Novelty. Flair. Allure. Sexy. Quality.

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?

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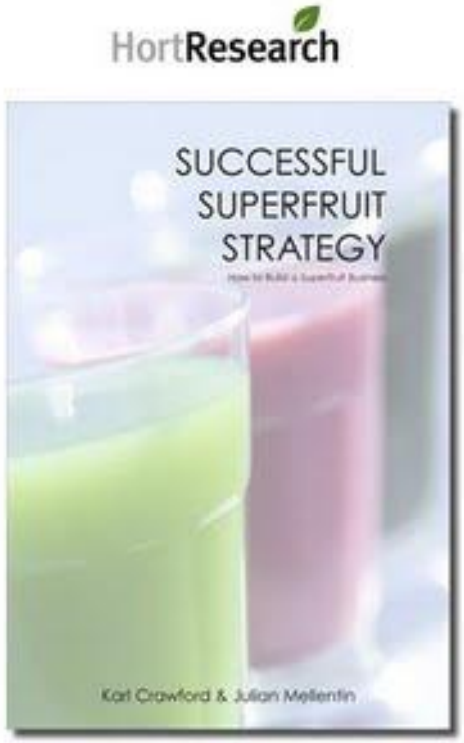
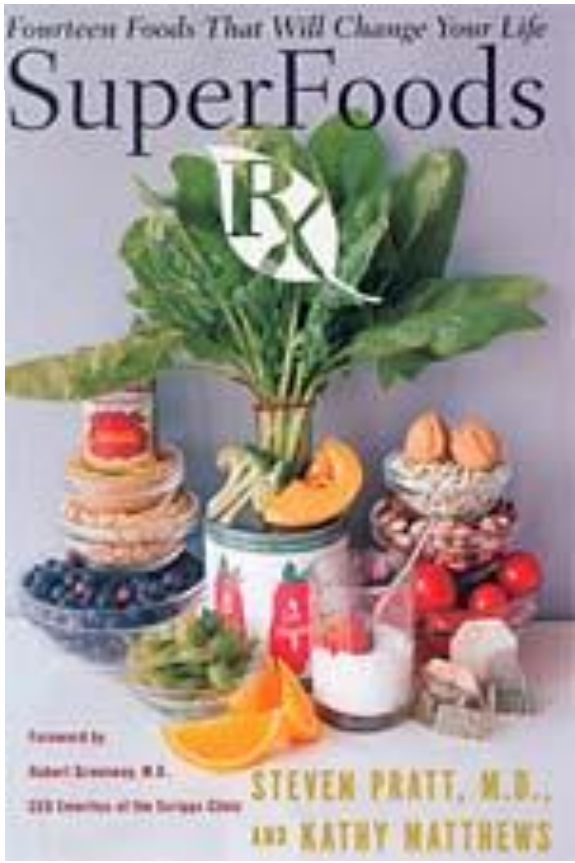
Superfruits Symposium: myth or truth? Ho Chi Minh City, Viet Nam, 1 – 3 July 2013

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?

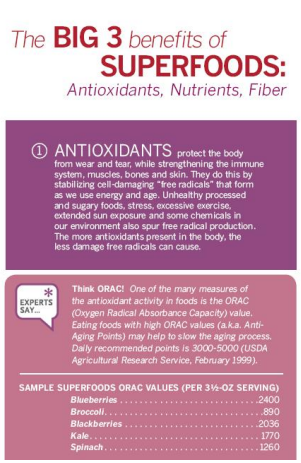
Superfruit – a marketing boom?

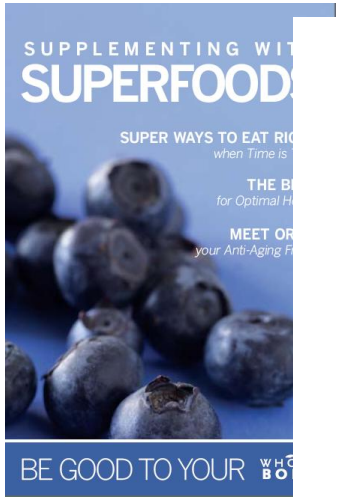
- A superfruit has appealing taste and appearance
- 1) high nutrient density,
- 2) superior antioxidant quality,
- 3) health benefits.
- *The popularization of superfoods means that many food and drinks now have a '**health-halo**' which significantly influences consumer preferences.*"

