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R E P O R T

BIOAKTIV – EXPERIMENT MADE IN REPUBLIC OF MACEDONIA

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1. INTRODUCTION

Each country's priority is to protect the environment, to improve the living conditions and welfare of people and animals. Intensive poultry is indoor and the poultry's health condition and protection of the environment shall depend on the type of the buildings where poultry stays, the way they are built and how the poultry is fed and bred. It is necessary to provide adequate conditions in the buildings, conditions which are closely related and similar to natural conditions, in order poultry to be in good health and production condition and the physiological functions of the poultry can happen as they should. By making stable balance between organisms and surrounding or in other words by creating good microclimate we create conditions for normal process of all physiological functions. Very common accompanying thing for poultry's production is the Ammoniak (NH_3) which is produced by disintegration of excrement in the buildings and has negative influence on the respiratory system and decreases the immunity of organisms to infections. The poultry's excrement mixed with scattered food, feathers, carcasses and other can be carriers of many infectious materials which are risky to poultry's health, to animals' and peoples' health, and pollute the environment. This is why poultry is labeled as one of the greatest polluters of the environment.

In that sense, for hens' nutrition BioAktiv, an additive, should be used in order to define its benefits. BioAktiv is natural calcium carbonate in powder form, which is treated by special bio-resonance procedure and at the end of the procedure it is treated by oxygen. There are no artificial substances and chemicals and the same is recommended for poultry farm breeding. BioAktiv additive is natural product which contain (90% calcium carbonate and 8% silica acid) and do not endanger peoples' and fowls' lives, and we consider that these researches shall confirm their positive influence on health, growth and production qualities of the animals and on creation of healthy working and living environment. These researches shall give answers to many issues related to better production conditions and reduction of poultry's' mortality, reduction of animals' aggressiveness and increase of meat quality as reduction of stink, Ammoniak and other gases in waste products and area where the poultry lives. This study shall be the first attempt to use BioAktiv as food additive and to prove scientifically in our conditions its positive effects on the

poultry production and protection of environment and chance further to be applied in practice. BioAktiv has proved that it improved animals' growth, appetite; it decreased the mortality and had tranquil effect with enormous reduction of the aggressiveness, especially important reduction of the animals' cannibalism. We still have not had any researches on this issue, although the interest to surpass problems with the release of Ammoniak and other gases from poultry's excrement, something which is especially significant and present during the summer period, is very big.

From the analyses of the production performances by using BioAktiv, it is expected to have better stimulation of intestines and food absorption; poultry's health condition to be improved and immunity increased, the total mortality reduced from 5-10%; to have better approach and better food conversion for 8-15%; increased egg production by improvement of the laying cycles from 80-85% to 90%; production of eggs with bigger weight and better quality eggshell; reduction of poultry's aggressiveness and improvement in the quality of ambient conditions. From benefits of the improvements of the environment where the poultry is bred, it is expected the quantity of Ammoniak (NH_3), methane (CH_4), carbon dioxide (CO_2), nitrogen oxide (N_2O) to be reduced in the animal excrement; to reduce the presence of midges in the dump inside and outside the building and to reduce the stink which is very intensive in this type of dumps. As a result of these benefits, ecological healthier working and living environment would be created.

The main aim of these researches is the intention to create healthy microclimate in the poultry buildings as a precondition for high-quality poultry production. Although there is a thesis that the poultry is one of the major polluters of the environment, the aim of this research primarily would be the result by using the additive to protect the environment from infectious pollutions through animals' excrement and secondary to affect on the improvement of the production characteristics and quality of the animals' products, which on the other hand has a direct influence on the peoples' health.

2. MATERIAL AND METHODS

Research was conducted on a small private farm in the village of Glogje, 10 km from the town of Tetovo. On the geographical map of Macedonia, Tetovo can be found in the northwest part of the state, 40 km far from the capital city of Skopje. Tetovo is located on 469 m above sea level and has temperate continental climate with average temperature of 11,6°C. In the farm for the experiment were included two groups of layers of Isa-Brown hybrid (C control group and E experimental group) located in two objects with a capacity of about 1380 layers. They were kept in the three-battery cages of the company Big Dutchman with complete automation and the controlled ambient conditions. Light regime was in accordance with the hens age, but because of better food utilization during July and August month, we introduced a one-hour night feeding. From the objects manure was removed regularly every 4th day and it was transported in the septic tank.

When the testing started in the C group was 1267 layers, while in E group 1258 layers and they were in the 53th weeks of age. Both groups received the same mixture recipe and chemical composition, which were completely balanced and were corresponded with the hens age. BioAktiv powder was added in the mixture for layers of E group in amount of 350g/t food, and during the four months hens were fed every day. In time of testing were estimated production and egg parameters as well as minimum and maximum temperatures in the objects. One-time a week was collected and calculated the following production parameters: mortality (cumulative in %), total production of eggs (in %), number of broken eggs (in %), food consumption per day and per egg (in grams) and one time a month was controlled the hen's body weight (in grams). Once a week were tested the following egg parameters: mass of eggs (g), egg shape index (%), eggshell mass (g) and eggshell thickness (mm). Eggs were taken by random selection from several places and levels from the nests of the battery cages. Egg mass and eggshell mass were measured by the digital scale with precisions of 0.01g, egg shape index was measured by Shubler-instrument with latitude and longitude measures of eggs that are placed in the proportions, and eggshell thickness were measured by Micrometer-instrument with precision of 0.0001 mm. At the beginning of testing and every next week at the same time with samples and dates collecting in the objects was observed and measured the amount of ammonia with the

special counter. It was measured in approximately the same time and at the same place in the building (in the middle between two lateral ventilators). It was created the database in the computer program Excel, was calculated the average values and variation distribution, were compared all examined parameter values between two testing groups and based of that were generated adequate graphs.

