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INFLUENCE OF REARING TECHNOLOGY ON BODY WEIGHT OF YOUNG BROILER BREEDERS

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Abstract

This paper describes a sequence from a massive experiment analyzing quality of semen material and breeding efficiency in roosters from hybrid ROSS 308. Study was performed to observe influence of some environmental factors (light intensity and poultry density) and of litter type on body weight in males during rising period (0-18 weeks). Several males were used (14 500 cap) in three experimental procedures (A - with analyze parameters sub-standard and litter made of chopped straws B - with analyze parameters above standard and litter made of rice hulls and C - with analyze parameters at the level recommended by the manufacturer of biological material and litter made of wood shavings). In group A body weight values were mostly under standard growth curve and differences were highly significant statistically. In group B body weight values were above standard growth curve (differences highly significant) and in group C A body weight values were close to standard (differences not significant statistically). Comparison of average body weights of individuals from the three groups has revealed that differences between groups are highly significant statistically during whole raising period except weeks 15-16. Therefore it is advisable the usage of analyzed parameters at values slightly above standard for the possibility to obtain poultries with higher body weight more able to resist to transfer stress de and a smaller mortality during next period to create the ground for good breading results of future adults.

Key words*: litter, rosters, density, light intensity, body weight.*

INTRODUCTION

Body weight is one of the most important factors for optimum breeding results as birds are being essentially broilers whose weight gain potential must be kept under control to be able to accomplish their breeding potential (Blokhuis and de Wit, 1992). There is a negative relationship between weight gain and breeding performances. For this reason we should not allow birds to gain weight up to their genetic potential otherwise breeding would became uneconomical. For this reason feeding programs are designed and adaptated to restrict quantitative and qualitative feed inteke to limit body growth and weight gain (Fairchild and Czarick, 2009). So far the only way to controla birds body weight is feed restriction and so this method is a source of majore management unless it is replaces by adding of feed intake inhibiting agents or additives with no nutritive value in feed.

MATERIALS AND METHODS

Researches have been performed during two years on chicks of ROSS 308 hybrid for studying influence of some environmental factors (light intensity, bird density) on body weight gain of young broiler breeders (hens) (Watkins S., 2013). Studied parameter has been analyzed in three different experimental circumstances (three trial series):

- experiment procedure A in which some environmental factors (light intensity and poultry density) are being at sub-standard values and litter is being made of chopped straws;
- experiment procedure B in which parameters are being raised over standard limits and litter made from rice hulls is being used;
- experiment procedure C with parameters at standard values and litter made from wood shavings.

Works were performed inside three farms with one farm for each experiment procedure: Avicola Călăraşi, S.C. Agrafood S.A. and Avicola Focşani.

Experiment procedure A was performed based on results from 4100 ROSS 308 male commercial hybrids during rising period (0-18 weeks).

Environmental parameters considered were:

- litter: chopped straws;
- sub-standard light intensity: 7 lux at 1-6 weeks, 20 lux at 6-9 weeks, 7 lux at 10-20 weeks, and 30 lux over 20 de weeks;
- sub-standard poultry density: 3 males/m^2;

Experiment procedure B was performed based on results from 6000 ROSS 308 male commercial hybrids during rising period (0-18 weeks). Environmental parameters considered were:

- litter: rice hulls;
- over standard light intensity: 30 lux at 1-6 weeks, 60 lux at 6-9 weeks, 30 lux at 10-20 weeks, 70 lux over 20 de weeks;
- over standard poultry density: 5 males/m^2;

Experiment procedure C was performed based on results from 4400 d ROSS 308 male commercial hybrids during rising period (0-18 weeks). Environmental parameters considered were:

- litter: wood shavings;
- standard light intensity: 15 lux at 1-6 weeks, 40 lux at 6-9 weeks, 15 lux at 10-20 weeks, 40 lux over 20 weeks;
- standard poultry density: 4 males/m^2;

Poultry were raised in uniform conditions inside the three units (for the three experiment procedures) on litter bed and in up-to-date houses and with feed and water delivered according to technical book of the hybrid. Poultry used in the three experiment procedures were fed the same way for results to be compatible (Aviagen, 2005).

Liveweight was the parameter observed during rising period (0-18 weeks).

