THE INFLUENCE OF FEED SUPPLEMENTS AND BIRTH SEASON ON THE GROWTH OF CALVES

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The aim of this study was to prove the hypotheses that the growth and health in calves are dependent on season of the birth. Total 186 calves were included in the experiment. All calves were weighed within two hours after birth. The growth and health were investigated from the birth to the fourth week of age. The effect of birth season was recorded in average daily gains (P<0.01). We concluded from the analysis, that the season of the birth had a positive influence on the growth increasing only.

Keywords: avarge daily gains, calves, season

INTRODUCTION

The incidence of metabolic disorders in dairy calves in the Czech Republic represents a highly actual problem and that one of the significant factors that influence this condition is the insufficient care for and the related insufficient colostral nutrition of the calves (Podhorský et al. 2007; Šlosárková et al. 2014). As it was proved by many studies (Svenson and Huldgren 2008; Svensson et al. 2003; Kamal et al. 2014; Nogalski 2003), the growth of live body weight and occurrence of calf diarrhoeas are influenced in dairy calves also by season of the year of the birth.

The importance of probiotics and prebiotics is based on their ability to stabilize the inner microbiota and to influence the calves´ health and welfare. The effect of *Lactobacillus sporogenes* was verified by Frizzo et al. (2011), the effect of *Lactobacillus* on the started feed intake and on the weight gain by Higginbotham and Bath (1993) and the effect of *Lactobacillus acidophilus* on the occurrence of calf diarrhoeas by Tarboush et al. (1996).

The regular application of probiotics may help to create the stable and balanced intestinal microflora that will improve the calf health (Soto et al. 2011). Probiotics are viable microorganisms exerting a favourable effect on the host's health by improving its intestinal microbial balance (Kaur et al. 2002). For pathogenic microorganisms probiotics are competitors in the utilization of intestinal space and nutrients, they reduce intestinal pH by the production of organic acids, release bacteriocins and hydrogen peroxide and stimulate the host's immunity system. Probiotics may reduce the risk of infections and intestinal disorders (Ewaschuk et al. 2004). To maintaince the changeless and high level of probiotics in the digestive tract of calves, the administration of these products should be as long as possible (Ohashi et al. 2009). After the application of a probiotic to grazing dairy cows in the summer season the temperature of their body surface decreases, which contributes to an alleviation of the heat stress of animals (Pompeu et al. 2011).

Prebiotics are selectively fermented components facilitating specific changes in the large intestine, both in the composition and growth and in the activity of bacteria in the digestive tract. The large intestine is one of the metabolically most active organs in the body; that is why the intake of prebiotic products has a significant influence on its function (Wang, 2009). The use of prebiotics showed a positive influence on the production of short-chain fatty acids in the intestinal microflora (Scheid et al. 2013).

MATERIALS AND METHODS

A total of 186 Holstein calves (62 in *Lactobacillus sporogenes* group, 62 in *Ascophyllum nodosum* group and 62 in control group) from one dairy cows herd were included in the experiment. After birth the calves were randomly divided into three treatment groups: group 1 *Ascophyllum nodosum*, group 2 *Lactobacillus sporogenes* and control group 3. They were separated and weaned from mothers on the first day after birth. Calves were reared in individual littered hutches from the second day of life to weaning. They received colostrum and mothers milk ad libitum three times a day from a bucket with nipple from the second to fourth day. From the fifth day they received 4.5 kg of milk replacer per day divided into 3 portions, starter mixture and alfalfa hay ad libitum until weaning. Colostrum and subsequently milk replacer were administered to calves in plastic buckets with nipples that were fitted in the hutches at a height of 40 cm above the ground. The calves had a free access to drinking water for the entire experimental period. The experiment was conducted from February 2011 to January 2013.

The *Ascophyllum nodosum* experimental group received orally 5 ml of hydrolyzate from brown seaweeds in addition to colostrum and milk replacer. The *Lactobacillus sporogenes* experimental group received orally 1 tablet of probiotics added to colostrum at first and then to milk replacer and thoroughly mixed. Experimental groups were administered these feed supplements one time a day (at the second feeding). Both supplements were applied to experimental groups within the first fortnight after birth. The control group received an unsupplemented diet, consisted 1.5 kg of milk replacer per feeding (totally 4.5 kg), starter mixture and alfalfa hay ad libitum. All calves were observed until the 28th day of life.

All calves were weighed within two hours after birth. They were weighed regularly every week.

The data were analyzed using a General Linear Model ANOVA (four ways with the interactions) of the statistical package STATISTICS 10 (Analytical Software, Tallahasee, FL, USA).

