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THE INFLUENCE OF ADDING ORGANIC SELENIUM IN CONCENTRATED MIXTURES ON PRODUCTION RESULTS OF DUCKS FATTENING

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ABSTRACT: ***The aim of this paper is to investigate the effect of the addition of different amounts of organic selenium (ALKOSEL R397) in concentrated mixtures on duck fattening production results. The tests was performed on 240 one-day ducklings (Cherry Valley), which were freely selected into 4 groups, one control K0 group, and three experimental K1, K2 and K3 groups. In two stages of fattening, ducklings were fed with two and nutritionally different concentrated feed ingredients: starter (from 1 to 14 days) and finisher (15 to 49 days of fattening). The control group of the ducklings (K0) was fed with food without added organic selenium in both stages of the fattening. The test group K1 in both phases was fed with food as well as a control group, but with the addition of 0.2 mg/kg of organic selenium, while the experimental group K2 used food with 0.4 mg/kg, and the experimental group K3 with 0.6 mg/kg of organic selenium. Adding organic selenium to duck foods has influence on increase in daily growth and a decrease in total consumption of food in ducks. The best food conversion was found in a group of ducks that received the highest amount of organic selenium during the whole experiment. Based on the research carried out, it can be concluded that the addition of organic selenium in concentrate mixtures had a positive effect on the production results of ducks fattening.***

Keywords: Organic Selenium, ducklings, production results

INTRODUCTION

The modern production of duck meat involves an intensive fattening for a period of 49 days with the proper selection of hybrids, the arrangement and control of zoohygenic and microclimate conditions in the facilities, and the use of optimized compound feed. Witak (2008) mentions for Pekinducks breed A-44, fattened 49 days with the use of standard mixtures, the average final weight of 3153 g in both sexes, or 3190 g in male and 3031 g in female animals. For the same group, yield was 61.70% in males, 60.90% females, or 60.70% in both sexes. Furthermore, the author states that the extension of fattening for 8 weeks increases the yield by 5.50% (on average, for both sexes, the yield is 66.20%), but if the fate lasts for 9 weeks, the yield is reduced by 1.50%, or on average is 65.3%.Poultry meat, as well as meat of ducks, has a high nutritional value (over 20% of proteins and less than 5% fat in breast and chicken legs). These data relate to hybrid lines of ducks intended for fattening. Nutrition is an important factor that affects the production results of fattened poultry. Poultry nutrition is primarily based on knowledge of needs and the provision of an adequate amount of food in order to achieve optimal production results and to obtain a satisfactory amount of high-value foods of animal origin for human consumption, as well as the appropriate selection of nutrients (Ševković et al., 1991; Hayes et al. 1979; He et al.,

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2003; Underwood and Suttle, 1999; US / NAS, 1980; NRC, 1980, 1994). Today, there is a well-known fact that feeding of animals can affect the nutritional value of meat, milk, eggs, or that this is one of the ways to get food special properties known as functional foods. Foods enriched with selenium can also be considered as functional foods. For a long time selenium was known as one of the most toxic substances on the earth (Mihailović, 1990), and only in 1957., experiments proved that selenium is necessary to be introduced into the organism in very small quantities (Schwarz and Folz, 1957). Based on an analysis of the use of organic selenium obtained from selenium yeast in cancer patients with a daily infusion of 200 mg/kg, a reduced mortality rate was observed in humans, as confirmed by the National Association for the Prevention of Cancer (NCP) in the United States (Clark et al., 1996). It plays its biological role in the organism via the glutathione peroxidase enzyme (GPx) in which the element is active. The activity of GPx in blood plasma is a reliable indicator of selenium status in animals, but only at suboptimal and optimal levels of selenium. The literature contains data on the effect of larger amounts of organic selenium on production results, and the obtained results indicate that high levels of organic selenium in food (up to 15 mg/kg) of chickens did not have a negative effect on production results. Also, in the literature referring to chicken feeding there are data on the use of various forms (inorganic, organic), as well as different quantities of selenium on the lean meat, pH of the meat, the ability to attach water, the chemical parameters of meat quality, oxidative stability of the meat and on the sensory properties of broiler meat. From the literature so far, a large number of researchers confirmed in their experiments the substitution of the inorganic form of selenium with organic form, which shows better production results in fattening chickens (Yang et al., 2012).

