EVALUATION OF CARCASS CHARACTERISTICS OF BROILER CHICKENS (COBB 500) FED ON COWPEAS *(VIGNA UNGUICULATA)* SUPPLEMENTED WITH SELECTED LIMITING AMINO ACIDS

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BANDA THOMAS

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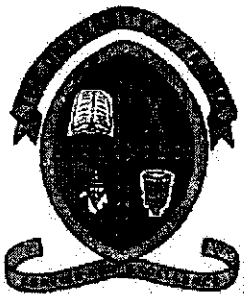

THE UNIVERSITY OF ZAMBIA

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF ANIMAL SCIENCE

EVALUATION OF CARCASS CHARACTERISTICS OF BROILER CHICKENS (COBB 500) FED ON COWPEAS *(VIGNA UNGUCULATA)* SUPPLEMENTED WITH SELECTED LIMITING AMINO ACIDS

By

BANDA THOMAS

A dissertation submitted to the School of Agricultural Sciences of the University of Zambia in partial fulfillment for the requirement of bachelor's degree in agricultural sciences.

DECLARATION

I BANDA THOMAS, declare that the contents of this thesis represent my own work. All sources of information have been acknowledged in the form of citations and references and that the work contained herein has not been submitted for an award of an academic degree at this or any other university.

Signature ..... **Date** 20/09/13

DEDICATION

To my parents, our last born Tomaida Banda and my elder brother Joseph Banda and my sister-in-law, Mercy Banda and to the Lord God the most high who makes everything possible.

ACKNOWLEDGEMENTS

Great appreciation for the invaluable guidance afforded me by my principle research advisor Ms M.N. Musukwa and Mr. M. Sampa who stood by every student in research for special advice. Great thanks to the production manager for hybrid hatchery for the provision of the chicks used in this research, Mr. M. Simuyala for assistance in the procurement of cowpeas used as feed in the study and indeed my co-researcher Mr. S. Mwale for being there for each other from the start to the end of the study. Many thanks to all the members of the Animal Science Department for a great support provided to achieve the objectives of the research.

I wish to acknowledge the support of my two brothers Mr. J. Banda and Mr. P. Zulu and my sisters-in-law and all my friends from class and church for the financial support and encouragement.

May the good Lord almighty be praised for all the people who got involved in this study.

LIST OF ABBREVIATIONS AND ACRONYMS

Ash (%)	Inorganic Component of Feed Stuff.
Ho	Null Hypothesis
Ha	Alternative hypothesis
DM	Dry Matter (%)
NFE	Nitrogen Free Extract (%)
ME	Metabolizable Energy (KJ/Kg)
DCP	Di-Calcium Phosphate
CP	Crude Protein
GM	Grand Mean
CV	Coefficient of Variance (%)
Met	Methionine
Lys	Lysine
Threo	Threonine

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ABSTRACT

The aim of this study was to evaluate the effect on carcass characteristics of Cobb 500 broiler chickens of supplementing cowpea meal with Methionine and Lysine only as well as supplementing the cowpea with Methionine, Lysine and Threonine. A total number of 100 day old chicks were used. An experimental diet containing soya bean meal supplemented with Methionine and Lysine was used as control. Each treatment had three replications in a Completely Randomized Design (CRD) and each replicate had eleven chicks. After 42 days of the experiment, three chickens were randomly selected from each replicate, slaughtered, eviscerated and cut into breast, thigh and drumstick and fat removed from the abdomen for evaluation of carcass characteristics. The average weights of the breast muscles, thighs, drum sticks and abdominal fat were used in the analysis. There was no significant difference among treatments ($P<0.05$) though birds on soya bean containing diet had a better performance compared with either of the other treatments. However, cow pea with Threonine amino acid showed better performance than that only supplemented with Methionine and Lysine.

Key words: Cowpeas, Threonine, carcass characteristics, broilers.

CHAPTER ONE

1.0 INTRODUCTION

1.1General.

Cowpea (*Vigna unguiculata)* is one of the pulse crops rich in protein *(Igbasan and Guenter, 1997).*It is an important crop in the tropical and sub-tropical areas where protein for non-ruminant feeds is a problem following high dependence on soybean with limited supply of animal protein like fish meal. Cowpea can tolerate heat and drought. In Zambia cowpea can be grown in a variety of soils that are deep and well drained, and can do well in soils with low PH levels such as those in the agro-ecological Region III of Zambia.

Apart from Methionine and Lysine, Threonine has been deduced to be the third limiting amino acid *(MacLeod et al.2003).* This has shown reduced cost of production at 65-70% of Lysine levels in soybean compounded feed. Livestock production is under increasing pressure to lower production costs and reduce waste products, primarily nitrogen and phosphorous, from entering the environment. Amino acid manufacturers have recognized the significant role crystalline amino acids can play in lowering feed costs and when using them to precision feed, excess crude protein (nitrogen and ammonia) is significantly reduced.

