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NUTRITIONAL COMPOSITION AND MINERAL PROFILE OF FRESH MEAT FROM HETEROGENEOUS RABBIT POPULATION RAISED UNDER SMALL-HOLDER UNITS IN SOUTHWESTERN NIGERIA

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ABSTRACT

This study was carried out to investigate the proximate composition and mineral profile of fresh meat from heterogeneous rabbits raised under small-holder units in five different locations (Iwo, Ejigbo, Ede, Osogbo and Ife), in southwestern Nigeria. Thirty adult rabbits comprising of fifteen buck and fifteen does were used for this study. Animals were sacrificed and samples were taken to the laboratory for proximate and mineral profiling analyses. Mineral profiling of samples was carried out with the use of Atomic Absorption Spectrophotometer (AAS) model AA-6800. Data generated were further analysed with SPSS version 20.0 to generate means and Duncan New Multiple range test was used to separate means. Results of the proximate analysis showed that rabbit meat contains the following in percentages: moisture (57.19±0.27 %); Ash content (2.69±0.01); Fat (2.02±0.12); Crude fibre (12.12±0.25); Crude protein (20.78±0.23); Carbohydrate (5.20± 0.51). Mineral profiling of the sample revealed that rabbit meat in this study area contains the following essential mineral elements (sodium, calcium, potassium, magnesium, Iron and zinc) and non-essential / heavy metals (Lead, Cadmium Arsenic and Manganese) in mg/kg. The heavy metal/ non-essential mineral group which include: Lead with a mean 0.04±0.01 and a range of 0.03 to 0.05, Cadmium 0.02±0.00 and a range of 0.01 to 0.02. Arsenic (0.04±0.00) with a range of 0.03 to 0.05 and Manganesse (0.12±0.01) with a range of 0.11 to 0.12. The essential minerals group include Sodium, Calcium, Potassium, Magnessium, Iron and Zinc have the following values:1.71±0.13, 0.04±0.01, 4.46±0.59, 1.52±0.13, 0.02±0.00, 0.11±0.01. The corresponding ranges are: 1.62±0.00 to 1.80±0.02, 0.03.±0.00 to 0.09±0.04, 4.07±0.05 to 5.01±0.32, 1.17±0.02 to 1.62±0.02, 0.01±0.00 to 0.02±0.00 and 0.11±0.00 to 0.12±0.00 respectively. There were no significant differences ($p>0.05$) in all the non-essential minerals and two essential minerals (Iron and Zinc) across all the locations but there were significant differences ($p<0.05$) in four essential minerals (Sodium, Calcium, Potassium and magnesium) in the five locations. It was concluded that, rabbit meat is healthy being high in protein and low in fat. Non-essential mineral content are tending towards being elevated in this study under the smallholder production units in some selected location in southwestern Nigeria.

Key words: Nutritional composition, Mineral profile, heterogeneous rabbit, Meat

INTRODUCTION

Rabbit meat is one of the non-conventional meat sources that is capable of improving protein consumption and livelihood especially among people in the developing countries.. Sherief and Doaa (2018) noted that rabbit meat is highly nutritious and it is recommended by nutritionists being healthier and cheaper in price than other meat sources especially the red meats. There are many breeds spread across the world especially in Europe and other con
tinents but these definite breeds are not available in the developing countries in sub-Saharan Africa thus the use of heterogeneous populations. Heterogeneous or composite rabbit population of south-western Nigeria are products of many generations of planned and unplanned crosses of local breeds

and four exotic domestic breeds (New Zealand White, Californian, Chinchila and Flemish Giant) of rabbits that were imported to Nigeria over a period of more than six decades. They are mostly raised under small-holder units which are characterized by limited land, capital and labour resources according to Lukefahr (1992). Several studies had been carried out on heterogeneous or mixed bred rabbit populations of south-western Nigeria. These include: Oseni *et al*., (2008); Oseni and Ajayi (2010) on reproductive characterization; Odeyinka *et al.*,(2014) on growth performance and haematological parameters; Ajayi *et al.,* (2014) on heritability and genetic correlations but there are paucity of information on nutritional value and mineral profile of meat from this rabbit population in south-western Nigeria. Nutritional value of rabbit meat has been reported by several authors at different locations and with different specific breeds and populations (Baiony and Hassanien, 2011) in Egypt using New Zealand White and Californian rabbits.

