LIFE CYCLE OF *OLIGONYCHUS ORYZAE* (HIRST, 1926), AN IMPORTANT PEST OF PADDY ON THREE DIFFERENT *KHARIF* CULTIVARS AND *BORO* CULTIVAR UNDER LABORATORY CONDITIONS

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Abstract

The study on life cycle of *Oligonychus oryzae* (Hirst, 1926) on *Kharif* early cultivar, IET 11870, *Kharif* mid-early cultivar, IET 11271, *Kharif* late cultivar, IET 12133 and *Boro* cultivar, IET 12055 reveals that the life cycle was completed in 11.24 ± 1.38 days, 12.29 ± 1.89 days, 11.99 ± 1.57 days and 12.97 ± 1.62 days on early, mid-early, late cultivars of *Kharif* and *Boro* cultivar, respectively. The corresponding figures for oviposition period were 16.0 ± 2.22 days, 17.03 ± 2.97 days, 16.91 ± 2.51 days and 17.19 ± 2.27 days, respectively while the corresponding figures for fecundity were 21 ± 1.10 eggs, 22 ± 0.97 eggs, 19.2 ± 1 eggs and 21.61 ± 0.87 eggs, respectively. It was observed that there is not much difference regarding life stages, total time taken to complete the life cycle as well as in oviposition and fecundity among the 4 cultivars studied and therefore, all the 4 cultivars appeared to be preferred hosts for this mite.

Keywords: *Oligonychus oryzae*, West Bengal, life cycle, IET 11870, IET 11271, IET 12133, IET 12055.

Introduction

Oligonychus oryzae (Hirst, 1926) is an important pest of paddy in different parts of India. In Karnataka, Andhra Pradesh, Tamil Nadu and West Bengal, it causes greater damage compared to other parts of India, causing the appearance of white patches on leaves which later turn yellow and start drying, causing 25% loss (Nagarjan, 1957; Banerjee, 1989). The damage may extend up to 25%. Devitalization and retardation of growth also occur. This mite is commonest during the pre-monsoon season. The population dwindles during the monsoon period, reappears in lesser numbers during the post-monsoon period and is scarce during winter months. In the case of West Bengal, it is not as serious a pest as *Steneotarsonemus spinki* Smiley, 1967 but yet it has been recorded in some pockets of South 24 Parganas, Hooghly and Nadia districts. The study of the life cycle was published by Misra & Israel (1968) from Odisha. Thereafter, no study was done on the life cycle of this mite, especially under conditions in West Bengal and hence, this study was undertaken.

Material and Methods

The mite infestation on paddy was observed in and around Canning area in South 24 Parganas district of West Bengal and the mites were collected therefrom for life cycle study. The early, mid-early and late *Kharif* cultivars and *Boro* cultivars which were selected were IET 11870, IET 11271, IET 12133 and IET 12055, respectively. The laboratory culture and the technique for life cycle study followed conventional methods (Helle & Sabelis, 1985; Gupta, 2012). This study was done under

laboratory conditions maintaining temperature and RH regimes of 30 ± 1°C and 75 ± 2% (pre-monsoon), 27.5 ± 1°C and 85 ± 2% (monsoon), 25 ± 1°C and 65 ± 2% (post-monsoon) and 18 ± 1°C and 65 ± 2% (winter season), respectively. The observations were recorded with regard to duration of different life stages along with pre-oviposition, oviposition, post-oviposition periods, fecundity, longevity and sex ratio. The data thus collected were subjected to statistical analysis and are presented in Table-1.

Results and Discussions

The duration of different life stages egg-adult period, pre-oviposition, oviposition, post-oviposition periods, fecundity, longevity, sex ratio, etc. have been given in Table1.

A perusal of that Table reveals the following:

Incubation period: Among the 3 cultivars of *Kharif* season, this duration was shortest in the case of early cultivar IET-11870 where it was 3.7 ± 0.37 days and the maximum was 4.1 ± 0.28 days in the case of mid-early cultivar (IET-11271). Not much difference existed between early cultivar IET-11870 and late cultivar IET-12133 as in the former case, it was 3.7 ± 0.37 days and in the latter case it was 3.8 ± 0.31 days. However, in the *Boro* cultivar i.e. IET-12055, the duration was shortest which was 2.9 ± 0.37 days.

Larval period: The larval period was shortest in *Kharif* early cultivar IET-11870 which was 2.40 ± 0.40 days and it was highest in case of *Kharif* mid-early cultivar IET-11271 where it was 3.29 ± 0.36 days. It was followed by 3.0 ± 0.29 days and 3.03 ± 0.37 days in case of *Kharif* late cultivar IET-12133 and *Boro* cultivar IET-12055, respectively.

