*American Chemical Science Journal*
*4(4): 546-553, 2014*

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# Nutritional and Functional Properties of African Wild Antelope (*Antilocapra americana*) Meat

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***Author's contribution***

*This whole work was carried out by the author OHN.*

***Original Research Article***

***Received 9th October 2013***
***Accepted 6th February 2014***
***Published 25th March 2014***

## ABSTRACT

The study attempts to evaluate the nutritional composition of African wild antelope (*Antelocapra americana)*. The data revealed that antelope meat contained high amount of crude protein (24.76g/100g), fat (5.32g/100g),moisture (8.08g/100g) and ash (4.67g/100g) respectively. Potassium was the most abundant mineral with the value of 292.22mg/100g followed by sodium (261.01mg/100g). Phytate was found to be the highest anti-nutrient with the value of 47.0 mg/g while oxalate was the least with the value of 0.27 mg/g. The sample exhibits water absorption capacity of 360.0%, emulsion capacity (47.36%) and least gelation concentration of 6%w/v. Glutamic acid was the most concentrated amino acid (13.2g/100g) in the sample while cystine was the least abundant amino acid (0.99g/100g protein).

*Keywords: Proximate; functional; minerals; anti nutrients; amino acids; antelope.*

## 1. INTRODUCTION

World demand for animal protein is growing continuously [1,2] Daily increase in world population, rapid development and increased rate of consumption of animal protein culminated to increasing animal production. The dearth in animal protein may be due to low livestock numbers [3]. Antelope is referred to as even-toed and hollow-horned species found all over the world in places like Africa, Asia and North America. It is also within the group of cattle, sheep, buffalo and goats [4]. About100 of antelope species live in Africa and Asia.

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They are widely consumed by the people because the meat contains good quality protein. The meat is a good source of protein, some nutritionally valuable minerals and essential amino acids for body development. Animal protein has been known to contain high proportion of essential amino acids required by the body than plant protein. Antelope is becoming very scarce and expensive because of human activities such as deforestation and bush burning processes. They are ruminant animal which feed on leaves and the soft parts of plants and are important to their habitats as grazers and browsers [4]. Some researches on the nutrient contents, cholesterol, calories, amino acid and fatty acid had been carried out on some varieties of antelope like North America wild game, domesticated antelope, Arizona antelope and Colorado antelope burger but there are scanty or no nutritional information on the African specie of wild antelope studied. Therefore, these data would serve as first hand information or add to the existing nutritional facts if any. The objectives of this study are to determine the proximate, minerals, anti-nutrients, functional properties and amino acids of African wild antelope (*Antelocapra americana)* meat and also to compare the data obtained with the literature values of some plants and animals that have high contents of protein.

## 2. MATERIALS AND METHODS

The whole African wild antelope (*Antelocapra americana*) was bought at Eruwa town in Oyo state South West of Nigeria. The entire body was dissected and the head, legs, bones and ribs were removed. Only the flesh was then smoked, sun dried and later milled into powdery form using a Kenwood blender then stored in plastic container and later kept in the freezer prior to analyses. The moisture and ash contents were determined using the air oven and dry ashing methods [5]. The sample was analyzed for crude fat and protein according to the methods [6]. The phytate content was determined using methods described [7,8] while alkaloid was determined using method [6]. The determination of oxalate and tannins were carried out according to the methods described [6,9]. The minerals were analyzed by dry-ashing the sample at 550$^{o}$C in a Muffle furnace to constant weight and dissolving the ash in 100 ml standard flask using distilled de-ionized water and then digested with 3ml of 3M HCl. Sodium and potassium were determined by using a flame photometer (model 405, corning, U.K). All other minerals were determined using atomic absorption spectrophotometer (Perkin and Elmer model 403, USA). The method [10] was used to determine gelation property with slight modification. The water and oil absorption capacities of the sample were determined as described [11] and the emulsion capacity and stability were determined [11] while foaming capacity and stability were determined [12]. The amino acid profile was determined using the method described [13].The sample was dried to constant weight, defatted using soxhlet extractor and later hydrolyzed in a sealed glass ampoule at 105$^{\circ}$C ± 5$^{\circ}$C for 22hours using 7ml of 6M HCl. The hydrolysate was evaporated in a rotary evaporator and loaded using a micro syringe into the Technicon Sequential Multi sample Amino acid Analyser (TSM, Taryton, USA).

