FUTOJNLS 2018 VOLUME- 4, ISSUE- 1. PP- 368 - 375

Futo Journal Series (FUTOJNLS)
e-ISSN : 2476-8456 p-ISSN : 2467-8325
Volume-4, Issue-1, pp- 368 - 375
www.futojnls.org

Research Paper July 2018

Response of Broiler Finisher Birds to Differently Processed *Canavalia Plagiosperma* Seedmeal Diet

Esonu, B. O*, Izukanne, R. O., Udedibie, A. B. I. and Okeudo, N. J.

Department of Animal Science and Technology, Federal University of Technology
P.M.B.1526 Owerri, Imo State, Nigeria
**Corresponding Author's E-mail: richardizukanne@yahoo.com.*

Abstract

High cost of poultry feeds and feedstuffs is a major constraint to poultry industries in Nigeria and thus, the search for non-conventional feed resource for poultry feeds such as *Canavalia plagiosperma* seeds. A feeding trial was conducted to ascertain the response of broiler finisher birds to differently processed *Canavalia plagiosperma* seedmeal. The *Canavalia plagiosperma* seeds were cracked into 4-6 pieces per seed and thereafter divided into three batches. Two batches were soaked in water while the third batch was soaked in alkaline solution (2 % palm bunch ash by weight of the seeds) in different plastic containers for 48 hours, before draining off the soaking solutions. They were separately boiled in different pots for 1 hour, 2 hours and 1 hour, respectively, sun dried and milled to produce cracked soaked in water and boiled for 1 hour (CSWB1), cracked soaked in water and boiled for 2 hours (CSWB2) and cracked soaked in alkaline and boiled for 1 hour (CSAB1), *Canavalia plagiosperma* seed meals (CPSM), respectively. The meals were used to formulate seven broiler finisher rations and fed to 7 groups of 39 five-week-old broiler chicks per group for 21 days, to evaluate the response and economic implications. There were significant differences ($P<0.05$) in daily feed intake, daily body weight gain and feed conversion ratio. Results from this trial suggests that CPSM could be included up to 20 % in broiler finisher diets if cracked, soaked in alkaline solution and boiled for an hour (CSAB1).

Keywords: *Canavalia plagiosperma* seeds, broiler finisher chicks, cracked, soaked, alkaline, boiled.

1. Introduction

High priced compounded feed has been a major constraint to poultry production in the tropics (Madubuike and Ekenyem, 2001). The major reason for this scarcity and increased cost of poultry feed has been attributed to increased competition between man and livestock for major feedstuffs such as maize, groundnut and many others, which supply the protein and other nutritional needs of the birds (Okorie, 2006). Ogunji (2003) reported that the problem is more with feeds supplying protein.The competition for food between humans and animals is a serious problem in developing countries such as Nigeria as the geometric increase in human population limits feed available for the expansion of poultry industry (Okorie, 2006). This has led to increase in production cost of livestock products in

Nigeria and consequently animal products are expensive to majority of the population (Hahns, Raynolds& Egbunike, 1988; Esonu, Izukanne & Inyang, 2005).

There is an urgent need to replace these costly conventional feed ingredients with cheap and available unconventional feed materials. The high cost and irregular supply of the conventional feed sources have stimulated research into unconventional feed materials that are biologically qualitative (Akpodiete, 2008) locally available, less expensive and non-edible to man (Ekenyem Ndubuisi & Anyanwu, 2008) such as *Canavalia plagiosperma* seeds. The crude proteins content of ripe seed ranged from 26 – 36 % on dry matter basis and the protein has relatively good amino acid profile (Anumni, 2010).*Canavalia* seeds contain toxic protein, concanavalin A, which is a lectin (Udedibie, Esonu, Obaji, & Durunna, 1994; Esonu, Udedibie, & Carlini, 1998), canavanine (alkaline toxic amino acid), saponins, alkaloids and glycosides (Udedibie *et al.,* 1994; Esonu, 1996). Some of these toxic factors (concanavalin A, canatoxin, haemagglutinin and canavanine) are thermo-stable (Udedibie *et al*., 1994), while some are heat labile. These anti-nutritional factors limit the use of *Canavalia plagiosperma* seeds as livestock feed. There is the need to find methods of rendering *Canavalia plagiosperma* seeds utilizable by monogastric animals through cracking, soaking in water and alkaline solutions prior to boiling, respectively.

