EXPERIMENTAL INFLUENCE OF LAKTINA® PROBIOTIC ON EGG LAYING CHARACTERISTICS, FERTILITY AND VIABILITY IN MUSCOVY DUCK (CAIRINA MOSHCATA)

ВЛИЯНИЕ НА ПРОБИОТИК ЛАКТИНА® ВЪРХУ НОСЛИВОСТТА И ОПЛОДЕНОСТТА И ЛЮПИМОСТТА НА ЯЙЦА ОТ МУСКУСНА ПАТИЦА (CAIRINA MOSHCATA)

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ABSTRACT

The effect of Laktina® probiotic on some major characteristics of the reproduction capacity of Muscovy duck (White variety) has been studied. The experiment was carried out with 96 ducks in their first reproduction season, distributed into an experimental and a control group of equal numbers. The combined forage for feeding the experimental group contained 500 g/t of the tested probiotic. The following characteristics were studied: egg production, egg weight, fertility and viability (hatchability of fertile eggs).

It was established that the average egg production (93.91 versus 67.88 eggs per duck) and the egg-laying intensity for the period (45.92 versus 34.63 %) were in favour of the group receiving probiotic, the advantage being statistically significant ($p< 0.001$) and sustainable throughout the season. The advantage of 2.33 g in the egg weight ($p< 0.001$) of the control group was explained by the significantly increased laying capacity of the ducks from the experimental group.

No effect of Lactina probiotic was established on egg fertility and viability.

KEY WORDS: Muscovy duck, probiotics, egg laying characteristics

DETAILED ABSTRACT

Пробиотиците се разглеждат като алтернатива на нутритивните антибиотици при хранене на селскостопанските животни и птици [2].

Според Koudela et al. (1997) [7] experimental application of probiotics changed the laying curve, laying intensity and basic egg technological properties. Положително въздействие on egg production, egg weight and egg quality при комбинираното или самостоятелно прилагане на ензими и пробиотици in laying hens са получили и [13, 14].

Произвежданият в България пробиотик "Лактина" ® съдържа лиофилизарани щамове от родове Streptococcus и Lactobacillus. Неговото стимулиращо действие е проучено при угояване на прасета [12] и зайци [11].

В настоящото проучване е изпитано влиянието на пробиотик Laktina® върху основни характеристики на възпроизводителната способност на Мускусна патица (White variety). Опитът е проведен с 94 едногодишни носачки от вида Мускусна патица, произхождащи от едно и също люпило и разделени на 2 групи. Опитната група получаваше пробиотик "Лактина®" от излюпване до края на опита в количества: 1-28 ден – 1 kg/тон, от 29 ден до края на опита – 0.5 kg/тон кобиниран фураж. Комбинираният фураж, изхранван на воля от февруари до август, 2004 година, бе постоянен и съдържаше (в 1 kg фураж): обменна енергия – 11.5MJ, суров протеин- 15.5%, лизин- 0.65%, метионин+цистин-0.45%, Ca- 2.5% и общ P- 0.6%. Птиците се отглеждаха по 48 в група, по конвенционален начин, при екстензивна система на производство, в закрита сграда със семейни гнезда, при полово съотношение 1: 6. Те целогодишно имаха неограничен достъп до дворчета с твърда настилка. Проучени са носливост (egg production), egg weight, fertility and viability (hatchability of fertil eggs).

Не се установява влияние на изпитваната добавка по отношение на възрастта на пронасяне и възрастта на достигане на 10 и 50 % интензивност на яйцеснасяне, както и върху продължителността на яйценосния период.

Приложението на пробиотик Лактина е довело до значително и статистически достоверно повишаване ($p<0.001$) на интензивността на яйцеснасяне, респективно- на средната носливост при птиците, получавали пробиотик. Средната носливост (93.91 срещу 67.88 яйца от патица) и интензивността на яйцеснасяне за периода (45.92 срещу 34.63%) са в полза на групата, получавала пробиотик, като превъзходството е статистически достоверно ($p<0.001$) и устойчиво през целия опитен период.

