

RESEARCHES CONCERNING THE USAGE OF A FEED ADDITIVE IN CHICKEN BROILERS FEEDING

Al. Usturoi, I.M. Pop

*Faculty of Animal Sciences, University of Agricultural Sciences and Veterinary Medicine
„Ion Ionescu de la Brad” Iasi, Romania*

Abstract

The main goal of this paper was to establish and reveal the role played by the BABY C₄ (acidifier) feed additive in the chicken broilers rearing.

The studied flock included 160 individuals, allocated in 4 groups: a control group -L_C and three experimental groups - E₁, E₂, E₃. A specific percentage of feed additive inclusion has been established for each group, during a certain technological period, as it follows:

- L_C = mixed fodder, standard formulated for each technological period;*
- E₁ = +0.3% BABY C₄ during starter period (1-7 days) and standard feed during the other periods;*
- E₂ = +0.3% BABY C₄ during starter period (1-7 days), +0.2% during growing period (8-14 days) and standard feed during the finishing period;*
- E₃ = +0.3% BABY C₄ during starter and growing period and standard feed during the finishing period.*

The achieved results revealed that the chickens in the E₁ group achieved better body weight (+35.84g) and a better average daily gain (+1.14g/chick), compared to the hybrid potential and obviously higher than other groups.

The best results concerning feed consumption have been also achieved by the chickens in the E₁ experimental group (81.65g/chick/day-average intake and 1.490kg feed/kg weight gain – feed conversion ratio), compared to the chickens in the E₃ experimental group (87.5g/chick/day-average intake and 1.679kg feed/kg gain).

Key words: broiler, feeding, acidifier, feed intake, weight gain

INTRODUCTION

Animal nutrition modern research underline a change trend in nutrient management for feed conversion increasing, thereby an achievement in production increase.

The research of this work aimed to determine the efficiency of "Baby C₄" feed additive utilization and respectively the effect of butyric acid, which is the basic ingredient of the product, on the performance of broiler chickens hen.

The use of fatty acids with short chain (such as butyric acid) in the mono-gastric feed is considered a possible alternative to the use of growth antibiotic promoters.

At one day old chickens, the levels of fatty acids in the thin intestine and caecum are low but record a growing and an expansion at the age of 15 days [3].

In addition to the bacterial activity of the butyric acid, this one appears to have an important role in the intestinal epithelium development. The butyrate, which is a bio-product of microbial fermentation (such as starch), have an important role in the development of epithelial cells [2].

Researchers have demonstrated the effectiveness of butyric acid on the growth of broiler chicken and the characteristics of processed carcasses, but they already tested it also as a food supplement, having in view the ability of the birds to resist at the changes imposed by coccidian oocist [1].

MATERIAL AND METHODS

The biological material was represented by the commercial hybrid hen "Ross 308", produced by "ROSS BREEDERS" from U.K. The "Ross 308" was created for to

produce chest and legs, being characterized by well-done proportioned carcasses; the males weighting 2.6 kg at slaughter; participation of cut parts in carcasses composition reaching the following values: chest–18.36%; higher pulp–12.91%, lower pulp–10.17% [4].

The flock studied was pursued from the age of 1 day to 35 days of life and was composed by 160 "Ross-308" broiler chickens, divided into 4 groups, a control group (C) and three experimental groups (E₁, E₂ and E₃). The experimental variables were

represented by the proportion of additive absorption in the used feeding stuff and by administration duration. (table 1):

- E₁ group- 0.3% "Baby C₄"-for 7 days (from the age of 1 day to 7 days);
- E₂ group- 0.3% "BabyC₄"-for 7 days (from the age of 1 day to 7 days);
- 0.2% "BabyC₄"-for 14 days (from the age of 7 days to 21 days);
- E₃ group- 0.3% "BabyC₄"-for 14 days (from the age of 1 day to 14 days).

