World Applied Sciences Journal 3 (6): 921-925, 2008
ISSN 1818-4952

Trado-Medicinal and Nutritional Values and Biosafety of *Lanistes libycus* in Ijebu North, Southwest Nigeria

[1]*Olufemi M. Agbolade,* [2]*Tajudeen O. Olayiwola,*
[1]*Eseroghene G. Onomibre,* [1]*Lateef A. Momodu and* [1]*Luwasegun O. Adegboyegun-King*

[1]Parasitology and Medical Entomology Laboratory, Department of Plant Science and Applied Zoology, Olabisi Onabanjo University, P.M.B. 2002, Ago-iwoye, Ogun State, Nigeria
[2]Department of Chemical Sciences, Olabisi Onabanjo University, P.M.B. 2002, Ago-iwoye, Ogun State, Nigeria

Abstract: The trado-medicinal and nutritional values and biosafety of *Lanistes libycus* were studied vis-à-vis the parasites and other organisms and heavy metals associated with it. Five hundred and five school children aged nine to 17 years from some communities in Ijebu North, southwest Nigeria were interviewed using a questionnaire. Mantle cavity and shell of specimens of *L. libycus* from four important streams in the study area were examined. Proximate, amino acids and heavy metals analyses of the snail species were performed. 81.8% and 79.8% of the school children were collectors and consumers of *L. libycus*, respectively. The commonest method of cooking the snail was frying (54.5%) ($P<0.001$). Treatment of ear problem was the commonest trado-medicinal value. 50% of the *L. libycus* specimens with *Carchesium sp* on the shell (from one of the streams) had concurrent presence of unidentified rotifers, nematodes, ciliates and eggs. Parasites found in the mantle cavity were *Dockovdia cookarum* (an aquatic mite), *Chaetogaster limnaei* (an annelid), unidentified species of leeches and flatworms. Crude protein content was 58.1% and all the essential amino acids were present. The concentrations of lead and iron were 18.5 and 160.25 mg kg^{-1}, respectively. *L. libycus* has significant nutritive and trado-medicinal values in Ijebu North, southwest Nigeria. However, children and adults need to be educated on the possible hazards associated with the collection and use of the snail.

Key words: *Lanistes libycus* · edible water snails · trado-medicine · nutrition · heavy metals · biosafety

INTRODUCTION

Lanistes libycus is a freshwater gastropod mollusc common in West Africa and widely distributed in southwest Nigeria [1, 2]. Some previous studies have indicated that the snail species is important in some ways. The snail is edible and appears a major reason for freshwater contact in some communities in Ijebu North, southwest Nigeria [3]. Moreover, *L. libycus*, like some other freshwater snails, has been found to be a valuable tool for evaluation of the metal burden of man-made dams and rivers in the tropics [4]. However, the snail has been reported to harbour *Dockovdia cookarum* (a water mite), *Chaetogaster limnaei* (an annelid), an unidentified nematode species, an unidentified ciliate species, an unidentified insect larvae and non-furcocercous schistosome cercariae [5-7]. In Kenya, another related species (*L. purpureus*) was found infested with cercariae [8].

Hitherto, the reports available on heterospecific associations involving *L. libycus* from Ijebu North area of Nigeria are only on some parasites in the mantle cavity of the snail species. To the best of our knowledge, nothing is known so far about orgarnisms associated with the shell of the snail species in Ijebu North, southwest Nigeria. Moreover, there is no information on the proportion of any community in the area that actually collect *L. libycus* for eating. Similarly, there is paucity of information on any other usefulness of the snail species in the present study area.

In view of the foregoings, this study was initiated to elucidate the trado-medicinal and nutritional importance of *L. libycus* particularly vis-à-vis the parasites found in the mantle cavity and organisms associated with the shell

Corresponding Author: Dr. Olufemi M. Agbolade, Parasitology and Medical Entomology Laboratory, Department of Plant Science and Applied Zoology, Olabisi Onabanjo University, P.m.b. 2002, Ago-iwoye, Ogun State, Nigeria

of the snail species in some communities in Ijebu North, southwest Nigeria. The presence of essential amino acids and some heavy metals in the snail species were also determined and quantified.

