

STUDY ON EGG LAYING CHARACTERISTICS OF MUSCOVY DUCK (CAIRINA MOSCHATA) DEPENDING ON THE BREEDING METHOD
ПРОУЧВАНЕ ВЪРХУ ЯЙЧНАТА ПРОДУКТИВНОСТ ПРИ МУСКУСНА ПАТИЦА (CAIRINA MOSCHATA) В ЗАВИСИМОСТ ОТ НАЧИНА НА ОТГЛЕЖДАНЕ

Matina NICKOLOVA

Agricultural University – Plovdiv

Manuscript received: October 15, 2004; Reviewed: November 8, 2004; Accepted for publication: December 15, 2004

ABSTRACT

Study was conducted on egg laying productivity and egg fertility of Muscovy duck in conventional and biological breeding of the fowls. The higher biological degree in the breeding method has lead to significantly higher values of all the studied characteristics: 4-week prolongation of the laying season, higher values in the laying peaks, greater egg weight (85.32 versus 78.36 g ***) and egg fertility (97.81 versus 96.18% *). Summer spells of hot weather and the high laying capacity in the peak did not exert a negative effect on the egg weight and fertility in biological breeding of the layers.

KEY WORDS: Muscovy duck, biological breeding, egg laying characteristics

DETAILED ABSTRACT

Проучванията на различни автори доказват, че отглеждането при условия, по-близки до природните, оказва благоприятно влияние дори при най-високопродуктивните породи [12].

При интензивни условия на отглеждане, за два репродуктивни периода, Мускусната патица достига носливост 120 – 150 яйца [6], [21], а според [17] носливостта при някои линии от този вид при интензивно отглеждане достига 210 яйца общо за два репродуктивни цикъла. Руски автори [9], [20] и [24] докладват за носливост за 5-месечен яйценосен период от 62 до 100, а [7] и [20] – за 45 до 100 яйца през първа репродуктивна година в зависимост от начина на отглеждане.

Вземайки под внимание факта, че органичното производство на животинска продукция набира все повече привърженици във все повече страни, както и факта, че при този начин на производство животните се отглеждат биосъобразно, а основният принцип на този начин на отглеждане е обезпечаване на благоденствие на животните и начинът за постигане на това благоденствие е максимална екстензификация на производството с цел максимално доближаване на отглеждането до природните условия на живот [12], ние си поставихме за цел чрез настоящото проучване да установим възможността за получаване на по-голям брой яйца при биосъобразно отглеждане на Мускусна патица и влиянието на този начин на отглеждане върху някои от разплодните качества на яйцата.

Проучванията по настоящия труд се проведоха с популация Мускусни патици (White variety). Бяха формирани две опитни групи от по тридесет патици във втора яйценосна година, произхождащи от едно и също люпило. Птиците от първа група се отглеждаха по конвенционален начин, при екстензивна система на производство, в закрыта сграда с прозорци, при гъстота 2.5 глави/m² и полово съотношение 1: 6. Патиците целогодишно имаха неограничен достъп до дворчета с твърда настилка при гъстота 1.5 глави/m². През репродуктивния период се хранеха с комбиниран фураж на базата на зърненожитни, соев и слънчогледов шрот и добавки, съдържащ 12 MJ ОЕ и 15.5% суров протеин.

Птиците от втора група се отглеждаха биосъобразно, върху затревена площ при гъстота 1 патица на 3.5 m² и същото полово съотношение. Те имаха на разположение лек тристенен навес, отворен на юг, с площ, разчетена за 1.5 глави/m². Използван беше комбиниран фураж със същия видов състав и хранителна стойност. Птиците от двете групи нямаха

достъп до водни площи.

Ежедневно се водеше контрол на преживяемостта на патиците и на груповата им носливост. Въз основа на дневната групова носливост се изчисляваха седмичната, месечна и годишна интензивност на яйцеснасяне, и средния брой яйца от патица за яйценосна година. Определяни бяха възрастта за достигане на 10, 50% и върхова носливост, и продължителността на яйценосния период при двете експериментални групи.

По-високата степен на биосъобразност в начина на отглеждане е довела до достоверно по-високи стойности на всички проучвани признаци:

При осигуряване на биосъобразност (по-голяма площ на индивид, затревяване на дворчетата) при отглеждането на патиците се наблюдава удължен с 4 седмици яйценосен период.

