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Purple clover

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Introduction

Purple clover (*Trifolium purpureum*) is a self-regenerating annual legume which originated in Eurasia and is naturalised in countries of this region that have temperate and Mediterranean climates. It germinates in autumn and grows rapidly in mid to late spring. Purple clover continues to produce green feed into late spring and early summer and has considerable potential as a pasture species and for forage conservation on a wide range of soils.

There was considerable interest in purple clover in the 1970s with the release of the cultivar Paratta. However this cultivar was highly susceptible to clover scorch (*Kabatiella caulivora*) and failed to persist.

During the 1990s new germ plasm was collected from Turkey. Subsequent field testing of these lines revealed very high herbage production and adaptability to a wide range of soils.

Purple clover is capable of producing high quality herbage for 6–8 weeks after other annual clovers such as sub clover die off. The extended growing season is possible because purple clover is a deep-rooted plant and thus can obtain moisture from deeper in the soil profile than many other annual legumes.

The ability to grow for an extended period in late spring and early summer allows purple clover to potentially enhance animal production at the time of year when animals are usually beginning to graze lower quality pasture residues. Its high herbage production and upright growth habit also make it well suited to silage and hay production. As it is an aerial seeding legume, purple clover seed can be harvested using a conventional header.

Adaptation

Purple clover has been successfully grown in areas receiving 550 mm of rainfall in northern NSW and 450 mm in southern NSW.

Purple clover is well adapted to a variety of soils. It has been successfully grown in soils with pH ($CaCl_2$) ranging from 4.7 to 6.0 in NSW. It grows well in heavy clay soils through to those with a sandy-loam texture and is tolerant of periodic waterlogging.

Description

Purple clover is an erect growing temperate legume. It can grow up to 1 m tall and grows most actively in mid spring to early summer.

Purple clover has long, thin leaflets. Flowers are triangular shaped and pinkish-purple in colour. Flower heads are up to 80 mm in length and contain approximately 200 florets. Each floret contains a pod with one seed. Seeds are round and yellow to light brown in colour with approximately 555,000 seeds/kg.

Figure 1. Purple clover flowers

Purple clover has a strong stem and is not prone to lodging. It is very leafy but the stem to leaf ratio declines rapidly after flowering.

Purple clover has a deep taproot which allows it to exploit moisture from deep in the soil profile and remain green into late spring and early summer.

Varieties

Electra™ was selected from a purple clover population collected from a site in Turkey in 1995 with an average annual rainfall of 625 mm and soil pH (water) 9.5. Single plant selections were made by Mr Peter Skinner (Department of Agriculture Western Australia) in 2002. Plants were sorted on the basis of leaf markings and inoculated with *Kabatiella caulivora*, which causes clover scorch. Four elite lines were subsequently selected which showed resistance to the disease and also had high herbage production, seed production and threshability. These lines were then evaluated in the field in NSW and WA. Electra™, the line selected for release, was evaluated under the code 139465 NM. Electra™ has no leaf markings.

Electra™ flowers at approximately 148 days in Tamworth and 161 days in Perth following a mid May sowing, making it similar in maturity to late flowering sub clover cultivars.

Paratta was the original cultivar released by the South Australian Department of Agriculture in 1971. This cultivar is no longer available and was highly susceptible to clover scorch.

Establishment and management

Sowing

Purple clover can be sown into a conventional seed bed or direct drilled for good establishment. No research has been conducted into how successful it is likely to be when sown as part of a broadcast application (i.e. sown with pasture fertiliser topdressing).

Purple clover seed is similar in size to lucerne and should be sown at a similar rate (1–5 kg/ha) in dryland situations. Higher sowing rates (10 kg/ha) may be desirable where purple clover is to be sown as a monoculture for specific fodder conservation purposes.

Inoculum

Purple clover requires Group C rhizobia for effective nodulation which is the same as used for sub clover.

Fertiliser

Adequate phosphorus (P) is required to optimise growth of legumes. At least 10 kg P/ha should be used when sowing purple clover. Added sulphur may be required in some areas. Consult your local agronomist for further information.

Grazing

Purple clover is an aerial seeding legume. Care should be taken not to graze pastures containing purple clover too intensively during flowering and seed set as this will affect the quantity of seed produced and regeneration in the following year. This is particularly important during the first year of pasture establishment as there is no seed reserve of purple clover in the soil.

Hard seed

Electra™ purple clover has moderate to high levels of hard seed which assist in protecting it from false breaks and enhance its long-term persistence. West Australian data reported that 92% of seed harvested in January was still hard in mid March and 61% of seed was hard in August.

Pests and diseases

Electra™ purple clover is resistant to Race 1, the most common form of clover scorch. Its level of resistance is similar to Denmark sub clover.

