

## THE CHEMICAL COMPOSITION AND *IN VITRO* DIGESTIBILITY OF FORAGE SAMPLES SELECTED BY OESOPHAGEAL FISTULATED SHEEP ON NATURAL PASTURE OF THE CENTRAL ORANGE FREE STATE

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According to Blaxter (1964), both nutrient content and digestibility are important factors in total nutritive value of forages. Nutrient content may be obtained by means of chemical analyses in the laboratory. Digestibility may be determined in conventional digestion trials. However, digestion trials with animals are laborious and time consuming.

The *in vitro* fermentation technique introduced by Tilley & Terry (1963), showed much promise for the prediction of the actual digestibility of forages. This technique was tested with 59 South African forages by Engels & Van der Merwe (1967), quite successfully. A positive correlation coefficient of  $r = 0,90$  was found between *in vivo* and *in vitro* digestibility of organic matter. Organic matter digestibility could be predicted with a standard error of prediction of  $SE = \pm 3,04$  percentage units of digestibility. Tilley & Terry (1963) reported a standard error of prediction of  $SE = \pm 2,31$  units of digestibility.

Since the chemical composition and *in vitro* digestibility may yield information for evaluating the nutritive value of pastures it was decided to study these two criteria under free grazing conditions on natural pasture. The relationship between chemical composition and *in vitro* digestibility of pasture was also investigated.

The trial was conducted at the Agricultural Research Institute, Glen on a dominant *Themeda triandra* pasture and the shrub *Aster muricatus* also fairly abundant.

Five Merino wethers, fitted with oesophageal fistulae, were used for the sampling of the pasture on three consecutive days during each month of the year. The samples collected by each sheep on the different days of each month were pooled and dried in a force draught oven at 100°C. The trial started in March 1967 and ended in February 1968. The sheep were kept continuously on the pasture together with other sheep in a paddock of 25 ha at a grazing intensity of 0,5 sheep per ha.

The *in vitro* fermentation technique of Tilley & Terry (1963), with slight modifications with regard to nitrogen supplementation (Engels & Van der Merwe, 1967), was used for the determination of the *in vitro* digestibility of organic matter. The chemical analyses for the determination of lignin and acid-detergent-fibre content, were carried out according to the method described by Van Soest (1963). Nitrogen content was determined

according to the method of the A.O.A.C. (1960) while cellulose content was determined as described by Cramp-ton & Maynard (1938).

The pertinent data on the chemical composition and *in vitro* digestibility of the forage samples collected by oesophageal fistulated sheep, are presented in Table 1.

**Table 1**

*The average chemical composition and in vitro digestibility of forage samples selected by oesophageal fistulated sheep during different months of the year on natural pasture*

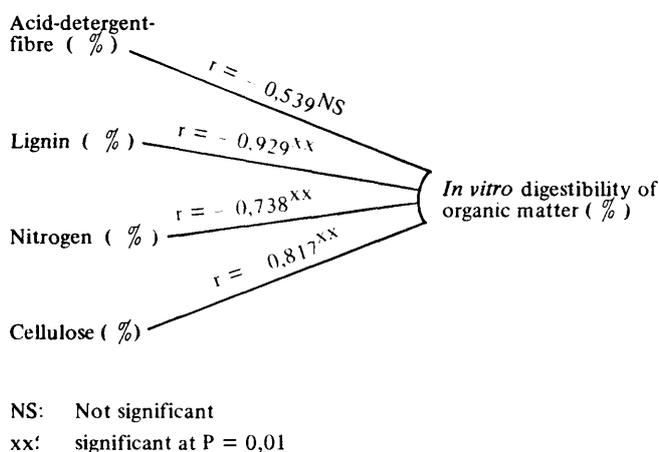
Month	Acid de- tergent fibre	Lignin	Nitrogen	Cellulose	<i>In vitro</i> digest- ibility of organ- ic matter
	1967	%	%	%	%
March	43,63	9,92	1,79	30,36	60,3
April	45,40	13,13	2,09	28,72	52,2
May	45,94	13,80	2,03	27,57	53,2
June	42,94	17,56	2,25	24,63	50,0
July	40,55	16,62	2,55	22,50	50,7
Aug.	41,11	16,06	2,34	24,38	49,1
Sept.	41,90	13,02	2,61	26,16	59,0
Oct.	40,36	9,76	1,50	28,35	61,1
Nov.	40,10	9,26	1,72	30,46	67,0
Dec.	37,77	8,12	1,27	29,61	63,2
Jan.	38,69	8,39	1,23	30,38	63,1
Feb.	41,06	10,44	1,54	29,60	62,3

From the results in Table 1 it is evident that the acid-detergent-fibre content did not vary considerably during the different months of the year. The lignin and nitrogen content of the forage samples collected by oesophageal fistulated sheep, followed a seasonal pattern. During the period April 1967 to September 1967, both lignin and nitrogen were high with the peak for lignin in July 1967 and for nitrogen in September 1967. During this six month period the fistulated sheep collected plant material consisting almost entirely of the shrub *A. muricatus*. The *in vitro* digestibility of organic matter of the samples was rather low during this period.

The results of the present study contradicted those of Swart, Van Schalkwyk, Hugo & Venter (1963) who found a maximum nitrogen content of 0,94% during October and a minimum nitrogen content of 0,38% during

tober and a minimum nitrogen content of 0,38% during August. The work of Swart *et al.* (1963) was also carried out at Glen on a comparable type of natural pasture. However, Swart *et al.* (1963) harvested the pasture and fed it to sheep in metabolism crates where the selective grazing behaviour of the grazing sheep was almost eliminated. Due to the selective grazing behaviour of free grazing sheep, the harvesting and subsequent feeding of the plant material in conventional digestion trials is of little if any value in the evaluation of the nutritive value of a mixed type of natural pasture. Hardison, Reid, Martin & Woolfolk (1954) found that the average diet selected by grazing animals from 23 swards representing a variety of plants and growth stages, contained 23% more crude protein 37% more fat, 26% more ash and 17% less crude fibre than the whole herbage cut from the same source at a stubble height of two inches.

The relationships between the different chemical entities and *in vitro* digestibility of organic matter are given in Fig. 1.



**Fig. 1.** — *The relationship between different chemical entities and in vitro digestibility of organic matter of oesophageal fistula samples selected from natural pasture*

The relationship between acid-detergent-fibre and *in vitro* digestibility of organic matter was not statistically significant. Van Soest (1964) reported highly significant negative correlation coefficients between acid-detergent-

fibre and *in vivo* digestibility. The statistically non-significant correlation coefficient of the present study may be due to the relatively small variation in acid-detergent-fibre content.

The highly significant negative correlation coefficient between lignin content and *in vitro* digestibility of organic matter is in agreement with the results of Van Soest (1964). Lignin content seems to be the main determinant of digestibility *in vitro*.

A statistically significant negative correlation coefficient was found between nitrogen content and *in vitro* digestibility of organic matter. This was caused by the high nitrogen content of the fistula samples during the period April to September with relatively low corresponding *in vitro* digestibilities due to the high lignin content of the samples. However, a negative correlation coefficient of  $r = -0,33$  between nitrogen content and dry matter digestibility was also reported by McCullough (1959).

From the results of the present study it is evident that the lignin content of a pasture seems to be the limiting factor in the digestibility of the available plant material.

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