International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 9 Issue 8, August 2022

ISSN: 2394-4404

Effect Of Pawpaw Leaf Extract In Drinking Water On The Performance And Economics Of Production Of Broiler Chickens

Okpe, A. A.

Adamu, R.

Department of Animal Production, Kogi State University, Anyigba

Abstract: ***The study was conducted on the performance and economics of production of broiler chicken fed varying levels of pawpaw leave extract in drinking water. A total of ninety-six (96), 4-weeks old broiler chickens were used for the experiment. The birds were randomly assigned to four (4) dietary treatments. Each treatment was replicated three times with 6 birds per replicate. The study lasted for 4 weeks. Feed and drinking water were provided ad libitum and standard routine management practices were followed. Data were collected for body weight, weight gain, average daily weight gain, daily feed intake, feed conversion ratio, feed cost/kg, feed cost/kg gain and cost benefit ratio. The results depict that there were no significant (p> 0.05) differences in the initial body weight among the treatments. However, significant (p< 0.05) differences were observed in the final body weight, weight gain, feed intake and feed conversion ratio between T1 and other treatments (T2, T3 and T4). The result shows that there was significant differences (p < 0.05) for all the parameters evaluated except for cost of feed/kg. The feed cost/kg gain of birds on T4 (N655.52) differed significantly (P<0.05) from the value of N699.04, N764.32 and N775.20 recorded for birds on control T3, T2 and T1 respectively. The values observed for the total cost of production were significantly higher for birds on T4 compared to birds on T1, T2 and T3 respectively. The values of N2610.00 observed for the total revenue in T4 was significantly higher compared to N2240.00, N2360.00, and N2510.00 for birds on T1, T2 and T3 respectively. The values observed for the benefit cost ratio was significantly higher for birds on T4 fed 75ml of pawpaw leaf extract compared to 0ml, 25ml and 50ml for birds on T1, T2 and T3 respectively. It was recommended that pawpaw leaf extract can be included up to 75ml in broilers diets to improve weight gain which would significantly translate to better dressed weight and carcass quality.***

Keywords: ***pawpaw, extract, economics, feedcost, diets, feed intake***

I. INTRODUCTION

Food production in Nigeria has not kept pace with its population growth, because the population is growing at about 3.2% per annum while food production is at about 2.0% (National Bureau of Statistics, 2011). The differences between the rate of food production and population growth has led to a food demand supply gap thus leading to a widening gap between domestic food production and total requirement, an increase resort to food importation and high rate of increase in food prices and as a result, wide spread hunger and malnutrition are evident in the country (Alabi and Isah, 2012).

Adeniji and Balogun (2002) suggested that the solution to the problem of poor consumption of animal protein by an average Nigerian is to increase the level of production of highly productive animals with short generation interval, such as poultry, pigs, rabbits, sheep and goats. For this situation to improve, poultry especially broiler production should be encouraged. Besides having the advantage of short generation interval and prolificacy, Sola-Ojo *et al*. (2013), reported that poultry has a high return over a short period, require relative low capital for investment and has high acceptability in many culinary traditions.

The significance of poultry to national economy cannot be over emphasized as it has become popular for the small-

ISSN: 2394-4404

holders that have contributed to the economy of the country. In Nigeria, poultry contributes about 15 percent of the total annual protein intake with approximately 1.3kg of poultry products consumed per head per annum (Ologbon and Ambali, 2012). The poultry industry has assumed greater importance in improving employment opportunities and animal food production in Nigeria. Due to the human and animal health risks associated with the use of synthetic feed additives as growth promoters in meat production, synthetic or antibiotic growth promoters are now being rejected in many countries (Gonzalez and Angeles 2017). The dietary supplementation with phytobiotics, phytogenic feed additives, phytochemical feed additives, and herbal supplements or ingredients are now being considered as alternatives to the synthetic growth promoters (Fallah *et al*. 2013; Oloruntola *et al*. 2018).

Parts of various plants that are of medicinal importance had been used as supplements and or ingredient in poultry production to achieve various purposes of performance and health importance (Oloruntola *et al*., 2016; Oloruntola and Ayodele, 2017; Oloruntola, 2018). One of the phytogenic feed additives gaining prominence in poultry feeding to improve their performance and boost their immune response is pawpaw whose leaf has been previously identified by Oloruntola *et al*. (2018) as a natural source of papain, chymopapain A and B, and papaya peptidase A. Papain is proteolytic and thus capable of enhancing protein digestion (Oloruntola *et al*., 2018).

