BIBLIOGRAPHY

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ABSTRACT

The study was conducted at the BSU Poultry Experimental Area, Balili, La Trinidad, Benguet, from October 29, 2012 to January 18, 2013 to determine the growth performance of native chicken given watercress (*Nasturtium officinale*) and commercial feeds.

Thirty-two (32) native chickens with varying ages were used. The birds were distributed, using the Randomized Complete Block Design (RCBD)into two treatments which are T_0 – commercial feeds and T_1 commercial feeds + watercress and the birds were grouped into three blocks, as follows: block 1 = 4 weeks old, block 2 = 6 weeks old, and block 3 = 8 weeks old, respectively.Treatment 0 had a total of 15 birds and treatment 1 had a total of 17 birds. Data gathered were analyzed using the Analysis of Variance and means were compared using the Duncan's Multiple Range Test (DMRT).

Statistical analysis revealed no significant difference between the treatment in terms of in all parameters evaluated specifically on the final weight, total gain in weight, average daily gain in weight, total feed consumption and the feed conversion ratio. The

birds had an overall mean initial weight of .258 kg and had an overall mean final weight of 1.436 kg. The overall mean average daily gain in weight and total gain in weight of the birds were 0.013 kg and 1.147 kg,respectively. In terms of TFC and FCR on dry matter basis, the birds overall mean were 7.525 kg and 5 .066 kg, respectively. On the other hand, the overall mean return on investment was 8.67 %.

Based on the results of the study, giving restricted commercial feeds and watercress on a restricted basis to native chickens will result to the same growth performance as the native chickens given *ad libitum* commercial feeds.

INTRODUCTION

Raising native chickens is an integral part of the farming systems of the Filipino farmers because they are the main source of eggs and meat for farmers (PCARRD, 2000).

In the Cordillera, native chicken is not just a source of eggs and meat for the family, but they play an important role in the culture of the people. Elders prefer native chickens together with native pigs as sacrificial animals for rituals. Moreover, native chickens are usually cooked into "*pinikpikan*", an indigenous well known menu in the Cordillera. This is often served to visitors and guests, and on family gatherings (Garcia, 2006).

Despite these mentioned importance, native chicken production is still considered low as revealed by the data from the Bureau of Agricultural Statistics (BAS, 2012). One evident reason is the lack of proper management from the owners especially on the aspect of nutrition. Most raisers do not invest on their nutrition since it is not for commercial purpose. The chickens are only fed with available left-over and are let loose during the day to scavenge for food.

With the increasing demand of consumers for a healthier, tastier and leaner source of meat, there is a need to explore on ways to improve native chicken production. One way is to improve feeding management by giving concentrate feeds in combination with locally available feedstuff.

Watercress (*Nasturtium officinale*), locally known as "*tunsoy*", is one of the potential feedstuffs that can be used as a supplement to native chickens. This edible water plant is a cheap yet nutritious source of green supplement for native chickens.

This study would provide additional information on improving the feeding management of native chicken particularly on the use of locally available feedstuff.

Moreover, it also provides data on the performance of native chickens when given commercial feeds with green supplement.

This experiment generally aimed to determine the effect of giving watercress with commercial feeds on the growth performance of native chicken.

Specifically, it aimed to determine the gain in weight, feed consumption and feed efficiency of native chicken; determine the morbidity and mortality of native chicken; and determine the profitability of raising native chicken given watercress and commercial feeds.

This study was conducted at the BSU Experimental Area, Balili, La Trinidad, Benguet from October, 2012 to January, 2013.

REVIEW OF LITERATURE

Characteristics of the Philippine Native Chicken

The domestic native chicken (*Gallus gallus domesticus*) is small, active, sensitive and capable of great flight when frightened. The hens have excellent mothering ability and excellent sitters. Under normal backyard production, the native hen produces 30 to 60 eggs per year. However, when properly managed, it may reach up to 120 to 200 eggs per year PCARRD-UPLB (1987) as cited by Molitas (1999).

