RESEARCH ON THE INFLUENCE OF SLOW-GROWING TECHNOLOGY ON MEAT PRODUCTION AT THE CHICKEN BROILER

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Abstract

In the last period, the poultry meat from other breeding systems than the industrial ones is increasingly being sought, which is why poultry farmers have used new hybrids and / or breeding technologies to meet this desire. For these reasons, we aimed to evaluate the quantitative production of meat in three hen hybrids (Ross-308, Hubbard and HB Color), reared according to the principles of slow growth and with slaughter at different ages (56, 63 and 81 days). After slaughtering, slaughter yields of 68.60-71.76% were obtained for the Ross-308 hybrid, 66.29-68.66% at Hubbard and 62.32-62.65% at HB Color. The cumulative weight of the two main components of the carcass (chest+thigs and drumstick) was 70.08-71.47% for the Ross-308 carcasses, higher by 1.60-3.23% compared to the situation from the Hubbard hybrid and by 6.92-9.21% than in HB Color. In contrast, the HB Color hybrid registered a high participation rate for wings (13.75-15.89%) and back (22.07-22.37%). In conclusion, it can be stated that the Hubbard hybrid provides good results in meat production (especially with slaughter at the age of 63 days) and which, in conjunction with other elements (productive performance, meat quality, etc.) recommends it for exploitation under slow growing conditions.

Key words: hybrids, chicken, slow growth, meat production

INTRODUCTION

In the following period too, the poultry meat will remain the favorite of the consumers, given its high nutritional value [13], but also for the relatively low prices at which it can be purchased [17, 18].

Worldwide, over 80% of poultry meat production is obtained in industrial-type systems, which are based on the growth in a controlled environment of selected hybrids for fast growth [15].

Although this technique allows very high yields per unit area [5, 16], the meat obtained is characterized by high water and collagen content and low vitamins [6].

The pressure of animal protection associations [10], as well as the orientation of consumers' preference towards higher quality products [3], have led to significant changes in the poultry breeding [15].

In this regard, the conditions for ensuring welfare (minimum space, periodic monitoring of microclimate factors and live weight per surface unit, etc.) were implemented in poultry practice [12].

New breeding technologies have been developed, at which age of slaughter is at least 56 days, and the administered feeds contain at least 70% cereals [4, 19].

Also, so-called slow-growing hybrids have been created, whose growth rate does not exceed 50 g/head/day [2, 9, 11].

These changes in the production of poultry meat are in line with the requirements of the current society, but they must also be evaluated in the light of the technical and especially financial results of the production units, as they can create considerable problems [7].

The effectiveness of the activity of raising poultry for meat is quantified at the

level of the slaughter units, through specific indicators, such as the yield at slaughter, the weighted of the sliced portions of the carcasses, the weight of the edible organs, as well as the losses at the slaughterhouse [1].

The level of these indicators of the quantitative production of meat is mainly influenced by the genetic material used and the applied growth technology [8, 14].

From the aforementioned considerations, a study was carried out to evaluate the quantitative production of meat in three chicken broilers, under the conditions of slow growth and slaughter at different ages.

MATERIAL AND METHOD

To achieve the proposed purpose, three hybrids were used for meat; they were reared for different periods of time, in halls with access to the outer paddocks and were fed with mixed fodder containing min. 70% cereals, according to the principles of slow growth.

For each age of sacrifice, three batches were organized, namely:
- slaughter at the age of 56 days: L1 (Ross-308), L-2 (Hubbard) and L-3 (HB Color);
- slaughter at the age of 63 days: L4 (Ross-308), L-5 (Hubbard) and L-6 (HB Color);
- slaughter at the age of 81 days: L7 (Ross-308), L-8 (Hubbard) and L-9 (HB Color).

The indicators of appreciation of meat production were determined according to the agreed methodology, as follows:
- the yield at slaughter was calculated as the percentage ratio between the live weight of the chicks and that of the carcasses;
- the weighted of the sliced portions - the obtained carcasses were cut into anatomical pieces (thigs and drumstick with bones, chest, wings and back), after which they were weighed and related to the weight of the carcass from which they came.

The data obtained were processed statistically, calculating: the arithmetic average ($\overline{x}$), the standard error of the average ($\pm$ sx) and the coefficient of variation (V%).

RESULTS AND DISCUSSIONS

Meat production of chickens slaughtered at the age of 56 days.

