RESEARCHES REGARDING THE BREEDING OF BROILER POULTRY IN DIFFERENT TECHNOLOGICAL CONDITIONS

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Abstract

The experiment was organized on a number of 24,000 broiler chickens of one day old, belonging to the commercial hybrid "Ross- 308". They were equally distributed, in two lots: a control lot (LC) and an experimental lot (LE). The chickens in the control lot were have been housed in an usual plant for the breeding of hen broilers on permanent bedding, and those in the experimental lot in a plant destined to the duck broilers, which was adopted in order to facilitate the exit of chickens in the grassed paddocks. In the first 14 days of life , both the chickens in the control lot, and those from the experimental lot were bred in plants, on permanent bedding, without access in the exterior paddock. After this age, the chickens from the experimental lot had access to the exterior paddock, but only during the day. The density of population, in the plant , was of 12 chickens/m^2 in both lots of experiment. In the case of chickens from the experimental lot, who had access in the exterior paddock, were ensured a density in the paddock of 6/m^2. From the data obtained, we ascertained that the hen broiler chickens from the LE lot achieved lower body weights with 21.29%, compared with the chickens from the LC lot; the index of food conversion (IC kg n.c/ kg increase) in the control lot was more reduced with 12.72% compared to the one in the experimental lot.

Key words: broiler chickens, alternative systems.

MATERIAL AND METHOD

The experiment was organized within SC AVICOLA Botoşani during the period June-July 2004, on a number of 24,000 broiler chickens of one day old, belonging to the commercial hybrid "Ross- 308". They were distributed, equally, in two lots: a control lot (LC) and an experimental lot (LE) (*tab. 1*).

The chickens from the control lot were housed in a usual plant for the breeding of chicken broilers on permanent bedding, and those from the experimental lot in a plant destined to the duck broilers, which was adapted for the purpose proposed.

Table 1
The experiment organization plan

The experiment lot	The control lot- LC	The experimental lot –LE
The number of broiler chickens studied	12,000	12,000
The control group	Nr. 1	Nr. 2
Number of chickens on a control group	200	200
The chickens' growth period	0 – 42 days	
Prebiotic product added in the water	NUTRI-SURE DW1 - 1‰	
The experimented growth factor	The technology of broiler chickens breeding on permanent bedding	The technology of broiler chickens breeding on permanent bedding, with access in the exterior paddock
Monitored indicators:		
- the dynamics of weight gain of the studied chickens; - the food consume; - the losses of chickens; - the European efficiency factor (EEF).		

In the first 14 days of life, both the chickens from the control lot, and those from the experimental lot, were bred in plants, on permanent bedding, without access in the exterior paddock. After this age, the chickens in the experimental lot had access to the exterior paddock, but only during the day. The population density, in the plant, was of 12 chickens/m^2 in both experiment lots.

In the case of chickens in the experimental lot, which had access to the exterior paddock, a density of 6 chickens/m^2 was ensured.

The poultry equipments from the plants was of Big. Dutchman type.

Since some monitored indicators could not be determined on such a high number of birds, as is the dynamics of the weight gain, we formed some control groups, one for each experiment lot (the control group no. 1 and the control group no. 2), summing 200 chickens/lot. All the chickens from the control groups were individualized. The marked chickens who effectively went out during the experiment were replaced with other chickens from the studied number, the latter having a body weight close to the group average.

The chickens breeding occurred until the fulfilment of 42 days, when they were killed.

The food administered to the chickens from the study was represented by complete combined fodder (*tab. 2*), which comprised several groups of fodder (cereals, proteins of vegetal origin, proteins of animal origin, minerals, premises and synthesis fodder). The combined fodder did not comprise bio stimulators with the exception of amino-acids.

The combined fodder administered to the chickens from the experiment presented nutritive characteristics similar with the norms and recommendations of "Ross Breeders" company from Great Britain, for the chicken commercial „Ross-308".

The combined fodder recipes which were experimented were optimized with the help of „Brill" program.

The drinking water which was administered to the chicken broilers studied have a content of 1‰ acidifying NUTRI-SURE DW1. This prebiotic product is a mixture of formic, lactic and acetic acid, which selectively acts against some bacteria, such as: *Campylobacter* and *Salmonella*, reducing the pH from the stomach and the thin intestine, which determines a good state of health and a good exploitation of the food.

