# International Journal Of Scientific And University Research Publication

ISSN No 2364/2018

Listed & Index with
ISSN Directory. Paris

Multi-Subject Journal

Volum : (3) | Issue : 211 |

INTERNATIONAL JOURNAL OF SCIENTIFIC AND UNIVERSITY RESEARCH PUBLICATION

Research Paper

# BREEDING BIOLOGY OF OLIGONYCHUS BIHARENSIS (HIRST) (ACARI: TETRANYCHIDAE) – A PEST ON COW PEA

**Sangeetha G Kaimal || Department of Zoology**
**Providence Women's College**
**Calicut – 673 009**
**Kerala**
**India.**

**Post embryonic development of Oligonychus biharensis (Hirst) was traced on cow pea in the la & 70 + 5% RH. Rearing of the life stages of the mite was**

**tages of the mite was carried out following leaf flotation technique. The life cycle of the species was found to comprise both sexual and parthenogenetic generations with slight variations in their respective durations. The respective durations of pre-oviposition period, oviposition period and post-oviposition period were found to be 1.5 days, 11.5 + 0.75 days and 0.9 + 0.25 day. Ovipositional rate of the species was observed to be 50.9 + 4.7 eggs and 40.2 + 1.4 eggs for mated and unmated females respectively. Total duration of sexual development and parthenogenetic development was observed to be 6.45 + 0.05 days and 6.0 + 0.07 days respectively. The sex ratio (male: female) was 1-2: 10.**

Oligonychus ,biharensis, cow-pea, الكلمات المفتاحية:
oviposition, quiescence, sexual,

2oC & ±Ramani, 2011) in an environmental growth chamber at 30 5% relative humidity. Observations on various aspects of ± 70 development were made regularly on each culture set at 6h intervals. Each culture set consisted of 2-4 leaf bits, kept in petri dishes lined with moistened cotton pads and was treated as an experimental unit. Stock cultures of the mites were also maintained in the laboratory in the same manner so as to ensure constant supply of life stages.

## 2-RESULTS AND DISCUSSION

disclosed the *O. biharensis* Post-embryonic developmental studies of occurrence of a larval and 2 nymphal stage prior to attaining adulthood. Each instar was constituted by an active period fol- lowed by a quiescent period, which then moulted to successive stages of development. Adult male was slightly reddish-orange in colour with elongate orange legs and tapering hysterosoma. Sexually mature male was smaller than the female and moved very actively moving in search of quiescent female deutonymphs for copulation or engaged in feeding. Adult female was larger than the male, red coloured with short orange legs and posteriorly rounded hysterosoma. Feeding was initiated soon after moulting and as feeding progressed, the colour preferred *O. biharensis* changed to dark red.Ovipositing females of areas close to the mid rib and major veins of the leaf though they showed no preference for the leaf surface. Such habit of laying eggs in secluded habitat may offer better chances of protection of eggs (Banu & ChannaBasavanna, 1972; Barrion & Corpuz-Raros, 1975; Sobha & Haq, 1999; Sangeetha & Ramani, 2007, 2011). Newly deposited eggs were orange coloured, spherical and shiny. The previposition period lasted for 1.5 days, oviposition period for 0.25 day on ± 0.75 days and post-oviposition period for 0.9±11.5 *et* cow pea leaves. The respective durations as recorded by Bonato ±1.3 days and 0.5 ± 0.3 day, 8.3 ±were 2.2 *O. gossypii* (1995a) on*al.* 0.2 days. Fecundity showed an increase on successive days of oviposition, reaching the peak levels on the 4th or 5th day and a gradual decrease from the 6th day onwards under laboratory 2.2 eggs when ±conditions. On cow pea fecundity averaged 45.55 1.4 eggs ± 4.7 eggs and 40.2 ± mated and virgin females laid 50.9 *et* respectively. This was in support of the findings of Bonato *O.* , Aponte & Mc Murtry (1997) on*O. gossypii* (1995a) on*al.* . However, fecundity *O. biharensis* (2005) on*et al.* , and Chen*perseae* (2005) (71.6 eggs/female) were *et al.* recorded by Ji*O. biharensis* of significantly much higher to that recorded in the present study. The 0.18 days. The ± on cow pea was 10.1*O. biharensis* life span of 0.3 ± mated females recorded comparatively shorter life span of 9.9 days and virgin females lived longer (Bonato & Gutierez, 1999) up 0.2 days. Bonato and Gutierrez (1996) also observed that ±to 10.3 infesting cow pea lived longer than *O. gossypii* unmated females of *O.* the mated ones. Mean longevity of 8.2 days was recorded for

