PRODUCTION PERFORMANCE OF NATIVE CHICKEN (Gallus gallus domesticus) SUPPLEMENTED WITH FERMENTED GOLDEN APPLE SNAIL (Pomacea canaliculata Lamark) EXTRACTS

Francisco F. Buctot, Jr.
College of Agriculture, Food and Environmental Sciences
Southern Leyte State University
Hinunangan, Southern Leyte
franciscojr.buctot@gmail.com

Abstract

The study was conducted to assess the potential of golden apple snail extracts as supplemental feed for native chicken. Using the Randomized Complete Block Design, the results revealed that there is a significant difference among treatments in terms of body weight. In a mixture of T1 got the highest in terms of body length followed by T2 and lastly is T0. The results on shank length and wingspan showed no significant difference, but it is an important economic trait of chicken to improve through continuous intense selection pressure on this trait under domestication. The average feed consumption and average body weight showed a significant difference and feed conversion efficiency resulted in no significant difference. This means that supplementation of golden apple snail has a great potential in the production of native chicken.

Keywords: growth booster, fermentation, economic trait and potential

Introduction

The poultry industry, as a contributor to protein sources, strives to escalate production; however, high production costs and diseases remain a problem. Poultry raisers resort to the use of antibiotics to prevent and control diseases as well as promote growth. Quite recently, a lot of setbacks emerged about the prolonged feeding of antibiotic in food animals which cause cancer, antibiotic residue, drug-resistant bacteria, allergy and others in humans (Jensen et al., 1998). This scenario resulted in the search of alternative natural, organic, indigenous and sustainable solutions to enhance animal performance. The use of probiotics is identified as one of those alternatives.

Golden apple snail (Pomacea canaliculata) is a freshwater gastropod that has become a serious pest of agriculture and included in the world’s 100 worst invasive alien species (Lowe et al. 2000). This species has invaded several European, North American, and Asian countries and damages rice and aquatic organisms (Accorsi et al. 2014; Horgan et al. 2014; Karraker and Dudgeon 2014). Given the adverse effect of this species, physical, chemical, and biological control techniques have been established; such methods include crop rotation (Wada et al. 2004), use of mollusicides (Cruz et al. 2000; Quijano et al. 2014), and use of predators (Su Sin 2006; Ip et al. 2014; Yusa et al. 2006).

Golden apple snail, though considered a pest in the Philippines, may be made beneficial through fermentation. In that way, golden apple snail will not be famous as being detrimental, but instead, it can be useful in the near future. The composition of Golden apple snail is amino acids which are organic and combined to form proteins, the building blocks of life. The golden apple snails are fermented in the usual way by diluting with brown sugar and water. Fermentation takes 7-10 days after remaining solids are removed.

Fermentation technique was used to predigest the fibrous protein in golden apple snail meat and preserve the golden apple snail nutritional profile. The similar study used as an alternative protein source in diets and the optimum level of fermented golden apple snails in sex-reversed red tilapia diet was investigated (Rattanaporn et al., 2006).

Also, an earlier study by Rattanaporn et al. (2006) indicated that lactic fermentation is an efficient method for preserving and improving golden apple snail meal quality. The silage is produced by incubating golden apple snail with locally screened lactic acid bacteria at ambient temperature using molasses as the carbon source for bacterial growth. The results of ensilation of golden apple snail for ten days helped improve the quality of the meal by increasing free amino acids, which are readily used by aquatic animals. Phonekhampheang et al. has reported the application of fermented golden apple snail in an aquatic animal
diet. The ensiled golden apple snail is a replacement of fishmeal in the diet of African catfish (Clarias gariepinus) of which growth performance and feed consumption were recorded for six weeks. It was found out that ensiled golden apple snail has a high nutritive value and could be used to replace fish meal in African catfish diet completely.

However, the commercial probiotics in the market today cost even higher than antibiotics. Producers, therefore, continue to incur high production costs which translate to high prices of "safe" products and unsustainable practice. To offset this consequence, the probiotics from different locally available and indigenous sources would serve a good potential as growth booster. Thus, this study aimed to identify the production performance of native chicken supplemented with golden apple snail extracts.

**Methods**

**Experimental Treatments and Design**

In this study, a total of 27 native chickens of almost the same age were used. There were 3 treatments and 3 replicates. Each treatment was composed of 9 native chickens (Mongrel) of the same age and of mixed gender that were laid out in Randomized Complete Block Design. The feeding trial was started at 14 days until two months age of the native chicken. The experimental treatments were as follows: T0 pure water, T1 20% of Golden Apple Snail, 40% of brown sugar and water; and T3 33.3% of Golden Apple Snail, brown sugar, and of water, respectively. The experimental set is shown below.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T₀</td>
<td>T₂</td>
<td>T₁</td>
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<td></td>
<td>T₂</td>
<td>T₁</td>
<td>T₀</td>
</tr>
</tbody>
</table>

Legend:
- I, II, III - replicate
- T₀ - control/pure water
- T₁ - 20% of Golden Apple Snail, 40% of brown sugar and water
- T₂ - 33.3% of Golden Apple Snail, brown sugar, and of water

**Experimental Procedures**

The collected and pulverized golden apple snail were segregated using a container. The first container contains a mixture of T1 20% pulverized or ground golden apple snail, 40% of sugar, and water. And the second container contains a mixture of T₂ 33.3% of pulverized or ground golden apple snail, sugar, and water. The said mixture was fermented for ten days. The fermented golden apple snail was extracted after ten days of fermentation and placed in a covered container to avoid contamination. The native chicken was weighed to get the initial body weight before the start of the study, and 2.33 L of extracts of golden apple snail was diluted to 10ml of water.

