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Influence of hot red pepper (capsicum frutescens l.) as a diet supplement for the growth of native chicken (Gallus gallus domesticus)

Florieza M. Mangubat*, Cerela S. Looc, Laramie Macalibo
Cebu Technological University Tuburan Campus, Philippines

Abstract

Native chicken production is a trend in many rural areas in the Philippines because of the highly adaptable conditions with less food, poor shelter, diseases, and sudden changes in weather patterns, which generally stress the exotic varieties. Thirty-six native chickens were used in the experiment, randomly allocated to 4 treatments, and replicated three times with nine native chickens for each treatment using a randomized complete block design. The treatments used in this experiment were T_0 = (control) 50 grams of commercial feeds; T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper; T_2 = 49.25 grams commercial feeds + 0.75 gram of hot red pepper; and T_3 = 49 grams commercial feeds + 1 gram of hot red pepper. Results showed that supplementation of hot red pepper had no difference *($P < 0.05$)* between the starter and finisher in cumulative feed consumption and cumulative feed conversion ratio on starter, grower, and finisher. However, weekly weight gain significantly differs from the first week to the ninth week *($P < 0.05$)*. Furthermore, native chicken feeds with 49.50 g of commercial feed + 0.50 g of hot red pepper (*Capsicum frutescens L.*) gained the highest percentage of weight. The study revealed that different levels of hot red pepper application affect the diet performance of the native chicken. Supplementing red hot pepper for the growth of native chicken also resulted in more than 50% return on investment. Therefore, incorporating red hot pepper as a diet supplement in feed can be profitable for native chicken farmers.

Keywords: Native chicken, Hot red pepper, Growth performance, and Feed supplement

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1. Introduction

Raising native chickens is very popular in many rural areas of the Philippines. They are standard features in many yards in many neighborhoods. Although commercial varieties like Dekalb are more productive and yield better, native chickens are sturdier [1]. They are highly adaptable to the conditions in the rural areas of the Philippines, where there is less food, poor shelter, diseases, and sudden changes in weather patterns, which generate stresses on the exotic varieties [2]. The native chickens of the Philippines are practically left to fend for themselves in rural areas, find their food and water, and find their way back to the shelter because the method of growing is categorized as a traditional method which is not truly a system of upbringing [3]. As a result, supplementing native chicken diets with some feed additives could be an alternative way to improve growth and feed conversion efficiency. Furthermore [4], improving management practices, such as providing better housing and feed, could help improve the productivity and profitability of native chicken production in the Philippines.

Chickens are the most popular poultry worldwide, irrespective of culture and region [5]. Poultry is one of the Philippines' fastest-growing segments of the agricultural sector today. Native chickens contribute significantly to Philippine agriculture by providing supplemental meat and eggs while providing extra income to many farmers [6]. [7], signified 81.09 million heads of native/improved chickens in the Philippines as of January 1, 2022. This represents a 4.4% increase from the 77.70 million heads recorded in the same period in 2021. Therefore it is apt [8-10] to engage in proper management practices for native chickens as a guide to help farmers and backyard raisers improve their native chicken

*Corresponding author; e-mail: florieza.mangubat@ctu.edu.ph

production practices and increase their income by utilizing locally available resources.

On the other hand, several studies have demonstrated the effect of hot red pepper (HRP) on the performance of broiler chickens [11-12]. HRP boosts pancreatic and intestinal enzyme activity, enhances bile acid secretion, and increases broiler chickens' body weight (Bwt) [13]. [14] proved that it reduces heat stress and improves feed digestibility, feed intake (FI), feed conversion efficiency, mortality, carcass features, blood parameters, and production cost. Adding hot red pepper to broiler chicken diets improved feed utilization because it stimulated appetite and feed intake, which improved endogenous digestive enzyme secretion [15]. Capsaicin, a naturally occurring substance that makes a pepper hot stimulates appetite in poultry, so adding hot red pepper to the diet influences broiler feed consumption [16]. Natural feed additives such as hot red pepper (*Capsicum frutescens L.*) and broiler chicken diets could enhance productive responses. Hence, this study is conceptualized to determine the influence of hot red pepper (*Capsicum frutescens L.*) as a diet supplement for native chicken. Investigating hot red pepper's influence as a diet supplement for native chickens can have important implications for animal health, food security, and sustainable agriculture. It can help improve the productivity and growth of native chickens, reduce synthetic additives, promote natural feed additives, and contribute to the overall health and welfare of the poultry.

