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The Influence of Organic Selenium (Sel-Plex) Administered in the Feed of Laying Quails, on Production Performances and Egg Quality

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Abstract. The research has been carried out on 66 laying quails, divided in 2 groups, 33 quails/group; a control group fed the base diet, without any additive, and an experimental group fed with organic Selenium (Sel-Plex, 0.04%) supplemented feeds. The experiment was carried out over a period of 26 weeks (from the 6th week of age until the 32nd week of age). The laying quails were individually weighted, at the beginning, the middle and the end of the experimental period. The following parameters were recorded: body mass evolution and survival rate, laying intensity, mean egg weight and the feed consumption for an egg. In order to determine the egg quality the following parameters of the main egg components were determined: weight and proportion of the main structural components of the egg, egg defects and the main morphological and physical indices of quality of eggs (format index, egg volume, specific weight, yolk index, egg white index, Haugh units). The results recorded confirm the positive influence of the organic Selenium on production performances in laying quails and on egg quality.

Keywords: Sel-plex, organic selenium, laying quails, production performances, eggs quality

INTRODUCTION

Lately, researchers focused their attention to obtain and use organic minerals in animal feeds. As a result, they have found that yeasts have the ability to incorporate Selenium as selenomethionine and selenocysteine, in quantities larger than their nutritive requirements. Some strains of yeasts are capable of forming over 97% selenomethionine. From such a strain of *Saccharomyces cerevisiae*, Sel-Plex (the organic Selenium) is produced.

One of the main features is that the animal organism absorbs and metabolizes selenomethionine the same way as the methionine itself. As a result, the organic Selenium (SeMet) is actively absorbed in the intestine as a common aminoacid, using similar processes as methionine. These chemical similarities allow the body to use them alternatively, in protein synthesis, making possible the occurrence of Selenium deposits o the organism (especially in the muscle tissue) (Pappas *et al.*, 2004; Karadas *et al.*, 2004). Hence the big differences that occur when using organic and inorganic Selenium, that is passively absorbed.

The use of organic Selenium (Sel-Plex) can lead to the enhancement of body weight, feed conversion ratio, an enhancement of the egg production, weight of eggs and egg components, including eggshell, yolk and white (Stanley *et al.*, 2004; Pan *et al.*, 2004; Sara *et al.*, 2008; Rutz *et al.*, 2003). At the same time, the use of organic Selenium (Sel-Plex) in the feeds destined to laying poultry leads to the Selenium enrichment of all the egg components (Renema, 2004; Surai *et al.*, 2004). Another positive effect of Sel-Plex is reflected on the

freshness and quality of the eggs during storage (Pan et al., 2004, Rutz *et al.*, 2003). Organic Selenium prevents the onset of certain diseases in poultry and the death due to Selenium deficiency (Surai, 2002)

The current research aimed to observe and highlight the possible influence of organic Selenium (Sel-Plex) administered in the feeds of lying quails on the production performances and egg quality.

MATERIALS AND METHODS

The research was carried out on a period of 26 weeks (02.06.2012–30.11.2012), on 66 lying quails, distributed in 2 equal groups (33 birds/group). During the experimental period, the quails were individually weighted, at the beginning, at the middle and at the end of the experiment. The 2 groups were housed in cages suited for laying quails, having dimensions of L/l/h=90/50/25. The cages were set in the same room, at equal heights from the floor, in the same environment. Room temperature was 23-24°C and was kept constant throughout the experimental period. Water and feed were *ad-libitum* for both groups. The base feed used, had the following structure: corn 37%, full fat soybean 24%, sunflower meal 13%, corn gluten, vegetable oil 2.8%, calcium phosphate 1.2%, L-lysine 0.075%, methionine 0.025% and calcium carbonate 7.5%. The base feed was administered to both groups (*Tab. 1*), the experimental group having the feed supplemented with organic Selenium (Sel-Plex), at a dose of 0.04%.

Throughout the experimental period the production and consumption parameters were recorded; these included the body mass evolution, laying intensity, mean egg weight, fodder consumption and conversion ratio for an egg.

To assess the egg quality, measurements have been carried out, including egg weight, weight of the main structural components (egg white, yolk and shell) and their proportion. Also, during the experimental period, eggshell defects and mortality rates have been recorded.

The data recorded were statistically analyzed by means of the Tukey and Student tests, using the GraphPad InStat software, v3.10.

Tab. 1

Crude chemical composition of the base fodder

	Energy (Kcal/Kg)	Crude protein (%)	Lysine (%)	Methionine (%)	Met.+Cist. (%)	Tryptophan (%)	Ca (%)	P (%)
1 Kg Fodder	2700	21.5	1.06	0.46	0.73	0.25	3.3	0.7

RESULTS AND DISCUSSIONS

Mean values of the body mass evolution and the intrinsic variability recorded in laying quails throughout the experimental period are presented in *Table 2*.

From the data recorded, it can be seen that the differences between the control 1(M) group and the Selenium fed group 2 (E) are very significant. At the end of the experimental period, the bird from the control group had a body weight gain of only 66.82g compared to the 101.79g recorded in the experimental group.