Electra™ is susceptible to bean yellow mosaic virus (BYMV) and cucumber mosaic virus (CMV), which are common diseases of sub clover, lupins and other legumes.

Redlegged earth mite will cause moderate levels of damage to Electra™. However, Electra™ was less severely affected than balansa clover.

Electra™ is also moderately susceptible to attack by blue-green aphid. It showed less damage than balansa and Persian clover but more than the resistant cultivar, Jester barrel medic.

Native budworm (*Helicoverpa* spp.) did cause some damage to purple clover in a field trial at Tamworth. However, damage levels were not severe enough to warrant spraying. Damage caused was less than that observed in chickpeas, maize and sorghum at the same site.

Seed production

Given its upright growth habit and the seed heads being set high in the canopy, purple clover will be well suited to on-farm seed harvest. Seed has been successfully harvested in Western Australia using a conventional header.

Figure 2. Purple clover being harvested for seed in Western Australia (Photo courtesy of Peter Skinner, Department of Agriculture Western Australia)

Herbage production and nutritional quality

Purple clover is capable of producing very large quantities of high quality herbage over a range of soil types (Table 1), particularly in areas receiving good rainfall over the latter part of spring.

Table 1. First year herbage production (t DM/ha) of purple clover and other annual clover varieties

	Holbrook	Harden	Binalong	Tamworth
Average annual rainfall (mm)	600	610	675	675
Location[1]	S. NSW	S. NSW	S. NSW	N. NSW
pH	4.7	5.5	4.2	5.4
Electra™	14.6	14.0	16.0	11.8
Paratta	8.1	8.2	9.8	10.7
Zulu[2]	16.4	15.3	16.0	
Bolta[3]	10.4	8.2	10.8	
Goulburn[4]	10.9	6.5	12.8	

[1] Southern or northern New South Wales. Areas of S. NSW receive the majority of rainfall in winter and spring while N. NSW receives a higher proportion of annual rainfall in summer.
[2] Arrowleaf clover. [3] Balansa clover. [4] Sub clover.

Purple clover has also been proven to be persistent and productive in lower rainfall areas of NSW (Figure 3). The data in these graphs was collected in the third year of the experiment. Rainfall over the two preceding years of the experiment averaged only 377 mm. The high hard seed levels of purple clover assist in protecting it from false breaks and therefore allow it to significantly add to pasture production over sustained periods in lower rainfall environments.

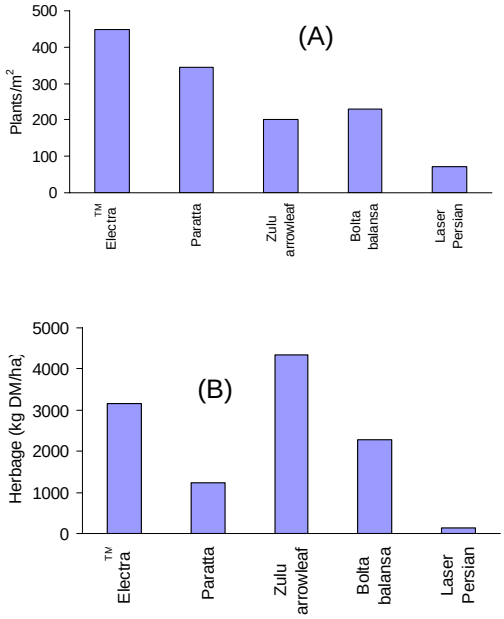

Figure 3. Plant density (plant/m^2) in the third year of an experiment at Grogan in southern NSW (A) and spring herbage production (kgDM/ha) (B)

While not encountered in the experiment mentioned above, an added advantage of purple clover if grown on heavy clay soils in low rainfall environments is that it can withstand periodic waterlogging events. Under such conditions, purple clover may be more productive than species that are less tolerant to waterlogging.

Herbage produced by purple clover is of a very high quality (Table 2). When cut for silage, both Electra™ and Paratta had similar digestibility levels. However, when cutting was delayed for the purposes of haymaking, the digestibility of Electra™ was significantly higher than Paratta. This is because Electra™ is a later maturing variety (it flowers approximately two weeks later than Paratta) and therefore its quality is higher for longer.

Table 2. Digestibility of Electra™ and Paratta purple clover when cut for silage or hay.

Harvest purpose	Variety	Digestibility (%)
Silage	Electra™	75.7
	Paratta	76.3
Hay	Electra™	68.2
	Paratta	56.0

All purple clover genotypes tested to date have had no detectable levels of the oestrogenic isoflavones formonentin, genistein or biochanin, so the use of purple clover should not cause ewe infertility.

Acknowledgments

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Dr Mike Ewing and Brad Nutt, Centre for Legumes in Mediterranean Agriculture

Graeme Sandral, NSW Department of Primary Industries and University of Western Australia

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 you 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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