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EFFECTS OF COOKING METHODS ON YIELDS AND ORGANOLEPTIC ATTRIBUTES OF LOCAL CHICKEN PARTS

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ABSTRACT

Experimentation was carried out to investigate the effect of three cooking methods (deep-fat frying, microwave and oven roasting) on yields, cooking loss, moisture, of fat contents and some sensory attributes of local chicken. The thighs and breast parts were used. Deep fat frying resulted in the lowest yield of the chicken thighs and the highest yield of the chicken breasts. Cooking loss was significantly high ($p < 0.05$) for the deep fat frying method, but lower significantly ($P< 0.05$) for the oven roasting method for the thigh portions. However, with the breast portion the oven roasting method had the highest cooking loss. The moisture and fat contents showed an inverse relationship for the thigh portion, while for the breast parts no clear cut pattern was observed. In the sensory rating, the deep fat frying method produced the darkest chicken parts and also the highest rating for flavor. The microwave cooked chicken parts was the least accepted by the panelist.

Key words: Local Chicken, Cooking Methods, Yield, Cooking Loss, Sensory evaluation.

INTRODUCTION

A desirable cooking method is one that is rapid, convenient and will result in acceptable product. Cooking procedure is usually accomplished by means of a water bath or roasting oven, both of these methods require a large amount of time. Microwave cooking requires substantially less time and energy than conventional cooking (Martin 1975) and therefore possibly reduce processing costs. Microwave energy heats food by penetrating the surface and causing the polar molecules to align with the electromagnetic field by alternating current. The friction produced by the motion of food molecules generates heat which is conducted throughout the food. The use of Microwave ovens has been increasing for institutional and home cooking. Microwave treatment is therefore faster to heat a meal than gas or electric heat sources do (Cipra and Bowers, 1971, Creamer and Richman 1987).

Guiland, et *al;* (1993) observed an increase in dry matter (Dm) and protein content of beef cooked in a conventional ovens, microwave

oven or boiling water. Cipra and Bowers (1971) reported that pre-cooked frozen turkey reheated by conventional gas oven had a greater percentage moisture content ($P < 0.01$) and higher juiciness scores than meat reheated by microwaves. However, the percent ether extract was found to be similar for the two methods of cooking. May *et al;* (1962) reported a toughening effect of microwave cooking on chicken parts. Janky and Obliger, (1976) observed microwave precooked turkey rolls made from the breast and thigh portions of the turkeys to be significantly more juicy with higher yield than water bath precooked samples.

Mickalbery and Stadelman (1962) observed deep fat frying to give the lowest yield when compared to microwave and steaming deep-fat frying. There is paucity of information on effect of cooking methods on yields and organoleptic attributes of Nigerian local chickens. This work was therefore designed to investigate the effects of cooking methods on quality attributes of local chicken parts.

MATERIALS AND METHODS

Sampling Sources.

Fifteen local chickens (*Gallus domesticus*) were brought from a Village market near Ilorin. The birds were kept together under the same management conditions for two weeks before being slaughtered. Their live weights varied from 1 kg to 1.5 kg. Slaughtering, defeathering, and evisceration were done conventionally. Each carcass was cut into thigh, drumstick, wing, breast and back parts. Only the thighs and breasts were used for the study. Ten pieces of thighs and half breast were allotted to each of the following cooking methods. Oven roasting, deep fat frying and microwave cooking. Before cooking, the chicken parts were battered (Awosanya and Okubanjo, 1991) by dusting with all purpose flour and then weighed. The roasting was done in a preheated oven (1700C) to an internal temperature of 810C for 20 minutes (both sides). Pure soya bean oil (1,750mls) was used in the deep fat frying. Frying was for 14 minutes to an internal temperature of 820C. The microwave cooking was carried out using the Saisho MW 770 oven model. The cooking was for a period of 6 minutes and the internal temperature obtained ranged from 810C to 820C. All temperature determination were done by the use of a digital thermometer.

After the cooking was completed, the sample were left at a room temperature to cool before their respective weights were taken. The yield was obtained by dividing the cooked weight by the raw battered weight multiplied by 100. Cooking loss was the difference between precooked weight after coating and post cooked weight. The cooked chicken portions were hand separated into coated meat and

bone. Percent edible portion and bone were calculated.