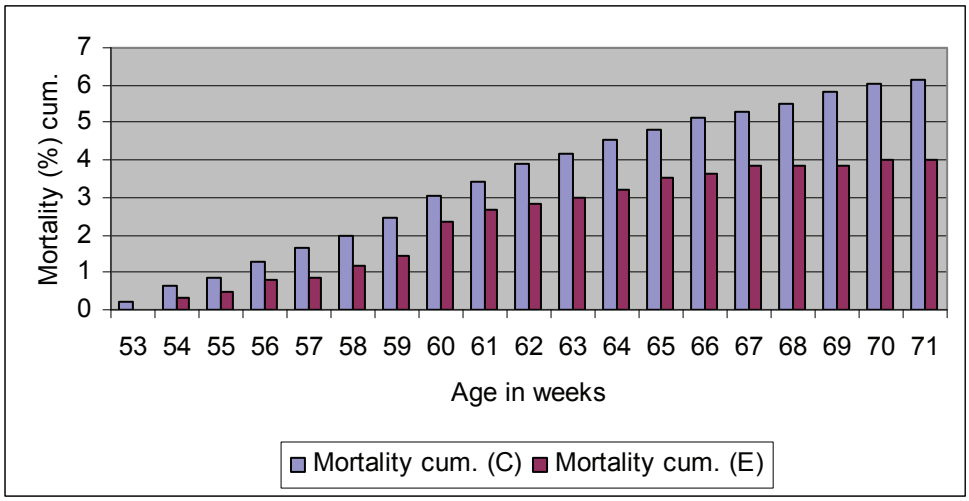
3. RESULTS AND DISCUSSION

Production parameters

In Table 1 and 2 (you can find on the end of report) are presented the results of experiment with BioAktiv. The experiment was started at 01.07.2008 and ended at 31.10.2008 in control (C group) and experimental group (E group) or total four months of testing. The layers from E group have started to use the BioAktiv powder of 12.07.2008 when they were at 55th week of age and until the end of the experiment (70th week of age). Once time a month hens body weight was measured in both of groups. At the beginning of experiment the average body weight in the control group was 1970g and 1990g in the experimental group. On the beginning of August, or more accurately in 60th week of age, there was a ventilator defects in the stall of experimental group, which increased mortality and reduction of average hens weight under the 1780g. This caused some decline in egg production and egg quality and therefore was intervened by adding vitamins to drinking water. After this there was an increase in hens body weight on average of 1950g to the end of the experiment.

Mortality

Cumulative mortality of chickens in control group was 6.12% and was higher for 2,11% in absolute or 52% in relative values than the mortality (4.01%) in experimental groupe. The higher mortality that has occurred in the E group in the 60th week of age was caused of defect ventilators for cooling, and therefore is considered that total mortality of hens could be lower.

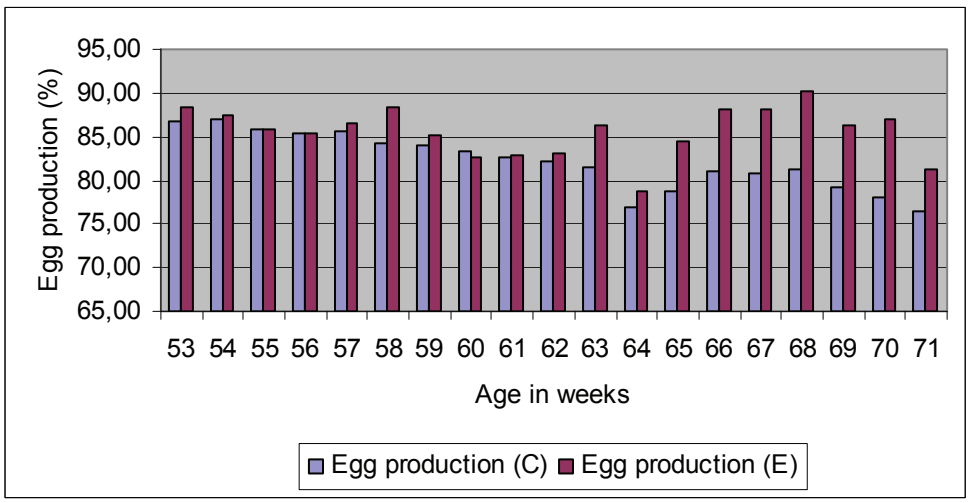


Graph 1. Cumulative mortality (%) at control (C) and experimental group (E) of hens

The greatest mortality in both groups of layers was in the summer months which was decreased in the fall. In the experimental group, which was used BioAktiv, the number of death hens was quite smaller during the whole experiment that was contributed with higher liveability of layers.

Egg production

Egg production (graph. 2) was expressed as the total number of eggs per week and in percentage also.



