JOURNAL OF ANIMAL SCIENCE ADVANCES

Effects of Raw False Yam (*Icacina Oliviformis*) Seed Meal in Broiler Rations, on Carcass Yield and Eating Qualities of the Meat

Teye G.A., Coffie M. and Teye M.

J Anim Sci Adv 2011, 1(2): 79-84

Online version is available on: www.grjournals.com

Original Article

Effects of Raw False Yam (*Icacina Oliviformis*) Seed Meal in Broiler Rations, on Carcass Yield and Eating Qualities of the Meat

[1]Teye G. A., [1]Coffie M. and [*1]Teye M.

[1]Animal Science Department, Faculty of Agriculture, University for Development Studies, Tamale, Ghana

[*1]Animal Science Department, School of Agriculture, University of Cape Coast, Cape Coast, Ghana

Abstract

This study was conducted to determine the effects of substituting raw false yam seed meal (RFYSM) with maize in broiler rations, on the sensory and carcass characteristics of the birds. A total of 48 broiler chickens were randomly selected from 120 birds fed diets containing 0% (control), 5% (T1), 7.5% (T2) and 10% (T3) RFYSM. The birds were slaughtered after a 24-hour feed withdrawal, dressed, eviscerated and chilled for 12 hours. The visceral were separated into gizzard, spleen and intestines; and were weighed. The cold carcasses were also sectioned into the various carcass joints and weighed. The breast muscles were used for sensory analysis whiles the thigh muscles were used for laboratory analyses. The results indicated that RFYSM inclusion beyond 5% adversely affects the carcass characteristics, but has no effect on the sensory and lipid per-oxidation in the meat. The poorer carcass characteristics of the RFYSM-fed birds were associated with anti-nutritive substances that might be present in the seeds.

Key words: False yam seed meal, carcass yield, sensory, lipid per-oxidation

[*1] Corresponding author: teye2012@yahoo.com

Received on: 6 Oct 2011

Revised on: 11 Oct 2011

Accepted on: 13 Oct 2011

Online Published on: 1 Nov 2011

Introduction

Chicken, unlike ruminant livestock, reproduce and multiply within a very short period of time, making their meat available in larger quantities for consumption. Chicken production however, is plagued by high feed costs, which accounts for 70 – 75% of the total cost of production in West Africa (Ademola and Farinu, 2006; Ensminger, 1983; Afrique Agriculture, 2002). Bell and Weaver (2002) reported that 85% of the world's chicken energy is derived from maize. This brings about a competition between animals and humans for the staple, making its supply limited and expensive when available (Kekeocha, 1984). The result of this occurrence is the increased costs of poultry products, which are mostly unaffordable to the average consumer.

An attempt to minimize the competition between humans and birds over grains and legumes has resulted in scientists investigating the potentials of non-conventional ingredients for use as feed in poultry production (Teguia et al., 2002a; Teguia et al., 2004). One of such ingredients being tested for use as feed ingredient is the false yam (*Icacina oliviformis)* plant.

False yam is a tuber crop belonging to the family *Icacinaceae*. It is a perennial shrub with pubescent erect leafy shoots from a large underground fleshy tuber (Michael, 1993). According to Agyemang (2010) and Afelete (2010), the plant has potentials for use as feed ingredient in livestock rations. Current studies are employing the use of raw false yam seed meal as substitute for maize in broiler rations.

However, the type of feed given to animals is reported to have significant effect on the carcass and sensory characteristics of the meat (Teye et al., 2006).

This study was therefore conducted to determine the effects of feeding raw false yam seed meal (RFYSM) to broiler finishers, on the carcass and eating qualities of the meat.

Material and Methods

The experiment was conducted at the Meat Processing Unit and Laboratories of the University for Development Studies, Tamale, Ghana.

Experimental birds

A total of forty-eight (48) broiler-chicken (cob-500) of eight weeks old with a sex ratio of 1:1 were selected from 120 birds raised by the poultry unit of the University for Development Studies. Twelve birds were selected from each of four groups of birds raised on rations in which maize was substituted with RFYSM at levels of 0% (Control), 5% (T1), 7.5% (T2) and 10% (T3) inclusions.

