

Taraxacum officinale - Common dandelion, Lion's tooth



Dandelion has commonly been regarded as a weed and most research has focused on its eradication rather than its cultivation. Crop & Food Research is exploring the potential for growing this plant as a crop for both medicinal and culinary uses.

Dandelion, a member of the Asteraceae family, is an introduced and widespread weed in New Zealand that is often found growing in wasteland, lawns and fields. It is a traditional medicinal plant of Europe and the Orient and is generally considered to have tonic and laxative properties, among others.

This hardy perennial herb usually has deeply toothed, hairless leaves, 5-30 cm long and 1-10 cm wide. It grows 3-35 cm in height, forming a rosette of leaves at ground level. It has single, golden yellow flowers on straight, leafless hollow stems, which emerge from the centre of the rosette. Each flower consists of a collection of florets. Flowers are produced from early spring until late autumn. When the florets mature they produce downy seeds, which are easily dispersed by the wind.

Dandelion plants have tap roots, tapering from 2 to 3 cm wide and at least 15 cm in length. Roots are fleshy and brittle, and are a dark brown colour on the outside and white on the inside. The whole plant, including the root, contains a milky white juice or latex.

Uses

Dandelion has both medicinal and culinary uses.

Roots can be dried, then roasted and ground to make a coffee substitute. Fresh leaves can be eaten in salads or as a green vegetable, often blanched to remove the bitterness. Dandelion leaves are a rich source of vitamins and minerals and are particularly high in vitamins A and C. Dried leaves may be used in digestive or diet drinks and herb beers. Wine and a syrup can be made from the flowers.

Dandelion is approved as a GRAS (generally recognised as safe) food ingredient in the US. Extracts are used as flavour components in various food products, including alcoholic (e.g. bitters) and non-alcoholic beverages, frozen dairy desserts, candy, baked goods, gelatins, puddings and cheese.

Medicinally, dandelion root has been used as a tonic, blood purifier, and to relieve rheumatic disorders for hundreds of years, particularly in Europe and China. The dried or fresh root extract is used as a general tonic or as

a diuretic, laxative, and to treat various liver and spleen ailments. The leaf is reputed to be similar in medicinal action to the root but weaker.

Due to its high content of inulin (~40%), juice of the root can serve as a source of a special high fructose syrup.

Agronomy

Dandelion has commonly been regarded as a weed and most research has focused on its eradication rather than its cultivation. The spread of dandelion is a testimony to its ability to grow in a wide range of climates and soil types.

For root production, a seed rate of 4-5 kg/ha drilled in rows 30 cm apart has been recommended overseas, while a local trial produced greater yields at an inter row spacing of 15 cm compared with 25 cm. Seed should be sown in spring and spacing will be improved by using pelleted seed. A suggested germination rate in the field is typically around 60%, but this could vary substantially.

As with most root crops, it is better to select ground that is friable and free of stones. A light, friable soil makes harvesting roots easier; more soil can be shaken from them before washing and there is less chance of breaking the roots when removing them from the soil.

Sowing onto raised beds or ridges will increase the rooting depth of soil and should increase the ease of harvesting. A trial showed greater root production from raised beds than flat beds. However, flat beds may be more suitable for tractor work.

Dandelions can also be raised by root division as any piece of tap root left in the ground will sprout again.

Another method of growing dandelions for leaf production is to sow the seed in a nursery and then transplant into the field, eight to ten weeks later. This is a more expensive option but has the advantage of encouraging branching of the tap root, increasing the amount of leaf produced. It also allows an even spacing of plants in the field and reduces weeding in the early stages.

In the nursery, sow 45-50 seeds per metre of row, in rows 25 cm apart. Assuming a 60-70% germination rate, this gives 30 plants per metre of row (120 plants per m²). Planting out can take place from the end of November to the end of January at a spacing of 6-8 plants per metre of row.

A number of named cultivars exist, most bred for leaf production, e.g. Improved Full Heart, Thick Leaf, Improved Giant. Some are bred for roots, e.g. Giant Forcing.

For leaf production, American growers raise plants in rows 15 cm apart.

No information is available on the fertiliser needs of dandelion. In our trials, 550 kg/ha of Cropmaster 18 (N:P:K:S 18-8-18-0) was applied to the crop, split into two

applications per year, i.e. 275 kg/ha applied in spring and the other 275 kg/ha in summer. An additional application of 30 kg/ha nitrogen can be applied after leaf harvests.

Weed control is important as weeds provide competition to the establishing dandelion plants. Techniques such as pre-sow spraying or sowing into a stale seed bed should be undertaken. Once established, dandelions are usually able to cover the beds quickly and this prevents most weeds from invading.

Dandelions are resistant to many herbicides and this is an advantage when keeping aisles weed free and reducing weed competition within beds. No herbicides are registered for use on dandelion and only limited research has been carried out. Herbicides showing potential for selective weed control in Crop & Food Research trials include trifluralin (Treflan®) at 0.8 kg active ingredient per hectare as a pre-plant soil-incorporated treatment. Two herbicides, metha-benzthiazuron (Tribunil®) at 0.7 kg a.i./ha or aziprotryne (Brasoran® 50 WP) at 3.0 kg a.i./ha, are post plant pre-weed emergence herbicides. The third option is the desiccant paraquat/diquat (Preeglon®) at 0.5/0.3 kg a.i./ha applied to weed strike immediately before sowing dandelion. All treatments controlled weeds adequately. It is important to always follow herbicide label instructions relating to soil type and application rates. Application rates may need to vary markedly depending on the type of soil that the chemical is being applied to.

