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BREEDING AND PRODUCTION PERFORMANCES OF MUSCOVY DUCK LINES

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Abstract

This paper has described breeding and production performances of three Muscovy duck lines (spotted, white and black) during December 2019-June 2020 which has been raise on the teaching waterfowl farm Moara Domnească of the University of Agronomic Sciences and Veterinary Medicine of Bucharest and results are compared with those recorded in year 2001. Each line group has been of 55 birds in size. There were monitored weekly, monthly and for whole laying cycle the following parameters: body weight, egg production, egg weight, fertility, hatchability, egg weight and day-old body weight. Spotted line had an average body weight of 2427 g for females and 4566 g for males an egg production of 59.42 eggs/bird and an egg weight of 78.21 g and a fertility of 88.48% and a hatchability of 39.79% and a day-old body weight of 47.10 g. White line had an average body weight of 2580 g for females and 4450 g for males and an egg production of 72.06 eggs/bird and an egg weight of 76.56 g and a fertility of 86.00% with a significantly lower hatchability (35.80%) and a day-old body weight of 48.32 g. Black line had an average body weight of 2262 g for females and 4750 g for males and an egg production of 52.45 eggs/bird and an egg weight of 84.72 g and a fertility of 90.24% with a significantly higher hatchability (40.90%) and a day-old body weight of 49.92 g.

Key words*: body weight, fertility, hatching, Muscovy duck.*

INTRODUCTION

Waterfowls are on second place next to chickens in poultry meat production with 6.98 million tons produced in 2017. Nowadays there are raised over 1150 million ducks and over 370 million gooses worldwide and flocks are increasing spectacularly in some Asian countries. Worldwide yearly growth was about 2.70% during 2000-2017 which means that total growth was 45.82% with a very good growth rate between 2005-2010 (4.02%/year) (Watt Poultry Statistical Yearbook, 2019).

Worldwide duck meat consumption/capita is of 600g by year and rising with 3.4% by year. Most ducks (83.5% of worldwide production) are being in Asia with 79% of them being raised in China (where consumption/capita is of 2 kg). It has been noticed a tendency to an impressive improvement of following characters: growth rate, feed usage efficiency, reducing fat percentage and increasing breast yield (Linden, 2015; Marin et al., 2015; Popescu-Micloşanu, 2004).

Muscovy duck is very popular especially in France (Guy, 2013) where several researches have been performed (Leclerq and Carville, 1986). Meat is having less fat and a dark red color. Breast weight is about 700 g and this contains about 70% of commercial value of duck and on the other hand thighs and drumsticks are representing 27% (Guy, 2013). Males are raised up to 4.5-5.5 kg in about 84 days with a specific consumption of 2.75 and a breast percentage of 16% of live weight (Grimaud, 2008). Body weight at 51 days is 3.3 kg with a specific consumption of 2.0 kg feed consumption/kg gain.

Female's growth rate has been much smaller compared to male's growth rate and so females are reaching 2.4-3.0 kg at 68 days of age. Egg production has been of 250/female in 46 weeks and fertility has been of over 90%. Hatching period has been of 35 days compared to 28 days for other species/races.

During last 42 years there has been registered a fast genetic advance at this specie. According to researches carried out by Guy (2013), average body weight at slaughtering has been about 5.5 kg; breast weight with skin has been on average 1007 g (18.3%); thigh + drumstick 803 g (14.6%) and abdominal fat 83 g (1.5%).

Researches about feed requirements have shown that this specie does not need rations with high energy level as there has been no growth rate difference until 10 weeks of age when diets in which ME varied between 10.4 and 13.3 MJ/kg have been used (Leclerq and Carville, 1986). Same study has shown that protein requirements decreased quickly from 21% (between 0 and 3 weeks) to 15% (between 6 and 10 weeks). Although this research was carried out more than 30 years ago general observation is still valid.

Grimaud (2008) has shown that Muskovy ducks and the mallard grown for meat have a smaller fat percentage and a higher percentage of valuable carcass parts compared with Muscovy duck.

MATERIALS AND METHODS

This study was performed at Educational Farm Belciugatele - Waterfowl Farm which is located in Moara Domnească and it is belonging to University of Agronomic Sciences and Veterinary Medicine of Bucharest and it is specialized in waterfowl production and breeding and in hatching eggs originated from an original biological material comprising a collection of 4 duck races and 3 goose races for the selection and preservation of sole genetic de waterfowl fund in Romania.