Table 2.
Experimented combined fodder

Raw materials (%)	Start (1-10 days)	Growth (11-25 days)	Finish (26-42 days)
Corn	38.01	37.29	39.56
Soy grit	53.83	9.12	0.43
Full fat soy	-	38.74	38.52
Corn Gluten	3.00	6.00	8.00
Barley	-	5.00	10.00
Soy oil	0.54	-	-
Calcium monophosphate	1.67	1.05	0.86
Calcium carbonate	1.57	1.52	1.51
Premix	0.50	0.50	0.50
Rhodiment- Methionine	0.24	0.20	0.10
L- HCl ADM lysine	0.10	0.21	0.16
Salt	0.20	0.15	0.09
Sodium bicarbonate	0.24	0.22	0.27
L-Threonine ADM	0.10	-	-
TOTAL	100.00	100.00	100.00
Nutritive characteristics			
EM kcal/kg	3010	3175	3225
Crude Protein %	24.50	22.50	21.00
Lipids %	7.49	9.69	9.08
Crude Fiber %	4.80	4.12	3.96
Ca %	1.05	0.90	0.85
P available %	0.50	0.45	0.42
Lysine %	1.45	1.33	1.14
Methionine + Cystine %	1.09	1.01	0.93
Threonine %	1.11	0.95	0.91

RESULTS AND DISCUTIONS

The dynamics of weight gain

The evaluation of the weight gain took place through the individual weighing of the whole number of marked chickens, weekly.

In the population, we registered values of the live weight for the chickens taken in the study, these being comprised between 40.70-41.00 g/chicken (*tab. 3*), with 2.38-3.09% lower than the standard weight of the Ross-308 chickens [13]. The homogeneity of experiment lots was good, the variation coefficient not exceeding the value of 10% (8.95% in the LC lot and 9.41 in the LE lot). There were no significant statistical differences between the lots.

Table 3.
The dynamics of weight gain

Age (days)	Experiment lots	n	$\bar{x} \pm s_{\bar{x}}$ (g)	V%
1	LC	200	41.00 ± 0.36	8.95
	LE	200	40.70 ± 0.31	9.41
	Fisher test	LC vs. LE: $\hat{F} = 1.58 < F_{0,05}$ (1; 398) 3.84. *There are no significant statistical differences.*		
7	LC	200	133.78 ± 1.82	13.48
	LE	200	135.31 ± 1.74	12.53
	Fisher test	LC vs. LE: $\hat{F} = 2.41 < F_{0,05}$ (1; 398) 3.84. *There are no significant statistical differences*		
14	LC	200	357.26 ± 8.02	16.49
	LE	200	354.84 ± 7.34	17.53
	Fisher test	LC vs. LE: $\hat{F} = 1.08 < F_{0,05}$ (1; 398) 3.84. *There are no significant statistical differences.*		
21	LC	200	697.82 ± 14.67	16.74
	LE	200	636.41 ± 12.53	19.67
	Fisher test	LC vs. LE: $\hat{F} = 22.79 > F_{0,001}$ (1; 398) 10.83. *The statistical differences are very significant (***).*		
28	LC	200	1106.73 ± 22.13	18.48
	LE	200	938.50 ± 28.93	24.64
	Fisher test	LC vs. LE: $\hat{F} = 23.41 > F_{0,001}$ (1; 398) 10.83. *The statistical differences are very significant (***).*		
35	LC	200	1609.46 ± 24.15	17.32
	LE	200	1289.11 ± 22.83	23.82
	Fisher test	LC vs. LE: $\hat{F} = 26.17 > F_{0,001}$ (1; 398) 10.83. *The statistical differences are very significant (***).*		
42	LC	200	2236.62 ± 22.87	17.59
	LE	200	1760.35 ± 19.52	24.21
	Fisher test	Lc vs. LE: $\hat{F} = 28.15 > F_{0,001}$ (1; 398) 10.83. *The statistical differences are very significant (***).*		

At the second weighing, when the chickens reached the age of one week, in the experimental lot, compared to the control lot, we obtained a weight increase of 1.14%. The analyzed lots had an average homogeneity, the variation coefficient registering a value of 13.48% in the LC lot and 12.53% in the LE lot. The calculation of the Fisher test did not indicate significant statistical differences between the experiment lots.

At the age of 14 days, we did not determine significant differences between the two lots, the control and the experimental lot. The homogeneity of lots was medium since in both lots we determined higher values than 10% (V%=16.49 in the LC lot and 17.53 in the LE lot).

In the fourth weighing, appropriate to the age of chickens of 21 days we emphasized weight differences between the experiment lots; thus, in the LC lot we registered an average weight 9.64 higher compared to the constant value in the LE lot (697.82 g in the LC lot and 636.41 g in the LE lot). The homogeneity of lots was medium towards high (V% = 16.74-19.67). The calculation of the Fisher test for these data emphasized the fact that there are very significant differences between the two lots.

