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Balansa clover

Dr Brian Dear

Principal Research Scientist, Pasture Genetics and Improvement, Wagga Wagga

Belinda Hackney

Research Agronomist, Pasture Genetics and Improvement, Wagga Wagga

Graham Crocker

Senior Research Agronomist, Pasture Genetics and Improvement, Tamworth

Introduction

Balansa clover (*Trifolium michelanium*) is a temperate annual legume, native to the Mediterranean region of southern Europe. Balansa clover was introduced to Australia accidentally, and became naturalised in Victoria prior to the 1950s. Commercially available varieties (derived from germplasm collected in Turkey) are now grown throughout the temperate areas of southern Australia.

Balansa clover can be grown in mixtures with grasses and other legumes, where it will regenerate from seed under appropriate management. It can also be used as a special-purpose crop for fodder conservation, and as a disease-break and source of nitrogen in cropping rotations.

Adaptation

Balansa clover has been successfully grown in areas receiving 375 mm average annual rainfall (AAR) in southern NSW, and 500 mm in northern NSW. It can also be grown under irrigation, where maximum productivity is achieved by sowing and then watering in February–March, to promote early germination and vigorous establishment.

Balansa clover is suited to a wide range of soils, but prefers mildly acid to neutral soils with pH ($CaCl_2$) 4.5–7.0. It is moderately sensitive to aluminium, and herbage production and persistence can therefore be increased by applying lime when pH ($CaCl_2$) is less than 5.0. It is tolerant of waterlogging once established, but young seedlings are sensitive to prolonged submersion. It has low tolerance of salinity.

Balansa clover should not be sown on deep, infertile sands or in poorly drained alkaline clay soils with pH ($CaCl_2$) of 8.2 or higher. Persian clover (*Trifolium resupinatum*) is the preferred option on alkaline soils, being particularly well adapted to poorly drained soils in which other legumes fail to persist.

Description

Balansa clover is a self-regenerating annual legume. It is a semi-erect, hollow-stemmed species that can grow to 1 m tall, but remains prostrate when grazed.

Leaves are trifoliate and vary greatly in size, shape and leaf marking. Leaflet margins can be smooth or serrated. The variation in leaf marking and shape is due to individual varieties being composed of a mixture of several genotypes. Both leaves and stems are hairless.

Flowers are white-pink in colour and round in shape, measuring 2–3 cm in diameter. Balansa clover is an outcrossing species, and is very attractive to bees.

Seeds vary in colour from pale yellow to dark brown. They are very small, with 980,000 to

Figure 1. Balansa clover

1,200,000 seeds/kg.

Varieties

FrontierΦ is the earliest flowering variety, reaching full flowering 103–115 days after a mid-May sowing at Wagga Wagga, and 107–118 days at Tamworth. It is best adapted to areas with shorter growing seasons, as it matures earlier than other varieties.

Paradana is a mid-season maturing variety, flowering approximately two weeks later than Frontier.

Enduro was developed in South Africa from Paradana material, but flowers two weeks earlier, and is therefore of similar maturity to FrontierΦ.

TaipanΦ was derived from a selection from the cultivar Paradana. It is similar in maturity to Paradana.

BoltaΦ is a late-flowering variety, maturing approximately 10 days later than Paradana. It is best suited to higher rainfall districts (>600 mm AAR) with a longer growing season.

ViperΦ was derived from a selection from the cultivar BoltaΦ, and has a similar maturity time.

Establishment and management

Sowing

Paddocks in which balansa clover will be sown should be managed in preceding years to minimise weed and insect burdens. This strategy is not specific to balansa clover, and should be used when considering sowing any pasture species.

Balansa clover can be sown into a conventional seed bed or direct drilled. As seed is very small, it should be sown no deeper than 7 mm. It can also be established by surface broadcasting. As balansa clover contains a very high proportion of hard seed, seed should be scarified prior to sowing.

