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Distribution and Feeding Preference of Giant African snail *Lissachatina fulica* (Bowdich 1820) in Dakshina Kannada District of Karnataka

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***Abstract*:** *Lissachatina fulica* is a polyphytophagous pest effecting native biodiversity and agricultural crops. Considering this the distribution and feeding preferences of *Lissachatina fulica* in three sites of Karnataka state was observed. The snails were fed with leaves of commonly available garden plants like *Areca catechu, Basella alba, Carica papaya, Piper betel* and their consumption was recorded. Abundance of *Lissachatina fulica* was more in Arecanut plantation (68 snails/quadrate), followed by home gardens and least in river bank. Among the single types of plant leaves and combination of leaves of provided to check the preferential plants for feeding, consumption of *Areca catechu, Hibiscus rosa-sinensis, Musa parasidisiaca, Carica papaya, Basella alba* was maximum than the other plants. The abundance of these plants in the selected sites was observed and snails were found actively feeding on these plants. Thus, abundance of *Lissachatina fulica* in Dakshina Kannada district could be attributed to the presence of these plants for feeding. However, plants preferred by Gaint African snails can be good baits to trap these snails, aiding in pest control and crop protection. The thorough comprehension of the feeding behaviour relating to the crop types can enable targeted crop protection strategies such as precision-based crop protection approaches.

Keywords: Giant African snail, *Lissachatina fulica* (Bowdich 1820), Feeding behaviour, Achatinidae

The Giant African snail, *Lissachatina fulica* (Bowdich 1820) is a Gastropod mollusc belonging to the family Achatinidae. It is a native of east Africa, has invaded many countries in the world and established as a polyphytophagous pest (Raut and Barker 2002). It is the largest land snail in the world and is known for its destructive nature on cultivated plants (Jayashanker et al., 2013). This herbivore does not discriminate between living or dead plant matters. It feeds on more than 500 types of plants, including those farmed by humans (D'Souza and Shenoy 2024). These snails are carriers of *Angiostrongylus cantonensis*, a rat lungworm, causing meningitis in humans (Prashad et al., 2004). African land snails established as a pest in areca ecosystem of Shimoga, Karnataka (Ravikumara et al,. 2007). Distribution records on Giant African snail in Karnataka in general and Dakshina Kannada in particular are limited and feeding habits are not observed. Although this snail is voracious feeder, having faster multiplication capacity, their distribution accordant with the availability of host plants for feeding is not known. Due to prolific breeding and hard protective shell, the control of this pest is difficult. Hence, the present study is designed to know the distribution of Giant African snails in Dakshina Kannada district and its feeding preferences.

MATERIAL AND METHODS

Study area: The three sites viz. home garden of Kanchana village (12°45'5.00"N, 75°12'48.15"E), arecanut plantation of Savanoor (12°44'37.52"N, 75°18'27.93"E), Uppinangady river bank (12°50'27.28"N, 75°14'54.94"E) of Dakshina Kannada district were selected and visited on monthly basis from August-December 2020. The snails were collected using quadrates (50cm x 50cm) and by handpicking, and abundance was noted.

The collected Giant African snails (GAS) were placed into well-ventilated plastic container. The base of the container filled with soil for burrowing and maintaining relative humidity and snails were acclimatized to the laboratory conditions. Prior to the experiment the snails were starved for 24 hours to ensure that the snails would have been motivated to search for food by hunger. The leaves of the different plants were used for the study (Table 1). These leaves were selected on which snail was actively feeding in field. The weeds such as *Chromolaena odorata, Crotolaria juncea, Lantena camera* are also included to examine the polyphytophagous nature of the Giant African snail beyond the consumption of cultivated crops. The leaves were cut into square shape so that total area of each leaf piece was 125sq.cm. Five leaf pieces of each plant were offered for the individual leaf feeding experiment.

Based on the feeding ability of GAS on single plant species and combination of plant leaves offered to check their preference for food. In the combined leaf feeding experiment, four kinds of leaves were used in each set of experiment (Table 1). The most fed plant leaves in the individual feeding experiments were offered with the leaves

of least fed plant species. The leaf pieces of equal size were kept at each corner of the container Then the snails were transferred to the experimental container and allowed to starve and acclimatised. The containers were kept undisturbed for 8 hours. After 8 hours the snails were removed from the container and the remaining leaf pieces were measured and their area fed was calculated.

