

## Possibilities of using unconventional methods and dietary supplements to affect weight gains of calves

### Možnosti využití nekonvenčních postupů a potravních doplňků na ovlivnění hmotnostních přírůstků telat

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#### Abstract

Healthy and strong individuals are fundamental in every cattle breeding. The aim of this study was to find out which of these given supplement had the best influence on calf weight gain in the early period after weaning to milk nutrition. This research was carried out in cooperation with the farm in Haklovy Dvory. Calves were studied from March 2012 to February 2013. They were weaned into outdoor individual box after birth. There were added supplements into their ration in the first two weeks of life. Calves were partitioned according to the added supplement into three experimental groups and one control group. The first weight control of calves was after birth and the second weight control was at the age of thirty days. The average weight gain was calculated from the differences in these values. The best demonstrable effect was in the experimental Homeopathy and Prebiotics (Biopolym) groups with the average increment of 26.9 kilograms, then in the experimental Probiotics (Lactovita) group with the average increment of 26.1 kilograms. The last group was the Control one, there was not any change in the calves' ration and their average increment was 23.5 kilograms. The results of the statistical evaluation was  $p = 0.0572$  in the Biopolym group,  $p = 0.2570$  in the Lactovita group and  $p = 0.2124$  in the Homeopathy group versus the Control group. It can be concluded from the results of this study that calves had a positive reaction on the supplements added in the first days of life and these had a favourable effect on diarrhoea prevention. Prebiotics, homeopathic drugs and probiotics beneficially stimulate calves' digestive system and, in general, they have a positive effect on the calves' physiological condition.

**Keywords:** calf, diarrhoea, dietary supplements, rumen

## Abstrakt

Základem každého chovu skotu jsou zdraví a silní jedinci. Proto bylo cílem této práce zjistit, který z podávaných doplňků stravy má nejlepší vliv na přírůstek živé hmotnosti u telat v raném období po odstavení od matky na mléčnou výživu. Výzkum probíhal za spolupráce statku v Haklových Dvorech. Telata byla pozorována od období března 2012 do února 2013. Po narození se odstavena do venkovních individuálních boxů, kde jim byly do krmné dávky přidávány doplňky stravy prvních 14 dní života. Na základě přidaného doplňku byla rozdělena do 3 skupin pokusných a 1 kontrolní. První vážení telat proběhlo po porodu a druhé ve 30 dnech života. Z rozdílu vah byl vypočten průměrný přírůstek živé hmotnosti. Nejlepší průkazný vliv měla pokusná skupina Homeopatika a Prebiotika (Biopolym) s průměrným přírůstkem 26,9 kg, dále pokusná skupina Probiotika (Lactovita) s hodnotou 26,1 kg a na závěr kontrolní skupina, které nebyla změněna krmná dávka s hodnotou 23,5 kg. Statistické vyhodnocení vyšlo oproti kontrole u skupiny Biopolym  $p=0,0572$ , u skupiny Lactovita  $p=0,2570$  a u skupiny homeopatika  $p=0,2124$ . Z výsledků pozorování lze usoudit, že telata kladně reagují na doplňky stravy v prvních dnech života a mají příznivý vliv na prevenci proti průjmům. Prebiotika, Homeopatika i Probiotika příznivě stimulují zažívací ústrojí telat a mají celkový kladný vliv na jejich fyziologický stav.

**Keywords:** bachor, diarhea, potravní doplňky, tele

## Introduction

Healthy calves are fundamental for successful breeding. Successful breeding leads to high milk and meat production. The precondition for a healthy herd is timely prevention and quick identification of illnesses. After birth, calves are more prone to various diseases, including diarrhoea that is the most serious and common cause of calves' weakening, as their immune system is not fully developed. Calves grow slower, lose weight, their immune system weakens and there is overall damage to the body due to illnesses. Quickly growing body weight of young calves increases metabolic requirements to nutrients and so it itself is its own competitor as for their use. In addition, if calves are prematurely weaned and do not get mother milk any more, a system lack and inability to meet all requirements will occur. Immature immune system of calves results in increased predisposition to infections within the metabolism under stress such as weaning. (JIANG et al., 2009). At first when the calves are weaned, the caused stress may increase concentration of cortisone in blood that may be harmful to the cell immunity and suppress the natural ability of an immune response, which causes predisposition to illnesses (HULBERT et al., 2011). For instance, except for growth stimulation, thymus hormones may also affect the function of the immune system and they may endanger the health of calves in some stress situations (BIOLATTI et al., 2005). Colostrum is the first natural food of newborn calves. Chemical composition of the colostrum is very complex because it is rich in nutrients and bioactive components. The most important bioactive components of the colostrum are immunoglobulin and growth factors. If the wall of small intestine absorbs it of a sufficient amount, immunoglobulin protects calves against infection from the surrounding environment (PIRMAN and LAVRENČIČ, 2012). Colostrum is the most important in nutrition and plays a key role in health and post-natal

