THE SUPPLEMENTATION EFFECT OF FEED WITH SELENIUM, ZINC AND MAGNESIUM ON BIOCHEMICAL SANGUINE PARAMETERS IN LAYING HENS

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Abstract

The experiment was conducted on 144 Isa Brown hens, for the duration of a production cycle. The biological material used in the experiment was divided into 4 experimental groups, each group being constituted of 36 hybrid hens. In the experiment we used a structure of mixed supplemented fodder in three experimental variants with selenium, zinc and magnesium. The blood biochemical parameters were determined in the three experimental stages. In the ascending phase of the egg laying curve, proteinemia ranged below the lower limit reference with the hens in the control group and those in the group supplemented with magnesium. In the steady phase proteinemia was in reference values at all experimental variants. In the downward phase although proteinemia was within reference limits, significant differences were confirmed between the control group and the groups supplemented with minerals. In the upward and downward phase of the egg laying curve, enzymatic activity of SGOT was within reference limits in all groups of hens, and in the steady phase, its activity was greatly reduced in the groups of hens supplemented with minerals. In the upward phase SGPT had lower values for all the hens in the experiment. In the downward phase its activity was higher in hens in the control group compared to the groups supplemented with minerals. In the upward and downward phase the enzyme activity of GGT was within normal limits, only in the steady phase it was more intense. ALP showed higher values for all hens in the experiment.

Key words: *biochemical, hens, parameters, sanguine.*

INTRODUCTION

The health and equilibrium state of the body is determined by the normal functioning of the metabolic processes which take place simultaneously. The occurrence of metabolic disorders in the animal is determined by numerous factors which are independent from the body and/or dependent, such as: nutrition, imbalances between various components of the ration, modification of the composition of fodders, technical – organizational factors and others (Pârvu, 1992; Stoica 1997).

The purpose of our study was to evaluate and interpret the modifications induced by the basic food rations supplemented with selenium, zinc and

magnesium used in egg-laying hens during a biological cycle on certain sanguine biochemical parameters.

MATERIALS AND METHODS

The experiments were carried out on „Isa Brown" hybrid egg-laying hens in a zootechnical farm in the Western part of the country, where the recommended microclimate conditions have been provided. The combined fodder recipes have been observed according to the requirements of the hybrid in the experiment in all the three operational phases (upward, steady and downward). A control lot (CG) with 36 hybrid hens and 3 experimental lots of 36 hens each have been constituted (EG-Se, EG-Zn and EG-Mg). The experimental groups have been fed with combined fodder (CF) supplemented with 20 g Sel-Plex concentration 1000 mg/100 kg CF with 9.5 g zinc oxide conc. 72%/100 kg CF and the 3rd one with 100 g magnesium oxide conc. 75%/100 kg CF. The monitored parameters have been analyzed for the three phases of the egg-laying curve, for 57 weeks. In order to determine the biochemical parameters the kinetic method was used. The statistical interpretation of the data was carried out by means of the Minitab 14 program.

RESULTS AND DISCUSSIONS

Tables 1, 2 and 3 show the significance of the differences between the groups regarding the sanguine biochemical parameters.
In the ascending phase of the egg laying curve, proteinemia ranged below the lower limit reference with the hens in the control group and those in the group supplemented with magnesium.
Carrying out the enzymatic profile in egg-laying hens represents an essential condition in specifying the diagnosis of the health state and can identify the action of certain etiological factors which can influence the egg production.
In the upward phase of the egg-laying curve, aspartate-aminotransferase (SGOT) was within normal limits in all the hens in the experimental lots. Alanine-aminotransferase (SGPT) has had a lower activity in comparison with the data in the specialty literature in all the experimental hen lots.

Table 1

Comparative evolution of the sanguine biochemical parameters with egg-laying hens and the significance of the differences (upward phase)

Parameters	Group	x ± Sx	CV %
Total proteins g/dl	CG	4,11 ± 0,03	2,61
	EG-Se	498,12 ± 21,94	14,62
	EG-Zn	483,29 ± 25,30	17,38
	EG-Mg	4,45 ± 0,09	6,38
SGOT U/I	CG	147,95 ± 2,47	5,54
	EG-Se	162,59 ± 7,00	14,29
	EG-Zn	149,96 ± 8,48	18,77
	EG-Mg	124,07 ± 2,78	7,45
SGPT U/I	CG	5,38 ± 0,25	15,48
	EG-Se	3,73 ± 0,07	5,93
	EG-Zn	2,11 ± 0,08	13,17
	EG-Mg	3,88 ± 0,13	11,14
GGT U/I	CG	13,82 ± 0,10	2,33
	EG-Se	14,15 ± 0,84	32,09
	EG-Zn	13,75 ± 1,09	24,20
	EG-Mg	16,09 ± 0,23	4,66
ALP U/I	CG	797,92 ± 37,50	15,60
	EG-Se	715,58 ± 69,16	32,09
	EG-Zn	716,12 ± 52,20	24,20
	EG-Mg	812,50 ± 33,55	12,68

