GENETIC ANALYSIS OF CONDENSED TANNINS IN *LOTUS PEDUNCULATUS*

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Introduction

A plant breeding program based in Canberra is aimed at producing cultivars of *Lotus pedunculatus (Lotus uliginosus)* for meat and dairy production in south eastern Australia. Selection for low condensed tannins (CT) has been practiced to maintain bloat protection while improving the protein utilization from the forage.

Little is known of the genetic control of CT in this species. A cross was made between parents with contrasting levels of CT and F1, F2, and reciprocal backcross populations were developed. The six generations of this cross were used to provide estimates of the pooled additive and dominance gene effects for CT.

Materials and Methods

Parental populations

G4703 is a diploid population developed in New Zealand with relatively low CT content. CPI 67677 is a diploid from the Algarve region of southern Portugal and has high CT.

Experiment layout

Plants were grown in the field in a randomized block design with 4 replications. In each replication the 6 generations were present as single-row plots of 4 plants, 0.5m apart and 1.0m between rows. The experimental unit was a single plant.

Condensed tannins

Two basal shoots were sampled from each plant at late vegetative/early flowering stage. The shoots were oven dried at 70°C and ground through a 0.5mm sieve. CT were extracted in 70 % acetone, hydrolysed in butanol/hydrocloric acid (95:5 v/v) for 1hr at 95°C and absorbance measured at 550nm. Concentrations were expressed as % dry weight.

Genetic analysis

The genetic effects were estimated by a weighted least square regression analysis. The suitability of the genetic model was examined by a chi square test comparing the observed and expected means for each generation.

Results and Discussion

The additive/dominance model was in strong agreement with the the generation means derived from this cross and additive gene effects for CT were significant (Table 1), indicating that selection for lower CT should be successful. Dominance gene effects for CT were also significant in this cross (Table 1) and the high mean CT content of the F1 and F2 and BC1 populations suggest the presence of non-additive effects for high CT production (Table 2). This information supports the decision to continue selection for lower CT in additional cycles of recurrent selection before the progeny testing phase of the breeding program.

Table 1 Generation mean analysis of condensed tannins in the cross

CPI67677 x G4703.

	Condensed tannins	P(t)
m	8.244±0.147	
a	1.087±0.221	0.02-0.01
d	1.625±0.536	0.10-0.05
$\chi^2(3)$	3.09	
P	0.30-0.50	

Table 2: Generation means for condensed tannins in the cross

CPI67677 (P1) x G4703 (P2)

Generation	Observed mean	Expected mean
P1	8.3183	8.5185
P2	6.2308	6.3433
F1	8.1313	9.0563
F2	8.2591	8.2436
BCP1	9.0016	8.7874
BCP2	7.8409	7.6998