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THE BIOLOGY AND VARIETAL PREFERENCES OF THE LACE BUG CORYTHUCHA MORRILLI (OSBORNE & DRAKE) (TINGIDAE) ON SWEET POTATOES IN BARBADOS

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ABSTRACT

Corythucha morrilli (Osborne & Drake) sucks vascular fluids from leaves of Ipomoea batatas (L.) and causes severe browning and defoliation. Under greenhouse conditions the entire life cycle from egg through five aggregated instars is completed on the plant in nineteen days. Female longevity is about thirty-five days, during which time about 400 eggs are laid. Twenty-one varieties of I. batatas screened against the pest have shown different levels of susceptibility.

INTRODUCTION

Sweet potato, Ipomoea batatas (L.) has become one of the most widely grown food crops in Barbados for the local and export market. It is easily integrated with sugarcane as a rotation and cash crop. Of increasing interest is the improvement and selection of varieties with good yield, consumer appeal and natural resistance to the major pests.

The pest complex of I. batatas has been investigated by Alam (1976). Tucker (1937) and more recently Alleyne (1979 unpublished, 1982) have studied its major pest Euscepes postfasciatus (Fairmaire).

The 1981 outbreak of the lacebug Corythucha morrilli Osborne & Drake (Tingidae) on sweet potatoes in Barbados presented a new problem for farmers as this insect achieved pest status for the first time on many plantations throughout most of the parishes in the island.

Both adults and nymphs suck vascular fluids from the leaves causing severe browning and defoliation. In highly infested fields, leaves were virtually covered with the pest on both upper and lower surfaces.

The nymphs and particularly the adults, cause skin irritations and, therefore, present problems mainly for harvesting workers.

In this study, aspects of the biology, distribution and varietal preference are investigated so that an effective control strategy could be formulated.

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MATERIALS AND METHODS

The biology of *C. morrilli* was studied under greenhouse conditions of about $30 \pm 3^\circ\text{C}$ and $60 \pm 10\%$ relative humidity. In the laboratory the temperature was slightly lower, about $29 \pm 2^\circ\text{C}$, and plants were grown in bins 2' x 6'. The susceptible variety A26/7 was used as host in both situations.

From at least 6 plantations per parish, random samples of 20 leaves per field were taken and infestation scored as mean numbers per leaf.

At Fairview plantation in St. George, 21 varieties were planted from cuttings in rows 800 m long, 1 m wide and intra row spacing of plants was 10 cm. Seven random samples each of 20 plants were taken at intervals over a 2-months period and the level of susceptibility was arrived at using the rating scale shown in Table 1.

Table 1.--Susceptibility rating scale for sweet potato varieties to *C. morrilli* infestation

Nos. per leaf		Susceptibility
Egg	Nymph	
0	0	Resistant
1 - 5	1 - 50	Low susceptibility
6 - 30	51 - 100	Medium susceptibility
> 30	> 100	High susceptibility

RESULTS

I. Biology

The egg is cylindrical in shape with a firm dark-brown chorion differentiated at the anterior extremity to form a distinct opercular cap. It measures 0.39 mm in length and 2 mm in width (measurements based on 100 samples).

The female inserts the egg obliquely within the soft tissues of the leaf often close to the vascular tissues during low infestation and less discriminately during high infestation. A brown viscid substance from which the operculum may protrude is deposited over the egg during egg-laying; this hardens to form a gentle cone which camouflages the egg against natural enemies and reduces the rate of dehydration.

At eclosion, the operculum is conspicuously detached. The first instar nymph emerges after 10 days (Table 2), and like other nymphal instars bears little resemblance to the adult.