MATERIALS AND METHODS

Study area: The study area consisted of Ago-Iwoye, Mamu and Oru in Ijebu North Local Government area of Ogun State, Nigeria. The area lies within the tropical rainforest belt, between latitudes 7°05' and 6°55' N, longitudes 3°50' and 3°55' E. Ago-Iwoye is the main seat of the Olabisi Onabanjo University. Mamu and Oru are about 20 and 3.8km, respectively from Ago-Iwoye.

Questionnaire administration: A total of 505 (257 males, 248 females) school children aged nine to 17 years were interviewed using a questionnaire. The questionnaire was administered in English and, sometimes, Yoruba languages. The information obtained include age and sex of each interviewee, collection time, method of cooking, eating or non-eating and trado-medicinal values of *L. libycus*. However, only the responses of children aged 12-17 years were analysed for trado-medicinal values of *L. libycus*. During the interview shells of *L. libycus* were shown to the school children to ensure proper identity.

Collection and examination of *L. libycus*: *L. libycus* specimens were collected from Omi stream in Ago-Iwoye and three streams in Oru which are Eri-Oru, Areru and Ojupon. The collection was done using a pair of stainless steel tongs between August 2004 and February 2005. In the laboratory, the shell height of each sample was measured with a pair of vernier callipers. Scrappings were taken from the outer part of the shell and put on a glass slide. One or two drops of water was added and mixed with the scrappings which was then observed with dissecting and light microscopes. All observable organisms were identified and recorded. Subsequently, each specimen was screened for patent schistosome infection by exposure to sunlight for about four to six hours in a beaker of water. The shell of each specimen was then crushed with mortar and pestle, the mantle was dissected in a petri dish containing water and examined with dissecting microscope [7, 9].

Proximate and amino-acid analyses: Crude protein determination was done by the routine semi-micro kjeldahl technique. Crude fat was determined using soxhlet apparatus, while the gross energy was determined using Gallenkamp Ballistic Bomb Calorimetre. Amino-acid analysis was done using spectrophotometric method.

Determination of heavy metals: The presence and concentration of lead (Pb), iron (Fe) and cadmium (Cd) were determined using atomic absorption spectrophotometre. The detection limit for Cd was 0.002 mg kg^{-1}.

RESULTS

Out of the 505 school children interviewed, 413 (81.8%) were collectors of *L. libycus* which were statistically more than 92 (18.2%) non-collectors ($P<0.001$). The percentage of collectors among males (83.2%) was statistically similar with that among females (80.2%) ($P>0.05$). Figure 1 shows the percentages of collectors of *L. libycus* among genders and age groups in the study area. The percentage of collectors among male children was statistically similar to that among females in each of the age groups ($P>0.05$). The total percentages of collectors among the age groups were statistically similar ($P>0.05$). Figure 2 summarises the time of collection of *L. libycus* by school children in the study area. Out the collectors, 87.4% indicated morning and aftrenoon as collection periods, although morning was the statistically most important period of collection ($P<0.001$).

A total of 403 (79.8%) of the school children answered that they ate *L. libycus*, while 102 (20.2%) did not. The two percentages were significantly different ($P<0.001$). Among the collectors, 45.1% were non-eaters. The percentage of eaters among males (78.7%) was

