The Use of the Addition of Probiotics on the Production Growth and Health of Broilers

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Abstract
Probiotic ingestion can be recommended as a preventative approach to maintaining the balance of the intestinal microflora and thereby enhance 'well-being'. The aim of this study was to determine the effect of probiotics on the health and growth of broiler chickens. Feed stuff enriched with 0.10 % probiotics was used for this purpose. The experiment was carried out on two groups – control (without addition of probiotics) and experimental group (with addition of 0.10 % of probiotics). Samples of caecal chime were collected and the number of *Enterococcus sp*. from 5.79 to 5.85 log CFU.g^{-1}, the number of *Lactobacillus sp.* from 5.48 to 6.88 log CFU.g^{-1}, and the number of *Enterobacteriaceae* sp. from 6.92 to 7.06 log CFU.g^{-1}was determined. After feeding of feed mixtures with probiotics addition a decrease of *Lactobacillus* sp. and an increase of *Enterococcus* sp. counts was detected. Also the increase of *Enterobacteriaceae* sp. counts in the experimental group comparing with the control group was detected.

Keywords: Broiler, caecum properties, intestinal microflora, probiotics,

1. Introduction

The word probiotic was first used in the sense opposed to antibiotics, possibly as a substance secreted by one organism that stimulates the growth of the second organism [1].
Probiotics are living microbial additives suitable for both animals humans, whereas to maintain and improve the balance of intestinal microflora [2].
They are currently defined as products containing sufficient number of viable micro-organisms, that after colonization change consumers microflora of digestive tract and thus have a positive effect on his health [3,4].
Probiotics as a certain fermented milk products are living microorganisms which, in adequate quantities have a positive impact on the host [5].

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As a living microbial probiotic culture they positively affect the host organism by improving its microbial balance [6].
Recent research suggests that this may not be the only living microorganisms, which positively affect the health of the consumer, but may also some components of the cell walls of already dead [7,8].
The theoretical basis for the selection of suitable probiotic cultures include food safety, performance (survival of microorganisms in the digestive tract, gastrointestinal tract colonization, antimicrobial activity and the prevention of pathogens) and technological aspects (sensory characteristics, stability) of provided product [9,10].
In terms of the use of probiotics in medicine and nutrition for livestock is very important - their biomedical impact, which is due to inhibition of pathogens, optimizing of the digestion process,

stimulation of the immune system [11,12,13]. Probiotics also have a positive impact on resistance against *Eimeria acervulina* [14].
Furthermore, plant extracts and essential oils may be in poultry nutrition and other livestock also benefit from probiotics, respectively prebiotic preparations as substitutes for antibiotics [15].
However, it is important to evaluate the type of probiotics used for feeding, whereas probiotic culture consisting of several strains of microorganisms has a greater effect especially in broiler chickens [16].
The aim of this work was an experimental verification of the effect of probiotics on population of gut microflora in fattening chickens as well as the impact of probiotics on the actual production growth and health of fattening chickens.

