

SUMMARY

Key words: *biostimulants, broiler, growth, health, meat quality*

In modern poultry farming, emphasis is placed on improving the quality of poultry products, but especially on the health status of the birds. Increasingly, biostimulant products derived from natural compounds are being used.

To achieve the stated goal of the doctoral thesis, namely improving the performance in broiler chicken rearing through the use of natural biostimulants, three experiments were organised. The first two were conducted under microproduction conditions (Experiments 1 and 2), while the third was conducted under production conditions (Experiment 3).

The experimental variables were the biostimulants used (Esstence and Herba Safe) and the doses administered, as well as the type of combined feeds used (for slow growth and for rapid growth).

Experiment 1 was organised with 100 Ross-308 chicks, equally divided into two growth series: series A (slow growth feed administration) and series B (rapid growth feed administration). For series A, five groups were formed, one control group (AE-M) and four experimental groups (AE-1, AE-2, AE-3, AE-4). Similarly, for series B, there were also five groups, one control group (BE-M) and four experimental groups (BE-1, BE-2, BE-3, BE-4).

In both growth series (A and B), the chicks in the experimental groups received the Esstence preparation administered through water for the first 15 days of life in the following doses: 8.0 ml/litre in groups AE-1 and BE-1 (according to the manufacturer's recommendation); 6.0 ml/litre in groups AE-2 and BE-2 (75% of the recommended dose); 4.0 ml/litre in groups AE-3 and BE-3 (50% of the dose); and 2.0 ml/litre in groups AE-4 and BE-4 (25% of the dose).

Experiment 2 was organised identically to Experiment 1, but with the biostimulant Herba Safe administered only for the first 10 days of the chicks' lives. Two growth series were organised (series C - slow growth feed and series D - rapid growth feed), each having five groups, one control group (CHS-M and DHS-M). In the experimental groups CHS-1 and DHS-1, a dose of 2.0 ml Herba Safe/litre of water was administered (manufacturer's recommendation), in groups CHS-2 and DHS-2 1.5 ml Herba Safe/litre (75% of the recommended dose), in groups CHS-3 and DHS-3 1.0 ml Herba Safe/litre (50% of the dose), and in groups CHS-4 and DHS-4 0.5 ml Herba Safe/litre (25% of the dose).

Experiment 3 was conducted under production conditions, involving 9000 Ross-308 chicks divided into two growth series (series E - slow growth feed; series F - rapid growth feed). The chicks received either the biostimulant Esstence (for the first 15 days of life) or Herba Safe (for the first 10 days) in the doses that showed the best results in previous experiments.

The chicks in series E (4500 head) were divided into three equal groups, one control group (E-M) and two experimental groups: group E-E with Esstence administration (8.0 ml/litre of water) and group E-HS with Herba Safe administration (2.0 ml/litre of water).

The chicks in series F (4500 head) were also divided into three groups, one control group (F-M) and two experimental groups: group F-E (8.0 ml Esstence/litre) and group F-HS (2.0 ml Herba Safe/litre of water). The chicks in this series were housed in another production hall, equal in size and with the same facilities as the one used for the chicks in series E..

Experiment No. 1: Effects of the "Esstence" Biostimulant on Broiler Chicken Performance (Series A and B).

- The average weight gain achieved during the 1-42 day period by chicks administered with different doses of Esstence was higher by 4.35-6.78% (series A - slow growth feed) and by 1.96-2.32% (series B - rapid growth feed) compared to the chicks in the control groups. This is validated by the body weights at the end of the study period, which were also higher in the experimental groups by 4.27-6.62% and 1.92-2.28%, respectively.
- Mortality in the control groups was 20% with slow growth feed (series A) and 10% with rapid growth feed (series B), while there were no losses in the experimental groups (treated with Esstence).
- Compared to the control groups, the experimental groups (treated with Esstence) achieved lower levels of total feed consumption (by 1.35-2.87%) and feed conversion ratios (by 5.48-9.03%) with slow growth feed (series A) and by 6.47-9.73% and 8.23-11.80% respectively when rapid growth feed was used (series B).
- The slaughter yield calculated for chicks that received the Esstence biostimulant was higher by 0.71-1.47% in series A (slow growth feed) and by 1.12-2.27% in series B (rapid growth feed). This also reflected in the weight of anatomical parts, which were heavier by 9.02-9.40% (breast) and 3.81-4.48% (thighs) in series A chicks and by 1.14-4.40% (breast) and 4.43-5.71% (thighs) in series B chicks. The internal organs of chicks that received the Esstence preparation were also better developed, as indicated by liver weights, which were higher by 7.04-8.96% (series A) and 6.44-9.21% (series B) compared to the control groups.
- European growth factors recorded very low values in chicks fed with slow growth feed (series A), with experimental groups achieving scores higher by 37.90-46.51% (European Efficiency Index) and 38.01-46.71% (European Broiler Index) compared to the control groups. The administration of rapid growth feed (series B) led to much better results, but again the experimental groups performed better, with values higher by 23.40-28.84% for EEI and 23.45-28.89% for EBI.