The Philippine native chicken is found in the backyards of most rural households. It is a mixture of different breeds and believed to have descended from the domesticated red jungle fowl. It is estimated that 54.7% of the total chicken population of the country are native chicken distributed as follows: Western Visayas, 13.32%; Southern Mindanao, 10.63%; 10.63% Southern Tagalog, 9.51%; Central Visayas, 10.36%; Cagayan Valley 9.29%. Under free-range system of management, the chickens are allowed to forage and look for their own food. They are well known for their adaptability to local agro-climatic conditions, hardiness, ability to utilize farm by-products and resistance to diseases. Moreover, they require minimal care, management and inputs. Meat and eggs of native chickens are preferred by many Filipinos over commercial poultry because of their taste, leanness, pigmentation and suitability to Filipino special dishes. Moreover, native chicken meat and eggs are priced higher than those coming from commercial poultry (PCARRD, 2000).

According to Arboleda (1987) as cited by Bondoc (1998), the adult size of native chicken is usually small. Generally, the male weighs an average of 1.3 kg and the female

weighs 1 kg. They are nervous and flighty. The female are broody and have strong maternal instincts. A chicken lays only about 40 to 60 eggs per year. This is because they are allowed to incubate their eggs and their natural broodiness is allowed to set in. but, with improved management and a better nutrition, native hens can lay 130 to 200 eggs a year weighing 50 grams.

Under traditional system of management, native chicken attain 1 kilogram of body weight at 18 to 20 weeks of age. But under the improved management, native chickens can reach 1 kilogram body weight as early as 12 weeks (PCARRD, 2000).

Garcia (2006) stated that native chicken have the ability to survive in adverse conditions like inadequate shelter, sudden changes of weather and poor and scanty feeds. They require very minimal input and care while providing nutritious meat and eggs for the family. Some farmers who manage to raise more heads sell it to the market.

Attfield (1990) cited that if we confine chickens in pens or cages with clean feeders and waterers, we will have the following advantages like better control of diseases, fewer losses of chickens to theft or predatory animals, less disturbance to vegetable gardens and neighbor's property by free-ranging hens, easy collection of eggs, easy access to chickens for routine inspection and easy collection of manure for use in the garden over the free-ranging birds.

Native Chicken Inventory

Based on the Bureau of Agricultural Statistics (BAS) in 2012, the inventory of native chicken (heads) in the Philippines is 315,957,240 in 2009; 309,708,390 in 2010 and 305,310,167 in 2011. Cordillera Administrative Region contributes to the said inventory with 5,366,048; 5,542,169; and 5,849,952 in 2009, 2010, and 2011, respectively.

Feeding Native Chicken

Nutrition is the paramount issue to be dealt with this era of human history. Human nutrition is intricately dependent on livestock and poultry production. Here, feed constitute 65 to 75 percent of the total economic inputs. Therefore we have to improve the quality of feed by conventional or nonconventional sources without an attendant increase in its production cost (Reddy and Dwivedi, 1992).

Proper nutrition is essential in keeping the birds healthy and productive. Let the birds loose in the range to allow them access to the natural feeds like worms, grains, seeds, insects, greens and other sources. Give supplement feeds to the birds during summer months when feeds in the range is scarce, and also during increment weather. Practice supplementation with high-energy feedstuffs like corn, *palay* and grated coconut or farm-mixed formulations during these times. This will give the chickens the energy source that they rarely find in the field. The supplement feedstuffs can be made available in the house early morning, before the birds are allowed to scavenge and in the afternoon to develop their homing instinct. Commercial feeds can be given, if local feeds are scarce and not available, however, this is not economical because the native birds are not as efficient as commercial poultry. Provide clean and fresh water to the bird. Bamboo poles split in half can be used as feeders and waterers. Commercially available feeders and waterers can also be adapted. Keep in mind the proper design and size of feeders to minimize feed wastage (PCARRD, 2000).

