Journal of Global Biosciences
ISSN 2320-1355
Volume 4, Number 5, 2015, pp. 2181-2186
Website: www.mutagens.co.in
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Research Paper

NATURAL EGG PARASITISATION OF LEMON BUTTERFLY, *Papilio demoleus* ON DIFFERENT HOST PLANTS

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Abstract

The present investigation, Natural egg parasitisation of Lemon butterfly *Papilio demoleus* on different host plants was conducted in laboratory of Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during July 2010 to February 2011 with the object to study the natural parasitisation in egg of *Papilio demoleus.* Most favourable period of activity of eggs parasite of *Papilio demoleus* was observed in July, December and November month respectively during July 2010 to February 2011 on different host plant of Citrus. The maximum egg parasitisation was observed on *Citrus aurantifolia, Citurs sinensis and Citurs reticulata* respectively. The mean egg parasitisation was recorded 11.81, 11.60 and 1.44 per cent on *Citrus reticulata*; 13.87, 13.07 and 1.29 per cent on *Citrus sinensis* and 15.28, 13.38 and 1.56 per cent on *Citrus aurantifolia* by *Trichogrmma chilionis, Telonemus* spp. *and Ooencyrtus papilionis* respectively.

INTRODUCTION

Citrus is one of the important horticultural crop of India and area under citrus plantation is increasing year after year. The lemon butterfly, *Papilio demoleus* is a key pest of citrus in India. It feeds voraciously on vegetative growth of citrus plants throughout the year. It is most destructive to citrus seedling as well as new flushes (Butani and Jotwani, 1975). Its epidemic was recorded during 1940, 1969, 1982, 1983 (Thakare et al., 1985) and recently in 1996 (July-Aug.) on Nagpur mandarin in Vidarbha.

In India more than 250 insect species are reported of citrus, about 20 of them cause major damage (Bindra, 1967). In Maharashtra state 14 species were reported of which 8 species are significantly important (Thakare and Borle, 1974). The most common and problematic Citrus pest found all over the world is lemon butterfly (*Papilio* spp.). The lime butterfly, *P. demoleus* is the most notorious and destructive pest of citrus plantation throughout the world (Saljoqi et al., 2006). All the species of *Papilio* are the major pest of citrus; the major important

species of papilionide are *Papilio demoleus*, *Papilio polytes, Papilio polymenstor* and *Papilo helenus* (Singh, 1991).

Natural enemies played a significant role in controlling the lemon butterfly population. There are several important bioagents reported on lemon butterfly (Lewis and Delano, 2009). Very negligible work on this aspect has been reported in India particularly in Vidarbha region. Hence the study of natural parasitisation occurs on different citrus species like Nagpur mandarin, Acid lime, Sweet orange was under taken.

MATERIAL AND METHODS

Extent of natural parasitisation was estimated by collecting eggs of *Papilio demoleus* monthly from different host plant like Sweet orange, Nagpur mandarin and Acid lime at different location viz., All India Co-ordinated Research Project on Tropical Fruit Crop, Akola and field of Horticulture Department, Akola during July 2010 to February 2011.

Later on these collected eggs were kept individually into the glass vials (7.5 x 1.21 cm). Daily observations on number of adult parasitoids emerged out from the eggs and natural parasitisation were note down on the basis of adult emergence. The honey diet swab was kept inside the glass vials for increasing the life span of emerged adult of egg parasitoids. The different parasitoids were observed under stereoscopic microscope for their identification. Natural eggs parasitized were recorded by counting the blackened eggs of *Papilio demoleus*. Percent parasitisation were calculated on the basis of emergence of adult eggs parasite.

RESULT AND DISCUSSION:

During the period of study three eggs parasitoids, viz., *Trichogramma chilonis, Telonemus spp.* and *Ooencyrthus papilionis*, were observed in eggs of Citrus butterfly, *Papilio demoleus* during July 2010 to February 2011. Extent of natural eggs parasitization by different parasitoids is presented in table 1 on *Citrus reticulata*, *Citrus aurantifoilia* and *Citrus sinensis.* The results revealed that egg parasitoids activity was found more or less throughout the course of study on egg of *Papilio demoelus*.

