Survey of Papaya Mealybug *Paracoccus marginatus* on Tapioca Crop in Different Districts of Tamil Nadu

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**ABSTRACT**

The extensive survey was made during year 2011 to 2012 in different blocks of Coimbatore, Erode, Perambalur, Salem and Tirupur districts of Tamil Nadu on the incidence of papaya mealybug, *P. marginatus* on tapioca. Among the ninety five farmer’s holdings observed, none of the field was free from the pest incidence. The incidence ranged from 2 to 100 per cent. All the plant parts were covered with mealybugs with crinkling of leaves and leaves and fruits covered with honey dew and sooty mold and were started drying. Among the 95 fields surveyed, 13 recorded very high incidence, 3 with high incidence, 5 with medium incidence, 22 with low incidence and 52 with very low incidence. Very high incidence of 100 per cent was observed in only eight fields. Complete shedding of leaves occurred in most of the plants.

**Keywords**
Papaya mealybug, Tapioca, varieties, Incidence, Pest intensity, Different Districts.

**Introduction**

Tapioca is affected by several arthropods, that can be considered as key or secondary pests including painted grasshopper (*Poekilocerus pictus* Fab.), aphids (*Aphis gossypii* Glov.), red spider mite (*Tetranychus cinnabarinus* Boisd.), grey weevil (*Myllocerus viridanus* Fab.), cotton whitefly (*Bemesia tabaci* Genn.), spiralling whitefly (*Aleurodicus dispersus* Russel) and scale (*Aspidiotus destructor* Sign.) (Regupathy *et al.*, 2003; Pena *et al.*, 2005). Recently, it was observed that tapioca was affected severely by mealybug *Paracoccus marginatus* (Williams and Granara de Willink) (Pseudococcidae: Hemiptera) (Muniappan, 2009; Suresh *et al.*, 2010). Papaya mealybug is a polyphagous pest that can damage a large number of economically important field crops, tropical and sub-tropical fruits, vegetables and ornamental plants. It has caused an estimated loss of about Rs. 300 crores in each state (Anonymous, 2010). It became serious pest of papaya in Tamil Nadu and nearly 820 ha in Erode and 576 ha in Coimbatore had been affected (Revathy, 2010). Entire papain industry at Coimbatore was lost due to the severity of the pest on papaya, which spread to tapioca and mulberry in neighbouring districts of Tamil Nadu (Suresh *et al.*, 2010).
The papaya mealybug is believed to be the native of Mexico or Central America and was first described in 1992 by Williams and Granara de Willink and re-described in 2002 by Miller and Miller. Papaya mealybug infestations are typically observed as clusters of cotton-like masses on the above-ground portion of plants. Colonization of mealybugs on tapioca has been noted along the veins and the midribs of the older leaves and all areas of tender leaves (Walker *et al.*, 2006). Severely affected older leaves turn yellow and dry up. Tender leaves become bunched and distorted.

Heavy mealybug populations produce a large volume of honey dew, which causes black sooty mould on the infested fruits and vegetation (Meyerdirk *et al.*, 2004).

**Materials and Methods**

**Survey for *P. marginatus* incidence in papaya field**

One time survey was undertaken during 2011 to 2012 in 95 farmers’ holdings in Coimbatore, Erode, Perambalur, Salem and Tirupur districts of Tamil Nadu. Five spots were selected in each field and in each spot 20 plants were selected at random (totally 100 plants / field) and observed for mealybug incidence.

The per cent incidence of mealybug infested plant was worked out from the number of plants affected and total number of plants observed by following the formula,

\[
\text{Per cent Incidence} = \frac{\text{Number of plants affected}}{\text{Number of plants observed}} \times 100
\]

Infestation of the mealybug was categorized on the following parameters based on visual observations.

**Results and Discussion**

Survey was made during year 2011 to 2012 in different blocks of Coimbatore, Erode, Perambalur, Salem and Tirupur districts of Tamil Nadu on the incidence of papaya mealybug, *P. marginatus* on tapioca. Among the ninety five farmer’s holdings observed, none of the field was free from the pest incidence. The incidence ranged from 2 to 100 per cent.

All the plant parts were covered with mealybugs with crinkling of leaves and leaves and fruits covered with honey dew and sooty mold and were started drying. Among the 95 fields surveyed, 13 recorded very high incidence, 3 with high incidence, 5 with medium incidence, 22 with low incidence and 52 with very low incidence. Very high incidence of 100 per cent was observed in only eight fields and data presented in tables 2, 3, 4, and 5. Complete shedding of leaves occurred in most of the plants.

