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Study the population dynamics of jasmine eriophyid mite, *Aceria jasmini* in *Jasminum auiculatum*

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Abstract
Studies on the population dynamics of *Aceria jasmini* were conducted at different temperatures 15, 25, 34.1, 40, 45 °C with relative humidity 55 per cent under the laboratory condition in leaf disc method at Tamil Nadu Agricultural University, Coimbatore. Both high and low temperatures had direct effect on the mortality of the three developmental stages of *Aceria jasmini*. One hundred per cent egg mortality was occurred at 15 °C and 45 °C followed by 94.92 per cent mortality at 40 °C while the lowest egg mortality of 9.14 per cent was recorded at room temperature (34.1 °C). Absolutely, mortality was lowest at normal room temperature and highest at lower and higher temperatures viz., 15, 40 and 45 °C.

Keywords: *Population dynamics*, different temperatures, mortality percentage, *Aceria jasmini*, environmental chamber and survival percentage

Introduction
Mites are the representatives of an ancient lineage classified under Phylum: Arthropoda; subphylum: Chelicerata; class: Arachnida; subclass: Acari. Mites constitute one of the most heterogeneous cheliceran groups and extremely diverse in their morphology and biology thus enabling them to colonize in different ecological niches with varied behavior patterns (Krantz, 2009) [15]. Most important taxa exclusively phytophagous mites are Eriophyidae, Tetranychidae and Tenuipalpidae. All these taxa are associated with economically important crops as pest species distributed worldwide and several species are geographically restricted. Eriophyids are microscopic and often go unnoticed and are worm -like have 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 (Oldfield, 2005) [23].

Eriophyid feeding on plants induce toxaemias and non distortive effects like russetting, silvering, bronzing, formation of galls, distortions or other abnormalities and formation of rapid necrotic lesions (Westphal *et al*., 1996) [32]. 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 (Royalty and Perring, 1996) [27].

Eriophyids are found to attack many economic crops (Hong and Zhang, 1996) [13] and yield loss can decrease by 50% in severely damaged wheat plants (Lin *et al*., 1987) [18]. 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 (Zheng *et al*., 1991) [34] and mango eriophyid mites distributed in different parts of the world are known to cause economic damage. (Chandrapatya and Boczek, 1991; 1997; Amarine and Stasny, 1994) [10, 9, 4]. In European countries 80-90 per cent of the apple orchards are infested by eriophyid species. (Li and Cai, 1996) [17]. Budai *et al*. (1997) [7] reported 20–100 per cent infestation of garlic cloves and a considerable amount of storage loss. Naik (2003) [22] 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 (Sarmalkar, 2004) [28]. The level of infestation of eriophyid mite was highest in Thane district followed by Sindhudurg, Ratnagiri and Raigad (Desai *et al*., 2009) [11]. *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 (Larrain, 1986) [16].

Estimated losses in copra yield due to coconut mite damage ranged 10 per cent in Benin (Mariau and Julia, 1970) [20], 16 per cent in the Ivory Coast (Julia and Mariau, 1979) [14], 20-30 per cent in St. Lucia (Moore *et al*., 1989) [21], 25 per cent in Grenada (Hall, 1981) [12] and 30-80 per cent in different areas of Mexico (Hall, 1981; Olvera-Fonseca, 1986) [12, 24]. Julia and Mariau (1979) [14] and Moore *et al*. (1989) [21] found copra yield to decline with increasing severity of damage caused by the coconut mite. Based on the economic importance and damage severity by eriophyid mite species, the present “Study the population dynamics of jasmine eriophyid mite (Eriophyoidea: Acari). was carried out in Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore.

Materials and Methods

Studies on the population dynamics of *Aceria jasmini* were conducted at different temperatures 15, 25, 34.1, 40, 45 °C with relative humidity 55 per cent under the laboratory condition in leaf disc method (Plate. 1). The leaf disc was prepared with 2cm diameter and was kept inside the Petri dish upside down over the wet cotton mat to maintain the turgidity of the leaf disc. The plastic Petri dish dimension was diameter 8 cm x 1.5 cm height with single perforated hole in centre of the Petri plate. Five pairs of eriophyid adults were introduced and further observation were made in under a stereo microscope at every 24 hour interval. In *Jasminum auriculatum* Vahl the population dynamics parameters *viz*., birth (natality), death (mortality), immigration and emigration of density-independent and density-dependent factors were assessed.

