Egg Production and Quality of Kampung Chicken Fed Commercial Diet Mixed with and Supplemented with Forages

(Produksi dan Kualitas Telur ayam Kampung yang Mendapat Ransum Komersial Dicampur Dedak Padi dan Diberikan Suplemen Berupa Hijauan Pakan ternak)

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Abstrak

Telah dilakukan suatu penelitian mengenai produktifitas dan kualitas telur ayam Kampung yang mendapat ransum komersial dicampur dedak padi dan diberikan suplemen berupa hijauan pakan ternak. Perluasan yang diberikan adalah ransum komersial murni (RC); R + (ransum komersial dicampur dengan dedak padi dengan rasio 1:2); R - (Ri + King grass); Ri (Ri + daun kriminil) dan Ru (Ri + rumput lapangan). Rancangan yang dipergunakan adalah Rancangan Acak Lengkap dengan 6 kepelopok ulangan yang terdiri dari 4 ekor ayam betina dewasa. Data yang diperoleh dianalisis dengan Analisis Sidik Ragam (Analysis of Variance) disertai Dunan’s New York Multiple Range Test. Hasil analisis statistik menunjukkan bahwa hen-day production dari RC (36,19 ± 4,20%) sangat nyata (P<0,01) lebih tinggi daripada Ri (24,11 ± 3,77%), Ri (22,33 ± 4,50%), Ru (24,22 ± 3,71%) dan R (23,41 ± 0,82%), namun tidak terlalu pengaruh nyata terhadap bobot telur, bobot yolk, bobot kerabang, haugh unit dan grade. Bobot albumen R (21,22 ± 3,34 g) nyata (P<0,05) lebih tinggi daripada R (25,49 ± 2,31g). Nilai warna yolk RC (11,71 ± 0,97) sangat nyata (P<0,01) lebih tinggi daripada Ri (6,70 ± 0,56), Ri (9,91 ± 0,99), Ru (8,91 ± 1,24) dan R (8,68 ± 0,96), sedangkan R1 sangat nyata (P<0,01) lebih pucat daripada RC, Ri, Ru, dan R. Pencampuran dedak padi kepada ransum komersial sangat nyata menurunkan produktivitas telur <6dangkan penambahan hijauan pakan ternak memperbaiki warna yolk ayam Kampung yang dibieti ransum campuran komersial dan dedak. Ketetapan: Produksi, kualitas telur, ayam kampung, hijauan

Kata Kunci: Produksi, kualitas telur, ayam kampung, hijauan

Introduction

The eggs of Kampung (native) chicken is considered as a delicacy for most Indonesian consumers. The yolk is also used as a part of traditional herbal medicine ("Jamur"). As the demand for Kampung eggs increasing from year to year, the farmers try to increase egg production through intensive management system therefore the chickens should be fed balanced diet. The balanced diet available in the market is for the hybrid chicken which is too good, too expensive and not economical if it is given to the Kampung chicken due to its low productivity. Previous research results by Creswell and Gunawan (1982), Nataamijaya (1988, 1992) showed that when Kampung chicken were fed commercial diet its productivity increased very substantially, however it was not profitable. In order to reduce the feed cost usually the farmers give the Kampung hens a mixture of commercial diet and rice bran (1 part commercial diet + 2 parts rice bran). This mixture decreased the feed cost and also the egg productivity, yet it is more practical and profitable for the farmers, but it still give deleterious effects to egg quality especially the yolk colour. The yolk become pale which is not attractive to the consumers who prefer yellow orange colour of the yolk, besides the hatchability of the eggs was decreased substantially. The yellow colour of the yolk mainly come from xanthophylls in corn called zeaxanthin and crytoxanthin. When the
commercial diet being diluted and given to the hens, precursors of vitamin A (xanthophylls and other carotenes) in the diet was decreased sharply resulted in pale yolk and low hatchability, because vitamin A is required for normal hatchability. (Nataamijaya, 1985; North, 1975).

Mineral requirements, especially Ca, can be met by giving grit (oystershell) or minerals mixture while xanthophylls and precursors of vitamin A (carotenes) can be supplied by giving forages to the birds.

