BIBLIOGRAPHY

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Adviser: Jones K. Feliciano, Ed. D.

ABSTRACT

This study was conducted at the Benguet State University (BSU) Poultry Experimental House located in Balili, La Trinidad, Benguet from January to March 2013 to determine the effect of supplemental guava leaves decoction in growth, feed consumption, morbidity, and mortality of broiler chicken, and to evaluate the return on cash expenses in growing broiler chicken given supplemental guava leaves decoction.

A total of 132 week-old broiler were randomly distributed into three treatments with four replication and each replicate consisted of eleven birds to make a total of forty four birds per treatment. The treatments were the following: Broiler chicken fed with commercial feeds and given water only ($T_{1,}$ control), broiler chicken fed with commercial feeds and given 2 liters of guava leaves decoction mixed in 16 liters of water (T_2) and broiler chicken fed with commercial feeds and given commercial antibiotic and vitamins mixed in their water (T_3).

Statistical analysis using the Analysis of Variance (ANOVA) revealed no significant differences among the treatments in all the data that had been collected. However, comparison of treatment means using the Duncan's Multiple Range Test (DMRT) revealed significant difference between broiler chicken given commercial antibiotic-vitamin and broiler chicken given water only (control) of 187g or 0.187kg difference in the final weight, and average daily and total gain in weight of 7g and 185g respectively, indicating that broiler chicken given the commercial antibiotic-vitamin exhibited the most efficient effect of treatments. Also, broiler chicken given commercial antibiotic-vitamin got the highest ROCE of 4.99 %.

INTRODUCTION

The high cost of commercial feeds and antibiotics for birds has caused the poultry producers in many parts of the world to become a losing venture. In overcoming such a problem, poultry raisers need to use local alternative or supplementation that may lessen the impact of high costs of feeds and antibiotics.

Unfortunately, nearly all sources of agricultural by-products and plant protein posses associated high fiber and anti-nutritional factors which must be eliminated by special processing techniques to make them of maximum nutritional value. Water soaking, autoclaving, cooking in boiling water, steaming, radiation and treatment with acid or alkaline considered among the most common processing procedures being in use to improve the nutritive value as reported by many investigators (Abiola *et al.*, 2002, Hamza*et al.*, 2002, González-Alvarado *et al*., 2007, García *et al*., 2008 and Ferreiral *et. al.*, 2008).

Recently, Araujo *et al*. (2008) indicated that guava (*Psidium guajava L.*) is a tropical fruit, widely consumed fresh and also processed (beverages, syrup, ice cream, and jams). Pulp and peel fractions were tested, and both showed high content of dietary fiber (48.55-49.42%) and extractable polyphenols (2.62-7.79%). These results indicate that guava could be a suitable source of natural antioxidants. Peel and pulp could also be used to obtain antioxidant dietary fiber (AODF).

The guava fruit extract showed *in vitro* has antimicrobial activity against *Escherichia coli*, *Salmonella typhi, Staphylococcus aureus, Proteus mirabilis,* and *Shigella dysenteria.* The leaf extract is against *Staphylococcus aureus.* It was shown to antibacterialin another study and in addition to *Staphylococcus aureus* was also useful against *Streptococcus spp*. The leaves are rich in tannin, and have antiseptic properties (Anil Kumar, 2012).

The result of this study was to determine the efficacy of guava decoction as alternative or supplementary for vitamins and antibiotics. This is another way for the poultry producers to overcome their problem on the high cost of commercial vitamins and antibiotics and so that their business will become more profitable.

The objectives of the study were to:

1. determine the effect of supplemental guava leaves decoction in terms of growth, feed consumption, morbidity, and mortality, of broiler chickens at La Trinidad, Benguet condition and;

2. evaluate the return on cash expenses from the different groups or treatments.

This study was conducted at the Benguet State University (BSU) Poultry Experimental House located in Balili, La Trinidad, Benguet from January to March of 2013.

REVIEW OF LITERATURE

The whole plant of guava can be used to treatment of skin diseases, skin rash, edema, abscesses, bleeding from vagina, infectious wounds and mucous bloody stools; asa pus and lymph absorber, deodorant, antidiarrheal and antidysenteric. Guava leaves can be used for masking of alcohol smell on the breath, for wound healing, diarrhea and dysentery; treatment of gum inflammation, chronic wounds, infectious wounds, in growing nails, skin diseases, gastrointestinal disorders, mucous bloody stools and allergy from mosquitoes; as pus and lymph absorber and deodorant (Farnsworth and Bunyapraphatsara, 1992).

