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Review Article

Studies on Bio-ecology and Management of Alien Invasive Giant African Snail *Achatina fulica* (Bowdich)

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Abstract

The giant African snail Achatina (*Lissachatina*) fulica (Bowdich) invaded many countries as invasive species. These snails are threat to the local ecosystem and designated as a major nuisance for the local agro-horticulture plants. These snails caused great loss to agriculture economy for local farmers. The present review clearly indicate the complete biology and management of Alien invasive giant African snail *Achatina fulica* (Bowdich).

Key Words: Achatina fulica; polyphytophagous

Introduction

Achatina (*Lissachatina*) *fulica* (Bowdich), a huge African snail endemic to east Africa (Stylommatophora: Achatinidae), has spread around the world and become a polyphytophagous pest [1]. It has been reported earlier that the giant African snail *Achatina fulica* consume at least 500 distinct plant species [2-4]. It is a well-researched snail that is significant for the environment, economy, and medicine. *A. fulica* is a classic example of an introduced species, having been documented on every continent save Antarctica. The International Union for Conservation of Nature and Natural Resources (IUCN) has named *A. fulica* as one of the top 100 invasive species worldwide [5]. The enormous African snail has drawn notice because of its size. Due to its enormous size, alleged medicinal benefits, and potential as a food source for humans or other animals, the giant African snail has drawn attention. Its success as an introduced species is attributed to a number of factors, including its high reproductive capacity, voracious eating habit, insufficient quarantine measures, and human-assisted dispersal [6].

It was said to have been brought to India in 1847 by British conchologist William Henry Benson to the Chouringhie Gardens in Calcutta. Over time, it moved to other states in the nation [7]. In regions where it has been introduced, *A. fulica* promotes significant ecological and economic consequences [8-9]. One of the most damaging pests to subtropical and tropical regions, this snail severely affects home gardens as well as commercial crops. Additionally, it may be discovered near to waste deposits, on trees, and on decomposing materials [10-11]. In addition, *A. fulica* can be an intermediate host of *Angiostrongylus consaricencis* [12]. The etiological factor of abdominal angiostrongylosis and its distribution can indicate the possible risk of spreading this disease [13]. *A. fulica* is now widespread in Japan [14-15], Indian Islands, Australia, Southeast Asia [16-18] and the American continent [19].

Human presence is one of the most critical elements in the establishment and spread of *A. fulica* [20]. This snail is often more prevalent in areas with a high population density [21]. Food choice is another significant element that may influence the survival, fertility, growth rate, and population dynamics of *A. fulica* [22]. Most people consider members of the Achatinidae family to be herbivorous, mainly consuming vascular plants [23]. According to earlier research, *A. fulica* is a serious agricultural pest that also seriously damages the environment [24-26]. Still, the majority of these research focus on species of agricultural plants.

A. fulica populations have been managed and eradicated using physical, biological, and chemical methods [27]. Snails and their eggs were gathered and destroyed using physical control techniques [28-29]. *A. fulica* has also been biologically controlled by invertebrate predators of terrestrial gastropods [30-32]. In conclusion, several toxicants have been employed in the fight against *A. fulica* [33-37]. The enormous African snail *A. fulica* is globally dispersed and has a well-documented habitat.

A. fulica may have arrived in India at the turn of the century. It has migrated to the northeastern states of India during the past fifty years, and it is now moving eastward from there. It is now recognized as an agri-horticultural pest in almost all of India's northeastern states, including Assam, North Bihar, Manipur, Meghalaya, Nagaland, Orissa, Tripura, and West Bengal, as well as in a few isolated areas in Western and Southern India. This snail is not found in Central India. Port Blair is home to the highest reported population density of 42 snails per square meter [38-39].

It is currently Eastern Uttar Pradesh that is under attack from this enormous African snail (*A. fulica*). *A. fulica* was discovered in some areas in 1993 in Nepal's Narain Ghat, Lucknow, and Muradabad, Uttar Pradesh. Various observations indicate that this snail is currently migrating to numerous districts in eastern Uttar Pradesh, including Gorakhpur, Deoria, Kushinagar, and Mahrajganj. According to observations, there were 20–22 snails per square meter in the Burgo neighborhood of Gorakhpur between September 2011 and November 2011 [40-41]. The population density in the Deoria area was around 15–17 snails per square meter. The Kushinagar district had the highest level of infection of this insect. The population density of Ramkola town was 20–25 snails per square meter. In the district of Maharajganj, it was snails/meter square. There is a worrying population density here. The economy of eastern Uttar Pradesh, which is dependent mostly on agriculture, may suffer if adequate control measures are not implemented [42].

