

Sensory Attributes and Consumer Acceptability of Meat from Broilers Fed Diets Substituted with Sun-Dried Cassava Peels and Maize as Energy Sources

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Abstract

A study to determine the sensory attributes and consumer acceptability of meat from broilers fed diets substituted with sun-dried cassava peels and maize as energy sources. Four dietary feed with graded levels of sun-dried cassava peels and maize were used: T₁ (0%CSP: 100%M) – control; T₂ (25%CSP: 75%M); T₃ (50%CSP: 50%M) and T₄ (75%CSP: 25%M) respectively. On the last day of the 56-day feeding and growth trial, 3 birds were decapitated per dietary treatment, singed in warm water, defeathered, eviscerated, deboned and meat cuts of about 800g each were obtained from the thigh and breast muscles of each of the representative birds per treatment was mixed in 0.4% of iodized common salt. They were cut into 2.5 – 3.0cm pieces before boiling in a pot at a cooking temperature range above 100°C for 20 minutes. The pieces of the boiled meat were placed according to the four (4) feed treatments. Twelve (12) consumer panelists (6 for the thigh and 6 for the breast muscles respectively) within the age range of 20 – 26 years were used for the sensory evaluation. The overall acceptability results depicted by the sensory parameters (colour, flavour, tenderness, juiciness and toughness) revealed that meat (thigh and breast) of broilers fed T₂ (25%CSP: 75%M) were most preferred by consumers and will be recommended.

Keywords: Sensory Attributes Broiler Meat; Cassava Peels; Maize; Consumer; Acceptability

Introduction

Broilers are a type of fast growing fowls produced specifically for their meat usually between 8 to 10 weeks of age [1]. Meat from broilers is one of the most nutritious foods that humans can consume, particularly in terms of supplying high quality protein (essential amino acids), minerals (especially iron) and essential vitamins [2].

Similarly Suchý P, et al. explained that meat products are a highly valued source of nutritional facts for human consumers and their nutritional value can be accessed on the basis of parameters such as content and composition of proteins, contents of amino acids, content of fat and also from the content of saccharides, mineral substances and vitamins [3]. According to Troy DJ, the quality of meat can be directly or indirectly influenced by numerous

factors such as species, gender of animals, animal growth rate and maturation, diet, genetic factors, disease status, medication and hormone usage, rearing conditions, temperature, relative humidity and generally husbandry practices and these can lead to changes in the consumption or marketing of the meat [4]. Furthermore, these factors and the quality of meat are closely related with consumers' behaviour as well as with some sensory characteristics such as colour, texture, odour, and acceptability and correct determination of the relationships between these variables play an important role in meat marketing and consumption [5].

Sensory analysis or evaluation involves the inspection of a food product by the senses of sight, smell, taste, touch and hearing for various qualities attributes like appearance, flavour, aroma, texture and sound [6]. The sensory qualities of meat are one of the primary factors influencing consumers' satisfaction [5]. According to Kalio GA, et al. sensory attributes of toughness, juiciness, flavour, tenderness and overall acceptability could be used as a measure to determine meat quality and consumer preference [7]. Consequently, the sensory evaluation of meat utilizing trained panelists could be the most appropriate means to explain differences between 'treatments' as perceived by humans [8].

Compared to other species of farm animals, there have been limited studies on sensory analysis of meat from broilers fed graded levels of sun-dried cassava peels and maize. Therefore the essence of this study is to determine the sensory attributes of meat from broilers fed diets substituted with sun-dried cassava peels and maize as energy sources.

Materials and Methods

Site of the Experiment

The first stage of the experiment involving the preliminary feeding and determination of performance parameters (feed intake, weight gain, feed conversion efficiency and final live weight) of the broilers was carried out at the Teaching and Research Farm, Ignatius Ajuru University of Education, Ndele Campus, Rivers State. This site is located on Latitude 40 58' N and Longitude 60 48' E, Nigeria [9].

