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### **INFLUENCE OF DIFFERENT LEVELS AND SOURCES OF SELENIUM IN PIGLET MIXED FODDER ON PRODUCTIVITY AND HEAVY METALS CONTENT IN THE SLAUGHTER PRODUCTS**

Аналіз літературних джерел свідчить про доцільність використання селеновмісних препаратів у раціонах тварин з метою зменшення трансформації ртуті, кадмію і свинцю у продукцію. Це дає змогу підвищити продуктивність сільськогосподарських тварин та якість продуктів забою.

Уведення різних рівнів (0,2; 0,3; 0,4 мг/кг сухої речовини) і джерел селену (селеніт натрію, Сел-Плекс) в повнораціонний комбікорм показав, що найбільш ефективною для молодняку свиней була органічна сполука селену. Додаткове введення її в комбікорм для досягнення загального вмісту селену на рівні 0,3–0,4 мг/кг сухої речовини сприяло зниженню концентрації кадмію на 29,7–35,1 %, і ртуті – на 18,8–19,2 % у м'ясі. Виявлено тенденцію до зниження вмісту свинцю у продуктах забою тварин дослідних груп. Використання селеніту натрію, порівняно з органічною сполукою, має менш позитивний вплив на продуктивність і якість м'яса свиней.

**Ключові слова:** селен, свині, продуктивність, кадмій, свинець, ртуть.

**Statement of the problem.** Provision of farm animals high productivity and quality of their products depends not only on the valuable and balanced in energy and protein feeding but in mineral matter, including microelements. Among the microelements Selenium has been of great significance lately, as it is closely related to the exchange of albumens, fats, carbohydrates, mineral elements, vitamins and the enormous complex of the enzyme systems [1–2]. Nowadays study of Selenium various properties, its interconnection with other elements in particular, is being conducted. Thus, the ability of Selenium to substitute Sulphur in Sulphur containing amino acids and to partly execute functions of vitamin E has been proved. There is a report, that alongside with vitamins A, E, C and B-carotene it is able to block heavy metals like Mercury, Lead and Cadmium from getting into organism from the contaminated environment [2–3]. Of special significance nowadays is the research of interaction of Selenium with other microelements, particularly with heavy metals getting into the animals organism with feeds and accumulating in animal products due to connection with elevated technogenic influence on the environment. It is known that Selenium is the antagonist of Mercury, Lead and Cadmium [4–6]. But metabolic connection of selenium and heavy metals has not been studied properly yet.

**Material and methods of research.** Therefore the **aim** of our research was to study the influence of different levels and sources of Selenium in the rations of fattened young pigs on the productivity and heavy metals content in the slaughter products. For this purpose a scientific economic experiment was conducted in the conditions of „Pylypchanske” LTD pig farm in Kyiv region. The animals for the experiment were chosen according to the principle of pair analogues taking into account the kind, sex, pedigree, age, live mass, productivity and physiology state.

The experiment was conducted in five groups of young pigs with 10 animals each. In the basic period animals were fed with the full ration mixed fodder, which included barley, wheat, corn, soy-bean cake, the experimental animals of all of the groups, with addition of forage yeasts, grass flour, vitamin mineral premix and mineral additives (salt, forage chalk, dicalcium phosphate). The difference in animals' feeding was that the control group animals were fed with mixed fodder containing Selenium in the amount of 0.069 mg/kg of dry matter, and the mixed fodder of 2 experimental animal group was additionally enriched with Sodium selenite to provide general maintenance of Selenium at the level of 0.2 mg/kg of dry matter. Sel-Plex was injected in fodder of 3, 4 and 5 experimental animal groups in the amount which required to achieve the level of Selenium in 0.2; 0.3 and 0.4 mg/kg dry matter.

In the process of research we studied the actual amount of the consumed forages, dynamics of living mass. On the expiry the main period (age of pigs 240 days) we conducted the control slaughter of pigs, aiming to determine the maintenance of heavy metals in the slaughters.

The analysis of the data on mineral composition testifies that content of Copper, Zinc, Lead and Mercury in the mixed fodder was within the boundaries of maximally possible level (table 1). The amount of Cadmium 2.6 times exceeded the norm.

Table 1 – Content of heavy metals in mixed feed of pigs

Elements	Mineral elements content, mg/kg		MDP, mg/kg
	natural forage	dry matter	
Se	0.060	0.069	1.0
Pb	0.90	1.04	5.0
Cd	1.03	1.19	0.4
Hg	0.03	0.04	0.1
Cu	10.0	11.5	80.0
Zn	70.0	80.6	100.0
Mn	52.0	59.8	-
Fe	90.6	104.3	200.0
Co	0.8	0.92	2.0

Note: hereinafter MDR – the maximum permissible concentration.

**Results and discussion.** Feeding animals of experimental groups with additionally selenium enriched mixed fodder provided increase in average daily live mass increase by 5.8, 6.9, 12.2 and 11.3 % compared to the animals of control group (table 2).

Table 2 – Dynamics of the live weight of experimental pigs

Indices	Group				
	control	experimental			
	1	2	3	4	5
Live weight of pigs, kg					
Top of the basic period	32.0±0.50	31.8±0.56	31.8±0.61	31.5±0.64	31.6±0.64
At the end of the experiment	119.4±1.90	124.3±2.42	125.3±2.78	129.6±2.62**	129.0±2.51**
Of daily average live weight, g					
For fixed period	583±11.1	617±14.4	623±15.7*	654±14.4***	649±14.6**
Of consumption mixed feed per 1 kg increase, feed units	5.28	5.05	5.00	4.81	4.83

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

During the basic period of the experiment the animals consuming Sel-Plex with the mixed fodder, the average daily weight gain considerably exceeded not only the control analogues but piglets, whose ration contained Sodium selenite. The increase of average daily weight gain in pigs of experimental groups influenced considerably conversion of forage. Thus, the animals of the experimental groups per 1 kg of live weight gain took 4.7–8.7 % less forage units as compared to the animals of control group.

