Scientific Papers. Series D. Animal Science. Vol. LXIV, No. 1, 2021
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

# RESEARCH ON THE EFFECT OF A DIETARY SUPPLEMENT ON GROWTH AND ERYTHROGRAM IN PIGEONS

**Marian GHIȚĂ[1], Carmen Daniela PETCU[1], Gabriel COTOR[1], Gavrilă ZAGRAI[2], Crina ANDREI[1], Oana Diana MIHAI (OPREA)[1]**

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Independenţei Spl, District 5, 050097, Bucharest, Romania
[2]University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Faculty of Veterinary Medicine, 3-5 Calea Mănăştur Street, 400372, Cluj-Napoca, Romania

Corresponding author email: oprea_diana2008@yahoo.com

***Abstract***

*Pigeon breeding is an activity with tradition in Romania, because their meat is a very valuable food product. The aim of the current paper is to investigate the effect of a dietary supplement (containing trace elements, vitamins and amino acids) used by pigeon fanciers for growing pigeon chicks. Another goal is to investigate whether the dietary supplement has effects on the erythrogram of pigeon chicks. The obtained results showed that the dietary supplement, due to its components, determined an intensification of the growth rate of pigeon chicks, so it can be used successfully for this purpose. Regarding the erythrogram, there were observed significant increases in the number of erythrocytes and hemoglobin (which demonstrates an intensification of erythropoiesis) and decreases in MCV and MCH (which demonstrates that the intensification of erythropoiesis is accompanied by the installation of microcytosis and hypochromia).*

***Key words****: amino acids, erythrogram, pigeon, trace-elements, vitamins.*

## INTRODUCTION

Pigeon breeding is an activity with tradition in Romania and their meat is a very valuable food product (Savu et al., 2002; Petcu, 2015; Costachescu et al., 2019; Paraschiv et al., 2020; Okoh et al., 2020). Nowadays, there is a wide range of dietary supplements on the market that can be administered to pigeons in different situations (growth, convalescence, during training, during the cold season, after the administration of treatments, during the mating season, before competitions, etc.). Their beneficial effects are obvious.

The effects of these supplements on the growth rate of pigeon chicks and on the erythogram are not so well known.

The aim of the current study is to find out how the food supplement Selevit sol. influences the growth rate of pigeon chicks and also if it has effects on the erythrogram.

We consider this study as a novelty for those interested in raising pigeons because the obtained values (the body weight of the pigeon chicks) can be used as reference values for pigeon fanciers who use dietary supplements in their own farms. At the same time, the values of the erythrogram resulting after the use of the dietary supplement and especially the explanations of the obtained results may be useful in the future in carrying out other research on similar topics.

## MATERIALS AND METHODS

The biological material was represented by 20 pigeon chicks of the standard carrier breed. They were split in 2 lots (each lot being made up of 10 pigeon chicks), resulting a control group and an experimental group. The dietary supplement used in the current research was Selevit sol. (contains vitamins, amino acids and trace elements).

The working methods used in the research were: determination of pigeon chicks body weight, determination of erythrocyte count (RBC), hemoglobin dosing (Hb), determination of hematocrit (HCT) and determination of derived erythrocyte constants (MCV, MCH, MCHC).

In order to **determine body weight,** an electronic Myria scale was used on the day of hatching and on days 7, 14, 21 and 28 of the experiment. Blood samples were taken on the 28th day to determine the erythrogram.

**The erythrocyte count (RBC)** was determined by direct counting using a hemocytometer.

**The dosing of hemoglobin (Hb) and hematocrit (HCT)** was performed using the HemoSmart device.

Determination of average erythrocyte volume (MCV), determination of average erythrocyte hemoglobin (MCH) and determination of average erythrocyte hemoglobin concentration (MCHC) were obtained using the calculation formula recommended by the literature (Cotor et al., 2012; Ghiță, 2010).

The current research was performed on 2 experimental groups, as follows:

- group 1: control group (no food supplement was administered);
- group 2: experimental group (0.1 ml dietary supplement was administered orally, daily, during the experiment).

## RESULTS AND DISCUSSIONS

### Results and discussions on the evolution of body weight

Regarding the evolution of the body weight of the pigeon chicks, the obtained results are presented in Table 1 and in Figure 1, accompanied by comments and discussions (explanations and comparisons with the data found in the literature). We specify that the obtained results will be presented as average values for each experimental group. Comparisons on the statistical relevance of the differences between the experimental groups were made using the t (Student) test.

