

**Original Research Paper**

## Seasonal incidence, population dynamics and morphometric traits of exotic coconut whiteflies in southern Tamil Nadu

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### ABSTRACT

Survey was conducted at fortnightly intervals to assess the intensity of damage caused by the invasive whiteflies in coconut in the southern districts of Tamil Nadu viz., Thoothukudi, Tirunelveli, Tenkasi and Kanyakumari from December 2020 to August 2021. Among the four districts, Kanyakumari recorded the highest whitefly incidence (56.30%), whereas, Tenkasi showed the lowest infestation (48.83%). Two whitefly species viz., rugose spiralling whitefly, *Aleurodicus rugioperculatus* Martin and bondars nesting whitefly (BNW), *Paraleyrodes bondari* Peracchi were observed in all the surveyed districts. The rugose spiralling whitefly nymphs and adult populations were found to be highest in Kanyakumari (49.46 nymphs/leaflet; 36.99 adults/leaflet) and lowest in Tenkasi (32.76 nymphs/leaflet; 26.71 adults/leaflet). Similarly, the population of bondars nesting whitefly nymphs and adults were highest in Kanyakumari (35.31 nymphs/leaflet; 34.84 adults/leaflet), whereas, the lowest nymphal population was observed in Tenkasi (22.79 nymphs/leaflet) and adult population in Thoothukudi (24.19 adults/leaflet). In morphometric analysis, length and breadth of egg ( $0.24 \pm 0.03$  mm and  $0.13 \pm 0.02$  mm), nymphal ( $0.83 \pm 0.08$  mm and  $0.38 \pm 0.04$  mm), pupal ( $1.08 \pm 0.09$  mm and  $0.70 \pm 0.09$  mm), adult (female:  $2.59 \pm 0.09$  mm,  $1.71 \pm 0.14$  mm; male:  $2.27 \pm 0.21$  mm,  $1.30 \pm 0.05$  mm) was recorded for *A. rugioperculatus* and egg ( $0.15 \pm 0.02$  mm and  $0.08 \pm 0.01$  mm), nymphal ( $0.46 \pm 0.02$  mm and  $0.36 \pm 0.02$  mm), pupal ( $0.59 \pm 0.16$  mm and  $0.41 \pm 0.09$  mm), adult ( $1.09 \pm 0.08$  mm and  $0.73 \pm 0.07$  mm) for *P. bondari*.

**Keywords :** Coconut, intensity of damage, morphometry, whiteflies

### INTRODUCTION

Coconut (*Cocos nucifera*), palm of family Arecaceae is an important plantation crop grown in India and the southern states viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh constitute major area and production of coconut. In India, coconut is grown in an area of 2,150.89'000 ha with an annual production of 21,288.24 million nuts and productivity of 9897 nuts/ha (CDB, 2018-2019). In Tamil Nadu, coconut is cultivated in 4,38,935.20 ha with 49,474 lakh nuts and 11,271 nuts/ha production and productivity, respectively (CDB, 2019-2020). Most of the human population in India depends on coconut directly or indirectly for their livelihood. Coconuts possess high nutritive value including minerals, vitamin B, copper, iron along with proteins and antioxidants. They have several health benefits and it is a multipurpose tree, as the whole parts of coconut are used in one or the other way.

The coconut tree is infested by several insect pests throughout the year (Thampan, 1975). Recently, whiteflies pose serious threat to the coconut growers in the country. Rugose spiralling whitefly (RSW), *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) originally known as gumbo limbo spiralling whitefly was reported first from coconut during 2004 in Belize, Central America (Martin, 2004), in South Florida, United States in 2009 (Stocks *et al.*, 2012), in Changanassery, Kottayam, Kerala during 2016 (Shanas *et al.*, 2016), Mangalore and Udipi of Karnataka in 2016 (Selvaraj *et al.*, 2017) and in Pollachi tract, Coimbatore district, Tamil Nadu, in August 2016 (Srinivasan *et al.*, 2016). A total of 118 hosts have been documented to be attacked by the RSW, including crops and weeds (Stocks *et al.*, 2012). They deposit creamy golden eggs in a spiral pattern on the underside of the leaves. When the nymphs hatch, they begin sucking the plant sap from the underside of the leaves, releasing honeydew that falls



on the upper surface of the fronds below them (Josephraj Kumar *et al.*, 2016). The fungus *Capnodium* grows on the honeydew, giving it a charcoal black appearance that may be visible from distance (Chandrika *et al.*, 2016) that affects photosynthesis and in turn reduction in the quality of nuts.

