



Original Contribution

EFFECT OF EGG WEIGHT ON THE PRODUCTIVE TRAITS OF HATCHED TURKEY POULTS NOT LATER THAN 16 WEEKS OF AGE

M. Oblakova¹, M. Lalev¹, P. Hristakieva¹, S. Georgieva²

¹Agricultural Institute, Hybrid Centre of Poultry Breeding, Stara Zagora, Bulgaria

²Thracian University, Stara Zagora, Bulgaria

ABSTRACT

The experiment was performed in 2007 in the selection farm of the Agricultural Institute, Stara Zagora. The eggs were products of artificial insemination in turkeys, aged 36 weeks, of the Layer Light (LL) strain. After hatching, the hatching percentage of incubated and the hatching percentage of fertilized eggs were determined, the percentage of the weight of poults from the weight of incubated eggs. In order to establish whether the egg weight had any effect on the growth potential of turkeys, 15 LL poults of both genders in each egg group were reared. Total forage consumption, survival rates and body weight at some chosen ages were recorded. The heaviest turkey poults were hatched from the heaviest eggs; the percentage ratio of these weights to the egg weight was 71.48 % and 70.63%, respectively. After 10-12 weeks, the death rates became stable and then decreased up to the end of the experimental period. Our study did not show weight of turkey eggs displaying a significant effect on the growth of turkey by age 16 weeks. Accordingly, eggs from all studied weight groups could be used in the production of turkeys.

Key words: turkey, broiler, growth, way of breeding, slaughter analysis

INTRODUCTION

The primary aim in turkey breeding is to increase the intensity of growth at an early age. The studies of some authors have shown that the size of eggs influenced the postembryonic development of birds (1, 2). As early as in the embryonic age, different foetal growth intensity was observed as being dependent on egg weight (3). Christensen et al. (4) believe that the foetal growth of turkey poults is specific even when not related to egg size and the egg functional traits.

The results from other studies on the effect of hatching body weight of turkeys on their subsequent development are contradictory. According to (5) the hatching weight had no effect upon the development in the next periods of life, and (6) reported that it correlated to the subsequent growth rate, survival rate and feed consumption.

Kunev et al. (7) observed increased live body weight of turkeys at the age of 9 months with increase in the weight of incubated eggs. Sharlanov et al. (8) determined that the growth rate up to the age of 12 weeks of turkey poults that hatched from smaller eggs

was more intensive compared to birds that hatched from heavier eggs.

In the view of (9) turkeys that hatched from larger eggs had a higher live body mass at both early age and later, as well as higher slaughter age than turkeys, having hatched from smaller eggs. In a study on the relationship of the productivity of meat-type chicken lines to the weight of incubation eggs, it was found that the body weight of young birds depended on the weight of hatching eggs (10).

In an experiment with turkeys, it was determined that the increase of egg weight from 70 g to 100 g resulted in higher live body weight of male (from 7.1 kg to 7.5 kg) and female (from 5.25 kg to 5.8 kg) turkeys at the age of 150 days (11). The authors reported that with increase of egg weight up to 90 g, the body weight of 150-day-old turkeys increased ($r = +0.58$), whereas the increase of egg weight from 90 to 100 g resulted in live body weight reduction.

Many companies (12, 13, 14) obtained average live weight of 4.5–5.0 kg at an age of about 100 days at feed intake 2.2–2.3 kg.

Shell reported a live body weight of 10–12.5 kg at the age of 20 weeks and 6.60–8.50 kg at the age of 16 weeks at a forage

*Correspondence to: Mgdalena Oblakova,
moblakova@abv.bg, tel:042607012

consumption rate of 3.06 and 2.75 kg/kg weight gain in male and female turkeys, respectively (15).

The increased demand for turkey meat and its market expansion require full characteristics and comparison of its most general indices with those of broilers. Bakalivanova reported a higher portion of breasts in turkeys from the whole slaughter weight (31.72%) compared to broiler chickens (29.28%) (16,17).

Many of studies on the subject have obtained variable results and thus, the conclusions are somewhat inconsistent.

The present study aimed to investigate the effect of egg weight on the growth potential of hatched turkey poults from the Layer Light (LL) strain. For this purpose we have monitored the survival rate and the dynamics of body weight of poults at the age of 4, 6, 8, 10, 12, 14, and 16 weeks.

