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Pumpkin spice loving pests, a short study on rearing of *Maconellicoccus hirsutus*¹Salome Ruth Jimmy V* and ²Ruchita. Naidu.D

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Introduction

Maconellicoccus hirsutus commonly known as the pink mealybug is a widespread pest of the order Hemiptera under the family Pseudococcidae. They come under a group of sucking pests as the females possess stylet-like mouthparts which are injected into the plant, sucking the sap out, thus leaving the host to become dry and withered, as the phloem responsible for transporting nutrients throughout the plant gets damaged. The plants begin to have an appearance of lesions, mottling, rotting and complete drying. Mealybugs possess a waxy layer and are therefore known to be resistant to a variety of pesticides and treatments. This pest being polyphagous affects a variety of plants such as hibiscus, chrysanthemum, grapevine, avocado and many others causing significant loss to farmers and small holders. The damage done on these crops results in lesser yield and harvest.

Life cycle

Pink mealybugs (female) usually have a lifecycle that mainly consists of 5 stages, namely: the egg, three nymphal stages of the crawler known as instars and the adult.

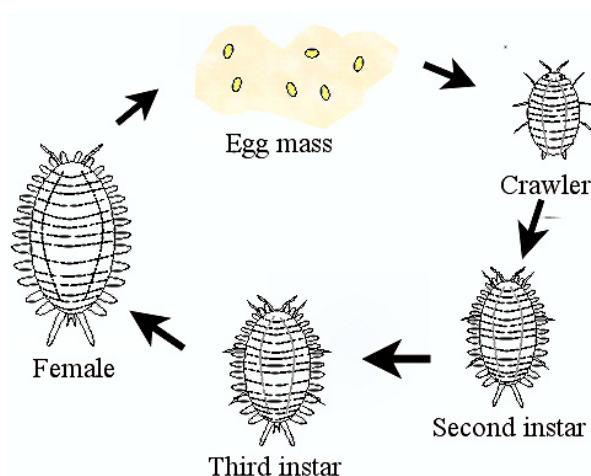


Fig. 1- Life cycle of *Maconellicoccus hirsutus*. Source: <https://blog.pestprophet.com/mealybugs/>

These pests usually reproduce by means of parthenogenesis or asexual reproduction, on non-availability of adult males. Although the hatching percentage of parthenogenetically produced eggs is quite successful, it has been found that eggs produced as a result of male and female breeding show a slightly higher percentage. (Hakim Ali Sahito et al. 2012)

The females are wingless having reduced legs and antennae and therefore do not move far to longer distances. In the wild, they most commonly settle in the peduncle of

plants. The female's body gets converted into an egg sac towards the end of the lifecycle, which gets covered with white mealy matter that protects the eggs from damage due to harsh environmental conditions and treatments applied by humans on the host plant. The adult females subsequently die after the egg sac formation. Adult males possess one pair of delicate wings, well-developed legs, antennae, and no mouthparts. They have a shorter life span than the females.


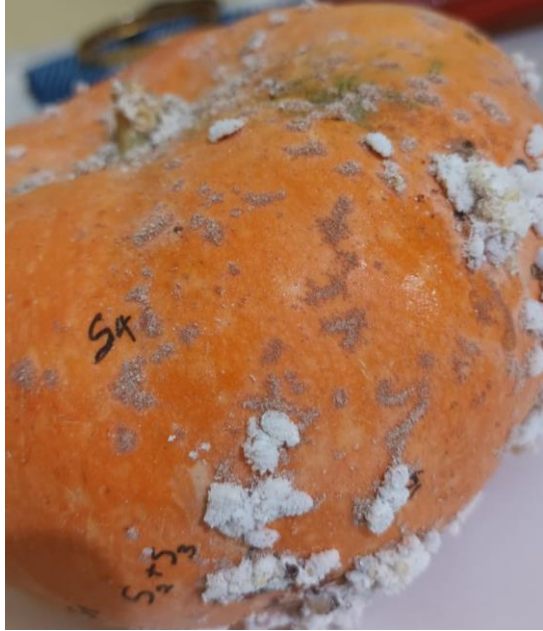


Materials and Methods

This laboratory study was conducted at Rashvee - International Phytosanitary Research and Services (R-IPRS), Bangalore for a period of two months during January and February 2023. Female egg sacs of mealybugs (*Maconellicoccus hirsutus*) were sourced from ICAR-NBAIR on 23rd December 2022. Pumpkins were selected as the laboratory host in accordance with studies done by Miguel S. Serrano and Stephen L. Lapointe, 2002 and Satish V. Patil *et. al*, 2011. Pumpkins are a great host as they provide ample amount of sap to these sucking pests, they do not degrade quickly and can be used to rear almost 2 generations of mealybugs on a single pumpkin. The pumpkins were first washed with 1% sodium-hypochlorite solution followed by plain water. This was performed in order to remove dust and other micro-organisms which

would lead to premature degradation. The pumpkins were then air dried. The egg masses were placed on the pumpkins carefully and these pumpkins were placed in the BOD incubator with a constant temperature of 28°C. The temperature used to rear these pests were found to be similar to the study done by Juang-Horng Chong, Amy L. Roda and Catherine M. Mannion, 2008. The data obtained from the observations was subjected for correlation and linear regression.

