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# Sulla

**Graham Crocker**

Research Agronomist, Pasture Genetics and Improvement Unit, Tamworth

**Belinda Hackney**

Research Agronomist, Pasture Genetics and Improvement Unit, Wagga Wagga

## Introduction

Sulla *(Hedysarum coronarium)* is a highly productive, short lived perennial legume. Individual plants live for 2–3 years, but it will regenerate readily from seed. Sulla is used for grazing/green chop/hay production and contains condensed tannins that make it bloat-safe, increase protein digestion and make sulla less attractive to insects. These tannins also provide a reputed anthelmintic effect which may reduce worm and nematode burdens. Overseas experience shows increased weight gain, wool growth, milk production and ovulation rate in sheep feeding on sulla foliage.

Sulla is native to the central and western Mediterranean, Egypt and North Africa and is also known as Spanish or Italian sainfoin, French honeysuckle or sweet vetch. It is the main forage legume species in southern Italy and Sicily.

Germplasm from genetic collections has been nationally evaluated under the National Annual Pasture Legume Improvement Program (NAPLIP). Elite lines were chosen to go into breeding programs in South and Western Australia, with three new Australian cultivars having been released.

## Adaptation

Sulla is best suited to calcareous soils but will grow on well-drained, medium to heavy, neutral to alkaline soils with pH range of 5.5 – 8.5 ($CaCl_2$), and average annual rainfall (AAR) 400–1200 mm. Sulla grows well in southern Australia, sub-tropical northern New South Wales and southern Queensland. In northern areas, it requires at least 550 mm AAR.

Sulla is adapted to similar areas to lucerne, not tolerating water-logged or acidic soils. It has performed poorly on acidic soils in southern New South Wales where it has proven less tolerant of acidic soils than lucerne. Evidence suggests it is also poorly adapted to sodic and saline soils.

Sulla has been used in New Zealand for at least 30 years as a soil stabilisation plant because it forms rosettes in its early growth phase, giving good soil protection. The large amount of biomass produced by sulla offers further ground cover. Its later, erect growth is more suited to forage production but is also used for grazing by sheep, deer and cattle.

The main role of sulla is as a ley legume in short term rotations in cereal cropping. Sulla's high production of more than 20 tonnes DM/ha (over 2 years) can be expected to increase soil nitrogen and organic matter. Sulla is much easier to remove at the end of the rotation than lucerne, which is often difficult to kill once well established.

## Description

Sulla is a semi-erect to erect plant, growing to 1.5 m in height with pinnate (fern-like) leaves divided into 5–15 pairs of leaflets and a terminal leaflet.

*Figure 1. Sulla foliage with bright red flowers*

*Figure 2. Sulla seed with slightly spiny pods*

Leaflets are elliptical, 15–35 x 12–18 mm and slightly pubescent underneath. It has a deep, strong taproot that is also branched, giving good drought tolerance.

The plant produces 10 to 35 bright red or crimson flowers, rarely white, each 3–6 mm long, that are very attractive to bees, which are necessary for pollination and seed set. It is reportedly a good honey producer.

Flowering commences in late spring and pods mature about 8 weeks later. Sulla seed develops in small, flattened, slightly spiny pods, comprising 2–6 segments. Each segment contains 1 creamy white to pale brown seed about 3 mm in diameter. There are approximately 200,000 seeds/kg.

## Varieties

There are at least 4 varieties released overseas, and 3 new Australian varieties (Wilpena, Moonbi, Flamenco) will be available here in 2008. The new varieties have all been selected for Australian conditions with increased forage and seed production. All new varieties are protected by plant breeders rights (PBR).

**Wilpena** is an erect, later maturing variety (flowering 123 days after an early June sowing at Tamworth) more suited to forage/hay/silage cutting than grazing. Seed of this line is likely to be the most available.

**Moonbi** is a semi-erect variety, slightly earlier maturing than Wilpena with a strong crown, suited to grazing and forage production.

**Flamenco** is an upright variety released in Western Australia for increased seed production from material collected in Tunisia.