Procurement, Processing of Feed Ingredients and Production of Experimental Diets

Cassava peels were collected from farmers around the university. The peels were spread on a black polythene

bag on an open floor and sun dried for 2 weeks, until it became crispy. Sun drying the peels was carried out to reduce moisture content, prevent fungal growth and enhance easy milling of the cassava peels. The milling of the cassava peels was done with a grinding machine. The milled cassava peels were incorporated in graded replacement measures together with maize in addition to other feed ingredients such as groundnut cake, palm kernel cake, palm oil, soya bean-meal, wheat bran, bone meal, lime stone, lysine, methionine, salt, mineral and vitamin premix. The composite experimental diets (broiler starter and finisher diets) are as prescribed in the study of Kalio GA, et al. [10]. However, the sun-dried cassava peels (CSP) to maize (M) ratios in the experimental diets fed to the broilers at the two phases (starter and finisher) of growth are: T₁ (0%CSP: 100%M) – control; T₂ (25%CSP: 75%M); T₃ (50%CSP: 50%M) and T₄ (75%CSP: 25%M) respectively.

Meat Processing and Preparation to Undertake Sensory Evaluation

On the last day of the 56-day feeding and growth trial, 3 birds were decapitated per dietary treatment, singed in warm water, defeathered, eviscerated, deboned and meat cuts of about 800g each were obtained from the thigh and breast muscles of each of the representative birds per treatment. The bulk of the 800g meat was thoroughly mixed in 0.4% of iodized common salt. They were then cut into 2.5 – 3.0cm pieces before boiling. Boiling of the meat samples was done in a pot at a cooking temperature range above 100°C for 20 minutes using a kerosene stove. After cooking the pieces of meat were placed and properly sealed in white cellophane bags properly labeled according to the meat samples and placed in a cooler for about one hour to permit the internal temperature cooled to room temperature (20 – 25°C) [7].

Sensory Evaluation

The pieces of the boiled meat was placed according to the four (4) feed treatments: T₁ (0%CSP: 100%M) – control; T₂ (25%CSP: 75%M); T₃ (50%CSP: 50%M) and T₄ (75%CSP: 25%M) respectively. A total of twelve (12) consumer panelists (6 for the thigh and 6 for the breast muscles respectively) within the age range of 20 – 26 years were used for the sensory evaluation. The panelists were served the meat samples immediately after preparation to prevent changes that may occur during holding since samples can dry out or develop off-flavour. The panellist evaluated each sample for colour, flavor, tenderness, juiciness and toughness, based on a 4 – point scale, where 4 = very desirable, 3 = slightly acceptable, 2 =

unacceptable and 1 = very unacceptable with the help of a questionnaire. The panelists were seated far away from each other in a well lit room during the session to avoid conversation and communication. At each successive chewing, panelists were instructed to rinse their mouth with water to prevent the taste bud of the carry over effect from the previous sample tasted. At the end of the sensory evaluation, the questionnaires were collected from the panelists and a comprehensive collation of scores based on their responses was made for preference rankings and overall acceptability.

Statistical Analysis

At the end of the sensory evaluation, the questionnaires were collected from the panelist and a comprehensive collation of scores based on their responses was made for preference rankings and overall acceptability determined as prescribed by Kalio GA, et al. [7].

Result and Discussion

The results of the sensory evaluation of the boiled (thigh and breast) meat of broilers fed the experimental diets: T₁ (0%CSP: 100%M) – control; T₂ (25%CSP: 75%M); T₃ (50%CSP: 50%M) and T₄ (75%CSP: 25%M) respectively by taste panelists based on the sensory parameters: colour, flavour, tenderness, juiciness and toughness is shown in table 1. The table presents the independent responses of the taste panelists provided boiled meat (thigh and breast) samples of broiler chickens fed the experimental diets. Similarly, Table 2 presents the overall acceptability of the boiled meat of the broilers putting all the sensory parameters into consideration.

The studies on the sensory analysis of boiled broiler meat was conceived to ascertain the influence the graded replacements of sun-dried cassava peels to maize in broiler diets may have on the sensory qualities in terms of colour, flavour, tenderness, juiciness and toughness and how these parameters may influence the preference for these meat by consumers.

