BIOVALENTIA: BIOLOGICAL RESEARCH JOURNAL
***e*-ISSN: 2477-1392**
Vol. 8 No. 2, Nov 2022

Morphological Description of Internal Organ Color and Its Relationship to Body Weight of Free-Range Chickens in The Palembang Landfill Environment

Mutia Nurrahmandani[1]*, Sofia Sandi[2], Asep Indra Munawar Ali[2]

[1] *Sriwijaya University, Palembang, Indonesia, Jalan Padang Selasa 524, Palembang, South Sumatra 30139, Indonesia.*
[2]*Department of Animal Husbandry, Faculty Agriculture, Sriwijaya University. Jalan Raya Palembang-Prabumulih km 32, Indralaya, Indonesia.*

*Corresponding author

E-mail address: nurrahmandanimutia@gmail.com (Mutia Nurrahmandani).
Peer review under responsibility of Biology Department Sriwijaya University

Abstract

The landfill environment in Palembang City produces various types of waste so that people keep free-range chickens around the environment, which is potentially harmful to livestock health. This study aims to determine the color morphology of the internal organs (liver and heart) and the relationship between body weight and organ weight. The number of free-range chickens used was 30, with one year. The morphological description of organ color was carried out by direct observation, and sampling was carried out by weighing free-range chickens body weight and organ weight. This study used the Pearson correlation statistical test, and secondary data was collected on waste data in the landfill environment. The results showed that the relationship between body weight and liver weight was 0.694, and the correlation value between body weight and heart weight was 0.663 in native chickens in the landfill environment. The results of the two values have a strong correlation interpretation, which means that when the chicken's body weight increases, the weight of the liver and heart of the chicken will also increase. The liver is faded red with normal size in native chickens in the landfill environment in the morphological picture. While the color of the heart is red, and the size is normal.

***Keywords**: chicken; contamination; waste.*

Received: April 27, 2022, Accepted: June 16, 2022

1. Introduction

Garbage is one of the serious problems in Palembang City. The more the population increases, the more waste piles into the landfill. Waste entering the Palembang City landfill, especially Sukawinatan, in 2021 will reach 225.216,06 tons/year [1]. Along with the increase in population and the economic growth of the community, waste handling is carried out by collecting waste in their respective homes; then the waste is taken by the garbage officer and taken to the TPS (Temporary Shelter), from the TPS the waste is transported by a garbage car and then disposed of to the landfill. The accumulation of waste and the volume of waste entering the landfill results in an increase in waste capacity. The garbage generated from various sources, namely industry, offices, household activities, and public facilities, causes the formation of mountains of garbage that can interfere with the health and beauty of the city and can become a nest of various disease vectors [2].

The amount of waste in the landfill causes people to raise native chickens around the landfill environment. The source of feed comes from the landfill environment, a mixture of waste containing various kinds of toxic materials to native chickens and can also pollute the soil, water, and air environments. The waste produced is of various types, namely organic, inorganic, and hazardous toxic waste (B3). The various types of waste in the landfill environment will produce leachate or liquid wastewater through piles of garbage carrying dissolved or suspended materials resulting from the waste decomposition process [3].

The form of environmental pollution contains toxic heavy metals, one of which comes from leachate. Decreasing soil and water quality occurs when a hazardous substance enters the soil and settles as a toxic chemical that directly impacts humans and livestock around the environment [4].The decrease in soil and water quality is caused when leachate flows and reaches the soil around the landfill. Heavy metals in the waste are very dangerous when consumed by native chickens. By releasing free-range

chickens into the landfill environment, the maintenance system causes these metals to accumulate in the chicken's body. The chemical and biological contaminants enter the chicken body directly through the food chain. The food that enters occurs metabolic processes in organs, one of which is the liver and heart. The liver stores minerals, vitamins, and fats and filters various toxins, while the heart functions as a place for blood circulation and nutrients. The content of harmful substances in chicken body tissues through the feed eaten and long-term causes residues and morphological changes in chicken body tissues. This study aims to determine the color morphology of internal organs (liver and heart) and the relationship between body weight and organ weight.

2. Materials and Methods

The research was conducted from March to May 2021 at the Postgraduate Integrated Laboratory of Sriwijaya University.

2.1 Materials

The samples used were 15 male and female free-range chickens in the Palembang City landfill environment and 15 tails in Sembawa, Banyuasin Regency, each aged one year.

2.2 Method

This study uses a qualitative method with direct object observation and interviews. Sampling Procedure the chicken is weighed and then slaughtered by cutting the windpipe. The chicken is weighed, and then the chicken is cut by cutting the windpipe. After that, the chicken is dipped in hot water at 50 ^{o}C for 10 minutes then, the feathers are removed by hand. After the chicken is clean, the liver and heart are taken and weighed.