The farm is having two computerized waterfowl houses with an area of 250 square meters each divided in wire pens to keep flocks by races and types and it is also having its own hatching house.

Adult birds body weight and individual egg production has been registered sand eggs were weighted and then they were incubated and incubation parameters have been establishing for the productive evaluation of populations of spotted, black and white Muscovy duck.

Hatching eggs were collected from nests daily usually in the morning when most waterfowl are laying eggs. Eggs are stored inside a room with relative humidity of 60-70% and at a temperature of 12-16°C. Usually ducklings are hatching from the 28th day. Temperature and humidity are very important parameters of which hatching success is dependent. If values are too low or too high ducklings might have deformities or embryo might die. Eggs need a temperature of 37.5°C and an average humidity of 60-70%. Egg candling (ovoscope egg testing) has been carried out from day seven. In last 3 hatching days eggs have been transferred from setter in special hatching crates. Newly hatched ducklings have been kept some hours in the hatchery for to dry themselves and to gain strength.

Some of the hatched ducklings have been kept to replace the parent flock and the others have been sold.

Production and breeding figures have been monitored from December 2019 and yearly average results have been compared with those registered in year 2001 also in Educational Farm of the University. These parameters (monitored weekly / monthly and as average by lying cycle) are the followings: body weight of adult birds (monthly - between December, 2019 - May, 2020), egg production/lying cycle (February - May 2020), egg and chick weight (February - May 2020), fertility and hatching (February - May 2020).

Results were statistically processed by classical means by calculating the average, variation, standard deviation, error of average and variability coefficient.

Student test has been used to study homogeneity of averages and to test the statistical significance of differences observed between averages (between groups) (Sandu, 1995). Calculated Student test value has been compared with its critical (tabular) value at corresponding liberty degrees (cumulated liberty degrees $n_1 + n_2 - 2$) and desired significance level ($\alpha = 0.05$; $\alpha = 0.01$; $\alpha = 0.001$; at a probability of 95%, 99% and respectively 99.99%).

RESULTS AND DISCUSSIONS

Results obtained from the study are presented in the followings for the three lines of Muscovy duck:

At Barbarie duck spotted variety (body feathering is black with white) production and breeding performances of analyzed population are as following:

- females average body weight is 2427 g and males average body weight is 4566 g with no significant differences between months and years;
- birds are having red meat with a low-fat percentage (2% abdominal fat) being also appreciated as "lean duck". Sexual dimorphism is well developed. Late sexual maturity: 26-28 weeks in females and 28-30 weeks in males;
- egg production is 59.42 eggs/bird and egg color is white yellowish and egg weight is 78.21 g with no significant differences between months and years;
- good hatchability - 88.48% with significant differences between months February - May, March - May, April - May and significantly distinct between February - March and February - April.
- hatching percentage is low with an average of 39.79% and it is ranging between 19.90 and 50.07% with very significant differences between months March - April and March - May;
- ducklings weight at day one age was 47.10 g with limits between 45.97 and 47.80 g and without significant differences.

Table 1. Body weight of Muscovy duck populations (grams)

Mention		Spotted			White			Black		
		2020	2001	Student 2001-2020	2020	2001	Student 2001-2020	2020	2001	Student 2001-2020
♂	X	**4566**	**4183**	**2.0050**	**4450**	**3923**	**1.4965**	**4750**	**4222**	**2.3410**
	sx	152.53	115.00		200.01	289.57		180.55	134.94	
	CV	7.47	6.15		10.05	16.50		8.50	7.15	
♀	X	**2427**	**2286**	**0.8356**	**2580**	**2240**	**1.5430**	**2262**	**2280**	**0.0981**
	sx	107.61	129.98		128.07	178.72		135.07	124.10	
	CV	9.91	12.71		11.10	17.83		13.35	12.17	

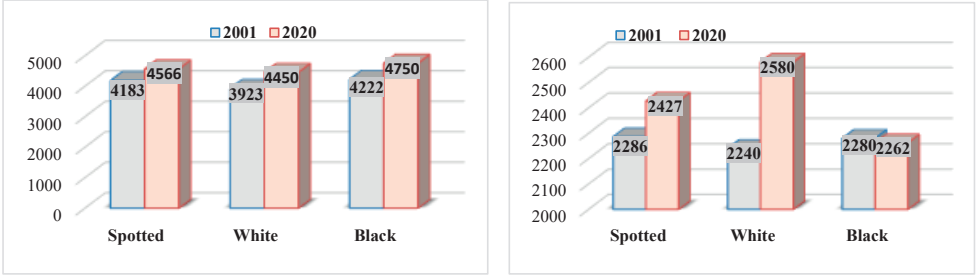

Figure 1. Body weight of males (a) and females (b) of Muscovy duck race (adults, g)