Lazo (1992) said that native chicken also require unsophisticated management because they can be sustained by kitchen left-over, rotten fruits and vegetables and small

insects. Moreover, they are usually resistant to diseases hence they were the ideal to be raised in the farm.

According to Guinyang (2005), plants as feed supplement make the animal healthy and resistant to diseases due to its large quantities of vitamins, minerals and a biotic content. They are of the highest efficiency when feeds are in proper mixture.

Yadav (2010) said that poultry differ from other animals in that their sense of taste and smell is poorly developed and to them the palatability of feed largely depends upon its appearance and feel. Light-colored material with a smooth surface appeals to them, and feeds with irregular, rough surfaces which cause discomfort when being swallowed.

Watercress

Watercress (*Nasturtium officinale*) is an aquatic plant renowned for its vivid green and unique peppery flavor. Fortified with more than 15 essential vitamins and minerals even since ancient times its health giving properties have been highly valued. In modern times it is increasingly seen as a powerful cancer fighting super food. A famous Persian chronicler advised Persians to feed cress to their children to improve bodily growth. The herbalist John Gerard extolled watercress as an anti-scorbutic (remedy for scurvy) as early as 1636 (Burgoon and Weaver, 2010).

Watercress owes its name to its preferred growing conditions, clean streams and ponds. It also has high water content. One cup of watercress weighs 34 g and contains 32 g of water. This serving has only 16 calories. The protein content is 0.78 g. It has 0.03 g of fat, but no cholesterol. The total carbohydrate content is less than 1 percent of the daily value in a 2,000-calorie diet, or 0.44 g. The fiber content is 1 percent of the DV at 0.2 g, with a sugar content of 0.07 g. This serving provides 22 percent of the DV of vitamin A,

or 1,085 international units, which helps your eyesight and skin. The 15 mg of vitamin C equals 24 percent of the DV.Watercress has trace amounts of the B-complex vitamins and vitamin E. A 1-cup serving of watercress contains no minerals that provide at least 5 percent the DV. The calcium and manganese content are 4 percent each, at 0.41 mg and 0.8 mg, respectively. The potassium content is 3 percent, at 112 mg. It also contains trace amounts of copper, magnesium, phosphorus and zinc. Watercress is a source of valuable antioxidants. The main antioxidants in watercress are 615 mcg of beta-carotene and 1,961 mcg of lutein. It also contains trace amounts of vitamin E and selenium (Myers, 2011).

Watercress as Feed for Poultry

A comparative study conducted by Guinyang (2005) on the growth performance of broiler given pure commercial feeds, supplemented with 10% watercress, 20% watercress and 30% watercress, revealed that there were no significant differences among treatment means in terms of initial weight, total gain in weight and feed conversion ratio.Significant differences were observed in the final weight, feed consumption, feed cost of feed to produce a kilogram gain in weight, it was observed that T_0 – pure commercial feeds, registeredthe highest mean of feed cost of feed to produce a kilogram gain in weight. It was observed that the birds fed 10% watercress + commercial feeds, 20%watercrees + commercial feed and pure commercial feeds, registered higher final weight as compared to T_3 (30% watercress + commercial feeds). For the feed consumption, T_1 (10% watercress + commercial feeds), registered the lowest mean. It was observed also that birds given 20% chopped watercress supplement gave the highest net return on investment.

MATERIALS AND METHODS

Materials

The experimental animals used in the study were thirty-two (32) native chickens taken from different brood. Their ages ranged from 4 weeks to 8 weeks. Experimental chickens include those non-descript breeds of colored chicken raised in the backyards. Commercial feeds and watercress were used as treatment diets. Other materials used were weighing scale, cages, feeding troughs, waterers, disinfectants, leg bands and recording materials.

Methods

Preparation of cages, feeders and waterers. A week before the chicks arrived, the cages as well as other important facilities such as feeding troughs, waterers were cleaned and disinfected.