## مقدمة

is a sporadic pest of vegetables, rose, *igonychus biharensis lO* camphor, litchi and many other plants of high importance. Feeding by this mite causes characteristic bronzing on leaves and severe damage to the host plant. Severe infestation and prolonged feeding results in crinkling, subsequent drying and defoliation of affected leaves. Attack by these mites normally affects the growth and vigour (L.) Walp. (Cow pea), the current *Vigna unguiculata* of host plants. host plant proved to be a potential host for the successful throughout the year. Cow pea is one *O. biharensis* establishment of of the most important tropical multi- purpose legumes with astonishing ability to fix atmospheric nitrogen through its root is cultivated *V. unguiculata* nodules thereby adding to soil fertility. for its seeds (shelled green or dried), pods, leaves that are consumed as green vegetables, grain, for- age, hay, silage and green manure. The edible pods are 10-23 cm long with 10-15 seeds/pod. The seeds, pods and tender shoot apices are power houses of nutrients proteins, fats, carbohydrates, fibers, minerals (calcium, *viz.,* -phosphorous, iron, sodium and potassium) and vitamins (A, B thiamine, riboflavin, niacin and C) and are therefore a potential source of human nutrition. Cowpea seeds are believed to be medicinal to many tribes and are prescribed for treatment of sick children. Considering the nutritive value of the plant, ease of *O.* establishment and the infestation by dense populations of on it throughout the year, studies on the biology of the *biharensis* mite were initiated on cow- pea.

## 1-MATERIALS AND METHODS

were maintained on cow pea in the *O. biharensis* Live cultures of field to observe closely the mode of infestation, progressive damage symptoms induced on the host plant and also to make quantitative estimation of damage potential of the concerned species. To achieve *ii–*, mite free plants and (*M* )*i*this objective, two mite treatments ( +, plants artificially infested with mites, were included in a *M*) randomized block design plots (3 m ×3 m) which was replicated four times within a season. Cultivation of host plants was done by planting stem cuttings of cow pea in enriched soils prepared for the study. The plots were irrigated regularly and the plants were made mite-free by spraying a broad-spectrum insecticide to eliminate mite , 2004). Artificial infestations *et al.*pests and predators (Reddall + plants were done by stapling mite infested leaf bits grown in *M*of the glass house 60 days after planting. The plots were covered with fine nets to ensure protection from pest attack and to reduce the risk – plots.Studies on the *M* + and*M*of cross infestation between were initiated in the laboratory on *O. biharensis* development of fresh leaves of cow pea by leaf flotation technique (Sangeetha &

tetranychids as described by several authors. No significant change in the duration was recorded for the Ist, IInd and IIIrd quiescent on cow pea and was completed in 0.55 day.*O. biharensis* stages of

**gnitluo8-M**

Appearance of a dorsal slit marked the initiation of the process followed by widening of the slit towards either side. The division was complete and hence the moulting skins were observed as two separate pieces on the leaf surface. The individual released from the exuviae moved away from the site in order to resume its normal life activities. The entire process was completed in 15 minutes for all the quiescent stages of the mite.

**9-Mating**

During mating, the male placed its anterior pair of legs over the dorsum of quiescent female deutonymph and awaited the female's emergence. The process of moulting was assisted by the male, helping the female to cast off its moulting skin. During the act of copulation, the male moved under the posterior ventral surface of the female, arching its opisthosomal part so as to bring its aedeagus in contact with the genital aperture of the female. These observations are in agreement with the behavioural activities observed in the case (Beavers & Hampton, *P. citri* 1969),*et al.,* (Qureshi*T. evansi* of *T.* (Banu & Chan- naBasavanna, 1972),*E. orientalis* 1971), (Sangeetha & *T. neocaledonicus* (Penman & Cone, 1972), and*urticae* Ramani, 2008). Mating lasted for 2 minutes. A single male mated with several females, though females were receptive to a single male only (Banu & ChannaBasa- vanna, 1972).

