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Growth performance of Rhode Island red chicken supplemented with concoction and probiotic under free-range condition

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Abstract

This study was conducted to evaluate the effect of concoctions and probiotics on the growth performance of Rhode Island Red chicken is under free-range condition. A total of 75-day-old-chickswere used in the study regardless of sex and randomly distributed to 5 treatments which were replicated 3 times with five represent birds per replication. The treatments used were: T1- Control, T2 - Commercial Probiotics, T3 - Oriental Herbal Nutrient (OHN), T4- Fermented Plant Juice (FPJ), T5 - 15ml OHN and 15ml FPJ were laid out in CRD in three replications. Production performances of birds were assessed in terms of: growth performance. There were no significant differences among treatments in all the parameters except for the initial weight with a significant level ($P<0.05$), yet birds supplemented with FPJ at 30ml were more profitable than the rest of the treatments. Thus, supplementing fermented plant juice is co considerably an excellent way to increase growth capacity of Rhode Island Red Chicken.

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Introduction

The poultry industry is widely spreading globally. It is continuously improving extensively over the past decades up to the present; the poultry industry began as a backyard enterprise but shifted to the formation of an extensive integrated contract farming operations. It comprises broiler, layer, and native chickens as well as ducks. The production of broiler and layer chickens are characterized by a large-scale, intensive, commercial production system with modern technology, imported hybrids, and the consumer demand is rapidly increasing. However, it faces several challenges. For example, it is well established that a chick's weight is one of the most determinants of growth rate survival. Therefore, extra effort in attention and nutritional care can alleviate the disadvantage of being born small or late (Chang, 2007, cited by Pacot, 2016).

Over the years, several products of feed additives and non-feed additives can affect the improvement of meat quality, increase the rate of weight, and promote good health. As a result, Poultry farmers adopt numerous feeding systems, including the latest technique for controlling disease and producing high-quality chicken meat and eggs (Magallon, 2002). However, although the birds raised with these additives perform well, their potential side effects cause a real public health problem worldwide (Engberg *et al.*, 2000). Furthermore, due to the potential for bacterial resistance and antibiotics residues in animal products and drug residue in the bird's body, as cited by Burgat (1999). Nowadays, some attempts have been made to replace the additives with herbs. Thus, antibiotics as feed additives are no longer acceptable and are prohibited in developed countries. Consequently, developing substitute materials and strategies for animal growth advancement and disease prevention has become necessary. Currently, plant extract and spices as single or mixed compounds can be used to promote performance and health conditions for animals. (Goodarzi *et al.*, 2014). natural products such as this must be allowed to utilize their potential and be free from synthetic supplements, which may lead to deleterious effects on the chicken.

Organic supplements such as fermented fruit juices, fermented plant juice, and oriental herbal nutrient are the best ways to enhance the performance level of broiler chicken. Natural farming was widely used in some counties with indigenous microorganisms are a method of agriculture that uses naturally occurring microorganisms that are deliberately collected and cultured. The most commonly used input is Fermented Plant Juice. The process of fermentation uses natural ingredients to encourage the growth of these beneficial microorganisms, or probiotics as they are commonly known. They help restore the correct balanced bacteria in the gut (Ikeda D. *et al.*, 2013).

Materials and methods

Experimental site and duration of the study

The study was conducted at Central Mindanao University, Animal Science Research Station from November 2020 to January 2021.

Materials and Facilities

The materials used in the study were the following: poultry cages for ranging, feeding, and drinking trough, weighing scale, camera, electric bulb and wires, newspaper, empty sacks, laminate sacks, record book, and pencil.

The poultry facilities and equipment that were used and included in the study were a brooding house, rearing pens, feeding trough, waterer, weighing scale and electric bulbs, old newspaper, and empty sacks which were utilized as bedding material to help maintain the correct temperature of the chicken during the brooding period. In preparing the Organic Herbal Nutrient, the following materials were used: garlic, ginger, and onion, beer, gin, molasses, container, paper, and rubber band. For the making of Fermented Plant Juice, the following materials were used: alugbati leaves, molasses, basin, ceramic pot or plastic pail, net bag or cloth bag, paper or cloth for cover, string, stone as weight, bolo, chopping board, marking pen and glass jars.

Acquisition of Experimental Animals and Facilities

Rhode Island Red chicks were obtained from Davao City.

The day-old chicks were subjected to a brooding period of 21 days before exposing to the different treatment. After which, they were placed in free range study where the nylon net was used as pen for the chicken to have a safer area to avoid the predators.

Selection and Preparation of rearing area

The experimental birds were allowed to roam in the area that corresponded to the number of treatment levels for the colored chicken. The ranging-area was approximately 150 square meters.

Experimental Animals and Design

A total of 75-day-old chicks were used in the study regardless of sex and randomly distributed to five (5) treatments which were replicated three (3) times with five (5) birds per replication. The study was laid out in Completely Randomized Design (CRD) using analysis of variance or ANOVA.

