



PARSNIPS

— Production guideline —



agriculture,
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PART I: GENERAL ASPECTS

1. Classification

Scientific name: *Pastanica sativa*

Common names: Parsnip

Family name: Apiaceae

2. Origin and distribution

Parsnips are native to Europe and Asia and were used by the ancient Greeks and Romans for medicinal and food purposes. Parsnips were introduced into North America in the early 1600s and were grown by the early colonists and Indians. Parsnips are biennial, but are grown commercially as an annual. It is cultivated mainly in temperate regions worldwide and only occasionally in the cooler parts of the tropics, including East and southern Africa.

3. Major production areas in South Africa

PRODUCTION REQUIREMENTS

It can grow in slightly shady localities (open woodland) or in full sunlight. In the tropics it can only be cultivated above a 900 m altitude.

SOUTH AFRICA

The ideal growing regions in George and other parts of South Africa are ideal for planting this crop.

4. Description of the plant

BOTANY

Roots

They have a tough, creamy white root, tapering somewhat from the crown, from which arises the erect stem, 30 to 60 cm high.

Stem

The leafstalks are about 20 cm long, the leaves divided into several pairs of leaflets, each 2-5 cm long, and up to 2 cm wide.



Leaves

All the leaflets are finely toothed at their margins and softly hairy, especially on the underside.

Flower

The flowers are yellow and borne in umbels at the ends of the stems, similar to the carrot. The flowers of the cultivated parsnips are a deeper yellow colour than those of the wild plant.

5. Cultivars

VARIETIES

The old cultivar 'Hollow Crown' is mostly cultivated in East Africa; other well-known cultivars are 'Guernsey' and 'Offenham', both with shorter roots.

6. Climatic requirements

TEMPERATURE

The optimum temperatures for growing parsnips are cool (16 to 20 °C) which are the conditions for optimum root maturity and quality. The crop may be scorched above 30 °C. Roots are not harmed by frost, however cold weather may result in root loss owing to flowering or "bolting".

Rising temperatures cause the root quality to decline rapidly, and temperatures above 30°C are likely to result in root damage. Parsnips are able to tolerate frost.

7. Soil requirements

SITE AND SOIL

Parsnips have an effective rooting depth of 35 to 50 cm and grow well in deep, sandy soils. Acid soils should be limed before planting. Heavy soils and stony soils are not suitable for parsnips.

Deep, loose fertile soils that have a good water-holding capacity and a pH of 6,0 or above are necessary for the development of long, straight roots. Well-drained sandy loams, peat and mucks are ideal for parsnip production.



Parsnip seeds germinate optimally when soil temperatures range between 10 to 21 °C. In general, germination is slow, even under ideal field conditions and where suboptimal conditions prevail, emergence may require more than four weeks. After germination, the soil surface should not be allowed to bake out or the seedlings may die off. Parsnip seed usually retains its viability for only two years; it is therefore advisable that growers purchase new disease-free seed each year from a reliable seed distributor.



To ensure continuous parsnip growth, consistent soil moisture is important. In muck soils the water table should be kept at 76 to 91 cm below the soil surface. Supplemental irrigation may be needed on mineral soils of low water-holding capacity during dry spells. If the soil is allowed to dry out for a period of time before irrigation, the developing roots may be prone to splitting.

PART 2: CULTIVATION PRACTICES

1. Propagation

Cuttings from a strong root are planted in the late autumn. These will overwinter well and will produce new parsnips in the next growing season.

2. Soil preparation

Parsnips are grown successfully on both mineral and muck soils. Muck soils are among the easiest to work and yield high-quality roots. Parsnips are also ideally suited to loam soils. Heavier soils, where moisture cannot be controlled, are not the best for parsnips because it is more difficult to es-



establish a good plant stand as a result of soil crusting. The soil depth should be at least 45 cm to promote the development of straight roots. Shallow soils may lead to forked or crooked roots. Good soil drainage is essential because waterlogging can result in crop failure.

The soil should possess a fine tilth and be free of clods and debris. Soil obstructions make seedling emergence, difficult thereby leading to a more variable plant stand and may also result in misshapen roots.

3. Planting

At optimum temperatures, germination takes about 14 days, but in cold conditions it could be up to four weeks. Establishment is better in the cooler months. The seed is more difficult to germinate than that of carrots and requires regular moisture for establishment.