Tremendous strides have been made in commercializing essential amino acids for these purposes. L-Threonine among other amino acids has been produced for some time, but production is currently being expanded which will ensure sufficient supply at a significantly lower cost *(Wiryanwan, 1997).* This will allow it to be used in practical, least cost in broiler diets. The current trend to lower nitrogen excretion (in litter and air emissions) is forcing industry to look for ways to minimize the feeding of excess crude protein in broiler feeds, while still maintaining adequate levels of amino acids to optimize performance.

1.2 Problem Statement

Only two amino acids (Methionine and Lysine) have for a long time been considered as most limiting in bird and animal feeding as supplements to the protein source. Though L-Thrconine has been used as a third amino acid supplement with soya bean, it has not been used yet in cow pea, which has been identified as potential protein source in feed formulation.

1.3 Justification

The need to assess effects of L-Threonine supplementation in feed formulation is of value because the amino acid has been found to be the third limiting amino acid after Methionine and Lysine in animal production. The assessment using cowpea follows that it is among the alternative unconventional protein sources to replace lipid extracted soya bean meal *(Wiryanwan, 1997).* The assessment in this study involved the evaluation of meat characteristics regarding the weight of selected body parts and abdominal fat content following the supplementation of cowpea with L-Threonine in addition to the usual Methionine and Lysine.

1.4 Objectives:

The main objective was to evaluate the carcass characteristics of broiler chickens fed cowpea that was supplemented with Threonine in addition to Methionine and Lysine amino acids.

1.4.1 Specific objectives:

i. To determine effect of Threonine inclusion in broiler chicken diet on the weight of the breast muscles, thigh and drum stick.
ii. To determine the effects of Threonine inclusion in chicken diet on abdominal fat levels

1.5 Statistical Hypotheses

H_O: There are no significant differences in weight of the breast muscle, thigh and drum stick of broiler chicken on cow pea supplemented with L-Threonine amino acid.

H_A: There are significant differences in weight of the breast muscle, thigh and drum stick of broiler chicken on cowpea supplemented with L-Threonine amino acid.

H_O: There is no significant difference in abdominal fat content in broiler chicken on L-Threonine supplemented cowpea.

H_A: There is significant difference in the abdominal fat content in broiler chicken on L-Threonine supplemented cowpea.

Requires rewriting these

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Nutrient Content Comparison between Cowpeas and Soya Bean.

The nutrient and energy concentrations of cowpeas compare well with those of soya beans with similar amino acid profiles *(Ravindran and Blair, 1992),* but are often less expensive. Although the protein level of cowpeas shows great variation among cultivars *(Canon and Carre, 1989),* they can offer an alternative to lipid extracted soya oilcake meal. The variation in protein level that is observed within species may be attributed to differences in genotypic and environmental factors, as well as to agronomic practices *(Ali-khan and Youngs, 1973).* However, it is highly nutritious with dry seed containing 25% crude protein and has highly digestible protein compared with other legumes *(Silano et al.1981; Olaghobo and Fetuga 1983).* Tshovhote *et al 2003,* determined nutrient variations of three cowpea cultivars as presented in Table 1 below.

Table 1: Chemical Composition (g/Kg dry matter) of three Commercial Cow pea Cultivars.

	Indigenous	Agrinawa	Glenda
Dry matter	907	902	901.5
Crude protein	264	258	253
Lipid	13.2	14.1	13.3
Crude fibre	51.5	57.2	58.1
Calcium	1.32	1.44	1.55
Total phosphorus	3.86	3.77	4.22
ME (MJ/Kg)	10.29	10.78	10.44

Source: South African Journal of Animal Science 2003, 33 (1)

Abdelrahim (1968) and Salanino *et al* (1981) noted that cowpeas has protein 25%, ether extract 2.4%, fibre 28% and nitrogen free extract 43.1%, results which were reported by

Olaghobo and Fetuga in 1983.Cowpeas are characteristically low in sulphur containing amino acids and high in Lysine *(Coertze and Venter, 1996)*

Using the same cultivars of cow pea (Indigenous, Agrinawa and Glenda) the amino acids were determined and presented as shown in table 2below.