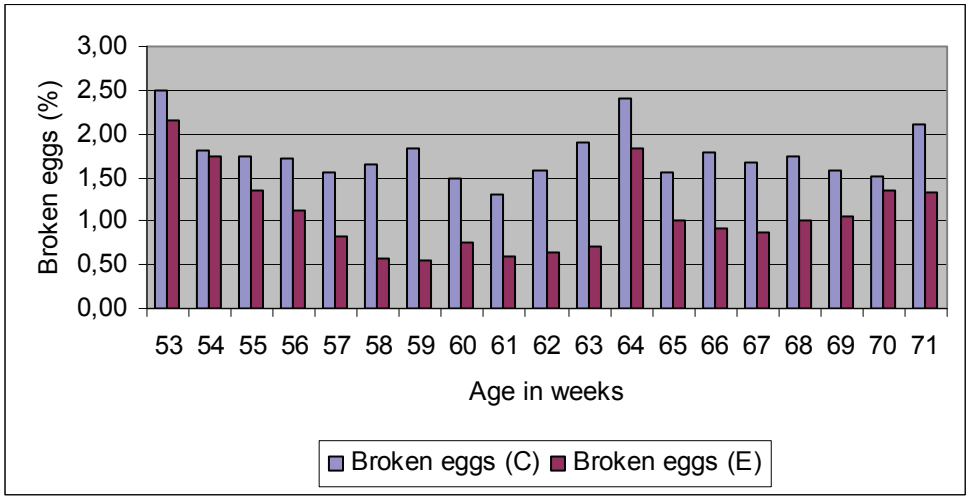
Graph 2. Egg production (%) at control (C) and experimental (E) group of hens

Layers of E groups were given total 129625 eggs, and those of group C total 123034 eggs. The percentage of egg production was calculated on the average number of hens during testing and was 85.59% in E group and

82.14% at C grupe. Better egg production of E group for more than 4% in relative value, expressed in number it was more than 6000 laying eggs in four months. It is interesting to note that the greater difference in egg production between both groups was in September and October months instead of decline with to higher age, layers in E group have given egg production with the same temptem extend, even in some weeks was greater than the previous.

Broken eggs

In the course of the experiment as a factor of production parameter testing also was used the number of broken eggs without number of dirty and defect eggs. During the summer months usually leads to increase in broken and cracked eggs as a result of high temperature and the impossibility of layers to form a strong shell. The number of broken eggs in a group C was total of 2114 for research, or an average of 1.72% a week, while in a group E that number was 1322 for the same period or that was an average of 1.02% a week.



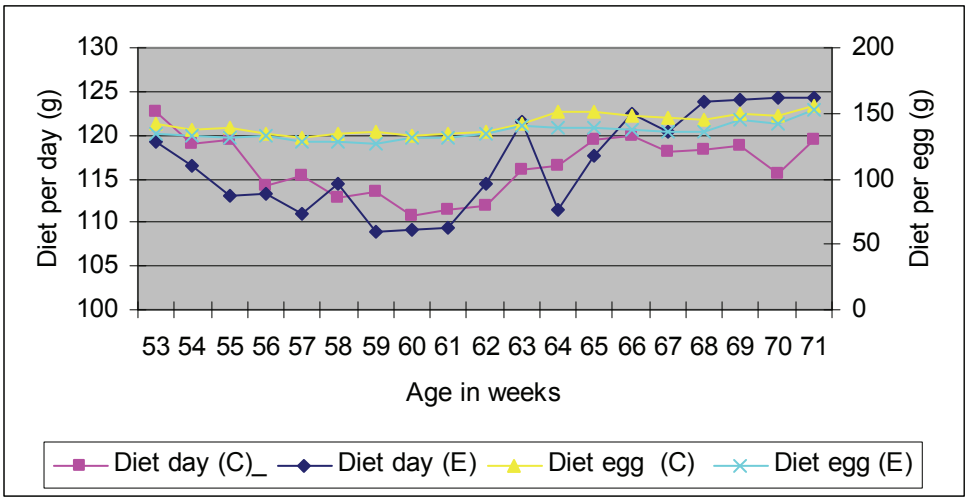
Graph 3. Broken eggs (%) at control (C) and experimental (E) group of hens

Graphic display of the Chart 3 clearly shows that the number of broken eggs in group C was permanently on the high level. The number of broken eggs in E group was much smaller and the reason was using in BioAktiv hen's diet. In the summer months usually come to increase the number of broken eggs, but in this case in the experimental group, which was used this nature preparation, there was a reduction of the number of broken eggs for almost 41%. Using the BioAktiv powder by egg-laying hens was increased the number of eggs in medium weight

class (50-60g), while was reduced eggs with bigger and lower mass of eggs (above 60g and 50g below). Medium weight class eggs have a stronger shells, unlike large eggs because the same amount of shell has arranged by greater surface in the phase of eggs formation, because of that, eggs shell are thinner and easier breakable.

Feed consumption

Feed consumption (graph.4) was monitored weekly and was calculated (expressed) as a daily feed consumption in grams by average hens and feed consumption per laid egg.



