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EFFECTS OF PREBIOTIC INCLUSION IN THE DIET OF WEANED CALVES

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By using prebiotic supplements in domestic animals many positive effects were observed considering the regulation of the microbiological balance in the digestive system, as well as the facilitated growth and the food conversion, even the positive effect on immunological system. The digestion system in the calf makes proper basis for the development of the micro-organisms, where the excessive increase of potentially pathogenic micro-organisms very often may occur. Therefore, the possibility of adding prebiotics mannan-oligosaccharides into the milk for calf nutrition is considered to be significant for investigation. The primary aim is to prevent gastro intestinal disorders, as well as to stimulate the growth, and at the same time acceptable from the point of health protection of people and with no negative, damaging effects on the environment, hence, it would be an alternative to the usual regime of solving such problems with antibiotics. The experiment was carried out at the dairy farm Zlatibor (Serbia) with Simmental calves. Two groups of calves were formed control and experimental. The ration of experimental calves was supplemented with 4 g of prebiotics mannan-oligosaccharides per day, named Bio-Mos. The results of the experiments demonstrated that prebiotic preparations in the ration for 1–3 month age calves facilitate growth, improve digestibility of the ration nutrients and positively effect immunological status of the animals.

Key words: prebiotic; mannan-oligosacharides; calves; milk

ЕФЕКТ НА ВКЛУЧУВАЊЕТО НА ПРЕБИОТИЦИ ВО ИСХРАНАТА НА ОДБИЕНИ ТЕЛИЊА

Користењето на пребиотски додатоци во исхраната на домашните животни покажува многу позитивни ефекти во поглед на регулацијата на микробиолошкиот баланс во дигестивниот систем, побрз развој и конверзија на храна, како и позитивен ефект врз имунолошкиот систем. Дигестивниот систем на телето, во кој многу често се појавува прекумерно зголемување на потенцијалните патогени микроорганизми, создава сопствена база за развој на микроорганизмите. Според тоа, се смета дека можноста за додавање на пребиотиците манан-олигосахариди во млекото за исхрана на телиња е од значење за истражување. Главна цел е да се онемозможат гастроинтестинални нарушувања, како и да се стимулира растењето, а во исто време тоа да биде прифатливо од гледна точка на заштитата на здравјето на луѓето и без негативни, штетни ефекти на животната средина. Значи, тоа треба да е алтернатива на вообичаениот режим за решавање на проблемите со антибиотици. Експериментот беше поставен на краварската фарма Златибор (Србија) со сименталски телиња. Беа формирани две групи телиња: контролна и експериментална. Дажбата на експерименталните телиња беше со додаток на 4 g пребиотици манан-олигосахариди на ден, т.н. био-мос. Резултатите од експериментот покажаа дека додавањето на пребиотици во дажбата на телиња стари од 1 до 3 месеци го олеснува растењето, ја подобрува сварливоста на нутриентите во дажбата и позитивно влијае на имунолошкиот статус на животните.

Клучни зборови: пребиотици; манан-олигосахариди; телиња; млеко

INTRODUCTION

One of the stages of cattle production, where there are large problems, especially in the organized farms with intensive cultivation, is the-growth of calves after birth. In fact, calves in the earlier stages of the increase have not developed the alimentary system characteristic for the cud, but the way of digestion of food, milk, very little different in comparison to the nonruminants, which means that rent pathogenic microorganisms in the organism, usually through the gastrointesti-

nal tract and if the protective mechanism of the body does not work, come to the multiplication of cells and tissues and pathological disorders.

An organism defends itself from penetration of pathogenic agents, originating from the digestive tract, by a very complex mechanism, which depends on many factors, primarily the secretion of immunoglobulin, the establishment of appropriate microflora, the establishment of certain physiological conditions, production of mucins and intestinal movements that altogether represent a complex of the factors that define the normal functioning of the gastro-intestinal system. The nutrition influences all these factors, including the microflora, which by its activities directly affect the secretion of antibodies (Majamaa et al., 1995), intestinal environment (Tazume et al., 1990; Campbell et al., 1997), intestinal mucus secretion, mucins (Meslin et al., 1993; Pesto et al., 2000), and peristaltic movements of intestines (Rolf, 1984).

In terms of industrial production, where the population, not an individual, is considered as the basic biological unit, the preconditions for the development of gastro-intestinal disorders are much higher in relation to the extensive rearing conditions. That does not mean that there are no problems in extensive husbandry, but in those circumstances, where calves rearing has a priority, it is easier to recognise and cure a problem. Contribution to find alternative ways of promotion normal functions of the gastro-intestinal system was the aim of this research, where a prebiotic addition to the diet was used. Thus the goal of this research was to determine the influence of a prebiotic on the body weight and weight gain of Simmental calves.

