
Superfruit should have these attributes and also be important for human health.
Postharvest requirements: farm to market and is there a case for certifying superfruit?

Errol W. Hewett
Institute of Food, Nutrition and Human Health
Massey University, NEW ZEALAND

ewmrhewett@xtra.co.nz

Superfruits Symposium: myth or truth? Ho Chi Minh City, Viet Nam, 1 – 3 July 2013
Superfoods – 14 flagship foods said to confer health and wellbeing – most are fruit

- Blueberries
- Oranges
- Beans
- Broccoli
- Oats
- Pomegranate
- Pumpkin
- Salmon
- Soy
- Spinach
- Tea (black and green)
- Tomatoes
- Turkey
- Walnuts
All fruit are super.

But are some fruit more super than others?
Superfruit – a marketing boom?

• A superfruit has appealing taste and appearance
• 1) high nutrient density,
• 2) superior antioxidant quality,
• 3) health benefits.
• The popularization of superfoods means that many food and drinks now have a 'health-halo' which significantly influences consumer preferences.
Major superfruit

• Use of term ‘superfruit’ on labels banned unless specific nutritive and health attributes have been scientifically demonstrated, e.g. cranberries; too many spurious claims?
• Red, purple, black flesched fruits have high antioxidant activity plus increasing number of health conferring attributes.
• Increased number of processed products (juices, purees, cosmetics) using combinations of superfruit.
Supermarketing

The BIG 3 benefits of SUPERFOODS:
Antioxidants, Nutrients, Fiber

1. ANTIOXIDANTS protect the body from free radicals, which are harmful to the immune system. They can damage cells, tissues, and organs. Antioxidants can slow this process.

2. NUTRIENTS: Superfoods contain a variety of nutrients, including vitamins and minerals, that are essential for good health. They can help to prevent chronic diseases such as heart disease, cancer, and diabetes.

3. FIBER: fiber-rich superfoods can help to improve digestion, lower cholesterol, and control blood sugar levels.

Sample Superfoods ORAC Values (per 34g-62 grams):

- Blueberries: 15,000
- Blackberries: 9,000
- Raspberry: 8,000
- Blackcurrant: 7,000

Supplementing with SUPERFOODS:
Super ways to eat right when time is tight.

The best for your Anti-Aging Regimen.

Meet our Anti-Aging Superfoods:

- Broccoli
- Galangal
- Pomegranate
- Ginger
- Cinnamon
- Spinach
- Ginseng
- Bilberry
- Kiwi
- Garlic

Superfoods for your Heart

Superfoods

All fruits and vegetables are good for you, but certain fruits and vegetables are Superfoods because they are super-rich in nutrients, which have proven targeted health benefits.

Superfuits

Power-up Your Health with Pomegranate, Açai, Gac, Mangosteen, and Goji

Superfruits

Nature's Bounty of Nutrition & Health

Paul M Gross, PhD
Xiaoping Zhang, MD
Richard Zhang

Wolfberry

4 Nutritional Reference for China's Ancient Herbal Treasure

枸杞子

Barbara Wexler, MPH
Superfruit

Plumegranate – a new plum from Israel

Cranberry

Blueberry

Elderberry

Concord grape

Pomegranate

Raspberry

Bilberry

Chokeberry

Boysenberry

Black currants

Blackberry

Goji berry
Tropical and subtropical **superfruit**
Baobab tree - *Adansonia digitata*

- Baobab grown in African countries in the savannah around the equator.
- Underutilized and not cultivated.
- Baobab is a supertree as all plant parts are useful to man and animals.
- Bark, leaves, fruit, seeds and trunk are all used.
- Leaves are used for condiments and medicines.
Superfruit are very perishable as are all fruit.

• All fruit have limited shelf life.
• All are susceptible to physical, physiological and pathological damage during and after harvest
• Most superfruit from tropical or subtropical regions and have relatively short postharvest lives.
• Supply chain management critically important.
Supply chain concept

- Consumer satisfaction is the key and will ensure profits for all when quality maintained and losses minimised.
- Growers must understand the supply chain.
- Communication between all players along chain is essential.
- Constraints should be identified and fixed.
- Use available IT systems for real time product monitoring and connections along chain.
Key factors affecting postharvest quality

• Preharvest factors.
• Breeding and selection - cultivars must have desired attributes of size, shape, colour, juiciness and texture and taste.
• Cultivars with pest and disease resistance, long shelf life, high nutritional status.
• Tree management – pollination, pruning, thinning, spraying to optimise fruit quality.

• Nutrition, irrigation, fertilization, pest and disease control.
Harvest maturity

- Optimum harvest maturity will depend on planned market; different for local and export.
- Too immature – lack of flavour, aroma and sweetness; susceptible to disorders, chilling injury and damage.
- Over mature – rapid senescence, softening, insipid flavour, susceptible to pathogens and physical damage.
- Physiological studies required to determine respiration and ethylene rate changes;
- Are fruit climacteric or nonclimacteric?
Harvesting

• Harvesting - coordinate with packaging, storage and marketing strategy.
• Avoid physical damage to products
• Train staff to adopt strict hygiene protocols – clean hands, short fingernails.
• Where possible harvest during cool time of day – e.g. early morning.

• Supermarkets must not be allowed to dictate harvesting time
Temperature management
Most effective method to extend shelf life

• Postharvest deterioration is a function of temperature
• Place into shade and remove field heat quickly after harvest through precooling.
• Store at optimum temperature to reduce C₂H₄ production and action as well as respiration.
• Avoid chilling temperatures
Chilling injury [CI]

- Most tropical and subtropical fruit susceptible to CI.
- CI is result of physiological damage when products exposed to low BUT not freezing temperatures.
- Range of symptoms of CI – include pitting, water soaking, internal browning but eventually decay.

