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Biology of *Oligonychus indicus* (Acari : Tetranychidae) Infesting Sorghum in South Gujarat

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ABSTRACT

Investigations were carried out from March to May, 1986 on the biology of *Oligonychus indicus* (Hirst) in the laboratory of the Department of Entomology, Gujarat Agricultural University, Navsari at room temperature (22 to 31°C, Av. 26.50°C). Various stages, their duration and sexual behaviour are described in detail. The average developmental periods for incubation, larva, protonymph and deutonymph were 4.73 ± 0.75, 2.11 ± 0.79, 1.21 ± 0.50, 1.56 ± 0.84 days in the case of females and 1.94 ± 0.63, 0.91 ± 0.56, 1.38 ± 0.52 days in the case of males. Preoviposition period was 1.80 ± 0.62 day and the females laid an average of 30.79 ± 11.48 eggs during their average ovipositional period of 4.71 ± 1.46 days. An egg hatch of 93.75 ± 10.56 per cent was recorded. Females laid an average of 4.06 ± 2.56 eggs per day. The adult lived on an average for 9.35 ± 3.08 days in the case of females whereas males lived for 2.65 ± 1.06 days.

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench), an important food crop in India, valued both for grain and fodder, is subjected to over a dozen insect pests. The spider mite *Oligonychus indicus* (Hirst) has in recent years been identified as one of the serious sap-sucking pests of sorghum in South Gujarat where it is locally known as 'Ratodo'. The occurrence of this mite on sorghum was first noticed in Tamil Nadu (Cherian, 1933). The feeding of this mite generally causes the appearance of reddish patches on infested leaves but remains pale yellow in the case of hybrid CSH-5 and CSH-6 and maize variety. The infestation of this mite starts along the midrib leading to gradual withering of leaves and finally drying. The mite lives in colonies preferably on the lower surface of leaves.

Oligonychus indicus was first described by Hirst in 1923 as *Paratetranychus indicus*. Later Pritchard and Baker (1955) revised this genus and renamed as *Oligonychus indicus*. So far eight species of *Oligonychus* have been reported from India with an extensive host range but mostly reported on sorghum (Banu and Channa Basavanna, 1972). Biology of this mite was studied in India by Rahman and Sapra (1940) and Gupta *et al.*,

(1974). Inspite of apparent importance of this mite, there is scanty information on its biology which is of great value in evolving control measure. Studies on its biology were, therefore, made under the agroclimatic condition of South Gujarat and the results are reported here-under.

MATERIALS AND METHODS

Rearing technique : Five pairs of *Oligonychus indicus* were collected from the leaves of sorghum grown on Agricultural College Farm, Gujarat Agricultural University, Navsari. Further rearing was done in the laboratory on sorghum leaves from the eggs to have pure mass culture and constant supply of materials for the present investigation.

The life cycle of *O. indicus* was studied with mated female in the laboratory at room temperature (22 to 31°C, Av. 26.50°C) from March to May, 1986. For the purpose 20 females taken from mite culture were released per leaf disc and kept for oviposition for a day and after 24 hours of oviposition, the adult females were removed from leaf discs. The eggs laid were counted and marked for observing subsequent development. Observation regarding various stages of mite was recorded by rearing fifty (50) newly emerged larvae on sorghum leaf made into circular discs of 2 cm. dia. placed over wet cotton in Petri dishes at the rate of one larva per leaf disc per Petri dish. Water was added periodically so as to keep cotton saturated and to maintain leaf discs in turgid condition. Whenever it was found necessary the mites were transferred to fresh leaves with the help of zero number camel hair brush. Detailed biological studies were made under stereoscopic binocular microscope.

Observation : During the larval and nymphal development, observations were recorded twice daily whereas only one observation was made during the adult stage. The fecundity was worked out by noting total number of eggs laid by an individual adult female during its life period. During oviposition, the eggs laid were crushed to avoid recounting.

RESULTS AND DISCUSSIONS

Both sexes of *O. indicus* in their development from hatching to adult passed through a larval and two nymphal stages *viz.*, protonymph and deutonymph. These three active immature feeding stages were each followed by a short period of quiescence called nymphochrysalis, deutochrysalis and teleochrysalis, respectively. The duration of various stages (sex-wise) of this mite is presented in Table 1.

