercial bottled water
- Dispense into 300ml bottles

Coconut Water-Mauby Mixture

- 180ml commercial mauby / 5L coconut water
- Dispense into 300ml bottles

Control/ Placebo

- Commercial bottled water (300ml)± dye