Experimental design and treatment. Due to the varying ages of the birds, the lay-out for Randomized Complete Block Design (RCBD) was followed. The birds were grouped into three, as follows: block 1= 4 weeks old; block 2= 6 weeks old; and block 3= 8 weeks old. Each group was distributed at random into the two treatments with five to six birds per block making a total of 15 birds in treatment 0 and 17 birds in treatment 1.

The diet to be given for each treatment was introduced a week before the actual start of the study. After this adjustment period, the birds were weighed for their initial weights.

T_0 - commercial feeds

T_1 - commercial feeds + watercress

Preparation of watercress. The watercress (Figure 1) was bought from the vendors of watercress in La Trinidad. These were washed thoroughly with clean water to remove the unnecessary particles and set aside for two hours to be air dried. After that, it was chopped into pieces approximately 0.5 cm, conducive for the native chicken.

Feeding management. The birds in the control treatment were given commercial feeds. For treatment 1, the commercial feeds and the chopped watercress were given separately. The time of giving commercial feeds was restricted. It was given twice a day from 6 am to 8 am in the morning and 4 pm to 6 pm in the afternoon. After the specified time, any left-over was withdrawn and measured.

On the other hand, the watercress was given *ad libitum* from 9 am to 3 pm. After the specified time, any left-over was withdrawn.This feeding scheme was followed all throughout the study.

Figure 1. Watercress used in the study

Care and Management

All the experimental animals were cared and managed equally. Feeds were offered exactly at the specified time and adequate drinking water was always available for the chickens. Cleaning of cages was done regularly to protect the chickens from illness.

Data Gathered

1. Initial weight (kg). This was obtained by weighing the birds individually at the start of the study where the birds were four to eight weeks old.

2. Final weight (kg). This was taken by weighing the birds individually after 82 days of feeding trial.

3. Weekly gain in weight (kg). This was obtained by weighing the birds individually at weekly interval.

4. Feeds offered (kg). This was the amount of feeds given to the bird on a dry mater basis.

5. Feed left-over (kg). This was the amount of commercial feeds and watercress not consumed by the birds on a dry mater basis.

6. Dry mater content of feeds (DM). This was determined by oven drying the feeds sample to constant weight.

7. Morbidity. This was the number of birds that got sick during the study.

8. Mortality. This was the number of birds that died during the study.

9.Cost of inputs (Php). This was determined by recording all the expenses used in the study.

Data Computed

1. Total gain in weight (kg). This was computed by subtracting the initial weight from the final weight of the birds per replicate.

2. Daily gain in weight (kg). This was the difference between the final weights and the initial weights of the experimental birds divided by the number of days of the experimental period.

3. Total feed consumption (kg). This was the total amount of feeds that will be consumed by the birds from the start until the end of the study.

4. Feed conversion ratio (kg). This was determined by using the formula:

$$FCR = \frac{\text{Total feed consumption}}{\text{Total gain in weight}}$$

5. Percent dry mater (%DM). This was obtained by using the formula:

$$\%\ DM = \frac{\text{Dry weight of sample}}{\text{Fresh weight of sample}} \times 100$$

6. Dry mater intake (DMI). This was obtained by using the formula:

$$DMI = \text{Fresh weight intake} \times \%DM$$

7. Feed cost to produce a kilogram in weight (Php). This was obtained by using the following formula:

$$FC = FCR \times \text{price per kilogram of feeds}$$

8. Return on investment (ROI). This was obtained by using the formula:

$$ROI\ (\%) = \frac{\text{Gross sales - total cost of production}}{\text{Total cost of production}} \times 100$$

Statistical Analysis

All data were analyzed using Analysis of Variance (ANOVA) appropriate for Randomly Complete Block Design (RCBD) and means were compared using the Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Body Weights

Table 1 presents the body weights (initial and final) of the birds in the two treatments. While figures 2 and 3 shows the sample appearance of the birds at the start and at the end of the study, respectively.

Initial weight. The birds in the control treatment (commercial feeds) had a mean initial weight of 0.262 kg, while the birds in treatment 1 (commercial feeds + watercress) had 0.255 kg. Statistical analysis revealed that there was no significant difference between the two treatments. This shows that the experimental birds between the two treatments were more or less of the same weights at the start of the study.

