

## DYNAMICS OF SOME HEMATOLOGICAL PARAMETERS DEPENDING ON THE AGE OF PHEASANTS (*Phasianus Colchicus Colchicus*)

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**Abstract.** The article presents experimental data on the dynamics of hematological blood parameters (number of erythrocytes, leukocytes, hemoglobin concentration) of pheasant chicks (*Phasianus colchicus colchicus*) incubated from eggs of different weights for 1-60 days. Hematological analyses revealed that with increasing age of pheasant chicks at the age of 1-30 days there was a decrease in the number of erythrocytes and leukocytes, hemoglobin concentration and in the blood of pheasants at the age of 60 days there was an increase in the number of marked indicators. The reason for the sharp decrease in the number of erythrocytes in the blood of pheasants hatched from eggs of large mass can be explained by the fact that the average life span of these cells is 7 days. Therefore, physiological anemia is registered on day 10. Then gradually increases the activity of hematopoietic organs, the number of erythrocytes also increases. This pattern is also registered in the blood of chicks hatched from eggs of medium and light weight. The presented information can be used in assessing the physiological state of pheasant chicks.

**Keywords:** Pheasant, erythrocyte, leukocyte, hemoglobin, phasianus colchicus, hematology.

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### 1. Introduction

It is reported that pheasants have up to 32 subspecies or geographic forms that vary in color and that 49 of the 181 species of pheasants present in the world are found in Asia (McGowan, 1994). An article published in 2019 noted that the common pheasant (*phasianus colchicus*), belonging to the family Phasianidae of the order Galliformes, has 30 subspecies distributed throughout its range in the Palearctic (Liu *et al.*, 2019). The nominate subspecies *Phasianus colchicus Colchicus* inhabits the Caucasus, throughout Western and Southern Europe in acclimatized and tame conditions. The homeland of this species is generally considered to be the river valleys of the North Caucasus and Transcaucasia, covered with forests and reedbeds. Although the common pheasant is a widespread species, its regional populations are declining due to overhunting and habitat loss.

The common pheasant has historically been considered a species used recreationally for hunting. Due to the increase in pheasant numbers from farmed

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individuals released into the wild, evidence is given that they already have large stocks for hunting purposes (Braasch *et al.*, 2011; Laikre *et al.*, 2010; Voslarova *et al.*, 2009). Around 12 million pheasants are caught in the UK each year and around 25 million artificially reared pheasants are released into the UK countryside each year in late summer to conserve their stock (*phasianus colchicus*) (Tapper, 1999).

Very valuable data have been found on biochemical and hematological parameters of blood of pheasants, physiological condition of individuals kept and breeding in closed conditions (Lloyd *et al.*, 2006; Schmidt *et al.*, 2007a; Schumann *et al.*, 2014).

Hematological parameters are influenced by many factors such as age, genotype, sex, gender, physiological condition, nutrition, micro- and macro-climatic conditions, breeding method, circadian rhythm, season and various diseases (Adamu *et al.*, 2013; Alikwe *et al.*, 2010; Al-Rawashdeh *et al.*, 2000; Akhmedov, 2012; Cechova *et al.*, 2023; Farooq *et al.*, 2019; Fazlolahzadeh *et al.*, 2011). At the same time, the methods of collecting biological material, analyzing samples in the laboratory also play an important role in determining the parameters of blood parameters (Meluzzi *et al.*, 1992).

The aim of the research is to study the dynamic variations occurring in hematological blood parameters of pheasant chicks hatched from eggs of different weight, depending on age during their growth and development.

## 2. Material and methods

In order to monitor the dynamics of some hematological parameters on different days of growth and development of incubated 1-60-day-old pheasants from eggs of different weight, blood samples required for analyses were always taken from the underwing vein of chicks at the same time of day (10:00). To prevent blood clotting, 1% heparin was used as an anticoagulant, which was injected into a syringe. By morphologic indices of blood the number of erythrocytes and leukocytes, changes occurring in the amount of hemoglobin were studied. The Goryaev chamber was used to determine the number of erythrocytes and leukocytes and the Sali hemometer was used to determine the amount of hemoglobin (Yonas & Mersha, 2014). The preparations were examined in immersion oil under high magnification (X100) of Axio Scope AI microscope (Germany, Carl Zeiss Jena).