Once the egg mass was placed on the pumpkins a new generation of crawlers emerged and began forming colonies which was observed on 2nd January 2023. The colonies were marked and measured length wise using a ruler, and the area of each colony was calculated using the formula Πr^2 . The area increase was recorded every 5 days until there was a stagnation and decrease in the area of the colonies on the 25th day. This indicated the end of the first generation and the beginning of the second.

10 colonies were randomly selected, and the number of crawlers were counted. This data was then plotted against the area of each corresponding colony to understand and correlate the two. Linear Regression and correlation were performed using Data Analysis on MS Excel, as shown below in the results.

	
<p>Fig. 2- First generation of colonized Mealybugs on pumpkin</p>	<p>Fig. 3- Light brown colonies of crawlers for second generation</p>
	
<p>Fig. 4- Crawlers</p>	<p>Fig. 5- Fresh pumpkins used to rear Mealybugs</p>

Results and Discussion

The observations plotted on the graph indicated that there was a gradual increase in area of the colonies till day 10 and there was a drastic increase after day 10. This is considered as the period where the crawlers were

increasing in size and transformed into adults. The duration between day 15 and day 20 showed very little or no increase in the area as most of the females had got converted into egg sacs and the eggs were in the incubation period. After the 20th day the area sees a slight

fall, as the colonies had started to fall off the host due to the moving away of crawlers after hatching to colonize on new locations of the pumpkin. The total life cycle of the pink mealybug- *Maconellicoccus hirsutus* was completed in a span of approximately 30 days. The graph shows a positive co-relation, with R^2 value of 0.89 indicating goodness of fit of the model.

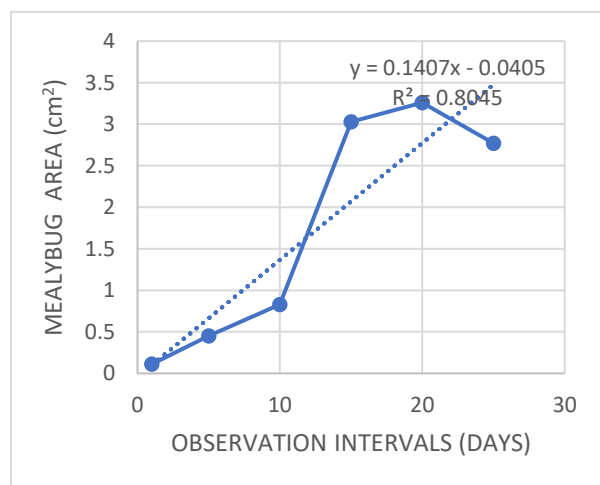


Fig. 6- Mealybug colony growth

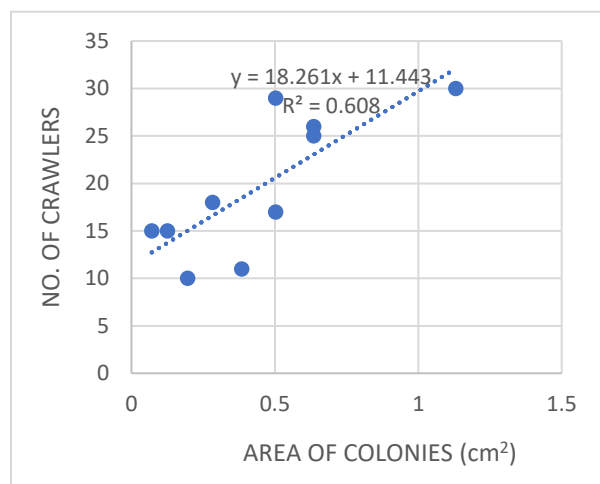


Fig. 7- Relationship between the mealybug crawlers and area of the colony

10 colonies were selected at random and the number of crawlers in each were counted. This data was co-related with the area of each corresponding colony. This plot indicates that greater the area of the colonies, higher are the number of crawlers. There is a positive co-relation with R^2 value of 0.779 indicating that it is statistically significant.

Conclusion

This study provides ample information in understanding the techniques of rearing field pests under laboratory conditions. It urges a researcher to make appropriate arrangements in the laboratory to match the field conditions in order to get good cultures. The duration of a single generation at a constant temperature of 28°C of the pest is very clearly indicated along with the number of days involved in the transformation of the nymphs to the adult stages. These rearing techniques can also be performed to rear very serious pests causing damage to economic crops in the fields so that they can be used to test insecticides or botanicals. Hence one can come up with the perfect formulation which will show mortality. This in turn will aid farmers in gaining great control against these pests to get a good harvest.

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