Research Methods

As many as 120 heads of 14 months old Kemphong chicken hens were assigned into 5 treatment groups with 6 replicates of 4 hens each. The treatments were,

| RC | Commercial layer diet |
| R1 | RC + rice bran, ratio 1 to 2 |
| R2 | R1 + 20g fresh king grass |
| R3 | R2 + 20 kriminil grass (Portulacea majora sativa) |
| R4 | R3 + 20 field grass (Paspalum conjugatum) |

Mineral mixtures (2%) was added to R1, R2, R3, and R4 diet while 20% fresh forage were given to R1, R2, and R4. Each bird was given 90g diet daily and drinking water was given ad libitum. Eggs were collected daily for 90 days, quality test was done every three days. Parameters measured were egg weight, albumen height, yolk weight, shell weight, haugh unit/grade and yolk colour by using Roche Yolk Colour Fan.

A Completely Randomized Design was used followed by analysis of variance and Duncan’s New Multiple Range Test (Steel and Torrie, 1993).

Result and Discussion

Hen-day Production

The hen-day production of RC (36.10 ± 4.20%) was higher (P<0.01) than those of R1 (24.11 ± 3.70%); R2 (22.33 ± 4.50%); R3 (24.22 ± 3.71%); R4 (23.41 ± 0.82%). The difference was caused by the difference in calculated crude protein (16.11% vs 14.00%). Metabolizable energy (2900 Kcal/kg vs 2400 Kcal/kg) and other nutrients content which were essential for high egg productivity (Scott et al., 1976 and Nataamijaya, 1978) such as essential amino acids and vitamins. However, it was higher than previous report from Gultom et al. (1989) that the hen-day production of Kemphong hen was 79.99%, when it was fed diet containing 14% crude protein and 2400 Kcal metabolizable energy.

Egg Weight

The averages egg weight were 44.04 ± 3.46g (RC); 46.40 ± 2.81g (R1); 46.69 ± 2.81g (R2); 42.68 ± 3.91g (R3) and 42.61 ± 3.85g (R4), no significant difference was found (Table 1). However, there was tendency that the addition of rice bran slightly increased the average egg weight as showed in R1 and R4, but the supplementation of kriminil grass (R3) or field grass slightly decreased the average egg weight. The average eggs weight obtained in this study was similar to some previous report. Creswell and Gunawan (1982) reported that the average egg weight of Kemphong hen was 45.60g while Nataamijaya (1992) reported that it was 42.89 ± 1.82g. Sukardi and Mufti (1989) found that the average weight of Kemphong hen was 41.90 ± 4.04g.

Yolk Weight

The average yolk weight of RC, R1, R2, R3, R4.}

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and RIV were $16.52 \pm 3.17g$; $15.09 \pm 0.81g$; $16.05 \pm 0.67g$; $15.43 \pm 1.19g$ and $15.09 \pm 1.10g$ consecutively; no significant difference was found (Table 1). Yet the rice bran dilution seems to give negative effect to the yolk weight even though statistically not significant. This result indicated that the decrease in feeds quality may affect the egg fertility and hatchability since the yolk is a main of nutrients for the embryo. According to Gilbert, 1981 (in King and Mc Lelland, 1981), yolk is composed of $\mu$g of 50% solids, 94% which are protein, as much as 30% of the yolk being formed of lipop and phosphoproteins. Composition of the yolk plays dominant role in embryogenesis and forms the main nutrient source of the developing embryo. Since embryonic yolk sac grows over the surface of the yolk, the nutritional future of embryo is determined mainly before fertilization. North (1978) also stated that the yolk is a source of nutrients from which the blastoderm and the resultant embryo partially sustain their growth.

**Albumen Weight**

There were significant differences ($P<0.05$) between the albumen weight of $R_1$ (25.45g $\pm 2.31g$) and RC (21.95 $\pm 4.95g$) and $R_{III}$ (21.72 $\pm 3.34g$) as shown in Table 1.

In hybrid hens' egg the albumen weight comprise 65% of the egg weight and it is mainly composed of water and protein which functions as chick aqueous environment necessary for embryo development. It also contains lysozimes and ovotransferrin to protect the embryo from bacterial infections, besides it provides some additional nutritional material for the embryo (Board, 1968; Sibley, 1960 as cited by King and Mc Lelland, 1981)

This study showed that the addition of rice bran to the commercial diet significantly increased the albumen weight however the forages supplementation reduced substantially this effect, it is beneficial because most consumers don’t like the eggs with too much albumen. The mechanism in which the forage supplementation bring the albumen weight back to normal is unknown.