Parsnips may be seeded with a nurse crop such as cereal rye, which germinates quicker than parsnips and protects the seedlings from wind and sandblasting.

The cereal rye may be sprayed off when the parsnips have three leaves.

PLANTING PERIOD

Parsnips are planted in the early spring after the threat of frost is over, mostly seeded in the field from April until mid-May. On mineral soils, a major problem in parsnip production is stand establishment. Careful attention should be given to preparing the seedbed.

DAYS TO MATURITY

Parsnips are a long-season crop typically needing 110 to 130 days to reach maturity. However, in certain areas, roots are lifted and sold after only 95 days.

SPACING

Parsnips are planted in rows 45 to 75 cm apart with spacing between plants from 3 to 6 cm. To maximise yields, some growers use planters that scatter seeds thinly over a 5 to 8 cm strip rather than drilling seeds in a single line within the row. Thinning is seldom practiced owing to the expense. The density of planting is important since this will determine root size at harvest. Few growers use, precision seed to ensure root uniformity and a lower number of culls.



The seeds should be planted at a depth of 0,6 to 2,0 cm. If the seeds are sown too deeply emergence will be reduced, and if they are planted too shallowly soil moisture necessary for germination may be lacking. In areas where winds are a problem, attempts should be made to protect planted fields from soil dispersal. Blowing soil may result in unevenly covered seeds, which may lead to patchy, uneven stands.

SEEDING RATE

The spacing between the rows may depend upon the type of harvester.. Sow the seed in situ 5 to 20 mm deep in rows 30 to 40 cm apart.

This requires a total of 3,3 to 4,6 kg of seed to sow 1 ha. Parsnips may also be planted in double rows with 40 cm centres, with the two lines in the double rows at 6 cm apart and plants at 8 to 10 cm within the rows.

4. Fertilisation

FIELD FERTILISATION

The nutritional requirements of parsnips are very similar to those of beets and carrots. Adequate supplies of nitrogen, phosphorus and potash are important for optimal parsnip development. On mineral soils 110 kg/ha of nitrogen is recommended with 70 kg/ha applied preplant and 40 kg/ha as a side-dressing.

The quantity of nitrogen applied to muck soils should be reduced to 60 kg/ha applied pre-plant. Nitrogen fertilisation should be monitored carefully since excessive usage may result in rank foliage growth and increased susceptibility to diseases. If manure is applied or a soil-improving crop such as a legume precedes the planting of parsnips, the nitrogen requirements should be reduced. Also, if manure is applied it should be well rotted before parsnips are sown. Fresh or non-rotted manures may cause deformed roots.

The phosphorus and potash requirements of the soil may be established by means of appropriate soil tests. Parsnips could be susceptible to boron deficiency on new muck soils. In severe cases, boron deficiency may cause a breakdown in leaf and root tissue.

The application of compost at up to 50 m³/ha to other crops in the rotational system will be beneficial. It will supply organic manure, add nutrients and help to retain soil moisture.



Apply the following trace elements and magnesium per hectare before planting:

- 11 kg borax to supply boron;
- 18 kg copper sulphate to supply copper;
- 18 kg ferrous sulphate to supply iron;
- 25 kg manganese sulphate to supply manganese;
- 2 kg sodium molybdate to supply molybdenum;
- 16 kg zinc sulphate to supply zinc;
- 50 kg magnesium sulphate to supply magnesium.

It is recommended that nutrient analyses are undertaken of the soil and irrigation water before planting, as well as one to two analyses of the youngest mature leaves after planting. This will enable some adjustments to the fertiliser programme and provide information on nutrients that are deficient or toxic. Do not apply excess fertilisers, because nitrogen, phosphorus and potassium are easily washed from sandy soils by rainfall and irrigation. This may lead to groundwater pollution in rivers and estuaries.

5. Irrigation

Parsnips have shallow roots and the crop has higher moisture requirements than other vegetables. Use overhead butterfly sprinklers as rotary sprinklers will not apply enough water to parsnip crops in summer. In warmer months, apply half the water between 7 to 9 a.m. and half between 2 to 3 p.m. In cooler months, apply all of the water in early to mid morning. Do not allow the roots to dry out in order to avoid splitting.

Irrigation of 25 mm to 40 mm should be provided at 7 to 10-day intervals, or when necessary. Soluble fertilisers may be applied through the irrigation. The roots should not be allowed to dry out, but watering should be reduced for six to eight weeks after the development of the first leaf, to encourage the roots to grow deeper.