Table 2: Total Amino acid Concentration (g/Kg dry matter) for the three Commercial Cowpea Cultivars

Amino acid	Indigenous	Agrinawa	Glenda
Threonine	0.86	0.84	0.84
Valine	1.27	1.19	1.24
Methionine	0.28	0.32	0.31
Isoleusine	1.12	1.06	1.01
Leucine	1.90	1.80	1.74
Tyrosine	0.54	0.56	0.59
Phenylalanine	1.41	1.34	1.29
Histidine	0.79	0.75	0.74
Lysine	1.67	1.61	1.52
Arginine	1.77	1.65	1.52

Source; South African Journal of Animal Science 2003, 33 (1)

2.2 Anti-Nutritional Factors in Cowpeas.

It is generally accepted that cowpeas contain factors that depress performance of chickens. These are anti-nutritional factors, some of which are proteins in nature that are equally present in other legume grains *(Igbasan and Guenter.1997)*. These include protease inhibitors, non-starch polysaccharides (NSP), pectins and phenolic compounds *(Arora, 1995)*, which reduce protein quality and nutrient digestibility. Protease inhibitors impair the activity of pancreatic enzymes such as trypsin and chymotrypsin. The problem of the anti-nutritional factors is most pronounced in the feeding of raw cowpeas. Wiryawan and Dinlge (1999), Bressani (2002), Teguia *et al.* (2003) reported poor performance of birds when fed

raw cowpea and black common bean. Some studies *(Udensi et al., 2007, Umapathy and Erwanger, 2008, Ayssiwed et al., 2011 and Belal et al., 2011)* reported the presence of trypsin inhibitor, lectins, phenols, tannins, phytate and phytic acid, haemagglutinin, hydrogen cyanide, stachyose, raffinose and saponininin cowpeas. These authors affirmed that heat treatments could reduce the anti- nutritional factors of the seeds.

Anjos, *et al*,2012, reported that chickens subjected to 20% cowpea inclusions of raw and roasted in two diets, respectively, and compared with a diet with 100% soya bean showed no significant difference ($P<0.05$). However, those on raw cowpea had inflammation of the duodenum.

2.3 Effects of Feeding Graded Cowpeas to Broiler Chickens on Performance and other Carcass Measurements.

The effects of feeding broilers with cowpea dietary inclusions of 0.0, 10, 20 and 30% on the performance, dressing percentage and carcass cuts relative weights was done in Sudan (2009).It was found out that the parameters under investigation showed significant improvement including feed conversion ratios though there was no significant difference. Feed intake reduced on a daily basis which was attributed to the palatability of cowpea compared with soybean meal.

2.4 Effects of Threonine Supplemented Diets on Broiler Chicken performance.

Before 1990 not much work was done on defining Threonine requirements, however, since then various researchers have published Threonine requirements for broiler chickens, *(Baker et al., 1994; Kidd et al., 1996; Webel et al., 1996; Kidd and Kerr, 1996; Penz et al., 1997; Kidd et al., 1999; and Barkley and Wallis, 2001; Baker et al., 2002).*

A study, using a practical corn/ soy diet, was conducted at University of Kentucky in United States of America to establish the ratio of Threonine to Lysine. Ingredients were analysed and digestibility coefficients *(Ajinomoto Heartland, 2001)* were applied to these values. The basal feed, containing 1.0% digestible Lysine, similar to a commercial broiler grower diet

was formulated. To ensure Threonine was first limiting up to the highest Threonine level, DL-Methionine, L-Isoleucine, L-Valine, L-Arginine and L-Tryptophan were added to bring those amino acids up to 105% of minimum formulated levels. This study indicated that broiler chickens respond to higher levels of Threonine than is currently being fed. General observations are that industry nutritionists are formulating, on a digestible basis, at between 62 and 64 Threonine to Lysine ratio. Of particular interest is the effect of the higher Threonine levels on improved feed conversion ratio (FCR). This response has been seen in a number of studies, the latest being Dozier *et al.*2003.

Adequate digestible Threonine levels are needed to support optimum growth *(Kidd et al. 1999)* because it serves as an important component of body protein and plays an important role as precursor of Lysine and serine *(Ojano and Waldroup, 2002)*. Threonine is needed for optimal immune response and gastro-intestinal mucine production. Threonine can help in the counteraction of heat stress in broiler chicken (Kidd, 2000). Increased dietary Threonine concentration is known to improve nitrogen retention in broiler chickens and therefore changing level of Threonine concentration is an important tool to improve nitrogen utilization *(Dozier, 2001)*.

2.5 Effects of reduced Crude Protein Levels in Broiler Diet.

Unfortunately, there is still a common belief that whenever crude protein levels are lowered, performance is negatively affected. This is a result of a number of studies where researchers have lowered crude protein levels beyond practical formulation levels and then failed to supplement all limiting amino acids to sufficient levels. In some cases crude protein levels were lowered without supplementing amino acids other than Lysine and Methionine *(Neto et al., 2000 and Bregendhahl et al., 2002.)* Studies where practical diets, with reasonable crude protein reduction and care taken to maintain essential amino acids intake showed no significant differences in growth rate, body composition or breast meat yield according to *Hai and Blaha, 1998; Hai and Blaha, 2000; MacLeod et al. 2003.* Lowering crude protein up to 10% has no negative effect on the performance of chicken as long as the levels of essential amino acids are satisfied *(Rezaei et al 2004)*.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1. Processing of Materials.