Превъзходството от 2.33g в масата на яйцата ($p<0.001$), получени в контролната група отдаваме на значително повишената носливост на патиците от опитната група.

Не е установено влияние на изпитвания пробиотик върху оплодеността и люпимостта на яйцата, и нивата на ембрионална смъртност по периоди на ембрионалното развитие.

INTRODUCTION

Probiotics were discussed as an alternative to the nutritive antibiotics in feeding agricultural animals and poultry [2]. They are biostimulators and immunomodulators [1] containing live or lyophilizing bacterial cultures, which regulate and optimize the ratios among the different types of microorganisms in the digestive system, preventing upsets and exerting a stimulating effect on the disintegration and absorption of the nutrient substances. Lactina® probiotic produced in Bulgaria contains lyophilizing strains of Streptococcus and Lactobacillus genuses. The standardized product contains CFU - min 1.10^8/g and lactic acid 2,0 - 2,6 %. Its stimulating effect was studied in fattening pigs [12] and in rabbit breeding [11]. The amounts recommended to be added to the combined forage for poultry were from 300 to 900 g/t. Surdjiiska et al., 2004 [11] reported that after adding 500 g/t of Lactina in broiler raising 12 % higher growth was obtained, the forage utilization was 5,5 % better and the breast musculature contained more proteins and less fats.

Our studies [9, 10] showed that adding Lactina probiotics in standard combined forages for growing ducklings for reproduction enabled the rapid overcome of the "crises of feather loss", as well as achieving higher growth (over 15 % for a 70-day period), decreasing the expenses for forage (about 18 %) and increasing the content of proteins and essential aminoacids in the breast musculature.

According to Koudela et al. (1997) [7] experimental application of probiotics changed the laying curve, laying intensity and basic egg technological properties. A positive effect on egg production, egg weight and egg quality in combined or separate application of enzymes and probiotics in laying hens was also obtained by Yalcin et al. (2000) [13, 14].

The aim of the present study was to investigate the effect of Lactina® probiotics on some major characteristics of the Muscovy ducks reproduction capacity.

MATERIALS AND METHODS

In the period February – August 2004 an experiment was carried out with 96 one-year layers of Muscovy duck species (White variety) originating from a single hatch and divided into two groups. The experimental group received Lactina® probiotic from hatching to the end of the experiment at the following rates: 1st–28th day – 1 kg/t, from 29th day by the end of the experiment - 0.5 kg/t of combined forage. The combined forage fed volitionally from February until August 2004 was one and the same, containing (in 1 kg of forage): metabolizable energy - 11.5 MJ, crude protein – 15,5 %, lysine – 0.65 %, methionine + cystine - 0.45 %, Ca - 2.5 % and total P - 0.6 %.

The poultry were raised by 48 in a group, following the conventional method, at an extensive production system, in a building with family nests, the sexual ratio in the groups being 1 : 4,5. Throughout the year the ducks had an unlimited access to inner yards with hard pavement.

Everyday control of the duck survival and the group laying capacity was conducted. On the basis of the daily group laying capacity, the week, month and annual (28-week period of laying) egg intensity were calculated, as well as the mean number of eggs per duck for a laying year. The age of achieving 10 %, 50 % and the highest laying capacity and the duration of the egg laying period were established. Laying intensity for a week, month and the laying period were calculated by the formula:

$I=Ne \times 100/Nd \times 7(30, (28, 31 \text{ or } 196))$, where

I – egg laying intensity

Ne – number of eggs for a week (month, reproductive period)

Nd – number of ducks

7(30, (28, 31 or 196)) – number of days in a week (month, reproductive period = 28 weeks= 196 days)

In order to characterize the egg weight, about 50 % of the eggs laid in both groups were weighted by electronic scales OHAUS-2000 with a precision of ± 0.01g. The incubation egg qualities were detected in a private hatchery by incubating 450 eggs from each group, produced in the period of highest laying capacity. Testing by the ovoscope method was carried out on the 9th day of the embryonic development for establishing egg fertility.

The following characteristics were reported: beginning of laying (age of reaching 10 % of laying capacity), age of achieving 50 % of laying capacity, laying intensity, average laying capacity of a duck, duration of the laying period, egg weight, fertility and hatchability.