Table 1
 Experimental protocol

| Experimental group | Nr. of chickens per group | Administrated feed | | |
|--------------------|---------------------------|-------------------------------|-------------------------------|-------------------------|
| | | Starting (1-7 days) | Growing (8-15 days) | Finalising (16-35 days) |
| C | 40 | feed | feed | feed |
| E ₁ | 40 | feed+0.3% Baby C ₄ | feed | feed |
| E ₂ | 40 | feed+0.3% Baby C ₄ | feed+0.2% Baby C ₄ | feed |
| E ₃ | 40 | feed+0.3% Baby C ₄ | feed+0.3% Baby C ₄ | feed |

To could be appreciate the effect of "Baby C₄" additive upon the realised performances of "Ross 308" hen commercial hybrid, the main morph-productive indicators was establish through the following methods:

- o dynamic of weight growth: was determined by individual chicken weighting from 4 groups of experience, at population and then at ages of 7, 14, 21, 28 and 35 days. Weighting was done using an electronic scale;
- o situation of outputs from flock: weekly, have been recorded death cases and then reported at chickens number from each experimental group;
- o feed consumption: has been determined total consumption (g/group), weekly individual consumption (g/chicken/period), daily average consumption (g/chicken/day) and rate of feed conversion (kg feed/kg growth);

The main experimental data obtained were statistically processed by concretion: arithmetic mean (\bar{X}), variance (S²), standard

deviation (s), standard deviation of the mean ($\pm S_{\bar{X}}$), variability coefficient (V %).

RESULTS AND DISCUSSIONS

Body weight dynamics. At age of one day, body weights of studied chickens were close, with limits ranking between 38.03 g-E₁ group and 40.65 g-E₃ group. The most relevant results were recorded at the age of 35 days, when the highest body weights were realized by the chickens from E₁ experimental group (1917.8±41.156g); followed by the chickens from the control group C with average weights of 1869.8±36.941g, the ones from the E₂ experimental group with 1868.1±35.832g and E₃ chickens with the lowest body weight of 1824.1±29.757g.

The studied character was homogeneous at one day chickens (V%=7.037-9.637) and less homogeneous at the end of the experimental period, when the calculated values for the variation coefficient (V%=10.318-13.229) showed a medium variability (table 2).

Table 2
 Dynamics of weight mass at studied chickens

| Control period | Group | N | \bar{X} | $\pm S_{\bar{X}}$ | s | V% | Min. | Max. |
|----------------|----------------|----|-----------|-------------------|---------|--------|---------|--------|
| 1 day | C | 40 | 40.43 | 0.509 | 3.218 | 7.960 | 32.07 | 46.20 |
| | E ₁ | 40 | 38.03 | 0.470 | 2.974 | 7.822 | 32.22 | 47.05 |
| | E ₂ | 40 | 39.78 | 0.606 | 3.833 | 9.637 | 31.56 | 52.11 |
| | E ₃ | 40 | 40.65 | 0.452 | 2.860 | 7.037 | 35.31 | 46.14 |
| 7 days | C | 40 | 148.35 | 2.326 | 14.714 | 9.918 | 110.10 | 176.04 |
| | E ₁ | 38 | 143.74 | 2.536 | 15.636 | 10.878 | 110.36 | 172.55 |
| | E ₂ | 40 | 144.43 | 2.697 | 17.056 | 11.810 | 110.27 | 173.60 |
| | E ₃ | 39 | 142.51 | 3.764 | 23.508 | 16.495 | 98.90 | 173.54 |
| 14 days | C | 39 | 395.87 | 6.478 | 40.453 | 10.219 | 286.00 | 483.00 |
| | E ₁ | 38 | 388.47 | 5.060 | 31.191 | 8.029 | 328.00 | 448.00 |
| | E ₂ | 37 | 389.73 | 9.251 | 56.270 | 14.438 | 260.00 | 480.00 |
| | E ₃ | 39 | 373.18 | 6.407 | 40.522 | 10.859 | 263.00 | 447.00 |
| 21 days | C | 38 | 764.26 | 23.339 | 143.872 | 18.825 | 300.00 | 1000.0 |
| | E ₁ | 37 | 755.89 | 10.910 | 66.364 | 8.498 | 635.00 | 880.00 |
| | E ₂ | 37 | 746.27 | 18.779 | 114.231 | 15.307 | 330.00 | 934.00 |
| | E ₃ | 39 | 731.38 | 11.386 | 71.108 | 13.722 | 570.00 | 867.00 |
| 28 days | C | 37 | 1349.53 | 23.601 | 143.561 | 10.606 | 1040.00 | 1695.0 |
| | E ₁ | 37 | 1350.59 | 21.351 | 131.615 | 9.753 | 1055.00 | 1660.0 |
| | E ₂ | 37 | 1320.57 | 25.192 | 153.238 | 11.604 | 955.00 | 1630.0 |
| | E ₃ | 39 | 1278.23 | 20.888 | 132.107 | 10.335 | 1050.00 | 1550.0 |
| 35 days | C | 37 | 1869.78 | 36.941 | 224.705 | 12.018 | 1130.00 | 2300.0 |
| | E ₁ | 37 | 1917.84 | 41.156 | 253.702 | 13.229 | 1485.00 | 2930.0 |
| | E ₂ | 37 | 1868.14 | 35.832 | 217.957 | 11.667 | 1308.00 | 2246.0 |
| | E ₃ | 39 | 1824.08 | 29.757 | 188.201 | 10.318 | 1443.00 | 2129.0 |

