

BIOLOGY AND CONTROL OF THE DUBAS BUG, *OMMATISSUS  
BINOTATUS LYBICUS* DE BERG. (HOMOPTERA, TROPIDUCHIDAE),  
INFESTING DATE PALMS IN IRAQ.

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(PLATE XVIII.)

The dubas bug (Pl. XVIII), so called from the honeydew (Arabic, *dibis*) excreted by the nymphs, is a serious pest of the date palm (*Phoenix dactylifera*) in Iraq. *Ommatissus binotatus* Fieb. was described from material from Spain taken on an ornamental palm (*Chamaerops humilis*) and occurs also in North Africa (Lepesme & others, 1947); series from Iraq and Iran in the collection of the British Museum (Natural History) are currently referred to the subspecies *O. b. lybicus* de Berg., described from specimens collected on date palm in the Siwa Oasis, Egypt. The nymphs and adults of *O. b. lybicus* suck sap from the fronds and the former excrete honeydew (Dowson, 1936). Ramachandra Rao (1922) stated that the presence of this insect in large numbers on date palms does not cause serious damage. The insect has one generation a year in Libya (Alfieri, 1934) and two generations a year in Iraq.

The present paper reports the results of work carried out mainly in Hilla, near Babylon, during the years 1957 and 1958.

**Materials and methods.**

*Life-history and degree of infestation.*

In order to study the degree of infestation and the distribution of eggs on the date palm, 20 leaflets were taken from the middle part of a frond of the second frond row from the north, south, east, and west sides of each palm, or a total of 80 leaflets per palm. (The crown of the date palm consists, on the average, of ten frond rows, the first (outermost) of which is about five years old and the tenth less than one year old.) In addition, five leaflets from the middle part of one frond from each of the frond rows were taken from the north, south, east, and west sides of each palm.

A total of 20 leaflets was thus taken from each frond row. The eggs on the lower and upper surfaces of each leaflet were counted. After hatching, the nymphs on 30 leaflets from each date palm were counted.

For studying the various phases of life-history, 15 date palms were selected for observation and samples were taken every week. As soon as egg hatching began, two leaflets were cut from a frond in each quadrant, making a total of eight leaflets per palm. Each pair of leaflets was placed in a glass tube about 30 cm. long containing a little alcohol. The hatched and unhatched eggs, the nymphs, and the adults were counted.

In order to estimate the average number of eggs laid by one female, a number of fifth-instar nymphs were caged in the field on small date-palm seedlings that were free of eggs.

*Chemical control.*

Experiments on chemical control were carried out during September, October and November. Sprays containing malathion, heptachlor, DDT, diazinon or Dipterex, alone or in some cases in combination, were applied with a Holder-type sprayer, at concentrations shown in Table V, to young palms some of which were

not old enough to bear fruit. The trees were at least six metres apart. This, and careful spraying, prevented spray drift.

In these tests, a Latin-square design with four palms per plot was used, the population being sampled on three fronds per palm by counting the nymphs and adults on the ten middle leaflets (five from each side) of each frond. Each frond was taken and held carefully with both hands in such a way that the insects were not disturbed during counting. The effectiveness of the various treatments was calculated as the percentage reduction in population according to the modification of Abbott's formula used by Henderson & Tilton (1955).

### **Description of the insect.**

#### *Adult.*

Female 5-6 mm. long and yellowish green. Body with four to ten black spots; two on the frons at base, two laterally on the pronotum; often, in addition, two on the vertex and one on each side of both the seventh and eighth abdominal segments.

Male 3-3.5 mm. long. It differs from the female in the absence of the four spots on the seventh and eighth abdominal segments, the more tapered abdomen, and the greater length of the wings relative to the abdomen.

#### *Egg.*

Egg elongated, cucumber-like in shape, 0.5-0.8 mm. long and 0.1-0.13 mm. wide, bright green when first laid, changing to yellowish white and then to bright yellow just before hatching. The anterior part of the egg is like a lid separated from the rest of the egg by a suture.

#### *Nymph.*

First instar 1-1.25 mm. long; white, with three grey spots laterally on each of the abdominal segments; eyes red; wing buds not yet evident.

