Horseradish

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Scientific Name and Introduction

Horseradish **(***Armoracia rusticana,* syn. *Cochlearia armoracia* Gaertn., Mey., Scherb.) is a perennial of the Cruciferae family. The plant is native to southeastern Europe, where the roots and leaves are used for food, condiments, and medicinal purposes. Horseradish is grown for its enlarged taproot, which is used as an appetizing condiment for meats and fish. The characteristic pungent aroma and taste come from sulfur compounds. Horseradish is grown worldwide, but especially in Europe, the United States (mainly southwestern Illinois), and Russia.

Quality Characteristics and Criteria

Several criteria are used for quality evaluation of horseradish, such as uniformity of shape and size, firmness, smoothness, freedom from hollow heart, internal color of the roots, other defects, and decay. The most important quality criteria are long, uniform roots with white flesh and pungent flavor.

Horticultural Maturity Indices

Horseradish is ready to harvest after the leaves have been killed by frost. Sometimes it is harvested at an early stage of development and the roots used for processing. Horseradish that is harvested when roots are actively growing does not store as well as roots that are conditioned by cold before harvest.

Grades, Sizes, and Packaging

Horseradish roots Grade I should be at least 25 cm (10 in) long and 2.5 cm (1 in) in diameter measured one-third of the distance from the top. Grade II horseradish roots are 15 cm (6 in) long and 1.5 cm (0.6 in) in diameter. Smaller roots may be acceptable for processing. Horseradish for fresh harvest is commonly packed in 20- to 25-kg (44- to 55-lb) sacks or in small retail packages about 1 kg (2.2 lb). Roots intended for storage are packed in 15-kg (33-lb) polyethylene-lined crates or large containers with a capacity 300 to 500 kg (660 to 1,100 lb).

Precooling Conditions

Horseradish roots are very sensitive to wilting. Roots should be precooled to 4 to 5 °C (39 to 41 °F) immediately after harvest using forced air at 0 °C (32 °F) with 90 to 98% RH.

Optimum Storage Conditions

Roots can be stored for 8 to 12 mo at 0 °C (32 °F) with 98 to 100% RH (Adamicki et al. 1999). Pungency is rapidly lost at higher temperatures, and roots dry out at lower RH. Perforated

polyethylene bags and lined crates or bins can maintain a high RH during storage. Roots can also be stored at -1 to -2 °C (28 to 30 °F). Freshly harvested and washed roots can be stored for several months in polyethylene bags or lined polyethylene crates. In areas with mild winters, horseradish may be left in the ground and harvested in early spring. Horseradish can also be stored over winter in cool cellars or in outdoor pits (clamps) or trenches.

Controlled Atmosphere (CA) Considerations

There is no or only slight benefit from CA. High levels of CO_2 increase respiration but do not cause greater loss of weight, dry matter, or sugar content during storage. An increase in sucrose occurs as CO_2 increases up to 7.5% (Weichmann 1980).

Retail Outlet Display Considerations

Washed horseradish roots packed in polyethylene bags can be placed on refrigerated shelves for several days at temperatures below 10 °C (50 °F).

Chilling Sensitivity

Horseradish roots are not chilling sensitive and can survive temperatures as low as -8 °C (18 °F) (Bohling and Hansen 1980).

Ethylene Production and Sensitivity

Horseradish roots produce a very low amount of ethylene, <1 $\mu L\ kg^{-1}\ h^{-1}$, and are not particularly sensitive to ethylene exposure.

Respiration Rates

Temperature	mg $CO_2\ kg^{-1}\ h^{-1}$
0 °C	8
5 °C	14
10 °C	25
15 °C	32
20 °C	40

Data from Ryall and Lipton 1983.

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.

Physiological Disorders

There are no important physiological disorders of horseradish root.

Postharvest Pathology

The soilborne fungus *Verticilium dahliae* Kleb. infects the vascular tissue of the horseradish plant, resulting in discoloration (Eastburn and Weizierl 1995). The discoloration often appears as black specks in cross section or as streaks along the root when the root is cut lengthwise. It is the major reason for loss in market quality of horseradish roots.

Quarantine Issues

None.

Suitability as Fresh-Cut Product

There is no current potential.

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