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EVALUATION OF CARCASS QUALITY IN VILLAGE CHICKENS

BY

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DECLARATION

This project report has been compiled by myself and has not been accepted in any previous application for a degree. The work which this report records has been done by me and all sources of information have been acknowledged by means of references.

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JUNE, 2012

DEDICATION

This report is dedicated to my Uncle, Mr. Festone Simfukwe and my family members who have sacrificed their meager resources to see me complete my degree programme.

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ABSTRACT

The objective of the present study was to evaluate carcass quality of two commonly reared types of village chickens in Zambia, namely Guinea Fowl Spotted (GFS) and Naked Neck (NN). Ten breast muscles from each village chicken type were excised after slaughter as per established standards. The left halves were used for determination of shear force while the right halves were used for determination of pH and colour.

The results showed that there were no significant differences ($P>0.05$) in all the parameters measured between the two types of village chickens. The breast muscle pH of the GFS and NN chickens was 5.62 and 5.70, respectively. These values were within the normal ranges as the birds were slaughtered under similar and controlled conditions and therefore their post-mortem glycolysis was controlled. In terms of colour, the GFS recorded the L* value of 54.24 while NN recorded a value of 52.52. Similarly, no differences were found because of the improved water holding capacity (WHC) of the muscles which influences colour of the meat by affecting the reflectance properties of the muscles. The NN recorded a shear force value of 1.81 kg while the GFS recorded a value of 1.83 kg thereby showing the same level of tenderness. It is concluded that carcass quality of the two strains is the same.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Definition of local chickens

Local chickens, commonly known as village chickens in Zambia, are more widely distributed in rural Africa and Asia than any other livestock species. Permin and Pedersen (2002) noted that almost all families in developing countries keep a small chicken flock of 5-20 adult chickens, the majority being kept in free-range scavenging systems. Sonaiya and Olori (1990) also defined Nigerian indigenous chickens as dual purpose birds that are used for meat and egg production found in rural and peri-urban areas of the country and based on scavenging management system. Their feed resources include household refuse, homestead pickings, crop residues, herbage, seeds, green grasses, earthworms, insects and small amounts of supplemented feed by the stock owner. They are well adapted to the tropical environment and adverse climatic conditions.

1.2 Importance of meat production

Poultry production still remains the major contributor of meat on the table for many developing countries and continues to be an integral part of nearly all rural, peri-urban and urban households both directly and indirectly. Scanes (2007) stated that eggs and poultry meat provide an excellent source of critically important nutrient, protein, together with minerals and vitamins such as B12. Poultry are also used for social and traditional occasions and ceremonies (Lunguet al., 1996). This has been supported by Simainga et al. (2010) who conducted a study on the socio-economic importance of the village chickens in Mongu and Kalabo districts of Western Province of Zambia and reported that over 99% of the households kept village chickens mainly for consumption and as income source and 97% of the restaurants served village chicken meat as the main dish. Many customers in that study preferred meat from village chickens to commercial chicken meat as the former was said to be tastier. Although livestock production has been rising in Zambia, with its importance being equal to crops (Yambayamba et al., 2003), the livestock industry still remains underutilised as the per capita consumption of meat which is about 2.4 kg/year is far below the global per capita consumption of 38 kg/year (Speedy, 2003).

1.3 Factors affecting meat quality

Meat in general is affected by a number of factors including pre-slaughter (Petracci et al., 2001), post-slaughter handling procedures and genetics. These factors in turn affect the properties of meat such as water holding capacity, colour, texture, structure, and firmness which induce certain perceptions in consumers on the meat quality (Northcutt, 2009). The water holding capacity is important in that it determines the amount of proteins, vitamins, minerals, carbohydrates and water which contribute to the juiciness and palatability of the meat.

While several studies have been done on the meat quality of commercial birds (broilers), there is scanty information on village chickens. In Zambia, no similar work has been done in village chickens despite the fact that several chicken types exist in the country. Some of the chicken types found in Zambia include Naked-neck, Guinea Fowl Spotted type, Frizzled type, the Dwarf type as well as the Giant type (Yambayamba, 2010, unpublished report). All these chicken types are raised for both eggs and meat. A number of hotels and restaurants in Lusaka and other parts of the country are serving village chicken as a special dish. Given the popularity of village chicken meat, it is important to understand certain aspects of the quality of meat from these birds. This knowledge will form the basis of genetic selection among the village chicken types to produce birds of the desired quality among the consumers.

