

Meat Yield and Meat Composition of Broiler Chickens Fed Sodium Chloride Treated Rice Bran as a Replacement For Corn Offal

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Target Audience: Poultry farmers, feedmillers, animal nutritionists.

Abstract

A total of 270 broiler chickens were fed on sodium chloride treated rice bran with the aim of investigating the effect of the aqueous alkaline salt on the CF of the rice bran, broiler meat yield, meat quality characteristics and meat acceptability. The birds were divided into 9 experimental groups in two replicates and designed T₁, T₂, T₃, T₄, T₅, T₆, T₇, T₈ and T₉. Diets T₁, T₂ and T₃ contained rice bran soaked in 0% aqueous solution of NaCl at 0, 10, and 20% levels respectively while diets T₄, T₅ and T₆ contained rice bran soaked in 1% aqueous solution of NaCl at 5, 10 and 20% levels. Diets 7, 6 and 9 contained rice bran soaked in 3% aqueous solution of NaCl at 5, 10 and 20% levels respectively. The birds were fed for 8 weeks. Two birds from each replicate were slaughtered at 8 weeks for meat and eating quality assessment. The results indicated that treatment of rice bran with the different concentrations of NaCl slightly reduced the DM and CP levels but the levels of CF, EE, NFE and ash were increased in the treated compared to the untreated rice bran. This observation was attributed to the solubility of some of the nutrients in the aqueous solution. The alkaline salt used was strong enough to digest the CF level of the rice bran. No significant differences ($p > 0.05$) were observed in the meat yield and meat quality characteristics evaluated but meat acceptability was improved. It was concluded that rice bran could be fed up to 20% level in broiler diets without any significant adverse effects on meat quality characteristics.

Keywords: Meat yield, sodium chloride, rice bran.

Description of Problem

Meat and meat products have continued to remain valuable food materials because of their yield, general acceptability and sensory characteristics. However, meat palatability and acceptability depends on factors such as colour, texture, juiciness, flavour and tenderness. These factors are influenced by species, breed, sex, diet, and post mortem handling skills (1). (2) stated that feed composition played only a minor part in influencing flavour unlike other environmental factors such as musty taint caused by chloromisolet present in the litter on which the birds were reared. They also reported a considerable decrease in

water holding of meat during heating due to loss in juice as a result of tightening of myofibrillar network by heat denaturation of proteins. The losses due to shrinkage of cooking are determined by factors such as method, time and temperature of cooking (3).

Previous report (4) had shown that apart from changes in nitrogen balance, biochemical parameters, nutrition and other dietary manipulations exert several influences on the development of carcass traits, organs and certain muscles in broilers. However, the effect of feeding sodium chloride treated rice bran on meat yield and meat composition has never been documented. The characteristic lowering of fibre and CP

accompanied by excessive ash deposition following alkaline treatment has been previously established for farm residues (5), (6) and (7) found NaOH treatment of cocoa pod (CPH) to be most effective on hemicellulose in agreement with (8). It is therefore, thought, that treatment of rice bran, a readily available farm residue, will enhance its utilization in broiler diets through its influence on meat yield and meat composition of broilers. Similar works that have been reported on animal meat quality characteristics are: (9), (10), (11), (12), (13), (14), (15) and were mostly on rabbit, Ndama and guinea fowl surprisingly with no information on meat yield and meat composition of broilers with reference to alkali treatment of the feed ingredients. Consequently, this work was designed to investigate meat yield and meat composition of broilers fed sodium chloride treated rice bran.

Materials and Methods.

Two hundred and seventy avian broiler chicks from ZATECH farms Ibadan were purchased and used for this study. At day-old they were divided into nine experimental groups in two replicates each. Each treatment group had 30 birds with 15 birds per replicate and designated T₁, T₂, T₃, T₄, T₅, T₆, T₇, T₈ and T₉ respectively. Diets T₄, T₅ and T₆ contained rice bran treated with 1% sodium chloride (NaCl) at the level of 5, 10 and 20% respectively while diets T₇, T₈ and T₉ contained rice bran treated with 3% sodium chloride and included at 5, 10 and 20% respectively. The bran samples were soaked at room temperature for 24 hrs after which they were air-dried. Each sample was soaked inside a drum to the extent that the bran is completely covered with water. The birds were fed on these diets for a period of eight weeks. At the end of eight weeks a total of 18 birds, that is, two birds from each replicate were slaughtered for meat yield and meat composition analysis. The composition of the experimental diets is shown in Table 1.0 while the chemical composition of the

sodium chloride treated and the raw (untreated) rice bran is shown in Table 2. The proximate composition of the diets and the meat samples were determined by (16) methods. The meat composition is presented in Table 3. Energy of the meat was determined using Ballistic Bomb calorimeter. Meat yield was calculated according to (17). PH readings were taken postmortem by sticking the electrode of a standardized Kent EIL pH meter into the muscles at 3 points and the mean values recorded

