

MANGO



UPDATE: EXPLORING THE PHYTOCHEMICALS IN IMPORTED MANGOS

PENELOPE PERKINS-VEAZIE, Lane OK
JOHN MANTHEY, Winter Haven FL
USDA-ARS

pperkins-usda@lane-ag.org

WHAT IS IN MANGOS?

- VITAMIN A PRECURSORS (BETA CAROTENE, VIOLAXANTHIN)
- VITAMIN C
- PHENOLIC COMPOUNDS
- CARBOHYDRATES (SUGAR, STARCH)



WHY DO WE CARE?

- **NUTRIENTS FOR HUMAN HEALTH**
- **CAN BE USED AS MARKETING TOOL**
- **NON-NUTRIENTS AND NUTRIENTS
MAY PREVENT CHRONIC DISEASES
(CANCER, CARDIOVASCULAR,
STROKE, AGING)**

OTHER COUNTRIES

- **MANGO IMPORTANT SOURCE OF VITAMIN A**
- **USE STEMS, LEAVES, BARK FOR HOLISTIC MEDICINES**
- **MANY DIFFERENT VARIETIES (>200)**



PURPOSE

- 1. DETERMINE RANGE OF VITAMIN A, VITAMIN C IN MANGOS COMING INTO U.S.**
- 2. DETERMINE IF ORIGIN STRONGLY AFFECTS VITAMIN A, C**
- 3. LOOK FOR PHENOLIC COMPOUNDS OF INTEREST AMONG MANGO VARIETIES**

PROTOCOL

- **MANGOS SHIPPED ON GREEN SIDE (FIRM)**
- **RIPENED AT LANE AT 90% RH, 22-26 C**
- **FIRMNESS OF <1 LB WITH McCORMICK FRUIT TESTER**
- **SLICED FROM KERNAL**
- **50 G FOR VIT C, REMAINDER PUREED**
- **JUICE SQUEEZED ONTO DIGITAL REFRACTOMETER**



TOTAL OF 900 MANGOS

- **SSC, PH, FIRMNESS ON ALL**
- **THOSE WITH BROWNING, CHECKERING DISCARDED**
- **SELECTED 12 FROM EACH SET WITH RANGES OF SSC OF 10 TO 15%, PH OF 3.8 TO 4.5, AND FIRMNESS OF <1 LB**



COMPOSITION OF ALL SAMPLES

<u>VARIETY</u>	<u>NO.</u>	<u>Wt (g)</u>	<u>%SSC</u>	<u>pH</u>	<u>Firmness (kg)</u>
ATAULFO	148	264	18.1	4.14	0.64
HADEN	156	416	13.7	4.20	0.76
KEITT	91	416	14.0	3.61	0.46
KENT	200	410	15.7	4.08	0.91
TOMMY	302	429	12.9	4.03	0.76
ATKINS					

PUREED SAMPLES

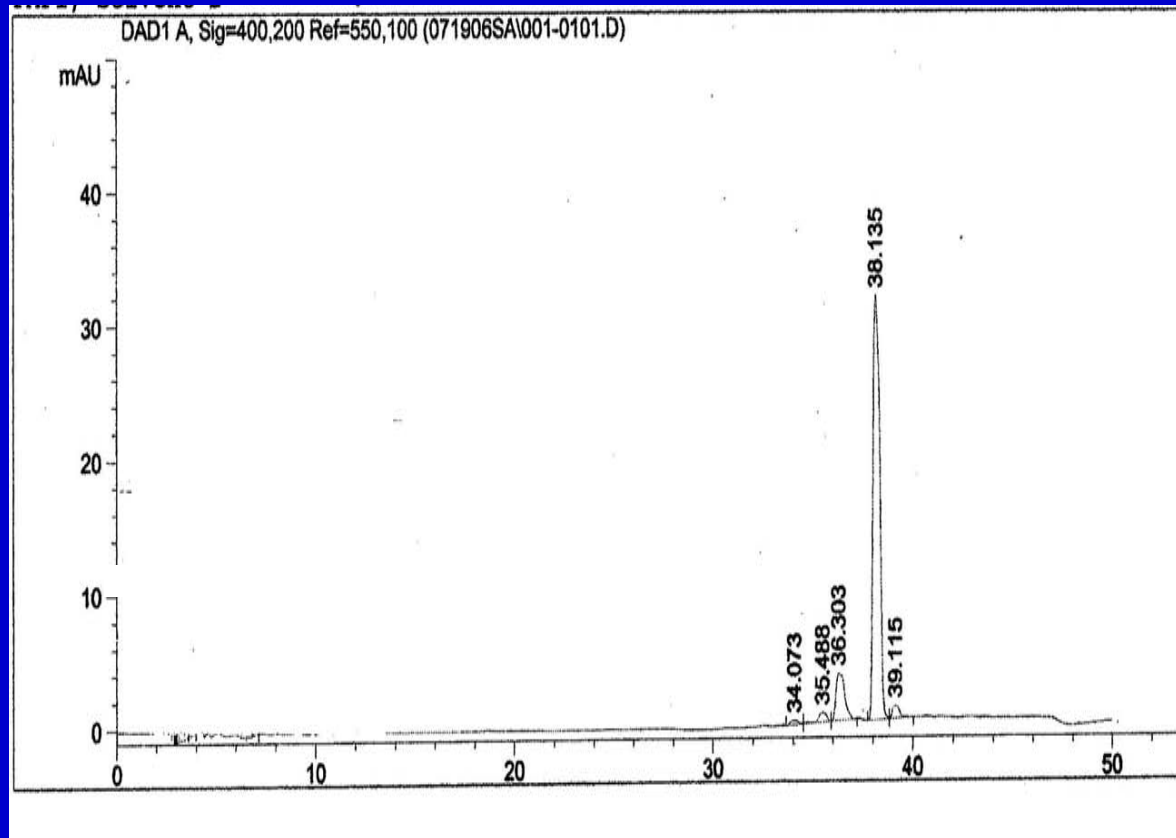
- 12 FRUIT PER DATE, SOURCE, VARIETY WERE SAMPLED FOR CAROTENOIDS AND ASCORBIC ACID
- CAROTENOIDS BY HPLC, ASCORBIC ACID BY COLOR REACTION (HODGES)