For organic production, mulching will suppress weeds and a flame weeder could also be used.

Dandelions are rarely troubled by pests and diseases. Roots can suffer from a dark coloured root rot but this is not common.

Production

Root yield from one-year old plants is typically in the range of 12-16 t/ha fresh root which dries to yield 4-5 t/ha dry root.

Small production trials sown at a 15 cm row spacing, and having a density of 60 plants/m², had similar yields. The 14-month-old plants produced an average fresh root yield of 12 t/ha and a dry root yield of 4 t/ha while the two-year-old plants produced an average fresh root yield of 28 t/ha and a dry root yield of 10 t/ha. These trial figures are for graded, washed roots that have had all leaves removed and any diseased portions of the roots removed.

In a Crop & Food Research trial of dandelion at five sites around New Zealand – Clyde, Mosgiel, Invercargill, Hamilton, and Hastings – most sites produced around 6-7 t/ha of dried root after six months of growth. Yields at Hastings were closer to 9 t/ha. Large differences in plant density between sites (40-250 plants/m²) were compensated for by differences in plant size (3-25 g/root).

Harvesting

There is debate about the optimum time to harvest dandelion root. Some believe the roots to be more bitter when harvested in autumn but others consider the roots to be more bitter when harvested in spring. Chemical components of the root vary depending on the seasons. In autumn the inulin content of dried root is up to 40% and in spring it is only 2%.

The British Herbal Pharmacopoeia (BHP) and other sources recommend harvesting the roots in autumn. When collected in spring, food reserves from the root have been used up for the production of leaves and flowers and the root may have a shrivelled and porous appearance when dried. If growing roots specifically for dandelion coffee, it is recommended that they are harvested in autumn, although it may be possible to extend the harvesting season into winter.

Plants are lifted using a carrot digger or similar machine that can work to a depth of 25-30 cm. Excess soil should be shaken off the roots but care should be taken not to damage the roots. The foliage needs to be removed and then the roots washed thoroughly.

For leaf production, harvesting leaves in late spring is recommended. One reference suggests that young leaves should be picked before the flower stems appear as they are then less acid. The full-grown leaves are considered to be too bitter for salads. A medicinal tincture is sometimes made from the entire plant gathered in the early summer.

In France, dandelion is grown commercially as an autumn salad herb from seed sown in spring. It is grown as an annual to prevent a bitter flavour from developing. In Northern France dandelion is planted in spring to develop large healthy roots. The roots are lifted in autumn and replanted indoors. During winter the roots are 'forced' to produce mild-tasting shoots similar to endives. When grown in the dark the shoots lose their green chlorophyll, becoming white or blanched.

Drying and storage

The roots should be dried whole if possible, but large roots may be cut transversely into pieces 8-15 cm in length or longitudinally. For some products, such as roasted dandelion, roots may be sliced into small pieces (about 1.5 cm) before drying.

As a general rule, roots should be dried at 35-40°C until hard and brittle. However, temperatures of 50°C have been used. Thick roots need to be checked carefully to ensure that the outside has not dried and sealed leaving the inside still moist.

Store roots in paper bags or non-plastic containers in a dry environment. It is important to keep the area free of moths as their larvae eat the dried root.

Quality

There are a number of quantitative standards for dandelion root (Table 1). However, apart from these gross physical determinants, there appears to be no widely accepted quality criteria relating to chemical content. Individual companies may use their own in-house standards to assess quality, based on experience and basic chemical tests.

Table 1: *Dandelion standards (British Herbal Pharmacopoeia, 1983)*

	Total ash	Acid insoluble ash	Foreign organic matter	Water soluble extractive
Root	≤ 10%	≤ 5%	≤ 2%	≥ 40%
Leaf	≤ 15%	≤ 3.5%	-	≥ 20%

Markets

The price paid to growers for dried whole root usually ranges from NZ\$9 to 20/kg. No current information is available on the price for dandelion leaf.

Dandelion is cultivated in France, Belgium, Germany, Italy, United Kingdom, and the US. There are small-scale suppliers and buyers of dandelion in New Zealand.

The size of the New Zealand and overseas market for dandelion is unknown, although dandelion products are widely available in health food shops and from other specialised retailers.

Growers will need to identify major buyers and determine their requirements before large scale production is considered.

Seed sources

Seed costs of around NZ\$100 to 200/kg are typical. The thousand seed weight of dandelion is about 0.4 g but for some varieties may be as much as 1.0 g.

Directories of seed suppliers include:

Anon., 1992. *The New Zealand Nursery Register 1992/1993*. Reference Publishing Co., Auckland, New Zealand.

Philip, C. (ed. Lord, T.) 1991. *The Plant Finder 1991/92 Edition*. Headmain Ltd, UK.

Issacson, R.T. 1989. *Andersen Horticultural Library's Source List of Plants and Seeds*. Andersen Horticultural Library, University of Minnesota, USA.

Further reading

Bonar, A. 1985. *Herbs*. Hamlyn Publishing, Middlesex.

British Herbal Pharmacopoeia. 1983. British Herbal Medicine Assoc., United Kingdom.

Grieve, M. 1931. *A modern herbal (1982 Edition)*. Dover Publications Inc., New York.

European Scientific Cooperative for Phytotherapy (ESCOP), 'Proposal for a European Monograph of the Medicinal Use of *Taraxaci Radix* Dandelion Root', March 1992.

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