**Laboratory Breeding of *Lymnaea natalensis* (Krauss, 1848), Intermediate Host of *Fasciola gigantica* (Cobbold, 1856)**

1Oyeduntan Adejoju Adediran, 1Emmanuel Chibuike Uwalaka,

1Department of Veterinary Microbiology and Parasitology, University of Ibadan, Ibadan, Oyo State, Nigeria

[oa.adedokun@mail.ui.edu.ng](mailto:oa.adedokun@mail.ui.edu.ng), [oyeadedokun95@yahoo.com](mailto:oyeadedokun95@yahoo.com).

**Abstract**: *Lymnaea* *natalensis* the intermediate host of the *Fasciola* *gigantica* (the causative agent of liver fluke disease) was collected from the zoological and botanical gardens, University of Ibadan, Nigeria and reared in our laboratory. The aim was to improve and standardize a rearing and maintenance technique for this snail. Two kinds of diets were compared: Blanched, Dried lettuce (A) and blanched, dried lettuce + 10% Calcium carbonate (CaCO3) (B). The age at oviposition, growth rate using shell size as indices and the durations of incubation and hatching were determined. Age at beginning of ovipostion ranged from 39 to 60 days. The snails fed with CaCO3 enhanced diet presented an increased growth rate, however, the difference was not significantly different (p>0.05). The maximum size attained by snails fed with diet A was 18mm length and 8mm height and 23mm length and 14mm height for diet B. The maximum duration of incubation of the eggs for the diets are 12 days (B) and 11 days (A) while the duration of hatching for diet B and A are minimum of 2 days and 6 days respectively. The method of mass breeding and maintenance of *Lymnaea natalensis* usingCaCO3 as supplement to blanched dried lettuce was found to be suitable in our laboratory.

[Oyeduntan Adejoju Adediran, 1Emmanuel Chibuike Uwalaka. **Laboratory Breeding of *Lymnaea natalensis* (Krauss, 1848), Intermediate Host of *Fasciola gigantica* (Cobbold, 1856). .** *N Y Sci J* 2013;6(8):55-57]. (ISSN: 1554-0200). <http://www.sciencepub.net/newyork>. 9

**Keywords**: *Lymnaea natalensis*, Laboratory rearing, Nutrition, intermediate host, *Fasciola* *gigantica.*

Running title: Rearing of *Lymnaea natalensis*

1. **Introduction**

Snails are a group of animals which have a diverse habitat ranging from freshwater, marine and terrestrial environments (Brown, 1994). Pulmonate freshwater snails have been studied and shown to be intermediate hosts of some parasitic diseases which are of veterinary and public health importance (Ndifon and Ukoli, 1989). *Lymnaea* snails are a group of freshwater snails distributed worldwide (Godan, 1983)). In Nigeria, the most important genus is *Lymnaea natalensis*, which is the intermediate host of fascioliasis, a disease which has been observed to be of public and veterinary health importance. This organism is widely distributed geographically in Nigeria (Ukoli and Asamu, 1979; Thomas and Tait, 1984).

In a malacology survey of 11 local governments of Ibadan*, Lymnaea natalensis* was found in 6 without restriction of spread (Adedokun, 2005). Specimens collected from various locations were found to be susceptible to natural and experimental infections with *Fasciola gigantica* (Guobadia, et al, 1996).The main type of feeding regime used for the snails brought into our laboratory has been dried blanched lettuce without calcium carbonate (CaCo3).

The study was initiated to compare two feeding regimes for these snails, collecting data on growth, oviposition, and productivity with the objective of improving and optimizing the breeding methods.

2. **Materials and methods**

Collection and identification of samples

Snails used in this study were collected from breeding colonies in streams running through the Zoological and Botanical gardens of the University of Ibadan, southwest Nigeria. After identification, the snails were divided in two groups of 20 and placed in two 60 x 30 x 30 cm glass aquaria filled with dechlorinated water and the aquaria were exposed to natural light supply in the laboratory. Eggs were collected daily on transparent plastic sheets placed into the aquaria.

