Science Behind the Superfruits

Liwei Gu
Food Science & Human Nutrition

Univesity of Florida
Superfruits, the history

- A marketing term created in 2004
- Refer to fruits of exceptional nutrient and antioxidant richness
- Mainly developed into juice
- Forecast to become a $10 billion global industry by 2011
Superfruits Under Spotlight

Worldwide SKU, 2006

- Pomegranate: 311
- Açaí: 71
- Mangosteen: 10
- Noni: 45
- Goji, or wolfberry: 54
- Cranberry: 658 million pounds*

Todd Runestad, *Functional Ingredients* market overview, 10/2007
SKU, Stock keeping unit
*US Census Bureau, November, 2004
Juice of Superfruits in a Wal-Mart supercenter in Gainesville

September 8th, 2008,
The Emerging Candidates

- Maqui berry
- Indian gooseberry
- Yumberry, “Yang Mei”
- Guarana
- Cupuaçu

- Cape gooseberry
- Seabuckthorn
- Acerola
- Baobab
# Evaluation of Scientific Evidences

<table>
<thead>
<tr>
<th>Types of Research</th>
<th>Scientific strength</th>
<th>Cost and difficulties to carry out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term clinical trial</td>
<td>☺☺☺☺☺☺</td>
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<td>Animal disease models</td>
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<td>Cell culture studies</td>
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<tr>
<td><em>In vitro</em> antioxidant activity</td>
<td>☺</td>
<td>☺</td>
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<tr>
<td>Nutrient composition study</td>
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What is ORAC?

- Refers to “Oxygen Radical Absorbance Capacity”
- An index for antioxidant capacity, measures the capacity of scavenging peroxyl free radicals
- Developed by Ronald Prior and co-workers in USDA
- Widely adopted by the food industry
Superfruits reported to have exceptionally high ORAC

- Maqui berry, Indian gooseberry, Açaí, pomegranate, Cranberry, Goji berry, Blueberry

ORAC is expressed on the basis of weight (TE/g)

- Extract > freeze dried powder > air dried powder > fresh fruits

One cannot over extrapolate the meaning of ORAC, or directly translate high ORAC to health effects
Phytonutrients (phytochemicals)

- Are plant-derived chemicals, not essential nutrients; Have no established Dietary Reference Intake
- Are structurally diverse, can be divided into many groups
- Believed to be active components in many dietary supplements
  - Grape seed extract – procyanidin
  - Ginkgo extract – terpenoid
  - Ginseng – ginsenoside
The best-known phytonutrients that contribute to antioxidant capacities:

- **Anthocyanins** – Açaí, cranberry, blueberry
- **Procyanidins** – Cranberry, blueberry
- **Hydrolysable tannins** – Pomegranate
- **Xanthone** – Mangosteen
- **Lignans** – Noni
Superfruit #1 Açaí

✓ Grows in the Amazon rain forest of Brazil

✓ Seed 80%, pulp & skin 20%

✓ Featured on Oprah and other public media

# Research Summary of Açai

<table>
<thead>
<tr>
<th>Types of Research</th>
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<td>Cell culture studies</td>
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<td>Cancer cell apoptosis</td>
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<tr>
<td>Antioxidant activity</td>
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<td>High ORAC</td>
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<tr>
<td>Nutrient composition</td>
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<td>High anthocyanin content</td>
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</table>

Ovid.com and Pubmed.gov accessed 8/31/2008
What can we say about Açaí?

- A few *in vitro* studies on health benefits
- Possess high antioxidant capacities and anthocyanins

Major phytonutrients in Açaí

Cyanidin 3–glucoside

Cyanidin 3–rutinoside
Superfruit # 2 Pomegranate

Originated in the Middle East and India

Major areas of cultivation are India, Spain, Israel, and the United States

Clinical Trials on Pomegranate

3 clinical trials completed, 14 trials in progress

<table>
<thead>
<tr>
<th>No. Of Trials</th>
<th>Conditions</th>
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<tbody>
<tr>
<td>7</td>
<td>Prostate cancer*</td>
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<tr>
<td>3</td>
<td>Diabetes</td>
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<tr>
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<td>Benign Prostatic Hyperplasia</td>
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<tr>
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<td>Atherosclerosis</td>
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<tr>
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<td>Coronary Artery Disease</td>
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<td>1</td>
<td>End Stage Renal Disease</td>
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<td>1</td>
<td>Common Cold</td>
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<tr>
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<td>Influenza</td>
</tr>
<tr>
<td>1</td>
<td>Follicular Lymphoma</td>
</tr>
</tbody>
</table>

* Interim results from one trial suggested positive outcome

Clinicaltrials.gov accessed 9/15/2008
Super fruit #3 Mangosteen

Originated and cultivated in southeast Asia

Endocarp (edible)

Exocarp

Xanthones
More about mangosteen

- The edible endocarp has appealing fragrance and taste
- Endocarp contains little antioxidant strength and phytonutrients
- The exocarp contain xanthones as major phenolics, and also contain proanthocyanidins
- Exocarp phenolic extract are often added to mangosteen juice to produce a purple color and astringency
Superfruit #4 Noni

- Native to the Pacific islands
- A small evergreen tree in the open coastal regions
- Grows abundantly in Hawaii

Asuperlosidic acid
Superfruit #5 Goji berry

- Grows world wide
- Commercial cultivation in China
- Possess Food/Drug dual status in Chinese regulation

zeaxanthin
Summary of Mangosteen, Noni and Goji

- There are many *in vitro* studies and a few animal models suggesting health benefits.

- None of the effects have been confirmed in human clinical trials.

- No clinical trial yet for Mangosteen and Goji. The results of one clinical trial on Noni have not been published.
Superfruit #6 Cranberry

- A fruit native to North America
- Best known for urinary tract infection prevention

A-type Procyanidin
Clinical Trials on Cranberry

5 clinical trials completed, 14 trials in progress

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<td>Urinary Tract Infection</td>
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<tr>
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<td>Cardiovascular Disease</td>
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<td>2</td>
<td>Pregnancy</td>
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<tr>
<td>1</td>
<td>Type 2 Diabetes</td>
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<tr>
<td>1</td>
<td>Bacterial Vaginosis</td>
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</table>

* 6 trials were founded by NIH. Results were not published.
I like it because I like it

- There is no scientific criteria to define “Superfruits”
- For many fruits, there is little or no research
- Results from *in vitro* studies are often over extrapolated, even distorted in the media
- Very few or no claimed health benefits had been confirmed by controlled long-term clinical trials

More studies are needed
Thank You