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Research Article

INCIDENCE AND DEVELOPMENTAL PARAMETERS OF *BREVIPALPUS PHOENICIS* GEIJSKES (ACARI: TENUIPALPIDAE) ON AN INVASIVE PLANT, *MIKANIA MICRANTHA* KUNTH

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ABSTRACT

The plant *Mikania micrantha* is treated as one among 100 of the world's worst invaders in the Global Invasive Species Database. Invasions by alien plants are rapidly increasing in extent and severity, leading to large-scale ecosystem degradation. The tenuipalpid mite, *Brevipalpus phoenicis* is a cosmopolitan species with an extensive host range and was found to infest *M. micrantha* with peak population during the summer months of April-May and the minimum population during June-July. Laboratory cultures of the mite were maintained by adopting leaf flotation technique at constant temperature humidity conditions of 30 ± 2^0C and 65 ± 5% RH. The species was found to exhibit parthenogenetic mode of reproduction with the pre-oviposition and oviposition periods of 4.2±0.37 and 8.9±0.28 days respectively. Thus the results of the present study disclosed that the mean duration of F_1 generation of *B. phoenicis* on *M. micrantha* was 41.5±1.07 days.

INTRODUCTION

Having important ecological and environmental roles to play, invasive alien species of plants have attracted public attention through their very rapid spread outside the normal distribution range and successive colonization in new locations. The false spider mite, *Brevipalpus phoenicis* was first described by Geijskes (1939) on *phoenix* species in Holland. Kitajima *et al.* (2003) conducted studies on the role of *B. phoenicis* in the transmission of plant viruses and they reported that a number of viral diseases could be transmitted by *Brevipalpus* sp. Teodoro and Reis (2006) provided information on the reproductive performance of *B. phoenicis* on Citrus and Coffee. Invasive plants are known to create life-threatening situations as well as environmental and cultural upheaval. These plants generally exert a negative impact on their new area of invasion, leading to untold hardship on the people, particularly the poor resource farmers and the biodiversity including entomofauna and phytoflora. In the present study an attempt was made to provide a general awareness on the developmental strategies of *B. phoenicis*, the most common mite species found during the study that would help in forecasting the outbreak of this mite.

MATERIALS AND METHODS

Developmental studies were carried out on a selected species of false spider mite viz. *B. phoenicis* infesting the host plant viz. *M.micrantha* by making random sampling of leaves from various localities of 3 districts of Kerala viz. Malappuram, Thrissur and Palakkad. Laboratory cultures of individual stages of the mite were maintained in the laboratory by adopting leaf flotation technique at constant temperature humidity conditions of 30 ± 2^0C and 65 ± 5% RH, in the laboratory. The culture cells will be prepared with petridishes lined with moistened cotton pads basally, on fresh leaves of the host plant. When sufficient numbers of eggs were laid, the adult mites were transferred from the leaf discs to new culture dishes. Regular observations were made under the stereomicroscope to record data on oviposition, incubation, hatching, active periods of life stages, quiescent phases, moulting etc. The experiment was repeated and confirmed by maintaining 5 numbers of culture sets maintained in the laboratory under the same temperature-humidity parameters. Data thus collected and confirmed through repeated trials, on the various developmental parameters of the species were tabulated and presented.

RESULTS AND DISCUSSION

Brevipalpus phoenicis was reported as a cosmopolitan species, infesting a variety of economic crops comprising vegetables, fruit crops, medicinal plants, spices and so on (Jeppson *et al.* 1975; Kumari and Sadana 1990; Chiavegato and Kharfan 1993; Childers *et al.* 2003, Prabheena and Ramani, 2013) and

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inducing varied plant abnormalities (Childers *et al*.2003).*B. phoenicis* was found to infest the lower surface of the leaves of *Mikania micrantha*, but when the population density of the mite was high, eggs were laid on the upper surface of the leaves also. Usually, the eggs were laid singly, but were placed very closely to impart a clustered appearance. Such clusters of bright reddish orange eggs could be more easily seen with the naked eye. The eggs appeared very sticky, and were laid in small cracks, crevices and other protected areas.

