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Evaluation of Bait Attractants for Eco Friendly Trapping of the Giant African Snail, *Achatina fulica*

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A B S T R A C T

The research were conducted to evaluate various bait attractant for eco friendly trapping of giant African snail (*Achatina fulica*)" at Department of Entomology, College of Agriculture, VNMKV, Parbhani during 2023 and 2024 under field conditions. Among all the evaluated treatments, Moringa + jaggery (200g) + water (200ml) was found the most effective bait attractant where maximum number of snails attracted were 26.34 and highest per cent of 17.56% after twelve hours of treatment. And minimum number of snails attracted to Citrus fruit waste were 6.83 and lowest per cent of 4.46% after twelve hours of treatment. The overall results of two years shown that Moringa + jaggery (200g) + water (200ml) was found to be the most effective attractant for attracting and trapping of giant Africa snail in field.

Introduction

Soft bodied malacological organisms i.e. mollusc (term "mollos" originates from ancient Greek etymology) are one among the most ancient groups of animals on earth. Class Gastropoda (stomach footed) have the most devastative land molluscs which are snails possessing a huge coiled calcareous shell, which encloses the body and is carried over a long broad foot. The origin of *Achatina fulica* is generally regarded to be the coastal area of East Africa, including many islands (Bequaert, 1950). Among all the snails present in the world, giant African land snail is one of the fastest growing polyphagous plant pest and has been the most damaging invasive species in the world. Nearly 90% of plants cultivated were damaged and eaten by *A. fulica* in India (Raut and Ghose, 1984). In Marathwada region of Maharashtra, farmers from Latur, Dharashiv, Jalna and Chhatrapati Sambhajinagar districts are the worst affected by the havoc of snails (Prasad Joshi, 2022). Giant African snail is very active during rainy seasons and nocturnal in nature. Snails feed on new succulent leaves, shoots, petiole and tender stem of soybean seedling. It feeds on leaves by making circular holes, scraping the surface of plant tissue. (R5www.krugerseeds.com)

Most of the farmers are using metaldehyde and niclosamide which is an effective molluscicide available for the management of snails. But these substances may lead to change the soil properties and causing problems

for planting (Singh *et al.,* 2012; Moreau *et al.,* 2015). As of now, control measures across the board have failed to eradicate this pest, hence an integrated approach to control the snail is being recommended as the ultimate remedy by numerous scientists over the world. The environmental impact is as a result of these mollusc have clustering behaviour, without dietary requirements and competing directly with native mollusc (Almeida *et al.,* 2016). In this background, the recent study was formulated and executed to evolve management approaches for giant African snail in soybean crop.

Material and Methods

These study was conducted in Randomized Block Design at the field cafeteria of Department of Entomology, VNMKV, Parbhani with ten treatments and three replications during *Kharif* 2023-24 and *Kharif* 2024-25. To determine the bait attractants for giant African snail, *Achatina fulica* included T_1; Moist gunny bag (1 bag), T_2; Gunny bag + jaggery (200g) + water (200ml) (1 bag), T_3; Mulberry + jaggery (200g) + water (200ml) (1 kg), T_4; Citrus fruit waste (1 kg), T_5; Decomposing weed mass (1 kg), T_6; Banana fruit waste (1 kg), T_7; Groundnut + jaggery (200g) + water (200ml) (1 kg), T_8; Moringa + jaggery (200g) + water (200ml) (1 kg), T_9; Soaked rice + jaggery (200g) + water (200ml) (1 kg), T_{10}; Soaked wheat + jaggery (200g) + water (200ml) (1 kg).

