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Population Dynamics of Sugarcane Leaf Hopper (*Pyrilla perpusilla* Wlk.) and its Ectoparasite (*Epiricania melanoleuca* F.) in Relation to Climate*

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ABSTRACT

The present investigation was carried out at farmers field to study the population dynamics of sugarcane leaf hopper and its ectoparasite on sugarcane in relation to weather parameters. Egg laying of leaf hopper was observed from second week of May to third week of September with maximum in the month of August. The leaf hopper population started appearing from fourth week of May and continued till third week of October. Egg masses of *Epiricania* were noticed in first week of August to fourth week of October and maximum in the second week of October. Highest per cent parasitism was recorded in second week of September while maximum number of cocoons were observed in the first week of October. The influence of weather parameters on population of leaf hopper and different stages of ectoparasite was studied by working out correlation coefficient and multiple/simple regression.

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INTRODUCTION

Sugarcane leaf hopper, *Pyrilla perpusilla* Wlk. is a serious pest of sugarcane, causing enormous damage to the crop by sucking cell sap from the leaves. Heavy attack of this pest reduces sugar recovery to an extent of 0.2 to 5.0 units (Gupta, 1948) and when affected canes are used as seed material they give poor germination, low yield and finally, sugar or jaggary produced is of poor quality. (Khan and Kanhaya, 1987). Population fluctuation of leaf hopper at a place is affected by various biotic and abiotic factors. In South Gujarat, sugarcane crop is sown from September to March. Continuous availability of the crop in overlapping seasons favours the pests to multiply enormously and to spread to other areas. It was therefore felt to study population dynamics of this pest as well as its parasite on sugarcane crops sown in different months of the year and effects of climatic condition on the pest and the parasite population.

MATERIALS AND METHODS

The present investigation was conducted at farmers field at village Eru, Ta. Navsari to study the population dynamics of sugarcane leaf hopper and its parasite on sugarcane in relation to weather parameters during the period from February '90 to February '91. From the selected field three spots were located. At

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each spot ten plants were selected at random to record observations. To determine the population of sugarcane leaf hopper, observations on number of eggs nymphs and adults were recorded weekly on three leaves each from top, middle and lower part of the selected cane plants. Number of different stages *viz*; egg masses, larvae and cocoons of parasite was also recorded. Per cent parasitism was calculated from the observations on number of parasitized individuals (Nymphs and adults) of leaf hopper out of total number of individuals observed. In order to study the effect of weather parameters on population of leaf hopper and its ectoparasite, correlation, coefficient and multiple/simple regression were worked out. Weekly meteorological observations recorded for the period from February '90 to February '91 were used for this purpose.

RESULTS AND DISCUSSION

The egg laying of leaf hopper was found from second week of May to third week of September. There was no egg laying in the months from February to April and October '90 to February '91. Maximum egg laying was recorded in the month of August (Table 1). According to Brar and Bains (1980) egg masses were found on sugarcane plant from April to November. The adults/nymphs appeared from fourth week of May and remained continued till the third week of October, ranging between 0.33 to 21.33 per ten plants. Two higher peaks of leaf hopper population were observed, one in second week of July (21.33/ten plants) and second in fourth week of July (16.67/ten plants). Rehman (1942) reported that nymph and adult stages were present in

TABLE 1

Average number of *Pyrilla* and different stages of *E. melanoleuca* F. per 10 plants on sugarcane at farmer's field, village Eru, Ta. Navsari (1990-91).

Month	*Week*	*Std. met. week*	*No. of* ***Pyrilla eggs***	*No. of* ***Pyrilla*** *nymphs & adults*	*Per cent parasitism by* ***E. melanoleuca***	***E. melanoleuca***	
						No. of egg mass	*No. of cocoon*
1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
1990	III	08	00.00	00.00	00.00	0.00	0.00
February	IV	09	00.00	00.00	00.00	0.00	0.00
March	I	10	00.00	00.00	00.00	0.00	0.00
	II	11	00.00	00.00	00.00	0.00	0.00
	III	12	00.00	00.00	00.00	0.00	0.00
	IV	13	00.00	00.00	00.00	0.00	0.00
April	I	14	00.00	00.00	00.00	0.00	0.00
	II	15	00.00	00.00	00.00	0.00	0.00
	III	16	00.00	00.00	00.00	0.00	0.00
	IV	17	00.00	00.00	00.00	0.00	0.00
	V	18	00.00	00.00	00.00	0.00	0.00