Table 2. Egg production in Muscovy duck

Mention		Spotted		White		Black	
		Total	Student 2001-2020	Total	Student 2001-2020	Total	Student 2001-2020
2020	X	59.42	0.4220	72.06	0.7561	52.45	0.8117
	sx	5.191		8.216		3.064	
	CV	17.47		22.80		11.68	
2001	X	62.52		64.28		55.84	
	sx	5.264		6.193		2.834	
	CV	16.83		19.27		10.17	

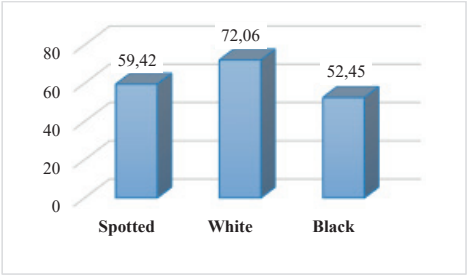

Figure 2. Egg production/lying cycle in Muscovy ducks

The following performances have been registered in white type of Barbary duck (B3, white feathering and orange beak and feet):
- females average body weight is 2580 g (with significant differences between months December, January and May) and males average body weight is 4450 g with significant differences between months December - May;
- sexual dimorphism is sharp;
- sexual maturity is tardy at 26-28 weeks in females and 28-30 weeks in males;
- egg production is 72.06 with eggs of white yellowish color and egg weight of 76.56 g and with no significant differences between months and years;
- fertility is good - 86.00% with significant differences between months February - March and February - April;
- hatching percentage is low - 35.80% ranging between 18.06 and 45.27% with significant differences between years and with very significant differences between months March - April and March - May;
- ducklings body weight at day old age - 48.32 g ranging between 47.18-48.91 g with significant differences between months February - May.

Data processing revealed the following performances in black variety of Muscovy duck (B4, black feathering with greenish metal shine and wings with white spots):
- females average body weight is 2262 g and males average body weight is 4750 g with no significant differences between months and years;
- sexual dimorphism is sharp;
- late sexual maturity: 26-28 weeks in females and 28-30 weeks in males;
- average egg production was 52.45/duck and eggs had a white-yellowish color and a weight of 84.72 g, with significant differences between months February - May;
- fertility is very good - 90.24% with significant differences between months February - April and distinctive significant between February - March;
- hatching percentage - 40.90%, ranging between 20.45 and 51.52% with significant differences between years and with very significant differences between months March - April and March - May;
- ducklings weight at day one age - 49.92 g, ranging between 48.76-51.71 g with significant differences between months May - February.

Table 3. Egg and ducklings' weight in Muscovy duck (grams)

Mention		Spotted			White			Black		
		2020	2001	Student 2001-2020	2020	2001	Student 2001-2020	2020	2001	Student 2001-2020
Egg weight	X	**78.21**	**79.60**	**1.2413**	**76.56**	**78.37**	**1.4930**	**84.72**	**83.52**	**1.0512**
	sx	0.828	0.750		0.765	0.994		0.807	0.805	
	CV	2.37	2.11		2.23	2.69		2.13	2.15	
Ducklings weight	X	**47.10**	**47.97**	**1.2744**	**48.32**	**48.91**	**0.7712**	**49.92**	**48.81**	**1.6891**
	sx	0.499	0.456		0.474	0.583		0.474	0.455	
	CV	2.37	2.13		2.20	2.66		2.12	2.08	