MATERIAL AND METHOD OF WORK

The study of influence of organic selenium on production results of ducklings fattening, was conducted on a total of 240 day-old ducklings. Ducklings were randomly selected and divided into 4 groups and this control K0 group, and three experimental K1, K2 and K3 groups. In each group there were 60 one-day ducklings, and fattening was done in three reps of 20 ducklings. Immediately on day 1 of the migration, in each experimental group, the ducklings were marked by placing rings on the legs, with numbers from 1-240 to the experimental groups (K0 = 1-60, K1 = 61-120, K2 = 121-180 and K3 = 181-240). During the experimental period each week ducklings were weighed by experimental groups and repetitions. Body weight is controlled on 1, 7, 14, 21, 28, 35, 42 and 49 days. The weighing was carried out using the Libelaelsi BV-P 3828 electronic scales with a deviation of ± 1 g, in order to determine the weekly increase in body weight. Ducklings were in two phases of the feeding during fattening, fed with two and nutritionally different concentrated feed ingredients: starter (from 1 to 14 days) and finisher (15th to 49th day of fattening). The first control group of the ducklings (K0) was fed food without added selenium in both stages of the fattening. The second group of ducklings (K1) was fed both with food as well as a control group, but with the addition of 0.20 mg/kg of organic selenium (commercial preparation, Alcosel R 397, France). The third group of ducklings (K2) used foods with 0.40 mg/kg organic selenium, and the fourth group of ducklings (K3) with 0.60 mg/kg of organic selenium. The experiment lasted for 7 weeks (49 days), and the food recipe for individual stages of fattening was adjusted to the selected duck hybrid. At the beginning of the fattening, the chemical composition of concentrate mixtures as well as the selenium content was determined (to determine the total content of selenium, i.e., basal, which originates from food and add organic selenium). During each fattening week and at the end of the fattening, each duck was weighed individually, and for each of these periods, i.e. for the total fattening, the increase, consumption and conversion of food was calculated. At the end of the fattening, after the last weighing on the farm, the ducks are placed in the marked plastic transport cages according to the experimental groups for each repetition. Fattened ducks that did not reach a minimum body weight of 1800 g (write-offs) were isolated from the experiment. After marking the transport cages and loading into the vehicle, the loaded ducks were transported to slaughter in a private poultry slaughterhouse in Gračanica according to the dynamics of migration (repetitions).

ISSN: 2348-1358
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Table 1. Plan of experiment

	Experimental groups			
	K0	**K1**	**K2**	**K3**
	Number of ducklings			
According to repetitions				
I - V1	20	20	20	20
II - V2	20	20	20	20
III- V3	20	20	20	20
Total	**60**	**60**	**60**	**60**

Ducklings are in two phases of the feeding during fattening - fed with two and nutritionally different concentrated feed ingredients: starter (from 1 to 14 days) and finisher (15th to 49th day of fattening). Ingredients of the mixtures composition used in feed (starter and finisher) are shown in Tables 2 and 3.

Table 2. Ingredients of compositions of starter concentrate for fattening ducklings

Row material (%)	**Concentrate mix- starter (1. to15. days)**			
	Experimental groups			
	K0	**K1**	**K2**	**K3**
Corn	54,83	54,63	54,43	54,23
Soybean grits	18,00	18,00	18,00	18,00
Soybean meal	16,00	16,00	16,00	16,00
Soy protein concentrate	5,00	5,00	5,00	5,00
Alcoholic yeast	2,50	2,50	2,50	2,50
Mono-Ca-phosphate	1,30	1,30	1,30	1,30
Premix for ducks I	1,00	1,00	1,00	1,00
Cattle chalk	0,90	0,90	0,90	0,90
Salt for cattle	0,35	0,35	0,35	0,35
Dl-Metiomin	0,12	0,12	0,12	0,12
Organic selenium (Se) mg/kg	-	0,20	0,40	0,60
Σ	**100,00**	**100,00**	**100,00**	**100,00**

Table 3. Ingredients of compositions of finisher concentrate for fattening ducklings