Leaf disc method | Environmental chamber | Experimental setup inside the Environmental chamber

Plate 1: Population dynamics of eriophyid mite *Aceria jasmini.*

Results

Both high and low temperatures had direct effect on the mortality of the three developmental stages (Egg, Protonymph and Deutonymph) of *Aeria jasmini*. One hundred per cent egg mortality was occurred at 15 °C and 45 °C and there was no emergence of first and second instar nymph followed by 94.92 per cent mortality of eggs and survival of 5.08 percentage at 40°C while the lowest egg mortality of 9.14 per cent was recorded at room temperature (34.1 °C) (Table.1). The first instar larval mortality 10.34 percentage was recorded and followed by second instar larval mortality 9.72 percentage was recorded at normal room temperature.

Highest mortality of first instar larval stages was recorded as16.44 per cent at 25 °C whereas very minimum of 10.34 per cent mortality was recorded at room temperature (34.1 °C). In the second instar maximum mortality of 14.15 per cent was recorded at 25 °C compared to normal room temperature. Absolutely, mortality was lowest at normal room temperature and highest at lower and higher temperatures viz., 15, 40 and 45 °C.

Table 1: Population study at different temperatures in *Aceria jasmine*

Temperature	Survival percentage			Mortality percentage		
	Egg	I-Instar	II-Instar	Egg	I-Instar	II-Instar
15 °C	-	-	-	100	-	-
25 °C	87.18	83.56	85.85	12.82	16.44	14.15
34.1 °C*	90.86	89.66	90.28	9.14	10.34	9.72
40 °C	5.08	0	0	94.92	-	-
45 °C	-	-	-	100	-	-

Mean of five replications. *Under natural fluctuating temperature.
A dash (-) indicates that no development was possible at that temperature.

Temperature had significant effects on the survival percentage of immature stages. Survival percentage was decreased as the temperature increased from 15 and 45 °C. Highest egg survival was (90.86 per cent) recorded at normal room temperature whereas lowest (5.08 per cent) was at 40 °C. Larval survival percentage was highest at room temperature than the other temperatures. However, even the eggs laid did not develop into larvae at 40 °C.

Discussion

Temperature was denoted as an important factor for development and population growth of any insect (Bale *et al*., 2002; Auad and Moraes, 2003) [6, 5]. *A. jasmini* survival was increased with decreasing the mortality at normal room temperature at 34.1°C (Fig.1). Above 35 °C the survival was decreased and hundred per cent mortality was recorded. It is in accordance with Okonya *et al*., 2013. At 15 °C and 45 °C there was no growth and development of mite population. The present findings in contrary with Reis *et al*. (1974), in a study on bud mite bio ecology made a different observation that the population of *Aceria* sp was reduced when exposed to high humidity or low winter temperature.

Suresh and Mohanasundaram (1995) [29] recorded a significantly higher mango bud mite population during April than in May month and predicted that the higher mite populations during April might be due to higher temperatures. Walia and Mathur (1998) [31] recorded the maximum population of *Tetranychus urticae* during the months of June to August which indicated that higher temperature favoured the build up of mite population, with a gradual decrease in subsequent month and nil population during December to March.

Mallik and Puttaswami (2000) [19] reported the association of predators belonging to bdellidae, cheyletidae, cunaxidae, phytoseiidae, stigmaeidae, tarsonemidae and tydeidae preying on *A. mangiferae* in Karnataka. A great difference was noted between numbers of motile stages of *A. mangiferae* and *Metaculus mangiferae* on buds and leaves of sunny and shady zones during the two summer seasons of 2003 and 2004 (Abou-Awad *et al*., 2011). This phenomenon could be due to the preference of eriophyid mango mites to the shady zones seeking shelter against heat during the summer season.

