Biolife AN INTERNATIONAL QUARTERLY JOURNAL OF BIOLOGY & LIFE SCIENCES 4(1):184-188

ISSN (online): 2320-4257
www.biolifejournal.com

BIOLIFE RESEARCH ARTICLE

Giant African Snail, *Achatina fulica* Bowdich a destructive pest of V1 mulberry (*Morus alba* L.) by - A new report and control strategies from Kolhapur, Maharashtra, India

Jadhav, A. D[1]., Dubal, R.S[2]*., Bagade R. P[3]., Sanadi Reshma A[4]., Kamble, P.L[5]. Belgumpe S[6]. and Sathe, T.V[7]

[1,3-7] *Department of Zoology, Shivaji University, Kolhapur – 416 004, India.*
[2]*Y C Institute of Science, Satara, Maharashtra*

*Email: dradjadhav@yahoo.co.in

ABSTRACT

In recent years during the routine visits to sericulture farmers of Kolhapur district, it was observed that the mulberry gardens were damaged by Giant African Snail (*Achatina fulica*) leading to drastic reduction in mulberry leaf yield ranging from 40-50 percent. Though the incidence was observed throughout the year, higher activity was noticed in rainy season with cloudy environment and also in flood irrigated garden with practice of composting mulberry waste in mulberry than the drip irrigated .It was the biggest land snail among snail species having a protective shell and measuring about 25cm in length. Giant African Snail (GAS) is one of the world's largest and most damaging land snail pests. The Global Invasive Species Database has included this snail is among the "100 World's Worst" invaders.In order to investigate the level of snail infestation and assess the snail damage, a survey was undertaken in Yalgud and surrounding villages of Kagal taluk from Kolhapur district. The survey was undertaken during July 2012 to August 2014 on every 10 days to study infestation and occurrence. Farmers were interviewed to obtain feedback on the problem and snail specimens were collected to ascertain the species. Based on the data collected from the farmers and actual visits in present study it was observed that, the snail population is spreading from field to field throughout the village. Leaves of mulberry plants (*Morus sp.)* were damaged by snails on large scale 40-50 percent and instances of 100 percent spoiling of the foliage was also noticed with some of the farmers which has given setback for continuing sericulture activities and undue fear among the other sericulturists of the district . The main reason of loss in cocoon crop was due to discomforts silkworms to feed the slime smeared leaves by the crawling snails and their waste on leaves. It was noticed the snails surge in large numbers at dusk, and take refuge in to their hideouts to escape desiccation in day in the adjacent quarry stones piled with soil . Large aggregations of adult snails A. *fulica* was noticed at the base of mulberry (*M. alba*) V1 variety plants, on shoot and leaves. Besides mulberry in other commercial crops about 10 to 20 percent damage was also observed particularly in groundnut (*Arachis hypogea)* and French beans (*Phaseolus vulgaris*) as these crops were adjoining to mulberry garden. It is to noteworthy that, the environmental conditions of Kolhapur district were conducive for growth of mulberry and commercial rearing of *B. mori* L. Temperature in summer rises up to 40°C in April-May months (summer season) and 24-30 Celsius during rainy where as it comes down to 14°C in winter season. On an average 700 mm rainfall and an average humidity of 60% was noticed in the district. Since many years, sericulture is practiced by many farmers crop and found to be profitable. The V1 variety of mulberry was popular among the farmers as gave high productivity and quality in silk. However, environmental factors found to be promoting large scale multiplication spread of snails in mulberry which was harmful by reducing mulberry leaf yield and quality and in turn economical loss to sericulturists. The present study will provide an account of all future management measures to be designed for effective control of A. *fulica* in different cropping ecosystems of this area. It seems that, recommending an integrated approach involving (IPM) cultural, mechanical, chemical and biological methods is necessary to control the impact of the snail population in mulberry.