**Aokau** is a New Zealand variety with semi-erect growth and developed primarily for soil conservation purposes, but also used for forage. It was selected from lines originating in Italy, Morocco and Portugal.

**Necton** is another New Zealand variety, more erect than Aokau and bred for hay, silage and grazing. It was selected from lines originating from Spain, Italy, Morocco, France and Switzerland.

**Grimaldi** is an Italian variety with an erect habit, best adapted to cutting and grazing. It was selected partly for its cold tolerance.

**Sparacia** is an Italian variety with an erect habit, better adapted to cutting than grazing. It flowers a week earlier than Aokau.

## Establishment and management

### Sowing

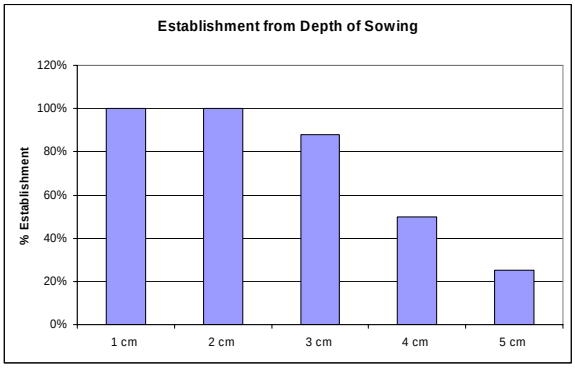
Sulla seed is approximately twice the size of lucerne and should be sown at 5–10 kg/ha into a moist, prepared seed bed. Seed can be sown in the pod, but dehulled seed gives faster and more uniform establishment. The pods have short spines which impede its flow through machinery. A target establishment density is 25 plants/$m^2$.

Ideally weeds should be controlled before sowing because sulla is slow to establish and therefore does not compete strongly with weeds.

The optimum sowing time is early to late autumn. This allows the plants to develop before winter as frequent temperatures below –4ºC will severely affect the growth of small plants. Planting in spring is not recommended in northern New South Wales or Queensland because the plants become dormant under high summer temperatures. In southern Australia, spring planting may enable better weed control prior to sowing, especially with a late seasonal break preventing autumn sowing.

Sulla should be sown about 1 cm deep and certainly not more than 3 cm. Plant establishment is reduced at a depth greater than this (Figure 3).

*Figure 3. Establishment of sulla seeds from various depths using a loam soil in a pot experiment.*



While sulla is a relatively large seedling, it is slow to establish while developing its root system. The plants, however, do form large rosettes that give good soil protection. Sulla is best sown alone as it is easily out-competed by strong upright growth, and it is easier to manage on its own. If planning to sow a companion species, it is advisable to establish sulla in the first year and sow companion grasses in the second year.

### Inoculum

It is essential that sulla be inoculated as it requires a specific inoculum (WSM 1592) for effective nodulation.

### Fertiliser

Being a legume, sulla is capable of fixing nitrogen (up to 500 kg N/ha over 2 years when it is effectively nodulated), assuming it fixes 20 kg N/tonne of dry matter produced. To achieve this, adequate amounts of nutrients need to be available: 10–15 kg P and 10 kg S/ha should be applied annually along with other nutrients known to be deficient.

### Herbicides

There are currently no herbicides registered for control of weeds in sulla, so it is advisable to sow sulla in paddocks which are relatively free of weeds.

### Grazing

Sulla must be rotationally grazed, not set stocked. Sulla should be grazed when it reaches about 40–50 cm in height and should not be grazed lower than 15 cm as regrowth is faster from the leaf axils than from the crowns.

Sulla is best managed by cutting for forage/silage or strip grazing. When grazing, it is advisable to move large numbers of stock onto small areas for rapid grazing and prompt stock removal when the desired grazing height is achieved. Regrowth is generally slower than for lucerne, and the grazing interval should be 6–10 weeks depending on moisture, day length and temperature. In New Zealand, 4–5 grazings/year is common.

### Pests and disease

Sulla appears to be highly tolerant to lucerne aphids and is not known to be greatly affected by virus diseases. It shows moderate resistance to red-legged earth mite and lucerne flea.