Comparing the obtained results at age of 35 days, with the potential hybrid used, was found that chickens from E₁ group had a higher average weight of 35.8 g, while specimens from groups C, E₂ and E₃ were below standard 12.2-57.9 g

Growth dynamic of weight gain: Based on body weights of chickens from experimental groups, the daily average achieved was calculated, both in control periods and also for total period.

From the obtained data (table 3) resulted the fact that, in the first age period (1-7 days) daily growth average realised by the studied chickens varied between 14.5 g/chicken at E₃ group and 15.4 g/chicken at the control group, during period 7-14 days the variation limits were by 32.9 g/chicken at E₃ group and 35.4 g/chicken at the control group, and within period 14-21 days the lowest daily growth average was determined at E₂ group

(50.9 g/chicken) and the highest at the control group (52.6 g/chicken).

In the next age stages (21-28 days, respectively, 28-35 days), the highest daily average scores were achieved in the experimental E₁ group (84.9 g/chicken and 80.6 g/chicken), and the lowest at experimental E₃ group (78.1 g/chicken and 77.9 g/chicken).

Regarding the daily increase for the entire experimental period (1-35 days), the best results were obtained at E₁ group, with 53.7 g/head exceeding the values stated in the managerial guideline of the "Ross 308" hybrid (52.6 g/chicken). On the next position were ranked chickens from the control group with an average growth of 52.3 g/chicken, very close from the ones of E₁ group were the ones from E₂ group experimental with 52.2 g/chicken and the lowest values were recorded at E₃ experimental group with only 50.9 g/chicken.

Table 3
 Average daily growth realised by the studied chickens

| Age (days) | Specification | Experimental group | | | |
|--|------------------------------------|--------------------|----------------|----------------|----------------|
| | | C | E ₁ | E ₂ | E ₃ |
| 1-7 | Weight at period beginning (g) | 40.4 | 38.0 | 39.8 | 40,6 |
| | Weight at period end (g) | 148.3 | 143.7 | 144.4 | 142,5 |
| | Daily average increase (g/chicken) | 15.4 | 15.1 | 14.9 | 14,5 |
| 7-14 | Weight at period beginning (g) | 148.3 | 143.7 | 144.4 | 142,5 |
| | Weight at period end (g) | 395.9 | 388.5 | 389.7 | 373,2 |
| | Daily average increase (g/chicken) | 35.3 | 34.9 | 35.0 | 32,9 |
| 14-21 | Weight at period beginning (g) | 395.9 | 388.5 | 389.7 | 373,1 |
| | Weight at period end (g) | 764.2 | 755.9 | 746.3 | 731,4 |
| | Daily average increase (g/chicken) | 52.6 | 52.5 | 50.9 | 51,2 |
| 21-28 | Weight at period beginning (g) | 764.2 | 755.9 | 746.3 | 731,5 |
| | Weight at period end (g) | 1349.5 | 1350.6 | 1320.6 | 1278,3 |
| | Daily average increase (g/chicken) | 83.6 | 84.9 | 82.0 | 78,1 |
| 28-35 | Weight at period beginning (g) | 1349.5 | 1353.6 | 1320.6 | 1278,2 |
| | Weight at period end (g) | 1869.8 | 1917.8 | 1868.1 | 1824,1 |
| | Daily average increase (g/chicken) | 74.3 | 80.6 | 78.2 | 77,9 |
| Daily average growth per all period (g/chicken) | | 52.3 | 53.7 | 52.2 | 50.9 |

