Volume : 2 | Issue : 4 | April 2013 • ISSN No 2277 - 8160

Research Paper | Zoology

Effect of Temperature on Duration of Developmental Stages of Red Spider Mite (*Oligonychus Coffeae* Nietner), a Serious Pest of Tea

Salma Mazid	Research Scholar, Dept. of Zoology, Gauhati University, Guwahati-781014, Assam
R.C. Rajkhowa	Associate Professor, Dept. of Zoology, Cotton College, Guwahati-781001, Assam
J.C.Kalita	Professor, Dept. of Zoology, Gauhati University, Guwahati-781014, Assam

ABSTRACT

The red spider mite, Oligonychus coffeae Nietner (Acarina: Tetranychidae) is a serious pest of tea (Camellia sinensis) in North-East India. The life history of O.coffeae was studied under laboratory conditions with the prevailing weather parameters from February to July 2012. Pure culture of the mite was maintained by rearing them in the laboratory by leaf culture method. The observation on life history included incubation period, duration of larva, protonymph, deutonymph, duration of life cycle, fecundity, pre-oviposition, oviposition and post oviposition periods. The duration of life cycle was found to be shortest in June followed by May and July. In February life cycle was recorded to be completed in 14.47 days. Temperature was found to have a profound impact on the duration of developmental stages of the red spider mite. It was recorded that the developmental rate increased and the duration of developmental stages decreased with the increase in temperature.

KEYWORDS: *Oligonychus coffeae*, pest, tea, developmental stages

INTRODUCTION:

Tea, *Camellia sinensis* belonging to the family Theaceae is one of the most important industrial crop that earns a major share of foreign exchange to the nation. Assam is the pride of India when it comes to tea production. The red spider mite, *Oligonychus coffeae* Nietner (Acarina: Tetranychidae) is an important pest causing considerable crop loss in tea (Muraleedharan et al., 2005). It normally attacks the upper surface of the mature leaves in which the sap is not flowing freely. In severe infestation, particularly under conditions of dry weather, the lower surface and the young leaves are almost equally attacked. The affected leaves turn brown, then bronze, and may eventually dry up and fall off. Red spider mite is on the verge of attaining a key pest status on tea crop in N.E India and occurs in all tea districts under diverse climatic conditions (Das 1959a). The mite causes an annual crop loss of 7-10% (Das 1962). The red spider mite also attacks jute, cotton, castor, mulberry, orange, indigo etc as alternative hosts in India (Das 1959b). Present study was undertaken to study the duration of developmental stages of red spider mite infesting tea in six different generations under the influence of different temperature.

MATERIALS AND METHOD :

The developmental stages of red spider mite was studied under laboratory conditions with the prevailing weather parameters. Pure culture of red spider mite, *Oligonychus coffeae* was initiated by collecting the adults from tea gardens of Darrang district (Assam) and was maintained in the laboratory. The mites were reared on tea leaves by following detached leaf culture method (Hazarika et al.,1995). The leaves were placed on cotton bed in petridish facing the surface upward. The petioles of the leaves were wrapped in moist cotton. Also water was added on to the cotton bed to keep it wet so that the leaves remained fresh. The leaves were changed after 3 to 4 days. Twenty mated females were released on a fresh leaf in the petridish and allowed overnight, in order to obtain the eggs. Next morning the eggs were carefully lifted with the help of a moistened hairbrush and transferred to fresh tea leaves at the rate of one egg per leaf per petriplate. The leaves were observed after every 24 hours and the development of various stages of the mite was recorded. Fifteen such plates were maintained for each generation to study the biology of red spider mite. The duration of the developmental stages were recorded for six different generations in 6 months from February to July. The experiment was conducted from 1st February to 31st July 2012.

RESULT AND DISCUSSION : The period of development of red spider mite was found to be longer in the colder months. Life cycle was completed within the shortest duration in June where as in February it took the longest time. Incubation period was found to be highest in the month of February (7.01days) followed by March (6.03days). It was recorded to be lowest in the month of June. The mean duration of different developmental stages of red spider mite has been shown in Table 1. Thus, it was observed that with the increase in temperature, developmental rate increased and the duration of developmental stages decreased.

Table 1 : The mean duration (in days) of different developmental stages of *Oligonychus coffeae* infesting tea.

Months	Different developmental stages {Mean ± Standard Error (in days)}					Average temperature (°C)
	Incubation period	Larval period	Protonymphal period	Deutonymphal period	Total	
February	7.01±0.04	2.73±0.02	2.48±0.01	2.25±0.06	14.47±0.25	22.75
March	6.03±0.16	2.45±0.07	2.20±0.05	2.52±0.06	13.2±0.21	25.50
April	5.08±0.05	1.93±0.06	1.87±0.02	2.02±0.02	10.9±0.17	29.10
May	3.82±0.03	1.56±0.01	1.45±0.01	1.46±0.02	8.29±0.13	31.25
June	3.00±0.06	1.38±0.02	1.10±0.06	1.32±0.01	6.8±0.09	32.00
July	3.65±0.04	1.50±0.03	1.39±0.02	1.38±0.02	7.92±0.16	31.90
R (temperature)	-0.980**	-0.994**	-0.969**	-0.894*	-0.978**	