COMPOSITION OF SUBSAMPLES

<u>VARIETY</u>	<u>WT</u>	<u>SSC</u>	<u>pH</u>	<u>%DWT</u>	<u>FIRMNESS</u>
ATAULFO	274	18.5	4.06	20.6	0.55
HADEN	415	14.1	4.01	15.1	0.65
KEITT	420	15.1	3.82	17.1	0.60
KENT	420	17.2	4.08	18.5	0.56
TOMMY	423	12.9	4.05	14.6	0.68
ATKINS					

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY



COMPARISON OF FRUITS

<u>VARIETY</u>	<u>(UG/ G)</u> <u>BETA CAROTENE</u>	<u>INT. UNITS (IU)</u> <u>SERVING (160 G)</u>
ATAULFO	27.9a	7440
KENT	16.6b	4427
KEITT	8.3c	2213
HADEN	6.7cd	1787
TOMMY	4.6d	1227

RECOMMENDED DAILY VALUE: 5,000 I.U.

***IMPORTED MANGOS HAVE 20 TO 150% OF VIT A DAILY
VALUE***

ASCORBIC ACID (VITAMIN C)

<u>VARIETY</u>	<u>MG/100G</u>	<u>160G</u>
	<u>TOTAL VITAMIN C</u>	<u>MG/SERVING</u>
ATAULFO	126.0a	202
HADEN	30.0bc	48
KENT	25.9c	41
KEITT	23.5cd	38
TOMMY ATKINS	20.5d	32

RECOMMENDED DAILY VALUE: 60 MG

ALL VARIETIES PROVIDE 50 TO 340% DAILY VALUE

COMPARISON OF ORIGIN

<u>VARIETY</u>	<u>ORIGIN</u>	<u>SSC</u>	<u>BCAROTENE</u>	<u>VITC</u>
HADEN	MEXICO	14.2	8.1	33.4
	PERU	13.5	5.1	27.1
KENT	MEXICO	16.2	21.8	27.4
	ECUADOR	18.4	12.4	26.0
	PERU	15.0	8.1	22.2
TOMMY	MEXICO	13.8	5.8	20.1
ATKINS	ECUADOR	13.4	4.5	20.2
	PERU	13.8	5.1	15.1
	BRAZIL	12.3	4.7	17.0

PHENOLIC SIDE

- Complete mango puree extractions and HPLC analyses of complex phenolic gallic acid conjugates.
- Improve and complete analysis of phenolic compounds in HPLC chromatograms
- Complete HPLC-MS measurements of mangiferin and ellagic acid conjugates
- Complete Folin Assay of phenolic content
- Complete DPPH antioxidant assay



TOTAL PHENOLIC CONTENT

GALLIC ACID EQUIV (MG/KG)