At the age of chickens of 28 days (the V weighing), the experimental lot reached a medium body weight of 938.50 g, this being 15.20% smaller than the one registered by the lot (1106.736 g). We can ascertain the fact that, with the aging of chickens the differences between the two lots of experiment is emphasized. The chickens in the experimental lot, benefiting from more movement, in different mediums (in the interior of the plant and in paddocks (have spent more resources for movement compared to the chickens in the control lot who benefited only from the controlled medium from the plant. The homogeneity of the control lot was medium (V% = 18.48); at the same time, in the experimental lot we registered a high variability (V%= 24.64%). The Fisher test emphasized very significant statistical differences between the experiment lots.

At the age of 35 days (the VI weighing), the chickens in the LC lot had a medium value (V% =17.32) for the control and high lot for the experimental lot (V% = 23.82). The high variability of the chickens in the LE lot, bred in the plants, on permanent bedding, with access on the exterior paddock is due to the competition for the food from them and the chickens' run to find the food. After testing the variation we determined very significant statistical differences between the experiment lots. The variation coefficient was of 17.59% at the control lot, which indicates a medium homogeneity of this character. In the LE lot, the studied character was non-homogenous given by the very high value of the variation coefficient, of 24.21%. By calculating the Fisher test, we emphasized the fact that, this time as well, there were very significant differences between the two experiment lots.

Comparing the medium values of the weights of the chicken broilers studied with the standard weights specified in the guide for breeding the "Ross 308" chickens [1], [9], [10], [11], [12], [13], we can notice the fact that we obtained lower weights, in the case of the control lot and very low in the LE lot.

The differences between the standard and the studied chickens were signaled, even since the age of one day of chickens but they were emphasized after they were 14 days old, especially in the LE lot, who had access to the exterior of the plant.

At the age of chickens of 42 days, the standard value of "Ross-308" chickens was 26.65% higher compared to the average of chickens in the control lot.

The food consume

At the end of the experimented period, when the chickens were 42 days old, we calculated the food conversion index (kg n.c./kg increase) [2], [4], [8], the calculated values were of 1.839 in the LC lot and 2.073 in the experimental lot, in percentage, it was 12.72% higher in the LE lot than in the LC lot (*tab. 4*).

Table 4
The food conversion index

Experiment lots	Total increase (kg/chicken)	Medium consume (kg/cap)	IC (kg n.c./kg increase)	±% compared to LC
LC	2.195	4.037	1.839	-
LE	1.719	3.565	2.073	+12.72

The loss of chickens and their causes

The loss of chickens, during the entire experimental period, was of 4.54% in the LC lot and of 8.39% in the experimental lot (*tab. 5*). If in the LC lot, these losses were situated under the minimum accepted level for this category of birds (5%), in the experimental lot it was much more exceeded.

Table 5
The evolution of deaths from the studied chickens

Experiment lots	The number at the beginning of the experiment (chickens)	The number at the end pf the experiment (chickens)	Losses (number)	%
LC	12,000	11,455	545	4.54
LE	12,000	10,993	1,007	8.39

Most losses were especially registered in the first week of life of chickens, being of accidental nature. After the age of chickens of 14 days, we ascertained an increase of the loss of chickens which formed the LE lot, compared to the LC lot, due to a significant number of cases, among which we name: the intestinal warms, gastroenteritis, pulmonary disorders, fractures etc.

The lower results obtained by the chickens from the experimental lot compared to those in the control lot regarding the weight gain , the exploitation of the food and the losses of chickens, we believe is due to a series of disadvantages among which we mention:

✓ The appearance of intestinal warms at a great number of chickens from this lot which determined the significant decrease of the daily average increase of weight gain, at the same time with the increase of the percentage of number losses; moreover, the treatments applied required supplementary expenses, which decreased the profit rate, as it would be shown afterwards. Although there were not determinations regarding the microbes of the medium in which the studied chickens lived, it can be deduced that this microorganism was promoted from the exterior of the plant in the interior and vice-versa, fact responsible not only with the appearance of intestinal warms, but also of the frequent disorders of gastrointestinal nature. In the mentioned context, we propose in the ulterior researches to also determine the microbes in the body of birds bred in different technological conditions together with the microbial load from the bedding, from the air, from the plant walls and from the exterior paddock as well.

✓ The quantity of powders (dust) from the plant, determined in the last week of life of chickens was of 10.70 mg/m^2 of wall compared to 6.32 mg/ m^2 of wall in the control lot, where the chickens benefited from a acclimatized medium, without significant influences outside the plant. This state of being determined an increased incidence of the breathing disorders which had negative repercussions on the performances in the chickens breeding.

