Effect of condensed tannins in sainfoin on *in vitro* protein solubility of lucerne

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Introduction Proteins of fresh legume forages such as lucerne are highly degraded in the rumen, resulting in their inefficient use by the animal. The condensed tannins (CT) present in some forages can improve the nutritional value of these forages and of associated feeds in the diet. Previous *in vitro* work (Waghorn & Shelton, 1997) showed that CT from *Lotus corniculatus* are able to bind with and precipitate protein from a ryegrass/clover pasture, but when these forages were fed to sheep, the CT effects on digestion and animal performance were weak. This revealed a need for a better understanding of the mechanism of CT interaction between feeds. The present work was designed to measure, *in vitro*, the effects of CT in sainfoin when mixed with fresh lucerne.

Materials and methods Fresh finely chopped lucerne (L) and sainfoin (S) were mixed in the proportions (L-S): 100-0, 75-25, 50-50, 25-75, 0-100. Six 8 g samples of each mixture were individually ground in a Waring blender with 100 ml of artificial saliva (Verité & Demarquilly, 1978); PEG 4000 (600 mg) was added to 3 samples to inhibit the effect of CT in sainfoin. These slurries were continuously stirred for 60 min at 20°C, and then centrifuged (27,000 *g*, 20 min). The supernatant was analysed for total N (tN) before and after protein precipitation with TCA 10% (v/v) to measure N solubility (Nsol) and protein N content in soluble N.

Results The Nsol and the protein N content in soluble N were much lower for sainfoin than for lucerne (Table 1). Increasing the proportion of sainfoin in the mixture strongly decreased its Nsol and the proportion of protein N in the soluble N (Table 1). As showed by results with PEG, this effect mainly arose from CT in sainfoin. The CT had a larger effect in reducing the solubility of the protein fraction than the non-protein fraction. Measured Nsol values in the mixtures were lower than theoretical values calculated from Nsol of each plant and the proportion of the plant in the mixture. This showed that CT in sainfoin are able to decrease the solubility of the lucerne protein.

Table 1 *In vitro* nitrogen solubility and protein N in soluble N for mixtures of lucerne (L) and sainfoin (S) in different proportions, measured with and without PEG 4000. Measured values are expressed as the mean and standard deviation (SD) of 3 replicates. Theoretical Nsol values of mixtures are calculated from Nsol values measured on L and S alone (100-0 and 0-100 treatments respectively)

	Proportion of lucerne (L) and sainfoin (S) tested				
L-S on dry matter basis	100-0	75-25	50-50	25-75	0-100
Nitrogen solubility (% tN)					
without PEG					
measured	57.1 (2.5)	42.1 (1.7)	22.7 (2.1)	12.0 (0.2)	10.1 (0.5)
theoretical values of mixtures		*45.1*	*33.6*	*22.0*	
with PEG					
measured	54.6 (1.5)	52.8 (1.0)	48.3 (1.8)	46.9 (1.8)	40.6 (2.6)
theoretical values of mixtures		*51.8*	*48.5*	*45.0*	
Protein N in soluble N (%)					
measured without PEG	69.2 (3.1)	58.4 (1.9)	44.6 (3.4)	25.9 (0.7)	5.9 (8.2)
measured with PEG	61.5 (0.4)	65.1 (1.1)	62.6 (0.4)	66.9 (2.7)	62.7 (2.5)

Conclusion CT in excess in sainfoin can efficiently reduce in vitro nitrogen solubility of other forages, here lucerne, when intimately mixed. The right conditions must now be found to reproduce this effect in animals.

References

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