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Full Length Research Paper

Epidemiological and nutritional perspectives of snails

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The microbiological (epidemiological), proximate and mineral element composition of the different species of snails (*Achatina fulica*, *Limcolaria sp*. and *Helix pomatia*) obtained from three different market in Uyo, Akwa Ibom state were investigated. Total bacterial count ranged from 1.00 - 1.50 x 10^8 cfu/g, Coliform count ranged from 1.68 - 2.20 x 10^7 cfu/g, *Salmonella/Shigella* count ranged from 5.2 - 8.2 x10^7 cfu/g, lactic acid bacteria count ranged from 1.03 - 1.30 x 10^8 cfu/g and fungi count ranged from 7.3 x 10^7 to 1.00 x 10^8 cfu/g. The organisms isolated were *Bacillus subtilis, Staphylococcus aureus, Lactobacillus spp., Escherichia coli, Micrococcus luteus and Bacillus cereus* while the fungal isolates were *Aspergillus terrus, Aspergillus fumigatus, Absidia* sp., *Fusarium oxysporum, Eurotium* sp. and *Aspergillus flavus.* The results showed that *Helix pomata* have the highest microbial load of 2.20 x 10^8 cfu/g. The proximate analysis showed that African giant snail (*Achatina fulica)* was nutritionally richer than the other snails. Mineral determination also showed that African giant snail had the highest amount of minerals. It was generally observed that snails though nutritionally rich are reservoirs of pathogenic microorganisms which are of public health importance.

Key words: Microbiological, proximate, mineral composition, coliform, *Helix pomata*

INTRODUCTION

Snail meat is a high quality food that is rich in protein (low in fats,) and a good source of iron, that is, 3.5 mg/100 g (USDA, 2006) . The comparative nutritive value of snail meat to some animal protein sources have been studied by some researchers. In an instance, the protein contents of 88.37, 82.42 and 92.75% were discovered in snail, pork and beef respectively (Imevbore and Ademosun, 1988).

With a fat content of only 1.3% and iron content of 12.2 mg/100 g in edible carcass, the nutritive value of snails is reported to be comparable to that of domestic livestock. It is estimated that snail is 15% protein, 2.4% fat and about 80% water (Saldanha et al., 2001). This makes snail healthy alternative food for people with high protein low fat diet requirements.

Besides, snail is high in health benefiting essential fatty acids such as linoleic acids and linolenic acids. A study on a snail species in Brazil estimated that 75% of the fat in snail is unsaturated fatty acids. That is 57% polyunsaturated fatty acids, 15.5% of monounsaturated fatty acids and 23.25% of saturated fatty acids (Su et al., 2004). However, it can be easily contaminated by pathogens and serve as vehicle of transferring infectious agents to consumers. Kirkan et al. (2006) reported the presence of *L. monocytogenes* in fresh snail sample which notably could have been contaminants from soil.

So, despite rich nutritional values of snail, the involvement of the mollusks in general in the transmission of infection mostly as secondary host for pathogens makes it necessary to study the microbiology of the resident snail without leaving their nutritive values behind. This project therefore aimed at isolation and identification of

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Table 2. Total bacterial count for snail samples.

Sample	Total bacteria count x 10^8 Cfu/g	Total coliform count x 10^7 cfu/g	Salmonella/ shigella count x 10^7 cfu/g	Fungal count x 10^7cfu/g	Lactic coun
A	1.45	2.00	6.0	9.0	
B	1.00	1.68	9.2	7.3	
C	1.50	2.20	5.2	1.0	

Key: A: *A. fulica* (African giant snail), B: *Limicolaria* sp (Land snail), C: *Helix pomatia* (Land snail).

Table 3. Cultural and morphological characteristics of the isolated fungi.

Isolate code	Colony colour	Type of soma	Nature of hyphae	Special vegetative structure	Asexual spore	Special reproductive structure		Con hea
Lss 1	Hp1	Gray green wrinkled spread colony Dense felt yellow green colony Compact white or yellow basal dark colony			Filamentous	Septate	None	Ova te coni dia
Lss2		Brownish colony becoming darker with age Floccose felty whitish colony with a purple tinge			Filamentous	Septate	Foot cell	
Lss3		Floccose light grayish, rapidly growing colony Compact white or yellow basal dark colony			Filamentous	Septate	Foot cell	Glo bos e coni dia
Lss4		Smoky or gray green colony Compact white or yellow basal			Filamentous	Septate	Foot cell	
Lss5					Filamentous	Septate	None	Glo bos e coni dia
Lss6					Filamentous	Coenocytic	Stolons and rhizoids	
AGS1					Filamentous	Septate	Foot cell	
AGS2					Filamentous	Septate	Stolons and rhizoids	Glo bos e coni dia
AGS3					Filamentous	Septate	Foot cell	

Filamentous Septate Foot cell

Table 3 contd.

