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Evaluation of Traditional Cooking Methods on Eating Meat Characteristics and Chemical composition

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***Abstract**: This study was conducted to evaluate the traditional meat cooking methods, beef topside cuts were used in the experiment and divided into four groups, and four different cooking methods were done. A-roosting, B-frying, C-boiling, and D- Babiker (1981) methods as a control method which is used as one of cooking loss % methods in meat. Sample prepared from cooked meat for meat chemical analysis. Protein, moisture, fat, and ash content % were determined. Cooking loss (%) and cooking time were determined and there were significantly different ($p<0.05$), and no difference in cooking loss (%). The sensory attributes for cooked meat were assessed by panelists and conducted color, flavor, tenderness and juiciness with significantly different ($p<0.05$) in flavor were panelists prefer the frying cooked meat.*
***Keywords:** meat, cooking methods, evaluation.*

I. Introduction

Tenderness of meat products, together with juiciness, flavour and colour are the main eating quality characteristics that do influence the consumers' overall judgment of quality (Wood, et al., 1995). They can be influenced by several production factors (genetics, feeding systems, etc.) and processing techniques (chilling, marinating, cooking). Therefore, to be able to enhance product quality, meticulous measurements of processing steps need to be conducted and optimized (Warkup, 1993). Marinating is a traditional culinary technique that is used to tenderize and to improve flavour and juiciness of poultry meats (Lemos et al., 1999). Sodium chloride, polyphosphates and sugars are considered important ingredients of marinades, as they improve meat tenderness and flavour. Marinating also increases water binding capacity of meats, thus reducing cooking losses and improving meat juiciness (Brotsky, 1976; Babdji, et al., 1982; Froning & Sackett, 1985). Oven cooking is widely used in commercially processed poultry meats, particularly in the foodservice systems. The air forced convection method is the most representative cooking system, and it results in desirable foods quality traits.
Air convection is often coupled with steam injection in the oven chamber to improve meat tenderness and to reduce cooking losses (Murphy et al., 2001). However, this combined cooking technique is quite complex and difficult to understand because it leads to unpredictable results, due to not well-understood effects of steam on meat products. As a consequence, one must consider that the key eating quality characteristics of meats (for example, cooking loss, tenderness and crust formation), are mainly affected by both the cooking technique and by the time-temperature profiles (Murphy & Marks, 2000). The measurement of changes occurring during meat cooking may be carried out by a wide range of analytical methods, including textural and microstructural evaluations (Yoon, 2002), soluble protein identification, protein fragmentation, cooking loss or co lour evaluation (Murphy et al., 2001; Quiao, et al, 2002; Garcia., et al, 2003). In particular, it is widely recognized that meat tenderness is the most significant factor affecting consumers' satisfaction (Savell et al., 1987; Obuz, et al., 2003). The improvement of tenderness in meats is mainly caused by changes in the structure of connective tissues solubilized by heat, while at the same time heat-denaturation of myofibrilar proteins generally causes meats toughening (Palka &Daun, 1999).

Objectives of the study:
- To determine effect of different traditional methods on chemical composition and sensory attributes.
- To determine the best cooking methods effect and time relationship, on sensory and chemical characteristics.

II. Material And Methods

2.1 Experiment:

Beef topside cuts 2kg were purchased from traditional market in Khartoum state used in the experiment, and then were divided into four groups, according to cooking method (A) roasting, (B) frying, (C) boiling, and Babiker 1980 as control method.

2.2 Chemical composition

Meat samples were ground to a homogenous mass in a grinder, and then used for chemical analyses. Chemical composition of cooked meat samples were measured according to standard methods of AOAC (1980). Crude protein was determined using a Foss Tecator Kjeltec 2300 Nitrogen/Protein Analyzer. Fat was determined by Soxhlet extraction of the dry sample, using petroleum ether. Ash content was determined by ashing samples in a muffle furnace at 500 °C for 24 h.

2.3 Cooking loss:

Cooking loss was determined as the difference in samples weight before and after cooking and was expressed as percentage of the weights of samples before cooking.
The control method, meat prepared for cooking as traditional and placed in polythene bags and cooked in a thermostatically controlled water bath at 90 ± 0.5°C for 90 min. (Babiker, 1981). After cooking, cooling was done under tap water for about 20 min. and samples were taken off the exudates fluid was dried with paper towel and cooking loss was determined as the difference in samples weight before and after cooking and were expressed as percentage of the weights of samples before cooking.