2. Materials and Methods

2.1. Location of the experiment

The research was conducted at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology Owerri, Imo State, Nigeria. Owerri is in the South-eastern Agro-ecological zone of Nigeria in the humid tropical area of West Africa situated on longitude 7° 01′ 06″ E and 7° 03′ 00″ E and latitude 5° 28′ 24″ N and 5° 30′ 00″ N (Obi *et al.*,2010) . The climate data has been summarized from the Ministry of Lands and Survey atlas of IMO State, 1984, as reported by Enyenihi (2012).

2.2. Sources and processing of the test materials

Canavalia plagiosperma seeds for the research were obtained from Ikwuano Umuahia in Abia State of Nigeria. The *canavalia* seeds were cracked with small metal hammer and rod into 4 – 6 pieces per seed then divided into three batches and later soaked into big plastic containers separately for 48 hours. One of the three containers was mixed with alkaline (2% palm bunch ash by weight of the cracked seeds) before soaking the cracked seeds. The soaking water was drained off and the soaked seeds boiled in large cooking pots separately for 1 hour, 2 hours and 1 hour, respectively. After boiling, the seeds were dried separately under the sun for 4 - 5 days. The sundried seeds were separately bagged, later milled in a hammer mill and stored for the trial. Samples of the raw, cracked soaked in water and boiled for 1 hour (CSWB1), cracked soaked in water and boiled for 2 hours (CSWB2) and cracked soaked in alkaline and boiled for 1 hour (CSAB1) *Canavalia plagiosperma* seed meals (CPSM) respectively were analysed, using standard methods (AOAC 1990) to determine the nutrients composition (Table 1).

Table 1: Proximate composition of the Raw, CSWB1, CSWB2 and CSAB1 *Canavalia plagiosperma* seed meal

Components	Raw	CSWB1	CSWB2	CSAB1
Dry matter (%)	80.65	81.65	81.15	79.25
Moisture content (%)	19.35	18.35	18.85	20.75
Crude protein (% DM)	36.11	26.12	33.93	26.25
Crude fibre (%DM)	5.15	6.30	6.80	7.10
Ether extracts (% DM)	5.48	3.41	5.16	4.67
Ash (% DM)	1.80	1.40	1.60	2.10
NFE (% DM)	51.46	62.77	52.51	59.88

NB:- CSWB1 = Cracked, soaked in water for 48 hours and boiled for 1hour
CSWB2 = Cracked, soaked in water for 48 hours and boiled for 2 hours
CSAB1 = Cracked, soaked in alkaline solution and boiled for 1hour
Raw = raw or unprocessed *Canavalia plagiosperma* seed meal

2.3. Experimental diets

Seven (7) experimental broiler finisher diets were formulated such that the differently processed *Canavalia plagiosperma* seed meals CSWB1, CSWB2 and CSAB1, were included at 0, 10 and 20% dietary levels respectively as shown in Table 2. Feed and water were offered *ad-libitum*.

Table 2: Composition of the broiler finisher experimental diets.