Pawpaw is a plant native to tropical America. It is popular in the tropics and sub-tropics because of its easy cultivation, rapid growth, quick economic returns and easy adaptation to diverse soils and climates (Amadinze *et al*., 2016). Pawpaw latex contains proteolytic enzymes papain, chymo-papain A and B, and papaya peptidase A (Amadinze *et al*., 2016) and chitinase enzyme (Savon, 2005). In addition, the papaya leaf contains broad-spectrum phytochemicals including alkaloids and phenols. Phenolic compounds have high antioxidant activity and free radical scavenging capacity, with the mechanism of inhibiting enzymes responsible for reactive oxygen species production (Kahkonen *et al*., 2001). The antibacterial, antifungal, antiviral, neuroprotective and antifertility activities of papaya have also been documented (Kadiri *et al*., 2016). It is conceivable that the nutritive and phytogenic potentials of the papaya leaf could be used as a growth promoter in broiler chicken feed.

Broiler production provides employment and regular income within the shortest time due to its fast growth and shorter production cycle. However, reasonable return can be guaranteed only when produced at minimum cost, because net profit is a function of gross return and cost of production. Though minimum cost of production is desirable to obtain higher return, care must be taken so as not to be too rigid so that the goal of producing soft, tender and high quality meat is not compromised. According to Asghar *et al*. (2000), lower cost of production and higher returns are key factors for higher profit in broilers.

It is a common knowledge that feed constitute the greatest and costliest input in any livestock farm; especially poultry. Thus, any significant reduction in the cost of feeds will significantly reduce the overall cost of production and increase the profit margin of the farm. Due to ban on feed additives (Gonzalez and Angeles 2017), the trust of nutritional research is now towards identifying non-conventional sources and natural alternative feed additives that are locally available with low human demands. One of such natural alternative feed additives sources that could be used to reduce the high cost production in poultry diets is the pawpaw leaf (*Carica papaya*) meal

The objectives of this study are to:

- ✓ Determine the effect of pawpaw leaf extract in the drinking water on the performance of broiler chicks.
- ✓ Evaluate the economics of production of pawpaw leaf extract in raising broiler chicks.

II. MATERIALS AND METHODS

EXPERIMENTAL SITE

The study was carried out at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Production, Kogi State University, Anyigba in Dekina Local Government Area of Kogi State. Anyigba is located on Latitude 7030N of the equator and Longitude 7009E of the Greenwich meridian and with an average altitude of 420 metres above the sea level. The study area falls within tropical wet and dry climate region of the Guinea savanna, with average annual rainfall of 1600mm and daily temperature range of about 250C-350C (Ifatimehin et al., 2011).

Fresh pawpaw leaves were harvested from the Crop Research Farm Kogi state university Anyigba. The leaves were dried under room temperature while retaining the greenish coloration and then, ground into meal. The pawpaw leaf extract was prepared by soaking 50g of the ground pawpaw leaf meal in 7 liters of boiled water overnight (12 hours). This was filtered in the morning and measured. The quantity of filtrate was measured to be 25ml, 50ml, and 75ml/l of drinking water for T_2, T_3 and T_4 respectively.

EXPERIMENTAL BIRDS AND MANAGEMENT

96-day old broiler chicks purchased from Zartech wewe used for the study. The birds were fed with standard commercial broiler starter diet for the first four weeks, during which time, they were vaccinated against Newcastle disease with a Lentogenic strain of Newcastle disease vaccine (LaSota). Anti-stress (glucose and vitalyte), Vitamins and Antibiotics were administered through the water to the birds upon arrival. The birds were dewormed and administered antibiotics before the commencement of the feeding trial. At four weeks of age, the birds were randomly assigned to four dietary treatments designated T_2 (0ml), T_2 (25ml), T_4 (50ml) and T_4 (75ml), with each treatment having twenty-four birds. Each of the treatments were replicated three times with eight birds for replicate in a completely randomized design (CRD).

