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THE COCCIDAE OF PALESTINE

First Report on this family

by

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Introduction.

This report is the result of a work of 1½ year with the destination to explore the scale-insect-fauna of Palestine systematically under special consideration of the economic important species. The scale-insects belong to the most important injurious animals of the plantations and in the last report of the Government they are described as equal dangerous as the plague of mice or locusts and it will therefore not appear strange when this certain group of animals has been object to thorough studies. 65 species have been discovered so far including 8 new species, and it is almost certain that therewith the coccidae-fauna of Palestine is not at all exhausted and that probably in the next decades 30-40 other species may be discovered. It is however certain that the entire character of the fauna in its outlines has been ascertained and as the economic important species are all included this report will be worthwhile, especially, as a first publication from Egypt (Hall 1922) only quotes 56 species, and this country has been doubtless explored in a more thorough way.

With regard to the nomenclature I followed nearly always Lindinger (1912), who by comprehensive nomenclatural studies has conclusively fixed the names of the majority of the palea-arctic coccidae. The common and distributed synonyms are always assigned, I only have deviated in one case from Lindinger, as I do not consider the name in accordance with the rules of the international zoological nomenclature. (Aspidiotus camelliae Sign. 1869 instead of A. rapax Comst. 1880).

I attach a short description of each species so that it may simplify to determine the most important species and show the characteristics for non-specialists.

It further simplifies to find the requested species as in annexed list the scale-insects have been arranged in accordance with their nutritive plants. The new species have of course been described in extenso. The biology and control of the most important species from the economic point of view has been detailed as full as possible.

I am extremely obliged to my teacher Dr. Lindinger and to Mr. E. E. Green who have determined and revised a great part of the material for me. I am further obliged to Mr. Hall of the Ministry of Agriculture at Cairo and Mr. P. A. Buxton of the Health Department at Jerusalem for their continuous kindness in furnishing me with material and for their ready help. I also have to express my thanks to my colleagues of the Experiment Station and to the numerous collaborators in the country, the enumeration of whom would take too much space.

The photographs have been made in excellent quality by Mr. Soskin, Tel-Aviv in pleasant collaboration while the drawings are due to the pen of Miss Dina Lewin, Tel-Aviv.

I. General Part.

History of Exploration of the Coccidae of Palestine

There was very little known of the coccidae-fauna of Palestine until the last few years. So far nothing had been systematically collected here in that direction.

In here catalogue „The scale-insects of the world" Mrs. Fernald (1903 p. 288) of „Syria" quotes Chrysomphalus aurantii.

In the same year appeared a detailed monography by Mangin et Viala (1903) of Pseudococcus vitis and the damage caused by the scale insect in connection with the fungus Bornetina corium in the colonies of Judea.

Lindinger collected the following 9 species of „Syria" from several herbariums (Schildläuse Europas, 1912): Aspidiotus hederae, Chrysomphalus aurantii, Chionaspis striata, Diaspis syriaca (Damascus), Lepidosaphes pinniformis, Leucaspis pusilla, Parlatoria pergandei, Lecanium hesperidum, Pseudococcus citri.

Schumacher (1914) found Lecanium hesperidum on Viscum cruciatum.

Hall (1922), who on a fortnight's journey specially collected coccidae extended this list to 17 species, of which the following 10 species are not included in Lindingers list: Aspidiotus lataniae, Diaspis echinocacti, Parlatoria oleae, Ceroplastes floridensis, Ceroplastes rusci, Icerya purchasi, Saissetia oleae, Pseudococcus sacchari, Pollinia pollini, Asterolecanium pustulans var sambuci.

P. A. Buxton added by handwritten notice (1923) Cry hemichionaspis africana.

In the course of my explorations 45 other species, inc ding 8 new species, have been added to the 20, which we already known.

The Coccidae of Palestine from the point of view of the animal-geography.

The following line shows the result of an analysis the coccidae-fauna of Palestine. It may be pointed out th all those animals are assigned as cosmopolitan, which a distributed over more than 2 animal-geografic-areas, and su as palaearctic which are distributed over 2 ore more pala arctic sub-areas.

