

SURVEY AND DISTRIBUTION OF COMMON LADY BEETLES
[COL. COCCINELLIDAE] ON DATE PALM TREES IN ISRAEL (*)

BY

M. KEHAT

Introduction

Among the date palm pests in Israel, the scales are of great importance; the most widely distributed of them is *Parlatoria blanchardi* TARG. Another scale causing substantial damage is *Asterolecanium phoenicis* RAM. Both are to be found on all parts of the tree; if the infestation is severe, the fruit, too, is affected. The damage is reflected in leaf withering, tree stunting and fruit disfigurement to the point of culling.

In the course of our efforts to reduce the damage caused by these pests, their phenology was studied (AVIDOV, 1962; KEHAT, 1966; KEHAT & AMITAL, 1966; SWIRSKI, KEHAT & BANKIER, 1960) and trials were conducted for their control (AVIDOV, 1962; KEHAT & SWIRSKI, 1964; KEHAT, SWIRSKI & BANKIER, 1964). Simultaneously, it became clear that chemical means do not constitute a satisfactory solution to the problem.

Chemical control is to be regarded as a temporary expedient only, especially in foci of heavy infestation. On the other hand, the use of the biological factors existing in plantations where toxic insecticides have not yet been introduced, does constitute an effective and inexpensive method. That is why it became necessary to find out more about the natural enemies of the date palm pests especially of the *Parlatoria* scale. The present work, which was carried out in 1961-1965, was devoted mainly to the study of *Coccinellidae* beetles existing in date palm groves in Israel.

The predators were collected in many palm groves in all palm growing regions in this country.

(*) Contribution from The National and University Institute of Agriculture, Rehovot, Israel. 1966 Series No. 1073-E.

**The natural enemies of the date palm scale
Parlatoria blanchardi in Israel**

Five main groups of natural enemies were found : Parasitic wasps, beetles of the genus *Cybocephalus* (*Nitidulidae*), lacewings, predatory mites and lady beetles.

Regarding the existence of wasps parasitizing the *Parlatoria* scale, information was received only from Iraq. In that country, mention is made of the wasp *Aphytis mytilaspidis* LEBARON (*Aphelinidae*) (BUXTON, 1920; RAMACHANDRA, 1922). In North Africa, where much research has been done on *Parlatoria*, there is no information concerning parasitic wasps (SMIRNOFF, 1957). In Israel, two parasitic wasps were found : *Aphytis* aff. *citrinus* COMP. (determined by Prof. P. DEBACH, University of California) and another — *Pteroptria* WESTWOOD (determined by Dr. T. W. FISHER, University of California). The first is widely distributed, both in groves in the North and in those of the Arava (the southern desert of Israel), and its activities are liable to be highly effective (KEHAT & SWIRSKI, 1964). The second species is very rare and until now was found only at Yotvata (Arava).

The *Cybocephalus* beetles seem to represent an important factor for the control of the *Parlatoria*. The species belonging to this genus (three species whose final identification is not yet finished) appear in high-density populations primarily in the Arava region and, to a lesser extent, in the northern groves. Adults of this species are present in the grove all the year over. During winter, most of them were found hidden within the pinnae. The highest density of population was recorded between May and December.

Adults and larvae of *Chrysopa* spp. were found only infrequently, both in the North and in the Arava. At Elat (Arava), many egg-masses were found in March, many larvae in May, and adults in June. During July and August, only a few larvae and adults were found. In September and October, the population figure rose again, and dropped steeply during winter.

The predatory mite *Saniosulus nudus* SUMMERS (*Eupalopsellidae*) is extremely infrequent and was found until now only at En-Boqeq (Dead Sea Valley) (U. GERSON — personal communication).

The fifth group is of paramount importance for the control of the *Parlatoria*; to this group, the lady beetles (*Coccinellidae*), we have devoted this work.