development of new-born calves (BLUM, 2006). Colostrum is not only a source of antibodies and nutrients but it also contains a great number of biologically active substances such as insulin, insulin-like growth factors (IGF s), growth hormone, prolactin, thyroid hormones, cortisol and some other substances (SANEI et al., 2012). In order to reach sufficient passive immunity of calves with the help of colostrum immunoglobulin, it is necessary the concentration of immunoglobulin (IgG) in the colostrum is 150 to 200 g/l (CHIGERWE et al., 2008). Colostrum provides calves with immunoglobulin (IGS), nonspecific immune factors and nutrients, but it can also expose calves to pathogens (STABEL et al., 2004). Bacteria of contaminated colostrum may decrease efficiency of absorption of IgG (JOHNOSON et al., 2007). Nowadays UV radiation is available as one of the modern methods leading to reduction of the number of pathogens in the colostrum. However, TEIXERIA et al. (2013) have proved in their study that UV radiation does not affect the reduction of the number of pathogens in the colostrum. For the purposes of epidemiological studies, the World Health Organization defined diarrhoea as the passage of two or more loose or liquid stools per day or any other loose stool containing mucus, blood or pus. (TÁBORSKÁ, 2005). Calf diarrhoeal diseases at the early post-natal stage are the most significant health troubles of this cattle category and create significant direct and indirect economic losses. Incidence of this disease is significant and, depending on a number of factors, it affects 10 to 90 % of calves in individual breeds and the mortality rate usually ranges between 3 - 10 %, however, it can also exceed 30 % in troubled breeds. Economic losses occur not just because of the death of animals but also because of a decrease in gains, increased costs on treatment, cure, prevention and significant breeding selection of animals (ILLEK, 2007). When a calf is born, it has a sterile gastrointestinal tract, however, at the age of three days coliform bacteria prevail over lactobacillus and bifidobacterial flora in stool. During the colostrum period, calves are prone to diarrhoea that may result in high mortality rates (QUEZADA-MENDOZA et al., 2011). Both conventional and nonconventional treatment is significantly risky in terms of adverse effects as well as the “placebo effect” and suggestive aspects (NIGGEMANN, 2006). Homeopathic preparations are based on plants, animals or mineral substances. A substance of high dosages that shows particular symptoms at a healthy individual can cure a disease with similar symptoms of an ill individual. Following the principle of similarity treatment. In order to meet this principle, a patient has to follow the overall picture of his/ her symptoms. In homeopathy health is considered and maintained with the strength of vital force and an illness occurs if such strength of vital force has been disturbed. The strength is simulated and reacts and regenerates the patient’s balance by means of a homeopathic drug. The treatment does not heal the illness directly but it provides an individual with strength to fight inside. It is important that the environment in which a patient lives is balanced and thus supports the homeopathic treatment (HEKTOEN, 2001). Homeopathic drugs may be administrated in form of drops, pills, intravenously, in form of capsules or by means of pills soluble in a liquid (ISSAUTIER, 2009). A great number of homeopathic drugs are made of natural resources, are available in various easy-to-use forms, i.e. probably it is better followed than the conventional treatment (YU-HIN, 2011). Probiotics were defined as live microbial supplements beneficially affecting the microbial balance of the host. Their administration stimulates growth of other microorganisms, mucosal and system immunity, and it improves alimental and microbial balance of the intestinal tract (OELSCHLAEGER, 2010). Most of the probiotic bacteria belong to lactobacillus and bifidobacterium family. The other

probiotic microbes that are an essential part are yeasts (*Saccharomyces boulardii*) and some non-pathogenic strains of *Escherichia coli* and *Bacillus spp* that are usually in the gastrointestinal tract (VRESE and SCHVEZENMEIR, 2008). During the treatment with antibiotics, Lactovita maintain biological balance of intestinal microflora through lactose-fermenting bacteria producing favourable conditions for its growth. It compensates for the low supply of B vitamins during a digestion disorder, disorders of the overall health condition, during the period of quick growth, increased metabolic activity, if exhausted after physical exertion, during infectious illnesses especially those with fever and diarrhoea (HABROVÁ, 2012). It is generally known that microflora of the large intestine significantly affects health. Nowadays, there is a great interest in using prebiotic oligosaccharides as a functional component of nutrition with the aim to improve the individual's health. Prebiotic oligosaccharides stimulate growth and colonization of probiotic bacteria beneficial to health (RASTALL and MAITIN, 2002).

