

The Effect of the Mechanical Treatments of the hay on Animal Feeding Behaviour

Y.I. El-Talty, A.K. Abou-Raya, E.R.M. Abu-Hussein,
H.M. Mourad and O.A.I. Salem.

Faculty of Agriculture, Cairo University, Egypt.

HAY WAS fed to Rahmany sheep in three forms: long, chopped (5-7cm) and finely ground. Animal behaviour during feeding each form was studied, including hourly mean consumption of hay and water, total rumination time and rumination rate.

The trend of the mean hourly consumption of hay was similar to that of water, being high in the 1st hr after feeding then decreased gradually till the animal stop consumption. The highest consumption was recorded with chopped hay. The mean numbers of drinking with long hay was equal to that with chopped, both being lower than with ground hay.

The highest total rumination time (during 12 hr after feeding) was 174 min with long hay, 75 with chopped and 58 with ground. The respective rumination rate was 85, 80 and 66 chews/min

Results appeared to be in favour of chopped hay. With this form, higher intake was associated with moderate rumination time, waisting distinctly less energy than with long hay. The rate of passage was also slower than with ground hay, allowing suitable rumen fermentation and absorption of produced metabolites.

Feeding behaviour of animals has been studied by many previous workers. Consumption of food and water and especially rumination were studied more than the other patterns. Gorden (1965) observed that rumination increased with hay intake in a characteristic way. He also, in 1968 stated that the amount of rumination which can be measured as total time of ruminating, actual time chewing, the number of rumination chews or the number of boli regurgitated is affected by : (1) the amount of food eaten; (2) the physical form of the roughage ; (3) water intake, and (4) the method of feeding.

Welch and Smith (1969 a and b) found that, single meals of 1000 g of hay produced 67 % more rumination time than 500 g meals. They also recorded that increasing amounts of chopped hay significantly increased

rumination times during the 48 hr after feeding. Voskuil and Metz (1973) reported that daily intake of hay was positively correlated with duration of rumination. A relation between intake of hay and rumination time was expressed (Welch and Smith 1969 b) by the equation :

$$y = 112 + 0.5317x - 0.000163x^2$$

where, x, g hay eaten/day, and y ; the rumination time in min /day, the standard error of estimate was 41 min.

Material and Methods

Clover hay from *Trifolium alexandrinum*, sun cured, having the International Ref. No.- 1-01-340 (Harris *et al.*, 1968) was prepared in three forms ; long, chopped (5-7cm) and finely ground (2 mm).

Three healthy Rahmany rams of approximate age (1½ year) and average weight (40 kg). were used for carrying out the trials. Approximate voluntary feed intake for each sheep during a 15-day preliminary period was estimated. A daily ration of 1½ kg hay seemed to cover the animal feed consumption, therefore, such amount was offered once daily at 8 a.m with free access to a known volume of water. Sheep were under close observation during the tested period (2 days) to record the data hourly (from 8 a.m. to 8 p.m.) for calculating the rumination rate according to the procedure suggested by Hodgson (1971) as:

$$\text{Rumination rate (chews/min)} = (b) \times \frac{60}{(a)}$$

Where :

(a) is the time which elapsed between the regurgitation and subsequent re-swallowing of a bolus of ingesta.

(b) is the number of jaw movements made during the rumination of the bolus.

Results and Discussion

Data concerning the effect of the physical form of hay on the mean hourly consumption of hay and water, are demonstrated in Table 1 and 2. Fluctuations of the mean consumption of hay and water were observed through twelve hr after the beginning of feeding. The rate of consumption (g/hr) was high in the 1 st. hr after feeding then decreased remarkably in the 2nd hr and remained approximately at the same level until 6hr after feeding. The rate of hay consumption of the three forms of hay was very low until it reached the zero rate after 12 hr. The same trend was observed with the water consumption rate (l/hr).

Assuming that the total quantity consumed of every form of hay during the 12 hr was 100%, it was found that the hay consumption of animals as a percentage from the total intake (Table 1) deeply differed from one form to another. With long hay it was clear that, the intake decreased gradually until 6 hr after the beginning of feeding, then increased again in the following two hr reaching zero intake after 10 hr. The consumption of chopped hay was lower than of long hay at the 1st hr then fluctuated twice to zero intake the first after 7 hr and the second after 12 hr from the beginning of feeding. The lowest % intake in the 1st hr was observed with ground hay but with great fluctuation than the former two types during the whole time of feeding, then reached zero intake after 8 and 12 hr.

Although the rate of passage of ground hay in the tract was more rapid than the other two forms, the lower rate of consumption may be due to its palatability. It was clear that, with all three forms about 50% of the total required amount of hay was eaten within the first 2 hr.