Therefore, the objectives of the study were to evaluate the nutritional composition and mineral profile for essential mineral elements (sodium, calcium, potassium, magnesium, Iron and zinc) and non-essential / heavy metals (Lead, Cadmium Arsenic and Manganese) of fresh rabbit meat. Others are to determine the effect of location on mineral content of meat from various locations for rabbits raised under smallholder units in some selected locations in southwestern.

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MATERIALS AND METHODS

Animals and experimental designs

The study was carried out in the Teaching and Research Farm and Meat Science Laboratory of Osun State University, College of Agriculture, (Ejigbo campus), Osun State. Thirty adult rabbits of heterogeneous population with ages ranging between five and six months were purchased from smallholder backyard keepers from five different locations (Ejigbo, Iwo, Ede, Osogbo and Ife). Animals used for this experiment were fed assorted feed materials which included chicken growers feed both in mash and pelleted forms, forages: *Ipomea batatas* (Sweet potatoe vines), *Tridax procumbens*) fetched from the keepers' environments. Kitchen wastes which included yam and plantain peels and cowpea testa were also fed to the rabbits in all the locations. Three males and three females were purchased from five locations to make thirty rabbits in all. Live weights of the animals ranged between 1.33 - 2.44 kg with a mean of 1.83 kg. The animals were stunned and slaughtered after being starved for eight hours but with clean cool water. Animals were de-skinned, eviscerated and 50 g each of thigh muscle samples were taken to the laboratory for analyses.

Chemical Analyses

Fresh meat samples of slaughtered rabbits were kept in polythene bags and were taken to the laboratory for proximate analysis. The proximate analysis of the meat was carried out for moisture, protein, fat, Ash, fibre and carbohydrate by the methods of AOAC (2003). Minerals comprising of essentials (sodium, calcium, potassium, magnesium, Iron and zinc) and non-essential / heavy metals (Lead, Cadmium Arsenic and Manganese) were also analysed using Atomic Absorption Spectrophotometer (AAS) AA-6800.

Statistical Analysis

The data generated were analyzed with (SPSS) version 20.0 to generate means and other descriptive statistics of variables under consideration. All data were subjected to One-way Analysis of Variance (ANOVA) and means were separated with Duncan's New Multiple Range Test.

RESULTS AND DISCUSSION

Nutritional composition of Heterogeneous rabbit meat

Table 1 shows the proximate composition of fresh rabbit meat in percentages from five different locations: moisture content, ash content, fat, crude fibre, crude protein and carbohydrate. The values of the moisture content in percentage ranged from 51.27±0.61to 62.15±0.66 with a mean value of 57.19 ±0.27. This value is lower to the report of Sherief and Doaa (2018) in Egypt that reported a

value of 75.2 ±0.48. It is also lower to the value (67.9) stated by USDA (1963). The mean value of 2.69±0.01 and a range of 2.21±0.02 to 3.47±0.02 were observed for ash content. The mean value for fat in this study is very low 2.02±0.12 % and a range of 1.93 to 2.13. This is far lower to the value (10.2) reported by USDA (1963). The value for crude fibre is 12.12±0.25 and a range of 11.05 to 12.93 while protein value of 20.78 compares favourably well with the value (20.8%) reported by USDA (1963) but higher to 19.81±0.22 reported by Sherief and Doaa (2018) in Egypt. The value for protein in this study is in agreement with the report of Baiomy and Hassanien (2011) that reported 20.35% and 20,40% in NZW and CAL rabbits respectively in Egypt. Nistor *et al.* reported moisture, protein fat and ash to be 68.5±1.05, 21.2±0.79, 9.2±0.38 and 1.1±0.08 in g/100 g respectively. These values compares favourably well eith the values reported in ths study except the far lower value reported for fat (2.02±0.12) in this study. The mean value for carbohydrate was 5.20±0.51 the reason for the wide variability of these values (1.46±0.24 to 10.90) might be as a result of differences in locations and management practices under which the animals were produced.

Mineral profile of Heterogeneous rabbit meat

Table 2 shows the mineral composition of the fresh rabbit meat in mg/kg from the study area. The heavy metals or the non-essential mineral group includes: Lead with a mean 0.04±0.01 with a range of 0.03 to 0.04. Cadmium 0.02±0.00 (ranged between 0.01 and 0.02). Arsenic: (0.04±0.00) and Manganese: (0.12±0.01) are tending towards being elevated. The essential mineral group considered in this study (Sodium, Calcium, Potassium, Magnesium, Iron and Zinc) had the following overall mean values: 1.71±0.13, 0.04±0.01, 4.46±0.59, 1.52±0.13, 0.02±0.00, 0.11±0.01. The corresponding ranges are: 1.62±0.00 to 1.80±0.02, 0.03.±0.00 to 0.09±0.04, 4.07±0.05 to 5.01±0.32, 1.17±0.02 to 1.62±0.02, 0.01±0.00 to 0.02±0.00 and 0.11±0.00 to 0.12±0.00 respectively.