Experimental Treatment

The experiment treatments consisted of commercial ration supplemented with varying levels of Organic Herbal Nutrient and Fermented Alugbati Leaves, commercial probiotics through drinking water. The experimental treatments were as follows:

Treatment 1- 1000ml tap water
Treatment 2- 1g of Commercial Probiotics + 1000ml tap water
Treatment 3- 30ml OHN + 970ml tap water
Treatment 4- 30ml FPJ + 970ml tap water
Treatment 5- 15ml OHN+ 15ml FPJ+ 970ml tap water

Statistical Analysis

Gathered data was organized, tabulated and analyzed statistically using the analysis of variance in Complete Randomized Design. Tukey's test was used to compare any significant differences among treatment means.

Results and discussion

Average Initial Weight

The initial body weight was measured to determine the weight of the birds at 22 days of the day here treatments were being applied.

The table shows the initial weight. Statistical result showed significant difference among the treatment means ($P<0.05$). Treatment 3 had 212.13, Treatment 4 with 203.67, Treatment 5, 182.47, Treatment 2, 171.53 and Treatment 1, 167.80 respectively.

Table 1. Average initial and final weight, total weight gain, average daily gain, and total feed consumption, feed efficiency and water intake of Rhode Island Red chicken (*Gallus domesticus*) supplemented with concoctions and probiotics under free-range condition.

Parameters	Treatment					Fc	% CV
	1	2	3	4	5		
Initial Weight, grams	167.80	171.53	212.13	203.67	182.47	5.21*	7.93
Final Weight, grams	666.20	762.40	784.83	841.67	744.80	1.03ns	14.36
Total Weight Gain, grams	498.40	590.87	572.70	638.00	562.33	0.84ns	16.67
Average Daily Gain, grams	12.78	15.15	14.68	16.36	14.42	0.84	16.67
Total Feed Consumption, kg	1.87	2.18	2.12	2.18	2.03	0.93ns	11.32
Feed Efficiency	3.76	3.70	3.73	3.53	3.61	0.16ns	11.13
Water Intake, ml	3,152.20	3,123.00	3,401.65	3,456.63	3,371.87	0.38ns	13.00

Average Final Weight

Table 1 presents the average final weights (grams) of the RIR chickens supplemented with concoction and probiotic trough drinking water.

Treatment 4 got the highest mean of 841.67 grams followed by Treatment 3 with 784.83 grams, Treatment 2 with 762.40 grams, Treatment 5 with 744.80 grams, and lastly, Treatment 1 with 66.20 grams. Statistical analysis showed no significant difference among treatment means. The result implies that supplementation of concoction and probiotics through drinking water did not affect the overall final weight of the chicken. However, Treatment 4 got the highest mean for final weight but still comparable to treatments.

This finding is consistent with the finding of Reboldela and Raguindin as described by Andrew (2017) in his article that birds supplemented with fermented plant juice were heavier among other. In addition, the performance of the birds in the study surpassed the findings of Tabinda *et al.* (2016) were the Rhode Island Red chicken at eight weeks' old has a final weight of 514.60 grams.

Total Weight Gain

The total weight gains of RIR chicken fed with commercial ration supplemented with concoctions and probiotics are presented in Table 1. Statistical Analysis showed non-significant differences among treatment means. Treatment 4 exhibited the highest total weight gain of 638.00 grams, followed by Treatment 2 with 590.87 grams, Treatment 3 with 572.70 grams, and Treatment 5 with 562.33 grams and Treatment 1 with the lowest total weight gain of 498.40 gram. Based on the results, the total weight gain of free-range chicken was not affected by the supplementation of concoctions.

Average Daily Gain

Similarly, with total weight gain, the average daily gains of the Rhode Island Red chicken supplemented with concoctions and probiotics showed non- significant differences among treatment means (Table 1). However, it was observed that chicken in Treatment 4 shows a slightly heavier average daily gain than other treatments. Treatment 4 ADG was 16.36 grams, Treatment 2 was (15.15 grams), Treatment 3 with (14.68 grams), Treatment 5 with (14.42 gram) and Treatment 1 with (12.78 grams). The results imply that supplementation of different concoctions to the free-range chicken did not affect the average daily gain. Similar observations with Salehimanesh *et al.* (2016) reported with probiotics and bio-organic had no significant effect on body weight gain. In contrast to the study of Abdel-Hafeez *et al.* (2017) that there is an increase of body weight gain in the chicken supplemented with probiotics and bio organics. Variation among reports of researchers could be related to bird age, sex, breed, housing management system, overall from hygiene, environmental stress, type of concentration dosage, and methods of use and frequency of applications (Salehimanesh, 2016).