Experiments

Aquaria A and B were set up in ten replicate each containing 3 newly hatched snails. The snails in A group were fed with only blanched dried lettuce which has been the staple for rearing *Lymnaea natalensis* in our laboratory (400mg every 72hours) while B group were fed with the blanched dried lettuce + 10% CaCO3,(360mg lettuce + 40mg ground chicken egg shell). Snail development was evaluated by measurement of shell length and height. Egg masses and egg were collected and counted daily. Longevity was observed in each group.

Statistical Analysis

Average lengths of the snails were compared using Student t test (p ≤ 0.05).

3. **Results**

The age at first oviposition ranged from 39 days for diet B to 60 days for diet A. The number of egg per egg mass in aquaria A and B ranged from 0 to 73 for A and 0 to 75 for B. Snail growth, incubation and hatching rate and average number of egg masses in both experiment are shown in table 1 and 2 respectively. The snails in aquaria B developed faster than those in aquaria A although the difference was not statistically significant (p<0.05). Water turbidity and colour was visibly higher in B than A although this was not measured.

**Table 1**: Age and Growth Rate of Snails

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group | No of snails | Age (days | Average shell length(mm | Average shell height(mm |
| A | 30 | 14 | 4.1 | 2.2 |
| B | 30 | 14 | 4.8 | 2.5 |
| A | 30 | 28 | 8.5 | 4.3 |
| B | 30 | 28 | 8.9 | 4.8 |
| A | 30 | 42 | 10.8 | 4.8 |
| B | 30 | 42 | 11.5 | 5.7 |
| A | 30 | 56 | 11 | 5.8 |
| B | 30 | 56 | 11.7 | 6.83 |
| A | 25 | 70 | 12.2 | 7.9 |
| B | 30 | 70 | 14 | 8.0 |

**Table 2:** Age and Productivity Rate of Snails

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Group | Age (days) | Average No Egg mass / snail | Average No of Eggs / Snail | Average Duration of Incubation (days) | Average Duration of Hatching (days) |
| B | 39 | 1 | 67 | 10 | 5 |
| B | 40 | 2 | 45 | 12 | 5 |
| B | 41 | 2 | 45 | 9 | 4 |
| B | 43 | 2 | 57 | 10 | 5 |
| B | 45 | 1 | 42 | 9 | 2 |
| B | 46 | 2 | 52 | 8 | 3 |
| A | 60 | 3 | 50 | 11 | 6 |

4. **Discussion**

Several techniques have been developed by various authors for the laboratory rearing of the lymnaea snails (Madsen and Monrad, 1981 Sachez et al, 1998, Souza de Perieira and Magalhaes, 2000).The techniques, maintenance of the aquaria and diets however vary widely. The need to improve on our rearing methods which led to the search for an effective, cheap and more productive rearing method for our laboratory was achieved to a great extent.

The methodology in the present study used to rear *Lymnaea natalensis* was similar to that used to rear *Lymnaea columnella* by Souza de Pereira and Magalhaes, 2000 and satisfactory results were obtained.

The number of egg masses laid per snail was at a maximum of 3 egg masses which is in contrast to Islam et al, 2001 who said that freshwater snails generally have a high fecundity. This low fecundity could however be due to a change of environment (Callow, 1970 and Skoog, 1978) since they were offspring of snails brought in from the wild. There is a significant relationship between age at point of lay, number of egg masses per snail, duration of hatching and incubation. However, in contrast with the reports of Garaerts and Muhammed(1981) there is a lack of significance between the relationships of age at point of lay, height and length of shell.

There is also an indication that both indices of growth (height and length of snail shell) increased at same rate and according to the works of Russell-Hunter (1961 a and b) the onset of reproduction is determined by genetic and environmental factors. Both indices of growth (height and length of snail shell) increased simultaneously which is as reported by Madsen, 1982. The enhancing effect of calcium carbonate on snail size and productivity rate as seen in this study corroborates the works of Madsen, 1982 who reported that calcium enhances snail egg production.

This study shows that *Lymnaea natalensis* gets to point of lay between 39 days and 60 days and the older the snail, the more egg masses they produce. Also, dietary supplementation with calcium carbonate from egg shell (95%, CaCo3) has a positive influence on growth and snail productivity rate.

However our research is continued for a detailed understanding of *Lymnaea* *natalensis* to ensure a comprehensive understanding of the factors that surround and influence the biology of this snail with the possibility of obtaining an environmentally friendly means of control.