In the Philippines the astringent, unripe fruit, the leaves, the cortex of the bark and roots through more often the leaves only in the form of a decoction, are used for washing ulcers and wounds. Guerrero states that the bark and leaves are astringent, vulnerary, and when decocted, antidiarhetic. The bark is used in the chronic diarrhea of children and sometimes adults; half an ounce of the bark is boiled down with six ounces of water to 3 ounces; the dose (for children) is one teaspoonful 3 to 4 times a day. The root-bark has been recommended for chronic diarrhea. In a decoction of ½ oz. in 6 oz. of water, boiled down to 3 oz. and given in teaspoonful doses; and also recommended as a local application in prolapsus and of children. A decoction of the root-bark is recommended as a mouthwash for swollen gums (Anonymous, 2012).

Guava leaves are used in folk medicine as a remedy for diarrhea and, as well as the bark, for their supposed antimicrobial properties and as an astringent. Guava leaves or bark are used in traditional treatments against diabetes. The leaves, when chewed, are said to be remedy for toothache. In Trinidad, a tea made from young leaves is used for diarrhea, dysentery and fever. The decocted leaves are used in Mexico for cleansing ulcers. The ground leaves make an excellent poultice. A decoction of the young leaves and shoots is prescribed in the West Indies for febrifuge and antispasmodic baths, and an infusion of the leaves for cerebral affections, nephritis, and cachexia; the pounded leaves are applied locally for rheumatism; an extract is used for epilepsy and chorea; and the tincture is rubbed into the spine of children suffering from convulsions. The leaves have also been used successfully as an astringent in diarrhea. In Mexico the leaves are said to be a remedy for itches. In Uruguay, a decoction of the leaves is used as a vaginal and uterine wash, especially in leucorrhoea (Anonymous, 2012).

According to Farnsworth and Bunyapraphatsara, (1992), there are some bits of information of pharmacological activities of guava leaf: 1. Antiviral activity: Fresh guava leaf juice at a concentration of 66% was effective against tobacco mosaic virus; 2. Antibacterial activity: Saline extract of guava leaves (1:40) was effective against *Staphylococcus aureus*, but showed no activity against *Escherichia coli*. The water extract of dried leaves also possessed bactericidal activity against *S. aureus*, *Sarcinalutea* and *Mycobacteriumphlei*. Moreover, the water extract of leaves was also reported to be effective against *Shigella dysenteriae*; 3. Antifungal and anti yeast activities: Various solvents were used in extracting the dried leaves in a study for antifungal activity. It was found that 95% alcohol, acetone and water extracts, at concentrations of 50% showed no in vitro fungicidal activity against *Neurosporacrassa*. A hot water extract was also not effective against *Aspergillusniger* or *Saccharomyces cerevisiae*; 4. Molluscicidal activity: Water saturated with the essential oil from fresh guava leaves, was not effective against *Biomphalariaglabrata*; 5. Antiscorbutic activity: Guava leaves, containing high vitamin C content, showed antiscurvy when administered orally to guinea pigs at a dose of 1 g daily;

6. Acetylcholine release inhibition: An alcohol extract of guava leaves exhibited a morphine-like inhibition of acetylcholinerelease in the coaxially stimulated guinea pig ileums. The morphine-like inhibition was found due to quercetin and quercetin-3-arabinose starting at a concentration of 1.6µg/mL; 7. Antidiarrheal activity: A double-blind study of the powdered leaves of guava was compared with tetracycline in the treatment of 122 diarrhoeal patients (64 males and 58 females) at ages of 16 – 55years. Both guava leaves and tetracycline were administered at a dose of 500 mg every 6 hours for 3 days. There was no significant difference in the results using T-testbetween guava leaves and tetracycline.