2. Materials and methods

In the experiment with broilers, we have focused on observing the impact of probiotics in two experimental groups, where probiotic were added in the following scheme: KS (control group) - no added probiotics and 4 PS (test group) - with the addition of 0.10% of probiotics(Enterococcus faecium).
In the experiment, one day old broilers of meat-type ROSS 308 have been used. The trials were carried out in a poultry farms in the hall with the possibility of feeding of 24 000 broiler chickens.
Boxes were created at the entrance door. Each box was intended for one group. Boxes have been separated by perforated netting and plastic fence. In each box were located 100 broiler chickens. Size of the area in each frame allowed unrestricted access to feed and water (as well as for natural activities) for each broiler chicken. Chickens were reared on deep litter material. The bottom layer of bedding was up to 8 cm and consisted of wood chips and the top layer consisted of 5 cm high straw. The total fattening period was divided into three phases: starter, intended for chickens aged from 1 to 18 day during which the chicks were fed the starter feed mixture (HYD-01), growth for chicks aged 19 to 31 days with growth forage mixture HYD-02, final, for chicks aged 32 to 38 days with final forage mixture HYD-03 . They were usually served mixed compound feed for chickens for fattening with the balanced content of nutrients and metabolizable energy in accordance with their needs.
Monitored microbiological parameters:
The number of cfu (colony forming units) of *Enterococcus* sp. on Slanetz-Bartley agar after 48 to 72 hours incubation at 37 ^{o}C. The number of cfu of *Lactobacillus* sp. on MRS agar after the incubation took from 48 to 72 hours at the temperature 37 ^{o}C. The number of cfu of *Enterobacteriaceae* sp. on McConkey agar after 48 to 72 hours at 37 ^{o}C.
In evaluating the results we used the plate dilution method. Basic dilution was: 1 g Chym + 99 ml saline (0.85% NaCl) by decimal dilution system. Basic dilution (10^{-1}), we prepared by mixing 5 g sample and 45 ml saline or 10 g sample and 90 ml of normal saline. The basic dilution, was prepared further by decimal dilution system. Samples have been incubated on the surface or embedded. The inoculated Petri dishes were cultivated in an incubator, bottom up. Temperature and time, was adjusted according to the group of cultivated microorganisms. After the cultivation, we counted colonies grown on culture medium in Petri dishes. To calculate CFU.g^{-1} (Colony Forming Units), we used the following formula (which takes into account Petri dishes of two consecutive dilutions):

$$N = \sum C / [(n1 + 0.1\ n2).\ D]$$

$\sum C$ - the sum of characteristic colonies on selected dishes
n1 - number of dishes of 1 dilution used to calculate
n2 - number of dishes of 2 dilution used to calculate
d - dilution factor is identical to the 1st dilution used. [17]
For the inoculation we used dilutions 10^{-4}, 10^{-5} and 10^{-6}. Applied inoculation and cultivation methods are given in Table 2. The results were evaluated according to basic statistical characteristics.

3. Results and discussion

The prohibition on use of antibiotics as growth promoters increased the search for alternative feed in livestock production. One possible alternative is the use of the probiotics.
There is evidence that many of the clinical application of probiotics in the treatment and

prevention of gastrointestinal diseases and the overall improvement in health status [18].

In our experiment, we monitored the population of microorganisms in the digestive tract of broiler chickens. Number of Lactobacillus sp. (Figure 1) varied in the experimental group in the range from 5.81 log CFU.g^{-1} to 6.78 log CFU.g^{-1}. The highest average number of log CFU.g^{-1} Lactobacillus sp. was in the experimental group 4 PS - 6.39 log CFU.g^{-1}. Compared with the control group, we observed lower numbers of Lactobacillus sp. Jin et al.[19] reported higher numbers of Lactobacillus sp. in the experiment, which was mainly based on probiotic cultures, Lactobacillus sp. Low numbers of Lactobacillus sp. may have different reasons, competition in the digestive tract as well as the age of the host [20] and also a high specifity of used strain of microorganism [21].

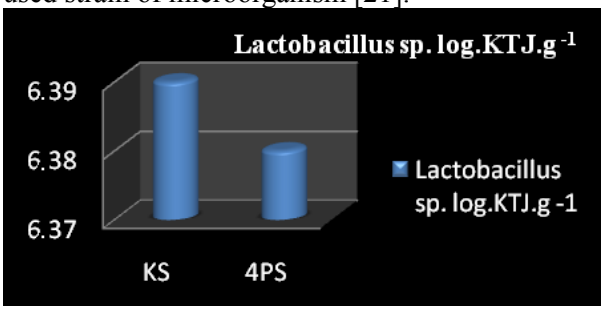

Figure 1: Average numbers of Lactobacillus sp. in intestinal tract KS (control group) – no addition of probiotics and 4. PS (trial group) - addition of 0.10 % of probiotics

The number of Enterococcus sp. (Figure 2), was in the range from 5.79 to 5.85 log CFU.g^{-1}. The highest average number of log CFU.g^{-1} of Enterococcus sp. was observed in the experimental group 4 PS (5.75 log KTJ.g^{-1}), where the chickens were fed with probiotics added feed. Numbers of Enterococcus sp. in the control group were significantly lower. Results indicated by Alcicek et al. [22] also confirmed that the use of Enterococcus sp. appropriately affects gastro-intestinal flora and has the potential to reduce pathogens.

