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Comparative Evaluation of the Egg Production Performance Indicators of Hy-Line Hybrid Kept in Traditional Cage System versus the Enriched Cages One

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Abstract:

In this paper the performance indicators outlined in two poultry cage systems, were studied. For this purpose, in a poultry farm have been monitored for 20-56 week period two batches of birds housed in two different caging systems: control group was housed in a conventional battery cages and experimental group in enriched cages. Chickens in two herds were hybrid Hy-Line W 98, the same age and it was used the same amount and structure of the ration. They were recorded continuously egg production, egg weight, mortality, food consumption and food was estimated FCR (Feed Conversion Rate). At the end of the study it was showed that the use of different cage system showed no impact on production performance of eggs and egg weight. Layers reared in conventional cages manifested a higher egg laying than the experiment and that the standard of the hybrid. As a result of greater density than the rate allowed in the two groups mortality was observed higher than the standard (the control group 3,04% more and

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the experiment group 4.78% more). The control group has saved 2,48g more feed for egg, or 2% compared with that of the experiment. There were no significant differences (P≤0.05) between the groups regarding the feed utilization. In both groups have achieved good results in the performance indicators. It leaves much to be desired but the use of feed for eggs, egg mass per kg, or as kg eggs are obtained from 1 kg of feed utilization compared to standard hybrid. This will certainly lead to increased cost of egg produced.

Key words: Conventional cages, layer, furnished cages, performance

INTRODUCTION

The poultry housing for egg production in conventional cages is a common practice of chicken farms in Albania, based on the experience of other countries (Rouf, G. 2001, WSPA, 2007; Pickett, H. 2007; LayWel, 2006).

In many European countries and in other advanced countries, there has been much debate about changing the poultry holding in conventional cages (Roll V.F.B et al, 2008; Defra Research Project AW0235, 2005-2008).

Requests for change of cages of layer hen housing, is not the only improvement of the poultry living conditions (Baxter MR. 1994; Scientific Veterinary Committee. 1996; Department for Environmental Food and Rural Affairs, 2002; Hunton, P, 2002), but also improving egg quality produced by them and the sensitivity of citizens for eggs income from free range chicken or subject to conditions and their well-being (Van Horne PLM and N. Bond 2003; European Commission. 2004; the Poultry Site, 2009).

Several authors suggest layer hen housing in large areas, to be free with unrestricted movement (M. Jendral 2005, McDonald's Europe, 2008; CIWF, 2009; Sainsbury's, 2010). In European countries there have been used, for poultry farms for

egg production the enriched cages and non-traditional ones for years (Van Emous, R. 2003; Appleby MC. 2003).

Space in enriched cages is 688.6 cm^2 of cage area per hen in comparison with 450 cm^2 which is in traditional cages (Commercial Management Guide Hy-line W-98 from 2008 to 2010; Hy-Line W-98 Performance standarts manual, 2011).

In our country currently we have only one farm that has implemented the keeping poultry for egg production in enriched cages.

The purpose of this study is to assess the breeding of poultry cages performance indicators in both systems, ie with traditional battery cages system (the control group) and battery system with enriched cages (the experimental group).

MATERIAL AND METHOD

They were monitored and compared the production indicators for chickens kept in two different systems with battery cages (five storey): with traditional cages and enriched cages. Chickens who underwent monitoring during 20-56 weeks were hybrid egg Hy-Line W-98 and of the same age. Hens kept in conventional cages we called the control group (since this is the practice of housing poultry at the farm), while chickens kept in enriched cages called the experiment group (as the new technology of keeping poultry). In both premises were used same feed ration structure. Feed was prepared in the own factory farm.

Every day, in both premises were enrolled quantity of feed consumed per hen. Also registered egg production, egg weight, mortality etc. In monitoring the conclusion it was constructed fertility curve for each batch and made comparisons with standards of hybrid Hy-Line not only for fertility, but also for other indicators that were monitored (Hy-Line W-98. Performance standarts manual, 2011).

