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RESEARCH ON THE INFLUENCE OF SOME PROBIOTICS ON THE PRODUCTION PERFORMANCE OF BROILER CHICKENS

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Abstract

The objectives of this research consist describe the principles mechanisms of action, selection and synthesizing criteria of probiotics and their application in poultry industry. Biotechnology plays a vital role in the poultry feed industry. In broiler chickens feeding, there have been tested probiotics species belonging to Enterococcus faecium NCIMB 11181 and Enterococcus faecium NCIMB 10415 to reduce broiler chickens mortality and increase body weight and started with products that need to be tested and verified under these conditions. The experiment was initially performed on two successive series of broilers. The birds were weighed at the beginning of the experiment. Day-old Ross 308 broiler chickens (n=484) unsexed were distributed in three halls, in separate compartments. The data were analysed using SPSS 20.0 software (SPSS Inc., Chicago, IL). Statistical differences among means of the treatments were compared using the Tukey's multiple test. Comparisons were considered statistically significant at P≤ 0.05.

Key words*: broiler, probiotics, parameters, testing.*

INTRODUCTION

The origin of probiotics dates back to 1930, when Metchinikoff's studies described the beneficial effects of the use of lactobacilli from yoghurt by human beings. The term of "probiotic" was first used by Lilly and Stillwell in 1965 and then by Parker in 1974 in order to define: "the organisms or the substances which contribute to the intestinal microbial balance" (Vaubelle et al., 1990). Fuller (1989) also defined probiotics as being feed additives based on live microorganisms (bacteria, yeasts, moulds) which have a beneficial effect on the intestinal microbial balance of the animal organism.

Microorganisms used in animal feed as probiotic products may contain one or more bacterial strains. (Dumitru et al., 2018). In the European Union (EU) microorganisms added as feed supplementation are bacterial strains, often Gram-positive belonging to the following genus: *Bacillus (B. cereus* var. *toyoi, B. licheniformis, B. subtilis), Enterococcus (E. faecium), Lactobacillus (L. acidophilus, L. casei, L. farciminis, L. plantarum, L. rhamnosus), Pediococcus (P. acidilactici), Streptococcus (S. infantarius)*. Probiotic bacteria used in animal nutrition prevent digestive disorders or increase the zootechnical performance (Agawave et al., 2004). Also, probiotic bacteria stimulate the endogenous microorganisms which are able to modify the intestinal microbiota in order to increase the health status and improve feed efficiency (Alkhalf et al., 2010). Probiotic used in animal nutrition improved parameters such as: feed conversion by efficiency of improving intestinal microflora, the growth of non-pathogenic bacteria suppression of growth of intestinal pathogens and accessory for digestion and nutrients utilization (Pană, 2000). (Drăgan et al., 2016). Recently, it was shown that adding of probiotic containing *Enterococcus faecium* microorganism to broiler diets increased the jejunal villus height and ileal villus height. Moreover, increased intestinal villi height was reported after addition of *Bacillus subtilis* in association with prebiotics. **(**Wageha Awad et al., 2008).

It is assumed that an increased villus height is paralleled by an increased digestive and absorptive It is assumed that an increased villus height is paralleled by an increased digestive and absorptive function of the intestine due to increased absorptive surface area, expression of brush border enzymes and nutrient transport

systems. It is well known that many substances can affect the intestinal villi development.
This study was to test two variants of probiotics to reduce broiler chickens mortality and increase body weight.