Natural egg parasitisation on different host:

Citrus reticulata

Extent of natural eggs parasitisation in *Papilio demoleus* on *Citrus reticulata* by different parasitoids was presented in table 1. Comparatively highest total parasitisation (53.84%) was observed on *Citrus reticulata* in the July month. Practically lower parasitizing was recorded during December (17.86%), January (18.75%) and February (6.66 %). While in remaining month parasitisation was recorded in the range of 23.81 to 53.84% out of these parasitoid *O. papilionis* was active only in the July month in eggs of *Papilio demoleus* on *Citrus reticulata*. Result also indicated that, out of total mean parasitisation (24.86%), *Trichogramma chiolonis* accounted for 11.81%, *Telonemus* spp. 11.60% and *O. papilionis* 1.44% in eggs of *Papilio demoleus* on *Citrus reticulata.*

Citrus sinensis

Result also indicated that out of total mean egg parasitisation on *Citrus sinensis* was to the extent of 28.26 per cent of which *Trichogramma chilionis* accounted for 13.87 per cent, *Telonemus spp*.13.07 per cent, and *O.papilionis* 1.29 per cent. Practically highest total parasitisation (46.55%) was observed in July month on *Citrus sinensis* and lower parasitisation was recorded during November (18.75%), December (17.39%) and February (15.38%) on *Citrus sinensis*. While remaining month parasitisation was recorded in the range of 25 to 46.55% in the eggs of *Papilio demoleus* on *Citrus sinensis.*

Citrus aurantifoila

Highest total egg parasitisation (57.81%) was observed in July month and lower parasitisation was recorded during November (21.43%), January (21.74%) and February (13.04%). While in remaining month parasitisation was recorded in the range of 25 to 57.81% in eggs of *Papilio demoleus* on *Citrus aurantifolia* result also indicated that out of total mean parasitisation (29.96%) *Trichogramma chilionis* accounted for 15.28 per cent, *Telonemus*

*spp.*13.38 per cent and *O.papilionis* 1.56 per cent; out of these parasitoids *Ooencyrthus papilionis* was active only in the July month.

Table no. 1: Natural parasitism in egg of *Papilio demoelus* on different hosts.

Host Plant	Month	Total eggs collection	Eggs parasitized	% egg parasitized	% eggs parasitization by			Average no. of adult emerged out /egg			% Eggs hatched	% unhatched eggs
					T. chilonis	*Telonemus* spp.	*O. papilionis*	*T. chilonis*	*Telonemus* spp.	*O. papilionis*		
C. reticulata	July	78	42	53.84	24.36 (19)	17.95 (14)	11.53 (9)	2-7	3-4	1-3	37.18 (29)	8.98 (7)
	Aug.	42	10	23.81	14.28 (6)	9.52 (4)	00	6	1-3	00	57.14 (24)	19.05 (8)
	Sept.	22	6	27.27	18.18 (4)	9.09 (2)	0	3-5	1-3	00	54.55 (12)	18.18 (4)
	Octo.	35	9	25.71	14.28 (5)	11.42 (4)	0	2-12	3	00	62.86 (22)	11.43 (4)
	Novem.	20	5	25	10 (2)	15 (3)	0	3	2	0	70 (14)	5 (1)
	Decem.	28	5	17.86	7.14 (1)	10.71 (3)	0	3-9	2	0	71.43 (20)	10.71 (3)
	Jan.	16	3	18.75	6.25 (1)	12.50 (2)	0	3-5	2-3	0	75 (12)	6.25 (1)
	Feb.	15	1	6.66	00	6.66 (1)	0	3	0	0	80.00 (12)	13.33 (2)
Mean per cent parasitisation				**24.86**	**11.81**	**11.60**	**1.44**				**63.52**	**11.62**
C. sinensis	July	58	27	46.55	22.41 (13)	13.79 (8)	10.34 (5)	3-7	3-4	1-3	41.38 (24)	12.07 (7)
	Aug.	34	13	38.23	20.59 (7)	17.64 (6)	00	6	1-3	00	47.06 (16)	14.70 (5)
	Sept.	21	8	38.10	23.80 (5)	14.28 (3)	0	3-5	1-3	00	61.90 (13)	00
	Octo.	24	6	25	8.33 (2)	16.67 (4)	0	2-17	3	00	66.67 (16)	8.33 (2)
	Novem.	16	3	18.75	6.25 (1)	12.5 (2)	0	3	2	0	75 (12)	6.25 (1)
	Decem.	23	4	17.39	8.69 (2)	8.69 (2)	0	7-13	2	0	73.91 (17)	8.70 (2)
	Jan.	15	4	26.67 (4)	13.33 (2)	13.33 (2)	0	3-5	2-3	0	73.33 (11)	00
	Feb.	13	2	15.38	7.69 (1)	7.69(1)	0	3	2	0	76.92 (10)	7.69 (1)
Mean per cent parasitisation				**28.25**	**13.87**	**13.07**	**1.29**				**64.52**	**7.22**
C. aurantifolia	July	64	37	57.81	25 (16)	20.31 (13)	12.50 (8)	2-4	2-3	2-3	31.25 (20)	10.94 (7)
	Aug.	21	7	33.33	23.80 (5)	9.52 (2)	00	6	3	2	52.38 (11)	14.29 (3)
	Sept.	23	8	34.78	13.04 (3)	21.79 (5)	0	2-7	2-3	0	56.52 (13)	8.70 (2)
	Octo.	18	5	27.78	11.11 (2)	16.16 (3)	0	2-9	3	0	72.22 (13)	0
	Novem.	28	6	21.43	14.28 (4)	7.14 (2)	0	3	2	0	71.43 (20)	7.14 (2)
	Decem.	17	5	29.41	17.65 (3)	11.76 (2)	0	3-9	3	0	70.59 (12)	00
	Jan.	23	5	21.74	13.04 (3)	8.70 (2)	0	3-5	2-3	0	69.57 (16)	8.69 (2)