Table 2.--Size and duration of C. morrilli juveniles

Dev. stage	Body length (mm)	Body width (mm)	Head capsule (mm)	Duration (days)
Egg	0.39	0.2	-	10
1st instar	0.6	0.3	0.17	1 - 1.5
2nd instar	0.8	0.4	0.2	1 - 1.5
3rd instar	1.0	0.5	0.25	1.5 - 2
4th instar	1.4	0.8	0.30	2
5th instar	2.0	1.0	0.35	2

eggs measured = 100
instars measured = 50

Moulting occurs between 24 - 36 hours. The second and subsequent instars become more dorsoventrally flattened with a lateral flange margined with spines. Five nymphal stages were observed, the last instar attaining a maximum length of 2 mm (Table 2).

All instars are closely aggregated and tend to move closer towards the leaf base where they feed and develop. The period of development from egg to adult takes about nineteen (19) days.

The emerging adult is pale-white in colour and acquires the characteristic ornamentation after about 2 hours. Copulation takes place about 3 hours after emergence and lasts for 3-4 hours, each pair mating once. The male mounts the female and grasps her close to the genital opening on the 7th and 8th abdominal segments. The male then turns about 90° to the right so that it lies at right angles to, and underneath the female with its wings extended across the female's back.

A single female lays about 400 eggs during its life span of about 35 days. The pattern of egg laying is shown in Fig. I. The number of eggs laid over the first twenty-five days is fairly constant, then decreases thereafter.

The survivorship curve (Fig. II) shows a gradual mortality rate after about fifteen (15) days. Few females survive after fifty days.