Cowpeas were purchased from Chongwe farms. They were boiled for 30 minutes to remove the anti-nutritional factors. This was followed by drying in the sun. The cowpeas were then packed and stored. Proximate analysis was done according to Association of Official Analytical Chemists (*AOAC, 1980*).The dry cowpeas were milled and the feed was formulated as shown in Table 3 below. Unsexed 100 Cobb 500 chicks were purchased from Hybrid Hatchery of Lusaka.

3.2. Experimental Location and Management System.

The broiler feeding experiment was done at the University of Zambia Animal Science Department Field Station using a deep litter system of management.

3.3 Experimental Design and Treatments.

The birds were subjected to three dietary treatments with three replicates in a Completely Randomized Design (CRD). Each replicate had eleven chicks. Treatment one had soya bean meal and was supplemented with Methionine and Lysine as the limiting amino acids, treatment two had cow pea meal and was supplemented with the same amino acids as treatment one above while treatment three had cowpeas Methionine, Lysine and Threonine as limiting amino acids. The chickens were fed on these rations for 42 days (6 weeks) in a two-phase feeding regime.

3.3.1 Summary of feed formulation

3.3.1.1 Starter feed formulation

Table 3 Ingredients and Nutrients Composition of the Soya Bean Methionine And Lysine Amino Acids.

		Nutrients Supplied				
Ingredients	**(%)**	CP %	Lys %	Met %	Ca %	P %
No. 3 Maize meal	53.65	4.30	0.13	0.12	-	-
Soya Bean	43.35	16.50	0.12	0.24	0.13	0.35
DCP	0.39	-	-	-	0.10	0.07
Limestone	1.76	-	-	-	0.67	-
Methionine	0.11	-	-	0.11	-	-
Lysine	1.19	-	0.95	-	-	-
Broiler Premix	0.30	-	-	-	-	-
Common Salt	0.40	-	-	-	-	-
Total	101	21.0	1.20	0.47	0.9	0.42
Requirement	100	22.0	1.20	0.47	0.9	0.42
Difference	+1.0	-1	0.00	0.00	0.00	0.00

Key: DCP= Di-calcium phosphate
Met Methionine
Lsy=Lysine
CP=Crude Protein
Ca=Calcium
P - Phosphorus

Table 4: Ingredients and Nutrients Composition of the Cowpeas with Methionine and Lysine Amino Acids.

		Nutrients supplied				
		CP	Lys	Met	Ca	P
Ingredients	%	%	%	%	%	%
No.3 Maize Meal	20.53	1.64	0.049	0.041	-	-
Cowpeas	75.47	17.3	0.126	0.021	0.53	0.19
DCP	1.28	-	-	-	0.33	0.23
Limestone	0.11	-	-	-	0.04	-
Lysine	1.28	-	1.02	-	-	-
Methionine	0.42	-	-	0.41	-	-
Broiler Premix	0.40	-	-	-	-	-
Salt	0.30	-	-	-	-	-
Total	99.74	19.0	1.20	0.47	0.9	0.42
Requirement	100	22.0	1.20	0.47	0.9	0.42
Difference	-0.26	-3	0.00	0.00	0.00	0.00

Table 5: Ingredients and Nutrient Composition of Cowpea Diet with Methionine, Lysine and Threonine Amino Acids

		Nutrients Supplied					
		CP	Lys	Met	Thre	Ca	P
Ingredients	%	%	%	%	%	%	%
No.3 Maize Meal	20.5	1.60	0.05	0.04	-	-	-
Cowpeas	76.0	17.2	0.13	0.02	0.07	0.53	0.19
DCP	1.28	-	-	-	-	0.33	0.23
Limestone	0.12	-	-	-	-	0.04	-
Lysine	1.28	-	1.02	-	-	-	-
Methionine	0.42	-	-	0.42	-	-	-
Threonine	0.72	-	-	-	0.71	-	-
Broiler Premix	0.40	-	-	-	-	-	-
Salt	0.30	-	-	-	-	-	-
Total	101.0	19.0	1.20	0.48	0.78	0.90	0.42
Requirement	100	22	1.20	0.47	0.78	0.90	0.42
Difference	+1	-3	0.00	+0.01	0.00	0.00	0.00

Key: Thre=Threonin

3.3.1.2: Finisher feed formulations

Table 6: Nutrient Composition of Soya Bean Diet with Lysine and Methionine Amino Acids

