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Influence of Zeolites Added in Full Feeding Mixture on Food Conversion of Laying Hens Isabrown SSL and Eggs Production

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Abstract: The aim of this work was to examine influence of zeolites (clinoptilolite) added in diet for laying hens, on feed conversion and production of eggs.

Zeolites (clinoptilolite) was added in diet for three examined groups of hens in different levels: 0-I group 0,2; 0-II group 0,3; 0-III group 0,5% of zeolites. Control group gained no zeolites in diet.

In experiment were 1000 laying hens, divided into the four groups (per 250 hens). The feeding experiment lasted seven months. Laying hens were held in cages.

The gained results showed that there were significant differences in feed conversion and production of eggs between groups of laying hens.

The best feed utilization were of 0-III group (2,306; 0,433 kg of egg weight/kg of diet) and the lowest of K-group (feed conversion 2,476; 0,404 kg of egg weight/kg of diet).

Key words: laying hens, diet, zeolites (clinoptilolite), conversion, eggs

Introduction

The full feeding mixtures for laying hens, geneticly of high level of laying and long exploatation, totally are enough for their need for energy in

every feeding parts. The composition of the full feeding mixtures is more often and succsesfull pointed to, not only bigger egg production, but to bigger eggs production of better feeding quality.

In diet for laying hens are used different additives. There use is to increase laying and production of quality eggs.

The main cause of this work was to examine influence of natural zeolites (clinoptilolite). Under the trade name "Minazel", was used like additive to full feeding mixtures in different levels, to feed conversion of laying hens and to eggs production.

Oliver (1983) was feeding laying hens (Hy-line lines) with diet which had 16 and 13,5 % of proteins. He did 4 feeding experiments. Control group gained no zeolites in diet, but in diets for the control groups of hens he added zeolites in the quantity of 5%. He confirmed same differences in daily feed utilization, feed conversion, meaming used diet for production of 1 kg of eggs.

Kasumov et al. (1988) fed laying hens with diet to which 3,5 and and 6% of clinoptilolite was added. The results confirmed that clinoptilolite had immensely contributed to a better production profitability.

Lon-Wo et al. (1993) with addition of 5% natural Cuban zeolites in diets for broilers, gained better feed conversion, Palić et al. (1993) presented results that showed that natural zeolites added in diets for broilers, increased body weight and growth, and made conversion and mortality lower.

Materals and methods

The examination of influence of zeolites added in full feeding mixtures for laying hens, consume eggs in different quantities to feed conversion, was done by feeding experiment. The experiment was formed by group-control system.

In experiment were laying hens, hybrid hen Isabrown SSL. Hens were held in cages, 4 nens in each cage. The feeding experiment lasted per 210 days. At the moment of setting up of the experiment, laying hens were 46 weeks old and 26. weeks lopsed from the beginning of their production. There were 1000 hens in the experiment dixided into four groups: control group and four examined groups. Each group had 250 hens.

According to the aim and object of these studies, experiment of feeding hens was organized in such a way that all the differences in the amount of added zeolites in diet, could be established, the obtained results explained and relevant conclusion drawn.

The hens of the control and of all three test groups, were fed with the full feeding mixture containing the same raw sources (Tab. 1).

The only difference between the full feeding mixture for the control and examined groups of hens was that the full feeding mixture for 0-I group gained 0,2; 0-II group 0,3; 0-III group 0,5% of zeolites (Tab. 1). The hens were fed ab libitum.

Tab. 1. Composition of full feeding mixture for laying hens, %

Food	% of Partic.	Groups of hens			
		K	O-I	O-II	O-III
1. Corn		55,5	55,3	55,2	55,0
2. Wheat bron		9,0	9,0	9,0	9,0
3. Cattle yeast		3,0	3,0	3,0	3,0
4. Soybean grits		13,0	13,0	13,0	13,0
5. Sunflower grits		2,0	2,0	2,0	2,0
6. Fish flour		3,0	3,0	3,0	3,0
7. Lucerne flour		5,0	5,0	5,0	5,0
8. Cattle shalic		7,0	7,0	7,0	7,0
9. CaHPO4		1,2	1,2	1,2	1,2
10.NaCl		0,3	0,3	0,3	0,3
11. Premix		1	1	1	1
12. Zeolites		-	0,2	0,3	0,5
Total	*100*	*100,0*	*100,0*	*100,0*	*100,0*

* For examination was used zeolites (clinoptilolite) under the trade name "Minazel", produced in the ITNMS, Belgrade.

During the experiment, feed utilization was surveged by the groups of laying hens.