Feed consumption: Nutrition consumption realised by the all 4 experimental groups was established for each week and after that on the whole period of time (table 4).

For the entire experimental period (1-35 days), best feed consumption were made by chickens from E₁ experimental group, at which the combined feed contained 0.3% "Baby C₄" additive, administered only during

the first 7 days of life. For the mentioned group, the daily average consumption was 81.6 g/chicken/day, while the index of feed conversion was 1.490 kg feed/kg growth. On the opposite side were situated the chickens from the E₃ experimental group (0.3% "Baby C₄" from age of 1 day till 14 days), with a daily consumption of 87.5 g/chicken/day and a conversion index of 1.679 feed kg/kg growth.

Table 4
 Fodder consumption at studied chickens

| Age (days) | Indicators | Experimental group | | | |
|------------|--|--------------------|----------------|----------------|----------------|
| | | C | E ₁ | E ₂ | E ₃ |
| 1-7 | Average flock (chickens) | 40 | 39 | 40 | 39,5 |
| | Total fodder consumption (g/group) | 5969 | 5432 | 5869 | 6039 |
| | Daily average consumption (g/chicken/day) | 21.3 | 19.9 | 20.9 | 21.8 |
| 7-14 | Average flock (chickens) | 39.5 | 38 | 38.5 | 39 |
| | Total fodder consumption (g/group) | 12187 | 11789 | 11746 | 12230 |
| | Daily average consumption (g/chicken/day) | 44.1 | 44.3 | 43.6 | 44.8 |
| 14-21 | Average flock (chickens) | 38.5 | 37.5 | 37 | 39 |
| | Total fodder consumption (g/group) | 22557 | 22046 | 21771 | 23189 |
| | Daily average consumption (g/chicken/day) | 83.7 | 83.9 | 84.1 | 84.9 |
| 21-28 | Average flock (chickens) | 37.5 | 37 | 37 | 39 |
| | Total fodder consumption (g/group) | 32339 | 31637 | 31836 | 34982 |
| | Daily average consumption (g/chicken/day) | 123.2 | 122.1 | 122.9 | 128.1 |
| 28-35 | Average flock (chickens) | 37 | 37 | 37 | 39 |
| | Total fodder consumption (g/group) | 41025 | 39124 | 40492 | 44526 |
| | Daily average consumption (g/chicken/day) | 158.4 | 151.06 | 156.34 | 163.1 |
| 1-35 | Average flock (chickens) | 38.5 | 38.5 | 38.5 | 39.5 |
| | Total fodder consumption (g/group) | 114077 | 110028 | 111714 | 120966 |
| | Daily average consumption (g/chicken/period) | 2963.0 | 2857.9 | 2901.6 | 3062.4 |
| | Average flock (chickens) | 84.66 | 81.65 | 82.90 | 87.50 |
| | Total fodder consumption (g/group) | 1.584 | 1.490 | 1.553 | 1.679 |

The situation of flock outputs: During the experimental period were recorded output

from the flock, both on age periods also on the total experimental period up, establishing the causes which have led them (table 5).