1.	2.	3.	4.	5.	6.	7.	8.
May	I	19	00.00	00.00	00.00	0.00	0.00
	II	20	10.67	00.00	00.00	0.00	0.00
	III	21	20.33	00.00	00.00	0.00	0.00
	IV	22	10.00	00.67	00.00	0.00	0.00
June	I	23	11.33	01.67	00.00	0.00	0.00
	II	24	21.33	00.33	00.00	0.00	0.00
	III	25	31.33	02.67	00.00	0.00	0.00
	IV	26	32.33	01.67	00.00	0.00	0.00
July	I	27	40.67	10.67	00.00	0.00	0.00
	II	28	10.67	21.33	00.00	0.00	0.00
	III	29	46.00	15.33	00.00	0.00	1.67
	IV	30	32.00	16.67	08.00	0.00	3.67
	V	31	12.67	14.33	09.30	0.00	4.00
August	I	32	30.67	10.33	09.67	2.33	4.67
	II	33	61.67	11.00	06.06	3.37	3.33
	III	34	58.33	10.66	15.63	3.67	3.33
	IV	35	18.67	14.33	23.26	3.37	3.67
September	I	36	23.00	07.33	40.91	1.33	2.33
	II	37	22.33	07.00	42.85	2.00	3.33
	III	38	12.67	07.33	36.37	2.33	4.00
	IV	39	00.00	03.33	40.00	3.37	3.67
October	I	40	00.00	07.67	23.73	3.67	6.33
	II	41	00.00	07.33	27.27	5.33	4.33
	III	42	00.00	02.33	14.29	1.00	3.33
	IV	43	00.00	00.00	00.00	1.33	2.00
	V	44	00.00	00.00	00.00	0.00	0.00
November	I	45	00.00	00.00	00.00	0.00	0.00
	II	46	00.00	00.00	00.00	0.00	0.00
	III	47	00.00	00.00	00.00	0.00	0.00
	IV	48	00.00	00.00	00.00	0.00	0.00
December	I	49	00.00	00.00	00.00	0.00	0.00
	II	50	00.00	00.00	00.00	0.00	0.00
	III	51	00.00	00.00	00.00	0.00	0.00
	IV	52	00.00	00.00	00.00	0.00	0.00
1991	I	1	00.00	00.00	00.00	0.00	0.00
Jaanuary	II	2	00.00	00.00	00.00	0.00	0.00
	III	3	00.00	00.00	00.00	0.00	0.00
	IV	4	00.00	00.00	00.00	0.00	0.00
	V	5	00.00	00.00	00.00	0.00	0.00
February	I	6	00.00	00.00	00.00	0.00	0.00
	II	7	00.00	00.00	00.00	0.00	0.00

field from May to December. As per Khan and Khan (1986) adult appeared in early April, late June or early July, August-September and late October or November. According to Gupta *et al.*, (1977) large population of *Pyrilla* was infesting sugarcane in August and September. Mathur (1978) recorded 15-55 nymphs and adults per leaf during August-October. Similarly Chaudhary and Sharma (1990) reported that leaf hopper was abundent in sugarcane field during July - August.

The egg masses of *E. melanoleuca* were recorded nil during the period from February 1990 to July 1990 and November 1990 to February 1991. The egg laying was first time observed in the first week of August and continued till fourth week of October, ranging between 1.00 to 5.33 egg masses per ten plants. Maximum number of egg masses were found in second week of October (5.33). Two higher peaks of number of egg masses were recorded i.e. one in third week of August (3.67) and second in second week of October (5.33). The per cent parasitism of leaf hopper by *E. melanoleuca* ranged between 6.06 to 42.85 from July to October with highest per cent parasitism in second week of September (42.85). The cocoons were found from July to October. The number of cocoons ranged between 1.67 to 6.33 per ten plants with highest number in the first week of October (6.33). No cocoon was found, during the period from February '90 to June '90 and November '90 to February '91 (Table 1). Mukerjee and Venkatraman (1946) and Khanna and Butani (1958) reported that the parasite *E. melanoleuca* was active from April to November at Delhi and Bihar respectively. According to Dhaliwal and Bains (1985) *E. melanoleuca* found to be parasitising nymph and adult to an extent of 60 to 80 per cent during August to October in Punjab. The variation in present finding may be due to effect of ecological condition prevailing in the area and population density of sugarcane leaf hopper in the locality.