	Dietary Inclusion level of CPSM (%)						
		CSWB1		CSWB2		CSAB1	
Ingredients	0%	10%	20%	10%	20%	10%	20%
Maize	55.00	55.00	55.00	55.00	55.00	55.00	55.00
Soybean Meal	26.00	16.00	11.00	16.00	11.00	16.00	11.00
CPSM*	0.00	10.00	20.00	10.00	20.00	10.00	20.00
Fish Meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Palm Kernel Cake	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Wheat Offal	9.00	9.00	4.00	9.00	4.00	9.00	4.00
Bone Meal	3.50	3.50	3.50	3.50	3.50	3.50	3.50
TM/Vit. Premix **	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Chemical composition of the experimental diets							
Crude protein	20.86	19.71	19.94	19.71	19.94	19.71	19.94
Crude fibre	4.26	4.32	4.70	4.32	4.70	4.32	4.70
Ether extract	3.87	3.77	3.90	3.77	3.90	3.77	3.90
Ca	1.47	1.48	1.49	1.48	1.49	1.48	1.49
P	0.98	0.95	0.96	0.95	0.96	0.95	0.96
ME (Kcal/Kg)	2873.20	2948.17	3153.27	2948.17	3153.27	2948.17	3153.27

* CPSM = Processed *Canavalia plagiosperma* seed meal

** *To provide the following per kg of feed: Vit. A, 10, 000iu; Vit. D_3, 1,500iu; Vit. K, 2 mg; riboflavin, 3 mg; Pantothenic acid, 6 mg; Niacin, 15 mg; Choline chloride, 3 mg; Vit. B_{12}, 0.08 mg; Folic acid, 4 mg; Mn, 8 mg; Zn, 0.5 mg; Iodine, 1.0 mg; Co 1.2 mg; Cu, 10 mg; Fe, 20 mg;*

NB:- CSWB1 = Cracked, soaked in water for 48 hrs and boiled for 1 hr
CSWB2 = Cracked, soaked in water for 48 hrs and boiled for 2 hrs
CSAB1=Cracked, soaked in alkaline solution for 48 hrs and boiled for 1 hr.

2.4. Experimental birds and design

Two hundred and seventy-three (273) five-week-old Marshal Strain broiler chicks were used which were divided into seven groups of 39 birds each. The 39 birds were further sub-divided into three replicates of 13 birds each and randomly assigned to the seven treatment diets in a completely randomized design (CRD). During the trial period, routine medications were applied, litter changed regularly and other routine poultry management practices maintained. The initial weight of the birds was: 1030.56, 1116.67, 1170.83, 1152.78, 966.67, 1116.67, and 933.33g for 0, 10, 20, 10, 20, 10 and 20% CSWB1, CSWB2 and CSAB1 respectively. (Table 3).

Table 3: Performance of finisher broilers fed different dietary inclusion levels of *Canavalia plagiosperma* seedmeal (CPSM).

	Inclusion levels of differently processed CPSM							
		CSWB1		CSWB2		CSAB1		
Parameter	0 %	10 %	20 %	10 %	20 %	10 %	20 %	SEM
Initial body weight (g)	1030.56	1116.67	1170.83	1152.78	1012. 67	1116.67	1033.13	29.62
Final body weight (g)	2422.22	2250.00	2175.00	2194.44	1875.00	2380.56	2125.00	54.06
Body weight gain (g)	1391.66[a]	1133.33[bc]	1004.17[c]	1041.66[c]	908.33[c]	1263.89[bc]	1191.67[b]	48.96
Daily body weight gain(g)	66.27[a]	53.97[b]	47.82[bc]	49.60[bc]	43.25[c]	60.19[b]	56.75[b]	2.33
Daily feed intake (g)	159.71[a]	131.69[c]	146.73[b]	137.93[bc]	136.47[bc]	142.33[b]	133.43[bc]	2.52
Feed conversion ratio	2.41[c]	2.44[c]	3.07[a]	2.78[b]	3.16[a]	2.37[c]	2.36[c]	0.09
Mortality	-	-	-	-	-	-	-	0.00

[abc] means within rows with different superscripts are significant (P<0.05)

SEM – Standard Error of the Mean

2.5. Data collection

The birds were weighed at the beginning of the trial period and subsequently on weekly basis. Feed intake was determined by obtaining the difference between the quantity of feed offered and quantity left over after 24 hours the next morning. Weight gain was determined by the difference between the initial weight and final weight. Daily weight gain was calculated by dividing the weight gain by the number of days the trial lasted. Feed conversion ratio was computed by dividing the average daily feed intake by the average daily body weight gain. Feed cost per kg was calculated by summing up the feed ingredients cost of100 kg and dividing by 100. Feed cost per kg meat produced was calculated by multiplying the feed cost per kg by the feed conversion ratio. The trial lasted 21 days.