RESULTS AND DISCUSSION

The first egg laid for both groups was registered at the end of the first decade of February – at the duck age of 27 weeks, and, 10 % and 50 % of laying capacity was reached also for both groups at the end of the first and in the middle of the sixth week of laying, respectively, (Fig. 1). Although the ducks from the control group reached the highest laying capacity (59.01%) at the end of the sixth (third week of March) and those from the experimental – in the eighth week of laying (end of March), the peak for the latter (69.64%) was significantly higher ($p<0.001$) and its reaching was preceded by constant and stable increase of the laying capacity. Three more peaks of laying intensity were registered for the experimental group: in the 12th week (end of April) - 68.45 %, 16th (end of May) - 66.07 % and 21st (end of June) - 61.31 %. At the same time the layers from the control group reached their first peak abruptly, after five weeks of laying capacity at a poor level of 10 – 15 %. Two more peaks of laying capacity were reported for them, which were statistically significant at a lower level ($p<0.001$) compared to the experimental - 55.90 and 51.71 %, reached in the 12th (end of April) and 20th (third week of June) week of laying. That resulted in significantly lower laying intensity during the whole reproduction period - 34.63 versus 45.92 % ($p<0.001$) and the lower average laying capacity - 67.88 versus 93.91 ($p<0.001$) eggs per duck (Table 2). The monthly levels of egg laying confirmed the above-mentioned (Table 1). The differences between the groups were always in favour of the experimental one and they were either of high ($p<0.001$) or of medium ($p<0.01$) statistical significance. The monthly peaks of egg laying were reported in May - 62.25% (the decline in the following month being only by 2.22 %) and in June - 52.05 % (the decline in the following month being by 18.02 % ($p<0.001$) for the experimental and the control groups, respectively. Due to the same breeding conditions and the same age and weight of the ducks from the experimental and the control groups, we attributed the differences obtained in the laying capacity only to the positive effect of the probiotic included in the forage. Egg laying in both groups continued for 28 weeks.

Table 1 also presents the monthly values of the egg weight. With the rapid increase of the laying intensity in the experimental group, statistically significant ($p<0.001$) monthly differences in the values of that index were reported in favour of the control group. As a result of that the mean egg weight in the reproduction period was 75.81 g for the control group and 73.48 g for the experimental ($p<0.001$) one.

The lowest egg weight in both groups, excluding the first laying month, was detected in the months with laying

Table 1: Egg laying characteristics

Month	Laying intensity		Egg·s weight	
	With Probiotic	No Probiotic	With Probiotic	No Probiotic
February	15.28 n.s.	10.35 n.s.	66.51±0.27	67.24±0.29
	a1a2a3a4a5	a1a2a3a4a5	a1a2a3a4a5a6	a1a2a3a4a5a6
March	45.83 ***	35.57 ***	73.48±0.25 ***	75.71±0.29 ***
	a1a6a7a8a9 b1	a1a6a7b1b2	a1a7a8a9c1	a1a7a8a9a10
April	59.67 ***	42.51 ***	76.19±0.21 ***	78.27±0.27 ***
	a2a6a10	a2a8a9b1b3	a2a7a10a11	a2a7a11b1b2
May	62.25 ***	45.32 ***	73.70±0.20 ***	77.28±0.25 ***
	a3a7a11a12	a3a10a11b2c1	a3a10a12a13	a3a8b1b3a12
June	59.97 **	52.05 **	74.13±0.20 ***	76.29±0.23 ***
	a4a8a13a14	a4a6a8a12a13c1	a4c1a11a14	a4a11b3a13b4
July	43.15 **	34.03 **	75.88±0.23 ***	77.16±0.26 ***
	a5a11a13a15 b1	a5a10a12a14b3	a5a8a12	a5a9b2b4a14
August	18.21 n.s.	12.89 n.s.	76.91±0.27 ***	78.72±0.31 ***
	a9a10a12a14a15	a7a9a11a13a14	a6a9a11a13a14	a6a10a12a13a14
Total	45.92 A1	34.63 A1	73.48±0.08 A2	75.81±0.10 A2

