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Seasonal incidence of different *Aceria* sp. correlated with weather parameters

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Abstract
Investigations were carried out regarding seasonal incidence of the jasmine eriophyid mite, mango bud mite and mulberry bud mites at the Department of Agricultural Entomology, TNAU, Coimbatore. Studies on the seasonal incidence revealed a major population peaks above the trend line during May to June, 2014. Maximum mite population of *Aceria jasmini* was recorded during first and second fortnight during June, 2014 (33.30 and 37.5 mites/leaf) respectively. The mango bud mite was very low in both October, 2013 (3.7 & 4.3) and 2014 (2.4 & 1.8). Mulberry bud mite was recorded during first and second fortnight of June, 2014 (15.8 and 16.4). Correlation studies between weather parameters and mean jasmine mite population displayed a positive correlation with maximum temperature (r = 0.605) and minimum temperature (r = 0.298) whereas the relative humidity (r = -0.543), rainfall (r = -0.689) were negatively correlated. There was significant relationship between the mite population and weather parameters except relative humidity of first fortnight and rainfall of second fortnight. The mango bud mite with correlation of maximum temperature (r = 0.303) as significance and minimum temperature (r = 0.155) which were positively correlated whereas rainfall (r = -0.843) as significance and relative humidity (r = -0.494) was negatively correlated with no significant in mite population in first fortnight observation. The mulberry bud mite population revealed significant relationship except for rainfall in the first fortnight mite population. The maximum (r = 0.329) and minimum temperature (r = 0.257) which were positively correlated with no significance in mite populations, relative humidity and rainfall negatively correlated with mite population and rainfall (r = -0.688) was significance during first fortnight with mite populations

Keywords: Seasonal incidence, *Aceria jasmini, Aceria mangifera, Aceria mori* and weather parameters

1. Introduction
Eriophyids are microscopic and often go unnoticed and are worm-like having only two pairs of legs which can be differentiated from other adult mites which have four pairs of legs; slow moving, usually white or yellow in colour. The superfamily Eriophyoidea (Acari: Prostigmata) comprising of about 4, 000 species belonging to 250 genera are known to the World. Among six families of Eriophyoidea, the members of eriophyidae and phytoptidae are known to induce different types of abnormalities like galls, erineum while most of the other species are vagrants. Generally, eriophyids are host specific with few exceptional species feeding on host plants within single genus and rarely having broad host range [17]. Eriophyid feeding on plants induce toxaemia and non-distortive effects like russetting, silvering, bronzing, formation of galls, distortions or other abnormalities and formation of rapid necrotic lesions [22]. All the plant parts except true root systems are preferred by eriophyids because of their high nutritional value. Interaction between host plant genotype, mite species and environmental factors results in the final form of damage symptoms due to mite feeding [19].
Eriophyids are found to attack many economic crops [9] and yield loss can decrease by 50% in severely damaged wheat plants [13]. The peach fruit malformation symptom was first found in Qian-An country, Hebei Province, North China in the 1970's-1980's in an area of 400 ha [23] and mango eriophyid mites distributed in different parts of the world are known to cause economic damage [4, 5, 2]. In European countries 80-90 per cent of the apple orchards are infested by eriophyid species [12]. 20–100 per cent infestation of garlic cloves and a considerable amount of storage loss [4, 16] accounted the eriophyid infestation on coconut palm range as 8.33 per cent to 80 per cent in Thane district during the year 2002 whereas it varied from 6.67 to 85.00 in Thane district during the year 2003 [20]. The level of infestation of eriophyid mite was highest in Thane district followed by Sindhudurg, Ratnagiri and Raigad [7]. *Aceria tulipae* was also known to cause severe crop losses in all garlic grown areas around the world,

reducing the yield up to 23 per cent [11].

Estimated losses in copra yield due to coconut mite damage ranged 10 per cent in Benin [14], 16 per cent in the Ivory Coast [10], 25 per cent in Grenada [8] and 30-80 per cent in different areas of Mexico [8, 18 10, 15] found copra yield to decline with increasing severity of damage caused by the coconut mite.

2. Materials and Methods

2.1 Seasonal incidence of eriophyid mites

Studies on the seasonal incidence of *A. jasmini, A. mangiferae and A. mori* were conducted on two and half years, five years and eleven years old plants of jasmine, mango and mulberry respectively, at TNAU Botanical garden, Orchard and Sericulture department of Tamil Nadu Agricultural University, Coimbatore from October, 2013 to October, 2014. Ten observations were recorded at fortnightly interval and the actual mite population was assessed.

