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KOSYANENKO O.M., PhD

Bila Tserkva National Agrarian University

lenakos@bk.ru

PRODUCTIVITY OF RABBITS AND BALANCE OF CALCIUM AND PHOSPHORUS IN THEIR BODY BY FEEDING DIFFERENT SOURCES OF SELENIUM

The analysis of literary sources testifies to insufficient content of Selenium in forage. Therefore some extra Selenium-containing compounds have to be added to the rabbits' diet so that the desired rate of Selenium could be reached. On data received from in-vivo research showed that from all used sources of Selenium (sodium selenite, sodium selenate, selenomethionine and Sel-Plex) is most effective for young rabbits was Sel-Plex. Inclusion of Sel-Plex into diet to reach Selenium level 0,2 mg/kg of dry matter improved to the increase of live weight of experimental rabbits by 4,7 % with a simultaneous decrease of 2,9 % rate of feed per 1 kg increase body weight. Using Sel-Plex instead of sodium selenite for young rabbits leads to a tendency to increase the absorption of Calcium and Phosphorus in the body of rabbits. The use of inorganic salts of Selenium, comparatively with organic, has a less positive influence on the productivity of rabbits.

Key words: *Selenium, Calcium, Phosphorus, rabbit, productivity, sodium selenite, sodium selenate, selenomethionine, Sel-Plex, live weight, feed.*

Introduction of the problem. In the history of development of animal mineral feed studies the year of 1817 was marked with a discovery of a new trace mineral – selenium, which during the following 140 years was considered to be extremely toxic for animals. Only due to Schwartz and Foltz, whose research was published in 1957, the attitude towards selenium changed completely. They suggested that selenium was an essential element of animal food. This sensational news opened a new era in the research on selenium and its influence on animals.

It has been proved by now that selenium possesses antioxidant characteristics which is conditioned by its participation in detoxification of lipoid peroxide oxidation products; its metabolism process and influence on metabolism of other matters have also been studied. It has been found that selenium is able to replace Sulfur in sulfuric amino acids and partially function as vitamin F. Lack of selenium causes over 77 diseases and their symptoms, most common of which are: muscular dystrophy, exudative diathesis of poultry, liver necrosis of pigs and poultry, mastitis and endometriosis of cows, microangiopathy of pigs, ovarian cysts, etc. However, surplus of selenium is also harmful for animals. As the range between lack and surplus of this element in the animal body is quite narrow, much of modern research is targeted at determining biotic doses of selenium for animals of different species, sex and age groups [1, 3].

After a number of investigations we have determined which selenium rate would be the most efficient in the diet of different sex and age groups of cattle and sheep, some species of fish and poultry as well as some groups of horses and pigs. However, not only the dosage but also the source of selenium is extremely important for better provision of this element in the animals' diet [2].

The amount of selenium in feed used for feeding rabbits in Ukraine is not sufficient. Therefore some extra selenium-containing compounds have to be added to the rabbits' diet so that the desired rate of selenium could be reached.

The sources of selenium could be conventionally divided into compounds of organic origin and those of inorganic origin. The most prevalent inorganic selenium salts are sodium selenite and sodium selenate, among organic ones – selenomethionine preparation, selenopyranium or SP–1 (9-phenilsimmoctahydroxanthene), DAFC–25 and Sel-Plex [2,4,5].

Material and methods of research. The aim of our investigation was to determine the most efficient Selenium rate and study the efficiency of different sources of Selenium in the diets of young rabbits.

For the above purpose two in-vivo experiments were carried out in the site of rabbit farm "Chubunetske" in Kyiv region. For each of the experiments animals were selected according to the pairwise analogue principle, considering their kind, sex, breed, age, live weight, productive performance and physiological condition.

The first experiment, aimed at determining the most efficient Selenium rates for the diet of young rabbits, involved 5 groups of animals, 15 heads per group. Sodium selenite was chosen as the source of Selenium. The results of the first in-vivo experiment show that the most efficient Selenium rate in the diet of young rabbits grown for meat was 0,2 mg/kg of feed dry substance. At this rate the live weight of young animals obviously exceeded the control one by 8,5 %.

Considering the results of the first *in-vivo* experiment another *in-vivo* experiment was carried out. It was aimed at analyzing Selenium's biological accessibility and efficiency of different sources of Selenium in the diets of rabbits (table 1).

Table 1 – ***In-vivo* experiment №2**

Groups of animals	Feeding terms and conditions	
	Comparative term (15 days)	Basic term (60days)
1 – control group	Basic diet (BD), balanced as per specified norms	BD + sodium selenite (with Selenium content rate of 0,2 mg/kg of dry substance)
2 – experimental group	BD	BD + sodium selenate (with Selenium content rate of 0,2 mg/kg of dry substance)
3 – experimental group	BD	BD + selenomethionine (with Selenium content rate of 0,2 mg/kg of dry substance)
4 – experimental group	BD	BD + Sel-Plex (with Selenium content rate of 0,2 mg/kg of dry substance)

The source of Selenium used in experimental groups 2, 3 and 4 was sodium selenate, selenomethionine and Sel-Plex respectively, in control group 1 – sodium selenite.

In the course of our research the following data were analyzed: virtual amount of feed consumed, live weight dynamics, digestibility of nutrients, nitrogen exchange process, balance of Calcium, Phosphorus and Selenium, and hematological indices.

Research results. Feeding young rabbits with various Selenium compounds substantially effected their growth rate (table 2).