Statistics in statistical processing of the results (StatSoft Inc. 2010) and Microsoft Excel 2016 software. In the process of mathematical analysis, standard parameters of variation order were calculated - arithmetic mean ( $\bar{y}$ ), standard deviation ( $\sigma$ ), coefficient of variation ( $v$ ), arithmetic mean error ( $M$ ). The obtained numerical parameters are expressed in tables as  $M \pm SD$ .

## 3. Results and discussion

Hematologic examination is one of the important methods that can help to detect changes that are not apparent during physical examination, but affect the health of the body. Blood, having relative stability of its composition, is quite a labile system, quickly reacting to changes occurring in the body both in physiological norm and in pathology.

In addition to the age factor affecting blood parameters of birds, another factor is the breeding period. Hauptmanova *et al.* (2006), who studied the dynamics of hematological indicators of common pheasant (*phasianus colchicus*) at 6 months of age, before and after the period of ovulation. It was found that the amount of hemoglobin in

males is significantly higher than in females, increases during the period of growth and development and decreases during the breeding period. It was also found that there is a positive correlation between bird weight and red blood cell count (Hauptmanova *et al.*, 2006).

Kececi and Col (2011) show that erythrocyte count, hemoglobin count and hematocrit values increase with the age of chickens. Such age-related results for pheasants were also determined by Pujman and Hanusova (1970). On the contrary, Schmidt *et al.* (2007b) he reported that there were no significant differences in erythrocyte volume as well as eosinophil, monocyte and basophil counts among young pheasants.

The results of our research work are presented in the Table 1. The data in the table show that the number of erythrocytes and leukocytes in the blood of day-old chicks hatched from eggs of different mass, the registered differences in the amount of hemoglobin are not significant ( $P < 0.05$ ).

**Table 1.** Dynamics of hematological blood parameters of hatched pheasant chicks of different weights depending on age

| Indicators          | Groups                                    |        |        |      |   |        |        |      |  |        |       |      |
|---------------------|---|--------|--------|------|---|--------|--------|------|--|--------|-------|------|
|                     | Eggs hatched with high mass group I, n=10 |        |        |      | Medium weight eggs hatched group II, n=10 |        |        |      | Hatching from eggs with a light mass group III, n=10 |        |       |      |
|                     | X ± Sx                                    | Min.   | Max.   | Cv,% | X ± Sx                                    | Min.   | Max.   | Cv,% | X ± Sx   | Min.   | Max.  | Cv,% |
| Chicks at 1 day old |   |        |        |      |   |        |        |      |  |        |       |      |
| RBC, $10^{12}/l$    | 4,16±0,02                                 | 4,13   | 4,18   | 0,41 | 4,11±0,01                                 | 4,10   | 4,12   | 0,20 | 4,11±0,04  | 4,06   | 4,18  | 0,92 |
| WBC, $10^9/l$       | 22,53±0,02                                | 22,50  | 22,56  | 0,09 | 22,49±0,02                                | 22,46  | 22,50  | 0,02 | 22,40±0,03   | 22,35  | 22,43 | 0,12 |
| HGB, q/l            | 148,21±0,07                               | 143,10 | 143,30 | 0,05 | 146,21±0,14                               | 146,00 | 146,40 | 0,09 | 141,40±0,52  | 141,0  | 142,0 | 0,37 |
| 10-day-old chicks   |   |        |        |      |   |        |        |      |  |        |       |      |
| RBC, $10^{12}/l$    | 3,53±0,02                                 | 3,51   | 3,56   | 0,45 | 3,80±0,01                                 | 3,78   | 3,82   | 0,39 | 3,83±0,04  | 3,76   | 3,87  | 0,92 |
| WBC, $10^9/l$       | 23,12±0,05                                | 23,00  | 23,16  | 0,20 | 23,14±0,01                                | 23,12  | 23,16  | 0,06 | 22,88±0,07   | 28,75  | 28,99 | 0,25 |
| HGB, q/l            | 147,52±1,91                               | 142,10 | 148,20 | 1,29 | 116,13±0,09                               | 116,0  | 116,30 | 0,08 | 114,10±0,74  | 113,0  | 115,0 | 0,65 |
| 20-day-old chicks   |   |        |        |      |   |        |        |      |  |        |       |      |
| RBC, $10^{12}/l$    | 3,54±0,02                                 | 3,52   | 3,56   | 0,45 | 3,89±0,02                                 | 3,85   | 3,93   | 0,57 | 3,88±0,04  | 3,80   | 3,93  | 0,98 |
| WBC, $10^9/l$       | 22,13±0,01                                | 22,10  | 22,14  | 0,06 | 22,29±0,02                                | 22,26  | 22,32  | 0,08 | 22,71±0,07   | 22,26  | 22,76 | 0,13 |
| HGB, q/l            | 141,13±0,16                               | 132,10 | 132,40 | 0,11 | 116,89±0,09                               | 116,70 | 117,00 | 0,09 | 112,90±0,74  | 112,0  | 114,0 | 0,65 |
| 30-day-old chicks   |   |        |        |      |   |        |        |      |  |        |       |      |
| RBC, $10^{12}/l$    | 4,32±0,01                                 | 4,30   | 4,34   | 0,28 | 4,34±0,02                                 | 4,31   | 4,36   | 0,36 | 4,30±0,03  | 4,26   | 4,34  | 0,66 |
| WBC, $10^9/l$       | 22,38±0,02                                | 27,35  | 27,40  | 0,06 | 22,34±0,03                                | 22,30  | 22,38  | 0,11 | 22,27±0,09   | 22,10  | 22,40 | 0,42 |
| HGB, q/l            | 132,32±0,10                               | 132,90 | 132,40 | 0,14 | 132,21±0,18                               | 131,90 | 132,40 | 0,14 | 128,60±1,35  | 126,0  | 130,0 | 1,05 |
| 60-day-old chicks   |   |        |        |      |   |        |        |      |  |        |       |      |
| RBC, $10^{12}/l$    | 4,83±0,01                                 | 4,81   | 4,85   | 0,25 | 4,79±0,02                                 | 4,76   | 4,82   | 0,51 | 4,79±0,04  | 4,73   | 4,85  | 0,80 |
| WBC, $10^9/l$       | 27,61±0,01                                | 27,60  | 27,63  | 0,04 | 27,56±0,03                                | 27,50  | 27,60  | 0,11 | 27,37±0,04   | 27,30  | 27,41 | 0,14 |
| HGB, q/l            | 145,08±0,09                               | 145,00 | 145,20 | 0,06 | 143,94±0,18                               | 143,6  | 144,2  | 0,12 | 141,40±1,01  | 140,00 | 143,0 | 0,72 |

