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STANDARDIZATION OF MASS REARING OF MANGO LEAFHOPPERS

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ABSTRACT

This study involved three predominant mango hopper species viz.: *Idioscopus clypealis* (Lethierry), *Idioscopus nitidulus* (Walker), and *Amritodus atkinsoni* (Lethierry). The nymphs and adults were collected from a mango orchard in Bhubaneswar, Odisha, India. To rear the leafhoppers, plastic containers with moist sand and mango twigs as food sources were used in different environments, including room temperature, an open environment, and a B.O.D incubator with controlled temperature (25°C) and relative humidity (75%). The survival and longevity of nymphs and adults were recorded. The results showed that rearing in the B.O.D incubator consistently resulted in the highest longevity rates for both nymphs and adults. Rearing in the open environment had the lowest longevity rates, while room temperature rearing fell in between. These findings highlight the importance of maintaining consistent temperature and humidity conditions for improved longevity in mango leafhopper populations.

Key words: Mango pest, *Idioscopus clypealis*, *Idioscopus nitidulus*, *Amritodus atkinsoni*, open environment, controlled environment, cage rearing, Bhubaneswar, nymphs and adults, mass rearing

Due to the abundance of insect pests, Odisha has one of the lowest yields of mangoes in the nation (3.9 t/ha) (Samant et al., 2018). Approximately 400 insect and mite pests attack this crop (Reddy et al., 2018). But only a small number have significant economic significance. Key pests include the leafhoppers, mealybugs, gall midges, leaf webbers, shoot borer, scale insects, thrips, stem borer, bark-eating caterpillars, fruit flies, nut weevil, fruit borer shoot gall psylla and termites (Reddy et al., 2022). Out of fifteen species of mango hoppers reported from Asia. However, only three to four species are serious pests. The most predominant and widespread species are *Idioscopus clypealis* (Lethierry), *Idioscopus nitidulus* (Walker), *Idioscopus nagpurensis* (Pruthi) and *Amritodus atkinsoni* (Lethierry) (Veeresh, 1989; Waite, 2002). Mango hoppers, including both nymphs and adults, feed on the sap of tender leaves, buds, flowers, flower stalks, and fruits. This feeding behavior can cause severe damage, resulting in curled leaves and dried inflorescence. Moreover, the hoppers also excrete honeydew on the affected plant parts, promoting the growth of fungal pathogens such as *Capnodium* sp. These pathogens form a black-colored sooty mold on the infested areas (Srivastava, 1997). However, the availability of a conventional, affordable method for mango hopper laboratory rearing has restricted the potential for in-depth investigation, particularly in the area of toxicology, and obviously for the development of an effective IPM approach. Therefore, to meet this demand and the development of new IPM tactics, an effort has been made through this work to standardize their rearing under controlled temperature and relative humidity conditions.

MATERIALS AND METHODS

More or less common in Odisha, mix populations of the three mango hopper species (*A. atkinsoni, I. clypealis,* and *I. niveosparus*) are abundant and acting as the main cause of yield loss in mango. This diverse population of nymphs and adults was gathered from a high-density (5m x 5m) mango orchard of OUAT located at Baramunda, Bhubaneswar, Odisha. A sweeping net did insect collecting during the early morning hrs of 6AM and 8AM. Nymphs and adults were kept apart. A delicate mango twig served as food kept in a perforated plastic jar together with the collected insects. One of the most important aspects of laboratory rearing is the proper container. As a raising container, a white 12-cm-dia round plastic jar was chosen. After the adults and nymphs of mango hoppers were released, each plastic container was covered with muslin cloth to allow for sufficient ventilation and keep mango hoppers from escaping. Fresh mango leaves were collected from a pesticide-free source and thoroughly washed to remove contaminants. A layer of clean, moist sand was placed in the bottom of the rearing containers to provide humidity and prevent leaf desiccation. The washed mango twigs are little bit inserted into the moist sand. Mango hoppers were then released into the plastic container, which has a muslin cloth covering it. Mango leafhopper adults were let to infest the shoots and inflorescence. The newly formed nymphs drained the shoots' and inflorescence's sap, causing drying. Before it totally dried the shoots' and inflorescence's base was cut off, leaving the hoppers intact, and they were moved to a new feeding niche. Rearing was carried out using a variety of techniques, including a cage at room temperature, a cage with 2 inches of dry sand, a cage with 2 inches of moist sand, and a cage within a B.O.D incubator at fixed temperature i.e. 25°C and 75% relative humidity, rearing cage in room temperature and rearing cage in open environments. Throughout 2023, rearing took place during March, April, and May, with each time 100 insects were introduced into the cage. The mortality data was gathered with an interval of four hr.

