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Growing sweet potatoes in Western Australia

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The sweet potato (*Ipomea batatas*) is a member of the morning glory or Convolvulaceae family. It is not related to the common potato. The plant has long trailing slender stems and is perennial, but is treated as an annual in cropping.

The tuberous root is high in food value, fibre and energy. It is rich in sugar and vitamin C, and also contains good quantities of vitamin A, vitamin B, calcium and iron. They can be steamed, baked, boiled, microwaved, roasted or fried. They can also be purchased as crisps.

Sweet potatoes are available all year from Western Australian growers and a large volume of produce is also imported from Queensland throughout the year. Consignments of sweet potatoes to Market City, Canning Vale are increasing and were 2215 tonnes in 1998/1999, but this does not represent total consumption in Western Australia.

Climate

The sweet potato is a semi-tropical plant that grows best between 20 and 30°C. A minimum frost-free growing season of 4 to 6 months is needed with a minimum of cool, cloudy weather. Plant growth is restricted below 10°C and plants are physically damaged at 1°C.

Soils

Sweet potatoes grow best on well-drained sandy loams, although sandy soils produce good crops if well fertilised and watered. Heavy and swampy soils tend to produce rough, misshapen roots.

The pH of the soil should ideally be 6.0 to 7.0 (water system of measurement).

The yield of roots declines rapidly as salt levels rise. The soil conductivity should be less than 25 to 50 mS/m.

Cultivate the soil to provide 20 to 30 cm depth of well worked soil. Additional deep ripping with a tined implement may improve soil drainage and root shape.

On sandy soils, the crop can be planted on flat or ridged ground, but ridged ground facilitates machine harvesting. On heavier soils and in situations where waterlogging may occur, it is preferable to grow the plants on ridges 20 to 25 cm high.

Rotation

Sweet potatoes should be rotated with other crops to prevent the build-up of diseases such as scurf. It is advisable to plant sweet potatoes on the same soil only once every 2 to 4 years.

Obtaining planting material

Sweet potatoes are vegetatively propagated from cuttings. Select storage roots from healthy, high yielding plants. Good quality sweet potatoes may be bought in the markets for planting material, although market agents and often growers may not know the names of their varieties.

Choose roots from a uniform consignment. They should be well formed, with bright skins and no trace of diseases. To plant 1 hectare, you will need 400 to 500 kg of seed potatoes. About 1000 tip cuttings are produced from 20 kg of roots.

The Queensland Department of Primary Industries maintains a stock of virus-free sweet potato mother stock. They will sell up to 100 tip cuttings of three varieties to growers. Enquire from Redlands Research Station, PO Box 3127, Cleveland, Queensland 4163.

Preparing cuttings

New growers should make a seed bed in a warm area by planting roots end-to-end in rows 5 to 10 cm apart and 3 to 4 cm below the soil surface. In Perth, do this in August–September. Clear plastic may be placed over the plants. In other areas, wait until the soil temperature is above 15°C. Take cuttings from the seed bed when the shoots are 15 to 20 cm long. Cuttings should not be contaminated with soil. Some leaves may be removed from the base of the cutting, but this is optional.

Cuttings may be rooted in water before planting, but this is not essential. Place bundles of cuttings in water 4 to 5 cm deep for 48 hours. Do not immerse the tip of the cutting in water or the growing point will rot. Rootlets may be just visible at planting, but should not be longer than 2 mm.

Established growers take cuttings from the best plants of the previous year's crop. They may protect these plants with shade cloth in winter and early spring.

Do not pull slips from the old tubers, as they may carry root diseases, especially scurf. It is preferable to cut off shoots (cuttings) with secateurs. These have not been in contact with soil and should be free of scurf.

Cuttings are normally planted by hand, but a mechanical transplanter may also be used. Plant cuttings with 5 to 7 cm of the tip exposed and with the lower half horizontally in the ground. Space rows 90 cm apart, with 25 to 35 cm between plants in the row. Plant closer if experience shows that a variety will produce roots which are too large at a wide spacing. Another system is to plant on ridges 1.2 m apart formed by banker discs, with double rows 0.3 m apart and 0.5 m apart within the rows.

Sweet potatoes can be planted at Carnarvon for most of the year, but growers should target periods of low supply in the markets to maximise financial returns. For this purpose, plant sweet potatoes between July and September in Carnarvon for harvest from December to February, and in March for harvesting from August to September.

In Broome, sweet potatoes are mainly harvested from December to March.

In Perth, plant from late September to late December and harvest from February/March to May/June.

Varieties

Several different types of sweet potato are available in Western Australia. Newer types became available in Western Australia in the 1980s and are compact and sweet, compared with the old purplish variety, Puerto Rico. The most widely grown variety is Jewel, which has orange skin and flesh. Beauregard is the latest variety, with pinkish skin and orange flesh, and is increasing in popularity.

