

Effects of Litter Materials on Body Weight, Packed Cell Volume and Ectoparasite *Dermanyssus gallinae*

(Pengaruh Bahan Serasah terhadap Bobot Hidup, *Packed Cell Volume* dan Ektoparasit *Dermanyssus gallinae*)

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ABSTRACT: This research aimed to investigate the most suitable litter materials for broiler farming. Ninety six broiler chicken of Cobb Strain (Anwar Sierad) were used. The Experimental design used was a Completely Randomized Design (CRD) with 4 treatments and 6 replications. Each treatment unit consisted of 4 chicken. The treatment applied was litter materials, which consisted of rice husk, rice straw, wood shavings and sawdust. Data obtained were analyzed using analysis of variance and continued with Honestly Significant Difference (HSD). Variables observed were body weight at harvest, packed cell volume (PCV) and number of ectoparasite *Dermanyssus gallinae*. Results showed that body weight at harvest of broiler kept on wood shavings was significantly ($P<0.05$) higher than those on the other litter materials. The treatments have no significant effect ($P>0.05$) on PCV. In addition, wood shavings contained significantly ($P<0.05$) less mite of *Dermanyssus gallinae* than the other materials. In conclusion, wood shavings was the best litter material for obtaining broiler body weight at harvest, and contained less ectoparasite microorganism, particularly of *Dermanyssus gallinae*, than the others.

Key Words: Broiler, litters, harvest, Packed Cell Volume, ectoparasite.

Introduction

Indonesia is a tropical country, having only two seasons that is dry and rainy seasons. The difference in temperature between those two seasons is not sharp. Chicken as a homoeothermic poultry need to reduce heat by radiation, conduction, convection and evaporation (North and Bell, 1990).

In addition, heat condition inside the cage is influenced by litter materials and other factors such as cage design, floor, heating system, ventilation, humidity and surrounding temperature. Agricultural and industrial wastes can be used as ideal litter materials because of easily and cheaply available. By using suitable litter material, the optimal growth of chicken would be obtained; since the litter will support the ideal condition of the cage. In a clean cage, with suitable temperature and ammonia (NH_3) content, the chicken feel convenient (Rose, 1997). Hence, management of litter quality is an important aspect in raising healthy broilers economically (Hess *et al.*, 2007).

Since broilers are in continuous contact with litter, so condition of litter will significantly influence broiler performances and, ultimately, the profit of growers and integrators. Litter as a bedding

material serves in absorbing excess moisture from droppings and drinkers, and promotes drying by increasing the surface area of the house floor, dilutes fecal material (thus reducing contact between broiler and manure), insulates broiler from the cooling effects of the ground and provides a protective cushion between the broiler and the floor (Ritz *et al.*, 2008).

Another consideration in choosing litter material is the population of ectoparasite *Dermanyssus gallinae*. During day time, *Dermanyssus gallinae* are usually hidden somewhere in the cage as well as on the litter material where they digest blood and multiply (Pavlovic, 2008). Choosing a litter material unsuitable for *Dermanyssus gallinae* means reducing places where mites might hidden as the first effort in controlling the population before they cause parasitism on broilers.

Therefore, the objective of this experiment was to investigate the effect of rice husk, rice straw, wood shavings and sawdust as litter materials on body weight at harvest, Packed Cell Volume (PCV), and number of ectoparasite *Dermanyssus gallinae*. The expected outcome was the most suitable litter material that could be used for a profitable broiler chicken husbandry.

Research Methods

A total of 35 days was required to complete this experiment. Materials used were 96 day old chicks (D.O.C.) produced by Anwar Sierad; with average initial body weight of 44.26 ± 1.806 g. All birds were fed with BR I (P.T. Cheil Samsung, Indonesia) with nutrient composition as shown in Table 1.

Table 1. Nutrient composition of BR I feed

Nutrients	Composition
Water, %	6.99
Crude Protein, %	23.74
Ether Extract, %	8.01
Crude Fiber, %	6.76
Ash, %	6.48
Non free Extract, %	55.01

Utilities used were a broiler house with litter system (width: 50 cm, length: 100 cm and height 60 cm), NH₃ detector (La Motte Trade Mark), haematocrit tube (used for measuring PCV). The litter materials were rice-husk (L₁), rice-straw (L₂), wood shavings (L₃) and sawdust (L₄). All litters contained no observed *Dermanyssus gallinae*.

During this research, consumption of drinking water were measured daily, whereas the house and litters temperature and litters pH were measured twice daily at 6 a.m. and at 12 at noon. The levels of ammonia (NH₃) of the litters were measured at day 27th, 29th, and 31st, respectively. Blood sampling were conducted before slaughtering of the chicken at day 35th via brachiates vein to measure the number of erythrocyte and PCV. Counting the total individual of *Dermanyssus gallinae* caught from litters was done at day 35th.

The method used was an experimental, using a Completely Randomized Design with four treatments and six replications. There were four chicken in each experimental unit. The observed parameters were body weight (measured weekly) to know the daily weight gain, PCV and total individual *Dermanyssus gallinae*. Data obtained were analyzed with Analysis of Variance, continued with Honestly Significant Differences (HSD) test (Steel and Torrie, 1981).

