



E-ISSN: 2278-4136

P-ISSN: 2349-8234

[www.phytojournal.com](http://www.phytojournal.com)

JPP 2021; 10(5): 313-315

Received: 18-07-2021

Accepted: 20-08-2021

**Ashish Kumar**Department of Agricultural  
Entomology, IGKV, Raipur,  
Chhattisgarh, India**Ganguli JL**Department of Agricultural  
Entomology, IGKV, Raipur,  
Chhattisgarh, India**Rashmi Gauraha**Department of Agricultural  
Entomology, IGKV, Raipur,  
Chhattisgarh, India

## Studies on life cycle of giant African snails *Achatina fulica* under laboratory condition at Raipur, Chhattisgarh

**Ashish Kumar, Ganguli JL and Rashmi Gauraha**

**Abstract**

The present investigation entitled “Studies on life cycle of Giant African snails *Achatina fulica* under laboratory condition at Raipur, Chhattisgarh was conducted in the Bio-control laboratory, Department of Entomology, IGKV, Raipur, Chhattisgarh during 2019-20.

Studies on the life cycle details of the giant African snail, *A. fulica* depicted that egg clutches contained an average of 150 eggs/clutches and the mean size of the eggs was 4.66 mm in length and 2.50 mm in width. The incubation period was of 7-8 days. The eggs were laid in depth of 6 to 8 cm below soil and in plastic tub under laboratory conditions. The freshly laid eggs were yellow and before hatching it turned lighter in color. The average size of the newly hatched snails (hatchlings) was 4.92 mm in length and 3.81 mm in width. The mortality rate was 2 to 3% in sample of 30 snails in 24 hrs under laboratory conditions. There were three juvenile stages viz. J1, J2 and J3. Total development from egg to adult stage was of 150-160 days, and the adult longevity of 2-3 years.

**Keywords:** Life cycle, mollusc

**Introduction**

The giant African snail (GAS), *Achatina fulica* Bowdich 1982 belongs to phylum: Mollusca. The pest is popularly called as the giant African snail because of its big size and nativity. Snails belong to phylum Mollusca which is the second largest phylum of the animal kingdom, forming a major part of the world fauna (Serb and Lydeard, 2003) [1]. Gastropoda is the only class of Molluscs which have successfully invaded land. Within modern India's boundaries 1129 species belonging to 140 genera and 26 families of land snails have been recorded (Ramakrishna *et al.*, 2010). The information regarding the incidence of molluscs pests in forest and horticulture nurseries are lacking. *A. fulica* is highly invasive, and large colonies of land snails can be formed from just a pair of individual snails (Thomsen, 1980). The snail is native to humid areas of the east coast of Africa but is prevalent in different ecological setups including in agricultural farms, coastal land, natural forests, planted forests, shrub lands, urban areas and wetlands (Mead, 1973). *A. fulica* is a principal pest of numerous economically crucial crops grown in Samoa, which includes cocoa, banana, crucifer vegetables, eggplant, bael and papaya.

It is known for its destructive nature on cultivated plants wherever it occurs and is one of the world's largest and most damaging land snail pests and considered as the most widely introduced land snail species (Thiengo *et al.* 2007). Some snails hibernate during the winter (typically October through April in the Northern Hemisphere). They may also aestivate in summer in drought conditions. To stay moist during hibernation, a snail seals its shell opening with a dry layer of mucus called an epiphragm. As the snail grows, so does its calcium carbonate shell. The shell grows additively, by the addition of new calcium carbonate, which is secreted by glands located in the snail's mantle.

Estimates of costs to agricultural production associated with infestation by *A. fulica* are exceedingly scarce. Mead (1979a) [2] argues that damage is characteristically localized and restricted to vegetable and flower gardens and that both the popular and scientific media have greatly exaggerated it. He expressed the opinion that the sheer numbers of snails, their slime trails, their excreta and even their decaying corpses have led observers to overestimate the threat to agriculture. Mead (1979a) [2] stated estimates of costs to agricultural production associated with infestation by *A. fulica* are exceedingly scarce. *A. fulica* also host parasitic organisms like the rat lungworm and can cause severe illness and diseases in humans if they are consumed. The giant African land snail, *A. (Lissachatina) fulica*, is considered by some to be one of the most damaging snails in the world.