Total Feed Consumption

Table 1 shows the total feed consumption of free-range chicken's commercial ration supplemented with the different concoctions. Statistical analysis showed non-significant differences among treatment means. Treatments 4, 2, 3 and 5 were slightly comparable in feed consumption (2.18kg), (2.18kg), (2.13kg) and (2.03kg) compared to Treatment with 1.87kg respectively. This shows that probiotic and fermented process supplementation slightly affected the feed intake of the poultry due to an increase in appetite. The increase in feed intake was also observed in the study of Riad *et al.* (2005). However, the feed consumption of the chickens did not differ significantly (Riad *et al.,* 2005).

Feed Efficiency

Feed efficiency is referred to as the kilogram of feed consumed to produce a kilogram of live weight gain. The lower the value, the more efficiency the chicken has in converting feeds to live weight.

Table 1 shows the feed efficiency of Rhode Island Red chicken supplemented with different concoctions. Treatment 1 had the highest mean of feed efficiency with 3.76 followed by Treatment 3 had 3.73, Treatment 2 had 3.70, Treatment 5 had 3.61 and Treatment 4 had 3.53 as the lowest mean respectively, statistically, no significant difference among treatment means. The result indicates that chicken given with supplementation of different concoctions and the control (Tap water) was comparable in feed conversion ratio. This observation corroborated with the study of Huervana, (2016).

Water/Treatment Consumption

Table 1 presents the average water consumption statistically shows non-significant difference among treatment means. Treatment 4(970 tap water + 30ml OHN) got the highest volume of water consumed with 3,456.63, as compared to Treatment 3 (3,401.65ml),

Treatment 5 (3,371.87 ml), Treatment 1 (3,152.20 ml) and Treatment 2 (3,123.00 ml) respectively. Result implies that chicken supplemented with probiotics and concoctions were comparable with other treatments.

Water consumption can be limited if the water is too hot or is contaminated with excess minerals. Temperature is one of the factors affecting water intake such that chickens drink between 30-50% more water when the environmental temperature is above 32 ^{O}C compared to when it is 21 ^{O}C. The rule of water intake is usually 1.5 to 2 times its feed intake (Poultry CRC, 2016).

Feed Cost per Kilogram Gain

Table 2 shows no significant differences observed among treatments on the feed cost per kilogram gain. However, results revealed that Treatment 4 got the highest feed cost with 71.97 Php followed by Treatment 2 with 71.96 Php, Treatment 3 with 70.13 Php, Treatment 5 with 67.04 Php, and Treatment 1 with 65.71 Php. Statistically, the results showed no impact of the supplements used in the study, which tend to have higher costs compared to the control group.

Table 2. Profitability estimates of Rhode Island Red chicken (*Gallus domesticus*) supplemented with concoctions and probiotics under free-range condition.

Parameters	Treatment					Fc	%CV
	1	2	3	4	5		
Feed Cost	61.71	71.96	70.13	71.97	67.04	0.93^{ns}	11.32
Return Above Feed Cost	38.15	52.16	46.24	44.91	19.54	0.75^{ns}	62.45

Return above Feed Cost

Return above feed cost refers to the return of the amount that has been using the treatment. It will analyze the impact of profit, either profitable or not. It depends on the growth performance, total amount of feeds, and the cost incurred.

Table 2 shows the economic analysis of this study wherein Treatment 2 with the highest net returned amount of Php 52.16, then Treatment 3 with Php 46.24, Treatment 4 with Php 44.91, Treatment 1 with Php 38.15 and Treatment 5 with Php 19.54, respectively.

Conclusion

This study was conducted to evaluate the effects of concoctions and probiotics on the growth performance response of Rhode Island Red chicken. A total of 75-day-old chicks were used in this study. They were subject to brooding management for 21 days with ad libitum feeding management and ample amount of clean water. On the 22nd day, the birds were randomly distributed in Simple Complete Randomized Design. The following were the experimental treatments which were replicated three times: Treatment 1- 1000ml tap water, Treatment 2- 1g of Commercial Probiotics + 1000ml tap water, Treatment 3- 30ml OHN + 970ml tap water, Treatment 4- 30ml FPJ + 970ml tap water and Treatment 5- 15ml OHN+ 15ml FPJ+ 970ml tap water. After 60 days, data for growth performance was completely gathered. The results showed significant difference in the average initial weight of the birds, which has added to the limitation of the study. There were no significant effects on the average final weight, total weight gain, average daily gain, total feed consumption, total water intake and feed efficiency. However, despite of the non- significant differences in treatment means, it was implied that supplementing fermented plant juice had a smaller value in feed efficiency, which means it was better converter of feeds. The profitability estimates showed no significant effect on feed cost per kilogram gain and return above feed cost. However, return above feed cost showed higher in supplementing fermented plant juice, which entailed more profit.

Recommendation

The following are the recommendations and suggestions for further research based on the result obtained from this study.

1. Supplementation of fermented plant juice to boost growth performance.
2. Supplementation of fermented plant juice also gives more profit as it shows a large value of return above feed cost.
3. Additional study on different rearing managements of Rhode Island Red chicken supplemented by organic concoctions and probiotics.

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