Yield at slaughter. For the chicks of the batch L-1 (Ross-308) we obtained a live weight of 2.25±0.03 kg and a carcass weight of 1.55±0.03 kg, which represented a sacrifice yield of 68.89±4.5%. In the batch L-2 (Hubbard), live weight was 2.20±0.03 kg, that of carcasses 1.46±0.03 kg, and the yield at slaughter was 66.29±5.1%. For the batch L-3 (HB Color), the live weight was 2.05±0.02 kg, that of the carcasses of 1.28±0.02 kg, and the yield at slaughter of 62.32±6.2% .

In none of the cases were values of the coefficient of variation higher than 10%, indicating the uniformity of the studied characteristics (tab. 1).

Table 1 Yield at slaughter in chickens slaughtered at the age of 56 days

Indicators	Batch	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$	V %	Min	Max
Live weight (kg)	L-1	2.25±0.04	3.42	2.15	2.30
	L-2	2.20±0.03	2.23	2.19	2.25
	L-3	2.05±0.04	3.53	2.01	2.17
Carcass weight (kg)	L-1	1.55±0.03	4.28	1.45	1.63
	L-2	1.46±0.03	4.05	1.36	1.53
	L-3	1.28±0.02	2.52	1.20	1.29
Yield at slaughter (%)	L-1	68.89±4.5	4.32	67.4	69.8
	L-2	66.29±5.1	4.69	64.0	68.2
	L-3	62.32±6.2	5.87	61.4	63.3
Meaning of differences					
Live weight	L-1 vs L-2: F=6.59>F5%=5.32 (*)				
	L-1 vs L-3: F=28.33>F0.1%=25.40 (***)				
	L-2 vs L-3: F=18.90>F1%=11.3 (**)				
Carcass weight	L-1 vs L-2: F=7.07>F5%=5.32 (*)				
	L-1 vs L-3: F=29.01>F0.1%=25.40 (***)				
	L-2 vs L-3: F=19.11>F1%=11.3 (**)				
Yield at slaughter	L-1 vs L-2: F=8.17>F5%=5.32 (*)				
	L-1 vs L-3: F=33.33>F0.1%=25.40 (***)				
	L-2 vs L-3: F=20.29>F1%=11.3 (**)				

Statistical evaluations revealed significant differences between the batches L-1 and L-2, distinctly significant between L-2 and L-3 and very significant between the batches L-1 and L-3 at each of the three parameters analyzed.

Weight of anatomical portions. Data resulted for chest with bone indicated a weight of 37.00±0.02% in Ross-308 (L-1) chickens, 34.70±0.02% in Hubbard (L-2) and 30.08±0.03% in HB Color (L-3).

For thigs and drumstick with bones, the values recorded were 33.80±0.02% at Ross-308, 34.50±0.03% at Hubbard and 33.80±0.03% at HB Color.

The weight of the wings in the carcass structure was 12.07±0.01% in the Ross-308 chicks, 12.33±0.01% in the Hubbard and 13.75±0.01% in the HB Color.

The backs and necks represented 17.13±0.01% of Ross-308 carcasses, 18.47±0.02% of Hubbard carcasses and 22.37±0.01% of HB Color chick carcasses.

No values higher than 10% of the coefficient of variation were found, which corresponds to a good homogeneity of the studied characteristics.

Significant, distinctly significant and very significant statistical differences were observed between batches, except for L-1 vs. comparisons. L-3 (thighs and drumstick) and L-1 vs. L-2 (wings) in which the differences were insignificant (tab. 2).