From the table 1 it is seen that *Pyrilla* population appeared in the last week of May. The population of *E. melanoleuca* appeared little late i.e. in the month of July and then simultaneously increased with host population. Population of *Pyrilla* and its parasite recorded nil in the month of February '90 to April '90 and Novebmer '90 to April '90 and November '90 to February '91 (Fig.-1).

The leaf hopper population (Y_1) had significant and negative correlation with maximum temperature (X_1) and sunshine hour (X_7). During the study when maximum temperature level was 28.8°C (3rd week of August) the *Pyrilla* population was 10.66, where as with maximum level 34.9°C (3rd week of October) it was 2.33. The correlation with the rest of the weather parameters was non significant. The correlation between egg masses of parasite (Y_2) and average temperature (X_3) was negative and significant, while no correlation was observed between egg masses of parasite and other weather parameters. The per cent parasitism by *E. melanoleuca* had significant negative correlation with average temperature (X_3) and significant positive correlation with morning relative humidity (X_4). The correlation between cocoon of parasite (Y_4) and minimum temperature (X_2) and average temperature (X_3) were negative and significant, while it was non significant with rest of the weather parameters (Table 2).

The multiple linear regression equation fitted for leaf hopper (nymph and adult) Y_1 was

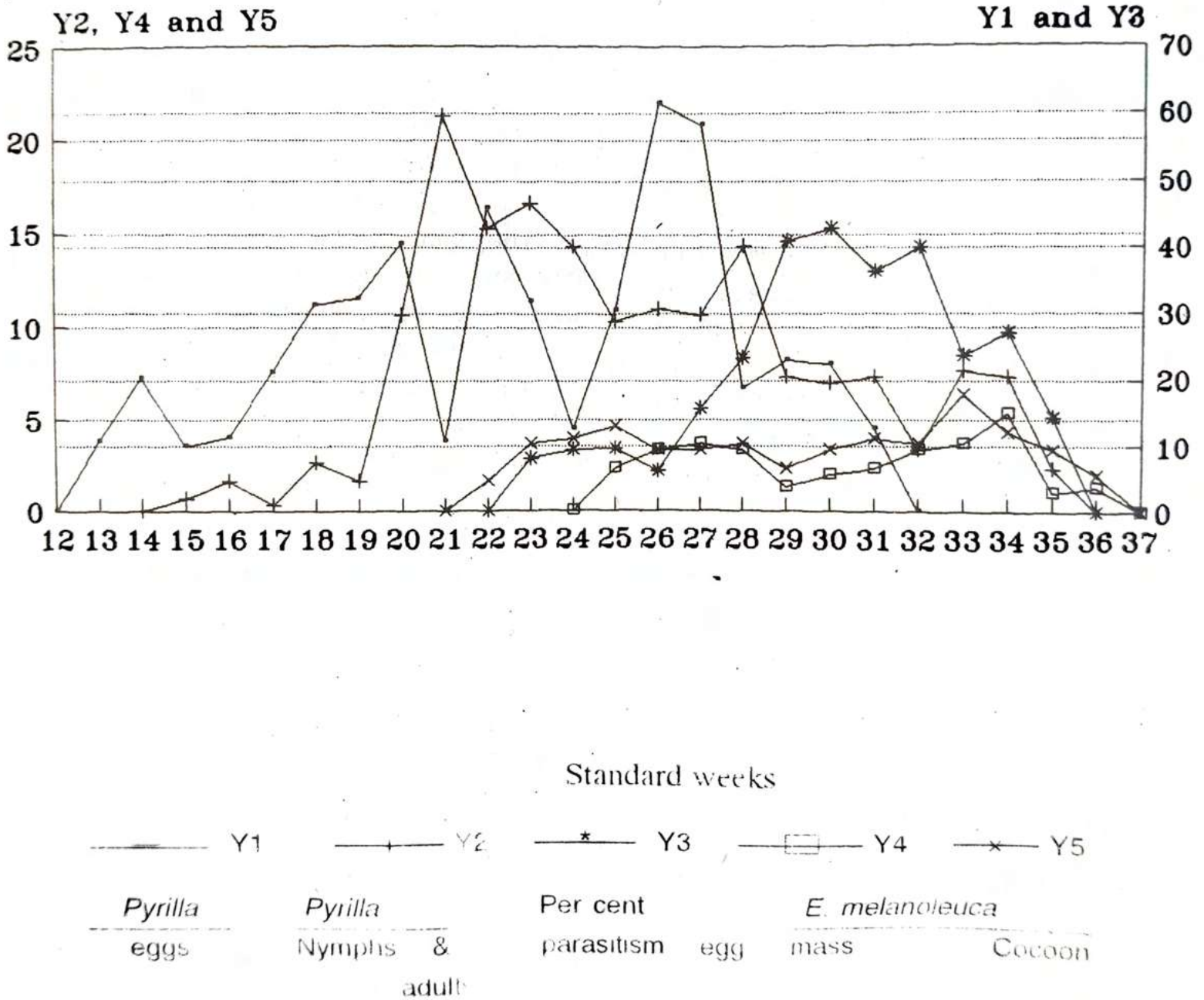

Fig. 1 : Number of *Pyrilla* and different stages of *E. melanoleuca* F. on sugarcane (1990-91)

TABLE 2

Correlation coefficient values of Pyrilla and its ectoparasite *E. melanoleuca* on sugarcane with respect to weather parameters. (Village Eru, Ta. Navsari).

Values	Correlation Co-efficient values								
	Maximum temperature	*Minimum temperature*	*Average temperature*	*Morning relative humidity*	*Evening relative humidity*	*Average relative humidity*	*Sun shine hours*	*Rainfall (mm)*	*Rainy days*
Y X	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Pyrilla (nymph and adult) (Y_1)	-0.553**	0.355	-0.150	0.011	0.378	0.350	-0.510*	-0.155	0.189
