



Effect Of Oven Drying On Selected Quality Composition Of Chicken

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ABSTRACT: This study determined the effect of oven drying on some quality attributes of chicken. The properties determined include sensory properties (including colour, flavor, taste, texture, tenderness, juiciness and overall acceptability) and physical properties (including cooking loss, pH and water holding capacity). The data collected was statistically analysed using the general linear model procedure available in SAS and Duncan's Multiple Range (DMRT) was used to determine the difference among means. Drying time had significant effect on the properties measured. It was obtained that the longer the drying duration of the sausage, the longer rate at which the sausage attain the degree of acceptance. The oven drying of sausage raised its shelf life and sensory attributes.

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1.0 INTRODUCTION

Food preservation and storage is one of the most important fundamentals for development and civilization. The origin of meat processing is lost in antiquity but began when early man first preserved meat with salt and also used cooking to prolong the keeping quality of fresh meat. Modern food processing traces its origin to the development of canning, since then advances in technology have continued to change processing methods. Modern meat processing has led to the development of products with unique flavor and forms, provision of variety of products and development of new products in addition to preservation.

Drying is probably the oldest method of food preservation. In developing countries, drying is used in preserving meat in surplus supply. The principle is to remove water from the food material under the influence of heat and temperature. Fresh meat has moisture content as high as 75% which promotes microbial, biochemical, enzymatic and physical process (Okonkwo, 1984) thus fast-tracking meat spoilage. The spoilage of the meat is slowed down or halted when the moisture content is lowered because spoilage organisms can no longer grow or proliferate in the absence of moisture content (Lawrie and Ledward, 2006; Leroy et al., 2006). Drying of meat products has

some advantages over other preservation techniques, it include less storage weight and space thus reducing distribution and storage costs; it can reduce the longevity of the products

Drying of meat extends its shelf-life by reducing its water activity, it can be achieved through the use of solar energy, smoking, hot-air drying and freeze-drying achieved by sublimation (Fellows, 2000; FAO, 2010). The preservative effect is based on the fact that microbial action, chemical and physical processes and enzymatic action on meat depend greatly on the amount of available moisture content. Moisture content of the meat is reduced to such a level that the activities of these deteriorative agents are reduced or halted (Nunez-Gonzalez et al., 2008)

Meat products undergo changes during drying and storage that changes their quality characteristics thus, a good and improved drying technology should minimize these changes and maximize the process efficiency (Marco et al., 2008)). The changes during drying occur in texture, loss of flavor and aroma, changes in color and nutritional value, it is therefore essential to determine the quality of dried meat products. This study therefore aimed at investigating the effect of oven drying on selected quality composition of chicken

MATERIALS AND METHODS

Materials:

The materials used include: Hand glove (for preventing direct contact in other to afford contamination), Charcoal (used as the heat source for drying), Masking tape (used for labeling the treatments), Plates and dishes (used for sensory assessment), Spirit and Cotton wool (used as a disinfectant in the laboratory), Goat casing/collagen (used for the sausage casing), Weighing balance (used for weighing the samples), Thermometers (used for determining the temperature of the oven and also the internal temperature of the sausage),

Sample Collection and Preparation

Live chicken (broilers) were purchased from Green pastures Nigeria Limited, Oluyole Extension Area, Ibadan Oyo State, Nigeria. The birds were carefully processed in the laboratory at the Institute of Agricultural Research and Training, Moor Plantation Apata, Ibadan, Southwest, Oyo State. 10kg of frozen chicken was placed in warm water for about 15 minutes to defreeze. The chicken was thereafter cut into pieces and cooked for about 45 minutes to soften

it. The chicken was deboned and the lean meat was grinded minced using mortar and pestle. The minced chicken meat was poured into a bowl and 213.97g of butter was added together with 85.67g of red chili pepper, 44.24g of Nut Meg, 120.06g of Green pepper, 85.33g of Ginger, 350g of corn flour, Onion and garlic powder of 1g, Maggi and salt were also added to the minced chicken. This was carefully mixed together to achieve uniform paste mixture. It was then stuffed into the prepared casing/collagen (cow intestines) and broken into links of diameter 20-22mm.

Sample Treatment

The experiment was conducted after storing the samples for 0, 3, 6, and 9 days consecutively. The samples were also dried in the electric oven at varying temperature and time as stated in Table 1. The oven used is a hot air circulation drying machine powered by charcoal with steady hot air flowing in the drying chamber. The hot air circulation dryer is a kind of all-purpose drying equipment, having wide application for the curing and dehydrating of many kinds of materials and products in the food industry, agriculture and sideline production and fishery industries.

Table 1: Oven Drying Duration

Sample treatment	Drying at 70°C	Drying at 85°C
T ₁	40 minutes	-
T ₂	40 minutes	40 minutes
T ₃	40 minutes	50 minutes
T ₄	40 minutes	60 minutes

Determination of Sensory Properties

The sensory properties (including colour, flavor, taste, texture, tenderness, juiciness and overall acceptability) of the chicken sausage were assessed by means of a 9-point hedonic scale rating described by Larmond (1977). The ratings on the 9-point hedonic scale were: 1-Dislike extremely, 2- Dislike very much, 3- Dislike moderately, 4- Dislike slightly, 5- Intermediate, 6- Like slightly, 7- Like moderately, 8- Like very much and 9- Like extremely (Appendix 1). The sensory questionnaires were distributed to ten panelists.