MATERIAL AND METHODS

The feeding experiment with calves was organized at a farm of the cattle company "PK Zlatibor Čajetina". The experiment was organized as a group control system, with calves of domestic spotted cattle of the type of Simmental. Calves were healthy, progressive, and vital without any shortcomings and defects. Calves were housed in facilities for the calves, where they were located after the separation from their mothers. The first 5 days after receipt of colostrum they started receiving the mother's milk, and later consumed the cumulative milk. Calves were marked with tattoo stamps and numbered ear tags. Microclimatic conditions in the facilities during the experiments, keeping, and care, feeding and watering were identical for all calves. Two groups of calves were formed, a control group that was fed without added manan-oligosaccharide (K), and the treatment (T) group, which received the mentioned prebiotic in milk. Each group of calves was comprised of 16 calves so that in total the experiment was conducted with 32 calves.

Calves basal ration was composed of concentrated part, where izoproteinic and izoenergetic properties were achieved. The difference was established in the milking part of the meals, where in the same quantity of milk 4 grams of prebiotics was added, and, with respect to this the results based on the influence of the added amount of prebiotics on the body mass and growth were under investigation.

RESULTS AND DISCUSSION

According to these results, it can be concluded that the addition of prebiotics after 75 days in this experiment does not induce a rapid change in the body mass of calves, in the sample compared to the control group of calves. The body weights of calves ranged in very similar intervals during the experiment and no statistically significant differences were observed. The body mass of the sample group, at the end of experiments achieved the body weight of 88.46 kg, higher in relative indices of 1.35% compared to the average body weight of the control group (87.28 kg), and showed no statistical significance (Table 1, Graphic 1).

The group of calves fed with addition of prebiotics showed improvement in growth; the sample group showed daily gain of 654.20 grams, which was 4.21% higher comparing it to the control group, whose average daily gain was 627.80 grams during 75 days. The most obvious differences are observed during the period from 31 to 45 days. However, during the experimental period the differences were not statistically significant.

By observing the weight gains for both groups during the experiment it can be concluded that mannan-oligosacharides influence in a positive way and increase the daily weight gain in the treatment group of calves that has achieved a positive difference of 4.21% compared to the control group.

Results achieved in the experiment are given in tables and graphics.

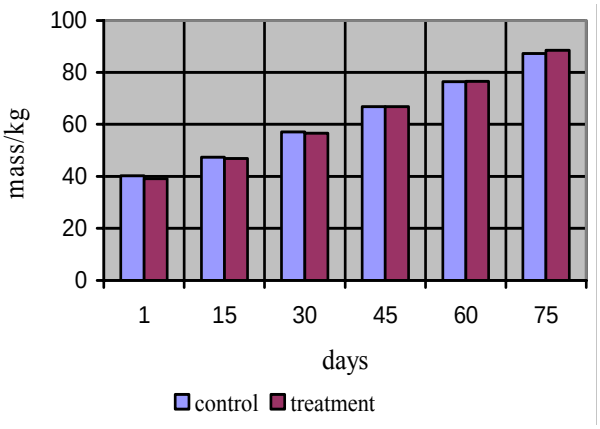

Fig. 1. Body weight

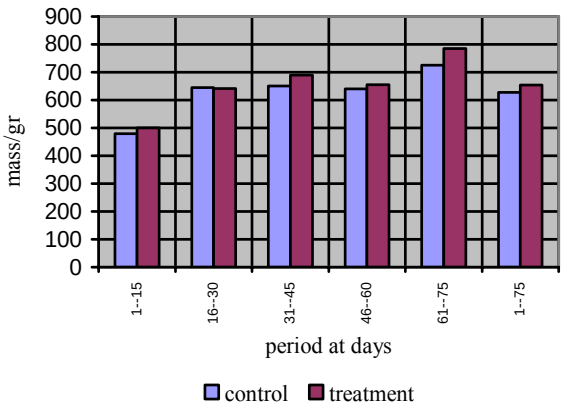

Fig. 2. Weight grain calvews

T a b l e 1

Body weight calves observed during the experiments, kg

Group	*N*	$\bar{x}$	*Sd*	*Se*	*C.V.*	Index %
Body weight at birth						
K	16	40.20	4.100	1.025	10.199	100
T	16	39.20	4.000	1.000	10.204	97.51
				P = 0.4904		t = 0.6983 df = 30
Body weight at day 15						
K	16	47.40	5.100	1.275	10.759	100
T	16	46.90	4.880	1.220	10.405	98.95
				P = 0.7789		t = 0.2833 df = 30
Body weight at day 30						
K	16	57.06	4.800	1.200	8.412	100
T	16	56.53	5.120	1.280	9.057	99.07
				P = 0.7647		t = 0.3021 df = 30
Body weight at day 45						
K	16	66.81	7.100	1.775	10.627	100
T	16	66.88	6.950	1.738	10.392	100.10
				P = 0.9777		t = 0.02818 df = 30
Body weight at day 60						
K	16	76.41	9.100	2.275	11.909	100
T	16	76.60	8.890	2.223	11.606	100.25
				P = 0.9528		t = 0.05974 df = 30
Body weight at day 75						
K	16	87.28	9.400	2.350	10.770	100
T	16	88.46	9.500	2.375	10.739	101.35
				P = 0.7264		t = 0.3532 df = 30

