BIBLIOGRAPHY

BOSLENG, KRIS-AN T. APRIL 2012. Growth Performance of Sunshine Chicken Given Garlic (*Allium sativum*) as Feed Supplement. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at the Benguet State University experimental project from October to December 2011to compare the level of garlicand with antibiotic premix on water on the growth performance of sunshine chicken, feed consumption, feed efficiency, morbidity and mortality, and lastly on the return of investment.

A total of 160 Sunshine Chicken day old chicks were randomly distributed after having a 5 day trial feeding into four treatments following the Complete Randomized Design (CRD). The four treatments were replicated four times with ten birds per replicate.

The result and observation showed after 56 days of the experiment that there were no significant in terms of the initial weight and total feed intake. While on the feed conversion ratio it was shown that it is significant same as through on the final weight, total feed intake, average daily gain, and total feed cost required to produce a kilogram in weight which has a result of highly significant.

Apparently, the treated sunshine chicken with 30 grams of garlic granules has a better effect when it comes to its final weight, total gain in weight, average daily gain and on the return on investment which has a higher percentage than those of the other treatments of 31.75 %.

TABLE OF CONTENTS

INTRODUCTION

Animal raising is an important and diverse component of Philippines Agriculture and one of it is poultry production which is a practice of raising domesticated birds, for the purpose of meat and egg as a part of our diet.

Feeding has a great effect in the growth of poultry industry and almost research now a day is focused on finding new supplement that improves animal performance that's why it is important to the raisers to know what the best feed is for their bird is. And we know the fact that chickens are omnivores, eating most anything they find. This eating habit of chicken makes them easy to feed a variety of supplemental feed. Though commercial feed provides a good base diet for chicken, it is still efficient if we add an herbal supplement on their diet which could boost its growth performance that will increase our profit.

This study allows us to improve more on chicken traits such as performance, and immune response. It was also conducted to find out the effect of garlic granules as a feed supplement to sunshine chickens. The result of this study can serve as a guide in using garlic granules as a feed supplement in chickens.Lastly, the research can be a good start to enhance the performance of chickens that can result to high income and profit.

The Studyspecifically aimed todetermine the effect of garlic in terms of: growth performance, feed consumption, feed efficiency, morbidity and mortality of chickens, and return on investment. And to determine the best level of granulated garlic to be utilized as feed supplement for sunshine chicken.

This study was conducted at the Benguet State University (BSU) Poultry Experimental House Balili, La Trinidad, Benguet.

REVIEW OF LITERATURE

Chicken broiler and egg production are the most progressive animal enterprises in the Philippines today. The poultry industry in fact began as a backyard enterprise but has shifted to the formation of very large integrated contract farming operations. The growth of poultry industry in the Philippines has indeed been impressive but its problems including inefficient management and the prevalence of many destructive poultry diseases and parasites cannot be ignored (EPA, 2005).

The practice of complementary and alternative medicine is now on the increase in developing countries in response to World Health Organization directives culminating in several pre-clinical and clinical studies that have provided the scientific basis for the efficacy of many plants used in folk medicine to treat infections (Vijaya and Ananthan, 1997; Dilhuydy and Patients, 2003; Iwalokun *et al*., 2004). Previous studies have demonstrated positive effects of herbal supplements on production performance and carcass quality to chickens (Schleicher *et al*., 1998; Tekeli *et al*., 2006, 2008).

In pursuit of improved broilers health and in order to fulfill consumer expectation in relation to food quality, poultry producers commonly apply natural feeding supplements, mainly herbs (Gardzielewska *et al*., 2003).

Garlic is one of the most beneficial natural food supplements. This is because of garlic's numerous significant health benefits. First of all, garlic helps to detoxify the body while enhancing the immune system. This makes garlic beneficial for fighting colds and infections. Garlic also is well known as a natural way to lower blood pressure while improving circulation. However, the benefits of garlic don't stop here. Garlic lowers blood lipid levels, helps to stabilize blood sugar levels, and may even help prevent ulcers.

Garlic is helpful for virtually any disease or infection, making it one of the most popular herbal food supplements (Anonymous, 2007).

Garlic, a member of the Allium family (Liliaceae), has been used traditionally for ages to treat a wide array of diseases, namely, respiratory infections, ulcers, diarrhea and skin infections (Fenwick and Hanley, 1985). Reuter *et al.* (1996) reported garlic as a plant with antibiotic, anticancer, antioxidant, immunomodulatory, anti-inflammatory, hypoglycemic and cardiovascular- protecting effects.