PARAMETERS MEASURED

The parameters measured were daily weight and final body weight gain, feed intake, feed conversion ratio, Cost of feed/kg, Feed Cost/Kg Gain and Cost Benefit Ratio

- ✓ Feed Intake = This was done by deducting the weight of remnant feed from the feed offered
- ✓ Weight Gain = Weight gain was computed by subtracting initial weight from final weight.
- ✓ Feed Conversion Ratio = This was computed as ratio of feed consumption to weight gain
- ✓ Feed cost/bird (N) = $\frac{\text{Cost of feed consumed}}{\text{Number of birds}}$
- ✓ Cost of Feed/kg gain = Feed cost/kg x FCR
- ✓ Benefit Cost Ratio (BCR) = $\frac{\text{Total Revenue}}{\text{Total Cost}}$

STATISTICAL ANALYSIS

Data collected were subjected to analysis of variance (ANOVA) using Statistical Package for Social Sciences (SPSS) version 20 and differences between treatment means were separated using Least Significant Difference (LSD).

III. RESULTS AND DISCUSSION

RESULTS

PERFORMANCE PARAMETERS

The result of the effect of pawpaw leaf extract on the growth performance of broiler chickens is presented in Table 1. The results depict that there were no significant ($p > 0.05$) differences observed in the initial body weight among the treatments. However, significant ($p < 0.05$) differences were observed in the final body weight, weight gains, daily weight gain, feed intake and feed conversion ratio between T1 and other treatments (T2, T3 and T4). The birds on T4 with 75ml inclusion level of pawpaw leaf extract showed superiority in all parameters.

The effect of pawpaw leaf extract on the final weight gain of broiler chicken shows that there was significant ($p < 0.05$) difference on the final weight gain of the birds fed with pawpaw leaf extract at different inclusion levels in T2, T3 and T4 (25ml, 50ml and 75ml) compared with those in T1 (control) for the period of the experiment (Table 1). However, bird's given 75ml inclusion of pawpaw leaf extract (T4) had the highest final weight gain (2.61kg), followed by those in T3 (50ml inclusion) with (2.51kg) final weight gain, followed by those in T2 (25ml inclusion) with (2.36kg) final weight gain and least weight gain was recorded from birds in T1 (control) (2.24kg).

The effect of pawpaw leaf extract on the weight gain of broiler chicken shows that there was significant ($p < 0.05$) difference on the weight gain of the birds fed with pawpaw leaf extract at different inclusion levels in T2, T3 and T4 (25ml, 50ml and 75ml) compared with those in T1 (control) for the period of the experiment (Table 1). With bird's given 75ml inclusion of pawpaw leaf extract (T4) recording the highest weight gain (1.43kg), followed by those in T3 (50ml inclusion) with (1.30kg) weight gain, followed by those in T2 (25ml inclusion) with (1.18kg) weight gain and least weight gain was recorded from birds in T1 (control) (1.16kg).

The effect of pawpaw leaf extract on the daily weight gain of broiler chicken shows that there was significant ($p < 0.05$) difference on the weight gain of the birds fed with pawpaw leaf extract at different inclusion levels in T2, T3 and T4 (25ml, 50ml and 75ml) compared with those in T1 (control) for the period of the experiment (Table 1). With bird's given 75ml inclusion of pawpaw leaf extract (T4) recording the highest weight gain (51.30g), followed by those in T3 (50ml inclusion) with (47.74g) weight gain, followed by those in T2 (25ml inclusion) with (42.26g) weight gain and least weight gain was recorded from birds in T1 (control) (41.42g).

The effect of pawpaw leaf extract on the feed intake of broiler chicken shows that there was significant ($p < 0.05$) difference on the feed intake of the birds fed with pawpaw leaf extract at different inclusion levels in T2, T3 and T4 (25ml, 50ml and 75ml) compared with those in T1 (control) for the period of the experiment (Table 1). With bird's given 75ml inclusion of pawpaw leaf extract (T4) recording the highest feed intake (123.14g), followed by those in T3 (50ml inclusion) with (121.75g) weight gain, followed by those in T2 (25ml inclusion) with (118.18g) weight gain and least weight gain was recorded from birds in T1 (control) (117.41g).

