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Nutritional Evaluation of Icacinia manni (Earth Ball) Processed in Saline as a Source of Dietary Energy in Broiler Production

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Abstract
The effect of *Icacinia manni* meal fermented in saline on the performance, carcass and internal organ characteristics were determined in a 65-day feeding trial. Proximate composition of the meal showed that *Icacinia manni* is high in crude protein, crude fibre and Ash. Three (3) experimental diets were formulated both at the starter phase and finisher phase. Diet 1 (control) contained maize as source of energy; diet 2 and 3 contained *Icacinia manni* fermented in saline (IMS) at 10% and 20% levels; partly replacing maize in the diet. One hundred and eighty day old broiler chicks were used for the experiment. The birds were divided into three groups of 60 birds each and each group assigned to one of the experimental diets using completely randomized design (CRD). Each group was further subdivided in 4 replicate of 15 birds. The values of feed intake, body weight gain and feed conversion ratio were not significantly ($p > 0.05$) different. The dressed weight, live weight, gizzard, liver and abdominal fat followed the same trend. Significant ($p < 0.05$) difference was recorded in the heart and kidney weight. The 20% IMS recorded a higher heart and kidney weight than the control. It was concluded that *Icacinia manni* meal can be included in broiler diet up to 20% if fermented in saline.

Introduction

Poultry provides the quickest source of meat and its production involves the least hazardous and arduous process compared to other livestock enterprises (Ojewola et al; 2006). Nigerian government has made effort in the past to develop a sustainable poultry industry with little success because of the complex arrays of constraints facing the industry. The plethora of constraints militating against the development of the industry in Nigeria is economical, biological, technical and institutional. Of greater importance is the economic aspect of it which involves shortage and high cost of feed ingredients. The provision of feed alone has been reported to account for 70-80% of the total cost of poultry production in developing countries (Igboeli 2000); Esonu, 2006, Obioha 1992, Idowu 1999). The scarcity and high cost of feed ingredients especially energy source e.g. maize is as a result of grain production lagging behind the demand and there exist a great competition between humans and animals in their grain consumption.

Bello (1988) has it that maize has the highest inclusion rate of 400-500kg/mt as compared to other cereal grains. Therefore, there is an urgent need to search for some cheaper readily available alternative energy feed.

Icaccinia manni (earth ball) seems to have potentials as source of dietary energy for birds in the country

Icacinia manni is a shrub with modified tuber which is mainly carbohydrate. It is not directly consumed by man. It is a common wild field crop, forest regrowth and is locally abundant in Nigeria (Akobundu and Agyakura, 1998). It is reported to contain anti-nutritive factors such as cyanogenic glycoside and phytic acid which render phosphorous unhydrolysable by intestinal enzymes (Fassiet, 1973).

Ekpo and Udedibie, 2012 reported that *Icacinia manni* contains gummy substances that limits or reduces it digestibility when consumed by animals. this work was therefore designed to investigate a way of removing the gummy substance contain in icaccinia manni that limits it use as animal feed by soaking the tuber in saline, so as to render the tuber acceptable to the birds.

Materials and Methods

The study was carried out at the poultry and research unit of the Department of Animal Science, Akwa Ibom State University, Obio Akpa campus. Obio Akpa is located between latitudes $5^{0}17^{1}$N and $5^{0}27^{1}$N and between longitudes $7^{0}27^{1}$N and $7^{0}58^{1}$E with an annual rainfall ranging from 3500mm – 5000mm and average monthly temperature of 25^{0}C, and relative humidity between 60-90%. It is in the tropical rainforest zone of Nigeria. (Wikipedia, 2016).

Source of Icacinia Manni and Processing Method

Fresh *Icacinia manni* tubers were harvested from fallow land within the university community. The tubers were washed thoroughly and chopped into small pieces and sundried. The chips were milled thereafter to produce sundried icaccinia manni tuber meal. The *Icacinia manni* tuber meal was soaked in saline prepared by dissolving common salt in water at the rate of 1kg salt to 50 litres of water and allowed to ferment for 72 hours. Thereafter the water was drained out and the fermented *Icacinia manni* was boiled in fresh water for 1 hour. It was later sundried and produces *Icacinia manni* tuber meal processed in saline (IMS). Proximate composition was carried out on the *Icacinia manni* tuber meal.

