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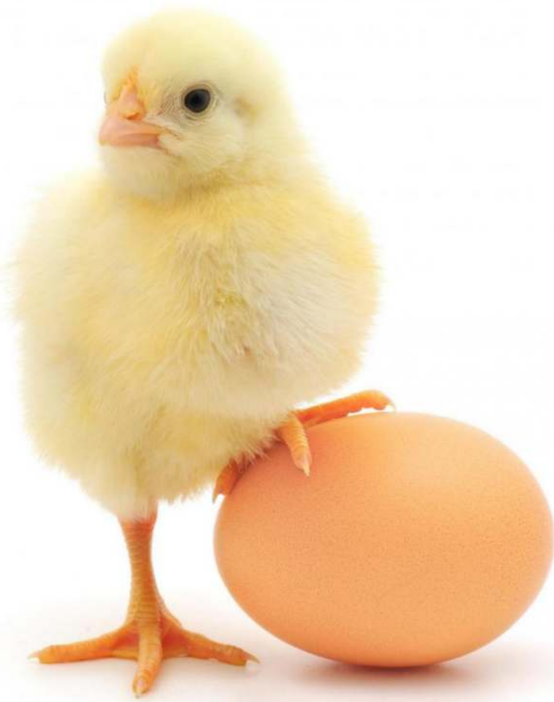

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ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Carcass, Organ and Organoleptic Characteristics of Spent Layers Fed Bambara Nut Sievates

S.O.C. Ugwu and A.E. Onyimonyi
Department of Animal Science, University of Nigeria, Nsukka, Nigeria

Abstract: The carcass, organ and organoleptic characteristics of spent layers fed Bambara nut sievates (BNS) were investigated. Ninety laying hens of the Brown Nera strain in their 9th week of lay were randomly assigned to five dietary treatment in which BNS were incorporated at levels of 0 (control), 5, 10, 15 and 20 percent. There were eighteen birds per treatment and each treatment was replicated thrice in a Completely Randomized Design. The feeding trial lasted for 45 weeks during which each bird received 120g of feed/day. Results showed that final body weight, dressing percentage and residual weight were significantly affected by treatments ($P<0.05$). There was an observed increase in these parameters up to the 10 percent levels after which the values declined. Birds on the 10 percent BNS diets were superior in these parameters. Gizzard and liver weights increased significantly ($P<0.05$) as levels of BNS increased. Organoleptic investigations revealed that colour, taste and texture of the breasts muscle were significantly ($P<0.05$) affected by treatments. Birds on the 10 percent BNS diet had significantly higher colour value whereas taste and texture significantly increased as level of BNS in the diets increased. In conclusion, the results of this study reveal that BNS can be incorporated at 10 percent level in diet of laying hens without compromising carcass characteristics at end of lay.

Key words: Bambara nut sievates, carcass, organoleptic characteristics

Introduction

Bambara nut sievate (BNS) is a by-product from the processing of bambara nut into its flour. This flour is widely consumed in the South Eastern states of Nigeria in a form of a pudding called 'Okpa'. At present these sievates have no direct food use by man. In most areas they are merely used as feed supplements for small ruminants. With the increasing demand and consumption of 'Okpa' more of these sievates are produced. They are carelessly disposed within the processing plants and thus constitute environmental pollutants. Recent works have revealed that BNS have promising potential as feeding stuff for pigs and poultry. Their incorporation in diets of these species have reduced the cost/kg of feed tremendously and improved growth and production parameters. Onyimonyi and Okeke (2007) reported that growth performance of weaner pigs were enhanced when bambara offal was fed at a 10 percent level. Also, enhanced growth was observed in pullets when bambara offals were incorporated in the diet at a 20 percent level (Onyimonyi and Onukwufor, 2003). Ekenyem and Onyeagoro (2006) reported that increasing levels of Bambara nut sievate reduced the cost of producing broilers thus making the product more affordable to consumers.