Experiment No. 2: Effects of the "Herba Safe" Biostimulant on Broiler Chicken Performance (Series C and D).

- At 42 days of age, the body weight of chicks that received the Herba Safe biostimulant was higher by 4.55-6.81% in those given slow growth feed (series C) and by 1.94-2.36% in those fed with rapid growth feed (series D) compared to the control groups.
- Naturally, chicks in the control groups (without biostimulant) had lower average weight gains than those that received the Herba Safe preparation, with differences of 4.67-6.98% in the slow growth feed groups (series C) and 1.98-2.40% in the rapid growth feed groups (series D).
- The mortality rate in the control groups was 30% in series C (slow growth feed) and 10% in series D (rapid growth feed), while it was zero in the experimental groups.

- The total feed consumption of the chicks in the experimental groups (treated with Herba Safe) was lower than that of the control groups (by 0.83-3.47% in the slow growth feed groups and by 2.14-5.78% in the rapid growth feed groups).
- Feed consumption also influenced the feed conversion ratio values, which were lower in chicks that received Herba Safe, by 0.66-5.76% in series C (slow growth feed) and by 4.03-8.01% in series D (rapid growth feed).
- The slaughter yield calculated for chicks treated with different doses of Herba Safe was higher by 0.66-1.38% (series C) and by 0.98-2.11% (series D) compared to the chicks in the control groups.
- In both the slow growth feed (series C) and rapid growth feed (series D) groups, the main anatomical parts were heavier in the experimental groups, being 9.27-9.47% (breast) and 4.06-4.50% (thighs) and 0.71-1.36% (breast) and 1.90-2.62% (thighs) heavier than the weights found in the control group carcasses, respectively.
- The internal organs of chicks in the experimental groups (with Herba Safe) were heavier than those in the control groups, both in series C (slow growth feed), where they were larger by 12.38-24.33% for hearts, 7.29-9.69% for liver, and 4.27-7.10% for gizzards, and in series D (rapid growth feed), where they were larger by 6.90-12.50%, 6.62-9.46%, and 3.70-8.39%, respectively.
- The experimental groups of chicks (different doses of Herba Safe) achieved better scores for European growth factors compared to the control groups, both in series C (slow growth feed), with scores higher by 50.34-61.92% for the European Efficiency Index and 50.54-62.17% for the European Broiler Index, and in series D (rapid growth feed), with scores higher by 18.02-23.64% for EEI and 18.06-23.69% for EBI.

Experiment No. 3: Effects of the "Esstence" and "Herba Safe" Biostimulants on Productive Performance and Meat Quality in Broiler Chickens (Series E and F).

- The body weight of chicks in the control groups was 1647.68 g (slow growth feed) and 2720.20 g (rapid growth feed) at the time of slaughter, which was 6.70-2.36% lower than the chicks treated with Esstence and 6.01-1.31% lower than those that received Herba Safe.
- The average daily weight gain was influenced by feed quality, being only 38.28 g/head/day (slow growth feed) and 63.81 g/head/day (rapid growth feed) in the control groups, values that were 6.84-2.40% lower than those treated with Esstence and 6.17-1.33% lower than those with Herba Safe.
- In the control groups, mortality was 4.73% in series E (slow growth feed) and 3.93% in series F (rapid growth feed), which was 1.68-1.66% higher than the mortality found in chicks that benefited from the Esstence biostimulant and 0.86% higher than those that received Herba Safe.
- The most unfavourable feed conversion rate was found in the control groups (3.290 kg feed/kg gain in the slow growth feed series and 2.062 kg feed/kg gain in the rapid growth feed series), which was 5.38-7.71% higher compared to chicks that received Herba Safe and 9.06-11.88% higher compared to chicks that received Esstence.
- The slaughter yield for the control groups was 77.82% (series E - slow growth feed) and 78.81% (series F - rapid growth feed), values that were 1.39-2.28% lower than those achieved by chicks treated with Herba Safe and 1.65-2.46% lower than those that received Esstence.

