



Growing radish in Western Australia

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Radish (*Raphanus sativus*) belongs to the Brassica family (such as cabbages, broccoli and cauliflowers). The red radish is the main type grown in Australia and originated in eastern Europe. It has been cultivated for a long time and was popular in Egypt at the time of the Pharaohs. The long white type is the most important vegetable in Japan (where it is called *daikon*) and consumption is 20 kg per person per year. There is potential to increase exports of long white radish to Asia, especially Japan and trials are being conducted with this crop at Medina Research Centre and at Manjimup Horticultural Research Centre. The consumption of long white radish is low in Western Australia. Radishes have good levels of carbohydrate, fibre and vitamin C.

Commercial red radish production in Western Australia is mainly confined to the Perth Metropolitan Area. The most important type for Western Australian markets is the small round radish. This is labour-demanding, but is easy to grow and popular with growers as it gives quick returns. Small red radishes are marketed fresh and are used to add spiciness to salads. In Asia, long white radish may be used fresh or for boiling, shredding, stir-frying, pickling, use in 'spring rolls' and 'dim-sims' and production of sprouts (from the seed) for salads.

Consignments to Market City, Canning Vale were 180 t of round radish and 30 t of long white radish in 1998/1999. This does not represent total production of radishes in Western Australia and does not include export production.

Radishes must be grown quickly on well-fertilised and irrigated soils, without any check on growth. They are best grown in the Perth Metropolitan Area after a crop which has been fertilised with conditioned poultry manure or compost.

Climatic and soil requirements

Radish is grown throughout the year in the Perth area, but grows best in cool weather. Producing quality radishes during mid-summer in the Perth area is more difficult. Radish will tolerate light frosts. These will not affect the roots of advanced plants, but heavy frosts may damage the leaves of young plantings. Depending on variety, flowering (bolting) may be a problem in spring with long white radish from May to July plantings. Long white radish may also bolt after hot weather. Bolted radish is not marketable. High

summer temperatures can cause the plant to develop small tops and the roots rapidly become pithy and strongly pungent after reaching maturity.

Radishes do best on sandy, well drained soils. This allows for even root development and ease of washing after harvest. Lime the soil if the pH is below 5.5 (water system of measurement). Deeper soils are required for the production of good quality long white radish.

Rotation

An interval of four years is recommended between brassica crops to prevent a build-up of diseases such as clubroot.

Planting

Sow weekly with a vacuum planter for the domestic market. Seed of red varieties is sown 5 to 10 mm deep in rows 20 cm apart. Plants germinate four to eight days after sowing. A plant density of 40 to 55 per metre of row is desirable. Seeds may also be sown in 1.5 m beds with three triple rows (30 cm between the centres) and with seeds at 5 cm apart between and within the lines in the triple rows. Excessive plant densities will produce irregular sized and misshapen roots.

Long white radish is planted in 30 to 40 cm rows and thinned to 10 to 25 cm apart within the rows in order to produce large roots. Use the wider spacing for export crops. Closer plantings may be made, if a smaller size of root is required.

Varieties

Red radish varieties differ in their size, shape and colour of the root. The main types grown are red and of globe shape such as the variety Red Planet. There are also oblong varieties which may be either red, or white plus red (French Breakfast). The latter are not widely grown for the domestic market.

Long white radish varieties range in shape from tapered (for example, Long White) to blunt ended (for example, Narumi) and grow to over 40 cm long roots, and are usually white. They take longer to grow than the red varieties. Sown in autumn, Narumi takes two to three months to reach maturity.

Important Disclaimer

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Fertilisers

Apply the following rates of magnesium and trace elements before planting.

Table 1. Magnesium and trace elements before planting

Magnesium sulphate	50 kilograms per hectare to supply magnesium
Manganese sulphate	20 kilograms per hectare to supply manganese
Ferrous sulphate	10 kilograms per hectare to supply iron
Copper sulphate	18 kilograms per hectare to supply copper
Zinc sulphate	18 kilograms per hectare to supply zinc
Borax	18 kilograms per hectare to supply boron
Sodium molybdate	2 kilograms per hectare to supply molybdenum

Apply double superphosphate three to five days before planting, at 600 to 1000 kg per hectare. The use of borax is important as boron deficiency may be a problem with radishes, especially on alkaline soils. This may show as misshapen, split, roots with brown flecks on the root surface. Note that double superphosphate is preferable to superphosphate as the latter contains more cadmium, which is a toxic heavy metal.

