

**HOST PLANT PREFERENCE BY THE PAPAYA MEALY BUG,
PARACOCCUS MARGINATUS (HEMIPTERA: PSEUDOCOCCIDAE) ON
SELECTED HOST PLANTS UNDER LABORATORY CONDITION ***

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INTRODUCTION

The papaya mealy bug (PM), *Paracoccus marginatus* is a polyphagous insect (Hemiptera: Pseudococcidae) (Borror *et al.*, 1992). It is a major pest of papaya and many other economically important tropical fruits, vegetables and ornamentals are also attacked by the pest. Papaya mealy bug is considered as an invasive pest and has invaded into many countries around the world. In Sri Lanka, occurrence of the PM was first recorded during 2008 from Colombo and Gampaha districts and observed spreading rapidly with large colonies on aerial parts of papaya and *Plumeria* (Galanihe *et al.*, 2010). The pest had spreaded further to the other districts in the Western, Sabaragamuwa, Southern, North Central, Central and Eastern provinces, indicating its ability to spread very rapidly.

Being new to the country and the absence of natural enemies, the PM has multiplied rapidly and developed to epidemic levels mainly in papaya growing regions. A number of chemicals were evaluated and none of them were sufficiently effective in controlling the pest (Galanihe *et al.*, 2010). Thus, chemical control was partially effective and required multiple applications. Furthermore, this led to problems with insecticide resistance development and destroys the natural enemy complex in the ecosystem. Therefore, classical biological control was identified as an important component in the management of *P. marginatus* in the country and highly efficient and prominent parasitoid, *Acerophagus papayae* was introduced in 2008 from Puerto Rico (Galanihe *et al.*, 2010). More than 90% of success was achieved from the introduction of the parasitoids to the selected locations. Within five years of the introduction of the parasitoid, *Acerophagus papayae*, several out

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breaks of the pest from certain locations were reported time to time. Therefore, standard technique for mass rearing of the parasitoid was used with sprouted potatoes as the rearing media. This involves high cost for the mass production program due to higher market price of the potato in Sri Lanka. Hence, present study was initiated with the objective to find out suitable host plant for the mass rearing of PM under laboratory conditions.

MATERIALS AND METHODS

Four host plant species *Hibiscus rosa-sinensis* (Hibiscus), *Jatropha curcas* (Jatropha), *Codiaeum sp.* (Croton) and *Ipomoea batatas* (Sweet Potato) were selected as alternative hosts for this study. The experiments were conducted in the laboratory and plant house of the Division of Entomology at Horticultural Crops Research and Development Institute, Gannoruwa, Peradeniya from September to December, 2014. Mean developmental time and percentage survival of different nymphal stages on four different host plants were determined using the well-developed leaf of each host plant. They were individually placed inside 13 cm diameter petri dishes and ten eggs of Papaya mealy bug were introduced on leaf terminal of each leaf using a hair brush. Position of the eggs on each leaf was mapped on to paper. Two halves of the petri dishes were sealed with gum tape and a small cotton piece was attached to the petri dish to prevent damage to the leaf stalk and allow ventilation. End of the petiole was covered with wetted cotton plug and moistened daily. This study was replicated 10 times for each host plant (40 host plants x 10 eggs = 400 eggs from one egg mass). Observations were made using a binocular microscope and hand lens in 24 hours interval for the development of life stages on each host plant. One-way analysis of variance (ANOVA) was performed using a general linear model (GLM) for all experiments (SAS software). Means were compared at the $P=0.05$ significance level using the Turkey's Honestly Significant Difference (HSD) test.

RESULTS AND DISCUSSION

There were differences in the developmental times of all the development stages and total development time of *P. marginatus* reared on four host species (Table 1). Lowest mean development time was observed from the jatropha plants and second lower was observed from Hibiscus plants and these data were significantly difference at $P= 0.05$ level. Mean percentage survival of the each

nymphal stage on four different host plants revealed that higher survival rate was in Hibiscus and second higher on Jatropha. However, Hibiscus gave the highest survival rate of 79% from first nymphal stage, 73% from second nymphal stage and 61% from third nymphal stage. Further, clear difference was observed for survival rate among the all nymphal stages. The number survived reduced gradually from nymphal stage one to three (Figure 1).