RESULTS AND DISCUSSION

Lissachatina fulica was mainly abundant in the arecanut plantation in Savanoor. Abundance of *Lissachatina fulica* was observed in August (68 snails/quadrate) in all the sites and decreased thereafter (Table 2). The abundance was more in arecanut plantation (Savanoor), then in home garden (Kanchana Village) and least in the river bank.

The Gaint African Snail preferred plants viz. *Areca catechu, Hibiscus rosa-sinensis*, *Carica papaya, Crotolaria juncea, Chromolaena odorata, Musa paradisiaca, Basella alba.* This preference could be due the attraction of Gaint African snail to the odour and increased palatability. The least preferred leaves for food were *Piper beetle, Jasminium sp, Hevea brasiliensis, Piper nigrum, Prunus dulcis, Coffea arabica, Theobroma cacoa, Mussaenda erythrophylla* (Fig. 1). Least preference is due to the repellent properties of plants because of their chemical nature.

Second set of experiment, the snails consumed *Piper betel* (20%) and *Coffea arabica* (21%). Snails did not feed on *Jasminium sp.* and *Theobroma cacoa.* The snails consumed *Mussaenda erythrophylla* (19%) and *Coffea Arabica* (22%) were preferred over *Hevea brasiliensis* and *Theobroma cacoa* (Table 3).

In the fourth set of experiments the snails completely fed the *Carica papaya, Hibiscus rosa-sinensis* leaves *Cucurbita pepo* was preferred in less amount whereas leaf pieces *Solanum lycopersicum* was not eaten. In the fifth set of experiments *Crotolaria juncea* was highly consumed (40 sq. cm) than the *Musa paradisiaca, Lantena camera* and *Mussaenda erythrophylla* (9 sq. cm). The snails completely consumed *Crotolaria juncea* and *Musa paradisiaca* not as fast as *Lantena camera*. The snails ate only a small portions

Table 2. Abundance of *Lissachatina fulica* in the study area (number of individuals/quadrate)

Months	Uppinangady river bank	Savanoor	Kanchana village
August	67	70	68
September	47	55	52
October	35	26	25
November	10	14	12
December	-	-	-

Table 1. Feeding preference of Giant African snail

Scientific name	Individual (Using single type of leaves)	Combined (four types of leaves)				
		Set 1	Set 2	Set 3	Set 4	Set 5
Areca catechu	+	-	-	-	-	-
Basella alba	+	-	-	-	-	-
Carica papaya	+	-	-	+	+	
Chromolaena odorata	+	+	-	-	-	-
Coffea arabica	+	-	+	-	-	-
Crotolaria juncea	+	+	-	-	-	+
Cucurbita pepo	-	-	-	+	+	-
Hevea brasiliensis	+	-	+	-	-	-
Hibiscus rosa-sinensis	+	+	-	+	+	-
Jasminium sp.	+	-	+	-	-	-
Lantena camera	-	-	-	-	-	+
Musa paradisiaca	+	-	-	-	-	+
Mussaenda erythrophylla	+	-	-	+	-	+
Piper betel	+	-	+	-	-	-
Piper nigrum	+	-	-	-	-	-
Prunus dulcis	+	+	-	-	-	-
Solanum lycopersicum	-	-	-	+	+	-
Theobroma cacoa	+	-	-	+	-	-

+ Present, - Absent

of the *Lantena camera* and *Mussaenda erythrophylla.* During the study, the abundance of *Lissachatina fulica* was more in arecanut plantation and home gardens, and least in the river bank. This could be due to the presence of plants for feeding, palatability and favourable ecological conditions (Kurup 2018).The snails were abundant in August because the rain intensifies their population will multiply (Patiño-Montoya et al. 2022). The decrease in their number till December corresponds to the high temperature and dry season. The snails undergo the state of dormancy called aestivation, which occurs when the weather condition is harsh, either dry season or warm season (D'Souza and Shenoy 2024). During this period, the Giant African snails form epiphragm, sealing the aperture of the shell which serves as the water preservative strategies, preventing the mechanical damage of the inner soft tissues (Ademolu 2016). *Areca catechu, B. alba, C. papaya, C. odorata, C. juncea, H. rosa-sinensis, M. paradisiaca* were which indicated the non-selective feeding ability of the snail and capacity to damage variety of plants (Ogbu et al., 2014). From the combined feeding preference experiments it was confirmed that GAS prefer juicy plants such as *H. rosa sinensis, C. papaya* and *B. alba*. These findings are in line with the studies of Kant and Siaka (2016). Preference of crops such as arecanut and garden plants by the snails for feeding could be due the attraction to the odour of the plants (Kumar et al., 2018). The study shows that when the required palatable plants are available in their habitats preference to plants such as *P. dulcis, Jasminium* sp*, P. beetle,* and *Hevea* sp decreased.

