Quality Characteristics Of Meat From Two Strains Of Indigenous Chicken Cocks

***Adeyanju[1], T.M.; Abiola[1], S.S ; Sanwo[1], K.A; Shittu[2], T.A And Adeyanju[3], S.A**
1- Meat Science Laboratory; Department of Animal Production and Health,
2- Food Science and Technology Department,
University of Agriculture, P.M.B.2240, Abeokuta, Ogun State, Nigeria.
3- Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria.

ABSTRACT
The study evaluated the quality characteristics of meat from two strains of indigenous chicken, Frizzle feather (FF) and Naked neck (NN), while one strain of exotic chicken, the Dominant Black (DB) served as control. Twelve birds per strain of average age of six months and live weight of 1 – 2 kg were used for the experiment which lasted four weeks. Each strain was distributed into 3 replicates of four birds per replicate, tagged and fed with growers' mash and water ad libitum. They were slaughtered and cut into parts. Meat from thigh muscle was sampled for determination of physico-chemical parameters. Data collected on meat samples were subjected to one-way analysis of variance. Strain of chicken had no significant (P>0.05) effect on the quality characteristics (pH, water holding capacity, nutrient composition) of chicken meat.

INTRODUCTION

Among many different sources of meat is the chicken which stands out as source of meat in most developing countries. Chicken can be classified into exotic and indigenous. Indigenous chickens are those native to the area of concern. Indigenous chickens are widely distributed in the rural areas of tropical and sub-tropical countries where they are kept by the majority of the rural poor. Indigenous chicken constitutes 80% of the 120 million poultry type raised in the rural areas in Nigeria {12}. They are self reliant and hardy birds with the capacity to withstand harsh weather condition and adaptation to adverse environment. Their products are preferred by the majority of Nigerians because of the pigmentation, taste, leanness and suitability for special dishes {9}. There have been reports on the characterisation of the local chicken in Nigeria and its potential for egg and meat production {10; 3}.

Meat and poultry are composed of naturally occurring water, muscle, connective tissue, fat, and bone. People eat meat for the muscle. The muscle is approximately 75% water (although different cuts may have more or less water) and 20% protein, with the remaining 5% representing a combination of fat, carbohydrate, and minerals. The percentage of naturally occurring water in meat varies with the type of muscle, the kind of meat, the season of the year, and the pH of the meat. Fat in meat is found both between muscles and within muscles. In both locations, fat contributes to overall flavor and juiciness in meats {7}.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Poultry Unit, Teaching and Research Farm Directorate and at the Meat Processing Laboratory, Department of Animal Production and Health, University of Agriculture, Abeokuta. Abeokuta lies within the Rain Forest vegetation zone of Western Nigeria at latitude 7°13' 49.46"N, longitude 3°26'11.98"E and altitude 76m above sea level. The climate is humid with a mean annual rainfall of 1,037mm, an average temperature of 34.7°C and an average relative humidity of 82% throughout the year.

Evaluation of pH of chicken meat

The warm carcasses were brought to the laboratory and were deeply incised at the right drumstick. The pH-values in meat were measured by deep insertion of the sensitive diaphragm of the electrode into the deeply incised chicken meat samples (right drumstick). Through the diaphragm differences in electrical load between the meat and electrolyte solution (e.g. Potassium chloride KCl) inside the glass electrode were measured and directly indicated as the pH-reading. In raw fresh chicken meat, small amounts of distilled water was sprayed onto the tissue at the point of measurement (prior to inserting the electrode), because the operation requires some fluidity in the sample and the glass electrode was thoroughly wet. The amount of water necessary did not appreciably alter the pH for accurate pH readings; the pH-meter was calibrated before use and adjusted to the temperature of the tissues to be measured. The electrode was rinsed with distilled water after each measurement {8}.