Feed conversion ratio was calculated as feed intake consumed per unit of gain. The feed conversion ratio of broilers fed with pawpaw leaf extract T2, T3 and T4 were significantly ($p < 0.05$) different to the birds on the control diet, birds on T4 had a feed conversion ratio of 2.41 which differed significantly ($P<0.05$) from the value of 2.85, 2.81 and 2.57 recorded for birds on the T1 (control), T2 and T3 respectively.

Parameters	Levels of inclusion					
	T2 (0g)	T3 (25ml)	T4 (50ml)	T1 (75ml)		
Initial Body Weight (kg)	1.17	1.17	1.17	1.17	0.01	NS
Final Weight (kg)	2.24^{c}	2.36^{bc}	2.51^{ab}	2.61^{a}	0.39	*
Weight Gain (kg)	1.16^{b}	1.18^{b}	1.30^{ab}	1.43^{a}	0.04	*
Daily Weight Gain (g)	41.42^{b}	42.26^{b}	47.74^{ab}	51.30^{a}	1.43	*
Feed Intake (g)	117.41^{b}	118.18^{ab}	121.75^{ab}	123.14^{a}	1.01	*
Feed Conversion Ratio	2.85^{a}	2.81^{a}	2.57^{ab}	2.41^{b}	0.07	*

^{a,b,c,d} = Means with different superscript on the same row differ significantly (P<0.05)
SEM……. Standard Error of Mean
LOS……. Level of Significance
NS……. Not Significant (p>0.05)
**……. Significant (p<0.05)*

Table 1: Effect of Pawpaw Leaf Extract on the Performance of Broiler Finisher Chicken

ECONOMICS OF PRODUCTION

The result of the effect of pawpaw leaf extract on the economics of production of broiler chickens is presented in Table 2. The result shows that there was significant difference ($p < 0.05$) for all the parameters evaluated except for cost of feed/kg. The feed cost/kg gain of birds on T4 (₦655.52) differed significantly ($P<0.05$) from the value of ₦699.04,

₦764.32 and ₦775.20 recorded for birds on control T3, T2 and T1 respectively. The values observed for the total cost of production were significantly higher for birds on T4 compared to birds on T1, T2 and T3 respectively. The values of ₦2610.00 observed for the total revenue in T4 was significantly higher compared to ₦2240.00, ₦2360.00, and ₦2510.00 for birds on T1, T2 and T3 respectively. The values observed for the benefit cost ratio was significantly higher for birds on T4 fed 75ml of pawpaw leaf extract compared to 0ml, 25ml and 50ml for birds on T1, T2 and T3 respectively.

Parameters	Levels Of Inclusion				SEM	LOS
	T1 (0g)	T2 (25ml)	T3 (50ml)	T4 (75ml)		
Cost of feed/kg	272.00	272.00	272.00	272.00	0.02	NS
Feed Cost/Kg Gain (₦)	775.20^{a}	764.32^{a}	699.04^{b}	655.52^{c}	28.22	*
Cost of Production(₦)	856.91^{d}	874.39^{c}	894.18^{b}	915.23^{a}	12.58	*
Total Revenue(₦)	2240.00^{c}	2360.00^{b}	2510.00^{a}	2610.00^{a}	81.55	*
Cost Benefit Ratio	2.61^{d}	2.69^{c}	2.81^{b}	2.85^{a}	0.05	*

Cost of production = Cost of feed + Cost of medication + Cost of day old chick + Miscellaneous cost.
Revenue based on ₦1000/kg live weight.
$^{a,b,c,d=}$Means with different superscript on the same row differ significantly (P<0.05)
SEM……. Standard Error of Mean
LOS……. Level of Significance
NS……. Not Significant (p>0.05)
……. Significant (p<0.05)

Table 2: Effect of Pawpaw Leaf Extract on the Economics of Production of Finisher Broiler Chicken

IV. DISCUSSION

The results of growth performance characteristics of broiler chicks fed bitter leaf meal as presented in Table 1 indicated that T4 had numerically better final body weight, weight gain and daily weight gain than T3, T2 and T1 while the same birds on T4 had the best feed conversion ratio. The result pertaining to feed intake had the highest numerical value in T4. This result suggests that, as the inclusion level increase so also the weight gain and this development may be attributable to the quality of the test diets which are also similarly to the findings of Amadinze *et al.*, (2016) who reported the efficiency of pawpaw laves in improving the performance of poultry birds.