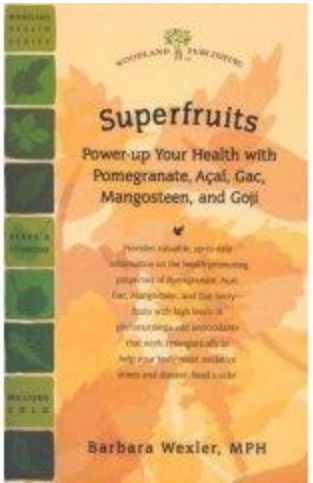
Major superfruit

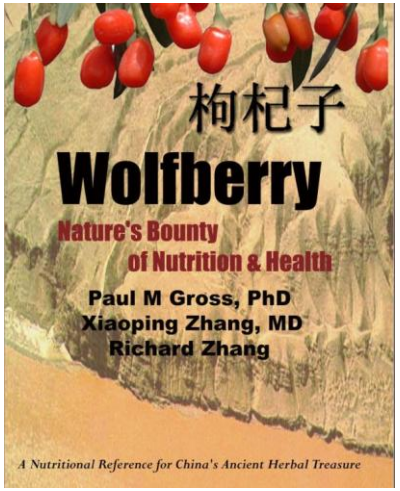
- Use of term ‘superfruit’ on labels banned unless specific nutritive and health attributes have been scientifically demonstrated, e.g. cranberries; too many spurious claims?
- Red, purple, black fleshed fruits have high antioxidant activity plus increasing number of health conferring attributes.
- Increased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

Supermarketing









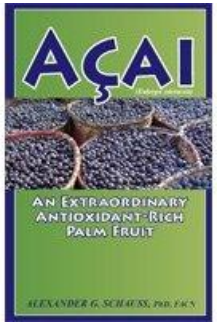
Plumegranate – a new plum from Israel

Superfruit

Cranberry

Elderberry

Concord grape



Blueberry

Pomegranate

Raspberry

Bilberry

Chokeberry

Boysenberry

Black currants

Blackberry

Goji berry

Tropical and subtropical **superfruit**

Baobab tree - *Adansonia digitata*

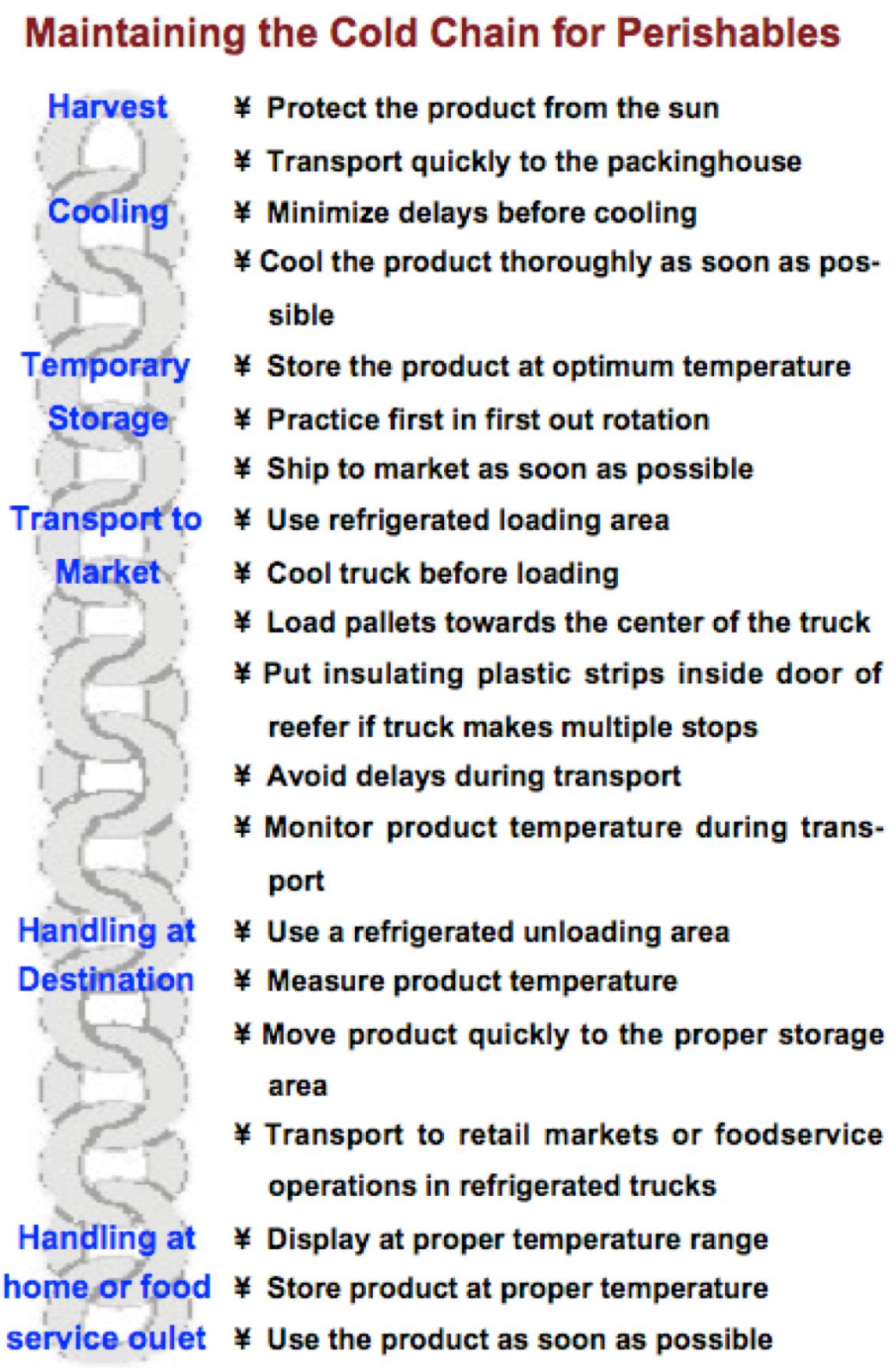
- Baobab grown in African countries in the savannah around the equator.
- Underutilized and not cultivated.
- Baobab is a supertree as all plant parts are useful to man and animals.
- Bark, leaves, fruit, seeds and trunk are all used.
- Leaves are used for condiments and medicines