2.4 Sensory evaluation:

The sensory evaluation was conducted in the sensory evaluation facilities of the Meat laboratory, Faculty of Agricultural Technology and Fish sciences, El-Neelain University. The samples to be used for sensory evaluation were randomly selected. 11 semi-trained panelists were used to evaluate the meat cooked samples. The evaluation included, colour, tenderness, flavour and juiciness using an 8-point scale score (hedonic scale) card as described by Cross and Overby. (1978).

2.5 Statistical analysis:

The experiment was designed as a randomized complete block with 4 treatments in three independent trials. The treatment consisted of cooking method (A) roasting, (B) frying, (C) boiling, and Babiker 1980 as control method. Differences among treatment means were tested by Duncan's multiple range tests. SAS version 6.12 was used to perform the statistical analysis (SAS, 1997).

III. Results And Discussion

The results shown in table (1) indicate that the Chemical composition of cooked meat (protein%, moisture%, fat%, and ash %) in this study were significantly different ($p<0.05$) in protein and moisture among cooking methods, a high average of mean value of protein percentage (28.6) for group A(roasting) with a low mean value of moisture %, that indicate for cooking time and temperature effect on meat protein and moisture% the lost in water means increased in protein of meat, and same effect on method B (frying), there were significant difference($p<0.05$) in fat % among cooking methods a high average of mean value of fat percentage (19.2) for group D (Babiker method), The cooked cuts showed a relative increase in total fat, but, when compared to the original fresh weight, they showed an absolute fat loss. This is because most of the water in living muscle is held within the myofibrils and any large changes in the distribution of water within the meat structure originate from changes in this space. Cooking induces structural changes, which decrease the water holding capacity of the meat (Gerber et al., 2009 Tornberg, 2005). Also ash % among cooking methods a high value in group C (boiling) 1.5.

Table(1) :means and standard error for chemical composition of cooking methods.

Item	A (Roasting)	B (Frying)	C (Boiling)	D (Control)
Protein	28.6^{a}±0.5	28.2^{a}±0.1	25.2^{b}±0.3	26.5^{b} ±o.1
Moisture	51.6^{a} ±0.3	51.7^{a} ±0.4	55.9^{b} ±0.4	59.1^{cd}±1.4
Fat	10.8^{a} ±0.9	13.1^{a} ±1.5	11.8^{a} ±0.6	19.2^{a} ±0.4
Ash	1.1^{b} ±0.1	1.5^{b} ±0.1	1.5^{b} ±0.2	1.3^{b} ±0.1

Table 1

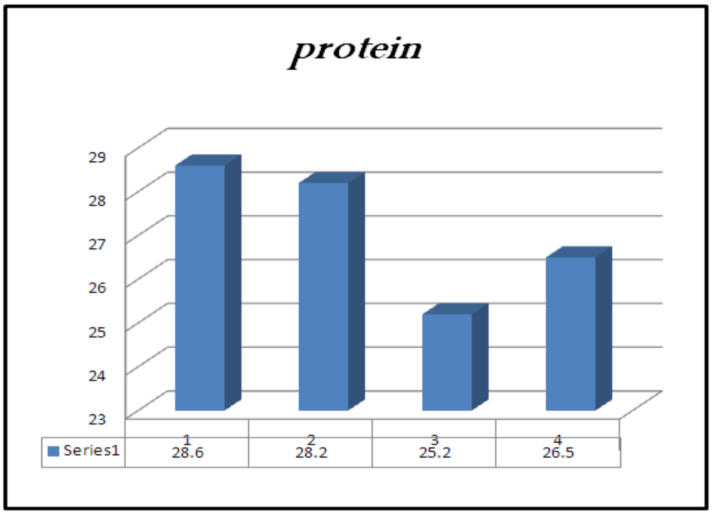

Fig 1

The sensory evaluation of cooking methods were not significantly difference (p>0.05) among cooked meat methods in juiciness, texture, color, and flavor. Meat cooking methods had a higher juiciness (7.5) in roasting method (7.1),(6.9), and (6.5) for frying, control and boiling respectively.

Table (2): Means and standard error for sensory attributes of cooking methods.