	Feb.	23	3	13.04	4.35 (1)	8.69 (2)	0	3	0	0	78.26 (18)	8.69 (2)
Mean per cent parasitisation				**29.96**	**15.28**	**13.38**	**1.56**				**62.78**	**7.31**

The results are in corroboration with work reported by Krishnamoorthy and Singh (1986) regarding two egg parasitoids of *Papilio demoleus* namely *Trichogramma chilioinis* and *Telonemus* spp. in 1984 at IIHR, Bangalore. Krishnamoorthy and Singh (1988) reported that the extent of parasitism by *Trichogramma chilioinis* and *Telonemus spp*. ranged from 0-65% and 10-78%, respectively. They further reported that though both the eggs parasitoids occurred simultaneously in the field, *Trichograma chilioinis* was dominant for nearly eight-month viz., August to December. They further added that *Trichograma chilioinis* alone parasitized 80.60% *Papilio* eggs, while *Telonemus spp*. accounted only for 41.3%.

Dadmal (2004) reported three egg parasitioids viz., *Trichograma chilioinis*, *Telonemus spp*. and *O. papilionis* on egg of *Papilio demoleus* and accounted 23.07-71.57, 0-15.38, 0-7.69 percent parasitizing respectively.

Gregarious parasitisation:

It was clearly revealed from results that *Trichogramma chilonis, Telonemus spp.* and *Ooencyrthus papilionis* yielded 2-13, 3-4 and 2-3 adults respectively from single egg of *Papilio demoleus* on different host of Citrus i.e. *Citrus reticulata*, *Citrus sinensis* and *Citrus aurantifolia*. Superparasitism also observed in egg of *Papilio demoleus*. It is might be due availability of more quantity of nutrient and wide space for development in eggs of *Papilio demoleus*.

The results are in corroboration with work reported by Boldt et al. (1973) stated that use of large host eggs could result in greater parasitisation. Krishnamoorthy (1987) recorded 1-3 adult of *Telonemus* spp. from single *Papilio* egg. Jalali and Singh (1990) recorded 3-7 adults of *O. papilionis* from a single *Papilio* egg. Dadmal (2004) recorded that the *Trichogramma chilonis* yielded 4-18 (9.5±2.8) adults from single *Papilio* egg. Whereas, *Telonemus* spp. and *Ooencyrthus papilionis* yielded 2-4 (3±0.8) and 2-3 (2.7±0.5) adults from single *Papilio* egg receptively. Thus these findings are in line which present finding.