## 3. RESULTS AND DISCUSSION

The proximate composition of the antelope meat is presented in Table 1. The value of the crude protein (24.76g/100g) was comparably higher than some varieties of cowpea reported [14] which varied from 20.6 g/100g DM in TVX 716 to 24.2 g/100g DM in Ife Brown and varieties of *m. longissimus dorsi* of rabbits which ranged between 21.37 – 21.80 g/100g reported [16] and varieties of *m. longissimus dorsi* from hartebeest as influenced by region and gender which varied between 22.6 and 24.7% reported [17] but lower than those values for African giant rat (56.8%), grass cutter (52.30%) reported [15]. The crude fat content was

higher than those of *m. longissimus dorsi* of hartebeest (0.20 – 0.61%) reported [17], 4.34% of broiler meat, 3.35% of *Tilapia macrocephala*, beef (4.59%) and *Clarias lazera* (3.18%) as reported [18]. It is note worthy that crude fibre was not detected in the antelope meat which corroborate the observation reported [18] for beef, broiler meat, *C. lazera* and *T. macroccphala* respectively

**Table1. Proximate composition of the antelope meat (g/100g dry matter)**

| Parameter | g/100g dry matter |
|---|---|
| Moisture | 8.08 |
| Crude protein | 24.76 |
| Crude fat | 5.32 |
| Crude fibre | N.D |
| Ash | 4.67 |
| Carbohydrate (by difference) | 57.17 |

*N.D- Not Detected*

The values of the anti- nutritional factors in antelope meat are shown in Table 2. The anti-nutrients determined were: alkaloid, tannin, phytate and oxalate. Phytate had the highest value (4.70 mg/g). The value of tannin (0.35%) was lower than those of walnut (2.33%) reported [19], faba beans (2.6 %) reported [20], rape seeds [21] and sorghum [22] respectively. This is an added advantage to support the nutritional potentials of antelope meat. It has been revealed that dietary phytic and oxalic acids may disturb the efficient utilization of certain minerals such as calcium, zinc and magnesium which may lead to development of rickets when certain cereals and legumes are consumed [23,24]. Therefore, intake of oxalate may require dietary supplementation of divalent minerals. The level of oxalate in the sample was 0.27 mg/g. This value reported was lower than those of oil seeds (1.7-6.5%) reported [25], *Trichochanthes anguina* [26] and 1.13% of walnut reported [19] but higher than 0.18% reported [27] for *Pennisetum pupureum* therefore, the antelope meat is unlikely to pose toxicity problems to man since it is below toxic level of 2-5g [28,29] and this also precludes that the consumption of antelope meat may not also need any further dietary supplementation. The value of phytate (4.70 mg/g) was lower than those of maize (5.39%) [28], cassava (5.30%) [30] and walnut (20.18% ) [19] but higher than that reported for yellow yam (4.52%) [30]. The phytin / phosphorus ratio of the sample was 13.22 mg/g. The sample also had low level of alkaloid (0.54%). Alkaloids, flavonoids, saponins and tannins are known to have anti microbial activity as well as other physiological activities [27,31,32]. The concentration obtained indicates that the intake of antelope meat would provide anti microbial activity in the body.

**Table 2. Anti – nutritional factors of antelope meat**

| Component | |
|---|---|
| Alkaloid (%) | 0.54 |
| Tannin (%) | 0.35 |
| Phytate (mg/g) | 4.70 |
| Oxalate (mg/g) | 0.27 |
| Phytin/Phosphorus (mg/g) | 13.22 |

The mineral composition of *Antelocapra americana* is shown in Table 3. The value of potassium (292.22mg/100g) was lower than that of 625mg/100g for tree squirrel [15] but higher than those for Cuban boa (38 mg/100g) [15] and African rat (138.75mg/100g) [33].

The amount of zinc obtained in antelope was 38.6mg/100g. Meat is the richest source of zinc in the diets. The iron content (15.0mg/100g) was higher than the values for various West African edible snails (4.6 – 9.3mg/100g) [34] and grass cutter (11.09 mg/100g) [15]. About 15 – 30% iron in meat is well absorbed in the body. The copper content (5.14mg/100g) was better than that reported for Nigerian fresh water fish (0.03 – 0.035 mg/100g) [35] and the phosphorus content (96.0mg/100g) was higher than that reported by [36] for *Zonocerus variegatus* (60.0mg/100g) while the magnesium content (141.67mg/100g) was lower than bat meat (488 mg/100g), grass cutter (607 mg/100g), python (480 mg/100g) [15] and giant rat muscle (260 mg/100g) but higher than African giant rat liver (105 mg/100g) [33] and *Illisha africana* fishes (1.38 – 1.8mg/100g) [35].