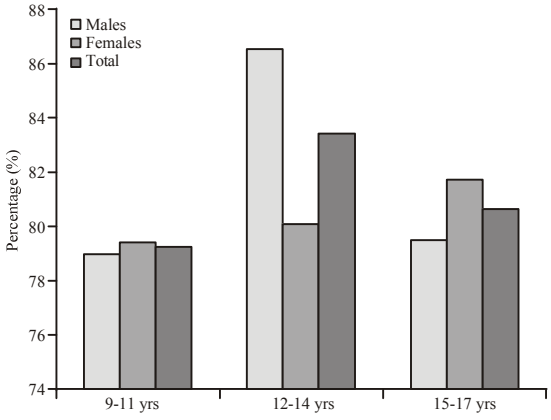

Fig. 1: Percentages of collectors of *L. libycus* among genders and age groups in Ijebu North, Southwest Nigeria

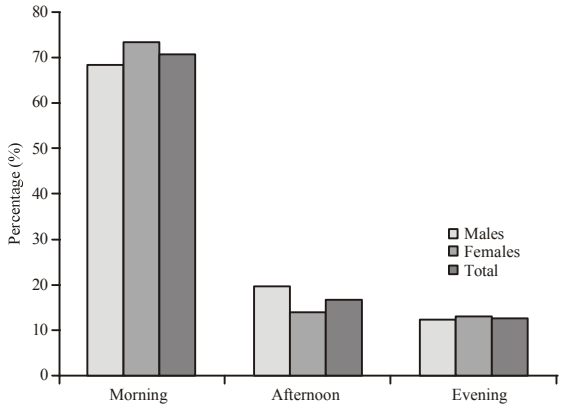

Fig. 2: Time of collection of *L. libycus* by school children in Ijebu North, Southwest Nigeria

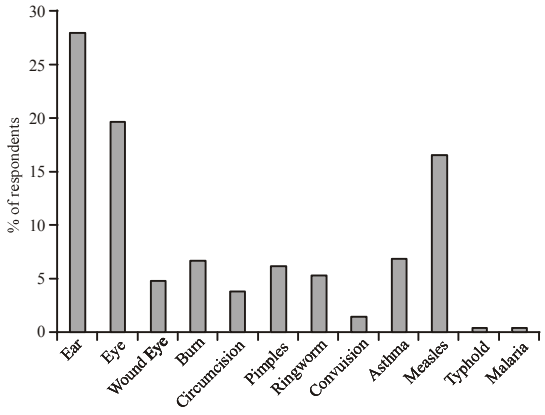

Fig. 4: Trado-medicinal uses of *L. libycus* in Ijebu North, Southwest Nigeria

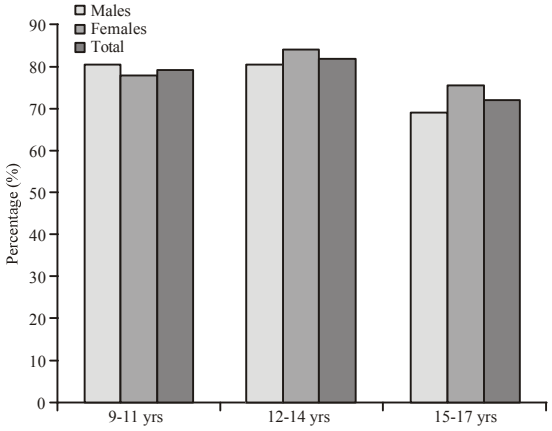

Fig. 3: Percentages of eaters of *L. libycus* among genders and age groups in Ijebu North, Southwest Nigeria

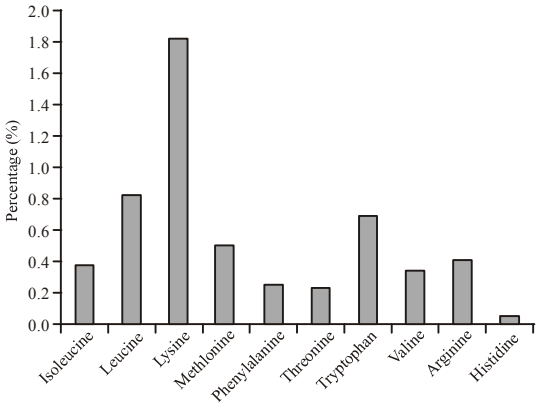

Fig. 5: Concentration of some amino acids in *L. libycus*

statistically similar to that among females (81%) (P>0.05). Figure 3 shows the percentages of eaters of *L. libycus* among genders and age groups in the study area. The percentage of eaters among males was statistically similar to that among females in each of the age groups (P>0.05). Similarly, the total percentages of eaters among the age groups were statistically similar (P>0.05). Among the *L. libycus*-eating respondents, the statistically commonest method of cooking *L. libycus* was frying (54.5%), followed by boiling (25.1%) and roasting (20.4%) (P<0.001).

