

Resistance Against *Salmonella Enteritidis* Natural Infection and Production Aspect on Kampung Chicken and Commercial Laying Hen

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ABSTRACT

The aim of this research was to study the resistance against *S. enteritidis* natural infection and its production aspect on kampung chicken and commercial laying hen. Kampung chicken and commercial laying hen (8 month aged), each of it were 20 chickens placed in cages on open housed system. Rearing was carried out for 4 weeks. Biological assays of resistance indicator were measured, including leucocytes concentration and their differentiation, concentration of *S. enteritidis*, and specific IgY of *S. enteritidis*. Observations on production aspect and income over feed cost analysis were done. Experiment was designed using a completely randomized design. Data from laboratory assays were statistically analyzed. Data from observations on production aspect were descriptively analyzed. Leucocytes concentration of kampung chicken and commercial laying hen were 20.23×10^3 and 29.36×10^3 cell/mm³. Percentage of monocytes was not different. Percentage of heterophiles on kampung chicken was lower significant, but percentage of lymphocytes was higher significant than commercial laying hen. H/L of kampung chicken and commercial laying hen were 0.88 and 3.57. There was no *S. enteritidis* finding in blood and eggs produced by the two types of chicken. Specific IgY of *S. enteritidis* was found on all types of chicken. Concentration of it in eggs yolk of kampung chicken and commercial laying hen were 3.19 and 1.08 mg/ml. The average of feed consumption, hen day production, and egg weight on kampung chicken were lower than commercial laying hen. Income over feed cost (20 chickens, during 28 days reared) from kampung chicken and commercial laying hen were Rp 288000 and Rp 90000. It can be concluded that kampung chicken was more resistant against *S. enteritidis* natural infection. Performance of production on kampung chicken was lower, but their income over feed cost was higher than commercial laying hen.

Key Words: *Salmonella enteritidis*, Leucocytes, IgY specific, Performance of production

INTRODUCTION

Salmonella sp. is one of the emerging pathogen in foodborne disease which is often found in contaminated chicken eggs and caused salmonellosis (Bhunja, 2008). The isolation incidence of salmonellosis in humans due to consumed of chicken eggs was mostly caused by *S. enteritidis* (Velge et al., 2005). Eggs can be contaminated with *S. enteritidis* from the beginning of the formation process inside parent body that infected by these bacteria. Eggs also can be contaminated by these bacteria from the environment in which eggs were stored until to consume (Gantois et al., 2009). Therefore it is recommended to consume eggs with cooked perfectly to avoid salmonellosis.

Nugroho (2005) stated that 1.4% of egg samples from 35 farms of commercial chicken in Sleman positively contaminated by *Salmonella sp.* The similar experiment has been conducted in Bogor. It has been found out that the eggs positively contaminated by *S. enteritidis* by 3.12% (Ulupi et al., 2009). Some researchs on the isolation of *S. enteritidis* on kampung chicken eggs in a various of conditions (fresh from cages, eggs that are being circulated in the market and eggs which is in the level of consumer) from different regions, did not find these bacteria (Aditya et al., 2012).

Kampung chicken eggs mostly used by Indonesian people as 'jamu' (a potion) or as an ingredient of potion that was directly consumed without cooking. Thus the chance of people who consumed kampung chicken eggs exposed to salmonellosis was very large. Nevertheless, there never has been found any report of salmonellosis cases due to consume of raw kampung chicken eggs. This fact raised the question of whether kampung chicken has greater resistance against the infection of *Salmonella* compared to commercial chicken.

To answer its question, this research was needed. The aim of this research was to study the resistance against *S. enteritidis* natural infection on kampung chicken and commercial laying hen, also its association on production aspect.

MATERIALS AND METHODS

Animal Experiments and Rearing: The study was conducted in field laboratory of Poultry Division, Faculty of Animal Science IPB. Its used two kinds of chicken (kampung and commercial laying), each of it were 20 chickens. All chickens were female and 8 months aged. The average of body weight of kampung chicken and commercial laying hen were 1.49 ± 0.27 kg and 1.86 ± 0.09 kg.

Each of individual cages were numbered 1K-20K (for kampung chicken), and 1P-20P (for commercial laying hen). The size of cage was $35 \times 45 \times 50$ cm³. All of the cages were placed in a pen (7x10 m²). The feed and water were placed in the front of cages. This pen was equipped with 2 light bulbs (18 Watt).

The chicken was placed in a cage that has been provided randomly. The feed was commercial feed for laying hen that contains 14-17% crude protein, and 2850 kcal/kg metabolizable energy. Feed and water were given *ad libitum*. Rearing was carried out for four weeks (2-29 April 2013).

In the first week of rearing was performed blood sample on brachial vein in the wing area. In the second week of it was performed a collection of eggs. The samples of blood and eggs were assayed in the laboratory. On production aspect was measured feed consumption, egg production and egg weight. Feed conversion ratio was calculated from feed consumption and total weight of eggs produced. Income over feed cost was also calculated in this study.