<table>
<thead>
<tr>
<th>Temp</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Jujube</td>
</tr>
<tr>
<td>4</td>
<td>Avocado (some cvs), lychee, tamarillo</td>
</tr>
<tr>
<td>5</td>
<td>Cactus pear, durian, guava, longan, mandarin, orange, feijoa</td>
</tr>
<tr>
<td>7</td>
<td>Some avocado cvs., olive, pineapple, pomegranate</td>
</tr>
<tr>
<td>10</td>
<td>Carambola, lime, mango, papaya, grapefruit, some melons, passion fruit, rambutan, water melon.</td>
</tr>
<tr>
<td>13</td>
<td>Banana, breadfruit, cherimoya, mangosteen, jackfruit.</td>
</tr>
</tbody>
</table>
Temperature summary

• Harvest products during cool of day - early morning or late evening
• Remove harvested product from direct sunlight, preferably into shade;
• If possible have packhouse cooled, or at least with good ventilation;
• Different technologies are available for rapid cooling of product after harvest
• Forced air cooling is applicable for many products;
• Hydro cooling can be used for fruit;
• Avoid chilling temperatures;
• Mobile units are available for forced air and hydro systems
Ethylene

- Simple naturally occurring gas produced by all products
- Also produced from internal combustion engines, gas burning machines, industrial pollution and rotting vegetation.
- Positive and negative affects on quality.
Ethylene affects

- Positive affects: induces and modulates ripening
- Negative affects at very low concentrations: induces premature ripening, senescence and deterioration
- Avoid postharvest exposure to ethylene through chain
- Rotting fruit produce ethylene

Phoma caricae- papayae
1-MCP SmartFresh<sup>SM</sup>

- Gas that inhibits ethylene action
- Patented application system released in air tight rooms
- Approved for use on melon, avocado, persimmons and kiwifruit in some countries.
How to reduce ethylene affects

• Avoid exposure to pollution that contains ethylene.
• Avoid physical, physiological and pathogen damage during harvesting, handling, packing, storage and transport
• Remove all reject product from packhouses and coolstores;
• Use electric forklifts in packhouses and coolstores;
• Use ethylene scrubbers to reduce ethylene concentrations;
• Run coolstores efficiently; maintain recommended temperatures to minimize ethylene production by products
• If permitted treat with SmartFreshSM;
• Use long life cultivars that have reduced production of and susceptibility to ethylene
Postharvest pathogens and decay

- Most products resistant to most organisms
- Pathogen losses result from:
  - physical damage during harvest and handling
  - product stored too long after harvest
  - sustained chilling injury
  - physiological stress during the growing season

- Postharvest pathogens include:
  - *Rhizopus stolonifera*
  - *Botrytis cinerea*
  - *Alternaria alternata*
  - *Colletotrichum spp.*
  - *Fusarium sp.*
Packaging – the 3 Ps

- **Protection**: from physical, physiological and pathological damage
- **Preservation**: shelf life extension; $C_2H_4$ scrubbing; active packaging ($O_2$ scavenging).
- **Presentation**: brand/logo for promotion, product traceability. Final presentation displays.
Traceability

• Essential tool – food safety and biosecurity drivers
• Electronic product code identification, bar coding and RFID systems prevalent
• New technologies and systems becoming cheaper
• Cheap disposable sensors
Certification – is it needed?

• Before certification can be created the following is needed:
  * Scientific proof required for health benefits of specific fruit.
  * Information required on component uptake in humans and subsequent positive physiological response.
  * Determination of component concentration or effectiveness as influenced by environment (including soil type, temperature, rainfall, biological stressors).

• More R&D essential to prove specific health benefits; collaboration between horticultural, food and medical scientists using ‘omics.
A challenge

• Actinidia [kiwifruit] genera have different composition and amounts of components.
• Grown in many regions of world.
• Will vary in chemical composition depending on growing environment.
• How can this be included in standard definition?
GAP

- To meet market demands GAP must apply for all fruit –super or otherwise – to meet market requirements.
- Food safety, quality and price will continue to influence consumer purchase decisions.
- Knowledge about proven health benefits will hopefully increase sales of tropical and subtropical fruit internationally if marketed professionally.
The future

- Superfruit will remain a marketing term but only when scientific proof exists.
- Some people might care where such fruit are grown.
- But for most consumers generic fruit type and generic health benefits will be more important than locality of production.
- Most important objectives are:
  * to get more people in more markets to eat more tropical and subtropical fruit;
  * to eat a more diverse range of fruit on a daily basis.
- If Superfruit terminology promotes this then that is just fine but must not decrease diverse fruit intake.
Does use of the word **SUPERFRUIT** de-emphasise the importance and value of other fruit? Yes.

Does it matter? Yes.
The end
Baobab leaves and fruit are edible. Fruit is eaten raw or processed into a local drink in Nigeria called “Kunnu” – a kind of yoghurt. Leaves rich in vitamin C, sugars, potassium tartrate and calcium. Fruit and seeds rich in macro- and micro-nutrients and amino acids.
R&D and superfruit

- Plant hunting – seek out and utilise botanical biodiversity in flora
- Plant selection and plant breeding to develop unique cultivars
- Know your fruits – biochemical and metabolomic studies to identify nutritive and health conferring properties
- Identify unique characteristics for use as key attributes for eventual marketing emphasis
- Develop efficient, productive, sustainable [GAP] production and postharvest systems