Statistical analysis revealed that there were significant differences on the initial weights among the blocks. This can be attributed to the two-week difference in the ages of the birds between blocks. Birds in blocks 1, 2 and 3 are about four weeks old, six weeks old, and eight weeks old, respectively.

Another factor that could be considered is the fact that the birds came from different broods and received different management prior to the experiment.

Final weight. Statistical analysis revealed no significant difference between the two treatments on their final weights. It implies that the birds between the two treatments were more or less of the same weight at the end of the study. The mean final weight of the birds given commercial feeds (T_0) and commercial feeds + watercress (T_1)is 1.4570 kg and 1.4157 kg, respectively. Statistically, these data have no differences. This means that the birds in T_1 (commercial feeds + watercress) has grown as fast as those in the control treatment even if they were fed on a restricted time.

Table 1. Initial and final weights of the birds after 82 days of feeding trial

TREATMENT	BODY WEIGHT (kg)	
	INITIAL	FINAL
Commercial Feeds	0.26200	1.4570
Commercial Feeds + Watercress	0.25500	1.4157

*Means without superscript are not significantly different at 0.05 DMRT

Figure 2. Native chicken at 4 to 8 weeks old

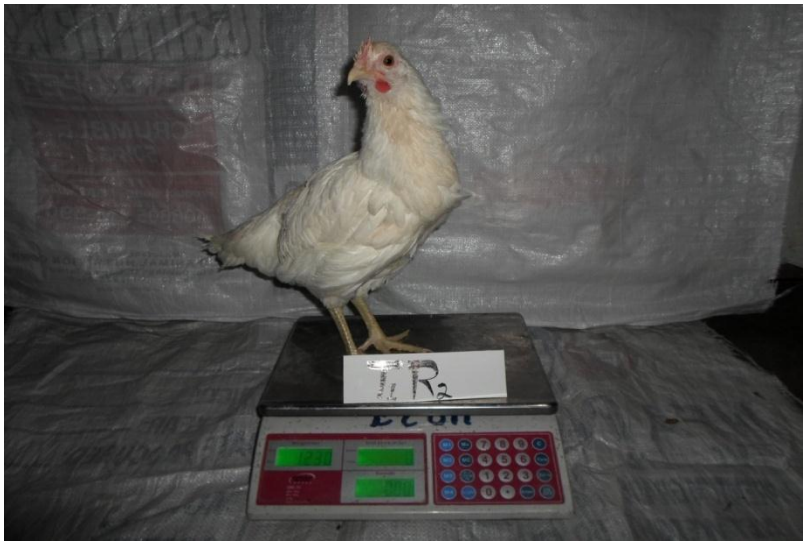

Figure 3. Native chicken at 16 to 20 weeks old

Gains in Weight

The total gain in weight and average daily gain in weight of the experimental birds in the two treatments are shown in Table 2. Homologous with the body weights, statistical analysis revealed no significant difference across the treatments in both the total gain in weight and average daily gain in weight of the experimental birds.This implies that the birds given commercial feeds and watercress (T_1) on a restricted time gained weight comparable to those birds given commercial feeds on *ad libitum* basis.The mean total gain in weight and average daily gain in weight of birds in T_0 (commercial feeds) is 1.1947 kg and 14.333 g while in T_1 (commercial feeds and watercress) is 1.1017 kg and 13.333 g, respectively.This concludes that even if the time of giving of commercial feed and watercress is restricted, birds will gain weight same as the birds given *ad libitum* commercial feeds.

The average daily gain of the native chickens in this study is much lower than the average daily gain for broilers (4.5 to 8 weeks) which is 38.2g (Pond *et al*, 2005). This difference is attributed to the genetic make-up of native chicken, where even under improved management they cannot gain weight as much as its commercial counterpart.