MATERIALS AND METHODS

The experiments were carried out in Medgidia, the number 1 farm Avicola Medgidia, which has a number of 13 halls with a capacity of 18,000 chickens per hall, the population density being of 18 chickens per metre for all the halls (Figure 1).
The experiment was initially performed on two successive series of broilers. Broilers come from the European Union, Gradus Bulgaria and also weighed on entering of the experiment. Day-old Ross 308 broiler chickens (n=484) unsexed were distributed in three halls, in separate compartments. The climatic conditions and lighting program were computer-operated and followed the commercial recommendations. The halls in which it was run experimentally were chosen to ensure fast access and to closely monitor the experiment, at the same time the chicks that entered the experiment were selected and weighed
Research has begun on the need to eliminate early-life mortality and increase body weight, in broiler chickens and started with products that need to be tested and verified under these conditions. The products to be tested to colonize the intestine, stimulate the growth of a beneficial microflora, and inhibit the growth of pathogenic germs (*Escherichia coli*, *Pseudomonas*, *Salmonella*, *Clostridium*).
The *Enterococcus. faecium* NCIMB11181 preparation used in this study was a commercial product purchased from Romvac România, which contained a total bacteria count 100 000 UFC/mL. The commercial probiotic used in this study was based on two *Enterococcus* strains: *Enterococcus faecium* NCIMB 11181 (Bioenterom-Romvac) and *Enterococcus faecium* NCIMB 10415 (Commercial product-Romvac). The probiotic was administrated in the drinking water of broiler using an automated dispensing system for medication dosing.
The experiments were assigned to 3 groups: one control pool and two testing pools with *Enterococcus faecium* NCIMB 11181 (Bioenterom-Romvac) and *Enterococcus faecium* NCIMB 10415 (Commercial product-Romvac).
The data were analysed using SPSS 20.0 software (SPSS Inc., Chicago, IL). Statistical differences among means of the treatments were compared using the Tukey's multiple test. Comparisons were considered statistically significant at $P \leq 0.05$.
During the first 3 days of life, chickens receive in the drinking water antibiotics as Enrofloxacina 10% (1 ml/L) and Colicrid (0.5 ml/L). *Enterococcus faecium* was not administered to the first group.
For the following 3 days, the probiotic is administered in a dose of 0.6‰ of second group and the third chicks group.
The chicks were feed with the starter diets from days 1 to 14 and grower feed from day 15 to 31 and finishing feed from day 32 to 35 days, also chicks were weight individually at the beginning of the experiment as well as at the end of feeling period at day 35. Once were weighed and the dead chickens.
The chickens were monitored daily, removed the dead where appropriate, weighed 7 days, 14 days, 21 days, 28 days and 35 days.

Figure 1. Hall presentation

RESULTS AND DISCUSSIONS

Probiotics have been proven to be beneficial for broiler breeding *Enterococcus faecium* is a *Lactobacillus* genus that shows many positive effects on broiler growth.
Drawing a comparison between the results obtained from differences resulted in relation to the body weight evolution and the mortality percentage.
In Tables 1 and 2, Figures 2 and 3 are presented the parameters during the experimental period

Table 1. Average weight of chickens at set time intervals (g) - series 1

Strain	0 days	7 days	14 days	21 days	28 days	35 days
Witness lot	42± 0.047	189± 0.047	489± 0.05	932± 0.049	1461± 0.047	1885± 0.049
NCIMB 10415	42± 0.043	194± 0.044	510± 0.04	952± 0.04	1490± 0.038	1969± 0.039
NCIMB 11181	42± 0.04	206± 0.035	520± 0.035	961± 0.037	1499± 0.037	1985± 0.038

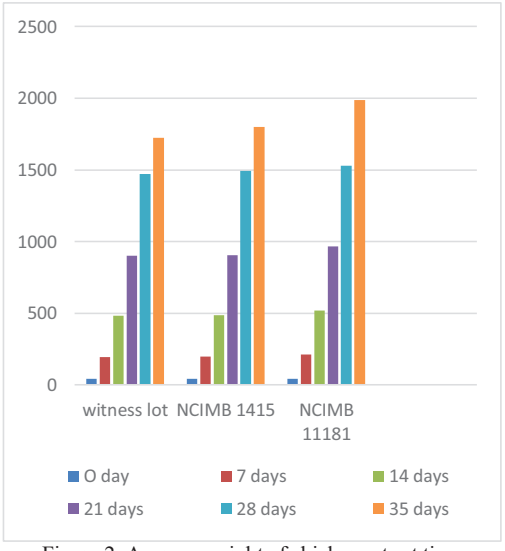

Figure 2. Average weight of chickens at set time intervals (g) seria 1

Table 2. Average weight of chickens at set time intervals (g) - series 2

Strain	0 days	7 days	14 days	21 days	28 days	35 days
Witness lot	42± 0.047	187± 0.0014	500± 0.007	927± 0.031	1469± 0.139	1849± 0.31
NCIMB 10415	42± 0.043	194± 0.0006	510± 0.005	962± 0.029	1520± 0.155	1920± 0.119
NCIMB 11181	42± 0.04	194± 0.0013	520± 0.005	983± 0.027	1569± 0.06	1986± 0.174