Table 1: Proximate composition (%) of male and female fresh rabbit meat samples from different locations in south-western Nigeria.

Proximate (%)	N	Mean±Se	Minimum	Maximum
Moisture content (%)	30	57.19±0.27	51.27	62.15
Ash content (%)	30	2.69±0.01	2.21	3.47
Fat (%)	30	2.02±0.12	1.93	2.13
Crude fibre (%)	30	12.12±0.25	11.05	12.93
Crude Protein (%)	30	20.78±0.23	20.16	21.27
Carbohydrate (%)	30	5.20±0.51	1.46	10.90

Table 2: Mineral profile of meat from heterogeneous rabbit population from five locations in southwestern Nigeria in mg/kg

Location	Ejigbo	Iwo	Ede	Osogbo	Ife	Overall mean±Se	Min.	Max.
Mineral (mg/kg)								
Essential minerals								
Sodium (Na)	1.69±0.06^{ab}	1.73±0.07^{ab}	1.69±0.05^{ab}	1.80±0.02^{b}	1.62±0.00^{a}	1.71±0.13	1.62±0.00	1.80±0.02
Calcium (Ca)	0.03±0.00^{a}	0.04±0.00^{a}	0.05±0.00^{b}	0.03.±0.00^{a}	0.03±0.00^{a}	0.04±0.01	0.03.±0.00	0.09±0.04
Potassium (K)	4.98±0.19^{b}	4.07±0.05^{a}	5.01±0.32^{b}	4.90±0.21^{b}	4.65±0.13^{ab}	4.46±0.59	4.07±0.05	5.01±0.32
Magnesium (Mg)	1.62±0.02^{c}	1.42±0.02^{ab}	1.37±0.03^{a}	1.62±0.02^{c}	1.51±0.06^{b}	1.52±0.13	1.17±0.02	1.62±0.02
Iron (Fe)	0.01±0.00	0.02±0.00	0.02±0.00	0.02±0.00	0.01±0.00	0.02±0.00	0.01±0.00	0.02±0.00
Zinc (Zn)	0.11±0.00	0.11±0.00	0.12±0.00	0.11±0.00	0.11±0.00	0.11±0.01	0.11±0.00	0.12±0.00
Non-essentials minerals								
Lead (Pb)	0.03±0.00	0.03±0.00	0.04±0.01	0.03±0.00	0.05±0.00	0.04±0.01	0.03±0.00	0.05±0.00
Cadmium (Cd)	0.01±0.00	0.01±0.00	0.02±0.00	0.02±0.00	0.02±0.00	0.02±0.00	0.01±0.00	0.02±0.00
Arsenic (As)	0.03±0.00	0.04±0.01	0.04±0.00	0.05±0.00	0.05±0.00	0.04±0.00	0.03±0.00	0.05±0.00
Manganese (Mn)	0.11±0.00	0.12±0.00	0.12±0.00	0.11±0.00	0.12±0.00	0.12±0.01	0.11±0.00	0.12±0.00

Means with different letters on the same row differ significantly (p< 0.05) (DNMT)

The high potassium and low sodium concentration may make rabbit meat particularly recommended for hypertensive diets. The differences in value in this report compared with others from other studies might be as result of differences in ages of animal used, environmental differences, feeds, and effects

of breeds and genotypes used in the experiments. The results from the statistical analysis show that, there were no significant differences ($p>0.05$) in all the non-essential minerals and two essential minerals (Iron and Zinc) across all the locations but there are significant differences ($p<0.05$) in four essential minerals (Sodium, Calcium, Potassium and magnesium) in the five locations. Non-essential mineral contents of the meat from small-holder units in southwestern Nigeria is tending towards being elevated which might be as a result of the sample size used in this study and location which these animals were purchased which were from urban and *peri*-urban areas of southwestern Nigeria.

CONCLUSIONS

The proximate analysis showed that fresh rabbit meat is high in crude protein and low in fat, while the mineral profiling showed that non-essential mineral content are tending towards been elevated under the smallholder units in southwestern Nigeria. Location affects the quantity of some of the essential minerals in the rabbit meats in this study.

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