Experimental Diets

Three (3) 150- nitrogenous broiler Starter experimental diets were formulated such that diet 1 (control) contained maize as the main source of energy. Diet 2 and 3 contained *Icacinia manni* meal processed in saline at 10% and 20% levels, partly replacing maize in the diet. Other ingredients were adjusted in such a way that they met the nutrient requirements of starter broiler. Three (3) broiler finisher diets were similarly prepared for the finisher phase. The ingredient composition and calculated chemical composition of both the starter and finisher broiler diets are presented in table 1 and 2.

Experimental Birds and Design

A total of 180 day old broiler chicks of mixed sexes were bought from a reputable distributor and were divided into three groups of 60 birds each and each group randomly assigned to one of the three experimental diets using completely randomized design.

Each group was further replicated 4 times and each replicate (15 birds) raised in a deep litter system of management with pens measuring 2m by 2m. Feed and water were provided ad libitum. The birds were weighed at the beginning of the feeding trial and weekly thereafter. The experiment lasted 8 weeks.

Carcass and Organ Weights Evaluation

At day 63, four birds were randomly selected from each treatment starved overnight of feed, weighed and their Jugular veins were cut and the carcass allowed to bleed thoroughly. The carcasses were scalded in hot water of about 80ºC for a minute and the feathers plucked manually. The carcasses were eviscerated by cutting through the vein and the viscera removed. Thereafter the dressed carcass weight of internal organs and abdominal fat were recorded.

Data Analysis

Data generated on feed intake, body weight gain, feed conversion ratio, carcass and internal organ weights were subjected to analysis of variance (ANOVA) using SPSS (2004). Where Anova detected treatment effects, means were compared using Duncan New Multiple Range Test (DNMRT) as outlined by Obi (1990).

Table 1: Ingredient and Nutrient Composition of the Experimental Starter Broiler Diets

Ingredients	Diets		
	1(0%)	2(10%IMS)	3(20%IMS)
Yellow maize	50.00	40.00	30.00
Icacinia manni meal	0.00	10.00	20.00
Soya bean meal	25.00	25.00	25.00
Blood meal	3.00	3.50	4.00
Fish meal	3.00	3.00	3.00
Palm kernel cake	5.00	5.00	5.00
Wheat offal	10.00	9.50	9.00
Bone meal	3.00	3.00	3.00
Common salt	0.25	0.25	0.25
Tm/ premix	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25
L-methionine	0.25	0.25	0.25
Total	100	100	100
Determined chemical Analysis (% of DM)			
Crude protein	22.92	22.86	22.88
Ether extract	4.09	4.19	4.29
Crude fibre	3.15	3.68	4.21
Ash	3.57	3.85	4.11
Nitrogen free extract	66.29	65.42	64.51
ME (mcal/kg)	2.74	2.65	2.60

IMS - *Icacinia manni* meal fermented in saline

To provide the following per kg of feed; vitamin A, 10,000, vitamin D3, 2000; vitamin E, 55iv; vitamin K,mg; vitamin B1, 1.5mg; zinc; Riboflavin, 4.2mg; vitamin B2, 4mg; vitamin B6, 1.5mg; vitamin B12, 12mg;niacin, 15mg; pantothenic acid, 5mg; nicotinic acid, 20mg; folic acid, 5mg; Biotin, 2mg; choline chloride, 100mg; magnesium, 75mg. Iron, 2mg; zinc, 5mg; Copper, 5mg; iodine, 1.0mg; selenium, 2.0mg; cobalt, 5; Antioxidant, 125mg

Table 2: Ingredient and Nutrient Composition of the experimental Finisher Broiler Diets Experimental Diets

Ingredients	Diets		
	1(0%)	2(10%)	3(20%)
Yellow maize	60.00	50.00	40.00
Icacinna manni meal	0.00	10.00	20.00
Soya bean meal	16.00	16.00	16.00
Blood meal	3.00	3.50	4.00
Fish meal	3.00	3.00	3.00
Palm kernel cake	4.00	4.00	4.00
Wheat offal	10.00	9.50	9.00
Bone meal	3.00	3.00	3.00
Common salt	0.25	0.25	0.25
Tm/ premix	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25
L-methionine	0.25	0.25	0.25
Total	100	100	100
Determined chemical Analysis (% of DM)			
Crude protein	19.28	19.24	19.26
Ether extracf	4.11	4.21	4.31
Crude fibre	2.80	3.34	3.87
Ash	3.12	3.39	3.66
Nitrogen free extract	70.68	69.52	68.40
ME (mcal/kg)	2.91	2.83	2.80

Results and Discusssion

The proximate composition of fresh and processed *Icacinia manni* is presented in table 3

The values of crude protein, crude fibre and ash in *Icacinia manni* meal processed in saline were slightly higher than the fresh *lcacinia manni* meal.