Row material (%)	**Concentrate mixfinisher (15. to 49. days)**			
	Experimental groups			
	K0	**K1**	**K2**	**K3**
Corn	72,02	71,82	71,62	71,42
Soybean meal	11,00	11,00	11,00	11,00
Soybean grits	9,00	9,00	9,00	9,00
Alcoholic yeast	2,50	2,50	2,50	2,50
Soy protein concentrate	2,00	2,00	2,00	2,00
Mono-Ca-phosphate	1,20	1,20	1,20	1,20
Premix for ducks II	1,00	1,00	1,00	1,00
Cattle chalk	0,90	0,90	0,90	0,90
Salt for cattle	0,30	0,30	0,30	0,30
Dl-Metiomin	0,08	0,08	0,08	0,08
Organic selenium (Se) mg/kg	-	0,20	0,40	0,60
Σ	**100,00**	**100,00**	**100,00**	**100,00**

ISSN: 2348-1358
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RESULTS AND DISCUSSION

Between the 1st to the 14th day, the total consumption of foods of the tested duck groups had the following decreasing series: K2 group> K1 group> K0 group> K3 group. Between the 14th and the 49th, as on day 1 and day 49, the total food consumption had the following decreasing series: K0 group> K1 group> K2 group> K3 group, from which it can be concluded that the highest consumption of food had control group K0, and with the increase in the amount of added selenium in food, the consumption of foods decreased, i.e. it was the smallest in the experimental group K3, with 0,60 mg/kg of selenium added in the food (Chart 1).

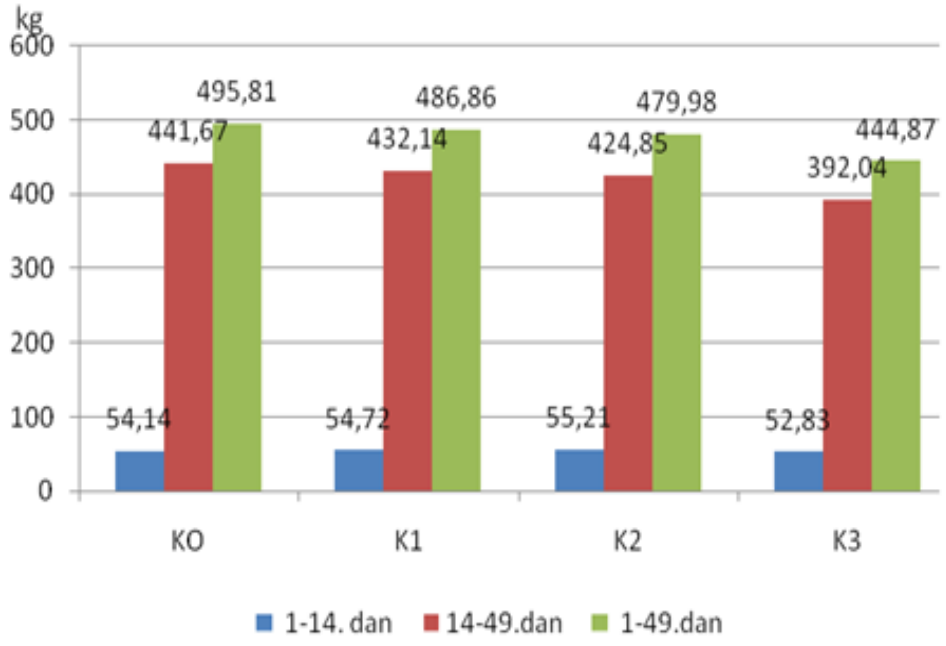

Chart 1. Total food consumption by period of fattening

The daily consumption of duck foods from the 1st to the 14th day had the following decreasing series: K2 group> K1 group> K0 group> K3 group, and from day 14 to 49, and from 1 to 49 days the next falling down K0 group > K1 group> K2 group> K3 group and here it is noted that the K3 group had the lowest daily food consumption, with the highest amount of selenium (0.60 mg/kg) added to food (Chart 2).