Two hundred and eighty one (81%) out of 357 school children aged 12-17 years answered that *L. libycus* had trado-medicinal values in the study area. Their responses are summarised in Fig. 4. Treatment of ear problem had the highest percentage (P<0.001).

Eight (6.1%) of 131 specimens of *L. libycus* collected from Areru had *Carchesium sp* on their shells. The size range of these specimens was 26-34mm. Four (50%) of the specimens with *Carchesium sp* had concurrent presence of one or more of the following unidentified ectofauna: rotifers, nematodes, ciliates and eggs of an unknown animal. None of the specimens from Eri-Oru, Ojupon and Omi had any of these organisms on its shell. However, pooled 20% prevalence of *D. cookarum* and 12.1% prevalence of *C. limnaei* were recorded in the mantle cavities of *L. libycus* specimens in the study area. One (2.3%) of the specimens from Ojupon had an unidentified species of leech in its mantle cavity. The shell length of the specimen wa 24mm. Three (2.3%) of the specimens from Areru had an unidentified species of flatworm in their mantle cavities. Their shell lengths were 31.5mm, 34.5mm and 36.5 mm.

The crude protein and fat contents of *L. libycus* were 58.1 and 5.46%, respectively, while the gross energy was 3.052 kcal/g. The concentrations of the essential amino acids in *L. libycus* are shown in Fig. 5. There was no siginificant difference between the concentrations of

the amino acids (P>0.05). The concentrations of Pb and Fe were 18.5 mg kg^{-1} and 160.25 mg kg^{-1}, respectively. Cd was not detected in the snail.

DISCUSSION

The common practice of *L. libycus* collection which was prominent among both genders and all age groups interviewed in the study area is worrisome. This is because the snails inhabit same freshwater bodies with snail vectors of schistosomiasis in the study area [3]. The matter is worsened by the fact that most of the school children visited freshwater bodies to collect *L. libycus* in the morning and afternoon. Unfortunately, those periods coincide with the period of abundance of cercariae of schistosome species of medical importance [10, 11].

The observation of many microscopic animals on the shell of *L. libycus* in this study is the first of its kind from Ijebu North, southwest Nigeria. None of the organisms has hitherto been recorded as being of medical significance. However, this study shows that *Carchesium sp* may provide suitable microhabitat for some microscopic organisms which may eventually constitute a threat to human well being. The presence of *D. cookarum* and *C. limnaei* in the mantle cavity of *L. libycus* agrees with earlier reports [6, 7]. *D. cookarum* and *C. limnaei* have not been found to be injurious to human health. Nevertheless, the occurrence of leeches and flatworms in the mantle cavity of *L. libycus* are herein reported for the first time. The occurrence of the leeches in *L. libycus* suggests that they are body-fluid suckers and this habit may render the infected snails dangerous to handle with bare-hand. Occurrence of cercariae in *L. libycus* had been earlier reported from the study area [7]. Cercarial dermatitis due to non-human cercariae is a well-known phenomenon [12]. This feature depicts the additional danger associated with collection of *L. libycus* from freshwater bodies in the study area. It is pertinent to note that in an unpublished study in the area, the first author of this paper observed some *L. libycus* specimens actively shedding cercariae and some with *Fulsarium sp* (a fungus) and *Tabellaria sp* (an alga) on their shells. The presence of *Fulsarium sp* suggests human faecal contamination in the study area [13] whch further renders collectors of *L. libycus* exposed to many water-related diseases including typhoid.