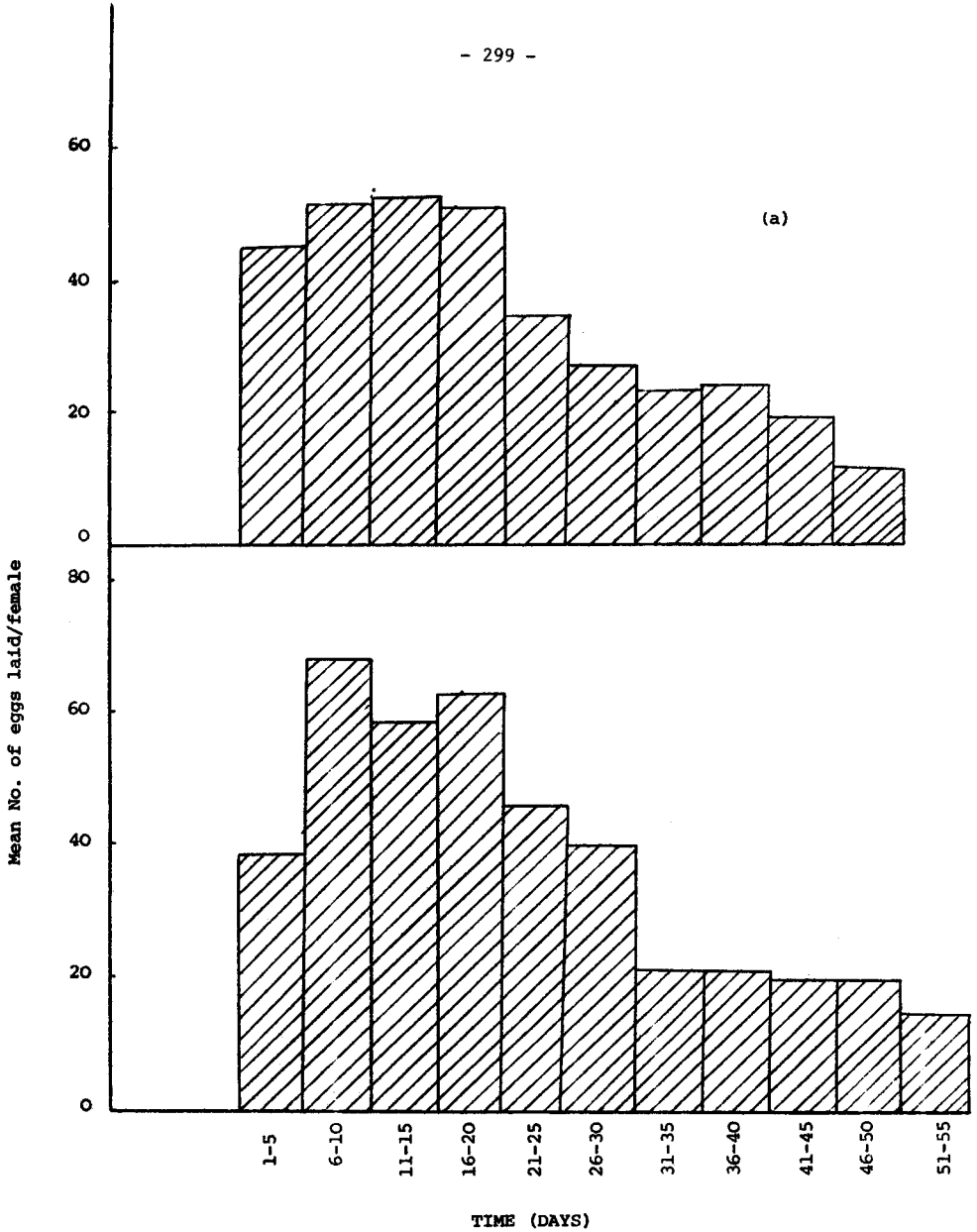


Fig. I: Frequency distribution of *C. morrilli* egg laying
(a) greenhouse
(b) laboratory

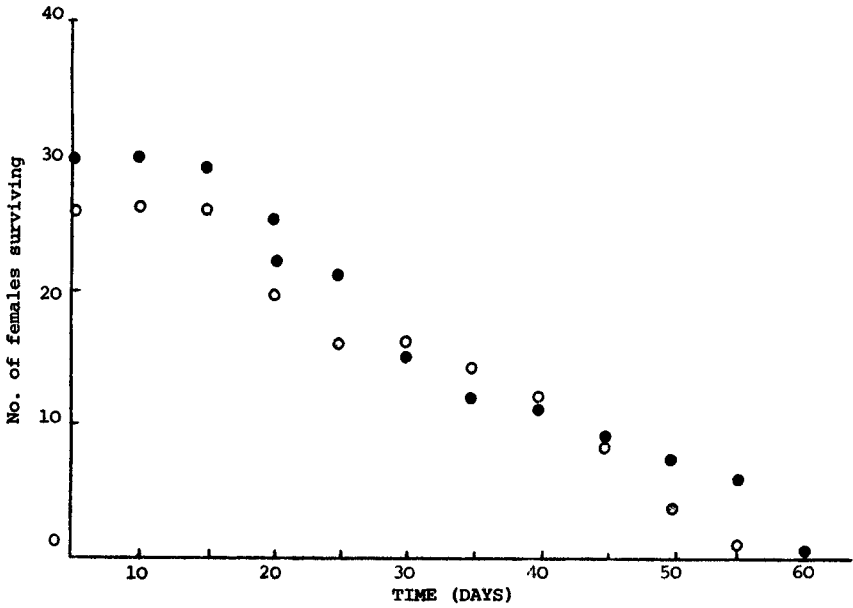


Fig. II: C. morrilli survivorship curve

- Greenhouse
- Laboratory

II. Distribution and varietal susceptibility

C. morrilli was encountered in all parishes and was particularly active in St. George, St. John, St. Peter and St. Lucy (Fig. III). In St. George, the pest was most active on Constant, Brighton, Buttals and Valley plantations. Not much damage was found in St. Andrew, St. James and St. Joseph.

There was no apparent affinity to any particular rainfall zone as mean nos. per leaf for each rainfall zone showed no significant difference.

The most popular variety planted A26/7 and the slightly less popular Caroline Leo were the most susceptible varieties found in the survey.

The results of the Fairview trial are summarized in Table 3. C-104 experienced no damage and may well be considered a resistant variety.