Moreover, garlic is very rich in aromatic oils, which enhance digestion and positively influenced respiratory system being inhaled into air sacs and lungs of birds. Also it was found that garlic has strong antioxidative effects (Gardzielewska *et al*., 2003).

Garlic extract and/or garlic components were able to prevent chemically induced tumors or acute toxic effects of chemicals. The chemo-preventive potential of garlic has been attributed to the presence of several bioactive organosulfur compounds. These compounds might act as antioxidants (Fanelli *et al*., 1998; Siegers *et al*., 1999). The antioxidative stress properties of garlic might result from the contributions of its sulfur component in different steps and not necessarily from the contribution of only one of them (Fanelli *et al*., 1998). Garlic also has been shown to have strong antimicrobial action (Iwalokun *et al*., 2004; Gbenga *et al*., 2009). Allicin and its derivatives have been shown to be a larvicidal and bacteriostatic, active against both Gram positive or Gram negative organisms as well as fungi such as *Candida albicans* and viruses including influenza viruses (Chang and Cheong, 2008). *Allium sativum* taken at a low dose may have some therapeutics potentials against gastric ulcers associated with *H.*

*pylori*infection(Adeniyi *et al*., 2006). Garlic extracts do have significant inhibitory effects against microorganisms associated with dental caries (Masaadeh *et al*., 2006).

When garlic is crushed, its health-promoting properties are released. Allicin is an antibiotic and an anti-fungal. Garlic also contains Vitamin B, enzymes, minerals and flavonoids, which attack cancer-causing free-radicals. Garlic's composition offers many healing possibilities (Paige, 1999).

Raw garlic is more potent; cooking garlic reduces the effect the green, dry 'folds' in the center of the garlic clove are especially pungent. The sulfur compound allicin, produced by crushing or chewing fresh garlic, produces other sulfur compounds: ajoene, allyl sulfides, and vinyldithiins. Aged garlic lacks allicin, but may have some activity due to the presence of S-allylcysteine. Allicin is released only by crushing or chewing raw garlic and cannot be formed from cooked garlic.

Garlic may interact with warfarin, antiplatelets, saquinavir, antihypertensives, calcium channel blockers, and hypoglycemic drugs, as well as other medications.Members of the *alium* family might be toxic to cats or dogs. Some degree of liver toxicity has been demonstrated in rats, particularly in extremely large quantities exceeding those that a rat would consume under normal situations (Wikipedia, 2011).

A study conducted by Raeesi*et al.*, 2010 on the effect of periodical use of Garlic (alliumsativum) powder on performance and carcasscharacteristics in broiler chickens showed that birds which received 1 and 3% garlic powder hadgreater weight gain than those who were fed 0.5% garlicpowder or the control group. The weight gain did not showsignificant differences between treatments from 0 to 21days.From day 22-42, treatments which received 1% garlic powder had greater body weight gain than others.

Thesedifferences were significant except between thesetreatments and those which got 0.5% garlic powder.Although birds who received garlic in their finisher diet only had greater body weight gain than others, period of feedinggarlic (starter, finisher or the whole of the experiment) had nosignificant effect on body weight gain.In the whole duration of the experiment (0-42 d), addition of 1 and 3% garlic to basal diets significantly increased body weight gainas compared with 0.5% garlic supplemented groups but it was not significant in comparison with control group.Groups which were fed garlic in the finisher diet had greater body weight gain but, the period of using garlic did not affect body weight gain significantly.

Feed intake was significantly higher in control group. Birds received garlic for the whole of theexperiment, had higher feed intake but generally, period offeeding garlic did not affect feed intake significantly.Chowdhuury*et al.*, 2002, added different levels of garlic to layersdiet. They reported no significant effects of thissupplementation on growth, feed intake and feed efficiency.

Supplementation of 1% garlic powder, decreased feedconversion rate (FCR) compared with 0.5% supplemented and control group, significantly. Birds received 3%garlic powder in their diets had better FCR than control group.Control groups significantly consumed more feed than theothers, except those which were supplemented with 0.5% garlic powder. There were no significant differencesbetween control and 0.5% supplemented group, although thelatter had lower FCR. Groups which were supplemented withgarlic powder in just the finisher diet had better FCR thanthose which were supplemented for the whole of theexperiment. Control groups consumed more feed than the others but they had no significant difference withthose which supplemented with

garlic in starter diet. Jamroz*et al*., 2005, reported that capsaicin, cinamaldehyde and carvacroldecreased FCR significantly in broiler chickens. Howeverthey did not affect body weight gain at all. Demir*et al*., 2003, added thyme and garlic powder to broilers diet. Theyconcluded that this supplementation did not affect growth,feed intake and feed conversion rate in whole of theexperiment. Konjufca*et al*., 1997, reported that althoughperformance was not affected when broiler diets weresupplemented with 1.5, 3 and 4.5% garlic in powder form,their serum and liver cholesterol decreased significantly. Theyalso indicated that this supplementation did not influence feedconversion rate. Lewis *et al*.,2003, reported that garlic extractincreased body weight gain and also improved feedconversion rate in broilers between 7-27d. Alcicek*et al*., 2003, indicated that broilers which received blend of essential oils,had higher weight and feed intake and also lower feedconversion rate than control group.

