Jicama

Marita Cantwell
Cantwell is with the Mann Laboratory, Department of Plant Sciences, University of California, Davis, CA.

Scientific Name and Introduction

Jicama (*Pachyrhizus erosus* [L.] Urban) is a root crop of the Legume family (Leguminosae). It is also called "yam bean" and is a brown-skinned, turnip-shaped root eaten raw or cooked as a substitute for water chestnut. The root only forms under warm, short days. Therefore, most jicama in U.S. markets is imported from Mexico, where it is a native crop. Jicama is also produced, to a limited extent, in Hawaii. Roots are about 85% water, less than 1% fiber, less than 1.5% protein, less than 0.5% ash, and about 10% carbohydrate, of which about 10% is sucrose.

Quality Characteristics and Criteria

Good quality jicama roots should be smooth and firm, be uniform in shape and size, be free from mechanical damage, and have a crisp, succulent, white, sweet-starchy flesh.

Horticultural Maturity Indices

Jicama roots can be harvested at various stages of development. Young, tender roots harvested from green plants (100 to 150 g; 3.5 to 5.3 oz) are found in specialty markets. Fully mature roots, however, weigh from 250 to 1,500 g (0.55 to 3.3 lb). Mature roots are characterized by size and well-developed periderm as well as their starchy-sweet flavor. To promote hardening of the periderm, plant tops are removed mechanically or irrigation is stopped.

Grades, Sizes, and Packaging

There are no U.S. grades for jicama. In Hawaii, however, two grades are recognized based on size and freedom from defects (dirt, discoloration, growth cracks, roughness, insect damage, and mechanical injury).

After transport in bulk, jicama roots are typically packed in wooden crates of 9 kg (20 lb) or more or in carton boxes of about 4.5 kg (10 lb) for export to the United States.

Optimum Storage Conditions

Jicama can be stored for 2 to 4 mo at 12.5 to 15 °C (54 to 59 °F) with 80 to 90% RH. However, leaf and stem sprouts develop after 2 mo with loss of weight and diminished juiciness of the pulp. Minimizing mechanical damage to the periderm during harvest will reduce decay incidence during storage.

Controlled Atmosphere (CA) Considerations

No information is available on the potential benefits of CA storage of intact jicama roots. Based

on work with other root crops, however, it would not be expected to provide much benefit. Decay development and discoloration of fresh-cut pieces was reduced by a modified atmosphere containing 5 to 10% CO_2 (Aquino-Bolaños et al. 2000).

Retail Outlet Display Considerations

Keep roots cool and dry to reduce water loss and superficial decay.

Chilling Sensitivity

Depending on variety and production area, jicama may develop symptoms of chilling injury after 1 to 3 weeks of storage at 10 °C (50 °F) (Cantwell et al. 1992, Mercado and Cantwell 1998). No chilling injury is observed on roots stored at 12.5 °C (55 °F). Decay is the main external symptom of chilling injury, and discoloration and loss of crisp texture are the main internal symptoms. The roots eventually become "rubbery" in texture when severely chilled. Internal discoloration typically occurs from the skin inwards and is more common and more severe in moderately chilled roots stored at 10 °C (50 °F). At lower temperatures, the pulp will take on a translucent appearance but not necessarily develop brown discoloration; these roots also exhibit external decay.

Ethylene Production and Sensitivity

Jicama produces only very low amounts of ethylene, <0.1 µL kg^{-1} h^{-1}, though higher rates may be observed after chilling at 10 °C (50 °F), about 0.5 µL kg^{-1} h^{-1}. Jicama is not sensitive to ethylene exposure (Cantwell 2006).

Respiration Rates

Temperature	Intact roots	Fresh-cut pieces
	----------mg CO_2 kg^{-1} h^{-1}----------	
0 °C	4 to 8	4 to 8
5 °C	10 to 12	8 to 12
10 °C	9.5 to 19	11 to 19
12.5 °C	4 to 8	-
20 °C	5 to 7	-

Data for intact commercial size roots from Cantwell et al. (1992).

To get mL CO_2 kg^{-1} h^{-1}, divide the mg kg^{-1} h^{-1} rate by 2.0 at 0 °C (32 °F), 1.9 at 10 °C (50 °F), and 1.8 at 20 °C (68 °F). To calculate heat production, multiply mg kg^{-1} h^{-1} by 220 to get BTU per ton per day or by 61 to get kcal per tonne per day.

At 5 °C and 10 °C, respiration rates increase during storage; rates decrease during storage at temperatures above 10 °C. Less mature roots may have higher rates (Bergsma and Brecht 1992). Respiration rates for fresh-cut pieces were from 2-by-3 cm cylinders (Aquino-Bolaños et al. 2000).

Physiological Disorders

See C*hilling Sensitivity* section above.

Postharvest Pathology

The most common decay organisms found externally on jicama roots are species of *Penicillium*, *Rhizopus*, and *Cladosporium* (Bruton 1983, Cantwell et al. 1992). Most postharvest decay of jicama is a consequence of mechanical or chilling injury.

Quarantine Issues

None.

Suitability as Fresh-Cut Product

Fresh-cut jicama is incorporated in mixed vegetable snack trays because of its crisp texture and sweet-starchy flavor. Fresh-cut jicama should be stored below 5 °C (41 °F) to reduce microbial growth and discoloration. A shelf-life of 4 to 8 days can be expected at 5 °C (41 °F) in air. Modified atmosphere with 5 to 10% CO_2 maintains quality and extends shelf-life of fresh-cut jicama (Aquino-Bolaños et al. 2000).

Special Considerations

Curing. The periderm of jicama roots is easily damaged during harvest and transport, and this leads to an unsightly appearance, high rates of water loss, and increased susceptibility to decay. Wound healing or curing can be achieved by holding jicama roots at 20 to 25 °C (68 to 77 °F) under 95 to 100% RH for at least 1 week. These conditions are similar to those described for curing sweetpotatoes and other tropical root and tuber crops.

References

Aquino-Bolaños, E.N., M.I. Cantwell, G. Peiser, and E. Mercado-Silva. 2000. Changes in the quality of fresh-cut jicama in relation to storage temperatures and controlled atmospheres. J. Food Sci. 65(7):1238-1243.

Bergsma, K.A., and J.K. Brecht. 1992. Postharvest respiration, moisture loss, sensory analysis and compositional changes in jicama *(Pachyrhrizus erosus)* roots. Acta Hort. 318:325-332.

Bruton, B.D. 1983. Market and storage diseases of jicama. J. Rio Grande Valley Hort. Soc. 36:29-34.

Cantwell, M. 2006. Jicama Recommendations for Maintaining Postharvest Quality. Perishables Handling. *At* http://postharvest.ucdavis.edu/produce_information.

Cantwell, M., W. Orozco, V. Rubatzky, and L. Hernández. 1992. Postharvest handling and

storage of jicama roots. Acta Hort. 318:333-343.

Mercado-Silva, E., and M. Cantwell. 1998. Quality changes in jicama roots stored at chilling and nonchilling temperatures. J. Food Qual. 21:211-221.

Paull, R.E., and N.J. Chen. 1988. Compositional changes in yam bean during storage. HortScience 23(1):194-196.

The editors of this Handbook will appreciate your input for future editions of this publication. Please send your suggestions and comments to HB66.Comments@ars.usda.gov.