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.

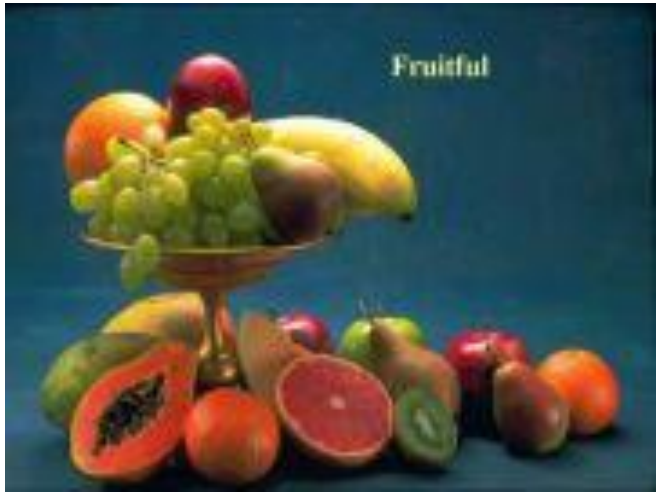
Supply chain concept

- 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?

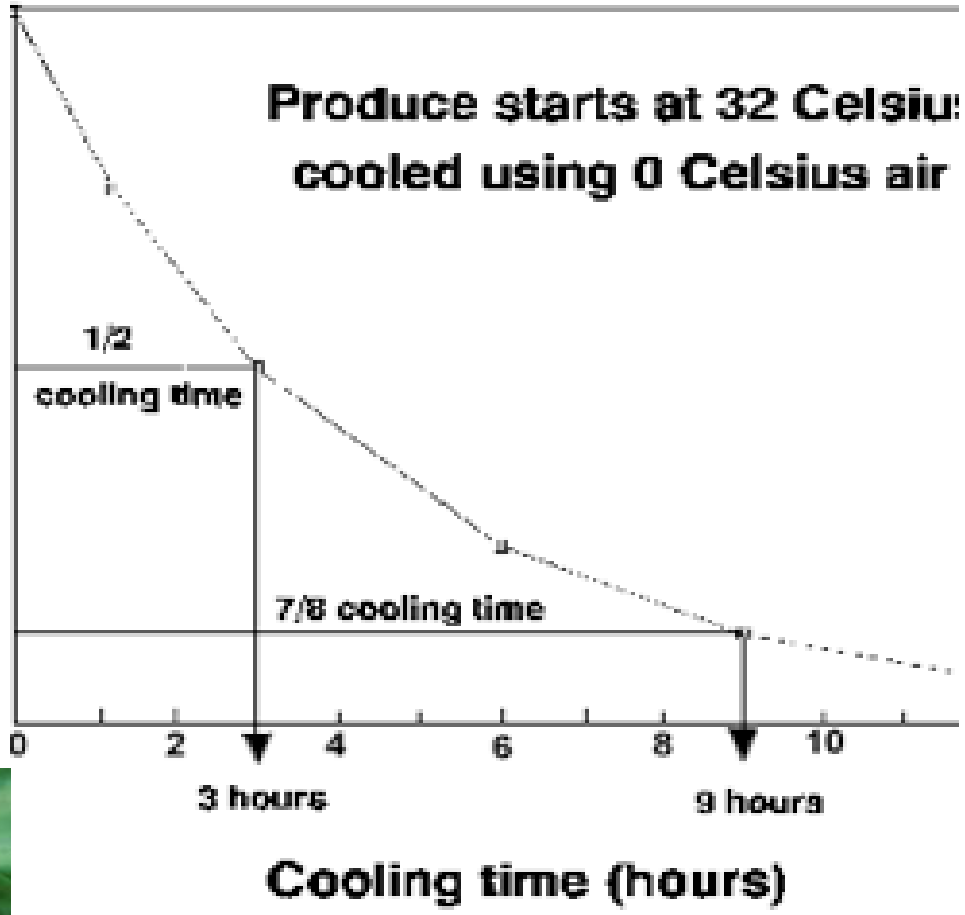
Harvesting

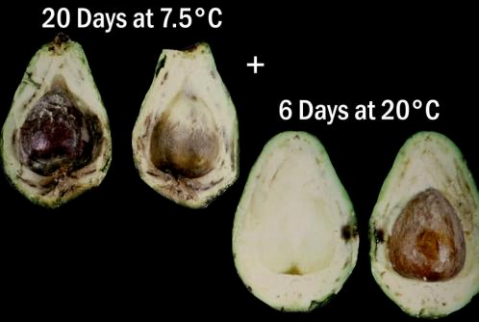
- Harvesting - coordinate with packaging, storage and marketing strategy.
- Avoid physical damage to products
- Train staff to adopt strict hygiene protocols – clean hands, short fingernails.
- Where possible harvest during cool time of day – e.g. early morning.

- 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 C_2H_4 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.

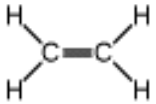
Chill sensitive fruit and lowest safe temperature	
Temp	**Product**
3	Jujube
