SEASONAL INCIDENCE OF LEMON BUTTERFLY, *PAPILIO DEMOLEUS* (LINNAEUS) AND ITS PARASITOID, *APANTELES ANGALETI* (MUESEBECK) ON SWEET ORANGE IN NORTH EASTERN DRY REGION OF RAICHUR

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Abstract: A random survey on incidence on of lemon butterfly indicated that mean population was maximum at Yergera village (8.70 %) and minimum at Sirwar village (7.10 %). Seasonal incidence of lemon butterfly indicated that the activity started from July and continued till December month. Maximum per cent leaf damage was observed during 32nd standard week 15.00/shoot during August and minimum per cent damage was observed during 52nd standard week (2.50/ shoot). Parasitization of *P. demoleus* was observed from August to December and highest per cent parasitization of *P. demoleus* by *A. angaleti* which was 25.12 noticed during August month which coincided the peak activity of lemon butterfly caterpillar. The incidence of larvae was peak during August to November month and parasitization rate decreased with decline in lemon butterfly larvae.

Key words: Random survey, lemon butterfly, incidence, parastization.

Itroduction: Sweet orange is the second largest citrus fruit cultivated in India which belongs to the family Rutaceae. The production of sweet orange is largely favored by dry, semi-arid to subtropical regions of India. Sweet orange fruits are acidic, which contain healthy nutrients required for the body. The quality of fruits and productivity is lacking due to the infestation of insect pests on vegetative stage as well as fruit formation stage. At vegetative stage lemon butterfly, Papiliodemolus (L.) is mojor and inflicts defoliation of whole plant (Pathak and Rizvi, 2002) keeping in view its economic importance, the study has been carried out to know the seasonal incidence of lemon butterfly, *P. demoleus* with its associated parasitoid on sweet orange, during 2012-13.

Materials and Methods: Aromdom survey was conducted throughout the year at farmers field composed of five villages namely Yapaldinni, Sirwar, Palavaldoddi, Appandoddi and Yergera the incidence of pest was recorded at fortnightly intervals on ten randomly selected sweet orange plants, three shoots were selected from all the four directions *viz.,* North, East, South, and West similarly fixed plot survey was conducted new orchard of at Main Agriculture Research Station (MARS) Raichuron sweet orange variety Satgudi. The observation was recorded at weekly interval and the damaged leaves per shoot was worked out and expressed as per cent damage of leaves per shoot. Similarly the larvae were brought to the laboratory and observed for per cent parasitization.

Result and discussion: Random survey conducted in north eastern dry zone revealed that the activity of lemon butterfly *P. demolus* on sweet orange noticed from August to December months. The per cent leaf damage in Yapaldinni village ranged from 4.90 to 15.0 and maximum was observed at first fortnight of August (15.0 %), and gradually decreased on second fortnight of February (4.90 %). The observation on each directions indicated the number of leaves damaged was highest in south direction (9.7%) followed by north direction (8.7 %). In Sirwar village the per cent leaf damage ranged from 4.02 to 13.05 and maximum leaf damage was observed from first fortnight of August (13.50 %), and gradually decreased at second fortnight of February (4.70 %). Maximum leaf damage of 8.5 per cent was noticed at south direction followed by north direction (7.07 %). The per cent leaf damage in Palavaldoddi village was ranged from 5.02 to 14.06 and maximum damage per shoot was observed at first fortnight of August (14.06 %), and gradually decreased on second fortnight of February (5.02 %). The highest population was observed in south direction (9.06 %) followed by north direction (8.06 %). The least population was recorded in east (7.02 %) and west (7.03 %) direction. In Appandoddi village the per cent leaf damage ranged from 5.03 to 14.00 and maximum damage per shoot was observed from first fortnight of August (14.0 %), and gradually decreased upto second fortnight of February (5.30 %). In south direction the leaf damage was high (9.7 %) followed by north direction (8.7 %). The per cent leaf damage ranged from 6.20 to 13.70 and maximum damage per shoot was observed from first fortnight of August (13.70 %), and gradually decreased upto second fortnight of February (6.20 %) From first fortnight of December there was gradual decline of damage caused by lemon butterfly in Yergera village. The observation on the number of leaves damaged was found highest population in south direction (9.09 %) followed by north direction 9.03 per cent (Table 1).