Sensory Evaluation

A team of 5 judges or panelists who have been selected among those that have been earlier on ranked according to their ability to make correct judgements using triangular tests with cooked meat samples were used for this evaluation. Cooking losses were determined by comparing weights of meat (cut into cubes of approximately 2cm²) before and after 15 minutes of cooking (18). Visual assessment of colour and wetness of the lean meat were as described by (19). During evaluation equal pieces of meat from each replicate of birds were placed on white flat enamel plates. These plates were placed at the sensory evaluation booths and labeled. Each of the judges moved to the meat samples one at a time. Eighteen plates were used. Each judge evaluated the samples on a seven-point rating of Excellent (7), very good (6), Good (5), Medium (4), poor (3), very poor (2) and unacceptable (1). Other parameters evaluated were texture, flavour, tenderness and general acceptability. The results of the sensory evaluation are presented in Table 4.0.

Statistical Analysis:

Data collected were analysed by analysis of variance using Randomized Complete Block design (RCB) (20) and mean separation was done by (21) were significant differences exist among the means.

Results and Discussion.**Table 1: Composition of experimental diets (%)**

	Sodium chloride concentration								
	0 %			1 %			3 %		
	Rice bran level								
Feed ingredients	0 %	10 %	20 %	5 %	10 %	20 %	5 %	10 %	20 %
Maize	34.85	34.85	34.85	34.85	34.85	34.85	34.85	34.85	34.85
GNC	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Oyster shell	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Lysine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Blood meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Oil	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Rice	0.00	10.00	20.00	5.00	10.00	20.00	5.00	10.00	20.00
Corn offal	20.00	10.00	0.00	15.00	10.00	0.00	15.00	10.00	0.00

Table 2: Chemical composition of the diets sodium chloride treated and untreated rice bran (%)

Treatment	DM	CP	CF	EE	Ash	NFE
T1	80.47	22.00	8.00	6.80	11.78	41.42
T2	88.87	20.00	14.00	11.10	11.00	43.90
T3	82.00	20.00	16.50	10.00	9.23	44.27
T4	93.76	20.24	10.00	10.00	11.14	48.62
T5	84.45	20.32	12.00	12.95	11.00	43.73
T6	93.00	19.00	13.00	13.20	10.39	44.41
T7	80.10	21.00	10.00	12.00	14.19	42.81
T8	79.95	22.37	12.00	12.80	12.93	39.90
T9	80.10	20.00	12.00	12.00	11.23	34.77
Untreated rice bran	95.70	7.48	25.00	7.00	17.00	33.52
0% Sodium chloride treated rice bran	95.40	6.20	34.00	6.00	18.25	35.60
1% Sodium chloride treated rice bran	94.00	5.15	34.00	7.40	19.00	34.45
3% treated rice bran	94.32	4.94	30.00	7.80	19.00	38.26

Table 3: Proximate composition (%) of the meat of broilers fed sodium chloride treated rice bran (Dm Basis)

Treatment	DM	CP	EE	Ash	NFE	pH	Energy Kcal/kg	Meat yield %
Day old	75.00	16.81	4.10	0.02	78.92		2825.42	30.84
T1	65.05±3.05	13.06±0.56	1.27±0.07	1.78±0.14	66.45±1.54	6.25±0.10	2872.32±76.74	71.99±2.08
T2	64.86±1.24	11.95±0.85	0.49±0.17	2.85±0.04	64.81±1.08	6.34±0.13	3051.84±7.33	67.81±2.63
T3	62.59±2.56	16.22±1.12	0.76±0.05	2.75±0.45	60.60±1.64	6.45±0.01	3032.06±9.53	69.64±2.86
T4	61.10±0.10	12.47±1.78	0.50±0.18	1.40±0.01	68.32±1.88	6.63±0.03	2852.50±2.50	70.48±3.31
T5	61.79±0.50	15.07±6.84	.72±0.21	2.56±0.26	63.16±1.37	6.20±0.17	2949.26±146.56	70.97±0.09
T6	60.16±1.84	14.85±3.35	.09±0.23	1.20±0.10	63.46±3.42	6.52±0.04	3015.21±29.32	66.14±2.78
T7	60.85±0.25	13.26±3.37	0.47±0.14	1.20±0.10	65.87±4.17	6.82±0.05	2999.82±27.12	66.07±0.14
T8	63.40±2.30	12.65±5.55	0.75±0.23	1.25±0.08	66.95±4.87	6.29±0.24	2863.16±119.08	62.75±2.40
T9	59.95±0.03	14.33±0.00	1.13±0.80	2.33±1.18	62.68±0.94	6.27±0.01	3048.18±131.90	66.07±0.41
SE Mean	±1.70	±3.47	±0.31	±0.43	±3.03	±0.12	±82.14	±2.41