**The species of *Coccinellidae* connected with preying on
*Parlatoria blanchardi***

Most of the lady beetle species referred to in this survey are of little importance as natural enemies of *Parlatoria*. Their mere presence upon palm trees, sometimes of a very infrequent nature, does not

constitute proof of their being typical natural enemies of *Parlatoria*; their presence on palms may be merely accidental. Therefore, as important predators we can only regard insects whose larvae were also found in the field feeding upon the scale, or which were grown on the scale in the laboratory. As to the other species, it seems to us that the criteria for the determination of their importance as predators of *Parlatoria* are their distribution, density and regularity of appearance on the palms. Bearing this in mind, the species may be subdivided into the following four groups :

GROUP A : Constant predators (adult and larval activity) :

- | | |
|---|---|
| <i>Pharoscymnus numidicus</i> PIC, 1900. | <i>Chilocorus bipustulatus</i> LINNAEUS, 1758. |
| <i>Pharoscymnus setulosus</i> CHEVROLAT,
1861. | <i>Rhyzobius (Lindorus) lophantae</i>
BLAISD., 1892. |
| <i>Pharoscymnus ovoideus</i> SICARD, 1929. | <i>Scymnus (Nephus) bipunctatus</i> |
| <i>Pharoscymnus pharoides</i> MARSEUL,
1868.. | KUGELANN, 1794. |

GROUP B : Constant predators (adult activity only) :

- | | |
|---|--|
| <i>Exochomus flavipes</i> THUNBERG, 1781. | <i>Stethorus punctillum</i> WEISE, 1861. |
| <i>Scymnus (Pullus) pallidivestis</i>
MULSANT, 1853. | |

GROUP C : Occasional predators :

- | | |
|---|--|
| <i>Scymnus (Pullus) subvillosus</i> GOEZE,
1777. | <i>Synharmonia conglobata</i> LINNAEUS,
1785. |
| <i>Hyperaspis polita</i> WEISE, 1885. | <i>Coccinella septempunctata</i> LINNAEUS,
1785. |
| <i>Adonia variegata</i> GOEZE, 1777. | <i>Coccinella undecimpunctata</i> LINNAEUS,
1785. |

GROUP D : Accidental predators :

- | | |
|--|--|
| <i>Platynaspis luteorubra</i> GOEZE, 1777. | <i>Scymnus (Scymnus) frontalis</i> FABRICIUS
1787. |
| <i>Exochomus quadripustulatus</i> LINNAEUS,
1758. | <i>Scymnus (Nephus) quadrimaculatus</i>
HERBST, 1783. |
| <i>Rodolia cardinalis</i> MULSANT, 1850. | <i>Adalia decimpunctata</i> LINNAEUS, 1785. |
| <i>Scymnus (Scymnus) interruptus</i> GOEZE,
1777. | <i>Propylaea quatuordecimpunctata</i>
LINNAEUS, 1785. |
| <i>Scymnus (Scymnus) apetzi</i> MULSANT,
1846. | |

GROUP A : This comprises species whose larvae feed naturally on the scale or which were reared on the scale in the laboratory, from the egg up to the adult stage. The seven species belonging to this group constitute the most important predators connected directly with preying upon the *Parlatoria*.

GROUP B : This group comprises the species whose larvae were not found upon the scale in the field, but whose adults were present on

palm trees at fixed intervals and in quite large numbers. The possibility of raising these species in the laboratory was not investigated.

GROUP C : This group comprises species whose adults were found on palm trees at fixed intervals, but only in small numbers. The species in this group are all known as aphid or mealybug predators; it seems that their presence on palms was merely accidental.

GROUP D : Here, we included species whose adults were found on palms only very infrequently, and only as single individuals. Their presence on the palms was certainly accidental.

Seven species were thus identified as important predators of the *Parlatoria*. Of the others, *Stethorus punctillum* is known to be an active predator of mites. Two additional species may be of some value as date palm pest predators. All other species mentioned are of either little or no importance in this respect.

The distribution of the most common predators of the *Parlatoria* scale (the « A » group)

The distribution of the predators depends generally upon the macroclimatic conditions of the region. Thus, there exists some difference in the predators' fauna between the north and the Arava. *Pharoscymnus numidicus*, for instance, is widespread throughout all parts of the country, but the types occurring in the north are morphologically different from those found in the south. Most specimens of the northern variety have brownish-black elytrae, each with two distinct spots.

This form (fig. 5, 6) is known in the literature (SMIRNOFF, 1957) as *Pharoscymnus numidicus* PIC. On the other hand, the individuals found in the Arava were characterized by the light-brown ground color of the elytrae, on which the number of spots were varied. Here, two types were noted :

a) The elytrae are generally light brown, without spots, but become darker near the scutellum and along the margins. This type (fig. 7) is known as *Ph. numidicus* PIC. f. *unicolor* SMIRN (SMIRNOFF, 1957);

b) The elytrae are light brown, each with two very light spots which can hardly be discerned and merge with each other in most cases — *Ph. numidicus* f. *unctus* PIC. (fig. 8-9).