Item	A	B	C	D
Juiciness	7.5[a]±0.3	7.1[a]±0.3	6.4[a] ±0.2	6.9[a] ±0.4
Texture	5.4[a] ±1.6	6.5[a] ±0.4	6.9[a] ±0.3	7.1[a] ±0.5
Color	6.9[a] ±0.3	7.2[a] ±0.2	6.6[a] ±0.4	6.8[a] ±
Flavor	7.6[a] ±0.3	7.3[a] ±0.3	5.6[b] ±0.4	6.5[b]±0.3

[abcd] Means in the same row bearing similar superscripts are not significantly different (P>0.05)

Samples of cooked meat texture were highest in Babiker method which is control with mean value (7.1) followed (6.9), (6.5), and (5.4) for boiling, frying and roasting respectively. The best color (7.2), in frying method, (6.9), (6.8), and (6.6) for roasting ,control and boiling respectively. Finally the best flavor (7.6) in roasting method, then (7.3) for frying method, and (6.5) for control group, but the last one with low mean value conducted by 11 panelists (5.6) for boiling method. Huffman and Egbert (1990) found no differences in beef flavour intensity over a range of 5-20% fat content of patties. Decreasing fat content in patties from 20 to 5% reduced texture scores. As protein has a greater influence on texture than fat. Reducing fat meat products can have a greater hardness (Jimenez-Colmenero et al., 1995). This relationship has been observed by other authors in various meat product results (Akoh, 1998; Garcia et al., 2003; Serdarglu and Sapanci-Ozsumer, 2003). Adding 4% oat flour to patty formulation increased the juiciness scores. Panelists found these patties more juicey than other treatments. This is not surprising as adding of additives to meat products results in more moisture retention in the product during cooking. An increase in moisture levels has been reported to increase juiciness in frankfurters (Hung and Carpenter, 1997) and goat patties (Gujral et al., 2002). The tenderness, juiciness and flavour were affected by fat level (Meltem Serdaroglu, 2006).

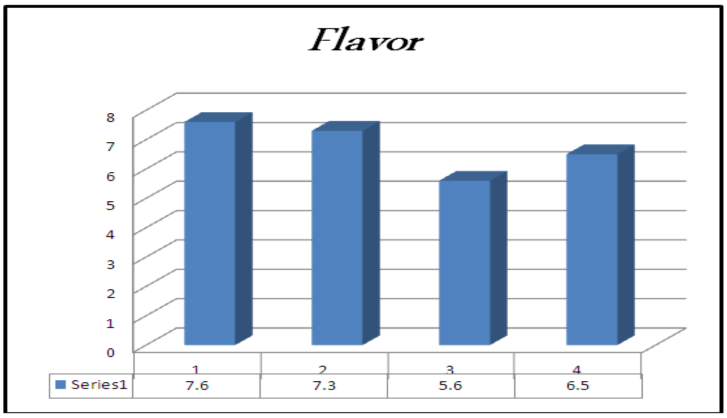

Fig (2) flavor for cooked meat treatments.

Cooking time and cooking loss (%), present in table (3) and show significant difference on cooking time with long time for Babekir method (1980) and a higher one in loss with mean value (38.3), roasting take 13 minutes and had 36.6 % loss of weight which in touch directly to fire, Although boiling time about half an hour had loss 35.2 %. However, a short time for cooked meat and less quantity of cooking loss % in frying method. (Aberle et al., 2001) reported that many of the physical properties of meat (including colour, texture and firmness of raw meat, and juiciness and tenderness of cooked meat) are partially dependent on water holding capacity.

Cooking time and cooking temperatures the main factors in meat cooking loss. Lawrie and Ledward (2006) cooked beef muscles to constant internal temperature of 60, 70 and 80 °C and observed that, total cooking loss (% wet weight) 10.5, 28.8, and 40.5. Beside moisture loss (% wet weight) 5.6 9.6 14.0 Gann (1977) also mentioned that, the water soluble compounds of meat which include odor precursors which were developed in cooked meat upon heating. Agreement with Shaerd et al., (1998) reported that the cooking loss% for beef cooked by fried method ranged (20.3-30.4) and (20.9%) for boiled minced beef, beside that the loss % by oven cooked (31.4)% and 27.2 for restructured steaks. The same Author mentioned that the Ash% for beef cooked (1.2) ,(0.8) and (1.5) fried method ,boiled beef minced meat and beef burger respectively .