The coated meat portion of each chicken part was blended together before moisture and fat contents were determined (AOAC, 1975). The objective tenderness was obtained by cutting cored samples from the thigh and breast through the blades of Warner - Bratzler shear press. The consumer panel consisted of 12 University Students who received instructions relevant to palatability assessment . The rating was based on a 9 point hedonic scale. An analysis of variance was used to identify significant differences in the data collected and Duncan multiple range test was used to locate the significance of treatment means (Steel and Torrie 1960).

RESULTS AND DISCUSSION

Table 1 shows the yield of chicken thighs and breast cooked by three different methods. There was no significant difference in the initial raw battered weights of the chicken parts. The oven roasting method of cooking had significant effect on the thigh portion while there was no significant effect of cooking methods on the breast yield. Cooking loss was significantly more ($p< 0.05$) for the chicken thighs that were cooked by deep fat frying and least for the oven roasting methods of cooking. The microwave heated thigh samples had cooking loss that was significantly less than that cooked by deep fat frying but significantly greater than that for oven roasting method respectively. The greatest cooking loss for the breast portion was observed with the oven roasting methods, while the deep fat frying and microwave cooked samples had losses that were similar. Several researchers have reported differences in yield and cooking losses of meat cooked by microwave and other heating sources. Mickelberry and Sladelman (1962) observed that deep fat frying gave the lowest yield when compared to microwave and steaming-deep fat frying. Smith and Vail (1963) reported that breaded raw chicken parts which were oven fried gave a lower percent yield (57.2%) than deep-fat fried (58.6%) or skillet-fried (62.3%) samples. Cooking loss was observed to be greater for the thigh portions and not for the breast part cooked by the microwave when compared to conventional oven-heated samples. In cooking chicken parts, the time of cooking varied from method to method. The time of 6 minutes was used for the microwave while 14 and 20 minutes were used for deep-fat frying and oven roasting respectively to achieve the same doneness. Meat cooked quickly to a given internal temperature is more juicy than meat cooked slowly to the same temperature (Wilkinson and Dawson, 1976). Hence longer cooking time causes greater losses in meat.

The edible portion of the

cooked chicken thighs were significantly higher ($p < 0.05$) with the microwave cooking method than the deep fat fried and oven roasted methods which were similar. The reason for this could be the loss of coating materials into the shortenings during the deep fat frying and the wetness of the roasted samples which resulted in peeling off of the coating. A close examination of chicken parts heated by microwave revealed dry and firm exterior with the coating intact.

The high moisture and the low fat contents observed with oven roasted chicken parts (Table 2) were not unexpected, since most of the water that should have been lost were absorbed by the coatings. The rapid heating by the microwave caused more of the loosely bound water in the meat system to be lost as evaporative moisture. On the other hand, the oil used in deep fat frying replaced most of the moisture lost through fat translocation, hence the high fat contents observed for this cooking method regardless of the chicken part. It has been established that deep fat frying dehydrate muscle tissue of chicken breast more than microwave heating (Hale and Goodwin, 1968). Smith and Vail (1963) reported that fat absorption was highest for deep fat frying followed by skillet frying and then oven roasting.

The low shear values observed for the microwave heated chicken parts could be due to the fact that the interior portions of the chicken sample were sheared away from the dry and firm exterior noticed for the microwave heating samples. This observation was in agreement with the report of Lyon and Willson (1986) but contradicts the work by May *et al* (1962) and Goodwin *et al* (1962).

The microwave heated breast chicken part produced significantly ($p < 0.05$) high fibre diameter than any of the other methods of cooking. There was no significant cooking effect on the sarcomere length of the chicken breast. According to Bower, *et al* , (1987) fibre Shrinkage and Sarcomere shortening result when muscle is heated above an internal temperature of 70oC . In Table 3 are the sensory scores of chicken parts as affected by cooking methods. Deep fat frying methods produced meat that was significantly darker in color than that cooked by either microwave or oven roasted methods. Deep fat frying was rated highest in desirable flavor production followed by oven roasting and then microwave. Subjectively, there was no significant difference in tenderness as a result of cooking methods for the thigh portion. However, the microwave methods of cooking produced a significantly tender breast meat than the other two methods. The sensory scores for juiciness were not found to be influenced by methods of cooking for the thigh portion, but were found to be

significantly higher with oven roasting methods than other methods studied for the breast portion.