The sensory analysis of the thigh and breast muscle in terms of visual appraisal (colour) as assessed by the taste panelist is presented in table 1. The sensory analysis score by the taste panelists based on visual appraisal in assessing the preferred colour of the boiled meat for thigh in ascending order was 9 > 14 > 18 and > 19 for T₄ (75%CSP: 25%M), T₃ (50%CSP: 50%M), T₁ (0%CSP: 100%M) and T₂ (25%CSP: 75%M) respectively. Similarly,

The sensory analysis score by the taste panelists based on visual appraisal in assessing the preferred colour of the boiled meat for breast in ascending order was 10 > 13 > 15 and > 22 for T₄ (75%CSP: 25%M), T₃ (50%CSP: 50%M), T₂ (25%CSP: 75%M) and T₁ (0%CSP: 100%M) respectively. The meat of the broilers fed the sun-dried cassava peels and maize tends to have a better eye appeal (yellow-skinned colour) for the thighs and breast with the increasing amounts of maize tend to have a better eye appeal (yellow-skinned colour) for the thighs and breast with the increasing amounts of maize in the diets as re-corded by the taste panelist. The yellow-skinned colour of the meat samples (thigh and breast) may be as a result of the use of yellow maize in the experimental diet formulations. Yellow maize has been implicated to possess β- carotene which may have impacted the yellowish skin colour that would have influence the choice of the taste panelist and their preference rankings [11,12].

The sensory analysis of the thigh and breast muscle in terms of flavor as assessed by the taste panelist is presented in table 1. The sensory analysis score by the taste panelists based on the preferred flavour of the boiled meat for thigh in ascending order was 10 > 11 > 19 > 20 for T₁ (0%CSP: 100%M), T₃ (50%CSP: 50%M), T₄ (75%CSP: 25%M) and T₂ (25%CSP: 75%M) respectively. Similarly, The sensory analysis score by the taste panelists based on preferred flavour of boiled meat for breast in ascending order was 11 > 13 > 15 > 21 for T₃ (50%CSP: 50%M), T₁ (0%CSP: 100%M), T₄ (75%CSP: 25%M) and T₂ (25%CSP: 75%M) respectively. Based on the sensory scores of the taste panellists the meat samples (thigh and breast) of T₂ (25%CSP: 75%M) portrayed the best flavour. This may be attributed to the high crude proteins in the composite experimental broiler starter and finisher diets as well as the additional presence of vitamins and β- carotene in the yellow maize [10]. This is agreement with the findings of, Fasuyi AO, et al. [13], who explained that the availability of additional protein source and provision of some necessary vitamins, minerals and oxycarotenoids in supplemental leaf meals will have an impact on the flavour of meat.

The sensory analysis of the thigh and breast muscle in terms of tenderness as assessed by the taste panelist is presented in Table 1. The sensory analysis score by the taste panelists based on the preferred tenderness of the boiled meat for thigh in ascending order was 12 > 14 > 16 > 18 for T₄ (75%CSP: 25%M), T₁ (0%CSP: 100%M), T₂ (25%CSP: 75%M) and T₃ (50%CSP: 50%M) respectively. Similarly, The sensory analysis score by the taste pa-

nelists based on preferred tenderness of boiled meat for breast in ascending order was 13 > 14 > 16 > 17 for T₃ (50%CSP: 50%M), T₁ (0%CSP: 100%M), T₄ (75%CSP: 25%M) and T₂ (25%CSP: 75%M) respectively. From the results obtained, there were no clear patterns or relationships and explanations for the disparities in the tenderness, juiciness and toughness of the meat samples for the thigh and breast meat as scored by the panellists (Table 1).

Consequently, sensory analysis based on the overall acceptability or preference of the thigh and breast meat of broilers as presented in table 2, are in the descending

order of 89 > 83 > 68 > 60 for T₂ (25%CSP: 75%M), T₃ (50%CSP: 50%M), T₄ (75%CSP: 25%M) and T₁ (0%CSP: 100%M) for the thigh and 84 > 80 > 72 > 64 for T₂ (25%CSP: 75%M), T₁ (0%CSP: 100%M), T₄ (75%CSP: 25%M) and T₃ (50%CSP: 50%M) for the breast meat respectively. The overall acceptability or preference of the thigh and breast meat by the panelists is the revelation of their cumulative sensory score (responses) to all the sensory parameters (colour, flavour, tenderness, juiciness and toughness). Thus, meat samples of the thigh and breast for T₂ (25%CSP: 75%M) were most acceptable judging by the responses of the panelists.

