

= Radish =

The radish (*Raphanus sativus*) is an edible root vegetable of the Brassicaceae family that was domesticated in Europe in pre @-@ Roman times . Radishes are grown and consumed throughout the world , being mostly eaten raw as a crunchy salad vegetable . They have numerous varieties , varying in size , flavor , color , and length of time they take to mature . Radishes owe their sharp flavor to the various chemical compounds produced by the plants , including glucosinolate , myrosinase , and isothiocyanate . They are sometimes grown as companion plants and suffer from few pests and diseases . They germinate quickly and grow rapidly , smaller varieties being ready for consumption within a month , while larger daikon varieties take several months . Another use of radish is as cover or catch crop in winter or as a forage crop . Some radishes are grown for their seeds ; daikon , for instance , may be grown for oil production . Others are used for sprouting and both roots and leaves are sometimes served cooked or cold .

= History =

Varieties of radish are now broadly distributed around the world , but almost no archeological records are available to help determine their early history and domestication . However , scientists tentatively locate the origin of *Raphanus sativus* in southeast Asia , as this is the only region where truly wild forms have been discovered . India , central China , and central Asia appear to have been secondary centers where differing forms were developed . Radishes enter the historical record in third century BC . Greek and Roman agriculturalists of the first century AD gave details of small , large , round , long , mild , and sharp varieties . The radish seems to have been one of the first European crops introduced to the Americas . A German botanist reported radishes of 100 lb (45 kg) and roughly 3 ft in length in 1544 , although the only variety of that size today is the Japanese Sakurajima radish . The large , mild , and white East Asian form was developed in China , but is mostly associated in the West with the Japanese daikon , owing to Japanese agricultural development and larger exports .

= Description =

Radishes are annual or biennial brassicaceous crops grown for their swollen tap roots which can be globular , tapering , or cylindrical . The root skin colour ranges from white through pink , red , purple , yellow , and green to black , but the flesh is usually white . Smaller types have a few leaves about 13 cm (5 in) long with round roots up to 2 @.@ 5 cm (1 in) in diameter or more slender , long roots up to 7 cm (3 in) long . Both of these are normally eaten raw in salads . A longer root form , including oriental radishes , daikon or mooli , and winter radishes , grows up to 60 cm (24 in) long with foliage about 60 cm (24 in) high with a spread of 45 cm (18 in) . The flesh of radishes harvested timely is crisp and sweet , but becomes bitter and tough if the vegetable is left in the ground too long . Leaves are arranged in a rosette . They have a lyrate shape , meaning they are divided pinnately with an enlarged terminal lobe and smaller lateral lobes . The white flowers are borne on a racemose inflorescence . The fruits are small pods which can be eaten when young .

The radish is a diploid species , and has 18 chromosomes ($2n = 18$) .

= Cultivation =

Radishes are a fast @-@ growing , annual , cool @-@ season crop . The seed germinates in three to four days in moist conditions with soil temperatures between 65 and 85 ° F (18 and 29 ° C) . Best quality roots are obtained under moderate day lengths with air temperatures in the range 50 to 65 ° F (10 to 18 ° C) . Under average conditions , the crop matures in 3 ? 4 weeks , but in colder weather , 6 ? 7 weeks may be required .

Radishes grow best in full sun in light , sandy loams , with a soil pH 6 @.@ 5 to 7 @.@ 0 , but for late @-@ season crops , a clayey @-@ loam is ideal . Soils that bake dry and form a crust in dry

weather are unsuitable and can impair germination . Harvesting periods can be extended by making repeat plantings , spaced a week or two apart . In warmer climates , radishes are normally planted in the autumn . The depth at which seeds are planted affects the size of the root , from 1 cm (0 @. @ 4 in) deep recommended for small radishes to 4 cm (1 @. @ 6 in) for large radishes . During the growing period , the crop needs to be thinned and weeds controlled , and irrigation may be required .