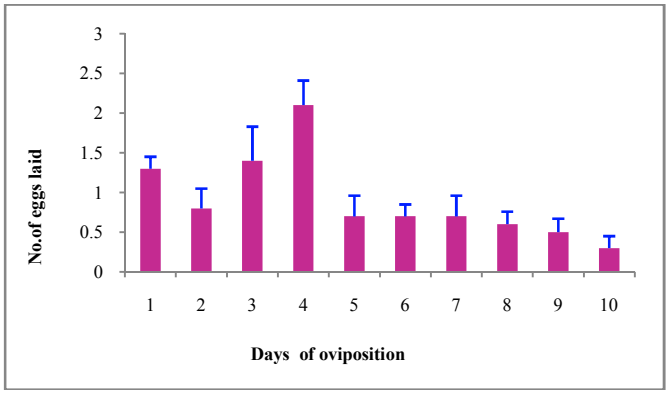

Fig1 Number of egg laid by *B.phoenicis* on different days of oviposition at 30 ±2^{0}C and 65 ±5% RH.

Table 1 Duration (in days) of pre-oviposition, oviposition, post-oviposition periods and longevity of *B.phoenicis* at 30 ± 2^{0}C and 65 ± 5% RH.

Sl.No.	Pre-oviposition	Oviposition	Post-oviposition	Longevity
1	5	9	6	20
2	6	8	5	19
3	4	10	6	20
4	5	8	6	19
5	3	10	6	19
6	4	10	4	18
7	3.5	9	6	18.5
8	5	8	5	18
9	2	9	7	18
10	4.5	8	6	18.5
Mean±Sem	4.2±0.37	8.9±0.28	5.7±0.26	18.8±0.24

The process of hatching involved the formation of a semi-circular slit at the apical portion of the egg case which helped in the separation of egg case in to two halves. The post-embryonic development involved 1 larva and 2 nymphal instars before reaching the adult stage.

The newly hatched larva was small which initiated feeding activity soon after hatching. The active larval period extended for 3.35 ±0.13 days, at the end of which it became lethargic and underwent the first quiescence which lasted for 1.6±0.10 days. After subsequent moulting the protonymph emerged. The protonymph was larger than larva and possessed four pairs of legs. The active period of the protonymph lasted for 3.95 ±0.20 days, after which it entered into the second quiescent phase and it was lasted for 2.3±0.20 and subsequently moulted into the deutonymph. The active period of the deutonymph lasted for 4.9±0.27 days. After third quiescent period of 1.95±0.19 days the deutonymph moulted in to the adult stage.

The pre-oviposition period of *B. phoenicis* was recorded to be 4.2±0.37 days. The oviposition period was observed to be 8.9±0.28 days. The oviposition period of *B. phoenicis* on *C. siphonanthus* was reported to be 7 days and that on O. indicum was 9 days (Lal. 1979). The mean number of eggs laid by a single female on different days of oviposition could be recorded as 9.1±0.66. The maximum number of eggs laid by *B. phoenicis* on *M. micrantha* was 12, that on *O. gratissimum* was 11(Prabeena and Ramani, 2010). The number was found to be much lower than that of earlier reports on other host plants (Sadana and Kumari, 1987 and Childers et al., 2003). The number of eggs laid was maximum on the 4th day of oviposition. The post- oviposition period of *B. phoenicis* on *M. micrantha* was recorded to be 5.7±0.26 days. The longevity of adults of *B. phoenicis* could be recorded as 18.8±0.24 days.

In the present study *B. phoenicis* populations comprised entirely of female individuals and the mode of reproduction was solely through parthenogenesis. Such feminization was reported to be owing to endosymbiotic association of bacteria like Wolbachia, Cardinium etc. which block the formation of androgenic gland in males (Weeks and Breeuwer, 2000 and Weeks *et al.,* 2001).

The mean duration of life cycle of *B. phoenicis* on *M. micrantha,* through parthenogenetic mode, at a temperature of 30±2^{0}C and 65±5% relative humidity, was found to be 22.7±0.83 days.

Table 2 Duration (in days) development of *B.phoenesis* on *M.micrantha* at 30 ± 2^{0}C and 65 ± 5%RH.