Results and Discussion

The result of variance analysis showed that litter materials have significant effects ($P < 0.05$) on body weight at harvest. HSD test showed that the use of shavings yields a higher result than the use of other (Table 2).

The effects of litter materials on feed consumption and feed conversion were not significant ($P > 0.05$); which might due to the materials provides similar environmental condition (mean litters temperature was 30.393 ± 0.448 °C). Sharnam *et al.* (2008) reported that body weight and body weight gain were not influenced by either feed or litter or period interaction effect.

Agricultural wastes can improve growth and body weight gain of the broiler chicken and can provide riboflavin, vitamin B₁₂, and APF (Animal Protein Factor) (Mugiyono, 2001; Wahyu and Soegandhi, 1979; Nesheim *et al.*, 1979; Togatorop, M.H., 1986; Weaver Jr. *et al.*, 1991).

Chicken can grow and improve the efficiency of feeding (Table 2). Food conversion ratio were statistically similar, with a little improvement on L₃. Chicken grown on shavings litter (L₃) showed significantly higher body weight harvest ($P < 0.05$), despite of feeding consumption and feed conversion ratio.

Table 2. Means feed consumption, final body weight and feed conversion broiler chicken during 35 days.

Parameter	Treatment			
	Rice husk	Rice straw	Shavings	Sawdust
Feed consumption, g	2961.71	2872.50	2973.00	2893.54
Final body weight, g	1732.21 ^b	1707.33 ^b	1802.88 ^a	1771.79 ^{ab}
Feed conversion ratio	1.69	1.68	1.65	1.66

^{a,b}. Means in the same row with different superscripts were significantly different ($P < 0.05$)

Table 3. Water contents, temperature, and pH of litters and temperature of cage.

Physical condition of litter	Treatment			
	Rice husk	Rice straw	Shavings	Sawdust
Water content before use, %	9.11	9.00	9.43	9.15
Water content after use, %	49.38	55.15	49.59	52.09
Litter temperature, °C	30.26	30.39	30.45	30.47
pH litter	6.21	6.22	6.08	6.40
Temperature of cage, °C	27.95	28.02	28.10	28.03

Table 4. Body weight at harvest, numbers of *D. gallinae* and PCV of litter materials

Parameter	Treatment			
	Rice husk	Rice straw	Shavings	Sawdust
Final body weight, g	1732,20 ^b	1707,33 ^b	1802,88 ^a	1802,88 ^{ab}
<i>D. gallinae</i> , cell	2,20 ^b	1,70 ^{ab}	1,00 ^a	2,50 ^b
Packed Cell Volume, %	33,70	25,20	23,70	24,20

^{a,b}. Means in the same row with different superscripts were significantly different ($P < 0.05$)

Temperature is an environmental factor which affects feed consumption, energy content, feed protein, activity, environmental temperature (Davis, 1982). In this research, temperature range were in the normal limit needed by chicken to life, grow, and reproduce.

In keeping broiler chicken, particularly on day 27th, 29th, and 31st, the ammonia content (NH₃) of all material litters were in the normal limit with an average of ammonia content of 1.891 ± 0.707 ppm (morning) and 2.748 ± 0.530 ppm (afternoon). Ammonia production starts when pH is approaching and reaches eight or more (Reece *et al.*, 1979). According to Slobodzian-Ksenicz and Kuczyński (2002), ammonia emission reached its maximum in week 6 – 7 from long straw litter, whereas from chopped straw and shavings litters, it took place at approximately week 10 and there was no significant effect of litter type on total ammonia emission in turkey house.

From the observation on PCV obtained that the PCV were not significantly different ($P > 0.05$) among treatments (Table 4). It was indicated that there was no significant stressed from *Dermanyssus gallinae* presented on litters, although the number of *Dermanyssus gallinae* in the shavings (L₃) was the lowest one and showed significantly different ($P < 0.05$) compared to the numbers found on the other materials. *Dermanyssus gallinae* in a large number could cause anemia to the chicken (Noble and Noble, 1989). However, early detection of the presence of *Dermanyssus gallinae* (van Emous, 2008) and regular control of this red mite is

necessary for a successful eradication program (Pavličević *et al.*, 2007).

From the body weight gain during the 35 days, it could be assumed that shavings litter provides a more convenient place to grow for the broiler. Hard fiber litter materials (wood shavings) have been demonstrated to improve gizzard development and improve feed conversion efficiency, without having an effect on feed intake or weight gain. The hard fiber is thought to stimulate gut development, improve nutrient digestibility and alter the composition of the gut micro flora of chicken ingesting it.

A comparison of sawdust and wood shavings as litter materials for broiler (Boa-Amponsem and Osei-Sumuah, 2004) showed that broiler raised on shavings were heavier than those raised on sawdust at 49 and 42 days of age for males and females, respectively.

Conclusion

Shavings could be used to increase harvest body weight with minimal *Dermanyssus gallinae* population compared to rice-husk, rice straw and sawdust.

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