**10-Parthenogenesis and Sexual development**

exhibited sexual as well as *O. biharensis* The female of parthenogenetic reproduction. As a rule, the progeny of fertilized females produced individuals of both the sexes in the ratio 3 males: 10 females whereas the progeny of unfertilized females produced males only (Manjunatha & Puttaswamy, 1989, Sangeetha & Ramani, *et* 2007). Sex ratio therefore appeared to be female biased (Ghoshal 0.06 days ± , 2006). The total durations recorded averaged 6.22*al.* 0.07 days). This ± 0.05 days & Parthenogenetic -6.0 ± (Sexual - 6.45 ± duration appeared to be on the lower side as compared to 13.50 0.15 days ± 2006), 10.9*et al.,* (Ghoshal*T. neocaledonicus* 0.15 days in (Sangeetha & Ramani, 2007). Tem- perature exerted a significant 2007, *et al.,* effect on all developmental stages of the mite (Haque Sangeetha & Ramani, 2008).The shorter developmental periods in successfully *O. biharensis* averaging 6 – 12 days enabled completing 3 – 5 generations per month and attain pest status. The temperature of 30°C proved to be most favoured by the mite because of the minimum time taken to complete the life cycle and high . *et al*fecundity of both fertilized and unfertilized females (Gupta 1995a, Sangeetha & *et al.,* 1974, Congdon & Logan.1983, Bonato Ramani, 2011). Confirmation of this combination identified during drier and hotter months of the year in Kerala through field studies on cow *O. biharensis* also revealed peak levels of infestation of pea plants. Being one of the most valuable crops of our nutritional concern, this has to be considered seriously, as this major mite pest if not controlled would definitely cause heavy yield loss, branch die back and even death of the plant. A cognitive aspect that emerged from this study was the occurrence of the mite on cow pea, a so far unrecorded host for the species.

## استنتاج

The shorter developmental periods averaging 6 – 12 days enabled O. biharensis in successfully completing 3 – 5 generations per month and attain pest status. The temperature of 30°C proved to be most favoured by the mite because of the minimum time taken to complete the life cycle and high

*O. coffeae* 0.60 days for ± (1995a), 8.88*et al.,* by Bonato*gossypii* *et* by Ji*O. biharensis* 3.11 days for ± (1999) and 19*et al.* by Saha (2005).Increase in the size of the egg was a notable change, few *al.* hours.

**3-Research Paper**

before the hatching process was initiated. This was followed by slit formation and the separation of the egg case by the forceful movements of the emerging larva. The mouth parts and the first pair of legs protruded out of the egg shell in the beginning fol- lowed by the emergence of the last two pairs of legs. Soon after hatching the larva moved away in search of food. The hatching process was completed in about 10-12 minutes. This is in confirmation with the observations reported by earlier workers (Das & Das, 1967; Aponte & Mc Murtry, 1997).

**cubation periodnI3-Duration of developmental stages**

The fresh orange coloured eggs turned brownish with age and the red eye spots clearly visible prior to hatching. Incubation period (2006) and Sangeetha *et al.* 0.05 days. Ghoshal ±recorded was 2.66 & Ramani (2007) reported 3.33 days on an average for the period *T. neocaledonicus.*on

**4-Larval period**

The newly emerged larva was hexapod, small, spherical and red- dish orange in colour. Change in body colour was noted with progress in feeding to dark red with dark spots on the dorsal body surface. The larva exhibited random movements on both surfaces of the leaf actively sucking the leaf sap. On cow pea, the active larval Mallik & *T. ludeni,* 0.05 day. In ±life lasted for 0.88 *T.*ChannaBasavanna (1981) reported 32.5 hours, in and Manjunatha & Puttaswamy, (1989) and *neocaledonicus* 0.23 days ± (2006) reported 1 – 2.5 days and 3.33*et al.,* Ghoshal respectively.

**5-Protonymphal period**

The protonymph was larger in size, reddish-orange coloured, octapod in nature with reddish-orange legs. Sexual dimorphism was apparent at this stage. Protonymph developed dark blotches on its dorsal surface with progress in feeding. The duration of active 0.02 days. Observations reported on ±protonymphal period was 1.24 were 2.30 days (Puttaswamy *T. ludeni* mean protonymphal period of *T.* 0.17 days in ±& ChannaBasavanna, 1981) and 3.80 2006).*et al.,* (Ghoshal*neocaledonicus*

**6-Deutonymphal period**

The largest among the nymphal instars, the deutonymph was orange red coloured at the time of emergence. The colour later darkened with dark blotches on the dorsum. The hysterosoma of the male and female deutonymph showed marked differences which were tapering posteriorly in the former and rounded in the latter. The duration of 0.06 days. This observation is ±deutonymphal period lasted for 1.45 in conformity with the reports of Manjunatha & Puttaswamy (1989) and Sangeetha & Ramani (2007).

