

STUDIES ON THE WELFARE CONDITION PROVIDED TO LAYING HENS WITHIN ALTERNATIVE HUSBANDRY SYSTEMS

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Abstract

The researches focused on the assessment of welfare condition (health status and biochemical blood parameters) provided to hens within certain husbandry systems. The investigations were carried on 4698 "Hisex Brown" laying hens, allocated in 5 groups which differed through rearing technology (Lc: B.P.-3 classic battery, 500 cm²/hen; Lexp-1: B.P.-3 battery with enlarged cages, 1000 cm²/hen; Lexp-2: B.P.-3 battery without wired front panels, freedom of movement across the entire hall; Lexp-3: deep litter husbandry, 0.167 m²/hen; Lexp-4: deep litter husbandry, hall opened to outer paddock, 0.133 m²/hen). Flock casualties were negatively correlated to accommodation space, reaching 12.08% in hens accommodated in standard battery (Lc group), compared to just 8.08% in those reared in "free range" system. Although they received the smallest husbandry area, the hens in Lc group achieved best eggs yield, whereas lower blood serum levels for cholesterol (9.99-37.49% less), triglycerides (0.96-3.17% less), calcium (8.45-35.9% less) and phosphorus (18.62-36.16% less), compared to the levels found in other groups hens. The study concluded that the alternative husbandry systems comply the fowl welfare wish, providing them freedom of movement and elements from the natural environment, while they do not generate satisfactory productive responses.

Key words: hen, husbandry, alternative, health, welfare

INTRODUCTION

Animal welfare regulations have required the application of new principles in poultry, affecting especially the production of table eggs, which is prohibited to be achieved in battery cages, in closed halls [6].

For this reason, the alternative systems have been implemented in practice, which includes technical concepts and certain specific elements of the natural habitat of birds in the idea of ensuring the welfare condition [5].

Although various technological equipments were designed and put into practice of laying hens rearing, the results obtained under production conditions were not sufficiently conclusive [2], in this respect, it was found that productive [1] and behavioural [3] responses of birds varied within very wide limits, especially for problems of veterinary supervision of flocks [4].

The paper presents results on the adaptability of "Hisex Brown" laying hens hybrid to the conditions provided by different farming systems, the assessment being made

on fowl health status and on the levels of blood key biochemical indicators.

MATERIAL AND METHOD

The biological material comprised 4698 laying hens, "Hisex Brown" commercial hybrid, allocated to 5 experimental groups, as related to the rearing technological system:

- Lc group: superintensive husbandry, environment controlled hall, endorsed with conventional B.P.-3 battery; brooding was done at 4 hens/cage of 2000 cm² (500 cm² cage floor/hen);
- Lexp-1 group: intensive husbandry, into an environment controlled hall, endorsed with B.P.-3 battery, with dimensional modified cages; brooding done at 6 hens/cage of 6000 cm² (1000 cm² cage floor/hen);
- Lexp-2 group: intensive type-husbandry, in an environment controlled hall, endorsed with a B.P.-3 battery without front wired panels, in order to provide fowl freedom throughout the entire hall (each hen was provided with 500 cm² in

laying and resting cage + 500 cm² in cage for feeding and water intake);

- Lexp-3 group: intensive type husbandry, deep litter system, in a climate controlled hall; brooding density of 6 hens per m² of floor (0.167 m² floor/hen);
- Lexp-4 group: semi-intensive husbandry, deep litter system, in a hall opened toward an opened paddock; brooding density reached 7.5 hens/m² (0.133 m² floor/hen).

Welfare status was assessed through the survival rate and of biochemical blood constituents, as follows:

- Flock casualties were daily assessed and cumulated weekly, then reported to the entire flock of the week;
- Biochemical parameters were investigated with the ABX Micros VET ABC analyser, on blood samples taken from 28 weeks old and 79 weeks old fowl.

Main acquired experimental data were statistically processed, to achieve the statistical estimators: mean (\bar{x}); standard mean error ($\pm s_{\bar{x}}$) and variation coefficient (V%).

RESULTS AND DISCUSSIONS

1. Flock casualties. Freedom of movement in studied birds, expressed through the provided rearing surface (within the battery cages, respectively, on the floor) resulted in higher or lower energy expenses, correlated with the achieved yields. In the case of groups with high productivity, early exhausting of the fowl was observed and was correlated to the survival rate decreasing.

Thus, in the 60 weeks of operation (from the age of 20 weeks of birds until the 80th week, inclusive), the proportion of casualties reached 12.08% in hens that received only 500 cm² / head in standard cages Battery BP-3 (group Lc), compared to 9.71% as was for hens kept in modified battery cages BP-3, which provided 1000 cm² per bird (group Lexp -2) and 9.17% in those birds raised in opened cages battery and had access in the gap between them (group Lexp-3).

In the case of husbandry systems with horizontal arrangement (deep litter), birds have benefited from better conditions of maintenance, leading to lower casualties till certain levels of 9.12% in hens reared on the deep litter environment controlled hall (group

Lexp-3) and respectively of 8.08% in those exploited on permanent litter, but had access to the outer paddock (group Lexp-4) (Fig. 1).

