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Haematological Indices Study in Four Subpopulations of Java Sparrow (*Padda oryzivora* L.)

Kajian Indeks Hematologis pada Empat Subpopulasi Gelatik Jawa (*Padda oryzivora* L.)

Sang Putu Kaler Surata

Fakultas Pendidikan MIPA IKIP Saraswati Tabanan Bali
Present address: Jl Cendrawasih No 34 Bangli-Bali. 80613.
E-mail suratak@yahoo.com

Abstrak

Gelatik Jawa (*Padda oryzivora* L) merupakan salah satu spesies burung yang terancam punah dan perlu dikonservasi. Salah satu penyebab kepunahan adalah ketidakmampuan spesies tersebut untuk beradaptasi dengan perubahan alam sekitarnya yang dapat ditunjukkan pada perubahan ciri biokimiawi individu seperti indeks hematologis. Penelitian ini bertujuan untuk mempelajari apakah ada perbedaan indeks hematologis pada empat subpopulasi gelatik Jawa di Jawa Barat, Jawa Timur, Bali Utara dan Bali Selatan. Hasil penelitian menunjukkan bahwa indeks hematologis darah gelatik Jawa dari empat subpopulasi tersebut dengan bobot badan antara 21-30 g, memiliki nilai rerata eritrosit 5,00±0,60 x 10^6/mm^3; leukosit 2,35±0,86 x 10^3/mm^3; PCV 61,32±11,62%; limfosit 58,25±17,32%; heterofil 35,93±15,72%; monosit 3,05±2,98%; dan basofil 0,05±0,21%. Ratio heterofil terhadap limfosit (H/L) burung tidak meningkat seiring dengan meningkatnya suhu lingkungan. Diduga hal tersebut disebabkan gelatik Jawa sudah beradaptasi dalam waktu yang relatif lama terhadap lingkungan lokal.

Kata kunci: gelatik Jawa (*Padda oryzivora* L), subpopulasi burung, indeks hematologis.

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Introduction

Several factors might affect normal haemotological indices for given species of animal, including sex, strain, age, climate and other environmental stress (Maxwell *et al.*. 1992). No haematological studies have been done on Java Sparrows, instead of the bird has reduced dramatically as direct result of hunting and capturing for local and international pet trading. van Helvoort (1981) reported that the bird were captured and offered for sale in considerable numbers at local bird markets and hundreds of Java Sparrows were traded each year at Denpasar, Bali.

Intensive use of pesticides in rice fields had a negative impact on the population of the species (van Balen, 1997). For example organochlorine contamination may be able to decline breeding success in birds (Green, 1996). While granular pesticides were toxic to birds, because one potential route of exposure was the consumption of these materials as a source of grit (Gionfriddo and Bets, 1995).

Conservation may be able to protect the bird from extinction. Various data base are needed to guarantee this effort to give a successful result. Haemotological indices provide a means of assesing health status of the birds and also as an indicator of their geographical distribution. The aim of this study was to examine haematological features in Java Sparrows.

Material and Methods

The studies were carried out during September to December 1998. The birds were collected from West Java (n=5), East Java (n=6), North Bali (n=11) and South Bali (n=22). Based on physical barrier among West Java, East Java, North Bali and South Bali, the population of Java Sparrow was assumed to be separated into four subpopulations.

The body weight was measured with Tanita balance (1 000 g). The bird was measured in the field, soon after capturing. The blood samples were taken from the wing vein (*vena ulnaris*) after 15 days adaptation using 1 ml disposable syringe.

Standard haematological analysis were utilized in determining haematological values. The red blood cell (RBC) count, was determined with haemocytometer after the blood was diluted 100-x in Hayem solution and mixed well. The white blood cell (WBC) count was determined using the same apparatus under 10-x dilution in Turk liquid. Packed cell volume (PCV) was measured by heparinized capillaries (Ramis and Planas, 1982). While the differential leucocyte count, examined by blood smear using avian giemsa staining following Ferris *et al*. (1986). The differential count was examined by grouping each 100 leukocytes under the 1 000 magnification (Swenson, 1993). The count for each cell type was recorded as a percentage of total leukocyte population.

Analysis of varians were performed for estimated the haematological differences among subpopulations.

Results and Discussion

The birds body weight ranged from 21 to 29 g, with average 24.88±1.78 g. The RBC count ranged from 3.80 to 6.26 x 10^6/mm^3 with average 5.00±0.60 x 10^6/mm^3. WBC count ranged from 1.20 to 4.40 x 10^6/mm^3 with average 2.35±0.86 x 10^6/mm^3 while the PCV ranged from 40 to 80% with average 61.32±11.62%. The proportion of heterophils in the differential leukocyte count ranged from 20 to 61% with average 35.93±15.72%, lymphocytes from 39 to 83% with average 58.25±17.32%, monocytes from 0 to 5% with average 3.05±2.98%, eosinophils from 0 to 4% with average 0.93±1.35%, and basophils from 0 to 1% with average 0.05±0.21%. The number of RBC and PCV were increased following the body weight (Figure 1), but statistically was not significant ($P > 0.05$).