Later in 2018, bondar's nesting whitefly (BNW), *Paraleyrodes bondari* Peracchi was first identified in Kayamkulam, Kerala. It feeds on more than 25 host plants. (Chandrika *et al.*, 2018) which is also creating menace in the coconut gardens of Tamil Nadu recently. The nymphs and adults of *P. bondari* construct nesting chambers of woolly wax and the adults will be remaining on the nests for egg laying. The woolly wax nests will be seen on the under surface of the leaflets. Another invasive nesting whitefly, *Paraleyrodes minei* laccarino was observed in coconut gardens in larger areas along the Western Ghat coastal regions of Kerala and Karnataka since November 2018 (Sujithra *et al.*, 2019). Palm infesting whitefly, *Aleurotrachelus atratus* Hempel was first reported on ornamental areca palm in 2019 at Mysore and Mandya districts of Karnataka (Selvaraj *et al.*, 2019). At present, the whitefly complex in coconut pose serious threat to the growers as the under surface of leaves were totally covered with whiteflies and the sooty mould infestation dominates the upper surface. Coconut is an important crop in the southern districts of Tamil Nadu and the incidence of whiteflies can cause stress to the plant by removing nutrients and water. In addition to damaging the host plants, whiteflies also create a nuisance in the area of infestation. In this context, the present study was undertaken to assess the seasonal incidence and population dynamics of whitefly species in southern regions of Tamil Nadu and to study the morphometric parameters of exotic whiteflies of coconut.

## MATERIALS AND METHODS

Surveys were conducted at fortnightly intervals in the southern districts of Tamil Nadu *viz.*, Thoothukudi, Kanyakumari, Tirunelveli and Tenkasi on five locations of each district from December 2020 to August 2021 to assess the incidence and population dynamics of whitefly species. The seasonal incidence and the population dynamics of coconut whiteflies was assessed on the under surface of 100 leaflets randomly on ten palms each in five locations. The intensity of

damage was calculated using the following formula as suggested by Elango *et al.* (2019).

$$\text{Intensity of damage (\%)} = \frac{\text{No. of fronds infested / tree}}{\text{Total no. of fronds observed / tree}} \times 100$$

The adult whiteflies were caged on potted coconut plants leaf for oviposition and freshly laid egg spirals were identified for *A. rugioeperculatus* and the nests were observed for the eggs of *P. bondari*. The eggs were observed regularly and the immature stages of whiteflies were excised daily and measurements on eggs, nymphal stages, pupae and adults were made using LEICA S8 APO with image analyser. The data obtained on the intensity of damage and populations of *A. rugioeperculatus* and *P. bondari* were statistically analysed using SPSS version 16.0 software.

## RESULTS AND DISCUSSION

Survey on the incidence and population dynamics of coconut whiteflies in the four southern districts of Tamil Nadu revealed that among the different species of whitefly inhabiting coconut the two whitefly species *viz.*, rugose spiralling whitefly, *A. rugioeperculatus* and bondar's nesting whitefly, *P. bondari* were prevalent in Thoothukudi, Tirunelveli, Tenkasi and Kanyakumari districts. The intensity of damage, nymphal and adult population of coconut whiteflies and their morphometric parameters are detailed here.

### Intensity of damage (%) by coconut whiteflies

The distribution and severity of *A. rugioeperculatus* and *P. bondari* in the southern districts of Tamil Nadu from December 2020 to August 2021 are presented in Table 1. The highest whitefly infestation (56.30%) was recorded in Kanyakumari followed by Tirunelveli (54.36%) and Thoothukudi (51.83%), whereas, Tenkasi district had the lowest infestation (48.83%). On considering the pest infestation in different months among the four districts, the highest infestation was observed in March 2021 (54.44%) followed by December 2020 (54.20%). The per cent infestation was found to be low during August 2021 (47.78%). The survey results on the intensity of damage (%) revealed that the mean per cent infestation of coconut whiteflies among the different months ranged from 47.78 to 54.44% and the mean infestation of coconut whiteflies in different districts revealed that the highest damage was recorded in Kanyakumari district

