Journal of Entomology

ISSN 1812-5670

Academic Journals Inc.

www.academicjournals.com

Journal of Entomology 3 (2): 156-160, 2006
ISSN 1812-5670

Studies on Scorpion (*Androctonus australis*): Nutritional and Anti-nutritional Factors

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Abstract: Studies were carried out on scorpion (*Androctonus australis*) to investigate its proximate composition, mineral content, oxalate, tannins and phytate. The sample was washed, sieved, dried and finally milled to flour before analysis. The sample may serve as weaning protein source and contained 52.91% protein. The predominant metal was potassium (695.21 mg kg^{-1}) and cobalt found only in traces (2.50 mg kg^{-1}). The anti-nutrient ranged as follows. Tannin (0.24%), phytate phosphorus (2.09 mg g^{-1}), phytate (7.41 mg g^{-1}) and oxalate (0.72 mg g^{-1}). On average, a serving (100 g) of milled, scorpion sample guarantees 331.55 kcal of the daily recommended energy. The phytate, tannin and oxalate contents are of nutritional significant they form insoluble complexes with proteins and minerals.

Key words: Scorpions (*Androctonus australis*), nutritional, anti-nutritional, human and animal diets

Introduction

Scorpion (*Androctonus australis*) known as fat tailed scorpion is powerful due to its cauda. It is widely distributed in African and Asia. Scorpion is found in dry habitats/desert, areas. It is found in stony soils, catus hedges and mountainous regions and high plateaux. It can also be found on steep slops of drifting sand dupes. The scorpion doesn't dig large burrows but hide under stones and in natural crevices. Different species are often found near human habitations (in cracks in walls etc.). This scorpion is one the world most dangerous scorpion, with very potent venom. This species is medicinal important and causes several death each year. Two different sources list LD_{50} values of 0.32 and 0.75 mg kg^{-1} (Stockwell, 2001).

Scorpions are the oldest arachnids for which fossils are known. The earliest scorpions are considered to be proto scorpions, since they posses many traits which are plesiomorphic for scorpions. For examples, in all scorpions the thick front portion in the abdomen is made up of seven segments, but the numbers of sternite plates which cover this region varies among the earnest fossils, while all living species have five. All scorpions have an additional five segments after the initial seven, ending in a sharp sting. The stings contain a pair of poison glands, which can paralyze prey; usually insects or small rodent may deliver a painful seining to incautious persons. Most scorpion stings are merely painful leading to swelling in the immediate region of the stings, but some scorpions of northern Africa and the American southwest, can be deadly (Stockwell, 2001). In Shanghai, scorpion has got many uses, which include production of drugs and medical foods (Stockwell, 2001).

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Most Nigerians are scared of this creature, because of its deadly acts and so interest in its nutritional advantage was never explored. This means that the detailed information on the nutritional values is yet to be documented. Therefore the aim of the study is to establish the nutrients and anti-nutrients present in scorpion with a view of ascertaining its nutritional role in humans and animals diets.

Materials and Methods

Sample Preparation

The scorpion sample was obtained of the Federal College of Agriculture, Akure, Ondo State campus. A 100 g lot of the sample was washed in distilled water, oven dried at 105°C for 3 h, ground, sieved (45 mm), the samples was then stored in an air tight container prior to analysis.

Chemical Analysis

The proximate composition of the sample was determined using the AOAC (1990) methods. Protein was calculated from the total nitrogen using the factor 6.25. The carbohydrate composition was determined by subtracting the sum of the weights of protein, fat, fibre and ash from the total dry matter and presented as nitrogen free extract. Total energy was calculated according to the following equation (Manzi *et al.,* 2001).

$$\text{Energy (Kcal)} = 4(\text{g protein} + \text{g carbohydrate}) + 9\text{x (g fat)}$$

Phytate phosphorus (P) and phytate were determined using the method of Young and Greaves (1940) as modified by Abulude (2001). Tannin was determined by the quantitative methods of Markkar and Goodchild (1996). Oxalate was estimated by the method of the AOAC (1990). Mineral were analyzed using the solution obtained by dry ashing the sample and dissolving it in 10% hydrochloric acid and making up to 50 cm^3. All metals were determined with a Pye Unicam SP9 atomic absorption spectrophotometer (Abulude, 2004).

Data collected were subjected to statistical analysis using SPSS for windows 10.

Results and Discussion

Table 1 presents the proximate composition of the scorpion sample protein, ash, carbohydrate, fat, moisture and energy (Kcal) ranged as follows. 52.91, 6.86, 5.61, 10.83, 13.97 and 331.55. The results for protein in were generally higher than those reported for millipede (Abulude and Folorunso 2003), cricket (Abulude, 2004a) and termites (Abullude, 2004b). The fat content compared to that of insect (10-18%) (Abeduntan, 2005). Ash, fibre and carbohydrate contents were low, whereas moisture content was high, from the results obtained, the sample produced a high fat content. It is suggested to eat scorpion in a complementary mixture with other types of fat foodstuffs. The low fibre content makes this proteins source a suitable warning food. The results also depicted the potential for its uses as source of good quality feed in livestock production. Energy obtained was 331.55 kcal 100 g^{-1} and higher than those obtained for livestock dungs (Abulude *et al.,* 2003). This sample is a good energy source and the energy is derived mainly from fat.