The high occurrence of human consumption of *L. libycus* is another important cause for concern in the study area. *L. libycus* consumption may be beneficial to both children and adults in the study area partly because its meat provides cordial flavour particularly that their diets are dominated by starchy staples [14]. Secondly, animal proteins are known as being of superior quality [15]. Fortunately, the snail has appreciable quantity of protein with all the essential amino acids. Studies have shown that dietary intake of substantial quantity of protein rich in essential amino acids is imporatnt for both children and adults including sedentary elderly [16]. In addition, studies have established positive relationship between sufficient dietary protein and resilience (ability to withstand effects of infection), increased immunity and resistance to reinfection [17, 18]. Moreover, the relatively low fat content indicates that the snail meat is not likely to enhance fat accumulation in human. In view of the fact that the basal metabolic rate of man is 35 kcal/kg/day [19], the snail would have contributed substantially to daily energy requirement of consumers in the study area. The high concentration of Fe in *L. libycus* is an additional advantage for the consumers because Fe is an important constituent of haemoglobin which is required daily in human diet [20]. Daily consumption of large quantity of Fe is further neccessitated in view of the fact that hookworms and schistosomiasis, which elicit direct and indirect blood loss in humans, are endemic in the study area [21, 22].

On the other hand, the results of this study have shown that some problems are associated with *L. libycus* meat consumption in the study area. Some of the children preferred roasting of the snail before eating. This practice creates the possibility of consuming improperly-cooked *L. libycus* which may harbour dangerous endoparasites. In addition, the high concentration of Pb in the snail almost nullifies its dietary usefulness. This is because Pb is non-metabolisable and it is toxic to human nervous system [13]. *L. libycus* had earlier been reported to accumulate heavy metals elsewhere in southwest Nigeria [4]. Presence of Pb in *L. libycus* in the present study area is an indicator of high level of chemical pollution of freshwater in the area, especially from petrochemicals.

Use of the snails in traditional treatment of some human ailments seems laudable. However, in cases where the snails are used unprocessed or improperly-cooked, the parasites in the mantle cavity (particularly cercariae) may pose significant threat to human victims.

This study has shown that, although *L. libycus* has some nutritive and trado-medicinal values, its collection and use may pose serious danger to human health. Further studies are required to establish the identity of the unidentified species of leeches, flatworms, ciliates, nematodes and rotifers found in/on the snails.

ACKNOWLEDGEMENT

We sincerely thank the managements of the Institute of Agricultural Research and Training, Ibadan, for the proximate and amino-acid analyses and Rotas Soilab Limited, Ibadan, Nigeria, for the heavy metals analysis.