Also, other investigators reported the antimicrobial activity of guava leaf extracts. Goncalves *et al.* (2001) have also reported the antibacterial effect of guava leaves extracts and found that they inhibited the growth of the *S. aureus*. Gnan *et al.* (1999) testing guava leaf extract found good antimicrobial activity against nine different strains of *Staphylococcus aureus*. Jaiarj *et al.* (1999), testing for antibacterial action of aqueous, methanol and chloroform extracts of *P. guajava*, on strains of *S. aureus* isolated from clinical patients, obtained better results from aqueous extracts than from methanol extract. Aguilar *et al.* (1993) described the antibiotic activity of the aqueous extract of dried leaves of *Psidium guajava* to two compounds, namely guajaverin and psidiolic acid. Cortez *et al.* (2005) evaluated the antibacterial activities of *Psidium guajava* against Gram positive and negative bacteria testing ethanol: water extract of *P. guajava* leaves, stem bark and root, and aqueous extract against *Staphylococcus aureus* were found to be more active by using ethanol: water extract than with just aqueous extract.

Recently, Wedy J. Lannaon (2009) conducted an experiment on the decoction of leaves of different herbal trees used as antibiotics for broiler where guava is included and she claimed that it has a significant on the performance of the chicken in terms of growth, mortality, and weight gain.

MATERIALS AND METHODS

Materials

The materials used were sacks, guava leaves (any variety), bulbs, disinfectant, old newspapers, commercial feeds, weighing scale, commercial antibiotic and vitamin premix, pails, brooding-rearing cages, feeder troughs, waterers, and the experimental 132 heads broiler chicks.

Methods

Preparatory measures. Before the arrival of the chicks, all facilities including the cages, feeding troughs, and waterers were thoroughly cleaned and disinfected. The old newspaper sheets were used to cover the floor, while the sacks for covering the sidings of the cages to maintain the temperature inside. The bulbs also were used to provide the heat needed by the broiler chicks.

Upon arrival of the 132 broiler chicks, they were placed inside three of brooder cages. These birds were fed ad libitum with commercial feeds (booster) and their water was available at all times. The birds had been cared for seven days before distributed into three treatment groups with four replication for each.

Preparation of guava decoction. Two hundred grams of matured leaves were collected from guava trees and these were washed and boiled in four liters of clean water until two liters of the water was remained. The remaining two liters of the guava decoction was mixed in sixteen liters of clean water and these were given to the broilers.

Treatment and experimental design. In the eight day from their arrival, these experimental birds were weighed to obtain their initial weight, and evenly distributed into three treatment groups following a Completely Randomized Design (CRD). Each treatment group had four replications and each replication consisted of 11 birds.

The three treatment groups were the following:

T_1 = commercial feeds + water only (control)

T_2 = commercial feeds + 2 liters of guava leaves decoction mixed in 16 liters of water

T_3 = commercial feeds + commercial antibiotic-vitamins mixed in the water

Management of experimental animals. The birds at all treatments were given the same care and management except for introducing different treatments to each of the groups from day eight to the 35^{th} day of the experiment. The birds from Treatment one (T_1) were given commercial feeds and water without antibiotic (control). Treatment two (T_2) birds were given commercial feeds with 2 liters of guava decoction mixed with 16 liters of water. Treatment three (T_3) birds were given commercial feeds with commercial antibiotic and vitamins mixed with their water. The antibiotic-vitamin premix was incorporated in the drinking water from day eight to the 35^{th} day of the experiment.

The shifting of commercial feeds in each of the groups were from day 1^{st} to day 15^{th} where they were fed with booster, day 16^{th} to day 30^{th} the feeds were shifted into starter, and day 31^{st} to the end of the experiment (35^{th} day), the feeds were shifted into grower ration.

Data Collected

1. Initial weight (kg). This refers to the weight of the birds at the start of the study. This was taken at day eight from the arrival of the chicks.

2. Final weight (kg). This refers to the weight of the birds taken at the end of the experiment which was at 35th day from arrival.

3. Daily feed offered (kg). This refers to the ration or to the amount of feeds offered daily.

4. Total feed offered (kg). Summation of feeds offered from day eight until day thirty-fifth.

5. Daily feed left-over (kg). The weight of the feeds left daily on the feeding troughs.

6. Total feed left-over (kg). The summation of feed left-overs from day eight until thirty-fifth.

7. Water consumption (ml). This was measured and recorded every time the water is replaced.

8. Morbidity. Refers to the number of birds that got sick during the duration of the study.

9. Mortality. This refers to the number of dead birds during the duration of the study.

Data Computed

1. Total gain in weight (kg). This was computed as a group by subtracting the initial weight from the final weight.

Total gain in weight = final weight – initial weight

2. Average daily gain (kg). This was obtained per treatment by dividing the total gain in weight by the duration of the experiment (28 days).