Garnet and Rojo Blanco are purple skinned varieties with white flesh. Rojo Blanco matures earlier than Garnet, but the latter is the main purple variety grown in Western Australia.

Irrigation

Soil must be kept moist after planting to ensure good establishment of the cuttings.

On sandy soils, daily irrigation of established plants is recommended, although this will vary with temperature, wind speed and the stage of crop development. Yields and quality are seriously affected if the crop is stressed when the harvest roots begin to develop about 50 to 60 days after planting. Water quality is important and the conductivity of water used for irrigating sweet potatoes should be less than 170 mS/m.

Do not overwater as plants mature, as this may cause rotting and skin cracking.

Plants are usually watered by overhead sprinkler irrigation, but may also be watered by trickle irrigation. The latter must be removed before harvesting. There have been no trials on the watering requirements of sweet potatoes in Western Australia.

Fertilising

Sweet potatoes require less fertiliser than most other vegetables.

The use of compost at up to 50 cubic metres per hectare before planting will be beneficial. It will supply organic manure, add nutrients and help to retain moisture in the soil.

On sandy soils, apply the following rates (see Table 1) of magnesium and trace elements before planting.

Table 1. Trace elements and magnesium applied before planting on sandy soils

Magnesium sulphate (magnesium)	50 kg/ha
Borax (boron)	15 to 25 kg/ha
Copper sulphate (copper)	15 kg/ha
Ferrous sulphate (iron)	15 kg/ha
Manganese sulphate (manganese)	10 to 25 kg/ha
Sodium molybdate (molybdenum)	1 to 2 kg/ha
Zinc sulphate (zinc)	15 to 20 kg/ha

The most common trace element deficiencies of sweet potatoes are boron, manganese and iron. These elements should be applied immediately before planting and if deficiencies are noticed in the leaves, they may also be sprayed directly on the foliage or applied to the soil after planting.

Information on fertilising of the main nutrients is shown in Table 2. Double superphosphate is preferred as a phosphorus source to single superphosphate, because it contains less cadmium, which is a toxic heavy metal. Have the soil tested to find out how much phosphorus is present. If there are high levels of bicarbonate extractable phosphorus in the soil, applications of phosphorus can be reduced. Nitrogen, phosphorus and potassium are easily washed through sandy soils by rain and irrigation. Do not overuse fertiliser, because nutrients leach into lakes and rivers leading to groundwater pollution.

Table 2. Fertiliser requirements of 1 hectare of sweet potatoes on three soil types

Sandy soils

Before planting, apply:

200 kg double superphosphate

Starting one week after planting until three weeks before harvesting, apply weekly:

25 kg ammonium nitrate
25 kg muriate of potash

At running, apply once:

50 kg magnesium sulphate

Loamy soils

Before planting, apply:

500 kg double superphosphate
200 kg muriate of potash
200 kg urea

Carnarvon

When plants start to run, apply:

50 kg urea per hectare

Two weeks later, apply:

50 kg urea per hectare

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 the programs 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.

Weed control

Many growers control weeds mechanically. During early crop growth, shallow cultivation between rows and hand weeding will control weeds. Once plants cover the ground, the crop tends to smother the weed growth, except a few tall-growing weeds.

Chlorthal (Dacthal®) is a pre-emergent herbicide registered for use on sweet potatoes, but there may be problems with its availability. It is sprayed over the plants at 6 to 15 kg/ha immediately after transplanting, and can be used again six weeks later. Sethoxydim (Sertin®) is registered to control emerged grasses and may be sprayed over the crop.

Selective herbicides are not available to kill emerged broad-leaved weeds in the crop.

Pests and diseases

The sweet potato crop is relatively free of pest and disease problems. In some seasons, it is not necessary to apply any pesticides to the crop. There are few pesticides registered for use on sweet potatoes.

Sweet potato leaf miner

The major insect pest of sweet potatoes in Western Australia is the sweet potato leaf miner. This is a small, dark reddish to black grub up to 10 mm long. The adult is a small moth.

The grub eats plant tissue between the upper and lower leaf surfaces, leaving a transparent papery 'window' in the leaf. The grub can be seen inside this window. Heavy infestations can develop quickly, and severely defoliate the crop, reducing yield.

African black beetle

African black beetle causes severe damage by chewing holes in sweet potato roots. It is common in crops following pasture. Treatment of the soil before planting with metham sodium will help to control African black beetle. Refer to Farmnote No. 75/88 'Identifying soil insect pests – beetles' (Agdex 611) for more information.

Rutherglen bug

Rutherglen bug can appear in large numbers in November and December. The small bugs delay plant establishment. Rutherglen bug breeds on weeds, particularly *Portulaca* and eradication of weeds near the crop will reduce problems with Rutherglen bug.