Table 2: Fecundity, pre-oviposition, oviposition and post oviposition period of *O.coffeae*

Month	Pre-oviposition (days)	Oviposition (days)	Post-oviposition (days)	Fecundity /female	Average temperature(°C)
February	2.00±0.04	16.06±0.05	1.83±0.03	76.52±0.14	22.75
March	1.63±0.01	15.78±0.04	1.68±0.01	68.14±0.05	25.50
April	1.42±0.02	14.38±0.11	1.59±0.01	63.25±0.05	29.10

May	1.15±0.01	12.57±0.08	1.50±0.02	58.03±0.04	31.25
June	1.00±0.08	10.83±0.18	1.23±0.09	52.30±0.11	32.00
July	1.12±0.03	12.26±0.06	1.48±0.02	57.9±0.06	31.90
r (temp)	-0.987**	-0.931**	-0.891*	-0.971**	

Fecundity,preoviposition,oviposition and post-oviposition periods has been shown in Table 2. The pre-oviposition period lasted for an average period of 1 day in June and in February it was found to be 2.0 days. Fecundity was recorded to be highest in February (76.52 eggs). It was seen that pre-oviposition, oviposition and post oviposition period decreased with the increase in temperature. The results of the present study are in agreement to the findings of Northcraft and Watson (1987), Deciyanto et al. (1989), Tsai et al., (1989), Yasuda(1982), Congdon and Logan(1983), Pralicka and Huszar(2004), Kasap(2009), Abou-Awad et al. (2011) and Karami-Jamour and Shishehbor(2012) who reported temperature to have a profound impact on the developmental biology of different spider mites. In this experiment it was found that developmental rate was highest in June followed by May.

REFERENCES

1. Abou-Awad, B. A., Al-Azzazy, M. M., & Afia, S. I. (2011). Effect of temperature and relative humidity on the rate of development, fecundity and life table parameters of the red spider mite Oligonychus mangiferus (Rahman and Sapra) (Acari: Tetranychidae). Archives Of Phytopathology And Plant Protection, 44(19). 2. Congdon, B. D., & Logan, J. A. (1983). Temperature Effects on Development and Fecundity of Oligonychus pratensis (Acari: Tetranychidae). Environmental Entomology, 12(2), 359-362. 3. Das, G. M. (1962). Termites in tea. Termites in the Humid Tropics, Humid Tropics Research UNESCO (Proceeding, New Delhi Symposium), pp. 229-231. 4. Das, G. M. (1959b). Bionomics of the tea red spider mite, Oligonychus coffeae (Nietner). Bull. Entomol. Res. 50, 265-274. 5. Das, G. M. (1959a). Problems of pest control in tea. Sci. Cult., 24, 493-498. 6. Deciyanto, S., Amir, M., Trisawa, I., & Harijanto, M. (1989). Study on biology and population development of Tetranychus sp. (Tetranychidae: Acarina) on Mentha spp. Pembaritaan Penilitian. Taneman Industri Indonesia , 15(10), 9-14. 7. Hazarika, L. K., & Puzari, K. C. (1995). White muscardine fungus Beauveria bassiana pathogenic to different stages of rice hispa, Dicladispa armigera. Indian J. Agric. Sci. , 65(5), 368-372. 8. Karami-Jamour, T., & Shishehbor, P. (2012). Development and life table parameters of Tetranychus turkestani (Acarina: tetranychidae) at different constant temperatures. Acarologia, 52(2), 113–122. 9. Kasap, I. (2009).The biology and fecundity of the citrus red mite Panonychus citri (McGregor) (Acari: Tetranychidae) at different temperatures under laboratory conditions. Turk J Agric For, 33, 593-600. 10. Muraleedharan, N., Sudarmani, D. N. P., & Selvasundaram, R. (2005). Bioecology and management of the red spider mite infesting tea in south India. In: Proceedings of International symposium on Innovation in tea science and sustainable development in tea industry. China Tea Science Society, Hangzhou, China. pp. 756–766. 11. Northcraft, P. D. & Watson, T. E. (1987). Developmental biology of Tetranychus cinnabarinus (Boisduval) under three temperature regimes. Southwestern Entomologist, 12(1), 45-50. 12. Praslicka, J., & Huszar, J. (2004). Influence of temperature and host plants on the development and fecundity of the spider mite Tetranychus urticae (Acarina: Tetranychidae). Plant Protect. Sci., 40, 141–144. 13. Tsai, S. M., Kung, K. S. & Shih, C. I. (1989). The effect of temperature on life history and population parameters of kanzawa spider mite Tetranychus kanzawai Kishida (Acari: Tetranychidae) on tea. Plant Prot. Bull. Taiwan, 31(2), 119-130. 14. Yasuda, M. (1982). Influence of temperature on some of the life cycle parameters of Citrus red mite, Panonychus citri (McGregor) (Acarina: Tetranychidae). Jap J Appl Ent Zoo., 26, 52-57.