**Corresponding Author:****Ashish Kumar**Department of Agricultural  
Entomology, IGKV, Raipur,  
Chhattisgarh, India

Despite its documented ability to feed on hundreds of different plants, giant African snail can be expected to do most damage to vegetables, flowers and other ornamental plants, and to annual weeds. However, any succulent plant is at risk, particularly seedlings. The need to change cropping practices or to control these snails once they establish creates additional economic burdens.

### Material and Methods

Matured giant African snails were collected from the Horticulture nursery during November-December (2019-20) and reared under laboratory conditions in the Bio-control laboratory. They were kept plastic tub (Diameter 12 inch, height 6 inch) with soil conditions a mixture of sand, red soil and black soil.

The culture was maintained at 23 °C to 28 °C and 80-90% R.H. throughout the experiment. The mortality rate, egg laying (total number of eggs laid) and hatching was recorded. All the studies on the life-cycle of the giant African snail were done by providing the most preferred food.

The adult snails were released in plastic tubs. Number of eggs laid and incubation period were recorded. Details of various developmental stages along with their biometrics and longevity were also recorded.

### Reproductive biology of *A. fulica*

Mature snails were collected from the field and were acclimatized under laboratory conditions and were kept in the plastic tubs having sterilized soil. The tubs were placed in incubators set at 25 °C. Relative humidity of more than 80% was maintained throughout the rearing period. The mating behavior was observed and the eggs were counted and their size were recorded help of digital Vernier callipers. The eggs were removed gently from the plastic tubs and placed in petri dishes containing sterilized soil. They were allowed to hatch and develop. The development of the snail from egg to adult was categorized into the following stages: The time taken for the development egg to adult was recorded as mentioned in Table 1.

**Table 1:** Different life stages of (*A. fulica*)

S.N.	Developmental stages <i>A. fulica</i>	Total mean duration (in days)
1.	Mean number of eggs laid/ clutches	150 eggs
2.	Eggs (incubation period)	7-8
3.	J1 (one ring develops)	25-30
4.	J2 (two ring develops)	33-40
5.	J3 (three ring develops)	44-48
6.	Adults (Six to seven ring develops)	65-70
7.	Total duration of development	150-160
8.	Longevity	2-3 years

Mean number of eggs laid by the giant African snail, *A. fulica* were recorded 150 eggs/clutches. Incubation period was ranged from 7-10 days. Giant African snail passed through three juveniles stage (J1, J2, J3) based on the number of ring development and their developmental period was 25-30, 33-40, 44-48 respectively. Identification marks of the adult giant African snail was recognized by development of 6-7 rings on the shell. Adult period ranged from 65-70 days. Total duration of life cycle were 150-160 days and longevity were recorded 2-3 years.