Table 2.Total and average daily gain in weight of the birds

TREATMENT	**GAIN IN WEIGHT**	
	TOTAL GAIN (KG)	AVERAGE DAILY GAIN (G)
Commercial Feeds	1.1947	14.333
Commercial Feeds + Watercress	1.1017	13.333

*Means without superscript are not significantly different at 0.05 DMRT

Weekly Weights

Figure 1 shows the average weekly weight of the birds in the two treatments. Similar to the trend in the average daily gain in weight and total gain in weight, there were no significant differences in the weekly weights of birds. This concludes that the experimental birds given restricted commercial feeds and watercress on a restricted time had the same ability to gain in weight with those birds given *ad libitum* commercial feeds.

Feed Consumption

The total feed consumption of the birds in the two treatments after 82 days of feeding trial is shown in Table 3. Statistical analysis revealed a significant difference

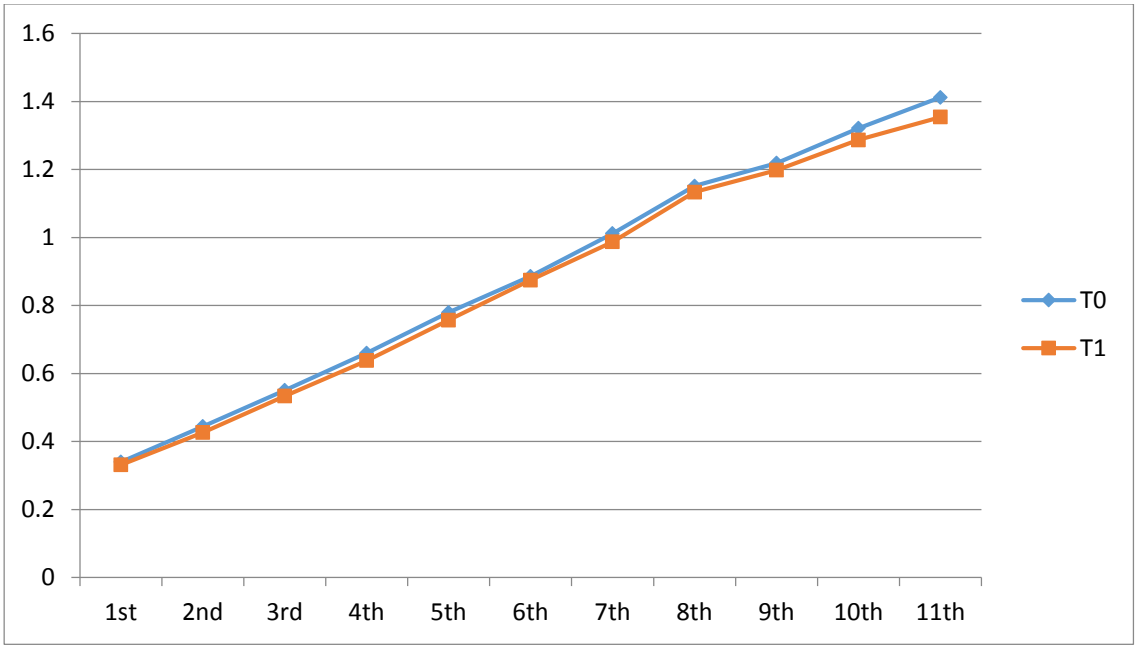

Figure 4. Weekly weights of the birds (kg)

between the two treatment means. The birds given *ad libitum* commercial feeds had higher feed consumption with a mean of 9.0020 kg compared to the birds given restricted commercial feed and watercress which had a mean of 5.7917 kg.

Feed Conversion Ratio

The feed conversion ratio of T_0 (commercial feeds) with a mean of 7.436 kg and T_1 (commercial feeds and watercress) with a mean of 5.048 has no significant difference.

Pond *et al* (2005) cited an FCR of 2.44 of finishing broilers from 4.5 to 8 weeks. Compared to the average FCR of the birds in this study which is 5.066, it reflects the poor ability of native chickens to convert feeds to a unit gain in weight. Since the feeding management done in this study is improved, the poor FCR of the native chickens could be mainly attributed to their genetic make-up as the limiting factor.