4	Avocado (some cvs), lychee, tamarillo
5	Cactus pear, durian, guava, longan, mandarin, orange, feijoa
7	Some avocado cvs., olive, , pineapple, pomegranate
10	Carambola, lime, mango, papaya, grapefruit, some melons, passion fruit, rambutan, water melon.
13	Banana, breadfruit, cherimoya, mangosteen, jackfruit.

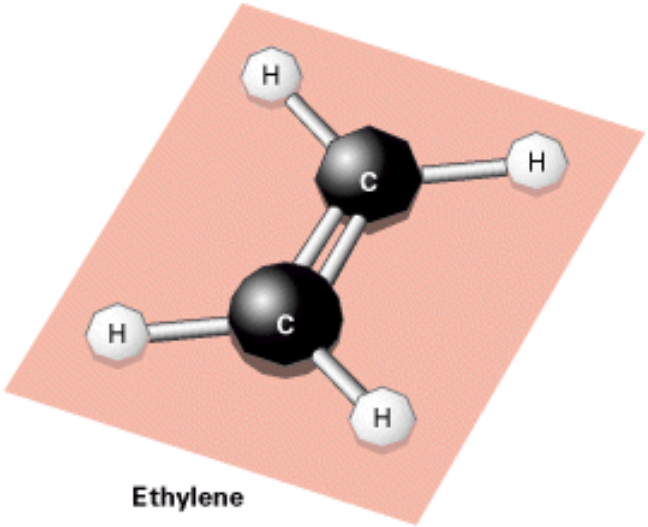
Temperature summary

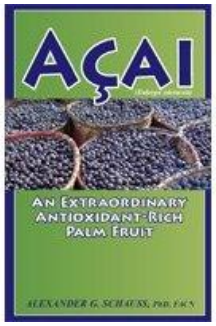
- Harvest products during cool of day - early morning or late evening
- Remove harvested product from direct sunlight, preferably into shade;
- If possible have packhouse cooled, or at least with good ventilation;
- Different technologies are available for rapid cooling of product after harvest
- Forced 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.