		Nutrient Supplied				
Ingredients	%	CP %	Lys %	Met %	Ca %	P %
No.3 Maize Meal	63.71	5.10	0.15	0.13	-	-
Soya Bean	33.29	14.0	0.09	0.18	0.10	0.22
DCP	1.11	-	-	-	0.29	0.20
Limestone	1.34	-	-	-	0.51	-
Lysine	0.88	-	0.7	-	-	-
Methionine	0.071	-	-	0.07	-	-
Broiler Premix	0.40	-	-	-	-	-
Salt	0.30	-	-	-	-	-
Total	100	19.1	0.94	0.38	0.90	0.42
Requirement	100	18.0	0.94	0.38	0.90	0.42
Difference	0.00	+1.1	0.00	0.00	0.00	0.00

Table 7: Nutrient Composition of Cowpea Diet with Lysine and Methionine Amino Acids

		Nutrient supplied				
Ingredients	%	CP %	Lys %	Met %	Ca %	P %
No3. Maize Meal	28.7	2.30	0.07	0.06	-	-
Cowpeas	68.3	15.5	0.11	0.02	0.48	0.17
DCP	1.38	-	-	-	0.36	0.25
Limestone	0.16	-	-	-	0.06	-
Lysine	0.94	-	0.76	-	-	-
Methionine	0.31	-	-	0.30	-	-
Broiler premix	0.40	-	-	-	-	-
Salt	0.30	-	-	-	-	-
Total	100.49	18.0	0.94	0.38	0.90	0.42
Requirement	100	18.0	0.94	0.38	0.90	0.42
Difference	+0.49	0.00	0.00	0.00	0.00	0.00

Table 8: Nutrient Composition of Cowpea Diet with Lysine, Methionine and Threonine Amino Acids.

		Nutrient supplied					
		CP	Lys	Met	Thre	Ca	P
Ingredient	%	%	%	%	%	%	%
No.3 Maize Meal	27.2	2.22	0.07	0.05	-	-	-
Cowpeas	68.8	15.6	0.12	0.02	0.06	0.45	0.17
DCP	1.38	-	-	-	-	0.36	0.25
Limestone	0.16	-	-	-	-	0.09	-
Lysine	0.94	-	0.75	-	-	-	-
Methionine	0.32	-	-	0.31	-	-	-
Threonine	0.65	-	-	-	0.64	-	-
Broiler Premix	0.40	-	-	-	-	-	-
Salt	0.30	-	-	-	-	-	-
Total	100.15	18.0	0.94	0.38	0.70	0.90	0.42
Requirement	100	18.0	0.94	0.38	0.70	0.90	0.42
Difference	+0.15	0.00	0.00	0.00	0.00	0.00	0.00

3.4 Data Collection and Statistical Analysis:

At the end of six weeks three birds from each replicate were randomly selected. They were slaughtered, eviscerated and cut into pieces of breast muscles, drum sticks and thighs and weighed. Abdominal fat was also removed and weighed. The collected data of the experiment was subjected to analysis of variance (ANOVA) using Genstat version 14. Least significant difference test was used to separate treatment means as described by Gomez and Gomez (1984).

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Chemical Composition of Raw and Boiled Cowpea.

Table 9: Chemical Composition of Raw and Boiled Cowpeas.

Component	Raw cowpeas (%)	Boiled cowpeas (%)
Dry matter	90.64	90.94
Crude protein	20.83	22.66
Crude oil	1.52	1.42
Moisture	9.36	9.06
Calcium	0.40	0.70
Phosphorus	0.29	0.25
Ash	4.50	7.06
Nitrogen free extract	63.79	55.54
Metabolizable energy(kcal/kg)	2960.65	2748.90

Nitrogen Free Extract was calculated by difference

Metabolizable Energy was calculated according to the equation of *Lodhi, et al. (1976).*

Protein content in boiled cow pea was found to be higher than raw cow pea where it was 22.66% and 20.83% respectively. The results therefore contradict what was reported by Wiryawan and Dingle (1999) who found lower crude protein levels in boiled than raw cow pea. The two researchers further reported that failure to maintain temperature during boiling leads to varying protein content in boiled cowpeas following denaturation of protein. Different cultivars have different levels of protein but on average it is 25%.The fat content of the cowpeas in this study was lower (1.42%) than reported by Anjos, *et al,* 2012 (1.8%) in Mozambique. This difference could possibly be due to the differences in varieties, soil or climate growth conditions.

4.2. Effect of Feeding Cowpea for Six Weeks on Broiler Chicken Performance.

Table 10: Effects of Feeding Cowpeas for Six Weeks on the Performance of Broiler Chickens.