Classical statistical methods were used for phonotypical identification of groups as following (Sandu, 1995):

- *Student* test to compare evenness of two samples averages;
- *Fisher* test was used for several samples after a variance analyze. Calculated value *F* was obtained by referring square averages between samples to samples square average;
- χ^2 test was used to verify evenness of an empirical distribution (of observed frequency O_j) with a theoretical distribution (of frequency T_j).

RESULTS AND DISCUSSIONS

To emphasize the possible influence of environmental factors and litter type on live weight we are showing average values of analyzed parameter for the three experimental procedures and statistical significance of differences observed between average figures. Observations and records were performed weekly during whole raising period (0-18 weeks).

Values obtained for live weight from individuals in experiment procedure A during raising period are presented in Table 1 and graph from Figure 1.

Table 1. Average values for live weight in the growth period, for first experience series

Week	$\bar{X} \pm s_{\bar{x}}$ (g)	s	c.v.%	Standard
1	87 ± 0.14	8.7	10.00	150
2	180 ± 0.67	43.2	24.00	310
3	400 ± 1.17	75.2	18.80	505
4	700 ± 1.61	102.9	14.70	720
5	740 ± 1.10	70.3	9.50	900
6	920 ± 1.34	85.56	9.30	1075
7	1100 ± 1.48	94.6	8.60	1230
8	1280 ± 1.70	108.8	8.50	1375
9	1440 ± 1.80	115.2	8.00	1510
10	1550 ± 1.94	124	8.00	1640
11	1680 ± 2.07	132.72	7.90	1770
12	1920 ± 2.43	155.52	8.10	1900
13	2080 ± 2.05	131.04	6.30	2030
14	2160 ± 2.43	155.52	7.20	2160
15	2320 ± 2.90	185.6	8.00	2290
16	2460 ± 3.11	199.26	8.10	2430
17	2640 ± 3.46	221.76	8.40	2575
18	2780 ± 3.08	197.38	7.10	2725
Differences significance	$\chi^2 = 192.18^{**}$ $\chi^2_{17;0.05} = 27.59$; $\chi^2_{17;0.01} = 33.41$			

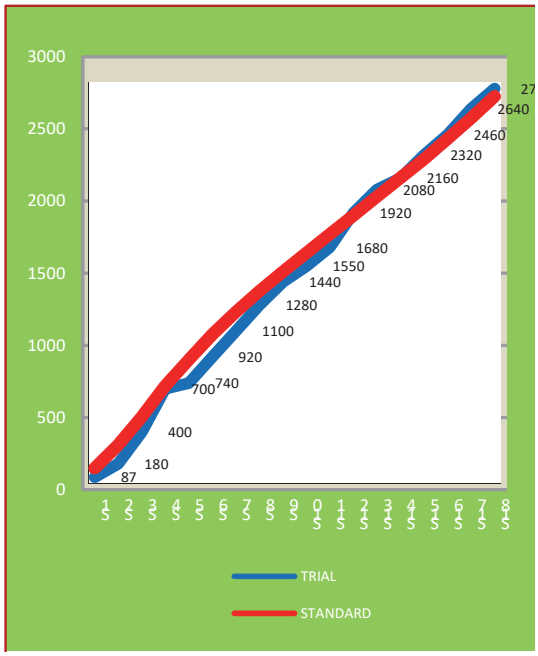

Figure 1. Average values for live weight in the growth period, for first experience series

It is noticed that average live weight falls between normal limits of the specie with a small variability during the 18 weeks which suggest the presence of uniform conditions of feeding and management.

It is noticed that in ROSS 308 hybrids males from experiment procedure A (Avicola Călăraşi) liveweight values are mostly under standard hybrid's growth curve. These noticed differences between averages of analyzed parameter during the 18 weeks and hybrid's growth curve were tested for statistical significance and value of χ^2 test (192.18) pointing to some highly significant statistical differences between the two allowances. These registered differences might be also explained by litter type and value of environmental parameter values which are sub-standard in this experiment procedure.

Liveweight values from birds from experiment procedure B during growth periode are being shown in Table 2 and graph from Figure 2.

Analyze of results is revealing that average live weight in poultry from experiment procedure B is being inside normal species limits with just a small variability during the 18 weeks revealing also uniform feeding and management conditions.

