

INHERITANCE OF CONDENSED TANNINS AND TANNIN-FORAGE QUALITY RELATIONSHIPS IN BIRDSFOOT TREFOIL

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Birdsfoot trefoil (*Lotus corniculatus* L.) contains condensed tannins which have significant implications for ruminant nutrition. Condensed tannins have the ability to complex with protein primarily by hydrogen bonding. The goal of this research was to bidirectionally select for condensed tannin concentration to develop parental material for studies of the inheritance of condensed tannins and studies on relationships of tannins with other forage quality parameters. A birdsfoot trefoil nursery consisting of 750 spaced plants from NC-83 germplasm was planted at the University of Minnesota Rosemount Agricultural Experiment Station. We followed the Vanillin-HCl procedure of Terrill et al. (1990) to identify high, low, and intermediate tannin selections.

Tannin Inheritance

Two complete 6x6 diallel mating designs were used to consider inheritance from quantitative and qualitative perspectives. Each diallel consisted of two high, two intermediate, and two low tannin parents. Eighteen progeny from each reciprocal cross was evaluated in the field at St.Paul. To date, one of the two diallels has been analyzed. Quantitative genetic analysis followed Griffing's (1956) analysis. The GCA:SCA ratio (Baker, 1978) was 0.93 which indicated highly additive genetic variance (Table 1). Qualitative analysis consisted of genetic modeling and chi-square analysis to test goodness of fit. To date, we have been unable to fit the data to a one gene model. Further qualitative analysis will be necessary to determine the appropriate genetic model.

Table 1. ANOVA of tannin concentration (catechin equivalents, %DM basis) for diallel I.

Source	DF	MS	F
Rep	2	0.097	NS
Cross	(14)	17.996	**
GCA	5	16.095	**
SCA	9	0.444	**
Error	490	0.130	

** Significant (P = .01).

Forage Quality Relationships

From the field selections, 24 high and 24 low tannin parents were intercrossed to form synthetic populations. Seed from these two synthetics and from original NC-83 germplasm was planted in eight replicates at two locations, Rosemount and St.Paul. Two harvests were taken at both locations in 1990, three harvests were taken at St.Paul in

1991, and only one harvest was taken at Rosemount due to severe plot damage from *Fusarium* sp.. Forage yield, tannin concentration, neutral detergent fiber, acid detergent fiber, acid detergent lignin, crude protein, and in vitro digestible dry matter were measured to determine if changes in other forage quality parameters are associated with selection for tannin concentration. Selected data from 1990 is presented. Conclusions about the forage quality study will not be drawn until 1991 data analysis is complete. There were no significant yield differences. It does appear that bidirectional selection for tannin concentration has been successful (Table 2).

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Table 2. 1990 Forage quality measurements combined over 2 locations and 2 harvests.

<u>Population</u>	%TAN*	CP	NDF	ADF	ADL
Synl-Low	2.72a**	22.10a	37.38a	31.57a	7.54a
NC-83	4.40b	21.96a	36.64a	30.92b	7.43a
Synl-High	8.11c	20.90b	37.30a	31.02b	7.36a

* %TAN = tannin in catechin equivalents, % dry matter basis.

** Means followed by the same letter not significantly different (P=.05).

References

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