The corresponding weather parameters *viz.*, maximum and minimum temperature, relative humidity and rainfall for the above mentioned period were obtained from Agro Climatic Research Centre, Tamil Nadu Agricultural University, Coimbatore. Hence the correlation between weather parameters and mite population was worked out.

3. Results

3.1 Seasonal incidence of *Aceria jasmini* Chan

The population was highly variable and observed that jasmine eriophyid mite, *Aceria jasmini* was very minimum during the first and second fortnight of October, 2013 and slowly increased up to June, 2014 and thereafter declined till October, 2014 (Table.1). The mean population was observed to be more between April, 2014 and June, 2014 in both the first and second fortnight periods. However, maximum mite population was recorded during June, 2014 (33.30 and 37.5 mites/leaf).

Table 1: Weather parameters and incidence of jasmine, mango and mulberry eriophyid mean mite populations

Months	Air Temperature (°C)		RH (%)	RF (cm)	Jasmine leaf mite		Mango bud mite		Mulberry bud mite	
	Max	Min			I Fortnight	II Fortnight	I Fortnight	II Fortnight	I Fortnight	II Fortnight
October, 2013	32.7	21.5	80.3	15.1	6.7	6.5	3.7	4.3	4.9	5.6
November, 2013	31. 3	22.1	77.3	6.8	11.8	12.3	7.7	8.1	5.8	6.1
December, 2013	30.9	20.7	79.8	3.1	12.9	13.8	9.7	10.1	6.7	7.1
January, 2014	29.8	16.7	72.7	0.9	14.5	14.9	10.5	10.9	7.5	7.7
February, 2014	31.8	16.3	73.3	0.0	15.3	18.9	11.6	11.9	7.9	8.2
March, 2014	35.2	16.9	65.7	0.0	20.8	22.5	12.2	12.7	8.4	8.8
April, 2014	37.1	24.2	66.5	0.0	24.5	26.1	13.5	13.9	9.1	9.4
May, 2014	34.6	24.5	73.5	0.0	30.7	33.2	14.5	14.8	9.6	10.5
June, 2014	33.2	23.9	78.5	0.0	33.3	37.5	14.8	23.8	15.8	16.4
July, 2014	31.2	22.7	81.5	0.7	19.5	21.1	18.6	18.5	12.8	9.8
August, 2014	29.7	23.3	82.9	1.7	14.3	11.4	13.1	9.3	8.1	7.6
September, 2014	31.5	22.2	84.5	3.3	7.2	8.7	7.2	7.7	7.4	7.9
October, 2014	29.9	22.0	95.7	10.8	6.4	6.7	2.4	1.8	2.1	1.6

Mean of five replications.

3.2 Seasonal incidence of *Aceria mangiferae* Sayed

The bud mite population observations displayed a steady increase from October, 2013 to July, 2014 and thereafter population decreased. The mite incidence increased four times during April, 2014 (12.2 mites/bud) and almost five times during July, 2014. The mite population declined by fifty per cent immediately in August, 2014. The trend was similar during first and second fortnight. The mango bud mite was very low in both October, 2013 (3.7 & 4.3) and 2014 (2.4 & 1.8).

3.3 Seasonal incidence of *Aceria mori* Keifer

The mulberry bud mite incidence was very similar to the jasmine leaf mite and mango bud mite trend. Maximum mite on mulberry bud mite was recorded during first and second fortnight of June, 2014 (15.8 and 16.4). The increase in mite population was in numerical with one or two mite up to May, 2014 and with sudden increase during June, 2014. Drastically reduced the mite numbers during July, 2014. The mite incidence was high during October, 2013 (4.9 and 5.6) whereas low in October, 2014 (2.1 and 1.6).

3.4 Comparison of mean mite population of different hosts with weather parameters.

Among the three different hosts with the respective eriophyid mite species, the highest mean

mite population was recorded for *Jasminum auriculatum* (33.3 & 37.5 mites/leaf) and *Morus alba* (18.6 & 23.8 mites/bud) in June, 2014 and *Mangifera indica* in July, 2014 (18.60 & 23.8 mites/bud).

3.5 Correlation analysis of seasonal incidence with weather parameters in jasmine.

Correlation studies between weather parameters and mean jasmine mite population displayed a positive correlation with maximum temperature (r = 0.605) and minimum temperature (r = 0.298) whereas the relative humidity (r = -0.543), rainfall (r= -0.689) were negatively correlated. There was significance relationship between the mite population and weather parameters except relative humidity of first fortnight and rainfall of second fortnight (Table.2).