Table 2. Average values for live weight in the growth period, for second experience series

Week	$\bar{X} \pm s_{\bar{X}}$ (g)	s	c.v.%	Standard
1	128 ± 0.15	11.52	9.00	150
2	267 ± 0.39	30.17	11.30	310
3	418 ± 0.73	56.85	13.60	505
4	622 ± 1.20	93.30	15.00	720
5	877 ± 1.09	84.19	9.60	900
6	999 ± 1.17	90.91	9.10	1075
7	1231 ± 1.38	107.10	8.70	1230
8	1409 ± 1.60	123.99	8.80	1375
9	1578 ± 1.87	145.18	9.20	1510
10	1753 ± 1.95	150.76	8.60	1640
11	1958 ± 2.10	162.51	8.30	1770
12	2021 ± 2.32	179.87	8.90	1900
13	2122 ± 2.58	199.47	9.40	2030
14	2195 ± 2.72	210.72	9.60	2160
15	2328 ± 2.70	209.52	9.00	2290
16	2461 ± 2.83	219.03	8.90	2430
17	2697 ± 2.96	229.25	8.50	2575
18	2818 ± 2.95	228.26	8.10	2725
Differences significance	$\chi^2 = 97.56^{**}$ $\chi^2_{17;0.05} = 27.59$; $\chi^2_{17;0.01} = 33.41$			

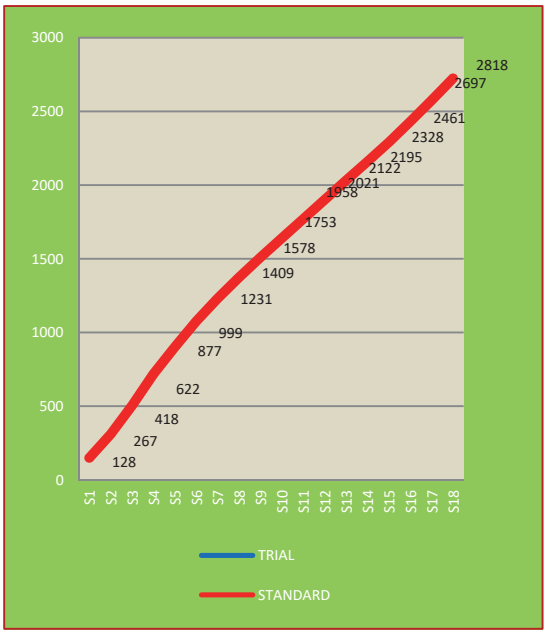

Figure 2. Average values for live weight in the growth period, for second experience series

So in ROSS 308 hybrids males from experiment procedure B (Agrafood) average live weight values are mostly above standard hybrid's growth curve which is favorable for biological and economical efficiency of farm. These differences noticed between average values of character from the 18 weeks analyzed and hybrid's standard values were tested for statistical significance and value of χ^2 test (97.56) pointing to some highly

significant statistical differences between values actually recorded and those recommended de hybrid's standard. As poultry from the three experiment procedures received same feeding conditions and greater live weight registered in roosters from experiment procedure B might be assigned to litter type and to environmental parameters above standard.

Values obtained for live weight from experiment procedure C from growth period are presented in Table 3 and graph from Figure 3.

Table 3. Average values for live weight in the growth period, for third experience series

Week	$\bar{X} \pm s_{\bar{X}}$ (g)	s	c.v.%	Standard
1	144 ± 0.17	11.52	8.00	150
2	308 ± 0.46	30.8	10.00	310
3	514 ± 0.85	56.54	11.00	505
4	732 ± 1.26	83.448	11.40	720
5	912 ± 1.07	71.136	7.80	900
6	1094 ± 1.32	87.52	8.00	1075
7	1250 ± 1.55	102.5	8.20	1230
8	1396 ± 1.66	110.28	7.90	1375
9	1530 ± 1.78	117.81	7.70	1510
10	1662 ± 2.00	132.96	8.00	1640
11	1794 ± 2.30	152.49	8.50	1770
12	1926 ± 2.41	159.86	8.30	1900
13	2060 ± 2.42	160.68	7.80	2030
14	2196 ± 2.45	162.5	7.40	2160
15	2330 ± 2.49	165.43	7.10	2290
16	2470 ± 2.83	187.72	7.60	2430
17	2616 ± 3.16	209.28	8.00	2575
18	2766 ± 3.42	226.81	8.20	2725
Differences significance	$\chi^2 = 6.67^{NS}$ $\chi^2_{17;0.05} = 27.59$; $\chi^2_{17;0.01} = 33.41$			