As figures in Table 2 indicate, at the beginning of the basic term of the experiment, that is at the age of 60 days, the average live weight of experimental group rabbits had little difference with that of the control group.

Table 2 – **Changes of live weight of young rabbits, g**

Indices	Group			
	control	experimental		
	1	2	3	4
60 days	1112,9±21,19	1110,2±22,69	1093,1±26,17	1093,2±19,74
90 days	2121,0±27,56	2133,2±30,44	2177,9±14,80*	2186,9±25,43
120 days	2937,0±37,63	2963,8±39,93	3049,5±32,68*	3076,1±39,03*

Note: hereinafter *P<0,05; **P<0,01; ***P<0,001 as compared with the control group.

After 30 days of consuming mixed feed which included different Selenium-containing compounds (sodium selenate, sodium selenite, selenomethionine and Sel-Plex) by their live weight the rabbits of experimental groups 2, 3 and 4 exceeded the control level by 0,6; 2,7 (P<0,05) and 3,1 % respectively.

By the end of the basic term of the experiment (the age of the rabbits – 120 days) by their live weight rabbits of experimental group 2 exceeded their counterparts of the control group by 0,9 %, group 3 – by 3,8 % (P<0,05), group 4 – by 4,7 % (P<0,05).

Special consideration attention in our research was attached to calcium, as we consider it to play a very important role in the animal body.

In what extend different sources of Selenium influence the calcium exchange process can be understood from the data given in Table 3.

As the amount of feed consumed by the rabbits of all groups was approximately the same, the amounts of calcium consumed by them together with the feed differed by less than 1%.

Table 3 – **Balance of calcium in the body of test rabbits (n=3, M±m), mg**

Indicators	Group			
	control	experimental		
	1	2	3	4
Consumed with feed	990±2,10	992±19,5	995±1,9	998±20,9
Secreted with excrements	470±0,0155	467±17,9	465±13,3	462±11,0
Secreted with urine	34±0,0029	34±1,3	37±1,7	40±1,8
Assimilated	486±0,0088	491±5,1	493±12,5	496±9,0
Assimilated, % of the amount consumed	49,1±0,29	49,5±0,94	49,5±1,34	49,7±0,35

The amounts of Calcium secreted by the rabbits of different groups with their sacraments was a little different. By this index the control group excelled the experimental groups by 0,6; 1,1 and 1,7 %.

The amounts of Calcium secreted with their urine by the rabbits of experimental group 2 and the control group were the same. The rabbits of experimental groups 3 and 4 secreted it by 8,8 and 17,6 % less than the control group.

The rabbits of experimental groups 3 and 4 excelled the control group as to the amount of calcium assimilated. This superiority made up 1,4 and 2,1 %. The rabbits of experimental group 2 excelled the control group by 1,0 %.

Calcium assimilation rate can be seen from the ratio between the assimilated minerals and the consumed one. By this index the rabbits of experimental groups 3 and 4 excelled the control group by 0,40 and 0,56 %. The rabbits of experimental group 2 also excelled the control group, this difference in calcium assimilation rate made up 0,39 %.

To recapitulate, Calcium exchange process to a certain extend depends on a certain source of Selenium.

In the course of our research it was found that a certain source of Selenium does influence the calcium exchange process but what still remains unclear is its ability to influence the Phosphorous exchange process. For this purpose we studied the influence of a certain source of Selenium in the animal diet on the balance of Phosphorous (Table 4).

Table 4–**Balance of Phosphorous in the body of test rabbits (n=3, M±m), mg**

Indicators	Group			
	control	experimental		
	1	2	3	4
Consumed with feed	890±18,9	891±17,5	894±1,7	897±18,8
Secreted with excrements	512±43,9	514±51,8	515±43,9	516±34,4
Secreted with urine	26±2,0	23±3,9	19±2,1	17±3,1
Assimilated	352±34,1	354±37,6	360±42,5	364±22,8
Assimilated, % of the amount consumed	39,6±4,10	39,8±4,76	40,3±4,73	40,6±3,00

As depicted in Table 4, the amount of Phosphorous consumed by the rabbits of all groups was approximately the same – the difference made up less than 1,0 %.

The amounts of Phosphorous secreted with their sacraments by the rabbits of the experimental groups are also near the same with that of the control group. The superiority of the experimental groups over the control group made up less than 1,0 %.

The amounts of Phosphorous secreted with their urine by the rabbits of experimental groups 2, 3 and 4 were respectively by 11,7; 26,0 and 33,8 % less, compared with the control group.

There was very little difference in the amount of the Phosphorous assimilated by the animals. By this index the rabbits of experimental groups excelled their counterparts of the control group by 0,5–3,3 %.

The amount differentials of the Phosphorous consumed, secreted and assimilated caused a slight rise of the ratio between the assimilated minerals and the consumed one within the rabbits of experimental groups. This rise lies within the bounds of 0,2–1,0 %, and, like other changes in the process of Phosphorous exchange, has not been proved by statistical treatment. Hence, there are no grounds to state that replacement of sodium selenite with other test sources of Selenium, whether of organic or inorganic origin, considerably influences the Phosphorous exchange in the body of young rabbits, grown as a source of meat.

Conclusions. 1. The best doses of Selenium for rabbits is 0,2 mg/kg of dry matter and from all used sources of Selenium (sodium selenite, sodium selenate, selenomethionine and Sel-Plex) the most effective was Sel-Plex.

2. Replacement of sodium selenite in the diet of young rabbits on organic sources of Selenium leads to a tendency to increase the absorption of Calcium and Phosphorus in the body of rabbits.

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