2. Materials and Methods

This research applied experimental design. A randomized complete block design (RCBD) was utilized in this study. The treatments used in this experiment were as follows: T_0 = (control) 50 grams of commercial feeds; T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper; T_2 = 49.5 grams commercial feeds + 0.75 gram of hot red pepper; and T_3 = 49.0 grams commercial feeds + 1 gram of hot red pepper with the experimental layout as:

Block	Treatment allocation			
1	T_3	T_2	T_1	T_0
2	T_0	T_3	T_2	T_1
3	T_2	T_3	T_0	T1

2.1 Birds and housing

Thirty-six (36) chicks of native chicken were randomly selected per treatment, with three heads per replicate. The brooding pen and cages were cleaned thoroughly using detergent soap, water, brush, and brooms. For sanitation purposes, hot water was poured to kill bacteria that would cause disease to the native chickens. The waterier and feeding troughs were thoroughly cleaned. Cages were provided with lights at night for easy access to feeders and waterers. The poultry house was made from bamboo, branches of river tamarind, nipa, and extruded green-colored plastic net that measures 60 cm × 70 cm × 65 cm per cage to have a cool temperature.

2.2 Hot red pepper collection and preparation

The hot red pepper was harvested in the researcher gardens in Purok 5, San Isidro, Asturias, Cebu. The hot red pepper was ground into smaller pieces using a knife and chopping board. These were placed on the net for sun-drying for 8 hours and transferred to big plastic ware. Eight hundred thirty-seven (837) grams of hot red pepper was used as a diet supplement for native chickens for the entire study.

2.3 Brooding stage

Thirty-six (36) chicks of native chicken (1-month-old) were placed into the brooding pen. They were fed an ad libitum system to ensure their rapid development growth. The native chicks were given lights (5 watts bulb) to keep them warm on cold nights.

2.4 Feeding system

Feeding management for the study using 1-month-old native chicken as experimental animals comprised the following: Days 31-41—native chicks starter crumble; day 42—75% of native chicks starter crumble + 25% of native grower crumble; day 43—50% of native chicks starter crumble + 50% of native grower crumble; day 44—25% of native chicks starter crumble + 75% of native grower crumble; days 45—69 a composition of 100% native grower crumble; day 70—comprised of 75% of native grower crumble + 25% of native finisher crumble; day 71—50% of native grower crumble + 50% of native finisher crumble; day 72—25% of native grower crumble + 75% of native finisher crumble; and day 73-92—chickens were given 100% native finisher crumble.

Creep feeding. A ratio of 75%: 25%, 50%: 50%, and 25%: 75% of native chick boosters were fed to the 42nd, 43rd, and 44th days old native chicks, respectively. From the 45th to the 69th day, 100% of native grower crumble (Integra 2000) was given to 36 native chickens. The creep feeding system was used again on the 70th, 71st, and 72nd days; the native chicken was fed at a ratio of 75%: 25%, 50%: 50%, 75%: 25% of native grower crumble (Integra 2000) and native finisher crumble (Integra 3000). The native finisher crumbles (Integra 3000) were fed to the native chicken 100% fully from the 73rd day up to the 92nd day of termination.

2.5 Data gathering

The data was collected by measuring the cumulative feed consumption, weekly weight gain, cumulative feed conversion ratio, and voluntary feed intake.