Regarding water intake (Table 2), it was nearly the same in the 1st hr with long and chopped hay, but with ground hay it was about half as much as of that in the former two cases. Wide fluctuations were observed in the % of water intake. Zero intake appeared 3 times in the case of long and ground hay, after 6, 8 and 12 hr with the former and after 8, 9 and 12 with the later. While it appeared only once after 11 hr with the chopped hay.

From the previous work, it was noticed that water intake increased with increasing the rate of hay intake, this was in agreement with those results found by Gordon (1965) and Pogrebnaja and Husainov (1969) but did not agree with those of Voskuil and Metz (1973).

Results in Table 3 indicate the effect of the physical form of hay on the behaviour pattern of the animals. The highest average total time of eating was found when ground hay was fed, while the minimum was with chopped hay. These results were in contrary with those found by Weston and Hogan (1967) that the sheep generally spent less time in ruminating and eating when the roughages were ground. In this study, water consumption was found to be affected by the different forms of hay fed. The numbers of drinking differed with the three forms of hay fed. They were to be 8, 11 and 12 times with long, chopped and ground hay, respectively. Animals on chopped feed drank more water than the other two forms, these results agree with those of Pogrebnaja and Husainov (1969).

It was also appeared from the data that the total time of rumination was the highest with long hay, but decreased with chopped hay and became the lowest with ground hay.

TABLE 1. Effect of the physical form of hay on the hay consumption rate (g/hr) during 12 hr of feeding.

Hay type	Consumption	Mean hourly consumption of hay (from 8 a.m.)												Total		
		9	10	11	12	13	14	15	16	17	18	19	20			
Long hay	g.	495	170	107.5	90	60	32.5	70	72.5	37.5	12.5	0	0	0	0	
	% total	43.14	14.81	9.37	7.84	5.23	2.83	6.10	6.32	3.27	1.09	0	0	0	0	
Chopped hay	g.	550	83.3	83.3	116.6	100	116.6	0	133.3	16.6	100	66.6	0	0	0	
	% total	40.25	6.10	6.10	8.53	7.32	8.53	0	9.76	1.21	7.32	4.87	0	0	0	
Ground hay	g.	400	150	200	166.6	83.3	150	33.3	0	16.6	33.3	50	0	0	0	
	% total	31.17	11.69	15.59	12.98	6.69	11.69	2.60	0	1.29	2.60	3.90	0	0	0	
															1147.5	
																1366.3
																1283.1

TABLE 2. Effect of the physical form of hay on the water consumption during 12 hr. after feeding.

Type of hay	Consumption	Mean hourly consumption of water (from 8 a.m.)												Total		
		9 (a.m.)	10	11	12	13	14	15	16	17	18	19	20			
Long hay	Liter	1.50	0.95	1.03	0.18	0.30	0	0.02	0	0.03	0.02	0.08	0	0.08	0	4.08
	% of total	36.81	23.31	25.28	4.48	7.42	0	0.49	0	0.67	0.49	1.84	0	1.84	0	
Chopped hay	Liter	2.18	0.78	0.28	0.40	0.55	0.45	0.12	0.35	0.38	0.05	0	0.35	0	0.35	5.89
	% of total	37.01	13.24	4.75	6.79	9.34	7.64	2.04	5.94	6.45	0.85	0	5.94	0	5.94	
Ground hay	Liter	0.78	0.83	0.63	0.20	0.25	0.40	0.18	0	0	0.50	0.48	0	0.48	0	4.25
	% of total	18.35	19.53	14.82	4.71	5.88	9.41	4.24	0	0	11.76	11.29	0	11.29	0	

Dealing with total time of feeding, laying and rumination, the data appeared to be in favour of saving energy for chopped hay. This was reflexed on the feeding value, being 31.3, 35.6 and 28.0% SV (on DM) for long, chopped and ground hay, respectively. Results here were in agreement with Gordon (1968) who indicated that the animal could save energy to the extent of about 10% of energy intake when lies down to ruminate instead of standing.

The rumination rate was 85 chews/min with long hay, decreased ($P < 0.05$) to 80 chews/min with ground hay (Table 3 & Fig. 1). So, grinding reduced both the total time of rumination and the rumination rate. The present results seem to agree with those of Kick *et al.* (1937) Keck *et al.* (1962), Pearce and Moir's (1964), Ruckebusch and Marquet (1963) and Gordon (1968). But the results were in contrary with those found by Gordon (1958) and Voskuil and Metz (1973).

