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ANALYSES OF FEEDING BEHAVIOUR OF DAIRY COWS

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Abstract: Feeding behavior of dairy cows in the captive, industrials systems of rearing is different than natural, because when animals feel hunger, behavior realization of the basic instincts is deprived. In addition, depending from the way of raising, differences exist in behavior of dairy cows during the feeding. Aim of this study was to explore this difference with statistical approach. In the experiment, feeding behavior of 35 dairy cows was observed, black - white breed in the Holstein type. Dairy cows were divided into two groups, group of 15 dairy cows raised in the farm with tied system and 20 dairy cows raised in the farm with free system. With sequentional analyses and with statistical data processing we determinate numerical values of high statistical significant interactions between activities inside each farm, and on the contrary we do not determinate statistical significant interaction in feeding behavior of dairy cows between farms.

Key words: dairy cows, feeding, behavior, sequentional analyses, interaction, hunger

Introduction

Behavior of animals is unique expression appearance of internal emotions. Emotions are made as sensitive answers on neurophysiology stimulus. Research of feeding behavior is strongly connected with two basic emotions: hunger and satiety *(D'Eath et al., 2009)*. Motivation for expression the feeding behavior of dairy cows are consist from feeling of hunger and from appetitive behavior, with the purpose to eliminate such unpleasant state of being hungry *(De Graaf et al., 2004)*. Emotion of hunger is subjective feeling and each animal experience different, but with mutual physiology mechanism and neurogical regulation of hunger and satiety. The ways that cattle can express their feeding behavior depends from rearing systems. Cattle are grazing animals and in the natural environment, when feeling of hunger is notified, they can move in large distance searching for quality pasture, what is a kind of appetitive behavior. Because, recognizing the taste and smell of plant,

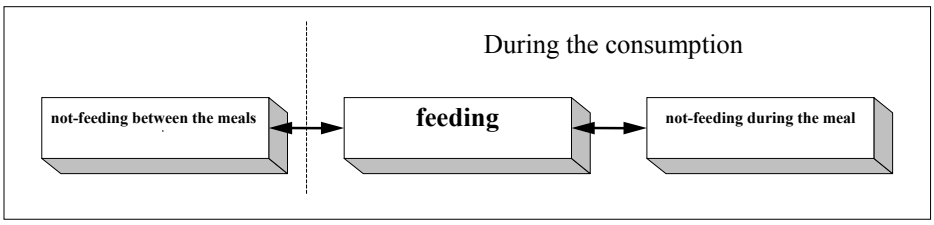
cattle choose the one who is more tasteful *(Albright, 1993)*, and with more energy *(Grubić and Adamović, 2003; Toates, 1986; Le Magnen,1985)*.

Feeding behavior of dairy cows in the captive, industrials systems of rearing is different from natural, because the basic instincts for grazing are deprived. In such condition, where natural behavior is not allowed, dairy cows had to modify their natural actives for an adaptation level which farmer allowed *(Waiblinger et al., 2003)*. In that sense, in this work we started from hypothesis that feeding behavior of dairy cows is different in different systems of raising. Because of that, we did research in two farms, one with free system and second with tied system of raising.

Materials and Methods

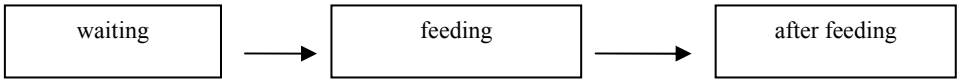
During three months (summer period), on the farm ``13 May`` Zemun Polje with free system and on the farm ``Budućnost`` Dobanovci (present ``BD Agro``) with tied system of rearing, research was done. Dairy cows were fed once per day in the first farm and twice per day in the second farm. Total number of dairy cows included in the experiment was 35, 15 dairy cows were raised in the farm with tied system and 20 dairy cows were raised in the farm with free system. For the behavior recording, it was used video camera. Each group was recorded in several repeating, for the purpose to minimize human error during the observation time *(Frazzi et al., 2000)*. Periods of recording with video camera started 15 minutes before feeding and lasted 45 minutes during the feeding. We record a large number of activities and because of that, we choose by three activities in every sequence. In the sequence of waiting, this was activities: standing, watching and mooing. In the sequence of feeding, we choose activities: taking the feed, selection and defending from stable fly.

