Chapter 6
Herbs

Herbs .............................................................................. 168
Geoff Moore

6.1 Chicory (Cichorium intybus) ............................... 169
6.2 Plantain (Plantago lanceolata) ......................... 172

Photographic credits:
Carol Harris (NSW Ag.): page 170; Peter Maloney (DAFWA Image Resource Centre): pages 168 (sheep’s burnett), 169, 172; Geoff Moore (DAFWA): pages 168 (evening primrose), 171, 173.
Herbs are broad-leaf perennial plants which are non-leguminous (i.e. do not fix nitrogen from the atmosphere). Forage herbs have not been widely grown in WA, so there is limited information on their performance under local conditions.

The main herbs are chicory and plantain (see below). Other herbs include evening primrose and sheep’s burnett.

Evening primrose (*Oenothera stricta*) also called sweet-scented or common evening primrose is a biannual herb with a strong, fleshy tap-root which comes from South America. Evening primrose and related species have naturalised in WA and occur on roadsides and paddock margins from Gingin to Esperance. Evening primrose is readily eaten by sheep and can be grazed to the crown without damaging the plant, however it will not persist under set-stocking and requires some form of rotational grazing. Evening primrose has been successfully grown on deep sands on the south coast along with perennial veldt grass and serradella. It has mainly been grown to help stabilise sandy soils subject to wind erosion.

Sheep’s burnett (*Sanguisorba minor*) is a long-lived, deep-rooted perennial herb, which is native to parts of Europe and western Asia. It has been grown in New Zealand, mainly for revegetation and as a forage in harsh environments.

It has numerous fine stems and dark green dissected leaves which form a dense clump, 20-40 cm in height. It has pinky-red flowers on short stems, while the seeds form within hard, brown, oval seed pods with a roughened surface. Each pod contains a single yellowish-brown oval seed.

Sheep’s burnet is palatable, can contain high levels of protein and is a good source of vitamin A. It mainly grows in autumn, winter and early spring. Its role in WA is unknown. Seed is currently not available.
6.1 Chicory (*Cichorium intybus*)

**Features**

- warm season growing herb
- excellent feed quality, suitable for finishing stock
- good acid soil tolerance
- requires deep, fertile soils
- moderate drought tolerance.

Chicory is a short-term (two to five years) perennial herb native to Europe, temperate and tropical Asia and North Africa. It has been cultivated as both a summer forage and as a ‘coffee substitute’ for centuries and was introduced into Australia in the 19th century.

High animal growth rates, e.g. 290 g/day (lambs) and 900 g/day (calves) have been measured on chicory. Chicory provides a good balance between crude protein, energy and minerals and combined with rapid passage through the animal results in high feed intake and liveweight gain.

The potential of chicory in WA is still being investigated. It has been evaluated in field trials by the CRC Salinity and grown by a small number of farmers. Chicory is also gaining popularity as a cover crop in vineyards. On the Esperance sandplain the dry matter (DM) production from chicory was superior to lucerne, while at Katanning it was persistent but DM production was lower than lucerne.

In high rainfall districts chicory could be a perennial option on cropping soils that are too acidic to grow lucerne, as a specialist pasture for finishing stock, or as a high quality component of a mixed perennial pasture.

**Seasonal growth pattern**

In temperate environments where there is adequate summer rainfall, chicory grows actively from early spring to late autumn. In winter, growth is checked by frosts but it will continue to grow slowly providing the soil temperature is more than 9°C.

In WA chicory grows from early spring to late spring/early summer, opportunistically over summer depending on soil moisture and after the autumn rains until the first frosts in winter. Chicory requires vernalisation over winter for its reproduction with plants flowering in...
late spring to early summer in response to increasing day length. In a given season not all the plants will be reproductive and those that are vegetative in one year are more likely to be reproductive in the following year.\textsuperscript{63}

**Establishment**

The time of sowing is flexible as chicory can be sown in autumn or late winter to early spring – similar to lucerne. The keys to successful establishment are: (i) good weed control (there are few post-emergent broad-leaf herbicide options); (ii) avoid frosting the young seedlings; and (iii) sufficient soil moisture for the plants to be well established before summer.

Seed should be sown at a depth of 10 mm\textsuperscript{341} with a seeding rate of 4-5 kg/ha when sown alone or 0.5-1 kg/ha when sown in a mixture (seed size 830,000/kg). A residual insecticide is essential as chicory is susceptible to redlegged earth mites. Chicory has good seedling vigour when sown under favourable conditions. A good stand will have 45-60 plants/m\textsuperscript{2} at the start of the first summer.