6. Weed control

Weeding is an essential operation during the first month after emergence. During early development parsnip seedlings are quite vulnerable to being crowded out by invading weeds. If hand or mechanical methods are em-



ployed for weed control the cultivations should be kept shallow or damage of the developing feeder roots may result.

7. Pest control

PARSNIP FLY

Identification: Small white maggots that feed on and burrow into the developing roots.

Control: Use soil-applied chemicals at planting, or cover young, emerging seedlings with fabric row covers to exclude egg-laying adults.

8. Disease control

LEAF BLIGHTS

Symptom: Fungal diseases that cause spotting on infected leaves.

Control: Occur when foliage remains wet for long periods.

ROOT ROTS AND SPOTS

Symptom: Fungal diseases cause decay and rotting of the roots. It leads to forked and misshapen roots.

Control: Crop rotation. Soil solarisation.

YELLOWS

Symptom: Yellow discolouration of plants.

Control: It is carried by leafhoppers. Cover the plants with fabric mulch. There are no known controls.

9. Other crop management considerations

ROTATION

The optimum rotation is to include one crop of parsnips every four years to avoid diseases such as *Rhizoctonia* and canker. In practice, if these diseases are not present, growers may grow one crop of parsnips on the same ground each year, this should be avoided if possible because it increases the possibility of diseases.



Do not include too many crops of carrots, celery and parsley in the rotation as these are in the same family as parsnips. Parsnips are often grown following a leafy crop such as brassicas or lettuces which have been well fertilised.

Mulches

Soil mulches are frequently used to moderate soil temperatures, control weeds, conserve water, protect the fruit from soil moisture, and the plants from insects and control erosion. The colour and texture of the mulch dictates how it affects soil temperatures.

TABLE 9.1.1 Effects of different mulches on soil temperatures

Mulch colour	Night-time effect on soil	Daytime effect on soil
Clear	warms	warms
Black	warms	no effect
White	warms	cools
Aluminum	warms	cools

In addition to affecting soil temperature, opaque mulches control weed growth. Black mulches become hot and may burn fruit that touches them during the day. Aluminum mulches are also used to disrupt aphid flights and decrease the chances of aphid-transmitted diseases. All mulches help to conserve soil moisture and control soil erosion.

THINNING

Parsnips can be grown in a similar way, but as they are larger they should be thinned to 15 cm.

10. Harvesting

Parsnips are a long-season crop typically needing 110 to 130 days for maturity. However, in certain areas, roots are lifted and sold after only 95 days.

Parsnips are harvested in a similar way as carrots. In fields where excess foliage growth has occurred, some growers remove part of the parsnip tops during the season or prior to harvesting, thereby facilitating harvesting. The roots are lifted by a carrot or modified potato harvester or in small plantings by hand. It should be noted that parsnip roots and foliage possess compounds which may induce inflammation of the skin. It may



be necessary for certain employees to wear protective clothing with long sleeves hand gloves when handling parsnips.

Some parsnips are lifted in late August and sold fresh. Most of the parsnips are harvested in October and November for winter storage. Some of the crop is left in the soil over the winter and then harvested in March through April the following year. Parsnip roots left in the field over the winter are very resistant to freezing damage. However, overwintered parsnip roots will not tolerate soil thawing and freezing, which may occur in April. Roots subjected to these conditions quickly lose quality and become cracked and pithy. Overwintered roots should be dug up as early in the spring as possible, before sprouting leads to a loss in root quality.

HARVESTING METHODS

Harvest with care by hand or machine to avoid damage. It is possible to use a modified carrot harvester (top-puller) or potato harvester (digger elevation) for harvesting parsnips. If this is not used, a modified blade can be used to loosen the soil 30 cm below the surface. The crop is then harvested manually. The standard system is to slash half the tops and then use a carrot harvester to lift the leafstalks and pull up the roots. A good yield is 25 to 35 t/ha.

Wear protective clothing for harvesting parsnips. Parsnip roots and leaves contain compounds (furan coumarins) which may cause inflammation of the skin.

HARVESTING RECOMMENDATIONS

The time from sowing to harvest varies from 3,5 to 6 months. At harvest, the roots should be 250 to 400 mm long and 30 to 70 mm in diameter. The harvesting period may extend for up to two months without damage to the crop in cool weather. In spring, harvest promptly as flowering (bolting) occurs and adversely affects root quality of crops stored in the soil. There is also a limited market for miniature “gourmet” varieties.