In conclusion, 1 and 3% supplemented groups in finisherperiod had better performance as compared with other groups.Since present study conducted in optimum and antisepticconditions, it seems that better or more responses could beexpected in performance if the raising conditions would not behealthy. The authors suggest it needs more studies to conductin more periods to achieve more accurate results.

According to USDA (2011).the Nutrient content of raw garlic per 100 g serving is as follows:

Energy	623 kJ (149 kcal)
Carbohydrates	33.06 g
- Sugars	1.00g
- Dietary fiber	2.1 g
Fat	0.5 g

Protein	6.39 g
- beta-carotene	5 µg (0%)
Thiamine (Vit. B_1)	0.2 mg (15%)
Riboflavin (Vit. B_2)	0.11 mg (7%)
Niacin (Vit. B_3)	0.7 mg (5%)
Pantothenic acid (B_5)	0.596 mg (12%)
Vitamin B_6	1.235 mg (95%)
Folate (Vit. B_9)	3 µg (1%)
Vitamin C	31.2 mg (52%)
Calcium	181 mg (18%)
Iron	1.7 mg (14%)
Magnesium	25 mg (7%)
Phosphorus	153 mg (22%)
Potassium	401 mg (9%)
Sodium	17 mg (1%)
Zinc	1.16 mg (12%)
Manganese	1.672 mg
Selenium	14.2 µg

METHODOLOGY

Materials

The material that was used were 160 heads of Sunshine Chicken, Commercial Feeds (CF), Garlic, Antibiotic Premix, Brooding-rearing Cages, Feeders, Waterers, Sacks, Incandescent Bulb (100 watts), Old Newspaper Sheets, Weighing Scales, Pails, Record Book, and Disinfectant.

Methodology

Pre-experimental phase. Before the arrival of the chicks, the brooding pens together with the feeding through and watererswas thoroughly cleaned and disinfected. The floor was covered with old news paper sheets and the light was switched on a few hours before the arrival of the chicks.

Upon arrival of the chicks, theywere placed inside the brooder house (Figure 1) where they were fed with B-Meg Integra 1000. Water was available to them at all times. During this pre-experimental period which was lasted for five days, the birds were given the same care and management. They were fed twice a day, once in a morning and once in the afternoon.

Preparation of garlic supplement. Clean garlic was bought from the market, and then diced (Figure 2). The resulting product was added on the basal diet of Sunshine Chicken on specified amounts depending on treatment.

Figure 1. Chicks inside the brooding house

Figure 2.The diced garlic supplement

Experimental design and treatment. After 5 days, the experimental birds was weighed to obtain their initial weight, and was distributed at random into four treatments following the Completely Randomized Design (CRD) each treatment was replicated fourtimes with 10 birds per replication, making a total of 40 birds per treatment.

The four treatments were the following:

T_0= Commercial Feeds with antibiotic premix in the water (Control)

T_1= 15 g Garlic / kg of Commercial Feeds (Figure 3)

T_2= 30 g Garlic / kg of Commercial Feeds (Figure 4)