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

	Binalong	Harden	Holbrook	Burraga	Tamworth	Curban	Moree	Moree
Average annual rainfall (mm)	625	600	600	750	675	550	600	600
pH ($CaCl_2$)	4.8	5.6	4.2	4.3	6.0	5.1	5.6	5.6
Exchangeable aluminum (%)	15	0	5	25	0	0	0	0
Soil type	Sandy loam	Red earth	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)							
FrontierΦ balansa clover					3.8	8.6	5.2	6.5
Paradana balansa clover	10.8	7.7		5.4	4.3			
BoltaΦ balansa clover	10.8	8.3	10.4	5.4				
CoolamonΦ sub clover[2]	14.8	6.8		2.2	2.9			
GoulburnΦ sub clover[2]	12.9	6.5	10.9	2.7				
RiverinaΦ sub clover[3]	14.6	6.7		3.3		7.8	4.6	6.5
Clare sub clover[4]	16.0	7.9		3.3	5.6	7.5	5.9	7.0
Electra™ purple clover	16.0	14.0	14.6	3.5	10.3			
Zulu arrowleaf clover	16.0	15.2	16.4	4.7	8.2	2.8	12.6	13.7

[1] refers to southern(s), central (c) or northern NSW

[2] Coolamon and Goulburn belong to the subterranean clover sub species *subterraneum*

[3] Riverina belongs to the subterranean clover sub species *yanninicum*

[4] Clare belongs to the subterranean clover sub species *brachycalycinum*

Balansa clover seed is readily harvested and removed by ants. To prevent this, seed should be sown as close to the autumn break as possible, and lightly covered with soil.

If mixed with other grasses and legumes as part of a general-purpose pasture, balansa clover should be sown at rates of 0.5–1 kg/ha. It is often sown in a mix with subterranean clover, if parts of paddocks are poorly drained or subject to waterlogging over winter. If it is sown alone as a special-purpose one year forage crop, rates of 5–7 kg/ha may be used.

The optimum time for sowing is mid-late autumn for dryland conditions, or as early as February under irrigation. This allows for more rapid establishment prior to the onset of winter.

Inoculum

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

Fertiliser

Adequate phosphorus (P) is required to optimise legume growth. At least 10 kg P/ha should be used when sowing balansa 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

Newly sown pastures can be grazed lightly in the first year, but should be spelled at flowering to permit good seed set. In established stands, light to

Table 2. Quantity of herbage produced (t/ha) of several annual legumes in a regenerating sward at several locations in NSW.

	Urana	Grogan	Holbrook	Binalong	Harden	Tamworth	Curban	Moree	Moree
Average annual rainfall (mm)	450	525	600	625	600	675	550	600	600
pH	6.0	5.4	4.2	4.8	5.6	6.0	5.1	5.6	5.6
Exchangeable aluminum (%)	0	0	5	15	0	0	0	0	0
Soil type	Grey clay	Grey clay	Loam	Sandy loam	Red earth	Medium brown clay	Sandy loam	Red clay loam	Black earth
Location[1]	sNSW	sNSW	sNSW	sNSW	sNSW	nNSW	nNSW	nNSW	nNSW
	Herbage production (t/ha)								
Frontier[2]	3.7	1.1				2.7	1.0	1.3	1.9
Paradana[2]				3.6	6.6	1.7			
Bolta[2]			5.7	3.7	8.3				
Urana[3]	3.8	1.4				2.6			
Coolamon[3]				4.6	6.6	1.3			
Goulburn[3]				4.5	4.7				
Riverina[4]				4.4	5.0		4.3	1.5	1.9
Rosedale[5]	4.6	0.70				2.6	2.0	1.8	2.0
Clare[5]	7.5	3.7		4.3	6.1	2.3	8.9	2.0	3.1
Electra™ [6]				0.60	3.9	9.5			
Zulu[7]				4.1	6.3	8.5	6.2	4.0	2.8
Laser[8]	3.4	1.3							
Prolific[8]						3.9	1.0	2.1	2.1

[1] refers to southern (s) or northern (n) NSW, [2] balansa clover, [3] subterranean clover ssp *subterraneum*, [4] subterranean clover ssp *yanninicum*, [5] subterranean clover ssp. *brachycalycinum*, [6] purple clover, [7] arrowleaf clover, [8] Persian clover.

moderate grazing can continue throughout flowering, with reasonable seed-set still expected.

It is important to remove the majority of dry residues over summer by grazing, in order to achieve good seedling regeneration in the following autumn. Removal of residues is thought to assist in hard seed breakdown.

A high proportion of the seed ingested by livestock will pass through the gut undigested, and will be spread in dung. Late-harvested hay will also contain a large quantity of seed, which is likely to spread when fed out.