При двата начина на отглеждане върхова носливост се достига през първа десетдневка на месец май, като пикът е достоверно по-висок при носачките от втора група ($p < 0.05$).

Затихването на репродуктивната функция при групата с конвенционално отглеждане е по-рязко и следва веднага след летните горещини, докато при биосъобразно отглежданите птици се наблюдава по-продължително запазване на носливостта на сравнително високо ниво и по-плавното ѝ понижаване, едва след месец август независимо от атмосферните температури. Този факт налага извода, че по-високата степен на благосъстояние на индивидите, осигурена при биосъобразен начин на отглеждането им допринася за по-добро справяне на организма с екстремните стойности на климатичните фактори.

При осигуряване на птиците на «по-комфортни» условия за съществуване, се получават достоверно по-едри яйца, като масата им почти не се влияе от високите летни температури и високата носливост по време на пик.

По-близкия до естествения начин на отглеждане води и до достоверно по-висока оплоденост на яйцата, която не се влияе от пиковите на яйцеснасяне.

INTRODUCTION

Studies of different authors showed that breeding under conditions closer to the natural exerted a positive effect even on the most highly productive breeds [12].

According to [21] Muscovy duck species had less expressed seasonal character in egg laying compared to the other species of *Anas* genus. In Europe it preserved its seasonal character of reproduction at extensive breeding, being more obviously expressed in the female ducks.

Under those conditions the one-year old ducks began to lay eggs in April; those two years old or over – at the end of February and the beginning of March, at the age of 26 – 30 weeks [7], [15], [16], [18], [23], [21], [11].

According to [21] the first and the second reproductive periods continued from three to five months, the pause between them being about six months. According to those and to some other researchers, conducting studies on Muscovy duck species established that under intensive breeding conditions the fowls reached laying capacity of 120 – 150 eggs for two reproductive seasons [6], and, according to [17] the laying capacity of some Muscovy duck lines in intensive breeding reached up to 210 eggs in total for two reproductive cycles. Russian authors ([9], [20], [24]) reported about laying capacity of 62 to 100 eggs for a 5-month laying season and (1978) [7] and [20] – 45 to 100 eggs in the first reproductive year depending on the breeding method. Under intensive breeding conditions the former two authors obtained in the first reproductive period laying capacity of 75 eggs at an average laying intensity of 48.27 %, the peak laying capacity of 70 % being reached in the 9th week after the beginning of laying. Under extensive conditions the authors obtained laying capacity of 63 eggs in the first year, the average laying intensity being 40.86 % and the peak of 55 % reached in the 8th week, and, in the second year – 62 eggs, intensity of 40.54 %, the peak of 62 % reached in the 9th week after the beginning of laying.

Muscovy duck laid eggs of 65 to 100 g weight ([7], [19], [8]). According to [21] the mean egg weight of that species for three reproductive years was 77, 81 and 83 g, respectively. In another experiment, the same authors [22] established that at the beginning of the second reproductive season the mean egg weight was 85 g and at the end – 84.78 g, varying between 81 and 85 g.

Compared to the other agricultural poultry and to the ducks of *Anas* genus Muscovy duck species is distinguished by very high degree of egg fertility: over 92 – 93 % in average ([1, 3, 4, 5, 8, 10, 26, 27]). Very good egg fertility was obtained by (1991) [25] – 96.77 % in average in the period between the 3rd and the 18th week of the laying season in one-year old Muscovy ducks in Poland. Data about high egg fertility of the species (94 – 98.25 %) at the beginning of the reproductive season (April, May) was also reported by [9] and [13]. Bagliacca-M. et al. (1989) [1] announced a peak in egg fertility of one-year old Muscovy ducks in the second month of the laying period – 85 to 95 % depending on the variety. Although spermatozoon concentration of Muscovy drakes was the highest in March – April, egg fertility of the species was maintained high (above 92 %) during the whole reproductive period, i.e. from March until August [21],

slightly decreasing after the middle of August.