T_3= Commercial Feeds with no antibiotic premix

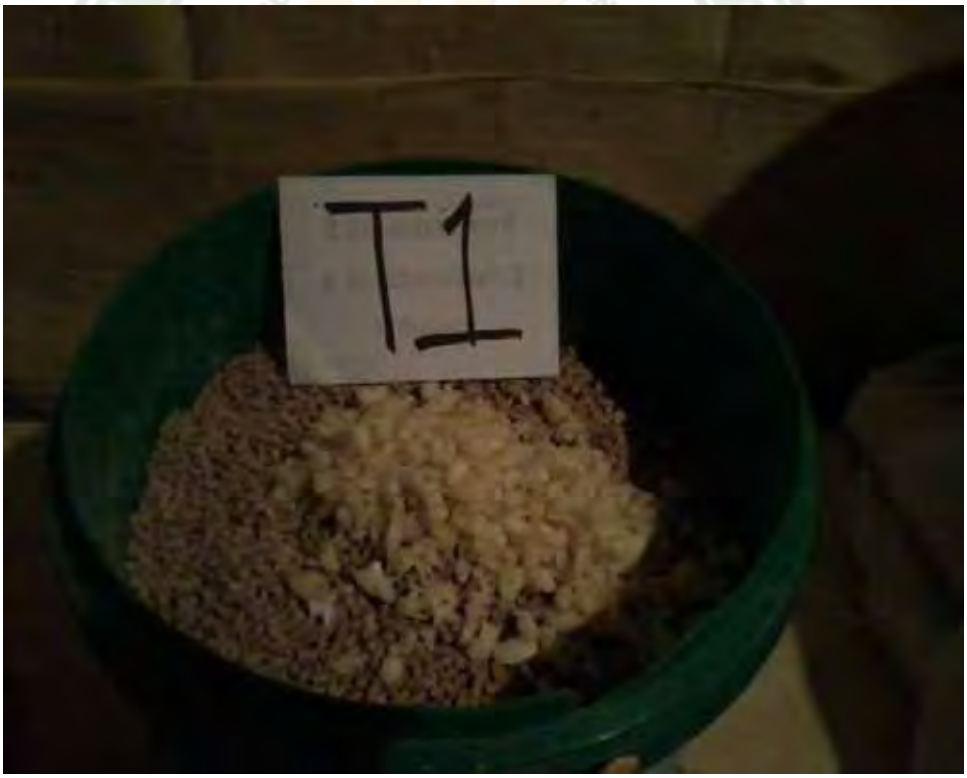

Figure 3. Commercial Feeds with 15g garlic

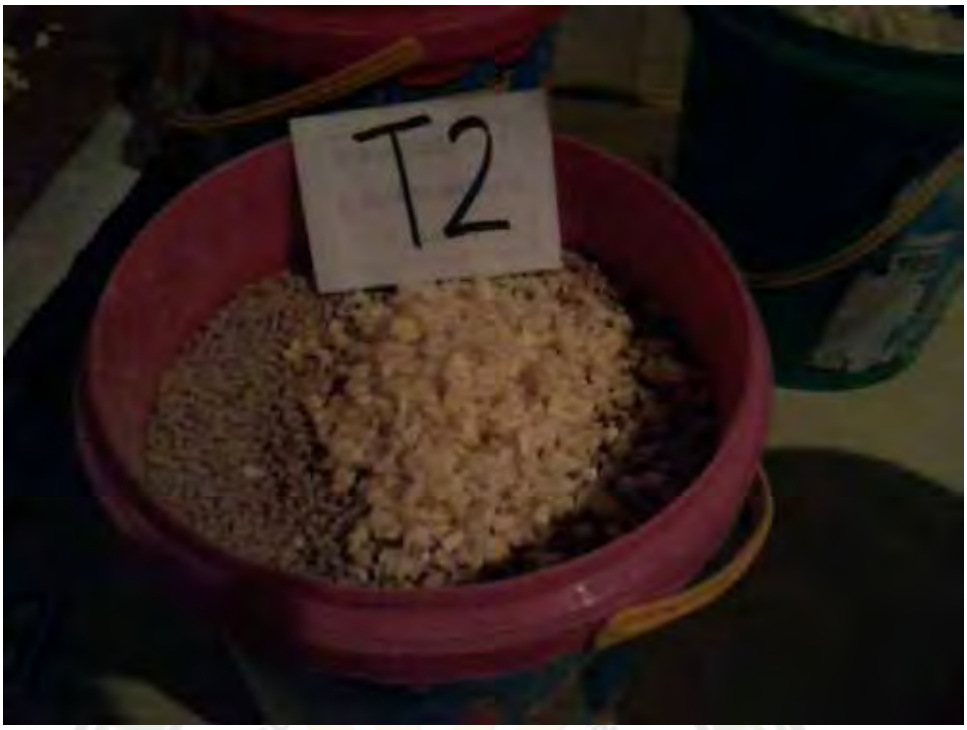

Figure 4. Commercial Feeds with 30g garlic

Care and management of birds. The garlic was fed to the birds from six until fifty six days of age. The birds in all treatments were given the same care and management except on the levels of garlic that was added to their ration. The birds on the Control (T_0) was fed commercial feeds with antibiotic premix in the water; while the birds that were assigned to $T_1$was given 15 grams garlic per kilogram of commercial feeds (Figure 3). The T_2 birds were given 30 grams garlic per kilogram of commercial feeds (Figure 4), and those under T_3were given commercial feeds with no antibiotic premix. The birds were fed with B-Meg Integra 1000 from day 1 up to 14 days, while B-Meg Integra 2000during 15-42 days, and B-Meg Integra 3000from 43 daysto the end of the study at 56 days.