1st Quiescent stage: There was not much difference in the duration of 1st Quiescent stage which ranged between 0.89 ± 0.37 days (*Kharif* mid-early cultivar IET-11271) and the maximum was 0.94 ± 0.48 days in *Kharif* early cultivar IET-11870.

Protonymphal period: Not much difference existed in duration of protonymphal period in 4 cultivars as was evident from the fact that it was 2.64 ± 1.13 days, 2.33 ± 1.890 days, 2.58 ± 1.72 days and 2.47 ± 1.64 days in case of *Kharif* early cultivar IET-11870, *Kharif* mid-early cultivar IET-11271, *Kharif* late cultivar IET-12133 and *Boro* cultivar IET-12055, respectively.

Deutonymphal period: This period was minimum (2.97 ± 0.39 days) in *Kharif* early cultivar IET-11870 and was maximum (3.7 ± 0.3 days) in *Boro* cultivar IET-12055. Among *Kharif* mid-early cultivar IET-11271 and *Kharif* late cultivar IET-12133, the difference in duration was very marginal.

Total developmental period (egg- adult): This period was shortest in *Kharif* early cultivar IET-11870 which was 11.24 ± 1.38 days and which was very close to *Kharif* late cultivar IET-12133 where it was 11.99 ± 1.57 days. The maximum duration was 12.97 ± 1.62 days in *Boro* cultivar IET-12055 followed by 12.29 ± 1.89 days in case of *Kharif* mid-early cultivar IET-11271.

Pre-oviposition period This period was more or less of similar duration in all 4 cultivars selected in present study and that was 2.21 ± 0.34 days, 2.36 ± 0.24 days, 2.29 ± 0.31 days and 2.39 ± 0.49 days in case of *Kharif* early cultivar IET-11870, *Kharif* mid-early cultivar IET-11271, *Kharif* late cultivar IET-12133 and *Boro* cultivar IET-12055, respectively.

Oviposition period: Although the duration for the completion of life cycle was shortest in *Kharif* early cultivar IET-11870 but the oviposition period in the same cultivar was shorter (16.0 ± 2.22 days) as compared to other two cultivars like *Kharif* mid-early cultivar IET-11271 where it was 17.03 ± 2.97 days and *Boro* cultivar IET-12055 where it was 17.19 ± 2.27. However, the oviposition period in case of *Kharif* late cultivar IET-12133 was quite close to *Kharif* early cultivar IET-11870.

Post-oviposition period: As regards postoviposition period, the shortest duration was 2.81 ± 0.44 days in case of *Boro* cultivar IET-12055 and the longest duration was 3.03

± 0.51 days in case of *Kharif* mid-early cultivar IET-11271.

Fecundity: No difference existed between *Kharif* early cultivar IET-11870 and *Boro* cultivar IET-12055 as in case of the former the fecundity was 21 ± 1.10 eggs and in the latter it was 21.61 ± 0.87 eggs. The fecundity was highest in case of *Kharif* mid-early cultivar IET-11271 where it was 22± 0.97 eggs while this was poorest in case of *Kharif* late cultivar IET-12133 and that was 14.2 ± 2.42 eggs.

Sex ratio: In case of *Boro* cultivar IET-12055 the sex ratio was more female biased where it was 1:5.1 whereas it was 1:3.7 in *Kharif* early cultivar IET-11870, 1:4 in case of *Kharif* mid-early cultivar IET-11271 and 1:4.02 in case of *Kharif* late cultivar IET-12133.

Discussion

From the analysis of the entire result, it appeared that the shortest life cycle was in the case of *Kharif* early cultivar IET-11870, which was close to *Kharif* late cultivar IET-12133, but so far as fecundity is concerned, *Kharif* mid-early cultivar IET-11271 was slightly better as compared to other cultivars. Regarding longevity, the longest period was *Boro* cultivar IET-12055 where the female lived for the longest period. In the same cultivar, the sex ratio was also more female biased as compared to other cultivars. But the overall, there was no significant or noticeable difference among the cultivars and whatever differences existed was more or less marginal in nature.

As regards incubation period, Nayal *et al*. (2007) reported the life cycle of *Oligonychus oryzae* and Saha *et al.* (1999) reported the life cycle of *Oligonychus coffeae* (Nietner, 1861). In both cases, the duration as mentioned was much higher (4.70 ± 1.09 days) in *Oligonychus oryzae* and 6.33 ± 0.52 days in *Oligonychus coffeae*, respectively. In the case of *Eutetranychus uncatus* Garman, 1952, Lal & Mukherjee (1979) reported higher incubation period than what was observed in the present case. Maity & Chakroborty (1978) also reported a higher incubation period for *Panonychus citri* (McGregor, 1916).