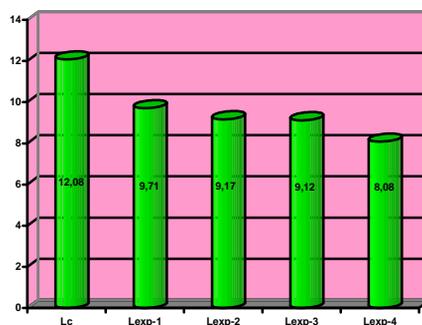


Fig. 1 Total casualties (%) in the studied fowl

Better survival rate in experimental groups 2, 3 and 4 was due to higher maintenance conditions that were provided, added, in Lexp-4 group, with the beneficial influence of external atmospheric factors on the birds with free access to the outer paddock.

2. Biochemical traits. Assessments showed that all biochemical indicators were within normal limits, specific to that category of birds, but also the existence of direct links between them and laying intensity, influenced in turn by the applied rearing technology.

In birds with the highest egg production (group Lc), cholesterol levels ranged from 136.78 ± 10.01 mg / dl (peak of laying) till 159.81 ± 12.21 mg / dl (end of lay), while at the hens with the lowest egg production (group Lexp-4), limits of variation were 189.38 ± 23.92 mg / dl (peak of laying) and 218.4 ± 23.92 mg / dl (end lay).

A similar situation was recorded for the triglycerides found in smaller quantities (190.96 to 193.21 mg / dl) in laying hens housed in conventional battery (group Lc) and somewhat higher (196.6 to 199.74 mg / dl) in the deep litter hall opened to the outside paddock (group Lexp-4). (tab. 1)

Total protein varied between 3.94 ± 0.33 g/dl (group Lexp-1 at age 28 weeks) and 4.93 ± 1.14 g / dl (Lexp-3 at the age of 79 weeks) and glucose within the range of 200.13 ± 20.97 mg / dl (Lexp-1 at 28 weeks) and 261.24 ± 26.3 g / dl (Lexp-3, to 79weeks).

Table 1. Biochemical blood traits of the studied fowl

Investigated trait	Group	28 weeks old		79 weeks old	
		$\bar{X} \pm s_{\bar{x}}$	V%	$\bar{X} \pm s_{\bar{x}}$	V%
Cholesterol (mg/dl)	Lc	136.78±10.01	19.11	159.81±12.21	21.09
	Lexp-1	150.47±12.45	24.06	175.75±14.02	24.56
	Lexp-2	156.78±13.68	26.35	181.12±17.11	23.17
	Lexp-3	171.11±15.82	34.58	202.15±15.82	34.58
	Lexp-4	189.38±23.92	30.94	218.40±23.92	30.94
Total protein (g/dl)	Lc	4.03±0.62	14.31	4.38±0.74	12.97
	Lexp-1	3.94±0.33	13.31	4.40±0.80	13.81
	Lexp-2	3.99±1.11	13.90	4.41±0.90	11.13
	Lexp-3	4.11±0.90	18.25	4.93±1.14	17.81
	Lexp-4	4.25±1.02	21.14	4.90±0.96	15.97
Try-glycerides (mg/dl)	Lc	190.96±7.72	11.49	193.21±10.11	11.97
	Lexp-1	192.83±9.20	17.21	195.02±10.95	13.98
	Lexp-2	194.33±10.34	18.68	197.78±12.06	15.84
	Lexp-3	194.37±11.65	25.40	197.98±12.72	20.82
	Lexp-4	196.60±13.99	26.94	199.74±13.98	24.11
Uric acid (mg/dl)	Lc	11.17±0.62	21.24	9.21±0.28	16.81
	Lexp-1	9.67±0.33	20.50	8.74±0.19	20.15
	Lexp-2	8.03±0.50	21.99	6.66±0.13	18.55
	Lexp-3	7.28±0.21	22.15	5.86±0.08	20.81
	Lexp-4	7.71±0.18	26.02	5.99±0.09	22.46
Urea (mg/dl)	Lc	5.01±0.36	19.27	5.13±0.37	17.85
	Lexp-1	5.19±0.42	17.69	5.22±0.45	19.30
	Lexp-2	5.15±0.41	17.18	5.19±0.44	22.11
	Lexp-3	5.19±0.46	17.01	5.23±0.51	14.84
	Lexp-4	5.21±0.57	16.58	5.30±0.59	20.12
Calcium (mg/dl)	Lc	8.55±0.19	18.92	8.97±0.22	17.24
	Lexp-1	9.16±0.41	24.31	9.84±0.49	16.59
	Lexp-2	10.72±0.48	25.94	10.99±0.51	14.73
	Lexp-3	11.24±0.77	26.11	11.73±0.80	25.84
	Lexp-4	11.73±0.89	27.48	12.09±0.94	20.41
ALP (U/l)	Lc	88.88±16.51	16.68	93.74±17.11	18.18
	Lexp-1	90.47±18.88	18.75	92.43±16.30	14.21
	Lexp-2	94.05±19.52	15.78	95.22±20.01	23.11
	Lexp-3	91.69±18.94	17.74	98.54±20.14	15.88
	Lexp-4	93.72±19.98	15.21	97.08±19.74	19.21
AST (U/l)	Lc	248.74±19.51	21.92	261.61±21.04	20.19
	Lexp-1	250.98±20.77	21.26	263.94±21.84	22.41
	Lexp-2	244.51±17.17	19.25	288.42±25.90	19.75
	Lexp-3	278.44±24.21	24.08	294.13±26.11	22.22
	Lexp-4	281.57±25.13	25.54	299.99±26.58	24.38
Phosphorus (mg/dl)	Lc	5.64±0.37	8.38	6.28±0.43	10.48
	Lexp-1	6.77±0.63	9.28	7.37±0.75	9.61
	Lexp-2	7.05±0.81	11.11	8.00±0.91	12.21
	Lexp-3	7.18±1.13	10.98	8.13±0.99	12.17
	Lexp-4	7.69±1.24	14.21	8.54±1.07	13.42
Glucose (mg/dl)	Lc	207.69±21.09	18.76	245.22±24.31	20.19
	Lexp-1	200.13±20.97	25.09	240.39±23.97	19.98
	Lexp-2	210.85±21.14	23.19	257.01±25.07	19.99
	Lexp-3	201.34±22.70	24.05	261.24±26.30	22.79
	Lexp-4	219.13±23.05	25.25	258.88±25.97	24.04