2.6. Statistical, design and analysis

The experimental design used in this research was Completely Randomized Design (CRD). Data collected were subjected to analysis of variance (ANOVA) as outlined by Snedecor and Cochran (1980). Where significant differences were observed between treatments, means were compared using Duncan's New Multiple Range test (DNMRT) as outlined by Obi (1990).

3. Results and discussions

The proximate composition of the raw, CSWB1, CSWB2 and CSAB1 was shownin Table 1. The CP values of the raw and processed *Canavalia plagiosperma* seedmeal (36.11 - 26.12%) were higher ($P<0.05$) than that reported for most legumes (17 - 30%) (Seena *et al*., 2006). This protein value makes *Canavalia plagiosperma* seed a probable supplement to cereal based diets with CP of 8.55% or below (Sagarika *et al*., 1999) and alternative vegetable protein source than most other unconventional tropical legumes (Seena*et al*., 2006). The CP of the processed *Canavalia* seedmeal decreased due to solubilisation and loss of nitrogenous compounds. The CSWB2 had higher CP value than CSWB1 and CSAB1and *Canavalia carthatica* (3.36%) (Seena *et al.,* 2006).

The CF content falls within the reported range (6.49 - 12.87%) of other *Canavaliaspp* (Udedibie, 1990; Esonu, 1996). The CF is less than that of *C. ensiformis* (8.5 %), *C. gladiata* (12.8 %) and *C. Maritama* (17.3 %) (Seena, Sridhar, Arun, & Chiu-Chung, 2006). The lipid values ranged from 5.48 - 3.40%for raw and processed CSPM, respectively. This is in line with other unconventional legumes such as swordbean (2.94%) (Akinmutimi, 2004), *Atylosiascarabaevides* (4.56%) *Neonotoniawightii* (4.64 %) (Arinathon, Mohan, & De Britto, 2003).The appropriate level of ether extract (EE) suggests that the seeds should be considered as an oil seed as it compares with groundnut (6.0%) and higher than soybean (3.5 %) (Pfizer Nutrients Master Plan, 1995).The NFE values recorded compared favourably with sword bean (50.38%), *Mucuna conchinchinesis* (51.86%) and jackbean (60.20%) as reported by Udedibie (1990), Esonu *et al.* (1997), Ukachukwu (2000) and Akinmutimi (2004) respectively for raw jackbean and swordbean. Ash content values were lower than that of *Canavalia ensiformis* (4.64 %), *Canavalia gladiata* (3.72%) and *Canavalia carthatica* (3.36 %) (Seena *et al.,*2006)

Data on the performance and economic analysis of the finisher broiler chicks fed the differently processed CPSM were shown in Tables 3 and 4, respectively. Birds on 10%

CSWB1 dietary level of inclusion performed best (P<0.05) in term of feed intake.This performance could be attributed to higher protein quality content of the test material due to detoxification of the ANFs in the processing methods.It was observed that the daily weight gain dropped as the level of the test material increased from 10% to 20 %. This confirms that anti-nutritional factors reduced growth rate and feed conversion ratio (Tamir & Alumot, 1996). This agrees with the report of Akanji, Ologbobo, Emiola, Adedeji & Adedeji (2003) that prolonged boiling periods increased CP values due to destruction of anti-nutritional factors contained in the seeds.

However, birds fed on 10% inclusion levels of CPSM performed better (P<0.05) than their counterparts on 20% dietary inclusion levels at CSWB1 and CSWB2 while the reverse was observe in the case of those fed on CSAB1 based diet which could be attributed to soaking in alkaline which agrees with the findings of D'Mello and Walker (1991) who reported complete elimination of canavanine in jackbeans soaked in alkaline solution. Based on the trial, the birds on 20 % CSAB1 dietary inclusion level were economically produced (167.01) than the other groups in ₦/Kg meat produced. Birds from the groups fed on CPSM diets were generally economically produced in term of ₦/Kg meat produced than those on the control diet.(Table 4).

