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Research Article

## HEALTH PROFILE OF BROILER CHICKENS USING A RATIO OF RICE HUSK, SAWDUST, AND LIME AS LITER

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### Keywords:

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**Abstract:** Chicken rearing requires special handling, one of which is using the right litter as bedding for broiler chickens. This study aims to determine the effect of the ratio of rice husk, sawdust, and lime as litter on the health of broilers. This study used a completely randomized design (CRD) with five treatments and four replications. Each replication consisted of five broilers. The treatment given included P1 = 100% rice husk. P2 = 100% sawdust, P3 = 70% rice husk, 25% sawdust, and 5% lime. P4 = 25% rice husk, 70% sawdust, 5% lime. P5 = 47.5% rice husk, 47.5% sawdust, and 5% lime. The research parameters included: physical characteristics of external and internal organs, percentage of internal organ weight, and broiler mortality. The results show that there are abnormal physical characteristics in the external organs (legs look dry, feathers are dull and the cloaca looks dirty) and internal organs (the liver is brownish yellow and there are petechi hemorrhages, the spleen is swollen and there are grayish-white spots on the surface, the thymus swollen and there is bleeding petechi and kidneys are batik colored and swollen). The average percentage of liver, heart, and gizzard weight of broilers ranged from 3.98-357%, 0.70-0.84%, and 3.29-4.0%. The average mortality rate reached 0.01% of 100 broilers reared for six weeks. The percentage of liver, heart, and gizzard weight and the mortality rate of broiler chickens did not show a significant effect. It was concluded that the rice husk, sawdust, and lime ratio showed abnormal physical characteristics in broilers' external and internal organs. The best physical characteristics of the external organs were shown in P4, while the internal organs showed the same physical characteristics in each treatment. The use of P2, P3, and P5 tends to be better than other treatments.

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## INTRODUCTION

The cultivation of broiler chickens is increasingly popular because the rearing process is relatively faster when compared to cattle or other types, which are also cultivated for their meat. Chicken maintenance requires special handling and is very important to pay attention to. One of the actions of handling chickens in good maintenance management is using proper litter as coop bedding for broiler chickens (Ratnasari *et al.*, 2015; Syaefullah *et al.*, 2019). Litter is a coop base that absorbs water and ammonia, insulating heat and minimizes direct contact with the floor for chickens (Najibulloh *et al.*, 2020). According to Saputra *et al.*, (2015), good types of litter have low moisture absorption, are cheap, and are preferred when sold as fertilizer.

Different types of litter will provide different conditions in terms of particle size, particle weight, temperature, thermal conductivity, and absorption of water to provide different litter internal conditions. The type of litter material has a direct impact on the production parameters, behavior, and welfare of broiler chickens (Thennakoon *et al.*, 2024). According to Saputra *et al.* (2020), increased litter water content, litter pH, litter temperature, and litter ammonia indicate poor litter conditions. The accumulation of nutrients in the excreta will trigger the growth of pathogenic microbes and an increase in ammonia gas (Mahardika *et al.*, 2023). The increasing number of pathogenic bacteria can affect body weight, weight gain, consumption, and feed conversion of broiler chickens (Widodo *et al.*, 2009). Increased ammonia gas has an impact on the health and welfare of livestock, reducing production efficiency (Bist *et al.*, 2023), causing oxidative stress, decreasing the ability to uptake oxygen, and disrupting the metabolic rate and thermoregulation of broiler chickens (Saputra *et al.*, 2020), decreasing immunity (Mahardika *et al.*, 2023). Apart from that, continuous exposure to 25 ppm ammonia can cause irritation and the appearance of lesions in the respiratory tract (Beker *et al.*, 2004), decreased feed intake (Saputra *et al.*, 2020), decreased body weight gain, and increased FCR so that chicken performance is reduced. optimal (Yahav, 2004), vulnerable to infectious disease and death (Bist *et al.*, 2023).

Several researchers have used various materials as litter, including: spraying rice husk litter with up to 12% formalin causes a decrease in total litter bacteria, inhibits and kills litter bacteria (Widodo *et al.*, 2009); the use of litter consisting of 50% husk, 33% sand and 17% lime can increase feed consumption and body weight gain in broiler chickens and does not reduce feed conversion (Muharlieni *et al.*, 2011); The use of husk, charcoal, shell, zeolite and soil litter showed a low ammonia concentration (0.95 mg/m<sup>3</sup>), feed consumption was 411.18 g/head, body weight gain was 283.80 g/head and conversion was 1.35 (Ibrahim and Allaily, 2012); the use of rice husk litter, wood shavings and rice straw does not affect live weight, carcass weight, giblet weight and abdominal fat of finisher stage broiler chickens reared in closed houses (Saputra *et al.*, 2015); the use of sawdust shows better growth and higher body weight compared to straw and rice husks as litter (Purwono, 2018); recycling litter by fermentation and drying in sunlight showed a reduction in total bacteria of 57.75%, levels of carbon dioxide, ammonia, hydrogen sulfide and total dust were within the normal range so they did not cause eye irritation, respiratory tract problems and negative effects. others (Najibulloh *et al.*, 2020); closed house cages with a length of 120 m have higher microclimate conditions of ammonia, ammonia excreta, ammonia litter, temperature, pH, and water content of rice husk litter in the starter period than 60 m cages (Saputra *et al.*, 2020); bean straw, corn cob, and corn stover litter materials are suitable for use as alternative litter because they provide good performance (feed consumption, body weight gain and feed conversion) in broiler chickens (Mahardika *et al.*, 2021); The addition of zeolite, charcoal, quicklime and limestone to litter can improve the performance and health of broiler chickens, increase overall growth and reduce footpad dermatitis (Sujiwo and Ariyadi, 2023).