1.4 Objectives

The objective of the study was to evaluate the carcass quality of two common types of village chickens raised in Zambia. The specific objective was to determine tenderness and colour of the carcasses.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Factors affecting the meat

Several factors quality of affect muscle characteristics in meat animals and may be grouped into four categories, namely, animal factors, stress and stress susceptibility factors, post-mortem temperature and post-mortem handling practices. The most important meat attributes that are affected by these factors include meat tenderness, water holding capacity (WHC), appearance, consumer preference, filet dimensions, juiciness, favour and aroma (Groom, 1990).

2.1.1 Animal factors

2.1.1.1 Genetic selection

Meat quality is strongly determined by the histological and biochemical characteristics of muscle fibers (Berri, 2000). Touraille et al. (1981) detailed the effect of genotype and of the age at slaughter on the sensorial characteristics of chicken meat, by comparing two experimental lines divergently selected for growth. The authors reported that age was the most significant variation factor of sensory characteristics as, in both the thigh and breast muscles, tenderness and juiciness decreased between 9 and 16 weeks while flavor intensity increased. Ricard et al. (1983) compared the distribution of carcass fat and meat quality of birds divergently selected for fatness, abdominal fat deposition being four times greater in the fat than in the lean line. No significant difference between fat and lean birds was found for juiciness, flavor and cooking loss of the breast or thigh meat, while a slightly higher tenderness was observed for the fat birds. Other studies have looked at the effect of genetic selection (Berri et al., 2001; Debut et al., 2003), age (Sandercock et al., 2001; Smith et al., 2002; Anadon, 2002; Bianchi et al., 2006), gender (Anadon, 2002) and slaughtering procedures (Savenije et al., 2002) on meat quality in poultry. However, some results on meat quality parameters of broiler and turkey breast meat were contradictory. For example, Ngoka et al. (1982) reported no effects of gender on breast muscle pH, WHC, cooking loss, and color L*, a* and b* of turkeys. However, in a comprehensive study by Anadon (2002) on broiler chickens, it was reported that Pectoralis major muscle of female birds exhibited lower pH values at all times post-mortem, higher L*, a* and b* values, and lower WHC compared to males, which were significantly heavier than females. Muscle of females showed a greater rate and extent of pH decline, lighter, redder and yellower breast meat color

and lower WHC compared to males. These differences appeared to be the result of a higher degree of protein denaturation in muscles from female birds that exhibited lower pH values at all post-mortem time periods. Several studies also have looked at the effect of broiler age on subsequent meat quality (Anadon, 2002; Sandercock et al., 2001). Sandercock et al. (2001) reported lower pH immediately post-slaughter, lower shear values and higher pH and drip loss for 35 d old birds compared to 63 d old birds, which were speculated by the authors to be due to a greater degree of post-mortem glycolytic metabolism in the more mature muscle. On the contrary, Anadon (2002) reported higher WHC for breast fillets from 53 d old birds than 42 d old birds despite the lack of any significant differences in pH and L* values at 24 h post-mortem. Results from this study suggested that rigor mortis and post-mortem glycolysis occurred somewhat faster in younger than in older birds, which was contrary to the findings of Sandercock et al. (2001). In another study, Anadon (2002) reported an age related change in colour of Pectoralis major muscle, where, L* values tended to increase linearly with increasing age at slaughter, which did not agree with the author's earlier study.

2.1.1.2 Unnatural growing environment

It is assumed that antemortem temperature affects the postmortem metabolism of muscle and subsequent meat quality via adrenal or other physiological responses or simply by fatigue of the animals (Lambooij, 1999). In poultry, Woods and Richards (1975) reported an increased rate of postmortem glycolysis and prolonged glycolysis with heat and cold stress, respectively. Froning et al. (1978) and Holm and Fletcher (1997), working with turkeys and broiler chickens, respectively, reported lower pH and higher shear value from birds kept at elevated temperatures compared to birds held in cooler conditions. The authors explained that exposure of birds to cold temperature causes glycogen depletion in the muscle of the birds due to increased energy consumption to maintain normal body temperature under those conditions which results in high muscle pH and higher shear values.