Slaughtering of birds

Each live bird was weighed with an electronic scale (Sartorius, CP 245S) after a 24-hour feed withdrawal. The birds were then stuck with a sharp knife to cut the jugular veins and allowed to bleed for approximately 60 seconds, after which they were scalded in warm water (60°C). The feathers were plucked manually and head and shanks detached. An incision was then made at the vent area to remove the viscera, and the hot carcass weight was taken after washing with cool water.

Carcass yield

The viscera were separated into intestines, gizzard, liver and spleen. The dressed carcass was chilled for 24 hours and cold weight taken. Primal cuts were made from the chilled carcass, and were weighed. The breast and thigh muscles were packed separately in transparent polythene bags and vacuum-sealed, then frozen (-18°C) for sensory and laboratory analyses.

Sensory analysis

A total of fifteen (15) panellists, comprising staff members and students of the University, were randomly selected and trained according to the British Standard Institution guidelines (BSI, 1993) to evaluate the products. The breast muscles were thawed and grilled to a core temperature of 70°C in an electric oven (Turbofan, Blue seal, UK). The products were sliced into uniform sizes (about $2cm^3$) and wrapped with coded aluminium foils and presented to the panellists. Each panellist was provided with water and pieces of bread to serve as neutralizers between the products. Sensory

evaluation was conducted on the 1st and 7th days of storage.

A five-point category scale was used to evaluate the sensory characteristics of the chicken as follows:

Colour: very pale red (1); pale red (2); intermediate (3); dark red (4); very dark red (5).

Off-odour: very weak (1); weak (2); intermediate (3); strong (4); very strong (5).

Juiciness: very juicy (1); juicy (2); intermediate (3); dry (4); very dry (5).

Tenderness: very tender (1); tender (2); intermediate (3); tough (4); very tough (5).

Chicken flavour: very weak (1); weak (2); moderate (3); strong (4); very strong (5).

Flavour-liking: like very much (1); like (2); intermediate (3); dislike (4); dislike very much (5).

Proximate compositions and lipid per-oxidation (Peroxide values) of the meats

The nutritional composition and lipid per-oxidation of the products were conducted according to the methods of the AOAC (1999).

Data Analyses

Data obtained were analyzed using the General Linear Model (GLM) of Analysis of Variance (ANOVA) of the Minitab Statistical Package, version 15 (MINITAB, 2007). Where significant differences were found, the means were separated using Tukey Pair Wise comparison, at 5% level of significance.

Table1: Carcass Characteristics and primal cuttings of the chicken

Parameters	Control	T1	T2	T3	S.e.d	Sig
Dressing %	75.93^{a}	75.09^{a}	74.78^{a}	71.09^{b}	2.44	**
Cold weight (kg)	1.81^{a}	1.61^{a}	1.33^{b}	1.15^{c}	0.16	**
Drumstick (g)	230.30^{a}	237.80^{a}	208.70^{a}	171.50^{b}	30.19	***
Wing (g)	198.20^{a}	180.50^{a}	156.30^{b}	141.70^{b}	15.96	***
Thigh (g)	577.80^{a}	521.70^{a}	408.20^{b}	363.50^{b}	51.26	***
Breast (g)	719.50^{a}	588.00^{ab}	494.80^{b}	408.80^{b}	76.02	***
Shank (g)	1.81^{a}	1.61^{a}	1.33^{b}	1.15^{c}	0.16	**
Head (g)	55.05^{a}	55.98^{a}	51.36^{ab}	45.82^{b}	5.44	*
Whole intestine (g)	80.00^{b}	85.35^{a}	86.12^{a}	87.70^{a}	10.92	**
Whole gizzard (g)	60.60^{a}	68.03^{a}	56.47^{b}	48.18^{b}	7.99	***
Empty gizzard (g)	45.13^{ab}	47.33^{a}	38.08^{bc}	32.80^{c}	6.18	**
Spleen (g)	2.18	1.79	2.28	1.81	0.53	ns
Liver (g)	40.74	35.26	33.26	34.64	7.27	ns

Means in the same row with different superscripts are significantly different, s.e.d.= Standard error of difference, ns= not Significant, *= significant ($p<0.05$), **= significant ($p<0.01$), ***= Significant ($p<0.001$)

Results and Discussion

The primal cuts and carcass characteristics of the chicken are presented in Table 1. The dressing percentage of the chicken reduced with an increase in RFYSM inclusion, but the differences were not significant among the Control, T1 and T2 chickens, but these were significantly higher than the T3 chickens (Table 1). Similarly, the major primal cuts (thighs, drumstick and breast muscles) of the Control and T1 chicken were significantly higher ($P< 0.05$) than the T2 and T3 chickens. The weights of the whole intestines of the birds increased with an increase in RFYSM inclusions. This might be due to undigested feed in the intestines of the birds fed the RFYSM diets.