**Shell Weight**

The averages shell weight of RC, $R_{II}$, $R_{III}$, and $R_{IV}$ were $5.76 \pm 0.27g$; $5.82 \pm 1.04g$; $5.23 \pm 0.74g$ and $5.51 \pm 0.41g$ respectively, no significant difference was found which was reasonable because all groups were given enough mineral supplement needed to form egg shell.

**Yolk Height**

The hens of RI group showed significantly ($P<0.01$) lower yolk height (15.05 $\pm 0.23$) than those of RC (17.67 $\pm 0.39$); $R_{II}$ (16.85 $\pm 0.37$); $R_{III}$ (16.62 $\pm 0.21$) and $R_{IV}$ (16.77 $\pm 0.93$) as can be seen in Table 1.

The yolk height indicates its quality; the higher the height, the richer its nutrients contents. The result of this study has showed that the supplementation of forages to the Kumpung hens fed rice bran diluted commercial diet significantly improved the yolk quality. In this case the forages may functions as source of some vitamins and minerals needed to partially support the formation of good quality yolk.

**Yolk Colour**

The eggs produced by groups RC showed better yolk ($P<0.01$) colour score (11.71 $\pm 0.57$) in all those of $R_1$ (6.70 $\pm 0.56$); $R_0$ (9.51 $\pm 0.99$); $R_{III}$ (891 $\pm 124$) and $R_{IV}$ (8.68 $\pm 0.96$), as shown in Table 1.

Group $R_0$, $R_{III}$ and $R_{IV}$ were also better than ($P<0.01$) group I, indicated that the hens of group I received very small quantity of carotenoid, including xanthophyll, which is needed to give strong yellow colour to the yolk. Hens of group $R_1$, $R_{III}$ and $R_{IV}$ received forages as source of...
carotenoid so that the eggs showed better yolk colour than that of Rn even though not as good as RC. The natural source of carotenoid in feed stuffs normally are corn (zeaxanthin and crotoxanthin), but when the diet was diluted with rice bran which has no carotenoid content, the carotenoid concentrations in the diet, became very low resulted in pale yolk colour. The supplementation of forages as carotenoid sources, gave positive effect on the yolk colour, because green leafy vegetables and forages are good sources of carotenoid (Maynard et al., 1979).

Albumen Height

The albumen height of RC, RI, RII, RIII, and RIV were 4.71±0.92; 4.91±1.26; 5.35±1.18; 4.81±1.18 and 5.08±0.50 respectively. no significant difference was found, the height of albumen has a positive correlation with viscosity. Together with the egg weight, the albumen height are used to determine the haugh units score.

Haugh units and grade

There was no significant difference on the haugh units value of RC (73.10 ± 7.42); R1 (72.50 ± 9.29); RII (77.20 ± 8.48); RIII (76.70 ± 9.42) and RIV (74.00 ± 3.36). According to North (1978) the eggs to be grade AA should have haugh units index above 72, but since the albumen height will be decreased during hot weather and during the later part of laying period, it is better to have haugh unit score at least 78. The score of haugh units was determined by relation between egg weight and albumen height. In this study, no significant differences were found on the egg weight and albumen height of all treatment groups, therefore the haugh units and grade were also not significantly different.

Conclusion

Rice bran dilution to the commercial diet decreased the hen-day production and the yolk quality, but supplementation of forages reduced substantially the negative effect on the yolk. It was concluded that if the native hens raised in confinement and fed low quality diet it must be supplemented with fresh forages and mineral sources in order to improve egg quality.

Acknowledgement

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Table 1. The averages weight of egg, yolk, albumen and shell; height of yolk and albumen; score of yolk colour, haugh units and grade

<table>
<thead>
<tr>
<th>Treatment group</th>
<th>Weight (g)</th>
<th>Height (g)</th>
<th>Score</th>
<th>Grade</th>
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<td>Whole Egg</td>
<td>Yolk</td>
<td>Shell</td>
<td>Yolk</td>
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<td>RC</td>
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<td>16.52</td>
<td>27.76a</td>
<td>5.76</td>
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<td>3.46</td>
<td>3.17</td>
<td>4.95</td>
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<td>15.09</td>
<td>25.49a</td>
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<td>0.81</td>
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<tr>
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<td>16.05</td>
<td>23.24b</td>
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</table>

Means within a column with different superscripts are significantly different at P<0.05 or P=0.01.

Egg Production and Quality (Notoamijaya.)
References