Regarding larval period, the duration as was observed in the present case was shorter than the one reported by Lal & Mukherjee (1979) in case of *Eutetranychus uncatus* where it was 4.62 days.

Regarding, egg to adult period, the present observation is quite close to the observations made by most of the previous workers, like on *Oligonychus oryzae* (Nayak *et al.,* 2007), *Oligonychus coffeae (*Saha *et al.,* 1999*)* and *Tetranychus neocaledonicus* Andre, 1933 *(*Mallikarjunappa & Nageschandra, 1989*)*

Regarding fecundity, the number of eggs per female observed in the present case was much lower compared to *Oligonychus coffeae (*Saha *et al.,* 1999*)* where it was 68.50 ± 1.38 eggs but it was close to that reported by Mallikarjunappa & Nageschandra (1989*)* in the case of *Eutetranychus hicoriae* (McGregor, 1950) where it was 13.77 ± 3.48 eggs.

As regards longevity, the present observation was quite similar to Saha *et al.* (1999), who reported 15.60 ± 3.71 days in case of *Oligonychus coffeae* but compared to the observation made on *Oligonychus oryzae* (Hirst*)* by Nayak *et al.* (2007), the present observation is of shorter duration.

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Table- 1. Life cycle of *Oligonychus oryzae* on *Kharif* (early, mid-early and late cultivars) and *Boro* cultivar (2015-16).

	Kharif Early cultivar (IET-11870)		*Kharif* Mid-early cultivar (IET-11271)		*Kharif* Late cultivar (IET-12133)		*Boro* cultivar (IET-12055)	
Stages	Mean ± SD(Days)	Range	Mean ± SD (Days)	Range	Mean ± SD(Days)	Range	Mean ± SD(Days)	Range
Incubation	3.7 ± 0.37	1.3-8.7	4.1 ± 0.28	0.9-9.9	3.8 ± 0.31	1.2-8.8	2.9 ± 0.37	0.1-7.8
Larva	2.40 ± 0.40	1.6-7.4	3.29 ± 0.36	1.71-8.29	3 ± 0.29	0.2-8	3.03 ± 0.37	1.97-8.03
1st Quiescent	0.94 ± 0.48	0.46-5.94	0.89 ± 0.37	0.11-5.89	0.99 ± 0.5	0.01-5.99	0.09 ± 0.63	0.1-5.8
Protonymph	2.64 ± 1.13	0.06-7.64	2.33 ± 1.89	0.67-7.33	2.58 ± 1.72	0.42-7.58	2.47 ± 1.64	0.53-7.47

2nd Quiescent	0.96 ± 1.13	0.04-5.96	1.02 ± 0.27	0.98-6.02	1 ± 0.2	0.04-6	1.19 ± 0.34	0.81-6.19
Deutonymph	2.97 ± 0.39	2.03-7.97	3.01 ± 0.26	1.99-8.07	3.09 ± 0.31	1.91-8.09	3.7 ± 0.3	1.3-8.7
3rd Quiescent	0.86 ± 0.29	0.14-5.86	0.93 ± 0.33	0.07-5.93	0.92 ± 0.27	0.08-5.92	0.89 ± 0.34	0.11-5.89
Total developmental period (egg-adult)	11.24 ± 1.38	6.24-16.24	12.29 ± 1.89	7.29-17.29	11.99 ± 1.57	6.99-16.99	12.97 ± 1.62	7.97-17.97
Pre-oviposition period	2.21 ± 0.34	0.79-7.24	2.36 ± 0.29	0.64-7.36	2.29 ± 0.31	0.71-7.29	2.39 ± 0.49	0.61-7.39
Oviposition period	16.0 ± 2.22	11-27	17.03 ± 2.97	12.03-22.03	16.91 ± 2.51	11.91-21.91	17.19 ± 2.27	12.19-22.19
Post-oviposition period	2.86 ± 0.46	2.14-7.86	3.03 ± 0.51	1.97-8.03	2.93 ± 0.5	0.07-7.93	2.81 ± 0.44	0.19-7.87
Longevity	15.0 ± 2.26	10-20	16.9 ± 3.39	11.9-21.9	15.87 ± 2.9	10.87-20.87	17.33 ± 3.15	12.33-22.33
Fecundity Eggs/female	21 ± 1.10	16-26	22 ± 0.97	17-27	19.2 ± 1	14.2-2.42	21.61± 0.87	16.61-26.64
Sex ratio (male:female)	1:3.7		1:4		1:4.02		1:5.1	