Table 4: Economic analysis of different dietary inclusion levels of CPSM in broiler finisher rations.

		Inclusion levels of different processed CPSM					
		CSWB1		CSWB2		CSAB1	
Parameter	0 %	10 %	20 %	10 %	20 %	10 %	20 %
Feed cost (₦/Kg)	93.57	79.57	70.77	79.57	70.77	79.57	70.77
Feed savings (%)	-	14.94	24.37	14.94	24.37	14.94	24.37
Feed cost (₦/Kg) meat produced	225.19	194.15	217.03	221.47	223.63	188.58	167.01

CPSM = *Canavalia plagiosperma* seed meal

4. Conclusion

This study suggests that finisher broiler chicks fed on 20 % CSAB1 (cracked, soaked in alkaline and boiled for 1 hour) based diet performed best (P<0.05) in feed conversion ratio and was the least expensive diet in the trial.

References

Akanji, A.M., Ologbobo, A. O., Emiola, I. O., Adedeji, T. A. & Adedeji, O. S. (2003).The effect of processing on haemagglutinin and other anti-nutritional factors in jackbean (*Canavaliaensiformis (L) (DC)).*Proceeding of the 28th Annual Conference of Nig. Soc. for Animal Production, 28, 189 -193.

Akinmutimi, A.H., (2004). Evaluation of swordbean (*Canavalia @gladiata*) as an alternative feed resources for boiler chickens. Ph.D thesis, College of Animal Science, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Akpodiete, O.J., (2008). Performance of laying birds fed enzymes supplemented palm kernel cake (P.K.C.) based diet. Animal Production Research Advances, 4 (1), 42 - 46.

Anumni, P.E., (2010). Evaluation of *Canavalia plagiosperma* seed meal as feed ingredients in poultry diets. M.Sc. Thesis, FUTO, Nigeria.

Arinathon, V., Mohan, V.R. & De Britto, A.J. (2003).Chemical composition of certain tribal pulses in South India. Int. J. Food Sci. and Nutri., 54, 209 - 217.

Association of Official Analytical Chemists (AOAC), (1990).Official Methods of Analysis, 15th ed. Washington DC.

Ekenyem, B.U. Ndubuisi, E.C. & Anyanwu, L., (2008).Effect of partial replacement of sorghum (*Sorghum bicolor*) dust for maize (*Zea mays*) in broiler starter ration. Animal Production Research Advances, 4 (2), 88 - 91.

D'Mello, J.P.F. & Walker, A.G., (1991). Detoxification of jackbean *Canavaliaensiformis*., Studies with young chicks. Animal Feed Science and Technology, 33, 117-127.

Enyenihi, G. E. (2012). Gelatinization of fermented cassava tuber meal and its nutritive value in poultry diets.Ph.D thesis, Federal University of Technology, Owerri, IMO State, Nigeria.

Esonu, B.O. (1996). Studies on the method of improving the nutritive value of jackbean (*C. ensiformis*) for poultry industry. Ph.D thesis, Federal University of Technology, Owerri.

Esonu, B.O., Udedibie, A.B.I., & Herbert, U. (1997).Nutritional evaluation of raw jackbeans (*Canavaliaensiformis*) for weaner rabbits. Delta Agric., 4, 18 - 24.

Esonu, B.O., Udedibie, A.B.I. & Carlini, C.R. (1998).The effect of roasting, dry urea treatment and sprouting on some thermostable toxic factors in the jackbean seeds. Nig. Anim. Prod., 25 (1), 36 - 39.

Esonu, B.O., Emenalom, O.O., Udedibie, A.B.I., Udoh, H., Ekpor, C.F., Okoli, I.C. & Iheukwumere, F.C. (2001). Performance and blood chemistry of weaner pigs fed raw mucuna bean. Trop. Anim. Prod. Invest. 4, 49 - 54.