And also fat % (19.2),(11.6) and (11.3) restructure steaks beef ,beef burger and fried beef respectively .

David and Marina (2005) were recorded the crude protein % for beef cooked by drying method (27.24-28.29) in temperature 130c for 4 min and also moisture % for beef (43.9-56.5) in temperature 170c for 12 min

Table (3):- Means and standard error for cooking time and cooking loss%.

Item	A	B	C	D
Cooking time	13±3	11.7±2	30.7±4	90±0.0
Cooking Loss	36.6±6.2	23.9±8.5	35.2±10.8	38.3±1.8

[abcd] Means in the same row bearing different superscripts are significantly different ($P<0.05$).

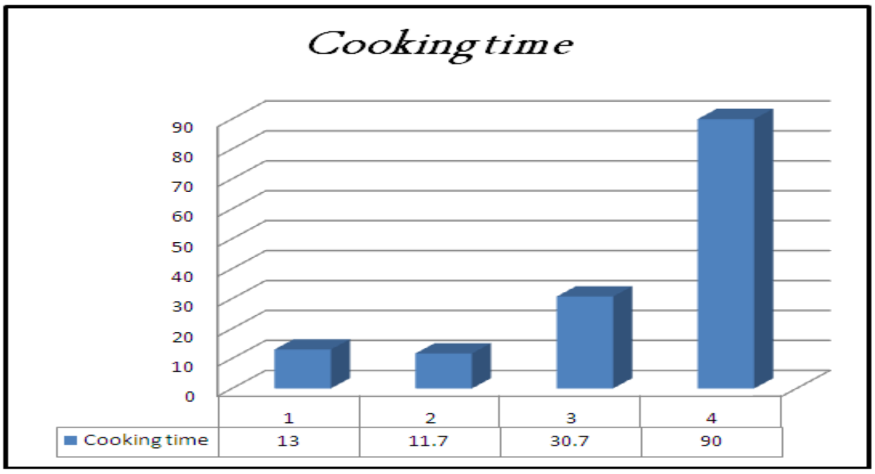

Fig (3) time of cooking methods.

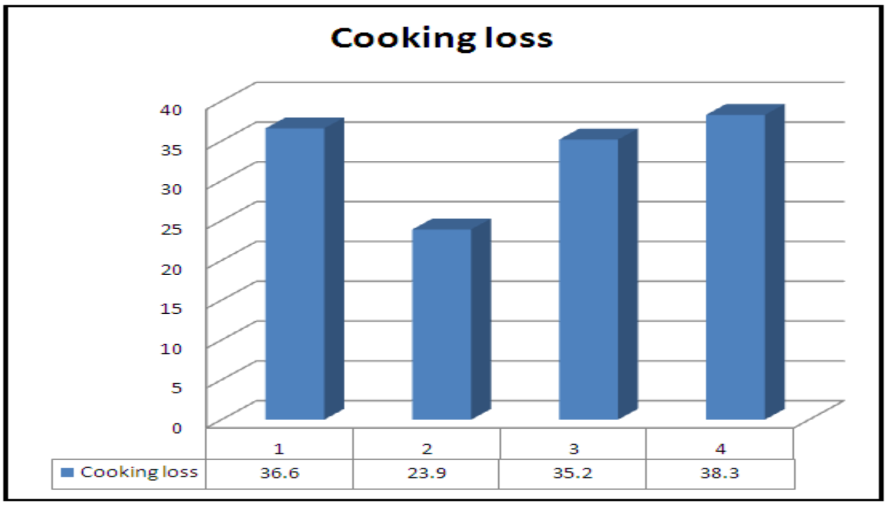

Fig (4) cooking loss% of cooking methods.

IV. Conclusion

According to results found a high percentage of protein by roosting more than other methods, in cooking by water bath (control) found a high percentage on moisture.
The entire panelist prefers frying meat then roosting, control, and finally boiling.

V. Recommendation

- Using cooking by frying as we have found that it is the most acceptable method by panelists.
- Carrying out more experiments on the method of cooking by water bath (control), because it was noticed that there were a great longer time, compared to other methods.
- Carrying out more experiments on other different traditional methods, using other methods and looking for these methods, effect on all nutritional materials which were not included in this study.

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