**7-Quiescent Periods**

A period of zero activity or quiescence was observed at the end of the active period of each developing stage, as observed in the case of other tetranychid species. The individual ceased all its visible life activities and became inactive. Selection of concealed or secluded areas especially near the petiole, mid rib or in be- tween the leaf veins in order to settle down in quiescence was a notable feature. During quiescence, the body assumed oval shape, developed a pale white covering and retracted all its legs below its body with stylets in pierced state in the leaf tissues. At the end of quiescent phase, the cuticle turned transparent and developed a slit on the dorsal region preparing itself for the moulting process. The observation on the quiescence seemed to follow a common pattern as in other

fecundity of both fertilized and unfertilized females (Gupta et al. 1974, Congdon & Logan.1983, Bonato et al., 1995a, Sangeetha & Ramani, 2011). Confirmation of this combination identified during drier and hotter months of the year in Kerala through field studies also revealed peak levels of infestation of O. biharensis on cow pea plants. Being one of the most valuable crops of our nutritional concern, this has to be considered seriously, as this major mite pest if not controlled would definitely cause heavy yield loss, branch die back and even death of the plant. A cognitive aspect that emerged from this study was the occurrence of the mite on cow pea, a so far unrecorded host for the species.

**ref_str**


and Mc Murtry J A (1997) Biology, life table and mating **Aponte O** .1
*Intl. J.* (Acari: Tetranychidae).*seae erpligonychus O* behaviour of
(3), 199-207.**23** ,*Acar.*

and ChannaBasavanna G P (1972) Plant feeding mites of **Banu K** .2
India I. A pre- liminary account of the biology of the spider
(Klein) (Acari: *Eutetranychus orientalis* mite
(3), 253-268.**6**., *Mysore J. Agri. Sci*Tetranychidae).

and Corpuz-Raros L A (1975) Studies on citrus mites **Barrion A T** .3
Rimando *Eotetranychus cendanai* (Acarina) : Biology of
*Brevipalpus*(Tetranychidae) and population trends in
(1), **3** ,*The Phillipine Entomol.* Donnadieu (Tenuipalpidae).*obovatus*
30-45.

and Hampton R B (1971) Growth, development and **Beavers J B** .4
*Ann.* mating behaviour of the citrus red mite (Acari: Tetranychidae).
,804-806.20.**64** ,*Entomol. Soc. Amer.*

and Gutierrez J (1996) Reproductive strategy of two major **Bonato O** .5
*nn. Entomol.A* mite pests (Acari: Tetranychidae) on cow pea in Africa.
(5),676-680.**89**., *Soc. Amer*

and Gutierrez J (1999) Effect of mating status on the **Bonato O** .6
fecundity and longevity of 4 spider mite species (Acari:
(8), 623-632.**23**.,*Expt. Appl. Acarol*Tetranychidae).

and Gutierrez J (1995a) Comparison of **Bonato O, Baumgartner J** .7
*Mononychellus* biological and demographic parameters for
on cow pea: influence of *Oligonychus gossypii* and*progresivus*
,119-125.**75** ,*Entomol. Experimentalis Appl.*temperature.

and Gutierrez J (1995b) Influence of relative**Bonato O, Divassa M S** .8
*Mononychellus progresivus* humidity on life-history parameters of
*Environ. Entomol* (Acari: Tetranychidae).*Oligonychus gos- sypii* and
(4), 841-845.**24**.,

and Peng Z (2005) Effect of different **Chen W, Fu Y, Zhang F** .9
*Oligonychus* varieties of litchi on the development and reproduction of
11-16.**10,** .*Syst. Appl. Acarol* (Hirst).*biharensis*

and Logan J A (1983) Temperature effects on **Congdon B D** .10
(Acari: *Oligonychus pratensis* development and fecundity of
359-362.**12,** ,*Environ. Entomol.*Tetranychidae).