Results and Discussion

Table 1. Cumulative feed consumption of native chicken fed hot red pepper as a diet supplement in grams

Treatment	Starter (31 DAH)	Grower (51 DAH-78 DAH)	Finisher (79 DAH-92 DAH)
T_0	52.6950	53.1875**	55.2200
T_1	54.5150	54.4800**	57.4333
T_2	53.6650	53.0000**	54.9533
T_3	51.6600	57.5600*	59.0867
CV(%)	3.9500	3.9147	6.3872
P-value	0.02202*	0.00001*	0.0012*
Mean	53.1337	54.5568	56.6733

Legend:

T_0 = 50 grams of commercial feeds

T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper

T_2 = 49.25 grams commercial feeds + 0.75 gram of hot red pepper

T_3 = 49.0 grams commercial feeds + 1.0 gram of hot red pepper

DAH = days after hatching

*= significant

**= not significant

Table 1 explains there is a significant effect on the starter stage in all treatments. This means that native chicken is affected by the hot red pepper diet, but in the grower stage, T_3 showed statistically comparable to all T_1 and T_2. Based on the result [17], adding hot red pepper to the diet influences and improves feed consumption. The same results in the finisher stage were significant in all treatment groups. The result of the present study negated [18] that pepper can be added to the drinking water of native chicken at 30 ml/L water to affect growth and increase profit positively. The result shows that a higher hot red pepper dosage may not necessarily result in better growth performance and that an optimal dosage must be determined for each growth stage. Overall, the findings provide important insights for developing effective feeding strategies for native chickens using natural feed additives such as hot red pepper.

Table 2 . Weekly weight gain in grams/ bird of native chicken fed hot red pepper as a diet supplement

Treatment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
T_0	199.9967**	257.2167**	300.5300**	364.99**	493.61**	624.99**	657.80**	752.22**	761.66**	977.22*
T_1	341.6667*	399.1633*	535.5533*	626.66*	716.39*	834.44*	902.50*	986.39*	1,029.44*	1,113.61*
T_2	298.3300***	330.5500*	384.4400***	474.16**	555.28**	639.72***	697.22***	768.33**	866.66***	945.27*
T_3	268.3267***	322.2200***	399.1667***	463.05**	540.00**	652.22***	721.39***	816.11***	891.67***	1,148.33*
P- value	0.0123*	0.0012*	0.0456*	0.0021*	0.0001*	0.0087*	0.0002*	0.0134*	0.0018*	0.00001*
Mean	277.0800	327.2875	404.9225	483.215	576.32	687.8485	727.56	830.7625	887.3575	1,046.1075

T_0 = 50 grams of commercial feeds
T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper
T_2 = 49.25 grams commercial feeds + 0.75 gram of hot red pepper
T_3 = 49.0 grams commercial feeds + 1.0 gram of hot red pepper
*= significant
**= not significant
***= slightly significant

Table 2 shows that in the 1st week, T_2 is statistically comparable to T_3; however, T_0 is slightly significant to T_1; the data were subjected to analysis of variance and showed a significant result at 0.05 % significance level. In the 2nd week, T_0 is slightly significant to T_1, and T_2 is comparable to T_3. During the 3rd week, T_0 is slightly significant to T_1; however, T_2 is statistically comparable to T_3. In the 4th week, T_1 is significant between treatment T_0, T_2, and T_3, respectively, compared to each other. In the 5th week of weekly weight gain, T_1 is significant in all treated groups. The data were subject to analysis of variance and showed a significant result at a 5 % level of substantial. In the 6th week and 7th weeks, T_1 is slightly more significant than T_0. However, T_2, and T_3 are statistically comparable. In the 8th week, T_1 is slightly significant to T_0 and T_2, while T_3 is statistically comparable to all treated groups. In the 9th week, T_0 is slightly significant to T_1, while T_2 is comparable to T_3. In the 10th week, the last week of the study, all treatments are not significantly affected by hot red pepper (HRP) given to the native chicken.