Table 1 showed little differences of haematological values among subpopulations, but no significant differences ($P>0.05$) were recorded in those values. The heterophil /lympocyte (H/L) ratio was highest in South Bali subpopulation (0.698), and followed by the East Java (0.672), North Bali (0.649) and West Java subpopulations (0.608).

Table 1. Haematological indices on four different Java Sparrow (*Padda oryzivora* L.) subpopulations (SP).

Blood Indices	West Java SP (n=5)	East Java SP (n=6)	South Bali SP (n=22)	North Bali SP (n=11)
Body weight	26.00 ±1.00	25.83 ±0.98	25.86 ±1.23	22.91 ±1.05
RBC (x10^6/mm^3)	5.24 ±0.35	5.31 ±0.82	4.83 ±0.54	5.07 ±0.64
WBC (x10^6/mm^3)	2.44 ±0.83	2.83 ±1.27	2.45 ±0.77	1.84 ±0.63
PCV (%)	67.50 ±12.08	53.58 ±2.64	67.56 ±9.82	62.35 ±12.12
Heterophils (%)	44.33 ±9.02	43.50 ±10.73	43.00 ±13.13	41.30 ±13.93
Basophils (%)	0.00 ±0.00	0.00 ±0.00	0.09 ±0.29	0.00 ±0.00
Lymphocytes (%)	72.75 ±20.44	64.80 ±11.71	61.60 ±11.71	63.63 ±11.28
Monocytes (%)	2.20 ±0.84	3.50 ±1.76	2.55 ±3.20	4.18 ±3.52
Eosinophils (%)	1.60 ±1.67	0.50 ±1.23	1.00 ±1.48	0.73 ±1.01

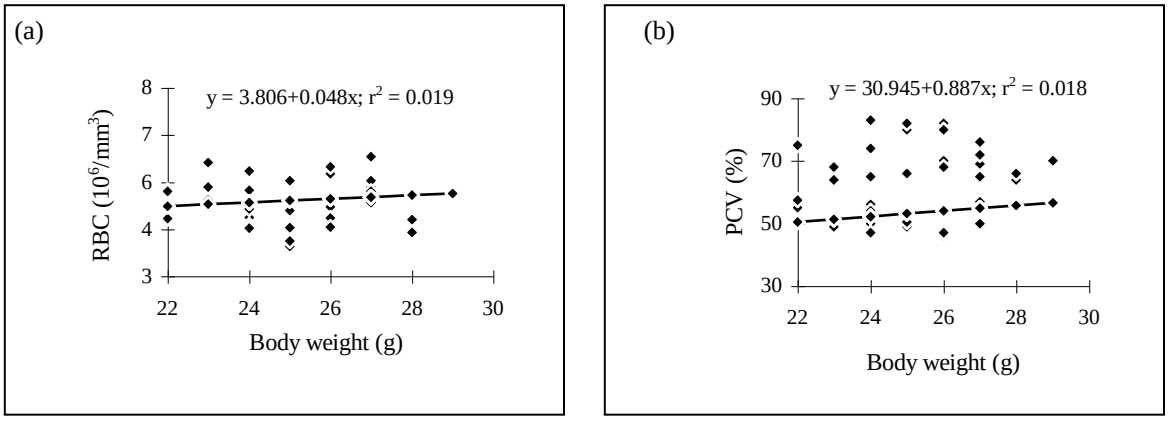

Fig. 1. The relationship between body weight and the number of red blood cells (a); and between body weight and PCV (b).

The wide range of hematological values were reflected a high individual variability of blood indices in Java Sparrows. These values vary widely might be influenced by spontaneous or latent diseases, genetic factors, physiological condition, sex, age, nutrition, lying performance, moulting, physical exercise and other environmental condition (Mitruka and Rawnsley, 1981; Atmowi, 1991).

The RBC and PCV count were higher in Java Sparrows than in the Little Auk (*Plautus alle*), Arctic Tern (*Sterna Paradisea*), Pigeon (*Columbia livia*), Duck (*Anas platyrhynchos domesticus*), Turkey (*Meleagris gallopavo*), Quail (*Coturnix coturnix coturnix*) and Great Tit (*Parus major*) (Kostelecka-Myrcha, 1987; Kostelecka-Myrcha, 1997).

If we compare with those birds, Java Sparrow relatively was smaller birds. The intensity of changes of the values of haematological indices determining the level of this function was higher in the species with the lower body weight (Kostelecka-Myrcha and Myrcha, 1989). As a result smaller birds have much efficient mechanism of providing oxygen to its tissues. Kosteclecka-Myrcha and Jaroszewic (1993) reported the metabolism rate in family of Ploceidae about twice faster than Wreathed Hornbill (*Rhycticeros undulacus*).

The WBC count in birds increases in diseases such as bacterial pneumonia, erysipelas, gastrointestinal infectious diseases, urethral infectious diseases, but decrease in the presence of fatal chronic infectious diseases. It has also been reported that the WBC count in birds was higher in juveniles than adults. The present study revealed that the WBC count in Java Sparrows exceed that of chicken, pigeon, quail and turkey (data not shown).