Second instar 1.75-2.25 mm. long; body white with two grey lines along the dorsal side of the body; wing buds extending downward.

Third instar 2-2.5 mm. long; wing buds covering first abdominal segment and part of second. In this and later instars the bodily markings are as shown in Plate XVIII, fig. 3.

Fourth instar 3-4 mm. long; wing buds covering first, second and part of third abdominal segments.

Fifth instar 2.5-3 mm. long; wing buds covering the first to third, and part of the fourth abdominal segments.

In each instar, the nymph has 16 white waxy filaments, 3 mm. long, at the caudal part of the body. Each filament consists of several finer filaments.

### **Degree of infestation and type of damage.**

The degree of infestation was determined before hatching by counting the number of eggs per leaflet. Infestation was regarded as heavy when the number of eggs per leaflet exceeded ten, medium when it was five to ten, and light when it was under five.

The bug was found, in various degrees of infestation, wherever the date palm grows in Iraq. Heavy infestations were usually limited to orchards near the rivers. Both male and female date palms of all varieties were infested.

The nymphs and adults suck the sap from the leaflets and midrib of the frond, the fruit stalks, and the fruits. The parts attacked exude sap from the punctures made by the insect mouth-parts, and the insect also excretes honeydew. When fermented, both honeydew and exuded sap encourage infection of the leaflets by bacteria and fungi. The insertion of the eggs in the tissues of the leaflets causes

TABLE I.  
The distribution of eggs on the upper and lower surfaces of the leaflet and on the four aspects of the date palm.

Generation	No. of eggs counted	No. of eggs on the leaflet surface		No. of eggs on the four aspects of the date palm			
		Upper	Lower	Northern	Eastern	Southern	Western
Overwintering	203100	155683	47417	48366	47561	51751	55422
Summer	1685	1166	519	323	363	575	424
Total	204785	156849	47936	48689	47924	52326	55846
Overwintering generation (%)	—	76.6	23.4	23.8	23.4	25.8	27.3
Summer generation (%)	—	69.2	30.8	19.2	21.5	34.1	25.2
Both generations (%)	—	76.6	23.1	23.8	23.4	25.5	27.3

the death of these tissues. The appearance of the damage on part of a leaflet as seen in the field about nine months after oviposition is shown in Plate XVIII, fig. 1. The presence of a large amount of honeydew on the leaflets and the accumulation of dust on the honeydew turned the leaflets to light green or yellowish green. When abundant, the honeydew drips on to the fruit trees, field crops, and vegetables that are grown between the palms and causes similar damage. The fruits of infested palms are slow to ripen and small in size and less sweet. Being covered with honeydew and dust, they fetch a low price. Repeated heavy infestations cause the weakening and death of some of the date palms.

### Life-history.

#### *Egg-laying.*

The ovipositor has two saw-like projections which are curved inward toward the ventral surface of the abdomen. Using its ovipositor, the female makes a small hole in the tissues about 0.17-0.2 mm. in diameter and about 0.4-0.5 mm. deep, in which one egg is laid, leaving only its anterior part exposed. Egg-laying begins in the second week of November, but these eggs do not hatch until the following April; they and the individuals to which they give rise are accordingly termed the overwintering generation. This in turn gives rise to a summer generation, of which the first eggs are laid from the second week of June, the adults appearing about the end of September.

#### *Egg distribution.*

The eggs were laid on the midrib of the frond, the primary axis of the spadix (the fruit stalk), the secondary axes of the spadices, and the upper and lower surfaces of the leaflets. Eggs were not laid on the fruits. Part of a leaflet showing the result of oviposition by a field infestation is illustrated in Plate XVIII, fig. 2. The photograph was taken in early April, during the hatching period of the overwintering eggs and five months after oviposition.

The count of eggs of both overwintering and summer generations on the leaflets revealed about 77 per cent. of them on the upper surface and 23 per cent. on the lower surface of the leaflet. The eggs of both generations were distributed rather evenly on the four aspects of the palm (Table I).

The eggs were distributed unevenly on the frond rows. In the overwintering generation, the highest percentage of eggs was laid on the second frond row and

TABLE II.

Distribution of eggs in the frond rows.