Surveys conducted in tapioca fields at different blocks of Coimbatore, Erode, Perambalur, Salem and Tirupur districts of Tamil Nadu revealed that the incidence of papaya mealybug ranged from 2 to 100 per cent in tapioca in 95 farmers’ holding fields’. Earlier observations by Regupathy and Ayyasamy (2010) in 81 holdings across Tamil Nadu revealed 1 to 100 per cent incidence in tapioca. *P. marginatus* was recorded in papaya for the first time in Tamil Nadu Agricultural University, Coimbatore, during July, 2008 by Muniappan (2009) and was also observed on commercial papaya plantations in Udumalpet, Karur, Coimbatore and Erode as well as on mulberry and jatropha fields in 11 locations in and around Coimbatore (Table 1).

The level of incidence of *P. marginatus* varied from 0 to 60 per cent in Coimbatore, Erode and Tirupur districts (Suresh *et al.*, 2010).
Surveys conducted during May 2009 between latitude and longitude ranges of 10°. 56'-11°. 16' North and 76°. 46 - 77°. 10’ East respectively in Coimbatore district of Tamil Nadu registered heavy infestations of *P. marginatus* in plantation of papaya (*Carica papaya* L.: Caricaceae), mulberry (*Morus alba* L.: Moraceae), jatropha (*Jatropha curcus* L.: Euphorbiaceae) and tapioca (*Manihot esculenta* C.: Euphorbiaceae) besides moderate to low infestations on the shoe flower (*Hibiscus- rosa- sinensis* L.: Malvaceae), guava (*Psidium guajava* L.: Myrtaceae), brinjal (*Solanum melongena* L.: Solanaceae) and tomato (*Lycopersicon esculentum* L.: Solanaceae) (Anonymous, 2009).

**Table.1** Grade chart for estimating the pest intensity level of *P. marginatus* in tapioca as adopted by Regupathy and Ayyasamy, 2010

| Grade      | Infestation levels                                                                 |
|------------|-----------------------------------------------------------------------------------|
| Very Low   | i. Few individuals of the mealybug casually found                                   |
| Low        | i. Mealybug found in low numbers                                                   |
|            | ii. No adverse symptoms like deformation of leaf observed on the plant              |
| Medium     | i. Almost 75 to 100 per cent coverage of leaves / fruits/ inflorescence             |
|            | ii. Yellowing of leaves                                                            |
|            | iii. Shedding of infested leaves and fruits                                         |
| High       | i. Almost all plant parts (stem, leaves, flowers and fruits) covered with mealybug showing white appearance |
|            | ii. Leaves, fruits and inflorescences covered with honey dew excretion and sooty mould |
| Very High  | i. All plant parts (stem, leaves, flowers and fruits) covered with mealybug showing white appearance |
|            | ii. Honey dew rain under the tree                                                  |
|            | iii. Crinkling of leaves                                                           |
|            | iv. Drying and death of plants                                                     |


