Researches on Consumption Speed of Forages in Dairy Cows when Fed in Three Portions

Silvia Erina, Ludovic Toma Cziszter, Stelian Acatincăi, Marioara Nicula, Simona Baul, Gabriel Răducan, Radu Neamţ, Ion Valeriu Carabă

Faculty of Animal Sciences and Biotechnologies, Timişoara, 300645-Timişoara, C. Aradului Nr. 119, România

Abstract

In this study we assessed the consumption speed (g/min), as well as the required time for consumption of 1 kg of raw forage for alfalfa-hay, herbs silage, beet and concentrates), administered in three portions (P_1, P_2, and P3) per day, in 2 equal feedings (F_1, $F_{2)}$ per portion., to Romanian Black and White cows. The administration order of forages (fibrous-succulents and succulents-fibrous), the number of feedings and the average consumption speed among the three portions were the experimental variants. Data was computed by ANOVA/MANOVA. The highest consumption speed was registered for herbs silage (237.41 g/min), followed by the beets (233.43 g/min), concentrates (180.89) and alfalfa hay (48.89 g/min). The required time for 1 kg of raw forage consumption (minutes and seconds) was 5.32 for concentrates, 20.27 for alfalfa hay, 4.13 for herbs silage and 4.17 for beets.

Keywords: consumption speed, nutritional behaviour, Romanian Black and White Cows

1. Introduction

Dairy cows have a natural daily eating and rumination pattern. Modern lactating dairy cows may eat more often than their ancestors. Housing and feeding management should accommodate their need for frequent meals [1,2]. The interest on the feeding behaviour of cattle has recently been increased. The feeding behaviour should be encountered to obtain optimal performance from cattle [3]. Eating rate, determined by Prescott (1998) is expressed as minutes per kilogram of feed consumed. Therefore, a high number such as 18.6 minutes per kg is a relatively slow rate of feed consumption. An eating rate of 18.6 minutes per kg is equivalent to 54 grams of feed dry matter consumed per minute. The fastest eating rate was 6.9 minutes per kg (145 grams per minute) and the average was 14.2 minutes per kilo (or 70 grams per minute) [4]. The aim of the paper was to determine the consumption speed of some cold-season specific forages, administered in three portions, according to their nature, the number of feedings in a portion and the administration order of forages within one portion.

* Corresponding author: Silvia Erina, 0040-256277084, silviaerina@animalsci-tm.ro

2. Materials and methods

Investigations were carried out in The Experimental and Didactical Station of the Banat University of Agricultural Sciences and Veterinary Medicine Timisoara, during the autumn-winter season. The biological material in the study was 6 Romanian Black and White cows at first freshening, in their first one hundred days of lactation. In this study we assessed the consumption speed (g/min), as well as the required time for consumption of 1 kg of raw forage for alfalfa-hay, herbs silage, beet and concentrates. The forages were administered in 3 portions (P_1, P_2, and P3) per day, in 2 equal feedings (F_1, $F_{2)}$ per portion. The administration order of forages (fibrous-succulents and succulents-fibrous), the number of feedings and

the average consumption speed among the three portions were the experimental variants. Ration was made of 3 kg concentrates, 6 kg alfalfa hay, 15 kg grass silage (leguminous and grasses) and 15 kg beets.

Methods used were: daily weighing of forages portion and feedings, tape recording of forage consumption length, data processing and statistical interpretation with ANOVA-MANOVA.

3. Results and discussion

Table 1 presents averages and significance of differences for forages consumption speed (g/min) according to their administration order fibrous-succulents (O_1) and succulents-fibrous (O_2). The average consumption speed for concentrates was 180.89 g/min, a speed that was not influenced by the administration order. In herbs silage, the average consumption speed increased to 105.1% in case of given it before hay (O_2), difference being statistically non-significant. Also, there were non-significant differences in average consumption speed for beets. Significant difference ($p<0.05$) was observed for the alfalfa hay only. Consumption speed of this was 50.01 g/min when it was administered before succulents, speed that decreased at 95.5% if it was given after succulents.

Table 2 shows the averages and significance of differences for the feed consumption speed administered in portions 1, 2 and 3 (P_1, P_2 and P_3). Given in three portions, the consumption speed for concentrates was 187.70 g/min in P_1, 174.25 g/min in P_2 and 180.71 g/min in P_3. The only significant difference were observed between P_1 and P_2 ($p<0.01$). For alfalfa hay average consumption speed increased in P_2 (118.3%) comparative to P_1, and the difference was very significant ($p<0.001$). The hay consumption speed was 111.5% higher in P_3 than in P_1 (>5.12 g/min, ($p<0.001$). The difference between P_3 and P_2 was distinct significant statistically ($p<0.01$). For herbs silage, the consumption speed was similar in P_2 to that in P1 (100.6%), difference being statistically non-significant ($p>0.05$). A very significant difference ($p<0.001$) was observed between $P_3$and P_1, the consumption speed in P_3 increased to 47.76 g/min compared to P_1. A similar difference ($p<0.001$) was observed between P_3 and P_2, the consumption speed in P_3 increased to 46.40 g/min compared to P_2. The consumption speed for beets was statistically non-significant according to the three portion the ration was given.