The panel responses to the overall acceptability of the chicken parts cooked by the three methods were found to be significantly influenced by the methods of cooking. The ratings for the deep fried thigh portion was significantly higher ($p < 0.05$) than for either the microwave or oven roasting method, with the rating for microwave cooking being the least for both thigh and breast portions, while the rating for both deep-fat frying and oven roasting were similar for the breast portion. Research works (Ream *et al* ; 1974, Karchgeon *et al*; 1976 and Drew and Rhee, 1978) on meat products (beef, pork and lamb) have shown that the conventional oven roasting tended to produce higher panel rating for sensory attributes of flavor and juiciness than the microwave cooking for the same products.

In conclusion, the deep fat frying method produced chicken parts that had the best appeal to the consumers in terms of sensory attributes.

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Table 1: **Effect of Cooking Methods on Yield, Cooking Loss and Gross Composition of Local Chicken's Legs and Breast Parts**

Chicken part	Cooking Method	Battered weight (g)	Cooked Yield (%)	Cooking Loss (%)	Edible Portion (%)	Bone Portion (%)	Deboning loss (%)
Thigh	Deep fat frying	48.63	71.53[a]	28.20[c]	86.34[a]	12.13[b]	1.53
	Microwave	48.82	73.05[a]	26.82[b]	87.59[b]	10.98[a]	1.43
	Oven roasting	49.00	78.88[b]	21.68[a]	85.61[a]	12.98[b]	1.41
	Average	48.82 ± 2.01	74.94 ± 0.56	25.57 ± 0.51	86.51 ± 1.05	12.03 ± 0.21	1.46 ± 0.02
Breast	Deep fat frying	73.30	75.87	23.98[a]	83.12[a]	15.43[b]	1.45
	Microwave	72.90	71.88	21.81[a]	85.93[b]	12.48[a]	1.59
	Oven roasting	73.08	71.44	28.14[b]	83.85[a]	14.64[b]	1.51
	Average	73.09 ± 1.21	73.06 ± 0.46	24.64 ± 0.63	84.30 ± 1.19	14.18 ± 0.24	1.52 ± 0. 01

a,b,c Means in the same column followed by a common superscript letter are not significantly different ($p > 0.05$).

Table 2: **Effect of Cooking Methods on Moisture, Lipid and Objective Tenderness of Local Chicken Parts.**

Chicken Part	Cooking Method	Moisture Content (%)	Fat Content (%)	W - B Value	Fibre Diameter (um)	Sarcomere Lenght (um)
Thigh	Deep fat frying	50.96[a]	19.66[b]	3.12		
	Microwave	56.30[b]	18.50[b]	2.90	ND	ND
	Oven roasting	59.55[c]	13.23[a]	3.16		
	Average	55.60 ± 1.42	17.13 ± 0.10	3.06 ± 0.01		
Breast	Deep fat frying	48.25[a]	15.32[c]	3.28	21.30[a]	1.0
	Microwave	55.60[b]	8.93[a]	2.91	40.80[b]	1.2
	Oven roasting	56.55[b]	12.30[b]	3.25	28.90[a]	1.1
	Average	53.47 ± 2.30	12.18 ± 1.32	3.15 ± 0.01	30.33 ± 3.40	1.1 ± 0.03

a,b,c means in the same column followed by a common superscript letter are not significantly different ($P > 0.05$). 2 Warner - Bratzer Shear Value

N.D: Not Determined

Table 3: Effect of Cooking Methods on Sensory Attributes of Local Chicken Parts.

Chicken Part	Cooking Method	Color	Flavor	Tenderness	Juiciness	Overall Acceptability
Thigh	Deep fat frying	2.75^{a}	6.75^{c}	5.25	6.00	7.31^{c}
	Microwave	5.57^{b}	4.38^{a}	5.25	5.94	4.65^{a}
	Oven roasting	4.46^{b}	5.31^{b}	5.31	6.52	5.63^{b}
	Average	4.26 ± 0.01	5.48 ± 0.15	5.27 ± 0.11	6.15 ± 0.14	5.86 ± 0.01
Breast	Deep fat frying	3.31^{a}	6.38^{c}	5.25^{a}	5.25^{a}	6.36^{b}
	Microwave	5.94^{b}	4.38^{a}	4.81^{a}	4.81^{a}	4.19^{a}
	Oven roasting	5.38^{b}	5.31^{b}	5.56^{b}	5.56^{b}	6.66^{b}
	Average	4.88 ± 0.01	5.36 ± 0.02	5.21 ± 0.21	5.21 ± 0.21	5.74 ± 0.01

a,b,c means in the same column followed by a common superscript letter are not significantly different ($P > 0.05$)