Spent layers have remained a good source of meat for most Nigerians, even though their meat is tougher than those of broilers. The sale of these spent layers at the end of the laying cycle is one important source of money to the poultry farmer. To command good market price these birds must have good meat characteristics at end of laying without compromising the primary role of egg production. This informs our decision to explore a feeding regime for laying birds that would enable laying birds maintain good carcass quality during and after their laying cycle. The present study was therefore designed to evaluate the effect of feeding varying dietary levels of BNS on the carcass, organ and organoleptic characteristics of laying hens.

Materials and Methods

The study was conducted at the Poultry Research Unit of the Department of Animal Science, University of Nigeria, Nsukka. BNS were collected from processing plants in Nsukka town. The sievates were toasted over five for about twenty minutes, allowed to cool and then incorporated at levels of 0, 5, 10, 15 and 20 percent in diet of laying hens (Table 1). A total of ninety laying hens of the Brown Nera strain in their 9th week of lay were used for the study. The hens were randomly divided into five treatments with eighteen birds per treatment in a Completely Randomized Design. Each treatment was replicated thrice. Each bird received 120g of feed per day. Water was given *ad libitum*. Other management practices typical of laying hens were strictly adhered to. The feeding trial lasted for 45 weeks. At the end of the 45 week (ie. 54 weeks in lay) six birds were randomly selected from each treatment. The birds were fasted for 24 hours and slaughtered by humane decapitation of the neck. They were dipped into hot water (70-80^{o}C) and

Talbe 1: Percentage Composition of the Experimental Diets

	Dietary levels of BNS				
Ingredients	0	5	10	15	20
Maize	43.00	38.00	35.00	33.00	30.00
Wheat offal	18.00	18.00	18.00	18.00	18.00
Bambara Sievate	-	05.00	10.00	15.00	20.00
Soyabean meal	17.50	17.00	15.00	12.00	10.00
Palm kernel cake	9.00	9.00	9.00	9.00	9.00
Local fish waste	2.50	3.00	3.00	3.00	3.00
Oyster shell	6.00	6.00	6.00	6.00	6.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25	0.25
Mehtionine	0.25	0.25	0.25	0.25	0.25
Vitamin mineral premix	10.25	0.25	0.25	0.25	0.25
Common Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated					
Crude protein	17.39	17.00	17.08	17.25	17.20
Energy (KcalME/kg)	2762.00	2791.00	2734.00	2774.00	2754.00
Crude fibre	5.02	5.94	5.97	6.25	6.60

[1]Vitamin Premix (2.5kg/1000kg): vitamin A (15,000.000 U.I), vitamin D_3 (3,000.000 I.U) and vitamin E (30,000 I.U) vitamin k (2,500 I.U), Thiamin B_1 (2,000mg), Riboflavin B_2 (6,00mg). Pyridoxine B_6 (4000mg) Niacin (40,000mg), vitamin B_{12} (20mg), panthothenic B_6 (10,000mg), Folic Acid (1,000mg), Biotin (80mg), Chlorine Chloride (500mg), Antioxidant (12g). Manganese (96g), Zinc (60g), Iron (24g), Copper (6g), Iodine (1,4g), Selenium (24g), Cobalt (12g).

their feathers manually plucked. Each bird was eviscerated and the weight measured. The wings were removed by cutting anteriorly severing at the humeo-scapular joint. Lateral cuts were made through the rib heads to the shoulder girdle and the breast muscle removed intact by pulling anteriorly. Weight of cut parts and organs were determined using an electric sensitive scale (G and G Electronic scale J.J. 2007).

The breast muscles of each of the six birds per treatment were cut approximately 1cm^3 pieces and boiled in water for 30 minutes. The samples were cooled to room temperature and presented to a panel of 10 undergraduates for evaluation. The colour of the meat was rated on a six point scale of very white to very dark grey. Texture was assessed by mouth feel on a similar rating scale of very dry to very juicy. Tenderness/toughness was rated on an eight point scale of extremely tough to extremely tender. Taste was rated as extremely unpleasant to extremely pleasing.

All data collected were processed and subjected to analysis of variance (ANOVA) according to the method of Steel and Torrie (1980). Significantly different means were separated using the methods of Duncan's (1955).