Hard seed

Balansa clover has high levels of hard seed. South Australian research has found that freshly harvested seed from Frontier®, Paradana and Bolta® had hard seed levels of 96%, 89% and 93%, respectively. When left in the field, these levels had declined to 76%, 63% and 83% for Frontier®, Paradana and Bolta® respectively (A Craig, pers. comm.). Therefore, when sowing a new pasture, you should check that the balansa seed purchased has been scarified to ensure higher germination.

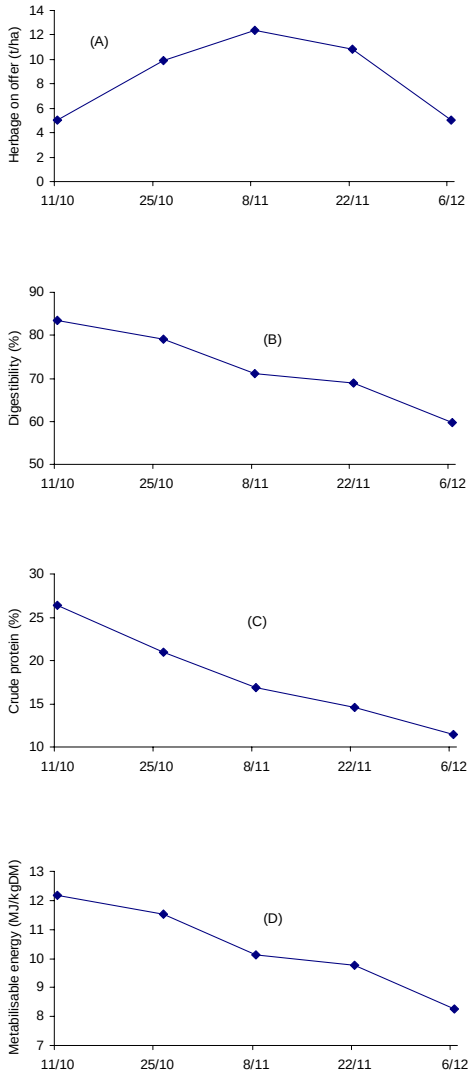

Figure 2. Herbage production (A), digestibility (B), crude protein (C) and metabolisable energy (D) of Bolta® balansa clover in uncut swards measured on five occasions through spring 2005 at Cootamundra NSW.

Pests and diseases

Balansa clover is highly susceptible to red-legged earth mite (RLEM) attack, particularly at the seedling stage. Newly sown pastures should be monitored closely for signs of RLEM activity, and treated as required. Where possible, action should be taken to minimise RLEM carryover from seasons preceding sowing. Contact your local agronomist for further information.

Balansa clover is also susceptible to lucerne flea. It is quite tolerant of cowpea aphid and spotted alfalfa aphid under field conditions, despite being susceptible to them under glasshouse conditions. Monitor pastures for signs of these pests, and control as necessary.

Balansa clover has good resistance to clover scorch, but is susceptible to pythium during the seedling stage, particularly under wet, cold conditions.

Seed production

Balansa clover is a prolific seed producer, with seed yields of up to 800 kg/ha. Seed crops are generally windrowed when 70% of the seed in the flower head is mature, and then harvested using a conventional header. Seed can be direct-header harvested, but significant quantities can be lost through shattering.

Herbage production and quality

Herbage production

In NSW, balansa clover is capable of producing large quantities of herbage across a range of soil and climatic conditions, when sown as a one year fodder conservation crop (Table 1). It is also a very useful component of a longer term pasture, and, if managed appropriately, is capable of regenerating and supplying high quantities of high quality fodder for a number of years (Table 2). It typically produces between 3 and 8 t DM/ha, though this is governed by seasonal conditions, soil type and fertiliser input.

Herbage quality

Under sound management, balansa clover can produce herbage of very high quality. Herbage quality declines as the plant ages and senesces

(Figure 2), as is typical of all temperate annual legumes.

In this experiment, flower buds were recorded on some plants at the second sampling time (25 Oct), with plants in full flower at the third sampling time (8 Nov). Herbage quality declined sharply from the second sampling time onwards; therefore, maximum productivity of grazing animals will be achieved by utilising herbage prior to flowering. This becomes important in considering when to cut for silage or haymaking purposes. Delaying cutting in an attempt to harvest maximum herbage mass may result in a significant decline in herbage quality, which may then impact on animal production.

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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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