Frond row no.	Percentage of eggs	
	Overwintering generation	Summer generation
1	20.12	4.51
2	36.19	8.61
3	9.23	19.37
4	18.43	34.52
5	7.86	19.42
6	5.74	13.57
7	1.31	0
8	1.12	0
9	0	0
10	0	0

TABLE III.  
Egg hatching in the overwintering and summer generations.

Overwintering generation						Summer generation			
Date	No. of eggs examined	No. of eggs hatched	Percentage of eggs hatched	Date	No. of eggs examined	No. of eggs hatched	Percentage of eggs hatched		
April 4	441	72	16.3	August 3	2227	30	1.3		
April 13	689	372	54.3	August 24	2546	691	27.3		
April 19	633	400	63.2	August 31	3347	570	17.0		
April 27	5218	3461	66.3	September 7	2250	1658	73.9		
May 5	6264	4832	77.1	September 14	858	785	91.5		
May 11	4950	3727	75.2	September 21	974	953	97.8		
May 18	5982	4708	78.7						
May 26	5163	4662	90.3						
June 1	3376	3068	90.9						
June 8	2937	2840	96.7						
June 15	2524	2519	99.8						
Total	38177	30663			12202	4687			

in the summer generation on the fourth frond row. Frond rows 7-10 had a few or no eggs in either generation (Table II).

#### *Hatching of the eggs.*

The lid-like anterior part of the egg-shell is demarcated from the rest of it by a suture. During hatching, the nymph pushes the hatching spine situated on its head against the anterior part of the egg-shell, which then separates from the rest, permitting the young nymph to leave.

Egg hatching in the overwintering generation starts during the first week of April and ends during the second week of June. Egg hatching in the summer generation starts during the first week of August and ends during the third week of September (Table III).

The percentage of eggs hatching is higher on the lower surface of the leaflet than on the upper surface in the overwintering generation and *vice versa* in the summer generation. The percentage of eggs hatching on the northern, eastern, southern, and western aspects of the date palm is rather even.

#### *Duration of the stadia.*

The average duration of the egg, nymphal and adult stadia in the overwintering and summer generations is given in Table IV.

TABLE IV.  
Duration of the egg, nymphal and adult stages.

Stage	Duration (days)	
	Overwintering generation	Summer generation
Egg .. ..	141	50
Instar I .. ..	5	4
"  II .. ..	7	3
"  III .. ..	8	16
"  IV .. ..	13	12
"  V .. ..	14	15
Adult .. ..	15	13
Total .. ..	203	113

#### **Habits.**

The nymph feeds on the leaflets, midrib of the frond, the fruit stalks, and the fruit. (Pl. XVIII, fig. 3.) While sucking the plant sap, the nymph raises and lowers the waxy filaments on the posterior end of the body. When disturbed, the nymph jumps quickly. It prefers the shady and green parts of the date palm to the dry parts or those covered with dust.

In order to escape the severe summer heat, the nymphs of the overwintering generation migrate towards the bases of the young fronds (the heart of the date palm) and complete the migration during the last week of June. Similarly, the adults of the overwintering generation prefer the shady parts of the palm, sucking the sap from leaflets, midribs, fruit stalks and fruits, hiding during the heat of the day between the bases of the new fronds and coming out during the comparatively cool nights to lay eggs. When disturbed, the adult jumps 1-2 ft. and flies a short distance. It is not attracted to light.

The droplets of honeydew appear about one week after the first nymphs appear. These droplets are small shiny spots at first; they become larger and are spherical and of variable size three weeks later. (Pl. XVIII, fig. 4.)

### Sex ratio.

Examination of 1,349 adults of the overwintering generation and of 1,046 adults of the summer generation showed the proportions of males to be 47.1 and 45.9 per cent., respectively, giving a sex ratio of about 1:1.

### Fecundity.

Seventeen caged females laid 1,801 eggs, an average of 106 eggs each. As the normal sex ratio is about 1:1, the mortality rate for a constant population level is 98.11 per cent.