Egg Hatching:

Results also revealed that per cent egg hatched was more observed on *Citrus reticulata* from the month of November 2010 to February 2011 (70-80%). Extent of egg hatching and non hatching in egg of *Papilio demoelus* observed on *Citrus reticulata*, *Citrus sinensis* and *Citrus aurantifolia* was given in table 1. Also it is clearly indicated from the results that in *Citrus sinensis* per cent egg hatched were noted from month of November 2010 to February 2011 (73.33-76.92%) and on *Citrus aurantifolia* per cent egg hatched was more from the month of November 2010 to February 2011 (69.57-78.26%).

Also it was clearly revealed from results that mean per cent hatched egg on *Citrus sinensis* and *Citrus aurantifolia* 64.52 %and 62.78 % receptively and mean unhatched egg of *Papilio demoleus* on *Citrus sinensis* and *Citrus aurantifolia* was recorded 7.21 %and 7.31% receptively from July 2010 to February 2011. The maximum egg hatching was observed on *Citrus sinensis* (64.52%) than *Citrus reticulata* (63.52%) and *Citrus aurantifolia* (62.78%). Comparatively unhatched egg was highest observed on *Citrus reticulata* (11.62%) than *Citrus sinensis* (7.22%) and *Citrus aurantifolia* (7.31%).

The results are in the line of earlier work reported by Dadmal (2004) recorded percent egg hatching in host larvae was maximum in collected from *Ruta graveolens* (66.67% to 100%) as compared *Citrus aurantifolia* (28.57 to 42.85%).

Favourable period of activity:

During the period of study three eggs parasitoids, viz., *Trichogramma chilonis, Telonemus spp.* and *Oencyrthus papilionis*, were observed in eggs of *Papilio demoleus* during July 2010 to February 2011 in Akola vicinity. It was clearly revealed from results that the maximum egg parasite activity of *Papilio demoleus* was observed in July month on different host of Citrus, i.e *Citrus reticulata* (53.84%), *Citrus sinensis* (46.55%) and *Citrus aurantifolia* (57.81%) in Akola vicinity during July 2010 to February 2011 (table1, 2 and 3). The maximum activity of

Trichogramma chilonis in egg of *Papilio demoleus* was recorded in July month on *Citrus reticulata* (24.36%), *Citrus sinensis* (22.41%) and *Citrus aurantifolia* (25%). The minimum activity of *Trichogramma chilonis* in egg of *Papilio demoleus* was recorded in February on *Citrus reticulata* (00%), November on *Citrus sinensis* (6.25%) and February on *Citrus aurantifolia* (4.35%).

The maximum activity of *Telonemus spp.* in egg of *Papilio demoleus* during July 2010 to February 2011 was recorded in July month on *Citrus reticulata* (17.95%), in August month on *Citrus sinensis* (17.64%) and in September month on *Citrus aurantifolia* (21.79%). The minimum activity of *Telonemus spp.* in egg of *Papilio demoleus* during July 2010 to February 2011 was recorded in February month on *Citrus reticulata* (6.66%), November month on *Citrus sinensis* (7.69%) and November month on *Citrus aurantifolia* (7.14%).During the period of study *Ooencyrthus papilionis* was active in July month only in eggs of *Papilio demoleus* on *Citrus reticulata* (11.53%), *Citrus sinensis* (10.43%) and in September month on *Citrus aurantifolia* (12.50%). during July 2010 to February 2011 in Akola vicinity.

So on the basis of above finding the favorable period for activity of egg parasitization in Akola vicinity are for *Trichogramma chilonis* is July month on all the three host study. While *Telonemus spp.* mostly favorable periods is July month on *Citrus reticulata,* august on *Citrus sinensis* and September on *Citrus aurantifolia.* Where *O.papilinis* is active in July month only on all the three host study.

ACKNOWLEDGEMENTS:

The authors are grateful to Dr. S. M. Dadmal, Associate professor and Project co-ordinator of National Project on Insect biosystematics, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola for identifying the parasitoid.

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