## Material and methodology

The aim of the study was to evaluate the effect of selected supportive preparations and their effect on gains in weight of calves under operation conditions at the early stages after weaning to milk nutrition. Hypothesis: Dietary supplements will affect the gains in weight of calves and their overall health condition at the stage of milk nutrition after weaning from mother's milk positively. 30 calves in the experimental groups and 10 in the Control group, i.e. in total 40 calves were included in the experiment. The experiment was done in cooperation with the university farm of the University of South Bohemia in České Budějovice – Haklovy Dvory. After the calves were born, they were divided into four groups: group one – Lactovita, group two – Homeopathy, group three – Biopolym and group four – Control. Before the calves were put into the outdoor individual boxes, they were weighted and their initial live weight was recorded into a table. Except for the colostrum, the Lactovita experimental group was orally administrated with one pill of probiotics. Except for the colostrum, the Biopolym experimental group was orally administrated with 5 ml of hydrolysate of brown seaweeds; group three was orally administrated with 5 ml of homeopathic drugs. Group four was the Control one and it was fed with an unchanged feeding ration. All experimental groups were always administrated with the substance once a day within the second feeding for a period of 14 days. The groups were monitored for a period of 30 days when their live weight was recorded. A table was created for the experiment into which the values – calf number, date of birth, date of weaning, live weight at birth and live weight at the age of 30 days – were recorded. T-test (unequal variances) was used for statistical processing because we know the mean value therefore we can consider an assumption that the sample meets the common division. One-sided hypothesis was always tested where  $H_0$ : of mean values of the Control group and preparation x are same versus  $H_1$ : of mean values of the preparation x is higher than of the Control group. We reject the  $H_0$  hypothesis if the T value estimated from our data is higher or equal to the tabulated value, our results are converted so they tell us our calculated value of the t-test and at which level of significance we could reject  $H_0$  by means of the p-value.

Composition of the feeding ration:

- 1) Dried milk Madesa – Grand acidified, 8 litres per day (3,2,3)
- 2) ČOT ad libidum – shredded wheat 20 %, shredded barley 15 %, whole maize 10 %, whole oat 19,5 %, rape coarse meal 15 %, 48 % soya coarse meal 15 %, tetavit 5 %, calcite 0.5 %.
- 3) Water

Used preparations:

- 1) Biopolym FZT – active ingredient Sodium alginate (E 401) - hydrolysate of brown seaweed *Ascophyllum nodosum*
- 2) Lactovita – a complex of B vitamins and lactose-fermenting bacteria

composition:

- active ingredients: 1 effervescent tablet of Lactovita contains: *Bacillus coagulans* (*Lactobacillus sporogenes*) 4 mil.; Vitamin B1 2 mg; Vitamin B2 2.5 mg; Vitamin PP 5.0 mg; Vitamin B6 1.5 mg

- processing aids: Sodium hydrogen carbonate, citric acid, calcium carbonate, sodium chloride, amylum, polyvinylpyrrolidone, polyethylene glycol, sweetening agent, aroma

- 3) Homeopathic drug – PVB – Verminous conditions – is a homeopathic veterinary speciality, treats all symptoms of parasitic diseases.

composition of PVB:

ASCARIS, OXYURUS, TOENIA SAGINATA – homeopathic solutions made of own parasitizing worms. Each of them affects its equivalent in a specific way.

CINA – mother tincture of *Artemisia cinam*, contains santonin. Abdominal and neurological symptomatology very similar to that we know in animals suffering with intestinal parasites can be found in its pathogenic picture. The drug is nearly systematically prescribed for syndromes caused by verminosis.

SABADILLA, SPIGELIA ANTHELMIA – beneficially affecting reflexive disorders accompanying verminosis, especially severe irritation of mucosas and spasms (cramps).

CUPRUM, OXYDATUM – little drug, in homeopathy recommended to treat spasmodic cough of verminous origin.

GRANATUM, SULFUR – effective drainage preparations helping to open all elimination ways as much as possible and supporting activity of secreting organs.