Mean Values in the same column are not significantly different (P>0.05)

Table 4: Sensory characteristics of broiler meat fed sodium chloride treated rice bran

Parameter	T ₁	T ₂	T ₃	T ₄	T ₅	T ₆	T ₇	T ₈	T ₉	SEM
Color	5.80±0.20	6.10±0.30	5.90±0.10	5.90±0.10	6.20±0.20	5.90±0.10	6.10±0.20	5.70±0.20	6.10±0.30	±0.25NS
Texture	6.00±0.20	5.80±0.60	5.90±0.10	6.20±0.20	6.10±0.10	5.90±0.30	5.60±0.20	5.80±0.20	5.60±0.00	±0.27NS
Juiciness	6.40±0.00	6.30±0.30	6.10±0.10	6.20±0.00	6.30±0.10	6.20±0.20	6.40±0.20	6.00±0.20	5.90±0.10	±0.16NS
Flavor	6.00±0.00	6.10±0.10	5.90±0.10	5.70±0.30	6.10±0.10	6.10±0.10	6.10±0.10	5.70±0.10	5.70±0.10	±0.13NS
Tenderness	5.50±0.00	5.80±0.40	5.60±0.20	6.00±0.00	6.30±0.00	5.40±0.20	5.70±0.10	5.60±0.00	5.60±0.20	±0.18NS
Acceptability	6.30±0.10	6.40±0.20	6.30±0.10	6.60±0.00	6.30±0.00	6.40±0.00	6.30±0.10	6.10±0.30	5.9±0.10	±0.14NS
Cooking loss	35.78±0.42	33.24±1.47	33.07±0.99	39.27±0.51	37.81±0.40	36.98±0.10	34.20±2.02	34.70±3.56	33.71±1.89	±1.63NS

Mean values in the same row are not significantly different (p>0.05)

The results shown in Table 2 indicate that treating rice bran with 3% solution of sodium chloride could not remarkably reduce the DM and EE levels of the diets but increased the levels of CF, EE, and ash contents compared to the raw (untreated) rice bran. The CP of the treated rice bran was lower than the control. This trend was observed in the chemical composition of the various diets compounded with these treated rice bran. The slight reduction observed in DM and CP contents was attributed to loss of the nutrients during soaking (22); (23). However, the increase observed in the proportion of CF, and EE could be due to the fact that these two nutrients are not soluble in cold water while the increase in ash content was attributed to the addition of sodium chloride to the water. The nutrients that dissolved to form the solution were drained away in the process of drying. The observed differences Table 2 were not significantly different ($P > 0.05$).

The results of the meat yield and the chemical composition presented in Table 3 show no significant differences ($p > 0.05$) in the meat yield and the proximate composition of the meat. The values compare well with the meat composition values reported by (24). The results indicate that the various diets fed had no significant effect on the chemical composition of the meat of the birds. These results agree with the findings of (17).

Table 4 shows the results of the sensory evaluation. Feeding broilers with sodium chloride treated rice bran produced no significant effects ($p > 0.05$) on the colour, texture, juiciness, flavour, tenderness, cooking loss but improved general acceptability of broiler meat as there were increased demands for the meat. The non-significant ($p > 0.05$) effect of the different rice bran levels in the cooking loss of the meat is in agreement with the findings of (2) who reported that fibre level had no effect on the loss of meat cooked for 15 minutes.

Conclusion

Treatment of rice bran with different concentrations of sodium chloride reduced the DM and CP levels compared to the raw or untreated rice bran but the levels of CF, EE, NFE and ash were increased in the treated compared to the untreated or the

different levels of corn offal CF was decreased by treating the bran in 3% alkaline solution. These results were attributed to the solubility of some of the nutrients such as proteins, minerals, and vitamins in the aqueous solution. It was observed that sodium chloride concentrations used were not strong enough to digest or break down the CF contents. No significant differences ($p > 0.05$) were observed in the meat yield, meat quality characteristics, and meat sensory evaluation results. General acceptability of the broiler meat was improved due to improved taste as indicated by higher demands from the customers. It was therefore concluded that rice bran could be fed up to 20 % level in broiler diets without any significant adverse effects on meat quality characteristics.

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