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Crimson clover

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Introduction

Crimson clover (*Trifolium incarnatum*) is a self-regenerating annual legume, which originated in Eurasia and is naturalised in countries of this region that have temperate or Mediterranean climates. It germinates in autumn, and exhibits relatively good winter production followed by rapid growth in early to mid-spring.

The vigorous upright growth of crimson clover, coupled with its ability to grow productively on a wide range of soils under differing climatic conditions, make it well-suited to fodder conservation. It has been successfully used in this role, sown as a monoculture or in a mix with cereals or short term perennial grasses. It can also be a useful component of mixtures for short term pastures.

As it is an aerial seeding legume, crimson clover seed can be harvested using a conventional header.

Adaptation

Crimson clover has been successfully grown in areas receiving 600 mm of rainfall in northern NSW, and 500 mm in southern NSW.

Crimson clover is well-suited to a variety of soils. It has been successfully grown in soils with pH ($CaCl_2$) ranging from 4.8 to 6.0 in NSW. While it grows best on fertile, well-drained soils, it is also well adapted to lower fertility situations. It does not tolerate waterlogging or saline soils.

Description

Crimson clover is an erect-growing temperate species. It generally grows to a height of 60 cm, with the most active period of growth occurring in early to mid spring.

Crimson clover has trifoliate leaves. Individual leaflets are relatively large, on average measuring 1–3 cm long and nearly as wide. Purple edging often develops on the leaflets as the plant ages. Leaflets are hairy, as are stems. Stems are strong and are not prone to lodging, becoming woody and very fibrous after flowering. Flowers are cylindrical in shape, measure up to 40 mm in length, and are generally bright red, though an occasional yellow or white flower may occur. The flower head is comprised of up to 125 florets, each containing a

Figure 1. Crimson clover

seed, which is cream to light brown in colour and oval to spherical in shape, with approximately 250,000 seeds/kg.

Crimson clover has a taproot with many finely-branched lateral roots, which allow it to extract water from deep in the soil profile and can assist it in overcoming periods of moisture stress.

Varieties

There is generally very little difference between crimson clover varieties in terms of flowering maturity time.

Dixie is a variety developed in the USA. It is the first known commercial crimson clover variety to be marketed.

Caprera was developed by CLIMA (Centre for Legumes in Mediterranean Agriculture) in Western Australia. It is a mid-season maturity variety (similar in maturity to Coolamon subterranean clover). Caprera is tolerant of clover scorch.

Contea has a flowering time very similar to Caprera. It was developed in Italy.

BlazaΦ flowers approximately one week earlier than Caprera and Contea. Blaza Φ was developed in New Zealand. It is tolerant of clover scorch.

Caprera and Blaza Φ are the most common varieties for which seed is available in Australia.

Establishment and management

Sowing

Paddocks in which crimson clover will be sown should be managed in preceding years to minimise weed and insect burdens. This strategy is not specific to crimson clover, and should be used when considering sowing any pasture species. Crimson clover can be sown into a conventional seed bed, or direct drilled for good establishment.

Crimson clover should be sown at rates of 1–4 kg/ha when used in mixtures with other legumes, grasses or cereals. If sowing as a monoculture for specific fodder conservation purposes, rates of up to 10 kg/ha may be beneficial.

Seed should be sown no deeper than 25 mm into a moist seed bed. The optimum sowing time is early to late autumn.

Inoculum

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

Fertiliser

Adequate phosphorus (P) is required to promote vigorous growth of pasture legumes. At least 10 kg P/ha should be used when sowing crimson clover. Added sulphur (S) and trace elements such as molybdenum (Mo) may be required in some areas. Consult your local agronomist for further information.

Grazing

Crimson clover can be utilised as a one-year forage crop providing large quantities of high quality fodder. If it is a component of a pasture mix intended for more than one year of production, care should be taken to avoid heavy grazing at flowering and seed set. This is because crimson clover is an aerial seeding legume, meaning that heavy grazing at or after flower initiation will result in poor post-grazing recovery, and therefore reduce the quantity of seed set for regeneration in the following year.

Hard seed

All varieties of crimson clover have very low levels of hard seed. Therefore, in areas where false breaks occur over summer and autumn, large quantities of seedlings will emerge and subsequently die without adequate follow-up rainfall. This will result in poor long-term persistence in such areas.

The significance of low levels of hard seed in crimson clover for subsequent regeneration can be seen in Figure 2, where seedling numbers of four species following a false break were recorded at two sites in southern NSW. The number of seedlings recorded for each species following the subsequent autumn break is also shown.

The density of seedlings recorded in the regenerating stand of crimson clover was too low for high second year herbage production, whereas the other three clover species with higher hard seed levels had good second year seedling densities.

These results indicate that crimson clover is best used as a one-year forage or fodder conservation crop, or as a component of a short-term pasture, rather than in permanent pasture mixes – particularly in areas where false breaks are common.

Pests and diseases

Crimson clover is susceptible to damage by red-legged earth mite (*Halotydens destructor*), particularly at the seedling stage. It is also susceptible to attack by blue-green aphids (*Acyrthosiphon kondoi*).