## Results and discussion

The experiment was conducted at the farm around 5 km far from České Budějovice at the altitude of 376 above the sea. 2 types of breeds – Holstein Friesians and Czech Red Cattle – are bred here. Calves are bred in outdoor individual boxes without roof located next to the farm. Calves were fed twice a day and they were fed

with the colostrum from plastic buckets with teats. Claves had access to clean water and starter food all the time.

**Table 1.** Ø weight gains in the Control group in 30 days [kg]

Calf	Sex	Weight at birth	Weight at the age of 30 days	Increment
1	♂	50	71	21
2	♂	37	60	23
3	♂	38	65	27
4	♂	37	56	19
5	♀	36	55	19
6	♀	38	60	22
7	♂	39	70	31
8	♀	36	62	26
9	♀	34	58	24
10	♀	39	62	23
Average				23,5

**Table 2.** Ø weight gains in the Biopolym group in 30 days [kg]

Calf	Sex	Weight at birth	Weight at the age of 30 days	Increment
1	♀	39	77	38
2	♀	40	65	25
3	♂	46	75	28
4	♀	33	64	28
5	♂	40	70	30
6	♀	35	57	22
7	♂	36	70	34
8	♂	35	53	18
9	♂	36	62	26
10	♀	36	56	20
Average				26,9

**Table 3.** Ø weight gains in the Lactovita group in 30 days [kg]

Calf	Sex	Weight at birth	Weight at the age of 30 days	Increment
1	♂	47	69	22
2	♂	44	70	26
3	♀	39	60	21
4	♀	36	69	33
5	♂	39	78	39
6	♂	41	65	24
7	♀	38	63	25
8	♂	37	52	15
9	♂	38	71	33
10	♀	35	58	23
Average				26,1

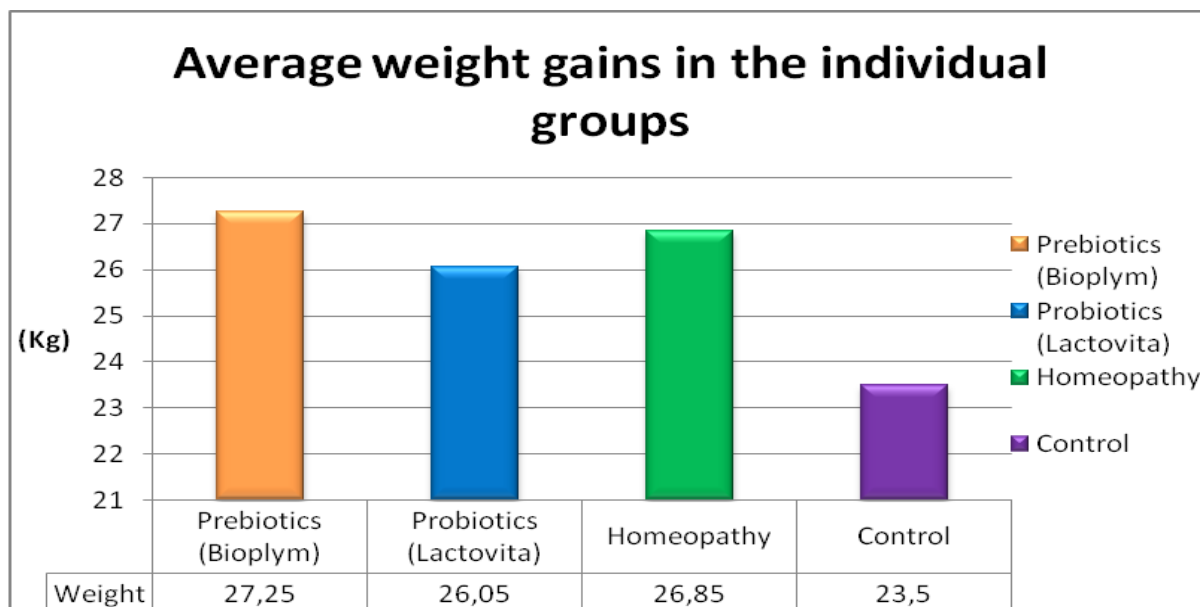
**Table 4.** Ø weight gains in the Homeopathy group in 30 days [kg]

Calf	Sex	Weight at birth	Weight at the age of 30 days	Increment
1	♂	45	67	22
2	♂	46	80	34
3	♂	42	83	41
4	♀	35	66	31
5	♂	38	69	31
6	♀	37	59	22
7	♂	34	67	33
8	♂	42	56	14
9	♂	37	58	21
10	♀	41	61	20
Average				26,9