REFERENCES

1. Ndifon, G.T. and F.M.A. Ukoli, 1989. Ecology of freshwater snails in south-western Nigeria. 1. Distribution and habitat preferences. Hydrobiologia., 171: 231-253.
2. Brown, D.S., 1994. Freshwater snails of Africa and their medical importance. 2nd Edn. Taylor and Francis Ltd., London, pp: 609.
3. Agbolade, O.M., D.O. Akinboye, O.T. Fajebe, O.M. Abolade and A.A. Adebambo, 2004. Human urinary schistosomiasis transmission foci and period in an endemic town of Ijebu North, Southwest Nigeria. Tropical Biomedicine, 21(Suppl): 15-22.
4. Adewunmi, C.O., W. Becker, O. Kuchnast, F. Oluwole and G. Dorfler, 1996. Accumulation of copper, lead and cadmium in freshwater snails in southwestern Nigeria. Science of the Total Environment, 193: 69-73.
5. Gledhill, T., 2003. A new genus and species of water mite (Acari: Hydrachnidia: Hygrobatidae) from the prosobranch gastropod *Lanistes libycus* (Morelet) (Steptoneura: Ampullaridae) in Nigeria. In: An Acaralogical Tribute to David R. Cook- From Yankee Spring to Wheeny Creek. Smith I.M. (ed.). Indira Publishing House, Michigan, pp: 75-82.
6. Agbolade, O.M. and A.B. Odaibo, 2004. *Dockovdia cookarum* infection and the prosobranch gastropod *Lanistes libycus* host in Omi Stream, Ago-Iwoye, Southwestern Nigeria. African Journal of Biotechnology, 3: 202-205.
7. Agbolade, O.M., D.O. Akinboye, O.T. Fajebe, O.M. Abolade and T.M. Olateju, 2005. Population, seasonal abundance and infections of *Lanistes libycus* from a schistosomiasis-endemic town in Ijebu North, south-west Nigeria. Nigerian Journal of Parasitology, 26: 37-41.
8. Kariuki, H.C., J.A. Clennon, M.S. Brady, U. Kitron, R.F. Sturrock, J.H. Ouma, S.T. Ndzovu, P. Mungai, O. Hoffman, J. Hamburger, C. Pellegrini, E.M. Muchiri and C.H. King, 2004. Distribution patterns and cercarial shedding of *Bulinus nasatus* and other snails in the Msambweni area, Coast Province, Kenya. American Journal of Tropical Medicine and Hygiene, 70: 449-456.
9. Fashuyi, S.A., 1990. Occurrence of *Unionicola (Pentatax) macani* Gledhill (hydrachnellae, acari) in the prosobranch mollusc *Lanistes ovum* Peters in Ajara Fish Ponds in Badagry, Nigeria. Hydrobiologia, 202: 171-174.
10. Gillespie, S.H., 2001. Intestinal nematodes. In Principles and practice of clinical parasitology, Gillespie, S. H. and R. D. Pearson (Eds.). John Wiley & Sons Ltd., Chichester, England, pp: 561-583.
11. Heyneman, D., 2004. Medical Parasitology. In Medical Microbiology. Brooks, G. F., J.S. Butel and S.A. Morse (Eds.). 23rd Edn. McGraw Hill, New York, pp: 661-701.
12. Smyth, J.D., 1996. Animal parasitology. Cambridge University Press, Cambridge, pp: 549.
13. Gadd, P., 1976. The ecology of urbanization and industrialization. Macmillan Educational Ltd., London, pp: 30.
14. Prescott-Allen, R. and C. Prescott-Allen, 1982. What's wildlife worth? International Institute for Environment and Development, London, pp: 90.
15. Begum, M.R., 1991. A textbook of foods, nutrition and dietetics. 2nd Edition. Sterling Publishers Ltd., New Delhi, pp: 356.
16. Millward, D.J., 2004. Macronutrient intakes as determinants of dietary protein and amino acid adequacy. Journal of Nutrition,134(Suppl.):1588-1596.
17. Coop, R.L. and P.H. Holmes, 1996. Nutrition and parasite interaction. International Journal of Parasitology, 26: 951- 962.
18. van Houtert, M.F. and A.R. Sykes, 1996. Implications of nutrition for the ability of ruminants to withstand gastrointestinal nematode infections. International Journal of Parasitology, 26: 1151-1167.
19. Steinberg, D., 1985. Energy balance. In: Best and Taylor's Physiological basis of medical practice. West, J.B. (Edn.). Williams and Wilkins, London, pp: 834-842.
20. Rapaport, S.I., 1985. The red blood cell. In: Best and Taylor's Physiological basis of medical practice. West, J.B. (ed.). Williams and Wilkins, London, pp: 390-408.
21. Taiwo, A.K. and O.M. Agbolade, 2000. Intestinal helminthiasis among school children in Oru, Ogun State, Nigeria. Nigerian Journal of Science, 34: 283-286.
22. Agbolade, O.M., D.O. Akinboye and A. Awolaja, 2004. Intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North, Ogun State, Nigeria. African Journal of Biotechnology, 3: 206-209.