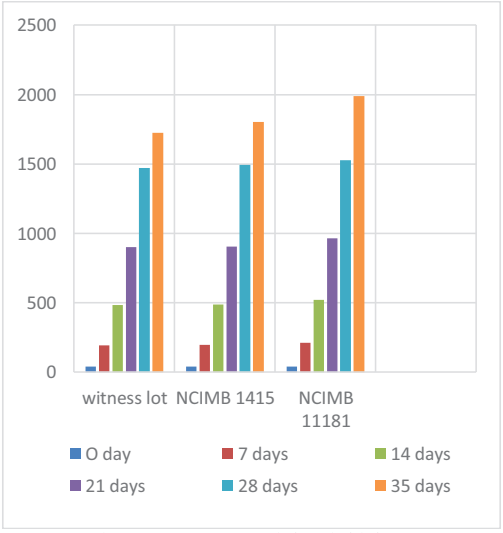

Figure 3. Average weight of chickens at set time intervals (g) series 2

Table 3. Evolution of mortalities (%) series 1

Strain	7 days	14 days	21 days	28 days	35 days
Witness lot	0.81± 0.013	1.25± 0.08	1.69± 0.015	2.12± 0.016	2.38± 0.09
NCIMB 10415	0.72± 0.017	1.01± 0.036	1.42± 0.037	2± 0.06	2.23± 0.012
NCIMB 11181	0.51± 0.013	0.74± 0.015	1.15± 0.014	1.45± 0.05	1.91± 0.06

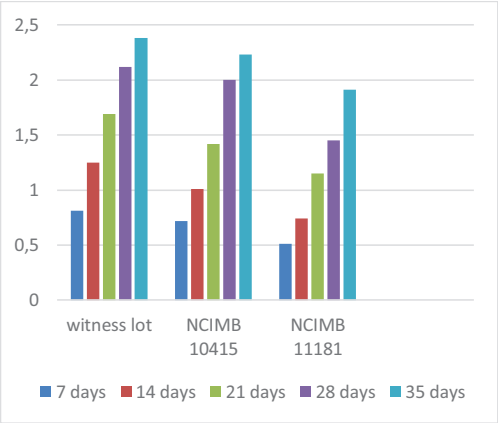

Figure 4. Evolution of mortalities (%) series 1

Table 4. Evolution of mortalities (%) series 2

Strain	7 days	14 days	21 days	28 days	35 days
Witness lot	0.92± 0.021	1.25± 0.09	1.69± 0.015	2.12± 0.07	2.58± 0.1
NCIMB 10415	0.66± 0.0174	0.91± 0.03	1.38± 0.037	1.97± 0.04	2.12± 0.01
NCIMB 11181	0.41± 0.01	0.74± 0.011	1.15± 0.015	1.45± 0.045	1.88± 0.056

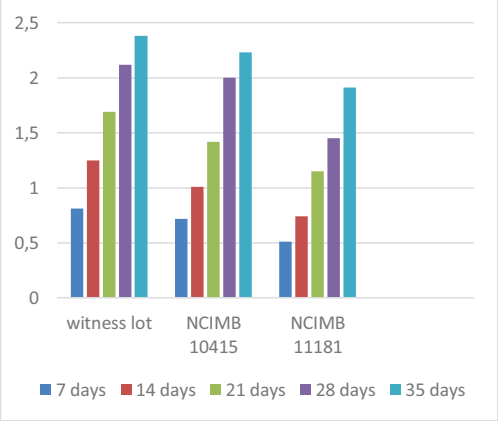

Figure 5. Evolution of mortalities (%) series 2

It`s significant differences between experimental groups was registered in term of BW ($P \leq 0.05$).

Probiotics utilisation with strains of *Enterococcus faecium* NCIMB 11181 ensures the fast colonisation of the gastrointestinal tract (GIT) with a beneficial flora having a 18-minute/generation multiplication rate, blocking the cell receptors in the intestine for pathogenic bacteria.