However, the combination of rice husks, sawdust and lime has not been implemented. Mixing the three types of litter materials is expected to overcome problems caused by humidity due to chicken manure and other factors that can interfere with broiler chickens' health. Therefore, research needs to be carried out to determine the impact of the ratio of using rice husks, sawdust and lime on broiler chickens, especially on health levels.

## MATERIAL AND METHOD

This research was conducted in the Laboratory of The Poultry Livestock Unit, Faculty of Animal Science, Halu Oleo University - Kendari uses 100 DOC (Day Old Chick) broiler chickens produced by PT Malindo, which are not differentiated by sex. The litter used in this study consisted of three materials: rice husk, sawdust, and lime. Rice husks are obtained from rice mills, sawdust from the furniture industry, and lime from a farm shop in Kendari city. Equipment includes a colony cage measuring 1m × 1m, a feeder, a 75-watt incandescent balloon jug as a heater and light, stationery, digital scales, buckets, and other equipment.

This study used a completely randomized design (CRD) which consisted of five treatments and four replications. Each replication consisted of five broiler chickens. The treatment given includes: P1: 100% rice husk without sawdust and lime; P2: 100% sawdust, without rice husk and lime; P3: 70% rice husk, 25% sawdust, and 5% lime; P4: 25% rice husk, 70% sawdust, 5% lime; P5: 47.5% rice husk, 47.5% sawdust, and 5% lime.

The variables observed in this study include:

Table 1. Scoring of abnormalities in external and internal organs of broilers.

Characteristic abnormalities in external organs	Characteristics of abnormalities in internal organs
<b>Eye</b>	<b>Heart</b>
a. Swollen or glazed eyes	a. The heart swells
b. eyelids purplish blue or raised nodules	b. Brownish-yellow in color
c. Discharge of fluid in the eyes	c. There are white spots
d. frothy exudate in the eyes	d. Ptechic bleeding
<b>Nose</b>	<b>Bursa</b>
a. Slimy	a. Bursa looks enlarged
b. The thick yellow liquid discharge	b. Ptechic bleeding
c. Pusy, smelly and thick	c. The outer surface of the bursa is covered with brownish-yellow mucus
d. There is a yellow exudate crust	d. Indentations or longitudinal fibers on the surface are more prominent
<b>Beak</b>	<b>Spleen</b>
a. Slimy	a. The spleen is slightly swollen
b. The discharge of blood clots in the beak	b. bleeding
c. There is exudate on the beak	c. There are grayish-white spots on the surface
d. Beak opens or yawns steam	d. There is a tumor or nodules
<b>Comb</b>	<b>Thymus</b>
a. Faded or pale colors	a. The thymus is slightly swollen
b. It looks purplish blue	b. Ptechic bleeding
c. There are nodules	c. It is thick and has gelatinous connective tissue covering the surface
d. The thickness is thick	d. Experiencing atrophy
<b>Feather</b>	<b>Proventriculus</b>
a. Glazed, dull fur	a. bleeding in the mucosa near the junction between the proventriculus and ventricles
b. Chicken feathers standing up, looking sluggish	b. Inflammation of the proventriculus
c. Broken limbs of wing feathers	c. There are wounds
d. Persistence of the yellow color on the underside of the coat until 30 days of age	d. Tech of the proventriculus
<b>Leg</b>	<b>Kidney</b>
a. There is bleeding on the legs in the form of red spots ( <i>ptechi</i> )	a. Experiencing swelling
b. There are nodules on the legs	b. There is urea in the kidney
c. Feet look dry	c. The kidneys appear pale
d. Chickens sit sluggish and weak	d. Tumors on the kidneys
<b>Cloaka</b>	
a. Dirty	
b. Small	
c. There is white pasta	
d. d. The hairs around the anus are dirty and look dry	

Assessment of normal and abnormal physical characteristics of broiler chickens' external organs (eyes, nose, beak, comb, feathers, legs, cloaca) and internal organs (liver, bursa, spleen, thymus, proventriculus and kidneys). Characteristics of normal and abnormal organs refer to Pudjiatmoko (2014), Roni (2014), Khasanah (2020), and Asep (2018) compiled and scored (Table 1). A score of 0 indicates that there are four abnormal features; Score 1 indicates that there are

three abnormal features; score 2 indicates that there are two abnormal characteristics; score 3 indicates that there is one abnormal feature and score 4 indicates that there are no abnormal characteristics in the external organs or internal organs of broiler chickens. Percentage of internal organ weight (liver, heart, and gizzard).