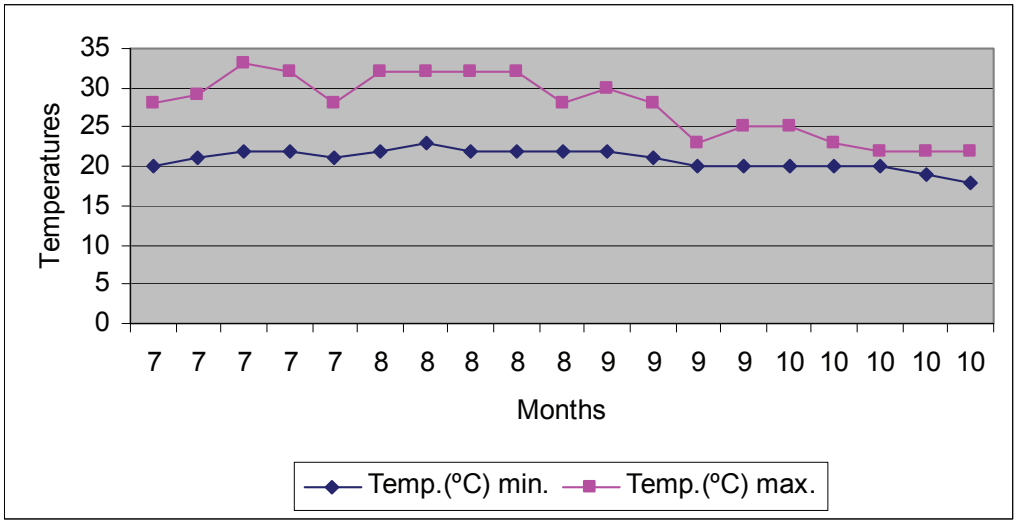
Graph 4. Diet (g) per day and diet (g) per egg at control (C) and experimental group (E) of hens

Control group during the experiment has spent on average of 116.15g concentrate per day. The most feed consumption was in the 53, 66 and 71 week of age, and the smallest in the 60, 61 and 62 week. Experimental group was spent an average of 116.30g mixture per day, which was slightly larger than the control. The most food consumption in this group was occurred in the 63 week and 66 week of age until the end of testing. In this period there was a slightly greater dispersal of food and increased appetite chickens that was received additional vitamin preparations in the drinking water. Before that said, there was an increased mortality caused of cooling ventilator defect and decreased of layers weight of which was intervened by adding vitamins. Feed consumption per laid egg, produced in the group C was average of 140.85g, while in a group E was 135.52g. Difference between two

groups was 5.33g (or almost 4% in relative values) lower feed consumption per egg in the experimental group, which used BioAktiv in their mixtures.

Temperatures

The summer temperatures in Republic of Macedonia are very high and regulary amounts above 30 degrees. Because of that, it is necessary to manage solid ventilation in farms and provide permanent flowing of fresh drinking water.

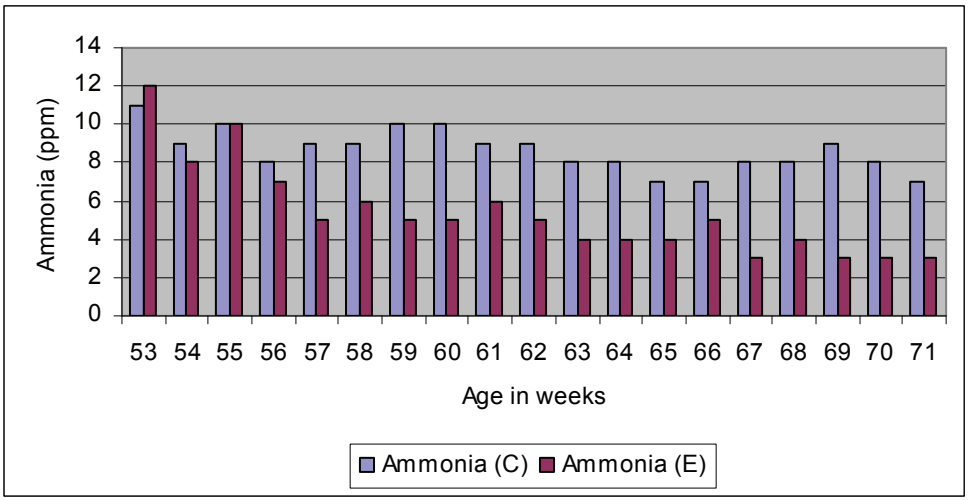


Graph 5. Minimal and maximal temperatures per months in the farms during the experiment

During the testing in the farms were monitored the highest and the lowest daily temperatures, which are shown in 5th graph. The average maximum temperature was 27.7 degrees (ranging from 22-32), while the average minimum temperature was 20.9 degrees (ranging from 18-23). The greatest temperatures were happened during July and August months.

Ammonia

One of the most important factors in this experiment was the amount of ammonia in the facilities where was kept the layers. The important of quantities of ammonia in easier breathing chickens, a good egg production, the fall of mortality and easier manipulation of the employeres in the buildings is a very well known.



Graph 6. Quantity of ammonia (ppm) in the farms at control (C) and experimental group (E) of hens

