

A vibrant collage of various root vegetables. In the top left, there are several bright orange carrots and a white carrot. To the right, there are leafy greens with large, rounded leaves. In the center, a large, round, reddish-brown radish is prominent. Below the radish, there are more root vegetables, including a long, light-colored root vegetable. The background is a mix of these vegetables, creating a rich, colorful scene.

ROOT VEGETABLES

BY JOHN MASON AND STAFF OF ACS DISTANCE EDUCATION

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CHAPTER 1 INTRODUCTION

Root vegetables are often botanical oddities; unlike other plants most of them develop specialised plant parts at or below ground level with the purpose of storing nutrients for the plant during difficult times. Root vegetables, in the culinary sense, includes more than what botanists term as 'true roots' - they may also include rhizomes, tubers, swollen roots and swollen stems.

Commonly grown root vegetables include:

- Beets (sweet beets, beetroot)
- Carrots
- Daikon (Japanese radish)
- Potatoes
- Parsnips
- Radishes
- Rutabaga (Swedes or Swedish turnips)
- Sweet Potato Salsify - Salsify *Scorzonera* (Black salsify), *Scolymus* (Spanish salsify)
- Turnip rooted chervil
- Yams

This book contains information on all of these as well as many others.



Root Vegetables

What are True Roots?

To be classified as 'true roots', in botanical terms, roots must have the ability to:

- Secure the plant in the soil.
- Physically support the stems.
- Absorb water and nutrients and move them around in the plant through their conductive tissues (scientifically referred to as the xylem and phloem).
- Store nutrients.

The internal anatomy of a 'true root' consists of a central core (xylem) around which other tissue is arranged: the endodermis (the inner layer which forms a ring around the central vascular cylinder i.e. the xylem and phloem); the pericycle (the outer layer of cells that surround the vascular cylinder) and the epidermis (the outermost layer of cells that surrounds the root).



True roots also lack the types of buds from which leaves, flowers, cones and other plant structures develop.

True roots from other plants including as angelica, horseradish, sassafras, sarsaparilla and liquorice are used to extract flavours or spices. The plant roots of many plants are also used to make herbal medicines - for example ginseng roots.

Vegetables Commonly Known as Root Vegetables

A lot of vegetables commonly described as 'root vegetables' are actually not 'true roots', but for the purposes of this text we will include them as 'root vegetables'. These include:

- Corms: Taro (*Colocasia esculenta*), Chinese water chestnut, Elephant root yam (*Amorphophallus paeoniifolius*), Konjac (*Amorphophallus konjac*).
- Rhizome: Ginger, Lotus root (*Nelumbo nucifera*).
- Swollen basal stems (above ground): Kohlrabi.
- Tubers (modified stems): Potatoes, yams (not to be confused with sweet potatoes which are true roots), Jerusalem artichoke, Oca (also known as the New Zealand yam).
- Tuberous roots (modified lateral roots): Cassava, Sweet potatoes, Jicama.

Human Nutrition and Root Vegetables

Root vegetables are packed with vitamins and fibre, both essential for good health. Contrary to popular belief, most are also quite low in calories.

Beetroot: Very low in calories but a high source of folic acid (a B vitamin), important for pregnant women. Also contain betalains which are a rich source of antioxidants.

Carrot: One of the best sources of beta-carotene (an anti-oxidant).

Celeriac: A very low calorie vegetable, great source of both soluble and insoluble fibre.

Daikon: A rich source of Vitamin C, and a very good source of folate, copper and potassium, very high in fibre but also very low in calories.

Jerusalem artichoke: A reasonable source of dietary fibre, Vitamin B6, Vitamin C and magnesium and a good source of iron and potassium.

Kohlrabi: No fat, no cholesterol and low in carbohydrates and sugar a high source of Vitamin C and a good source of B6.

Oca (New Zealand yam): Extremely high in carbohydrates and energy; a good source of beta carotene (Vitamin A), B6, potassium and some fibre. The red varieties have the anti-oxidant anthocyanins and the yellow varieties beta carotenes.