Table 3. Total feed consumption of the birds in 82 days

ATMENT	**ED CONSUMPTION (kg)**	**Y MATER INTAKE (kg)**
nercial Feeds	6.049	5.694
nercial Feeds + Watercress	9.002	5.288

*Means without superscript are not significantly different at 0.05 DMRT

Table 4. Feed conversion ratio of the birds after 82 days of feeding trial

ATMENT	**FEED CONVERSION RATIO**	
	AS FED	DRY MATER BASIS
nercial Feeds	5.208	4.583
nercial Feeds + Watercress	7.593	5.549

*Means without superscript are not significantly different at 0.05 DMRT

Morbidity and Mortality Rate

Despite the weather changes during the conduct of the study, there were no instances of mortality or morbidity among the birds. This supports Attfield (1990) when he cited that confining chickens in pens or cages will result to better control of diseases, fewer losses of chickens to theft or predatory animals and easy access to chickens for routine inspection. In addition, a study on the confinement of native chickens conducted by Molitas (1999), showed that morbidity and mortality were significantly reduced.

Return on Investment

Table 5 shows that T_0 (commercial feeds) had 10.10 % ROI and T_1 (commercial feeds and watercress) had 7.24 % ROI. These numerical differences were not found by DMRT significant.

Table 5. Return on investment from the sales of the birds

ATMENT	**AL COST OF PRODUCTION (Php)**	**INCOME (Php)**	**ROI (%)**
nercial Feeds	)0	481.68	10.10
nercial Feeds + Watercress	)0	401.89	7.24

*Means without superscript are not significantly different at 0.05 DMRT

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

The study was conducted to determine the effect of watercress on the growth performance of native chickens at the BSU Poultry Experimental Area, Balili, La Trinidad, Benguet from October, 2012 to January, 2013.

Thirty-two (32) native chickens with varying ages were used. Because of their different ages, the birds were distributed using the lay out for Randomized Complete Block Design (RCBD). The birds were grouped into three blocks, as follows: block 1 = 4 weeks old; block 2 = 6 weeks old; and block 3 = 8 weeks old and were distributed at random into the two treatments. Treatment 0 (commercial feeds) had a total of 15 birds with 5 birds per block and treatment 1(commercial feeds + watercress) had a total of 17 birds with 5 to 6 birds per block. Data gathered were analyzed using the ANOVA and means were compared using the DMRT.

Statistical analysis revealed no significant difference between the treatments in all parameters measured specifically on the final weight, total and average daily gain in weight, weekly weight, total feed consumption, and the feed conversion ratio. The birds had a mean initial weight of 0.258 kg and had a mean final weight of 1.436 kg after 82 days of feeding trial. The mean total gain in weight and average daily gain in weight of birds given commercial feeds was 1.101 kg and 0.013 kg, respectively, while birds given commercial feeds and watercress was 1.194 kg and 0.014 kg, respectively. In terms of total feed consumption, T_0 had a mean of 6.049 kg and T_1 had 9.002 kg. For the FCR as dry matter based, birds in control treatment had 4.583 and birds in treatment 1 had 5.549.

On the other hand, native chicken given commercial feeds had 10.10 % ROI while native chicken given commercial feeds and watercress had 7.24 % ROI.

Conclusion

Based on the results of the study, it is therefore concluded that giving restricted commercial feeds and watercress on a restricted basis to native chickens will result to the same growth performance as the native chickens given *ad libitum* commercial feeds.

Recommendations

It can be recommended that watercress may be given with commercial feeds on a restricted basis to minimize wastage of feeds, hence, increasing returns.

Related studies can be conducted modifying the feeding scheme of giving commercial feeds to one hour feeding while giving watercress at least two hours after giving commercial feeds to promote higher consumption.

In addition, studies on the use of watercress in combination with other cheaper base feeds can also be conducted.

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