METHODS

The experiment was performed in 2007 in the selection farm of the Agricultural Institute, Stara Zagora, Bulgaria. The eggs were products of artificial insemination in turkeys, aged 36 weeks, of the Layer Light (LL) strain. The feeding was ad libitum with commercial compound feed consistent with the age and category of birds. In the middle of the productive period of layers, the average weight of eggs was determined in three consecutive days with a precision of 0.1 g.

Two hundred and eighty four eggs were randomly selected, weighed and divided into

three groups according to the weight (group I, group II and group III). The second group included eggs weighing across board ± 3 g of the average for the line. Groups I and III included eggs with weights outside this range.

The first examination performed at the 7th day of the incubation, non fertilized eggs were discarded and the fertility rate was calculated. By the time of the second examination (13th day of incubation), dead embryos were removed and on the 25th day the eggs were transferred to the incubation chamber for hatching.

After hatching, the hatching percentage of incubated and the hatching percentage of fertilized eggs were determined, the percentage of the weight of poults from the weight of incubated eggs. In order to establish whether the egg weight had an effect on the growth potential of turkeys, 30 LL poults (15 of both genders) of each egg group were reared. The total consumption of forage, the survival rates by periods and the body weight at the age of 4, 6, 8, 10, 12, 14, and 16 weeks were recorded.

The statistical processing of data was done by ANOVA (EXCEL 2000).

RESULTS AND DISCUSSIONS

The heaviest turkey poults (table1) are hatched from the heaviest eggs (weighing 93.50 g) – at the age of 1 day, male weighed 66.84 g ($p < 0.01$) and females: 66.04 g; the percentage vs. egg weight being 71.48 % and 70.63%, respectively.

Table 1. Weight of ephemeral turkey and percentage of the weight of the eggs

Group egg weight, g	I under 83(84) g	II 83(84)-89(90) g	III above 89(90)g
egg weight, g	79.73 \pm 0.32	86.10 \pm 0.31	93.50 \pm 0.57***
turkey weight, g			
• male	n=33 59.93 \pm 0.19***	n= 37 61.14 \pm 0.25	n= 27 66.84 \pm 0.20 ^{ab}
• female	n= 32 53.89 \pm 0.17	n= 35 60.78 \pm 0.26	n= 23 66.04 \pm 0.19
(%)the percentage ratio of these weights to the egg weight			
• male	75.16	71.01	71.48
• female	67.59	70.59	70.63

a- III-I npu $p < 0.001$

b-III-II npu $p < 0.01$

Significantly higher live body weight had male turkeys (59.93 g) hatched from the lightest eggs with mass < 83 compared to female poults (53.89 g at $p < 0.001$). The same

tendency was observed in turkeys hatched from eggs with intermediate weight (group II). For all weight groups, the percentage of male turkey poults' weight from egg weight was

higher than that in females.

In all three weight groups of the studied strain, the loss of weight from the initial egg weight was within the acceptable limits (18, 19). This showed that the eggs of all three studied groups were suitable for hatching. In all groups as well, the percentage ratio of male

poults' weight to egg weight was higher than the respective ratio in females.

Data on the survival rates in turkey poults during the studied periods of life are shown on **Tables 2** and **3**.

Table 2. Viability of turkey of male turkey % by periods

Groups	Weeks - Viability (%)								
	0	2	4	6	8	10	12	14	16
I under 83 g	100	100	100	100	86.66	86.66	86.66	86.66	86.66
II 83-89 g	100	83.33	80.00	80.00	80.00	80.00	66.66	66.66	66.66
III over 89g	100	100	100	100	93.33	86.66	86.66	86.66	86.66

Table 3. Viability of turkey of female turkey % by periods

Groups	Weeks - Viability (%)								
	0	2	4	6	8	10	12	14	16
I under 83 g	100	93.33	93.33	93.33	86.66	86.66	86.66	80.00	80.00
II 83-89 g	100	86.66	86.66	86.66	86.66	86.66	86.66	86.66	86.66
III over 89g	100	86.66	86.66	86.66	86.66	80.00	80.00	80.00	80.00

The survival of male turkeys from groups I and III was 86.66 % for the entire period, and that of group II – 66.66%. In male turkeys, the death rates became stable after the 10th week. Between weeks 0 and 10, the highest mortality rates of up to 20% occurred in birds from group II and the lowest (13.34 %) - groups I and III.