**Data Collection and Analysis**

The following were the data gathered: initial body weight (g) of chicks, bi-weekly body weight (g) of chicken, average weight gain (AWG), (g) using the formula of final live weight minus initial weight, average feed consumption (AFC), (g) using the formula total feed given minus total feed refused divided number of birds fed, average feed conversion efficiency (AFCE) using the formula average feed intake minus average gain in weight, body length (cm), shank length (cm), and wingspan (cm). The collected data were subjected to analysis of variance while the comparison of means was made using Tukey's Honestly Significant Difference (HSD) Test.
Results and Discussion

Body weight. Bi-weekly body weight showed highly significant (p<0.01) starting from 2 weeks to 8 weeks (Table 2). On the other hand, 2, 4, and 6 bi-weekly body weights revealed comparable to T0 pure water and T1. Although not significant, T0 pure water at 8 weeks was lowest among all treatments. The T1 and T2 were expected to be heavier than T0 pure water due to the Pomacea canaliculata. These were best supported by the Rice Technology which revealed that the nutrient content of Pomacea canaliculata in terms of crude protein in the flesh of the snail (excluding shell) 62.0 % (DM basis), dry matter 14.9 % (UAF laboratory, 2004). It contains high minerals and vitamins. It was also revealed that it was a good source of mineral by the contents of calcium (35% in the shell) and phosphorus (1.2%) and it is also a good source of energy (13.94 MJ kg-1).

According to Bureau of Agricultural Research, the meat of a snail provides protein and energy-giving fat while the shell contains calcium, phosphorus, vitamins, and minerals that result to faster growth performance of native chicken. The study of A.B. Serra compared it that feeding of uncooked GAS was also tried in native chicks. Ten percent inclusion in a single chick’s diet showed a 31 % increase in total gain in weight and 35 % improvement in feed efficiency than the chicks’ feed without GAS; thus, leading to the faster growth of native chicken performance.

Table 1. Body weight of native chicken supplemented with varying levels of Golden Apple Snail Extracts.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 control/pure water</td>
<td>109.44b</td>
<td>207.78b</td>
<td>232.78b</td>
<td>252.32b</td>
</tr>
<tr>
<td>T1, 20% of Golden Apple Snail, 40% of brown sugar and water</td>
<td>338.88a</td>
<td>533.33a</td>
<td>586.11a</td>
<td>592.56a</td>
</tr>
<tr>
<td>T2 33.3% of Golden Apple Snail, brown sugar, and of water</td>
<td>116.66b</td>
<td>222.22b</td>
<td>283.33b</td>
<td>400.00ab</td>
</tr>
</tbody>
</table>

*p value* 0.000** 0.000** 0.000** 0.05*

* The mean treatment is significant if (p < 0.05)
** The mean treatment is highly significant if (p < 0.01)
* The mean treatment is not significant if (p > 0.05)

Body length. Bi-weekly body lengths showed significant (p<0.05) differences starting from 2 weeks to 8 weeks. (Table 2). On weeks 2, 4 and 6 consistently longest body lengths were manifested on T1. The body lengths at weeks 4 and 6 were comparable to T0 and T2. Although not significant, the eight bi-weekly body lengths revealed slightly heavier on T1 over the other treatments combinations. Bi-weekly body lengths were measured to distinguish the improvement of the native chicken in the different treatments. This is best supported by the result of Duguma’s (2006) study that feed requirement for the maintenance is lowered thereby increasing the efficiency of feed utilization. This trait helped solve the persistent problem of feed scarcity in rural village in Ethiopia and found to be relevant to the commercial poultry industry in order to reduce high feed cost especially if the gene is incorporated to commercial chicken lines.