Determining the life history of a polyphagous insect is vital factor to recognize its development, distribution and abundance. Their life cycle can vary with the plant species that is used for nutrient requirement. Different plant species make available different nutrients and chemical composition for their reproduction, development and survival. The differences observed in this study on life history of *P. marginatus* may be due to nutritive factors, allelo-chemical compounds, and physical differences in leaf structures and tissues.

Table 1. Mean development time of different nymph stages of papaya mealy bug on four different host plant species.

| Host plant Species | Development Stages (Days) | | | Total Development time |
|-----------------------|---------------------------|--------|--------|---------------------------|
| | First | Second | Third | |
| Hibiscus | 4.69 b | 7.51 b | 4.07 b | 16.27 b |
| Jatropha | 4.11 b | 6.90 b | 3.89 b | 14.74 b |
| Croton | 5.66 a | 8.02 b | 5.33 a | 19.01 a |
| Sweet potato | 5.62 a | 9.58 a | 5.55 a | 20.75 a |
| Standard Error | ± 0.15 | ± 0.26 | ± 0.18 | ± 0.44 |

Note: Means within a column followed by the same letters are not significantly different at $P=0.05$ (Turkey's HSD test).

Amarasekara *et al.* (2008) reported differences in the developmental times of *P. marginatus* reared on four host species, *Hibiscus rosa-sinensis* (hibiscus), *Plumeria rubra* (plumeria), *Acalypha amentacea* (acalypha), and one weed species, *Parthenium hysterophorus* (parthenium). They further explained that developments of the different stages are much faster on acalypha and parthenium than on hibiscus and plumeria. Also they conclude that lower survival rate of first

and second instars on plumeria and survival rate of third and fourth instars is not affected by the host species.

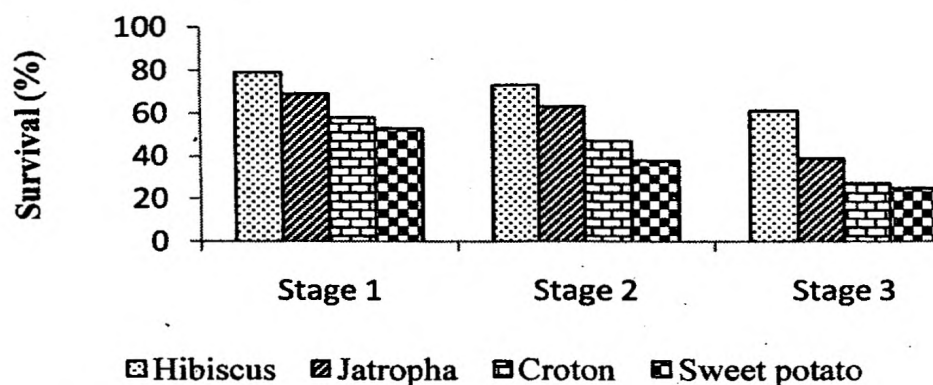


Figure 1. Mean percentage survival for each developmental stage of the papaya mealy bug reared on four different host plants

In this study, movement of crawlers (first instars) away from the leaf tissues and they falling off the plants and misplacing leaves were commonly observed on all plant species. Crawlers shown more preference to light and may caused them to move towards light and dislodge from the leaves or the shoots. Eventually, the low percentage survival of different instars was reflected in the low number of survival of *P. marginatus*.

The ability of *P. marginatus* to develop on these plant species depend on the possibility of movement, distribution, and establishment of *P. marginatus* in different host plant species. Therefore, it demonstrates that this information will support in selecting new host plant for mass rearing programme of *P. marginatus*. However, further studies may be required to confirm the selection of suitable host plant by investigating series of another set of experiments with more details on time taken to complete the life cycle and the suitable maturity stage of the plant.

The life history of *P. marginatus* is affected by the host plant and it has the ability to develop and survive in variety of host plant species. Information collected from this study revealed that Jatropha and Hibiscus plants are suitable in the maintenance of mealy bug cultures under laboratory conditions. Similarly, confirmation on developmental time of its life cycle and its ability to survive on these two host plants supports further developments of the mass rearing programme of the *P. marginatus*.

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