Amounts of uric acid were higher in the peak period of laying (from 7.28 to 11.17 mg/dl) and lower toward its end (5.86 to 9.21 mg / dl), while the determination of urea showed a certain balance between the two age stages, the values measured being 5.01 to 5.21mg / dl during peak and 5.13 to 5.30 mg / dl at the end of laying.

To form the shell, a hen blood has to circulate 100-150 mg Ca / h; if Ca supply is not absorbed quickly in the gut, serum calcium level can reach zero, in just 10-12 minutes.

Laying hens we studied received the same type of feed, so that calcium absorption and bone reabsorption took place normally, but Ca blood level was influenced by the rate

of formation of eggs, being reduced in those birds in full production (8.55 to 11.73 mg / dl) compared with the birds at the end of production (from 8.97 to 12.09 mg / dl); it should be noted that higher blood calcium levels were recorded in birds that had access to the external environment (Lexp-4), where they found a mineral supplement.

This phenomenon was also true for phosphorus (5.64 to 7.69 mg / dl in the top lay and 6.28 to 8.54 mg / dl at the end of lay), except that its level recorded significant increases at 10 - 12:00 after laying, during shell mineralization.

Regarding the blood enzymes, the data obtained showed levels of 88.88 to 98.54 U / l for ALP (alanineaminotransferase) and 244.51 to 299.99 U / l for AST (aspartataminotrasferase), due to changes in liver metabolism, under the influence of different rates of laying.

The high amplitude of variation coefficients for each of the studied traits (from poor to very high), was due to physiological state in which the birds were at the time of blood sampling (various stages of egg synthesis, egg prepared for lay, egg laid).

CONCLUSIONS

A first finding was that the size of casualties in flocks was directly subject to freedom of movement guaranteed by the system applied in hens husbandry. It reached a high level (12.08%), meaning 2.37 to 4.0% higher than in other technological solutions.

The better situation was found in birds raised in the "free range" system, where mortality was only 8.08%, due to lower density of birds per unit area, but also to the beneficial influence of atmospheric factors outside onto fowl organisms.

In the same context enrol the assessed values for some biochemical indicators, which were influenced by the technological system, which was also responsible for reaching different laying levels.

Thus, birds in group Lc (kept in conventional battery) cholesterol reached an average of 148.29 mg/dl, lower by 9.99 to 37.49% than the experimental groups; triglycerides situated at an average of 192.09 mg / dl, 0.96 to 3.17% lower than the experimental groups, while for calcium and phosphorus were found averages of 8.76 mg / dl and respectively 5.96 mg / dl, which were lower by 8.45 to 35.9%, respectively with

18.62 to 36.16%, compared to the levels determined in birds from other groups.

This phenomenon can be explained by the fact that birds in group Lc, having a higher laying intensity, used to a greater extent the four components of blood biochemical constituents suitable for egg formation.

For the other biochemical traits, the values measured ranged from one group to another, but also by age, except that they were within normal limits for the category of birds studied.

The final conclusion was that the technological system in which laying hens are exploited influence mortality rate and blood biochemical constants, but no link has been found on the fowl perception of wellbeing, because, under the productive manner, the best results were achieved within the conventional batteries system.

However, it should be noted that alternative variants we tested for laying hens, correspond, indeed, the desire for welfare, through the freedom of movement guaranteed by the fact that they replicate the natural life habitat.

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