Compost is not normally used directly before radish, but using this at up to 50 cubic metres per hectare to other crops in the rotation will be beneficial. It will supply organic manure, add nutrients and help to retain moisture in the soil.

After planting, apply urea at 50 kg per hectare or ammonium nitrate at 70 kg per hectare and muriate of potash at 60 kg per hectare or sulphate of potash at 75 kg per hectare at weekly intervals. Commence these applications in the first week. Few topdressings may be required with red radish as it is soon harvested, especially in summer. Borax at 10 kg/ha may be needed after planting to correct boron deficiency.

It is recommended that nutrient analyses are made of the soil and irrigation water before planting, plus one to two analyses of the youngest mature leaves after planting. This will enable some adjustments to the fertiliser program and provide information on nutrients that are deficient or toxic. Some of the suggested nutrients in this publication may be deleted or reduced, if it is obvious that they are sufficiently high in the irrigation water and soil, including sources from compost and fertilisers from previous cropping.

Do not apply excess fertilisers, because nitrogen, phosphorus and potassium are easily washed through sandy soils by rainfall and irrigation. This may lead to groundwater pollution in rivers and estuaries.

Irrigation

There has been no local trial work on irrigation requirements of radishes and in the Perth Metropolitan Area. It is suggested that watering is conducted at the 140 per cent evaporation replacement rate. Radishes will split if they do not receive adequate water.

In the warmer months, two waterings per day will give the best results. Apply half the water in the morning, preferably between 7 to 9.00 a.m. Apply the remaining half of the water preferably between 2 to 3.00 p.m.

On hot days, with temperatures exceeding 35°C, apply three irrigations as this will result in less crop stress and more efficient use of water.

From May to September, apply all of the water in mid morning, or in early morning where off-peak electricity is used.

Table 2 shows the amount of water required to grow radish in the Perth area for each month for either butterfly or knocker sprinklers. This is based on average evaporation at Medina Research Station, 30 km south of Perth. Use evaporation data from the nearest weather station in areas not close to Medina. This data represents average conditions and adjustments must be made for marked changes in temperatures, humidity, effective rainfall and wind speeds.

The irrigation data have been calculated for:

- butterfly sprinklers spaced at 6 x 6 m (277 sprinklers per hectare), with an output of 15 L per minute, that is, 4.15 kL/ha/minute or 25.0 mm per hour;
- impact ('knocker') sprinklers at a spacing of 12 x 12 m (69 sprinklers per hectare) with an output of 25 L per minute, that is, 1.725 kL/ha/minute or 10.4 mm per hour.

It is not necessary to irrigate if rainfall exceeds evaporation by 1.0 mm or more. Adjust the irrigation time if rainfall is lower than the actual evaporation.

Table 2. Irrigation per day on butterfly and knocker sprinklers in the Perth Metropolitan Area for average conditions based on 140 per cent evaporation replacement rate

Month	Average evaporation millimetres/day at Medina Research Station	Kilolitres of water needed per hectare per day at 140% replacement rate	Minutes per day for a typical butterfly sprinkler	Minutes per day for a typical impact sprinkler
January	8.8	123.2	39	89
February	8.9	124.6	40	90
March	6.8	95.2	30	69
April	4.0	56.0	17	41
May	2.6	36.4	12	26
June	2.0	28.0	9	20
July	1.9	20.6	8	19
August	2.3	32.2	10	23
September	3.3	46.2	15	34
October	4.8	67.2	21	49
November	6.6	92.4	29	67
December	8.4	117.6	37	85

Water quality

Radish has moderate tolerance to salinity. Water salinity should be less than 1000 mg/L total salts (electrical conductivity or EC of 180 millisiemens per metre [mS/m]).

Plants injured by salt are stunted and can develop thick, dark green leaves with marginal yellowing or burning.