Fixed plot survey conducted in new orchard of Main Agriculture Research Sciences, revealed that the

activity of lemon butterfly started from 27th standard week (4.30 % leaf damage) and continued till 51thstandard week (5.70 % leaf damage). The peak activity with highest leaf damage due to lemon butterfly was noticed at 32nd standard week (15.00 % leaf damage). The highest per cent parasitisation of lemon butterfly by *Apantelesangaleti* (25.12 %) was coincided with the peak activity of lemon butterfly (Table 2).Overall the per cent leaf damage due to lemon butterfly varied from one location to another location. The results of present findings are confirmation with Atwal, 1964 where the peak incidence occurred during April to May and July to August. Maximum leaves were damaged by lemon butterfly during 32nd standard week (15.00 % leaf damage) and minimum during December 52nd standard week (2.50 % leaf damage). The percent findings are in agreement with Narayanamma and Savitri (2002) where the peak activity of lemon butterfly was noticed during August month. The results of present findings are also in agreement with Sharavan*et al*., 2010, Ram *et al.,* 2000 who reported the infestation caused by *P. demoleus*was peak during August to September. The per cent parasitization of *Apantelesangeti* on lemon butterfly, *P. demoleus*was coincided with the peak incidence of larvae during August to November month (Plate: 1).

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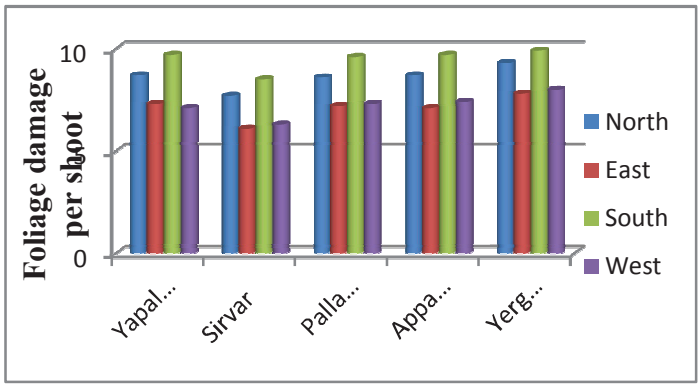
Fig. 1: Incidence of Lemon butterfly (damaged leaves/shoot) on sweet orange at differentlocation of Raichurtaluka.



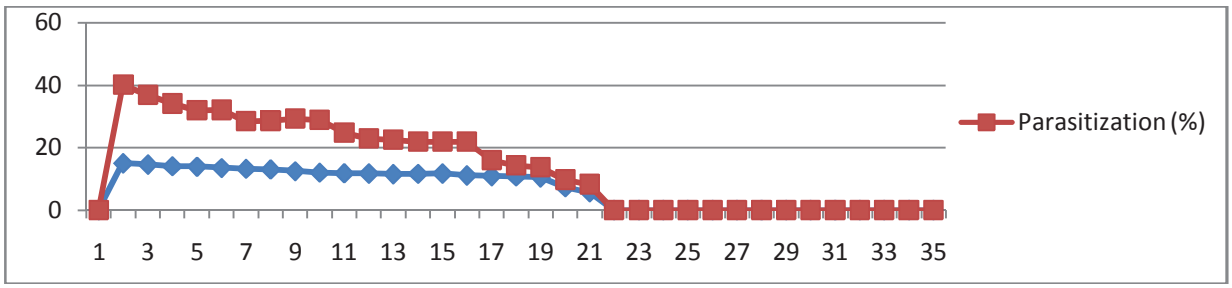


Fig 2: Seasonal activity of citrus butterfly, *Papiliodemoleus* and its parasitoid, *Apantelesangaleti* at MARS Raichur during 2012-2013

Plate 1: Cocoons of *Apantelesangeti* on citrus butterfly larvae, *Papiliodemoleus*

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Table 01:Incidence of Lemon butterfly (damaged leaves/shoot) on sweet orange at different location of Raichurtaluka.