On the basis of feed used, the number of feeding days and that of produced eggs we come to the following results:

- feed used for one egg per g
- number of produced eggs per 1 kg of feed
- daily consumption of feed per g
- feed conversion (production of egg weight from kg of diet kg/kg).

The presence of statistical significance was done by the analysis of variance, F-test like a group test and Lsd-test for individual comparasions for level differences 5% and 1% in both tests.

Results and discussion

On the basis of shown data about feed utilization and production of eggs weight, common feed conversion was calculated meaming: relation feed utilization /production of egg weight. However, new methods enquiries improve like better prove of feed utilization relation: production of egg weight/ feed utilization (+++, 1989). That is mutual value of common feed conversion. In these studies both points of feed utilization were calculated.

Feed utilization for one egg production (g) by hens of control group was 166,10, at 0-I group 164,59, at 0-II group 162,08 and 0-III group 158,16 g. Meaning at 0-I group comparing the control group 99,09, examined 0-II group 97,58 and 0-III group 95,23%. The number of produced eggs from 1 kg of diet, at control K-group was 6,02, 0-I 6,07, 0-II group 6,17 and 0-III group 6,32 eggs. Meaning, bigger at 0-I group comparing the control group for 100,83, 0-II group for 102,49 and 0-III group for 104,98%.

Tab. 2. Feed utilization per unit of production, g

Traits	Groups of hens							
	K	index	O-I	index	O-II	index	O-III	index
The aver. Num. of hens	245.00	100	246	100.41	247	100.82	247.50	101.02
The number of days of production period	210		210		210		210	
Feed utilization in kg for the whole period	7279.66	100	7227.23	99.28	7180.36	98.63	7122.65	97.84
Average per hen in kg	34.66	100	34.41	99.28	34.19	98.64	33.92	97.86
Daily feed consu-mation per average hen in gr	141.47	100	139.90	98.89	138.42	97.84	137.04	96.87
Feed utilization for one egg production	166.10	100	164.59	99.09	162.08	97.58	158.16	95.23
The number of produc. eggs from 1 kg of diet	6.02	100	6.07	100.83	6.17	102.49	6.32	104.98

The used diet for kg of produced egg weight by hens of control group was 2,476, by 0-I group 2,419, by 0-II group 2,324 and 0-III group 2,306 kg. Meaning, less by 0-I group for 97,70, 0-II 93,86, 0-III group 93,13%. From 1 kg of diet were produced eggs weight: by K (control group) 0,404, 0-I group 0,413, 0-II group 0,430 and 0-III group 0,433 kg of egg weight. Meaning, more by 0-I group per 102,22, 0-II group per 106,43 and 0-III group 107,18 (Tab. 3., 4., 5., 6., 7.).

Tab. 3. Feed conversion and production of egg weight, per unit of used diet, for the whole period of feeding

Traits	Groups of hens							
	K	index	O-I	index	O-II	index	O-III	index
Total feed utilizat. for whole feeding period (kg)	7279.66	100	7227.23	99.28	7180.36	99.63	7122.65	97.84
Total number of produced eggs	43826.0	100	43908.00	101.19	44299.00	101.08	45034.00	102.76
Average weight of examined eggs (g)	67.08	100	68.03	101.42	69.73*	103.95	68.57	102.22
Total produced egg weight (kg)	2940.02	100	2987.06	101.61	3088.97	105.07	3087.98	105.03
Feed conversion food eggs weight kg/kg	2476.00	100	2419.00	97.70	2324.00	93.86	2306.00	93.13*
Produced egg weight /feed utilizat. kg/kg	0.404	100	0.413	102.22	0.430	106.43	0.433	107.18*

Presented results about feed conversion show that the best feed conversion by all examined groups were during the first period of examination (September), and the lowest in the fifth period (January) by all groups. Feed utilization in the first period (September) was: K-group 2,193, 0-I 2,071, 0-II 2,029 and 0-III 1990 kg. In the fifth period (January): K-group 3,688, 0-I 3,577, 0-II 3,659, 0-III 3,436 kg. The total average shows that the biggest feed

utilization was by the control group, and became less with increasing the percentage of zeolites by examined groups.

It is the same with production of egg weight/used diet. The largest production of egg weight, per unit of used diet, was of the first period (September-4. week). K-group 0,457, 0-I 0,473, 0-II 0,493, 0-III 0,509 kg of egg weight/kg of diet. The lowest egg weight production was at the fifth period (January-3. week). Control group 0,271, 0-I 0,279, 0-II 0,288, 0-III 0,291 kg of egg weight/kg of diet. (Appearance of very low temperatures).