Taking into account the fact that organic production of animal produce wins more supporters in more and more countries, as well as the fact that by following the mentioned production method the animals are being raised in a biologically friendly way and the major principle of the method is providing for the animal welfare; and the means of achieving that welfare is the maximum extensification of production with the aim of maximal adaptation of breeding to the natural life conditions [12], the aim of the present study was to establish the possibility of obtaining a bigger number of eggs in biological breeding of Muscovy duck and the effect of that way of breeding on some reproductive qualities of eggs.

MATERIAL AND METHODS

The present studies were conducted with Muscovy duck (White variety) populations. Two experimental groups were formed, each of them consisting of thirty ducks in the second year of laying, from one and the same hatching. Concerning the breeding method we adopted the opinion of Nikolov and Nikolova (1999) who had offered in the frames of the previous use of the term “ecological animal breeding” (synonyms with “ecology-friendly” and “nature-friendly”) to distinguish between two principally different directions: ecology-friendly and biological breeding.

The fowls from the first group were raised following the conventional method at an extensive production system, indoors in a building with windows at a density of 2.5 heads/m² and a sexual ratio of 1 : 6. The ducks had an unlimited access to yards with solid pavement at a density of 1.5 heads/m². During the reproduction period they were fed on combined forage based on cereals, soya and sunflower groats and additives, containing 12 MJ OE and 15.5 % of crude protein.

The ducks from the second group were raised following the biological method on a grassy area at a density of 1 duck per 3.5 m² and the same sexual ratio. They had at their disposal a light three-wall shelter open to south with an area calculated for 1.5 heads/m². Combined forage of the same content and nutritive value was used.

The duck survival and the group laying capacity were daily reported. On the basis of the daily group laying capacity the following indices were calculated: week, month and annual laying intensity and the mean number of eggs per laying year. The age of achieving 10, 50 % and the peak laying capacity and the duration of the laying period in the two experimental groups were established. The week and month laying intensity were calculated by

the following formula:

$I = Ne \times 100 / Nd \times 7(30(28 \text{ or } 31))$, where

I - laying intensity

Ne – number of eggs obtained for a week (month)

Nd – number of ducks

7(30,(28 or 31)) – number of days in a week (month)

For characterizing the egg weight about 50 % of the eggs laid in both groups were weighed by electronic scales OHAUS-2000 with precision ± 0.01 g.

Egg fertility was detected by egg ovoscopy on the 9th day of the embryonic development.

All calculations were executed by the software product MS EXCEL 5.

RESULTS AND DISCUSSION

In the present experiment the beginning of the second egg laying year was registered at 79 week of age for the ducks bred conventionally and at 77 week of age for the ones bred following the biological method. Egg laying period of the latter continued for five weeks more (until the middle of October), while the ducks from the first group ended their second reproductive season as early as in the first week of September. The fact could be attributed to the better welfare of the layers provided by the biological breeding method.

The analysis of the data presented in Figure 1 showed that 10 % of laying capacity in both groups was achieved at the beginning of the second week after laying the first egg. 50 % was achieved in the middle of the third week (second decade of March) and at the end of the second week (end of February) for the first and for the second group, respectively.

For conventionally bred ducks three peaks of laying were observed, having the following values: 67.62; 79.52 and 69.05 %, reached in the 4th week of laying (end of March), 10th week (first decade of May) and 15th week (first decade of June). After the first and the second peaks the egg productivity remained at a comparatively high level for two to three weeks, while, after the third peak, the laying capacity gradually but continuously fell down until its final cease, which happened at the beginning of the 28th reproductive week. That explained the comparatively high monthly values maintained for the egg laying intensity in April, May and June (60.10; 67.61 and 57.02 %, respectively), the differences concerning the rest reproduction months being mathematically significant ($p < 0.001$), (Table 1). The decrease of laying to 48.92 % in July was highly significant ($p < 0.001$ compared to April and May and $p < 0.01$ compared to June) and it can be explained by the high atmospheric temperatures in

that month of the year.

In the group of biologically bred layers a bigger number of laying peaks were observed but not so obviously expressed as in the first group: 88.57 (first week of April), 87.62 (first decade of May), 80.00 (first week of June), 85.71 (last week of June) and 71.43 % (last decade of July). More abrupt decrease of laying capacity was reported just after the last peak while between the other peaks the laying intensity remained comparatively constant and high. As a whole the average laying intensity for the reproduction period was significantly higher in comparison with the one reached in conventional breeding: 61.46 versus 48.85 % ($p < 0.001$). All the differences between the groups within the month were highly significant statistically ($p < 0.001$) with an exception of the first reproductive month ($p < 0.05$).