Environmental conditions during transport and holding of poultry have been shown to affect bird welfare and subsequent meat quality. Holding conditions prior to slaughter might dramatically affect live bird shrink and apparent yields (Petracci et al., 2001). This loss in live weight is not desirable from both welfare and economic points of view and could cause considerable loss to the poultry industry. In addition, pre-slaughter environmental stress could affect post-mortem

metabolism and resultant meat quality.Heat stress has been reported to accelerate rate and extent of rigor mortis development, post-mortem glycolysis, and biochemical changes in the muscle, causing undesirable changes in meat characteristics similar to the PSE condition reported in pork (Sandercock et al., 2001). Cold environmental conditions prior to slaughter were reported to affect broiler and turkey breast meat by causing an increase in pH of the meat (Holm and Fletcher, 1997).

2.1.2 Stress and stress susceptibility factors

When an animal is slaughtered under stressful conditions, there are physiological adjustments in parameters such as heart rate, respiration, body temperature and blood pressure. These changes are influenced by various hormones including adrenocorticotrophic hormone (ACTH), cortisol, thyroid hormones, and catecholamines. The effect of these hormones on meat is the accelerated post-portem glycolysis which causes the development of pale, soft and exudative (PSE) meat (Barbut et al., 2005). Froning et al. (1978) showed that turkeys exposed to pre-slaughter stresses, such as struggling or heat, exhibited an accelerated pH decline which later resulted in tougher breast meat. The pale, soft, exudative (PSE) state is an important quality defect in pig.

On the other hand, low glycogen levels at slaughter will prevent normal post-mortem glycolysis from taking place and increase meat reflectance thus leaving the muscles in dark, firm and dry (DFD) state. When the chickens have lower glycogen levels at slaughter, lactate production is low and consequently the pH remains high, above 5.8, thus yielding DFD meat. DFD meat is characterized by a high water holding capacity, making the meat lose a lot of moisture during cooking and becomes very dry, reduced shelf life by allowing bacteria to grow more rapidly due to the higher pH and moisture and a sticky texture (Eagan et al., 1998).

2.1.3 Post-mortem temperature

Most postmortem chilling processes of livestock carcasses are primarily employed to ensure food safety, maximize shelf-life, and reduce shrinkage with less emphasis on maintaining tenderness and colour factors of the finished product. Broiler carcasses are chilled to below 4°C within 1.5 hours of death with water immersion chilling or 2.5 hours of death with air chilling (Sams, 1999). However, exposure to low temperatures when ATP is still present in the muscle cell, such as prior to rigor mortis development, has been demonstrated to toughen the meat through a process termed "cold shortening" (Hamm, 1982). At low temperatures, the sarcoplasmic reticular

membranes become less efficient at sequestering Ca^{2+} and allow it to "leak" into the myofibrillar space. If ATP is present, the Ca^{2+} initiates the contraction cycle and causes the sarcomere to shorten. Although broiler breast muscle is primarily composed of white fibers (Sams and Janky, 1991), which are less prone to cold shortening than red fibers (Bendall, 1975), Bilgili et al. (1989) showed that broiler breast muscle has still been shown to experience cold shortening.

Additional sarcomere shortening conditions are thaw and heat rigor. These conditions are caused when carcasses are exposed to extreme cold or hot temperatures pre-rigor (Aberle et al., 2001). Thaw rigor is a form of rigor mortis that develops when muscle that was frozen pre-rigor is thawed (Aberle et al., 2001). Aberle et al. (2001) stated that when this muscle is thawed, contraction is produced by the sudden release of Ca^{2+} into the sarcoplasm resulting in a physical shortening of 60 to 80 percent of the original muscle length and a release of large quantities of meat juices and severe toughening. Heat rigor occurs when muscles are maintained at elevated temperatures up to 50°C while the pH is around 5.8-6.0 before onset of rigor mortis. This results in a rapid depletion of ATP, which creates severe shortening and the early onset of rigor (Aberle et al., 2001). The severity of these two extreme conditions show the importance of designing chilling conditions that do not negatively impact meat quality.

2.1.4 Post-mortem handling practices

After shackling and exsanguinations, a bird dies after 1.5 to 6 minutes but the individual tissues and cells continue to react to their environment. As the animal dies due to loss of blood and the resulting anoxia, the muscle cells continue to respire, producing and consuming ATP, the primary currency of cellular energy (Sams, 1999). As cellular oxygen is depleted, the cell depends almost solely on anaerobic metabolism for the production of its needed ATP as glycogen is depleted and lactic acid, the end product of anaerobic metabolism, accumulates due to the lack of blood flow to remove it (Sams, 1999). When the ATP concentration falls to a critical level [1 m*M*/g (Hamm, 1982)], there is insufficient ATP to dissociate all of the actin and myosin. These proteins begin to remain complexed as actomyosin, and the onset phase of rigor mortis begins. Once rigor mortis has developed, the muscle is not extensible (cannot "relax") and becomes stiff. The process of rigor mortis development is central to the process of muscle death and to meat quality. Rigor begins in normal meat at pH values of 5.7 to 5.8 (Hannula and Puolanne, 2004), sarcoplasmic pH decreases to a level that inhibits further glycolysis, and ATP