The percentage of liver/heart/gizzard is calculated from the weight of the liver/heart/gizzard divided by the final weight of the chicken (before slaughter) multiplied by 100% (Pratama *et al.*, 2018). Broiler mortality is obtained by dividing the chicken deaths by the total chicken population during the study multiplied by 100 (Risa *et al.*, 2014). The data obtained were analyzed descriptively and statistically using SPSS software.

## RESULT AND DISCUSSIONS

### Physical Characteristics of Broiler External Organs

The results of the study of the ratio of rice husk, sawdust, and lime to the average physical characteristics of the external organs of broiler chickens in the eyes, nose, beak, comb, feathers, legs, and cloaca can be seen in Table 2. The ratio of rice husk, sawdust, and lime as litter to the physical characteristics of the external organs of broiler chickens (Table 2) shows that the eye, nose, beak, and comb areas have an average value of 4 (normal), that is, there are no abnormal physical characteristics in the study chickens. Rice husk, sawdust, and lime as litter are suspected to have good water absorption capacity. A good absorption rate causes environmental conditions to be more stable so that it does not affect the health of broiler chickens. According to Dewanti *et al.*, (2014), litter has good absorption properties, is not dusty, easy to obtain, and cheap. According to Triawan *et al.*, (2013), Suryanah *et al.*, (2016), and Utama *et al.*, (2021), during the maintenance process, the litter thickness needs to be around 5 cm from the bottom of the floor sometimes. Litter use was carried out from the beginning of maintenance until the chickens were 30 days old.

The ratio of rice husk, sawdust, and lime to the physical characteristics of the external organs of broiler chickens (feathers, legs, and cloaca) shows that there are abnormal physical characteristics, with an average score of 3 in the observed broiler chickens. The results showed that the fur looks dim and dull, the feet look dry, and the cloaca looks dirty. This is presumably due to the high temperature and humidity of the cage lining due to spilled drinking water. The bed temperature of the cage in this study ranged from 33.3-34.2°C. According to Knizatova *et al.*, (2010) and Jaya *et al.*, (2022), high temperatures will cause the temperature of the litter to be higher, and broilers tend to consume more drinking water than rations, making the manure wetter, which has an impact on humidity and water content in the litter. The ideal litter temperature is between 29-31°C

Table 2. Average values of abnormalities in the external organs of broilers using litter with different ratios of rice husks, sawdust, and lime.

Treatment	Parameter						
	Eye	Nose	Beak	Comb	Leg	Feather	cloaca
P <sub>1</sub>	4,00	4,00	4,00	4,00	3,00	3,00	3,00
P <sub>2</sub>	4,00	4,00	4,00	4,00	3,00	3,00	3,00
P <sub>3</sub>	4,00	4,00	4,00	4,00	3,00	3,00	3,00
P <sub>4</sub>	4,00	4,00	4,00	4,00	3,00	4,00	3,00
P <sub>5</sub>	4,00	4,00	4,00	4,00	3,00	3,00	3,00
Average	4,00	4,00	4,00	4,00	3,00	3,50	3,00

Description: P<sub>1</sub> : 100% rice husk without sawdust and lime; P<sub>2</sub> : 100% sawdust, without rice husk and lime; P<sub>3</sub>: 70% rice husk, 25% sawdust, and 5% lime; P<sub>4</sub>: 25% rice husk, 70% sawdust, 5% lime; P<sub>5</sub>: 47.5% rice husk, 47.5% sawdust and 5% lime.

The litter used in this study has an adequate absorption rate so that environmental conditions can be more stable and do not affect the health of broiler chickens. Nurbaya *et al.* (2023) stated that the pH of litter with the same treatment as in this study (P<sub>1</sub>=100% rice husks, P<sub>2</sub>=100% sawdust, P<sub>3</sub>=70% rice husks, 25% sawdust and 5% lime, P<sub>4</sub>=25% husks rice, 70% sawdust, 5% lime, P<sub>5</sub>=47.5% rice husk, 47.5 sawdust, 5% lime) ranges from 8.1 to 8.3. The pH is

still in the normal range according to Chen et al. (2021) namely 7.5-8.5 (alkaline pH). pH < 7.0 (acid) can cause ammonia emissions (Wang *et al.*, 2021) because it inhibits the decomposition of uric acid as urea and the conversion of ammonium to NH<sub>3</sub> gas. High levels of NH<sub>3</sub> (>25 ppm) can cause keratoconjunctivitis or eye damage in chickens (Olanrewaju *et al.*, 2008), in the respiratory system and cause widening of the upper epithelial area of the trachea in broiler chickens (Oyetunde *et al.*, 1978; Bist *et al.*, 2023), irritation of the skin, eyes and respiratory tract (Jannah *et al.*, 2020; Bist *et al.*, 2023), dermatitis on broiler chicken footpads (Durmus *et al.*, 2023). All combinations of litter types in this study (P1-P5) can be used by breeders because in general, they do not have a bad effect on the health of broiler chickens, especially on their external organs.