Table 1. Average body weight values in pigeon chicks from the 2 experimental groups, expressed in grams

| The experiment's day | Group 1 | Group 2 |
|---|---|---|
| 1st day | 16.4 | 15.9 |
| 7th day | 67.5 | 72.4* |
| 14th day | 171.3 | 189.2* |
| 21th day | 346.6 | 412.2* |
| 28th day | 424.1 | 574.7* |

*p<0.05

Analyzing the data presented in Table 1, it is observed that on the first day of the experiment the average body weight of the pigeon in group 2 is 3.05% lower than the average body weight of the pigeons in the control group, the difference not being statistically significant. This statement confirms that the 2 experimental groups were constituted correctly.

On the 7th day of the experiment, the average body weight of the pigeons in group 2 is higher than the average body weight of the pigeons in the control group by 7.26%, the difference being statistically significant ($p<0.05$). The increase body weight is probably due to trace elements.

Studying the literature (Dojană et al., 2019) we found data that were related to the intensification of the growth rate of youth in all species, so it can be deduced that pigeons were included. An explanation of the obtained results seems to be represented by the time from the introduction of dietary supplement, which was probably insufficient for the vitamins and amino acids (from the dietary supplement) to be effective.

On the 14th day of the experiment, the average body weight of the pigeon chicks in group 2 is higher than the average body weight of the pigeon chicks in the control group by 10.45%. On the 21st day of the experiment the average body weight of the pigeon chicks in group 2 is 18.93% higher than the average body weight of the pigeon chicks in the control group. On the 28th day of the experiment the average body weight of the pigeon chicks in group 2 is higher than the average body weight of the pigeon chicks in the control group by 35.51%.

In all three situations mentioned above, the differences are statistically significant ($p<0.05$). These differences of the average body weight are due to vitamins, amino acids and trace elements (the trace elements are involved in the metabolism of carbohydrates, lipids and proteins, by participating in various anabolic reactions as enzyme activators) (Cotor et al., 2006; Pop et al., 2006).

The dietary supplement can be successfully used when the aim is to increase the body weight of pigeon chicks because, in order to obtain a maximum effect, it is necessary to supplement the diet with vitamins, amino acids and trace elements.

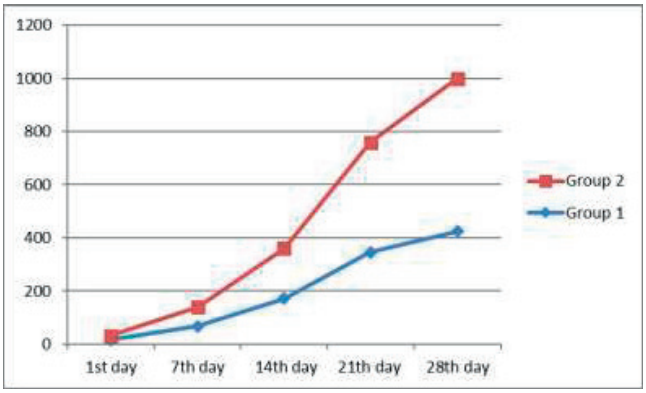


Figure 1. Variation of body weight of pigeon chicks during the experiment

**Results and discussions on erythrogram values**

The obtained results are presented in Table 2 and in Figure 2, regarding the values of the erythrogram.

**The average number of erythrocytes (RBC)** of pigeon chicks in group 2 is 23.88% higher than the average number of erythrocytes of pigeon chicks in the control group, the difference being statistically significant ($p<0.05$).

This observation means a strong intensification of hematopoiesis due to the compounds present in the composition of the dietary supplement. It results that the trace elements present in the composition of the used dietary supplement are responsible for the intense change of this parameter, a fact reported also in the literature (Constantin et al., 2004). Moreover, the composition of the food ration affects the blood count (Bălăceanu et al., 2017).

Table 2. The average values of the hemogram of the pigeon chicks from the 2 experimental groups

| Hematological parameter | Group 1 | Group 2 |
|---|---|---|
| **RBC** (million/mm$^3$ blood) | 3.35 | 4.15* |
| **Hb** (grams/dl blood) | 11.2 | 12.6* |
| **HTC** (%) | 37.3 | 38.1 |
| **MCV** (fl) | 113 | 93* |
| **MCH** (pg Hb/erythrocyte) | 33.94 | 30.73 |
| **MCHC** (g Hb/dl erythrocyte mass) | 30.03 | 33.07 |