Table 3: Proximate Composition of fresh and processed Icacina manni (%DM)

Component	IMR	IMS
Moisture %	11.33	13.59
Crude protein, %DM	3.45	3.78
Crude fiber, %DM	2.53	2.81
Ash, %DM	3.81	4.18
Ether extract, %DM	2.56	2.59
Nitrogen free extract %DM	87.69	86.84
Caloric value (Kcal)	387.52	359.11

IMR – Raw *Icacinia manni meal*, IMS - *Icacinia manni* meal fermented in saline

The performance and carcass evaluation of the experimental broiler birds are presented in table 4 and 5. The dietary treatments had no significant effects ($p > 0.05$) on final body weight, weight gain, feed intake and feed conversion ratio of the experimental broilers. Birds fed 10 and 20% of icaccinia manni meal had the highest weight gain (57.71 and 57.57) and the best feed conversion ratio (2.28 and 2.30) respectively.

Umoren et al.,(2001) reported significant increase in feed intake of broilers fed *Icacinia manni* meal fermented in cassava. The results contradict those of Owokere (2010) and Ekpo and Udedibie (2012) which indicated depression in feed intake of broilers fed diets containing 20% cooked *Icacinia manni* meal.

The live weight, dressed weight, dressing percentages of the slaughtered birds showed no significant ($p > 0.05$) difference among the treatments. The values obtained in the study were higher than the values of Ekpo and Udedibie (2012) on dressed weights of broiler birds fed moist-heat treated *Icacinia manni* meal at 10 and 20% dietary levels.

Significant ($p < 0.05$) differences were recorded in the heart and kidney weights of the slaughtered birds. The control diet and 20% IMS diet recorded significantly ($p < 0.05$) reduced heart weights while the kidney weight of the control and 10% IMS group were lower than the 20% IMS group. Enyenihi et al (2013) also recorded a significantly ($p < 0.05$) lower heart and kidney weight values for finisher broilers fed peeled and unpeeled fermented gelatinized cassava tuber meal. The liver weight, gizzard weight and abdominal fat of the slaughtered birds showed no significant ($p > 0.05$) difference.

The crude protein content of *Icacinia manni* meal was higher than that of cassava but similar to it as source of energy, in view of their high NFE values. Fermentation is one of the local ways of detoxification of tuberous crops and has proved to be an effective method of detoxification of *Icacinia manni*. The reason for fermentation

in saline was to break the gummy substances found in *Icacinia manni* since saline enhances formation of electrolytes and micelles thereby destroying the gummy tendency of the compound so that it could be washed away. The results of this work showed that body weight gain, feed intake, and feed conversion ratios were not affected by the treatments.

Similarly, the dressing percentage, live weight and dressed weight, liver, gizzard, abdominal fat followed the same trend.

The liver is a strategic organ involved in nutrient metabolism Udedibie and Omekan, (2001). Thus, the similarity in liver weights among the treatments groups was an indication that the diets did not inflict the birds with any serious toxicity.

Also, the similarity in weight of the gizzard was an indication that the diets were similar in composition and texture (Nir et al, 1995).

The smaller kidney and heart weights recorded in the experiment could be attributed to the mild level of toxic substances present in the diets, but since the control group was also affected, the reason for this could not be ascertained.

Conclusion

The results of the trial has shown that fermentation in saline prior to cooking has help to detoxify *Icacinia manni* and has greatly reduced the levels of poisonous substances found in it that limit its usage as feed ingredients by animals especially non-ruminant. The removal of the galactomannan gum has improved the nutritive value of the meal, thereby rendering it acceptable to broilers. This is a significant improvement over earlier processing methods like the most heat treatment, toasting and sun-drying methods.