	Parameters (g)			
	Breast muscle	**Thigh muscle**	**Drum stick**	**Abdominal fat**
Soya bean +Met + Lys	130[a]	193.8[a]	157.9[a]	14.9[a]
Cow pea + Met + Lys	277[a]	190.6[a]	145.8[a]	24.4[a]
Cow pea +Met, Lys +Threo	271[a]	197.5[a]	149.5[a]	29.1[a]
Grand Mean	283	194	151	19.5
Coefficient of variance (%)	14.4	12.4	14.80	27.8

Figures in the same column followed by the same superscript are not significantly differen ($p<0.05$).

Key: Met=Methionine, Lys=Lysine and Threo=Threonine

The breast, thigh and drum stick are the principle parts of chicken with more muscles and thus the justification for their weight evaluation. The mean values of the breast muscles (bone less) showed no significant difference among treatments at 95% confidence level but those fed on soya bean (control) had numerically higher breast muscle weights as shown in Figure 1, below. Thus soya bean containing diet supplemented with Methionine and Lysine amino acids had the highest mean weight of 300 grams with cow pea supplemented with all amino acids having the lowest mean weight of 271 grams.

Figure 1: Mean Weight Breast Muscles

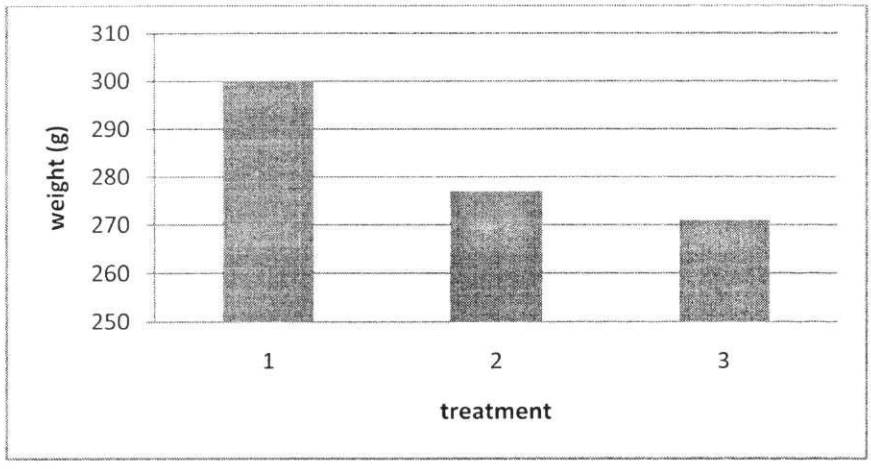
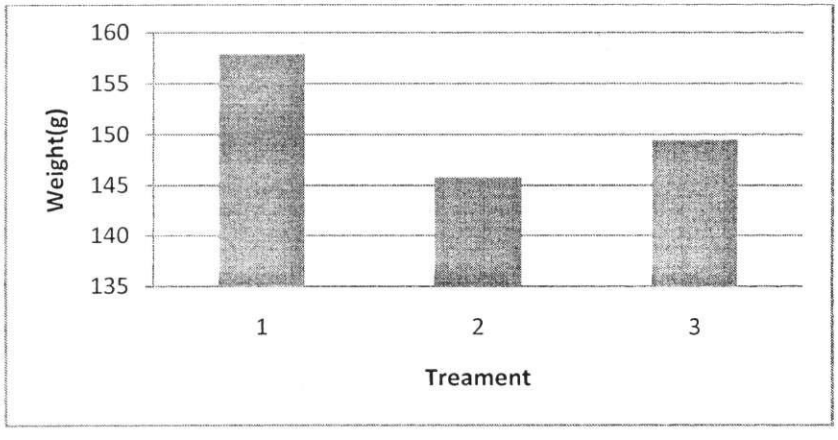


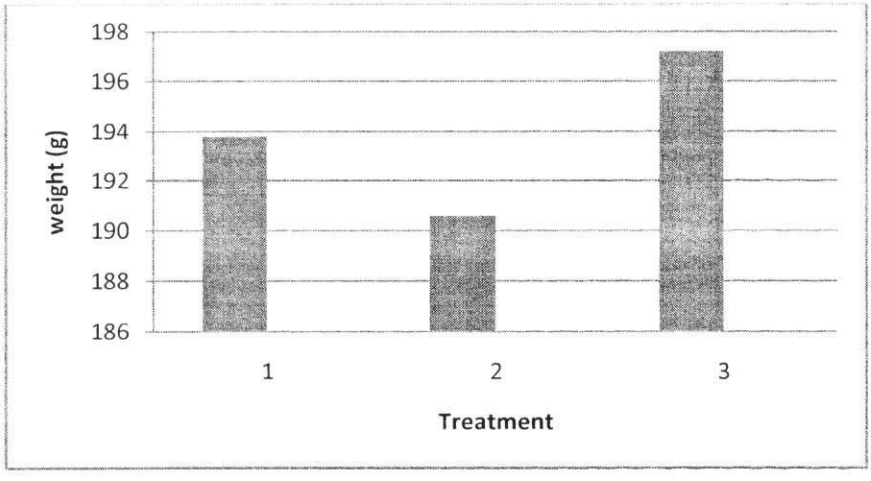
Figure.2 shows mean weights of drumsticks. The birds on soya bean meal had the highest value with the lowest being cow pea with only Methionine and Lysine.

