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

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A B S T R A C T

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.

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 (Walke**r** *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 Tripur 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 10º. 56' -11º. 16' North and 76º. 46 - 77º. 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
Grade	**Infestation levels**
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

Table.2 Infestation levels of *P. marginatus* on tapioca at different locations in Coimbatore District

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 Periyanayakkan palayam	1.00	7	Mulvadi	100	Very high
22	Mathampalayam Periyanayakkan palayam	1.00	5	Mulvadi	45	Medium
23	Bellathi Karamadai	1.00	8	Mulvadi	100	Very high
24	Onnipalayapudhur Periyanayakkanpalayam	1.50	3	Mulvadi	8	Very low
25	Onnipalayapudhur Periyanayakkanpalayam	1.50	4	Mulvadi	6	Very low
26	Onnipalayapudhur Periyanayakkanpalayam	3.00	9	Mulvadi	100	Very high
27	Onnipalayapudhur Periyanayakkanpalayam	1.50	5	Mulvadi	90	Very high
28	Onnipalayapudhur 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

Table.5 Infestation levels of *P. marginatus* on tapioca at different locations in Salem and Tirupur Districts

S. No	Location	Area (Acre)	Age (Months)	Variety/Hybrid	Pest Incidence (%)	Pest Intensity
1	Karumandurai, Karumandurai	4.00	8	Mulvadi	100	Very high
2	Karumandurai, Karumandurai	5.00	7	Mulvadi	100	Very high
3	Karumandurai, Karumandurai	4.00	8	Mulvadi	100	Very high
4	Peranayakkan pudhur, Avinasi	4.00	7	Mulvadi	55	Medium
5	Peranayakkan pudhur Avinasi	3.00	7	Mulvadi	44	Medium
6	Peranayakkan pudhur Avinasi	2.00	5	Mulvadi	26	Low
7	Neelipalayam Avinasi	1.00	5	Mulvadi	55	Low
8	Peranayakkan pudhur Avinasi	2.00	5	Mulvadi	37	Low
9	Neelipalayam Avinasi	1.00	5	Mulvadi	28	Low
10	Neelipalayam Avinasi	2.00	2	Mulvadi	22	Low
11	Neelipalayam Avinasi	1.00	9	Mulvadi	27	Low
12	Nochikottai Avinasi	1.00	10	Mulvadi	33	Low
13	Nochikottai Avinasi	1.00	10	Mulvadi	39	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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