Keywords; Snail pest, *A. fulica,* mulberry, IPM

INTRODUCTION

Giant African Snail (GAS) *Achatina fulica* (Bowdich) (Stylommatophora: Achatinidae) is one of the world's largest and most damaging land snail pests. The Global Invasive Species Database has included this snail is among the "100 World's Worst" invaders. It is non-host specific and can consume at least 500 different types of plants, including breadfruit, cassava, cocoa, papaya, peanut, mulberry and most varieties of beans, peas, cucumber and melon (Prasad *et al.,* 2004). The snail is native to coastal East Africa, but is now widespread throughout the World except Antarctica. It is highly adaptive to a wide range of environmental conditions and is capable of modifying its life cycle to suit local conditions. GAS is a threat to the sustainability of crop systems and native ecosystems, has a negative impact on native fauna, and acts as a vector of human diseases also. The giant African snail, a native of east Africa has invaded many countries in the world and established as a polyphytophagous pest .It is reported to feed on at least 500 different types of plant species (Capinera, 2011) and is extensively studied snail of economic, ecological and medical importance (M. Jayashankar *et al.,* 2013). The introduction of Giant African Snail outside its native range dates back to the early 1800s, when it spread to Ethiopia, Somalia, Mozambique and Madagascar. The first occurrence outside Africa was in West Bengal (India) through Mauritius in 1847 (M. Jayashankar *et al.,* 2013). GAS is commonly found in countries with a tropical warm, humid climate. The species occurs in agricultural areas, coastal areas and wetlands, disturbed areas, natural and planted forests, riparian zones, scrublands, shrub lands and urban areas. The snail also thrives in forest edges, modified forest, and plantation habitats. The snail prefers hot lowlands and the warm temperate lower slopes of the mountains. It needs temperatures well above freezing year-round and high humidity at least during part of the year; the drier months are spent in dormant aestivation. GAS remains active at a temperature range of 9 to 29°C, and survives temperatures of 2°C by hibernation and 30°C by aestivation. It is killed by sunshine. Review of literature indicates that several workers (Sathe, 1998, Jadhav & Sathe 2001, Jadhav et al., 2013, 2016, Sathe *et al.,* 2014 etc.,) worked on pest management of mulberry.

MATERIAL AND METHODS

In order to investigate the level of snail infestation and assess the snail damage, a survey was undertaken in Yalgud village in Kagal taluk of Kolhapur district, India. The survey and field observations were undertaken during July 2013 to August 2014 on every 10 days collection of eggs, different stages of snails during morning and evening hours and observations were made for further study. Farmers were interviewed to obtain feedback on the problem and snails were collected to ascertain the species. Based on the data collected from the farmers, it was noticed that, the snail population was spreading from field to field throughout the village ever since its introduction four years ago *i.e.,* during 2009.

RESULTS & DISCUSSION

Results are recorded in figure 1 to 6.Mulberry variety V1 (*M. alba*) is popular among the farmers of Kolhapur district as it is highly productive as far as productivity and quality of leaves is concerned. In recent days it was noticed that, mulberry gardens in Kolhapur district were damaged by Giant African Snail leading to reduction in mulberry leaf yield up to 30-40%. In present study, about 10 to 20 per cent damage was also observed in groundnut (*Arachis hypogea* L.) and French beans (*Phaseolus vulgaris* L.) (Jadhav, et *al*., 2013). It was the biggest land snail among snail species having a protective shell and measuring even about 22cm in length (Jadhav, *et al.,* 2013). Adults of *A. fulica* were large enough easy to handpicking them from resting sites (garbage, weeds and house refuse) in the evening and the morning was crucial for managing the snails (Sharma and Agarwal,1989; Shah, 1992). The giant African snail has gained attention due to its large size, supposed medicinal properties and its potential as human or animal food source (Mead, 1979; Raut and Barker, 2002). In order to investigate the level of snail infestation and assess the snail damage, a survey was undertaken in Yalgud and surrounding villages of Kagal taluk from Kolhapur district during July 2012 to August 2014 on every 10 days. Farmers were interviewed to obtain feedback on the problem and snail specimens were collected to ascertain the species. Based on the data collected from the farmers, and actual visits it was observed that, the snail population was spreading from field to field throughout the village. Leaves of Mulberry plants (*Morus sp.)* were damaged by snails on large scale instances of 100 percent spoiling of the foliage with some farmers which has given setback for continuing sericulture activities and undue fear among the other sericulturists of the district . This was mainly due the reason that silk worms were discouraged to feed the slime smeared leaves by the crawling snails and their waste on leaves. The snails surge in large numbers was at dusk, and took refuge in to their hideouts to escape desiccation in day in the adjacent quarry stones piled with soil .Aggregations of adult snails were located at the base of mulberry plants. It was observed that, snail was very active during rainy season, particularly in cloudy environment and nocturnal in habitat and also observed that it damages many crops like papaya, areca nut, marigold, brinjal, beans, leafy vegetables etc., including mulberry. During day time they hide below fallen leaves under the mulberry plants and come out during night time and defoliate mulberry plants. It was prominently noticed that, snail feed on sprouting new buds of mulberry after pruning , tender leaves, shoots, petiole, tender bark and