Table 4: Performance of finisher broiler fed *Icacina manni* meal fermented in saline

Performance parameters	Diet 1 (0%)	Diet 2 (10% IMS)	Diet 3 (20% IMS)	SEM
Average Initial Weight (g)	7110.10	1112.0	1189.30	36.59
Average Final Weight (g)	2705.03	2728.11	2801.10	24.05
Average body weight gain (g)	1595.10	1616.00	1616.21	31.71
Average daily weight gain (g)	56.95	57.71	57.57	1.03
Average Feed Intakke (g/d)	130.00	133.11	139.07	2.11
Feed Conversion ratio(gfeed/ggain	2.32	2.30	2.28	0.17
Mortality	0.00	0.00	0.00	0.00

IMS - *Icacina manni* meal fermented in saline

Table 5: Carcass and Internal organ characteristics of Broiler fed Icacina manni meal fermented in saline

Carcass and Internal organ parameters	Diet 1 (0%)	Diet 2 (10% IMS)	Diet 3 (20% IMS)	SEM
Live weight (kg)	2.60	2.43	2.46	0.70
Dressed weight (kg)	1.69	1.60	1.60	0.13
Dressing percentage (%)	64.92	65.98	64.96	4.31
Liver, % LW	2.08	2.02	2.07	1.03
Gizzard, % LW	1.59	1.53	1.50	0.41
Heart, % LW	0.39^{b}	0.33^{b}	0.44^{a}	0.03
Kidney, % LW	0.16^{b}	0.16^{b}	0.20^{a}	0.01
Abdominal fat % LW	1.62	1.68	1.66	0.33

ab – means within a row in different superscripts are significantly different (P <0.05); IMS - Icacina manni meal fermented in saline

References

Akobundu, I.O. and Agyakwa, C.W (1998). A Hand Book of West African Weed (2nd revised edition). IITA, Ibadan INTEC Printers, Nigeria

Bello, A.O. (1988). "Problems Confronting feed milling industry in Nigeria and possible way out" in Babatunde (G.M), ed: Proceedings of National workshop on alternative formulation of livestock feed. Pp. 65-94

Ekpo K. O and Udedibie A. B. I (2012). moist-treatment as a method of improving the nutritive value of Icacinia manni (Earth Ball) for Broilers intl Journal of Agricultural and Rural development; 15:1154-1161

Enyenihi, G.E; A.C. Esiegwu, B.O. Esonu, M.C.Uchegbu and A.B.I Udedibie, (2013). Gelatinization of fermented cassava tuber meal and its nutritive value for laying hens. Journal of Agricultural Technology 9(5): 1137-1149

Esonu, B.O.; O.O Emenalom, A.B.I. Udedibie, U. Herbert, C.F. Ekpor, I.C.Okoli and F.C. Ihenkwuenene (2001). Performance and blood chemistry of weaner pigs fed raw mucuna (velvet Beans) meal. Trop. Anim. Prod.

Invest; 4:49-54
Fassiet, D.W. (1973). Oxalates. In. toxicants Occurring Naturally in foods Academy of Science, Washington D.C.
.Idowu, O.M. (1999). Performance and Nutrient Utilization of broiler chicken fed low level protein level under two housing system. M. Agric, Thesis university of Agriculture, Abeokuta, Nigeria.
Igboeli, G. (2000). Animal Production and Agricultural in the new millennium. Proceedings of the 25th Annual Conference. Nigeria society of Animal Production.
Nir, I., Hillela. R., Ptichi, I and Shefet, G. (1995). Effect of Particle size on performance, 3 Grinding, pelleting interactions. Poultry Science, 74:711-783
Obi J.U. (1990). Statistical Methods of Detecting Differences Between Treatment Means (2nd Edition) Snaap Press, Enugu, Nigeria.
Obioha F.C. and Anikwe P.C.N. (1982). Utilization of ensiled and sumdried cassava peels by growing Swine. Nutria. Rep. Intl; 26(6): 961-972
Owokere, O.E. (2010). The potentials of icaccinia manni as feed ingredient in broiler diets. M.Sc Dissertation, University of Uyo, Uyo- Nigeria
Ojewola, G.S.; Okpara, D.E and Ndupu, D. (2006). The substitution cassava meal supplemented and unsupplemented with palm oil for maize in broiler diets, J. Animal Vet. Sci; 5:473-478.
Udedibie, A.B.I; and Omekam, V.N. (2001). Nutritional and health implications of dietary inclusions of dried poultry waste (DPW) for broilers. Agro-Science, 2:24-29
Umoren, U.E., Essien,A.I and Ntukekpo, L.L. (2003). Chemical Evaluation of cassava and iccacinia manni Mixture under various stages of fermentation. Journal of Applied Science, 6(3) : 3669-3676.
Wikipedia The free Encyclopedia *http*.s:// *en.wikipedia*.org/ wiki/ Akwa – Ibom.