Figure 2: Mean weight drum stick



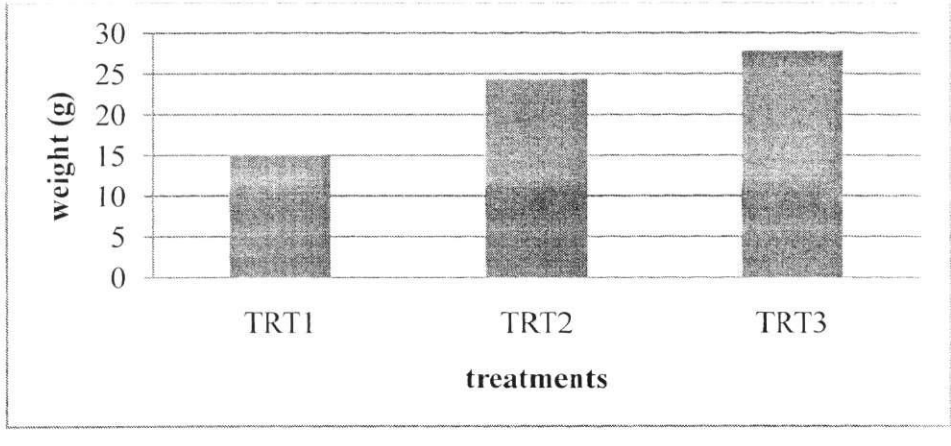
For thigh muscles mean weight, cow pea with the three amino acids had the highest weight of 197.5 grams though there was no significant difference among the treatments. The lowest mean value was observed in birds on cow pea without Threonine amino acid (190.6g) as shown in the figure 3 below.

Figure 3: Mean thigh weight



Despite having no significant difference, fat levels were observed to be the highest in chicken on cow pea supplemented with the three amino acids and the lowest in those chickens on soya bean diet as shown in figure 4 below.

Figure 4: Mean Weight Abdominal Fat



Eljack *et al.* (2009) reported that there was no significant difference among the treatments fed on diets with cowpea inclusions of 0, 10, 20 and 30% with regards to the parameters

evaluated in this study where there was 100% soya bean replacement in two experimental diets. The difference between the two studies concerns the significantly higher weights of the carcass cuts in the Eljack *et al.* (2009) study especially at 30 % inclusion rate. Udensi *et al.* in 2007 reported reduced performance in chickens on diet with up to 50% cow pea inclusion following reduced palatability. Despite cowpea having protein with high digestibility *(Ologhobo and Fetuga 1983; Silanino et al 1981),* the seed coats have high levels of crude fibre that possibly reduce its palatability *(Tarawalie tal.1991).* This was the case with the study of Eljack, 2009 where feed intake was found to be low with higher cow pea inclusion in the diet. Furthermore, Threonine is reported to have an effect of reducing feed intake though it was reported to improve performance in chickens *(Dozier et al. 2003)* where the amino acid was included in a diet of soya beans and corn as major ingredients. Dozier *et al.* (2003) further, reported reduced feed intake in the chickens on Threonine supplemented diet. Thus as shown in the table above where the performance of the chicken on diet with Threonine was lower than control, the combined effect of cowpeas being low in palatability and that of Threonine to reduce intake could be the cause of that reduce performance. However, generally the diet with Threonine had better performance than that which had cowpea but no Threonine amino acid.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the results of the present study, it can be concluded that the nutritive value of cultivated cowpea as a non-conventional protein source for poultry, is satisfactory and has a positive effect on broiler chicken performance. Furthermore, broilers can still perform well when cowpea diet is not supplemented with Threonine amino acid. No significant difference was observed on the carcass cuts and abdominal fats among the three experiments diets. However, the birds on showed a better performance comparing with the rest.

5.2 Recommendations

As was observed that birds on cow pea diet without Threonine amino acid had almost the same performance as those on cow pea diet with Threonine, it can be recommended to feed the chickens without supplementing the diet with Threonine amino acid. Furthermore, because cow pea showed no significant difference with soya bean diet, it can be used as a replacement to soya bean in poultry feeding.