2.3 Measured Change

Free-range chicken body weight, liver weight, heart weight, organ color morphology.

2.4 Statistical Analysis

Statistical analysis of chicken body weight with liver and heart weights used Pearson correlation analysis. At the same time, the morphological description of organ color was carried out by direct observation, and collecting waste data was carried out through secondary data at UPT.TPA Palembang City. To find the correlation coefficient using the formula [5]:

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2]\ [n\sum Y^2 - (\sum Y)^2]}}$$

Information :
r count= correlation coefficient
X = total score of each item
Y = total score (all items)
n = number of respondents

3. Results and Discussion

3.1 Data on the Amount of Waste and Types of Waste in the Palembang Landfill Environment

The amount of waste and types of waste in the Palembang landfill environment are presented in Table 1 and Table 2.

Table 1. The Amount of Waste in Landfill

Number	Month	Amount of Waste (ton)	Average (ton)
1	January	22,525.31	726,623
2	February	19,606.40	700,229
3	March	20,385.43	657,595
4	April	19,691.54	656,385
5	May	20,462.81	660,091
6	June	16,876.01	562,534
7	July	17,849.00	575,774
8	August	17,427.36	562,173
9	September	17,848.00	594,933
10	October	17,172.89	572,430
11	November	17,678.89	589,296
12	December	17,692.42	570,723
	Total	225,216.06	619,065

UPT. TPA DLHK Palembang, 2021

Table 2. Type of Waste in Landfill

Source of Waste	Percentage (%)
Households	70,12%
Offices	1,45%
Markets	8,34%
Trade	13,22%
Public Facilities	5,10%
Other Regions	1,18%
All Sources	0,59%
Total	100 %

UPT. TPA DLHK Palembang, 2021

Waste in the Palembang City TPA still undergoes a natural decomposition process in the long term. It is dominated by waste originating from organic waste, inorganic waste, and hazardous toxic waste (B3) [6]. The amount of waste in the TPA comes from various sources, namely households, offices, markets, commerce, public facilities, areas, and others. The waste management system at the Palembang City TPA is carried out using a control landfill system. Management with this system can negatively impact the environment and health, such as pollution, disease transmission, and accumulation of heavy metals. Handling needs to be done to make no changes to the environment, soil, water, and air [7].

3.2 Results of The Relationship Between Body Weight and Internal Organ Weight of Free Range Chickens

The results of the relationship between body weight and the weight of internal organs (liver and heart) are presented in Table 3.

Table 3. Relationship Between Body Weight and Internal Organ Weight of Free-Ranged Chicken

Variable	Correlation Value (r)	
	Landfill Environment	Control Environment
Chicken Body Weight with Liver Weight	0,694**	0,663**
Chicken Body Weight with Heart Weight	0,539*	0,599*

Note: (**) significance: p<0,01, (*) significance: p<0,05

Based on the values in Table 3, the body weight and organ weights (liver, heart) of free-range chickens in the landfill and control environments showed significant values.

Relationship Between Body Weight and Chicken Liver Weight

The analysis results showed a relationship between body weight and liver weight of free-range chickens in the landfill environment, with a significance value (P <0.01); the value of the relationship was 0.694. At the same time, the control environment has a significance value (P<0.05) with a relationship value of 0.539. The results of the two values have a strong correlation interpretation, which means that when the chicken's body weight increases, the weight of the chicken liver will also increase. The environment influences chicken body weight, feed consumption, and feed content. The nutritional content of the feed, especially protein is one of the essential elements for growth if a lack of protein results in disrupted chicken growth [8]. Several factors affect feed content: temperature, development, and body type. Agree with Chairul [9] that humidity, temperature, environment, and feed quality affect chicken body weight. If the chicken is overweight, the liver functions more in synthesizing protein and fat in the body's metabolism. The liver plays a role in toxic detoxifying compounds, storing vitamins, and secreting bile. Chicken liver is closely related to body weight which is influenced by the age of the livestock. The weight of the liver increases when harmful compounds enter the body so that the work activity of the liver increases. To the research of Damara *et al* [10], there is a relationship between body weight and broiler chicken liver and is influenced by the type of chicken and the nutritional content of livestock.

Relationship Between Body Weight and Heart Weight of Free Range Chicken

The results of the analysis in Table 3 show a relationship between body weight and the heart of native chickens in the landfill environment with a significance value (P < 0.01) with a relationship value of 0.663. The significance value (P<0.05) with the relationship value in the control environment was 0.599. The results of the values

in the TPA and control environments have a strong interpretation, meaning that the heavier the body weight, the larger the chicken heart and vice versa. This is because chicken body weight is influenced by feed consumption. According to Setiadi [11] argue that organ weight is closely related to chicken body weight in addition to the content of feed consumption.

