

*Animal Production Research Institute, Dokki, Giza (Egypt)*

## **Efficiency of conventional versus marker technique for shortening the time in digestion trials**

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A collection period in the digestibility trials should be sufficiently long to minimize the fluctuations in feces excretion from day to day and to reduce the experimental error. There are few attempts for shortening the length of the collection period to save the time required in the digestibility trials (Abou-El-Hassan et al. (1) and White et al. (9)). This problem needs recent investigation.

One of the several attempts for easier evaluation is the marker technique, which needs critical investigation with minimum time after administering the marker.

### **Material and methods**

These experiments involved the determination of the digestibility of main nutrients (dry matter, protein and energy) in three roughages (clover hay, hay: maize stalks and hay: rice straw) using the conventional and marker techniques. The conventional method was conducted using 3 collection periods, 1 up to 3rd day, 1 up to 5th day and 1 up to 7th days (control) using 10 days preliminary period.

Three samples were taken at the 3rd, 5th and 7th day after initial administration for determining the chromic oxide recovery and the marker ratio.

Four Rahmany rams were used in each digestion trial, each animal being given 2.5 g  $\text{Cr}_2\text{O}_3$  offered at 9 a.m. and 4 p.m. daily. Chromic oxide in the feces was determined by the procedure of Kimura and Miller (8), and the energy of the feed and feces samples was estimated using a standard non-adiabatic bomb calorimeter (Veb).

### **Results and discussion**

#### *Percentage recovery and unrecovery of the marker*

Results in table 1 indicated that the recovery of the 3rd day (procedure I) ranged between  $92.35 \pm 3.52$  up to  $104.58 \pm 9.03$  % with an average  $99.71 \pm 3.75$  % with the three rations. The high variability in procedure I using clover hay was due to the high and low recovery with an individual sheep (116.00, 121.30 and 81.20 %).

In procedure II (5th day), the recovery ranged between  $93.70 \pm 1.73$  % up to  $97.15 \pm 4.62$ , the average being  $95.17 \pm 1.03$ .

Procedure III (7th day), the recovery ranged between  $91.84 \pm 3.41$  to  $99.10 \pm 1.71$ , the average being  $96.53 \pm 2.35$ . This means that the unrecovery would be  $3.47 \pm 2.35$  (insignificant from zero).

Table 1. Percentage recovery and unrecovery of chromic oxide with some roughages fed directly to sheep using three procedures.

Ram No.	Procedure I		Procedure II		Procedure III	
	Recovery %	Unrecovery %	Recovery %	Unrecovery %	Recovery %	Unrecovery %
				5th day		7th day
1	99.80	0.20	Clover hay		82.10	17.90
2	116.00	- 16.00	98.20	1.80	98.06	1.94
3	121.30	- 21.30	106.00	- 6.00	93.44	6.56
4	81.20	18.80	84.20	15.80	93.77	6.23
			100.20	- 0.20		
Aver.	104.58 ± 9.03	- 4.58 ± 9.03	97.15 ± 4.62	2.85 ± 4.62	91.84 ± 3.41	8.16 ± 3.41
1	82.20	17.80	Hay : Maize stalks		97.46	2.54
2	98.20	1.80	97.20	2.80	99.02	0.98
3	93.40	6.60	93.00	7.00	101.46	- 1.46
4	95.60	4.40	95.40	4.60	96.66	3.34
			89.20	10.80		
Aver.	92.35 ± 3.52	7.65 ± 3.52	93.70 ± 1.73	6.30 ± 1.73	98.65 ± 1.05	1.35 ± 1.05
1	100.60	- 0.60	Hay : Rice straw		100.66	- 0.66
2	107.20	- 7.20	106.00	- 6.00	96.28	3.72
3	110.38	- 10.38	90.00	10.00	103.20	- 3.20
4	90.64	9.36	83.62	16.38	96.26	3.74
			99.00	1.00		
Aver.	102.21 ± 4.36	- 2.21 ± 4.36	94.65 ± 4.93	5.53 ± 4.93	99.10 ± 1.71	0.90 ± 1.71
Aver.	99.71 ± 3.75	0.29 ± 3.75	95.17 ± 1.03	4.83 ± 1.03	96.53 ± 2.35	3.47 ± 2.35

and energy respectively). The corresponding percentage differences were  $0.29 \pm 1.77$ ,  $9.14 \pm 4.89$  and  $1.78 \pm 1.26$ . The high percentage difference with CP digestibility was due to hay : rice straw mixture.

The differences between the values of procedure I and procedure V indicated no significant differences also ( $t = 9.588$ ,  $1.465$  and  $0.800$ ) except with the DM digestibility ( $t$  was significant only at 5% level). The corresponding percentage differences were  $5.82 \pm 0.61$ ,  $7.68 \pm 5.24$  and  $1.36 \pm 1.70$ .

The same results were found with the last procedure (the percentage differences were  $3.23 \pm 2.10$ ,  $2.76 \pm 1.84$  and  $3.30 \pm 2.41$ ). The corresponding  $t$  were  $1.538$ ,  $1.500$  and  $1.369$ , the values indicating no significant differences.

These results indicated that minimizing the time after administrating the marker down to three days in the collection period could be used with safety under these conditions, Kiesling et al. (7) found no significant differences among days after the third day in the collection period using chromic oxide as a chemical marker.

### *Summary*

Investigation was carried out to determine the digestibility of the main nutrients (DM, CP and energy) in digestion trials using some roughages in order to reduce the collection period and to study the suitable time of the marker technique and its application. This study revealed the following results: (1) The average recovery of chromic oxide in feces were  $99.71 \pm 3.75$  % in the 3rd day (after administrating the marker),  $95.17 \pm 1.03$  % in the 5th day and  $96.53 \pm 2.35$  % in the 7th day. It could be concluded that this marker is indigestible and could be used as an ideal one. (2) There were no significant differences between the digestibility values with the conventional method and those of the two short-period techniques (the first three days and the first five days collection periods). The percentage differences were not exceeding 6 % except some deviations with CP digestibility in one trial (hay : rice straw mixture). These two methods seemed to be reliable in practice. (3) The same differences were found between the digestion coefficients, which conducted from the conventional method, and those of the marker technique using three times for collection except high deviations were found with one trial in the last two procedures. Using marker technique appeared promising from the 3rd day up to the 7th day after its administration.

*Key words:* digestion trials, time shortening, marker technique

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