Horseradish

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Scientific Name and Introduction: Horseradish *Armoracia rusticana* 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 comes from sulfur compounds. Horseradish is grown worldwide, especially in Europe, the U.S. (mainly southwestern Illinois), Russia and other countries.

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. Long and uniform roots with white color of fleshy rhizomes and pungent flavor are the most important quality criteria.

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 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 capacity 300 to 500 kg (660 to 1100 lb).

Pre-cooling conditions: Horseradish roots are very sensitive to wilting. Immediately after harvest, roots should be pre-cooled to 4 to 5 °C (39 to 41 °F) using forced-air cooling or placed 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 (28.4 to 30.2 °F). Freshly harvested and washed roots can be stored for several mo 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 a 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 < 10 °C (50 °F).

Chilling Sensitivity: Horseradish roots are not chilling sensitive and can survive -7 to -8 °C (17.6 to 19.4 °F) (Bohling and Hansen, 1980).

Ethylene Production and Sensitivity: Horseradish roots produce a very low amount of ethylene at < 1 μL 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

To get mL 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 metric ton per day. Data are from Ryall and Lipton, 1983.

Physiological Disorders: There are no particular physiological disorders of horseradish root.

Postharvest Pathology: The soil borne 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 length-wise. It is the major reason for loss in market quality of horseradish roots.

Quarantine Issues: None.

Suitability as Fresh-cut-Product: No current potential.

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