Tab. 4. Diet used per by of egg weight, kg/kg, per weeks and months in absolute indices

Groups of hens	Week of Feeding	Months of feeding I September	II October	III November	IV December	V January	VI February	VII March
K		2,222	2,121	2,113	2,375	3,180	2,677	2,801
O-I	the first	2,100	2,060	2,072	2,192	3,045	2,579	2,722
O-II		2,016	2,004	2,004	2,158	2,872	2,559	2,622
O-III		2,052	2,019	1,976	2,149	2,855	2,576	2,586
K		2,193	2,065	1,965	2,294	3,478	2,647	2,824
O-I	the second	2,077	2,081	2,080	2,215	3,352	2,580	2,729
O-II		2,029	2,016	2,013	2,173	3,117	2,551	2,628
O-III		1,990	2,019	1,982	2,139	3,171	2,560	2,577
K		2,165	2,060	2,156	2,345	3,688	2,727	2,787
O-I	the third	2,105	2,105	2,126	2,378	3,577	2,598	2,703
O-II		2,045	2,033	2,031	2,185	3,659	2,594	2,644
O-III		1,998	2,029	1,988	2,163	3,436	2,625	2,619
K		2,188	2,029	2,162	2,725	3,537	2,828	2,867
O-I	the fourth	2,113	2,061	2,144	2,582	3,406	2,704	2,781
O-II		2,029	2,026	2,072	2,376	3,374	2,684	2,641
O-III		1,963	2,028	2,002	2,346	3,356	2,654	2,559

		A	B	AxB
LSD	0,05	0,036	0,0524	0,1051
	0,01	0,0527	0,0697	

Tab. 5. Feed utilization per kg of egg weight kg/kg, in absolute and relative indices

Months Of feeding		Groups of hens K	O-I	O-II	O-III
I	I September	2192.00	2099.00	2030.00	2001.00
index		100.00	95.76	92.61	91.28*
II	II October	2084.00	2061.00	2020.00	2024.00
index		100.00	98.89	96.93	97.12
III	III November	2099.00	2105.00	2030.00	1987.00
index		100.00	101.00	96.71	94.66
IV	IV December	2435.00	2342.00	2223.00	2199.00
index		100.00	96.18	91.29	90.31**
VI	V January	3471.00	3345.00	3255.00	3204.00
index		100.00	96.37	93.78	92.31
VI	VI	2719.00	2615.00	2597.00	2604.00
index	February	100.00	96.17	95.51	95.77
VII	VII	2819.00	2734.00	2634.00	2594.00
index	March	100.00	96.98	93.44	92.02
Total average		2476.00	2419.00	2324.00	2306.00
Index		100.00	97.70	93.86	93.13
Difference			*-2.30*	*-6.14*	*-6.87*

Tab. 6. Production of egg weight per kg of diet, kg/kg

Groups of hens	Week of feeding	Mounths of feeding I September	II October	III November	IV December	V January	VI February	VII March
K		0,450	0,471	0,473	0,421	0,314	0,373	0,357
O-I	the first	0,476	0,485	0,482	0,456	0,382	0,388	0,367
O-II		0,460	0,499	0,499	0,463	0,348	0,391	0,381
O-III		0,487	0,495	0,506	0,465	0,350	0,388	0,387
K		0,456	0,484	0,509	0,436	0,287	0,378	0,354
O-I	the second	0,481	0,480	0,481	0,451	0,298	0,387	0,366
O-II		0,493	0,496	0,497	0,460	0,321	0,392	0,380
O-III		0,502	0,495	0,504	0,467	0,315	0,390	0,388
K		0,462	0,485	0,464	0,426	0,271	0,367	0,359
O-I	the third	0,475	0,489	0,470	0,420	0,279	0,385	0,370
O-II		0,489	0,492	0,492	0,457	0,288	0,385	0,378
O-III		0,500	0,493	0,503	0,462	0,291	0,381	0,382
K		0,457	0,478	0,462	0,367	0,283	0,353	0,349
O-I	the fourth	0,473	0,485	0,466	0,387	0,293	0,370	0,359
O-II		0,493	0,494	0,483	0,421	0,296	0,372	0,379
O-III		0,509	0,493	0,499	0,426	0,298	0,377	0,385

		A	B	AxB
LSD	0,05	0,0049	0,0065	0,0129
	0,01	0,0065	0,0086	0,0172

Tab. 7. Production of egg weight from kg of diet, kg/kg, in absolute and relative indices