Helicoverpa (native budworm or Heliothus) grubs may attack sulla pre- and early-flowering, causing some damage. The lucerne parasitic seed wasp can reduce seed yields.

Sulla is resistant to clover scorch disease, but susceptible to *Sclerotinium rolfsii and Rhizoctonia solani,* and moderately susceptible to *Phytophthora medicaginis.* It is reported to be susceptible to powdery mildew in Italy, but this has not been observed in northern New South Wales despite the disease being present on other species.

### Seed production

All three new varieties have been selected for seed production, and can produce around 100 kg/ha of clean seed in the first year and 250 kg/ha in the second year.

If seed production is intended in the first year, the crop should not be grazed. Sulla can be grazed in the second year, and it is advisable to reduce the bulk of plant material by grazing, before harvesting for seed. Grazing should cease by the end of August to allow time for regrowth before flowering.

Flowering starts in September/October and continues into November and seed matures about 8 weeks later. The crop can be harvested with conventional headers, but the seed pods tend to break up into individual segments during harvest and are easily blown out of the back of the header. This requires much reduced wind flow and drum speed and sieve and concave adjustments. There is often too much trash to handle and so the crop may have to be desiccated or windrowed and left to dry. Harvest the crop when half the seed hulls are brown and the rest purplish-red, turning brown.

A special dehulling process is required to remove the seed from the pod. The seed is passed between a stationary rubber pad and a rotating abrasive disc. This also provides adequate scarification to increase germination when the harvested seed is subsequently planted.

### Hardseed

Although the hard seed content is about 80% when first harvested, it germinates readily the following autumn in the field, following a rapid breakdown of hard seed over January and February.

### Herbage production and nutritive value

Sulla can produce up to 10 tonnes DM/ha in the first year and over 20 tonnes DM/ha in the second year (Table 1), if cut only once during the year. Under ideal conditions of adequate moisture and optimal temperatures, sulla can produce over 100 kg DM/ha/day for 2 months

While sulla grows well in autumn, late winter, spring and early summer, it becomes dormant under hot summer conditions and will not grow even if irrigated.

The herbage of sulla is palatable, highly nutritious, non-oestrogenic and comparable to that of lucerne. The crude protein content can be up to 26%, digestibility up to over 80% and metabolisable energy 10.5–13 MJ/kg DM for fresh forage.

*Table 1. Dry matter production (tonnes DM/ha) of a sulla line in its second year (2001) at Moree NSW. Sulla was not cut between samplings and production peaked in September.*

| Sulla | June 28 | Aug 16 | Sept 18 | Oct 10 |
|---|---|---|---|---|
| Line 18 | 5.5 | 8.7 | 26.0 | 19.6 |

Quality peaks before flowering, then stems become more fibrous and foliage less palatable. Sulla is non-bloating due to the condensed tannins it contains. Tannins reduce protein degradation in the rumen, increasing N absorption. This may lead to enhanced livestock benefits including increased live weight gain and reduced flystrike in sheep.

In New Zealand trials, lambs grazing sulla grew up to 25% faster than those grazing ryegrass/white clover pastures, and also had higher dressing out percentages.

Sulla does not drop its leaf like lucerne during the hay making process and therefore can make very good hay. However, the stalks of sulla are much thicker than lucerne, so it must be conditioned and it takes longer to cure, especially in spring.

## Acknowledgements

Wilpena and Moonbi were developed by the South Australian Research and Development Institute (SARDI) through the National Annual Pasture Legume Improvement Program (NAPLIP) while Flamenco was developed by the Centre for Legumes in Mediterranean Agriculture (CLIMA) and the Western Australia Department of Agriculture and Food.

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*Figure 4. Author with crop of sulla in flower*

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## Warnings

Pasture improvement may be associated with an increase in the incidence of certain livestock health disorders. Livestock and production losses from some disorders are possible. Management may need to be modified to minimise risk. Consult your veterinarian or advisor when planning pasture improvement.

Legislation covering conservation of native vegetation may regulate some pasture improvement practices where existing pasture contains native species. Inquire through your office of the Department of Natural Resources for further information.

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