The activity of gamma-glutamyltransferase (GGT) is within the physiological limits in all the hens in the experiment. Alkaline phosphatase (ALP) has had a high activity in all the hen lots, in comparison with the data in the specialty literature, the increase of the activity of this enzyme being determined by the hepatic or hepato-biliary disorder or deficiencies of calcium metabolism (Ghergariu, 1995; Pârvu, 1992).

In the steady phase proteinemia was in reference values at all experimental variants (table 2). In the downward phase (table 3) although proteinemia was within reference limits, significant differences were confirmed between the control group and the groups supplemented with minerals.

Diaz et al. (1999) have studied the activity of several enzymes AST, ALT, LDH, regarding egg-laying hens. The research result shows that their activity can suggest a hepatic lesion and some of them can be part of the protocol for diagnosing the syndrome of hemorrhagic hepatic steatosis.

In the steady phase of the egg-laying curve the activity of the GOT enzyme was higher in comparison with the data in the specialty literature which can confirm certain hepatic or muscular disorders.

Table 2

Sanguine biochemical parameters with egg-laying hens (steady phase) - Multiple Comparisons Tukey HSD

Parameters	Group		Standard error	Sig.	95% CI	
					Lower limit	Upper Limit
Total proteins g/dl	CG	EG-Se	0,25206	0,994	-0,6129	0,7449
		EG-Zn	0,25206	0,091	-1,2889	0,0689
		EG-Mg	0,25206	0,**000***	-2,1329	-0,7751
	EG-Se	EG-Zn	0,25206	,051	-1,3549	0,0029
		EG-Mg	0,25206	**0,000***	-2,1989	-0,8411
	EG-Zn	EG-Mg	0,25206	**0,010***	-1,5229	-0,1651
SGOT U/I	CG	EG-Se	4,67415	**0,000***	114,7474	139,9246
		EG-Zn	4,67415	**0,000***	53,1974	78,3746
		EG-Mg	4,67415	**0,000***	73,9974	99,1746
	EG-Se	EG-Zn	4,67415	**0,000***	-74,1386	-48,9614
		EG-Mg	4,67415	**0,000***	-53,3386	-28,1614
	EG-Zn	EG-Mg	4,67415	**0,000***	8,2114	33,3886
SGPT U/I	CG	EG-Se	1,69049	0,893	-5,7519	3,3539
		EG-Zn	1,69049	**0,001****	-11,8119	-2,7061
		EG-Mg	1,69049	**0,000***	-19,9339	-10,8281
	EG-Se	EG-Zn	1,69049	**0,005****	-10,6129	-1,5071
		EG-Mg	1,69049	**0,000***	-18,7349	-9,6291
	EG-Zn	EG-Mg	1,69049	**0,000***	-12,6749	-3,5691
GGT U/I	CG	EG-Se	2,67468	1,000	-7,4305	6,9765
		EG-Zn	2,67468	0,742	-4,4905	9,9165
		EG-Mg	2,67468	**0,000***	-45,1845	-30,7775
	EG-Se	EG-Zn	2,67468	0,692	-4,2635	10,1435
		EG-Mg	2,67468	**0,000***	-44,9575	-30,5505
	EG-Zn	EG-Mg	2,67468	**0,000***	-47,8975	-33,4905
ALP U/I	CG	EG-Se	44,21266	0,177	-26,8007	211,3487
		EG-Zn	44,21266	**0,000***	115,8743	354,0237
		EG-Mg	44,21266	0,329	-43,0727	195,0767
	EG-Se	EG-Zn	44,21266	**0,014***	23,6003	261,7497
		EG-Mg	44,21266	0,983	-135,3467	102,8027
	EG-Zn	EG-Mg	44,21266	**0,005****	-278,0217	-39,8723

*p<0,05, **p<0,01, ***p<0,001

GPT was within the reference values in CG and EG-Se, EG-Zn, except for the hens group whose ration was supplemented with magnesium. GGT has had a higher activity in all the hens in the experiment. At this moment it is considered the most sensitive enzyme which proves the secreting function of the liver. ALP has had the most intense activity in the hens in the CG, compared with the supplemented groups with selenium, zinc and magnesium.