ISSN: 2348-1358
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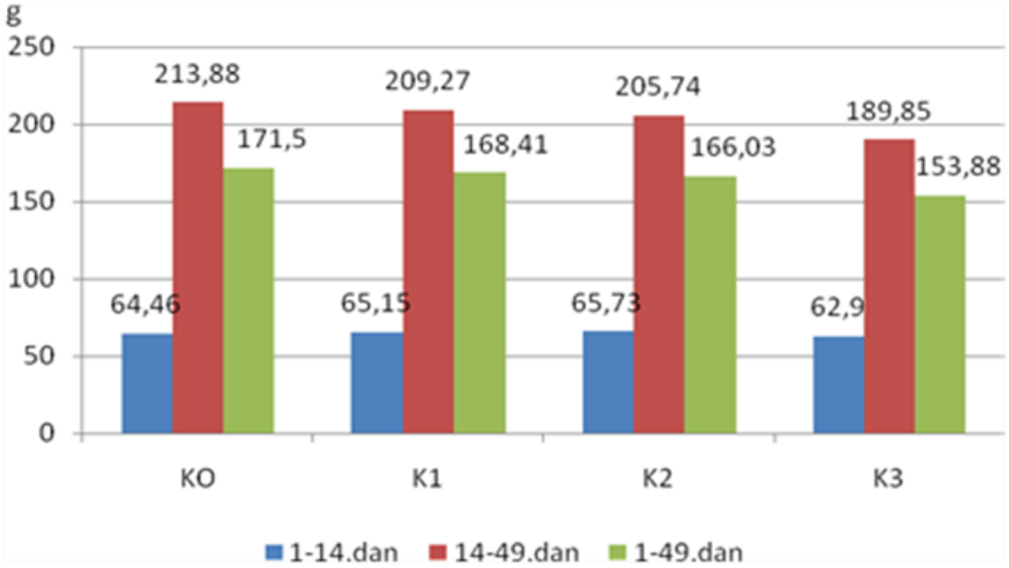

Chart 2. Daily consumption of food by period of fattening

From the results of the experiment it can be concluded that at the beginning of the fattening, i.e. to half the fattening, the conversion is much better than in the second half of the fattening. The best conversion was recorded by the K3 experimental group (2.17 kg) and the experimental group K2 2,18. The conversion of K1 group of ducks was 2.27 kg, and the highest conversion was at the control K0 group of ducks 2.31 kg (Table 4).
According to Ševković et al., (1991) for 1 kg of duck growth, 3-4 hg of food is required. From that time to the present, thanks to the genetic selection, hybrids have been created that make much better use of food which, according to our results, is just over 2 kg (2.17-2.31 kg for 1 kg of increase). The conversion at broilers (chickens) is about 2 kg (Drljačić, 2013; Marković, 2007; Kinal et al., 2012).

The average conversion (interaction of increase, consumption- food consumption) was in both periods of fattening, and for the overall period always the best in the K3 group.
From the results of the test it can be concluded that at the beginning of the fattening, i.e. to half the fattening, the conversion is much better than in the second half of the fattening. The best conversion was recorded by the D3 experimental group (2.17 kg) and the K2 2.18 experimental group. The conversion of K1 foods to the group of ducks was 2.27 kg, and the highest conversion was at the control K0 group of ducks 2.31 kg (Table 4).

Table 4. Conversion of duck foods by periods of fattening and total (kg)

Fattening period (days)	**Group**			
	K0	**K1**	**K2**	**K3**
1-14	1,40	1,41	1,42	1,38
14-49	2,75	2,69	2,42	2,40
1-49	2,39	2,34	2,22	2,20
The actual (final) food conversion kg/kg increase	**2,31**	**2,27**	**2,18**	**2,17**

It is noticeable that the food conversion of the control group K0 is below the average, up to the period between the 21st and 28th day, and after that period it was higher than the average (Chart 3).

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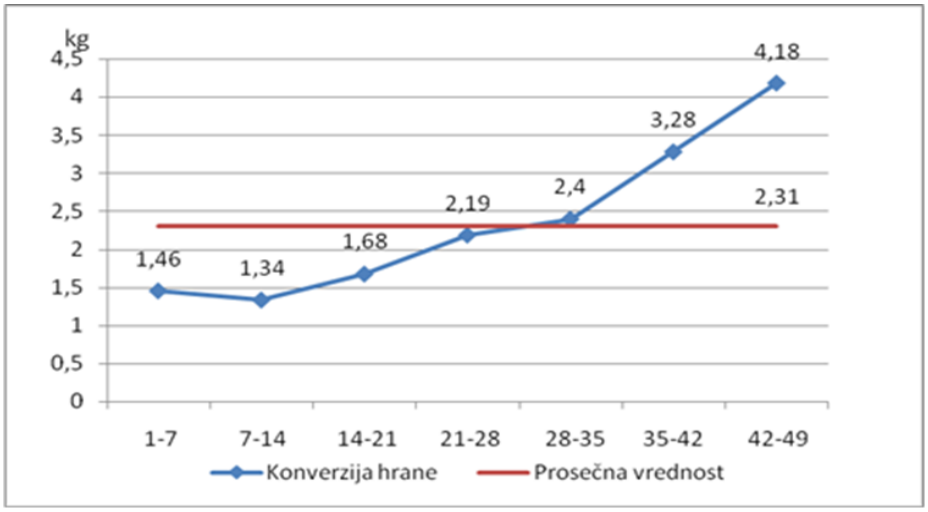