### Natural enemies.

The eggs were found to be parasitised by a small Chalcidoid, and the larvae of the lace wing *Chrysopa carnea* Steph. preyed upon the nymphs and adults. The lace wing eggs, each of which was laid at the end of a thread 12 mm. long, were found on the upper surface of the leaflets. The adults of three species of Coccinellids (*Coccinella septempunctata* L., *C. undecimpunctata* L. and *Chilocorus bipustulatus* (L.)) preyed upon the nymphs and adults of the bug.

### Chemical control.

DDT (alone or with diazinon), malathion (alone or with heptachlor), and Dipterex were tested in sprays at two dilutions against adults and late-instar nymphs and at the greater dilution only against the early instars.

All insecticides tested were effective in controlling nymphs and adults (Table V).

TABLE V.  
Effect of the insecticides on the control of the bug.

Insecticide	Active ingredient in 100 gal. water (g.)	Percentage kill		
		Early nymphal instars	Late nymphal instars	Adults
Malathion .. .. .	240	99.0	96.9	97.3
	360	—	97.3	94.6
Malathion + heptachlor ..	120 + 120	98.0	90.3	98.6
	180 + 180	—	98.3	98.8
DDT + diazinon ..	120 + 108	96.0	95.4	97.6
	180 + 162	—	97.0	87.8
DDT .. .. .	240	98.2	93.9	98.5
	360	—	97.4	89.4
Dipterex .. .. .	240	86.1	84.1	85.1
	360	—	91.5	73.9

Dipterex was the least effective. Since the two dosages of each insecticide gave nearly similar high percentages of kill, the lower dosage is recommended.

For commercial control, a high-pressure sprayer is recommended. Where older trees are involved, it will be necessary for the operator, carrying the spray-gun attached to a sufficient length of hose, to climb to the crown of each tree with the aid of the climbing apparatus in local use. Spraying should start when egg hatching reaches about 75 per cent. For good coverage, each palm requires an average of 1½ gallons of spray.

### Summary.

The dubas bug, *Ommatissus binotatus lybicus* de Berg. is a serious pest of the date palm (*Phoenix dactylifera*) in Iraq, where there are two generations a year. Both nymphs and adults, which are described, suck the sap from the date palm. Repeated heavy infestations cause the weakening and death of some of the palms.

The eggs are laid on all the green parts of the palm except the fruits, the majority on the leaflets, especially the upper surface. They are distributed evenly on the four aspects of the date palms, but unevenly on the frond rows, the second and fourth oldest rows having the majority of the eggs in the overwintering and summer generations, respectively. Deposition of eggs of the overwintering generation began in the second week of November and hatching started during the first week of April, the nymphal period lasting 47 days and the adults surviving for 15 days. Eggs of the summer generation were deposited from the second week of June, and hatching started in the first week of August, the nymphal period lasting 50 days and the adults surviving for 13 days. There are five nymphal instars.

The nymphs excreted droplets of honeydew, and both nymphs and adults prefer the shady parts of the date palm. In order to escape the severe heat of the summer days, the nymphs and adults of the overwintering generation migrated towards the bases of the new fronds. The sex ratio was nearly 1:1, and the mean number of eggs laid per female was 106. The mortality rate for a constant population level was 98.11 per cent.

The eggs were parasitised by a small Chalcidoid. The larvae of the lace wing *Chrysopa carnea* Steph. and the adults of *Coccinella septempunctata* L., *C. undecimpunctata* L., and *Chilocorus bipustulatus* (L.) preyed upon the nymphs and adults.

In tests with insecticidal sprays containing 240 g. active ingredient per 100 gal. applied at the rate of 1½ gal. per palm against adults and nymphs, DDT and malathion were equally effective, but Dipterex was less so. Similar concentrations of mixtures of malathion with heptachlor and DDT with diazinon were also effective.