In vegetable fields, *A. fulica* causes significant impact from July to November. Due to its ferocious hunger and rapid growth, the enormous African snail *A. fulica* is feared above all other terrestrial gastropods in tropical and subtropical regions. This snail grazes the agri-horticulturist field and may cover a distance of 50 meters in a single night. It is an agri-horticulturist that is nocturnal and voracious. Its active phase lasts from July through December of last year; the remaining portion is spent dozing. During its active phase, *A. fulica* severely damages the following plants: ghia torai (*Luffa cylindrical*), chilli (*Capsicum annuum*), annona (*Annona squamosa*), guava (*Psidium guava*), banana (*Musa sapientum*), bitter gourd (*Momordica charantia*), cauliflower (*Brassica oleracea* var. *botrytis*), and lady's finger (*Hibiscus*) papaya (*Carica papaya*), citrus (*Citrus limon*), maize (*Zea mays*), croton (*Croton riglium*), tomato (*Lycopersicum esculentum*) and various types leafy vegetables and paddy crop. There are about 85 ornamental and vegetable plants are harmed by *A. fulica* [40]. The huge African snail prefers vegetables and garden plants, but it also does well on wild plants in places that are not farmed for crops or gardens [43-44].

The gigantic African snail, *A. fulica*, has been a major agri-horticultural pest in India for over 60 years, although there aren't many studies on its economic status or methods of control. Typically, *A. fulica* lays eggs 20 days after mating. Almost 300 snails were generated annually by a couple of snails. A snail's lifespan is five to six years, depending on the surrounding factors (temperature, humidity, etc.) [45].

Interdisciplinary Relevance

Gastropods are important in medical and veterinary science since they serve as intermediate hosts for certain parasitic worms of man and his domestic animals. Some of the freshwater snails are the vector of digenaean trematode larvae which causes endemic diseases fascioliasis and schistosomiasis to man and his domestic cattle. Schistosomiasis is transmitted by several species of the pulmonate snails *Bulinus, Planorbis, Biomphalaria* and *Oncomelina.* There are at least 500million people affected by this disease in 76 tropical and subtropical countries of Asia and Africa. There are three species of *Schistosoma* parasite is found in human beings. *Schistosoma haematobium, S. mansoni* and *S. japonicum* [46]. The cause of an eosinophilic menango-encephilitis ofpeople living in Hawaii and Pacific Islands, is *Angiostrongylus contomensis* lives in the vector snail *Lymnaea stagnalis and Galba polustris* [47]. Fascioliasis is very common zoonotic disease in eastern UP caused by two digenean trematodes *Fasciola hepatica* and *Fasciola gigantica*. The vector of these flukes is a fresh water snail *Lymnaea acuminate* [48].

Snail Control

Snail control have been performed through different means as like chemical, biological, ecological, mechanical and bait formulation. W.H.O. started a campaign and published a multi series of monographs and research articles for the reduction of schistosomiasis and control of snails [49]. However, during 60's and 70's due to its basic functioning nature, W.H.O. was not concerned with the control of agricultural pests while in different parts of the world snail control studies were being carried out [50].

Mechanical Control

In the mechanical control of the snails collection of the snails and slugs takes place and their destruction in boiling water and burying in field away from human habituation. A number of mechanical methods to prevent gastropod damage have been used with more or less positive results in different parts of the world.

Biological Control

In biological control there are several organisms which are predator of destructive snails. A predatory millipede *Orthromorpha* sp. is found to predating on the giant African snail *Achatina fulica* (Godan, 1983). An important predator for biological control of phytophagous terrestrial pulmonates, particularly of *Achatina fulica* is the hunter snail, *Gonaxis kibweziensis* a small (20 mm) African snail [51].