Chart 3. Food conversion of ducks experimental group K0

It is noticeable that the conversion of food in the experimental K1 group is below the average, up to the period between 21-28. days and 28-35. days, and after that period it was higher than the average (Chart 4).

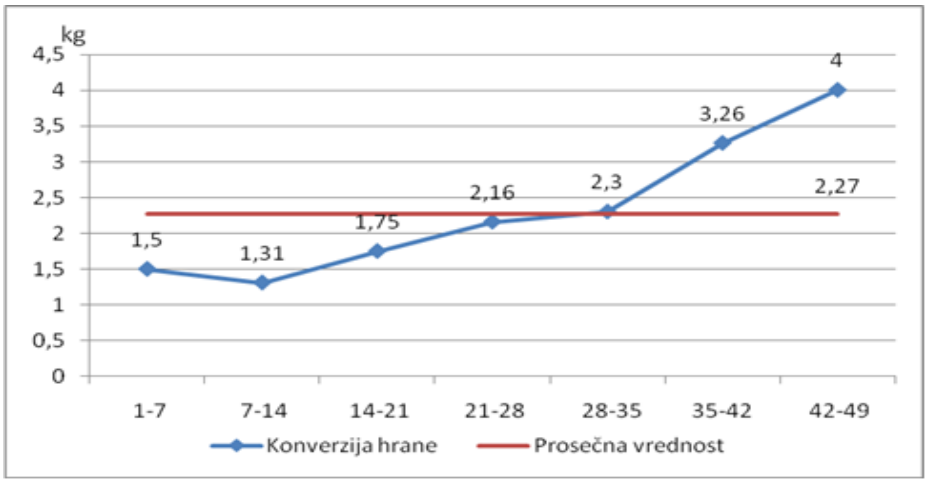

Chart 4. Food conversion of ducks experimental group K1

It is noticeable that the food conversion at the experimental K2 group is below the average, up to the period between the 21st and 28th day, and after that period it was higher than the average (Chart 5).

ISSN: 2348-1358
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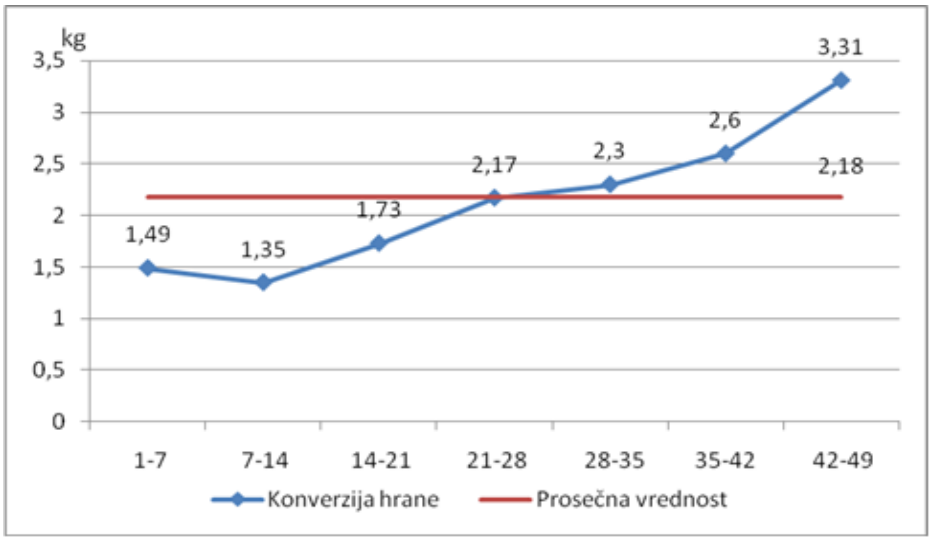

Chart 5. Food conversion of ducks experimental group K2

It is noticeable that the food conversion is below the average with the experimental K3 group, up to the period between the 21st and 28th day, and after that period it was higher than the average (Chart 6).

