

## CONSUMER ACCEPTABILITY AND QUALITY ATTRIBUTES OF DUCK MEAT AS INFLUENCED BY FROZEN STORAGE

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**Target Audience:** Meat merchants, processors, consumers, teachers and researchers and extension workers.

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### ABSTRACT

Consumer acceptability, consumption pattern and preference for duck meat among Nigerians were investigated through a field survey of 240 randomly selected respondents using a well structured questionnaire.

It was found that duck meat was acceptable and rated highly by most of the respondents. Consumption of duck meat was constrained by availability, inability of potential consumers to slaughter the live bird and other taboos. The potential consumers are ready to patronize established meat shop for duck meat.

The effect of frozen storage on the quality attributes of duck meat was also examined. Dressed and film packaged duck meat was stored at -20°C for 6 weeks. Percentage weight loss, pH, water holding capacity, cooking loss and sensory quality (colour, juiciness, tenderness, flavour and overall acceptability) scores of the meat samples as the storage duration increased were determined. Weight loss, pH and cooking loss increased with storage time, while water holding capacity decreased. Sensory quality scores for colour, juiciness, flavour and overall acceptability decreased with increase in storage duration, but significant differences were not obtained ( $P > 0.05$ ) until the 6th week in storage.

Duck meat could be stored under freezing conditions for at least a month without any deleterious effect on meat quality.

**Key words:** Duck, Consumer acceptability, Preference, Frozen storage, Meat

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### DESCRIPTION OF PROBLEM

Duck production in Nigeria has not been given the same attention received by the chicken. Of recent, interest in the domestic duck production has increased

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so much so that people now want to know more about the technology of commercial duck production.

In an attempt to encourage livestock farmers to go into duck production and for the current producers to increase their number, Kogi State ADP (Agricultural Development Project) in Nigeria recently commissioned a 3 - phase Duck Multiplication Programme (DMP) which is expected to increase the awareness and production of ducks in the state (1).

Since the ultimate goal of production is to satisfy consumers, it will be useless to increase the production of duck for meat supplies without first investigating the demand for the meat. In particular, it is necessary to determine the acceptability of duck meat in frozen form which commercial production might necessitate.

This study was therefore designed to investigate the consumer acceptability, preference and rating of duck meat and assess the change in quality attributes of the meat due to frozen storage.

## MATERIALS AND METHODS

### Field Survey

A field survey to determine the acceptability of and the preference for duck meat among selected Nigerians was carried out by means of structured questionnaires which were administered to 240 (120 men and 120 women) respondents. The respondents were randomly selected within Ilorin township. Data collected included consumer acceptability, preference for duck meat and factors influencing consumption pattern of duck meat.

### Quality Assessment of Fresh and Stored Duck Meat

From the preliminary field survey it was apparent that most potential consumer of duck meat cannot and/or will not like to slaughter live duck by themselves because of certain taboos. But they are prepared to buy and eat already processed (dressed) duck meat.

This therefore means that frozen storage of duck meat is inevitable if it is to be made readily available to the potential consumers, merchants and processors.

Twelve mature market weight ducks were obtained from a duck farmer in Ilorin, Nigeria. The ducks were slaughtered and dressed following a standard procedure described earlier (2). The thigh muscles were packed in heat sealed low density polyethylene film bags (0.04mm thick) and stored at frozen temperature (-20°C). Six thigh muscles were randomly selected each time and analysed immediately without storage (control) and after two, four or six weeks in storage.

Weight loss (%) was calculated by comparing weight of meat from the muscles before and after storage. PH readings were taken by sticking the electrodes of a standardised Kent EIL 7020 pH meter into the thigh muscles. Water holding capacity of the thigh muscles were assessed using the filter press method as

described by comparing weight of meat from the thigh muscles before and after 20 minutes boiling at 170°C (4).

Sensory tests were carried out on the thigh meat boiled for 20 minutes by a trained (5) nine-member panel that rated the samples for colour, juiciness, tenderness, flavour and overall acceptability on a 9-point hedonic scale.

