

# Ecofriendly Management of Giant African Snail (GAS) *Achatina fulica* (Bowdich)

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## Abstract:

The Giant African Snail (GAS) is a native of East Africa and. Presently the snail had infested over many areas and is becoming very difficult to control. This snail feeds on over 500 species of vegetation, and given that the Eastern Uttar Pradesh is self-sufficient in vegetable production, the burden of this pest can be a significant threat to Eastern Uttar Pradesh's domestic food security. The GAS can be considered the only agricultural polyphagous herbivorous pest which is a threat to public health since it is a known vector of the rat lungworm which causes eosinophilic meningoencephalitis in humans. The study can provide insight into the preferences for selected parts within a plant which can be incorporated into the design for more target-specific crop protection approaches. Giant African snails are an invasive, and can cause extensive damage to important food crops and other agricultural and natural resources. They eat crops, reducing yields and making them unsuitable for sale. Some snails grow to 15 cm in length and 5- 8 cm wide, whereas others only grow to 6.5 cm in length. Commonly, the shells are light brown with darker brown and cream bands. The present review evaluated that the GAS is the second worst invasive alien species in the world.

**Key words:** swine; doum palm; maize; serum; minerals; phytochemicals

## Introduction

The Giant African Snail (GAS), *Achatina* (Lissachatina) *fulica* (Bowdich) (Stylommatophora: *Achatinidae*), a native of east Africa has invaded many countries in the world and established as a polyphytophagous pest [1]. It is reported to feed on at least 500 different types of plant species [2] and is extensively studied snail of economic, ecological and medical importance [3]. *Achatina fulica* has been recorded in every continent except Antarctica and is a major crop pest across the globe [4]. It is a classic example of an introduced species and has been listed as one of the world's 100 most invasive species by the International Union for Conservation of Nature and Natural resources (IUCN). The giant African snail has gained attention due to its large size, supposed medicinal properties and its potential as human or animal food source and its success as an introduced species is attributed to several factors viz., high reproductive capacity, voracious feeding habit, inadequate quarantine arrangements and human aided dispersal *Achatina fulica* is related to environmental, economic, urban, and public health problems. The environmental impact is because these mollusks have clustering behavior, without dietary requirements, competing directly with native mollusks [5]. Direct competition for space and food can have negative impacts and can cause the extinction of native species. In addition, the absence of dietary requirements leads to an economic impact due to the rapid and voracious destruction of crops and gardens [6].

In India, it was believed to have been introduced in Chouringhie gardens of Calcutta in 1847 by the British Conchologist William Henry Benson and from there on spread to many states of the country in course of time [7]. The Giant African Snail (*Achatina fulica* Bowdich, 1822) promotes substantial ecological and economic impacts in areas where it has been introduced [8]. This snail is one of the most destructive pests affecting subtropical, and tropical areas, causing large damages to farms, commercial plantations and domestic gardens. It can also be found on trees, decaying material in decomposition and next to garbage deposits. Furthermore, *Achatina fulica* could be an intermediate host of *Angiostrongylus consaricencis* the etiological agent of abdominal angiostrongylosis, and its dispersion could imply a possible risk of transmission of this disease [9].

One of the most important factors for the establishment and dispersion of *Achatina fulica* is human presence. In general, this snail is most abundant in sites with high human density. Another important factor that may condition *Achatina fulica* population dynamics, growth rate, survival and fecundity is food preference. *Achatinidae* species are generally regarded as herbivorous, feeding primarily on vascular plants. Previous studies support that *Achatina fulica* is an important agricultural plague and causes

substantial environmental loss [10]. However, most of these studies deal with agricultural plant species.

Physical, biological and chemical strategies have been used to eradicate and manage *Achatina fulica* populations. Physical control strategies were used to collect and destruct snails and their eggs. Invertebrate predators of terrestrial gastropods have also been used for biological control of *Achatina fulica*. Finally, a large number of toxicants have been used against *A. fulica*. It has been widely documented that giant African snail *Achatina fulica* is well-adapted and distributed around the world [11].

In India, *Achatina fulica* perhaps first arrived in the beginning of the century. During the last fifty years it has moved to the north east states of India from where it is migrating eastwards. At present it has become established as Agri-horticultural pest in nearly all North Eastern states (i.e. Assam, North Bihar, Manipur, Meghalaya, Nagaland, Orissa, Tripura, West Bengal) of India and certain pockets in Western and South India. Central India is free from this snails. Highest population density 42 snails/meter square has been recorded in Port Blair [12].