These tables suggest that the gain in the Control group in 30 days is 23.5 kg, 26.9 kg in the Biopolym experimental group, 26.1 kg in the Lactovita experimental group and 29.9 kg in the Homeopathy experimental group. It can be concluded from the average values that Biopolym and homeopathic drugs have the best effects on the digestive tract and related gain in weight. The tables show that the best gain in weight was in the experimental group administrated with Biopolym. The results ascertained do not agree with the results by ZÁBRÁNSKÝ et al. (2012) having Lactovita the most effective preparation in weight gain. The differences in the results might have been caused by a number of important factors. Differences in housing of calves (outdoor individual boxes/ indoor housing in beds), larger spaces, higher infection pressure, number of monitored calves in groups, more frequent feeding. Also TIMMERMAN et al. (2005) and FRIZZO et al. (2010) have come to the conclusions following their results that probiotic substances support increase in body weight of calves fed with milk especially in the first week of calves' life. Further, the authors say that probiotics may contribute to improvement of effectiveness of food especially of food with high content of dry matter in form of grains having positive effect on rumen development. Improvement of growth at this stage significantly affects performance in the following breeding. Such improvement of performance thanks to probiotics could contribute to improvement of production and economic indicators of agricultural businesses. MORRELL et al. (2008) states in his study that increased use of some of laboratory strains of probiotics may improve the health condition of calves and that they can be used as prevention of diarrhoea which leads to high mortality rate and morbidity of new-borns. Some of the strains of *Enterococcus* are assessed as probiotics, which opens new possibilities especially in the area of production of bacteriocins as inhibitive substances in veterinary medicine (VEIR et al., 2007). GAGGIA (2010) says that experiments done with both healthy and stressed animals showed positive effects of probiotics and prebiotics mainly on ruminants, pigs and poultry. The number of useful bacteria was increased and the potential burden of pathogens was reduced. It is necessary to say that the effects of probiotics and prebiotics on the growth ability of farm animals were significant only in some of the studies in terms of statistics. Low or no effect on the growth ability of animals treated with prebiotics can be affected by that there is enough prebiotic substance contained in the common food such as oat, barley, wheat and prebiotic availability of nutrients is not its limiting factor. KROUPOVÁ et al. (2005) states in her

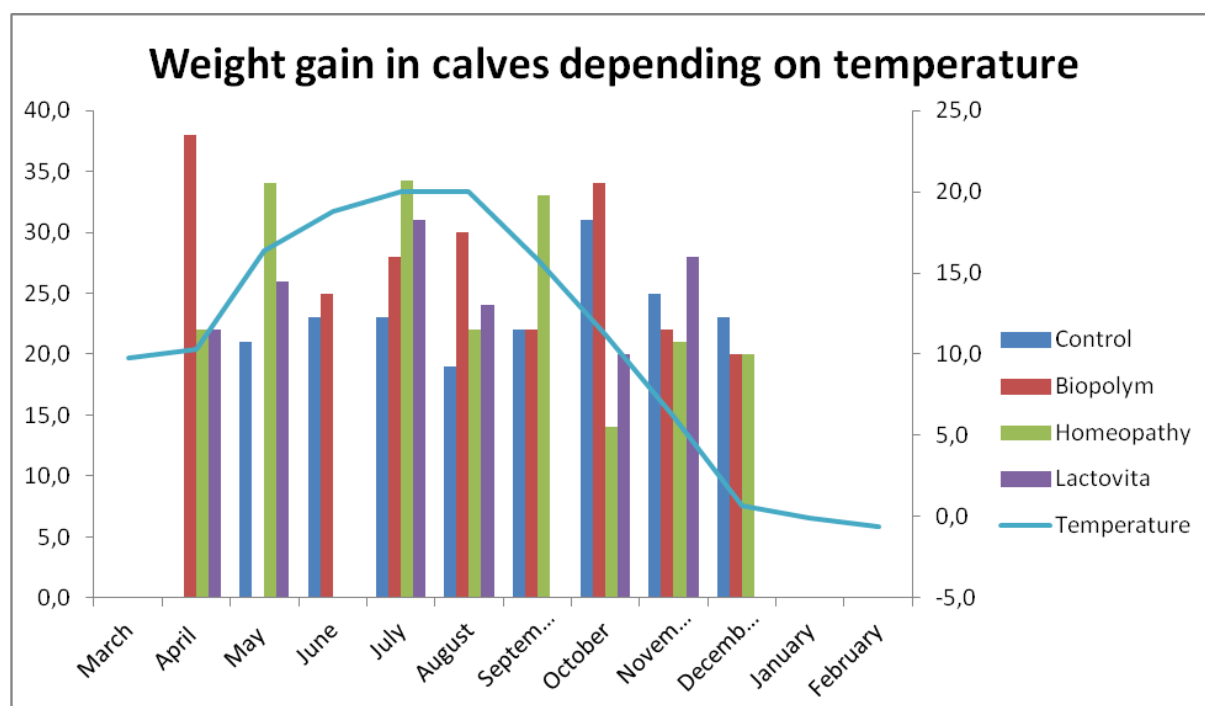
study that occurrence of diarrhoea in calves in the experimental group treated with homeopathic drugs was not significant in terms of statistics, however, it can have a sort of economic impact on the decreasing veterinary interventions, costs on maintenance of increase in weight and future increase in the value of an animal within the herd.