Female turkey poults weighing under <83 g and > 89 g exhibited survival rate of 80 % for the 16-week period of rearing. The female birds from group II (83-89 g) had lower mortality rate of 13.34 % (Table 3).

The data on the vitality of studied turkey poults led us to conclude that survival rates for the 16-week period of rearing was within the range, reported by other authors. Roberson et al (20) reported survival rates between 85.50 and 95.90% in various turkey strains up to the age of 19 weeks.

The data on the dynamics of growth in turkey poults are presented on **Table 4** and **Table 5**.

The weight of 1-day-old male turkey poults (**Table 4**) hatched from the heaviest eggs (>89 g) was significantly higher ($p < 0.001$) vs. the weight of poults from the other 2 groups. Up to the age of 12 weeks, the poults hatched from the heaviest eggs, were

superior to those from groups I and II, and maintained a high intensity growth. In the period between the 10th and the 14th week, birds from group I reached the highest live body weight gain, 5420 g, with highest daily weight gain of 50.68-133.57 g. The existing differences in the live body weight between groups were low and insignificant.

At the age of one day (**Table 5**), female turkey poults hatched from the heaviest eggs (group III) with live body weight of 66.04 g, were superior to those from group I (live body weight of 53.89 g) and group II (live body weight of 53.89 g). During that period, the growth of birds hatched from eggs with lower weight (groups I and II) and was more intensive. At the age of 14-16 weeks, turkeys hatched from heavier eggs (groups II and III) and exhibited considerably higher body weight (**Table 5**).

For the total fattening period (0-16 weeks), the amount of consumed forage was 18.096 kg for group I, 18.792 for group II and 20.150 kg for group III, and the respective feed expenditure per 1 kg live weight gain were 3.15 kg, 3.44 kg and 3.697 kg.

Table 4. Live weight (g) of male turkey by periods

Groups weeks	I Under 83 g		Average daily yield,g	II 83-89 g		Average daily yield,g)	III Over 89g		Average daily yield,g
	n	x± Sx		n	x± Sx		n	x± Sx	
0	33	59.93±0.19		37	61.14±0.25		27	66.84±0.20ab	
4	15	490±20.82	15.36	12	483.33±28.86	15.68	15	520±22.61	16.38
6	15	935±42.19	31.28	12	933.33±84.16	32.14	15	1015±61.48	35.36
8	13	1283.33±38.97	24.38	12	1322.22±41.69	27.78	14	1395±71.91	27.14
10	13	1992.86±101.01	50.68	12	1888.81±176.28	40.42	13	2050±139.29	46.78
12	13	3550±176.08	111.20	10	2920±286.80	79.66	13	3480±198.48	102.14
14	13	5420±190.00	133.57	10	5175±295.25	161.07	13	5300±145.40	80.00
16	13	6664.0±263.20	88.75	10	6450±262.99	91.07	13	6775±293.42	105.72

a- III-I at $p < 0.001$ b- III-II at $p < 0.01$ **Table 5.** Live weight (g) of female turkey by periods

Group week	I under 83 g		Average daily yield, g	II 83-89 g		Average daily yield, g	III over 89g		Average daily yield, g)
	n	x± Sx		n	x± Sx		n	x± Sx	
0	32	53.89±0.17		32	53.89±0.17		23	66.04±0.19	
4	14	450±25.51	14.15	13	444.44±25.61	13.95	13	462.50±27.50	14.16
6	14	870.83±45.83	30.06	13	872.22±54.07	38.56	13	762.33±65.72	21.42
8	13	1145.83±41.63	29.27	13	1244.44±79.25	26.59	13	1000±106.07	27.65
10	13	1683.30±111.18	34.88	13	1788.89±125.21	38.88	12	1525.33±102.59	36.21
12	13	2558.33±165.35	62.50	13	2583.33±133.07	56.75	12	2121.30±170.32	41.14
14	12	3779.17±190.63	87.20	13	3933.33±175.79c	96.43	12	3287.33±209.97	79.72
16	12	4850±249.95	76.49	13	4444±175.68d	79.39	12	4125±226.63	59.83

c-II-III at $p < 0.05$ d- II-III at $p < 0.01$ **CONCLUSION**

1. The heaviest turkey poults (males 66.84 g and females 66.04 g, $p < 0.01$) were hatched from the heaviest eggs; the percentage ratio of these weights to the egg weight was 71.48 % and 70.63%, respectively.
2. After the age of 10-12 weeks, the death rates became stable and then decreased up to the end of the experimental period: 86.66% in males from groups I and II and 86.66% (group II) and 80% (groups I and III) in females.
3. In this study, the weight of turkey eggs did not display a significant effect upon the growth of turkey poults up to the age of 16 weeks.
4. Eggs from all weight groups could be used in the production of turkeys.