The general improvement in the final live-weight and weight gain of birds fed pawpaw leaf extract in this study revealed that pawpaw leaf extract, enhanced growth performance of broiler birds. Birds in treatment 4 (75ml pawpaw leaf extract) performed better, the high level of pawpaw leaf extract in their diet might have improved the production and activities of digestive enzymes. The improved performance recorded for birds on Diet 4 may be attributed to the increased secretion of digestive enzyme and enhanced nutrients utilization in the liver (Kadiri *et al.*, 2016). The antibacterial action of essential component of medicinal plant such as pawpaw leave may suppress the growth of pathogenic bacteria on one hand and promote the growth of probiotic bacteria in the gut (Gonzalez and Angeles, 2017). These indicated why medicinal plants may be used as alternative to antibiotic growth promoters because they exhibit antimicrobial properties and thus can form integral part of poultry nutrition (Oloruntola and Ayodele, 2017).

According to the report of (Oloruntola *et al.* 2018), poultry birds are less exposed to microbial toxins and other undesired microbial metabolites such as ammonia and biogenic amines as a result of more stabilized intestinal health. The birds are relatively relived from immune defense stress during critical situation and there is increased availability of essential nutrients for absorption, thereby helping them grow better within the framework of their genetic potential.

The improved performance observed as level of Pawpaw leaf extract in the diets increased is a deviation from the earlier opinion that at high levels of leaf meal inclusion, growth is depressed (Iheukwumere *et al.*, 2008). The improved performance of the birds as level of pawpaw leaf extract in the diets increased may be closely related to its crude protein content and its relatively low fibre and could also be that the papain in pawpaw leaf extract did aid protein digestion thus enhancing the release of free amino acids necessary to enhance growth. This view is in line with earlier view of (Gonzalez and Angelez, 2017), that papain is an effective natural digestive aid which breaks down protein and cleanses the digestive tract. Leaf meal supplementation in poultry rations has also been proved to be a means of reducing cost and improving profit margin (Amadinze, *et al.*, 2016).

Birds on T4 had a feed conversion ratio of 2.41 which differed significantly (P<0.05) from the value of 2.85, 2.81 and 2.57 recorded for birds on the T1 (control), T2 and T3 respectively. The significantly better feed conversion ratio (FCR) observed in T4 may be attributed to the higher weight gain values observed for birds on this diet. The result pertaining FCR of this study is in line with the findings of (Oloruntola *et al.*, 2016; Oloruntola and Ayodele, 2017; Oloruntola, 2018) that inclusion of *Carica papaya* leaf in broiler feed significantly improved FCR. This could be associated with its effect on enhancing the gastro intestinal enzyme thereby improving digestion and assimilation of nutrients. The findings by Amadinze *et al.* (2016) reported improved FCR of cockerels fed *Carica papaya* leaf meal.

The birds in T4 (75ml) has the best Benefit cost ratio of ₦2.85 which implies that for every ₦1 cost incurred, the benefit acquired increases by ₦2.85 as compared to birds on the control diet (₦2.61). This signifies that feeding pawpaw leaf extract to broiler is profitable. This view agrees with (Oloruntola and Ayodele, 2017; Oloruntola, 2018) that leaf meal supplementation in poultry rations has been proven to be a means of reducing cost and increasing profit.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The result of this experiment shows that the use of pawpaw leaf extract in the production of broiler finishers had no detrimental effect on the performance of the broilers.

Pawpaw leaf extract given at 75ml inclusion level numerically enhanced the growth rate of the birds. Also the feed conversion ratio (FCR) for birds on the 75ml inclusion level was best, which translated to increased body weight with less cost of feed per kg weight gain, bringing more returns to the farmer as evidenced by the significantly lower feed cost/kg gain. Based on the principle of economics of production it would be advisable to supplement bitter leaf meal in broilers' diet up to 75 ml inclusion level because it proved to be economically better.

VI. RECOMMENDATIONS

Based on this study, it can be recommended that pawpaw leaf extract can be used at up to 75ml inclusion level in broilers' diets to improve weight gain which would significantly translate to better dressed weight and carcass quality.

ACKNOWLEDGEMENT

The Authors are grateful to the authorities of Kogi State University for providing the Facilities and the enabling environment for the successful conduct of this research work.