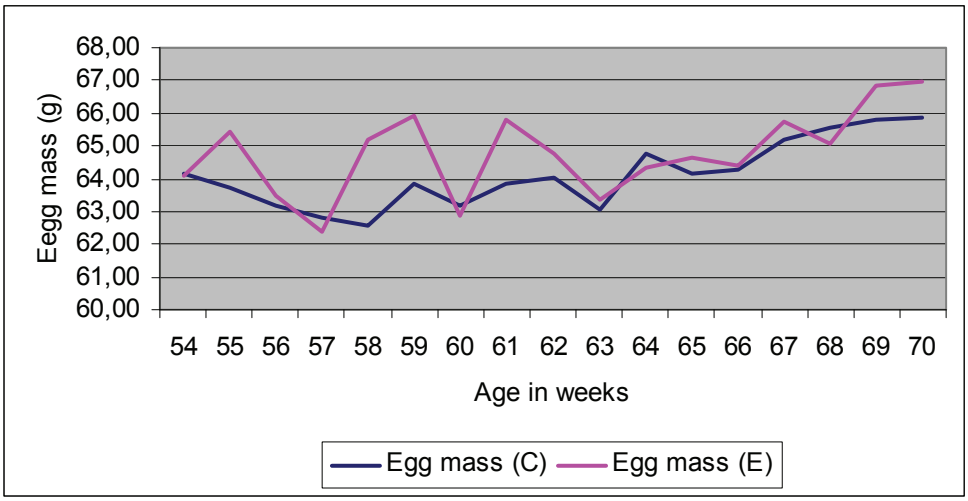
On the following graph (graph. 6) are presented the values of the quantity of ammonia in the stalls during the experiment. It show that in the experimental group of layers the amount of ammonia in average was 5.37 ppm, while in the control was much greater and amounted of average 8.63 ppm. Chart very clearly shows that layers, which are received BioAktiv powder measured amount of ammonia with a 10-12ppm in July, decreased to 4-6ppm in August and to the end of the experiment was maintained on a 3-4ppm. In contrast to it, in the control group amount of ammonia in the summer months was in the range of 9-11ppm while in the other months did not fallen under 7ppm. In the stall with control group of hens, although the ventilation was good, there was felt the smell of feces and ammonia especially in dead areas of object (where there is a little air circulation). In the stall where the birds used BioAktiv was not felt any smell of hens feces, there was no music, the air inside was pure and easily breathed. Outside the building whit the experimental group, was put out hens faeces without smell, ammonia, music and other contaminations, so that the environment was protected.

Egg parameters

Egg mass

In relation to the analysis of parameters examined eggs results are shown in Table 3. During the testing of four months in control and experimental group of hens were examined the following characteristics of quality of eggs: egg mass, egg

shape index, eggshell mass and thickness of eggshell. The eggs for testing were taken once a week at the same time and about the same place in the cages. The average mass of eggs in group C was 64.11g, while in group E was 64.78g and was greater for 0.67g expressed in absolute or about 1.04% higher in relative values.

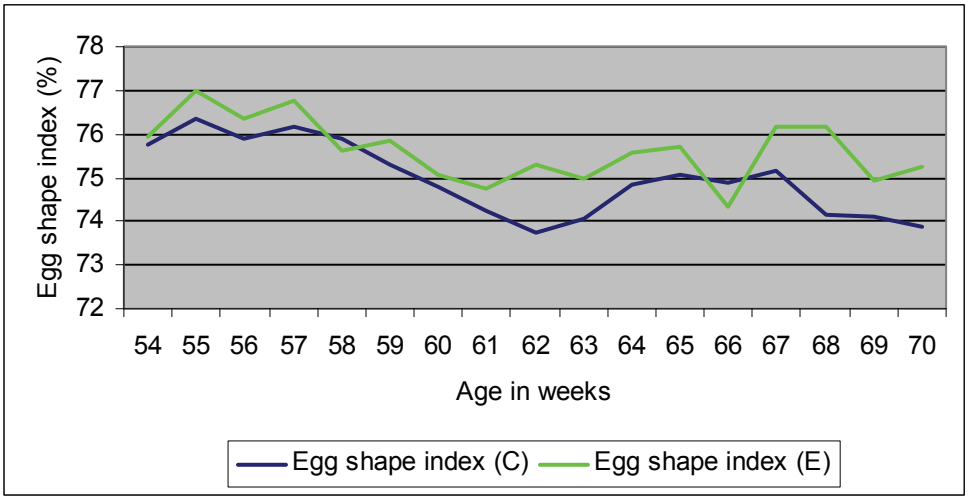


Graph 7. Egg mass at control (C) and experimental group (E) of hens during the experiment

Graphic presentation of results (graph.7) shows that in group E were came to nonlinearly increase in mass of eggs, especially in summer months, so mass of eggs in this period was in the range of 62.40 to 65.82 g, while in the control group was more uniform and have been gradually increased with the growing age of hens. In September and October the increase in the mass of eggs was normalized, therefore I think that the influence of high summer temperatures were crucial for the discontinuity in linearly increase of egg mass.

Egg shape index

The average egg shape index in the control group of hens was 74.95% as opposed to the experimental group that was 75.64%. Measuring of egg shape index is not required in such tests, because believed that food has no major influence in shaping the form of eggs. In this experiment, greater influence on the shape index of eggs had season and age factors, and less impact had nutrition or mixtures in addition of BioAktiv powder which was used of experimental group.

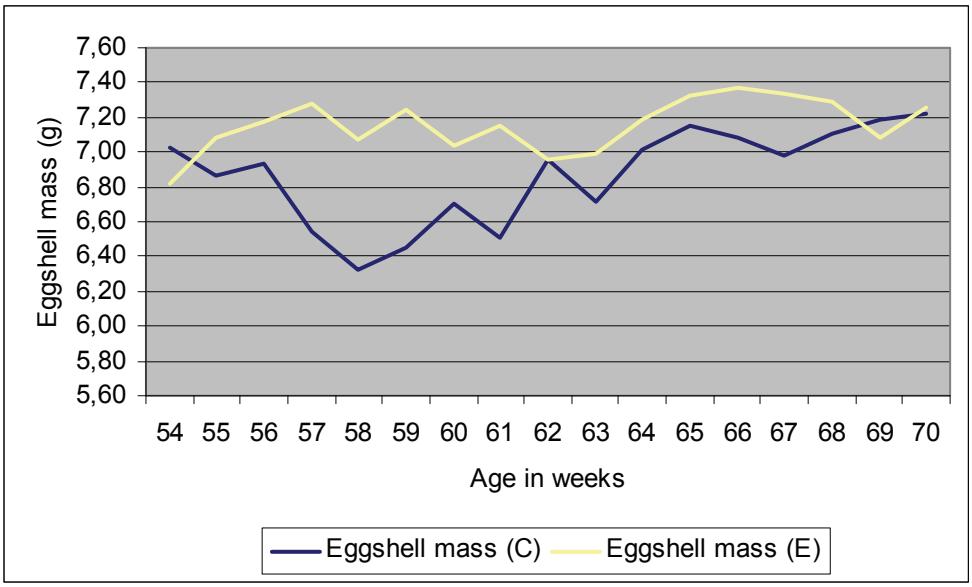


Graph 8. Egg shape index at control (C) and experimental group (E) of hens during the experiment

