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Population dynamics of lemon butterfly (*Papilio demoleus*) in *bael* (*egle marmelos*) as influenced by abiotic factors in arid region of Rajasthan

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Abstract

It was observed that population and infestation of *P. demoleus* appeared from August to February. The highest egg, larval population and plant infestation were observed 12.75, 6.15/ 10 branches and 65.0 %, respectively. The relationship between lemon butterfly egg, larval population and maximum temperature was (-0.53 & -0.55) negatively correlated whereas the maximum relative humidity was (0.44 & 0.53) positively correlated. Then, the egg and larval population gradually increased and reached to its peak, when the temperature decreased and humidity increased. The rainfall was also negatively correlated (-0.51) with egg population of lemon butter fly in arid region.

Key words: *Papilio demoleus*, *Aegle marmelos*, population dynamics, abiotic factors.

Introduction

Bael (*Aegle marmelos* Correa) belongs to family Rutaceae is an important indigenous fruit crop to dry forest in hills, plains of central and southern parts as well as arid and semi arid regions of India. It also called as Bengal quince or Indian quince. Fruits are famous for its medicinal values as well as edible fruit quality. The *bael* is gaining popularity among the farmers of arid and semi arid areas for economic cultivation. However, the quality of fruits and productivity is not obtained up to the standard. One of the reasons for it is infestation of insect pests on the vegetative as well as developing fruits which ultimately leads to significant yield loss and quality attributes of the fruits. About 30 species of insect and mites have been reported feeding on *bael* in India (Lakra, 2004). Various types of insect-pests are found to be infesting bael in which *P. demoleus* is major one which defoliate the plant. Pathak and Rizvi (2002) reported that the *P. demoleus* is a serious citrus pest in India. Keeping in view its economic importance, the study has been carried out for population dynamics of lemon butterfly, *P. demoleus* on bael to develop a tool for ecofriendly management.

Materials and methods

The population dynamics of *P. demoleus* on bael *(A. marmelos)* was recorded throughout the year at experimental farm of Central Institute for Arid Horticulture, Bikaner situated in western parts of Rajasthan. The observations of egg, larval population and plant infestation were recorded at fortnight intervals from appearance of lemon butterfly. The study was conducted in three replications, each having 10 branches per plant. Correlation coefficients among abiotic factors (temperature, relative humidity and rainfall) and egg, larval population and plant infestation of butter fly were also determined.

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Results and discussion

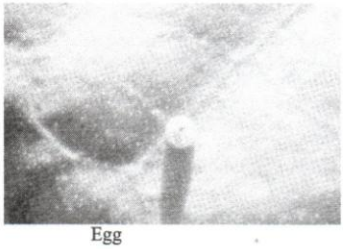
The field experiments were conducted during 2009-10 and 2010-11 with bael (*Aegle marmelos*) to determine the population dynamics of lemon butter fly (*Papilio demoleus*) and influenced by abiotic factors. It revealed from the study that the damaging effect of lemon butterfly was recorded on bael from August to February months. The population of *P. demoleus* was observed between 0.75 to 6.15 larvae and 0.60 to 12.75 eggs per 10 branches of plant during the plant growth period. The plant infestation was observed from 3.30 to 65.00 per cent (Table 1). The first appearance of *P. demoleus* was observed 0.75 larvae, 0.60 eggs per 10 branches of plant and 3.30 per cent infestation on first fortnight of August when the maximum temperature was 37.33°C with maximum relative humidity 67.50 per cent. Narayanamma and Savithri (2002) studies on the seasonal abundance of citrus butterfly, *P. demoleus* were undertaken on 'Sathgudi' sweet orange and 'Tenali' acid lime. Pest incidence was first initiated from the second fortnight of August on sweet orange and from the first fortnight of September on acid lime. Then, the egg population gradually increased and reached to its peak 12.75 eggs per 10 branches of plant on first fortnight of November. The larval population (6.15/ 10 branches) and plant infestation (65.00 %) were maximum in second fortnight of November when the maximum temperature was 25.40 °C with maximum relative humidity 76.25 per cent. So, it observed that November was the most favorable period for *P. demoleus*. Sunita (2003) reported that the population dynamics of lemon butterfly was highest from November to February and peaked in August when the rainfall was 311.4 mm and the temperature was 32.8. The highest number of lemon butterfly larvae was highest in Kinnow lime during both years. Ram *et. al.* (2000) also reported that the incidence of *P. demoleus* was maximum in

the month of August-September on lime in Bundelkhand region of Uttar Pradesh.

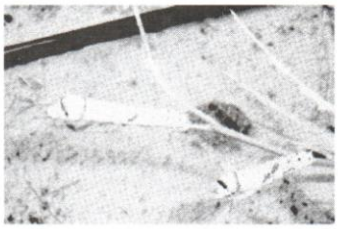
Correlation coefficient between the egg, larval population and maximum and minimum relative humidity was found positively (0.44 & 0.53) and (0.26 & 0.39), respectively which showed that increase in relative humidity then increase the egg and larval population. Similar, correlation was found among per cent plant infestation and maximum and minimum relative humidity (0.43 & 0.34), respectively. The negative correlation was found between rainfall and egg, larval population and infestation (-0.51, -0.42 & -0.48), respectively which means increase in rainfall decreased the larval population. Narayanamma and Savithri (2002) correlation coefficient values were worked out in relation to weather factors and larval population of lemon butterfly. There was negative and significant relationship among pest population and maximum and minimum temperatures, while positive relationship with relative humidity. The plant infestation was positively correlated with egg and larval population (0.96 & 0.90). When the per cent plant infestation was increased then egg and larval population of lemon butterfly also increased (Figure.1). The finding was in agreement with Reddy and Kumar (2005).