(56.30%) followed by Tirunelveli district (54.36%). Alagar *et al.* (2020) assessed the intensity of infestation of *A. rugioperculatus* during June 2018 to March 2020, the severity of *A. rugioperculatus* infestation was substantially higher in Tirunelveli (70.50%) and Kanyakumari (75.70%) districts, respectively. The study results are also in line with the findings of Selvaraj *et al.* (2016) and Sundararaj *et al.* (2017) who reported that the severity of infestation of *A. rugioperculatus* ranged from 40-60% in coconut.

**Population of *A. rugioperculatus* nymphs**

The population of *A. rugioperculatus* nymphs in four different southern districts of Tamil Nadu is given in Table 2. On considering the overall mean

of different months, the descending order of the nymphal population of *A. rugioperculatus* is as follows: Kanyakumari (49.46 nymphs/leaflet) > Tirunelveli (44.01 nymphs/leaflet) > Thoothukudi (39.68 nymphs/leaflet) > Tenkasi (32.76 nymphs/leaflet). The nymphal population of *A. rugioperculatus* was found to be highest throughout the period of observation except April and June 2021 in Kanyakumari district and Thoothukudi district recorded highest population in April 2021 (51.24 nymphs/leaflet) and Tirunelveli district in June 2021 (46.11 nymphs/leaflet). The lowest population of 22.95 nymphs/leaflet was observed in Tenkasi district during August 2021. In the

**Table 1 : Intensity of damage by coconut whiteflies in southern districts of Tamil Nadu**

Location	Intensity of damage*(%)									Mean
	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Thoothukudi	53.24 (46.88)	50.59 (45.34)	52.30 (46.32)	54.27 (47.46)	51.69 (45.97)	53.89 (47.24)	50.46 (45.26)	52.46 (46.41)	47.59 (43.62)	51.83 (46.06)
Tirunelveli	55.10 (47.93)	54.91 (47.82)	54.78 (47.75)	55.84 (48.36)	55.55 (48.19)	54.62 (47.65)	54.57 (47.62)	53.76 (47.16)	50.15 (45.09)	54.36 (47.51)
Tenkasi	48.11 (43.92)	50.18 (45.10)	49.70 (44.83)	51.08 (45.62)	50.20 (45.12)	49.40 (44.66)	50.30 (45.17)	49.00 (44.43)	41.51 (40.10)	48.83 (44.33)
Kanyakumari	60.35 (51.07)	58.56 (49.93)	58.11 (49.67)	56.58 (48.79)	56.17 (48.56)	54.40 (47.53)	54.06 (47.34)	56.62 (48.81)	51.89 (46.08)	56.30 (48.64)
Mean	54.20 (47.45)	53.56 (47.05)	53.73 (47.14)	54.44 (47.55)	53.40 (46.96)	53.08 (46.76)	52.35 (46.34)	52.96 (46.70)	47.78 (43.72)	
SE(d)	District = 0.387; Month = 0.580; D×M = 1.159									
CD (P=0.05)	District = 0.767; Month = 1.150; D×M = 2.301 <sup>ns</sup>									

\*Mean of five replications. Figures in parentheses are *arc sine* transformed values

**Table 2 : Population of *Aleurodicus rugioperculatus* nymphs in southern districts of Tamil Nadu**

Location	Population of <i>A. rugioperculatus</i> nymphs/leaflet*									Mean
	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Thoothukudi	44.99 (6.71)	35.15 (5.96)	32.98 (5.78)	42.39 (6.53)	51.24 (7.19)	43.46 (6.63)	33.37 (5.80)	40.04 (6.36)	33.48 (5.80)	39.68 (6.30)
Kanyakumari	62.70 (7.89)	49.83 (7.01)	53.83 (7.33)	55.30 (7.44)	45.15 (6.71)	50.73 (7.13)	45.13 (6.70)	42.80 (6.52)	39.65 (6.28)	49.46 (7.00)
Tirunelveli	50.62 (7.02)	41.07 (6.35)	47.21 (6.75)	40.21 (6.27)	46.38 (6.72)	50.37 (7.05)	46.11 (6.69)	34.95 (5.95)	39.15 (6.28)	44.01 (6.56)
Tenkasi	40.94 (6.41)	31.24 (5.60)	26.82 (5.23)	36.35 (6.07)	39.90 (6.35)	35.08 (5.96)	28.54 (5.38)	32.98 (5.78)	22.95 (4.83)	32.76 (5.73)
Mean	49.81 (7.00)	39.32 (6.23)	40.21 (6.27)	43.56 (6.57)	45.67 (6.74)	44.91 (6.69)	38.29 (6.14)	37.69 (6.16)	33.81 (5.80)	
SE(d)	District=0.133; Month =0.200; D×M = 0.398									
CD (P=0.05)	District =0.262; Month =0.394; D×M = 0.787 <sup>ns</sup>									

