

Horseradish: The Pungent Powerhouse

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Horseradish, botanically known as *Armoracia rusticana*, belongs to the Brassicaceae (Cruciferae) family, which also includes mustard, cabbage and broccoli. Native to the mud swamp lands of southern Europe and western Asia, horseradish has a long history of cultivation and use, dating back to ancient times.

Botanical characteristics of horseradish

The horseradish plant is a perennial herb with a fleshy, white or buff coloured taproot, which is the primary source of its pungent flavour. The taproot is about 30 cm long with several swollen roots branching out from different angles. The plant is characterised by its large, dark-green, lance-shaped leaves, which are wavy and resemble spinach. The leaves are coarse and can grow up to 28 inches in length. It produces clusters



Fig. 1: Horseradish



Fig. 2: Horseradish



Fig. 3: Horseradish

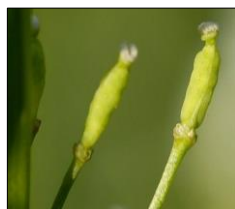


Fig. 4: Horseradish



Fig. 5: Horseradish

of small, white, aromatic flowers during the late spring. The fruit pods are short, oblong and crinkled, but frequently fail to mature or contain viable seeds. Understanding the morphology of horseradish is essential for both cultivation and identification.

There are two varieties of horseradish—the common type with broad, crinkled leaves having high quality roots and the Bohemian type with narrow, smooth-edged leaves and inferior quality roots.

Culinary history

The culinary use of horseradish can be traced back to ancient Greece and Rome. The Greeks valued

it for its pungent taste and used it to enhance the flavour of their dishes. Similarly, the Romans incorporated horseradish into their cuisine, recognising its ability to complement a wide range of foods. Over the centuries, horseradish has continued to be a staple in various culinary traditions for its bold and pungent flavour, making it a popular ingredient in various dishes and condiments:

- Condiments and sauces:** One of the most well-known uses of horseradish is in the preparation of condiments and sauces. Horseradish sauce, a classic accompaniment to roast beef, is made by combining grated horseradish with ingredients like mayonnaise, mustard and vinegar. The sharpness of the condiment adds a zesty kick to meats and sandwiches.
- Pickling and fermentation:** Horseradish roots can be pickled or fermented to preserve their pungent flavour. Pickled horseradish is often served as a side dish or garnish, providing a tangy and spicy element to meals.
- Culinary pairings:** Beyond condiments, horseradish is used to flavour various dishes, including soups, stews and salads. Its versatility makes it a valuable ingredient in the culinary world, allowing chefs to experiment with different flavour profiles.



Fig. 6: Horseradish



Fig. 7: Pickled



Fig. 8: Horseradish

Phytochemical composition

The distinctive flavour and medicinal properties of horseradish can be attributed to its complex phytochemical composition. The plant contains a variety of bioactive compounds, each contributing to its unique characteristics:

- a) **Glucosinolates (GSLs):** One of the key components in horseradish is glucosinolates, sulphur-containing compounds, that are responsible for its pungency. When the plant is crushed or cut, an enzyme called myrosinase interacts with glucosinolates (sinigrin) in presence of water, leading to the release of allyl isothiocyanate (AITC). AITC is known for its antimicrobial and anticancer properties.

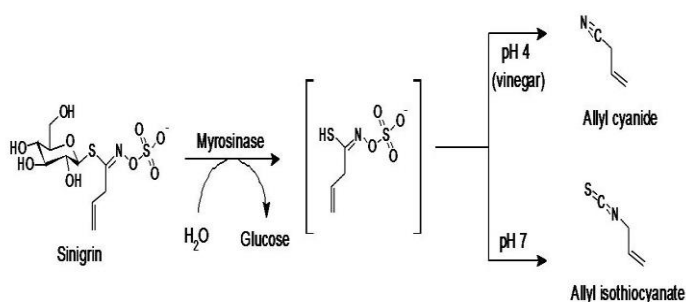


Fig. 9: Mechanism of hydrolysis of sinigrin into allyl isothiocyanate (AITC)

- b) **Phenolic compounds:** Horseradish root also contains phenolic compounds (481 mg/100 g), such as flavonoids and phenolic acids, which contribute to its antioxidant properties. These compounds play a role in neutralising harmful free radicals in the body, potentially reducing the risk of chronic diseases.
- c) **Essential oils:** The essential (volatile) oils present in horseradish contribute to its aromatic and flavourful profile. These oils, including mustard oil, add depth to the culinary applications of horseradish.

Medicinal uses

Horseradish is a neglected and underutilised plant species (NUS), especially concerning the potential benefits to improve human health. It has a long-standing reputation for its medicinal properties. It has been utilised as a stimulant, antiseptic, diuretic, aid to digestion, remedy for worm's expectorant and in treatment of scurvy. Horseradish has been traditionally used to alleviate respiratory issues such as congestion and coughs. The inhalation of allyl isothiocyanate, released when horseradish is grated or crushed, can help clear nasal passages and provide relief from respiratory discomfort. Research has demonstrated the antimicrobial properties of horseradish, particularly due to allyl isothiocyanate,

against various bacteria and fungi. Horseradish is believed to stimulate the production of digestive enzymes and enhance overall digestive function. While more research is needed to fully understand these effects, the historical use of horseradish in digestive health provides a foundation for further investigation.

Cultivation and harvesting

Successful cultivation of horseradish requires an understanding of its growth requirements, propagation methods and harvesting techniques:

- **Growing conditions:** Horseradish thrives in deeply worked medium-textured, well-drained soil rich organic matter and potash, with a neutral pH. It prefers full sunlight but can tolerate partial shade. Adequate moisture is crucial, especially during the early stages of growth.
- **Propagation:** Horseradish is commonly propagated through root cuttings of 5-8 cm length. These cuttings, known as sets, are sections of the plant's root containing both the crown and the upper part of the taproot. Planting sets in early spring or fall allows for optimal root development.

Note: It is advisable to grow horseradish in a distant and less formal place in the garden as it grows out of control. Once it is strongly grown in an area, it is very difficult to completely eradicate the plant as the smallest piece of root will grow again.

- **Harvesting:** The roots of horseradish are typically ready for harvest after six to eight months of growth. Harvesting is usually done in the fall or early spring before new growth emerges. Careful digging and cleaning of the crowns and roots are essential to preserve their quality. The straight lateral roots are preserved for planting. Roots to be marketed are trimmed, washed and packed. They are never exposed to light as they will turn green, which is undesirable.

Conclusion

Horseradish (*Armoracia rusticana*) stands as a testament to the harmonious interplay between

culinary delight and medicinal benefits. From ancient civilisations to modern kitchens, this robust herb has earned its place as a versatile and esteemed plant. As ongoing research unveils more about its phytochemical composition and potential health benefits, horseradish continues to captivate the

attention of scientists, chefs and health enthusiasts alike. Horseradish is truly an underestimated, underexploited and neglected species for various reasons, but especially regarding its potential benefit to improve human health.

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