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Compositional Studies on Tropical Species of *Agama agama* Lizards

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Abstract: The aim of this study was to assess nutrient values of lizards (*Agama agama*). The samples earmarked for this study were obtained at Federal College of Agriculture, Akure, Nigeria. In male and female *Agama agama* lizards, anatomical weights, proximate and mineral contents, tannin, oxalate and phytate compositions were determined using standard methods. The samples contained: 54.05-57.69% protein; 2.56-3.01% fat, 1.11-3.18% fibre, 12.91-13.40% ash, 21.38-21.94% NFE, 3.85-4.18% moisture and 328.80-347.5 kcal energy. All the major elements determined were found to be high. The tannin, oxalate, phytate contents were low, meaning that the bioavailability of protein and minerals are high. The values recorded for proximate and minerals compared with other animal sources. It is recommended that nutritional qnalities of lizards should be harnessed.

Key words: *Agama agama*, Lizards, compositional studies, anatomical weight, houses farms

INTRODUCTION

Lizards are reptiles that belong to the class of reptiles and phylum Chordata (Wikipedia, 2007). They are distinguished from amphibian by their dry, scaly skin that limits water loss, more powerful jaws, internal fertilizer, advanced circulatory, respiratory, excretory, nerves system and considerable behavioral control over their body temp (Miller and Harley, 1996). Agama lizards have different types in shape some of the types can be found in the tropical. Agama lizards live in groups or colonies. The lizard has a head and a trunk that are jointed by a definite neck. It has a long tapering fail (Raven, 1989). They live in walls and ceiling of buildings, feed on small insects by picking them up on the tip of their sticky tongues.

In Nigeria, there is death of information on nutritional values of lizards, the reason been that people hate seeing them. The intake of livestock animals is reducing due to the fact that majority of the populace cannot avoid them, hence alternative sources are being sourced (Abulude *et al*., 2005a). To increase the nutrient intake, from the animal source, one of the approaches is to carry out research on nutritional values of lizards. Therefore, an attempt has been made in the current study to evaluate the anatomical weights, proximate composition, minerals, tannin, oxalate and physical contents of male and female *Agama agama* lizards with a view of recommending their consumption.

MATERIALS AND METHODS

Male and female lizards (*Agama agama*) samples were obtained at the Federal College of Agriculture, Akure, Campus. The samples were collected in March, 2005 life without causing body damage. They were scarified, weighed and dissected and weighed. The meats were oven dried at 105°C for six hours, ground in a Kenwood blender, sieved (45 mm) and stored prior to analyses. Samples

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were analyzed for proximate composition using the AOAC (1990) procedures. Nitrogen Free Extract (NFE) was determined by difference. Energy was calculated according to the following equation (Manzi *et al*., 2001):

$$\text{Energy (kcal)} = 4x\,(\text{g protein} + \text{g NFE}) + 9x\,(\text{g fat})$$

Minerals were analyzed using the solutions obtained by dry ashing the samples in a muffle furnace (530°C) for 3 h, dissolving them in 2 M HCl, filtering and making up to 50 cm^3. All metals were measured with a Pye Unicam SP9 atomic absorption spectrophotometer.

Tannin was determined by the quantitative methods of Markkar and Goodchild (1996). Oxalate was estimated by the methods of AOAC (1990) and phytate was determined by the methods of Young and Greaves (1940) as modified by Abulude (2004a).

RESULTS AND DISCUSSION

The mean life weight of the samples was 53.3 g (Table 1). Male sample was heavier with a wide margin of 49.5 g and longer than the female. As expected, the female lizard produced four eggs (1.8 g). All other values of parts separated were found to be higher in male than in female. These weight differences could be due to their physiological compositions, age and feed intake. K (522 mg kg^{-1}) and Pb (4.0 mg kg^{-1}) were found to be higher in female sample (Table 2). Cd was not detected in any of the samples, while other minerals present in male surpassed that of the female. The values of 70-95 mg kg^{-1} recorded for Fe in this study surpassed those recorded for cricket (5.50 mg 100 g^{-1}, Abulude, 2004b), cattle egret (51.25 mg 100 g^{-1}; Abulude *et al*., 2005a), pigeon bird (57.5-68.93 mg 100 g^{-1}; Abulude *et al*., 2005b), mushrooms (7.25-10.35 mg 100 g^{-1}; Abulude *et al*., 2001) and termites (4.8 mg 100 g^{-1}; Abulude, 2004c). Present Ca, K, Mg and Na values were higher than those

Table 1: Anatomical weight composition of samples of *Agama agama* lizards (wet wt. in g)

Parameters	Female	Male	Mean	±SD	CV (%)
Life weight	28.5	78.0	53.3	35.0	65.7
Length (cm)	26.0	33.0	29.5	5.0	16.8
Tail length (cm)	17.0	20.5	18.8	2.5	13.2
Left leg	2.1	5.5	3.8	2.4	63.3
Right leg	2.2	5.8	4.0	2.6	63.6
Left arm	1.5	3.0	2.3	1.1	47.1
Right arm	1.5	3.1	2.3	1.1	47.1
Head	4.2	9.5	6.9	3.8	54.7
Tail	2.8	13.7	8.3	7.7	93.4
Liver	1.3	1.9	1.6	0.4	26.5
Eggs (4)	1.8	-	1.8	-	-