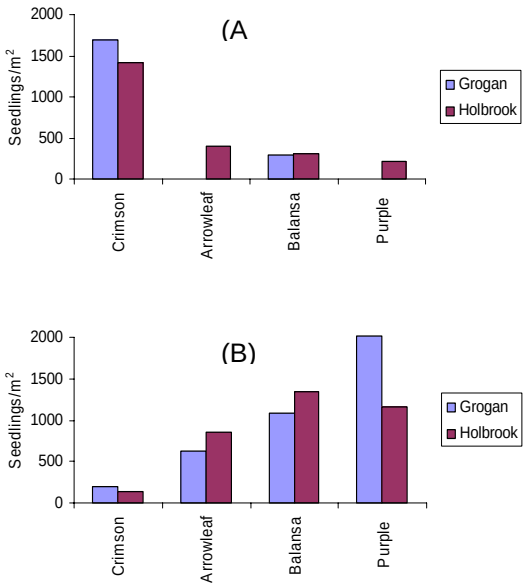

Figure 2. Seedling density (plants/m^2) of Caprera crimson clover, Zulu II® arrowleaf clover, Bolta® balansa clover and Electra™ purple clover following a false break (A) followed by subsequent autumn break (B) in the second year of a field experiment at Grogan and Holbrook in southern NSW.

A number of fungal diseases can affect crimson clover. These include crown and stem rot (*Sclerotinia trifoliorum*), which is most prevalent during wet winters in ungrazed swards. Fusarium wilt (*Fusarium oxysporum*) and fusarium root rot (*Fusarium* spp.) may also affect crimson clover. The incidence of these diseases may be reduced by avoiding sowing crimson clover on poorly-drained soils, and by moderate grazing through winter to reduce humidity in the canopy, which is conducive to fungal growth.

Crimson clover is generally tolerant of the fungal disease clover scorch (*Kabatiella caulivora*), which is common in many areas of southern Australia where clovers are grown.

Seed production

As crimson clover is an aerial seeding legume with an upright growth habit, it is well-suited to harvesting using a conventional header. Seed yields in southern NSW have ranged from 500–750 kg/ha in regions with 500–600 mm average annual rainfall.

Table 1. Herbage production (t/ha) of several annual pasture legumes sown as a one year fodder crop at various locations in NSW.

	Rand	Grogan	Holbrook	Burraga	Tamworth	Curban	Moree	Moree
Average annual rainfall (mm)	500	525	600	750	675	550	600	600
pH ($CaCl_2$)	6.0	5.4	4.2	4.3	6.0	5.1	5.6	5.6
Exchangeable aluminum (%)	0	0	5	25	0	0	0	0
Soil type	Red clay	Grey clay	Loam	Sandy loam	Medium brown clay	Sandy loam	Red clay loam	Black earth
Location[1]	sNSW	sNSW	sNSW	cNSW	nNSW	nNSW	nNSW	nNSW
	Herbage production (t/ha)							
Caprera crimson clover	3.6	2.5	8.0	3.0	6.0	5.2	5.9	6.1
Bolta® balansa clover	1.6	1.8	10.5	5.4				
Persian clover[2]	2.5	2.1	13.9	2.4	5.2	7.4	7.5	6.0
Elite II® berseem clover	3.7	4.3	12.4	2.1				
Zulu II® arrowleaf clover	1.8	2.0	16.0	4.7	8.2	2.8	12.6	13.7
Electra™ purple clover	1.9	1.3	14.6	3.5				
Clare subterranean clover					5.6	7.5	5.9	7.0
Hykon rose clover					5.2	5.1	7.2	7.5

[1]Refers to trial sites in southern (s), central (c) or northern (n) NSW, [2] Laser Persian clover used in central NSW and southern NSW experiments, Prolific used in northern NSW.

Herbage production and nutritional quality

Herbage production

Crimson clover is capable of producing moderate to high quantities of herbage production when sown as a one year fodder crop (Table 1). Generally, crimson clover was one of the most productive species at the lower rainfall sites. As average annual rainfall level increased, later maturing species such as arrowleaf clover and purple clover were more productive.

Herbage quality

Herbage produced by crimson clover is of very high quality, providing it is harvested at the correct time. Crimson clover rapidly loses quality from the commencement of flowering through to maturity. Table 2 shows the results of an experiment at Cootamundra in southern NSW, where crimson clover was sown as a one year fodder conservation crop. The quantity and quality of herbage on offer was sampled on five occasions through the spring–early summer period.

The results show that optimum herbage quality was recorded early in spring (11 October). Delaying harvesting by 2 weeks until the commencement of flowering (26 October) greatly increased the quantity of herbage available for fodder conservation, but quality (particularly digestibility) declined considerably. Delaying harvesting beyond mid-spring would result in a significant decline in herbage quality, with implications for the performance of animals fed the conserved fodder.

Table 2. Herbage production, dry matter digestibility (DMD), crude protein (CP) and metabolisable energy (ME) of crimson clover at five harvest dates in spring–summer 2005 at Cootamundra NSW.

	11 Oct	26 Oct	8 Nov	22 Nov	6 Dec
Herbage (t/ha)	5.2	9.0	9.5	8.7	8.7
DMD (%)	81	74	62	61	53
CP (%)	27	23	17	16	13
ME (MJ/kgDM)	12	11	9	9	8

Crimson clover contains no known anti-nutritional compounds. It can potentially cause bloat; however, bloat can be caused by a wide range of leguminous pasture species.

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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 adviser 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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