Average daily gain of the group = total gain in weight / duration of experiment (days)

3. Total feed consumption (kg). The amount of feeds consumed by the birds from the start until the end of the experiment (day 8^{th} to day 35^{th}). This was computed by adding the total feeds offered after the total left- over have been subtracted.

Total feed consumption = total feed offered – total left-over

4. Feed conversion ratio (FCR). This was obtained per treatment by dividing the total feed consumed by the total gain in weight. FCR is computed for the whole duration of the experiment (30 days).

FCR = total feed consumed / total gain in weight

5. Total cost of the total feed consumed (PhP). This was obtained by multiplying the cost of feed per kilogram to the total feed consumed.

Cost of the total feed consumed = cost of feed per kilogram × total feed consumed

6. Feed cost per kg gain of broiler (PhP). The feed cost per kilogram of gain in weight and this was computed as the price of feeds per kilogram multiplied by the total gain in weight.

Feed cost per kilogram gain (PhP) = price of feeds per kg × total gain in weight

7. Morbidity rate (%). This was computed as a group by the number of sick birds divided by the initial number of the birds in each group and multiplied by 100.

Morbidity rate (%) = no. of sick chickens / initial number of birds as a group × 100

8. Mortality rate (%). This was obtained in each treatment by dividing the number of dead birds from the start (day 8th) until to the end of the experiment (day 35th) by the total number of the birds from the start of the study and then multiplied by 100.

Mortality rate (%) = no. of dead chickens / initial number of birds as a group × 100

9. Cost of production (PhP). This includes the cost of stocks, feeds, commercial antibiotics and vitamins, electricity, and materials used.

10. Gross income (PhP). This was obtained as a group by multiplying the sum of the final weight of the birds by the price per kilogram of liveweight.

Gross Income = total weight of the birds (as a group) × price per kilogram

11. Net income (PhP). This was obtained by subtracting the cost of production from the gross income.

Net income = gross income – cost of production

12. Return on Cash Expenses (%). This was obtained by dividing the net income by the total expenses then multiplied by 100.

ROCE = Net income / Total expenses × 100

Data Analysis

The data was analyzed using the Analysis of Variance and comparing the means from each treatment groups by using the Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Initial and Final Weight

Table 1 presents the means of initial and final weight of the broilers. Statistical analysis revealed that the mean initial weights of the broilers is not significantly different. This means that they have the same initial weights.

Comparing the means at .05 level of differences using DMRT showed not significant difference in their initial weights. For the mean final weight of birds treatment three (T_3) was significantly higher among the two treatments. And followed by treatment two (T_2) which was significantly higher than treatment (T_1).

Total and Average Daily Gain (ADG) in Weight

The total gain in weight and average daily gain in weight are shown in Table 2. Statistical analysis revealed that the treatments in the total gain in weight were not significantly different same through with treatments in the average daily gain in weight.

Table 1. Initial and final weight of birds at 8 days old and 35 days old respectively

TREATMENT	INITIAL WEIGHT (kg)	FINAL WEIGHT (kg)
Commercial feeds + water only	0.105^{a}	1.201^{b}
feeds + decocted guava leaves mixed with their water	0.104^{a}	1.362^{ab}
Commercial feeds +antibiotic-vitamin premix mixed with their water	0.107^{a}	1.388^{a}

Means with the same superscript are not significantly different ($P \geq 0.05$) DMRT

Comparing the means at .05 level of differences using DMRT in the total gain in weight the treatment three (T_3) was significantly higher than the two treatments, and the treatment two (T_2) also was significantly higher than treatment one (T_1). These indicate that guava decoction has an effect on the gain in weight of the birds and this coincides with the conclusion of Linnaon (2009).

Feed and Water Consumption

Table 3 shows the data of the feed and water consumption of the experimental birds. Statistical analysis revealed no significant differences of the treatments in the feed consumption and the water consumption.

Comparing the treatment meansfor the feed consumption and for water consumption there were no significant differences as computed at 0.05 level of difference using the DMRT.