The findings imply that the effects of hot red pepper (HRP) on weekly weight gain in native chickens may vary depending on the dosage and duration of treatment. The study found that different dosages of HRP (0.50 gram, 0.75 gram, and 1.0 gram) showed different levels of effectiveness in promoting weight gain in chickens, and the effects were not consistent across all weeks. The HRP treatment effectively promoted chicken weight gain during some weeks but not others. For

example, in the 5th week, treatment 1 (0.50 gram of HRP) was significant in all treated groups, but in the 10th week, none of the treatments showed significant effects. The differences in effectiveness between HRP dosages and between weeks show that there may be an optimal dosage and duration of HRP treatment for promoting weight gain in native chickens. Further research may be needed to determine the optimal conditions for HRP treatment in chicken farming. The statistical significance of the results at a 5% significance level indicates that some differences between treatments are likely not due to chance, while others may be.

Table 3. Cumulative feed conversion ratio of native chicken fed red hot pepper as a diet supplement

Treatment	Starter (31 DAH)	Grower (51 DAH-78 DAH)	Finisher (79 DAH-92 DAH)
T_0	6.9504	7.0022	6.6720
T_1	7.0080	7.0035	6.6667
T_2	6.9535	6.9708	6.7400
T_3	6.9500	7.0000	6.6333
CV(%)	5.4695	8.8956	9.9580
P- value	0.00536*	0.0012*	0.00001*
Mean	6.9654	6.9941	6.678

Legend:
T_0 = 50 grams of commercial feeds
T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper
T_2 = 40.25 grams commercial feeds + 0.75 gram of hot red pepper
T_3 = 49.0 grams commercial feeds + 1.0 gram of hot red pepper
DAH= days after hatching
*= significant
**= not significant

Table 3 illustrates that in the starter stage, grower stage, and finisher stage, in the cumulative feed conversion ratio of native chickens, there is a significant effect on all treatments. It means that the FCR changes consistently throughout the different stages of the birds' growth. This could have important implications for poultry farmers and feed producers. Different additives' effect on digestibility slightly improved the performance, and this effect was statistically significant. The result of the present is confirmed that of [19], who noticed that the dietary inclusion of HRP significantly ($P < 0.05$) improved FCR compared with the control.

The study's findings imply that there is a significant advantage in changing the feed formulation or nutrient content of the diet across the different stages of growth. This could simplify the feeding regime for farmers and reduce costs associated with switching feed formulations. The lack of significant differences in FCR across different stages of growth in native chickens highlights the need for further research to determine the optimal feeding strategies for these birds.

Table 4. Voluntary feed intake of native chicken fed hot red pepper as a diet supplement in grams

Treatment	Starter (31 Days after Hatching)	Grower (51 DAH-78 DAH)	Finisher (79 DAH-92 DAH)
T_0	474.2850	451.8350*	441.8000***
T_1	462.7500	436.3000***	460.5000*
T_2	483.0200	449.4975***	447.6667***
T_3	485.6000	422.9750**	413.6333**
CV(%)	2.6606	5.0211	5.8707
P-value	0.00448*	0.0012*	0.0123*
Mean	476.4137	440.1518	440.9

Legend:
T_0 = 50 grams of commercial feeds
T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper
T_2 = 49.25 grams commercial feeds + 0.75 gram of hot red pepper
T_3 = 49.0 grams commercial feeds + 1.0 gram of hot red pepper
DAH= days after hatching
*= significant
**= not significant
***= slightly significant