The Giant African Snail (*Achatina fulica*) has now invaded the Eastern Uttar Pradesh. In 1993, certain pockets of *Achatina fulica* was observed in Lucknow, Muradabad in UP and Narain Ghat in Nepal. According to different observations this snail is now migrated in the different part of eastern UP i.e. Gorakhpur, Deoria, Kushinagar and Mahrajganj districts. It has been observed that in Burgo area of Gorakhpur, the population density of this snail in month of September 2022 to November 2022 was 25-28 snails/meter square. In Deoria district, its population density was in between 22-26 snails / meter square. Maximum infestation of this pest was observed in Kushinagar district. In Ramkola town its population density was 30-35 snails / meter square. In Mahrajganj district it was 26-28 snails/meter square. This population density is alarming. If effective control measures will not be taken, it will cause havoc in the agriculture based economy of eastern Uttar Pradesh [13].

In month of July to November, *Achatina fulica* causes heavy harms in vegetable fields. The giant African snail *Achatina fulica*, because of its voracious appetite and the speed with which it spreads, is considered to be most dreaded terrestrial gastropod in the tropics and subtropics. This snail can travel a 50 meter distance overnight and grazes the Agri-horticulture field. It is a nocturnal and voracious Agri-horticulture pest. Its active period starts from July onward to December last, and rest part of the time, it aestivate. In active period, *Achatina fulica* cause great damage to cabbage (*Brassica oleracea* var. *capitata*), bitter melon (*Momordica charantia*), cauliflower (*Brassica oleracea* var. *botrytis*), ghia torai (*Luffa cylindrical*), chilli (*Capsicum annuum*), annona (*Annona squamosa*), guava (*Psidium guava*), banana (*Musa sapientum*), lady's finger (*Hibiscus esculentus*), papaya (*Carica papaya*), citrus (*Citrus limon*), maize (*Zea mays*), croton (*Croton riglium*), tomato (*Lycopersicon esculentum*) and various types leafy vegetables and paddy crops. It has been reported the name of 85 vegetable and ornamental plants which is damaged by *Achatina fulica* [14]. The giant African snail prefer vegetables and garden plants but in wild areas where crops and garden plants are not grown, they thrive equally well on wild plants.

Although the giant African snail *Achatina fulica* is a serious agri-horticulture pest in India for more than six decades only few reports are available on its control and economic status. *Achatina fulica* lay eggs usually after 20 days of mating. A pair of snail produced nearly 300 snails per year. The life span of a snail is 5-6 years, depending upon the environmental conditions (temperature, humidity etc.)

## 2. Invasion and General Features of *Achatina fulica*

The giant African snail *Achatina fulica* Bowdich (1922) (*Achatinidae*) has been originated from East Africa. An oviparous hermaphrodite matures at between 5-8 months, can reach 15 cm in length, and lay an average of a thousand of eggs during its life time. The giant African snail *Achatina*, because of its voracious appetite and the speed with which it spreads, is considered to be the most dreaded terrestrial gastropod in the tropics and subtropics. *Achatina fulica* attacks hundreds of different plant species and eats dead plants as well as living ones. This snail eats the leaves and fruits of plant under cultivation in fields and garden. It destroys paddy and prefers commercial plants of the family cruciferae, leguminosae and cucurbitaceae along with mulberry and tea.

## 3. 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 fresh water snails are the vector of digenean 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 500 million 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* [15].

## 4. Discussion

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. 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.

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 habitation. A number of mechanical methods to prevent gastropod damage have been used with more or less positive results in different parts of the world.

In biological control there are several organisms which are predator of destructive snails. A predatory millipede *Orthomorpha* sp. Is found to predate on the giant African snail *Achatina fulica* [16]. 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 [17].

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 biomagnification 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 thirty plant products have been reported as potent molluscicides, which has been used against harmful snails such as *Lymnaea acuminata*, *Indoplanorbis exustus* and *Achatina fulica* [18-20].

## Conclusion

From the above review it can be in controlling the giant African snail *Achatina fulica* snail population through which the economic loss can be reduced. The lively hood of many of the farmers of Uttar Pradesh especially in eastern Uttar Pradesh totally depend on vegetable crops and in actual the giant African snail *Achatina fulica* destroys many of the vegetable crops. The above study definitely help in reducing the population of giant African snail *Achatina fulica*.

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