Table 2. Total and average daily gain (ADG) in weight

TREATMENT	**TOTAL GAIN (kg)**	**AVE. DAILY GAIN (kg)**
Commercial feeds + water only	1.096^{b}	0.039^{b}
Feeds + decocted guava leaves mixed with their water	1.258^{ab}	0.045^{ab}
Commercial feeds + antibiotic-vitamin premix mixed with their water	1.281^{a}	0.046^{a}

Means with the same superscript are not significantly different ($P \geq 0.05$) DMRT

Table 3. Feed and water consumption

TREATMENT	FEED CONSUMPTION (kg)	WATER CONSUMPTION (L)
Commercial feeds + water only	1.989 [a]	3.999 [a]
feeds + decocted guava leaves mixed with their water	2.031 [a]	4.251 [a]
Commercial feeds + antibiotic-vitamin premix mixed with their water	2.034 [a]	4.228 [a]

Means with the same superscript are not significantly different ($P \geq 0.05$) DMRT

Feed Conversion Ratio (FCR)

The mean results of Feed Conversion Ratio (FCR) is shown in Table 4. Statistical analysis revealed no significant differences. But, comparing treatment means at .05 level of differences using DMRT, the treatment one (T_1) had the highest significant difference followed by treatment two (T_2).

Mortality and Morbidity Rate (%)

Table 5 presents the morbidity and mortality rate.Statistical analysis revealed no significant differences of treatments in the morbidity rate and same through with the mortality rate.

All treatments had one bird that was dead during the duration of experiment of unknown caused and which give an equal percentage of 2.273 % to all treatments.

Table 4.Feed conversion ratio (FCR)

TREATMENT	FCR
Commercial feeds + water only	1.826[a]
Feeds + decocted guava leaves mixed with their water	1.624[ab]
Commercial feeds + antibiotic-vitamin premix mixed with their water	1.591[b]

Means with the same superscript are not significantly different (P ≥ 0.05) DMRT

Table 5. Mortality and morbidity rate

TREATMENT	MORBIDITY RATE (%)	MORTALITY RATE (%)
Commercial feeds + water only	0	2.273[a]
Feeds + decocted guava leaves mixed with their water	0	2.273[a]
Commercial feeds + antibiotic-vitamin premix mixed with their water	0	2.273[a]

Means with the same superscript are not significantly different (P ≥ 0.05) DMRT

Feed Cost per Kilogram Gain in Weight

Table 6 presents the feed cost per kilogram gain in weight of broilers. Statistically, there were no significant differences as computed. But comparing treatment means at .05 level of differences using DMRT, treatment one (T1) shows a higher cost of Php51.126 than treatment two (T2) at Php45.477 and treatment three (T3) at Php44.543. These results imply that guava decoction increases the conversion of feeds into body gain in weight, thus, increases the profit.

Table 6. Feed cost per kilogram gain in weight

TREATMENT	MEAN (Php)
Commercial feeds + water only	51.126[a]
Feeds + decocted guava mixed with their water	45.477[ab]
Commercial feeds + antibiotic-vitamin premix mixed with their water	44.543[b]

Means with the same superscript are not significantly different ($P \geq 0.05$) DMRT

Return on Cash Expenses (ROCE)

Table 7 shows the cost and return analysis per treatment. It was not statistically analyzed but the highest return on cash expenses of4.99%was obtained from broilers under treatment three (T3) given the antibiotic-vitamin premix. Followed by broilers under treatment two (T2) that had a return on cash expenses of 2.26 % while treatment one (T1) had a negative return on cash expensesof – 4.37 % indicating that the total sales couldn't compensated the total cost of production instead decreases.

The computations for the profit or return on cash expenses in this study was suggested not to be your basis for your computations when you are planning to have a business. The expenses for housing was not included in the total cost of production and the cost of labor, feeds, and electricity that was used here may vary.

Table 7. Returns on cash expenses

TREATMENT	TOTAL SALES (PhP)	TOTAL COST OF PRODUCTION (PhP)	NET PROFIT (PhP)	ROCE (%)
Commercial feeds + water only	5422	5670	-248	-4.37
Feeds + decocted guava leaves mixed with their water	6149	6013	136	2.26
Commercial feeds + antibiotic-vitamin premixmixed with their water	6266	5968	298	4.99