Indicators that were recorded and monitored:

1. Mortality (%). Every day injuries were reported, which were reflected in the graph.
2. The daily production, weekly egg and productivity for each group (in grains).
3. Egg production (%). For each day and week were estimated egg production for each group.
4. Egg weight for each group. Egg weight was monitored every day and week.
5. Food consumption per hen (kg).
6. Calculation of Feed Conversion Ratio (FCR) for eggs produced, per kg egg mass.
7. Daily recording of temperature, humidity
8. Lighting mode and the intensity of illumination

We monitored density of animals per cage on two premises.
The experimental data were subjected to statistical processing method ANOVA single factor that descriptive analysis and for comparisons was used tTest.

RESULTS AND THEIR DISCUSSION

In table 1 are presented the performance indicators for the monitoring period as follows:

Table 1. Performance Indicators for the period of 20-56 weeks

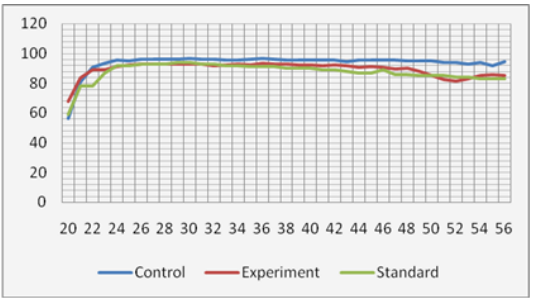
The Indicators	Control group	Experimental group	The Standards
Hen housed eggs per week	6.30±0.83	6.18±0.51	6.20±0.50
Hen housed eggs for the period 20-56 weeks	229.39	223.78	227.1
Egg laying (%)	93.82±6.86	89.46±5.12	87.54±6.41
The average egg weight (g)	62.54±4.25	62.01±4.62	60.45±4.37
Egg mass (kg)	14.35	13.88	13.73
Mortality (%)	5.94	7.68	2.9

Hen housed eggs per week

The average egg production per week in the experiment group was 1.9% lower (or 0.12 eggs / chicken / week less) than in the control group. The differences are statistically non significant for $p \leq 0.05$ (tStat = 0.88 and tCrit = 1.69). But the production yield for the period 20-56 weeks is 2.45%, or 5.61 more eggs in the control group compared with the experiment. If we compare with the standard hybrid for the period 20-56 weeks, we see that the control group has exceeded the values with 2.29 eggs / chicken, and the experiment group would have to produce 3.32 eggs / chicken to reach the standard values.

Hen housed eggs for the period 20-56 weeks and egg laying (%)

From the data that we highlight the beginning of egg production of both groups is achieved at 19 weeks (about 20% of production). The supremacy of the control group chickens to experiment (tCrit = 1.67 and tStat = 3.10) and standard (tStat = 4.06) to the percentage of fertility was confirmed after calculating tTest. But the experiment group has a slight advantage over standard but the difference is not statistically verified.



Graph No. 1 Egg laying (%) curve for the period 20-56 weeks

From the graph it is clear that, during the period under study, the control group reached the highest value in egg production,

that the experiment group and higher than the standard of its hybrid.

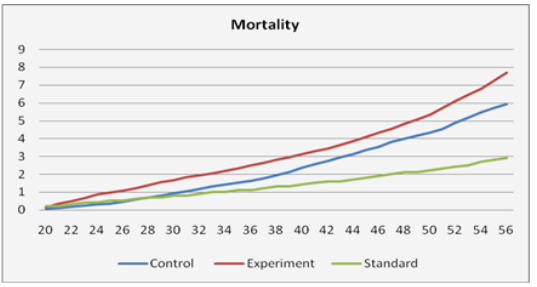
The average egg weight and egg mass (kg)

The table evidenced control group superiority to standard hybrid (2.09g, or 3.34 %), and compared with experimental differences are not significant (0.53g, or 0.85% more). Although the whole period of using the weight of the egg experiment group is greater than the standard (1.56g, or 2.5%), the value differences are not significant ($p \leq 0.05$).