**A:** Eggs of Giant African Snail (*Achatina fulica*)



**B:** Newly hatched (hatchlings) Giant African Snail (*Achatina fulica*)



**C:** Life cycle of Giant African Snail (*Achatina fulica*)

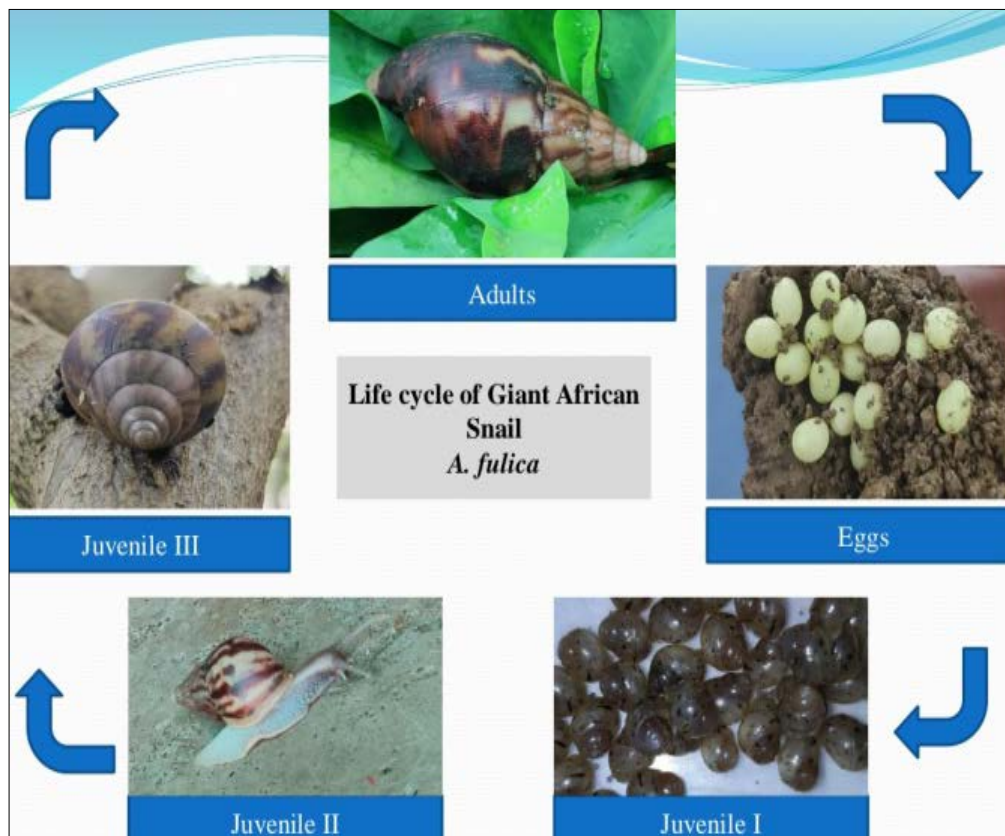
**Fig 1.**

### Result and discussion

Mature giant African snails were collected during November – December (2019-20) and reared under laboratory conditions in the Bio-control laboratory, College of Agriculture, IGKV, Raipur. They were kept under two different conditions. One group was kept in glass jar containing a mixture of (sand, red soil, black soil) and the second group was kept in plastic tub (Diameter 13 inch, height 6 inch) with similar soil content. The culture was maintained at 23 °C to 28 °C and 80-90% R.H. throughout the experimental period.

The egg laying *ie* number of eggs laid, and percentage of hatching and egg mortality rate were recorded and it was found that maximum egg laying was found to be 150±20 eggs per snail.

The mean sizes of the eggs were 2.50 mm in width and 4.66 mm. in length. The incubation period was of 7-8 days. The eggs were laid at a depth of 6 to 8 cm in plastic tub. The colors of eggs were yellow just after egg laying and before hatching it turned light yellow in color. The average size of newly hatched snails was 3.81 mm in width and 4.92 mm in length. The mortality rate was 2 to 3% in sample of 30 snails in 24 hrs.



**Fig 2:** Life cycle of giant African snail (*A. fulica*)

Upatham *et al.* (1988)<sup>[7]</sup> studied the life cycle of *A. fulica* and observed that egg clutches contains 80-100 eggs and the incubation period was 7-10 days which is in agreement with the present studies.

Similarly, Pawson *et al.* (1984) studied the life-cycle, growth characteristics and reproductive activity of *A. fulica* in laboratory culture and reported that egg clutches contain 100-200 eggs which is also in match with the present studies. The range of incubation times was 1-25 days, due to a variable degree of ovoviviparity exhibited by the snail in also line with the present results.

### Conclusion

In the life cycle studies on the giant African snail, *A. fulica*, revealed that, the mean width and length of the egg was 2.50 mm and 4.66 mm respectively. The mean incubation period was of 7-8 days and the eggs were laid at a depth of 6 to 8 cms under soil. The colour of the eggs were yellow initially, *i.e* just after egg laying and before hatching it turned light yellow. The average size of the newly hatched snail s (hatchling) was 3.81 mm in width and 4.92 mm in length and the mortality rate was observed to be 2 to 3% in a sample of 30 snails in 24 hrs.

The color of eggs were yellow just after egg laying and before hatching it turned light yellow in color. The average size of newly hatched snail (hatchling) was 3.81 mm in width and 4.92 mm in length. The mortality rate was 2 to 3% in sample of 30 snails in 24 hrs.

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