Radishes are a common garden crop in the United States , and the fast harvest cycle makes them a popular choice for children 's gardens . After harvesting , radishes can be stored without loss of quality for two or three days at room temperature , and about two months at 0 ° C (32 ° F) with a relative humidity of 90 ? 95 % .

= = = Companion plant = = =

Radishes can be useful as companion plants for many other crops , probably because their pungent odour deters such insect pests as aphids , cucumber beetles , tomato hornworms , squash bugs , and ants . They can function as a trap crop , luring insect pests away from the main crop . Cucumbers and radishes seem to thrive when grown in close association with each other , and radishes also grow well with chervil , lettuce , peas , and nasturtiums . However , they react adversely to growing in close association with hyssop .

= = = Pests = = =

As a fast @-@ growing plant , diseases are not generally a problem with radishes , but some insect pests can be a nuisance . The larvae of flea beetles (*Delia radicum*) live in the soil , but the adult beetles cause damage to the crop , biting small " shot holes " in the leaves , especially of seedlings . The swede midge (*Contarinia nasturtii*) attacks the foliage and growing tip of the plant and causes distortion , multiple (or no) growing tips , and swollen or crinkled leaves and stems . The larvae of the cabbage root fly sometimes attack the roots . The foliage droops and becomes discoloured , and small , white maggots tunnel through the root , making it unattractive or inedible .

= = Varieties = =

Broadly speaking , radishes can be categorized into four main types according to the seasons when they are grown and a variety of shapes lengths , colors , and sizes , such as red , pink , white , gray @-@ black , or yellow radishes , with round or elongated roots that can grow longer than a parsnip . It is not widely known that Beatrix Potter 's famous character " Peter Rabbit " is shown eating long scarlet radishes , not carrots , in Mr McGregor 's garden .

= = = Spring or summer radishes = = =

Sometimes referred to as European radishes or spring radishes if they are planted in cooler weather , summer radishes are generally small and have a relatively short three- to four @-@ week cultivation time .

The ' April Cross ' is a giant white radish hybrid that bolts very slowly .

'Bunny Tail ' is an heirloom variety from Italy , where it is known as Rosso Tondo A Piccola Punta Bianca . It is slightly oblong , mostly red , with a white tip .

'Cherry Belle ' is a bright red @-@ skinned round variety with a white interior . It is familiar in North American supermarkets .

'Champion ' is round and red @-@ skinned like the ' Cherry Belle ' , but with slightly larger roots , up to 5 cm (2 in) , and a milder flavor .

'Red King ' has a mild flavor , with good resistance to club root , a problem that can arise from poor drainage .

'Sicily Giant ' is a large heirloom variety from Sicily . It can reach up to 5 cm (2 in) in diameter .

'Snow Belle ' is an all @-@ white variety of radish , similar in shape to the ' Cherry Belle ' .

'White Icicle ' or ' Icicle ' is a white carrot @-@ shaped variety , around 10 ? 12 cm (4 ? 5 in) long , dating back to the 16th century . It slices easily , and has better than average resistance to pithiness .

'French Breakfast ' is an elongated , red @-@ skinned radish with a white splash at the root end . It is typically slightly milder than other summer varieties , but is among the quickest to turn pithy .

'Plum Purple ' , a purple @-@ fuchsia radish , tends to stay crisp longer than average .

'Gala ' and ' Roodbol ' are two varieties popular in the Netherlands in a breakfast dish , thinly sliced on buttered bread .

'Easter Egg ' is not an actual variety , but a mix of varieties with different skin colors , typically including white , pink , red , and purple radishes . Sold in markets or seed packets under the name , the seed mixes can extend harvesting duration from a single planting , as different varieties may mature at different times .

= = = Winter varieties = = =

'Black Spanish ' or ' Black Spanish Round ' occur in both round and elongated forms , and are sometimes simply called the black radish (*Raphanus sativus* L. var. *niger* (M.) S.K. or L. ssp. *niger* (M.) . D.C. var. *albus* D.C) or known by the French name Gros Noir d 'Hiver . It dates in Europe to 1548 , and was a common garden variety in England and France during the early 19th century . It has a rough , black skin with hot @-@ flavored , white flesh , is round or irregularly pear shaped , and grows to around 10 cm (4 in) in diameter .

