Comparative Study on the Breeding Performance of Red Jungle Fowl versus Native Roosters under Confinement System

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Abstract

This study was conducted to determine the production performance of red jungle fowl roosters and native roosters mated with native hens under confinement system. A total of two red jungle fowl roosters, two native roosters and eight native hens were randomly assigned to two treatments with two replications. Each replicate was composed of one rooster and two hens that were randomly laid out in a Randomized Complete Block Design. Egg weight showed a highly significant difference at \( t < 0.05 \) and revealed heavier weight (39.5 g). Comparable results were obtained in % egg production, % fertility, % hatchability rates, yolk and shell weight, egg length and width, egg shape index and yolk color score. The performance of RJF regarding production potential and egg quality traits were comparable with the native chicken.

Keywords: Egg shape index; Fertility; Hatchability

Introduction

Strategies for producing sires lines, dam lines and crosses that differ in production traits are continuing today. Cross-breeding is used to take advantage of heterosis and to combine stocks in which the performance complement each other or conversely to cover particularly poor performance of a pure strain for a commercially pair character.

Native chickens contribute a year-round supply of meat and eggs and provide extra income for backyard farming. Most farmers prefer to raise native chickens than commercial breeds because of the less input and their inherent ability to survive under harsh environmental conditions and reproduce even under a minimal care and marginal management (Lambio, 2000). Most populations of native chickens, however, have been subjected to little selection for higher productivity.

Native chicken are raised predominantly under the free-range system, while some farmers raised them in semi-confinement. The latest trend promoting organic production of chickens among smallholder farmers involves native chickens and their crosses with imported stocks. Organic production system is a predominantly free range with very minimal use of commercial feeds and biological regularly used in intensive commercial poultry production.

One of the problems encountered by those who engaged in marketing eggs is on maintaining fresh egg quality from producer to consumer. Proper attention to production, distribution and point-of-sale phases are of vital importance in maintaining egg quality. Grading and standardization consist of arranging produce into some uniform categories according to physical and quality...
characteristics of economic importance. However, the lack of performance and breeding records has always been the problem to improve animal genetic resources of the native chickens in most developing countries like the Philippines. As a matter of fact, the native chicken still contributes to a high degree on the supply of meat and eggs in the markets especially in rural areas (Arboleda, 1987).

According to Bondoc (1999), native chickens constitute genetic niche evolved by natural selection which is crucial to the continued animal production in the country. Unfortunately, the information on the potential of the different genetic groups of Philippine native chickens regarding some basic genetic parameters is still limited. Hence, this study is conducted to explore the production potential of red jungle fowl, and native roosters mated with native hens under confined management system, and characterize and compare the different egg traits.

**Methodology**

The red jungle fowl (RJF) native roosters were geographically acquired in the forest of Hinundayan, Southern Leyte and the native chickens were collected from the backyard raisers. The four roosters were used to mate the eight native hens that of the first time to lay eggs at a mating ratio of 1:2. However, the crosses between RJF rooster and red jungle fowl were not included in the study due to difficulties in capturing female RJF in the forest. The study on breeding performance was conducted at Biasong, Hinundayan Southern Leyte while the egg quality traits characterization was done at Southern Leyte State University - San Juan Biology laboratory room.

A total of four roosters (two Red Jungle Fowl, and two native) and eight native hens were used in assessing the potential and egg quality traits of RJF roosters with native hens. There were two treatments and a total of eight replications. Each replicate was composed of one rooster and two hens (a mating ratio of 1:2) that were randomly laid out in Complete Randomized Design set up as follows:

<table>
<thead>
<tr>
<th>T₁R₁ₖ</th>
<th>T₂R₂ₖ</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₂R₁ₖ</td>
<td>T₁R₂ₖ</td>
</tr>
</tbody>
</table>

RJF- Red Jungle Fowl rooster  
Rn- Native rooster

Where:
T₁ - Native (Rn) x Native  
T₂ - Red Jungle Fowl (Rj) x Native

During the egg traits assessment, a random sample of four eggs per treatment were collected and measured for the different egg quality parameters. Moreover, the rest of the eggs was measured for the egg production and hatchability. The following data were taken and adapted from the study of Buctot and Espina (2015):

1. Egg Weight (g) - individually weighed using an egg weighing scale.
2. Egg Quality Traits:
   a) Yolk weight - after separating from
Table 1. Egg weight (g), yolk weight (g), and shell weight (g)) of Native Chicken and Red Jungle Fowls under confinement system.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Egg weight</th>
<th>Yolk weight</th>
<th>Shell weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Native x Native)</td>
<td>39.5</td>
<td>22.85</td>
<td>5.21</td>
</tr>
<tr>
<td>T2 (RJF x Native)</td>
<td>36.75</td>
<td>22.44</td>
<td>5</td>
</tr>
<tr>
<td>t-value</td>
<td>0.000**</td>
<td>0.392ns</td>
<td>0.307ns</td>
</tr>
</tbody>
</table>

RJF-Red Jungle Fowl
** highly significant (t<0.01)
ns Not significantly different (t>0.05)