Varieties with low susceptibilities were A26/86, Cliff, B63/726 and T-62. The most susceptible varieties were K-4, O/100, B63/343 and B63/532. The adult distribution on different varieties was ignored for this classification since the extent of mere migration could not be known instantaneously.

The heterogenous distribution of C. morrilli in the field is evident from the figures for each sampling date, so that the expected pattern of pest build-up over the sampling period was not very obvious because of the random sampling method used.

DISCUSSION

The results of the Fairview trial should not be taken as conclusive but as an indicator for further replication and screening.

The use of varietal resistance as a strategy for pest control has long been recognized, and any attempt to develop this strategy against C. morrilli must necessarily be done simultaneously against E. postfasciatus. Thus Alleyne (1982) found C-104 to be very susceptible to E. postfasciatus but resistant to C. morrilli, similarly T-62 suffered little damage by C. morrilli yet sustained heavy damage by E. postfasciatus. On the other hand, B63 726 the most highly acceptable variety (Alleyne 1982) showed low susceptibility to both C. morrilli and E. postfasciatus.

The patchy distribution of C. morrilli in the field gives the observant farmer an opportunity to limit pest build-up through temporary chemical means. Obviously there is a basis for further investigation into control possibilities based on the apparent levels of varietal susceptibility and this may well define the direction for urgent research.

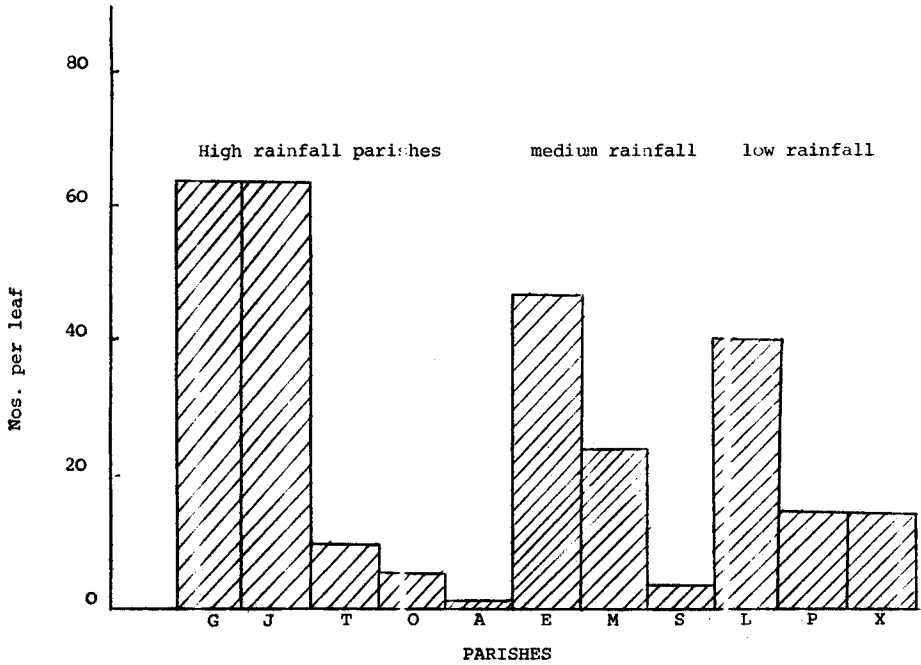


Fig. III: Distribution of *C. morrilli* in Barbados.

- | | |
|-----------------|-------------------|
| A - St. Andrew | O - St. Joseph |
| E - St. Peter | P - St. Philip |
| G - St. George | S - St. James |
| J - St. John | T - St. Thomas |
| L - St. Lucy | X - Christ Church |
| M - St. Michael | |

TABLE 3 : C. morrilli infestation levels on sweet potato varieties.