It is noticed that average live weight values in individuals from experiment procedure C is being inside normal species limits with just a small variability during the 18 weeks revealing also uniform feeding and management conditions. However in individuals from experiment procedure C variability coefficients have lowest values for analyzed character most probably due to taking care of ROSS 308 hybrid's standard.

For ROSS 308 males from experiment procedure C (Avicola Focşani) average live weight values are entirely hybrid's standard growth curve.

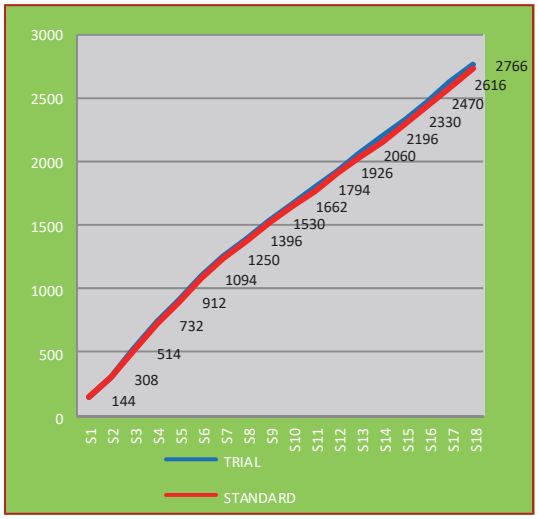

Figure 3. Average values for live weight in the growth period, for third experience series

This statement is corroborated by statistically testing din the observed differences between average values of the character during the 18 analyzed weeks and standard values and test χ^2 (6.67) pointing to differences which might be due to chance or individual variation and with no statistical significance. As birds from all the three experiment procedures received the same feeding conditions being and staying on growth curve might be attributable to litter type and abiding to environmental parameters standard. Next in line would be pointing to and evaluating differences between average live weight values in ROSS 308 males in all the three experiment procedures and the path of these differences and testing their statistical significance.

Table 4 and graph from Figure 4 are showing noticed differences between average values registered in all the three experiment procedures for the analyzed character.

Calculated values of Student test are higher than the presumed values which are revealing the existence of some differences with a high degree of statistical significance between the average values of the analyzed character (live weight), for all combinations, with the exceptions o weeks 15-16, when the growth curves are having a tendency to overlap themselves in all the 3 experiment procedures (as it can be also noticed in graph from Figure 4).

Table 4. Differences between experimental series for live weight

Week	Group A $\bar{x} \pm s_{\bar{x}}$ (g)	Group B $\bar{x} \pm s_{\bar{x}}$ (g)	Group C $\bar{x} \pm s_{\bar{x}}$ (g)	Observed differences		
				A-B (g)	A-C (g)	B-C (g)
1	87 ± 0.14	128 ± 0.15	144 ± 0.17	-41	-57	-16
2	180 ± 0.67	267 ± 0.39	308 ± 0.46	-87	-128	-41
3	400 ± 1.17	418 ± 0.73	514 ± 0.85	-18	-114	-96
4	700 ± 1.61	622 ± 1.20	732 ± 1.26	78	-32	-110
5	740 ± 1.10	877 ± 1.09	912 ± 1.07	-137	-172	-35
6	920 ± 1.34	999 ± 1.17	1094 ± 1.32	-79	-174	-95
7	1100 ± 1.48	1231 ± 1.38	1250 ± 1.55	-131	-150	-19
8	1280 ± 1.70	1409 ± 1.60	1396 ± 1.66	-129	-116	13
9	1440 ± 1.80	1578 ± 1.87	1530 ± 1.78	-138	-90	48
10	1550 ± 1.94	1753 ± 1.95	1662 ± 2.00	-203	-112	91
11	1680 ± 2.07	1958 ± 2.10	1794 ± 2.30	-278	-114	164
12	1920 ± 2.43	2021 ± 2.32	1926 ± 2.41	-101	-6	95
13	2080 ± 2.05	2122 ± 2.58	2060 ± 2.42	-42	20	62
14	2160 ± 2.43	2195 ± 2.72	2196 ± 2.45	-35	-36	-1
15	2320 ± 2.90	2328 ± 2.70	2330 ± 2.49	-8	-10	-2
16	2460 ± 3.11	2461 ± 2.83	2470 ± 2.83	-1	-10	-9
17	2640 ± 3.46	2697 ± 2.96	2616 ± 3.16	-57	24	81
18	2780 ± 3.08	2818 ± 2.95	2766 ± 3.42	-38	14	52