Table 2: Mineral contents (mg kg^{-1}) of meat sample of *Agama agama* lizards

Parameters	Female	Male	Mean	±SD	CV (%)
Na	574.8	643.2	609.0	48.4	7.9
K	522.0	508.2	515.1	9.3	1.9
Fe	70.0	95.9	83.0	18.3	22.1
Ca	558.0	638.3	598.2	56.8	9.5
Cu	1.4	2.8	2.1	1.0	47.1
Zn	5.5	20.2	12.9	10.4	80.9
Mg	560.5	662.9	611.7	72.4	11.8
Cd	ND	ND	-	-	-
Pb	4.0	1.4	2.7	1.8	68.1
Co	3.4	4.6	4.0	0.9	21.2
Cr	2.0	2.5	2.3	0.4	15.7
Mn	4.3	4.7	4.5	0.3	6.3

ND: Not Detected

in the literatures. The levels of trace metals may not be of concern in terms of toxicity to consumers. They were below the upper limits of safe intake. Mineral elements are necessary for life. Iron facilitates the oxidation of carbohydrates, proteins and facts. Lack of adequate iron in the diet is associated with poorer learning and decreased cognitive development (FAO/WHO, 1990). Calcium tends to be a kind of coordinator among inorganic elements for example calcium is capable of assuming a correcting role if amounts of K, Mg and Na are present in the body and Fe is utilized to better advantage in the diet (Fleck, 1976). Cu is present in the enzyme cytochrome oxidase involved in energy metabolism its absorption failure can lead to Menkes' disease and needed to form red blood cells (with Vitamin C) (FAO/WHO, 1990). Zn is present in all tissues of the body and is a component of more than 50 enzymes (Bender, 1992).

Moisture, ash, fat, protein and NFE contents were recorded in percentage of dry weight (Table 3). The mean protein, fat, fibre, ash, NFE, moisture and energy (kcal) ranged as: 55.87, 2.79, 2.15, 13.45, 21.06, 4.00 and 338.15, respectively. These results were similar to those of variegated grasshoppers (Olaofe *et al*., 1998) and snails (Adeyeye, 1996). The results for protein were generally high compared to that of locust beans and termites (Mayhew and Macmillan, 1988). The fat content was low compared to that of locust (10-18%: Mayhew and Macmillan, 1988). Fibre and moisture contents were also low, whereas ash and NFE contents were high.

From the present observations on fat, it is suggested to consume the lizard samples in a complementary mixture with other types of high fat foodstuffs. The low fat contents may not allow the sample to contribute significantly as a source of non-visible oil to the diet in which it may be present. The low fibre makes the protein source suitable weaning food. From the analytical results, it was observed that ash content was high. This was reflected in the high mineral contents recorded for this study. The energy values of the edible portion of each sex are shown in Table 3 (male 347.5 and female 328.80 kcal). It is evident that these samples would satisfy the nutritional requirements of consumers.

The phytate content ranged from 7.37-7.74 mg (Table 4). These values were higher than those reported for vegetable fruit and roots (Ologhobo and Fetuga, 1984). The levels of phytate P were comparable to levels reported for cowpea (Balogun and Fetuga, 1989). Phytate contents vary considerably depending on the enviroumental conditions, maturation and processing procedures. Phytate chelates with mineral elements thereby have significant effects on the utilization of the minerals and interfere with basic residues of proteins (Abulude, 2004a). The tannin content was higher in female than male, whereas oxalate was higher in male. These anti-nutrients were comparable to the studies of Enujiugha and Agbede (2000) on Africa oil bean seeds. High tannin in diets is ascribed to its astringent property which is a consequence of its ability to bind with proteins with remarkable property of glycoprotein and it is capable of inducing mitosis in lymphocytes (Sharon and Lis, 1972).

Table 3: Proximate composition (%) of meat samples of *Agama agama* lizards

Parameters	Female	Male	Mean	±SD	CV (%)
Protein	57.69	54.05	55.87	2.57	4.61
Fat	2.56	3.01	2.79	0.32	11.43
Fibre	1.11	3.18	2.15	1.46	68.24
Ash	12.57	14.33	13.45	1.25	9.25
*NFE	21.94	21.38	21.66	0.40	1.83
Moisture	3.85	4.18	4.00	0.21	5.13
Energy (kcal)	328.80	347.50	338.15	13.22	3.91

NFE: Nitrogen Free Extract (calculated by difference)

Table 4: Tannin, oxalate and phytate contents of meat samples of *Agama agama* lizards

Parameters	Female	Male	Mean	±SD	CV (%)
Tannin (%)	0.36	0.22	0.29	0.10	34.14
Oxalate (mg g^{-1})	0.78	0.80	0.79	0.01	1.79
Phytate P (mg g^{-1})	2.12	2.02	2.07	0.07	3.42
Phytate (mg g^{-1})	7.74	7.37	7.56	0.26	3.46

CONCLUSIONS

The present results showed that the lizard meat samples have high protein values and rich minerals. It is gratifying to note that the anti-nutrients were low, which means that the nutrients would be bio-available for absorption. The consumption of lizards should be harnessed because it would go a long way in reducing malnutrition.

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