Differences were significant at: A, a - p<0.001; b - p<0.01; c - p<0.05

Table 2: Egg fertility and hatchability

Indices	With Probiotic	No Probiotic
Egg production, number of eggs	93.91 a	67.88 a
Fertility, %	95.71	96.17
Viability, %	80.95	81.47
Mortality, %		
1 - 10 day	2.86	2.78
11 - 30 day	2.31	3.52
31 - 35 day	13.17	12.00

Differences were significant at: a - p<0.001

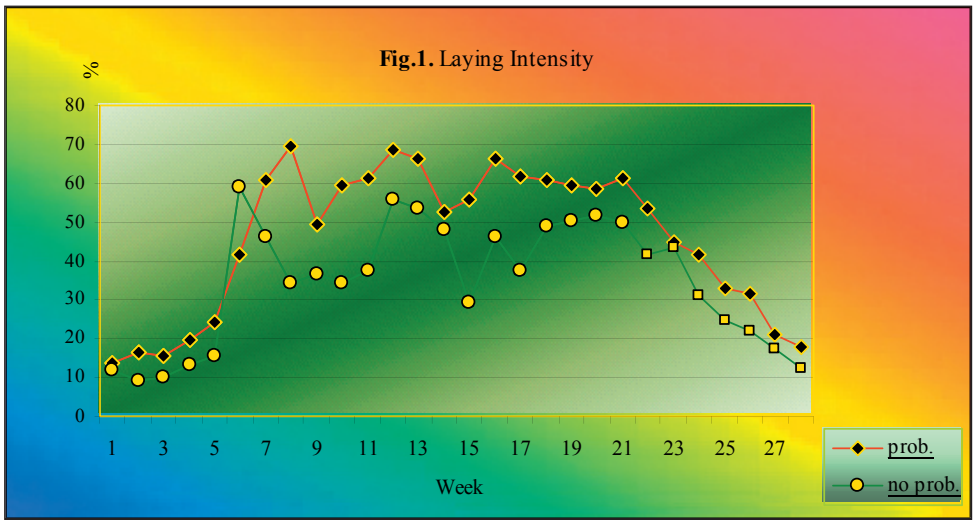

Figure 1: Laying intensity

capacity peaks (May - 73.70 g for the experimental group and June - 76.29 g for the control group. What is more the decrease of the index for the ducks receiving the probiotic in the months April – May (May – June for the control) was by 2.49 g ($p<0.001$) versus 1 g in the control group ($p<0.01$). And reaching the higher egg weight again was very slow despite the continuing growth and development of the young one-year old ducks. The latter fact was a consequence of the stable high level of laying capacity in the experimental group maintained until the middle of July. In the layers from the experimental group accumulation of the effects of high laying capacity and high atmospheric temperatures in July – August were observed affecting the egg weight and leading to its decrease. At the same time in the control fowl the high temperatures did not depress the increase of the egg weight, which resulted from the continuing growth and development of the one-year old ducks. The existence of statistically significant monthly differences in the egg weight within each of the experimental groups could also be explained by the continuing growth and development of the layers in their first laying year.

Egg fertility and hatchability (Table 2) as well as the embryonic mortality by incubation periods, obtained for the two groups, did not differ and did not deviate from the characteristics of the Muscovy duck species, reported by [3], [4], [5], [6] and [8].

CONCLUSIONS

1. No effect of the studied additive was detected on the beginning of laying age and the age of reaching 10 % and 50 % laying intensity, as well as on the duration of the laying season.

2. The application of Lactina probiotic has led to significant and statistically proven increase ($p<0.001$) of the laying intensity and, respectively, of the average laying capacity of the fowl receiving the probiotic.

3. As a result of the proven higher laying intensity throughout the whole experimental period ($p<0.001$) for the ducks receiving Lactina probiotic, the eggs laid by them had lower weight compared to the control group ($p<0.001$).

4. No effect of Lactina probiotic was established on egg fertility and hatchability and on the level of embryonic mortality by periods of embryonic development.

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