### Analysis of Data

Data on consumer acceptability and preference tests were analysed using frequency distribution and chi-square (6). For the storage study, the data were subjected to the analysis of variance, using the complete randomised design (6). Analysis of variance of data on sensory evaluation was determined in accordance with the procedure described by Larmond (7). Least significant differences between sample means were determined using the Duncan (8) multiple range test.

## RESULTS AND DISCUSSION

### Field Survey

Table 1 shows the data collected on consumer acceptability and preference for duck meat. Eighty three per cent of the respondents would like to take duck meat.

**Table 1: Consumer Acceptability and Preference for Duck Meat**

	Characteristics	% Respondents	Chi-Square $\frac{S(0-E)^2}{E} = \chi^2$
1.	Do you eat duck meat?		
	Yes	83	43.56*
No	17		
Rating of Duck meat:	Liked extremely (5)	12	3.56
	Liked (4)	20	
	Liked moderately (3)	21	
	Liked slightly (2)	16	
	Indifferent (1)	14	
	Disliked (0)	17	
3.	Frequency of intake (per week):		
	5 times and above	-	202.01*
	4 times	-	
	3 times	-	
	Twice	-	
	Once	15	
	Occasionally	68	
Do not take it at all	17		
4.	Constraints limiting the consumption:		
	Price	05	68.23*
	Availability	42	
	Inability to slaughter the bird	28	
	Other taboos	12	
	Not familiar with the meat	05	
No constraint	08		
5.	Willingness to patronize established duck meat shop:		
	Yes	78	31.36*
	No	22	

Characteristics		% Respondents	Chi-Square $\frac{S(O-E)^2}{E} = \chi^2$
6.	Knowledge of meat shop where duck meat is available: Yes No	00 100	100*
7.	Preference for duck and broiler meat:		
(a).	Perceived to be more tasty**: Broiler meat Duck meat	47 53	0.004
(b).	Perceived to be tougher**: Broiler meat Duck meat	14 86	51.84*
(c).	One preferred**: Broiler meat Duck meat	69 31	14.44*
8.	Perceived duck to be a dirty bird: Yes No	57 43	0.02
9.	8 above affected preference for the meat: Yes No	42 58	0.03

\* Values significant at  $P < 0.05$ .

\*\* Percentage of those respondents who take the meat.

Source: Survey, 1998.

Most of the respondents (69%) liked duck meat, 17% disliked it, while 14% of the respondents were indifferent. Majority of the respondents (68%) ate the meat occasionally and 15% took it once a week. The low frequency of intake of duck meat could be attributed to such constraints as inavailability and inability to slaughter the live bird.

Those who do not take the meat attributed their dislike for the meat to certain taboos. Seventy eight per cent of the 83% of respondents that ate the meat were prepared to patronize meat shop to buy duck meat if it is established, while only 5% were not willing. All the respondents were not aware of any meat shop selling duck meat. There was no significant difference ( $P < 0.05$ ) in taste

rating for duck and broiler meat, but duck meat was perceived to be a tougher ( $P < 0.05$ ) meat. Most respondents (69%) preferred ( $P < 0.05$ ) broiler meat to duck meat.

This is not surprising considering the constraints limiting the consumption of the meat, especially inavailability, inability to slaughter the live bird and the nature of the bird. There was no significant difference ( $P > 0.05$ ) in opinions about the dirtiness of the bird and its effect on preference for the meat.

### Quality Assessment of Fresh and Stored Duck Meat

The quality attributes and changes in quality due to increase in duration of storage are presented in Table 2. It is apparent from the Table that certain changes in terms of physical and sensory qualities occurred in the meat as the duration of storage increased. Low temperature storage is meant to prevent or minimize many undesirable changes in meat, but unfortunately some chemical reactions still occur which adversely affect product quality. The rate of freezing, storage time, relative humidity, product composition and type of package are all known to affect the meat quality under frozen storage (9,10). For instance changes in water holding capacity, cooking loss and sensory quality scores during storage have been reported in guinea fowl (11).