**Note:** RBC – eritrosit, WBC – leykosit, HGB-hemoglobin

Comparison of the number of erythrocytes in the blood of 10-day-old pheasant chicks hatched from eggs of large mass with the corresponding index of day-old birds showed that while the number of erythrocytes in the blood of 10-day-old chicks is  $4.16 \pm 0.02 \cdot 10^{12}/l$ , in 10-day-old birds its number decreases to  $3.53 \pm 0.02 \cdot 10^{12}/l$ . We believe that this can be explained by the fact that the average life span of erythrocytes is 7 days. Therefore, physiological anemia is registered on the 10th day of birds' life. Then the activity of hematopoietic organs gradually increases, the number of erythrocytes also increases. This pattern is also registered in the blood of chicks hatched from eggs of medium and light weight. Thus, the number of erythrocytes in the blood of day-old chicks hatched from eggs of medium and light weight is  $4.11 \pm 0.01 \cdot 10^{12}/l$  in both cases.

If the number of erythrocytes in the blood of 20-60-day-old, heavy mass-hatched pheasants on day 20 is  $3.54 \pm 0.02 \cdot 10^{12}/l$ , then on day 30 and 60 it was determined  $4.32 \pm 0.01 \cdot 10^{12}/l$  and  $4.83 \pm 0.01 \cdot 10^{12}/l$ , respectively. The marked index is  $3.89 \pm 0.02 \cdot 10^{12}/l$  and  $3.88 \pm 0.04 \cdot 10^{12}/l$  respectively in 20 day old pheasants hatched from medium and light weight eggs, in 30 day old chicks  $4.34 \pm 0.02 \cdot 10^{12}/l$  and  $4.30 \pm 0.02 \cdot 10^{12}/l$  and in 60 day old chicks in both cases  $4.79 \pm 0.02 \cdot 10^{12}/l$  was determined.

Although the number of erythrocytes in the blood of medium and light weight hatchlings was higher than that of heavy weight hatchlings, the differences recorded were not statistically honest, the number of erythrocytes in all groups did not go beyond the physiological norm. The increase in the number of erythrocytes in the blood with age within the physiological norm is important to ensure intensive gas exchange of the organism during the period of active growth.