The influence of feedings (F_1 and F_2) on the forage consumption speed it may be seen by analyzing the averages and significance of differences shown in Table 3. Regarding the number of feedings per portion, always the consumption speed of the feedstuffs, as well as the amount consumed, was higher in the first feeding F_1 than in the second feeding F_2. The differences were statistically very significant ($p<0.001$) for all forages except beets. Thus, for concentrates the average consumption speed in F_1 was 191.08 g/min and decreased in F_2 at 89.3% (170.70 g/min). Consumption speed decrease in F_2 at 78.2% for alfalfa hay (-11.94 g/min) and at 66.8% for herbs silage (-94.57 g/min).

The consumption speed of the feedstuffs (g/min) irrespective to the portions, feeding number and administration order, as well as the required time for consuming 1 kg raw forage (minutes and seconds) are shown in Table 4.

The highest raw forage consumption speed was observed in herbs silage (237.41 g/min), followed by beets (233.43 g/min), concentrates (180.89 g/min) and alfalfa hay (48.89 g/min). The required time for consuming 1kg of raw forage (minutes and seconds) was 5.32 for concentrates, 20.27 for alfalfa hay, 4.13 for herbs silage and 4.17 for beets.

Table1. Averages and significance of differences for forage consumption speed according to their administration order (g/min)

Item	Administration order		O_2 vs. O_1	Differences and significance
	fibrous-succulents (O_1)	succulents-fibrous (O_2)	%	(O_2 - O_1)
Concentrates	**180.89**		-	-
Alfalfa hay	50.01	47.77	95.5	**-2.24***
Herbs silage	231.28	243.55	105.1	**12.27^{ns}**
Beets	228.58	238.28	104.2	**9.7^{ns}**

Table 2. Averages and significance of differences for forage consumption speed between the three portions (g/min)

Item	Portion			% difference			Differences and significance		
	P_1	P_2	P_3	P_2- P_1	P_3- P_1	P_3- P_2	P_2- P_1	P_3- P_1	P_3- P_2
Concentrates	187.70	174.25	180.71	92.8	96.3	103.7	**13.45****	**6.99**^{ns}	**6.46**^{ns}
Alfalfa hay	44.48	52.61	49.60	118.3	111.5	94.3	**8.13*****	**5.12*****	**-3.01****
Herbs silage	221.04	222.40	268.8	100.6	121.6	120.8	**1.36**^{ns}	**47.76*****	**46.4*****
Beets	231.63	230.47	238.21	99.5	102.8	103.3	**-1.16**^{ns}	**6.58**^{ns}	**7.74**^{ns}

Table 3. Averages and significance of differences for forage consumption speed according to their feedings (g/min)

Item	Feeding 1 (F_1)	Feeding 2 (F_2)	F_2 vs. F_1 (%)	Differences and significance (F_2-F_1)
Concentrates	191.08	170.70	89.3	**-20.38*****
Alfalfa hay	54.86	42.92	78.2	**-11.94*****
Herbs silage	284.70	190.12	66.8	**-94.57*****
Beets	247.80	219.06	88.4	**-28.73**^{ns}

Table 4. Average consumption speed of the feedstuffs (g/min) irrespective to the portions, feeding number and administration order and the required time for consuming 1 kg raw forage (minutes and seconds)

Item	Concentrates	Alfalfa hay	Herbs silage	Beets
Consumption speed (g/min)	180.89	48.89	237.41	233.43
Time for consuming 1 kg raw forage (min. and sec.)	5.32	20.27	4.13	4.17

4. Conclusions

The fodder administration order influenced only the consumption speed of hay, which was higher in the case of administration before succulents (50.01 g/min) than it was given after succulents (47.77 g/min) and difference was significant ($p<0.05$).

Given in three portions, significant differences were observed for concentrates only between P_1 and P_2 ($p<0.001$). For alfalfa hay very significant differences were between P_2- P_1 and P_3- P_1, and between P_3- P_2, the difference was distinct significant statistically ($p<0.01$).For silage the differences were very significant ($p<0.001$), except the difference between P_2- P_1.

In the second feeding of the portion (F2) the consumption speed decreased compared to the first feeding (F1) for concentrates, hay and silage, but remained relatively constant for beets.

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