The false yam plant is reported to contain anti-nutritive factors, which reduce palatability and nutrient utilization in livestock (Fay, 1991). Several

research findings reported a reduction in carcass parameters when diets containing anti-nutritive factors are fed to birds (Teguia et al., 2003). According to Saif (2003), anti-nutritive factors in feedstuffs are poorly digestible, inhibit protein digestion, depress growth and are capable of increasing the incidence of skeletal disorders in livestock. Anti-nutritive factors also combine with proteins and enzymes in the digestive tract of animals and thereby negatively affect protein and carbohydrate digestibility (Jansman et al., 1995). The poorer carcass characteristics of the RFYSM-fed birds might be due to the presence of the anti-nutritive factors that resulted in an improper nutrient digestion and utilization in the birds, and consequently retarding their growth and development. Chicken is sold on weight basis, and therefore, a 1% reduction in weights can result in drastic losses under large scale production.

Table 2: Sensory characteristics of the breasts of chicken fed RFYSM

Storage period (days)	Parameter	Control	T1	T2	T3	S.e.d	Sig.
1	Colour	2.07	2.20	2.27	2.47	0.57	ns
	Off-odour	2.67	2.53	2.27	2.27	0.77	ns
	Juiciness	2.80	2.60	2.00	2.47	0.59	ns
	Tenderness	2.87	2.53	2.67	2.80	0.71	ns
	Flavour intensity	2.87	2.93	2.93	2.80	0.68	ns
	Flavour liking	2.67	2.53	2.27	2.33	0.68	ns
7	Colour	2.53	2.20	2.07	2.00	0.59	ns
	Off-odour	2.40	2.27	2.53	2.47	0.66	ns
	Juiciness	2.73	3.13	2.80	3.07	0.71	ns
	Tenderness	2.80	3.13	2.73	2.67	0.61	ns
	Flavour intensity	2.67	2.53	2.60	2.67	0.63	ns
	Flavour liking	2.33	2.47	2.33	2.20	0.51	ns

S.e.d= standard error of difference, sig= significance, ns= not significant

The sensory characteristics of the chickens are presented in Table 2. The use of RFYSM had no significant effect ($p>0.05$) on the colour, odour, juiciness, tenderness, flavour and flavour liking of the chicken.

Meat purchasing decisions are influenced more by product appearance than any other quality factor (Lawrie and Ledward, 2006); colour and flavour represent perceived freshness and are of vital importance to the meat industry and meat science research (Mancini and Hunt, 2005). Colour is a major indicator of quality of meat, as the appearance of meat and meat products influences consumer acceptability (Van Oeckel et al., 1999; Bell & Weaver, 2002). Odour and flavour are other important parameters considered by consumers in making their buying decisions (Omojola and Adesehinwa, 2007). Feeding RFYSM to the birds resulted in products with similar sensory characteristics as those fed the traditional chicken diets, an indication that consumer patronage will not be adversely affected.

The proximate compositions of the carcasses are presented in Table 3. The fat and moisture contents of the chicken reduced marginally with an increase in RFYSM inclusion, but the differences were not significant ($p>0.05$). The crude protein contents however, increased significantly ($p<0.05$) with an increase in RFYSM inclusions.