REFERENCES

1. Vieira S.L., E.T. Moran. Effects of egg of origin and chick post-hatch nutrition on broiler live performance and meat yields. *World's Poultry Science Journal*, 55, Issue 02, pp 125-142, 1999.
2. Göth, A., Christopher S. E. Egg size predicts motor performance and postnatal weight gain of Australian Brush-turkey (*Alectura lathami*) hatchlings. *Canadian Journal of Zoology*, Vol. 82, N 6: 972-979(8), 1999.
3. Sergeeva, A. Incubation of eggs from different weight categories. *Poultry Breeding* 9:14-15, 1983.
4. Christensen VL, Grimes JL, Donaldson WE, Lerner S. Paternal influences on turkey embryonic growth in the absence of changes in egg weight and eggshell conductance. *Poultry science* 79:1810-1816, 2000.
5. Siennicka, A., Swierczewska, E., Wojtczak, W. Relation between egg weight chick's body weight at hatching and at 5 and 8 weeks of age. *Ann. Warsaw Agr.Univ. SGGW-AR. Anim. Sci.*, 19: 11 – 14, 1985.
6. Wilson H. R. Interrelationships of egg size, chick size, post-hatching growth and

- hatchability, *World's Poultry Science Journal* 47, 1:5-20, 1991.
7. Kunev, K., N. Bachev, D. Sharlanov. Effect of turkey egg size upon the productive traits of hatched turkeys. *Animal Science (Sofia)*.6: 103-106, 1970.
 8. Sharlanov D., K. Kunev, N. Bachev. Effect of turkey egg size upon their hatching traits and the weight development of hatched turkey poults. *Animal Science (Sofia)* 1:77-81, 1971.
 9. Ashurov Z.M., L.F. Rakov. Incubation parameters and productivity of turkey poults from various weight categories. *Scientific Works of the Uzbek Scientific Institute on Animal Research* 41:110-117, 1986.
 10. Shahnova L., G. Shashina. Productivity of meat-type hens depending on the weight of incubation eggs. *Poultry Breeding* N8: 24- 26, 1987.
 11. Breslavets, V.A., I.G. Zaporozhechenko. Calibration of turkey eggs according to their weight. Improvement of the quality of poultry products, Moskva, Kolos, 1983, pp. 55-60, 1983.
 12. Vanchev ,T. Research works, Higher Institute of Zoo Engineering and Veterinary medicine, p.23, 1983.
 13. Duyunov, Z., O. Gadyuchko. Science journal, Poultry Raising, 15, p.10-14, 1983.
 14. Stankevicene, G., A. Maculaitis. Teorical and practical questions of the genetic and breeding on microorganisms, plants and animals, Vilnus, 1985.
 15. . Shell, J. Turkey production in totality and on regions in USA. *Turkey world*. 63, 1, p.12-20., 1987.
 16. Bakalivanova, T., M. Lalev, M. Oblakova. Comparative characteristics of turkey and broiler chicken meat. *Poultry Raising*, 6, p.30-32, 2000 .
 17. Bakalivanova, T., St. Bakalivanov, Ts. Tsvetkov, M. Lalev, M. Oblakova. Turkey meat- quality and characteristics. Symposium of livestock production, Struga, p.131-135, 2000.
 18. Wilson H. R.. Interrelationships of egg size, chick size, posthatching growth and hatchability, *World's Poultry Science Journal* 47, 1: 5- 20, 1991.
 19. Halaj and Veterani Halaj, M. and L. Veterani. The effect of hen egg weight on hatching losses and hatched chick weight. *Czech. Journal of Animal Sci.* 43: 6, 263-266, 1998.
 20. Roberson, K.D., A.P. Rahn, R.J. Balander, M.W. Orth, D.M. Smith, B.L. Booren, A.M. Booren, W.N. Osburnand R.M. Fulton. Evaluation of the growth potential, carcass components and meat quality characteristics of three commercial strains o f tom turkeys. *J. Appl. Poult. Res.*, 12:229-236, 2003.