production ceases. However, ATP consumption continues, most importantly in the role of ATP as a plasticizer to dissociate actin and myosin, maintaining muscle extensibility. Because there is little ATP available to break down the actin and myosin bonds, muscles cannot relax and therefore become inextensible (Aberle et al., 2001). Since Pale, Soft, and Exudative meat is a growing problem in the poultry industry that has been associated with processing conditions such as improper chilling (Sams and Alvarado, 2002), chilling of carcasses is employed to ensure acceptable internal body temperature which prompt remove of animal heat and improve wholesomeness. Therefore, chilling controls the rate of pH decline as well as preserves the enzymes that are responsible for tenderization of meat during the aging process.

2.1.4.1 pH decline

Normally, the pH in the muscle decreases from 7.0 upon slaughter to approximately 5.3 to 5.8 (Smulders et al., 1992). The rate of pH decline has an inverse relationship to tenderness. As the pH drops, it nears the iso-electric point. At this point, all of the negatively and positively charged amino acid side chains equal, which causes the maximal attraction between the two. This attraction holds the filaments closely together and does not allow any water to get in, greatly reducing the water holding capacity (Smulders et al., 1992) which can be detrimental to the myoglobin pigment. This causes the myoglobin structure to be "open" and scatter light, creating a pale colored product (Swatland, 2004). The stiffness of a muscle in rigor mortis is a function of the extent of myofibrillar overlap of thick and thin filaments, which is determined by the strength of the opposing muscle groups (Cason et al., 1997).

2.1.4.2 Chilling

Broiler carcasses are chilled to below 4 ^{0}C within 1.5 h of death with water immersion chilling or 2.5 h of death with air chilling (Sams, 1999). Rapid chilling of poultry mainly serves to reduce microbial growth, but also serves to increase the firmness of the muscle and stiffness of the skeleton to facilitate automatic portioning and deboning. Olsson et al. (1994) recommended that carcasses should be kept at temperatures of above 7 ^{0}C in order to prevent cold shortening from taking place. At these temperatures there is rupture of lysozomal membranes and release of lysozomal enzymes which have been hypothesized to cause accelerated tenderization.

2.1.4.3 Aging

Aging, or maturation, is the procedure of storing intact carcasses or breast halves for several hours at refrigerated temperatures before deboning to allow for the development of rigor mortis. Stewart et al. (1984) reported that some time between 2 and 4 h postmortem was the critical period after which deboning did not cause toughening. The authors provided evidence that the normal degradative processes involved in rigor resolution were responsible for the tenderization. The rapid fall in pH while the temperature is still high contributes to the tenderness through the release of enzymes such as the calpains. Secondly, calcium binds to titin, splitting this protein and destabilizing the z-dics. At the same time calcium binds to paratropomyosin, releasing this protein from actin and myosin junction and weakening rigor linkages thereby tenderizing the meat.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Experimental birds

Ten naked-neck chickens (1.5±1 kg) and 10 Guinea Fowl Spotted chickens (1.4±1 kg) were purchased from known sources within the outskirts of Lusaka district. The birds were immediately transported to the Field Station belonging to the School of Agricultural Sciences at the University of Zambia. The birds were rested for two hours before slaughter.

3.2 Slaughter of birds and harvesting of breast muscles

The chickens were stunned using killing cones and then bled for 2 minutes by resecting the necks. They were then treated with hot water at temperature range of 59°C-60°C to facilitate defeathering. The carcasses were washed with tap water and had their feet and head removed and transferred to the evisceration line where the liver, gizzard, heart, kidneys, intestines and the crop were removed. Internal and external washing of the carcasses followed thereafter. The carcasses were then chilled in ice-water mixture with a temperature of 4°C for about 50 minutes to achieve internal muscle temperature of between 4.4°C-6°C within two hours of slaughter.

When the desired temperature was attained, the breast muscles were removed from the carcasses and put in plastics and then frozen for three days, after which they were transported to Zambia Bureau of Standards for laboratory analysis.