Table 3: Proximate compositions of the carcasses

Parameters (%)	Control	T1	T2	T3	S.e.d	Sig.
Moisture	76.28	71.36	71.57	70.50	6.63	ns
Fat (Ether extract)	10.80	6.69	7.61	7.81	3.15	ns
Crude protein	17.29[b]	19.60[a]	18.88[a]	18.87[a]	0.60	*

[ab=]Means in the same row with different superscripts are significantly different. S.e.d.=standard error of difference, sig=significance, ns=not significant, *=significant ($p<0.05$)

Various health organizations are advocating reduced meat consumption, as this is perceived to result in cancer of the colon (Warriss, 2010). Meanwhile, meat is the major source of protein required for growth and repair of worn-out tissues in man (Lawrie and Ledward, 2006). Therefore, a meat product with higher protein content is advantageous, as consumers need not consume a large portion of it to meet their nutrient requirements.

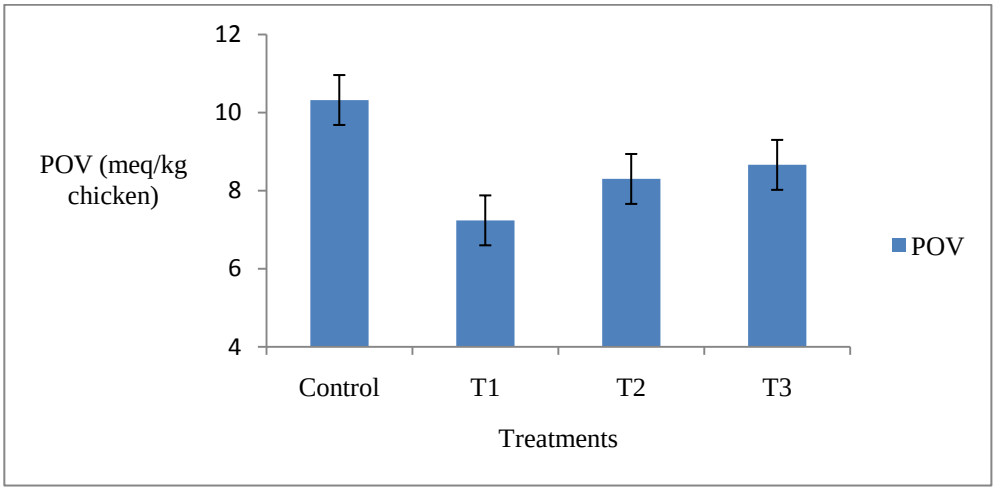

Fig. 1: Lipid per-oxidation (Peroxide value) of the chicken

Lipid peroxidation in the chicken

The rate of lipid per-oxidation in the chicken was determined on the 14th day in storage, and the results are presented in Fig 1. The lipid per-oxidation in the chicken ranged between 7.24 and 11.32millequivalent of O_2/Kg chicken.

Lipid oxidation is a major problem encountered in the storage of chicken, mainly due to the higher levels of unsaturated fatty acids in the fat of chicken. Lipid oxidation results in quality deterioration, which is perceived in the emission of off-flavours leading to a stale, rancid flavour in foods (Kerler and Grosch, 1996). The POVs were not significantly different and are much lower than the maximum permissible level of 25meq/Kg product (Evranuz, 1993; Narasimhan et al., 1986), an indication that the use of RFYSM would have no effect on product storability in storage.

Conclusion

The use of RFYSM beyond 5% inclusion, results in a significant reduction in the weights of the carcass and the primal cuts of broiler chicken, probably due to the presence of anti-nutritive factors in the false yam seeds. The RFYSM however, had no effect on the sensory characteristics and lipid per-oxidation in the meats. It is recommended that the false yam seeds should be processed (boiled or soaked in water) before feeding, to reduce the concentrations of the anti-

nutritional factors in the seeds, to determine their effects on carcass yield.

References

Ademola SG and Farinu GO (2006). Performance of laying birds fed diets containing forage meal of *Tithonia diversifolia* (Hemsl AG) and antibiotics. *Niger. J. Anim. Prod.* 33 (1): 58-68.

Afelete F (2010). Effects of processed False Yam (*Icacina oliviformis*) Tuber on the carcass characteristics and eating qualities of broiler chicken. An unpublished B.Sc. Dissertation, University for Development Studies 24pp.

Afrique Agriculture (2002). Mensuel d'information sur l'agriculture, l'élevage, la pêche et la forêt en Afrique, Nº 301, Mars 2002, p66.