No. of egg masses of parasite (Y_2)	-0.208	-0.414	-0.534*	0.403	-0.093	0.040	0.018	0.165	0.328
Per cent parasitism (Y_3)	-0.330	-0.390	-0.615**	0.496*	-0.021	0.123	0.085	0.258	0.312
Cocoon of parasite (Y_4)	-0.275	-0.448*	-0.620**	0.296	-0.150	-0.032	-0.077	0.053	0.253

** Significant at 1%

* Significant at 5%

TABLE 3

Multiple/simple regression equations to predict *Pyrilla* and *E. melanoleuca* on the basis of weather parameters having significant correlation (Village Eru, Ta. Navsari).

		Temperature 'C			*Relative humidity%*			*Sunshine hours*	*Rainfall (mm)*	*Rainy days*	R^2
	A vlaue	*Maxi num* X_1	*Mini num* X_2	*Average* $X3$	*Morn-ing* X_4	*Evening* X_5	*Average* X_6	X_7	X_8	X_9	
Pyrilla (nymph and adult) (Y_1)	52.6992	-1.3640	—	—	—	—	—	-0.4406	—	—	0.3264*
No. of egg masses of parasite (Y_2)	25.50822	_	_	-0.8650*	_	_	_	_	_	_	0.2853*
Per cent parasitism (nymph and aduit) (Y_3)	174.6278	_	_	-7.6510*	0.5655	_	_	_	_	_	0.3900**
Cocoon of parasite (Y_4)	33.9810	_	-0.1167	-1.0338*	_	_	_	_	_	_	0.3911**

** Significant ar 1%

* Significant at 5%

Y_1 = 52.6992-1.3640 (X_1) -0.4406 (X_7). The multiple regression coefficient (R^2=0.3264) was statistically significant explaining 32.64 per cent variation in the dependent variable by different independent variables. The multiple linear regression equation fitted for egg masses of *E. melanouleuca* (Y_2) was Y_2 = 25.5082-08650 (X_3). The multiple regression coefficient (R^2 = 0.2853) was statistically significant showing 28.53 per cent vriations in dependent variable by different independent variables. The multiple linear regression equation for per cent parasitism by *E. melanoleuca* F. (Y_3) was Y_3 = 174.6278-7.6510 (X_3) +0.5655 (X_4). The multiple regression coefficient (R^2 = 0.3900) was statistically — significant. The multiple linear regression equation for cocoons of parasite (Y_4) was Y_4 = 33.9810 -0.1167 (X_2) — 1.0338 (X_3). The multiple regression coefficient (R^2 = 0.3911) was statistically significant (Table 3).

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