3.3 Laboratory analysis

The frozen samples were thawed to 4 °C before determination of pH, shear force and colour.

3.3.1 Measurement of Meat colour

Meat colour was measured using a colour-reader camera. For the purposes of comparing the two chicken types, broiler breast muscle was used as a standard in the procedure. Following thawing of the breast muscles, the colour readings [L (lightness, a* (redness) and b* yellowness)] were taken at two different points and the averaged.

3.3.2 Measurement of pH

Twenty grams of the sample was ground using a stomacher circulator and placed in a 250 ml beaker followed by the addition of 200 ml of distilled water to make a homogenized mixture. The samples were shaken on a shaker for 30 minutes at 185 rpm. The contents of the beaker

were allowed to stand for 30 minutes, and then the filtrate was obtained. The pH of muscle was measured by dipping the electrode into the filtrate using a calibrated Hanna, HI 991300 portable pH meter.

3.3.3 Shear force

Shear force was measured using Warner-Bratzler shear force machine (Linux, Mumbra, Thane-400 612). The Warner-Bratzler shear force value is the amount of force mechanically required to shear through a uniform piece of meat and is reported in kilograms. This value is used to establish tenderness of meat and it follows that the higher the resistance, the higher the value and the tougher the meat.

Uniform sized steaks from the left halves of the breast muscles (5 mm thick by 10 cm long) were subjected to shear force action in the longitudinal orientation of the muscles fibers.

3.4 Statistical analysis

The data was inputted into Windows Excel (2010). A two sample t-test was used to test and compare the carcass quality of the two strains using Genstart (version 14.0).

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 pH measurements

The ultimate pH of breast muscle of NN chickens did not differ significantly (P=0.42) from the GFS chickens (Table 1). While the NN chickens recorded a pH of 5.70, the GF recorded 5.62. Smulders et al. (1992) reported that pH in the muscle normally decreases from 7.0 upon slaughter to approximately 5.3 to 5.8. A similar approach was conducted by Fernandez et al. (2001) in turkeys, by comparing two genetic types differing for growth in which no significant differences in enzyme activity was observed in relation to genetic background of the animals. That could partly be related to the highly controlled slaughter conditions used in the experiments that were rather far from commercial more stressful conditions. In another research the muscle pH of Thai indigenous chicken was 5.80 - 5.93 for pectoralis muscle and 5.85 - 6.06 for biceps femoris muscle as reported by Wattanachantet al. (2004). This could partly be attributed to the fact that pectoralis muscle is a fast-twitch glycolytic muscle while bicepts fermolis muscle is a slow-twitch muscle. Fast-twitch muscles contain more glycogen than the slow-twitch oxidative muscles hence there is more lactic acid accumulation in the fast-twitch glycolytic muscles resulting in into lower pH.

The pH of the muscle is important because haemoglobin-associated reactions are pH dependent. In addition, muscle pH affects the water binding nature of the proteins and therefore directly affects the physical structure of the meat and its light reflecting properties. Furthermore, pH affects enzymatic activity of the mitochondrial system thereby altering the oxygen availability for haem reactivity (Fletcher, 1999a).

Table 1: Least square means ± SE of ultimate pH of breast muscle in Naked Neck and Guinea Fowl Spotted chickens slaughtered at constant weight.

Chicken type	Ultimate pH	Probability
Naked neck	5.70 ± 0.06	0.42
Guinea Fowl spotted	5.62 ± 0.07	

4.2 Shear force

No significant differences (P=0.8) were found in shear force values of the GFS and NN chickens. Shear force of breast muscle in NN and GFS was 1.81 ± 0.08 kg and 1.83 ± 0.06 kg, respectively, (Table 2).

These values are similar to those reported by Wattanachant et al. (2004) from the comparison of composition, colour, and texture of raw pectoralis muscle of Thai Indigenous and broiler chickens. In this research Thai indigenous and broiler muscle recorded values of 1.78 kg and 1.20 kg, respectively. Thai indigenous pectoralis muscle was found to be tougher than broiler muscle and this could be due to a higher prorportion of collagen fibers (Wattanachant, 2004). Older indigenous chickens have more cross links of insoluble fibers compared to the broiler chickens. Animal age has been known to affect chemical composition, properties and structure of muscle which could all contribute to the quality of meat. However, in this research no significant differences were found due partly due to the fact that both strains were of almost same age and therefore could contain similar content of soluble and insoluble collagen fibers. During the growth of the indigenous chicken, moisture content in muscle decreases whereas protein and fat content increases. Total collagen remains unchanged with the age of chicken while soluble collagen slightly decreases (Wattanachant, 2007). The tenderness of chicken meat decreases during muscle growth probably because of the structural changes of collagen (Nakamura et al., 2004).