Depending on the level and source of Selenium in rations, the contents of heavy metals decreased in the slaughter products. In particular, the Cadmium concentration decreased by 10.8–35.1 %, in meat and by 6.9–20.7 % in fat of the experimental pig groups as compared with control (table 3).

Table 3 – Cadmium contents is in the experimental pigs slaughter products of, mg/kg

Index	Group				
	control	experimental			
	1	2	3	4	5
Meat (loin)	0.037±0.0023	0.033±0.0034	0.031±0.0026	0.026±0.0026 *	0.024±0.0029*
Fat	0.157±0.0129	0.153±0.0152	0.149±0.0118	0.142±0.0096	0.141±0.0140
Liver	0.126±0.0069	0.117±0.0042	0.115±0.0032	0.100±0.0055*	0.097±0.0029*
Kidneys	0.220±0.0026	0.209±0.0049	0.207±0.0045	0.178±0.0089*	0.173±0.0112*

Note: hereinafter \*P<0.05 as compared with the control group.

The liver of these groups pigs contained 7.1–23.0 % less Cadmium, and 5.0–21.4 % less in kidneys as compared with the animals of control group.

Applying Selenium containing complexes for feeding young pigs stipulated a tendency decreasing Lead content in slaughter products of the control group animals (table 4). Thus, the lowest content of this element was found in meat, viscera and fat of 4<sup>th</sup> and 5<sup>th</sup> experimental groups animals.

Table 4 – Lead contents is in the experimental pigs slaughter products of, mg/kg

Index	Group				
	control	experimental			
	1	2	3	4	5
Meat (loin)	0.086±0.0049	0.084±0.0052	0.082±0.0042	0.074±0.0056	0.072±0.0054
Fat	0.314±0.0274	0.312±0.0209	0.309±0.0208	0.286±0.0057	0.284±0.0078
Liver	0.101±0.0270	0.099±0.0254	0.096±0.0226	0.089±0.0181	0.088±0.0133
Kidneys	0.185±0.0083	0.182±0.0081	0.176±0.0141	0.154±0.0141	0.153±0.0110

Mercury complexes influence negatively on the organisms of animals and people even in their low concentrations. As one can see from the information of table 5, adding Selenium containing complexes to the rations provided decrease in Mercury content in meat of pigs of experimental groups by 4.3–19.2 %, in fat – by 5.2–19.1 % compared with the animals of control group.

Table 5 – Mercury contents is in the experimental pigs slaughter products of, mkg/kg

Index	Group				
	Control	experimental			
	1	2	3	4	5
Meat (loin)	2.55±0.128	2.44±0.340	2.34±0.298	2.07±0.100*	2.06±0.120*
Fat	1.86±0.116	1.81±0.077	1.76±0.076	1.66±0.042	1.63±0.064
Liver	5.6±0.21	5.4±0.18	5.1±0.10	4.8±0.16*	4.6±0.12*
Kidneys	6.1±0.22	5.8±0.23	5.4±0.34	4.8±0.26*	4.7±0.32*

Note: hereinafter \*P<0.05 as compared with the control group.

The increase in the level of Selenium organic source in rations provided lower contents of Mercury in the liver of pigs of experimental groups by 8.9–17.9 %, in kidneys – by 11.5–23.0 % as compared to the control analogues.

**Conclusion.** Thus, the analysis of the research results proves that organic, and inorganic Selenium, containing complexes in the mixed fodder, positively influences the growth and metabolism. However, the indexes of the animals consuming the mixed fodder with Selenium content at the level of 0.3–0.4 mg/kg of dry matter and the Sel-Plex as its source, take specific attention. The highest average daily live weight gains and lowest forage conversion were defined in these pigs. Products obtained from these animals were of better quality due to lower content of Cadmium, Lead and Mercury in the slaughter products.

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**Влияние различных уровней и источников селена в комбикорме молодняка свиней на производительность и содержание тяжелых металлов в продуктах убоя**

**Л.В. Пирова**

Анализ литературных источников свидетельствует о целесообразности использования селеносодержащих препаратов в рационах животных с целью уменьшения трансформации ртути, кадмия и свинца в продукцию. Поэтому, для повышения производительности и качества продуктов убоя в состав рациона молодняка свиней необходимо дополнительно вводить селеносодержащие соединения.

Введение различных уровней (0,2; 0,3; 0,4 мг/кг сухого вещества) и источников селена (селенит натрия, Сел-Плекс) в полнорационные комбикорма показал, что наиболее эффективным для молодняка свиней было органическое соединение селена. Дополнительное введение его в комбикорм для достижения общего содержания селена на уровне 0,3 мг/кг сухого вещества способствовало снижению концентрации кадмия на 29,7 (P<0,05), ртути – на 18,8 % (P<0,05) в мясе. Выявлена тенденция к снижению содержания свинца в продуктах убоя животных опытных групп. Использование селенита натрия, по сравнению с органическим соединением, имеет менее положительное влияние на производительность и качество мяса свиней.

**Ключевые слова:** селен, свиньи, производительность, кадмий, свинец, ртуть.

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