VARIETY	NOS. IN EACH STAGE PER SAMPLING DATE								SUSC. RATING
	03-18	04-05	04-15	04-27	05-05	05-08	05-17	TOTAL	
A26/86	0*	0	1	0	0	0	0	1	L.S
	0	0	0	0	10	0	0	10	
	0 ^Δ	0	0	0	70	0	0	70	
B63/343	1	4	15	60	0	10	30	120	H.S
	23	16	40	0	0	15	70	164	
	0	15	30	50	0	5	2	102	
O/100	0	3	80	30	10	10	30	163	H.S
	0	0	70	0	8	3	30	111	
	1	10	40	15	5	3	10	84	
Cliff	0	0	2	0	0	0	0	2	L.S
	0	0	0	2	30	0	0	32	
	1	0	0	10	30	0	0	41	
A26/7	0	0	15	0	20	30	0	65	H.S
	0	0	30	0	15	18	20	83	
	0	0	10	0	10	30	20	70	
B63/503	0	0	2	0	10	20	10	42	H.S
	0	14	15	0	30	23	10	92	
	0	0	15	0	30	18	0	63	
B63/399	2	0	15	15	0	70	0	102	H.S
	0	0	0	15	20	30	0	65	
	1	0	8	15	0	30	10	64	

* egg; † nymph; Δ adult (same order for each variety)

Sample size = 20 plants

L.S = Low susceptibility; H.S = High susceptibility; M.S = Medium susceptibility; R = Resistant.

TABLE 3. Cont'd.

VARIETY	NOS. IN EACH STAGE PER SAMPLING DATE								SUSC-RATING
	03-18	04-05	04-15	04-27	05-05	05-08	05-17	TOTAL	
B59/94	0	0	0	0	30	40	0	70	H.S
	0	0	5	0	30	50	0	84	
	0	0	0	0	0	20	0	20	
B63/726	0	0	0	0	0	5	0	5	L.S
	0	0	8	0	12	15	0	35	
	0	0	0	0	0	10	0	10	
T62	0	0	0	0	0	2	0	2	L.S
	0	0	0	0	0	3	0	3	
	0	0	0	0	0	5	0	5	
B63/603	0	0	10	0	15	0	2	27	M.S
	0	0	0	0	8	0	5	13	
	0	0	20	0	5	0	0	25	
H.S.W.	0	0	2	0	0	5	12	19	H.S
	16	0	20	0	2	0	70	108	
	1	0	10	0	0	30	0	41	
K-4	0	70	10	0	60	90	60	290	H.S
	0	70	0	0	40	100	100	310	
	0	20	0	30	60	70	30	210	
C-104	0	0	0	0	0	0	0	0	R
	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	
B63/532	0	0	0	0	10	30	60	100	H.S
	0	0	15	0	30	50	80	175	
	0	0	30	0	15	40	18	103	

TABLE 3. Cont d.

VARIETY	NOS. IN EACH STAGE PER SAMPLING DATE								SUSC-RATING
	03-18	04-05	04-15	04-27	05-05	05-08	05-17	TOTAL	
Deep South	0	0	0	0	2	1	0	3	L.S
	0	0	5	0	30	0	2	37	
	0	0	0	0	0	0	0	0	
T-57	0	0	13	0	0	2	0	15	M.S
	0	0	30	0	0	0	0	30	
	0	0	70	0	0	30	0	100	
B63/572	0	0	0	30	0	10	5	45	H.S
	0	0	0	70	50	30	90	240	
	0	0	16	30	25	30	30	131	
B63/05	0	13	70	80	60	60	30	313	H.S
	0	0	30	0	15	80	30	155	
	3	6	10	30	15	80	60	204	
A26/100	0	2	25	0	30	0	0	57	H.S
	9	2	0	0	0	0	15	26	
	7	1	70	0	30	70	0	178	
T-67	0	0	0	0	0	0	2	2	H.S
	0	0	0	0	70	70	40	180	
	0	0	0	0	70	70	90	230	

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