Average	Months of feeding	Groups of hens K	O-I	O-II	O-III
$\bar{x}$	I September	0.456	0.476	0.486	0.499
index		100.	104.380	106.580	109.43*
$\bar{x}$	II October	0.479	0.485	0.495	0.494
index		100	101.250	103.340	103.13
$\bar{x}$	III November	0.477	0.474	0.493	0.503**
index		100.	99.370	103.35	105.45
$\bar{x}$	IV December	0.412	0.428	0.450	0.455
index		100	103.88	109.220	110.440**
$\bar{x}$	V January	0.289	0.299	0.313	0.313
index		100	103.46	108.300	108.300
$\bar{x}$	VI February	0.368	0.382	0.385	0.384
index		100	103.80	104.620	108.170
$\bar{x}$	VII March	0.355	0.366	0.379	0.386
index		100	103.110	106.76	108.730
Total average		*0.405*	*0.415*	*0.430*	*0.433*
Index		*100.00*	*102.640*	*106.430*	*107.180*
Difference			*+2.64*	*+6.43*	*+7.18*

The best feed utilization during the whole period of examination was by 0-III group: feed conversion 2,306 and production 0,433 kg of egg weight per 1

kg of used diet. The worst feed utilization was by control group: feed conversion 2,476 and production 0,404 kg of egg weight per 1kg of used diet. The gained results are in accordance with work of Bunger (1982) who established reduction of feed conversion with adding zeolites to broiler's diet. Vest and Schutie (1982) come to the some results. Oliver (1983), Velikanov et al. (1983), Palić et al. (1993) established the reduction of feed conversion: by broilers with addition of zeolites in diet. Roland and Dorr (1989) addion of 0,75% synthetic HSCAS in broiler's diet reduce the feed conversion. Andronikashvili et al. (1994) clame that clinoptilolite, added in diet, make slower the passing of digest, trough digestive tract, for 2-2,5 hours in that way to improve absorption of feeding elewants, Lon Wo et al. (1995) clame that 5% of zeolites added in diet for broilers improved conversion of food with grate statistic significance.

In the way like the given results show, the examined groups which gaind zeolites in diet, had less feed conversion than K-group, meaning, made more egg weight/kg of diet.

The differences were for all periods, except the second period (October), statisticly significant ($P<0,05$) and statisticly of high influence ($P<0,01$) for groups which gained zeolites in diet.

Conclusion

On the basic of examination done with feeding experiment of 1000 laying hen Isabrown SSL, divided into 4 groups/per 250 hens/ during 28 weeks of laying fed with basicly same diet (fabric mixed food), with only difference in levels of zeolites (clinoptelolite) added into diet for examined groups: 0-I, 0,2; 0-II, 0,3; 0-III, 0,5% of zeolites, but control group gained diet with no additional zeolites, the conclusion can be made:

* the least feed utilization for the whole feeding period had hens of 0-III group 7.122,65 kg, and the biggest hens of control group 7.279,66 kg;
* the biggest egg production had hens of 0-III group 45.034,00, and the least hens of control group, from total number of produced eggs;
* totally produced egg weight (kg) is the biggest by hens of 0-II group 3.088,97, and the least. by hens of control group 2.940,02;
* the best feed utilization was by the hens of 0-III group 2,306; 0,433 kg of egg weight; and the worst by the hens of control group, feed conversion 2,476; 0,404 kg of egg weight/kg of food;
* all the differences of mean values among examined groups were statisticly highly significant ($P<0,05$) and statisticly highly significant ($P<0,01$) in benefit for groups which gained zeolites in diet;
* in conclusion, the application of zeolites to laying hen diet, consume eggs, may outstandingly increase economial valve and is widely used in practise.

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UTICAJ ZEOLITA DODATOG U KRMNE SMEŠE NA KONVERZIJU HRANE KOKOŠI NOSILJA ISABROWN SSLL I PROIZVODNJU JAJA

-originalni naučni rad-

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Rezime

U radu je ispitivan uticaj zeolita (klinoptilolita) dodatog u hranu za kokoši nosilje, na konverziju hrane i proizvodnju jaja.

Zeolit (klinoptilolit) dodavan je u hranu za tri ogledne grupe kokoši u različitim koncentracijama 0-I grupa 0,2; 0-II grupa 0,3; 0-III grupa 0,5% zeolita. Kontrolna grupa kokoši hranom nije dobila zeolit.

U ogledu je bilo 1000 kokoši, podeljenih u četiri grupe (po 250 grla). Ogled ishrane trajao je sedam meseci. Kokoši su držane u baterijskom sistemu.

Dobeni rezultati pokazali su da postoje značajne razlike u konverziji hrane i proizvodnje jaja između grupa nosilja.

Najbolje iskorišćavanje hrane bilo je kod 0-III grupe (2,306; 0,433 kg jajne mase/kg hrane), a najlošije kod K-grupe (konverzija hrane 2,476; 0,404 kg jajne mase/kg hrane).