RESULTS AND DISCUSSION

The results revealed that the cage with moist sand and tender leaves exhibited better survivorship than the one with dry sand and fragile leaves. Tender leaves increased the survival rate than mature leaves. The average room temperature and humidity from March 2023 to May 2023 were 26.2°C to 32°C and 45% to 58%, respectively. The longest nymphal lifespan ever observed was 61.77± 1.127 hrs at ambient temperature and humidity in the month of March 2023. The average lifetime of a mango hopper nymph was 56.32± 1.127 hrs in May 2023 and 58.32± 1.127 hrs in April 2023 (Fig. 1; Table 1). Even when fed with fresh, delicate leaves as food, the longevity of the nymph population was dramatically reduced when it was taken out of its native environment and kept at room temperature and humidity. The longest adult lifespan was recorded in the month of March 2023, and it was found to be 73.05± 0.25 hrs at ambient temperature and humidity. The adult lifespan in April and May 2023 was 71.07± 0.25 hrs and 69.32± 0.25 hrs, respectively. The lifespan of the mango hopper population significantly diminished when it was removed from its natural habitat and kept at room temperature and humidity, even when fresh, delicate leaves were provided as food. In an open setting, jar containing moist sand and young, tender leaves were used each month to house a group of 100 mango hopper nymphs. To ensure proper ventilation, muslin cloths were placed over the jar. The survival rate of the adult hoppers was monitored every four hr during specific time intervals. In March 2023, the longest recorded lifespan for a nymph in this setup was 40.37± 1.129 hrs. However, the nymphs' longevity decreased to 39.77± 1.129 hrs in April and further to 36.83± 1.129 hrs in May 2023. This decline in lifespan between March and May 2023 can be attributed to an increase in the ambient temperature. Throughout this period, the temperature in the open environment ranged from 29°C to 35°C, while the relative humidity dropped from 62% in March to 50% in May.

The rise in temperature and decrease in humidity were identified as the primary factors contributing to the decline in nymph populations and their reduced lifespan in the open environment. The longest adult lifespan in an open setting was 48.75± 0.15 hrs during March. Adult longevity in April and May 2023 was 46.85± 0.15 hrs and 44.67± 0.15 hrs, respectively. The decrease in lifetime duration from March to May 2023 may be related to an increase in ambient temperature. In an open environment, the temperature fluctuated from 29°C to 35°C from March to May 2023, while the relative humidity fell from 62% in March to 50% in May. Temperatures that are higher or lower than the ideal temperature level can affect the life cycle of some insect species (Reznik et al., 2009). The degree of relative humidity also has a significant impact on adult longevity. Changes in relative humidity levels can affect the functional response parameters of some mango hoppers (Moezipour et al., 2008). The B.O.D incubator maintained 25°C and relative humidity of 75%. This consistent temperature and humidity environment resulted in a steady pattern of longevity for the mango hoppers. Data collected during March 2023 indicated a nymphal life expectancy of 139.90± 0.25 hr, followed by 139.72± 0.25hr in April 2023, and 138.98± 0.25 hr in May 2023.

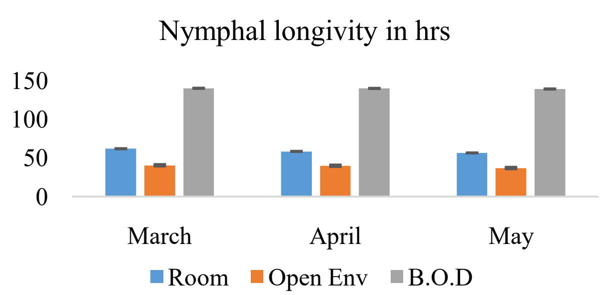

Table 1. Lifespan of mango hopper

	Adult longevity (hr)		
	Room	Open environment	B.O.D
March	73.05	48.75	147.32
April	71.07	46.85	147.26
May	69.32	44.67	148.95
SE(m)±	0.25387	0.15572	0.30457
CD (P=0.05)	0.756	1.205	1.304

Fig. 1; Table 1. Lifespan of mango leaf hopper

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AUTHOR CONTRIBUTION STATEMENT

SSD planned and designed this study. MKT analysed data. SSD and MKT revised the draft. SSD drafted and revised original manuscript.

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CONFLICT OF INTEREST

No conflict of interest.

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