The species *Pharoscymnus ovideus* is also distributed throughout the country, but here, too, the northern type differs from the southern. Only individuals found in northern groves have shiny black elytrae, each with three distinct yellow-brown spots; occasionally, the two

anterior spots merge with each other (fig. 14-15). By contrast, the southern specimens have light brown elytrae and only the margins are black. Usually no pattern can be discerned in the center of the elytra, except, on occasion, a single blackish spot (fig. 16, 17, 18, 19).

As regards to the other species, the differences in their distribution become more evident : *Ph. setulosus* is to be found only in Elat, and does not occur rather north. *Ph. pharoides* occurs only in northern

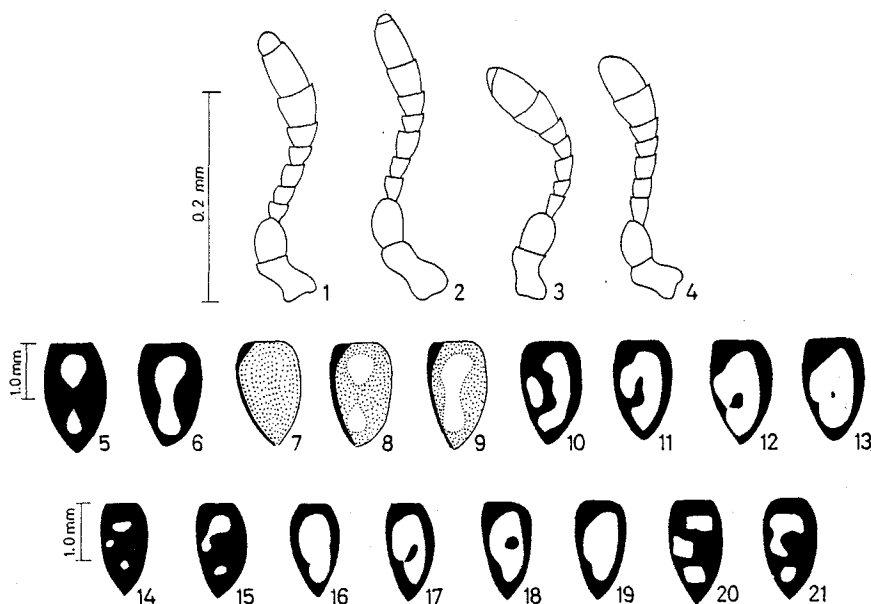


FIG. 1-21, Antennae and elytrae of the different species of *Pharoscymnus*.

- | | |
|--|--|
| 1, 5, 6, <i>P. numidicus</i> PIC. | 4, 17, 18, 19, <i>P. ovoideus</i> SIC. |
| 7, <i>P. numidicus</i> f. <i>unicolor</i> SMIRN. | 14, <i>P. ovoideus</i> f. <i>guttatus</i> SIC. |
| 8, 9, <i>P. numidicus</i> f. <i>junctus</i> PIC. | 15, <i>P. ovoideus</i> f. <i>hamifer</i> SMIR. |
| 2, 10, 11, 12, 13, <i>P. Setulosus</i> CHEVR. | 16, <i>P. ovoideus</i> f. <i>deserti</i> SIC. |
| 3, 20, 21, <i>P. pharoides</i> MARS. | |

groves and is absent from those in the Arava. The predator *Chilocorus bipustulatus* occurs very frequently in northern groves, especially in shaded adult ones. In young groves, where the *Pharoscymnus* species predominate, it is to be found to a much lesser extent. Its population at En Gedi (Dead Sea Valley) is very low, and at Elat is it not to be found at all. (Trials to establish it in that region failed.) The species *Lindorus lophantae* and *Scymnus* (*N.*) *bipunctatus* show similar tendencies with regard to their distribution (Table 1).

TABLE 1
The distribution of the common coccinellidae beetles
on date palm trees in Israel