| S. No | Location | Area (Acre) | Age (Months) | Variety/Hybrid | Pest Incidence (%) | Pest Intensity |
|-------|----------|-------------|--------------|----------------|-------------------|---------------|
| 1     | Kinathukadavu Coimbatore | 2.00 | 8 | Mulvadi | 100 | Very high |
| 2     | Kinathukadavu Coimbatore | 1.50 | 7 | Mulvadi | 94 | Very high |
| 3     | Kinathukadavu Coimbatore | 1.50 | 7 | Mulvadi | 84 | Very high |
| 4     | Kalankattuputhur Coimbatore | 2.00 | 7 | Mulvadi | 78 | High |
| 5     | Athurpollachi Pollachi | 5.00 | 10 | Mulvadi | 56 | Medium |
| 6     | Athurpollachi Pollachi | 4.00 | 5 | Mulvadi | 45 | Medium |
| 7     | Athurpollachi Pollachi | 1.00 | 2 | White rose | 30 | Low |
| 8     | Athurpollachi Pollachi | 1.00 | 10 | Mulvadi | 22 | Low |
| 9     | Athurpollachi Pollachi | 1.00 | 10 | Mulvadi | 26 | Low |
| 10    | Vadakkipalaiyam Pollachi | 2.00 | 12 | Mulvadi | 33 | Low |
| 11    | Vadakkipalaiyam Pollachi | 1.00 | 12 | Whiterose | 37 | Low |
| 12    | Vadakkipalaiyam Pollachi | 2.00 | 12 | Whiterose | 26 | Low |
| 13    | Vadakkipalaiyam Pollachi | 1.00 | 12 | Whiterose | 29 | Low |
| 14    | Nalloore Pollachi | 1.50 | 11 | Mulvadi | 39 | Low |
| 15    | Nalloore Pollachi | 1.00 | 10 | White rose | 22 | Low |
| 16    | Nalloore Pollachi | 1.50 | 11 | Mulvadi | 20 | Low |
| 17    | Nalloore Pollachi | 2.00 | 10 | Mulvadi | 92 | Very high |
| 18    | Narasipuramroad Thondamuthur | 2.50 | 6 | Mulvadi | 100 | Very high |
| 19    | Narasipuramroad Thondamuthur | 1.00 | 6 | Mulvadi | 92 | Very high |
| 20    | Narasipuramroad Thondamuthur | 3.00 | 5 | Mulvadi | 78 | High |
| 21    | Mathampalayam Periyanayakkanpalayam | 1.00 | 7 | Mulvadi | 100 | Very high |
| 22    | Mathampalayam Periyanayakkanpalayam | 1.00 | 5 | Mulvadi | 45 | Medium |
| 23    | Bellathi Karamadai | 1.00 | 8 | Mulvadi | 100 | Very high |
| 24    | Onnipalayapudur Periyanayakkanpalayam | 1.50 | 3 | Mulvadi | 8 | Very low |
| 25    | Onnipalayapudur Periyanayakkanpalayam | 1.50 | 4 | Mulvadi | 6 | Very low |
| 26    | Onnipalayapudur Periyanayakkanpalayam | 3.00 | 9 | Mulvadi | 100 | Very high |
| 27    | Onnipalayapudur Periyanayakkanpalayam | 1.50 | 5 | Mulvadi | 90 | Very high |
| 28    | Onnipalayapudur Periyanayakkanpalayam | 1.00 | 5 | Mulvadi | 65 | High |
| 29    | Vellamadai Kovilpalayam | 1.50 | 8 | Mulvadi | 22 | Low |
| 30    | Vellamadai Kovilpalayam | 0.50 | 9 | Mulvadi | 10 | Very low |
| 31    | Devampalaiyam Kovilpalayam | 0.50 | 5 | Mulvadi | 17 | Low |
Table.3 Infestation levels of *P. marginatus* on tapioca at Annur block of Coimbatore district

| S. No | Location   | Area (Acre) | Age (Months) | Variety/Hybrid | Pest Incidence (%) | Pest Intensity |
|-------|------------|-------------|--------------|----------------|---------------------|----------------|
| 1     | Pasur Annur| 1.75        | 9            | Mulvadi        | 16                  | Low            |
| 2     | Pasur Annur| 1.75        | 6            | Mulvadi        | 9                   | Very low       |
| 3     | Pasur Annur| 1.00        | 6            | Mulvadi        | 6                   | Very low       |
| 4     | Pongalore Annur| 2.50    | 7            | Mulvadi        | 10                  | Very low       |
| 5     | Pongalore Annur| 2.50    | 10           | Mulvadi        | 8                   | Very low       |
| 6     | Sokkampalayam Annur| 3.00 | 10           | Mulvadi        | 13                  | Low            |
| 7     | Thokkupalayam Annur| 1.00 | 2            | Mulvadi        | 6                   | Very low       |
| 8     | Thokkupalayam Annur| 3.00 | 2            | Mulvadi        | 8                   | Very low       |
| 9     | Pasur Annur| 1.50        | 8            | Mulvadi        | 5                   | Very low       |
| 10    | Pasur Annur| 1.50        | 7            | White rose     | 8                   | Very low       |
| 11    | Pasur Annur| 0.50        | 3            | White rose     | 7                   | Very low       |
| 12    | Pasur Annur| 1.50        | 8            | White rose     | 10                  | Very low       |
| 13    | Pasur Annur| 1.50        | 7            | Mulvadi        | 5                   | Very low       |
| 14    | Pasur Annur| 0.50        | 3            | Mulvadi        | 2                   | Very low       |
| 15    | Pasur Annur| 2.50        | 5            | Mulvadi        | 7                   | Very low       |
| 16    | Pasur Annur| 1.00        | 5            | Mulvadi        | 3                   | Very low       |
| 17    | Pasur Annur| 1.00        | 4            | Mulvadi        | 6                   | Very low       |
| 18    | Pasur Annur| 1.00        | 2            | Mulvadi        | 9                   | Very low       |
| 19    | Pasur Annur| 2.00        | 2            | Mulvadi        | 5                   | Very low       |
| 20    | Pasur Annur| 1.00        | 2            | Mulvadi        | 8                   | Very low       |
| 21    | Pasur Annur| 1.50        | 2            | Mulvadi        | 7                   | Very low       |
| 22    | Pasur Annur| 1.50        | 2            | Mulvadi        | 7                   | Very low       |
| 23    | Pasur Annur| 1.50        | 2            | Mulvadi        | 9                   | Very low       |
| 24    | Pasur Annur| 1.00        | 2            | Mulvadi        | 6                   | Very low       |
| 25    | Allapalayam Annur| 0.50 | 9            | Mulvadi        | 5                   | Very low       |
| 26    | Pasur Annur| 4.00        | 4            | Mulvadi        | 10                  | Very low       |
| 27    | Pasur Annur| 0.75        | 8            | Mulvadi        | 10                  | Very low       |
| 28    | Allapalayam Annur| 1.00 | 7            | Mulvadi        | 7                   | Very low       |
### Table 4 Infestation levels of *P. marginatus* on tapioca at different locations in Perambalur District