Table 2. Body length of native chicken supplemented with varying levels of Golden Apple Snail Extracts.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0 control/pure water</td>
<td>11.56c</td>
<td>13.38c</td>
<td>14.3c</td>
<td>24.44b</td>
</tr>
<tr>
<td>T1 20% of Golden Apple Snail, 40% of brown sugar and water</td>
<td>31.56a</td>
<td>34.11a</td>
<td>34.62a</td>
<td>35.56a</td>
</tr>
<tr>
<td>T2 33.3% of Golden Apple Snail, brown sugar, and of water</td>
<td>18.56b</td>
<td>20.89b</td>
<td>25.62b</td>
<td>31.78a</td>
</tr>
</tbody>
</table>

*p value* 0.000** 0.000** 0.005* 0.046*

* The mean treatment is significant if (p < 0.05)
** The mean treatment is highly significant if (p < 0.01)
* The mean treatment is not significant if (p > 0.05)

Shank length. The results of shank length showed a significant difference between treatments from week 2 to week 4. But it was recorded that T1 got the highest measurements of shank length followed by T2 and T0. Just like bi-weekly body weight and bi-weekly body length, the shank length improved in the
native chickens due to domestication selection pressure on important economic traits. There is a scope to improve native chicken, and further research is needed to explore the full potentiality of indigenous chicken by conservation and molecular characterization.

Table 3. Shank length of native chicken supplemented with varying levels of Golden Apple Snail Extracts.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt; control/pure water</td>
<td>8.44c</td>
<td>10.56b</td>
<td>14.44</td>
<td>18.00</td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt; 20% of Golden Apple Snail, 40% of brown sugar and water</td>
<td>18.11a</td>
<td>19.67a</td>
<td>25.14</td>
<td>27.33</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt; 33.3% of Golden Apple Snail, brown sugar, and of water</td>
<td>12.56b</td>
<td>15.11ab</td>
<td>19.56</td>
<td>23.22</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000**</td>
<td>0.002**</td>
<td>0.851</td>
<td>0.830</td>
</tr>
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</table>

* The mean treatment is significant if (p < 0.05)
** The mean treatment is highly significant if (p < 0.01)
*** The mean treatment is not significant if (p > 0.05)

Wingspan. Week 2, 4, and 6 showed a highly significant difference. Although not significant at week 8, T1 displayed the widest wingspan over than T0 and T2. The wingspan is an important economic trait of chicken, thus proven to improve through continuous intense selection pressure on this trait under domestication.

Table 4. Wingspan of native chicken supplemented with varying levels of Golden Apple Snail Extracts.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2 weeks</th>
<th>4 weeks</th>
<th>6 weeks</th>
<th>8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt; control/pure water</td>
<td>6.67b</td>
<td>7.88b</td>
<td>8.58b</td>
<td>8.98</td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt; 20% of Golden Apple Snail, 40% of brown sugar and water</td>
<td>13.89a</td>
<td>15.6a</td>
<td>16.78a</td>
<td>17.78</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt; 33.3% of Golden Apple Snail, brown sugar, and of water</td>
<td>10.33ab</td>
<td>11.59b</td>
<td>14.33a</td>
<td>15.68</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000**</td>
<td>0.001**</td>
<td>0.004*</td>
<td>0.054</td>
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</tbody>
</table>

* The mean treatment is significant if (p < 0.05)
** The mean treatment is highly significant if (p < 0.01)
*** The mean treatment is not significant if (p > 0.05)

Production Performance

The average feed consumption of native chicken supplemented with fermented golden apple snail showed significant difference among treatments. Results revealed the highest average feed consumption in T1 followed by T2 and T0, respectively. Further observation revealed that the feed intake indicated that birds were able to consume nearly the standard feed consumption at 1400 grams. The average weight gain of native chicken supplemented with fermented golden apple snail showed significant (p<0.05) difference among treatments. Results revealed highest but comparable average weight gain with T1. Meanwhile, T0 exhibited lower average weight gain. After an eight-week period of feeding, data showed no significant difference on feed conversion efficiency (Table 5). As recorded, the FCE results ranged from 2.04 – 3.6 and were comparable to the standard FCE that range from 2.0 – 2.50.

Table 5. Production performance native chicken supplemented with varying levels of Golden Apple Snail Extracts.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average Feed Consumed</th>
<th>Average Weight Gain</th>
<th>Feed Conversion Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;0&lt;/sub&gt; control/pure water</td>
<td>954.00c</td>
<td>252.32b</td>
<td>3.6</td>
</tr>
<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt; 20% of Golden Apple Snail, 40% of brown sugar and water</td>
<td>1180.00c</td>
<td>592.56a</td>
<td>2.04</td>
</tr>
<tr>
<td>T&lt;sub&gt;2&lt;/sub&gt; 33.3% of Golden Apple Snail, brown sugar, and of water</td>
<td>954.99c</td>
<td>400.00ab</td>
<td>2.38</td>
</tr>
<tr>
<td>P-value</td>
<td>0.000**</td>
<td>0.015*</td>
<td>0.093</td>
</tr>
</tbody>
</table>

* The mean treatment is significant if (p < 0.05)
** The mean treatment is highly significant if (p < 0.01)
*** The mean treatment is not significant if (p > 0.05)
Conclusions

The results of the study proved that the native chicken supplemented with varying levels of Golden apple snail extracts at 20% inclusion was generally better in terms of the overall economically important traits. Supplementation of Golden apple snail extracts has great potential in the production of native chicken. It is further recommended that chemical and microbial analysis for the golden apple snail extract should be conducted.

Acknowledgments

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References