The feed consumed by the chicken enters the body, and then a metabolic process occurs in the body's organ tissues. This process affects the performance of the liver and heart. The heart plays an important role in transferring nutrients and the circulatory system in the body. The chicken heart is susceptible to disease causing an increase in its weight. When the heart is infected with the disease and accumulated toxins, its size will increase. Enlargement of heart weight is influenced by the condition of the chicken's body, the age factor, and livestock activity. Suppose you look at the activities of native chickens roaming freely in the TPA environment. Agree with Karthika *et al* [12] in their research that heart weight is relatively related to chicken body weight and is influenced by several genetic and nutritional factors. The size of the heart organ is related to the type of age, body weight, and activity of livestock [13].

Morphological Description of Organ Colors in Free Ranged Chicken

Morphological descriptions of internal organs (liver and heart) in native chickens in the landfill and control environments are presented in Figures 1 and Figure 2.

The community in the landfill maintains free range chickens by releasing them from morning to evening. Free range chickens roaming around looking for their food usually eat organic waste. Still, free range chickens may be accidentally eaten by inorganic waste piled up in organic waste. The free range chickens reared in the landfill environment had normal sized livers but faded red color, while in the control environment, the livers were normal in size and red in color. The liver of native chickens can be seen in Figure 1.

This indicates that the liver color of native chickens in the TPA environment is caused by the accumulation of heavy metal contamination from various types of waste, namely market waste, household waste, and industrial waste. Normal chicken liver color is brownish-red. According to [13], if the liver is poisoned, the color of the liver will turn yellow. The poisoning is caused by excess minerals and toxic substances that cause disturbances in the digestive organs. The liver plays an important role in several functions: fat metabolism, protein metabolism, and detoxification. The detoxification process needs to be carried out to get rid of toxins and waste from the body's metabolism [14]. It can be seen from the morphology of the normal-sized heart organ, and the red color indicates that there are no abnormalities in native chickens in the landfill and control environments. The heart organs of native chickens can be seen in Figure 2.

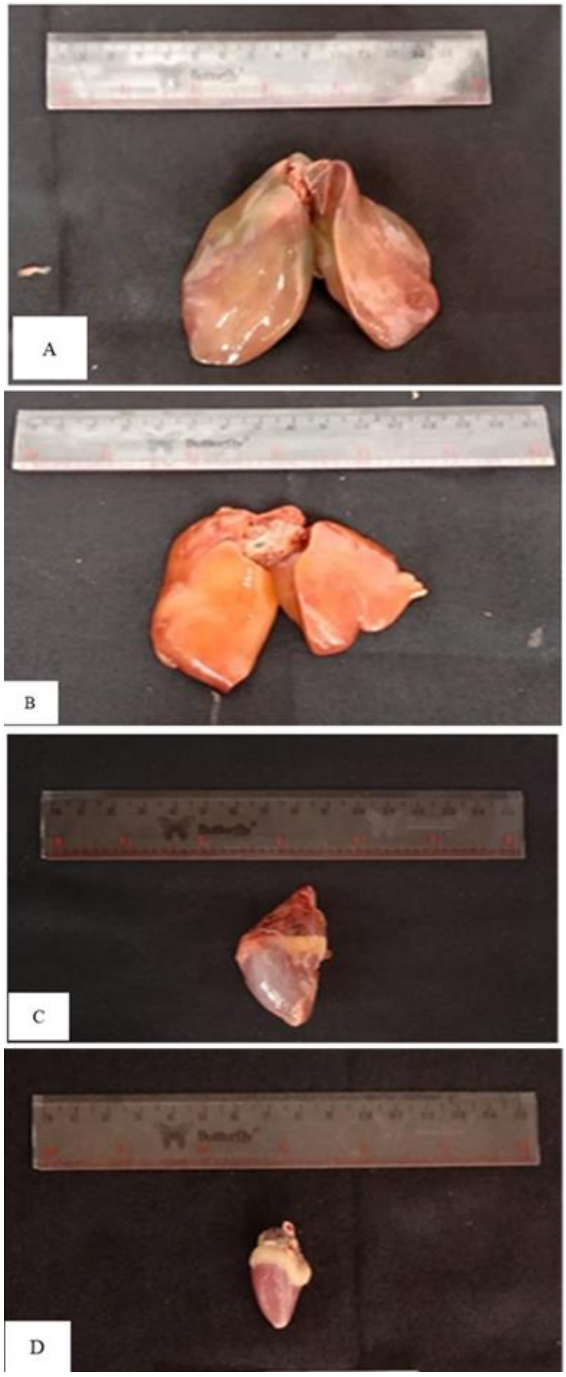

Figure 1. a. Chicken liver from the landfill environment, b. Chicken liver from the control environment, c. Chicken heart from the landfill environment, d. Chicken heart from the control environment

This is because there is no cause factor for the nutritional content of the feed. The heart has a shape resembling a cone which plays a role in pumping blood into the body's circulatory system. The amount of heart weight is

influenced by age, body weight, and type of chicken [11].

