Factors Influencing Consumption Speed of Forages Given in Two Portions in Primiparous Dairy Cows

Silvia Erina[1], Ludovic Toma Cziszter[1], Stelian Acatincăi[1], Simona Baul[1], Iulian Tripon[1], Gabriel Răducan[1], Genoveva Buzamăt[1], Radu Neamţ[1,2]

[1]Faculty of Animal Sciences and Biotechnologies, Timişoara, 300645-Timişoara, C. Aradului Nr. 119, România
[2]Research and Development Station for Bovine - Arad, 310059, Arad, Bodrogului 32, România

Abstract
The study was carried out on 6 Romanian Black and White cows in their first one hundred days of lactation. The aim was to assess 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 two portions (P_1, P_2,) 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 two portions were the experimental variants. Data was computed by ANOVA/MANOVA. The average consumption speed determined was 198.5 g/min for concentrates, 48.28 g/min for alfalfa hay, 203.19 g/min for silage and 235.32 g/min for beets. The required time for 1 kg of raw forage consumption (minutes and seconds) was 5.02 for concentrates, 20.43 for alfalfa hay, 4.35 for herbs silage and 4.15 for beets.

Keywords: consumption speed, nutritional behavior, primiparous cows, Romanian Black and White Cows

1. Introduction

Over the past 50 years dairy cattle have been selected intensively for milk production. One of the results from this selection is greatly increased milk production and higher levels of feed intake [2]. The studies in the literature investigated different aspects of dairy cattle feed consumption behavior, and their preference for various kinds of forages, the influence of number of portions, the order of administration [3]. There are controversies in the literature regarding the administering order of fibrous and silage within the same portion [4]. Some authors [5] say that feeding from the physiological point of view, is requires that fibrous fodder having a high crude fibre content, should be fed first, and then should be fed forages rich in fermentescible carbohydrates (concentrates and succulents), in this way avoiding sudden increase of rumen pH and allowing a good assimilation of the bacterial nitrogen [1]. The aim of the paper was to determine the consumption speed of some cold-season specific forages, administered in two portions, according to their nature, the number of feedings in a portion and the administration order of forages within one portion.

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, beets and

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

concentrates. The forages were administered in 2 portions (P_1 and P_2) 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

I the Table 1 are shown the 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), irrespective to the number of portion and feedings. The average consumption speed for concentrates was 180.89 g/min, a speed that was not influenced by the administration order, because concentrates were given always at the beginning of the portion. In herbs silage, the average consumption speed increased to 104.2% 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. Very significant difference ($p<0.001$) was observed for the alfalfa hay only. Consumption speed of this was 55.67 g/min when it was administered before succulents, speed that decreased at 73.4% if it was given after succulents. So, for the succulent forages (silage, beets), with a higher ingestion rate than alfalfa hay, the consumption speed was not influenced by the order of administration.
Table 2 presents the averages and significance of differences for the feed consumption speed administered in portions 1 and 2 (P_1 and $P_{2)}$. Given in two portions, the consumption speed for concentrates was 191.80 g/min in P_1 and 205.20 g/min in P_2, the difference being statistically distinct significant ($p<0.01$). For alfalfa hay average consumption speed increased in P_2 (106.9%) comparative to P_1, and the difference was significant ($p<0.05$). For herbs silage, the consumption speed was 191.12 g/min in P_1 and 215.26 g/min in P_2, The difference (24.14 g/min) being significant ($p<0.05$). The consumption speed for beets was statistically non-significant according to the two 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 ($p>0.05$). Thus, for concentrates the average consumption speed in F_1 was 209.69 g/min and decreased in F_2 at 89.3% (187.32 g/min). For alfalfa hay, consumption speed decrease in F_2 at 77.3% (-12.34 g/min) and for herbs silage at 64.4% (-87.88g/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 beets (235.32 g/min), followed by herbs silage (203.19 g/min), concentrates (198.5 g/min) and alfalfa hay (48.28 g/min). The required time for consuming 1kg of raw forage (minutes and seconds) was 5.02 for concentrates, 20.43 for alfalfa hay, 4.35 for herbs silage and 4.15 for beets. Our results are comparable to those reported by the literature [5].

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 (O_2 - $O_{1)}$
	fibrous-succulents (O_1)	succulents-fibrous (O_2)		
Concentrates	**198.5**		-	-
Alfalfa hay	55.67	40.90	73.4	**-14.77*****
Herbs silage	199.01	207.37	104.2	**8.36**^{ns}
Beets	229.82	240.81	104.8	**10.99**^{ns}

Table 2. Averages and significance of differences for forage consumption speed between portion 1 and portion 2 (g/min)

Item	Portion		P_2 vs. P_1	Differences and significance
	P_1	P_2	(%)	P_2- P_1
Concentrates	191.80	205.20	106.9	**13.40****
Alfalfa hay	46.86	49.70	106.1	**2.84***
Herbs silage	191.12	215.26	112.6	**24.14***
Beets	235.08	235.56	100.2	**0.48**^{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	209.69	187.32	89.3	**-22.37*****
Alfalfa hay	54.45	42.11	77.3	**-12.34*****
Herbs silage	247.13	159.25	64.4	**-87.88*****
Beets	245.41	225.24	91.7	**-20.17**^{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)	198.50	48.28	203.19	235.32
Time for consuming 1 kg raw forage (min. and sec.)	5.02	20.43	4.35	4.15

4. Conclusions

Alfalfa hay consumption speed was influenced by the administration order, being higher when it was given before succulents (55.67 g/min) than it was given after succulents (40.90 g/min) and difference was very significant ($p<0.001$).

Given in two portions, distinct significant difference was observed for concentrates between P_1 and P_2 ($p<0.01$). For alfalfa hay and for silage the differences were significant statistically between P_2- P_1 ($p<0.05$).

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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