Esonu, B.O., J.C. Azubuike, O.O. Emenalom, E.B. Etuk, I.C. Okoli, H.O Uku& C.S. Nneji, (2004). Effect of enzyme supplementation on the performance of boiler finisher fed *Microdesmispubercula* leaf meal. Int. J. Poultry Sci. 3, 112-114.

Esonu, B.O., Izukanne, R.O. & Inyang, O.A. (2005). Evaluation of cellulolytic enzyme supplementation on production indices and nutrients utilization of laying hen fed soybean hull based diet. International Journal of Poultry Science, 4 (4), 213 - 216.

Esonu, B. O., Nnaemeka, A. A., Azubuike, J.C., Uchegbu, M.C. & Ezeokeke, C.T. (2007). Performance and economic analysis of boiler starter fed dried rumen digesta. Int. J. Agric. and Rural Dev., 9 (1A), 77 - 79.

Hahns, S.K., Raynolds, L. & Egbunike, G.N. (1988). Use of cassava for feeding livestock in Africa. Proceedings of the IITA / ILCA / University of Ibadan workshop on the utilization of cassava as livestock feed in Africa, Ibadan, Nigeria. 14 – 18

Madubuike, F.N. & Ekenyem, B.U. (2001). Non-ruminant livestock production in the tropics. Gust-Chuks Graphic Center, Owerri, Nigeria.

Obi, I.U. (1990). Statistical Methods of detecting differences between treatment means.2nd edition, Snaap Press Enugu, Nigeria.

Obi, T.K.O., Ekenyem, B.U. & Nwangwu, U.M. (2010). Cassava peel meal as a substitute for whole maize on the performance of broiler finisher chicks. Ani. Prod. Res. Adv., 6(3), 197 - 200.

Ogunji, J.O. (2003). Alternative protein sources in diets of farmed tilapia. Dept of Animal Science, Ebonyi State University, Abakaliki, Nigeria. Review Series B, 74(9), 23 - 32.

Okorie, K.C. (2006). Evaluation of *Jacaranda mimosifolio T.* (Stans) leaf meal as ingredients in finisher broiler diet. Performance carcass and organ weight characteristics. Animal Production Research Advances 2 (1), 44 - 49.

Pfizer Nutrient Master Plan (PNMP). (1995). Tropical crops dicotyledons. Longman Group Ltd, London 1st ed. 242 -245.

Sagarika, E., Enol, R.J. & Baboo, M.N. (1999). Proximate composition, mineral and amino acid content of mature *Canavaliagladiata* seeds. Food Chemistry, 66, 115 - 119.

Seena, S., Sridhar, K. R., Arun, A. B. & Chiu-Chung, Y. (2006).Effect of roasting and pressure-cooking on nutritional and protein quality of seeds of mangrove legume *Canavaliacathartica* from South-West Coast of India. J. Food Composition and Analysis, 19, 284 - 293.

Snedecor, G.W. & Cochran, W. G. (1980). Statistical Methods. The Iowa State Univ. Press Ames. Iowa, 6TH ed.

Tamir, M. & Alumot, E. (1996).Inhibition of digestive enzymes by condensed tannins of green and ripe carots. J. Sci. Food and Agric., 20, 199 - 202.

Udedibie, A.B.I. (1990). Nutritional evaluation of jackbean (*C. ensiformis*) for the Nigeria Poultry Industry. AMBIO, 19, 361 - 365.

Udedibie, A.B.I., Esonu, B.O., Obaji, C.N. & Durunna, C.S. (1994).Dry urea treatment prior to roasting as a method for improving the nutritive value of jackbean (*Canavalia ensiformis)* for broiler. Animal Feed Technology, 48, 225 -345.

Ukachukwu, S.N. (2000). Chemical and nutritional evaluation of *Mucunaconchinchinesis* (lyon's beans) as an alternative protein ingredient in broiler diets. Ph.D thesis, Department of Animal Science University of Nigeria Nsukka, Nigeria.