Pena *et al*. (2005) [25] reported lower numbers of *A. mangiferae* from March to July compared to higher mite densities from September to February. In contrast, Tripathi and Singh (2007) [30] recorded highest population of *A. mangiferae* in the month of March and June. A positive correlation was observed between the mite population and temperature and a negative correlation was noted between the population with rain and relative humidity.

Abou-Awad *et al*. (2000) [2] revealed that the both shady buds and leaves as well as sunny buds and leaves harboured equal population of the fig bud mite *Aceria ficus* (Cotte) and the fig leaf mite *Rhyncaphytoptus ficifoliae* Keifer. Abou-Awad *et al*. (2011) reported that the population dynamics of eriophyid mites on abandoned mango trees were affected by prevailing climatic conditions, action of prey-predator relationship, shady and sunny zones and vertical distribution of mites. Baillod and Guignard (1986) [1] noticed that and deutogyne hibernation during winter in buds. The second, third or fourth leaf was shoot area since these leaves had a high density of eriophyid mites as observed by Castagnoli (2000) [8].

Conclusion

In population dynamics at 15 °C, 40 °C and 45 °C highest mortality of *Aceria jasmini* was recorded. Highest population survival of eriophyid mite was recorded at room temperature. Under the normal fluctuating temperature population survival was higher and also highest population existed the damage is higher and it reflect on economic part of yield. The fluctuating temperature is more than 25 °C and control measures should be taken to control the Jasmine eriophyid mite, *Aceria jasmini.*

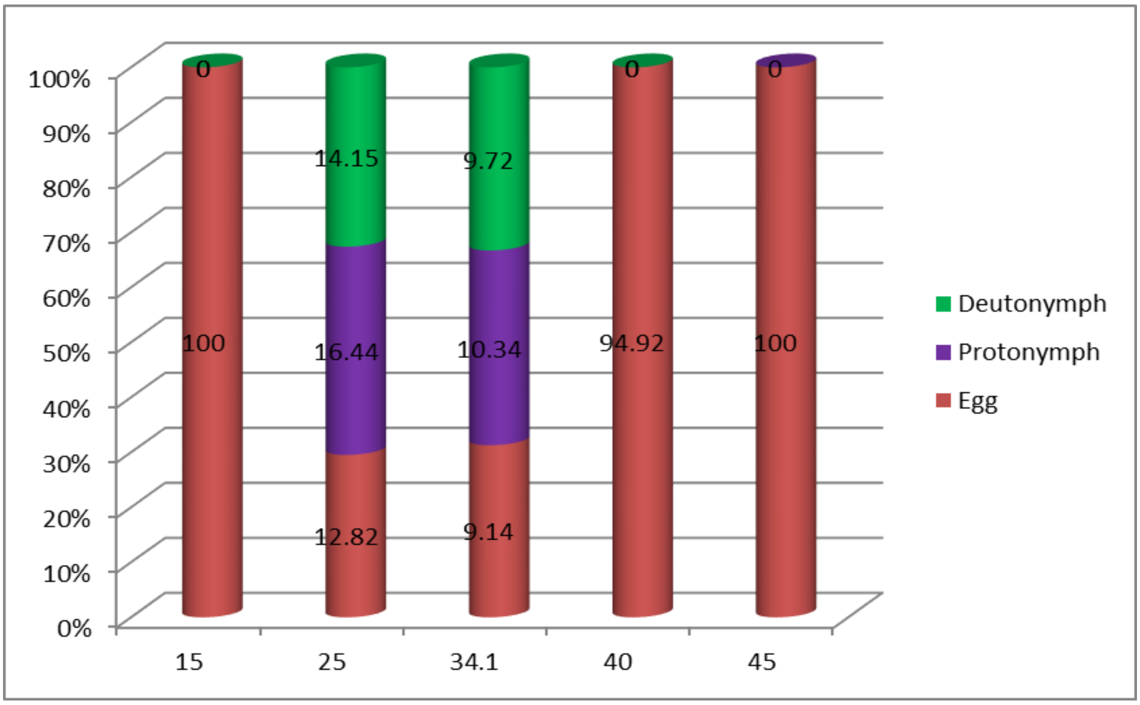

Fig 1: Mortality percentage of *Aceria jasmini* at different temperatures

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