Although the mean initial body mass of the 2 groups was about the same (183.18–L1(M) and 183,27–L2(E)), during the experimental period, the group fed with Selenium supplemented feeds gained more bodyweight, the final body weight gain being 34.97g heavier in this group than the one recorded in the control group. This weight gain is due to the use of organic Selenium, which has a positive influence at the intestinal level by increasing the nutrient absorption surface (develop of the villi and microvilli) (Lions, 2007).

Tab. 2

Body mass evolution in laying quails throughout the experimental period

Issue	Group	n	X±sx	s	V%
Initial body weight (3 weeks old)	L1(M)	33	183.18±3.35	19.32	10.54
	L2(E)	33	183.27±5.18	29.80	16.26
Body weight at the middle of the experimental period (19 weeks old)	L1(M)	29	250.65±6.02	32.41	12.93
	L2(E)	33	263.06±6.33	36.39	13.83
Final body weight (32 weeks old)	L1(M)	28	250.00±5.48	29.01	11.6
	L2(E)	33	285.06±5.22***	30.01	10.52

L1(M)- control group; L2(E)- Selenium supplemented
***- P<0.001 – very significant

The effects of Selenium supplementation on the main production and consumption indices are presented in *Table 3*.

Tab. 3

Mean values of the main production and consumption indices recorded in laying quails throughout the experimental period

Issue		Experimental groups	
		L1(M)	L2(E) (Sel-Plex)
Body weight (g)	Initial	183.18±3.35	183.27±5.18
	Final	250.00±5.48	285.06±5.22***
Weight gain (g)		66.82	101.79
Laying intensity (%)	Absolute	70.17±2.17	83.62±2.76**
	Relative	100.00	119.16
Average egg weight	g	12.07±0.12	12.62±0.13*
	%	100	104.55
Average daily egg-mass production	g	8.46	10.55
	%	100	124.70
Average daily feed consumption (g)		30.2±0.66	28.60±0.71
Average feed consumption /100 g egg mass	g	354.76±10.09	269.34±11.24***
	%	100	75.92
Feed conversion ratio/egg	g	43.09±1.19	34.19±1.30***
	%	100	79.34

*- p<0.05- significant ; **- p<0.01- distinctly significant; ***- p<0.001- very significant
L1(M)- control group; L2(E)- Sel-Plex

From the data presented in *Table 3*, it can be seen that organic Selenium supplementation of the laying quail feeds has a positive effect on the production and consumption indices. Also this positive influence can be seen in the case of laying intensity and feed conversion regarding the egg production. The absolute laying intensity in group 2(E), fed with Selenium supplemented feeds, was significantly improved compared to the control group, having a mean value of 83.62% compared to the control group 1(M), with a recorded value of only 70.17%. The relative intensity rose by 19.16% in the experimental group compared to the control group, thus confirming the effectiveness of Sel-Plex. The mean egg weight recorded in the 2 groups was 12.07±0.12g in group 1(M) and 12.62±0.13g in group 2(E), a significant difference being recorded in favor of the experimental group. Regarding the average daily egg-mass production, a 24.70% higher value was recorded on the experimental group compared to the control group 1(M).

The average daily consumption of feed was 30.2±0.66 g/bird in the control group and 28.60±0.71 g/bird in the experimental group, the differences recorded being non-significant. Regarding the average feed consumption/100g egg mass and the conversion ratio/egg, the

differences recorded between the 2 groups were very significant, in favor of the experimental group. So, the quails from the experimental group had a lower feed consumption/100g egg mass (L2(E)-269.34±11.24g) compared to the control group (354.76±10.09g). The average feed consumption/egg was also lower in the experimental group (L2(E)-34.19±1.30g), 20.66% lower than the control group (L1(M)-43.09±1.19g).

Results regarding the improvement of the production and consumption indices in laying hens by means of organic Selenium supplementation (Sel-Plex) were also noted by other authors (Stanley *et al.*, 2004; Pan *et al*., 2004; Şara *et al*., 2008). The weight of the main structural components of egg, their proportion and the thickness of the eggshell are presented in *Table 4*.

Tab. 4

The weight of the main structural components of egg, their proportion and the thickness of the eggshell at the end of the experimental period

Issue		n	Experimental groups	
			L1M	L2E (Sel-Plex- 0.04%)
Average egg weight (g)	g	20	12.61±0.047	13.18±0.043***
	%		100	100
Mean egg yolk weight (g)	g	20	3.89±0.056	4.03±0.069
	%		30.84	30.58
Mean egg white weight (g)	g	20	7.07±0.063	7.48±0.061**
	%		56.06	56.75
Average eggshell weight (g)	g	20	1.64±0.040	1.67±0.035
	%		13.1	12.67
Eggshell thickness (g)		20	0.215±0.002	0.214±0.003

- p<0.01- distinctly significant; *- p<0.001- very significant L1(M)- control group; L2(E)- Sel-Plex

The values presented in *Table 4* indicate that, at the time of measurement, the mean egg weight in group 2E (Sel-Plex) recorded values very significantly different compared to the control group, while the data regarding the average egg white weight presented distinctly significant values, compared to the control group. The average egg yolk and shell weights show higher values for the experimental groups, the differences recorded being non-significant. In the case of eggshell thickness, the values recorded for the 2 groups were very close with non-significant differences.