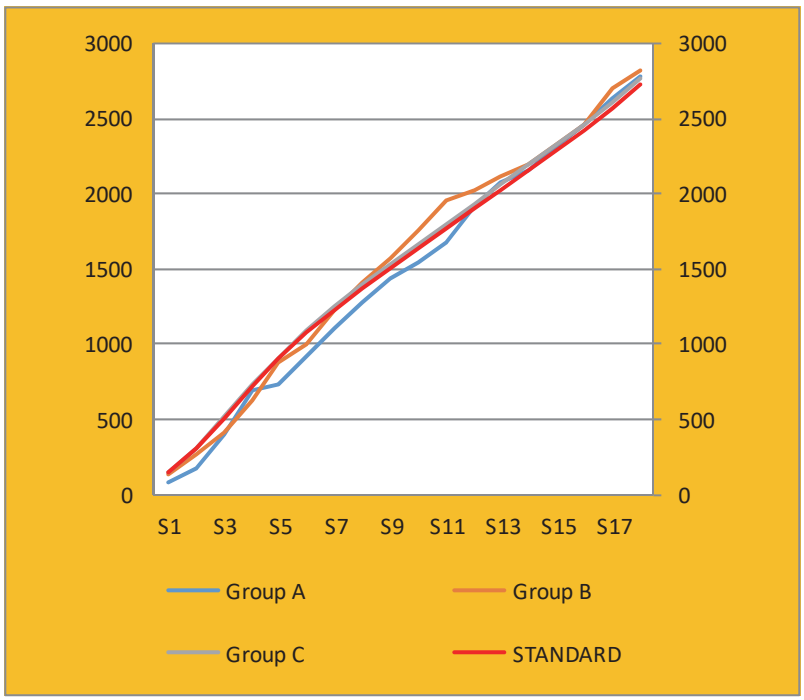

Figure 4. Differences between experimental series for live weight

As in experiment procedure C in which environmental parameters values are maintained at the standard level and litter type used is wood shavings values obtained for live weight are having the tendency to get close and even to overlap the growth curve of ROSS 308 hybrid results obtained look as if they are pleading in favour of experiment procedure B. Inside this procedure usage of rice hulls as litter and of some values of environmental parameters (density and light intensity) above standard seems to have a positive influence on live weight and males are having weekly average values over standard growth curve.

As a consequence it seems to be recommendable usage of some environmental factors with values higher than standard and a litter made from rice hulls with the aim to obtain a higher live weight or at least to

ensure a position above the growth curve at the moment of transfer to production house and as consequence to reduce in this way the effects of transport stress and of course to reduce mortality linked by this moment for a more efficient breeding activity of future parent flocks.

CONCLUSIONS

Considering the live weight might come to following conclusions:

1. In ROSS 308 hybrids males cluster from grouping A average live weight values are mostly under standard hybrid's growth curve with differences highly significant statistical.
2. In ROSS 308 hybrids males cluster from grouping B average live weight values are mostly above standard hybrid's growth curve with differences highly significant statistical.
3. In the case of cluster from procedure C average live weight values are in entirely on the standard hybrid's growth curve.
4. It is noticed the existence of some differences with a high degree of statistical significance between the average values of live weight), for all combinations, with the exceptions o weeks 15-16, when the growth curves are having a tendency to overlap themselves in all the three experiment procedures.
5. Usage of rice hulls as litter and of some environmental factors (density and light intensity) with values higher than standard seems to have a positive influence on live weight and males are having weekly average values which are being above standard growth curve.

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