

## Research...

This would be preferable to having it concentrated within a single office. Moreover there may be ways to keep costs of multiple sites low.

For example, the different associations and co-operatives could use common elements in the database structure and data processing that the web page builds on. Some commonality in design could also reduce costs.

Ultimately these individual web sites could link, not only to one another, but also to a national web site.

The consultation showed the multifaceted nature of the industry and revealed its many dimensions for growth. The dozen or so bushfoods that appear to have an established market position may expand their market share.

Industry growth may also take place through market acceptance of an expanding range of yet unrecognised 'bushfoods'.

On the growing side, growth may take place either through new large-scale plantations or through an increase in the number of small producers. In arid regions, growth may come from improved wild harvesting.

This wide range of growth opportunities makes it more difficult for a young industry to present a united front to government in identifying where market failure is hampering its growth prospects.

It probably also means that the industry as a whole is unlikely to support a single central database that covers all regions and bushfoods.

There are essentially two models for database management and organisation:

- a single central responsible organisation, perhaps with links to regional or product specific support groups, or
- specialist bodies serving growers/harvesters with common problems, perhaps with links to a central body.

Grower support will ultimately determine which is the better option. In turn, grower support will be determined by the nature of the collective problems they face.

At issue is:

- whether bushfood suppliers face common problems, and if so, would collective solutions benefit all growers? or,
- whether their problems depend mainly on what they grow/collect, their production methods, their climatic/ecological zone, etc.

### Conclusions

An industry database(s) would assist industry growth, and, if appropriately designed and implemented, would receive industry support.

The database(s) should have a web site as its (their) public face, but must incorporate the distribution of fact sheets to update database information maintained in loose-leafed folders.

The study team believes that the industry, at this time, favours the distributed database option over the centralised option, and expects that a government initiative that assists supplier associations and or co-operatives to set up their own databases will receive broad support.

These databases should preferably be sufficiently common in design to allow controlled cross-exchange of information between each other.

The supplier associations could also adopt a common approach in obtaining links to and from support organisations (such as the RIRDC-supported University of Queensland New Crops site, the Department of Agriculture networks, Plant Breeder Rights, CSIRO, and relevant commercial organisations).



## Research paper

### Maximising freshness but minimising microbial food safety hazards in fresh bamboo shoots

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Cultivation of bamboo for fresh shoots is an emerging industry in Australia. Consumers appreciate "freshness" in horticultural products but are concerned about microbial contamination of vegetables.

In the USA, the reported incidence of food-borne infection from fresh fruits and vegetables increased from two percent in 1973 to eight percent in 1991. However, there are no legal standards for acceptable levels of pathogenic microorganisms in vegetables.

Therefore, it can be recommended that producers optimise their crop-management and postharvest-storage practices to accommodate both, external quality (ie 'freshness') and internal quality (ie minimal microbial infection) of bamboo shoots.

Appropriate cooling and packaging practices can preserve external quality and maintain internal quality of fresh bamboo shoots.

Studies at Central Queensland University (CQU, Plant Sciences Group) in Rockhampton and at the Department of Primary Industry and Fisheries of the Northern Territory (DPIF-NT), Darwin show that storage in closed plastic bags decreased dehydration but increased respiration and microbial infection in bamboo shoots.

Respiration could be minimised and desiccation kept at acceptable levels by storing bamboo shoots in cooled (2 C) and open cardboard boxes for about one week (Figure 1, Page 95). This time span should be sufficiently long to transport shoots from producers to the markets within Australia.

Cultivation, harvest and postharvest procedures open pathways for infection of bamboo shoots with microorganisms.

There is well-established agreement that animal manure is a significant source of human pathogens (eg coliform bacteria).

Bamboo shoots are harvested below or just above the soil surfaces, leaving a severe wound which makes them prone to microbial infection.

Microbial studies at CQU show that chicken manure increased the total microbial load of the soil and of harvested bamboo shoots.

Although abundance was greater on the surface sheaths which will be removed before consumption, microbes were also present in the edible part (Plate 1, Page 95).

These parts contained members of the coliform bacteria (eg *Escherichia coli*) which are not heat-tolerant and can easily be destroyed by cooking bamboo shoots.

Other microbes present were species forming heat-resistant endospores and producing toxins potentially harmful to humans (eg *Bacillus sp.*).

These pathogens can survive extended periods of high temperature.

Bamboo growers should recognise that good sanitation practices during harvest can minimise microbial health hazards in fresh bamboo shoots.

Such practices include the use of properly treated or composted organic manures at appropriate application dates, clean field and processing equipment and sanitary processing water.

Postharvest decontamination procedures may have the potential to improve internal quality of fresh bamboo shoots.

Although the optimal procedure (concentration and treatment duration) was not known, sterilisation of bamboo shoots with hypochlorite reduced the microbial load of bamboo shoots (Plate 1).

The procedure does not take much time, is economical, easy to implement and has been promoted by regulatory bodies for other horticultural products.

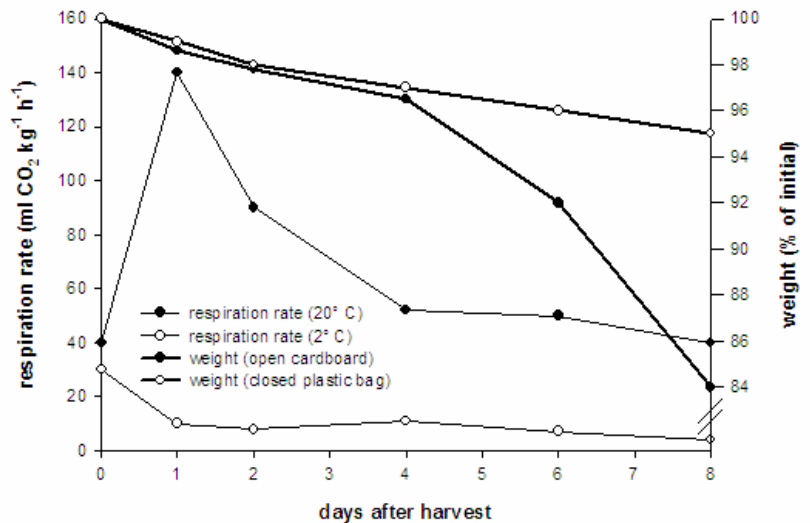


Figure 1 Respiration rate and weight loss in fresh bamboo shoots as affected by storage temperature and packing material

Plate 1 Growth of microbes from the external surface (a) before and (b) after decontamination with hypochlorite, and (c) from the internal tissue of fresh bamboo shoots