In biological duck breeding significantly bigger eggs ($p < 0.001$) were obtained: the average values in the studied second reproductive year (85.32 g in the second group versus 78.36 g in the first one), as well as in the frames of each egg laying month between the two experimental groups (Table 1). The monthly values of the egg weight within the group were similar, which was due to the relatively finished growth and development of the two-year old layers. In the ducks from the second group the values were more regular despite the egg laying peaks and the high atmospheric temperatures in July – August. At the same time statistically significant decrease ($p < 0.05$) of the egg weight in the first group was reported in the two hot summer months.

The difference of 1.63% in egg fertility (97.81 versus 96.18%) per reproductive year ($p < 0.05$) was also in favour of the layers from the second group. In the conventionally bred group high and sustainable egg fertility after the second reproductive month was detected, lower values being registered in the first ($p < 0.05$ for March – May) and in the second reproductive months. It should be noted that in May, the month of the highest laying capacity for both groups, statistically significant decrease ($p < 0.05$) of egg fertility by 3.38 % was observed for the conventionally bred fowls. It is explained by the bigger number of obtained eggs. However, it was not observed in biologically bred ducks, just the opposite – in the month of the highest laying capacity (in May) the highest egg fertility for the whole reproduction period (99.27 %) was established. The result obtained is a proof of the favourable effect exerted by the breeding method, close to the natural conditions, on the male representatives too.

Table 1. Egg laying characteristics in Cairina Moschata depending on method of breeding

indices	march	april	mai	juin	juillet	aug	sept	oct	total	eggs/ duck		
t°C	10.5	12.2	17.3	20.9	25.1	24.9	20.1	14.8	-	-		
Rel. humidity	73	74	75	66	60	60	62	64	-	-		
				CONVENTIONAL BREEDING								
Laying intensity,%	37.98 al b1 j1	60.10 al a2 b2 c1 i1	67.61 al a3 b2 i1	57.02 al a3 a4 b3 c1	48.92 al a2 a3 a5 b3	29.29 a2 b1 a2 a3 a4 a5 a6	10.95 a1 a2 a3 a4 a5 a6 i1	-	48.85 ***	92.33***		
Eggs weight, g	78.96± 1.31 j1	79.43± 0.28 i1	78.16± 0.33 i1	79.52± 0.24 c1 c2 i1	77.37± 0.29 c1 i1	77.94± 0.23 c2 i1	79.03± 1.27 j1	-	78.36± 019***			
Egg fertility, %	96.18 c1	97.63	95.89 k1	97.86	97.18	97.48	95.71	-	96.18*			
				BIOLOGICAL BREEDING								
Laying intensity,%	44.64 al j1	82.48 al a2 c1 i1	77.50 al a3 c1 i1	76.42 al a4 c1 i1	67.42 al a2 a3 a4	53.57 al a2 a3 a4	39.52 al a2 a3 a4 a5 a7 b2 b3 i1	25.23 al a2 a3 a4 a5 a6 a8 b3	61.46 ***	137.67***		
Eggs weight, g	85.31± 1.18 j1	84.68± 0.17 i1	84.97± 0.25 i1	86.24± 0.23 i1	86.56± 0.25 i1	86.11± 0.24 i1	86.28± 0.38 j1	84.44± 0.38	85.32± 0.12***			
Egg fertility, %	97.81 c1	96.28	99.27 c1 k1	98.71	98.23	98.47	98.08	97.53	97.81*			

Differences are significant at a, l, ***- p<0.001; b, j, **- p<0.01; c, k, *- p<0.05.