For the study period, we calculated the egg mass as a product of production yield with an average weight of eggs. Table 2 shows that the control group has produced 0.47 kg more eggs than the experiment (or 3.3%) and 0.62 kg egg mass rather than standard (or 4.3%). But the superiority of the experimental group is non significant to the standard (0.15kg, or 1.1%).

The poultry mortality during the period (20-56 weeks)

In the graph no. 2 it is provided the percentage of mortality in the two groups of chickens. The mortality in the two groups of chickens has been higher than the standard hybrid. Although that in the control group in the first weeks the mortality were lower than the standard, starting from week 29 these mortality were gradually increased until the end of production reached a mortality rate almost twice than the standard (3.04% more). Regarding the mortality in the experiment group, were higher than the control as well as the standard hybrid values respectively 1.74% and 4.78% more.



Graph nr 2. The poultry mortality during the period (20-56 weeks)

The higher mortality we think comes as a result of greater density than the rate in both groups. Thus, a chicken in the experimental group (in enriched cages) is provided 441.7cm^2, while should be 688.6cm^2 / chicken. While in the control group where drums are installed with traditional cages FACCO's, which have 2250 cm^2 surface, it is provided 321.4 cm^2 / chicken, while providing needed 450 cm^2 / hen. In the case of conventional cages are held seven heads / cage (cages are estimated to hold 5 heads). In the case of enriched cages (equipment from Big Dutchman) should be maintained maximum 68 heads / cage. In fact they held 106 heads / cage, or 38 more heads than the allowed rate of 35.8% or more / cage.

As we know, the enriched cages are one of the acceptable alternatives to the EU countries, starting from January 2013 (Van Emous, R. 2003; Appleby MC. 2003).

In our country there is only one egg production for consumption that is equipped with a battery of this type. Inside the cage of chickens there are provided some important structural elements to achieve a certain degree of their comfort: The nests, layer (carpet), steps, water dishes and food needed by the number of heads and on all the necessary space. But as has been done in this case? In both cases (control and experiment) more heads than the allowed rate are being kept, which impacted negatively on their well-being and health status, leading to result in unforeseen damage. The results of

this monitoring can be proved by other studies (Appleby MC et al, 1991; Flock KC, KF Laughlin, J. Bentley and 2005).

Feed consumption (g)

The following table, shows the consumption of feed and feed conversion ratio/ egg and egg mass (kg)

Table 3. Feed consumption and conversion indicators according to groups

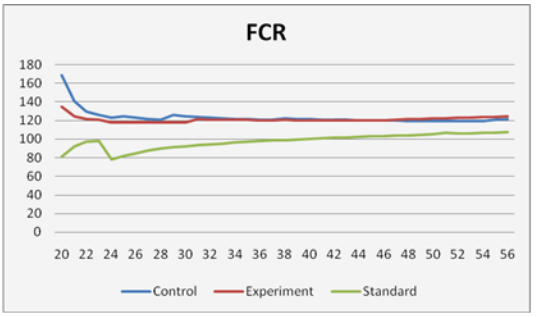
Treguesit	Control group	Experimental group	The Standards
The average daily rate of feed (g)	109.65±3.27	109.65±3.27	97.14±3.56
FCR Kg feed / per egg	121.59	124.07	107.94
FCR kg feed / kg egg mass	1.98	*2.04*	*1.79*
Feed utilization, kg eggs/ kg feed	0.51	*0.49*	*0.56*

For both groups are consumed more feed for hen, compared to the standard. In each group there is feed consumed 13.53% more than the standard hybrid.

Because in two poultry premises on which it is monitoring, the concentration of the number of heads has been higher than the norm, it is practiced to feed several times during the day, as the front of food for chicken has been insufficient and there are suggested from enough authors (Defra Research Project 2000-2004 AW0226).

According the standard rules, we need 10.8 cm linear feed front / chicken and should ensure a water container nipple tip to 8.5 chickens. In fact, for the feed it is provided a front of 6.9 cm / chicken and is provided one water container nipples / 12.5 chickens. So, the farm is given a higher amount of feed than the daily rates specified in the standard. The same is done with water by increasing the pressure.