Data Gathered

The data gathered as follows:

1. Initial weight (kg). This refers to the weight of the birds at the start of the study. This was taken after when the chicks were six days old.

2. Final weight (kg). This refers to the weight of the birds at 56 days of age.

3. Feed offered (kg). This refers to the total amount of feeds consumed by the birds from the start of the study until the end of the experiment. This was taken by adding all the feeds offered to the birds after the left-overs have been subtracted.

4. Feed leftover (kg). The weight of the feeds left in the feeding troughs taken every morning before feeding.

5. Mortality. This refers to the number of dead birds during the experiment.

6. Morbidity. This refers to the number of birds that got sick during the duration of the study.

7. Commercial feed cost. This refers to the cost of commercial feeds.

8. Cost of garlic granules. This refers to the cost ofgarlic.

7. Total feed cost. This refers to the cost of commercial feeds and the garlic.

From the data above, the following data was computed:

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

2. Average daily gain (kg). This was obtained by the following formula:

$$\text{Average daily gain} = \frac{\textit{Total gain in weight}}{\textit{Experimental period}}$$

3. Total feed intake. This was obtained by adding the amount of feed offered after the feed left-overs had been subtracted.

4. Feed conversion ratio. This was obtained by dividing the total feed intake by the total gain in weight.

5. Feed cost required to produce a kilogram gain in weight. This was obtained by multiplying the cost of one kilogram feed mixture by the FCR.

6. Percent Mortality. This was obtained by dividing the total number of dead birds in each treatment and multiplied by 100%.

7. Net returns. This was obtained by subtracting the total cost of production from the total sales.

8. Return on investment (ROI). This was computed using the following formula:

$$ROI = \frac{\textit{Total sales - total cost of production}}{\textit{Total cost of production}} \textit{ x 100}$$

9. Morbidity rate (%). This was computed by dividing the number of sick birds by their initial number multiplied by 100.

10. Mortality rate (%). This was obtained by dividing the number of dead birds from the start until the end of the experiment by the total number of birds at the start of the study multiplied by 100.

11. Cost of production (php). This includes the cost of stocks, feeds, labor and other materials that used in the study.

12. Gross income. This was obtained by multiplying the final weight of the birds by their price per kilogram live weight.

Data Analysis

The data was subjected to analysis of variance for Completely Randomized Design (CRD). Comparison of treatment means was done using Duncan's Multiple

Range Test (DMRT).

RESULTS AND DISCUSSION

Initial Weight

The average initial weights shown in Table 1 were taken when the experimental birds were 6 days old. Statistical analysis revealed that there were no significant differences among the treatments. While there are slight differences in the body weights of the experimental birds presented in the table, such difference were very minimal to cause a significant difference among the treatments. Result also implies that the experimental birds had more or less the same in weight at the start of the study. The average initial weight is 0.380 kg.

Final Weight

The final weights of the sunshine chicken at 56 days of age in all treatments are also shown in Table 1. The results indicate that the final weights of birds tend to increase as the level of garlic in the diets was elevated. The birds given 30 g weighed the heaviest. This was followed by the birds given 15 g garlic and those fed commercial feeds only but with antibiotic premix in water, respectively. Meanwhile, the weights of the birds fed commercial feeds with no antibiotic premix were comparable to the two former treatments. The increase in weights could be attributed to the stimulating effect on the immune system of the birds and its rich aromatic oils which enhanced their digestion as cited by Gardzielewska*et al.* (2003).

Total Gain in Weight

Table 2 presents the total gain in weight of the birds in the different treatments. Statistical analysis shows highly significant differences among the treatment means.

Table 1. Initial weight at 6 days and final weight at 56 days of age of the birds

TREATMENT	WEIGHT (kg)	
	INITIAL	FINAL
Commercial Feeds(CF) with antibiotic premix in the water	0.131[a]	1.908[c]
15 grams of garlic / kg of CF	0.131[a]	2.083[b]
30 grams of garlic / kg of CF	0.130[a]	2.205[a]
Commercial Feeds with no antibiotic premix	0.130[a]	1.966[bc]

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

Thirty grams of garlic supplementation resulted to a mean gain of 2.077 kg, same with the group fed with fifteen grams which is 1.952. The group fed with commercial feeds and lastly the one fed with commercial feeds with antibiotic premix in the water had comparable means which were lower than the above mentioned means.This collaborates with the study of Raeesi*et al.* which found that the addition of 1 and 3% garlic to basal diets of broilers significantly increased body weight gain as compared with 0.5% garlic supplemented groups. This implies that adding garlic granules on the feeds of the birds positively affects the growth performance of the birds. The result revealed that supplementing 15 to 30 grams garlic granules on sunshine chicken ration improves body weight gain.