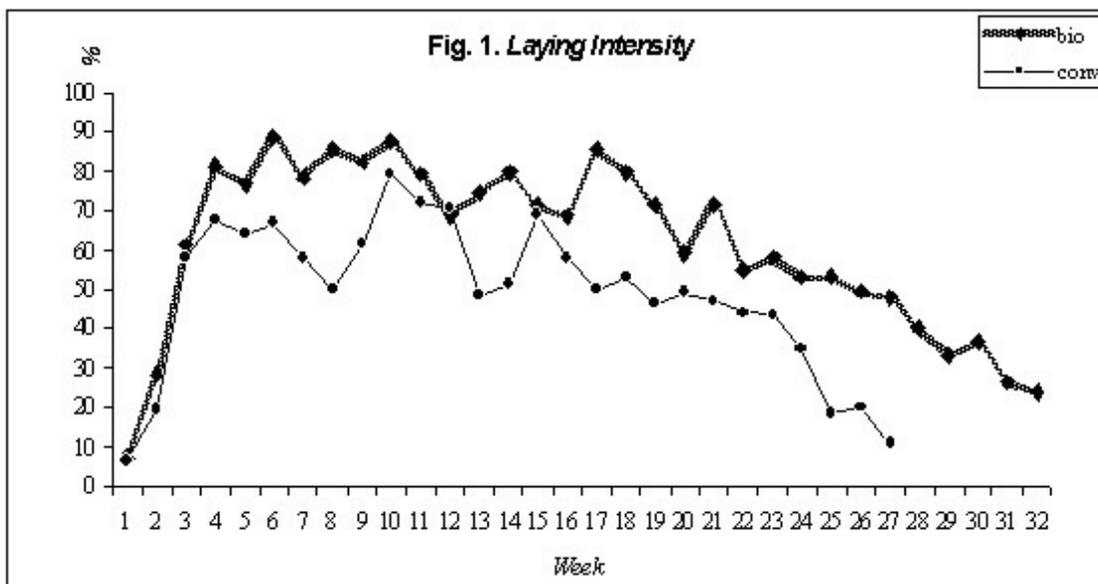


Figure 1: Laying intensity

CONCLUSIONS

The nature-friendly breeding method has led to significantly higher values of all the studied characteristics:

1. In biological breeding of ducks the laying season was extended by 4 weeks.
2. In both breeding methods the highest laying capacity was reached in the first decade of May, the peak being significantly higher for the layers from the second group ($p < 0.05$).
3. The ceasing of the reproductive function in the conventionally bred group was more abrupt and it followed immediately after the summer hot spells, while in the biologically bred ducks the laying capacity remained comparatively higher despite the atmospheric temperatures and it decreased more gradually after August. The fact motivated the conclusion that the better welfare of the individuals provided by the biological breeding method contributed to the better coping of the organism with the extreme values of the climatic factors.
4. Significantly bigger in size eggs were obtained, their weight being almost unaffected by the summer hot weather and by the higher laying capacity during the peak, when more “comfortable” living conditions were provided for the ducks.
5. The breeding method that was closer to the natural conditions led also to significantly higher egg fertility, which was not affected by the laying peaks.

REFERENCES

[1] BAGLIACCA M., G. PACI, M. MARZONI, C.

F. AVANZI, 1989, Tecnologia di incubazione nell' anatra muschiata: effetto della posizione e del raffreddamento delle uova durante l' incubazione Zoot. Nutr. Anim., 15: 423- 430.

[2] BIELINSKI K., A. ROSINSKI, 1988, Influence of the age of White Italian geese on their reproductive performance, Waterfowl production. Proceedings of the International Symposium on Waterfowl Production, the satellite conference for the XVIII World's Poultry Congress, September 11-18, 1988, Beijing, China. 1989, 223-227.

[3] BODI L., E. MESZAROS, I. ACS, J. KOZAK, K. KARSAINE, 1996, Prolificacy performances of Hungarian Upgraded and Grey Landes goose breeds. 1st Paper: Spring laying cycle, Allattenyesztes-es-Takarmanyozas (Hungary). (1996). v. 45(5) p. 473-480.

[4] BOGENFURST F., P. KARAKAS, L. PALMAI, Z. TARASZENKO, 1998, Poljoprivredna Znanstvena Smotra, 62: 1- 2, p. 122- 123.

[5] BONDARENKO A., 1992, Increasing reproductive performance of geese, Ptitsevodstvo, 12: 5-6.

[6] CAHIER TECHNIQUES DE L' ITAVI, 1979, tome 2: 97- 135, Institut Technique de l' Aviculture, Paris.

[7] CARVILLE H- DE & A DE CROUTTE, 1978, Le Canard, Vigot, Paris.