RESULTS

The calves from the 2nd treatment group (probiotics) reached the highest live body weight at the 28th day. Differences were significant in comparison to 1st group and control group (53.77 ± 6.18 kg vs 51.27 ± 4.71 kg, $P < 0.05$; 53.77 ± 6.18 kg vs 50.15 ± 5.61 kg, $P < 0.01$). Similarly, the of average daily weight gains over the experimental period were also the highest in the probiotics (2nd) group (0.39 ± 0.09 kg vs 0.33 ± 0.10 kg, $P < 0.05$; 0.39 ± 0.09 kg vs 0.30 ± 0.10 kg, $P < 0.01$) (Table 1).

Table 1: The influence of applied supplements on the growth of calves

Variables	N	Treatment groups			*P*	Significance
		Ascophyllum nodosum	*Lactobacillus sporogenes*	Control		
		$\bar{x}$± SD	$\bar{x}$± SD	$\bar{x}$± SD		
BW at birth (kg)	18 6	41.49±5.11	42.11±5.28	40.99± 4.70	0.4642	
BW in 28th day (kg)	18 6	51.27±4.71	53.77±6.18	50.15±5.61	0.0012**	2:3**, 1:2*
ADG from birth to 28th day (kg)	18 6	0.33±0.10	0.39±0.09	0.30± 0.10	0.0000	2:3**, 1:2*

*P < *0.05;* **P<*0.01; SD = standard deviation; ADG = average daily gains; BW = body weight;* P = *significance; N = number (1 – Ascophyllum nodosum, N=62, 2 - Lactobacillus sporogenes, N=62; and 3 – control, N=62); M = missing value*

At the present study significant effects of gender and season of the birth on growth intensity of calves (Table 2) were found. The calves born during the summer period had the lowest average daily gains over the observed period from the first week to the terminating oh experiment (0.30 ± 0.08 kg against 0.36 ± 0.13 kg, 0.36 ± 0.11 kg, and 0.36 ± 0.11 kg; P < 0.05).

Table 2: The influence of birth season on the growth of calves

Variables	Birth season				*P*	Significance
	1	2	3	4		
	$\bar{x}$± SD	$\bar{x}$± SD	$\bar{x}$± SD	$\bar{x}$± SD		
BW at birth (kg)	41.91±5.22	41.50±4.99	40.99± 5.01	42.00±5.07	0.7706	
BW in 28th day (kg)	52.86±6.58	50.39±5.16	51.83±4.90	52.74±6.52	0.1147	
ADG from birth to 28th day (kg)	0.36±0.13	0.30±0.08	0.36±0.11	0.36±0.11	0.0012**	2:3**, 1:2*, 2:4*

*P<*0.05;* **P<*0.01; SD = standard deviation; ADG = average daily gains; BW = body weight; 1 = spring, 2 = summer, 3 = fall, 4 = winter;* P = *significance; N (1 - spring, N=35; 2 - summer, N=61; 3 – fall, N=53; and 4 – winter, N=37), M = missing value*

DISCUSION

At the present work we studied the impacts of two feed supplements. However, the significant effect was showed only 2nd treatment group, which received probiotics. These calves had the most intensive growth of livebody weight. A positive influence of the use of Lactobacillus sporogenes on weight gains of calves was also reported by Soto et al. (2014), Frizzo et al. (2010), Fuller (1989), Tarboush et al. (1996), Schneider et al. (2004), and Timmerman et al. (2005). A low or no influence on an increase in weight gains of animals in the group with Ascophyllum nodosum may be a result of the availability of a sufficient amount of prebiotics in ordinary feed like oats, barley and wheat while the prebiotic availability is not a limiting factor (Gaggía et al. 2010).

At the present study were found significant effects of season of the birth on growth intensity of calves.

The calves born during the summer period had the lowest average daily gains over the observed period from the first week to the terminating of experiment. The main advantage of the hutch rearing of calves is the minimized risk of disease transfer from calf to calf. However, the temperature stress is generally disregarded (Coleman et al. 1996; Spain and Spiers 1996). Our research has confirmed the findings of many authors that high air temperature can cause stress also in calves (Mader and Davis 2004; Broucek et al. 2009).

CONCLUSION

The using of *Ascophyllum nodosum* has no meaning for improving of growth and health of calves. The results did not show a positive effect of both observed supplements (*Ascophyllum nodosum* or *Lactobacillus sporogenes*) on health and especially scour incidences.

We concluded from the analysis, that the effect of the probiotics (*Lactobacillus sporogenes*) was manifested only in the increased growth of calves. Action and effect of this feed supplement may be affected by season of the birth and gender of calves.

We should bear in mind that these substances will function correctly only if they are used considerately and if relevant tending of calves is practiced from their birth.

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