Month/ villages	Yapaldinni					Sirwar					Pallavaldoddi					Appandoddi					Yergera				
	N	E	S	W	Mean	N	E	S	W	Mean	N	E	S	W	Mean	N	E	S	W	Mean	N	E	S	W	Mean
Aug1FN	15.30	14.20	15.40	15.00	15.00	14.10	12.40	14.00	13.60	13.50	15.40	12.60	14.60	15.70	14.06	14.70	13.20	15.01	13.00	14.00	13.80	12.60	15.04	13.02	13.70
2 FN	15.00	12.30	15.60	10.00	13.20	13.05	10.60	15.01	10.30	12.04	12.90	12.00	150.4	11.15	12.09	13.02	10.70	15.40	12.04	12.09	13.50	12.30	13.07	12.60	13.00
Sep1FN	14.00	12.50	13.80	11.09	13.00	12.04	10.07	12.09	11.20	11.80	13.00	12.10	12.03	11.05	12.20	12.05	10.80	15.01	10.05	12.02	13.80	12.03	12.09	11.60	12.60
2 FN	13.10	12.10	14.30	11.90	12.80	13.60	10.07	12.02	10.50	11.08	13.02	11.05	14.20	10.05	12.03	13.04	11.00	12.05	10.07	11.09	13.00	11.50	14.02	11.40	12.50
Oct1FN	10.30	12.50	13.40	11.06	12.00	12.01	10.02	13.02	11.00	11.60	12.60	9.07	17.00	10.90	12.05	11.03	10.02	15.01	10.30	11.07	13.01	11.05	14.02	10.50	12.30
2 FN	12.80	10.0	13.20	11.00	11.70	9.09	11.03	12.30	11.10	11.01	12.90	11.40	13.50	9.40	11.08	12.03	10.60	13.04	9.05	11.05	11.50	9.90	13.02	12.60	11.80
Nov1FN	11.90	10.2	13.00	9.30	11.10	9.02	4.01	10.00	5.20	7.01	9.05	10.05	12.04	10.09	10.80	12.30	9.07	11.80	10.03	11.00	11.60	10.07	14.30	9.10	11.40
2 FN	10.60	8.70	14.90	9.80	11.00	6.05	3.00	6.04	4.02	5.00	9.15	9.03	11.20	9.04	9.09	10.00	9.06	12.05	9.08	10.05	11.50	9.08	12.02	10.2	10.90
Dec1FN	7.40	3.40	7.07	4.50	5.70	6.04	3.01	6.07	3.02	4.09	7.02	4.05	7.03	5.04	6.01	7.09	4.04	7.05	5.07	6.04	8.90	5.06	8.00	6.50	7.30
2 FN	7.10	3.20	7.05	3.40	5.20	5.08	4.07	8.04	3.04	5.06	8.07	3.05	7.05	4.03	6.00	8.50	3.04	7.09	4.06	6.01	9.05	4.05	8.08	5.20	7.00
Jan 1FN	5.90	4.90	7.30	3.00	5.30	5.03	4.03	6.50	4.04	5.01	7.00	4.09	7.09	4.06	6.01	7.30	5.06	8.07	5.09	6.90	7.09	6.05	9.05	6.70	7.70
2 FN	5.90	4.70	6.04	4.10	5.30	5.00	4.13	6.10	4.03	4.90	5.04	4.06	6.04	4.03	5.02	5.40	4.07	6.06	5.07	5.60	6.09	6.00	8.08	6.50	7.00
Feb1FN	5.20	4.60	6.20	4.00	5.00	5.00	4.01	6.00	3.07	4.07	5.03	4.07	7.02	5.01	5.06	5.50	4.71	7.02	5.01	5.60	6.09	5.08	6.09	6.00	6.40
2 FN	5.10	4.40	6.10	3.80	4.90	4.00	3.03	5.50	4.00	4.02	5.05	4.70	6.04	4.00	5.02	5.50	4.90	6.05	4.03	5.30	6.08	5.08	6.07	5.40	6.20
Mar1FN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 FN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean	8.70	7.30	9.70	7.10	8.20	7.07	6.01	8.05	6.03	7.10	8.06	7.20	9.06	7.03	8.02	8.70	7.10	9.70	7.04	8.20	9.03	7.08	9.09	8.00	8.70
T test	0.00					0.00					0.06					0.18					0.03				
	0.00					0.00					0.00					0.01					0.00				
	0.06					0.00					0.00					0.27					0.00				
	0.18					0.01					0.27					0.00					0.00				
	0.03					0.00					0.00					0.00					0.00				

*Mean of three shoots of 10 plants N- North, E- East, S- South, W- West

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Table 02: Seasonal activity of citrus butterfly, *Papiliodemoleus*and its parasitoid, *Apantelesangaleti* at MARS Raichur during 2012-2013

Month	ISD WEEK	Number of leaves damaged by lemon butterfly/ shoot	Parasitization (%)
June 25-01	26	0.00	0.00
July 02-08	27	4.30	1.85
July 09-15	28	10.30	5.30
July 16-22	29	10.50	7.50
July 23-29	30	11.80	10.50
July 30-05	31	12.50	15.80
Aug 06-12	32	15.00	25.12
Aug 13-19	33	14.60	22.24
Aug 20-26	34	14.00	20.11
Aug 27-02	35	13.90	18.10
Sep 03-09	36	13.50	18.54
Sep 10-16	37	13.20	15.33
Sep 17-23	38	13.00	15.56
Sep 24-30	39	12.50	16.76
Oct 01-07	40	12.00	16.87
Oct 08-14	41	11.80	12.98
Oct 15-21	42	11.70	11.21
Oct 22-28	43	11.50	10.98
Oct 29-04	44	11.60	10.32
Nov 05-11	45	11.70	10.13
Nov 12-18	46	11.10	10.87
Nov 19-25	47	10.90	4.98
Nov 26-02	48	10.80	3.44
Dec 03-09	49	10.50	3.21
Dec 10-16	50	7.30	2.43
Dec 17-23	51	5.70	2.56
Dec 24-31	52	0.00	0.00
Mean		10.58	10.84

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