Stabilizes digestion, increases feed conversion and absorption of nutrients, increases weight gain, stimulates intestinal barrier.

Also, these probiotics assure an efficient fight against diarrhoea, eliminating toxins, *Escherichia coli* and *Salmonella* from the gastrointestinal tract, offer protection of the intestinal mucosa by forming a biofilm at this level and a and involve an increased antibiotic resistance.

On the other hand, our current results showed that dietary inclusion of probiotics exerted a similar effect in improving growth performance of starter broilers compared with the antibiotic treatment. Enhanced growth performance of broilers receiving dietary antibiotics depends largely on consequent reduction of the microbial population of the alimentary tract that competes with the host for nutrients.

In addition, the previous studies suggested that antibiotics work as growth promoter probably by inhibiting the production and excretion of catabolic mediators by intestinal inflammatory cells, and the subsequent reduction in intestinal microflora.

In contrast, probiotic supplementation modulated the gut environment and enhanced gut barrier function via the fortification of the beneficial members of intestinal microflora, the competitive exclusion of pathogens, and the stimulation of the immune system. Therefore the mode of action for the probiotics differs from that of antibiotics in birds, although both of them could improve the performance of starter broilers.

Figure 6. Farm presentation

Enterococcus faecium produces organic acid which entails the decrease of the pH level in intestines and creates an unfavourable environment for the multiplication of some pathogenic bacteria.
Enterococcus faecium stimulates the defence mechanisms of the animal organism by increasing the antibody level and enhancing the activity of macrophages. Administration of probiotics as growth stimulators is performed for long periods of time as they have a relatively short action time.

CONCLUSIONS

The use of the probiotic product based on *Enterococcus faecium* NCIMB 11181 strain had the following advantages: increased weight rates, decreased number of mortality losses, lower price as compared to that of similar products. The *Enterococcus faecium* NCIMB 11181 strain was efficient by increasing the growth performance, in production and digestibility.
It may be concluded that including probiotics (*Enterococcus faecium* NCIMB 11181) in the feeding of broiler chickens is effective for the immune status.

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REFERENCES

Agawave, S.B., Lankar, P.S. (2004). Efectul probioticelor conținând *Saccharomyces boulardii* pe ochratoxicosis experimentală la puii pentru carne: studii hematobiochimice. *J.Vet.Sci*., 5(4), 359-367.

Alkhalf, A., Alhaj, M., Al-Homidon, I. (2010). Influența suplimentării cu probiotice asupra raspunsului imun la puii broiler. Egipt. Pui găină. *Sci*., 30.

Drăgan, I., Rizea, D., Chiurciu, C., Frunzăneanu, B., Guşită, I.Ş., Levandovschi, M., Nica, N., Nicolae, A., Sevciuc, I., Stoica, P., Tudoran, C., Uluitu, C., Călin, C., Chiurciu, I., Filip, V., Matei, V., Mazaneț, O., Radu, A.M., Păsărin, D., Rovinaru, C. (2016). Studiu comparativ privind eficacitatea a două probiotice cu tulpini de *Enterococcus faecium*. *Simpozion ASAS*, 1-20.

Dumitru, M., Sorescu, I., Jurcoane, S., Câmpeanu, G., Tabuc, C., Hăbeanu, M. (2018). Ansessing of morphological, cultural, biochemical profile and enzymatic activity of a *Lactobacillus paracasei* CCM 1837 strain. *Academy of Romanian Scientists Annals, Series of Biological Sciences*, 6(2), 22-31.

Fuller, R. (1989). *Probiotics*. New York, USA: Academic Press Publishing House.

Pană, C.O. (2000). *Biotehnologii în nutriția și alimentația animalelor*. Bucharest, RO: Coral Sanivet Publishing House, 137-145.

Vaubelle, M., Teller, E., Focant, M. (1990). Probiotics in animal nutrition. *Arch. Anim. Nutr*., 40, 543-567.

Wageha, A., Ghareeb, K., Böhm, J. (2008). Licensee Molecular Diversity Presentation International, Basel, Switzerland, 1-12.