Regarding the percentage composition of the main structural components of eggs (shell, egg white and yolk), the values recorded showed non-significant changes. The influence of organic Selenium on egg weight and its components including shell, yolk and egg white also have being proven by Rutz *et al.* (2003), in a research on laying hens.

The values of the main quality indices (egg format index, egg volume, specific weight, egg white index, Haugh units) of eggs are presented in *Table 5*.

Analyzing the main quality indices of eggs recorded in the 2 groups, slight increases can be observed in the case of egg format index, egg white index and the Haugh units; the values recorded did not show any significant differences between the control group and the experimental group.

Regarding the yolk index, the mean value recorded for group 2E was a little lower (0.5199±0.0067) compared to the one recorded in the control group (0.5211±0.0082) with no statistical significance. The only egg quality indexes that showed significant and distinctly significant changes in the experimental group compared to the control group were the egg volume and the specific weight. The egg volume in the control group was 10.74±0.31cm^3 while the experimental group had a mean egg volume 12.83±0.19cm^3, the difference recorded being very significant. The specific weight was 0.907±0.015 in the control group and

0.948±0.009 in the experimental group, the difference recorded being statistically significant in favor of the experimental group. The values presented show that organic Selenium (Sel-Plex) has a positive influence on the morphological indices of eggs that regard their quality.

Tab. 5

Main morphological and physical quality indices of eggs

Issue	Group	n	X±sx	s	V%
Egg format index (%)	L1M	20	76.59±0.73	3.28	4.28
	L2E	20	77.94±0.93	4.14	5.32
Egg volume (cm^3)	L1M	20	10.74±0.31	1.33	12.43
	L2E	20	12.83±0.19***	0.83	6.48
Specific weight (cm^3/g)	L1M	20	0.907±0.015	0.07	7.73
	L2E	20	0.948±0.009*	0.04	4.40
Egg white index	L1M	20	0.0918±0.002	0.010	11.54
	L2E	20	0.0932±0.004	0.016	18.12
Egg yolk index	L1M	20	0.5211±0.0082	0.036	7.05
	L2E	20	0.5199±0.0067	0.029	5.75
Haugh units (U.H)	L1M	20	93.77±0.43	1.92	2.05
	L2E	20	94.42±0.62	2.76	2.93

*- $p<0.05$- significant; ***- $p<0.001$- very significant L1(M)- control group; L2(E)- Sel-Plex

The effect of organic Selenium (Sel-Plex) on the exterior of the eggshell and mortality rate in lying quails, at the end of the experimental period is presented in *Table 6*.

Tab. 6

The effect of organic Selenium (Sel-Plex) on the exterior of the eggshell and mortality rate in lying quails, throughout the experimental period

Issue	Experimental groups	
	Group 1M	Group 2 (Sel-Plex 0,04%)
Normal eggs (%)	95.75	98.63
Broken eggs (%)	1.91	0.41
Cracked eggs (%)	0.85	0.49
Eggs with rugged shell (%)	0.41	0.22
Eggs with soft shell (%)	0.89	0.21
Completely white eggs (%)	0.19	0.04
Mortality rate (%)	15.15	0

During the experimental period, the number of eggs with defects (broken, cracked, with rugged shell or soft shell or white eggs) was much lower in the experimental group (1.37%) compared to the control group (4.25%). Regarding the mortality rate, the control group had losses of 15.15% while no losses were recorded in the experimental groups. Both the low rate of egg defects and the reduction of losses recorded in the experimental group compared to the control group confirm the important role of organic Selenium supplementation in order to obtain quality egg productions and a good health status.

CONCLUSION

The use of organic Selenium (Sel-Plex) in dose of 0.04% determined an increased body mass in laying quails during the experimental period (6 weeks to 32 weeks). The use of

organic Selenium in feeds for laying quails led to the enhancement of the main production and consumption indices throughout the experimental period

Regarding the weight of the main structural components of the egg, the use of organic Selenium led to significantly increased egg white weight, the rest of the structural components although having superior values did not show any statistically significant differences. The eggshell thickness and the percent proportion of the structural components of the egg were not influenced by feed supplementation with organic Selenium.

The organic Selenium (Sel-Plex) determined a larger egg volume and an enhanced specific weight, thus having a positive influence on the morphological indices of the eggs, regarding their quality. The low percentage of eggs with defects and also the reduction of losses in the experimental group compared to the control group, confirm the major role that the organic Selenium supplementation has on obtaining higher quality egg productions and quail health. The results recorded confirm the favorable influence of organic Selenium on production performances in laying quail and on the egg quality. So, based on the results recorded, we recommend the use of organic Selenium (Sel-Plex) in laying quails.

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