In as much as cow pea can be used as a source of protein its heat treatment needs to have a particular temperature and time be established as many researchers have reported different performances of chicken on cowpeas treated at different temperatures.

REFERENCES

Ajinomoto Heartland, Inc. (2001). True Digestibility of Essential Amino Acids for Poultry 2001.

Ali-khan, S.T. &Youngs, C.G., 1973.Variation in protein in field peas. Can. J. Plant Sci. 53, 41

A.O.A. C. (1980): Official Methods of Analysis. 13thedition.Association Official Analytical Chemists, Washington, D.C.

Arora, S.K., 1995. Composition of legume grains. In: Tropical legumes in animal nutrition. EdsD'Mello, J.P.F. &Devendra, C., Cab International, Wallingford, UK, pp. 67-93.

Bregendahl, K., J.L. Sell and D.R. Zimmerman, 2002.The effect of low-protein diets on growth performance and body composition of broilerchicks. PoultryScience., 81: 1156-1167.

Canon, L. &Carré, B., 1989.Effect of autoclaving on the metabolisable energy value of smooth peas (PisumSativum) in growing chicks. Animal Feed Science Technology 26, 337-345.

Coertze, A.F. & Venter, S., 1996. A.3 – Cowpeas. Indigenous seed crops. pp. 1-5. Agricultural ResearchCouncil.

Dozier, W.A. III; Moran, E.T. Jr.; Kid+d, M.T. (2003).Broiler chicken utilization of Threonine from fermentation by-product.Poultry Science Association, 92nd Annual Meeting, July 6-9, 2003.

Gomez, and Gomez, A.A.(1984): Statistical Procedure forAgricultural Research. 2nd edition.

Hai, D.T.; Blaha, J. 1998. The Effect of low-protein diets with supplementation of essential amino acids on broiler chicken performance. Agricultural-Tropical-and-Subtropical. 1998, No. 31 109-116.

Hai, D.T.; Blaha, J., (2000). Effect of low-protein diets adequate in levels of essential amino acids on broiler chicken performance. Chech-Journal-of-Animal Science, 2000. 45: 429-436.

Igbasan, F.A., Guenter. W. &Slominski, B.A., 1997. Field peas: chemical composition, energy and amino acid availabilities for poultry. Can. J. Anim. Sci. 77, 293-300.

MacLeod, M.G; Mcneill, L. and Kim, J.H., (2003). Food intake, weight gain, food conversionratio, breast muscle weight and abdominal fat weight in broiler chickens fed on diets of varyingprotein quality. British Poultry Science, Supplement 1 2003.44 S29-S29.

Neto, M.G; Pesti, G.M.; Bakalli, R.I., (2002). Influence of dietary protein level on the broiler chicken's response to Methionine and beanie supplements. Poultry-Science. 2002. 79: 1478-1484.

Ologhobo, A.D. and Fetuga, B.L, 1984. Effect of processing on trypsin inhibitor, haemagglutinin, tannic acid andphytic acid contents of seeds of ten cowpea varieties.TropicalAgricuture. (Trinidad) 16, 201-264.

Ravindran, V. and Blair, R., 1992. Feed resources for poultry production in Asia and the Pacific. II. Plant protein sources. World Poultry. Sci. 48, 205-231.

Tshovhote.N.J.,Nesamvuni.A.E., Raphulu. T. and Gous.R.M. 2003. The Chemical composition, energy and amino acid digestibility of cowpeas used in poultry nutrition. Journal of animal science 33 (1).

Wiryawan, K.G. & Dingle, J.G., 1995. Screening tests of the protein quality of grain legumes For poultry production. Broiler Journal Nutrition. 74, 671-679.

APPENDIX

APPENDIX I: ANALYSIS OF VARIANCE

Appendix Ia: Mean Weight Breast Muscle

Source of variation	Degree of Freedom	Sum of Squares	Mean Squares	Variation	F Probability
Treatment	2	1384	692	0.42	0.677
Residual	6	9951	1658		
Total	8	11335			

Appendix Ib: Mean Weight Thigh

Source of variation	Degree of Freedom	Sum of Squares	Mean Squares	Variation	F Probability
Treatment	2	72.2	36.1	0.06	0.940
Residual	6	3466.1	577.7		
Total	8	3538.4			

Appendix Ic: Mean Weight Drumstick

Source of variation	Degree of Freedom	Sum of Squares	Mean Squares	Variation	F Probability
Treatment	2	230.3	115.2	0.23	0.801
Residual	6	2997.7	499.6		
Total	8	3228.1			

Appendix Id: Mean Weight Abdominal Fat

Source of variation	Degree of Freedom	Sum of Squares	Mean Squares	Variation	F Probability
Treatment	2	135.0	67.50	2.30	0.181
Residual	6	175.99	29.33		
Total	8	310.99			