Sl.No.	Egg	Larva	1stq	Proto Nymph	2nd Q	Deuto Nymph	3rd Q	Total Duration	Male/ Female	Mode of Reproduction
1	4	3	2	3.5	2	4	1.5	20	Female	Parthenogenesis
2	4	3	1.5	3.5	1.5	4	1.5	19	Female	Parthenogenesis
3	5.5	3	2	4	2.5	6	2.5	25.5	Female	Parthenogenesis
4	5	3.5	1	4.5	1.5	5	2.5	23	Female	Parthenogenesis
5	5	4	2	5.5	2.5	5.5	2	26.5	Female	Parthenogenesis
6	4	3	1.5	4	2	5.5	1	21	Female	Parthenogenesis
7	5	4	1.5	4	3	6	1.5	25	Female	Parthenogenesis
8	4.5	3.5	1.5	3.5	2.5	5	2	22.5	Female	Parthenogenesis
9	4	3	1.5	3.5	2	4	2	20	Female	Parthenogenesis
10	5.5	3.5	1.5	3.5	3.5	4	3	24.4	Female	Parthenogenesis
Mean ± Sem	4.65 ± 0.2	3.35 ± 0.13	1.6 ± 0.I	3.95 ± 0.2	2.3 ± 0.2	4.9 ± 0.27	1.95 ± 0.19	22.7 ± 0.83		

The newly emerged adults started laying eggs within 4.2±0.37 days and hence the duration of F1 generation was completed within 41.5±1.07 days.

CONCLUSION

Postembryonic development of *B. Phoenicis* on *M. Micrantha* was discussed. The pre-oviposition period of *B. phoenicis* was recorded to be 4.2±0.37 days. The oviposition period was observed to be 8.9±0.28 days. The post- oviposition period of *B. phoenicis* on *M. micrantha* was recorded to be 5.7±0.26 days. The longevity of adults of *B. phoenicis* could be recorded as 18.8±0.24 days. The period of incubation was found to last for an average of 4.65±0.2 days at the end of which the process of hatching was initiated and it got completed within 12 to 30 minutes. The active larval period extended for 3.55±0.13 days. The first quiescent phase lasted for an average of 1.6±0.10 days and after which, moulting occurred leading to the emergence of the protonymph. The life cycle of *B. Phoenicis* was found to include 2 nymphal stages viz. the protonymph, and deutonymph, before attaining the adulthood. The average duration of the longevity of the females of *B. phoenicis* as observed during the present study was 18.8±o.24 days. The mean duration of life cycle of *B. phoenicis* on *M. micrantha,* through parthenogenetic mode, at a temperature of 30±20C and 65±5% relative humidity, was found to be 22.7±0.83 days. The newly emerged adults started laying eggs within 4.2±0.37 days and hence the duration of F1 generation was completed within 41.5±1.07 days.

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References

Childers, C. C., French, J. V., Rodrigues, J. C. V. and Welbourn,W.C. *Brevipalpus californicus, B. obovatus, B. phoenicis* and *B.lewisi* (Acari: Tenuipalpidae): a review of their biology, feeding injuryand economic importance. *Exp. Appl. Acar.* 2003a; 30: 5-28.

Geijskes, D. C. Contributions to the knowledge of European spinning mites with particular reference to the Netherlands species. *Arten. Mededelingen van de Landbouwhogescholl Wageningen*. 1939; 42: 1-68.

Kitajima, E. W., Rezende, J. A. M. and Rodrigues, J. C. V. Passionfruit green spot virus vectored by *Brevipalpus phoenicis* (Acari:Tenuipalpidae) in passion fruit in Brazil. *Exp. Appl. Acar*. 2003; 30: 225-231.

Lal, L. Biology of *Brevipalpus phoenicis* (Geijskes) (Tenuipalpidae:Acarina). *Acarol.* 1979; 20: 97-101.

Prabheena, P. and Ramani, N. *Biological studies of Brevipalpus phoenicis Geijskes (Acari:Tenuipalpidae) infesting Ocimum gratissimum Linn*. *Karnataka J. Agric. Sci*. 2010; 23: 193-194.

Sadana, G.L., and Kumari, M. Influence of temperature and relative humidity on the development of *Brevipalpus phoenicis* (Acari:Tenuipalpidae). *Insect Sci*.1987; 4: 157-159.

Teodoro, A. V. and Reis, P. R. Reproductive performance of the mite B*revipalpus phoenicis* (Geijskes, 1939) on citrus and coffee, using life table parameters. *Braz. J. Biol.* 2006; 66:899-905.

Weeks, A.R. and Breeuwer, J.A.J. AFLP finger printing for assessing intraspecific variation and genome mapping in mites. *Exp. Appl.Acar.* 2000; 10: 775-793.

Weeks, A.R., Marec, F. and Breeuwer, J.A.J. A mite species that consists entirely of haploid females. *Sci*. 2001; 292: 2479-2482.

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