Hp2	Dense felt yellow green colony	Filamentous	Septate	Foot cell	Globose conidia	Philides borne directly on the vesicle scerotia	Rad
Hp3	Floccose light grayish, rapidly growing colony	Filamentous	Septate	Stolons and rhizoids	Oblong sporangiosphore	Zygospores sporangiospores	Non

Key: AGS = *Achatina fulica* (African giant snail), Hp = *Helix pomatia* (land snail), Lss = *Limicolaria sp*. (land snail).

Table 4. Frequency of occurrence of fungi isolated from snails.

S/N	Fungi isolates	Frequency of occurrence (%)
1	*A. niger*	40.0
2	*A. terrus*	6.7
3	*F. oxysporum*	6.7
4	*Absidia* sp	20.0
5	*Eurotium* sp	6.7
6	*A. flavus*	13.4
7	*A. fumigates*	6.7
	Total	100

Table 5. Mineral composition of the snail samples.

Sample	Na_1 (mg/100 g)	Na_2 (mg/100 g)	K_1 (mg/ 100 g)	K_2 (mg/100 g)	Fe_1 (mg /100 g)	Fe_2 (mg/100 g)	Ca_1 (mg/100 g)	Ca_2 (mg/100 g) (m
A	28.97	28.94	64.15	64.15	1.51	1.49	186.35	186.32
B	24.78	24.83	56.72	56.76	1.36	1.36	179.65	179.64
C	13.63	13.65	31.59	31.57	1.17	1.14	13.51	132.48

Key: A: *A. fulica* (African giant snail), B: *Limicolaria* sp (Land snail), C: *Helix pomatia* (Land snail).

The crude protein, fat, Ash and moisture contents are higher in A than B and higher in B than C (Table 6).

DISCUSSION

Microbiological assessment of snail coupled with pathogenicity test in this study showed that the snail samples harbour quite a number of highly pathogenic bacteria of potential public health hazard to the dependants as protein source. Such hazards are more appropriate in some regions where the demand for the snail meat is high and the vendors in an attempt to meet with the de- mand usually due to consump mollusks that co are consumed health implicatio nisms with high overemphasized

Table 6. Proximate composition of the snail samples.

Sample	% Crude protein$_a$	% Crude protein$_b$	%Crude fat$_a$	% Crude fat$_b$	% Crude fiber$_a$	%Crude fiber$_b$	%Ash$_1$	%Ash$_2$	%Dry matter$_1$	% Dry matter$_2$
A	72.64	72.86	1.48	1.52	0.00	0.00	4.78	4.88	90.29	90.27
B	58.35	58.49	1.39	1.43	0.00	0.00	3.88	3.91	89.97	89.98
C	15.44	15.35	1.18	1.15	0.00	0.00	1.26	1.28	20.43	20.41

Key: A: *Achatina fulica* (African giant snail), B: *Limicolaria* sp (Land snail), C: *Helix pomatia* (Land snail).

induce gastroenteritis (Olowe et al., 2008). *Aspergillus* sp causes aspergillosis while *Staphylococcus aureus* isolates have been implicated in a number of clinical cases (Lowry, 1998; Komolafe and Adegoke, 2008; Adegoke and Komolafe, 2009) . Like in this study, Serrano et al. (2004) reported the presence of mesophilic aerobic bacteria, *Enterobacteriacea*e, *S. aureus* and coliforms among ready to eat snails. The coagulation of plasma in both the tube test and slide test by *S. aureus* coupled with their ß-haemolysis confirmed their pathogenicity. This organism (though easily killed by boiling heat) produces enterotoxin that is stable to heat at 100°C for 30 min and this toxin is known for food poisoning (Brook et al., 2004)

Snail is of epidemiological importance not only because it harbours pathogenic bacteria but also because it can serve as an intermediate host of the liver fluke; *Fasciola* spp. (Legaspi and Jovellanos, 1990) and Schistosoma (Oyawoye, 2008). There is therefore the need to set a thermal standard and time of cooking that would be sufficient for complete inactivation of pathogens while the nutritive contents would remain unaffected.

