

Effect of egg mass and Turkey genotype on incubation results

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Abstract: Our investigations were carried out with the aim of testing the values obtained during the incubation of breeder eggs in diverse turkey hen proveniencies, including 300 breeder eggs of three hybrids (Hybro 2,000, Hybro 3,000 and Nicholas). Egg fertility, hatchability and the egg mass losses dynamics for each hybrid line was examined, as well as those concerning weight of each group of eggs.

Based on obtained results, the lighter eggs displayed better values relating to both fertility and hatchability than heavier ones in all the three turkey hen proveniencies. From the genotype standpoint, the best egg fertility prevailed in the eggs from the parental breeder flock of the proveniency Hybro 3,000, and they also had the best hatchability.

Key words: turkey hens, incubation, hatchability, egg fertility, breeder eggs

Introduction

Fertility and hatchability of turkey hen eggs, as well as the incubation conditions in the course of the embryo development (incubation) are the factors of prime importance, which directly affect hatching of 1-day old turkey chicks. Therefore the majority of authors tried to establish the effect of individual factors (age, egg-laying turkey hen mass, laying season, egg mass, egg-shell porosity, the application of artificial insemination and the like) on fertility, hatchability, as well as the dynamics of egg mass losses during the incubation of diverse turkey hen-

proveniances. Reinhardt and Moran (1979) pointed out that breeder eggs mass had a considerable effect on 1-day old turkey chick production, i.e. that embryonic growth during the incubation was directly correlated with egg mass. Furthermore, Moran and Reinhardt (1979), Tullet (1981), Christensen and McCorkle (1982), Rahn et al. (1981), Meir et al. (1984) stressed that the highest hatchability of eggs was obtained under the conditions provided during the incubation as to result in the mass losses (up to the 25th day of the incubation) of about 10-14 % in relation to egg mass prior to incubation.

The main objective of our studies was to assess the incubation values of breeder eggs in the proveniances Hybrid 2,000, Hybrid 3,000 and Nicholas during laying, as well as to contribute to a better knowledge of egg mass losses dynamics during the incubation of the eggs varying in mass.

Material and Methods

The investigations were conducted at the incubation station (Bunar), owned by DOO „Jagodina“ (turkey hen farm).

In the present study, 300 breeder eggs, i.e. 100 eggs of each hybrid line of the turkey hens (Hybrid 2,000, Hybrid 3,000 and Nicholas) served as an experimental material. Breeder eggs of the investigated hybrids were divided into five weight groups, as follows: eggs of mass from 71-75 g, 76-80 g, 81-85 g, 86-90 g and 91-95 g, respectively. Due to different age of parental breeder flock of the proveniances examined, in the hybrid line Nicholas and Hybrid 2.000 (older breeder flocks), the first weight egg group was absent, whereas in the strain Hybrid 3. 000 the fifth group was absent.

Fertility, hatchability and egg mass losses dynamics were determined in each hybrid line and each weight group. For the purpose of individual monitoring of egg mass losses dynamics during incubation, eggs were separated from one another by means of appropriate partitions. Each egg had individually been weighed prior to placing into incubator, then on the 14th day lighting up was provided, followed by carrying the eggs over into hatchery on the 25th day, so that on the 28th day, 1-day old turkey chicks were hatched. At the end of the experiment, i.e. after the incubation, on the 28th day, a relative turkey hen mass share was calculated (percentage of egg mass).

Results and Discussion

When speaking about the values of the incubation of breeder eggs, we mean the percentage of fertilized eggs, i.e. the % of the hatched chicks out of the number of input eggs, embryo growth dynamics, i.e. the dynamics of egg mass decline over the incubation. To present the results more clearly the above indicators will be separately outlined, though all these characters are to be considered as more or less interrelated, i.e. they depend on one another.

1. Fertility and hatchability of turkey hen eggs

The obtained results of fertility and hatchability of breeder eggs in turkey hen hybrid lines are given in Tab.1.

As evident from Tab.1, the eggs of mass from 81-85 g of the provenience Hybrid 2.000 had the highest percentage of fertilized eggs, while those weighing from 91-95 g had the lowest percentage of fertilized eggs, i.e. 83.87% and 80.95%, respectively. In Hybrid 3.000, the lightest weight group had the highest percentage of fertilized eggs, whereas the heaviest one had the lowest, i.e. 95.65% and 88.89 %, respectively.