Evaluation of water holding capacity of chicken meat

This was determined using the method described by {13}. Meat sample in triplicates from the right thighs weighing 1 gram each were obtained from DB, FF, NN birds. Each weighed sample was placed in between two filter papers and then pressed between two fibre glasses using a vice to hold it for one minute. The compressed meat samples were oven dried at 60°C for 48 hours to determine the moisture content which was the difference between the initial and the final weight. Tracing sheets were placed on the filter papers to trace two areas out which were the areas of pressed meat samples and area of exudates. The quantities of water released were measured as follows;

WHC = Water holding capacity

$$WHC = 100 - \frac{[(Ar - Am) \times 9.47] \times 100}{Wm \times Wo}$$

Ar = Area of water released from meat (cm^2)
Am = Area of meat sample (cm^2)
Wm = Weight of meat sample in (mg)
Wo =Moisture content of meat (mg)
9.47 =Constant factor {13}.

Evaluation of chemical compositions of chicken meat

The meat samples were obtained from the right thighs of the dressed carcasses. The thighs were separated at the tibio-femoral and illeo-femoral joint. The skin was removed and flesh stripped from the bone. The meat obtained was used for evaluation of nutrient content. Chemical compositions (moisture, protein, fat, ash, carbohydrate and fibre) were determined according to the method of {5}.

RESULTS

pH and water holding capacity of chicken meat

There were no significant differences (P>0.05) in Table 1, the results obtained for both the pH and water holding capacity of meat from DB, NN and FF respectively. However, the best water holding capacity of 41.47% was observed in NN chicken meat, while DB and FF meat exhibited lower water holding capacity of 44.77% and 52.53% respectively.

Nutrient compositions of chicken meat

The result in Table 2 shows that there were no significant differences (P>0.05) between the nutrient compositions (moisture, protein, fat, ash, and carbohydrate content) of meat from DB, FF and NN. However, DB chicken meat had the highest protein content (21.23%) followed by NN (21.17%) while the least value of 20.73% was found in FF chicken meat. DB chicken meat exhibited the highest mean value (10.05%) for fat followed by FF (9.82%) and NN (9.74%) chicken meat respectively. The highest carbohydrate (1.24%) was found in FF chicken meat while the least (0.67%) was found in DB chicken meat.

Table 1: pH and water holding capacity of meat samples

	Meat samples			
Parameters	**DB**	**FF**	**NN**	**P-Value**
pH	6.28 ± 0.02	6.26 ± 0.02	6.29 ± 0.01	0.514
Water Holding Capacity (% free water)	44.77±3.76	52.53±4.85	41.47 ± 6.89	0.347

Table 2: Nutrient compositions of chicken meat

	Meat samples			
Nutrients	**DB**	**FF**	**NN**	**P-Value**
Moisture (%)	66.97 ± 0.32	67.14 ± 0.08	67.20 ± 0.10	0.713
Protein (%)	21.23 ± 0. 40	20.73 ± 0. 31	21.17 ± 0. 32	0.548
Fat (%)	10.05 ± 0.08	9.82 ± 0.17	9.74 ± 0.13	0.256
Ash (%)	1.07 ± 0.01	1.07 ± 0.02	1.07 ± 0.02	0.974
Carbohydrate (%)	0.67 ± 0.22	1.24 ± 0.35	0.91 ± 0.32	0.405

[a,b] Means in the same row with different superscripts are significantly (P<0.05) different.

Key:

DB: Dominant black, FF: Frizzle feather, NN: Naked neck

DISCUSSION

Effect of strains (DB, FF and NN) on pH of chicken meat samples was not shown. The pH of chicken meat samples in this study is close to neutral and has only decreased slightly from the pH of a living muscle. This might be because these birds were not subjected to stress prior to slaughtering. {1} mentioned that a normal pH declines in porcine muscle by a gradual decrease from approximately pH 7.4 in living muscle to a pH of about 5.3-5.7. In other animals muscle pH drops rapidly to around 5.4-5.5 during the first hour after exsanguinations. pH is important in determining the water-holding capacity of meat, the ability of meat to retain its water during application of external forces such as cutting , heating, grinding or pressing. High pH is relevant for high water-holding and firmness,