Description of developmental stages

Egg and Egg laying : Eggs were deposited singly on leaves and generally found below the webs. They were smoky in colour when freshly laid, later changing to pale yellow and becoming transparent prior to hatching.

Hatching : As the embryo developed, the egg gradually turned brown losing the shine with the age. Just prior to hatching marginal area along the periphery became transparent and two red spots corresponding to simple eyes of the larva were clearly visible. The larva emerged from the egg by making a vertical slit in the chorion on one side. The larva widened this opening with its legs and emerged leaving the egg shell

intact on the leaf surface. There was 93.77 ± 10.50 per cent hatching of eggs recorded under the study.

Larva : The newly emerged hexapod larva wandered around the egg shell for a few minuted and then settled down for feeding. When newly hatched, the larva was pale yellow in colour becoming elongated and develpoing a greenish tinge after feeding and finally to dark green when it had fed for some time. The colour varied due to the influence of the food consumed. Almost directly over the second coxae two bright prominent red eyes spots were evident on each side near the margin of dorsal propodosomal region. It usually fed and lived underneath the webs.

Nymphochrysalis : Before moulting into the next stage, the larva passed through a brief quiescent stage by anchoring itself to the leaf surface and assumed a characteristic position in which legs were stretched out. During this period of inactivity the mite suspended all its activity of feeding. At moulting, the mite freed the posterior of its body first and pulled out the anterior of its body afterwards, while the exuvium was attached to the leaf surface.

Protonymph : The protonymph differed essentially from the larva in being larger and in possessing four pairs of legs. The mite in this stage appeared more pigmented and turned darker in later period. The feeding habit and behaviour were similar to those of larva. The female protonymph had an ovoid body with a broad opisthosoma, whereas male protonymph had a narrow and pointed opisthosoma and roughly triangular body.

Deutochrysalis : At maturity, protonymph entered quiescent stage and suspended all its activity of feeding as above. The body shrank and reduced in size.

Deutonymph : The colour of the mite in this stage was dark greenish. The deutonymph emerged from deutochrysalis. The body was broader and larger than protonymph. However, it resembled the protonymph in its feeding and other habits.

Teleochrysalis : The mature deutonymph entered quiescent stage and remained inactive by anchoring istelf to leaf surface. The moulting of the quiescent deutonymph resulted in the emergence of adult mite.

Developmental Period

Biological observations relating to developmental stages have been found in general conformity with earlier studies reported by Rahman and Sapra (1940) on this species. They reported incubation period for Paratatranychus indicus to be 2½-3 days in April to September and 5–13 days in March to October when reared on sugarcane (*Sacchram officinarum*). This little variation from the present investigation (Table 1) might be due to disparity in rearing substrate and ecological variation. Padhiyar (1973) reported this period to be 5.6 ± 0.29 days for *O. indicus* reared on sorghum leaf at room temperature which is almost in consonance with the present findings (4.73 ± 0.75 days). Das (1959) recorded it to be 4–5 days for *O. coffeae* which is close to the present findings as far as genus is concerned. Padhiyar (1973) recorded larval, protonymphal and deutonymphal durations (irrespactive of sexes) of *O. indicus* to be 1.8 ± 0.51, 2.4 ± 0.21 and 2.6 ± 0.30 days, respectively, which is more or less close to the present findings but he could not make an observations on the

duration of quiescent stages which might have lead to little deviation from the present findings. Larval and nymphal periods (either protonymph or deutonymph) were reported to be 2–4 days and 2 days, respectively (Rahman and Sapra, 1940), which is close to the present findings. However, Saba (1971) working with *Tetranychus yusti* recorded quiescent stages (irrespective of sexes) *viz.*, nymphochrysalis, deutochrysalis and teleochrysalis to be 0.5 day, 0.5 to 1.0 day and 0.75 to 1.0 day, respectively, at 25.50 ± 1°C which are more or less close to the present findings (Table 1). The males emerged as adult a bit earlier than the females and were found close to or on top of female teleochrysalis.

Adult

Male : The body was triangular with distinctly pointed abdomen. The male was with slight tinge of red and was actively fast moving and smaller than female having four pairs of legs on their propodosomal region of the body. As indicated (Table 1) males were short lived and died within 1 to 5 days averaging 2.65 ± 1.06 days which is in consonance with the findings of Rahman and Sapra (1940) who recorded it to be 96 hrs (3 days) for *Paratetranychus indicus* on sugarcane. The duration of male was found to be varying as compared to that reported by Das (1959) for *O. coffeae* to be 4.5 days which might be due to species variation and host differences.