Parsnip: A very high fibre vegetable plus a good source of folic acid.

Potato: High in B1 vitamin, an average source of Vitamin C and a good source of fibre; great as a quick energy supply.

Radish: Very low in calories and a reasonable source of Vitamin C and some folic acid.

Swede (Rutabaga): Very low in calories and a good source of Vitamin C as well as some folic acid.

Sweet potato: Low in calories, high in beta carotene, a good source of Vitamin C and low GI (glycaemic index) compared to potatoes; the purple fleshed varieties contain anthocyanins which are rich anti-oxidants.

Turnip: A good source of Vitamin C and fibre.

Yam: High in potassium and beta carotene (yellow types), low in calories, very high in starch but with a low GI (glycaemic index) with slow release glucose providing energy for sustained periods.

General Guide to Growing Root Vegetables

Provide Good Drainage

Most root vegetables prefer a deep, sandy loam soil although potatoes and other tubers will grow well in other soils (loams, clay loams), as long as they are not too heavy. For root vegetables with a tap root, such as carrots, parsnips and parsley root, and also potatoes, you need a depth of 20- 30cm. For potatoes, you will need the ability to 'hill-up' the

plants with soil as they grow to prevent greening. Some gardeners use a thick layer of mulch around potatoes and top it up regularly as the plant adds height.

Good drainage is vital for successful vegetable growing. Root vegetables in particular do not like badly drained soils – it causes rot and promotes bacterial root rot which, once established in the soil, is very difficult to treat and usually means years of fallowing. If you have clay soil or if your site is in a low-lying area, then prepare a raised growing

bed (30cm above the natural ground level). You can do this by heaping the soil up into mounds and tapering the edges so that the beds remain stable during heavy rainfall. Alternatively use retaining materials such as sleepers, bricks, ACQ treated pine and hardwood timber. Provide sufficient drainage holes at the base of the bed so water can readily drain out from behind the retaining material. Slotted drains (agricultural pipes) may be needed if poor drainage prevails.



Beetroot in raised bed for deep soil

Soil pH

Soil pH is measured on a scale of 1 to 14. A pH of 7 is called neutral, below this the soil is called acid and above, alkaline (or limey). Plants require a pH between 4.5 and 9. The main effect of pH is on the availability of nutrients. The pH preferences of plants differ from species to species. This is due to their roots' ability to extract different nutrients depending on the pH. Most plants prefer a pH between 5 and 7. If a plant is put in a pH it is not adapted to, it may either be unable to extract enough nutrients or may extract so much that it becomes oversupplied.

Microorganisms are also affected by pH. These microorganisms can be either beneficial to plants (e.g. by helping to decompose organic matter) or disease starting (such as fungi like *Fusarium*). Different organisms will thrive at different pH levels. For example, dampingoff in conifer seedlings increases as pH rises. There are further notes on how to apply lime later in this text.



Hydroponic grown potatoes

Prepare the Vegetable Bed

1. Destroy all weeds. Establishing weed control early will mean less work later and a better crop. Dig out and remove the entire root system of perennial weeds, particularly bulbs from weeds such as oxalis, knotgrass and onion weeds. Remove annual weeds as they appear and are just large enough to handle. Don't let them flower, as this increases spread.
2. Thoroughly cultivate the soil and incorporate well decomposed compost to a depth of 15cm – 20cm. Do not add manures as most root vegetables either tend to fork if the soil is too nutritious or develop scab or other problems in heavily manured soils. Root crops such as carrots and parsnips may need the soil cultivated deeper or a raised bed with additional soil.
3. Leave for a week then ideally test for pH (simple pH test kits are available from your local nursery). The ideal pH for healthy vegetables is between 6 and 8. Later notes provide more information on the ideal pH for individual crops.
4. Correct the pH if necessary (according to the root crop you are planting) by incorporating lime or dolomite into the soil to raise pH, or sulphur to lower it. Make sure you check first because some vegetables, such as potatoes, develop scab in neutral to lime soil (i.e. soils with a pH of and above pH7).