**Acknowledgements**

The authors thank Mr. Adeleye Emmanuel for assistance with the statistical analysis.

**Corresponding Author**:

Dr Oyeduntan A. Adediran

Department of Veterinary Microbiology and Parasitology

University of Ibadan

Ibadan

Nigeria

[oa.adedokun@mail.ui.edu.ng](mailto:oa.adedokun@mail.ui.edu.ng),

[oyeadedokun95@yahoo.com](mailto:oyeadedokun95@yahoo.com).

Tel: +234 8023 222 926

**References**

1. Adedokun O.A, 2005: Application of GIS and computer simulation in the distribution of *Lymnaea natalensis (Krauss)* and the prevalence of fascioliasis in cattle. PhD Thesis. University Of Ibadan, Nigeria.
2. Brown D.S., 1994: Freshwater snails of Africa and their medical importance. London, Taylor & Francis Ltd. Revised 2nd edition.
3. Callow P, 1970: Studies on the natural diet of *Lymnaea peregea obtase (kinbelt)* and its possible ecological implications. Proc.Malag.Soc.Lond.19:203-215.
4. Gerearts, W.P.M and A.M.Muhammed, 1981: Studies on the role of the lateral lobes and the protestis of freshwater snail*, Bulinus truncatula*, the control of body growth and reproduction. International Journal of Invertebrate Reproduction 3: Pp 297-308.
5. Godan, D.1983. Pest slugs and snails: Biology and Control. Springer-Verlag, Berlin. Pp1-445.
6. Guobadia, E.E, Adedokun O.A, Fagbemi B.O, 1996: Parasite-snail-host relationship of *Fasciola gigantica* and *Lymnaea natalensis*. The Nigerian Journal of Parasitology.Vol 17:39-50
7. Hubendick, B.1958. Factors conditioning the habitat of freshwater snails. Bull. WHO. 18. 1072-1080.
8. Islam, M.N, G.R. Port and A.J. Nclachlam, 2001: The biology of lymnaea peregra (Muller) (Gastropoda: pulmonate Basonmatophora) with special reference to the effects of herbicides on its reproduction. Online Jour. Bw. Sci. 1(6) 532-540.
9. Madsen H, and Monrad J, 1981.A method for laboratory maintenance of *Lymnaea natalensis* and for mass production of *Fasciola gigantica* metacercariae.J.Parasitol 67:: 735-737.
10. Madsen H.1982: Snail ecology- 1: Methodology:Teaching notes – WHO collaborating center for applied malacology. Danish Bilharziasis laboratory.
11. Russell-Hunter, W.D 1961a: Annual variations in growth and density in natural populations of freshwater snails in the west of Scotland. Proceedings of the zoological society of London.16:219-253.
12. Russell-Hunter, W.D 1961b: Life cycle of four freshwater snails in limited populations in Loch Lomona with a discussion of intraspecific variations. Proceedings of the zoological society of London.137:135-171.
13. Sanchez R, Perera G, Sanchez J, 1995: Cultivo de Fossaria cubensis (Pfeiffer) (Pulmonata: lymnaeidae) Hospedero intermediario de Fasciola hepatica en Cuba. Rev cubana Med Trop 47:71-73.
14. Skoog G.1978: Influence of natural food items on growth and egg production in brackish water populations of *lymnaea peregra* and *Theodoxus fluviatillis* (mollusks) Dikos 31:140-148.
15. Souza de Perera, Cecilia and Magalhaes, KellyGrace, 2000: Rearing of *Lymnaea Columnella* (Say, 1987), intermediate host of *Fasciola hepatica* (Linnaeus, 1758) Mem.Inst. Oswaldo Cruz. Rio de Janeiro Vol 95(5):739-741.
16. Thomas. J.D. and Tait, A.I., 1984. Control of the snail hosts of schistomiasis by environmental manipulation. A field and laboratory appraisal in the Ibadan area, Nigeria. Philosophical Transactions of the Royal Society, London B305: 201-53.
17. Ukoli. F.M.A and Asamu, D.I.(1979). Freshwater snails of the proposed federal capital territory, Nigeria. Nigeria J. Natural Science.1 (1): 49-56.

3/19/2013