Table 2: Least square means ± SE of shear force of breast muscle in Naked Neck chickens and Guinea Fowl Spotted chickens slaughtered at constant weight.

Chicken type	Shear force (kg)	Probability
Naked Neck	1.81 ± 0.08	
		0.8
Guinea Fowl Spotted	1.83 ± 0.06	

4.3 Meat colour

The colour parameters of the breast muscle from NN chickens were not different from the GFS chickens, (Table 3). While the L* value for the NN breast muscle was 52.82 ± 1.06, the GFS breast muscle recorded 54.24 ± 1.53. Similarly, the a* values for the NN and GFS breast muscle were, respectively, 1.64 ± 0.45 and 0.86 ± 0.37. The b* values for the NN and GFS breast muscle were 11.03±0.90 and 9.37±1.22, respectively.

The colour of raw poultry meat is critical for consumer selection whereas the colour of the cooked meat is critical for final evaluation (Fletcher, 1999a). The major contributing factors to poultry meat color are myoglobin content, the chemical state and reactions of the myoglobin, and meat pH. Myoglobin content is primarily related to species, muscle type and age of the animal (Fletcher, 1999a). The concentration of myoglobin differs from breed to breed but did not result in significant differences in colour between the two strains.

Sanchai et al. (2008) recorded breast meat L* values of 54.8 and 53.5 for Thai indigenous (TH) and the cross breed between Thai indigenous chickens and Bar Plymouth Rock (THB), respectively. In the same experiment Shanghai chickens recorded an L* value of 59.1. There were significant differences in the colour of breast meat among genotypes ($P<0.01$) and the Shanghai breast meat were reported to be paler than (TH) and (THB). The differences were explained in terms of the differences in water holding capacities of the strains.

Non-significance in color L*, a*, and b* value between broiler and Thai indigenous chicken muscle was also reported by Wattanachant et al. (2004). This report was not in agreement with Miller (1994), who stated that the content of myoglobin increased with the increasing age of poultry meat. The biceps femoris muscle of indigenous chicken contained higher myoglobin content than that of pectoralis muscle. This is in support with the results between the GFS and NN since birds of the same age have almost the same amount of myoglobin content in the breast muscle.

The findings of this research show that the colour of the meat from the GFS chickens in terms of lightness (L*) fell within the normal ranges as reported by Barbut et al. (2007). In broiler meat, Berri et al. (2001) observed colour values of 0.64, 10.86 and 48.4 for a*, b* and L* respectively. It would appear that the a* and b* from village chickens in the present study were numerically

higher than those reported in broiler meat. The implication is that the village chicken meat is lighter, redder and yellower than broiler meat.

'able 3: Least squares means ± SE of colour values of breast muscle in Naked Neck chickens nd Guinea Fowl Spotted chickens slaughtered at constant weight.

Variable	Chicken type		Probability
	Guinea fowl spotted	Naked neck	
L*	54.24 ± 1.53	52.82 ± 1.06	0.46
a*	0.86 ± 0.37	1.64 ± 0.45	0.19
b*	9.37 ± 1.22	11.03 ± 0.89	0.29

=Lightness, a=Redness, b*=Yellowness

5.0 CONCLUSION

Carcass quality between Guinea Fowl Spotted and Naked Neck chickens did not differ significantly. This could partly be attributed to the fact that the chickens were slaughtered at constant weight and were exposed to the same pre-slaughter conditions and processing variables. Pre-slaughter conditions and processing variables are important factors known to affect the ultimate pH of the meat. Animal age has been known to affect chemical composition, properties and structure of muscle which could all contribute to the quality of meat. During growth of indigenous chickens total collagen still remains unchanged with the age of chickens while soluble collagen slightly decreases and does not correlated with the shear value of chickens. The major contributing factors to poultry meat colour are myoglobin content, the chemical state and reactions of the myoglobin, and meat pH. The myoglobin content of an animal increases with age and therefore animals of the same age will have similar levels of myoglobin. Similar meat pH values between the strains were recorded because of controlled post-slaughter conditions. It can be concluded that no strain outperformed the other in terms of meat quality and therefore both strains can be used in business outlets and homes. However, protein quality of these strains needs to be studied.

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