Table 2: Correlation between the weather parameters and occurrence of *A. jasmini*, *A. mangiferae* and *A. mori*.

Weather parameters	Jasmine leaf mite population (Numbers/leaf)		Mango bud mite population (Numbers/bud)		Mulberry bud mite population (Numbers/bud)	
	I – Fortnight	I – Fortnight	I – Fortnight	II – Fortnight	I – Fortnight	II – Fortnight
Maximum temperature (ºC)	0.605	0.618	0.303	0.381	0.313	0.428
Minimum temperature (ºC)	0.298	0.245	0.155	0.185	0.257	0.229
Relative Humidity (%)	-0.543	-0.542	-0.494	-0.455	-0.359	-0.464
Rainfall (mm)	-0.689	-0.686	-0.843	-0.745	-0.688	-0.675

Mean of five replications.

3.6 Correlation studies between seasonal incidence and weather parameters in mango bud mite.

Weather factors correlation studies revealed significant relationship except for minimum temperature and relative humidity in the first fortnight of mite population. The maximum temperature (r = 0.303) and minimum temperature (r = 0.155) were positively correlated whereas rainfall (r = -0.843) as significant and relative humidity (r = -0.494) was negatively correlated with no significance in mite population in first fortnight observation. In second fortnight observation maximum temperature (r = 0.381) and minimum temperature (r = 0.185) were positively correlated and significant with mite population. Rainfall (r = -0.745) and relative humidity (r = -0.455) were negatively correlated with non-significant mite population in second fortnight.

3.7 Correlation studies between mulberry bud mite seasonal incidence and weather parameters

Correlation between weather parameters and mulberry bud mite population revealed significant relationship except for rainfall in the first fortnight mite population. The maximum temperature (r = 0.313) and minimum temperature (r = 0.257) which were positively correlated with no significance in mite populations, relative humidity and rainfall negatively correlated with mite population and rainfall (r = -0.688) was significant with mite population in first fortnight**.** In second fortnight maximum temperature (r = 0.428) and minimum temperature (r = 0.229) which was positively correlated with no significance in mite population. Rainfall (r = -0.675) and relative humidity (r = -0.464) were negatively correlated with negative significance of rainfall in mite populations.

4. Discussion

4.1 Seasonal incidence of eriophyid mites

Aceria sp. incidence began to increase in April, then fluctuated and reached a peak in August, then decreased in December. A positive relationship was noted between the incidence of the three eriophyid mites on buds and leaves. These facts indicated that eriophyid prey probably play an important part of the predator diet which is in accordance with those reported by [3, 1].

Sudden decline in population of *A. jasmini* was noticed and same trend continued throughout the year, except the period from late April to the beginning of July (Figs. 1 to 4). This sharp decline of the population density is possibly due to the prevailing predatory phytoseiid and stigmaeid mites as well as the increasing unsuitability of the new young bushes growth as a feeding medium for the mites, and the new growth also loses its succulence as the season progress. The data obtained are in agreement with those reported by [21] who found almost the same behaviour for the pear bud mite, *Eriophyes pyri* (Pagan).