In tropical agriculture the cost of *A. fulica* is fourfold. First there is the loss of crop yield caused by herbivory (either directly through crop damage or indirectly through damage to key plants which enrich the soil for crop plants). Secondly, damage may be caused by the spread of disease through the transmission of plant pathogens. Thirdly, there is the cost associated with the control of the pest and finally there are the opportunities lost with enforced changes in agricultural practice such as limiting crops to be grown in a region to those crops resistant to snail infestation [52]. However, in a review of the economic importance of infestations little mention of *A. fulica* as a crop pest [53]. The apparent inevitable population decline that occurs in the wake of the invasion argues against a long term threat to agricultural production [54]. The list of economically important plants recorded as being subject to losses through damage by *A. fulica* Bowdich (Achatinidae) in regions outside of Africa is significantly long and includes the following groups of plants: amaranth (Amaranthaceae), banana (Muscaceae), basella (Basellaceae), beans and peas (Fabaceae), blimbi (Oxalidaceae), breadfruits (Moraceae), brinjal/aubergine (Solanaceae),brassicas (Brassicaceae), cacao (Sterculiaceae), carrot (Apiaceae), cassava (Euphorbiaceae), castor (Euphorbiaceae), chillis and peppers (Solanaceae),citus (Rutaceae), coffee (Rubiaceae), corm (Araceae), cotton (Malvaceae), drumstick (Moringaceae),erythrina (Fabaceae), eucalyptus (Myrtaceae), figs (Moraceae), gourd/pumpkins/cucumber/melons (Cucurbitaceae), jute (Tiliaceae),kokko (Fabaceae), lettuce (Asteraceae), mahogany (Meliaceae), mulberries (Moraceae), okra (Malvaceae), onion (Liliaceae), palmnuts (Arecaceae), Papaya(Caricaceae), passion fruit (Passifloraceae), potato (Solanaceae), rubber(Euphorbiaceae), shishu (Fabaceae), soursop (Annonaceae), spinach(Chenopodiaceae) Sunflower (Asteraceae), sweet potato (Convolvulaceae), taro(Araceae), tea (Theaceae), teak (Verbenaceae), tobacco (Solanaceae), tomato(Solanaceae), vanilla (Orchidaceae) and yam (Diascoreaceae).Economic crops that generally suffer little damage from *A. fulica* include sugar cane (*Saccharum officinarum*), maize (*Zea mays*), rice (*Oryza sativa*; but see Economic Impacts), coconut (*Cocos nucifera*), pineapple (*Ananas comosus*) and screw pine (*Pandanustectorius*). Onion (*Allium cepa*), garlic (*Allium sativum*), yam-beans (*Pachyrhizus tuberosus*) and betel (Piper betel) are particularly resistant todamage from *A. fulica* [55-57]. Irrespective of crop the seedling or nursery stage is the most vulnerable stage. In some cases infestations of the seedling stage are so severe that different crops must be planted. In more mature plants the nature of the damage varies with the species, sometimes involving defoliation and in others involving damage to the stems, flowers or fruits (Raut & Barker 2002). Conflicting reports of damage from different regions occur for yams, bitter gourd (*Momordica charantia*), tea coffee (*Coffea* spp.) and various taro species (*Alocasiamacrorrhizos, Colocasia esculenta*, *Xanthosoma brasiliense*).

A. fulica is a major agricultural pest, feeding on a variety of crops and causing significant economic losses. *A. fulica* distributes in its faeces spores of *Phytophthora palmivorain* Ghana; *P. palmivora* is the cause of black pod disease of cacao (Theobromacacao); the fungus which also infects black pepper, coconut, papaya and vanilla [58]. *A. fulica* spreads *P. colocasiae* in taro and *P. parasiticain* aubergine (*Solanum melongena*) and tangerine (*Citrusreticulata*) [59-60]. While the importance of these diseases is well established the importance of *A. fulica* as a vector for the spread of these diseases has not been well established [61].

The snail control measure was achieved by different synthetic molluscicides significantly, as like inorganic salts, nicolsamide, metaldehyde, carbamates, organophosphorus compounds and synthetic pyrethroids [61-62]. There are about 7000 synthetic compounds had been screened for the snail control [63].

Use of synthetic molluscicides is very harmful to the environment because once a chemical is released in the environment materiological, chemical, physical, biological and other allied factors, determines its fate and distribution in the ecosystem where it interacts with non-target species. Chemical pesticides play a crucial role in modern agriculture and health care programmers. They have been extensively used to control many agricultural pests and insect vectors that transmit a number of diseases. However, the indiscriminate use of chemical pesticides has caused great damage to ecosystem in several ways, such as accumulation through bio-magnification to alarming toxic levels in the ecosystem. Therefore an alternate approach of the chemical pesticides is inevitable. However, plants also produce their own bioactive compounds or natural pesticides which are much beneficial for ecosystem.