Pests

Radishes are attacked by the same pests which attack brassica crops. Major pests include cabbage white butterfly, diamond-back moth, snails, grasshoppers and aphids. Other pests may include wood-ducks, root-knot nematode, vegetable weevils and black beetle.

Severe problems may occur with control of diamondback moth or cabbage moth caterpillars in all brassica crops. The larvae are light green/brown and about 12 mm long. They tunnel into the heart of the plant and can be difficult to control with insecticides.

Pesticide resistance is a major problem affecting control of diamondback moth. Strategies to reduce the risk of insecticide resistance developing are based on using a biological insecticide containing *Bacillus thuringiensis* at certain stages of the crop and alternating pesticides from different chemical groups at other times.

Control strategies for diamondback moth are updated regularly and depend on the registration of effective insecticides. Check the latest information before spraying.

Diseases

Because of the short growing period, only a few diseases cause economic losses in radishes. Clubroot causes less problems compared with other brassicas. *Pythium* root-rot may cause problems in areas with poor drainage. Radishes may also be affected by downy mildew. Soft rot may be a major problem with long white radish in hot weather.

Radishes are occasionally attacked by white rust (*Albugo candida*). This disease causes raised white pustules on the leaves, stems and flowers. It is controlled by the

destruction of diseased crop residues, rotations of three to four years and the separation of young from old crops.

Weed control

Because radishes have such a short growing period and are grown only in small areas, weed control is generally not a serious problem. Apply chlorthal (Dacthal®), if available, before planting. There is an off-label permit for propachlor (Ramrod®) which is a residual herbicide that is applied after planting, but before weeds emerge. The current permit will expire in 2002. It may also be necessary to use inter-row cultivation and hand weed in the row during the growth of the crop.

Quizalofop (Targa®) or sethoxydim (Sertin®) may be used over the crop, if necessary, to control grasses.

Harvesting and marketing

Depending on season and variety, harvest commences three to eight weeks after planting with red radishes, and 7 to 12 weeks after planting for long white radishes. Do not allow roots to become over mature as they will be too pithy.

The leaves of long white radish are cut just before harvest. Roots can weigh approximately 1.5 kg for export, or 300 to 600 g for the domestic market. The tops of the roots have a diameter of 5 to 10 cm. Long white radish often has the root 10 cm out of the ground. For this reason, long white radish is easy to harvest by hand. Handle with care during harvesting washing and packing, as roots are easily bruised. Long white radish may be packed into cartons for export, or elastic bands are used to hold two to three roots for the domestic market.

Red radishes are harvested by hand and one to two elastic bands are often used in the field to hold bunches of 20 to 25 roots. These are then drum-washed and dried. Pack in cartons with a polythene liner, either in bunches or pre-packed without leaves in 500 g lots. The latter are also used for distant markets in Western Australia.

Radish leaves are susceptible to wilting. For bunching radish, harvest in early morning and keep cool and moist until they can be put into cool storage at a temperature of 0°C and a relative humidity of 90 per cent.

Table 3. Control of brassica pests

Pest	Pesticide chemical name	Tradename®	Withholding periods (days)
Aphids (under leaves)	Dimethoate	Perfekthion	7
		Rogor	7
	Fluvalinate	Mavrik	2
	Methidathion	Supracide	7
	Pirimicarb	Pirimor	2
Cutworm (stems, leaves)	Chlorpyrifos	Chlorfos; Lorsban	5
Grubs (leaves, heads)	<i>Bacillus thuringiensis</i>	Dipel, Dipel Forte, Thuricide, Xentari	0
	Chlorpyrifos	Chlorfos; Lorsban	5
	Cyfluthion	Bulldock	7
	Deltamethrin	Decis	2
	Esfenvalerate	Hallmark	2
		Sumi-Alpha	2
	Methidathion	Supracide	7
	Methomyl	Lannate	3
Redlegged earth mite	Chlorpyrifos	Chlorfos, Lorsban	5

Exports

A small volume of red radish are exported to South East Asia.

A small volume of long white radish is exported to Hong Kong from May to August in cartons. There is also potential to supply pickled long white radish to Asia.

Further reading

- Farmnote 39/90 'Diseases of crucifers'.
- Farmnote 69/90 'Clubroot disease of crucifers in Western Australia'.