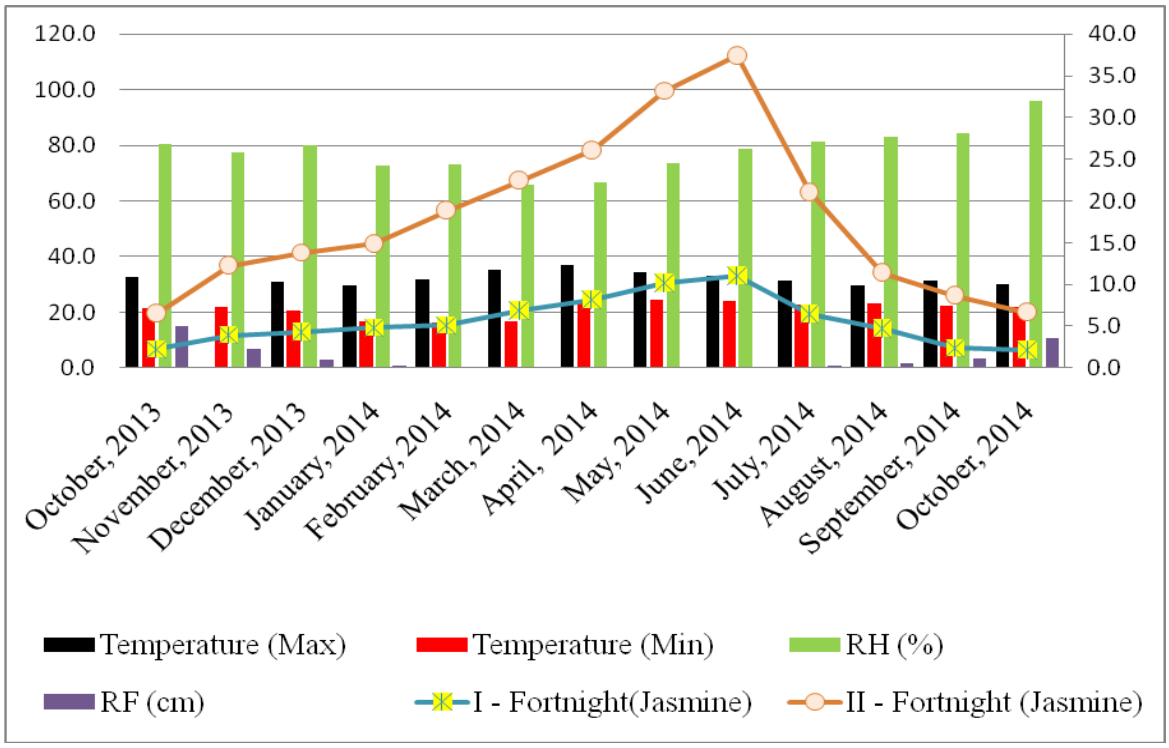

Fig 1: Seasonal incidence of *A. jasmini* in relation to weather parameters.