\*Mean of five replications. Figures in parentheses are  $\sqrt{x+0.5}$  transformed values



present study, it was observed that the mean population of *A. rugioperculatus* was prevalent throughout the study period and this is in tune with the findings of Elango *et al.* (2020) who studied the population dynamics of a novel exotic whitefly species, *A. rugioperculatus* and their natural enemies on five year old Chowghat orange dwarf coconut trees and found the population of *A. rugioperculatus* on coconut throughout the year, and the observation recorded on a weekly interval basis showed that the population of *A. rugioperculatus* increased from the first week of July 2018 (130.8 nymph/leaf/frond) to a maximum during the first week of October, 2018 (161.0 nymph/leaf/frond) and then decreased to a minimum during April, 2019 (Elango *et al.*, 2020).

**Population of *A. rugioperculatus* adults**

The adult population of *A. rugioperculatus* during the period of observation is presented in Table 3. The mean population of *A. rugioperculatus* adults varied from 29.50 to 34.60 adults/leaflet throughout the study period from December 2020 to August 2021. Considering the overall mean the highest population of *A. rugioperculatus* adults was recorded in Kanyakumari district (36.99 adults/ leaflet) and the lowest population in Tenkasi district (26.71 adults/ leaflet).

**Population of *P. bondari* nymphs**

The nymphal population of *P. bondari* was found to be less when compared to *A. rugioperculatus*. The mean nymphal population of *P. bondari* was high in Kanyakumari (35.31 nymphs/leaflet)

followed by Tirunelveli (31.70 nymphs/leaflet), Thoothukudi (25.31 nymphs/leaflet) and Tenkasi (22.79 nymphs/leaflet). The *P. bondari* nymphs was found to be maximum in December 2020 (32.78 nymphs/leaflet) followed by February 2021 with 30.17 nymphs/leaflet. Among the months of observation, the least number of *P. bondari* nymphs was noticed during January 2021 (25.69 nymphs/ leaflet) (Table 4).

**Population of *P. bondari* adults**

The adults of *P. bondari* were found to be highest in Kanyakumari district similar to nymphs with a population of 34.84 adults/leaflet and followed by Tirunelveli district (30.80 adults/leaflet) and then by Tenkasi and Thoothukudi districts with a mean population of 25.05 and 24.19 adults/leaflet, respectively (Table 5). While considering the monthly mean, the adult population of *P. bondari* was highest in December 2020 with a population of 33.07/leaflet followed by May 2021 (30.18 adults/leaflet). The lowest population of 25.01 adults/leaflet was recorded in July 2021.

**Morphometrics parameters of *A. rugioperculatus* and *P. bondari***

**Egg**

The rugose spiralling whitefly, *A. rugioperculatus* eggs were 0.24±0.03 mm length, 0.13±0.02 mm breadth and 0.67±0.07 mm diameter and the bondar’s nesting whitefly, *P. bondari* eggs were 0.15±0.02 mm in length, 0.08±0.01 mm breadth and 0.37±0.06 mm diameter.

