## THE EFFECT OF *IN OVO* INJECTION OF BEE POLLEN EXTRACT ON CHICKS DEVELOPMENT AND BROILER CHICKENS PERFORMANCE

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Poultry production is one of the most important sector in the agricultural food industry. It is characterized by the dynamic implementation of modern technological solutions. Genetic selection in poultry also aims at maximizing production, therefore modern broiler chicken lines are selected for increased growth rate and a higher proportion of breast muscles in the carcass. As a result, this leads to increased metabolic requirements for birds as early as during embryonic development. In chicken embryos, glycogen reserves are depleted during incubation, which temporarily hampers and limits the development of the chicken embryo. In poultry practice, compensation for these losses occurs after the transportation of chicks to the farm, which can take up to 72 hours after hatching. Considering the mass production of broiler chicks and their relatively short rearing period, even a slight improvement in the energy status during the pre-hatch period can have a beneficial effect on the condition and quality of chicks, as well as on broiler production results. In this way, the introduction of bioactive substances into the environment of developing chicken embryos (in ovo technology) as a supplementation for broiler chicks during embryogenesis is gaining increasing importance in poultry production. Phytobiotics, especially bee pollen, due to their natural origin, multifunctional effects, and lack of withdrawal period, appear to be particularly useful as a tool for improving chick quality and broiler productivity.

The aim of the first experiment was to investigate the effect of *in ovo* manipulation on the spread of hatch and quality of newly hatched chicks. In the second experiment, based on the results of hatchability and glycogen stores in the liver and pectoral muscles of the chicken, the most effective dose of bee pollen extract administrated by in ovo injection was tried to determine. In addition, in the third experiment, in order to determine precisely the effectiveness of the selected dose of bee pollen, an assessment of the impact of *in ovo* supplementation with bee pollen extract and carbohydrate solution on the development of the small intestine in chicks and the production performance of broiler chickens with delayed access to feed was conducted.

Within the conducted research, three experiments were performed on hatching eggs from a parental flock of Ross 308 set at 38 weeks of age. In the first experiment, on the 18th day of

incubation, the eggs with live embryos were randomly divided into four equal groups. Eggs in Group 1 were treated as controls and were not subjected to the *in ovo* technique. In the remaining experimental groups (2, 3, and 4), a hole with a diameter of approximately 1 mm was made in the eggshell (blunt side of the egg) using a 21G needle. In Group 2, only the dehermetization of the eggshell was performed, while in Groups 3 and 4, a "manual" *in ovo* injection of 500  $\mu$ l of 0.9% NaCl solution was administered into the air chamber of the egg (Group 3) and the embryonic amniotic fluid (Group 4). After the injection, the hole was sealed, and the eggs were transferred to hatching baskets for further incubation. The spread of hatch was assessed based on the internal and external pipping time and the moment of hatch recorded at 12-hour intervals. All unhatched eggs were subjected to embryopathological analysis. One-day-old hatched chicks were evaluated for quality using the following parameters: body weight, body length, and Tona scoring. The results obtained in the first experiment allowed for the selection of the least invasive *in ovo* injection method, which was applied in the second and third experiment.

In the second experiment, on the 18th day of incubation, eggs with live embryos were randomly assigned to five equal groups. The control group consisted of eggs injected with 500  $\mu$ l of saline solution, while the other groups were injected with 500  $\mu$ l of bee pollen extract at three different concentrations - 1.5%, 2.5%, and 5%. The last group received a carbohydrate solution. One-day-old hatched chicks were evaluated for quality using the following parameters: body weight, body length, and Tona scoring. During the experiment, the body weight of the birds, feed intake, and the number of dead birds were monitored. Biochemical blood tests were performed to assess the health status of the chicks. For the evaluation of glycogen content in tissues, samples of the right thigh muscle and liver were taken from the birds previously subjected to decapitation. After the rearing period, a simplified slaughter analysis was conducted.

In the third experiment, on the 18th day of incubation, eggs with live embryos were randomly assigned to four equal groups: no injection + feeding 8 hours after hatching (Group 1), no injection + delayed feeding (36 hours after hatching) (Group 2), *in ovo* injection of 1.5% bee pollen + delayed feeding (Group 3), and *in ovo* injection of carbohydrate solution + delayed feeding (Group 4). Further procedures related to the experimental indicators on the day of hatching (evaluation of chick quality) and during the rearing period (production parameters and slaughter analysis) were conducted following the methodology outlined in Experiment 2. After slaughter on the 7th and 42nd day of rearing, samples of the gastrointestinal tract tissues were collected for morphometric evaluation of the small intestine.

Based on the obtained results, it has been found that achieving high-quality one-day-old chicks is possible through *in ovo* injection. The beneficial effects of a 1.5% bee pollen extract on the body weight and length of one-day-old chicks were observed. Furthermore, supplementation of chicks with 1.5% bee pollen positively influenced body weight during the early rearing period and exhibited a hypocholesterolemic effect in young chicken. However, it was also found that a high

dose of bee pollen (5%) and the administration of carbohydrate solution *in ovo* had negative effects on hatchability rates of chicks. The implementation of a carbohydrate mixture led to a deterioration of biochemical indicators in the serum of newly hatched chicks, particularly in terms of transaminase activity. Additionally, compensatory effect of *in ovo* injection of bee pollen on body weight gain in broiler chickens was not observed.