

Flamenco - a new variety of sulla for southern Australia

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Abstract

Sulla (*Hedysarum coronarium*) is a highly productive, deep-rooted but short-lived perennial legume with excellent fodder quality suited to both pasture and fodder (hay or silage) production. 'Flamenco' is a new variety developed in a RIRDC-supported project and released to seed growers in 2006. Key features include high productivity and traits that confer lower costs of seed harvest and processing. This new variety is best suited to fertile soils in medium and high rainfall areas (>450 mm). Best results to date have been achieved on neutral to alkaline soils but the full extent of its soil adaptation is still to be determined. It is well suited to crop rotations, used as a short-term break crop or as a phase pasture. Its role is clearly differentiated from regenerating annual legume pastures and longer-term lucerne pastures. This paper outlines the development and performance of Flamenco, together with its potential role in forage production systems in southern Australia.

Key Words

Sulla, forage legume, seed production, seed costs

Introduction

Sulla (*Hedysarum coronarium*) is a productive, short-lived (generally 2 seasons) perennial forage legume currently used in parts of the Mediterranean region (notably Italy and North Africa) and New Zealand. Its deep-root system gives it the capacity to maintain extended periods of spring growth, and its perenniality allows rapid regrowth in the second autumn. It can be grazed directly or cut for hay or silage. Additionally, sulla contains condensed tannins, giving it anti-bloating properties (Niezen, 1995) which have been linked to internal parasite control (Terrill 1992) and reduced scouring in sheep (B. Bessier, DAFWA, pers. com.).

Although it is the second-most widely used forage legume (after lucerne) in Mediterranean Europe, sulla is virtually unknown in Australian agriculture. There are two major causes for the lack of an Australian sulla market. Firstly, the constraint of high seed prices, currently in the order of \$16 - \$24 per kg. In addition to the requirement to import seed, these high costs are due to low seed yields and high post-harvest seed processing costs. Sulla produces a high level of hard-seeds at maturity (Sulas, 2000) and its segmented pods must be dehulled after harvest to remove seed, which must then be scarified to increase germination. The dehulling process to date has been inefficient and added considerably to seed cost.

The second reason for the low use of sulla in Australia has been the lack of a suitable variety for low and medium rainfall conditions in Australia. Cultivars developed for other environments but commercially available in Australia mature too late for local conditions. Such cultivars include Grimaldi and Commerciale, which are used extensively in Italy, and Grasslands Necton and Grasslands Aokau which have been released for New Zealand conditions. The recent release of two locally tested cultivars (Moonbi and Wilpena) should provide better adapted and productive cultivars (C. de Koning, SARDI, pers. com.). However, these two cultivars were developed with the main emphasis on herbage production. This paper reports on 'Flamenco', a highly productive sulla cultivar developed to overcome the constraints of low seed production and difficulties of dehulling.

Method

A sulla breeding program commenced in Western Australia in 1996. More than 60 different accessions were evaluated. Considerable emphasis was placed on early flowering, high herbage and seed production, and harvestability characteristics such as erectness and pod retention. Flamenco (HRN83-A) is a single plant selection that emerged as the most productive and highest seed producing variety. Two field experiments that evaluated Flamenco against commercially available cultivars were conducted from 2002 to 2003.

Experiment 1.

The experiment was conducted at Northampton on a fertile alluvial loam of pH_{CaCl} 4.5. Average rainfall is approximately 450 mm with a growing season length of around 5 months. Eleven entries, including Flamenco, Commerciale, Grasslands Aokau, Grasslands Necton and Sceptre lucerne were sown in a randomised block design with 3 replicates. Plots were 20 m by 2.4 m and sown at a rate of 10 kg/ha on 28 May 2002. Measurements included spring biomass, flowering percentage and abortion ratings, seed yields and biomass in the following winter.

Experiment 2.

The experiment was conducted at Medina Research Station under sprinkler irrigation on a Spearwood loam of pH_{CaCl} 6.5. Eight entries, including Flamenco, Grasslands Aokau and 6 other sulla cultivars were sown in a randomised block design with 4 replicates. Rows were 3 m in length and sown at a rate of 1 g/m on 10 May 2003. Measurements included 1 m sections of rows cut on 1 September and 10 October, and the remaining 1 m was left to flower and set seed for flowering percentage ratings and seed yields.

Results

Experiment 1.

The performance of Flamenco and the other commercial entries at Northampton is shown in Table 1. Flamenco produced significantly ($p \leq 0.05$) more spring biomass than Commerciale, Grasslands Aokau, Sceptre lucerne and Grasslands Necton. Flamenco was also earlier flowering than the other sulla cultivars, with 40% of Flamenco flowering by mid-October. Additionally, Flamenco had lower levels of flower abortion and the highest seed production ($p \leq 0.05$) of all varieties tested. Flamenco had much higher over-summer survival rates than many of the other sulla varieties. Excellent regeneration from these crowns led to rapid growth of most lines in autumn with Flamenco producing significantly more dry matter than Grasslands Necton and Sceptre lucerne ($p \leq 0.05$) and was significantly different to Grasslands Aokau and Commerciale (Table 1).

Experiment 2.

At Medina, September and October biomass measurements of Flamenco were both significantly different to Grasslands Aokau (Table 2). Flowering of Flamenco was 3 weeks earlier than Grasslands Aokau and seed production was significantly higher ($p \leq 0.05$) than Grasslands Aokau (Table 2).

Table 1. Field performance data of Flamenco, Commerciale, Grasslands Aokau and Grasslands Necton at Northampton, Western Australia in 2002 and 2003. Flower abortion score: 1 = nil flowers aborted, 5 = all flowers aborted

Variety	Biomass t/ha	% of plants flowering	Flower abortion 1-5	Seed yield kg /ha*	Biomass t/ha
	25/09/02	17/10/02	29/10/02	16/12/02	30/07/03

Flamenco	7.8	40	2	73	4.7
Commerciale	5.4	10	3	35	3.7
Grassland Necton	5.5	5	3	35	3.1
Grasslands Aokau	5.1	0	4	12	3.7
Sceptre lucerne	1.9	25	3	14	1.5
I.s.d. ($p \leq 0.05$)	2.2	n/a	n/a	22.8.	1.0

* Site has a short growing season which was sub-optimal for sulla seed production

Table 2. Biomass, seed yields and flowering time of Flamenco and Grasslands Aokau at Medina, Western Australia in 2003.

Variety	Biomass grams per row 01/09/03	Biomass grams per row 10/10/03	Seed yield grams per row 23/12/03	Date to 50% flowering
Flamenco	65	243	32	26 September
Grasslands Aokau	48	205	18	18 October
I.s.d. ($p \leq 0.05$)	17	41	9.8	n/a

Conclusion

Flamenco is a new highly productive forage option for southern Australia. It combines superior herbage production with early maturity, high seed retention, erect growth habit and significantly higher seed production. These characters should help overcome the constraint that high seed cost has imposed on the wider adoption of sulla.

Note: Wilpena, Moonbi and Flamenco have currently been protected by PBR.

References

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