### Physical Characteristics of Broiler Internal Organs.

The results of the study of the ratio of rice husk, sawdust, and lime to the average physical characteristics of the external organs of broiler chickens in the liver, bursak, spleen, thymus, proventriculus, and kidney can be seen in Table 3 below:

Table 3. Average values of organ abnormalities in broiler chickens using litter with different ratios of rice husk, sawdust, and lime.

Treatment	Parameter					
	Liver	Bursa	Spleen	Thymus	Proventriculus	Kidney
P <sub>1</sub>	2,00	4,00	3,00	3,00	4,00	3,00
P <sub>2</sub>	2,00	4,00	3,00	3,00	4,00	3,00
P <sub>3</sub>	2,00	4,00	3,00	3,00	4,00	3,00
P <sub>4</sub>	2,00	4,00	3,00	3,00	4,00	3,00
P <sub>5</sub>	2,00	4,00	3,00	3,00	4,00	3,00
Average	2,00	4,00	3,00	3,00	4,00	3,00

Description: P<sub>1</sub> : 100% rice husk without sawdust and lime; P<sub>2</sub> : 100% sawdust, without rice husk and lime; P<sub>3</sub>: 70% rice husk, 25% sawdust, and 5% lime; P<sub>4</sub>: 25% rice husk, 70% sawdust, 5% lime; P<sub>5</sub>: 47.5% rice husk, 47.5% sawdust and 5% lime.

The results showed that in broiler chicken livers in the study, all ratios of rice husk, sawdust, and lime showed abnormalities with an average score ranging from 2. The liver of the study chickens was brownish-yellow, and there was petechial bleeding. This abnormality is probably caused by the chickens eating their litter so that the liver experiences heavy work and a buildup of toxins occurs, which causes the liver to be unable to neutralize toxins. According to Etik *et al.*, (2021), the factors that affect liver color are the nation, age, and individual status of the same livestock. If poisoned, the liver color changes to yellow, while the normal liver color is reddish brown or brown.

The mean value of the bursa score in all treatments is 4 (normal). This is presumably because the bursa can maintain the immune system of broiler chickens. This is to the statement of Sulistiyanto *et al.*, (2019) that the natural immune system in the body of broiler chickens depends on detoxification organs and the formation of antibodies, namely the liver, spleen, and bursa.

The spleen in this study showed a score ranging from 2.50 to 3.0. This score value shows that the spleen of broiler chickens in each treatment is abnormal, characterized by swelling and gray-white spots on the surface of the spleen of broiler chickens. The spleen abnormality is probably caused by the body of broiler chickens forming or secreting antibodies to protect the livestock's body from disease. According to Hakim *et al.*, (2021), the spleen plays a role in the overhaul of old erythrocytes and the secretion of antibodies. The presence of stress conditions and disease exposure in chickens can affect the size of the spleen organ.

In this study, the mean thymus score ranged from 3.0 to 3.75. This shows that the thymus of broiler chickens in each treatment showed abnormalities with the characteristics of experiencing slight swelling, and Ptechi was bleeding in the thymus of broilers. The thymus regulates the immune system response or immunity of broiler chickens. Abnormal conditions in the thymus indicate that the thymus is forming antibodies. These changes in the thymus indicate that the thymus may be neutralizing poisons originating from the increased amount of ammonia in the litter. According to Widiyanti *et al.*, (2019), the thymus can regulate the immune system's

response to infected cells and will differentiate into T lymphocytes that regulate the immune system's response.

The mean score on the proventriculus is 4 (normal). This shows that the ratio of rice husk, sawdust, and lime does not affect the shape of the broiler proventriculus in the study. The proventriculus can maintain the digestive system and can carry out chemical digestion. According to Amalia *et al.*, (2017), the proventriculus is the site of enzymatic digestion. The process of digesting food runs fast in a short period in the proventriculus, so little enzymatic digestion of food material occurs. The proventriculus is a chemical digestive organ and a dilation of the esophagus before contact with the gizzard.

Kidney scores in this study ranged from 2.75-3.5. This shows that the kidneys of broiler chickens in each treatment were abnormal, with the kidneys being batik colored and slightly swollen. These abnormal kidneys may be caused by chickens eating their litter, resulting in a buildup of toxins in the kidneys or exposure to NH<sub>3</sub>. According to Alipin *et al.* (2016), the kidneys can excrete metabolic waste products in the form of urine and toxic compounds so that the condition of the kidneys can be used as an indicator of the influence of exposure to toxic substances in the body. Han *et al.* (2020) stated that relatively lower kidney weights and higher concentrations of serum creatinine and uric acid indicated that chickens were exposed to NH<sub>3</sub>. NH<sub>3</sub> can cause kidney injury and oxidative stress.