REFERENCES

[1] Adeniji, I.A. and Balogun, A.O. (2002). An investigation of Technical Inefficiency of Production of farmers Under the National Directorate of Employment in Ondo State, Nigeria". Applied Economic letters, 6, 111-114.
[2] Alabi, O. O and Isah, R. G. (2012). Socioeconomic Factors Affecting Poultry Farmers in Ejigbo Local government Area of Osun State. Journal of Human Ecology. 18:39-41.
[3] Amadinze, C, Onyegbule T. O and Kwushue V (2016). Effect of Varying Levels of Pawpaw Leaf Meal (Carica papaya) on Growth Performance of Finisher Broilers. HND Research Project, Department of Health Technology, Imo State Polytechnic Umuagwo, Nigeria. 56 pp.
[4] Asghar, O. Y, Amata, P.S. and Olayemi, J.K. (2000). An Investigation of Production Efficiency in Food Crop Enterprises, Gombe State, Nigeria. Journal of Rural Economics and Development. Vol. 13, 1998/1999 pp. 111-122.
[5] Fallah, R, Kiani A, Azarfar A (2013). A review of the role of five kinds of alternatives to in-feed antibiotics in broiler production. J Vet Med Anim Health. 5(11):317–321.
[6] Gonzalez RM, and Angeles HJC (2017). Antibiotic and synthetic growth promoters in animal diets. Review of impact and analytical methods. Food Cont 72:255–267.
[7] Ifatimehin (2011). Anyigba Meterological status, teaching and research farm Kogi State University, Anyigba.
[8] Iheukwumere, F.C., E.C. Ndubuise, E.A. Mazi and M.UOnyekwere (2008). Performance, nutrient utilization and organ characteristics of Broiler fed cassava leaf meal (Manihotesculentacrantz).Pakistan Journal of nutrition 7(1): 13-16.
[9] Kadiri O, Olawoye B, Fawale O. S, Adalumo O. A (2016) Nutraceutical and antioxidant properties of the seeds, leaves, and fruits of Carica papaya: Potential relevance to human diets, the food industry, and the pharmaceutical industry—a review. Turkish J AgricTechn. 4(2):1039–1052.
[10] Kahkonen MP, Hopia AI, Heinonen M. Berry (2001). phenolics and their antioxidant activity. Journal of Agricultural and food chemistry 49(8), 4076-4082.
[11] National Bureau of Statistics (NBS) (2011). Official website http://www.nigerianstat.gov.ng.
[12] Ologbon, A. C and Ambali, I. (2012). Poultry Enterprise Combination among Sall-Scale Farmers in Ogun State, Nigeria: A Technical Efficiency Approach. Journal of Agriculture and Veterinary Sciences. Pp 8.
[13] Oloruntola O. D, Ayodele S. O, Agbede J. O, Asaniyan, E. K. (2016) Performance and digestibility of broiler starter fed diets containing Gliricidiasepium leaf meal. Asian J Biol Life Sci 5(1):97–102.
[14] Oloruntola, O. D, Ayodele S. O. (2017) Pawpaw leaf meal and exo-enzyme in rabbit: Effect on haematological and serum biochemical indices. Asian J AdvAgric Res 2(4):1–8.
[15] Oloruntola, O. D. (2018) Serum biochemistry and histological studies in growing rabbits fed diets supplemented with Mucunapruriens leaf meal. Arch Current Res Int 15(1):1–10.
[16] Oloruntola, O. D, Agbede, J. O, Ayodele, S. O, Ayedun, E. S, Daramola, O. T, Oloruntola, D. A. (2018). Gliricidia leaf meal and multi-enzyme in rabbit diet: effect on performance, blood indices, serum metabolites and antioxidant. J Anim. Sci. Techn. 10:24.
[17] Savon, L. (2005). Alimentacion no convencional de especiesmonogatricas utilization de alimentosallos en fibra VIII Encuentro de Nutricion Y production de animals monogastricos. UnellezGuanare, Venezuela Pp. 30.
[18] Sola-Ojo, O. K, Grace, O, Mako, A. A, Igbosanun, A.O, and Ettu, R.O. (2013). Mortality Rate at the Brooding Stage of Various Broiler Breeds Reared in Sub Sahara Region of West Africa. International Journal of Poultry Science 8 (8): 792-797.