We found the percentage of heterophils and lymphocytes in Java Sparrows was higher than other birds. (Mitruka and Rawnsley, 1981; Kostelecka-Myrcha, 1997). Unfortunatelly, the haematological values were not linked with environmental climate differences. Generally, the environmental temperature from West Java to North Bali tend to be higher by decreasing annual rainfall (MacKinnon, 1991). Previous researches showed that percentage of heterophil increased with increasing temperature, but on the contrary percentage of lymphocyte decreased with increasing temperature (Charles *et al*., 1981; Suwindra, 1998). Consequently, the H/L ratio now is established as a widely accepted indicator for determining stress in poultry (Gross and Siegel, 1983).

Although lymphocyte in birds from western to eastern tend to be decreased, but the heterophils did not increase with increasing environmental temperature. Therefore the phenomenom of increasing H/L ratio with increasing temperature, were not shown in this research. It means a change in the environment was not likely to affect these birds. Probably the birds have a long adaptation in local

environment (Shirai and Sakai, 1997). Unidentified sexua, limited number of samples and age distinction may also influenced these haematological values (Atmowi, 1991).

Our hematological values were be useful for monitoring the health of captive animals in Java Sparrow breeding facilities. These finding need to be extended to cover changes that occur with the onset of diseases.

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References

Awotwi, E. K., 1991. Haematological studies on three commercial layer strains of chickens in Ghana. *Bull. Anim. Hlth. Prod. Afr*., 39:231-236.

Charles, R. D., Groom, C. M and Bray, T. S., 1981. The effects of temperature on broilers: interactions between temperature and feeding regime. *British Poult. Sc*.; 22:475-481.

Ferris, M. and Bacha, W. J., 1986. Response of leukocytes in chickens infected with the avian *Schistosome austrobilharzia* variglandis (Trematoda). *Avian Dis*. 30:683-686.

Green, R. E. and Payment, M. D., 1996. Geographical variance in the abundance of the Corncrake Crex Crex in Europe in relation to the intensity of agriculture. *Bird Conserv. Intern*ational 6: 201-211.

Gross, W. B. and Siegel, H. S., 1983. Evaluation of the heterophil/lymphocyte ratio as a measure of stress in chickens. *Avian Dis*.27:972-979.

Kostelecka-Myrcha, A., 1987. Respiratory function of a unit blood volume in the Litle Auk (*Plautus alle*) and Arctic Tern (*Sterna paradisea*). *Comp. Biochem. Physiol*. 86A:117-120.

Kostelecka-Myrcha, A., 1997. The ratio of amount of haemoglobin to total surface area of erythrocytes in birds in relation to body mass, age of nestling, and season of the year. *Physiol. Zool*. 70:278-282.

Kostelecka-Myrcha, A. and Jaroszewicz, M., 1993. The changes in the values of red blood indices during nestling development of the House Martin *Delichon urbica*. *Acta Orn*. 28: 39-46.

Kostelecka-Myrcha and. Myrcha, A., 1989. Changes of the red blood picture during nesting development of Wilson"s storm petrel. *Pol. Polar. Res*. 2:151-162.

MacKinnon, J., 1991. *Pengenalan lapangan burung-burung di Jawa dan Bali* (in Indonesian). Gadjah Mada Univ. Press, Yogyakarta.

Maxwell, M. H., Hocking, P. M. and Robertson, G. W., 1992. Differential leucocyte response to various degree of food restriction in broilers, turkey and ducks. *Brit. Poult. Sci*.33:177-187.

Mitruka, B. M. and Rawnsley, H. D., 1981. *Clinical biochemical and haematological reference values in normal experimental animals and normal hum*ans. Second Edition. Year Book Medical Publishers, Inc., Chicago.

Ramis, J. and Planas, J., 1982. Haematological parameters and iron methabolism in Pigeon and Chickens with phenylhydraine-induced anemia; *Avian Dis*. 26:107-117.

Shirai, K. and Sakai, T., 1997. Haematological findings in captive dolphins and whales. *Aust. Vet. J*. 75:512-514.

Swenson, M. J., 1993. Physiological properties and cellular and chemical constituents of blood. In Swenson, M. J., and W. O. Keece (eds.). *Duke' physiology of domestic animals*. 7ed., Comstoctk Publishing Asscociates a division of Cornel Univ. Press, London.

Suwindra, I. N., 1998. Uji tingkat pakan protein terhadap kinerja itik umur 16 sampai 40 minggu yang dipelihara intensif pada kandang tanpa dan dengan kolam. *Naskah Disertasi (S3) IPB, Bogor.*

van Helvoort, B. E., 1981. Bird population in the rural ecosystems of West Java. Nature Conservation Department of Agriculture, Univ. Wageningen. Student report.

van Balen, S., 1997. Java Sparrow. *Padda oryzivora*. PHPA/BirdLife International Indonesia Programme, Bogor.