Table 4 shows that the voluntary feed intake of native chicken has a notable difference between treatments where the grower and finisher show a significant difference. For starters, a significant difference was observed during the treatments' application. On the other hand, in grower, there was a significant difference between the treatments where T_0 showed a higher voluntary feed intake than T_3, which shows the lowest voluntary feed intake between all the treatments, and T_0 is comparable to T_2 and T_1, where it shows no significant difference between each other. However, there was a significant difference between T_1 and T_3 in the voluntary feed intake at the finisher stage. The study of [20] further illustrates that supplementation with natural feed additives in a powder form of chili pepper in the concentration of 0.5% (CP0.5) and 1% (CP1.0) led to significant differences ($p < 0.05$) in the body mass of chickens compared to control and experimental treatments. At the end of the trial, chickens with the dietary addition of 0.5% chili pepper recorded the highest body mass of 2.46 kg, followed by treatment with 1% chili pepper (2.44 kg). Moreover, observed differences were statistically significantly ($p < 0.05$) higher when compared with other treatments.

The study's findings imply that using natural feed additives such as hot red pepper can influence the feed intake of the birds, particularly during the grower and finisher stages. The significant difference in voluntary feed intake between treatments during the grower stage could indicate that the use of hot red pepper in the diet may affect the palatability of the feed, which could result in reduced intake. However, it is worth noting that the comparison of T_0 with T_1, T_2, and T_3 showed no significant difference in feed intake during the starter stage. The significant difference in voluntary feed intake during the finisher stage between T_1 and T_3 could have implications for the growth performance of the birds.

The result of the study further illustrated that the synergistic effect of the combination of red hot pepper and commercial feeds in the native chicken diet enhances weight gain. The specific combination used in the study, with 49.50 g of commercial feed and 0.50 g of hot red pepper, effectively promotes growth in native chickens.

Table 5. Return of investment from native chicken fed hot red pepper as a diet supplement

Treatment	Gross Sales	Total Investment	Net Profit	ROI (%)
T_0	1,524	868.22	655.78	75.53%
T_1	1,792	870.88	921.12	105.77%
T_2	1,519	872.21	646.79	74.16%
T_3	1,593	873.44	719.56	82.38%

T_0 = 50 grams of commercial feeds
T_1 = 49.50 grams commercial feeds + 0.50 gram hot red pepper
T_2 = 49.25 grams commercial feeds + 0.75 gram of hot red pepper
T_3 = 49.0 grams commercial feeds + 1.0 gram of hot red pepper

Table 5 indicates the Return on Investment (ROI) on each treatment supplemented with hot red pepper for the growth of native chicken. Among the treatments, T_1 got the highest ROI of 105.77%, which means faster return payback than other treatments, followed by T_3 and T_0 with 82.38% and 75.53%, respectively. However, T_2 had the lowest percentage, 74.16%. Therefore, it is evident that red hot pepper as a diet supplement is a promising avenue for a good harvest and yield performance, as all treatments noted more than 70% of the return. Furthermore, the results indicate that including red hot pepper as a diet supplement could be a promising strategy for improving the economic performance of poultry production. T_1 had the highest ROI, meaning that the investment in this treatment resulted in the highest profits in the shortest time. T_3 and T_0 also showed a good return on investment, indicating that they are economically feasible treatments. However, T_2 had the lowest ROI, suggesting that it may not be the most cost-effective option for chicken production.

3. Conclusions

The study showed that 0.50 g of hot red pepper could be considered an alternative feed additive to the diets of native chicken, as it showed a significant increase in weekly weight gain and voluntary feed intake during the finisher stage. The results suggest that red hot pepper supplementation can positively affect the growth and development of native chickens, making it a promising avenue for native chicken production. Although there were no significant differences in the cumulative feed consumption during the starter and finisher stages and the incremental feed conversion ratio during all stages, the study found that red hot pepper supplementation resulted in more than 50% return on investment. This implies that using hot red pepper as a feed additive can produce a profitable poultry production system. Therefore, the study recommends the utilization of red hot pepper in growing native chickens, with the caution that the different levels of application may affect the diet performance of the birds. In conclusion, the results of this study suggest that the use of red hot pepper as a dietary supplement in the production of native chickens has the potential to improve performance and profitability in native chicken production.

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