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

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.

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.

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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 Laktina® 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 year. The age of achieving 10 %, 50 % and the highest laying capacity were calculated. Laying intensity for a week, month and year. The age of achieving 10 %, 50 % and the highest laying capacity were calculated by the formula:

\[ I = \frac{Ne}{Nd} \times 7(30, 28, 31 or 196) \]

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 ovscope 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).

Table 1 also presents the monthly values of the 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: Egg laying characteristics

<table>
<thead>
<tr>
<th>Month</th>
<th>Laying intensity</th>
<th>Eggs weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With Probiotic</td>
<td>No Probiotic</td>
</tr>
<tr>
<td>February</td>
<td>15.28 n.s.</td>
<td>10.35 n.s.</td>
</tr>
<tr>
<td>March</td>
<td>45.83 ***</td>
<td>35.57 ***</td>
</tr>
<tr>
<td>April</td>
<td>59.67 ***</td>
<td>42.51 ***</td>
</tr>
<tr>
<td>May</td>
<td>62.25 ***</td>
<td>45.32 ***</td>
</tr>
<tr>
<td>June</td>
<td>59.97 **</td>
<td>52.05 **</td>
</tr>
<tr>
<td>July</td>
<td>43.15 **</td>
<td>34.03 **</td>
</tr>
<tr>
<td>August</td>
<td>18.21 n.s.</td>
<td>12.89 n.s.</td>
</tr>
<tr>
<td>Total</td>
<td>45.92 A1</td>
<td>34.63 A1</td>
</tr>
</tbody>
</table>

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

Table 2: Egg fertility and hatchability

<table>
<thead>
<tr>
<th>Indices</th>
<th>With Probiotic</th>
<th>No Probiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg production, number of eggs</td>
<td>93.91 a</td>
<td>67.88 a</td>
</tr>
<tr>
<td>Fertility, %</td>
<td>95.71</td>
<td>96.17</td>
</tr>
<tr>
<td>Viability, %</td>
<td>80.95</td>
<td>81.47</td>
</tr>
<tr>
<td>Mortality, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - 10 day</td>
<td>2.86</td>
<td>2.78</td>
</tr>
<tr>
<td>11 - 30 day</td>
<td>2.31</td>
<td>3.52</td>
</tr>
<tr>
<td>31 - 35 day</td>
<td>13.17</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Differences were significant at: a - p<0.001
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.

REFERENCES
[8] Nickolova M., 2003, Study on some major reproduction factors of Muscovy ducks (Cairina moschata) with elements of the incubation technology, PhD thesis /in Bulgarian/.