Table 2 Share of sliced portions of slaughtered chickens at 56 days of age

Batch	Sliced portions	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$ (%)	V%	Min	Max
L-1	Chest	37.00±0.02	5.41	35.00	39.00
	T and D	33.80±0.02	3.13	33.00	35.00
	Wings	12.07±0.01	2.75	12.00	12.60
	B and N	17.13±0.01	1.35	17.00	17.40
L-2	Chest	34.70±0.02	0.76	34.50	35.00
	T and D	34.50±0.03	0.08	34.50	34.55
	Wings	12.33±0.01	4.68	12.00	13.00
	B and N	18.47±0.02	3.09	18.00	19.00
L-3	Chest	30.08±0.03	2.89	29.50	31.00
	T and D	33.80±0.03	1.02	33.40	34.00
	Wings	13.75±0.01	5.85	12.85	14.40
	B and N	22.37±0.01	0.52	22.30	22.50
Meaning of differences					
Chest		L-1 vs L-2: F=15.21>F1%=11.3 (**)			
		L-1 vs L-3: F=29.13>F0.1%=25.40 (***)			
		L-2 vs L-3: F=18.39>F1%=11.3 (**)			
Thighs and Drumsticks		L-1 vs L-2: F=5.97>F5%=5.32 (*)			
		L-1 vs L-3: F=0.02<F5%=5.32 (NS)			
		L-2 vs L-3: F=5.98>F5%=5.32 (*)			
Wings		L-1 vs L-2: F=1.92<F5%=5.32 (NS)			
		L-1 vs L-3: F=7.08>F5%=5.32 (*)			
		L-2 vs L-3: F=6.58>F5%=5.32 (*)			
Backs and Necks		L-1 vs L-2: F=8.57>F5%=5.32 (*)			
		L-1 vs L-3: F=27.21>F0.1%=25.40 (***)			
		L-2 vs L-3: F=19.19>F1%=11.3 (**)			

*T and D – Thighs and Drumsticks
B and N – Backs and necks

Meat production of slaughtered chickens at the age of 63 days.

Yield at slaughter. The average body weight of Ross-308 (L-4) chicks was 2.55±0.09 kg, and that of carcasses obtained

after slaughtering 1.83±0.06 kg, resulting in a slaughter yield of 71.76 ± 0.01% (Table 3).

Table 3 Yield at slaughter in chickens slaughtered at 63 days of age

Indicators	Bat ch	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$	V %	Min	Max
Live weight (kg)	L-4	2.55±0.06	4.14	2.40	2,60
	L-5	2.60±0.01	0.61	2.59	2,62
	L-6	2.28±0.11	8.00	2.15	2,50
Carcass weight (kg)	L-4	1.83±0.06	7.80	1.63	2,02
	L-5	1.79±0.02	3.57	1.65	1,78
	L-6	1.55±0.05	7.32	1.37	1,64
Yield at slaughter (%)	L-4	71.76±0.01	2.21	69.8	73,4
	L-5	68.66±0.01	3.72	67.2	71,1
	L-6	62.50±0.01	4.01	58.2	63,3
Meaning of differences					
Live weight		L-4 vs L-5: F=2,12<F5%=5,32 (NS)			
		L-4 vs L-6: F=8,11>F5%=5,32 (*)			
		L-5 vs L-6: F=9,72>F5%=5,32 (*)			
Carcass weight		L-4 vs L-5: F=2,89<F5%=5,32 (NS)			
		L-4 vs L-6: F=8,22>F5%=5,32 (*)			
		L-5 vs L-6: F=6,77>F5%=5,32 (*)			
Yield at slaughter		L-4 vs L-5: F=4,12<F5%=5,32 (NS)			
		L-4 vs L-6: F=7,79>F5%=5,32 (*)			
		L-5 vs L-6: F=5,97>F5%=5,32 (*)			

In Hubbard chicks (L-5), the live weight was 2.60±0.04 kg, the carcass weight was 1.79±0.02 kg, and the yield at slaughter was 68.66±0.01%.

The HB Color chicks weighed 2.28±0.08 kg alive, the carcasses obtained had an average weight of 1.55±0.05 kg, so the yield at slaughter was 62.50±0.01%.

No values greater than 10% of the coefficient of variation were found, which demonstrates the good homogeneity of the analyzed characteristics.

From the statistical point of view, there were significant differences between the batch L-6 and the batch L-4 and L-5, for both live weight and carcass weight and for slaughter efficiency.

Weight of anatomical portions. After the anatomical portions of the carcasses were cut, the values of 38.00±0.05% (L-4 batch), 35.14±0.04% (L-5 batch) and 30.40±0,04% (L-6 batch) for chest and, respectively, 33.47±0.04%, 34.40±0.04% and 33.40±0.01% for the thighs and drumsticks.

The weight of backs and necks had values of 16.33±0.02% in the Ross-308 carcasses, 18.33±0.02% in the Hubbard and 22.07±0.03% in the HB Color, in while the wings had the lowest participation rate in

carcass formation (12.20±0.01% at Ross-308, 12.13±0.01% at Hubbard and 14.13±0.01% at HB Color) (tab. 4).