Chart (graph.8) shows that in both groups mainly in the summer months had a higher index of egg shape, which indicates that the majority of eggs had more round shape of eggs, which is common for this period of the year. In September and October by change of season and age of birds have gotten eggs with lower egg shape index values. that were indicated on fact that the majority of eggs had more oval form. The group of layers which was used Bioktiv had something higher shape index form in the whole, what was indicated to have eggs with more round shape.

Eggshell mass

Egg shell mass is one of the most important factor in evaluating the quality of shell. Average eggshell mass in C group was 6.87g while in group E was 7.16 g. The difference in weight between examined groups was 0.29 g in absolute or 4.22% in relative values of eggs in favor of experimental group.

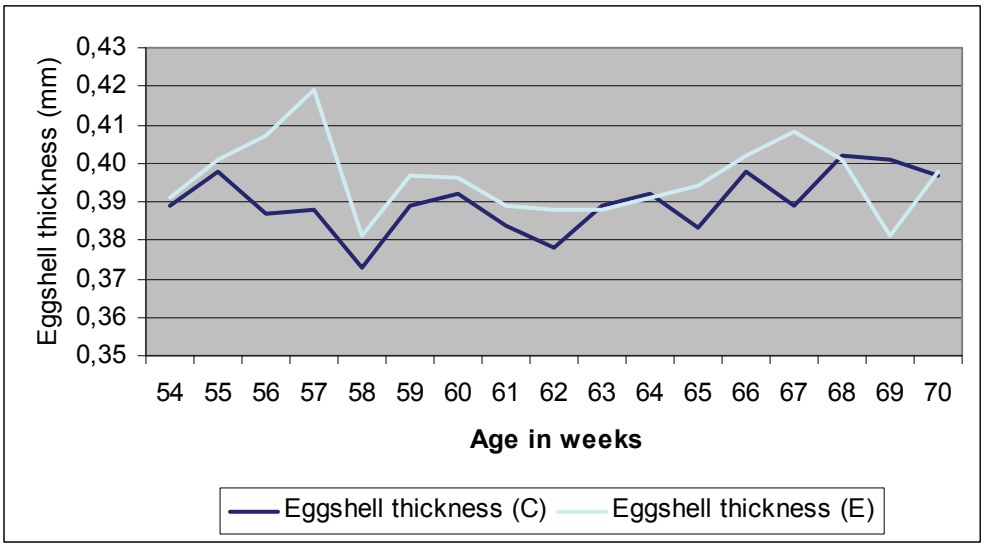


Graph 9. Eggshell mass at control (C) and experimental (E) group of hens during the experiment

Eggshell mass (graph.9) in a group C had a trend of decline in July and August, what is usually for that period of the year because layers insufficient used the calcium carbonate in the hot summer days (reduction of appetite, panting of hens, and the lack of calcium in the meals). However, the group E in the same period gained the eggshell, whose mass was not declined, but the contrary was same or was on higher level in comparison to the control group. The effect of high temperature on the eggshell mass in the experimental group of hens was not registered, so the production eggs have not been lost on the weight shell scales. It can be note that the use of BioAktiv in months with high temperatures can prevent decrease in egg mass shell with great certainty.

Eggshell thickness

Factor egg shell thickness is one of the most important in evaluating the quality of shell eggs. The average thickness of shell eggs in the control group was 0.390 mm, while in the experimental group was slightly greater (0.396 mm).



Graph 10. Eggshell thickness at control (C) and experimental group (E) of hens during the experiment

Graph 10 has shown the values of shell thickness at control and experimental groups of hens in the period of 4 months and the age of 54 to 70 weeks. In the experimental group where was used BioAktiv powder, there was a very thick shell increase to after a month came to the very decline and increase again, but something smaller. It is the possibility of the influence of high temperature, as well as the influence of defects of ventilators that was occurred in the same period. The importance of good ventilation facility and highly balanced food, especially in the summer months is unavoidable, so that every problem in this regard leads to decreased quality of egg shell.

4. CONCLUSIONS

After the end of testing and analysis of the results can be to get to the following conclusions:

- Cumulative mortality of chickens in experimental group was 4,01% and was for 2,11% in absolute or 52% in relative values lower than the mortality in control group (6,12%).
- The percentage of egg production in analyses was calculated on average number of hens and was 85,59% in experimental group and 82,14% at control group. Better egg production of group that used BioAktiv powder was more than 4% expressed in relative value.