Female : The mites were generally grayish green in colour. Striations on the dorsal opisthosomal integument were mostly transverse. The first pair of legs was longer than the fourth pair, while the second and third pairs were of almost similar size but shorter than fourth pair. The duration of female mite was recorded to be 9.35 ± 3.08 days which varied a bit as compared to that reported by Das (1959) and Rahman and Sapra (1940) for *O. coffeae* and *Paratetranychus indicus*, respectively; might be due to species and host differences. However, it was found to be more or less close to the findings of Loyttyniemi (1970) recording two weeks for *O. ununguish* at room temperature.

Mating behaviour

The mating among the mites was usualy observed soon after the shedding of last skin. Male emerged a bit earlier than female and was observed waiting for the emergence of females mite from its last moult. In act of mating, the male slipped underneath the female from behind and classped her abdomen on either side, wherein coupling was accomplished and sperm transferred in relatively short period of time (0.45 to 1.25 minutes). At times, single female mite soon after its emergence as an adult was observed to be mated by 1 to 3 males simultaneously one after the other. Almost similar mating behaviour was observed in *T. tumidus* taking approximately one minute coupling time (Saba, 1973). Beavera and Hampton (1971) reported that similar mating for citrus red mite which was the same as mentioned by Rahman and Sapra (1940) and Das (1959) for *P. indicus* and *O. coffeae*, respectively.

Preoviposition period : It varied with an average of 1.80 ± 0.62 days (1 to 3 days) which is close to findings of Rahman and Sapra (1940) recording it to be 1–2 days for *Paratetranychus indicus* on sugarcane. Das (1959) reported it to be 24 hrs (2 days) for *O. coffeae* which is close to present findings (1.80 ± 0.62 day).

TABLE 1

Duration of various developmental stages of both the sexes of sorghum mite, *Oligonychus indicus* (Hirst).

Stage	*Duration (in days)**	
	Female	*Male*
Incubation period (irrespective of sexes)	4.73±0.75 (3—8)	——
Larva	2.11±0.75 (1—5)	1.94±0.63 (1—3)
Nymphochrysalis (Ist quiescent)	0.89±0.36 (0.33—4.00)	0.82±0.31 (0.33—1.00)
Protonymph	1.21±0.50 (0.33—4.00)	0.91±0.56 (0.33—2.00)
Deutochrysalis (IInd quiescent)	0.85±0.32 (0.33—2.00)	0.81±0.17 (0.66—1.00)
Deutonymph	1.56±0.84 (0.66—3.00)	1.38±0.52 (1—2)
Teleochrysalis (IIIrd quiescent)	0.91±0.17 (0.33—1.00)	0.78±0.35 (0.33—1.00)
Adult (Longevity)	9.35±3.08 (3—14)	2.65±1.06 (1—5)
Preoviposition period	1.80±0.62 (1—3)	
Oviposition period	4.71±1.46 (2—8)	
Post-oviposition period	4.35±1.95 (3—10)	
Per day egg laying/female	4.06±2.57 (1.12)	
Fecundity (Total eggs/female during its life period)	30.79±11.48 (12—54)	

*Average of 50 sets.

Oviposition period : Both sexual and parthenogenetic reproduction were observed in this mite. The unmated female invariably gave rise to male progeny. Das and Das (1967) working with *O. coffeae* reported this period to be 5–9 days which is close to the present findings (4.71 ± 1.46 days).

Fecundity : A female laid 1–12 eggs (Av. 4.06 ± 2.57 eggs) daily. The fecundity ranged from 12–54 eggs averaging 30.79 ± 11.48 eggs in 2–8 days (Av. 4.71 ± 1.46 days). Rahman and Sapra (1940) reported that *Paratetranychus indicus* reared on sugarcane laid eggs 1–7 per day and total number of eggs laid by her (fecundity) ranged between 35–69 with an average of 53 which is more or less in consonance with the present findings.

Post-oviposition period : It varied from 3–10 days averaging 2.47 ± 1.45 days. Almost similar duration was reported by Rahman and Sapra (1940) for *P. indicus* on sugarcane (1–3 days from June to September and 2–6 days in October to November).

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