Results and Discussion

Results showed that the effect of feeding varying levels of BNS on final body weight, eviscerated weight, dressing percentage and residual weight of the carcass was significant (P<0.05), Table 2. There was an observed increase in these parameters up to the 10 percent levels and afterwards the values declined. The hens on the 10 percent level of BNS were superior to all other groups in these parameters. The birds on the 10 percent level of BNS had a final body weigh of 1833g which differed significantly from the values of 1723g, 1767, 1700g and 1617g recorded for birds on the Control, 5, 15 and 20 percent BNS diets respectively. Eviscerated weight followed the same pattern as final body weight with birds on the 10 percent diets having a value of 1371g which also differed significantly from the values of 1183g, 1163g and 1150 observed for the birds on the control, 15 and 20 percent BNS diets respectively. The results for dressing percentages also revealed that the same birds on the 10 percent BNS had the highest dressing percentage of 74.80 percent which differed significantly (P<0.05) from values obtained for the other treatments. The carcass superiority of the birds on he 10 percent BNS is an indication of the quality and utilization of the ration. It means the birds on the 10 percent BNS were better able to utilize the nutrients in the ration. This is in harmony with the earlier view of Bamgbose and Niba (1998) that carcass yield is an indication of the quality and utilization of a ration. It was reported in another study that a 10 percent level of bambara offal in the diet of laying hens supported significant weight gain (Onyimonyi and Ugwu, 2007). The result of the present study further corroborates our earlier assertion that nutrient utilization in laying hens is optimal at the 10 percent inclusion level of bambara offal. The effect of diet on the eviscerated weights reflected the influence of nutrient density on carcass measurements. This view is in harmony with the earlier report of Campbell (1988). The superior dressing percentage of the birds on 10 percent BNS is a further proof of the balance of nutrients supportive of carcass improvement at this level. Dressing percentage has been found to be a better indication of total edible meat after the visceral organs, blood and feathers have been removed. The reduction in the carcass measurements observed as level of inclusion of BNS increased beyond 10 percent may also be related to the increase in the fibre levels of the diets (see Table 1). Iyayi *et al.* (2005) had earlier reported that eviscerated weight and weight of broilers carcass reduced as brewers dried grain, corn bran or palm kernel was used to replace 40 percent of the maize in diets for broilers. In the present study reduction in carcass measurements began from the 15 percent level of inclusion. It follows that BNS supported carcass characteristics up to the 10 percent level. Bambara nut is a leguminous plant, thus it may be that the birds were able to utilize the nutrient from the feed for carcass deposition up to this level. The experimental birds are older hens and are better able to utilize fibre more that their broiler counterpart. At this stage the birds have developed sufficient capacity at the caeca to handle fibre digestion more than their broiler counterparts.

Table 3 shows the effect of treatments on organ measurements of the birds. Results showed that the weight of gizzard and liver increased significantly (P<0.05) as level of BNS increased. Birds on the 20

Table 2: Effect of feeding varying dietary levels of BNS

	Dietary levels of BNS					
Parameter (g)	0	5	10	15	20	SEM
Final body weight	1723.00^{a}	1767.00^{a}	1833.00^{b}	1700.00^{a}	1617.00^{a}	2.150
Eviscerated weight	1183.00^{a}	1250.00^{ab}	1371.00^{b}	1163.00^{a}	1150.00^{a}	2.220
Dressing percentage	68.60^{a}	70.74^{a}	74.80^{b}	68.41^{a}	71.12^{a}	0.471
Thigh	326.00^{a}	333.00^{a}	366.00^{a}	310.00^{a}	303.00^{a}	6.070
Breast	253.00	260.00	276.00	270.00	253.00	5.010
Head and neck	100.00	105.00	105.00	105.00	100.00	3.086
Residual	300.00^{a}	343^{b}.00	380.00^{c}	306.00^{a}	280.00^{a}	4.864

^{abc}Row means with different superscript are significantly different ($P<0.05$) SEM standard error of the mean.