The uncontrolled weed diversity of in an agricultural landscape is a food source for the Giant African snail in the absence of a cultivated crop (Chandaragi 2014). The current study provides evidence that there was preferential selectivity for the weed offered to the Giant African snail such as *Chromolaena odorata, Crotolaria juncea* and *Lantana camera*. There is apparent palatability preference for these weeds and the implications related to their distribution (Albuquerque et al., 2008). Knowledge on the vulnerabilities

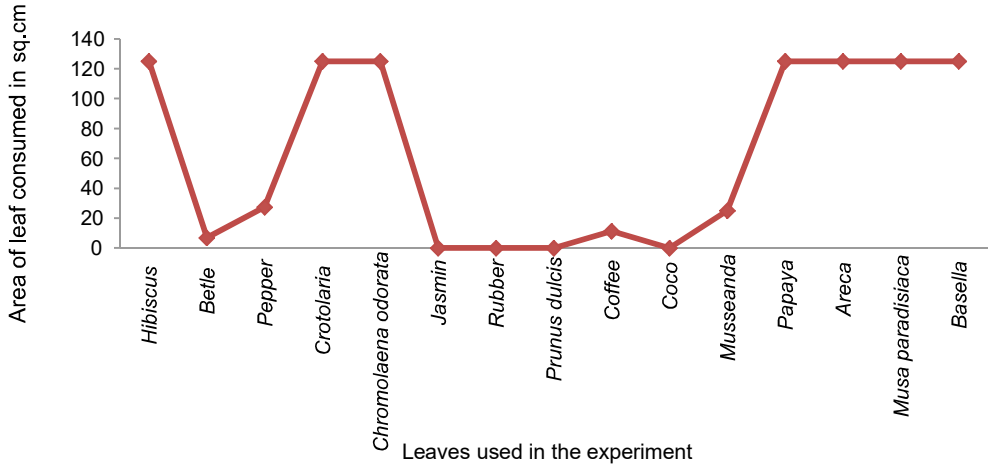

Fig. 1. Area of leaves consumed by the Gaint African snail in the experiment

Table 3. Leaves consumed by *Lissachatina fulica* in the combined feeding experiment

Plant	Area of leaves consumed (sq. cm)				
	Set 1	Set 2	Set 3	Set 4	Set 5
Carica papaya	-	-	-	35	-
Chromolaena odorata	20	-	-	-	-
Coffea arabica	-	12	13	44	-
Crotolaria juncea	42	-	-	-	45
Cucurbita pepo	-	-	-	27	-
Hevea brasiliensis	-	11	00	-	-
Hibiscus rosa-sinensis	45	-	-	45	-
Lantena camera	-	-	-	-	15
Musa paradisiaca	-	-	-	-	40
Mussaenda erythrophylla	-	-	12	-	13

of plant to preferential herbivory by Gaint African Snail is useful for the success of the crop protection efforts.

CONCLUSION

Giant African snails were abundant in arecanut plantations than the home garden and river bank. The distribution data has helped to understand the invasiveness of GAS and presence of preferred plants for feeding. The commonly available leaves of garden plants *Hibiscus rosa-sinensis, Musa paradisiaca, Carica papaya, Basella alba, Areca catechu* are the preferential plants for feeding. However, the least preference plants were *Piper betel, Jasminium* sp*, and Theobroma coca* indicates the availability most preferred plants for feeding. Consumption of weeds indicates that these could be used in control of GAS population. The plants preferred by GAS can be good baits to trap these snails thus helping in pest control and crop protection.

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