irrespective of how the pH has been obtained {6}. Results obtained for the water holding capacity of chicken meat samples from DB, FF and NN did not show any particular trend. The reason for the unnoticeable difference between the water holding capacity of chicken meat from different strains might be due to similarities in their age and species. The water holding capacity of meat product is a very important quality attribute which has influence on product yield which in turn has economic implications but is also important in terms of eating quality {2}. The different strains (DB, FF and NN) of chickens had no effect on the nutrient compositions of meat samples as observed in this study; this was shown only in fibre content where NN chicken meat had higher fibre content than FF and DB chicken meat. The result differs slightly from the result of the {11} who reported proximate analysis of pigeon meat considered in three breeds was similar to those reported for the other poultry species [e.g., turkey meat (protein 20.4%, fat 3.85%, ash 1.0%, and moisture 74.8%) while the protein and ash composition was close to the protein and ash composition of meat samples in this study. Meat and poultry are composed of naturally occurring water, muscle, connective tissue, fat, and bone. The muscle is approximately 75% water (although different cuts may have more or less water) and 20% protein, with the remaining 5% representing a combination of fat, carbohydrate, and minerals {7}. Nutrition and Calories in Chicken Meat (Roasted) are: water content 67.05/100g, Calorie content of Food (kcals per 100g/3.5oz) 178, protein content 23.25/100g, fat content (lipids) 8.75/100g, ash content 0.94/100g, carbohydrate content 0/100g, dietary fiber content 0/100g, sugar content (grams per 100g) N/A {4}.

CONCLUSION

This study concluded that pH values of meat from different strains of chicken were at acidic level hence better preservation with good keeping qualities.

REFERENCE:

1. Aberle, E.D., Forrest, J.C., Gerrard, D.E., Mills, E.W., Hedrick, H.B., Judge, M.D. and Markel, R.A. 2001.
Principles of Meat Science Ed.4/kendall/Hunt Publishing Company, printed in the United States ofAmerica.
2. Adam, Y.S.I. and Abugroun, H.A. 2010.Effect of Sudanese marketing condition on quality attributes of meat
products. *Pakistan Journal of Nutrition* 9(12):1149-1156.
3. Adebambo, O.A. 2005. Indigenous poultry breeds genetic improvement for meat and eggs. Proceedings of
The 1st International Poultry Summit, Feb. 20-25, Ota, Ogun State, pp: 1-8.4.
4. Anne, C. 2010. Energy and Calories in Chicken Meat - Information. Nutritional Values, Chicken, Turkey, Carbs, Protein, Fat, Vitamins, Minerals in Food. Nutrition and Calories in Chicken Meat. Anne Collins Weight Loss Program.pp1.
5. AOAC. 1995. Associations of Official Analytical Chemists. Official methods of analysis, 17th ed. Association of Official Analytical Chemists, Arlington, VA.
6. Eero, J.P., Marita, H.R. and Jukka, I.V. 2001. Combined effects of Nacl and raw meat pH on water-holding in cooked sausage with and without added Phosphate. *Meat Science Journal, volume* 58(1):1-7.
7. Fact Sheets. 2007. Meat Preparation. Water in Meat and Poultry. Fact Sheets. United States Department of Agriculture. Food safety and inspection service.
8. Heinz, G. and Hautzinger P. 2007. Meat processing technology for small - to medium - scale producers.FAO CORPORATE DOCUMENT REPOSITORY .Series title RAP Publication -2007. pp 249-316.
9. Horst, P. 1989. Native fowl as reservoir for genomes and major genes with direct and indirect effects on adaptability and their potential for tropical oriented breeding plans. *Arch. Fur. Guflugelkd.* 53: 93-101.

10. Nwosu, C.C. 1979. Characterization of the local chicken in Nigeria and its potential for egg and meat production. Proceedings of the 1st National Seminar on Poultry Productio, Dec. 11-13, Ahmadu Bello University, Zaria, pp: 187-210.
11. Paleari, M. A., Camisasca, S., Beretta, G., Renon, G., Corsico, P., Bertolo, G. and Crivelli, G. 1998. Ostrich meat: Physico-chemical characteristics and comparison with turkey and bovine meat. *Meat Science* 48:205–210.
12.RIM (Resources Inventory and Management Ltd), 1992. Nigeria National Livestock Survey. Federal Department of Livestock and Pest Control Services, Abuja, Nigeria, pp: 287.
13.Suzuki,A.,Kojima,N.,Ikeuchi,Y.,Ikarashi,S.,Moriyama,N.,Ishizuka,T. and Tokushige, H.1991. Carcass composition and meat quality of Chinese purebred and European x Chinese crossbred pigs. *Meat Science.* 29:31.