Laboratory Assays: Assay of *S. enteritidis* concentration in blood and eggs were refers to *Bacteriological Analytical Manual* (BAM, 2007). The presence of specific IgY of *S. enteritidis* in blood serum was done by using AGPT technique, and its concentration in egg yolk was measured by Indirect ELISA protocol. Concentration of leukocytes and differentiation of leucocytes were assayed with Giemsa method (Sastradipraja et al., 1989). This assays were performed in the Bacteriology Laboratory, Laboratory of Immunology and Laboratory of Physiology, Faculty of Veterinary Medicine IPB.

Data analysis: Data were analyzed with ANOVA using completely randomized design. The types of chicken (kampung and commercial laying) were as treatment and observation data were as response. Statistical model was used $Y_{ij} = \mu + P_i + \varepsilon_{ij}$ (Mattjik and Sumertajaya, 2002). Data on production aspects were analyzed descriptively.

RESULTS AND DISCUSSION

Resistance Aspect. The results of laboratory assays both on the kampung chicken and commercial laying hen were presented in Table 1. Leucocytes concentration on kampung chicken was lower significant than commercial laying hen. Nevertheless these concentrations were in the normal range, $12-30 \times 10^3$ cells/mm³ (Jain, 1993).

Table 1. Leucocytes concentration and differentiation of leucocytes, the presence of *S. enteritidis* and the specific IgY of *S. enteritidis* on kampung chicken and commercial laying hen

Parameter	Kampung chicken	Commercial laying hen
Leucocytes (x 10 ³ cells/mm ³)	20.23 ± 2.02a	29.36 ± 2.83b
Heterophiles (%)	43.57 ± 3.95a	71.80 ± 5.08b
Monocytes (%)	5.20 ± 1.06a	5.28 ± 1.17a
Lymphocytes (%)	49.49 ± 2.83a	21.00±3.31b
H/L ratio	0.88 ± 0.12a	3.57±0.54b
<i>S. enteritidis</i> in blood	negatif	negatif
<i>S. enteritidis</i> in egg	negatif	negatif
Specific IgY of <i>S. enteritidis</i> in serum	positif	positif
Specific IgY of <i>S. enteritidis</i> in egg yolk (mg/ml)	3.19 ± 0.47a	1.08 ± 0.25b

Note : Significant effect

Based on the percentage of differentiation of leucocytes, commercial laying hen potentially produced non-specific immune responses was higher, whereas the kampung chicken potentially produced antibody was higher. Stress level in kampung chicken due to high ambient temperature in the tropics, which was indicated by the value of H/L was lower significant than commercial laying hen.

The results assay of *S. enteritidis* presence in blood and eggs that produced by kampung chicken and commercial laying hen in this study were negative. The absence of this bacteria in the blood, did not mean that in the kampung chicken and commercial laying hen were never infected by *S. enteritidis*. It was shown from the positive results of assay specific IgY of *S. enteritidis* in blood serum on all kinds of chicken. These result indicated that in kampung chicken and commercial laying hen in this study ever exposed to *S. enteritidis* naturally that was derived from the rearing environment. This fact meant that the rearing environment of kampung chicken (traditionally) as well as in commercial laying hen (intensively) were in conditions of poor sanitation.

The presence of specific IgY of *S. enteritidis* in blood serum, then will be transferred to the egg yolk on the process of egg formation. Concentration of specific IgY of *S. enteritidis* in egg yolk was 3.19 mg/ml (on kampung chicken). It was higher significant than concentration of it from egg yolk of commercial laying hen (1.08 mg/ml).

Production Aspect. The observations of production aspect on two kinds of this chicken comprised of feed consumption, hen day production, egg weight, feed conversion, and income over feed cost were presented in Table 2. These data were not statistically tested.

Table 2. The observation of production aspect on two kinds of chickens

Parameter	Kampung chicken	Commercial laying hen
Feed consumption (g/chicken/day)	88.63 ± 3.11	133.15 ± 2.71
Hen day production (%)	52.36 ± 8.05	83.81 ± 3.65
Egg weight (g/egg)	40.67 ± 2.58	57.24 ± 2.08
Feed conversion ratio	4.16 ± 0,91	2.78 ± 0.22
Income over feed cost (Rp/20 chickens/28 days)	288000	90000

The egg production and egg weight of kampung chicken were lower than commercial laying hen. Income over feed cost which was reflected by difference between feed cost with receipt of egg sale that was derived from kampung chicken was Rp 288000/20 chickens/28 days. It was higher than income over feed cost from commercial laying hen (Rp 90000/20 chickens/28 days). It was because of kampung chicken egg in Indonesian sold not in units of weight (kg), but in units per egg. In addition, the price of kampung chicken egg is very high and stable.

CONCLUSION

In conclusion, kampung chicken have resistance to *S. enteritidis* infection naturally higher significant than commercial laying hen. Performance of kampung chicken production was lower, but income over feed cost from kampung chicken was higher than commercial laying hen. The results of this study further confirmed that kampung chicken is very potential to be developed, both in terms of safety of eggs produced from contamination by *S. enteritidis* and the earned income.

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