### Percentage of Broiler Internal Organ Weight

The study results of the ratio of rice husk, sawdust, and lime to the percentage of physical characteristics of the weight of organs in broiler chickens (liver, heart, and gizzard) can be seen in Table 4.

Table 4. Percentage of liver, heart, and gizzard organs weight and mortality of broiler chickens using litter with different ratios of rice husks, sawdust, and lime.

Parameter	Treatment (%)				
	P <sub>1</sub>	P <sub>2</sub>	P <sub>3</sub>	P <sub>4</sub>	P <sub>5</sub>
Liver	3,98±0,16	3,75±0,49	3,57±0,36	3,75±0,58	3,72±0,35
Heart	0,83±0,07	0,70±0,08	0,84±0,10	0,77±0,06	0,81±0,05
Gizzard	4,00±0,20	3,287±0,31	3,445±0,42	3,78±0,22	3,475±0,46
Mortality	0,01±0,05	0±0,00	0±0,00	0,01±0,05	0±0,00

Description: P<sub>1</sub>: 100% rice husk without sawdust and lime; P<sub>2</sub> : 100% sawdust, without rice husk and lime; P<sub>3</sub>: 70% rice husk, 25% sawdust, and 5% lime; P<sub>4</sub>: 25% rice husk, 70% sawdust, 5% lime; P<sub>5</sub>: 47.5% rice husk, 47.5% sawdust and 5% lime.

Table 4 shows that the ratio of rice husk, sawdust, and lime did not have a significant effect ( $P>0.05$ ) on the percentage of liver organ weight (%) of broiler chickens. The average value of liver weight percentage in this study ranged from 3.57-3.98%. This average value is higher than the normal liver percentage, according to Wenno (2018) and Mahya *et al.* (2023), which is 3% and 2,86%. The results of this study are in line with Adebayo *et al.* (2009) stated that there was no real difference between the liver weights of chickens raised using sawdust litter and rice husks even though the size tended to be larger in sawdust litter. The high percentage of liver weight in this study was probably caused by chickens eating their litter so the liver experienced heavy work and was unable to neutralize toxins. According to Kusmayadi *et al.* (2019), diseases or toxins brought in with food can cause the liver to work extra to increase the production and secretion of bile to neutralize these toxins so that the size or weight of the liver increases. The abnormal characteristics of the liver in this study were shown by a brownish-yellow color and swelling of the liver. Sujiwo and Ariyadi (2023) stated that the liver is one of the vital organs responsible for the body's immunity. Changes in liver size can indicate the chicken's immune response to disease. The liver of chickens infected with the virus is swollen and brownish-yellow with necrotic foci (Ren *et al.*, 2019).

The percentage of broiler heart organ weight did not show a significant effect ( $P>0.05$ ) due to the use of different ratios of paddy, sawdust, and lime (Table 4). The average value of the percentage of heart weight in this study ranged from 0.70-0.84%. The average heart weight percentage in this study was higher than normal weight according to Badaruddin *et al.*, (2022),

namely 0.58% of live weight. This shows that the heart is working hard to pump blood so that the weight of the heart is greater. Pangesti *et al.*, (2016) stated that factors that affect heart weight include body size, age, and environmental temperature. Heart weight relative to slaughter weight, where genotypic factors and feeding patterns will also affect heart weight. The heart is vulnerable to toxins and anti-nutritional substances (Kusmayadi *et al.*, 2019).

The ratio of rice husk, sawdust, and lime had no significant effect ( $P>0.05$ ) on the percentage of gizzard organ weight (%) of broiler chickens. The average value of the gizzard weight percentage in this study ranged from 3.29-4.0%. This average value is higher than the percentage of normal gizzards, according to Wenno (2018), which is 1.6-2.5%. This shows that the gizzards in this study worked hard to digest feed mixed with litter mechanically. According to Tama *et al.*, (2017), the gizzard functions to digest food mechanically with the help of grit and small stones in the gizzard, which broiler chickens swallow.

### **Mortality Percentage**

The percentage of broiler mortality (%) did not have a significant effect ( $P> 0.05$ ) due to the use of different ratios of paddy, sawdust, and lime in this study. The average percentage of chicken mortality reached 0.01% (P1 and P4) from 100 chickens kept for 6 weeks. This shows that the use of the ratio of rice husks, sawdust, and lime does not harm health and welfare which can cause death in broiler chickens. The low percentage of broiler chicken deaths in this study indicates that the cage environment is still quite good and the level of NH<sub>3</sub> gas emissions is still quite low. According to Risa *et al.* (2014), the causes of mortality are environmental factors, including temperature or weather and long rainy seasons. Bist *et al.* (2023) stated that NH<sub>3</sub> concentrations >25 ppm in poultry houses can cause poor air quality so livestock become susceptible to infectious diseases and die.