| S. No. | Location                        | Area (Acre) | Age (Months) | Variety/Hybrid | Pest incidence (%) | Pest intensity |
|--------|---------------------------------|-------------|--------------|----------------|--------------------|----------------|
| 1      | Sengunam Perambalur             | 1.00        | 10           | Mulvadi        | 7                  | Very low       |
| 2      | Sengunam Perambalur             | 1.50        | 11           | Mulvadi        | 5                  | Very low       |
| 3      | Somanapudhur Perambalur         | 1.00        | 10           | Mulvadi        | 5                  | Very low       |
| 4      | Sengunam Perambalur             | 2.00        | 11           | Mulvadi        | 10                 | Very low       |
| 5      | Sengunam Perambalur             | 2.00        | 11           | Mulvadi        | 14                 | Very low       |
| 6      | Sengunam Perambalur             | 1.50        | 11           | Mulvadi        | 6                  | Very low       |
| 7      | Poombukar Veppanthattai         | 1.00        | 12           | Mulvadi        | 5                  | Very low       |
| 8      | Poombukar Veppanthattai         | 1.00        | 11           | Mulvadi        | 8                  | Very low       |
| 9      | Annamangalam, Veppanthattai     | 3.00        | 11           | Mulvadi        | 10                 | Very low       |
| 10     | Annamangalam, Veppanthattai     | 4.00        | 11           | Mulvadi        | 7                  | Very low       |
| 11     | Poombukar Veppanthattai         | 3.00        | 11           | Mulvadi        | 6                  | Very low       |
| 12     | P.R. Nallor Alathur             | 6.00        | 10           | Mulvadi        | 9                  | Very low       |
| 13     | Jaminparaiyur Alathur           | 2.00        | 10           | Mulvadi        | 5                  | Very low       |
| 14     | P.R. Nallor Alathur             | 3.00        | 12           | Mulvadi        | 9                  | Very low       |
| 15     | P.R. Nallor Alathur             | 2.00        | 10           | Mulvadi        | 10                 | Very low       |
| 16     | P.R. Nallor Alathur             | 6.00        | 10           | Mulvadi        | 5                  | Very low       |
| 17     | K. Pudhur Veppur                 | 3.50        | 12           | Mulvadi        | 7                  | Very low       |
| 18     | Namiyur Veppur                  | 1.50        | 10           | Mulvadi        | 9                  | Very low       |
| 19     | Namiyur Veppur                  | 1.50        | 10           | Mulvadi        | 4                  | Very low       |
| 20     | K. Pudhur Veppur                 | 1.00        | 10           | Mulvadi        | 4                  | Very low       |
| 21     | K. Pudhur Veppur                 | 3.00        | 11           | Mulvadi        | 9                  | Very low       |
| 22     | K. Pudhur Veppur                 | 2.00        | 11           | Mulvadi        | 8                  | Very low       |
| 23     | K. Pudhur Veppur                 | 1.50        | 11           | Mulvadi        | 6                  | Very low       |
Papaya mealybug has a wide host range sparring more than 22 plant families (Ben-Dov, 2008) and more than 50 hosts (Regupathy and Ayyasamy, 2010), which includes field and horticultural crops, herbaceous perennials, climbers, trees, ornamentals and several weed hosts.

In conclusion, investigations were made on the incidence level of papaya mealybug, Paracoccus marginatus (Williams and Granara de Willink). A total of 95 tapioca farmers’ fields were surveyed for infestation by P. marginatus in Coimbatore, Erod, Perambalur, Salem and Tirupur districts of Tamil Nadu. The incidence of P. marginatus intensity ranged from very low to very high (2 to 100 per cent) in tapioca.

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