The progress of Feed Conversion Ratio can be introduced graphically in the graph nr. 3



Graph 3. The progress of Feed Conversion Ratio

Regarding the Feed Conversion Ratio (FCR)/egg, at the end of monitoring process, the conclusion is noted that both groups used more feed to produce one egg, compared to the standard hybrid. This has come as a result of the greater amount of feed consumed per hen in both groups. Although the control group saving 2.48g fee per egg, or 2% compared with that of the experiment, it is still inferior to the standard, because it has used 13.65g more feed or 11:23%. The experiment group has used 16.13g more feed, or 13%.

An important indicator is the reward of feed / kg egg mass, which is calculated as follows:

$$\frac{\text{The amount of feed consumed per hen}}{\text{Mass of eggs}}$$

As we can see in Table 3, both groups used more feed per kg egg mass in comparison with the standard. For the control group was used 0.19kg, or 9.6% more than the standard, while the experimental group used 0.25kg or 12.25% more than standard. The difference between the two groups is small, 0.06 kg or 2.9%. Likewise, we can analyze how eggs are produced from 1 kg feed consumed. In the control group they were produced 50g less (or 8.9%) egg from 1 kg of feed, while in the experiment were produced fewer eggs 70g (or 12.5%) from 1 kg of feed compared with the standard.

Although they have achieved good results in terms of performance indicators, leaves much to be desired use of feed for egg, per kg egg mass, or how many kg eggs are obtained from 1 kg of feed used. This will certainly lead to increased costs of producing an egg.

CONCLUSIONS

- Cage design in this study did not affect the hen housed eggs.
- The chickens housed in conventional cages manifested a higher egg production than those housed in enriched cages, and even higher than the standard hybrid.
- The chickens in the control group, produced eggs with greater weight than the standard hybrid (2.09g, or 3.34 %), but compared with experimental group the differences are not statistically significant (0.53g, or 0.85% more).
- The control group has produced 0.47kg egg mass rather than experiment (or 3.3%) and 0.62 kg egg mass rather than standard (or 4.3%).
- The Percentage of the mortality at the end of monitoring proccess, resulted higher in both groups compared with the standard hybrid. In the control group reached a mortality rate almost twice from the standard hybrid (3.04% more), while that of 4.78% above the experiment. Higher mortality has been as a result of greater density than the normal in both groups.
- Both groups have used more feed for an egg grain produced and more feed per 1 kg egg mass compared to the standard hybrid. This has come as a result of the greater amount of feed consumed per hen in both groups (13.53% more). In the control group they were produced 50g less (or 8.9%) egg with 1 kg of feed, while in the experiment were produced fewer eggs 70g (or 12.5%)

with 1 kg of feed compared with the standard. Although they have achieved good results in terms of performance indicators, leaves much to be desired use of feed for egg, per kg egg mass, or how many kg eggs are obtained from 1 kg of feed used. This will certainly lead to increased costs of producing an egg.

REFERENCES

1. Commercial management guide Hy-line W-98, 2008-2010.
2. Hy-Line W-98. Performance standarts manual, 2011.
3. Defra Research Project AW0226 – Effects of stocking density, cage height on health, behavior, physiology and production of laying hens in enriched cages. 2000-2004 (http://randd.defra.gov.uk)
4. Defra Research Project AW0235 – A study to compare the health and welfare of laying hens in different types of enriched cage. 2005-2008 (http://randd.defra.gov.uk)
5. Farm Animal Welfare Council (1997). Report on the Welfare of Laying Hens (www.fawc.org.uk)
6. WSPA. 2007. World Society for the Protection of Animals. International Farm Animal Survey. Conducted by Ipsos MORI in November, 2007.
7. Pickett, H. 2007. Alternatives to the Barren Battery Cage For the Housing of Laying Hens in the European Union. Compassion in World Farming (CIËF). http://www.ciwf.org.uk/includes/documents/cm_docs/2008/a/alternatives_to_the_barren_battery_cage_in_the_eu.pdf. Accessed January 25, 2010.
8. LayWel. 2006. Welfare implications of changes in production systems for laying hens. 2005.

http://www.laywel.eu/web/pdf/deliverable%2062.pdf. Accessed January 25, 2010.