4. Conclusion

The value of the relationship between body weight and organ weight (liver, heart) in native chickens has a strong correlation interpretation which means that if the chickens body weight increases, the organ weight increases. Meanwhile the morphology of normal sized organs, only has color organs differences in the landfill environment.

5. Acknowledgement

Researcher would like to thank the UPT.TPA Sukawinatan Palembang City and Postgraduate Integrated Laboratory, Sriwijaya University.

References

[1] DLHK, "Jumlah Sampah di TPA Sukawinatan Tahun 2021," Palembang, 2021.

[2] K. Himmatul, "Analisis Kesadaran Masyarakat Akan Kesehatan terhadap Upaya Pengelolaan Sampah di Desa Tegorejo Kecamatan Pegandon Kabupaten Kendal," *Indones. J. Conserv.*, vol. 10, no. 1, pp. 13–20, 2021, doi: 10.15294/ijc.v10i1.30587.

[3] R. N. Sari, P. L. Hariani, and Suheryanto, "Development of the Potentiometric Method for Measurement of Cu," *Indones. J. Fundam. Appl. Chem.*, vol. 4, no. 3, pp. 122–125, 2019, doi: 10.24845/ijfac.v4.i3.122.

[4] Indah Dewata Tarmizi, *Kimia Lingkungan Polusi Air, Udara dan Tanah*. Padang: UNP Press Padang, 2015.

[5] Sudjana, *Metode Statistika*. Bandung, 2005.

[6] F. Amalia and M. K. Putri, "Analisis Pengelolaan Sampah Anorganik Di Sukawinatan Kota Palembang," *J. Swarnabhumi*, vol. 6, no. 2, pp. 134–142, 2021.

[7] H. Jimmyanto, I. Zahri, M. Dahlan, and N. Putri, "Evaluasi Sistem Pengelolaan Sampah Padat Domestik Di Kota Palembang Tahun 2017," *Demogr. J. Sriwij.*, vol. 2, no. 2, pp. 2355–4738, 2018, [Online]. Available: http://ejournal-pps.unsri.ac.id/index.php/dejos/index.

[8] Eko Widodo, *Ilmu Nutrisi Unggas*. Malang: UB Press, 2018.

[9] F. Chairul, "Pertambahan Bobot Badan Ayam Broiler Dengan Pemberian Ransum Yang Berbeda," *Lentera*, vol. 15, no. 16, pp. 36–44, 2015.

[10] D. Damara, I. K. Berata, I. B. K. Ardana, N. L. E. Setiasih, and I. N. Sulabda, "Hubungan Berat Badan dengan Berat Hati serta Gambaran Histologi Hati Broiler yang Diberikan Tepung Maggot," *Indones. Med. Veterinus*, vol. 10, no. 5, pp. 714–724, 2021, doi: 10.19087/imv.2021.10.5.714.

[11] D. Setiadi, K. Nova, and S. Tantalo, "Perbandingan Bobot Hidup, Karkas, Giblet, Dan Lemak Abdominal Ayam Jantan Tipe Medium Dengan Strain Berbeda Yang Diberi Ransum Komersial Broiler," *J. Ilm. Peternak. Terpadu*, vol. 1, no. 3, pp. 1–7, 2013.

[12] K. Karthika, N. S. Sunilkumar, B. A. Dixy, H. Sebastian, and A. Sasidharan, "Comparative Studies on the Per Cent Organ Weights in Commercial Broiler and Layer Chicken," *J. Vet. Anim. Sci. 2019*, vol. 50, no. 2, pp. 133–137, 2019.

[13] dan N. M. S. S. Pratama , I W. A., N. W. Siti, "Pengaruh Abu Agnihotra dalam Pakan Komersial Terhadap Organ Dalam Ayam Broiler Umur 5 Minggu," *J. Trop. Anim. Sci.*, vol. 6, no. 3, pp. 723–734, 2018, [Online]. Available: https://simdos.unud.ac.id/uploads/file_penelitian_1_dir/80a62e1b18443e312ea393947017b283.pdf.

[14] I. Wahyudi, D. Anggraini, Y.L. Siska, "Pengaruh Penambahan Probiotik Starbio Dalam Ransum Terhadap Berat Organ Pencernaan Ayam Bloiler," *J. Green Swarnadwipa*, vol. 10, no. 1, pp. 71–77, 2021, [Online]. Available: http://ejournal.uniks.ac.id/index.php/GREEN/article/view/1177%0Ahttps://ejournal.uniks.ac.id/index.php/GREEN/article/download/1177/825.