**Table 3 : Population of *Aleurodicus rugioperculatus* adults in southern districts of Tamil Nadu**

Location	Population of <i>A. rugioperculatus</i> adults/leaflet*									Mean
	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Thoothukudi	30.13 (5.51)	35.67 (5.99)	27.88 (5.26)	31.86 (5.67)	28.30 (5.35)	38.69 (6.25)	30.58 (5.56)	22.83 (4.74)	26.75 (5.20)	30.30 (5.50)
Kanyakumari	41.48 (6.47)	35.45 (5.99)	41.41 (6.47)	33.94 (5.86)	40.94 (6.43)	33.01 (5.78)	31.39 (5.65)	35.91 (6.03)	39.38 (6.31)	36.99 (6.11)
Tirunelveli	38.76 (6.26)	34.70 (5.92)	32.12 (5.70)	35.07 (5.95)	32.10 (5.69)	31.16 (5.61)	34.47 (5.90)	33.50 (5.82)	32.66 (5.74)	33.84 (5.84)
Tenkasi	28.04 (5.33)	25.20 (5.06)	29.95 (5.51)	25.57 (5.10)	27.92 (5.31)	25.83 (5.13)	23.62 (4.90)	25.77 (5.12)	28.45 (5.38)	26.71 (5.21)
Mean	34.60 (5.89)	32.76 (5.74)	32.84 (5.73)	31.61 (5.65)	32.32 (5.69)	32.17 (5.69)	30.02 (5.50)	29.50 (5.43)	31.81 (5.66)	
SE(d)	District=0.093; Month = 0.139; D×M = 0.278									
CD (P=0.05)	District =0.184; Month =0.276 <sup>ns</sup> ; D×M = 0.551									

**Table 4 : Population of *Paraleyrodes bondari* nymphs in southern districts of Tamil Nadu**

Location	Population of <i>P. bondari</i> nymphs/leaflet*									Mean
	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Thoothukudi	29.72 (5.47)	22.11 (4.72)	24.99 (5.03)	28.08 (5.33)	26.55 (5.17)	21.54 (4.66)	27.45 (5.27)	22.21 (4.66)	25.18 (5.05)	25.31 (5.04)
Kanyakumari	40.58 (6.41)	32.07 (5.70)	39.31 (6.30)	31.23 (5.63)	37.79 (6.19)	31.04 (5.61)	34.46 (5.91)	37.70 (6.18)	33.63 (5.83)	35.31 (5.97)
Tirunelveli	35.90 (6.02)	28.97 (5.39)	32.02 (5.67)	33.02 (5.78)	32.41 (5.72)	30.75 (5.57)	31.31 (5.62)	29.43 (5.46)	31.54 (5.65)	31.70 (5.65)
Tenkasi	24.94 (5.03)	19.62 (4.48)	24.37 (4.98)	18.52 (4.36)	22.84 (4.83)	24.83 (5.03)	24.32 (4.97)	17.34 (4.19)	28.29 (5.36)	22.79 (4.80)
Mean	32.78 (5.73)	25.69 (5.07)	30.17 (5.50)	27.71 (5.28)	29.90 (5.47)	27.04 (5.22)	29.39 (5.44)	26.67 (5.12)	29.66 (5.47)	
SE(d)	District=0.097; Month = 0.146; D×M = 0.292									
CD (P=0.05)	District =0.193; Month =0.290; D×M = 0.579 <sup>ns</sup>									

**Table 5 : Population of *Paraleyrodes bondari* adults in southern districts of Tamil Nadu**

Location	Population of <i>P. bondari</i> adults/leaflet*									Mean
	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Thoothukudi	29.28 (5.44)	23.93 (4.92)	20.06 (4.49)	23.13 (4.84)	25.87 (5.12)	27.23 (5.26)	24.00 (4.94)	19.75 (4.42)	24.43 (4.98)	24.19 (4.94)
Kanyakumari	41.55 (6.47)	33.34 (5.81)	40.52 (6.40)	31.37 (5.64)	38.41 (6.24)	30.06 (5.53)	34.9 (5.95)	30.75 (5.58)	32.63 (5.75)	34.84 (5.93)
Tirunelveli	35.45 (5.98)	31.22 (5.62)	27.81 (5.30)	33.34 (5.81)	29.95 (5.51)	33.78 (5.85)	31.11 (5.61)	23.69 (4.90)	30.84 (5.59)	30.80 (5.57)
Tenkasi	25.99 (5.12)	21.42 (4.67)	25.93 (5.12)	19.21 (4.43)	23.73 (4.89)	29.64 (5.48)	23.88 (4.92)	25.86 (5.12)	29.80 (5.49)	25.05 (5.03)
Mean	33.07 (5.76)	27.48 (5.25)	28.58 (5.33)	26.76 (5.18)	29.49 (5.44)	30.18 (5.53)	28.47 (5.36)	25.01 (5.01)	29.43 (5.45)	
SE(d)	District=0.090; Month = 0.136; D×M = 0.271									
CD (P=0.05)	District =0.179; Month =0.269; D×M = 0.538									