Average Daily Gain

Thedifferences between the average daily gain in weight of the birds compared among treatments were highly significant, wherein the experimental birds given with 15to 30 grams garlic were found more capable to gain weight daily than those given commercial feeds only with or without antibiotic premix as shown in Table 2.

Total Feed Intake

The average feed consumption of the birds is shown in Table 3. Statistical analysis showed there were no significant differences among the different treatments. This is similar to the study of Chowdhuury *et al.*, where they added different levels of garlic to layers diet where they reported no significant effects of supplementation on feed intake. This means that all the experimental birds have eaten more or less the same amount of feeds. This implies that the garlic incorporated with the ration of the experimental birds was very minimal and did not significantly increase the feed consumption of the birds.

Feed Conversion Ratio

Table 4likewise presents feed conversion ratio of the treatments. Statistical analysis showed significant differences between treatments. The birds given 30 grams ofantibiotic premix on water.On the other hand, the feed conversion ratio of the birds fed 15 g garlic was comparable to that of the birds given commercial feeds with no antibiotic premix. This result was similarly reported byRaeesi*et al*., where the birds which

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

TREATMENT	GAIN IN WEIGHT (kg)	
	TOTAL	DAILY
Commercial Feeds(CF) with antibiotic premix in the water	1.777^{c}	0.032^{c}
15 grams of garlic / kg of CF	1.952^{b}	0.035^{b}
30 grams of garlic / kg of CF	2.077^{a}	0.037^{a}
Commercial Feeds with no antibiotic premix	1.836^{c}	0.033^{c}

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

Table 3. Total feed intake of the birds

TREATMENT	TOTAL FEED INTAKE (KG)
Commercial Feeds(CF) with antibiotic premix in the water	4.884[a]
15 grams of garlic / kg of CF	4.907[a]
30 grams of garlic / kg of CF	4.950[a]
Commercial Feeds with no antibiotic premix	4.814[a]

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

received 3% garlic powder in their diets had better FCR than control group. This indicates that the addition of garlic on the feeds makes them more efficient in converting feeds to flesh. The overall mean feed conversion ratio of the birds was 2.567. These could be possibly caused by capsaicin, cinamaldehyde and carvacrol which improved FCR in broiler chickens as reported by Jamroz*et al*.

Feed Cost to Produce a Kilogram of Sunshine Chicken

Presented in Table 5 is the feed cost to produce a kilogram increase in body

Table 4. Feed conversion ratio of the birds

TREATMENT	FEED CONVERSION RATIO (KG)
Commercial Feeds(CF) with antibiotic premix in the water	2.75[a]
15 grams of garlic / kg of CF	2.51[ab]
30 grams of garlic / kg of CF	2.39[b]
Commercial Feeds with no antibiotic premix	2.62[ab]

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

weight. Statistical analysis showed that there was a highly significant difference among the treatmentmeans. The birds given the highest amount of garlic (30 grams) has a higher feed cost to produce kilogram gain in weight. There was a direct relationship between the levels ofgarlic and the cost of feed to produce a kilogram gain due to the additional cost incurred in the procurement of the garlic.

Morbidity Rate

Two birds got sick when they were 11 days old.However, at 21 days age it was observed that the swollen and teary eyes got healed. Furthermore, birds given antibiotic premix on water was the only group which had a morbidity rate of 5 %. This mayproves that garlic is a plant with antibiotic, anticancer, antioxidant, immunomodulatory, anti-inflammatory, hypoglycemic and cardiovascular- protecting effects.

Mortality Rate

Two birds died during the duration of the study. The group fed commercial feeds with antibiotic premix in the water has 2.5% mortality rate similar with the group fed

Table 5. Total feed cost required to produce a kilogram in weight

TREATMENT	TOTAL FEED COST REQUIRED TO PRODUCE A KILOGRAM IN WEIGHT (KG)
Commercial Feeds(CF) with antibiotic premix in the water	73.32[c]
15 grams of garlic / kg of CF	80.19[b]
30 grams of garlic / kg of CF	89.72[a]
Commercial Feeds with no antibiotic premix	69.78[c]

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

with commercial feeds without antibiotic. The first bird that died was from the groupgiven commercial feeds with no antibiotic 42 days of age. The other bird died at 43 days of age from the group that fed with commercial feed with antibiotic premix. They were suspected to have died because of heat stroke.