Milinsk et al. (2003) reported that the nutritional composition of snail meat meets the required balanced diet for an average individual. In this study high contents of 72.75 and 1.50% for the crude protein and fat were observed, (Table 6) beside having 28.96 mg/100 g, 64.15 mg/100 g, 1.50 mg/100 g, 186.34 mg/100 g and 62.75 mg/100 g of Na, K, Fe, Ca and P respectively for one of the three species of snails in question (Table 5). These contents met the USDA National Nutrient Standard Reference, release 19 (2006).

Meanwhile, of the three specie of snails studied [(*Achatina fulica*), (*Limcolaria* sp.) and *Helix pomatia*), their rating in term of nutritional composition could be *A. fulica* > *Limicolaria* sp, > *Helix pomatia*. The nutritional compositions of the *A. fulica* (African giant snail) which are multiples of those of the other two make the species the dependable source of nutrient for the obessed or hypertensive individuals more so since snails have low cholesterol (Su et al., 2004; USDA, 2006).

While, the trend of poverty worldwide seems to be higher unabaited and hunger with malnutrition is endemic in the subsaharan African countries, African giant land snail can be a good source of nutrient especially because it is easy to rear by the rich and the poor. It is imperative in the same premise to ensure adequate care in its preparation so that the supposed source of nutrients would not be source of epidemic threat.

REFERENCES

Adegoke AA, Komolafe, AO (2009). Multi-drug resistant *Staphylococcus aureus* in clinical cases in Ile-Ife, Southwest Nigeria. Int. J. Med. Med. Sci. Vol 1. (3)068-072

Brooks GF, Butel JS, Morse SA (2004). In Medical Micro-biology. 23rd Edition, Mc Graw-Hill Publishers. pp. 161-175

Cowan C.S.T. (1985). Cowan and Steel's Manual for the Identification of Medical Bacteria. 2nd Edition, Cambridge University Press England. pp. 46-140.

Cruickshank R, Duguids JP, Marimion RO Swain RHA (1975). In Medical Microbiology. 12th Edition, Longman Group Limited London. pp. 60-61

Holt JG, Krieg NR, Sneath PHA, Stanley JTW (1994). Bergey's Manual of Determinative Bacteriology (9th edn). Williams and Wilkins, Tokyo.

Imevbore, Ademosun (1988). The Nutritive value of African giant land snail *Archachatina* marginata. J. Anim. Prod. Reserv. 8(2):76–87.

Komolafe AO, Adegoke AA (2008). Incidence of Bacterial Septicaemia in Ile- Ife, Nigeria. Malay. J. Microbiol. 4(2): 51- 61

Lowy, F.D. (1998). *Staphylococcus aureus* Infection. N. Engl. J. Med. 339: 520 - 532.

Legaspi CF, Jovellanos, ML (1990). A preliminary study of the golden apple snail (*Pomacea* sp.) as intermediate host of liver fluke (*Fasciola* spp.). J. Philippine Animal Health Center, 1: 70–76.

Milinsk MC, das Gracas Padre, R, Hayashi, C, de Souza, NE, Matsushita M (2003). Influence of diets enriched with different vegetable oils on the fatty acid profiles of snail. *Helix aspersa* maxima. Food Chem. 82: 553–558

Olowe OA, Okanlawon, BM, Olowe RA (2008). Antimicrobial Resistant Pattern of *Escherichia coli* from Human Clinical Samples in Osogbo, South Western Nigeria. Afr. J. Microbiol Res. 2: 008-011

Oyawoye, OM (2008). Environmental Pollution: Indicators, Monitoring and Management. Annual Conference and General meeting of the Nigerian Society for Microbiology

Saldanha T, Gaspar A, Santana, DM Da. N (2001). Composition of meat from the snail (*Achatina fulica*) produced in Iguape, SP. Higiene-Alimentar 15(85): 69-74.

Sampson RA, Hocktra ES, and Vampoerschol, CA (1984). Introduction to food-borne fungi, Onter Bereau Voor Shimei Culture. pp. 105-107.

Serrano S, Medina LM, Jurado M, Jodral M (2004). Microbiological quality of terrestrial gastropods prepared for human consumption. J. Food Prot. 67: 1779–1781.

Su, XQ Antonas KN, Li D (2004). Comparison of n-3 polyunsaturated fatty acid contents of wild and cultured Australian abalone. Int. J. Food Sci. Nutr. 55(2): 149 -154

Kirkan PKG, Ksoy EN, O Kaya (2006). Detection of Listeria monocytogenes by using PCR in Helix pomatia. Turk. J. Vet. Anim. Sci. 30: 375-380

USDA (2006). National Nutrient Standard Reference, release 19.