### **CONCLUSION**

The use of the rice husk, sawdust, and lime ratio as litter in this study showed signs of abnormalities in the external organs (legs look dry, feathers are dull and dull and the cloaca looks dirty) and internal organs (the liver is brownish-yellow and there are ptechi hemorrhages, the spleen is swollen and there are grayish-white spots on the surface, the thymus swollen and there is bleeding ptechi and kidneys are batik colored and swollen) of broiler chickens. The best physical characteristics of the external organs were shown in P4, while the internal organs showed the same physical characteristics in each treatment. The percentage of liver, heart, and gizzard weight and the mortality rate of broiler chickens did not show a significant effect due to the ratio of rice husks, sawdust, and lime as litter. The use of P2, P3, and P5 tends to be better than other treatments.

### **REFERENCES**

- Adebayo, I.A., Awoniyi, T., & Akenroye, A.H. (2009). Growth performance and meat wholesomeness of broiler chickens reared on different types of litter materials. *Journal of Food Agriculture and Environment*:7(3).
- Alipin, K., Fadilah, A., & Kuntana, Y. (2016). Gambaran morfologis ginjal ayam yang diberi ransum mengandung temulawak serta pengaruhnya terhadap bobot badan. *Seminar Naional Pendidikan dan Saintek*: 98-102.
- Amalia, F., Muryani, R., & Isroli. (2017). Pengaruh penggunaan tepung azolla microphylla fermentasi pada pakan terhadap bobot dan panjang saluran pencernaan ayam kampung persilangan. *Jurnal pengembangan penyuluhan pertanian* 14(26): 117-24.
- Asep, A. 2018. Sistem pakar identifikasi penyakit ayam pedaging. *Jurnal Cendekia* 10(5):60-61

- Badaruddin, R., Auza, F.A., Syamsuddin., Nafiu, L.O., Saili, T., Pagala, M.A., & Munadi, L.O.M. (2022). Percentage of internal organs of broiler chickens given *Vernonia amygdalina* flour feed additives." *IOP Conference Series: Earth and Environmental Science* 1107(1): 1-6.
- Beker, A., Vanhooser, S. L., Swartzlander, J. H., Teeter, R. G., (2004). Atmospheric ammonia concentration effects on broiler growth and performance. *Journal of Applied Poultry Research*, 13, 5-9.
- Bist, R.B., Subedi, S., Chai, L., & Yang, X. (2023). Ammonia Emissions, impact, and mitigation strategies for poultry production: a critical review. *Journal of Environmental Management*. 328:1-30.  
<https://www.sciencedirect.com/science/article/abs/pii/S0301479722024926>.
- Chen, B., Shao, Y., Shi, M., Ji, L., He, Q., Yan, S. (2021). Anaerobic digestion of chicken manure coupled with ammonia recovery by vacuum-assisted gas-permeable membrane process. *Biochemical Engineering Journal*, 175, 108135.
- Dewanti, A.C., Santosa, P.E., & Nova, K. (2014). Fisiologis broiler fase finisher di closed house the effect of various types litter materials on broiler physiological response of finisher phase in closed house. *Jurnal Ilmiah Peternakan terpadu* 2(3): 81-87.
- Durmus, M., Kursun, K., Polat, I., Taufan, M., Kutay, H., Benli, H., Baylan, M. & Kutlu, H.R. (2023). Effect of different litter materials on growth performance, the gait score and footpad dermatitis, carcass parameters, meat quality, and microbial load of litter in broiler chickens. *Poultry Science* 102:1-9. <https://doi.org/10.1016/j.psj.2023.102763>.
- Etik, Anggraeni, & Dihansih, E. (2021). Persentase karkas dan giblet ayam broiler (*Gallus domesticus*) yang diberi ekstrak daun kelor (*Moringa olifera*). *Jurnal peternakan nusantara*. 7(2): 107-16.
- Hakim, R.L., Mahfudz, L.D., & Muryani, R. (2021). Penambahan nukleotida pada ransum broiler yang dipelihara pada suhu lingkungan berbeda terhadap performa organ imunitas. *Jurnal Sains Peternakan*. 16(2): 164-70. DOI: <https://doi.org/10.31186/jspi.id.16.2.164-170>.
- Han, Q., Zhang, J.Y., Sun, Q., Xu, Y.M., & Teng, X.H. (2020). Oxidative stress and mitochondrial dysfunction involved in ammonia-induced nephrocyte necroptosis in chickens. *Ecotox. Environ. Safe*. 203:110974.
- Ibrahim, S & Allaily. (2012). Pengaruh Berbagai Bahan Litter Terhadap Konsentrasi Ammonia Udara Ambient kandang dan Performan Ayam Broiler. *Jurnal Agripet* 12(1): 47-51.
- Jannah, L.M., Sarjana, T.A., & Suprijatna, E. (2020). Pengaruh perubahan spasial mikroklimatik amonia pada zona penempatan dan panjang kandang berbeda terhadap performa ayam broiler periode starter. *Jurnal Ilmiah Peternakan Terpadu*, 8(1),14-20.
- Jaya, C.R.M., Riyanti., Septinova, D., & Nova, K. (2022). Kadar air, pH, suhu, dan kadar amonia pada litter di dua zonasi yang berbeda pada kandang closed house. *Jurnal Riset dan Inovasi Peternakan*. 6(2): 129-35. DOI: <https://doi.org/10.23960/jrip.2022.6.2.129-135>.