Table 3: Effect of feeding varying dietary levels of BNS on organ measurements of spent layers

	Dietary levels of BNS					
Parameter (g)	0	5	10	15	20	SEM
Gizzard	34.18^{a}	37.92^{b}	41.34^{c}	43.06^{c}	44.84^{d}	0.860
Heart	8.11	7.86	8.29	8.95	7.94	0.135
Liver	27.80^{a}	27.90^{a}	32.38^{b}	34.49^{c}	36.60^{c}	1.026
Length of small intestine (cm)	142.66^{a}	152.67^{b}	157.01^{b}	162.33^{c}	178.67^{d}	1.453

^{abcd}Row means with different superscript are significantly different ($P<0.05$) SEM standard error of the mean.

Table 4: Organoleptic characteristics of meat from spent layers fed varying dietary levels of BNS

	Dietary levels of BNS					
Characteristics	0 (control)	5	10	15	20	SEM
Colour	2.5^{b}	2.7^{b}	3.2^{a}	2.4^{b}	2.4^{b}	0.088
Taste	5.4^{b}	5.6^{b}	7.1^{a}	7.3^{a}	7.6^{a}	0.289
Tenderness	6.7	6.4	6.9	6.4	6.8	0.065
Texture	4.1^{b}	4.2^{b}	5.1^{a}	5.4^{a}	5.2^{a}	0.171

^{abc}Row means with different superscript are significantly different ($P<0.05$) SEM standard error of the mean.

percent BNS diet had a gizzard weight of 44.84g which differed significantly ($P < 0.05$) from values of 34.18g, 37.92g, 41.34g and 43.06g observed for birds on the control, 5, 10 and 15 percent BNS respectively. The same trend was observed for liver weight it increased linearly ($P < 0.05$) from a value of 27.80g in the control to 27.90, 32.38, 34.49 and 36.60 for birds on 5, 10, 15 and 20 percent BNS. The higher values observed for gizzard and liver weights as level of BNS increased could possibly be due to higher physiological activities by these organs triggered by the presence of anti-nutritional factors. The observed increase in the length of the small intestine agrees with an earlier report that fibre in monogastric diet specifically have a mechanical effect on intestinal wall and cause the gastro-intestinal tract to increase and thicken (Ahamed and Olorede, 2003).

The organoleptic characteristics of meat from the various treatments is shown in Table 4. Colour of meat from birds on the 10 percent BNS was significantly ($P<0.05$) superior to the other treatments. There was a progressive increase in taste as level of BNS in the diets increased. Meat from birds on the 10,15 and 20 percent diets were scored 7.1, 7.3 and 7.6 respectively and these differed significantly from 5.4 and 5.6 scored for meat from birds on the control and 5 percent diets respectively. Texture of the meats followed the same trend as taste. A score of 5.1, 5.4 and 5.2 were recorded for the birds on 10, 15 and 20 percent diets respectively. These scores differed significantly from the 4.1 and 4.2 recorded for birds on the control and 5 percent diets respectively. Colour of meat depends upon the pigment changes that takes place during cooking (Price and Schweigert, 1971). During cooking the colour of meat changes gradually from deep red or pink to a lighter tint and finally if higher temperature is reached to grey or brown. The significantly higher score for meat from birds on the 10 percent BNS may serve as an instant indicator of the acceptability of the meat by the panelists. Nwafor (1979) had earlier observed that colour and appearance are usually the primary basis of acceptance or rejection of meat. The observed higher score for colour of meat from birds on the 10 percent BNS can be attributed to increased decomposition and polymerization of carbohydrates, fats and proteins. This view is in harmony with the earlier assertion of Price and Schweigert (1960). The enhanced score in taste of meat as level of BNS increased is supportive of our earlier view that BNS when toasted had peculiar aroma (Onyimonyi and Ugwu 2007). This aroma must have impacted positively on the meat with increasing level of (BNS) in the diet. Texture here is the feel of meat in the mouth. The observed increase in texture as level of BNS in the diets increased is easily understood. It is probable that the increase in dietary fibre s level of BNS in the diet may account for this observed trend. This agrees with the view of Campbell (1988) that increased fibre results in increased collagen content in the meat. This makes the meat stronger with less water being released from it on heating.

It is concluded that feeding spent hens 10 percent dietary level of BNS yields best carcass, organ and organoleptic qualities. Poultry farmers can incorporate this level of BNS in layers diet without compromising carcass characteristics at end of lay.

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