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A modification of the Daisy II - 220 technique for the determination of *in vitro* dry matter digestibility

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Introduction

The digestibility value of a feed is one of the best indicators of nutritive value. *In vivo* determinations are expensive and time-consuming, rendering this technique impractical for routine analyses. *In vitro* determinations of digestibility using rumen fluid/cellulase have been used extensively in laboratories worldwide. These techniques use individual digestion containers shaken twice daily and a two-stage 48 h digestion. Due to the individual sample handling, filtration and washing steps performed, the introduction of human error and amount of time spent performing these steps are extremely high. The filter bag technology used in the Daisy apparatus involves enclosing the sample in a filter bag placed in a common rumen fermenter which can digest up to 100 samples at one time (compared with 40 in the conventional systems). This apparatus permits batch processing, removes the filtration step and maintain uniform heating with constant shaking. However, the use of the specially manufactured bags used in this technique makes the procedure expensive when analysing large quantities of samples. Furthermore, the determination of NDF as part of the procedure involves the use of a different apparatus for the completion of the analysis. In this study Daisy bags were compared with bags made of parachute and lining material. A comparison between 24 h and 48 h pepsin digestion and the replacement of NDF determination with the 24 h pepsin digestion was also evaluated.

Material and Methods

The reagents and procedure used in the Daisy II technique are reported in a companion abstract elsewhere in these proceedings. NDF was determined according to the Van Soest method. Bags measuring 5 x 10 cm were made from parachute and lining material and heat-sealed. Acid pepsin solution (Minson & McLeod, 1972) was prepared as follows: concentrated hydrochloric acid (20 ml) was added to a 2000 ml volumetric flask, half filled with distilled water and mixed well. Pepsin (activity, 1:10,000) (2 g) was added to the acid solution and the volume was made up to volume with distilled water. The final solution (1600 ml) was added to each of the Daisy flasks.

Results and Discussion

The means (n = 5) for dry matter digestibility of kikuyu, ryegrass, maize and eragrotis hay are presented in Table 1. No significant differences were observed between the different bags when maize and eragrotis hay were analysed. A significant ($P < 0.05$) difference was observed for kikuyu between the Daisy and the lining bags and a highly significant ($P < 0.01$) difference was found between Daisy and parachute bags for ryegrass. In terms of animal requirements, however, the difference observed for kikuyu is insignificant.

Table 1 Digestibility (%) of feeds determined with the Daisy, parachute and lining bag techniques.

				Level of significance	
	Daisy	Parachute	Lining	Daisy vs Parachute	Daisy vs Lining
Kikuyu grass	70.72	69.44	73.44	NS	
Ryegrass	95.92	89.36	96.88		NS
Maize crop	78.64	79.6	79.2	NS	NS
Eragrotis hay	42.32	41.04	40.96	NS	NS

The effect of a 24 h vs. 48 h pepsin digestion is shown in Table 2. Except for ryegrass, where the 24 h digestion gave significantly ($P < 0.01$) higher values than the 48 h digestion, no significant difference was observed between 24 h and 48 h pepsin digestion.

Table 2 Comparison of 24 h with 48 h pepsin digestion using the M&M buffer.

	24 h pepsin	48 h pepsin	Levels of significance
Kikuyu grass	57.76 ± 1.689	58.24 ± 1.182	NS
Ryegrass	88.24 ± 0.685	84.96 ± 0.588	**
Maize crop	89.72 ± 1.525	89.80 ± 2.297	NS
Eragrotis hay	37.26 ± 1.906	40.90 ± 1.849	NS

The comparison between 24 h pepsin digestion and NDF determination for the dry matter digestibility of kikuyu grass, ryegrass, maize and eragrotis hay is presented in Table 3. A highly significant difference was observed between 24 h digestion and NDF determination for kikuyu grass and ryegrass, while there was no significance differences for maize and eragrotis hay.

Table 3 Comparison between 24 h pepsin digestion and NDF determination using the M & M buffer

	24 h pepsin	NDF	Levels of significance
Kikuyu grass	68.96 ± 0.325	72.16 ± 0.531	
Ryegrass	93.84 ± 0.412	89.76 ± 0.786	
Maize crop	76.56 ± 0.349	76.24 ± 0.325	NS
Eragrotis hay	40.50 ± 1.135	39.76 ± 0.483	NS

Conclusions

Lining bags can economically replace the Daisy bags (R0.03 vs R3.00). Although there are reports that a one percent digestibility difference can affect milk yield, bigger variations in the digestibility of kikuyu and ryegrass between and within sheep were observed in a digestibility trial reported by Figueiredo et al (see elsewhere in these proceedings) than that found when 24 h pepsin replaced the NDF determination and 24 h pepsin digestion was used instead of 48 h digestion.

References

Minson, D.J. & McLeod, M.N., 1972. Division of Tropical Pastures Technical Paper No. 8, Commonwealth Scientific and Industrial Research Organization, Australia.

Van Soest, P.J., 1963. J. Assoc. Off. Agr. Chem. 46, 829.