Tab. 1 Fertility and hatchability of breeder eggs

Egg mass	Indices	Hybrid 2.000	Hybrid 3.000	Nicholas
71-75g	number of input eggs	23	-	
	% of fertilized eggs	95,65	-	
	% of hatchability, a	78,26	-	
	% of hatchability, b	81,82	-	
76 - 80g	number of input eggs	24	34	16
	% of fertilized eggs	83,33	94,18	93,75
	% of hatchability, a	62,50	79,42	87,50
	% of hatchability, b	87,50	84,37	93,33
81 - 85g	number of input eggs	31	34	25
	% of fertilized eggs	83,87	91,18	88,00
	% of hatchability, a	61,29	64,71	72,00
	% of hatchability, b	73,08	70,97	81,82
86 - 90g	number of input eggs	24	9	31
	% of fertilized eggs	83,33	88,89	87,10
	% of hatchability, a	62,50	88,89	70,97
	% of hatchability, b	75,00	100,00	81,48
91 - 95g	number of input eggs	21	-	28
	% of fertilized eggs	80,95	-	85,71
	% of hatchability, a	61,90	-	71,43
	% of hatchability, b	76,47	-	83,33
Total	number of input eggs	100	100	100
	% of fertilized eggs	84,00	93,00	88,00
	number of hatched turkey	62	75	74
	% of hatchability, a	62,00	75,00	74,00
	% of hatchability, b	73,81	80,64	84,09

a - % of hatchability from egg input No(incubation)

b - % of hatchability from fertilized eggs number

Similar findings were confirmed in the hybrid line Nicholas, i. e. 93.5% and 85.71%, respectively.

The best fertility, regardless of weight group, was found in the eggs coming from the parental breeder flock, Hybrid 3.000, and the poorest in those from the hybrid line Hybrid 2.000, i.e. 93.00 % and 84.00 %, respectively.

The highest percentage of hatched turkey chicks out of egg inputs in Hybrid 2.000 was found in the second and fourth weight group, and the lowest in the third group, i.e. 62.50 % and 61.29 %, respectively.

In Hybrid 3.000, the highest hatchability percentage prevailed in the fourth group, and the lowest one in the third group, i.e. 88.89 % and 64.71 %, respectively. The highest percentage of the hatched turkey chicks out of egg inputs prevailed in the second weight group of the hybrid line Nicholas, while the lowest one was prevalent to the fourth group, i.e. 87.50 % and 70.97 %, respectively.

The best hatchability in relation to the number of input eggs (regardless of weight group) predominated in those from parental breeder flock of the provenience, Hybrid 3.000, while it was the poorest in those from the provenience Hybrid 2.000, i.e. 75 % and 62 %, respectively.

The highest percentage of hatched turkey chicks out of the number of fertilized eggs in the line Hybrid 2.000 was found in the lightest group, and the lowest one in the third group, i.e. 87.50 % and 73.08 %, respectively. Similarly, in Hybrid 3.000, the third weight group eggs displayed the poorest hatchability - 70.97 %, while the fourth group proved the best, as much as 100.00 % despite its lowest number of eggs (9). In the hybrid line Nicholas, the highest hatchability percentage was assessed in the lightest eggs and the lowest one in the fourth group, i.e. 93.33 % and 81.48 %, respectively.

Taken on the whole, irrespective of the weight group, the best hatchability relating to the number of fertilized eggs was prevalent to those belonging to the parental breeder flock of the hybrid line Nicholas, while the poorest prevailed in those from the line Hybrid 2.000, i.e. 84.09 % and 73.81 %, respectively.

According to the obtained results, it may be inferred that the lighter eggs, and especially those of mass between 76 and 80g displayed better values, as regards fertility and hatchability than those greater in mass in each variant tested. The highest degree of fertility (regardless of weight group) prevailed in the eggs from parental breeder flock Hybrid 3.000, and the best hatchability (percentage out of egg inputs) in those from the hybrid line Hybrid 3.000 and Nicholas (percentage of the number of fertilized eggs).

2. Dynamics of egg mass losses during incubation

The results of measuring breeder eggs from time to time, i.e. those regarding egg mass decrease dynamics, as well as those concerning 1-day old turkey chick mass in the turkey hens proveniences tested according to weight groups are given in tables 2 and 3.