This kind of behavior measuring is "limited recording of behavior"; it considers continual observation of the certain activities only. With this method, video record could be divided on individual sequences. Each sequence represent particular pattern of activities. By the *Allcroft et al. (2004)* the structure of feeding behavior can be grafically represent (Graph 1).



Graph 1. Graphical presentation of model structure of feeding behavior of dairy cows *(Allcroft et al., 2004)*

According to these model, we define model used for recording feeding behavior of diary cows, who is consist from three sequences (Graph 2).



Graph 2. Model of sequentional analyses of feeding behavior used in this work

These of model of sequential analyses *(Blackshaw, 2003; Backeman and Deckner, 2000),* allowed statistical data processing with analyses of variance and Tuckey`s honest significant difference test *(Statistica v. 6., Stat Soft 2003)*.

Results and Discussion

In research, during the sequence of waiting and sequence of feeding, we analyzed interactions between recorded feeding behavior activities of dairy cows. On the both farms, all activity records are only for a green mass of alfalfa, because other components of meal, observed animal did not received always.

Waiting sequence

Mutual parameter during this sequence was time inaccurate meal distribution. In 5% only, during experiment, dairy cows get the meal on the regulate time. Meals were received with delay of one hour average, but in the extreme cases, it was much longer. Because of this fact, at all observed cows, characteristic behavior during waiting the entry of feed-dispenser, were activities of standing and mooing. Entry of feed-dispenser represent motivation trigger for behavior changing, in reference to start sequence of feeding and ending sequence of waiting. In contrast to natural conditions, where grazing animals can behave in accordance to their internal instincts, in captivity, on the observed farms, only allowed behavior for cattle, when they feel hunger, is to stand ready and to move head and body, watching the entrance in stable. For the change of behavior crucial is visual trigger is seeing feed-dispenser and hearing trigger is the sound of same machine. On the both excitements, animals react with anxiety mooing and this activity had high statistical significant ($p<0.01$) interaction with activities of standing and watching, Table 1 and 2.

Dairy cows Holstein-Friesian breed can have more intensive emotion of feeling hungry, than other breed, as a greater proportion of their energy is expended through milk output *(O'Driscoll et al., 2008)*. In the first stage of lactation, in which all observed cows were, important part of body fat cow use to

satisfy energy deficit, and the lost of body weight of 1kg gives enough energy for about 6-7 kg of milk, and 3-4 kg of protein *(Grubić and Adamović, 2003)*.

Table 1. Interaction between feeding activities of dairy cows on the farm with free system of raising

Activity	Standing	Watching	Mooing	Consum. 15 min.	Selection 15 min.	Defense 15 min.	Consum. 30 min.	Selection 30 min.	Defense 30 min.
Standing	-								
Watching	NS	-							
Mooing	**	**	-						
Consum. 15 min.	NS	NS	**	-					
Selection 15 min.	NS	NS	**	NS	-				
Defense 15 min.	**	**	NS	**	*	-			
Consum. 30 min.	NS	NS	**	NS	NS	**	-		
Selection 30 min.	NS	NS	**	NS	NS	**	NS	-	
Defense 30 min.	**	**	NS	**	*	NS	**	**	-

NS - Not significant statistical interactions
* Statistical significant interactions ($p<0.05$)
** Statistical high significant interactions ($p<0.01$)

Feeding sequence

Feeding sequence is divided in 2 subsequences, feeding time 0`-15` and feeding time 15`-30`, in order to changed amount of given feed, which drastically decreased and dairy cows modified their behavior according to available quantity. Obtain subsequences interactions between activities of consumption are not have statistical significance, inside both farms, even dairy cows were eaten continually during recording time for feeding sequence.

In the free system of rearing, in the first 15`of feeding, high statistical significant ($p<0.01$) interaction had consumption activity with mooing activity from waiting sequence. In addition, activity of mooing had high statistic significant ($p<0.01$) interaction with activity of feed selection from feeding sequence. In free system of raising, the meal is on delay and extend of feeling hungry is longer,

when dairy cows get the diet, they start competitive fight. More aggressive cows will eat more and they will choose more tasty feed, while less aggressive cows, usually this is more milk productive, will receive less feed then is necessary *(Grubić and Adamović, 2003)*. Defense activity of stable fly (15` - 30`) during consumption sequence, had high statistical significant ($p<0.01$) interaction with activities of consumption and feed selection, but statistical significant ($p<0.05$) interaction with feed selection in the first feeding subsequence (0`-15`). In the presence of stable fly, dairy cows can accelerate meal consumption and reduce request time for eating *(Dougherty et al., 1994a)*. As a result of anxiety, rate of dry matter intake, at the cows increase with a bites of larger volume *(Dougherty et al., 1994b)*.