There are a number of plant products have been reported as potent molluscicides, which has been used against harmful snails such as *Lymnaea acuminata, Indoplanorbis exustus and Achatina fulica* (.

References

1. Arruda, JO and Santos, L (2022) First record of Achatina fulica Bowdich, 1822 (Mollusca, Achatinidae), for the state of Rio Grande do Sul, Brazil. Biotemas 35(1), 1–6
2. Barbosa, TA, Thiengo, SC, Fernandez, MA, et al. (2020) Infection by Angiostrongylus cantonensis in both humans and the snail Achatina (Lissachatina) fulica in the city of Macapá, in the Amazon Region of Brazil. Memórias do Instituto Oswaldo Cruz 115(1), e200115.
3. d'Ovidio, D, Nermut, J, Adami, C and Santoro, M (2019) Occurrence of rhabditid nematodes in the pet giant African land snails (Achatina fulica). Frontiers in Veterinary Science 6(1), 88.
4. Dumidae, A, Janthu, P, Subkrasae, C, Dekumyoy, P, Thanwisai, A and Vitta, A (2019) Genetic characterization of Angiostrongylus larvae and their intermediate host, Achatina fulica, in Thailand. PLoS One 14(9), e0223257.
5. Jakkul, W, Chaisiri, K, Saralamba, N, Limpanont, Y, Dusitsittipon, S, Charoennitiwat, V, Chan, AHE and Thaenkham, U (2021). Newly developed SYBR Green-based quantitative real-time PCRs revealed coinfection evidence of Angiostrongylus cantonensis and A. malaysiensis in Achatina fulica existing in Bangkok Metropolitan, Thailand. Food and Waterborne Parasitology 23(1), e00119.
6. Lima, WS, Cruz, ACL, Samasquini, SJJ, Mesquita, MN, Medeiros, LS, Pacheco, AD and Souza, SF (2020) Aspectos epidemiológicos de Aelurostrongylus abstrusus no Brasil [Epidemiological aspects of Aelurostrongylus abstrusus in Brazil]. Scientia Naturalis 2(2), 920–933.
7. Meffowoet, CP, Kouam, KM, Tchakounte, FM and Kana, JR (2020) Parasites diversity of edible African giant snails (Achatina fulica and Archachatina marginata) in the Lekie, Wouri and Santchou localities of Cameroon during the dry season. Scientific Journal of Animal Science 9(7), 644–653.
8. Meijides-Mejías, C and Robledo, AR (2019) Primer reporte de larvas de estrongylidios Metastrongyloidea (Strongyluris larvae) en Achatina (Lissachatina) fulica (Mollusca, Achatinidae) en el municipio de Regla, La Habana, Cuba [First report of larvae of strongylids Metastrongyloidea (Strongyluris larvae) in Achatina (Lissachatina) fulica (Mollusca, Achatinidae) in the municipality of Regla, Havana, Cuba]. Revista estudantil 16 de abril 58(273), 90–93. [In Spanish.]Google Scholar
9. Oda, FH, da Graça, RJ, Lima, FS, Alvarenga, FS and Takemoto, RM (2020) Cysts and larvae of Strongyluris: a parasite of amphibians and reptiles found in an urban population of Lissachatina fulica (Férussac, 1821) in southern Brazil. Veterinary Parasitology: Regional Studies and Reports 20(1), 100386.