Two spotted mite

Two spotted mite will attack sweet potatoes. They are usually first noticed by the appearance of the leaves, which begin to look scorched, russetty and dry. The mites are cream coloured, with two dark spots on their back. They live on the underside of affected leaves and are just visible to the naked eye. The mites suck the sap of the leaves and breed very rapidly in warm weather.

Root knot nematode

Root knot nematode causes malformations and cracking of storage roots. Root knot nematode is a soil-borne pest that has a large number of hosts. If galls are present on the roots of susceptible weeds such as nightshade, or nematodes have affected a previous crop, treat the soil with metham sodium at 500 L/ha two weeks before planting.

Field mice

Field mice may cause substantial damage to roots in the field.

Scurf

Scurf (*Monilochaetes infuscans*) is a major problem for most growers of sweet potatoes in Western Australia. It is a soil-borne fungal disease that causes greyish brown spots and large blotches on the skin of roots. It reduces marketability and keeping quality of roots.

Scurf is introduced to new properties on diseased roots used for seed. Slips taken from infected roots effectively spread the disease throughout the growing field. Once established in the soil, the disease can survive for 2 to 3 years in light soils, and 3 to 4 years in heavy soils or soils rich in organic matter.

Control scurf using the following measures:

- Do not over-water.
- Plant cuttings only.
- Choose light soils.
- Do not plant sweet potatoes more than once every 2 to 4 years on the same plot of land.
- If scurf is present in the soil and a long rotation cannot be practised, reduce the disease level by fumigating with metham sodium.
- Do not store in the ground.

Fusarium rot

The fungus *Fusarium* causes the sweet potato roots to rot. Roots develop soft spots, which gradually enlarge. It affects some varieties more than others, and causes most damage in storage. In the field, the rot often starts when the roots have been damaged by cold or wet soils. It progresses rapidly within the root and, under favourable conditions, the whole root may break down in a few days.

Harvesting

Roots are ready for harvesting 14 to 20 weeks after planting, but can also be ground-stored in the soil when mature. Periodically, dig a few roots to check their maturity. They can be dug as soon as they are of a marketable size. Excessive size, cracking, breakdown and disease build-up may occur if harvesting is delayed too long. Good roots of the variety Jewel are 15 to 20 cm long and 5 to 8 cm wide.

Remove vines before digging the potatoes. They can be cut off by hand or slashed mechanically with a flail type pulveriser or rotary slasher.

The sweet potato is extremely sensitive to bruising. Most growers in Western Australia dig sweet potatoes by hand. This minimises damage to the skin of the potatoes, but is very labour intensive. It is possible to modify a potato harvester to successfully harvest sweet potatoes, but this may reduce quality and give rise to more volunteer crops. Good yields are 20 to 30 t/ha.

If frost kills the sweet potato vine, dig up roots as soon as possible, since their quality declines quickly. Potatoes rot quickly in cold wet soils.

In Perth, sweet potatoes are often ground-stored. A plastic cover 2.5 m wide is placed over the whole row in May to preserve quality. This may be removed in late August when there is less rainfall. By this means, roots may be stored up to December, but yields and quality will decrease with increasing ground storage. Roots must be harvested as soon as possible if an inspection shows any signs of scurf on the roots.

Storing roots

Select sound, marketable roots for storage. Do not wash roots intended for storage.

Harvested sweet potatoes store well for 1 to 2 months under ambient temperatures, but for prolonged storage, they must be handled as follows. First they must be 'cured' by holding them at 29°C with a relative humidity of 90 per cent for 7 to 10 days. Curing:

- heals cuts, bruises and skinned areas on roots to prevent decay;
- keeps shrinkage and weight loss to a minimum;
- improves the culinary qualities of the sweet potatoes by converting starches to sugars.

After curing is completed, drop the temperature to 13 to 15°C to prevent sprouting. Maintain the relative humidity at 85 per cent to prevent shrinkage. If the storage temperature drops below 10°C, the sweet potatoes will start to deteriorate. Special insulated storage sheds are required for curing and storage. A fan to ensure good air circulation during curing and storage is advisable.

Marketing

Wash and grade roots before packing. Sort potatoes into three grades:

- Small – about 3 to 5 cm diameter (No. 1)
- Medium – 5 to 7 cm (Special)
- Large – more than 7 cm (Jumbo)

The highest price is paid for medium sized, clean skinned potatoes. Roots affected by scurf are downgraded in price.

Sweet potatoes are normally marketed by local growers in 36 litre plastic crates which hold about 22 kg. Produce is imported from Queensland in cartons. Arrange the roots in an orderly manner to present an attractive pack. Mark the variety name and grade on the pack. Prices are often lowest from April to August. For the rest of the year prices may be moderate due to imports of sweet potatoes from Queensland.

Old crops

Old crops may give rise to volunteer plants in other crops. Repeated discings over summer may be required to kill old crops.

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