Table 1. Population dynamic s of lemon butter fly, *Papilio demoleus* on bael in 2009-10 and 2010-11

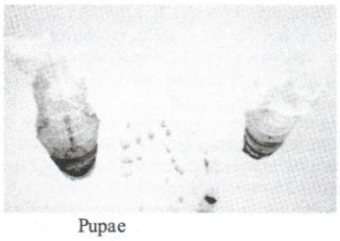
S No	Fortnight observations	Mean population/ 10 branches		Plant infestation (%)	Temperature (^{0}C)		Relative humidity (%)		Rainfall (mm)
		Egg	Larvae		Max	Min	Max	Min	
1.	August-I	0.60	0.75	3.30	37.33	28.03	67.50	39.25	22.88
2.	August-II	1.75	1.65	4.99	37.12	27.75	75.00	44.00	10.58
3.	September-I	1.85	1.85	11.67	36.88	25.98	69.25	29.50	27.00
4.	September-II	2.05	1.85	18.34	37.13	24.03	66.00	33.25	0.00
5.	October-I	6.00	2.25	35.00	37.90	23.48	55.50	25.00	0.00
6.	October-II	8.10	2.60	45.00	35.25	19.78	65.75	20.50	0.00
7.	November-I	12.75	5.80	61.67	28.40	16.40	81.00	45.25	4.25
8.	November-II	10.75	6.15	65.00	25.40	11.10	76.25	43.50	0.00
9.	December-I	9.80	5.42	48.34	25.15	9.73	67.75	35.75	0.00
10.	December-II	8.95	5.25	45.00	23.78	7.18	75.75	27.75	0.75
11.	January-I	7.00	3.20	41.67	18.35	4.43	81.75	38.00	0.25
12.	January-II	6.35	3.15	21.67	23.65	6.68	70.00	21.75	0.00
13.	February-I	2.95	1.75	11.67	26.30	10.50	69.00	18.00	0.00
14	February-II	2.45	1.55	5.00	27.25	12.23	59.50	17.50	0.00



Egg



Larvae



Pupae

Adult

Plate: 1. Lemon butter fly (*Papilio demoleus*) on bael

Table 2. Correlation coefficient between egg, larval, plant infestation population of lemon butterfly and abiotic factors on bael in 2009-10 and 2010-11

S. No.	Abiotic factors	Egg population	Larval population	Plant infestation
1.	Maximum temperature ^{0}C	-0.53	-0.57	-0.43
2.	Minimum temperature ^{0}C	-0.55	-0.56	-0.45
3.	Relative humidity (Max %)	0.44	0.53	0.43
4.	Relative humidity (Min %)	0.26	0.39	0.34
5.	Rainfall (mm)	-0.51	-0.42	-0.48
6.	Between plant infestation and egg population		0.96	
7.	Between plant infestation and larval population		0.90	

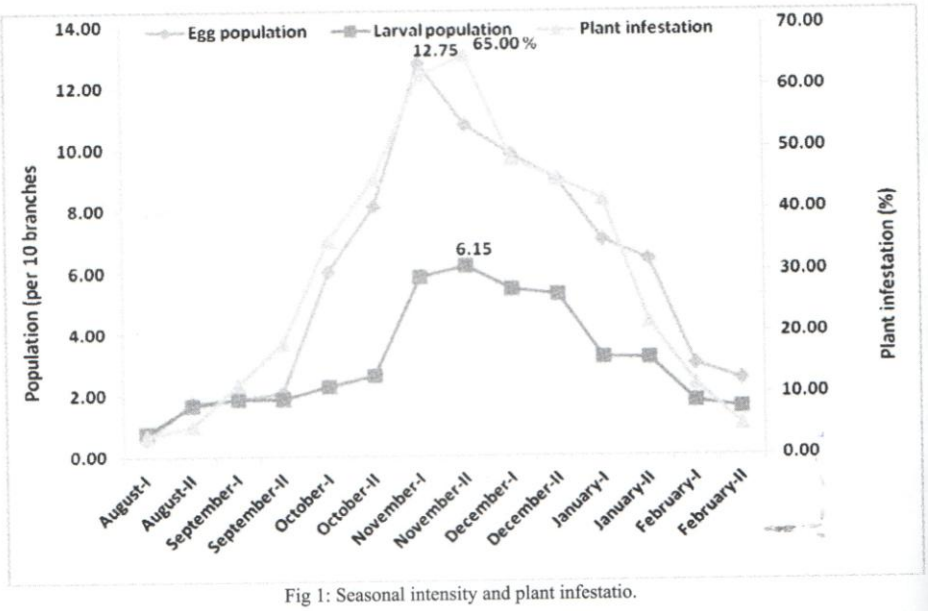


Fig 1: Seasonal intensity and plant infestatio.

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