Return on Investment

Table 7 shows the return on investment in the different treatments. Even though it was not subjected to statistical analysis, it is shown that the group fed with 30 g garlic has a higher ROI of 31.71% followed by the group given 15 g of garlic having 26.50%. The group fed commercial feeds without antibiotic, and the group fed commercial feeds with antibiotic premix on the water recovered lower ROI. This implies that supplementing garlic on the feed of chicken may result to a higher income.

Table 6. Morbidity and mortality rate

TREATMENT	MORBIDITY (%)	MORTALITY (%)
Commercial Feeds(CF) with antibiotic premix in the water	5	0
15 grams of garlic / kg of CF	0	2.5
30 grams of garlic / kg of CF	0	0
Commercial Feeds with no antibiotic premix	0	2.5

* Means with the same letters superscript are not significantly different at 0.05 by DMRT

Table 7. Net return and return on investment

PARTICULARS	T0 (Php)	T1 (Php)	T2 (Php)	T3 (Php)
Stocks(Php.)	1,600.00	1,600	1,600	1,600
Feeds(Php.)	5,571.63	5,570.83	5565.29	5565.49
Garlic(Php.)	-----	212.10	438.20	-----
Antibiotic(Php.)	240.00	-----	-----	-----
Disinfectant(Php.)	33.50	33.50	33.50	33.50
Waterers(Php.)	140.00	140.00	140.00	140.00
Newspapers(Php.)	42.25	42.25	42.25	42.25
Sac (Php.)	90.00	90.00	90.00	90.00
Bulb(Php.)	339.50	339.50	339.50	339.50
Fixtures(Php.)	331.25	331.25	331.25	331.25
Fare(Php.)	94.25	94.25	94.25	94.25
Labor(Php.)	765.00	765.00	765.00	765.00
TOTAL	9,247.38	9,218.68	9,439.24	9,001.24
SALES	10,682.00	11,662.00	12,362.00	11,011.00
NET INCOME	1,434.62	2,443.32	2,922.76	2,009.76
ROI %	15.52 %	26.50 %	31.71 %	22.33 %

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the effect of different levels of garlic on the growth performance of Sunshine Chicken. One hundred sixty day-old chicks were distributed at random following the Completely Randomized Design (CRD) into four treatments. Each treatment was replicated four times with ten birds per replication, making a total of 40 per treatment. The treatment were: T_0-Commercial Feeds with antibiotic premix in the water, T_1-15g garlic / kg of Commercial Feeds, T_2-30 g garlic / kg of Commercial Feeds, and T_3-Commercial Feeds with no antibiotic premix. This was conducted from October to December, 2011 at Benguet State University Poultry Experimental House at Balili, La Trinidad, Benguet.

Analysis of variance showed no significant differences in terms of initial weight and total feed intake. However, the feed conversion ratio of the birds fed with garlic relatively improved. The same effect was seen on the final weight, total gain, and feed cost per kilogram gain in weight.

This shows that supplementation of 15-30 grams garlic may cause the birds to gain more weight than those group fed with commercial feeds with antibiotic premix on water and commercial feeds only. It did not lower the feed consumption of the birds but it has made them more efficient in converting feed to flesh.

Though there were morbidity from the group fed commercial feeds with antibiotic premix on the water and mortality from the group fed with 15 grams garlicandthose given only commercialfeeds only, the values were low and thus did not affect the ROI. This means that adding 30 grams garlic on the basal diet may have been effective in keeping

the birds healthy since there was no mortality like the control group given commercial antibiotic.

The highest return on investment was observed in the birds given 30 grams garlic followed by the group fed with 15 grams,commercial feeds only with no antibiotic and lastly, the group given antibiotic premix on the water.

Conclusion

Based on the results of the study, the addition of garlic on the sunshine chicken ration resulted to higher body weights and weight gain, better FCR and lower feed conversion ratio, and total feed cost to produce a kilogram in weight. Therefore, it is concluded that garlic can be incorporated in the feed of sunshine chickens to enhance growth and feed efficiency.

Recommendation

Since supplementing garlic on sunshine chicken ration resulted to higher income, it is recommended that garlic may be added in sunshine chicken diets during the brooding-finishing period.

However, a similar study may be conducted to evaluate the effect if the level of garlic is increased beyond 30g.