**Table 3. Mineral composition of the antelope meat (mg/100g dry matter)**

| Mineral | mg/100g dry matter |
|---|---|
| Sodium | 261.01 |
| Potassium | 292.22 |
| Calcium | 198.00 |
| Magnesium | 141.67 |
| Phosphorus | 96.00 |
| Zinc | 38.60 |
| Manganese | ND |
| Lead | ND |
| Iron | 15.01 |
| Copper | 5.14 |

*ND = Not Detected*

The sodium content (261.01mg/100g) was higher than the range (12.5 – 63mg/100g) reported for Nigerian fresh water fish [35] but lower than those values reported for giant rat (490mg/100g), pigeon bird (611 g/100g) [15] and Tullberg's rat (275mg/100g) [15]. Potassium was the most concentrated mineral in the sample (292.22mg/100g) and the value was found to be greater than Tullberg's rat (260mg/100g) but lower than that reported for grass cutter (730mg/100g) [15]. The calcium content (198.0mg/100g) was higher than those reported for Nigerian land snails (22.2 – 21.2 mg/100g) [34] and *Illisha africana* fish (1.38 – 181mg/100g) (35). The values of Zn, Fe and Cu in antelope were relatively higher than 0.88, 1.56 and 0.49 mg/100g respectively reported for fishes in Turkey [37]. The result of functional properties of the sample is shown in Table 4. The water absorption capacity (360%) for *Antelocapra americana* was found to be higher than pigeon pea (138%) [38] and *Z variegatus* (127.5%) [36]. The oil absorption capacity (201.0%) was higher than those values reported for *Z. variegatus* (33.3%) [36], pigeon pea (89.7%) [38], wheat and soy flours (84.2 and 84.4%) [39]. The emulsion capacity (47.36%) was better than that of *Z. variegatus (25.6%)* [36]. The sample had the least gelation concentration of 6.0%w/v. This suggests that the sample flour maybe a good gelating agent. The foaming capacity and stability of the sample were 4% and 2% respectively. This suggests that *Antelocapra americana* would not be attractive for products like cakes or whipping and toppings where foaming is important [40]. The value of the emulsion capacity was favourable, making it potentially useful in some food formulations.

Table 5 shows the amino acid composition of the sample. Glutamic acid took the highest position among the amino acids in the sample with the value of 13.18 g/100g while cystine was the lowest. The percentage essential amino acid in *Antelocapra americana* (50.79%) was lower than 54.42% and 54.52% reported for rabbit fed with maize mixture [41]. Antelope

meat also contains higher amount of threonine, histidine, lysine, glutamic acid and glycine than those of chicken meat, ostrich meat [42,43] and rabbit meat [16].The value of glutamic acid (16.73 – 16.94 g/100g) and lycine (10.21 – 10.32 g/100g) for rabbit meat phyto-additives reported by [16] were higher than that reported for the sample studied. The present result contrasted that of oil seeds where aspartic and glutamic were the major abundant amino acids [44].

**Table 4. Functional properties of the antelope meat (%)**

| Functional properties | % |
|---|---|
| Water Absorption Capacity | 360.0 |
| Oil Absorption Capacity | 201.0 |
| Emulsion Capacity | 47.36 |
| Emulsion Stability | 5.26 |
| Foaming Capacity | 4.0 |
| Foaming Stability | 2.0 |
| Least Gelation Concentration (W/V) | 6.0 |

**Table 5. Amino acid composition of the antelope meat (g/100g protein)**

| Amino acid | Concentration (g/100g protein) |
|---|---|
| Lysine | 7.75 |
| Histidine | 2.40 |
| Arginine | 6.30 |
| Aspartic Acid | 9.06 |
| Threonine | 4.22 |
| Serine | 3.99 |
| Glutamic Acid | 13.18 |
| Proline | 4.27 |
| Glycine | 6.65 |
| Alanine | 5.62 |
| Cystine | 0.99 |
| Valine | 4.97 |
| Methionine | 2.87 |
| Isoleucine | 2.98 |
| Leucine | 7.05 |
| Tyrosine | 3.18 |
| Phenylalanine | 4.22 |
| Tryptophan | ND |
| %EAA | 50.79 |

*ND = Not Determined, %EAA= Percentage essential amino acid*

## 4. CONCLUSION

The findings provide knowledge on the nutritional qualities of *Antelocapra americana* meat and suggest that it is a potential source of protein, minerals and essential amino acids thus making it useful in food formulations. The meat has no negative health implication on the consumers since it has low levels of anti-nutrients.

## ACKNOWLEDGEMENT

The author is grateful to Dr D. Ojobe of Zoology Department, UNIJOS, Analytical Lab. Staff, FUTA, Ajayi Funmilayo and Oyeleke Esther for their technical assistance

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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