- Khasanah, H. (2020). Kesehatan ternak tropik. UPT Percetakan dan Penerbitan Universitas Jember. Kalimantan.
- Knizatova, M., Mihina, S., Broucer, J., Karandusovska, I., & Macuhova, J. (2010). The influence of litter age, litter temperature, and ventilation rate on ammonia emissions from a broiler rearing facility. *Czech Journal of Animal Science*. 55(8): 337–45. <https://doi.org/10.17221/176/2009-CJAS>.
- Kusmayadi, A., Prayitno, C.H., & Rahayu, N. (2019). Persentase Organ Dalam Itik Cihateup yang Diberi Ransum Mengandung Kombinasi Tepung Kulit Buah Manggis dan Tepung Kunyit. *Jurnal Peternakan Nusantara*. 5(1): 1–12.
- Mahardika, C.B.D.P., Djunina, H., & Hadisutanto, B. (2021). Pengaruh berbagai bahan litter terhadap performa ayam ras pedaging dan kualitas litter. *Jurnal Ilmu Ternak*. 21(1): 10.
- Mahardika, B.P., Sholikah, N., Kalsum, U., Suryanto, D., & Damayani, D.E. (2023). Upaya peningkatan retensi nitrogen dan penurunan kadar ammonia ekskreta ayam petelur melalui implementasi probiotik *Lactobacillus salivarius*. *Jurnal Nutrisi ternak Tropis* 6(2):133-239.
- Mahya, A., Pagala, M.A., Asminaya, N.S., Auza, F.S., & Zulkarnain, D. (2023). Percentage of broiler giblets fed with flour rations by-product of chicory (*Brassica pekinensis* L). *Indonesian Journal of Animal Agricultural Science*. 5(2):74-80.
- Muharlién, Achmanu., & Rachmawati, R. (2011). Meningkatkan Produksi Ayam Pedaging Melalui Pengaturan Proporsi Sekam, Pasir, dan Kapur Sebagai Litter. *Jurnal Ternak Tropika*. 12(1): 38–45.
- Najibulloh, M., Ulupi, N., & Salundik. (2020). Pengaruh daur ulang litter terhadap kualitas litter dan udara dalam pemeliharaan broiler. *Livestock and Animal Research*. 18(2): 107–15.
- Nurbaya, W.O.S., Asminaya., N.S. & Has, H. (2023). Production performance of broiler chickens using litter with different rations of chaff, sawdust, and lime. *Indonesian Journal of Animal Agricultural Science*. 5(2):59-66.
- Olanrewaju, H. A., Miller, W. W., Maslin, W. R., Thaxton, J. P., Dozier III, W. A., Purswell, J., Branton, S. L. (2008). Interactive effects of ammonia and light intensity on ocular, fear, and leg health in broiler chickens. *Poultry Science* 87:1407–1414. doi:10.3382/ps.2007-00486.
- Oyetunde, O.O., Thomson, R.G., Carlson, H.C. (1978). Aerosol exposure of ammonia, dust, and *Escherichia coli* in broiler chickens. *The Canadian Veterinary Journal*, 19:187.
- Pangesti, U.T., Natsir, M.H., & Sudjarwo, E. (2016). Pengaruh Penggunaan Tepung Biji Nangka (*Artocarpus heterophyllus*) dalam Pakan terhadap Bobot Giblet Ayam Pedaging. *Jurnal ternak tropika*. 17(2): 58–65.
- Pratama, I.W.A., Sitti, N.W., & Sukmawati, N.M.S. (2018). Pengaruh Abu Agnihotra dalam Pakan Komersial Terhadap alam Pakan Komersial Terhadap Organ Dalam Ayam Broiler

Umur 5 Minggu. *Journal of Tropical Animal Science*. 3(1): 723-34.  
<https://simdos.unud.ac.id/>