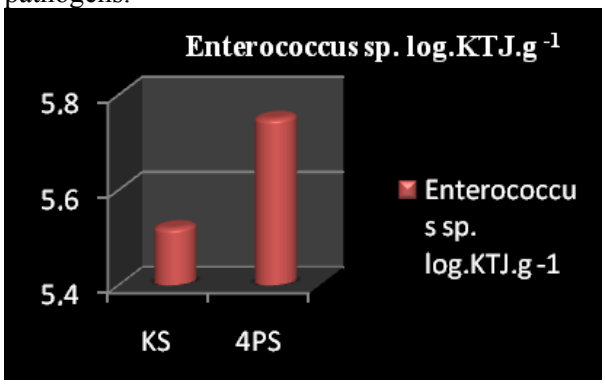

Figure 2: Average numbers of Enterococcus sp. in intestinal tract KS (control group) – no addition of probiotics and 4. PS (trial group) - addition of 0.10 % of probiotics

The number of Enterobacteriaceae sp. (Figure 3) ranged from 6.92 to 7.06 log CFU.g^{-1}. The highest average number of log CFU.g^{-1} Enterobacteriaceae sp. was recorded in the experimental group 4PS (6.93 log CFU.g^{-1}).

Table no 1: Monitored microbiological parameters

Microorganism cultivated	Growth media	Innoculation mode	Used dilution	Type of organism	Cultivation temperature	Time of cultivation
Enterobacteriaceae sp.	McConkey agar	Pouring plate	10^{-5}-10^{-6}	aerobic	37 °C	48 – 72 h
Enterococcus sp.	Slanetz-Bartley agar	Pouring plate	10^{-4}-10^{-5}	aerobic	37 °C	48 – 72 h
Lactobacillus sp.	MRS agar	Pouring plate	10^{-4}-10^{-5}	aerobic	37 °C	24 h

McConkey agar – Biomark laboratories, Pune (India)
Slanetz-Bartley agar, MRS agar – Imuna, Šarišské Michaľany

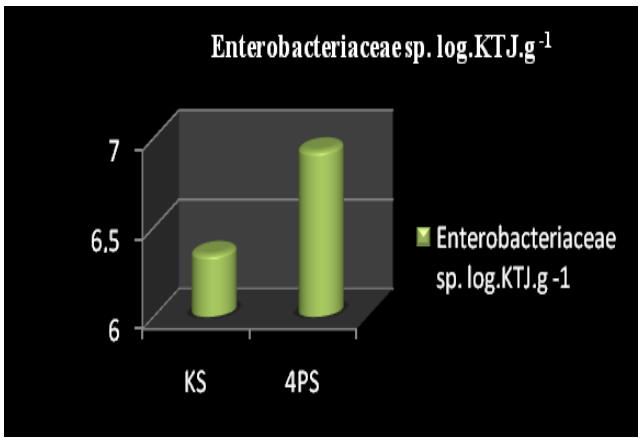

Figure 3: Average numbers of Enterobacteriacea sp. in intestinal tract KS (control group) – no addition of probiotics and 4. PS (trial group) - addition of 0.10 % of probiotics

4. Conclusions

The results of this experiment suggest that the use of probiotics as feed supplement has a positive effect on the digestive tract population in fattening meat-type chickens, and hence a positive effect on their health and productive growth. In this experiment, we studied the impact of probiotics as a suitable feed supplement. We used the feedstuff enriched with 0.10% of probiotics. The obtained results suggest that the probiotic colonization positively affects the digestive tract of Enterococcus sp. Compared with the control group were the numbers of Enterococcus sp. significantly higher. Numbers of Lactobacillus sp. ranged on average around 6.39 log CFU.g^{-1}. Numbers of Enterococcus sp. were on average around 5.75 log CFU.g^{-1}. We have also recorded the increases of the amount of Enterobacteriaceae sp. in average of 6.93 log CFU.g^{-1}, which may be due to the high competition in the digestive tract.

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