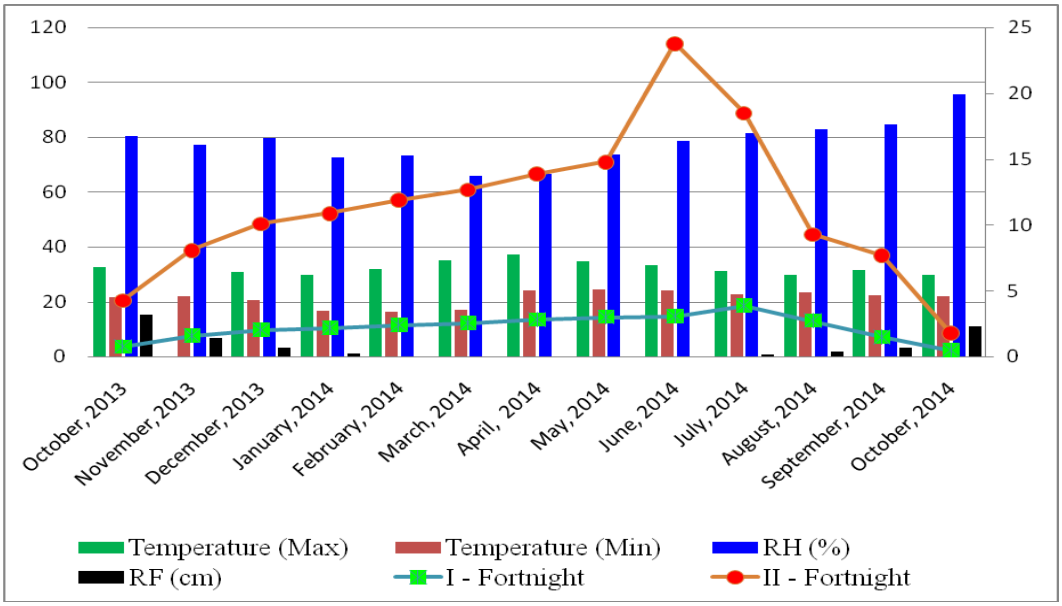

Fig 2: Seasonal incidence of *A. mangiferae* in relation to weather parameters

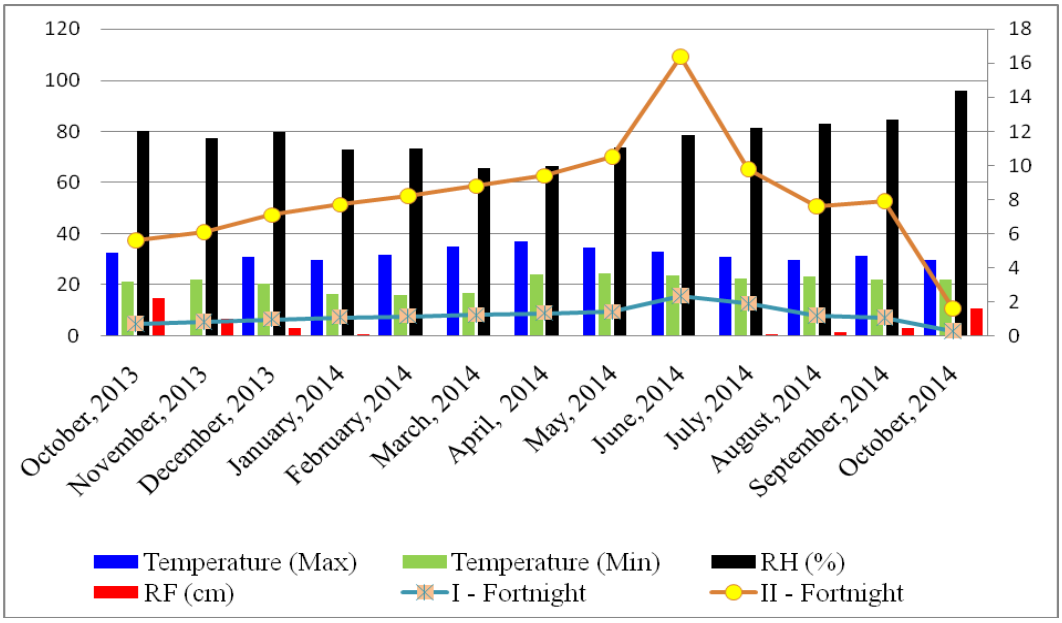

Fig 3: Seasonal incidence of *A. mori* in relation to weather parameters

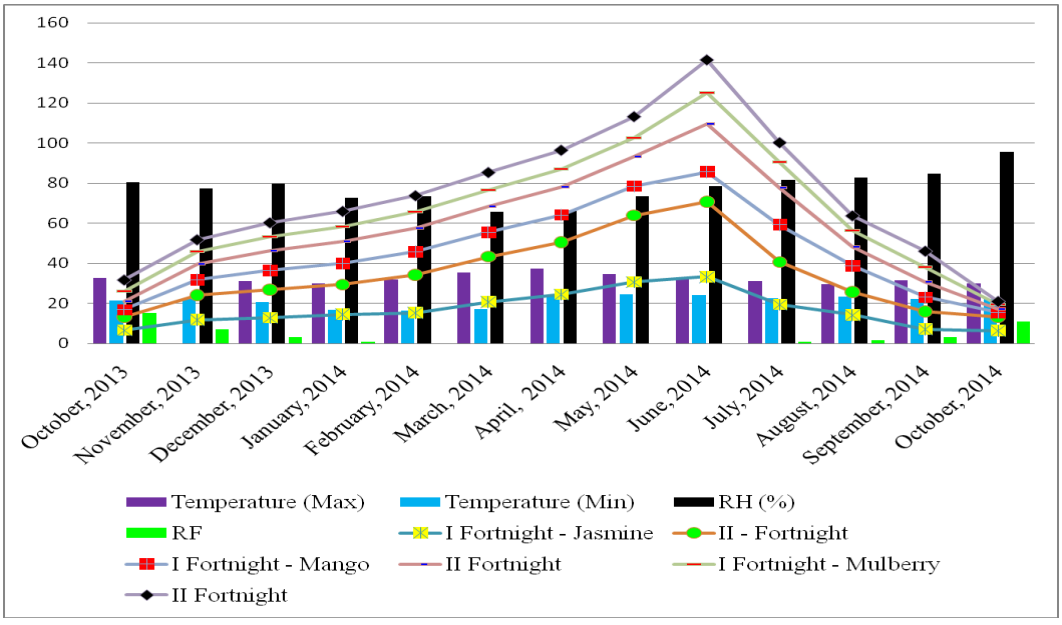

Fig 4: Comparison of seasonal incidence mean mite population for different hosts with weather parameters

5. Conclusion

Highest seasonal incidence of mites was recorded during the months of May to June in *Jasminum auriculatum* followed by *Mangifera indica* and *Morus alba* recorded the highest population in month of June. The correlation studies between the weather parameters and the mite population revealed that the data was not significant, while the bud and leaf mite population was found to be negatively significantly correlated with rainfall for all three host plants mites.

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