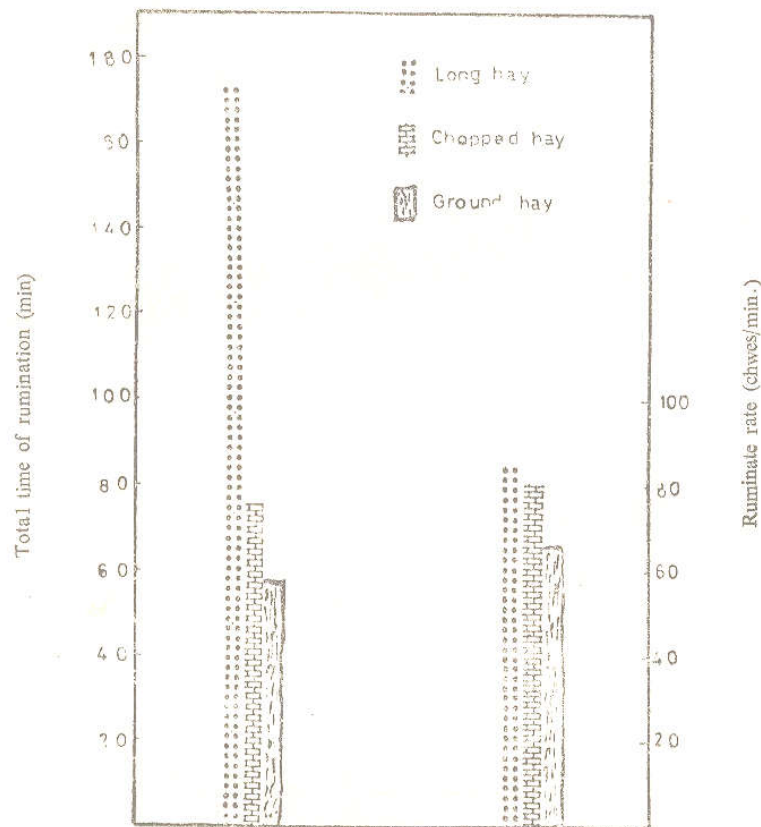


Fig. 1. Effect of the physical form of hay on the total time of rumination and rumination rate

TABLE 3. Effect of the physical form of hay on feeding patterns of sheep.

Item	Physical form		
	Long hay	Chopped hay	Ground hay
Total time of feeding (min)	247.7	209.7	256.0
Total time of laying (min)	275.5	275.5	162.0
Numbers of drinking	8.0	8.0	12.0
Total time of rumination (min)	174.0	75.0	58.0
Ruminating rate (Chews/min)	85.0	80.0	66.0

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تأثير المعاملة الميكانيكية على السلوك الغذائي للحيوان

يحيى ابراهيم التلى ، احمد كمال أبو رية ، السيد رفعت أبو حسين

حمدي مراد و عثمان ابراهيم سالم

كلية الزراعة - جامعة القاهرة

قدم الدريس للأغنام الرحمانى فى صور ثلاث وهى سليم ومقطع (هـ - لاصم) ومطحون ناعم * وقد تم دراسة السلوك الغذائى للحيوانات عند تناولها كل صورة من الصور الثلاثة على حده متضمنة متوسط الكمية التى تناولها الحيوان وكمية الماء فى الساعة ومدة ومعدل الاجترار *

وقد تشبه سلوك الحيوانات فى تناول الدريس مع سلوكها فى تناول الماء فارتفع الاستهلاك فى الساعة الأولى بعد التغذية ثم تناقص حتى توقف الحيوان تماما *

وقد سجل أعلى استهلاك للحيوانات من الدريس المقطع * وتساوى عدد مرات الشرب فى كل من الدريس المقطع والسليم ولكن زاد عدد المرات فى الدريس المطحون عنه فى المقطع والسليم *

وكانت أعلى فترة اجترار على مدى ١٢ ساعة عند التغذية بحيث كانت ١٧٤ دقيقة للدريس السليم ، ٧٥ للدريس المقطع ، ٥٨ مع الدريس المطحون ، ويقابل ذلك معدل اجترار ٨٥ ، ٨٠ ، ٦٦ مضافة/دقيقة على التوالى *

ومن هذه النتائج يتضح أن التغذية على الدريس المقطع تفضل تلك على الدريس السليم والمطحون حيث يزيد استهلاك الغذاء مع مدة اجترار متوسطة مما يقلل من الطاقة المفقودة بمقارنته بالدريس السليم ، كما أن معدل مرور الغذاء فى القناة الهضمية كان أبطأ منه فى حالة الدريس المطحون مما يتيح الفرصة الكافية للتخمير فى الكرش وامتصاصي نواتج هذا التمثيل *