and Das S C (1967) Effect of temperature and humidity on **Das G M** .11
*Oligonychus coffeae* the de- velopment of tea spider mite,
(3), 433-436.**57**.,*Bull. Entomol. Res*(Nietner).

and Mukherjee B (2006) Life cycle of **Ghoshal S, Gupta S K** .12
Lamk, *Rhizophora mucronata* Andre on*Tetranychus neocal- edonicus*
*ec. zool. Surv. R*under laboratory condition at controlled temperature.
(2), 61-65.**106** ,*India*

and Sidhu A S (1974) Effect of food and **Gupta S K, Dhooria M S** .13
temperature on the development, longevity and fecundity of
*Acarol* (Hirst).*Oli- gonychus indicus* sugarcane red spider mite
(3),436-440.**16**.,

and Begum A (2007) Developmental **Haque M, Wahab A, Naher N** .14
Neitner (Acari: *Oligonychus coffeae* stages of the red spider mite,
71-72.**26,** . Rajshahi Univ.,*Univ. J. Zool*Tetranychidae) infesting rose.

and Lin J Z (2005) Laboratory population **Ji J, Zhang Y X, Chen X** .15
(Hirst) (Acari: Tetranychidae) at *Oligonychus biharensis* life table of
(1), 37-41.**14** .,*Acta. Arachnol. Sinica*different temperatures.

and Channabasavanna G P (1981) Life history and life **Mallik B** .16
*Amblyseius* and its predator*Tetra- nychus ludeni* tables of
*Indian J. Acar* (Acari: Tetranychidae; Phytoseiidae).*longispinosus*
1-12.**8,** .,

*Tetranychus* and Puttaswamy (1989) Life history of **Manjunatha M** .17
*J. Acar.* under green house conditions.*neocaledoni- cus*
(1 & 2), 35-40.**11**,

and Cone W W (1972) Behaviour of male two spotted **Penman D R** .18
spider mites in response to quiescent female deutonymphs and to
1289-1293.**65,** .,*Ann. Entomol. Soc. Amer*web.

and Channabasavanna G P (1981) Influence of weather **Puttaswamy** .19
factors and predators on the populations of the spider
, **5** .,*Indian J. Acar* (Acari: Tetranychidae).*Tetranychus ludeni* mite
6979.

and Fleschner C A (1969) Biology of the **Qureshi A H, Oatman E R** .20
*Ann. Entomol.* Pritchard and Baker.*tranychus evansi eT* spider mite,
, 898-903.**62***Soc. Amer.,*

Wilson, L.J. and Gregg, P.C. (2004) **Reddall A., Sadras, V.O.,** .21
Physiological responses of cotton to two-spotted spider mite
835-846.**44,** *Crop Science,* damage.

Somchoudhury A K and Sarkar P K (1999) Effect **Saha K, Dey P K,** .22
of tempera- ture and relative humidity on the rate of development,
*Oligonychus coffea*longevity and fecundity of the red spider mite
(1 & 2), 84-88.**15** .,*Indian J. Acar.*

and Ramani N (2007) Biological studies of **Sangeetha G K** .23
Andre (Acari: Tetranychidae)*Tetranychus neocale- donicus*
(2), 51-57.**26A** .,*Pure Appl. SciBull.* Lam.,*Moringa oleifera* infesting

and Ramani N (2008) Effect of temperature and **Sangeetha G K** .24
*Tetranychus* relative humid- ity on oviposition and fecundity of
*Moringa* Andre (Acari: Tetranychidae) – a pest of*neocaledonicus*
(2), 279-282.**11** ,. *J. Exp. Zool. India*Lam*oleifera*

*Oligonychus* and Ramani N (2011) Biology of **Sangeetha G K** .25
*J. Exp. Zool.* (Hirst) (Acari: Tetranychidae) on cassava.*biharensis*
(1), 27- 30.**14** ,*India*

*Tetranychus* and Haq M A (1999) Incidence of **Sobha T R** .26
*J. .Dolichos lablab* (Acari:Tetranychidae) on*neocaledonicus*
(1&2), 73-76.**14***Acarol.,*


IJSURP Publishing Academy

International Journal Of Scientific And University Research Publication

Multi-Subject Journal

Editor.

International Journal Of Scientific And University Research Publication

+965 99549511

+90 5374545296

+961 03236496

+44 (0)203 197 6676

www.ijsurp.com