Table 3

Sanguine biochemical parameters with egg-laying hens (downward phase) Multiple Comparisons Tukey HSD

Parameters	Group		Standard error	Sig.	95% CI	
					Lower limit	Upper limit
Total proteins g/dl	CG	EG-Se	0,15017	**0,000*** **	-1,7480	-0,9429
		EG-Zn	0,15017	**0,000*** **	-1,4171	-0,6120
		EG-Mg	0,15017	**0,000*** **	-1,9216	-1,1166
	EG-Se	EG-Zn	0,15017	0,140	-0,0716	0,7334
		EG-Mg	0,15017	0,657	-0,5761	0,2289
	EG-Zn	EG-Mg	0,15017	**0,009** **	-0,9071	-0,1020
SGOT U/I	CG	EG-Se	12,65708	0,820	-22,8972	44,9554
		EG-Zn	12,65708	0,156	-6,7335	61,1190
		EG-Mg	12,65708	0,543	-16,9454	50,9072
	EG-Se	EG-Zn	12,65708	0,583	-17,7626	50,0899
		EG-Mg	12,65708	0,965	-27,9745	39,8781
	EG-Zn	EG-Mg	12,65708	0,851	-44,1381	23,7145
SGPT U/I	CG	EG-Se	0,34183	**0,000*** **	1,8838	3,7162
		EG-Zn	0,34183	**0,000*** **	4,6256	6,4581
		EG-Mg	0,34183	**0,000*** **	4,6101	6,4426
	EG-Se	EG-Zn	0,34183	**0,000*** **	1,8256	3,6581
		EG-Mg	0,34183	**0,000*** **	1,8101	3,6426
	EG-Zn	EG-Mg	0,34183	1,000	-0,9317	0,9008
GGT U/I	CG	EG-Se	1,70684	1,000	-4,7532	4,3969
		EG-Zn	1,70684	0,996	-4,2005	4,9496
		EG-Mg	1,70684	0,974	-5,2950	3,8550
	EG-Se	EG-Zn	1,70684	0,988	-4,0223	5,1278
		EG-Mg	1,70684	0,989	-5,1169	4,0332
	EG-Zn	EG-Mg	1,70684	0,918	-5,6696	3,4805
ALP U/I	CG	EG-Se	64,93866	**0,000*** **	141,0299	489,1556
		EG-Zn	64,93866	**0,000*** **	130,3808	478,5065
		EG-Mg	64,93866	**0,001** **	101,9944	450,1201
	EG-Se	EG-Zn	64,93866	0,998	-184,7119	163,4138
		EG-Mg	64,93866	0,931	-213,0983	135,0274
	EG-Zn	EG-Mg	64,93866	0,972	-202,4492	145,6765

*p<0,05, **p<0,01, ***p<0,001

AL-Bustany et al. (1998) found that at the same time with the aging of the egg-laying hens the activity of ALP is considerably reduced. As a result of the determinations carried out one can notice a significant increase in the GOT activity, in all the hens compared with the reference data. GPT has a significantly lower activity in all the hens, the enzymatic activity being under lower limit of the reference values. GGT has had a higher activity in all groups, the average values being comprised between 19-20 U/l, without statistical significant differences between the groups. ALP has had a higher activity in CG compared with supplemented groups. The increased values of serum activity of ALP can be traced back to a more intense osteoblastic activity and even to the existence of hepato-biliary disorders.

CONCLUSIONS

In the ascending phase of the egg laying curve, proteinemia ranged below the lower limit reference with the hens in the control group and those in the group supplemented with magnesium.
In the downward phase significant differences were confirmed between the GC and the groups supplemented with minerals.
In the upward phase of the egg-laying curve, the activity of AST enzyme was within the reference limits in the hens in the experimental groups, while in the steady phase its activity was lower in the hen lots supplemented with mineral substances.
In the upward phase ALT had lower values, justified by the more laborious hepatic activity for egg production.
In the steady phase, its activity was more intense in the lot supplemented with magnesium, and in the downward phase its activity was higher in the hens in GC, compared with experimental groups.
In the upward phase the activity of GGT was within the reference limits, in the steady phase it was above the maximum limit because of a higher egg production, and in the downward phase it came back to normal.
ALP in the upward and steady phase had values above the maximum limit and in the downward phase it had a higher activity in GC compared with experimental groups.

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