**Livestock disorders**

Chicory does not cause bloat in cattle as it contains condensed tannins (0.04\%).\textsuperscript{390} It has been reported to taint milk when it comprises more than 50% of the diet of dairy cows.

Meat flavours/odours for sheep on chicory are similar to those for sheep fed grass and are less intense than the meat from sheep fed legumes.\textsuperscript{335}

**Management**

Chicory requires rotational grazing to persist and can die out within 12 months if set-stocked. To maintain production and quality the key is to maximise leaf growth (highly palatable) and minimise stem growth (reduced palatability). A ratio of 70% leaf to 30% stem is considered optimal in terms of production and feed quality.\textsuperscript{66}

**Soil–climate adaptation**

- **Rainfall:** >500 mm (>400 mm south coast)
- **Season length:** >6.5 months
- **Drought tolerance:** Moderate
- **Frost tolerance:** Moderate to high\textsuperscript{361}
- **Soil type:** Prefers deep, well-drained fertile
- **Soil fertility requirements:** High for good production, responsive to N\textsuperscript{70}
- **Soil pH\textsubscript{Ca}:** >4.3
- **Aluminium tolerance:** Good
- **Waterlogging tolerance:** Low
- **Salt tolerance:** Slight\textsuperscript{51}

**Nutritive value**

- **DMD:** 66-80\%\textsuperscript{51,70}, 79\% (leaf), 45\% (stem)\textsuperscript{66}
- **ME:** 9-11 MJ\textsuperscript{402}
- **Crude protein:** 14-24\% (depending on N nutrition)\textsuperscript{402}

**Environmental implications**

**Weed control and ability to spread:** Chicory can compete with weeds in spring but in winter it is almost dormant. It can recruit new seedlings but is unlikely to become a problem weed.
Chicory can tolerate hard grazing to ground level providing it is then rested. As the stem content increases with longer periods between grazing, chicory is not a suitable species for accumulating biomass to overcome feed shortages.

Hard grazing in late autumn can reduce the persistence of the stand over winter, as insufficient leaf growth remains to replenish the root carbohydrate reserves. Grazing of the annual component of the pasture over winter should be controlled so that stock do not chew the crowns of the chicory, as this can increase the potential for crown infection from fungal diseases.

The plant density of a chicory sward will decline over time even when it is rotationally grazed and supplied with adequate N. Under favourable growing conditions in New Zealand, plant density declined from 66 plants/m² in the first year, to 49 and 24 plants/m² in years three and four respectively. The remaining plants grew larger and had more stems to compensate for the reduced density up to year three, but from year four onwards chicory production declined. Seedling regeneration in established stands can occur under favourable conditions and management.

Established stands are susceptible to redlegged earth mite damage. The main diseases of chicory are sclerotinia (Sclerotinia sclerotiorum) and charcoal rot caused by Fusarium spp. where the lower stem and tap-root darken in colour until they appear black. Avoid sowing chicory following crops susceptible to sclerotinia, like the pulse crops and canola.

Chicory is not suitable for making hay, as the leaves turn black and dusty on drying but it does make good quality silage.

**Companion species**

Chicory needs to be grown with annual legumes or supplied with sufficient N to maintain quality and production. It can be combined with a winter-active perennial grass like phalaris, which has a complementary growth pattern. If lucerne and chicory are grown in a mixture they are likely to be competing for the limited soil moisture in late-spring and summer.

**Cultivars**

The currently available varieties of chicory have been selected for New Zealand conditions. Drought-tolerant varieties for southern Australia will be released through the CRC Salinity.

‘Grasslands Puna’ (public variety) was the first forage cultivar of chicory. It was selected for its densely leaved habit and vigour from the north island of New Zealand from an unselected commercial line. It appears to be the hardiest of the current varieties and has the best persistence and the lowest rainfall requirement.

‘Puna II’ is a selection from Puna for more upright growth habit, greater winter-activity and improved uniformity. However it requires a longer growing season to persist.

‘Choice’ is also a selection from Puna and is similar to Puna II, but was specifically selected for dairy pastures as it has a low content of lactucin, which can taint milk.

‘Grouse’ (public variety) and ‘Forager’ (public variety) are both erect short-term varieties (one to two years) developed as summer cropping options.

