

THE CYANIDE CONTENT AND GOITROGENIC POTENTIAL OF SOME PLANTS

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Plants containing high levels of cyanogenic glycoside (CG) have goitrogenic activity when ingested by ruminants due to its conversion into thiocyanate (SCN^-) (Underwood 1977). Chemical analysis of plants is of limited value in predicting the goitrogenic effect on grazing animals, since neither the absolute intake of a particular plant, nor the efficiency of conversion of HCN to SCN^- can be reliably estimated. Changes in feed type and availability can result in large concentration changes of SCN^- in plasma (Ellis 1980), and analysis of body fluids may provide a more direct means of determining the goitrogen status of grazing animals.

White clover, (*Trifolium repens*), Red clover (*Trifolium pratense*), and wild mustard (*Sisymbrium* sp.) are often present in pastures, and contain CG. Cabbage (*Brassica oleracea* var *capitata*) was included in this study because it is known to contain a number of organic goitrogens in addition to CG. Lucerne (*Medicago sativa*) chaff contains very little CG, and was used as a basal diet.

Four Border Leicester x Merino ewes were maintained in metabolism crates equipped with automatic feeders and urine collecting apparatus. Each sheep was allocated one of the four test plants. During consecutive three day periods the animals were fed: 1) Lucerne hay ad lib.; 2) Freshly harvested test plant 3-hourly as a 50:50 mix with lucerne chaff (600 g D.M./d); 3) Freshly harvested test plant alone 3-hourly (600 g D.M./d). All feed offered in periods two and three was consumed. Plant material was collected twice daily and analysed for HCN. Urine samples were collected 4-hourly for SCN^- and creatinine analysis, and plasma collected at 9 am and 4 pm for SCN^- determination.

TABLE 1 Mean cyanide content (\pm sd) of plants and thiocyanate concentrations in plasma and urine of sheep fed these plants during different periods

	CN $^-$ in Plant (ppm in DM)	Plasma SCN^- (ppm)			Urine SCN^- (mgm/g of creatinine)	
		Period 1	Period 2	Period 3	Period 2	Period 3
Red clover	27 (11)	0.4(0.1)	1.8(0.9)	3.8(0.9)	3.5(2.5)	11(5.0)
Wild mustard	26 (11)	0.3(0.1)	1.6(1.0)	5.4(0.8)	14 (20)	47 (28)
Cabbage	47 (45)	1.9(0.4)	2.9(0.6)	7.3(2.6)	27 (16)	83 (35)
White clover	1164(398)	1.5(0.8)	5.6(2.2)	6.2(2.8)	45 (31)	105 (28)

Clearly the SCN^- content of plasma and urine increases with both the cyanide content of the plant and with the amount of plant which is ingested. However, it appears that there may be an upper limit to the concentration of SCN^- in both blood and urine, suggesting that there could be some metabolic process which limits the conversion of HCN to SCN^- in the sheep.

The data show that chemical analysis of plasma or urine offer a practical means of determining the extent of any potential goitrogenicity resulting from the accumulation of thiocyanate derived from cyanogenic glycoside intake.

UNDERWOOD, E.J. (1977). In "Trace Elements in Human and Animal Nutrition" 4th Ed., p. 292, (Academic Press: New York).

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