GROUP	SPECIES	NORTH		SOUTH	
		Bet Shean Valley	Jordan Valley	Dead Sea Valley	Arava
A	<i>Pharoscymnus numidicus</i> PIC.	+	+	—	—
	<i>Pharoscymnus numidicus</i> f. <i>unicolor</i> SMIRN.	—	—	+	+
	<i>Pharoscymnus numidicus</i> f. <i>junctus</i> PIC.	—	—	+	+
	<i>Pharoscymnus setulosus</i> CHEVR.	—	—	—	+
	<i>Pharoscymnus ovoideus</i> SIC.	+	+	—	—
	<i>Pharoscymnus ovoideus</i> f. <i>deserti</i> SIC.	—	—	+	+
	<i>Pharoscymnus pharoides</i> MARS.	+	+	—	—
	<i>Chilocorus bipustulatus</i> L.	+	+	+	—
	<i>Rhyzobius (Lindorus) lophantae</i> BLAISD.	+	+	+	—
	<i>Scymnus (Nephus) bipunctatus</i> KUGEL.	+	+	—	—
B	<i>Ezochomus flavipes</i> THUNB.	+	+	+	+
	<i>Scymnus (Pullus) pallidivestis</i> MULS.	+	+	—	—
	<i>Stethorus punctillum</i> WS.	+	+	—	—
C	<i>Hyperaspis polita</i> WS.	+	+	—	—
	<i>Scymnus (Pullus) subvillosus</i> GOEZE.	+	+	+	—
	<i>Adonia variegata</i> GOEZE.	+	+	+	+
	<i>Synharmonia conglobata</i> L.	+	+	+	—
	<i>Coccinella septempunctata</i> L.	+	+	+	+
	<i>Coccinella undecimpunctata</i> L.	+	+	+	+

+ Present

— Absent

Population density of the predators

In the course of the survey it was noted that, among the predators of *Parlatoria*, in young palm groves, the population of *Ph. numidicus* was the highest of all. However, in northern, old groves, the density of *Chilocorus* was more pronounced. The population of the other species, as compared with these two, was rather sparse.

ACKNOWLEDGMENT

It is my pleasant duty to express my thanks to all those who let me benefit of their advice, especially Professors Z. AVIDOV (Hebrew University, Jerusalem) and E. SWIRSKI (The Volcani Institute of Agricultural Research). Valuable help in the identification of the *Coccinellidae* was given to us by Dr. R. D. POPE of the British Museum.

RÉSUMÉ

Pendant la période de 1961-1965 une étude a été faite sur les entomophages de la cochenille du palmier-dattier, *Parlatoria blanchardi* TARG., en Israël. Parmi les ennemis naturels les plus efficaces, il faut citer les Coccinellides, les Hyménoptères parasites et les Coléoptères du genre *Cybocephalus*. Seulement 7 espèces de Coccinellides parmi les 25 trouvées sur les palmiers sont des prédateurs directs de *Parlatoria*. Leur répartition varie dans les différentes régions du pays. Quatre espèces de *Pharoscymnus* ont une importance primordiale et sont largement distribuées. L'espèce la plus fréquente et la plus répandue est *Ph. numidicus* PIC.

REFERENCES

- AVIDOV, Z. — 1962. Plant Pests in Israel. — *The Magnes Press, Hebrew University, Jerusalem*, 546 pp. (Hebrew).
- BUXTON, P. A. — 1920. Insect pests of dates and date palm in Mesopotamia and elsewhere. — *Bull. ent. Res.*, **11**, 287-303.
- KEHAT, M. — 1967. The phenology of the date palm scale *Parlatoria blanchardi* in Israel. — *Israel J. agric. Res.*, **17**, (in press).
- KEHAT, M. & AMITAI, S. — 1966. The morphology and phenology of the scale *Asterolecanium phoenicis* RAM. on date palms in the Bet Shean Valley. — *Israel J. agric. Res.*, **17** (in press).
- KEHAT, M. & SWIRSKI, E. — 1964. Chemical control of the date palm scale, *Parlatoria blanchardi*, and the effect of some insecticides on the lady beetle *Pharoscymnus aff. numidicus* PIC. — *Israel J. agric. Res.*, **14** (3), 101-110.
- KEHAT, M., SWIRSKI, E. & BANKIER, E. — 1964. Trials in the control of the scale *Asterolecanium phoenicis* RAM. on date palms. — *Israel J. agric. Res.*, **14** (1), 19-26.
- RAMACHANDRA, R. — 1922. Pests of the date palm in Iraq. — *Mesopotamia. Dep. Agric. Basrah. Memoir* 6, 12 pp.
- SMIRNOFF, W. — 1957. La cochenille du palmier dattier (*Parlatoria blanchardi* TARG.) en Afrique du Nord, comportement, importance économique, prédateurs et lutte biologique. — *Entomophaga*, **2**, 1-98.
- SWIRSKI, E., KEHAT, M. & BANKIER, E. — 1960. Distribution of *Asterolecanium phoenicis* in Israel. — *Prelim. Rep. Agric. Res. Stn. Rehovot.*, No. 290., 000 pp. (Hebrew).

(*The National and University Institute of Agriculture,
Rehovot, Israel.*)