Tab. 2 - Mean values and egg mass variability in 1-day old turkey chicks during incubation (g)

Egg mass	Hybrid eggs	on the 1st day	14 th day	25 th day	28 th day (turkey chicks)
71 - 75g	x	73.39	67.83	63.94	46.94
	H2 V(%)	2.34	3.01	3.19	3.62
76 - 80g	x	78.27	72.40	67.20	50.27
	H1 V(%)	1.90	2.60	3.87	2.31
	x	78.33	72.44	68.33	50.22
	H2 V(%)	1.58	2.87	3.44	2.78
	x	78.86	71.93	68.07	50.50
	H3 V(%)	1.79	2.07	2.26	2.36
81 - 85g	x	83.26	77.10	72.10	53.53
	H1 V(%)	1.83	2.66	3.43	3.25
	x	83.41	77.00	72.68	53.41
	H2 V(%)	1.83	2.53	3.38	3.86
	x	82.67	76.89	72.72	53.44
	H3 V(%)	1.80	2.35	2.69	2.66
86 - 90g	x	87.33	80.80	75.07	56.20
	H1 V(%)	1.20	2.25	4.34	3.88
	x	87.87	81.37	76.87	56.50
	H2 V(%)	2.06	3.82	3.51	5.52
	x	88.09	81.59	77.54	57.23
	H3 V(%)	1.85	2.55	3.60	3.69
91 - 95g	x	92.85	85.85	80.08	60.38
	H1 V(%)	1.44	3.11	4.00	3.48
	x	93.10	86.20	82.20	60.30
	H3 V(%)	1.71	2.60	2.77	3.91
Total	x	85.05	78.69	73.31	54.81
	H1 V(%)	6.17	6.58	7.08	7.08
	x	79.45	73.43	69.27	50.76
	H2 V(%)	5.94	6.09	6.38	6.33
	x	86.38	79.89	75.84	55.80
	H3 V(%)	6.25	6.83	7.24	7.31

H₁ = Hybrid 2.000H₂ = Hybrid 3.000H₃ = Nicholas

Tab. 3 Mean values and variability of egg mass losses dynamics during incubation, and of relative turkey chick mass in hatching (% of egg mass)

Egg mass	Hybrid	losses from 1 st - 14 th day		losses from 1 st - 25 th day		% of turkey chicks mass
		g	%	g	%	
71 - 75g	x	5.55	7,56	9,44	12.87	63.92
	H ₂ V(%)	26.31	26,06	15,89	15.62	2.78
76 - 80g	x	5.87	7.50	11.07	14.13	64.23
	H ₁ V(%)	18.06	18.27	22.22	28.00	1.67
	x	5.89	7.52	10.00	12.79	64.11
	H ₂ V(%)	25.13	25.40	18.20	18.37	1.90
	x	6.93	8.78	10.79	13.66	64.04
	H ₃ V(%)	18.33	17.65	15.11	14.35	1.58
81 - 85g	x	6.16	7.39	11.16	13.40	64.28
	H ₁ V(%)	25.00	25.18	18.01	18.13	2.52
	x	6.41	7.66	10.73	12.85	64.02
	H ₂ V(%)	32.92	31.98	22.27	21.94	2.75
	x	5.89	7.14	9.94	12.04	64.64
	H ₃ V(%)	1.73	21.29	13.58	13.54	1.64
86 - 90g	x	6.53	7.48	12.27	14.07	64.34
	H ₁ V(%)	20.67	20.86	20.05	20.86	2.98
	x	6.50	7.41	11.00	12.52	64.26
	H ₂ V(%)	30.77	31.31	16.82	17.17	3.77
	x	6.50	7.38	10.54	11.99	64.95
	H ₃ V(%)	16.92	17.21	15.37	16.26	2.74
91 - 95g	x	7.00	7.54	12.77	13.76	64.95
	H ₁ V(%)	28.57	28.65	21.46	21.73	2.66
	x	6.90	7.41	10.90	11.71	64.76
	H ₃ V(%)	26.09	25.91	15.14	15.20	2.99
Total	x	6.35	7.47	11.74	13.81	64.42
	H ₁ V(%)	24.09	22.89	20.70	20.20	2.50
	x	6.03	7.58	10.19	12.83	63.87
	H ₂ V(%)	28.52	27.31	19.14	18.08	2.35
	x	6.49	7.53	10.54	12.24	64.58
	H ₃ V(%)	22.80	22.97	14.90	15.77	2.82

H₁ = Hybrid 2.000H₂ = Hybrid 3.000H₃ = Nicholas

As evident from Table 2., the hybrid line Nicholas (H_3) possessed the greatest egg mass at the beginning, followed by H_1 with somewhat lesser mass, and by H_2 , which had the smallest one, i.e. 86.38 g, 85.05 g and 79.45g respectively. Similar ratios between the mean mass of breeder eggs within the studied proveniences occurred on the 14th and 25th day of the incubation, as well as while measuring 1-day old turkey chicks, since, the heaviest turkey chicks were hatched from the heaviest eggs and vice versa.