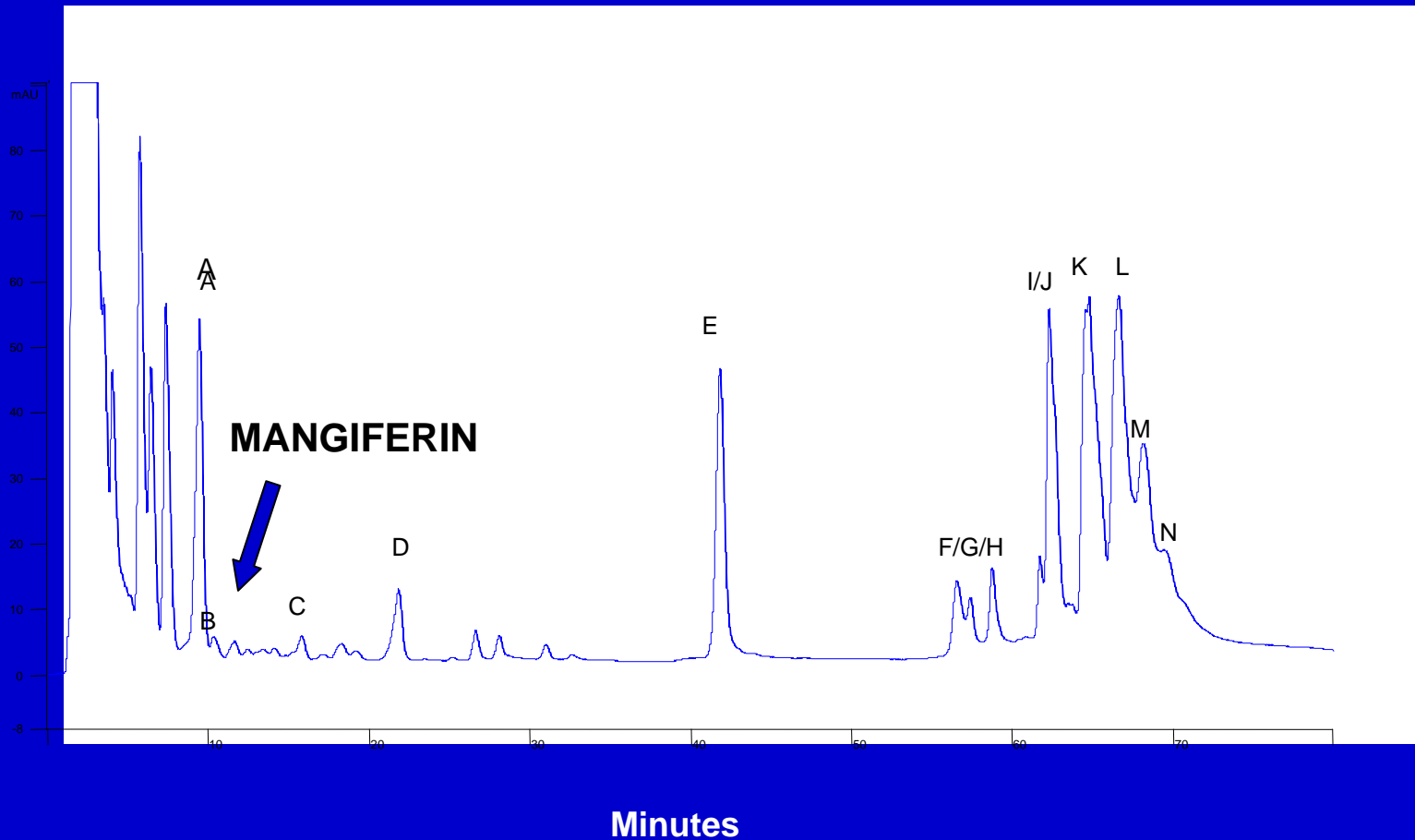
ATAULFO **806 -1395**

HADEN **394-509**

KENT **374**

TOMMY AT. **236-406**





HPLC-MS chromatogram (275 nm) of mango extract exhibiting UV properties of gallic acid conjugates.

PLAN

1. PUBLISH DATA ON VARIETIES, BETA CAROTENE, ASCORBIC ACID CONTENT IN NEXT 3 MONTHS
2. PHENOLIC DATA IS MUCH MORE DETAILED AND WILL BE PUBLISHED NEXT YEAR
3. USE THE FIRST PUBLICATION TO GENERATE INFORMATION ON IMPORTED MANGOS
4. USE SECOND PUBLICATION TO DETERMINE EXACTLY WHAT TYPES OF PHENOLIC COMPOUNDS ARE IN MANGO, AND USE THIS TO EXPLAIN MECHANISMS OF ACTION IN ANIMAL STUDY



SUMMARY

**ATAULFO IS CONSISTENTLY HIGH IN
MANY COMPOUNDS**

**NOT UNIQUE AMONG MANGOS-BRAZIL
HAS ONE (UBA) SHOWING SIMILAR
HIGH VALUES**

**TOMMY ATKINS IS A BASELINE LEVEL
HADEN, KENT, KEITT ARE
INTERMEDIATE**

SUMMARY (CONT)

**SOURCE (COUNTRY, ZONE) HAD
SLIGHT INFLUENCE ON VALUES
BUT, VARIETY WAS OVERWHELMING IN
DIFFERENCES**