- Pudjiatmoko. (2014). Manual penyakit unggas. Subdit Pengamatan Penyakit Hewan, Direktorat Kesehatan Hewan. Jakarta.
- Purwono, E. (2018). Pengaruh Berbagai Macam Litter terhadap Pertumbuhan Ayam Broiler. *Jurnal Triton*. 9(1): 89-95. <https://jurnal.polbangtanmanokwari.ac.id/index.php/jt/article/view/70>.
- Ratnasari, R., Sarengat, W., & Setiadi, A. (2015). Analisis pendapatan peternak ayam broiler pada sistem kemitraan di kecamatan gunung pati kota Semarang. *Animal Agriculture Journal*. 4(1): 47-53.
- Ren, G., Wang, H., Yan, Y., Liu, F., Huang, M., & Chen, R. (2019). Pathogenicity of a fowl adenovirus serotype 4 isolated from chickens associated with hydropericardium-hepatitis syndrome in China. *Poultry Science* 98:2765-2771.
- Risa, E., Semaun, R., & Novita, I. D. (2014). Evaluasi penurunan angka mortalitas dan penambahan tepung lempuyang (*Zingiber aromaticum* val) dalam ransum. *Jurnal Galung Tropika*. 3(3): 192-200.
- Roni, F. (2014). Aneka penyakit pada ayam dan cara mengatasinya. Agromedia Pustaka. Tangerang.
- Saputra, T.H., Nova, K., & Septinova, D. (2015). Pengaruh penggunaan berbagai jenis litter terhadap bobot hidup, karkas, giblet, dan lemak abdominal broiler fase finisher di Closed House. *Jurnal Ilmiah Peternakan Terpadu*. 3(1): 38-44.
- Saputra, M.R., Sarjana, T.A., & Kismiati, S. (2020). Perubahan Mikroklimatik Amonia Dan Kondisi Litter Ayam Broiler Periode Starter Akibat Panjang Kandang yang Berbeda. *Sains Peternakan*. 18(1): 8.
- Sujiwo, J., & Ariyadi, B. (2023). Effect of the additional natural compound in litter on performance and health parameter of broiler. *Jurnal Sain Peternakan Indonesia* 18(3):127-133. DOI: <https://doi.org/10.31186/jspi.id.18.3.127-133>.
- Sulistiyanto, B., Kismiati, S., & Utama, C S. (2019). Tampilan produksi dan efek imunomodulasi ayam broiler yang diberi ransum berbasis wheat pollard terolah. *Jurnal Veteriner*. 20(3): 352-59. DOI: 10.19087/jveteriner.2019.20.3.352.
- Suryanah., Nur, H. ., & Anggraeni. (2016). Pengaruh neraca kation anion ransum yang berbeda terhadap bobot karkas dan bobot giblet ayam broiler. *Jurnal Peternakan Nusantara*. 2(1): 1-8.
- Syaefullah, B.L., Herawati, M., Timur, N.P.V.T., Bachtiar, E.E., & Maulana, F. (2019). Income over feed cost pada ayam kampung yang diberi nanoenkapsulasi minyak buah merah (*pandanus conoideus* ) via water intake. *Jurnal Triton*. 10(2): 54-61.
- Tama, C.A., Septinova, D., & Kurtini, T. (2017). Pengaruh pemberian jamu tradisional terhadap bobot hidup, bobot karkas, bobot giblet dan lemak abdominal broiler. *Jurnal Riset dan*

- Thennakoon, T.M.I.D., Udagedara, U.G.D.M.B., Atapattu, N.S.B.M., & Senaratne, D. (2024). Effects of *Salvinia* as a broiler litter material on growth performance, behavior, welfare parameters, litter characters, and ammonia emission. *Poultry Science*. 103:103542 <https://doi.org/10.1016/j.psj.2024.103542>.
- Triawan, A., Sudrajat, D., & Anggraeni. (2013). Performa Ayam Broiler yang Diberi Ransum Mengandung Neraca Kation Anion Ransum yang Berbeda Performance of Broiler Chickens Fed Rations Containing Different Cation-Anion Balance. *Jurnal Pertanian*. 4(2): 73–81.
- Utama, C. S., Wahyono, F., & Haidar, M. F. (2021). pengaruh perbedaan dataran terhadap profil litter ayam broiler yang dipelihara di kandang Closed House. *Jurnal Peternakan Indonesia*. 23(2): 115.
- Wang, Z., Zheng, M., Duan, H., Ni, G., Yu, W., Liu, Y., Yuan, Z., Hu, S. (2021). Acidic aerobic digestion of anaerobically-digested sludge enabled by a novel ammonia-oxidizing bacterium. *Water Research*. 194, 116962.
- Wenno, D. (2018). Persentase bobot organ dalam ayam broiler yang diberi tepung biji pepaya dalam ransum dengan level berbeda. *Jurnal Fapertanak*. III(1): 1–9.
- Widiyanti, E., Wahyono, F., Suthama, N., & Krismiyanoto, L. (2019). Ketahanan tubuh pada ayam broiler yang diberi ekstrak buah mengkudu (*Morinda citrifolia* L.). *Seminar Nasional Pendidikan Biologi dan Saintek (SNPBS) Ke IV* : 127–32.
- Widodo, N., Wihandoyo., & Supadmo. (2009). Pengaruh level formalin dan frekuensi penambahan litter terhadap karakteristik litter ayam broiler. *Buletin Peternakan*. 33(3):170–77.
- Yahav, S. (2004). Ammonia affects performance and thermoregulation of male broiler chickens. *Animal Research, EDP Science* 53(4): 289-29.