Ca (595.81), Zn (52.23), Cr (3.08), Fe (135.91), Na (533.15), Mg (493.29), Co (2.50) and K (695.21) (Table 2). The calcium content was higher than that in *Citrus sinensis* and *Carica*

Table 1: Chemical composition (g 100 g^{-1}) and energy contribution of sample (data are means of duplicate analyses)

Parameter	Mean	SD	CV (%)
Ash	6.86	0.51	7.43
Moisture	13.97	0.25	1.79
Fat	10.83	0.35	3.23
Protein	52.91	0.40	0.76
Fibre	9.84	0.10	1.02
Carbohydrate	5.61	0.40	7.13
Energy (Kcal)	331.55	3.20	0.97

Table 2: Mineral composition (mg kg^{-1}) of sample (data are means of duplicate analyses)

Parameter	Mean	SD	CV (%)
Zn	52.23	0.80	1.53
Cr	3.08	0.10	3.25
Fe	136.91	1.20	0.88
Na	433.15	3.06	0.58
Mg	495.29	2.89	0.59
Co	2.50	0.05	2.00
Ca	595.81	3.18	0.53
K	695.21	4.20	0.60

Table 3: Anti-nutritional composition of sample (data are means of duplicate analyses)

Parameter	Mean	SD	CV (%)
Tannins (%)	0.24	0.01	4.17
Phytate phosphorus (mg g^{-1})	2.09	0.1	4.79
Phytate (mg g^{-1})	7.41	0.5	6.75
Oxalate (mg g^{-1})	0.72	0.1	13.89

papaya (392-490 mg kg^{-1}) (Abulude, 2000) but lower than values 601-1,6327 mg kg^{-1} recorded for vegetables (Abulude *et al.,* 2005), bush rat and tilapia (2,814 mg kg^{-1}) (Adeyeye, 1996). Sodium content was higher than that of Nigerian freshwater fish (Abdullahi, 2000) ranging from 125 to 631 mg kg^{-1} and that of variegated grasshopper (Olaofe *et al.,* 1998). The magnesium content was higher than those samples reported in the literatures (Abulude, 2004b; 2000). Zinc, iron, cobalt and chromium produced low values but these were better than those reported for West African edible snails (Adeyeye, 1996) and freshwater fish (Abdullahi, 2000).

Calcium plays important roles in blood clotting, coordination of in organic elements present in the body and balancing of Ca and P. Dietary K has lowered blood pressure in human, which by itself should reduce the risk of stroke, however, some of the protective effect of K appears to extend beyond its ability to lower blood pressure, Zn and Fe too play important role in nutrition, like Fe absorption, the types of food ingested influence Zn absorption. Wardlaw (1999) reported that Zn and Fe are most available from the same food. Individuals with iron deficiency are also at high risk of zinc deficiency. The scorpion contains important minerals, which will meet the recommended minimum daily allowance in conjunction with other foods. The coefficient of variation in percent (CV %) was low and it ranged between 0.53% (Ca) and 3.25% (Cr).

Anti-nutrients of the sample are shown in Table 3. The level of the tannins of the sample was 0.24% with CV (%) of 4.17, which could be considered low. According to Enujiugha and Agbede (2000), tannins usually, form insoluble complexes with proteins, thereby interfering with their bioavailability. It is gratifying to note that the low tannin content observed in this report would not interfere with the protein content of the sample and so consumers would be assured the RDA of protein. The poor palatability generally associated with high tannin diets is ascribed to its astringent property, which is a consequence of its ability to bind with proteins of saliva and mucosal membranes. Aletor (1993) reported that tannin strongly inhibit digestive enzymes and bind protein rich proteins in the saliva. Ruminant's animals generally have a higher capacity for dietary tannins than the monogastrics.

Phytate P and phytate levels were 2.09 and 7.41 mg kg^{-1} with CV (%) of 4.79 and 6.75%, respectively. The results were comparable to levels reported for lupin seeds (Abulude, 2001). Phytate contents very considerably depending on environmental conditions, maturation and processing procedures. Phytate chelates with minerals elements thereby having significant effects on the utilization of the minerals and also therefore with basic residues of proteins. The presence of the phytate contents in this sample may prevent the bioavailability of Ca, Zn, Mg and Fe and protein to animals and humans. It is advisable to subject this sample to different processing methods so as to reduce or eliminate the phytate content. In the present investigation, the presence of oxalate (0.72 mg g^{-1}) has been identified in this sample. Oxalate content in this sample was lower than the values reported by Enujiuha and Agbede (2000) and Amah *et al.* (2001) for green leafy vegetables and *Brachystegia eurycoma* respectively. The degree of accumulation of anti-nutritional factors is primarily related to species, species parts and age.

Conclusions

Scorpion contains nutritional content that can be good source of protein, fat, energy and minerals. The limitation of its utilization is the presence of tannin, phytate and oxalate. It is suggested that this sample should be subjected to processing methods. If scorpion is consumed after proper processing, it could have therapeutic effects towards particular disease in animals and humans.

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