The obtained results on the number of leukocytes in the blood of pheasants agree with the results of earlier studies by some authors (Lloyd & Gibson, 2006).

The mean leukocyte counts found in the studies were within the normal range for most bird species (Yılmaz, 2000). Although some authors have come to similar conclusions about leukocyte counts in different bird species such as pheasants, ostriches, depending on age (Levi *et al.*, 1989) sharps, etc. they show that in partridges there are no differences in leukocyte counts with age.

When comparing the number of leukocytes in the blood of diurnal pheasants, it can be shown that the highest number of leukocytes was in the blood of chicks hatched from eggs of large mass ( $22.53 \pm 0.02 \cdot 10^9/l$ ). At this time, the number of leukocytes in hatchlings of medium mass pheasants was  $22,49 \pm 0,02 \cdot 10^9/l$  and in hatchlings of light mass pheasants  $22,40 \pm 0,03 \cdot 10^9/l$ . Comparison of the number of leukocytes in the blood of 10-, 20- and 30-day pheasants shows that if in group I the marked index is  $23,12 \pm 0,05 \cdot 10^9/l$  in the blood of 10-day chicks, in group III it decreases to  $22,88 \pm 0,07 \cdot 10^9/l$ . And in group II this index increases to  $23,14 \pm 0,01 \cdot 10^9/l$ . The number of leukocytes in the blood of pheasants of II and III groups at 20 days of age continues to remain within the limits of  $22.29 \pm 0.02 \cdot 10^9/l$  and  $22.71 \pm 0.07 \cdot 10^9/l$ , respectively. And in the blood of 30-day-old pheasants it decreases to  $22.34 \pm 0.03 \cdot 10^9/l$  and  $22.27 \pm 0.09 \cdot 10^9/l$ , respectively. No significant changes in the number of leukocytes in the blood of 20- and 30-day-old birds were observed. The differences recorded were not significant ( $p > 0.05$ ).

In day-old chicks, hemoglobin content was  $148.21 \pm 0.07$  g/l in group I,  $146.21 \pm 0.14$  g/l in group II and  $141.40 \pm 0.52$  g/l in group III. The highest amount of hemoglobin was recorded in one-day old chicks in group II and it was found to be  $146.21 \pm 0.14$  g/l. In 10-day birds (group I) hemoglobin content increases by 4,31 g/l in comparison with the

indicators of day-old birds up to 147,52 g/l and in 30-day birds it decreases by 4,33% in comparison with the indicators of 20-day birds up to 141,13 g/l. From the 20-day age the hemoglobin content in the blood of pheasants of groups II and III is lower by 22.24 g/l and 28.23 g/l, respectively, compared to the index of group I. On the 30th day there is a decrease in the amount of hemoglobin in the blood of pheasants from groups II and III compared to the previous days. Thus, comparison of the indices of 20-day-old birds from the same group with those of 30-day-old pheasants shows that the hemoglobin content in the blood decreased in Group I by 8.81 g/l, in Group II by 15.32 g/l and in Group III increased by 15.70 g/l, amounting to 132.21 g/l and 128.60 g/l. These reported differences may be due to decrease in the number of red blood cells or decrease in the amount of hemoglobin in red blood cells.

Thus, the obtained results showed a noticeable effect of egg mass and age on hematological parameters of pheasant chicks. According to the results of the study, during the active period of growth and development of chicks, an increase in the number of erythrocytes and hemoglobin is registered.

The number of erythrocytes and leukocytes on hematological indicators of chicks hatched as a result of incubation of eggs of different masses collected from pheasants kept in closed conditions for 1-60 days, as a result of studying the dynamics of hemoglobin content it was found that with increasing age of pheasant chicks at the age of 1-30 days there is a decrease in the number of erythrocytes and leukocytes and the amount of hemoglobin, during the 60-day a in the blood of pheasants there is an increase in the number of marked indicators. The reason for a sharp decrease in the number of erythrocytes in the blood of pheasant chicks hatched from eggs of heavy, medium and light weight on the 10th day is physiological anemia. Then the activity of hematopoietic organs gradually increases and the number of erythrocytes also increases naturally.

The results provide new information on the number of leukocytes and erythrocytes in the blood of clinically healthy pheasant (*phasianus colchicus colchicus*) chicks at the age of 1-60 days, dynamic changes in the amount of hemoglobin.

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