PART 3: POST-HARVEST HANDLING

PREPARATION FOR THE MARKET

1. Cleaning

The roots are topped and washed before being graded and then packed into bags or cartons. Parsnips are not frequently tied into bunches because of possible allergies—parsnips contain compounds that may cause skin irritation in some people. Roots should not be allowed to dry out fully, as this may cause root discoloration. Parsnips are graded according to length and quality.

Parsnips can be stored successfully for several months at 0 °C and a relative humidity of 90% to 95%. They should not be stored with ethylene-producing crops. Storage for two weeks at 1°C can improve flavour by converting starch into sugars.

2. Sorting and grading

After lifting, wash parsnips in crates or on benches. Do not allow the parsnips to dry out at any stage, as this can result in discoloration of the roots, similar to carrots. Grade should be according to condition and length. Remove leaves and market only straight, sound, white roots. Pack in 22 or 36 l crates which have a plastic sheet on the bottom and sides or pack in 10 kg cartons.

3. Packing

Parsnips are usually packaged in 11-kg film bags, or 5-kg cartons, holding 12 cello bags, 454 g each.

4. Storage

Sound roots may be kept in cold storage for 4 to 6 months at 0 °C and 98 to 100% relative humidity. The sweet nut-like flavour of parsnips does not develop until the roots have been exposed to near freezing conditions; these temperatures normally prevail in late September and October. At low temperatures the starches in the root are converted to sugars.

Mature roots which have not been exposed to low field temperatures may be stored for two weeks at 0 to 1°C to develop flavour. Extremely low temperatures in storage may damage the root tissues. Parsnips will freeze at -1,7 °C. The centre of the core of frozen parsnips may become water



soaked with reddish-brown areas developing in the cambium layer. The root may become externally dark brown after freezing, and subsequent thawing, and exposure to room temperature for a short period of time. Parsnips should not be stored with ethylene-producing crops (e.g. apples), because the possibility exists that the ethylene may impart a bitter flavour to the root tissue.

During the winter months parsnips are periodically removed from cold storage, washed, sorted and usually packaged into 454 or 908-g plastic bags for sale.

5. Post-harvest disorders and diseases

POST-HARVEST DISORDERS

Surface browning is a significant problem that is largely associated with bruising and abrasion injury during harvesting (Kaldy et al., 1976; Toivonen, 1992). Crops grown on coarse sandy soils are more susceptible and there are cultivars that are resistant to browning (Kaldy et al., 1976; Toivonen, 1992). Surface browning also increases with length of storage (Kaldy et al., 1976). Postharvest dips reduce browning during storage (Toivonen, 1992). Waxing parsnips, to reduce moisture loss, will increase browning (Plantenius, 1939).

PART 4: PRODUCTION SCHEDULE

ACTIVITIES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Soil sampling		X	X		X	X	X					
Soil preparation			X	X		X	X	X				
Planting				X	X		X	X				
Fertilisation				X	X		X		X			
Irrigation				X	X		X		X			
Pest control				X	X		X	X	X			
Disease control				X	X		X	X	X			
Weed control				X	X		X	X	X			
Leaf sampling				X	X		X	X	X			
Harvesting												
Marketing						X	X		X	X	X	



PART 5: UTILISATION AND NUTRITIONAL VALUE

1. Culinary/Cooking

USES

Parsnips should be left unpeeled and steamed or boiled to bring out their maximum flavour potential. Because the parsnip ranks third behind the potato and manioc, with about three quarters the quantity of starch found in the potatoes, it ranks as an important food source. The parsnip offers a wide complementarity with other tasty foods. Compared to carrots, the parsnip is a minor crop in most grown countries.

The fleshy, aromatic and slightly mucilaginous root is eaten as a cooked or fried vegetable. It is also used in soups and to add flavour to stews. The seed which tastes similar to dill, is occasionally used as a condiment. The leaves have diuretic properties. A poultice from the roots is applied to sores and inflammations and to treat skin diseases.

2. Nutritional value

The crop is a member of the Umbelliferae family of vegetables, related to carrots, fennel, celeriac and parsley root. This creamy-white root vegetable is low in calories, fat and sodium, naturally cholesterol-free, and high in fibre and several vitamins and minerals.

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