**Table 2: Effects of Frozen Storage on Duck Meat's Quality Attributes**

Parameters	Storage Duration (in weeks)			
	0	2	4	6
Weight Loss %	0.00 <sup>a</sup>	2.30 <sup>b</sup>	2.39 <sup>b</sup>	2.51 <sup>b</sup>
pH	5.62 <sup>a</sup>	5.61 <sup>a</sup>	5.66 <sup>a</sup>	5.78 <sup>b</sup>
Water holding capacity%	51.39 <sup>b</sup>	51.29 <sup>b</sup>	51.08 <sup>b</sup>	50.76 <sup>a</sup>
Cooking loss (%)	37.66 <sup>a</sup>	37.86 <sup>a</sup>	38.16 <sup>ab</sup>	38.38 <sup>b</sup>
Sensory Quality Scores*:				
Colour	2.899 <sup>b</sup>	2.67 <sup>b</sup>	2.44 <sup>ab</sup>	2.11 <sup>a</sup>
Juiciness	6.44 <sup>b</sup>	6.11 <sup>b</sup>	5.78 <sup>ab</sup>	5.56 <sup>a</sup>
Tenderness	5.56 <sup>a</sup>	5.56 <sup>b</sup>	5.67 <sup>ab</sup>	6.22 <sup>b</sup>
Flavour	6.78	6.78	6.67	6.56
Overall acceptability	6.94 <sup>b</sup>	6.89 <sup>b</sup>	6.55 <sup>ab</sup>	6.22 <sup>a</sup>

\* Rated on a 9-point hedonic scale, 9 = extremely like; pale; tender or juicy; 1 = extremely dislike, deep tough or dry. Higher values indicate greater preference. Different superscripts on means within row indicate significant difference ( $P < 0.05$ ).

Although the percentage weight loss of the meat increased with increase in duration of storage, the difference was not significant ( $P > 0.05$ ). The relatively low weight loss obtained in this study could be because evaporation was minimized due to high relative humidity in the film packs (11).

The pH of the meat increased as the duration of storage increased but the increase was not significant ( $P > 0.05$ ) until the 6th week of storage. This result is

in agreement with our earlier observation with guinea fowl meat (11). Water holding capacity of the meat decreased with storage time and became significant ( $P < 0.05$ ) by the 6th week in storage.

Cooking loss of duck meat increased as the duration of storage increased, although the increase was not significant ( $P > 0.05$ ) until the 6th week in storage.

The decrease in water holding capacity and the subsequent increase in cooking loss with storage time could be explained in terms of protein denaturation resulting in a loss of gel matrix integrity and the concomitant loss in gel strength and water holding capacity which determines the volume of fluid formed on cooking (9,10).

### Sensory Evaluation

Sensory quality scores also changed with storage time, but there was no significant difference ( $P > 0.05$ ) in all the palatability traits (colour, juiciness, tenderness and flavour) until the 6th week in frozen storage.

Colour scores for duck meat decreased with increase in storage time.

Juiciness scores also decreased as the storage duration increased. The higher the water holding capacity and the lower the cooking loss the more juicy the meat will be (9,10,12). Tenderness scores increased with storage time. A similar trend was observed in guinea fowl (11).

Slight decreases in flavour were observed as the storage duration increased, but the observed decreases were not statistically significant ( $P > 0.05$ ). In terms of overall acceptability scores, the ratings decreased as the storage duration increased, but there was no significant difference ( $P > 0.05$ ) until the 6th week of frozen storage. This decreasing trend is similar to that of colour, juiciness and flavour. These palatability traits are therefore believed to have influenced the overall acceptability scores.

### CONCLUSION AND APPLICATIONS

- (1) Duck meat is generally acceptable and rated high by most of the respondents.
- (2) The major constraints of inavailability of duck meat and inability of respondents to slaughter the live birds limiting the consumption of the meat could be removed by encouraging the establishment of commercial production and processing farms for Duck.

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