[8] CHANGKANG W., LI ANG, W. GUANGYING, 1999, Effects of the Quantative Characteristics of Hatching Eggs on Hatchability in Muscovy Duck, 1st World Waterfowl Conference, Taichung- Taiwan, China,

1- 4 December 1999.

[19] CHIPCHIRYUK G., 1980, Ptitsevodstvo, 7:19-20 /in Russian/.

[10] FRANK C., 1989, Realisation of Poultry Breeding Program- a Contribution to the 40th Anniversary of the German Democratic Republic, Tierzucht, 43: 1, 7-9.

[11] GORYACHKO N., S. KOSJACHENKO, A. SOLTANOVA, 1988, Efficiency assessment of breeding populations and lines of Muscovy ducks, Means of increasing intensification and development of energy saving technologies of egg and poultry production, 98-99, 88- 24286.

[12] MANOLOV I., M. DIMITROVA, V. NIKOLOV, R. ANDREEV et al., 2003, Fundamentals of Organic Farming, "Vassil Petrov" Publishing House, Plovdiv, 480 pp.

[13] MELTZER A., 1988, Incubation of Muscovy Duck Eggs, Proc. of International Symposium on Waterfowl Production, the Satellite Conference for the XVIII World's Poultry Congress, Beijing- China, 11- 18 September, 1988.

[14] NIKOLOV V. and L. NIKOLOVA, 1999, Ecological Aspects of Breeding. I. Differentiation of ecological problems, Animal Sciences, 3-4: 114-117.

[15] OSMAN A., 1997, Effect of Diet Containing Dried Poultry Manure and Virginamicim on the Reproductive Performance of Muscovy Ducks. Egypt. Poult. Sci. Journ., 17: 2, p. 171- 191.

[16] RAUD H. & J. FAURE, 1990, Rhythmic Occurrence of Sexual Behaviour and Egg Laying Activity of Muscovy ducks, Brit. Poult. Sci., 31: 23- 32.

[17] RETAILLEAU B., 1997, Le point sur l' evolution des performances de reproduction du canard Barbarie, Deuxiemes Journees de la Recherche Avicole, Tours- France, 8- 10 Avril, 1997.

[18] ROMBOLI I., B. MORI, A. SALANI, K. F- AVANZI, 1984, Storage Condition and Hatchability in Muscovy Duck Eggs, 17^{eme} Congr. Mond., d' Aviculture, Helsinki (Finlande), aout- 1984, p. 218- 220.

[19] ROMBOLI I., T. BATTINI, 1986, Struttura del guscio e schiusa nelle uova di anatra muschiata, Avicoltura LV, 3: 63- 65.

[20] SAUVEUR B. & DE CARVILLE-H., 1990, Effect of daylength on early puberty in female Muscovy ducks, Control of fertility in domestic birds, Tours, France, 2-4 July, Colloques-de-l'INRA. 1990, 54: 197-203.

[21] SAUVEUR B. & H. DE CARVILLE, 1985, Recent Studies on the Management of Muscovy Breeding Ducks in France, Proc. of Workshop at CIPANAS, Bogor, Indonesia, November 18- 22, 1985.

[22] SAUVEUR B. 1988, Reproduction des volailles et production d' oeufs. Chapitre VI. INRA, Paris, p. 105-130.

[23] SAVITSKIY V., 1989, Characteristics of Muscovy duck breeding, Poultry Science, 3:16- 18.

[24] SOGOMONOV A. & L. RAHMANOV, 1988, Productivity of Muscovy ducks in hot climate, Ptitsevodstvo, 3: 25- 27 /in Russian/.

[25] SZEJNIUUK B., H. OLSZEWSKA, Z. PALUSZAK, 1991, Zootechnika (22), p. 55- 60.

[26] TIKK H. and I. VIHT, 1988, Egg laying and incubation properties of eggs from different Muscovy duck populations, Means of increasing intensification and development of energy saving technologies of egg and poultry production, 97- 98.

[27] YUVANTA T., A. WIBOWO, 1997, The Effect of Feeding Intervals and Sex Ratio on Production and Reproduction of Tegal Native Ducks, Proc. of 11th European Symp. on Waterfowl, Nantes (France), Sept., 1997, p. 455- 459.