T a b l e 2

Weight gain by calves during the period of experiment, g

Group	*N*	$\bar{x}$	*Sd*	*Se*	*C.V.*	Index %
Weight gain for period 1–15 day						
K	16	480.00	88.000	22.000	18.333	100
T	16	500.00	101.000	25.250	20.200	104.17
				P = 0.5549		t = 0.5972 df = 30
Weight gain for period 16–30 day						
K	16	644.00	112.000	28.000	17.391	100
T	16	642.00	105.000	26.250	16.355	99.69
				P = 0.9588		t = 0.05211 df = 30
Weight gain for period 31–45 day						
K	16	650.00	115.000	28.750	17.692	100
T	16	690.00	102.500	25.630	14.855	106.15
				P = 0.3073		t = 1.039 df = 30
Weight gain for period 46–60 day						
K	16	640.00	114.200	28.550	17.844	100
T	16	655.00	105.500	26.380	16.107	102.34
				P = 0.7023		t = 0.3859 df = 30
Weight gain for period 61–75 day						
K	16	725.00	170.000	42.500	23.448	100
T	16	784.00	125.000	31.250	15.944	108.14
				P = 0.2723		t = 1.118 df = 30
Weight gain for period 1–75 day						
K	16	627.80	148.000	37.000	23.574	100
T	16	654.20	124.000	31.000	18.954	104.21
				P = 0.5885		t = 0.5469 df = 30

Very similar effects of prebiotics on the growth of body mass have been given by other authors, who were engaged in research on this topic, confirming the thesis that the application of prebiotics, non-digestible food ingredients that act favorably on the host, selectively stimulating the growth and activity of one or a limited number of types of bacteria in the alimentary tract, thus improving host health (Gibson and Roberfroid, 1995).

It can be concluded that a drastic increase in growth can not be expected, but in order to prevent digestive disorders can perform the replacement of antibiotics. The use of prebiotics, on the basis of inulin in milk replacer in the series of experiments, during the first weeks of life, calves showed similar results regarding the production abilities compared with antibiotics (Mul & Perry, 1994). Using the same prebiotic statistically significant progress was obtained in terms of production results of calves, as well as health status in relation to antibiotics. Webb et al. (1992) by adding inulin (3.75 g/kg) received greater weight gain in Holstein breed male calves, 3–5 days old, while Donovan (2002) showed similar results, with the same prebiotic comparative with antibiotics, with calves of both sexes and concluded that the use of prebiotics to calves improved the response in comparison to antibiotics.

Very similar results, to the results of our experiments, Chuqinlin (1999) gave in his work where he explored the effect of BIO-MOS on the performance and health of calves. Calves were fed by the starter from the second week of life and daily feed consumption was investigated. The body weight was measured at birth, then 15th, 30th, 45th and 60th day of the experiment. The height was measured too, and health was controlled by the appearance of diarrhea and pneumonia. Differences in the average growth were not statistically significant, but found the improvement of greater than 7%, in calves that received BIO-MOS. In the period from 16–30 days incidence of diarrhea and pneumonia was reduced. It was easier to cure disease in calves that received mannan-oligosacharides.

Lazarević (2003) in his extensive work, by the use of BIO-MOS recorded a certain increase in the growth of body mass. The body weight was monitored for each head in particular, with the general progress of calves was good in all parts of the study, with the conclusion that the Bio-Mos significantly improved production results by increasing physical growth of 14.4%, which was significantly higher compared to our experiment, but also accomplished with a higher number of animals, which can be considered as an advantage in relation to our research.

CONCLUSION

On the basis of these investigations and the obtained values the following conclusions can be drawn:

– The body mass of the sample group at the end of experiment was 88.46 kg, while the average body mass of the control group was 87.28 kg, in fact the experimental group of calves achieved 1.35% higher body mass. These differences do not show statistical significance. The group of calves fed with addition of prebiotics showed significant improvement in terms of growth, so that the control group achieved daily weight gain for 75 days of 627.80 grams, as opposed to the sample group where the recorded daily gain was of 654.20 grams, which was for 4.21% higher. During the experimental period the differences were not statistically significant.

Looking at the complete results of experiments, it is possible to bring a positive conclusion on the overall activities of prebiotics manan-oligosacharides regarding the stimulation of positive health status and consistent production performance of calves. It is of particular importance to have in mind the need for defining a new strategy of preventive action in animal production and nutrition without antibiotic growth stimulators.

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