### Acknowledgements.

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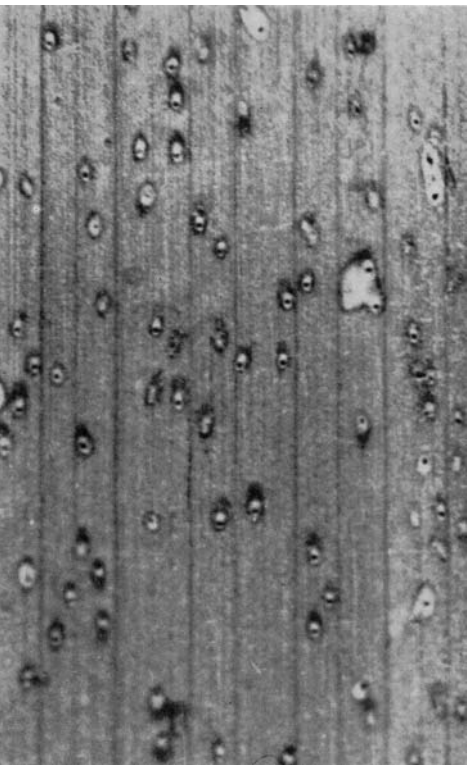


Fig. 1. Death of tissues of the leaflet caused by the insertion of the overwintering eggs of *Ommatissus bi-notatus lybicus*. Photograph of a field infestation taken about nine months after oviposition. The eggs have hatched. (x 6, approx.)



Fig. 2. The overwintering eggs of *O. b. lybicus* on the upper surface of a leaflet. Photograph taken during the hatching period. (x 3, approx.)

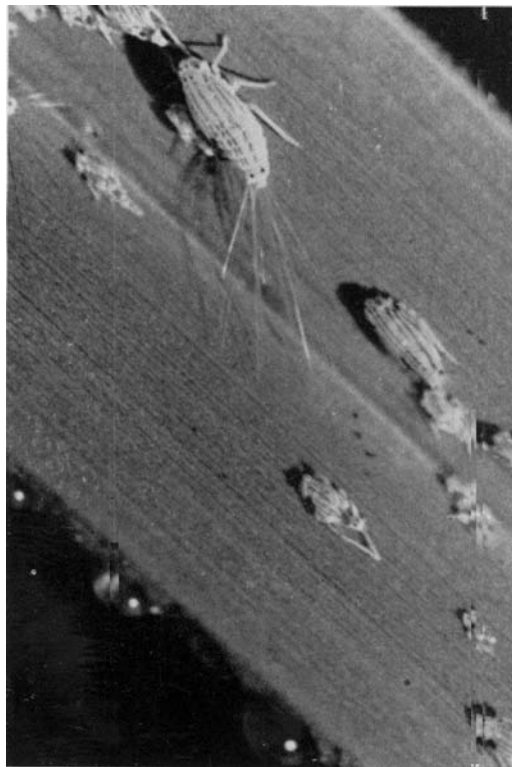


Fig. 3. Nymphs of *O. b. lybicus* and their moulted skins on the upper surface of a leaflet. Two droplets of honeydew are also seen on the leaflet edge. (x 3.5, approx.)

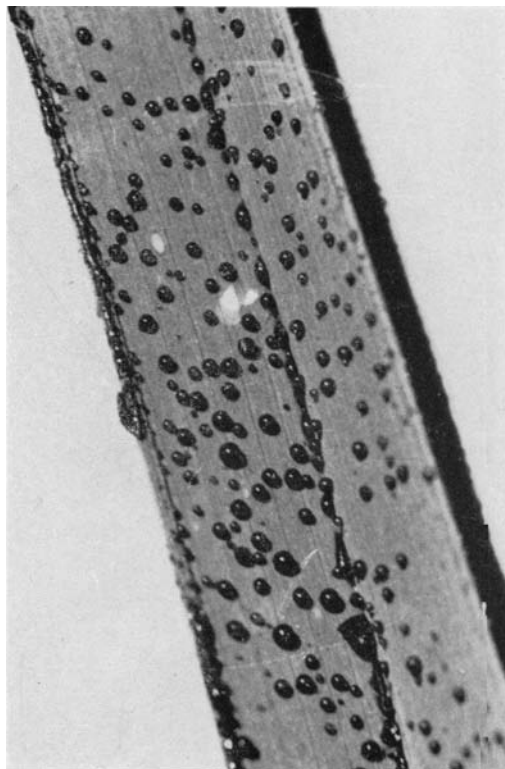


Fig. 4. Droplets of honeydew on the upper surface of a leaflet. (x 1-8, approx.)