- The percentage of broken eggs in a group C (control) was an average of 1,72% a week, while in a group E (experimental) was 1,02% average a week in the same period of testing. In the summer months usually come to increase the number of broken eggs, but in this case in the experimental group, which was used this nature preparation, there was a reduction of the number of broken eggs for almost 41% in relative values.
- Control group during the experiment has spent on average by 116,15g concentrate per day, while experimental group was spent an average of 116,30g mixture per day, which was slightly larger than the control. Feed consumption per laid egg, produced in the group C was average 140,85g, while in a group E was 135,52g. Difference between two groups was 5,33g (or almost 4% in relative values) lower feed consumption per egg in the experimental group, which was used BioAktiv in their mixtures.
- The average maximum temperature was 27,7 degrees (ranging from 22-32), while the average minimum temperature was 20,9 degrees (ranging from 18-23). The highest temperatures were happened during July and August month.
- In the experimental group of layers the amount of ammonia in the average was 5,37 ppm, while in the control was much greater and was amounted to 8,63 ppm. In the stall where the birds used BioAktiv was not felt any smell of hens feces, there was no music, the air inside was pure and easily breathed.
- The average mass of eggs in control group was 64,11g, while in experimental group was 64,78g and was greater for 0,67g expressed in absolute or about 1,04% higher in relative values.
- The average egg shape index in the control group of hens was 74,95% as opposed to the experimental group that was 75,64%. The group of layers which was used BioAktiv had something higher shape index form in the whole, what was indicated to have eggs with more round shape.

- Average eggshell mass in C group was 6,87g, while in group E was 7,16 g. The difference in weight between examined groups was 0,29 g in absolute or 4,22% in relative values of eggs in favor of experimental group. It can be note that the use of BioAktiv in months with high temperatures can prevent decrease in egg mass shell with great certainty.
- The average thickness of shell eggs in the control group was 0,390 mm, while in the experimental group that used BioAktiv powder was slightly greater (0,396 mm). The importance of good ventilation facility and highly balanced food, especially in the summer months is unavoidable, so that every problem in this regard leads to decreased quality of egg shell.
- As the last it can be concluded that the use of BioAktiv in the mixtures of layers in analysis of the production parameters had the greatest influence on the mortality of birds, on the percentage of broken eggs and on the quantity of ammonia in the stalls, while the less affected in egg production and food consumption per day and per egg. In relation to the egg parameters BioAktiv powder had biggest influence in the testing of eggshell mass, while slightly less impact had in the testing of egg mass and eggshell thickness.

5. USERS OF THE RESULTS

The results from the research shall use the following users: BioAktiv production firm from Germany primary, the Ministry of ecology and physical and regional planning, Ministry of agriculture, forestry and water-supply, Poultry group at the Economy Chamber, Macedonian farmer federation, academic public and all interested parties and individuals.

The results from the carried researches after their processing shall be recorded in a form of final report where there would be the following chapters: introduction, material and methods, results and discussion, conclusions and recommendations. The extract from that report shall be processed in order to be used in broad practice, and in case of a need, the results can be printed like a brochure for the users of the gained results

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Table 1. Analysis of production parameters (mortality and egg production) at control and experimental group of hens (weekly) during the experiment
Control group without BioAktiv = blue
Experimental group with BioAktiv = black

Duration the exp.	Date of using the BioAktiv		Hen's age (weeks)	Mortality (number)	Mortality (%) cum.	Mortality (number)	Mortality (%) cum.	Hens number	Hens number	Egg number	Egg production (%)	Egg number	Egg production (%)
01-02.07.2008			53	3	0,23	0	0	1264	1258	2193	86,68	2226	88,47
03-09.07.2008			54	5	0,62	4	0,32	1259	1254	7675	86,88	7650	87,37
10-16.07.2008	from 12.07.2008	bioaktiv	55	3	0,86	2	0,48	1254	1252	7552	85,86	7536	85,92
17-23.07.2008		bioaktiv	56	5	1,26	4	0,80	1248	1248	7476	85,37	7642	85,28
24-30.07.2008		bioaktiv	57	5	1,66	1	0,88	1242	1247	7467	85,68	7565	86,63
31-06.08.2008		bioaktiv	58	4	1,98	4	1,20	1238	1243	7326	84,30	7697	88,32
07-13.08.2008		bioaktiv	59	6	2,46	3	1,44	1229	1240	7245	83,91	7404	85,20
14-20.08.2008		bioaktiv	60	7	3,03	11	2,33	1222	1229	7146	83,30	7150	82,74
21-27.08.2008		bioaktiv	61	5	3,43	4	2,65	1215	1225	7056	82,72	7116	82,85
28-03.09.2008		bioaktiv	62	6	3,92	2	2,81	1209	1223	7021	82,13	7128	83,19
04-10.09.2008		bioaktiv	63	3	4,16	2	2,97	1204	1221	6892	81,60	7385	86,33
11-17.09.2008		bioaktiv	64	5	4,56	3	3,21	1199	1218	6466	76,88	6724	78,77
18-24.09.2008		bioaktiv	65	3	4,80	4	3,53	1193	1214	6585	78,65	7186	84,42
25-01.10.2008		bioaktiv	66	4	5,12	1	3,61	1189	1213	6757	81,05	7478	88,03
02-08.10.2008		bioaktiv	67	2	5,29	3	3,85	1184	1210	6702	80,69	7470	88,08
09-15.10.2008		bioaktiv	68	3	5,53	0	3,85	1181	1210	6724	81,23	7712	90,10
16-22.10.2008		bioaktiv	69	4	5,85	0	3,85	1177	1210	6530	79,13	7230	86,30
23-29.10.2008		bioaktiv	70	2	6,02	2	4,01	1173	1208	6428	78,15	7361	86,97
30-31.10.2008	until 31.10.2008	bioaktiv	71	1	6,12	0	4,01	1171	1208	1793	76,49	1965	81,33
				76 total	6,12 total	50 total	4,01 total	1213 (aver.)	1228 (aver.)	123034 total	82,14 (average)	129625 total	85,59 (average)