stem. Frequently climb on the plants and toward clinging to the leaf surface from down side. The infested leaves showed signs of circular holes in the centre as damage to mulberry. During several infestations mulberry plant was stunted by growth. In present study it was observed that being a hermaphrodite snails laid light yellow soybean seed shaped eggs in small groups of 70- 200 number in the soil surface or nearby mulberry stem surrounded by mucous substance beneath it. Hatching took place in a week time and the young ones spread on mulberry plants and other crops grown up to a year and reach sexual maturity and repeated cycle. Snails hatched towards the end of rainy seasons and took a long time to mature as they undergo hibernation and aestivation. Hatched snails became matured adults within 6 to 12 months and remain fertile for 400 days. Snail female laid up to 100 and 500 eggs during the first and second years, respectively. However, the fertility rate was declined after the second year. Giant African snails were survived to 5 years, yielding a total of 1,000 eggs (Raut and Barker, 2002).

It was difficult to control snails by chemicals in mulberry as compared to other agricultural farming systems as since mulberry leaves are to be feed to silkworm in turn to get good quality cocoon crop .Lots of limitations are faced by farmers for chemical control of snails particularly when silkworm crop was under way go as silkworm may get poisoned. Hence, for snail management practices at farmer's level were situation dependent infestation of the snail. Farmers in the village had resorted to different strategies, including cultural, mechanical and chemical methods. The farmers have been informed that hand collection and burying the collected snails in soil or burning them was the easiest and long lasting control. It's a part of biological control by Birds particularly hen /chicken helped to remove eggs, early stages snails. A better control was against matured snails by damaging their shell by birds. Above operations found more effective to check snail escape and thereby to facilitate their spread, hence farmers were advised to adopt these practices regularly. Deep ploughing helped in exposing snails and their egg masses to natural mortality factors. Locate hiding places and destroy hiding snails. Handpicking, involving a considerable labour expense was found to be very effective in commercial nurseries in Bangalore south taluk (Jayashankar *et al.,* 2009, 2010).After a series of trial and error combinations to devise a effective management measure, mechanical control, hand collection and destruction during early phase of infestation, cut pieces of papaya stems can be placed for attracting and trapping the snails. Use wet gunny bags, coconut thatches, papaya leaves as bait to congregate them and destroy by immersing in 25% salt solution .Chemical control; Sprinkling lime and bleaching powder (5:0.5) surrounding plants and other hiding places , around the mulberry plot borders for

Figure-1. Field photos of *A. fulica* infestation in mulberry from Kolhapur district Maharashtra, India.

a. Snail Eggs

b. Newly developed young snails

c. Damage to groundnut

d. Snail population on *M. alba*

prevention of snail migration from one plot to another was checked. Common crystal salt was spread in the paths of snails and also in the infested area. Utility of different dosage of metaldehyde was reported by different workers in different horticulture ecosystems. Sharma and Agarwal (1989) reported 5 % metaldehyde pellets at 25 kg/ha to manage the snails and Basavaraju *et al.,* (2000) reported 2.5% metaldehyde pellets as an effective dose to control the snail occurring on betel vine (*Piperbetle*) in Karnataka during kharif under lab condition. Basavaraju *et al.,* (2001), found metaldehyde pellets as most effective against *A. fulica*, compared to methomyl and carbofuran.

Figure-2. Adult snails on pruned mulberry

Figure-3. Control by collection and burning

In present study we advised the farmers to use bran bait (Rice bran + Jaggery + methomyl) in the ratio of 60:6:1 in acre plantation area and found to be very effective against snail control. However, any chemical control has to be used with more care as mulberry shoot and personnel contact with chemical bait may lead poisoning to silkworms in rearing results in crop loss. Hence, a judicial use of IPM strategies are required to apply for effective check of *A. fulica* in mulberry.

Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

References

[1]. Capinera, J. L. ENY-512 (IN904), Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida 2011.

[2]. Basavaraju, B. S. Kulapati Hipparagi Chinnamadegowda, C. and Krishnamurthy, N. Management of giant African snail in betelvine garden. *Current Research*, **30** (7/8): 116-118. 2001.

[3]. Basavaraju, S. B., Kulapati Hipparagi, Gowda. C.L., Jamagandi. and Murthy, N.K. Preliminary survey on the incidence of *Achatina fulica* Bowdich in Davanagere District. *Current Research*, **29**(7/8): 129. 2000.

[4]. Jadhav, A.D. Yankanchi, S.R and Bhoite, A.S. Infestation of Mulberry by snails in Kolhapur district of Maharshtra .Agrowon. P.11. 2013.

[5]. Jadhav, A.D.,Yankanchi, S.R and Bhoite, A.S. Management of snails in Mulberry. Agrowon.P.9. 2013.

[6]. Jayashankar, M., Reddy, M.S. and Shakuntala, K. Population estimate of the GiantAfrican Snail, *Achatina fulica* (Bowdich) in a medicinal plants nursery of Jnana Bharathi Bangalore University Campus, Bangalore. 2009.

[7]. Jayashankar,M.,Veeresh G.K., Rajagopal D. and Reddy,M.S. Evaluation of management strategies of the global pest, giant African snail *Achatina fulica* (Bowdich).*Proceedings of the International conference on environment, agriculture and food security in India.*180-186, 2010.

[8]. Jayashankar, M. Distribution, ecology and behaviour of the giant African snail, *Achatina fulica* (Bowdich) in and around Bangalore. Ph.D thesis submitted to Bangalore University. 2011.

[9]. M. Jayashankar, V. Sridhari and Abraham Verghese.Management of the giant African snail, *Achatina fulica* (Bowdich), (Stylommatophora: Achatinidae) in India. Pest Management in Horticultural Ecosystems, Vol. 19, No. 1 pp 1-9. 2013.

[10]. Mead, A.R. 1979. Economic malacology with particular reference to *Achatina fulica*. In: Fretter, V. and Peake, J.(eds.) Pulmonates, 2B. Academic Press, London, 150.

[11]. Raut, S. K. and Barker, G.M. *Achatina fulica* Bowdich and other Achatinidae as Pests in Tropical Agriculture. In: Barker G.M (eds.), Mollusc as Crop pests. CABI Publishing, Wallingford: 55-114. 2002.

[12]. Sathe, T.V. Sericulture crop protection. Asawari publication, Osmanabad,1-120,1998.

[13]. Sathe, T.V. and Jadhav A.D. Sericulture and Pest Management. Daya publishing house, New Delhi, Pp-1-197,2001.
[14]. Sathe, T.V., Jadhav, B.V., Desai, A.S., Shendage, Nilam, Kamble, Chandani and Jadhav, A.D. Ecology, ethology and control of green stink bug Plautia affinis Dallas (Hemiptera: Pentatomidae) on mulberry Morus alba l. Varieties V-1 and M- 5 from Kolhapur.Biolife,2(4).1332-1338;2014.
[15]. Shah, N. K. Management of the giant African snail. *Indian Farming*, **41**(11): 21. 1992.
[16]. Sharma, D. D. and Agarwal, M. L. Save your crops from giant African snail. *Indian Farming*, **38**(12): 15, 22. 1989.
[17]. A. D. Jadhav and T. V. Sathe. Host preference by Uzifly *Exorista bombycis* L. in pure line bivoltine breeds FC1 and FC2 (*Bombyx mori* L.) and Economical loss in seed cocoon production. Biolife, 4(1), pp 88-93. 2016.

How to Site This Article:
Jadhav, A. D., Dubal, R.S., Bagade R. P., Sanadi Reshma A., Kamble, P.L. Belgumpe S. and Sathe, T.V (2016). Giant African Snail, *Achatina fulica* Bowdich a destructive pest of V1 mulberry (*Morus alba* L.) by - A new report and control strategies from Kolhapur, Maharashtra, India. *Biolife*, 4(1), pp 184-188. doi:10.17812/blj.2016.4126

Published online: 28 February 2016