Determination of Physical Properties

The physical properties of the chicken sausage determined based on standard evaluation methods include proximate product yield, cooking loss, water holding capacity, pH, and lipid oxidation. The cooking loss was determined by weighing fresh lean chicken meat and also measuring of the cooked lean chicken meat (Malgorzata *et al.*, 2005; Apata *et al.*, 2015) and computed using Equation 1. The water holding capacity was obtained using the press method. 5.0g of

the product sample from each of the four treatments was placed between two previously weighed 9cm Whatman No. 1 filter paper (Model C, Caver Inc. Wabash, USA). The meat was pressed between two 10.2 x 10.2cm² plexi- glasses at about 35.5kg/cm³ absolute pressure for 1 minute using a vice. The weight of wet filter paper was taken and water holding capacity of meat sample was calculated using Equation 2:

$$CL (\%) = \frac{W_{rcs} - W_{ccs}}{W_{rcs}} \times 100\% \quad (1)$$

Where: CL is the cooking loss (%)

W_{rcs} is the weight of raw chicken Sausage (g)

W_{ccs} is the weight of cooked chicken sausage (g)

$$WHC (\%) = 1 - \frac{W_{wp} - W_{dp}}{W_{ms}} \times 100\% \quad (1)$$

Where: WHC is the Water holding capacity (%)

W_{wp} is the weight of wet paper (g)

W_{dp} is the Weight of dry paper (g)

W_{ms} is the Weight of meat sample (g)

Data Analysis

Data collected was analyzed using the general linear model procedure available in SAS. The Duncan's Multiple Range (DMRT) was used to determine the difference among means.

RESULTS AND DISCUSSION**i. Sensory Analysis of an oven dried chicken sausage**

The acceptability on Colour, Appearance, Tenderness, Flavour, Texture, Taste and Overall acceptability were satisfactory (Table 1). The overall acceptability of the Oven dried sausage was good. However, most acceptable treatments samples were from T₃, T₄ which proves that the higher the drying time, the faster the rate of sausage

Table 1: Sensory Properties of the Chicken Sausage, cooking.

Main effect	Colour		Appearance		Tenderness		Taste		Overall acceptability		Flavour	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
T ₁	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
T ₂	7.62 ^a	0.12	7.47 ^a	0.13	7.97 ^b	0.36	7.90 ^a	0.05	8.08 ^a	0.12	7.73 ^a	0.05
T ₃	7.91 ^b	0.13	7.57 ^a	0.13	7.86 ^b	0.36	7.89 ^a	0.05	8.22 ^a	0.12	7.91 ^b	0.05
T ₄	8.08 ^a	0.14	7.96 ^b	0.13	7.88 ^a	0.36	8.17 ^a	0.05	8.28 ^a	0.12	8.28 ^c	0.05
Storage Days												
0	7.93 ^a	0.14	6.76 ^a	0.15	7.28 ^a	0.42	7.70 ^a	0.05	8.23 ^a	0.15	7.63 ^a	0.64
3	7.80 ^a	0.13	8.04 ^b	0.14	8.37 ^d	0.42	8.13 ^c	0.05	8.21 ^a	0.14	7.87 ^b	0.64
6	7.86 ^a	0.14	8.00 ^b	0.15	8.10 ^c	0.42	8.30 ^d	0.05	8.20 ^a	0.15	8.26 ^c	0.64
9	7.90 ^a	0.14	7.86 ^b	0.15	7.86 ^b	0.42	7.83 ^b	0.05	8.13 ^a	0.15	8.13 ^c	0.64
P – Values												
Treatments	0.004		0.003		0.000		0.000		0.259		0.000	
Storage days	0.803		0.000		0.000		0.000				0.000	
Treatment * Storage	0.038		0.006		0.000		0.010		0.205		0.003	

abcd means in the same column (within a main effect) with different superscript differs significantly (p<0.005)

ii. Physical Properties of oven dried chicken sausage

The pH and Water Holding Capacity (WHC) properties of oven dried chicken sausage shows that T₂ (6.63) was significantly different to T₃ (6.70) and T₄ (6.76) where there is significant difference in T₃ and T₄

respectively, this implies that it safe for consumption. The pH increases as the storage days increases in the order: D₀ (6.40) < D₃ (6.71) < D₆ and D₉, there is no significant difference in D₆ and D₉ respectively as shown in Table 2.

Table 2: Physical Properties of Oven dried Chicken Sausage

Main effect	pH		WHC		Cooking loss	
	Mean	SE	Mean	SE	Mean	SE
T ₁	ND	ND	ND	ND	ND	ND
T ₂	6.63 ^a	0.34	94.25 ^a	0.36	28.20 ^a	0.25
T ₃	6.70 ^b	0.33	94.15	0.37	32.50 ^b	0.25
T ₄	6.76 ^b	0.32	93.85	0.35	35.14 ^c	0.25
Storage Days						
0	6.40 ^a	0.39	94.53 ^b	0.41	-	-
3	6.71 ^b	0.35	94.13 ^{ab}	0.41	-	-
6	6.82 ^c	0.37	94.07 ^{ab}	0.41	-	-
9	6.84 ^c	0.14	94.60 ^a	0.15	-	-
P – Values						
Treatments	0.003		0.318		0.000	
Storage days	0.000		0.191		-	
Treatment * Storage	0.126		0.13		0.000	

abc means in the same column (within a main effect) with different superscript differs significantly (p<0.005)

CONCLUSION

The effect of oven drying on selected quality composition of chicken sausage was investigated. Oven drying of the chicken sausage raised its shelf life and sensory attributes and the most acceptable treatments sample were those dried for 50 minutes and 1 hour.

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