✓ In the interior of the plant, on its walls, unlike those from the north-east side we emphasized a higher concentration of fungi, visible with the naked eye, which was due , according to our opinion, to the excessively warm and rainy weather from the experimental period, which made possible the increase of the humidity in the interior of the plant, in some of the days, at values of over 80%, while in the control lot, the relative humidity of the air never exceeded the value of 74%.

✓ The chickens in the LE lot were in a continuous state of nervousness, carrying out repeated movements of “come and go: from the plant to the exterior paddock and backwards, which led to an exaggerated consume of water, with unwanted repercussions on the consistence of the dejections produced, from where we deduced the weak exploitation of the administered food;

✓ The difference of light intensity between the interior of the plant and that outside it generated an emphasis of the stress state of chickens, which can explain the agitated movements of chickens from one side to the other. After these deficiencies, we also noticed an intensification of the percentage of feather fall in the last week of life of chickens, the cannibalism cases being sporadic;

✓ The increased incidence of fractures. That is exactly why, in the experiments which will be carried out in the following period, we propose to bring certain improvements to the experimental

technologies in the experimental lot and also the introduction of protected platforms in the exterior paddock, on which we will distribute regularly, the necessary equipments for the forage and pond of chickens so that they can have the possibility to feed and drink water in the plant, and in its exterior. As a result, the movements of chickens will be limited and their state of agitation will be reduced, with beneficial effects on the productive performances;

✓ The sanitary-veterinary monitoring of chickens was very difficult;

✓ The production expenses and the work volume in the chickens from the experimental lot reached appropriate levels characteristic to the stress phenomenon. At the same time, the administration of the prebiotic product NUTRI SURE DWI was more efficient in the chickens from the control lot than those in the experimental lot, determining a good state of health within the chickens from this lot and implicitly, a better exploitation of the food [5].

The European Efficiency Factor

At the end of the experimental period, when the chickens were 42 days old, we calculated the European efficiency factor (EEF), with the help of which we appreciated the efficacy of the broiler chickens within this experiment,

EEF was determined using as calculation basis the age where the chickens were killed (days); the average live weight on each lot (kg); the constant viability for each lot (%) and the conversion index (IC kg n.c./kg increase) [3], [13].

FFE s-a was calculated with the help of the formula:

$$EEF = \frac{\text{viability (\%)} \times \text{weight (kg)}}{\text{age (days)} \times \text{IC (kg nc/kg increase)}} \times 100$$

The live average weight of chickens from the LC lot was of 2.236 kg, and in the chickens from the experimental lot, of 1.760 kg (*tab. 6*). Regarding the conversion index of the food, it reached a level of 1.839 kg n.c./ increase in the control lot and 2.073 in the experimental lot.

Table 6.
The European efficiency factor

Experiment lots	Age (days)	Live weight (kg)	Mortality (%)	IC (kg n.c./kg increase)	EEF
LC	42	2.236	4.54	1.839	276.11
LE	42	1.760	8.39	2.073	185.19

From the data in *table 6*, we notice that, in the control lot we achieved a much higher value for EEF than in the experimental lot, respectively 276.11 in the LC lot and 185.19 in the LE lot, with 23.92% higher. These results are explained in the following manner:

✓ The average body weight in the chickens' slaughter age, of 42 days was much higher in the LC lot (2.236 kg) compared to the LE lot (1.760 kg);

✓ The losses in the number of chickens were significant in the LE lot (8.39%) and normal in the LC lot (4.54%);

✓ The food conversion index (kg n.c./kg increase) represented 2.073 in the LE lot and much less than in the LC lot (1,839) [6], [7].

CONCLUSIONS

From the data obtained by us, we ascertained that, in the case of broiler chickens bred in plants with permanent bedding and access in the exterior paddock (the LE lot) they achieved body weight much lower compared to those which were ascertained in the chickens bred in closed plants, on permanent bedding (the LC lot). Thus, at the age of 42 days, when the chickens were slaughtered, the medium body weight was of 1760.35 g in the LE lot and 2236.62 g in the LC lot, being 21.29 higher.

The cumulated food consume (g/chicken) was smaller with 11.69 % in the experimental lot than in the comparison lot, in conformity with the evolution of the body weight. The food conversion index – IC (kg n.c./kg/increase) in the control lot was more reduced with 12.72% (IC=1,839) compared to that of the experimental lot (IC=2,073).

From the data presented, we determined that the losses in the number of chickens were higher compared to the standard, in the case of the experimental lot (8.39% compared to 5% as the Ross-308 hybrid standard provides), while in the control lot, these losses were of 4.54%.

The calculated value for EEF in the control lot was situated over the threshold 250, while in the experimental lot, this threshold was not reached, the EEF value being with 32.92% lower.

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