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APPENDICES

Appendix Table 1.Initial weight of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	0.133	0.130	0.129	0.130	0.522	0.131
T_1	0.134	0.130	0.135	0.124	0.523	0.131
T_2	0.133	0.124	0.132	0.132	0.521	0.130
T_3	0.135	0.129	0.133	0.123	0.520	0.130
GRAND TOTAL					2.09	
GRAND MEAN						0.13

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F 5%	TABULAR F 1%
TREATMET	3	0.0000	0.000000417	0.0227^{ns}	3.4903	5.9525
ERROR	12	0.0002	0.000018375			
TOTAL	15	0.0002				

^{ns} = Not Significant Coefficient of Variation= 3.29 %

Appendix Table 2.Final weight of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	1.815	1.925	1.935	1.955	7.630	1.908
T_1	2.130	2.100	2.150	1.950	8.330	2.083
T_2	2.210	2.260	2.120	2.230	8.820	2.205
T_3	1.975	2.030	2.000	1.860	7.865	1.966
GRAND TOTAL					32.65	
GRAND MEAN						2.04

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F 5%	TABULAR F 1%
TREATMET	3	0.2081	0.069368229	13.0027**	3.4903	5.9525
ERROR	12	0.0640	0.005334896			
TOTAL	15	0.2721				

** = Highly Significant

Coefficient of Variation= 3.58 %

Appendix Table 3.Total gain of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	1.682	1.795	1.806	1.825	7.108	1.777
T_1	1.996	1.970	2.015	1.826	7.807	1.952
T_2	2.077	2.136	1.998	2.098	8.309	2.077
T_3	1.840	1.901	1.867	1.737	7.345	1.836
GRAND TOTAL					30.57	
GRAND MEAN						1.91

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F 5%	TABULAR F 1%
TREATMET	3	0.2114	0.070456562	14.1469**	3.4903	5.9525
ERROR	12	0.0598	0.004980354			
TOTAL	15	0.2711				

** = Highly Significant Coefficient of Variation= 3.69 %

Appendix Table 4.Average daily gain of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	0.030	0.032	0.032	0.032	0.126	0.032
T_1	0.036	0.035	0.036	0.033	0.140	0.035
T_2	0.037	0.038	0.036	0.037	0.148	0.037
T_3	0.032	0.034	0.033	0.031	0.130	0.033
GRAND TOTAL					0.54	
GRAND MEAN						0.03

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F 5%	TABULAR F 1%
TREATMENT	3	0.0001	0.000025	18.5000**	3.4903	5.9525
ERROR	12	0.0000	0.000001			
TOTAL	15	0.0001				

** = Highly Significant Coefficient of Variation= 3.40 %

Appendix Table 5.Total feed intake of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	4.737	4.775	4.980	5.045	19.537	4.884
T_1	5.119	4.652	5.635	4.220	19.626	4.907
T_2	4.946	5.127	4.739	5.008	19.820	4.955
T_3	4.813	5.354	4.958	4.131	19.256	4.814
GRAND TOTAL					78.24	
GRAND MEAN						4.89

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F	
					5%	1%
TREATMET	3	0.0412	0.013741729	0.0809^{ns}	3.4903	5.9523
ERROR	12	2.0385	0.169875313			
TOTAL	15	2.0797				

^{ns}= Not Significant Coefficient of Variation= 8.43 %

Appendix Table 6.Feed conversion ratio of the birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	2.816	2.660	2.757	2.764	11.00	2.75
T_1	2.565	2.361	2.796	2.311	10.03	2.51
T_2	2.381	2.400	2.372	2.387	9.54	2.39
T_3	2.616	2.816	2.655	2.378	10.47	2.62
GRAND TOTAL					41.04	
GRAND MEAN						2.56

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F 5%	TABULAR F 1%
TREATMET	3	0.289	0.096259729	4.4791*	3.4903	5.9525
ERROR	12	0.258	0.021490688			
TOTAL	15	0.547				

* = Significant Coefficient of Variation= 5.72 %

Appendix Table 7.Total feed cost required producing a kilogram in weight (php)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_0	75.10	70.94	73.53	73.72	293.29	73.32
T_1	82.00	75.48	89.39	73.88	320.76	80.19
T_2	89.57	90.29	89.24	89.80	358.90	89.72
T_3	69.77	75.10	70.81	63.42	279.10	69.78
GRAND TOTAL					1252.04	
GRAND MEAN						78.25

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARE	MEAN OF SQUARE	COMPUTED F	TABULAR F	
					5%	1%
TREATMET	3	926.0221	308.6740462	16.1546**	3.493	5.9525
ERROR	12	229.2897	19.10747627			
TOTAL	15	1155.3119				

** = Highly Significant Coefficient of Variation= 5.59 %