Agyemang K (2010). Effect of processing (Soaking / cooking) False Yam (*Icacina oliviformis*) Tuber on the performance of Broiler Chickens. An unpublished B.Sc. Dissertation, University for Development Studies. 31pages

AOAC International (1999). In P. Cunniff (Ed.), Official methods of analysis of AOAC International (16th ed.). Gaithersburg, MD, USA: AOAC International.

Bell DD and Weaver WD (2002). Jr. (Eds), Commercial chicken meat and egg production, 5th edition, Kluwer Academic publishers. Pp 7, 8, 47 and 873-910.

British Standard Institution (1993). Assessors for sensory Analysis. Guide to Selection, Training and Monitoring of Selected Assessors. BS 17667. British Standard Institute, London, United Kingdom.

Ensminger ME (1983). The Stockman's Handbook. The Interstate printers & publishers, Inc. Pp 215.

Evranuz ÖE (1993). The effects of temperature and moisture content on lipid per- oxidation during storage of unblanched salted roasted peanuts: shelf life studies for unblanched salted roasted peanuts. *International Journal of Food Science and Technology* 28, 193–199.

Fay JM (1991). Analyses of food products of underexploited plants. *Economic Botany* 45 (1): 19-26.

Jansman AJ, Verstegen MWA, Huisman J and Van den Berg JW (1995). Effects of hulls of faba beans (Vicia faba L.) with low or high content of condensed tannins on the apparent ileal and fecal digestibility of nutrients and the excretion of endogenous protein in ileal digesta and feces of pigs. Journal of Animal Science 73: 118-127.

Kekeocha CC (1984). Poultry production hand book. Macmillan, U.K. Pp 54-109.

Kerler J and Grosch W (1996). Odorants contributing to warmed-over flavour (WOF) of refrigerated cooked beef. *Journal of Food Science* 61, 1271 – 1274.

Lawrie RA and Ledward DA (2006). Lawrie's Meat Science, 7th edition, Woodhead Publishing Limited, Abington Hall, Abington, Cambridge CB1 6AH, England. 442 pages.

Mancini RA and Hunt MC (2005). Current research in meat colour, *Meat Science* 71 (1), 100–121.

Michael JF (1993). A close look at an underexploited food plant, iii. Ecology a production. *Economic Botany*, 42(2): 163-170.

Minitab (2007). Minitab Statistical Software, release 15 for Windows 95/98/2000 and Windows NT. Minitab Inc, USA.

Narasimhan S, Raghuver KG, Arumngham C, Bhat KK and Sen DP (1986). Oxidative rancidity of groundnut oil evaluation by sensory and chemical indices and their correlation. *Journal of Food Science and Technology* 23, 273–277.

Omojola AB and Adesehinwa AOK (2007). Performance and Carcass Characteristics of Broiler Chicken Fed Diets Supplemented with Graded levels of Roxazyme G®. *International Journal of Poultry Science* 6 (5), 335-339.

Saif YM (2003). Diseases of poultry.11th edition. A Blackwell publishing company. Pp 1138.

Teguia A, Awah-Ndukum J and Puene C (2002a). The effects of replacing maize with dried leaves of *Desmodium spp* on the growth performance of broiler chickens. Bulletin of Animal Health and Production in Africa 50:106-114

Teguia A, Japou IB and Kamsu EC (2003). Response of broiler chickens to *Vigna unguiculata (L)* Walp (cowpea), *Phaseolus vulgaris* (black bean) and *Voandzeia subterranean* (Bambara groundnut) as feed ingredients in replacement of meat meals. Submitted for publication to Journal of Animal and Feed Sciences.

Teguia A, Endeley HNL and Beynen AC (2004). Broiler performance upon dietary substitution of cocoa husks for maize. International Journal of Poultry Science 3 (12): 779-782.

Teye GA, Munkaila L and Dei HK (2006). Carcass Characteristics of the male and female broiler chicken. Agricultural and Food Journal of GhanaVol.5 December 2006

Van Oeckel MJ, Warrmant N and Bookque LV (1999). Measurement and prediction of poultry colour. *Meat Science* 52: 347-354.

Warriss PD (2010). Meat Science, An Introductory Text (2nd Edition). CAB International, Wallingford Oxfordshire, OX10 8DE, UK. 234 pages.