- The weight of the main anatomical parts was higher by 4.71-10.04% (breast) and 5.07-6.06% (thighs) in chicks that benefited from Esstence treatment and by 2.35-8.69% (breast) and 3.65-4.02% (thighs) in those treated with Herba Safe, compared to the weights found in the control groups (without biostimulants).
- The internal organs were heavier in the experimental groups (with biostimulants), regardless of the feed administered; for example, the liver was 6.53-6.63% heavier in groups treated with Herba Safe and 8.99-9.31% heavier in those treated with Esstence, compared to the control groups.
- The pectoral muscles of chicks that received biostimulants had higher values of dry matter by 0.16-0.26%, protein by 0.06-0.11%, and lipids by 0.04-0.10% in series E (slow growth feed) and by 0.19-0.28% for dry matter, 0.16-0.23% for protein, and 0.02-0.04% for lipids in series F (rapid growth feed).
- Fatty acids in the pectoral muscles of chicks without biostimulants were found at lower levels than in the experimental groups, by 0.17-0.50% in series E (slow growth feed) and by 0.13-0.62% in series F (rapid growth feed), which was also true for the total unsaturated fatty acids (UFA) content, which was lower by 1.22-4.10% and 4.61-6.06%, respectively.
- The $\Omega 6/\Omega 3$ ratio was narrower in the experimental groups (10.91-10.99 in chicks treated with Esstence and 11.71-12.33 in those with Herba Safe), compared to the control groups (11.97-12.62).
- The lowest cholesterol values were found in groups that received the Esstence biostimulant (0.1520-0.1585 g/100g), and the highest in the meat of the control groups (0.1852-0.1987 g/100g).
- The calorific value determined in the pectoral muscles was highest in the groups treated with Esstence (157.31-159.68 kcal/100 g), which was 0.35-0.49% higher than in chicks with Herba Safe and 1.10-1.12% higher than in the control groups.
- Chemical determinations on thigh muscles showed that samples from the experimental groups exceeded those of the control groups by 0.28-0.54% in dry matter, 0.06-0.09% in protein, and 0.01-0.04% in lipids in chicks that received slow growth feed and by 0.15-0.27%, 0.08-0.21%, and 0.02-0.05% respectively in those fed with rapid growth feed.
- The thighs of chicks in the biostimulant-treated groups had a higher total fatty acid content by 0.11-0.26% in series E (slow growth feed) and by 0.11-0.16% in series F (rapid growth feed), which was also true for the total unsaturated fatty acids (UFA) content, which was higher by 4.90-6.51% in the Esstence groups and by 1.71-3.11% in the Herba Safe groups, compared to the control groups.
- Naturally, the $\Omega 6/\Omega 3$ ratio was higher compared to the other muscles studied, but it was narrower in the groups that benefited from Esstence (12.92-14.04) and Herba Safe (13.20-14.12) compared to the control groups (13.29-14.63).
- Cholesterol in the thigh muscles was found in higher quantities in the control groups (by 4.20-8.83% compared to the Esstence groups and by 2.37-2.55% compared to the Herba Safe groups), while the calorific value was lower (by 0.96-1.58% compared to the Esstence groups and by 0.49-0.77% compared to the Herba Safe groups).
- Both the pectoral and thigh muscles had normal mineral salt contents in all the groups studied.

- Analysis based on European performance indicators showed that the best scores were in the groups administered with the Esstence preparation, higher by 5.32-6.28% for the European Efficiency Index and by 5.30-6.29% for the European Broiler Index than the groups treated with Herba Safe, and respectively, by 15.37-16.25% for EEI and 15.41-16.36% for EBI compared to the control groups (without biostimulants).

The results obtained allowed us to make several recommendations for both poultry farmers and researchers in the poultry field:

- Administering the product Esstence (8.0 ml/litre of water during the first 15 days of life) to broiler chickens raised in intensive systems, as it ensures high productive performance and a very good survival rate without the need for other products/preparations commonly used in this production system.
- Continuing research on the effects of natural biostimulants on broiler chickens, with the aim of identifying any residues or effects on the immune system, the capacity to metabolise nutrients, the impact on the environment, etc.
- Private poultry farmers should use slow growth feeds (homemade) as they provide better performance than the cereal mixtures commonly used, especially when associated with natural products with a biostimulant role.