Food material required for the experiment was available from university campus and local market nearby. The bait materials were placed equidistantly in centre on moist soil at a diameter fixed at the ground level and bait trays at 1 m apart. 150 giant African snails of similar size (4-6 whorls) and weight (25±5g) were selected to place in the at the centre and were released during 6 pm at evening hours. The whole experimental area was covered with nylon net to avoid the escape of giant African snail. The number of snails attracted to each bait were observed and recorded in the morning at 6 am i.e 12 hrs after release. Finally data was subjected to statistical analysis with one way ANOVA.

$$\text{Percent snails attracted} = \frac{\text{Snails attracted to baits}}{\text{Total no. of snails released}} \times 100$$

Results and Discussion

The results of the field experiment on efficiency of bait attractants in trapping *Achatina fulica* during the year 2023 are presented in Table 1.

Number of snails attracted to each bait after 12 hours

Twelve hours after bait placement, highest number of snails were attracted in Moringa + jaggery (200g) + water (200ml) which recorded 25.67 snails and found significantly superior to all other treatments. This was followed by Mulberry + jaggery (200g) + water (200ml) and Soaked rice + jaggery (200g) + water (200ml), which attracted 21.67 and 20.33 snails, respectively. Gunny bag + jaggery (200g) + water (200ml) followed with 18.33 snails, while Decomposed weed mass attracted 15.33 snails. The remaining snaisl attracted were observed in Groundnut + jaggery (200g) + water (200ml) (13.00), Banana fruit waste (11.00), and Soaked wheat + jaggery (200g) + water (200ml) (9.33). The Citrus fruit waste was found least attractive bait, attracting only 6.33 snails.

Per cent snails attracted after 12 hours

Among all the baits Moringa + jaggery (200g) + water (200ml) performed significantly superior, recording 17.11% of the snail population which was followed by Mulberry + jaggery (200g) + water (200ml) at 14.44% and Soaked rice + jaggery (200g) + water (200ml) at13.56% snails. Gunny bag + jaggery (200g) + water (200ml) found 12.22% snails attracted, while Decomposed weed mass recorded 10.22% snails. Whereas Banana fruit waste (7.33%), Soaked wheat + jaggery (200g) + water (200ml) (6.22%), and Moist gunny bag (6.00%) were found statistically at par with each other. Least percent of snails attracted by Citrus fruit waste (4.22%).

The results of the field experiment on efficiency of bait attractants in trapping *Achatina fulica* during the year 2024 are presented in Table 2.

Number of snails attracted to each bait after 12 hours

Among the baits evaluated Moringa + jaggery (200g) + water (200ml) recorded significantly higher number of snails (27.00) after twelve hours of bait placement and were found at par with each other. The next best treatment was Mulberry + jaggery (200g) + water (200ml) which attracted 20.33 snails, whereas Gunny bag + jaggery (200g) + water (200ml) and Soaked rice + jaggery (200g) + water (200ml) both attracted 19.33 snails and were statistically at par with each other. This

was followed by Decomposed weed mass (16.33) and Groundnut + jaggery (200g) + water (200ml) (12.00). However Banana fruit waste (10.33) and Soaked wheat + jaggery (200g) + water (200ml) (10.00), which were statistically at par and Citrus fruit waste was the least effective bait attractant which attracted 7.33 snails.

Per cent snails attracted after 12 hours

After 12 hours of bait placement, Moringa + jaggery (200g) + water (200ml) was found significantly superior which attracted highest snail population of 18.00%. This was followed by Mulberry + jaggery (200g) + water (200ml) at 13.55% snails whereas Gunny bag + jaggery (200g) + water (200ml) and Soaked rice + jaggery (200g) + water (200ml) recorded 12.89% snails and were statistically at par. The remaining baits like Decomposed weed mass attracted 10.89% snails, Groundnut + jaggery (200g) + water (200ml) followed with 8.00% whereas Soaked wheat + jaggery (200g) + water (200ml) and Banana fruit waste recorded 6.67% & 6.89% snails and were found at par with each other. Lowest percent of snails attracted to Moist gunny bag (5.33%) and Citrus fruit waste (4.89%).

The pooled results of the field experiment on efficiency of bait attractants in trapping *Achatina fulica* during the year 2023 & 24 are presented in Table 3.