Daikon refers to a wide variety of winter oilseed radishes from Asia . While the Japanese name daikon has been adopted in English , it is also sometimes called the Japanese radish , Chinese radish , Oriental radish or mooli (in India and South Asia) . Daikon commonly have elongated white roots , although many varieties of daikon exist . One well @-@ known variety is ' April Cross ' , with smooth white roots . The New York Times describes ' Masato Red ' and ' Masato Green ' varieties as extremely long , well @-@ suited for fall planting and winter storage . The Sakurajima radish is a hot @-@ flavored variety which is typically grown to around 10 kg (22 lb) , but which can grow to 30 kg (66 lb) when left in the ground .

= = = Seed pod varieties = = =

The seeds of radishes grow in siliques (widely referred to as " pods ") , following flowering that happens when left to grow past their normal harvesting period . The seeds are edible , and are sometimes used as a crunchy , sharp addition to salads . Some varieties are grown specifically for their seeds or seed pods , rather than their roots . The rat @-@ tailed radish , an old European variety thought to have come from East Asia centuries ago , has long , thin , curly pods which can exceed 20 cm (8 in) in length . In the 17th century , the pods were often pickled and served with meat . The ' München Bier ' variety supplies seed pods that are sometimes served raw as an accompaniment to beer in Germany .

= = Nutritional value = =

In a 100 gram serving , raw radishes provide 16 calories and have a moderate amount of vitamin C (18 % of Daily Value) , with other essential nutrients in low content (table) .

= = Uses = =

= = = Cooking = = =

The most commonly eaten portion is the napiform taproot , although the entire plant is edible and

the tops can be used as a leaf vegetable . The seed can also be sprouted and eaten raw in a similar way to a mung bean .

The bulb of the radish is usually eaten raw , although tougher specimens can be steamed . The raw flesh has a crisp texture and a pungent , peppery flavor , caused by glucosinolates and the enzyme myrosinase , which combine when chewed to form allyl isothiocyanates , also present in mustard , horseradish , and wasabi .

Radishes are mostly used in salads , but also appear in many European dishes . Radish leaves are sometimes used in recipes , like potato soup or as a sauteed side dish . They are also found blended with fruit juices in some recipes .

= = = Other uses = = =

The seeds of radishes can be pressed to extract radish seed oil . Wild radish seeds contain up to 48 % oil , and while not suitable for human consumption , this oil is a potential source of biofuel . The daikon grows well in cool climates and , apart from its industrial use , can be used as a cover crop , grown to increase soil fertility , to scavenge nutrients , suppress weeds , help alleviate soil compaction , and prevent winter erosion of the soil .

= = = Culture = = =

The daikon varieties of radish are important parts of East , Southeast , and South Asian cuisine . In Japan and Korea , radish dolls are sometimes made as children 's toys . Daikon is also one of the plants that make up the Japanese Festival of Seven Herbs (Nanakusa no sekku) on the seventh day after the new year .

Citizens of Oaxaca , Mexico , celebrate the Night of the Radishes (Noche de los rábanos) on December 23 as a part of Christmas celebrations . This folk art competition uses a large type of radish up to 50 cm (20 in) long and weighing up to 3 kg (6 @. @ 6 lb) . Great skill and ingenuity are used to carve these into religious and popular figures , buildings , and other objects , and they are displayed in the town square .

= = Production trends = =

About seven million tons of radishes are produced yearly , representing roughly 2 % of global vegetable production .

= = Gallery = =

= = = Cited literature = = =

Dixon , Geoffrey R. (2007) . Vegetable Brassicas and Related Crucifers (Print) . Crop Production Science in Horticulture 14 . Wallingford : CAB International . ISBN 978 @-@ 1 @-@ 84593 @-@ 138 @-@ 4 .