*$p<0.05$

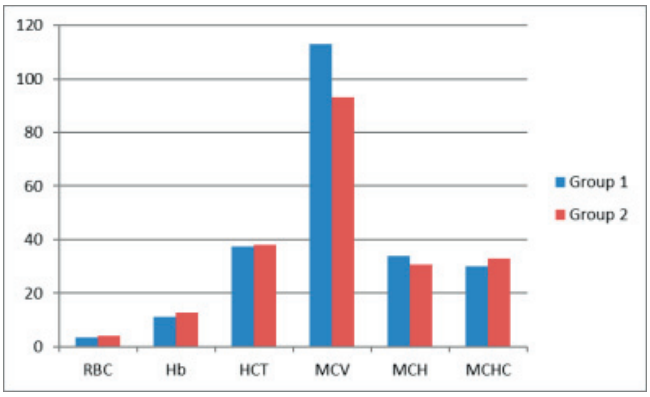


Figure 2. Erythrogram values in the case of the two experimental groups

**The average number of erythrocytes (RBC)** of pigeon chicks in group 2 is 23.88% higher than the average number of erythrocytes of pigeon chicks in the control group, the difference being statistically significant ($p<0.05$).
This observation means a strong intensification of hematopoiesis due to the compounds present in the composition of the dietary supplement. It results that the trace elements present in the composition of the used dietary supplement are responsible for the intense change of this parameter, a fact reported also in the literature (Constantin et al., 2004). Moreover, the composition of the food ration affects the blood count (Bălăceanu et al., 2017).

**The average hemoglobin value (Hb)** of the pigeons in group 2 is 12.5% higher than the average value of hemoglobin of the pigeons in the control group, the difference being statistically significant ($p<0.05$); it also indicates a strong intensification of hematopoiesis due to the substances present in the composition of the food supplement. The obtained results confirm that for the synthesis of hemoglobin (chromoprotein) both amino acids (for the synthesis of the protein component) and soluble iron (the nucleus of the hemoglobin molecule) are needed (Dojană et al., 2018).

**The average value of hematocrit (HTC)** in pigeon chicks in group 2 is 2.14% higher than the average value of hematocrit in pigeon chicks in the control group, difference which is not statistically significant. The obtained results confirm the data from the literature (Codreanu et al., 2019); it is known that this parameter is not changed by the intensity of hematopoiesis (the increase of the number of erythrocytes is accompanied by the increase of the amount of plasma, so that the percentage between the two major blood components remains relatively constant).

**The average value of MCV** (average corpuscular volume) in the pigeon chicks in group 2 is lower than the average value of MCV in the pigeon chicks in the control group by 17.7%, the difference being statistically significant ($p<0.05$). Comparing the value of the MCV parameter with RBC, it is found that there is a relationship of inverse proportionality between the intensity of erythropoiesis and the size of erythrocytes (the higher the number of erythrocytes is, the smaller their volume is).
Studying the literature (Evans et al., 2001) it can be noted that all MCV values obtained by us fall within the physiological limits (between 90 and 125 fl).

**The average value of MCH** (average corpuscular hemoglobin) in pigeon chicks from group 2 is 9.46% lower than the average MCH in pigeon chicks from group 1, difference which is not statistically significant. The decreases of this parameter compared to the control group can be explained by the intensification of hematopoiesis in the case of the experimental group, induced by the dietary supplement administered. However, it is observed that in the experimental group the amount of average erythrocyte hemoglobin

decreased, although the number of erythrocytes increased, which proves that the administered dietary supplement was not enough to support hemoglobin synthesis, so the hypochromia occurs. Comparing the data obtained by us with those presented in the literature (Gaytri et al., 1994; Codreanu, 2014), a slight hypochromia can be observed, the physiological values of the MCH parameter being between 33 and 45 pg hemoglobin/erythrocyte.

**The average value of MCHC** (average corpuscular hemoglobin concentration) in pigeon chicks from group 2 is 10.12% higher than the average value of MCHC in pigeon chicks from the control group, difference which is not statistically significant. The slight increase observed in the case of the experimental group may be due to the effect produced by the vitamins in the composition of the dietary supplement administered, knowing that some of them ($B_{12}$, C) stimulate hemoglobin synthesis (Dojană et al., 2018).
Regarding the comparison of the obtained values for this parameter, with the values communicated by other authors (Gaytri et al., 1994; Fudge, 2000; Evans et al., 2001), a decrease can be observed; it can be explained by not adapting the rate of hemoglobin synthesis to the intensity of hematopoiesis (erythrocyte formation).
As it was previously reported, the intensification of erythropoiesis is accompanied by a decrease in the volume of erythrocytes (MCV), but also by a decrease in the amount of hemoglobin contained in erythrocytes (MCH). In this context, it is normal for the MCHC parameter to decrease because it represents the amount of hemoglobin present in one dl of erythrocyte mass. So, if each erythrocyte contains less hemoglobin, it turns out that in one dl of erythrocyte mass, less hemoglobin will be found.