Table 5
 Situation of flock casualty

| Experimental group | Specification | Age (days): | | | | | Total period |
|----------------------|---------------|-------------|------|-------|-------|-------|--------------|
| | | 0-7 | 7-14 | 14-21 | 21-28 | 28-35 | |
| C | Chickens | - | 1 | 1 | 1 | - | 3 |
| E₁ | Chickens | 2 | - | 1 | - | - | 3 |
| E₂ | Chickens | - | 3 | - | - | - | 3 |
| E₃ | Chickens | 1 | - | - | - | - | 1 |

Achieved data concerning mortality showed that in the E₃ experimental group a single casualty has been recorded across the entire experimental period, during the 1st week of chickens life and induced by the low liveability of the individual.

Three casualties occurred in each of the other experimental groups, existing although differentiations related to the occurrence moment. Thus, in the control group, one casualty occurred in each of the periods comprised between 7-14, 14-21 and 21-28 days. At the E₁ experimental group, 2 individuals deceased during the 1st week of chicks life and another one within the 14-21 days period, while in the E₂ group, the 3 individuals deceased during the 2nd week of flock life.

Concerning the outputs reasons, there were not reported infectious diseases casualties.

CONCLUSIONS AND RECOMMENDATIONS

From the obtained data regarding administration effect of "Baby C₄" additive on the commercial hybrid "Ross 308", have resulted a number of conclusions which will be presented as follows:

- structure and quality of combined fodder were uniform throughout the period of growth, not to influence the experimental factors;
- at the moment of population with one day old chickens the average weights were with 1.35-3.97 g lower than the standard, where a less good start of them;
- however, at the end of the experimental period, the chickens from the group that received 0.3% "Baby C₄" within the first 7 days of life (E₁ group) had an average weight of 35.8 g greater than the used hybrid potential and a higher daily growth average of 1.14 g/chicken;
- poor results were recorded at the chickens from the E₃ group which received 0.3% "Baby C₄" for 2 weeks (1-14 days), in which case, the parameters represented by the body weight at the end of the experiment and the daily average growth was with 57.9 g respectively 1.6 g/chicken inferior to the performances which is credited the "Ross 308" hybrid;

- feed consumption of the studied chickens were correlated with the evolution of body weight; so the best results (81.6 g/chicken/day-average consumption and 1.490 kg feed/kg growth-specific consumption) were made by the chickens from experimental E₁ group (0.3% "Baby C₄" administered within 7 days of life) and less convenient (87.5 g/chicken/day-average consumption and 1.679 kg feed/kg growth) at the chickens in the experimental E₃ group (0.3% "Baby C₄" during the first 14 days of life);

- regarding the casualties situation, this was kept in normal limits only at the E₃ experimental group (0.3% "Baby C₄", fed within the first 14 days of life). However, a higher mortality degree has been recorded in the other groups, but not being related to the existence of infectious-contagious diseases.

Based on the above conclusions we will made several recommendations, including:

- administration of "Baby C₄" feed additive in the broiler chicken feed in 0.3%, proportion but only within the first 7 days of life;
- population with first quality one day old chickens and especially with adequate weight with the hybrid standard, for a properly run;
- more research upon "Baby C₄" additive management in broiler chickens feed, to determine the effect on their health status and economic efficiency.

REFERENCES

Journal articles

- [1] Leeson, S., Namkung, H., Antongiovanni, M. and Lee, E.H.: Effect of Butyric Acid on the Performance and Carcass Yield of Broiler Chickens. Poultry Science, 2005, no. 84 (2): 134-139.
- [2] Pryde, S.E., Duncan, S.H., Hold, G.L., Stewart, C.S. and Flint, H.J.: The microbiology of butyrate formation in the human colon. FEMS Microbiology Letters, 2002, 217: 133-139.
- [3] Van der Wielen, P.: Dietary strategies to influence the gastrointestinal microflora of young animals and its potential to improve intestinal health. Nutrition and Health of the Gastrointestinal Tract, 2002, pg. 37-60. Publ. Wageningen Academic Publishers.
- [4] ***Ross Broiler Management Manual, Jun 2007.