**Figure 1.** Weight gains in the treatment groups



In figure No. 1 gains in weight between the selected groups always compared with the Control group can be compared. The average gain in weight in the Control group was 23.5 kg. Compared with the Control group, the gain in weight in the Biopolym group was by 3.75 kg higher, in the Homeopathy group by 3.35 kg higher and in the Lactovita group by 2.55 kg higher. Following the statistical t-test processing, an evidential statistical difference between the Biopolym, Homeopathy and Lactovita groups was ascertained. When the Control group was compared with the Biopolym group, the result was  $T=1.6626$  and  $P\text{-value}=0,0572$ . In order to reach a statistical significance under  $P=0.05$ , it will be necessary to repeat the experiment with a higher number of individuals in the tested groups. When the Control group was compared with the Homeopathy group, the result was  $T=0.8231$  and  $P\text{-value}=0,2124$ . When the Control group was compared with the Lactovita group, the result was  $T=0.6690$  and  $P\text{-value}=0,2570$ . At the same time, it is possible to compare the gains in heifers and young bulls in the individual groups, which significantly differ in each group. The highest gain in young bulls was in the Homeopathy group – 28 kg, then in the Biopolym group – 27.2 kg, then the Lactovita group - 26.5 kg and the Control group - 24.2 kg. As for the heifers, the highest gain in weight was in the Biopolym (Prebiotics) group – 26.6 kg, then in the Homeopathy and Lactovita groups (Probiotics) – 24 kg and the lowest gain, once again, in the Control group – 22.8 kg. It can be concluded from the ascertained data suggest that there is a significant effect of dietary supplements on the body.



**Figure 2.** Weight gains observed in groups depending on the temperature

Further, the gain in weight was examined with respect to the differences in temperature. In figure No. 2 we can see that the highest gains in the Homeopathy experimental group were recorded in May – September when it was around 15°C, in the Biopolym (Prebiotics) group in April and October when it was around 10°C, in the Lactovita (Probiotics) group in July and November when the temperature was 20°C in July and around 5°C in November and in the Control group in October when it was around 10°C. Further, we can conclude that the highest gains were at the temperature of 10°C. There might be an explanation that this temperature is ideal for calves, thermophilic bacteria etc. do not reproduce. However, it cannot be concluded whether the temperature in question affected the higher gain, thus it can be just said that such temperatures are better for calves in general. The influence of temperature on the health condition and overall well being of calves is one of the very important factors as proved, for instance, by the study by SILANIKOVA (2000).

## Conclusion

When comparing the experimental groups – Homeopathy, Biopolym and Lactovita – with the Control group, it can be concluded that the dietary supplements positively affect calves' bodies. It can be said that there is a difference in gains in weight in the experimental groups compared with the Control one. The gain in weight in the Prebiotics (Biopolym) and Homeopathy groups was 26.9 kg, in Probiotics (Lactovita) group was 26.1 kg and in the Control group was 23.5 kg. However, the statistical results suggest that the gains in weight in the individual groups can be same, but the food supplement does not always have to necessarily demonstrably affect calves' bodies. Following comparison of the Control group with the experimental groups, the only food supplement Biopolym can demonstrably affect the gain in weight in contrast to the Homeopathy and Lactovita groups not having a demonstrable effect in terms of the statistics. Any demonstrable affect on the gain in weight of calves cannot be concluded from the monthly temperature values.

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