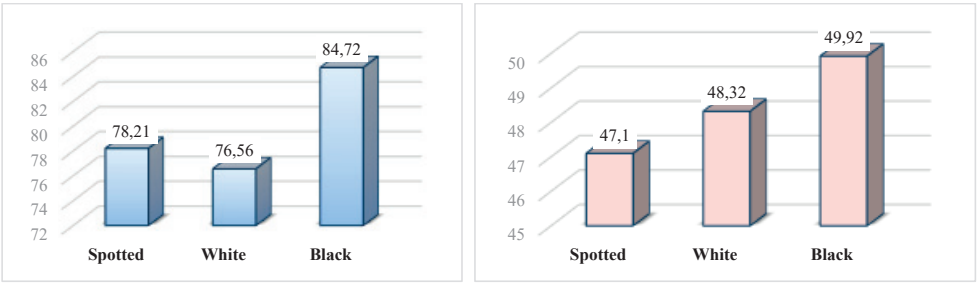

Figure 3. Average egg weight (a) and ducklings' weight (b) in Muscovy duck

Table 4. Fertility (%) and hatchability (%) in Muscovy duck

Mention		Spotted			White			Black		
		2020	2001	Student 2001-2020	2020	2001	Student 2001-2020	2020	2001	Student 2001-2020
Fertility	X	**88.48**	**87.83**	**0.4059**	**86.00**	**82.43**	**2.2208**	**90.24**	**88.11**	**1.3478**
	sx	0.834	1.358		1.229	1.034		0.995	1.230	
	CV	2.13	3.46		3.20	2.81		2.46	3.12	
Hatchability	X	**39.79**	**41.83**	**1.6398**	**35.80**	**41.83**	**4.9105***	**40.90**	**36.65**	**3.4376***
	sx	1.021	0.717		0.998	0.717		0.826	0.918	
	CV	5.74	3.83		6.23	3.83		4.52	5.60	

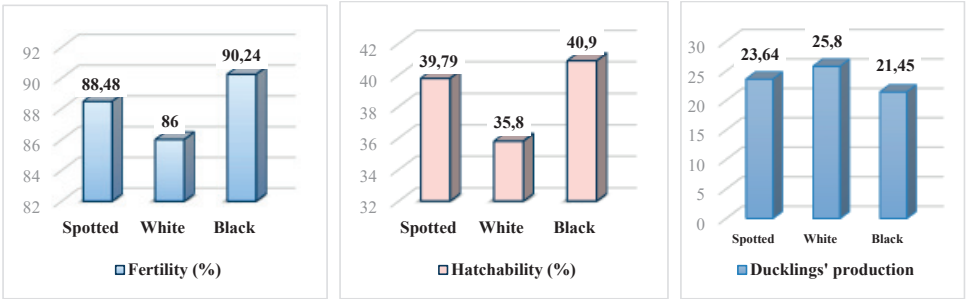

Figure 4. Fertility (%), hatchability (%) and ducklings' production/female in Muscovy duck

It was seen that in Muscovy (Barbary) duck males body weight ranges between 4450 g in line B3 (Muscovy white) and 4750 g in line B4 (Muscovy black) which is used on paternal line in hybridizations and in females body weight ranges between 2262 g in line B4 and 2580 g in line B3. As in the case of males spotted females have an intermediate body weight between the two lines.

Egg production of Muscovy (Barbary) duck ranges between 52.45 and 72.06 eggs/female and line B3 had the best egg production and so this line might be proposed for position of mother in hybridization for the production of mullards parents. Lowest egg production was registered in population B4 with 52.45 eggs (-27.21% compared to B3) smaller than the average of populations followed by the spotted line with 59.42 eggs (3.08% less than the average of all lines).

Average egg weight ranges between 76.56 g in Muscovy white and 84.72 g in Muscovy black.

Ducklings' weight at day one age had the same profile of egg weight curve with one exception in white line of Muscovy duck where egg weight curve is bigger than in spotted line (48.32 g compared to 47.1 g).

Fertility is high in all duck populations monitored. It has been noticed that biggest fertility in Muscovy duck was in line B4 (90.24%) and lowest fertility was in line B3 (86.00 %). These figures especially fitted for this race which is well known for its fertility problems.

Hatching percentage for monitored breeding cycle is low and varies between 35.80% in line B3 and 40.90% in line B4.
Registered ducklings' number by breeding female had the following values: 23.64 ducklings by female were in spotted line and 25.80 ducklings by female were in B3 line and 21.45 ducklings by female were in B4 line.

CONCLUSIONS

The three Muscovy duck lines present in Educational Farm in Moara Domnească (spotted, white and black) had production and breeding performances similar to those described in literature. It should be noticed that they are being the only strains existing in our country and a valuable gene pool which might be the foundation of both obtaining biological material suitable to be marketed and producing mullards by crossing with Peking race of ducks.

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