Table 2. Analysis of production parameters (broken egg, diet weekly and daily per hen, diet per egg, ammonia and temperatures) at control and experimental group
Control group without BioAktiv = blue
Experimental group with BioAktiv = black

Hen's age (weeks)	Broken eggs	Broken eggs (%)	Broken eggs	Broken eggs (%)	Diet week (kg)	Diet week (kg)	Diet day (g)	Diet day (g)	Diet egg (g)	Diet egg (g)	Ammonia (ppm)	Ammonia (ppm)	Temp.(ºC) minimum	Temp.(ºC) maximum
53	55	2,50	48	2,15	310	300	122,62	119,24	141,36	134,50	11	12	20	28
54	138	1,80	133	1,73	1050	1020	118,90	116,38	136,81	133,14	9	8	21	29
55	132	1,75	101	1,34	1050	990	119,38	113,05	139,04	131,43	10	10	22	33
56	128	1,71	86	1,12	1000	990	114,19	113,23	133,76	132,71	8	7	22	32
57	116	1,55	63	0,83	980	970	115,23	111,00	131,24	128,14	9	5	21	28
58	121	1,65	45	0,58	980	996	112,90	114,47	133,77	129,00	9	6	22	32
59	133	1,83	42	0,56	980	945	113,50	108,83	135,26	127,14	10	5	23	32
60	106	1,48	54	0,75	950	938	110,74	109,25	132,94	131,14	10	5	22	32
61	92	1,30	43	0,60	950	938	111,38	109,39	134,64	131,29	9	6	22	32
62	112	1,59	46	0,64	950	980	111,97	114,38	135,31	134,29	9	5	22	28
63	132	1,91	52	0,70	980	1040	116,04	121,58	142,19	140,57	8	4	22	30
64	156	2,41	124	1,84	980	950	116,52	111,38	151,56	139,29	8	4	21	28
65	103	1,56	72	1.00	1000	1000	119,44	117,67	151,86	138,86	7	4	20	23
66	121	1,79	68	0,91	1000	1040	119,95	122,33	147,99	137,71	7	5	20	25
67	112	1,67	66	0,88	980	1020	117,99	120,37	146,22	136,57	8	3	20	25
68	118	1,75	77	1,00	980	1050	118,39	123,76	145,75	135,71	8	4	20	23
69	103	1,57	76	1,05	980	1050	118,74	124,06	150,07	144,86	9	3	20	22
70	98	1,52	100	1,34	950	1050	115,50	124,27	147,79	142,14	8	3	19	22
71	38	2,11	26	1,32	280	300	119,45	124,17	156,16	152,00	7	3	18	22
	2114 total	1,72 average	1322 total	1,02 average	17330 total	17567 total	116,15 average	116,30 average	140,85 average	135,52 average	8,63 average	5,37 average	20,9 average	27,7 average

Table 3. Analysis of egg parameters (egg mass, egg shape index, eggshell mass, eggshell thickness) at control and experimental group during the experiment
Control group without BioAktiv = blue
Experimental group with BioAktiv = black

	Date of analysis	Hen's age (weeks)	Egg mass (g)	Egg mass (g)	Egg shape index (%)	Egg shape index (%)	Eggshell mass (g)	Eggshell mass (g)	Eggshell thickness (mm)	Eggshell thickness (mm)
no bioaktiv	09.07.2008	54	64,13	64,08	75,77	75,96	7,03	6,82	0,389	0,391
bioaktiv	17.07.2008	55	63,73	65,45	76,34	77,00	6,87	7,08	0,398	0,401
bioaktiv	23.07.2008	56	63,15	63,48	75,88	76,37	6,93	7,18	0,387	0,407
bioaktiv	31.07.2008	57	62,82	62,40	76,15	76,76	6,54	7,28	0,388	0,419
bioaktiv	07.08.2008	58	62,59	65,19	75,91	75,63	6,32	7,07	0,373	0,381
bioaktiv	14.08.2008	59	63,84	65,91	75,28	75,87	6,45	7,24	0,389	0,397
bioaktiv	21.08.2008	60	63,15	62,86	74,78	75,09	6,70	7,04	0,392	0,396
bioaktiv	28.08.2008	61	63,83	65,82	74,25	74,75	6,51	7,15	0,384	0,389
bioaktiv	04.09.2008	62	64,05	64,77	73,76	75,28	6,96	6,96	0,378	0,388
bioaktiv	11.09.2008	63	63,08	63,37	74,04	74,96	6,71	6,99	0,389	0,388
bioaktiv	18.09.2008	64	64,75	64,35	74,86	75,55	7,01	7,19	0,392	0,391
bioaktiv	25.09.2008	65	64,18	64,63	75,06	75,70	7,15	7,32	0,383	0,394
bioaktiv	02.10.2008	66	64,28	64,39	74,89	74,35	7,08	7,37	0,398	0,402
bioaktiv	09.10.2008	67	65,19	65,72	75,16	76,19	6,98	7,34	0,389	0,408
bioaktiv	16.10.2008	68	65,55	65,07	74,13	76,16	7,11	7,29	0,402	0,401
bioaktiv	22.10.2008	69	65,78	66,86	74,09	74,94	7,19	7,08	0,401	0,381
bioaktiv	29.10.2008	70	65,85	66,95	73,88	75,25	7,22	7,25	0,397	0,398
		Average:	64,11	64,78	74,95	75,64	6,87	7,16	0,390	0,396