



## **Goulburn, Denmark and Leura**

### ***Late-maturing subclovers for permanent pastures***

#### **Suggested use**

Goulburn, Denmark and Leura are subclover cultivars suitable for use in long term pastures in high rainfall areas of South Australia. They offer better herbage production and persistence than existing late-season cultivars (Mt.Barker and Karridale) in continuously grazed pastures. In SA trials, Leura has been the most productive subclover in intermittently grazed pastures in 700+ mm rainfall areas.

All three cultivars are late maturing and are suited to acid soils.

**Goulburn** is the earliest maturing of the three cultivars, has very good tolerance to both known races of clover scorch, and is more hardseeded than most other late season cultivars. It should perform well in areas receiving at least 600 mm rainfall per annum. In Western Australia, Goulburn flowers about one week later than Mt Barker.

**Denmark** is slightly later maturing than Goulburn and has particularly good tolerance to clover scorch. It should perform well in 650+ mm rainfall areas. Denmark was developed as a disease tolerant replacement for Kauridale.

**Leura** is the latest maturing of the three cultivars and, unlike other subclovers, can remain green after its main flowering period. In SA trials, Leura has produced more herbage than all other subclovers in 700+ mm rainfall areas.

Goulburn, Denmark and Leura are suited to well drained soils. If sowing on land prone to waterlogging, Trikkala, Gosse and/or Napier should be included in the sowing mixture, depending on rainfall received.

None of these cultivars are suited to alkaline soils.

#### **Origin**

Goulburn, Denmark and Leura were collected from the Italian island of Sardinia, and were developed through a national subclover evaluation program. Each cultivar was extensively evaluated across southern Australia prior to release. Field testing of these subclovers in South Australia, was conducted in the Mount Lofty Ranges and South East districts.

#### **Description**

These cultivars all have a prostrate growth habit during early stages of growth. All have a similar leaf mark - a pale green central mark flanked by two faint white/green side bands. Goulburn may develop a purplish-brown flush along the midrib of leaflets in cool weather.

The stems (runners) are hairless on Goulburn and Denmark, whilst Leura's stems are distinctly hairy. All three subclovers have minor red pigmentation on the stipules. Goulburn has faint red pigmentation on the flower tubes, whilst Denmark and Leura have none.

All three cultivars produce black seeds.

## Oestrogen levels

Some older subclovers (eg Yarloop) can cause infertility problems in sheep. Goulburn, Denmark and Leura all contain extremely low levels of formononetin, the main compound associated with infertility, and should not cause infertility problems.

## Pest and disease resistance

Seedlings of Goulburn, Denmark and Leura are susceptible to redlegged earth mite (RLEM). RLEM is the most important pest of subclover in South Australia, and can cause severe damage to seedlings in autumn and early winter. Control of RLEM with pesticides is essential when resowing pasture land to these cultivars.

Clover scorch is a fungal disease that can cause wilting and collapse of subclover foliage under mild, wet conditions. Goulburn and Denmark have very good tolerance to this disease. Leura's tolerance to clover scorch is satisfactory although growers may notice minor clover scorch damage in very lush stands eg. in pastures locked up for hay.

Goulburn possesses good tolerance to leaf rust and moderate resistance to powdery mildew and cercospora leafspot

Denmark is moderately resistant to both powdery mildew and cercospora leaf spot but is moderately susceptible to leaf rust.

Root rots are a less obvious disease of subclover, but have been known to cause serious clover losses. A range of fungi can be responsible, but the *Phytophthora* fungus has been associated with serious cases of root rot in South Australia. Laboratory tests indicate that Goulburn, Denmark and Leura all have good tolerance of *Phytophthora Race D*, the most common form. However, new potent strains of *Phytophthora* are now being identified, and it is difficult to predict the future impact of these new strains on these subclover cultivars.

## Seed production

In South Australia, there have been no consistent trends in the quantities of seed produced by these cultivars compared to Mt Barker and Karridale. However, in several interstate trials Goulburn and Denmark built up greater seed reserves over three years than older subclover / cultivars. Leura's seed production in these trials was sufficient to maintain dense clover swards.

Goulburn is more hardseeded than most other late-season subclovers, including Denmark and Leura. Goulburn should persist better than Denmark or Leura in lower rainfall areas, because of its earlier maturity and greater hardseed content. Higher hardseed levels are also advantageous when pastures are cropped, allowing for better regeneration and more clover dominant pastures.

## Field performance

Goulburn, Denmark and Leura have been shown to be both productive and persistent in a number of field trials in South Australia. They develop dense swards, and perform well under a variety of grazing systems.

## Continuous grazing

After three years of continuous sheep grazing at Kybybolite, pastures of Goulburn, Denmark and Leura had significantly higher clover contents than for Karridale and Mt Barker (see Table 1). Denmark and Leura also produced more clover dominant pastures than Karridale under continuous sheep and cattle grazing, at Harrogate and Springton respectively (data not shown).

**Table 1: Subclover content (%) in four year old sheep pastures at Kybybolite.**

Cultivar	Winter	Spring
Goulburn	26	27
Denmark	29	41
Leura	22	39
Mt. Barker	2	7
Karridale	2	2
Gosse	19	58
Trikkala	21	30

Karridale has a more erect growth habit than Goulburn, Denmark or Leura, and may be defoliated more severely under continuous grazing systems. This may explain its poor performance in continuously grazed trials.

### Intermittent grazing

After five years of dairy cattle grazing in the Adelaide Hills, Leura produced significantly more herbage than all other subclovers (see *Table 2*). Given good spring rains, Leura has the ability to remain green and productive longer after its main flowering period than other subclovers, a feature that makes it particularly productive in 700+ mm rainfall areas.

**Table 2: Annual herbage production (kg DM/ha) of subclovers in five year old dairy cattle pastures in the Adelaide Hills.**

Cultivar	Woodside	Gumeracha
Goulburn	5 172	2 316
Denmark	4 999	2 635
Leura	7 892	3 405
Mt. Barker	2 804	1 545
Karridale	4 860	2 708
Trikkala	4 449	1 956

In these block grazed trials, Goulburn and Denmark out-produced Mt Barker and Trikkala, but were no more productive than Karridale. Karridale's semi-erect growth habit makes it more competitive and productive in taller, block grazed pastures.

Leura also out-yielded other subclover cultivars in a trial being conducted in the lower South East of South Australia (see *Table 3*). This trial was rotationally grazed with sheep from 1996 and data collected from this site clearly demonstrates the excellent year round production of Leura.

Goulburn, Denmark and Leura are all protected by Plant Breeders Rights Legislation.

All these cultivars should be inoculated with Group C rhizobial inoculant prior to sowing.

**Table 3: Herbage production (kg DM/ha) of subclover cultivars in a rotationally grazed trial in the lower South East of South Australia.**

<b>Cultivar</b>	<b>Winter 1997</b>	<b>Total 1997</b>	<b>Winter 1998</b>	<b>Total 1998</b>
Goulburn	834	3513	980	6059
Denmark	800	4046	1151	7869
Leura	2094	6452	1513	8722
Mt. Barker	1811	5086	1503	7215
Karridale	2302	5892	1322	8152
Trikkala	1643	3468	1135	6604
Gosse	2198	5073	1347	6829
Larisa	1482	5540	1042	8342

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