10. Oliveira, KL, Simões, RS and Decanine, D (2021) First report of Achatina fulica (Bowdich, 1822) naturally infected with nematodes from the families Angiostrongylidae and Rhabditidae in the city of Campo Grande, Mato Grosso do Sul. Revista de Biologia Neotropical 18(1), 83–89.
11. Orico, LD, Barbosa, CM, Luca, LR, Soares, RM and Gregori, F (2019) Angistrongylus cantonensis and Ancylostoma caninum detection in snails of São Paulo city (2016–2017), Brazil. Ars Veterinaria 35(3), 115–121.
12. Muniappan R. Biological control of the giant African snail Achatina fulica Bowdich, in the Maldives. FAO Plant Protect. Bull. 1987; 35: 127–133.
13. Rout SK, Ghose KC.(1984). Pestiferous Land Snails of India and Zoological Survey of India, vol. 11. Bani Press: Calcutta; 1–151.
14. Singh VK, Singh DK. (1995).Characterization of allicin as a molluscicidal agent in Allium sativum (Garlic). Biol. Agric. Hortic.; 12: 119–131.
15. Singh S, Singh DK.(1998). Molluscicidal activity of Nerium indicum bark. Braz. J. Med. Biol. Res.; 31: 951–954.
16. Hostettmann K, Lea PJ. (1987).Biologically Active Natural Products. Oxford Science Publications: Oxford,
17. Singh A, Singh DK, Misra TN, Agarwal RA.(1996). Molluscicides of plant origin. Biol. Agric. Hortic.; 13: 205–252.
18. Rao IG, Singh DK.(2000). Effect of single and binary combinations of plant-derived molluscicides on reproduction and survival of the snail Achatina fulica. Arch. Environ. Contam. Toxicol.; 39: 486–493.
19. Rao IG, Singh DK. (2002).Toxic effect of single and binary treatments of synthetic and plant-derived molluscicides against Achatina fulica. J. Appl. Toxicol.; 22: 211–215.
20. Raut SK, Ghose KC. (1984.).Pestiferous Land Snails of India, Technical Monograph II. Zoological Survey of India: Calcutta,
21. Rao IG. (2000).Studies on control of harmful snails Achatina fulica and Lymnaea acuminata. PhD Thesis, DDU Gorakhpur University Gorakhpur, India,.
22. Smith, T.R., White-Mcien, J., Dickens, K., Howe, A.C. and Fox, A.(2013)., Efficacy of four molluscicides against the giant African Snail, Lissachatina fulica (Gastropoda: Pulmonata: Achitinidae). The Florida Entomologist, vol. 96, no. 2, pp. 396-402.
23. Parvate Y.A. and Thayil, L., (2017). Toxic effect of clove oil on the survival and histology of various tissues of pestiferous land snail Achatina fulica (Bowdich, 1822). Journal of Experimental Biology and Agricultural Sciences, vol. 5, no. 4, pp. 492-505.
24. Leite JCVA, Silva MARE, Santos JAA, Faria RX., (2022). Natural products as a control measure of the Achatina fulica (Gastropoda: Achatinidae). Braz J Biol. 84:1-10.
25. Basavaraju, B. S. Kulapati Hipparagi Chinnamadegowda, C. and Krishnamurthy, N.(2001)., Management of giant African snail in betelvine garden. Current Research, 30 (7/8): 116-118.