Number of snails attracted to each bait after 12 hours

Among all the baits used Moringa + jaggery (200g) + water (200ml) recorded the highest snails attracted i.e. 26.34 snails after twelve hours and were significantly superior to all other treatments. Next effective treatments was followed by Mulberry + jaggery (200g) + water (200ml), Soaked rice + jaggery (200g) + water (200ml) and Gunny bag + jaggery (200g) + water (200ml) which attracted 21.00, 19.83 and 18.83 snails, respectively. The other baits consisting of Decomposed weed mass attracted 15.83 snails, while Groundnut + jaggery (200g) + water (200ml) followed with 12.50 snails. Minimum snails were attracted to Banana fruit waste (10.67), Soaked wheat + jaggery (200g) + water (200ml) (9.67) and Citrus fruit waste (6.83).

Per cent snails attracted after 12 hours

Significantly superior among all treatments was found Moringa + jaggery (200g) + water (200ml) which attracted 17.56% of the snails and was followed by Mulberry + jaggery (200g) + water (200ml), Soaked rice + jaggery (200g) + water (200ml) and Gunny bag + jaggery (200g) + water (200ml) with attraction rates of 14.00%, 13.23% and 12.56%, respectively. Remaining bait attractant like Decomposed weed mass, Groundnut + jaggery (200g) + water (200ml), Banana fruit waste, Soaked wheat + jaggery (200g) + water (200ml) and Moist gunny bag attracted 10.56%, 8.34%, 7.11%, 6.45% and 5.67% snails respectively. The least effective treatment Citrus fruit waste recorded 4.56% snails.

The finding on the effectiveness of baits is in agreement with Chandaragi (2014) who reported that the highest per cent of snails attracted to moringa leaves (17.92%) and decomposing weed mass (16.46%) which followed banana sheath waste (4.38) and moist gunny bag (3.75). Kumar *et al.,* (2018) also showed that bait attractant performed well was chopped raw papaya (54 ± 1.48 and 53.3 ± 1.64) followed by rice bran with jaggery (52 ± 1.64 and 50.2 ± 2.09). Similar results by Minott *et al.,* (2018) revealed that highest number of snails attracted to breadfruit (8.63 ± 0.693) followed by banana (6.88 ± 0.693), papaya (2.44 ± 0.693) and cabbage (1.95 ± 0.693). Pallavi *et al.,* (2018) experiment found that highest mean number of giant African snails (*Achatina fulica*) was trapped in cane juice with 6.65/trap followed by jaggery solution with 6.60/trap, buttermilk (6.40/trap), tender coconut water (4.80/trap), saw dust solution (2.20/trap) and water (0.30/trap). In 2024, Bhondave showed the results that papaya fruit (16.67%), moist gunny bag (13.33%) and wheat + jaggery + water (9.17%) recorded maximum per cent of giant African snails attracted. The present results are in line with the above research workers.

Authors' Contribution

Field experiments, data collection, preparation of the manuscript, data analysis and their interpretation (A.S.K.); Formulation of research, guidance, providence of experimental materials and designing of the experiments (P.R.Z.); Review, data analysis and editing manuscript (A.S.K., M.M.S., S.S.D.,).

Field experiments data collection preparation of the manuscript data analysis and their interpretation, formulation of research guidance, providence of experimental materials and designing of the

experminents.

Table.1 Evaluation of various bait attractants on giant African snail during the year 2023.