‘INIA Le Lacerta’ is a variety selected in Uruguay for its tall, erect growth habit, leaf type, lateness in stem elongation and uniformity. It is more winter-active and earlier flowering than Puna and contains low levels of lactucin.
6.2 Plantain (*Plantago lanceolata*)

**Features**
- winter-active, perennial herb
- stands can regenerate from seed
- adapted to a wider range of soils than chicory
- moderate drought tolerance
- moderate feed quality with a high mineral content.

Plantain (narrow-leaved plantain) is a deep-rooted, short-lived perennial herb from Europe, temperate Asia and north Africa. It has been used for various medicinal purposes for centuries and only more recently as a forage plant. It is widely naturalised in temperate regions and is a weed of lawns and disturbed areas in southern Australia and North America.

Plantain can be highly productive,[335] is more drought-tolerant than chicory and can regenerate from seed to maintain the sward. Sheep on plantain gained 183 g/day liveweight, compared with 232 g/day on chicory and an average of 110 g/day on grasses.[335] In a grazing trial in NZ, palatability was similar to white clover.[335]

The potential role for plantain in WA is still to be identified, but it may have a role as a component of a mixed perennial pasture. It may have a similar climate adaptation to some of the temperate perennial grasses.

**Seasonal growth pattern**
Plantain grows moderately in winter with its main growth periods being in spring and autumn with opportunistic summer growth.

Meat flavours/odours for sheep on plantain are similar to those for sheep fed grass and are less intense than for sheep fed legumes.[335]

**Establishment**
Plantain is usually sown in autumn. Seed should be sown at a depth of 10 mm[341] and the suggested seeding rate is 8-10 kg/ha when sown alone, or 1-3 kg/ha when sown in a mixture (seed size 500,000/kg). Plantain is fairly slow to establish, so does not compete well with species with a high seedling vigour. It does not tolerate phenoxy-based herbicides (e.g. 2,4-D, MCPA).[401]
Livestock disorders
None have been reported. Plantain contains desirable levels of condensed tannins and is non-bloating.

Plantain is reputed to have some medicinal properties and evidence was obtained in a NZ study which identified anti-microbial, diuretic and some anthelmintic properties (the latter were identified in the laboratory but were not evident in grazing trials).335

Management
Plantain requires regular rotational grazing to persist and maintain feed quality, although the variety Grasslands Lancelot is reputed to tolerate some set-stocking.401 Feed quality declines with flowering as the proportion of stalk increases and overly mature feed has a low palatability.

Field observations show established plantain is highly susceptible to redlegged earth mite. Snails and slugs are also potential pests at all stages of growth.401 Ascochyta leaf spot and Rhizoctonia spp. root rot have been observed in old stands.401

Companion species
Plantain is mainly sown as a component of a mixed perennial pasture to add diversity to the diet. It can also be grown with a range of annual legumes depending on the soil type.

Cultivars
‘Grasslands Lancelot’335 was selected from local ecotypes in the North Island of NZ for its erect, bushy growth habit and ability to tiller strongly under close grazing. It was the first pasture cultivar of plantain.335

‘Ceres Tonic’335 was selected in New Zealand from germplasm from northern Portugal for its erect growth habit and large leaves. When compared with Grasslands Lancelot it has larger leaves, flowers six days earlier (under NZ conditions) and has better autumn-winter production.335 It requires rotational grazing.401

<table>
<thead>
<tr>
<th>Soil–climate adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rainfall:</strong> &gt;500 mm (&gt;450 mm south coast)</td>
</tr>
<tr>
<td><strong>Season length:</strong> &gt;6 months</td>
</tr>
<tr>
<td><strong>Drought tolerance:</strong> Moderate</td>
</tr>
<tr>
<td><strong>Frost tolerance:</strong> Moderate</td>
</tr>
<tr>
<td><strong>Soil type:</strong> Range, but not deep sands or waterlogged soils</td>
</tr>
<tr>
<td><strong>Soil fertility requirements:</strong> Low, but can be highly responsive to N when actively growing, but best grown with a companion annual legume</td>
</tr>
<tr>
<td><strong>Soil pH Ca2+:</strong> &gt;4.2-7.8 (est.)</td>
</tr>
<tr>
<td><strong>Aluminium tolerance:</strong> Unknown</td>
</tr>
<tr>
<td><strong>Waterlogging tolerance:</strong> Low to moderate</td>
</tr>
<tr>
<td><strong>Salt tolerance:</strong> Nil</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutritive value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DMD:</strong> 72% (leaf), 59% (stems)</td>
</tr>
<tr>
<td><strong>Crude protein:</strong> 23.5% (leaf), 13.8% (stems)</td>
</tr>
</tbody>
</table>

![Plantain-dominant pasture](image)