Meat samples	Thigh								Breast								
	1	2	3	4	5	6	Total	Acceptability Ranking	1	2	3	4	5	6	Total	Acceptability Ranking	
Colour									Colour								
T ₁	4	3	2	1	4	4	18	2 nd	3	4	4	4	4	3	22	1 st	
T ₂	3	4	4	2	3	3	19	1 st	4	1	2	2	2	4	15	2 nd	
T ₃	2	2	3	3	2	2	14	3 rd	2	3	1	3	3	1	13	3 rd	
T ₄	1	1	1	4	1	1	9	4 th	1	2	3	1	1	2	10	4 th	
Total	10	10	10	10	10	10	60		10	10	10	10	10	10	60		
Flavour									Flavour								
T ₁	2	2	1	3	1	1	10	4 th	4	3	2	1	2	1	13	3 rd	
T ₂	3	4	3	2	4	4	20	1 st	3	4	3	4	3	4	21	1 st	
T ₃	1	3	2	1	2	2	11	3 rd	2	1	1	3	1	3	11	4 th	
T ₄	4	1	4	4	3	3	19	2 nd	1	2	4	2	4	2	15	2 nd	
Total	10	10	10	10	10	10	60		10	10	10	10	10	10	60		
Tenderness									Tenderness								
T ₁	1	3	4	2	3	1	14	3 rd	4	3	2	2	2	1	14	3 rd	
T ₂	2	2	3	3	4	2	16	2 nd	3	4	3	4	1	2	17	1 st	
T ₃	3	4	2	4	2	3	18	1 st	2	1	1	3	3	3	13	4 th	
T ₄	4	1	1	1	1	4	12	4 th	1	2	4	1	4	4	16	2 nd	
Total	10	10	10	10	10	10	60		10	10	10	10	10	10	60		
Juiciness									Juiciness								
T ₁	2	1	1	1	2	2	9	4 th	4	1	1	3	1	4	14	3 rd	
T ₂	3	4	3	3	3	1	17	2 nd	1	2	3	2	2	3	13	4 th	
T ₃	4	2	2	4	4	4	20	1 st	3	3	2	4	3	2	17	1 st	
T ₄	1	3	4	2	1	3	14	3 rd	2	4	4	1	4	1	16	2 nd	
Total	10	10	10	10	10	10	60		10	10	10	10	10	10	60		
Toughness									Toughness								
T ₁	3	4	1	4	4	4	20	1 st	2	4	1	3	4	3	17	2 nd	
T ₂	4	2	2	3	2	3	16	2 nd	3	3	4	2	2	4	18	1 st	
T ₃	1	1	3	2	1	2	10	4 th	1	2	2	1	3	1	10	4 th	
T ₄	2	3	4	1	3	1	14	3 rd	4	1	3	4	1	2	15	3 rd	
Total	10	10	10	10	10	10	60		10	10	10	10	10	10	60		

Table 1: Sensory analysis of boiled thigh and breast meat of broilers fed graded mixture of sun-dried cassava peel and maize by taste panellists in terms of colour, tenderness, juiciness and toughness.

T₁ = 0%CSP: 100%M; T₂ = 25%CSP: 75%M; T₃ = 50%CSP: 50%M and T₄ = 75%CSP: 25%M; 4 = very desirable, 3 = slightly acceptable, 2 = unacceptable and 1 = very unacceptable.

Meat samples	Sensory parameters							Sensory parameters						
	Thigh							Breast						
	Col	Flav	Tend	Juice	Tough	Total	Acceptability Ranking	Col	Flav	Tend	Juice	Tough	Total	Acceptability Ranking
T1	18	10	14	9	9	60	4 th	22	13	14	14	17	80	2 nd
T2	19	20	16	17	17	89	1 st	15	21	17	13	18	84	1 st
T3	14	11	18	20	20	83	2 nd	13	11	13	17	10	64	4 th
T4	9	19	12	14	14	68	3 rd	10	15	16	16	15	72	3 rd
Total	60	60	60	60	60	300		60	60	60	60	60	300	

Table 2: Overall acceptability the thigh and breast of boiled meat of broilers fed graded mixture of sun-dried cassava peel and maize by taste panellists.

T₁ = 0%CSP: 100%M; T₂ = 25%CSP: 75%M; T₃ = 50%CSP: 50%M and T₄ = 75%CSP: 25%M; Col = colour; Flav = flavour; Tend = tenderness; Tough = toughness.

Conclusion and Recommendation

The sensory attributes and consumer acceptability of thigh and breast meat from broilers fed diets substituted with sun-dried cassava peels and maize was in favour of T₂ (25%CSP: 75%M). Thus this level of cassava peel replacement is recommended for better broiler meat assessment based on sensory qualities.

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