\*Mean of five replications. Figures in parentheses are transformed values

### Nymph

The first instar nymphs of *A. rugioeperculatus* were 0.35±0.04 mm length, 0.24±0.01 mm breadth, and 1.14±0.29 mm diameter, second instar nymphs were 0.58±0.04 mm length, 0.27±0.01 mm breadth and 1.27±0.19 mm diameter, third instar nymphs were 0.83±0.08 mm length, 0.38±0.04 mm breadth and 2.50±0.35 mm diameter and the fourth instar nymphs were 1.08±0.09 mm in length, 0.70±0.09 mm breadth and 2.93±0.28 mm diameter. The body measurements of *P. bondari* were 0.24±0.01 mm length, 0.16±0.02 mm breadth and 0.83±0.03 mm diameter for first instar nymphs, 0.35±0.04 mm length, 0.25±0.02 mm breadth, 0.90±0.03 mm diameter for second instar nymphs, 0.46±0.02 mm length, 0.36±0.02 mm breadth and 1.11±0.17 mm

diameter for third instar nymphs and 0.59±0.16 mm in length, 0.41±0.09 mm in breadth and 1.67±0.41 mm in diameter for fourth instar nymphs, respectively. Fourth instar nymphs are considered as a pseudo pupal stage.

### Adult

The length and breadth of adult male were 2.27±0.21 and 1.30±0.05 mm and the adult female were 2.59±0.09 and 1.71±0.14 mm. In bondar's nesting whitefly, *P. bondari* adult, the length and breadth were 1.09±0.08 and 0.73±0.07 mm, respectively (Table 6). The morphometric analysis on the developmental stages of *A. rugioeperculatus* in coconut revealed that the present result is almost similar in length (mm) with the findings of Saranya *et al.* (2021).

**Table 6 : Morphometric parameters of developmental stages of *Aleurodicus rugioperculatus* and *Paraleyrodes bondari***

Sl. No.	Parameter	Descriptions*		
		Length (mm)	Breadth (mm)	Diameter (mm)
<b><i>A. rugioperculatus</i></b>				
1	Egg	0.24 ± 0.03	0.13 ± 0.02	0.67 ± 0.07
2	Nymph			
	1 <sup>st</sup> instar	0.35 ± 0.04	0.24 ± 0.01	1.14 ± 0.29
	2 <sup>nd</sup> instar	0.58 ± 0.04	0.27 ± 0.01	1.27 ± 0.19
	3 <sup>rd</sup> instar	0.83 ± 0.08	0.38 ± 0.04	2.50 ± 0.35
	4 <sup>th</sup> instar	1.08 ± 0.09	0.70 ± 0.09	2.93 ± 0.28
3	Adult female	2.59 ± 0.09	1.71 ± 0.14	-
	Adult male	2.27 ± 0.21	1.30 ± 0.05	-
<b><i>P. bondari</i></b>				
1	Egg	0.15 ± 0.02	0.08 ± 0.01	0.37 ± 0.06
2	Nymph			
	1 <sup>st</sup> instar	0.24 ± 0.01	0.16 ± 0.02	0.83 ± 0.03
	2 <sup>nd</sup> instar	0.35 ± 0.04	0.25 ± 0.02	0.90 ± 0.03
	3 <sup>rd</sup> instar	0.46 ± 0.02	0.36 ± 0.02	1.11 ± 0.17
	4 <sup>th</sup> instar	0.59 ± 0.16	0.41 ± 0.09	1.67 ± 0.41
3	Adult	1.09 ± 0.08	0.73 ± 0.07	-

\*Mean ± SD of 10 observations

### CONCLUSION

From the present study it is concluded that the exotic whitefly species, viz., RSW, *Aleurodicus rugioperculatus* and BNW, *Paraleyrodes bondari* were the prevalent whiteflies in southern tracts of Tamil Nadu in coconut. The population of these invasive species were found throughout the year.

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