

Variation in tannin content and morphological traits in *Lotus corniculatus* L. (bird's-foot trefoil)

A.H. Marshall, F. Ribaimont, R.P. Collins, D. Bryant and M.T. Abberton

Institute of Grassland and Environmental Research, Plas Gogerddan, Aberystwyth, Ceredigion, SY23 3EB, UK.

Email: athole.marshall@bbsrc.ac.uk

Keywords: *Lotus corniculatus*, agronomic traits, tannin content

Introduction *Lotus corniculatus* L. (bird's-foot trefoil) is a potentially valuable species for UK grassland agriculture. The herbage contains proanthocyanidins, or condensed tannins (CT's), which help to reduce bloat, have anthelmintic properties, can protect protein in the rumen, and thus potentially reduce N losses to the environment. It is currently a relatively minor species within UK grassland, as available varieties lack persistence in mixed swards (Hopkins *et al.*, 1996). The seed used is of foreign bred varieties with no varieties bred specifically for the UK environment. To explore the feasibility of breeding *L. corniculatus* for the UK, variation in morphological traits, dry matter yield and tannin content within existing varieties was measured.

Materials and methods Forty plants of seven cultivars of *Lotus corniculatus* L. were grown from seed in an unheated glasshouse. At the onset of flowering, 3 stems were removed from each plant, separated into leaf and stem and tannin content of the leaf determined by the high throughput tannin assay developed at IGER (Bryant, pers.comm). Length and diameter of the longest stem on each plant was measured. Dry matter (DM) yield per plant was determined at harvest and after 45 days of recovery growth.

Results There was a significant difference between and within varieties in yield per plant and in length and diameter of the longest stem. DM yield was highest in Gran San Gabrielle (GSG) and lowest in ARS2620. At the 2nd cut, DM yield was greatest in ARS2620 and lowest in AL531. GSG had the longest stem and Highgrove the shortest. Stem diameter was greatest in Leo and least in Highgrove and ARS2620. Leaf tannin content was greatest in AL531 and lowest in Leo and the range in tannin content between individual plants of each variety was greatest in AL531 and least in Steadfast.

Table 1 Dry matter yield (g/plant), length and width of longest stem and tannin content (mg/g dry weight) of 7 varieties of *Lotus corniculatus* L. (mean \pm s.e.m.)

Variety and country of origin	Dry matter yield (g/plant)		Longest Stem		Tannin content (mg CT/g dry weight)	
	1 st cut	2 nd cut	Length (cm)	Diameter (cm)	Mean	Range
Inia Draco (Uruguay)	62.0 \pm 2.79	24.2 \pm 2.37	58.3 \pm 3.34	2.0 \pm 0.11	18.0	5.4-41.6
AL531 (UK)	47.9 \pm 3.32	20.9 \pm 2.47	63.4 \pm 4.11	2.2 \pm 0.13	58.8	42.8-103.5
Leo (Canada)	73.4 \pm 3.45	29.7 \pm 2.22	50.1 \pm 2.80	2.4 \pm 0.21	8.5	4.5-24.5
GSG (Uruguay)	81.4 \pm 3.89	27.6 \pm 4.06	70.5 \pm 29.7	1.9 \pm 0.12	22.6	11.7-35.1
Highgrove (UK)	56.9 \pm 6.93	28.4 \pm 2.26	35.9 \pm 3.55	1.2 \pm 0.11	30.4	9.9-66.1
Steadfast (USA)	63.1 \pm 3.55	30.3 \pm 3.38	58.8 \pm 2.46	1.3 \pm 0.11	14.2	3.6-23.7
ARS2620 (USA)	47.4 \pm 5.31	40.8 \pm 2.43	53.0 \pm 3.27	1.2 \pm 0.09	16.9	9.6-36.7

Conclusions The variety that produced the greatest yield at the 1st cut produced only average yields at the 2nd cut, while the variety that yielded the least at the 1st cut produced the greatest yield at the 2nd cut. Selection of plants with appropriate yields at the 1st and 2nd cut will be important in future breeding programmes. Stem length and width exhibited significant variation and stem length was correlated ($r=0.45$) with DM yield suggesting it could have potential as a selection tool. Tannin content differed significantly between and within varieties and was generally below the 5% of DM reported as optimal for good animal health and nutrition (Waghorn *et al.*, 1990). Further work will be carried out to investigate the stability of tannin levels over the growing season.

Acknowledgements The financial support of Defra and the BBSRC is gratefully acknowledged.

References

- Hopkins, A., T.M. Martyn, R.H. Johnson, R.D. Sheldrick & R.L. Lavender (1996). Forage production by two *Lotus* species as influenced by companion grass species. *Grass and Forage Science*, 51, 343-349.
- Waghorn, G.C., W.T. Jones, I.D. Sheldon & W.C. McNabb (1990). Condensed tannins and the nutritive value of herbage. *Proceedings of the New Zealand Grassland Society*, 11, 171-176.