Treatment	Treatments details	Quantity	No.of snail attracted to each bait (after 12 hours)	% snails attracted after 12 hours
T1	Moist gunny bag	1 bag	9.00 (3.08)*	6.00 (14.18)**
T2	Gunny bag + jaggery (200g) + water (200ml)	1 bag	18.33 (4.34)	12.22 (20.46)
T3	Mulberry + jaggery (200g) + water (200ml)	1 kg	21.67 (4.71)	14.44 (22.33)
T4	Citrus fruit waste	1 kg	6.33 (2.61)	4.22 (11.80)
T5	Decomposed weed mass	1 kg	15.33 (3.98)	10.22 (18.64)
T6	Banana fruit waste	1 kg	11.00 (3.39)	7.33 (15.71)
T7	Groundnut + jaggery (200g) + water (200ml)	1 kg	13.00 (3.67)	8.67 (17.12)
T8	Moringa + jaggery (200g) + water (200ml)	1 kg	25.67 (5.12)	17.11 (24.43)
T9	Soaked rice + jaggery (200g) + water (200ml)	1 kg	20.33 (4.56)	13.56 (21.61)
T10	Soaked wheat + jaggery (200g) + water (200ml)	1 kg	9.33 (3.14)	6.22 (14.44)
SE (M±)			0.023	0.262
CD at 5%			0.068	0.779
CV %			1.03	2.51

Figures in parenthesis are √x+0.5* and arc sin** transformed values

Table.2 Evaluation of various bait attractants on giant African snail during the year 2024

Treatment	Treatments details	Quantity	No. of snail attracted to each bait (after 12 hours)	% snails attracted after 12 hours
T1	Moist gunny bag	1 bag	8.00 (2.92)*	5.33 (13.31)**
T2	Gunny bag + jaggery (200g) + water (200ml)	1 bag	19.33 (4.45)	12.89 (21.04)
T3	Mulberry + jaggery (200g) + water (200ml)	1 kg	20.33 (4.56)	13.55 (21.59)
T4	Citrus fruit waste	1 kg	7.33 (2.79)	4.89 (12.77)
T5	Decomposed weed mass	1 kg	16.33 (4.10)	10.89 (19.27)
T6	Banana fruit waste	1 kg	10.33 (3.29)	6.89 (15.21)
T7	Groundnut + jaggery (200g) + water (200ml)	1 kg	12.00 (3.54)	8.00 (16.43)
T8	Moringa + jaggery (200g) + water (200ml)	1 kg	27.00 (5.24)	18.00 (25.10)
T9	Soaked rice + jaggery (200g) + water (200ml)	1 kg	19.33 (4.45)	12.89 (21.04)
T10	Soaked wheat + jaggery (200g) + water (200ml)	1 kg	10.00 (3.24)	6.67 (14.96)
SE (M±)			0.033	0.265
CD at 5%			0.097	0.787
CV %			1.47	2.54

Figures in parenthesis are √x+0.5* and arc sin** transformed values

Table.3 Evaluation of various bait attractants on giant African snail during the year 2023 & 2024 (Pooled)

Treatment	Treatments details	Quantity	No.of snail attracted to each bait (after 12 hours)	% snails attracted after 12 hours
T1	Moist gunny bag	1 bag	8.50 (3.00)*	5.67 (13.77)**
T2	Gunny bag + jaggery (200g) + water (200ml)	1 bag	18.83 (4.40)	12.56 (20.75)
T3	Mulberry + jaggery (200g) + water (200ml)	1 kg	21.00 (4.64)	14.00 (21.97)
T4	Citrus fruit waste	1 kg	6.83 (2.71)	4.56 (12.32)
T5	Decomposed weed mass	1 kg	15.83 (4.04)	10.56 (18.96)
T6	Banana fruit waste	1 kg	10.67 (3.34)	7.11 (15.44)
T7	Groundnut + jaggery (200g) + water (200ml)	1 kg	12.50 (3.61)	8.34 (16.78)
T8	Moringa + jaggery (200g) + water (200ml)	1 kg	26.34 (5.18)	17.56 (24.77)
T9	Soaked rice + jaggery (200g) + water (200ml)	1 kg	19.83 (4.51)	13.23 (21.33)
T10	Soaked wheat + jaggery (200g) + water (200ml)	1 kg	9.67 (3.19)	6.45 (14.71)
SE (M±)			0.020	0.204
CD at 5%			0.059	0.606
CV %			0.88	1.95

Figures in parenthesis are √x+0.5* and arc sin** transformed value

Review data analysis and editing manuscript. The authors declared that they have no conflict of interests. We thank head of the Department of Entomology, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth.

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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