26. Basavaraju, S. B., Kulapati Hipparagi, Gowda. C.L., Jamagandi. and Murthy, N.K., (2000).Preliminary survey on the incidence of Achatina fulica Bowdich in Davanagere District. Current Research, 29(7/8): 129.
27. Tiwari, F. (2021). Efficacy of Essential Oils from Plant Origin Molluscicides against the vector snail Lymnaea acuminata. International Journal of Food Science and Agriculture 5.4: 654-657.
28. Tiwari, F. (2022). Molluscicidal Effect of Essential Oils from Plant Origin against the Vector Snail Lymnaea acuminata Annals of Plant Sciences 11(02):4797-4801.
29. Tiwari, F., Singh DK. (2007). Toxicity of plant derived molluscicides in attractant food pellets against snail, Lymnaea acuminata. Iranian Journal of Pharmacology and Therapeutics, 6:103-107.
30. Tiwari, F., Singh, K. and Singh, D. K. (2008). Enzyme inhibition by different bait formulations in the nervous tissue of the snail Lymnaea acuminata. Chapter XIII, Environmental Pollution and Toxicology, pp 115-128. 22. 30.
31. Tiwari, F. (2012). Bait formulation toxicity of plant derived molluscicides in attractant food pellets against vector snail, Lymnaea acuminata. World Journal of Zoology, 7(1):55-59.
32. Tiwari, F. (2024). Ecofriendly management of giant African snail Achatina fulica (Bowdich). Journal of Nutrition and Food Processing, 7(4):1-4. 19. 29.
33. Tiwari, F. (2025). Molluscicidal Activity of Essential oils of Piper nigrum Against the Vector Snail of Fasciola Species. International Journal of Clinical Case Reports and Reviews, 25(3):1-4.
34. Tiwari, F. and Singh D. K. (2004). Behavioural responses of the snail Lymnaea acuminata to carbohydrates in snail attractant pellets. Naturewissenschaften, 91:378-380.
35. Tiwari, F. and Singh D. K. (2004). Attraction to amino acids by Lymnaea acuminata, the snail host of Fasciola species. Brazilian Journal of Medical and Biological Research, 3:587-590.
36. Tiwari, F. (2011). Chemoattractive effect of amino acids against Lymnaea acuminata snails. World Journal of Zoology, 6(2):117-119.
37. Tiwari, F. (2012). Bait formulation toxicity of plant derived molluscicides in attractant food pellets against vector snail, Lymnaea acuminata. World Journal of Zoology, 7(1):55-59.
38. Agarwal, R. A. and Singh, D. K. 1988. Harmful gastropods and their control. Acta Hydrochim Hydrobiol, 16: 113-138.
39. Silva, GM, Thiengo, SC, Menezes, AN, Melo, CMD and Jeraldo, VLS (2022) Relative condition factor and predictive model for the presence of the invasive snail Achatina (Lissachatina) fulica in Sergipe, Northeast Brazil. Biota Neotropica 22(2), 1–15.
40. Lima, MG, Augusto, RC, Pinheiro, J and Thiengo, SC, (2020). Physiology and immunity of the invasive giant African snail, Achatina (Lissachatina) fulica, intermediate host of Angiostrongylus cantonensis. Dev Comp Immunol. 105:103579
41. Rodrigues PS, Gomes SR, Montresor LC, Ramos-de-Souza J, Barros LA, Fernandez MA and Thiengo SC (2022). The giant African snail Achatina (Lissachatina) fulica Bowdich, 1822 as an intermediate host of Aelurostrongylus abstrusus (Railliet, 1898) in the Rio de Janeiro state, Brazil.Vet Parasitol Reg Stud Reports. 30:100712.
42. da Silva GM, Thiengo SC, de Sousa AKP, Madi RR, de Melo CM, Gomes SR and Sierpe Jeraldo (2024). Nematodes of concern to public and animal health associated with the invasive snail Achatina fulica, in Sergipe, Northeastern Brazil. VL.Vet Parasitol Reg Stud Reports. Sep;54:101096.
43. First record of a nematode Metastrongyloidea (Aelurostrongylus abstrusus larvae) in Achatina (Lissachatina) fulica (Mollusca, Achatinidae) in Brazil.
44. Thiengo SC, Fernandez MA, Torres EJ, Coelho PM, Lanfredi RM.J (2008).Invertebr Pathol. May;98(1):34-39.
45. Song L, Wang X, Yang Z, Lv Z, Wu Z.(2016).Angiostrongylus cantonensis in the vector snails Pomacea canaliculata and Achatina fulica in China: a meta-analysis. Parasitol Res. Mar;115(3):913-923.
46. Anettová L, Šipková A, Baláž V, Hambal M, Coufal R, Kačmaříková J, Vanda H, Eka Sari W, Modrý D.(2025).Hidden threats in urban environments: Angiostrongylus cantonensis in Banda Aceh's cityscape. PLoS Negl Trop Dis. Oct 30;19(10):e0013634.
47. Alogna A, Liboni A, Rizzo (2025).Evaluation of Biological Properties and Beneficial Effects for a Sustainable and Conscious Exploitation of Achatina fulica Snails R.Biology (Basel). Feb 12;14(2):190.
48. Jiang L, Li T, Jiang Y, Liu Y, Chen S, Liu H, Fang W, Zhao S, Li R, Guo Y.(2025).A cost-effective strategy for identifying Angiostrongylus spp. larvae in Achatina fulica: combined morphological and molecular biology. Parasit Vectors. Feb 9;18(1):47.
49. Chen T, Wu T, Hu Y, Zhu Z, Wu J, Lin D, Sun X, Wu Z, Li YP.(2025).Evaluation of Enrichment Approaches for the Study of the Viromes in Mollusk Species. Food Environ Virol. Jan 12;17(1):18
50. Griffin CD, Ezenwa VO, Cowie RH. (2025).Insights into the biology of the rat lungworm, Angiostrongylus cantonensis. Parasit Vectors. Apr 30;18(1):163.

DOI:10.31579/2641-0419/554