Table 4 Share of sliced portions of slaughtered chickens at 63 days of age

Lot	Sliced portions	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$ (%)	V%	Min	Max
L-4	Chest	38.00±0,05	2.63	37.00	39.00
	T and D	33.47±0,04	1.50	33.00	34.00
	Wings	12.20±0,01	2.84	12.00	12.60
	B and N	16.33±0,02	4.91	16.00	17.40
L-5	Chest	35.14±0,04	1.45	34.00	35.00
	T and D	34.40±0,04	0.02	34.05	34.59
	Wings	12.13±0,01	4.68	12.00	13.00
	B and N	18.33±0,02	3.15	18.00	19.00
L-6	Chest	30.40±0,04	2.89	29.50	31.00
	T and D	33.40±0,01	1.02	33.40	34.00
	Wings	14.13±0,01	1.63	14.00	14.40
	B and N	22.07±0,03	1.13	22.00	22.50
Meaning of differences					
Chest	L-4 vs L-5: F=19.19>F1%=11.3 (**)				
	L-4 vs L-6: F=37.32>F0.1%=25.40 (***)				
	L-5 vs L-6: F=28.03>F0.1%=25.40 (***)				
Thighs and Drumsticks	L-4 vs L-5: F=5.63>F5%=5.32 (*)				
	L-4 vs L-6: F=0.79<F5%=5.32 (NS)				
	L-5 vs L-6: F=5.79>F5%=5.32 (*)				
Wings	L-4 vs L-5: F=1.09<F5%=5.32 (NS)				
	L-4 vs L-6: F=6.03>F5%=5.32 (*)				
	L-5 vs L-6: F=6.79>F5%=5.32 (*)				
Backs and Necks	L-4 vs L-5: F=6.71>F5%=5.32 (*)				
	L-4 vs L-6: F=28.03>F0,1%=25.40 (***)				
	L-5 vs L-6: F=14.89>F1%=11.3 (**)				

*T and D – Thighs and Drumsticks
B and N – Backs and necks

Statistically, significant, distinctly significant and very significant differences were observed between the batches, with two exceptions (L-4 vs. L-6 for thighs and drumsticks and respectively, L-4 vs. L-5 for wings) when the differences did not had statistical coverage.

Meat production of chickens slaughtered at 81 days of age.

Yield at slaughter. The best yield at slaughter of 68.60±5.7% resulted from Ross-308 chicks (L-7 batch), against a live weight of 3.18±0.01 kg and a carcass weight of 2.25±0.03 kg.

Hubbard chicks (batch L-8) followed with a slaughter yield of 67.24±7.2% (live weight=2.99±0.01 kg; carcass weight=2.01±0.03 kg) and HB Color chicks (batch L-9) with a yield of only 62.65±4.5% (live weight=2.57±0.02 kg; carcass weight=1.61±0.01 kg).

Statistically, significant differences were identified between the batches L-7 and L-8, distinctly significant between the batches L-8

and L-9 and respectively, very significant between the batches L-7 and L-9, for each of the three analyzed parameters.

The values of the coefficient of variation (V%=0.40-8.40) denote the homogeneity of the three analyzed characters (tab. 5).

Table 5 Yield at slaughter in chickens slaughtered at 81 days

Indicators	Batch	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$	V %	Min	Max
Live weight (kg)	L-7	3.18±0.01	0.53	3.12	3.23
	L-8	2.99±0.01	0.40	2.89	3.09
	L-9	2.57±0.02	1.19	2.50	2.65
Carcass weight (kg)	L-7	2.25±0.03	2.98	2.17	2.34
	L-8	2.01±0.03	4.15	1.95	2.09
	L-9	1.61±0.01	2.09	1.56	1.65
Yield at slaughter (%)	L-7	68.60±5.7	7.05	67.5	70.9
	L-8	67.24±7.2	8.40	64.4	68.5
	L-9	62.65±4.5	6.92	61.0	64.2
Meaning of differences					
Live weight	L-7 vs L-8: F=7.19>F5%=5.32 (*)				
	L-7 vs L-9: F=29.10>F0,1%=25.40 (***)				
	L-8 vs L-9: F=13.90>F1%=11.3 (**)				
Carcass weight	L-7 vs L-8: F=6.22>F5%=5.32 (*)				
	L-7 vs L-9: F=30.92>F0,1%=25.40 (***)				
	L-8 vs L-9: F=12.87>F1%=11.3 (**)				
Yield at slaughter	L-7 vs L-8: F=6.37>F5%=5.32 (*)				
	L-7 vs L-9: F=31.87>F0,1%=25.40 (***)				
	L-8 vs L-9: F=12.59>F1%=11.3 (**)				

Weight of anatomical portions. Chest with bone represented, on average, 37.85% at L-7, 34.84% at L-8 and 29.15% at L-9 of carcass weight, and Thighs and drumsticks with bone represented 33.24% (L-7), 33.02% (L-8) and 32.73% (L-9).