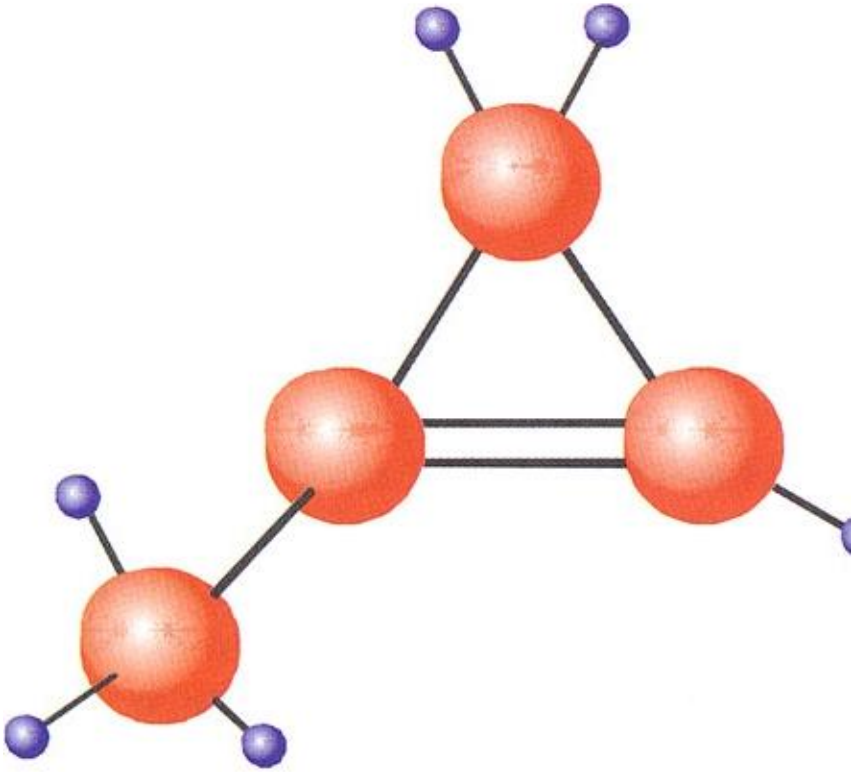
Ethylene affects

- 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

1-MCP SmartFresh^{SM}

- 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.



-Methylcyclopropene (1-MCP)

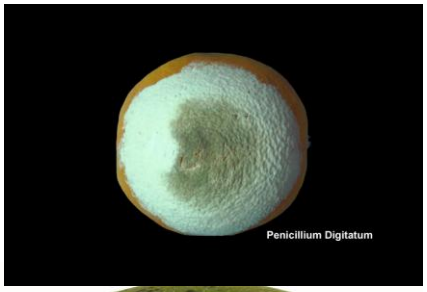
How to reduce ethylene affects

- 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 SmartFresh^{SM};
- 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 duri the growing season

- Postharvest pathogens include:
- *Rhizopus stolonifera*
- *Botrytis cinerea*
- *Alternaria alternata*
- *Colletochrichum spp.*
- *Fusarium sp*.



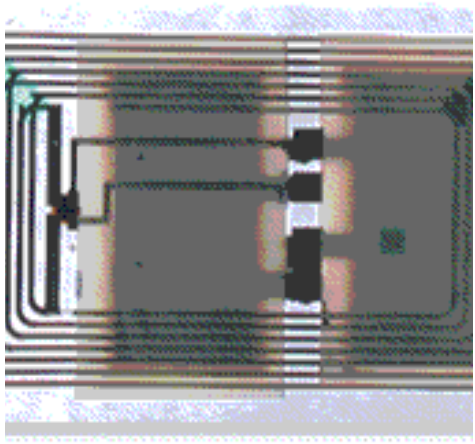
Colletotrichum gloeosporioides

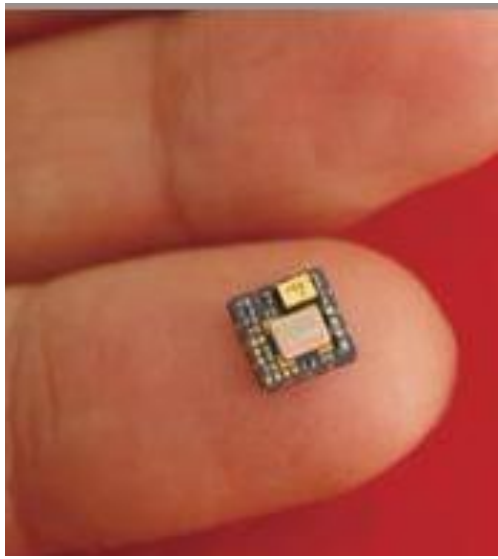
Packaging –the 3 Ps

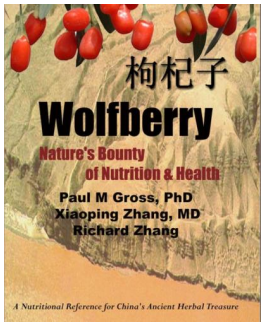
- **Protection:** from physical, physiological and pathological damage
- **Preservation:** shelf life extension; C_2H_4 scrubbing; active packaging (O_2 scavenging).
- **Presentation:** brand/logo for promotion, product traceability. Final presentation displays.

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

- 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