From the weight group standpoint, until the 25th of the incubation, in the line H_1 , the eggs having mass between 76 and 80g, had the greatest relative mass losses, and those ranging from 81 to 85 g in mass had the least relative mass losses, i.e. 14.13 % and 13.40 % respectively (Tab. 3). In the hybrid line H_2 , until the 25th day of the incubation, the greatest egg mass losses had occurred in the lightest group, and the lowest ones in the heaviest group, i.e. 12.87 % and 12.52% respectively. In the same way, in the line H_3 , until the 25th day of the incubation, the lightest eggs had the greatest relative mass losses, while the heaviest ones had the smallest relative losses, i.e. 12.87 % and 12.52 % respectively.

From the data in Table 3, it is obvious that the eggs within the H_1 , taken on the whole, had suffered the greatest relative mass losses until the 25th day of the incubation, and those from the H_3 provenience had the least losses, i.e. 13.81 % and 12.24%, respectively.

A relative turkey chick mass share (percentage of the initial egg mass) in the H_1 was the greatest in the heaviest egg group and the smallest in the lightest, group, i.e. 64.95 % and 64.23%, respectively. Nearly identical results, in respect of a relative turkey chick mass share, were obtained in the remaining two turkey hen hybrid lines.

In general, a relative turkey chick mass share was the greatest in the H_3 and the smallest in the H_2 , i.e. 64.58 % and 63.87 % respectively.

Based on the above results, it can be inferred, that lighter eggs rather than heavier, had lost greater relative egg mass until the 25th day of the incubation, although absolute values (g) implied reverse trends. As a result, the lighter eggs in relation to the heavier eggs had lower turkey chick mass percentage in each line, which is understandable, because the heavier turkey chicks were hatched from the lighter eggs and vice versa.

Consulsion

Our investigations were performed with the goal of studying the effect of egg mass on incubation results in different turkey hen hybrid lines, Hybrid 2.000, Hybrid 3.000 and Nicholas, including 300 of breeder eggs, i.e. 100 eggs of each turkey hen hybrid line tested. The results achieved in respect of egg fertility, hatchability, egg mass losses dynamics, as well as turkey chick mass percentage (percentage of egg mass) during the incubation, have led to the following conclusions:

- Lighter eggs, and especially those from 76 to 80 g in mass showed better values of egg fertility and hatchability than those greater in mass in all the three lines. The best fertility (irrespective of weight group) was found in the eggs from

the parental breeder flock of the line Hybrid 3.000. The best hatchability (percentage of the number of input eggs) was also manifest in the line Hybrid 3.000 and Nicholas (percentage of the number of fertilized eggs);

- Lighter eggs, when compared to the heavier ones, had greater relative egg mass losses, but lower absolute (g) ones until the 25th day of the incubation. Hence, the lighter eggs had the lower turkey chick mass percentage (percentage of egg mass) in all the variants, which is understandable bearing in mind that heavier turkey chicks were hatched from the heavier eggs and vice versa.

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UTICAJ MASE JAJA I GENOTIPA ČURAKA NA REZULTATE INKUBACIJE

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U cilju ispitivanja mase jaja na inkubacione rezultate različitih linijskih hibrida čuraka (Hybrid 2.000, Hybrid 3.000 i Nicholas), sprovedi smo istraživanja na 300 priplodnih jaja, odnosno na 100 jaja od svake ispitivane hibridne linije čuraka. na osnovu dobijenih rezultata u pogledu oplođenosti, izvodljivosti, dinamike gubitaka mase jaja u toku inkubacionog perioda i procenata mase ćureta (% od mase jajeta), mogu se izvesti sledeći zaključci:

- lakša jaja, a naročito jaja mase između 76 i 80 g u pogledu oplođenosti i izvodljivosti pokazala su bolje vrednosti od jaja veće mase kod sve tri ispitivane hibridne linije čuraka. Najbolju oplođenost (bez obzira na težinske grupe) imala su jaja poreklom od roditeljskog jata provenijence Hybrid 3.000, a najbolju izvodljivost (% od broja uložених jaja) jaja poreklom, takođe od linije Hybrid 3.000, odnosno linije Nicholas (% od broja oplođenih jaja).

- lakša jaja u odnosu na teža imala su veći relativni, a manji apsolutni (g) gubitak mase jaja do 25. dana inkubacije. Navedena pojava uslovila je da lakša jaja u odnosu na teža imaju manji procenat mase ćureta (% od mase jajeta) u sve tri ispitivane provenijence čuraka, što je i razumljivo imajući u vidu da su se iz težih jaja izlegli teži ćurići i obratno.