The weight of the wings in the structure of the analyzed carcasses was 13.18% in the Ross-308 chickens, 13.51% in the Hubbard and 15.89% in the HB Color, and that of the backs and necks was 15.73%, 18.63 % and 22.23% respectively.

From a statistical point of view, there were differences between the batches (significant, distinctly significant and very significant) for all the sliced portions, except the wings and the thighs and drumsticks respectively, when comparing the L-7 and L-8 batches.

The character was homogeneous, the values of the coefficient of variation being less than 10%, in all the analyzed situations (tab. 6).

Table 6 Share of sliced portions of slaughtered chicks at 81 days of age

Lot	Sliced portions	Statistical estimators (n=5)			
		$\overline{X} \pm s_{\overline{x}}$ (%)	V%	Min	Max
L-7	Chest	37.85±2.10	2.63	37.0	39.0
	T and D	33.24±2.05	1.50	33.0	34.0
	Wings	13.18±0.90	2.84	12.8	13.6
	B and N	15.73±0.95	4.91	15.6	16.4
L-8	Chest	34.84±2.05	1.45	34.5	35.6
	T and D	33.02±2.04	0.90	32.8	33.2
	Wings	13.51±0.88	4.68	12.6	13.9
	B and N	18.63±1.45	3.15	18.2	19.0
L-9	Chest	29.15±2.01	2.89	29.0	30.0
	T and D	32.73±2.15	1.02	32.4	33.0
	Wings	15.89±0.97	1.63	15.0	16.4
	B and N	22.23±1.60	1.13	22.0	22.7
Meaning of differences					
Chest	L-7 vs L-8: F=16.68>F1%=11.3 (**)				
	L-7 vs L-9: F=30.35>F0,1%=25.40 (***)				
	L-8 vs L-9: F=18.00>F1%=11.3 (**)				
Thighs and Drumsticks	L-7 vs L-8: F=1.12<F5%=5.32 (NS)				
	L-7 vs L-9: F=8.19>F5%=5.32 (*)				
	L-8 vs L-9: F=7.89>F5%=5.32 (*)				
Wings	L-7 vs L-8: F=2.29<F5%=5.32 (NS)				
	L-7 vs L-9: F=15.80>F1%=11.3 (**)				
	L-8 vs L-9: F=14.73>F1%=11.3 (**)				
Backs and Necks	L-7 vs L-8: F=14.38>F1%=11.3 (**)				
	L-7 vs L-9: F=29.57>F0,1%=25.40 (***)				
	L-8 vs L-9: F=18.07>F1%=11.3 (**)				

*T and D – Thighs and Drumsticks
 B and N – Backs and necks

CONCLUSIONS

From the resulted data it was found that the best values of the yield at slaughter were achieved by the fast-growing hybrid Ross-308 (68.60-71.76%) and which were higher by 1.36-2.90% only in Hubbard chickens and 5.95-9.26% than in HB Color.

It should be noted that the highest yields at slaughter were recorded in the chicks that were slaughtered at the age of 63 days, in all hybrids tested.

The highest participation rates of the chest in the structure of the carcass were in the Ross-308 industrial chicks (37.0-38.0%), while for the weight of the backs and necks and wings the HB Color hybrid was highlighted (22.07-22.37% and 13.75-15.89% respectively).

In the case of broilers up to the ages of 56 and 63 days, respectively, the highest proportions of the thighs and drumsticks were in the Hubbard hybrid (33.24-33.80%), and for the 81 days age were better values at Ross-308 (33.24%).

The Ross-308 hybrid proved to be superior in terms of meat production (normal appearance if one considers the selection criteria that were the basis for its production),

but good results ensured and the Hubbard hybrid, which, in conjunction with other elements (productive performance, meat quality, etc.) recommend the latter for exploitation under the conditions of slow growth application.

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