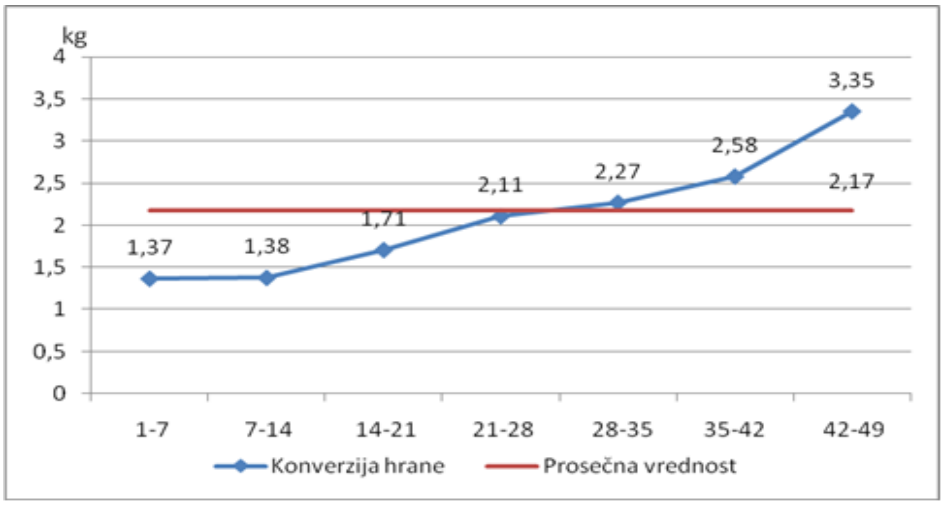

Chart 6. Food conversion of ducks experimental group K3

There is no data in the literature on the effect of different amounts of selenium added to food on food consumption and the increase in fattening ducks. These data, when it comes to the poultry data, are most relevant when we talk about the influence of selenium on the broiler production results (chickens in fattening). Most authors agree that better production results are achieved using an organic selenium form compared to the use of inorganic selenium in nutrition of broilers (MarkovićRadmila, 2007, Yang et al., 2012; Arruda et al., 2004; Anciuti et al., 2004; Edens and Gowdy, 2004). Data on the effect of different amounts of organic selenium in broiler nutrition indicate that significant negative effects on the production results of broilers in fattening were noticed at larger quantities of added organic selenium, but an increase in selenium content in meat was found. However, based on the results of Jokić et al. (2005), Drljačić (2013), Moksenesa (1983), the best production results of broilers in fattening are achieved using 0.60 mg/kg of selenium in the mixture. Although larger amounts of selenium do not have significant negative effects on production results, they can affect the cost of production as it is more expensive.

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With the control group K0 and the experimental K1 and K2 groups, the total increase has grown by 35 days and decreased in the last two weeks. In the K3 group, the fall in growth was recorded in the last week of the fattening.

Table 5. Total increase in fattening ducks by fattening weeks and groups (kg)

Fattening period (days)	Group			
	K0	K1	K2	K3
1-7	10,20	10,35	9,57	9,95
7-14	29,24	29,90	30,37	28,44
14-21	33,70	34,64	32,42	31,16
21-28	36,27	37,04	35,64	35,01
28-35	40,15	42,50	40,24	33,60
35-42	36,05	29,72	37,96	34,97
42-49	21,85	24,18	30,26	29,22

In the first period of fattening (from day 1 to 14), the highest total increase was found in the K1 group (40.25 kg), and the smallest in the K3 group (38.40 kg). In the second period of fattening, the highest total increase was found with ducks from K2 group (176.52 kg), and the smallest in the K3 group (163.96 kg). For the total fattening period, the highest increase was also found in the K2 group (216.46 kg), and the smallest in the K3 group (202.36 kg) (Chart 7).