Table 2. Egg length (mm), egg width (mm) and egg shape index (%) of Native chicken and Red Jungle Fowls under confinement system.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Length</th>
<th>Width</th>
<th>Egg Shape Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Native x Native)</td>
<td>48.82</td>
<td>35.53</td>
<td>73.19</td>
</tr>
<tr>
<td>T2 (RJF x Native)</td>
<td>47.53</td>
<td>32.29</td>
<td>67.98</td>
</tr>
<tr>
<td>t-value</td>
<td>0.228ns</td>
<td>0.07ns</td>
<td>0.0825ns</td>
</tr>
</tbody>
</table>

RJF-Red Jungle Fowl
ns Not significantly different (t>0.05)

the albumen using yolk separator, the yolk was weighed using a digital weighing scale.

b) Yolk color – under white background, color was evaluated using the ROCHE Yolk Color Fan.

c) Shell weight with shell membrane, grams - egg shell with shell membrane was weighed using a digital weighing scale

d) Egg (shape index),
\[
\% = \left(\frac{\text{width of egg (mm)}}{\text{length of egg (mm)}}\right) \times 100
\]

e) Number of eggs laid

f) Number of fertile eggs
g) Number of eggs hatched

h) Egg production
\[
\%HD = \left(\frac{\text{total number of eggs}}{\text{number of hen days}}\right) \times 100
\]
i) Fertility
\[
\% \text{ Fertility} = \left(\frac{\text{number of fertile eggs}}{\text{number of eggs set}}\right) \times 100
\]
j) Hatchability
\[
\% = \left(\frac{\text{number of chicks hatched}}{\text{number of fertile eggs}}\right) \times 100
\]

The data collected were subjected to the test of independent sample using the Statistical Package for Social Sciences (SPSS) version 17, while comparison of treatment means was done using the t-test for equality of variance.

Results and Discussion

Egg Weight

Egg weights (Table 1) were significantly different between treatment means. The Native x Native eggs (39.5 g) exhibited heaviest (t<0.01) egg weight. As emphasized by Alsoyabel et al. (1991), the age of the hen plays a role in determining egg weight, and weight increases when the age increases, and higher body weights are also associated with bigger eggs.

Egg Quality Traits

Yolk weight. Under confinement system, the yolk proved no significant difference between treatments (Table 1). It should, however, be noted that Native x Native yolk was slightly heavier compared to the RJF x Native). It can be deduced that yolk weight followed the same trend with the egg weight. Nevertheless, the result showed comparable weights between treatments. Crawford (1990) reported that
genetic and non-genetic factors such as the age of the hen, length of storage and seasons played the significant role in determining albumen and yolk quality.

Table 3. Yolk color scores of Native chicken and Red Jungle Fowl under confinement system.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yolk Color Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Native x Native)</td>
<td>5</td>
</tr>
<tr>
<td>T2 (RJF x Native)</td>
<td>5</td>
</tr>
</tbody>
</table>

Shell weight. In Table 1, the result was not significantly different between treatments. Result proved comparable shell weights between treatments, but it is important to note that the egg weight of Native x Native was largely influenced by its thick shell.

Egg Shape Index. The results in Table 2 revealed no significant difference in the egg in terms of egg length, egg weight and egg shape index between treatments. As per observation, the strength of the egg shell is directly related to egg shape index, varied according to the strain of the birds, size of the eggs and the position of the eggs in the clutch and the time of oviposition. As emphasized in the study of Narushin et al. (2002), shape index increases until the 5th or sixth month of production then decreases gradually. The eggs laid during the 2nd year of production had significantly lower shape indices than eggs laid in the 1st production because older layers lay eggs longer length but smaller width.

Yolk Color. The result on yolk color scores in Table 3 based on the Roche Yolk Color Fan manifested almost similar pale colors between treatments, and far below the acceptable color score of 9. North (1984) mentioned that some factors affected yolk color such as the fat content of the ration, ingredients of the ration, as well as individual variations played a significant role in determining yolk color of the egg.

Production Potential

The two mating combinations did not differ significantly regarding percent egg production, egg fertility and hatchability rates (Table 4), although data proved comparable hatchability (Native x Native, 81.94% and RJF x Native, 73.80%). Results suggest that the red jungle
Table 4. Breeding performance of Red jungle fowls and native roosters mated with native hens under confinement system.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Egg Production (%)</th>
<th>Fertility (%)</th>
<th>Hatchability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Native x Native)</td>
<td>70.00</td>
<td>81.93</td>
<td>81.94</td>
</tr>
<tr>
<td>T2 (RJF x Native)</td>
<td>68.33</td>
<td>81.94</td>
<td>73.80</td>
</tr>
<tr>
<td>t-value</td>
<td>0.3955*ns</td>
<td>0.4995*ns</td>
<td>0.1035*ns</td>
</tr>
</tbody>
</table>

RJF-Red Jungle Fowl  
*ns Not significantly different (t>0.05)

fowls were comparable with the native roosters on the percent egg fertility and hatchability rates. Aside from breed and strains, fertility and hatchability of eggs for the confined and scavenging chickens can be attributed to unbalanced male to female ratio, storage condition and duration of the eggs, the age of the bird, nutrition, disease, management and environmental factors (North & Bell, 1990).

Conclusion and Recommendation

The breeding performance of RJF was comparable with the native chicken, but they only differ on egg weight due to some genetic and non-genetic factors. It is highly recommended to increase the number of red jungle fowl roosters that mated with more number of native hens. If possible, RJF hens should be included to compare the performance of RJF chickens with that of native chickens. Future research may include genotypic analysis and cryopreservation.

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References