Table 2. Interaction between feeding activities of dairy cows on the farm with tied system of raising

Activity	Standing	Watching	Mooing	Consum. 15 min.	Selection 15 min.	Defense 15 min.	Consum. 30 min.	Selection 30 min.	Defense 30 min.
Standing	-								
Watching	NS	-							
Mooing	**	**	-						
Consum. 15 min.	NS	NS	**	-					
Selection 15 min.	*	NS	NS	*	-				
Defense 15 min.	**	**	NS	**	NS	-			
Consum. 30 min.	NS	NS	**	NS	*	**	-		
Selection 30 min.	**	**	NS	**	*	NS	**	-	
Defense 30 min	**	**	NS	**	NS	NS	**	NS	-

NS - Not significant statistical interactions
* Statistical significant interactions ($p<0.05$)
** Statistical high significant interactions ($p<0.01$)

In the tied system of raising, consumption activity in the first 15` of this sequence had high statistical significant ($p<0.01$) interaction with activity of mooing, same evaluation like in farm with tied system. Ration distribution delay, lead to anxiety at observed lactating cows and when diet is given, lead to rush

consumption. Interaction of stable fly defense with consumption (during all time of this sequence), had high statistical significant ($p<0.01$) interaction, but same activity with feed selection had statistical significant ($p<0.05$) interaction. Lactating cows during defense from stable fly, react with moving head, ears, legs, tail, body, and very often stop to eat.

Interaction between different rearing systems

Obtain analyses results of mutual interaction of feeding activity between farms are present in Table 3.

Table 3. Interaction of feeding activities of diary cows between different systems of raising

Activity	Interaction liberty/connected system
Standing	NS
Watching	NS
Mooning	NS
Consuming 0-15 min	NS
Selection 0-15min	NS
Defense 0-15min	NS
Konzumiranje 15-30 min	NS
Selection 15-30 min	**
Defense 15-30 min	NS

NS - Not significant statistical interactions
* Statistical significant interactions ($p<0.05$)
** Statistical high significant interactions ($p<0.01$)

By this results, between farms activity of feed selection in the feeding sequence (15`-30`) had statistical high significant ($p<0.01$) interaction. Other observed activities of feeding behavior did not have any statistic sinificance interaction between farms, where research was done.

Conclusion

In analysis of feeding behavior of dairy cows, reared on farm in tie system and on the farm with free system, many different activities were recorded. Inside the farm, we estimate existence of high statistically significant ($p<0.01$) interaction and statistically significant ($p<0.05$) interactions between analyzed sequences. Among the farms, it was not important statistic significant number of interactions, because activities were different in the way of expression and frequency. For that reason we can conclude, that feeding behavior is different in the different system of rearing, at the same breed and at the same lactation stage of diary cows. Acquired results pointed to strong influence of breeder, who could create specific activities

of feeding behavior with amount of feed and with proper manner of feed distribution.

Consequently, we can conclude that application of sequentional analyze is very practical for specific research, where is necessary to keep biological phenomenon in the function of time and after represent like numerical data for parallel analyze. On this way, we made compared interactions between activities, which are basic components of feeding behavior of dairy cows.

Analiza hranidbenog ponašanja krava u laktaciji

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Rezime

Hranidbeno ponašanje krava u laktaciji u zatvorenim, intenzivnim sistemima je drugačije od prirodnog, zbog uskraćenosti realizacije osnovnih nagona pri osećaju gladi. Takođe, u zavisnosti od načina gajenja, postoje razlike u ponašanju krava u laktaciji tokom ishrane. Cilj istraživanja hranidbenog ponašanja krava u laktaciji je bio da se metodom sekvencione analize utvrde razlike. U ogledu su korišćene krave u laktaciji, crno bele rase u tipu Holštajna, 15 gajenih u vezanom i 20 gajenih na farmi sa slobodnim sistemom gajenja. Sekvencionom analizom i statističkom obradom podataka, odredili smo brojne visoko statistički signifikantne interakcije aktivnosti u hranidbenom ponašanju krava u laktaciji u okviru svake farme, dok između farmi nije dobijen statistički signifikantan broj interakcija.

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