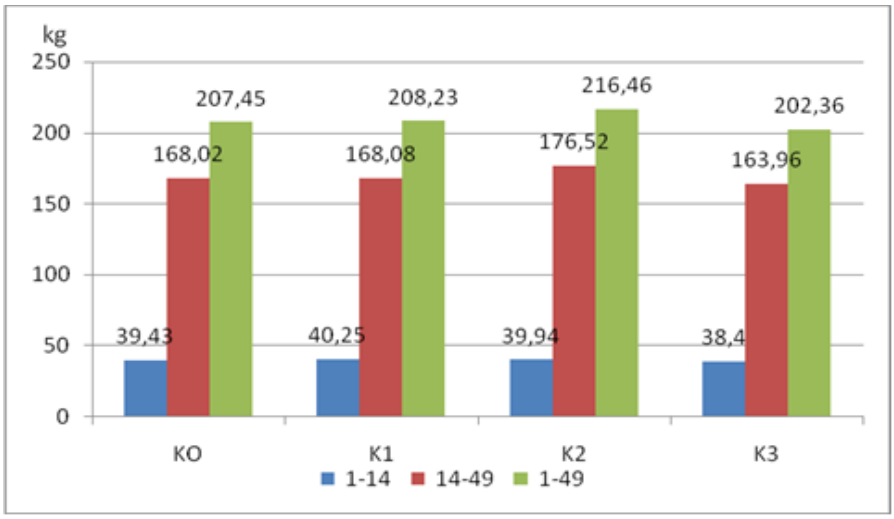

Chart 7. Total growth of ducks by periods of fattening

In the control group K0, the experimental groups K1 and K2, the daily growth was increased to 35 days, and in the K3 group up to 42 days (Table 6).

Table 6. Daily increase of ducks by seven days period of fattening (g)

Period of fattening (days)	Group			
	K0	K1	K2	K3
1-7	24,28	24,64	22,79	23,70
7-14	69,61	71,20	72,32	67,73
14-21	80,24	82,48	77,19	74,19
21-28	86,36	88,19	86,30	83,36
28-35	95,60	101,19	97,43	81,36
35-42	85,83	70,76	91,91	86,13
42-49	52,91	58,55	73,27	71,97

For all fattening periods, daily increase was highest in K2 group, and the smallest in the K3 group (Chart 8).

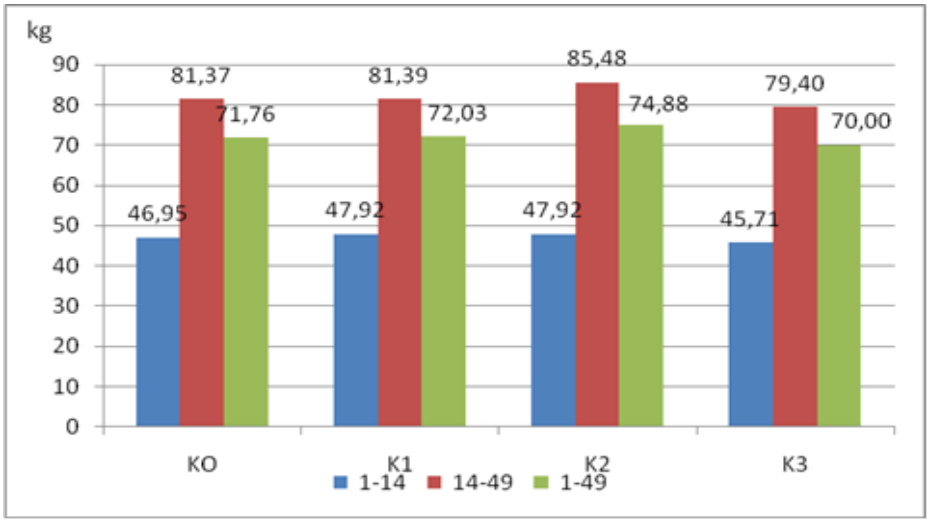

Chart 8. Daily increase of ducks by periods of fattening

CONCLUSION

1. The highest food consumption during the fattening period had a control group K0 that received food without added selenium, and with the increase in the amount of added selenium in food, the consumption of food declined, ie it was the smallest in the experimental group K3 with added 0,60 in food mg/kg selenium.
2. The worst conversion during fattening had a control group K0 that received food without added selenium, which amounted to 2.31 kg, and with the increase of the amount of added selenium in the food, conversion was corrected, or it was best for the experimental group K3 with 0.60 mg/kg of selenium added in food and amounted to 2.17 kg.
3. For the entire fattening period, the growth was the highest in the experimental group K2, with 0,40 mg/kg of selenium added to the food, and the smallest in the experimental group K3, which added 0.60 mg/kg of selenium to the food.
4. Based on the research carried out, it can be concluded that the addition of organic selenium in concentrate mixtures had a positive effect on the production results of fattened ducks.

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