9. Roll V.F.B et al, Ethological parameters and performance of Hy Line W-98 and ISA Brown hens when housed in furnished cages. V.F.B. Roll; G.A.M. Levrino; R.C. Briz; T. Buil. Arq. Bras. Med. Vet. Zootec. vol.60 no.3 Belo Horizonte June 2008
10. Baxter MR. 1994. The welfare problems of laying hens in battery cages. The Veterinary Record 134(24):614-9.
11. Department for Environmental Food and Rural Affairs. Code of Recommendations for the Welfare of Livestock: Laying Hens. 2002. Available at: http://www.defra.gov.uk/foodfarm/farmanimal/welfare/onfarm/documents/layerscode.pdf. Accessed April 10, 2010.
12. Sainsbury's. 2010. Eggs from cage-free hens. http://www.sainsburys.co.uk/food/foodandfeatures/safety_quality/articles/cage-free_hens-eggs.htm. Accessed January 25, 2010.
13. McDonald's Europe. 2008. McDonald's Europe receives _Good Egg' award from Compassion in World Farming as a result of its action on _cage-free eggs'. Press release issued April 16. http://www.mcdpressoffice.eu/downloads/pr/Good%20Egg_press_release.pdf. Accessed April 14, 2010.
14. CIWF. 2009. One billion eggs now from cage-free hens as leading UK companies win 2009 good egg awards. Press release issued May 14. http://www.ciwf.org.uk/includes/documents/cm_docs/2009/n/nr4708.pdf. Accessed April 14, 2010.
15. The Poultry Site. 2009. UK Supermarkets Halfway to Ending Cage Egg Sales. April 30. http://www.thepoultrysite.com/poultrynews/17639/uk-

supermarkets-halfway-to-ending-cage-egg-sales. Accessed January 25, 2010.

16. Rouf, G. 2001. Performance of egg laying pullets on littered floor and in cages. MS in Poultry Science Thesis, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh.
17. Van Emous, R. 2003. From cages to alternative systems. World Poultry. 19(6): 24-27
18. European Commission. 2004. Study on the socio-economic implications of the various systems to keep laying hens. Submitted by Agra CEAS Consulting. http://ec.europa.eu/food/animal/welfare/farm/socio_economic_study_en.pdf: p.45. Accessed January 25, 2010.
19. Jendral M. 2005. Alternative Layer Hen Housing Systems in Europe: Executive Summary. Report prepared for Alberta Egg Producers and Alberta Farm Animal Care Association. http://www.afac.ab.ca/reports/exechenhousing.pdf. Accessed January 7, 2010.
20. Scientific Veterinary Committee. 1996. Animal Welfare Section. Report on the Welfare of Laying Hens. For the European Commission; Doc VI/B/II.2. http://ec.europa.eu/food/fs/sc/oldcomm4/out33_en.pdf. Accessed January 25, 2010.
21. Van Horne PLM and Bondt N. 2003. Impact of EU Council Directive 99/74/EC ―welfare of laying hens‖ on the competitiveness of the EU egg industry. The Hague: Agricultural Economics Research Institute (LEI), p.25.
22. Appleby MC. 2003. The European Union Ban on Conventional Cages for Laying Hens: History and Prospects. Journal of Applied Animal Welfare Science 6(2):103-21.

23. HUNTON, P. Welfare regulations and their effects on breeding and genetics in laying hens. *World Poult.*, v.18, p.20-21, 2002.
24. Appleby MC and Hughes BO. 1991. Welfare of laying hens in cages and alternative systems: environmental, physical and behavioural aspects. World's Poultry Science Journal 47(2):109-28.
25. Flock DK, Laughlin KF, and Bentley J. 2005. Minimizing losses in poultry breeding and production: how breeding companies contribute to poultry welfare. World's Poultry Science Journal 61(2):227-37