## CONCLUSIONS

The administered dietary supplement determined the increase of the body weight of the pigeon chicks, the differences being significant compared to the control group, in all the experimental moments.

Regarding the effect of the dietary supplement on the erythrogram, significant differences were found compared to the control group for the following parameters: RBC and Hb (higher values) and MCV (lower values).

## REFERENCES


Bălăceanu, R., Stoica, L., Ghiță, M., Ognean, L., Negoiță, I., & Dojană, N. (2017). The effect of different fibre and starch dietary levels on haematology of post-weaning rabbits. *Agrolife scientific journal*, *6*(2), 22-26.

Codreanu, I. (2014). Studies Concerning the Effect of Glybenclamide, Streptozotocine and Insulin upon Pancreatic Juice Flow and Pancreatic Amylase and Lipase Activity, in Hens, *Indian Journal of applied research*, *4*(4), 417-418.

Codreanu, I, Călin (Nicolae), S., & Vasian, L. (2019). General aspects regarding the haematological profile in ewes during pregnancy and puerperium. *Revista Romana de Medicina Veterinara*, *29*(2), 37-40.

Constantin, N., Pop, A., Cotor, G., Codreanu, I., & Ghiță, M. (2004). The effect of some carbonic anhydrase activators in the oviduct of laying hens on the mechanical strength of the eggshell. *Revista Româna de Medicină Veterinară*, *14*(4), 27-44.

Costachescu, D.F., Boișteanu, P.C., Hoha, G., & Radu-Rusu, R.M. (2019). Morphological characteristics of the carcases and results obtained at sacrification preparations from the meat line. *Scientific Papers. Series D. Animal Science*, *LXII*(1). 416-423, ISSN 2285-5750.

Cotor, G., & Ghiță, M. (2006). *Biology of food production with food relevance*, Bucharest, RO: Cartea Universitară Publishing House.

Cotor, G., & Ghiță, M. (2012). *Theoretical and practical notions of animal biology*, Bucharest, RO: Printech Publishing House.

Dojană, N., & Bălăceanu, R. (2018). *Vitamins: their role in the animal body*, Bucharest, RO: Ceres Publishing House.

Dojană, N., Șonea, C., & Bălăceanu, R. (2019). *Vitamins: sources, functions and dysfunctions*. Bucharest, RO: Printech Publishing House.

Evans, H.E., Heiser, J.B. (2001). *What's inside: Anatomy and physiology. Handbook of Bird Biology*, 162-220, Ithaca, USA: Cornell Lab of Ornithology Publishing House.

Fudge, A.M. (2000). *Laboratory Medicine: Avian and Exotic Pets*. Philadelphia, USA: W.B. Saunders Company Publishing House.

Gaytri, K., & Hegde, S. (1994). Sexual differences in blood values of the pigeon. *Comp.Biochem.Physiol.B.* 109, 219-224

Ghiță, M. (2010). *Animal Biology - Practical workbook,* Bucharest, RO: Printech Publishing House.

Okoh, J.J., Mbap, S., Mancha, Y., & Ibrahim, T. (2020). Egg quality assessment of indigenous chickens in the north central agro ecological zone of Nigeria.

*Scientific Papers. Series D. Animal Science*, *LXIII*(2), 36-41, ISSN 2285-5750.

Paraschiv, I.A., Rizac, R.I., Soare, T., Ciobotaru-Pîrvu, E., & Militaru, M. (2020). Particularities of necropsy in cases of birds kept in captivity. *Scientific Works. Series C. Veterinary Medicine*, *LXVI*(2), 70-75. ISSN 2065-1295.

Petcu, C.D. (2015). *Meat quality and technology.* Bucharest, RO: Granada Publishing House.

Pop, A., Bianu, E., Ghiță, M., & Constantin, N. (2006). Evaluation of magnesium oxide intestinal absorption in laying hens, *Bulletin of the University of Agricultural Sciences and Veterinary Medicine*, 63, 136.

Savu, C., & Petcu, C.D. (2002). *Hygiene and control of products of animal origin*. Bucharest, RO: Semne Publishing House.