Endemical: 8 species.

Parlatoria judaica n. sp., Lepidosaphes palaestinensis n. sp Lepidosaphes zlocistii n. sp., Pseudococcus lindingeri n. sp Lecanium racheli n. sp., Aspidiotus aharonii n. sp., Aspidi tus herzlianus n. sp., Chionaspis engeddensis n. sp.

South-Eastern-Mediterranean: (Egypt, Palestin Cyprus). 7 speci

Adiscodiaspis tamaricicola, Leucaspis pistaciae, Pseud targionia glandulosa, Asterolecanium pustulans, var. sambu Chionaspis graminis var. aegyptiaca, Crypthemichionaspis af cana, Lepidosaphes bicuspis.

South-Mediterranean: 2 species.

Parlatoria blanchardi, Sphaerococcus marlatti.

East-Mediterranean: (predominant or fully) 3 speci

Pollinia pollini, Chionaspis striata, Epidiaspis gennadio

Middle and East-Mediterranean: 5 species,

Aspidiotus spinosus, Melanaspis inopinata, Targion distincta, Leucaspis riccae, Euphilippia olivina.

General Mediterranean: 7 species.

Aspidiotus britannicus, Aspidiotus zonatus, Parlato oleae, Pseudococcus vitis, Chionaspis berlesei, Lepidosaph conchiformis, Lepidosaphes minima.

Palaearctic: 5 species.

Asterolecanium variolosum, Aspidiotus ostraeiformis, Leucaspis candida, Leucaspis pusilla, Diaspis visci.

Oriental-Palestinian; 1 species.

Chionaspis herbae.

Ethiopean-Palestinean: 1 species.

Chionaspis stanotophri.

Cosmopolitan: 23 species.

Aspidiotus camelliae, Aspidiotus hederae, Aspidiotus lataniae, Chrysomphalus aurantii, Chrysomphalus ficus, Parlatoria pergandei, Diaspis echinocacti, Lépidosaphes gloveri, Lepidosaphes pinniformis, Lepidosaphes ulmi, Pinnaspis aspidistrae, Asterolecanium bambusae, Lecanium hesperidum, Lecanium hemisphaericum, Lecanium nigrum, Lecanium oleae, Ericoccus araucariae, Ceroplastes floridensis, Ceroplastes rusci, Pséudococcus citri, Pseudococcus sacchari, Icerya purchasi, Icerya aegyptiaca.

Mediterranean:	24	species
Endemical:	8	,,
Palaearctic:	5	,,
Cosmopolitan:	23	,,
Oriental-Palest.:	1	,,
Ethiopean-Palest.:	1	,,
Total:	62	species.

The general character of the scale-insect-fauna is a double one:

1. An evident Mediterranean (24 + 8 species).

2. An evident cosmopolitan adventitious (23 speciés.)

These two groups occupy with 55 from 62 analysed species almost 90% of the entire coccidae-fauna.

It is a remarkable fact that only very few Ethiopean relations are found on this animal group (only Chionaspis stanotophri of South-Africa), while such relations to the Oriental region are doubtless evident through Adiscodiaspis tamaricicola, Parlatoria oleae, Chionaspis herbae, Chionaspis graminis var. aegyptiaca.

The greater part of the cosmopolitan species are also of oriental origin, but the following 4 species have probably their origin in the Mediterranean-territory :

Aspidiotus hederae, Aspidiotus lataniae, Parlatoria pergandei, Ceroplastes rusci, while Lepidosaphes ulmi is of middle-European origin, but appears to be a very old mediterranean component. All other species are adventitious, although part of them may be for many centuries in the country.

The behaviour of the scale insects towards the different plants is very interesting. All Coccidae are adventitious on such as Citrus, Ricinus, Pirus, Nerium, Schinus, Agave, Eriobotrya, Gleditschia, Washingtonia. On the contrary belong over half of the species to the mediterranean fauna-group on Olea, Ficus, Ceratonia, Acacia, Pistacia, Quercus, Phoenix, Pinus, Styrax, Zizyphus.

We see here how in general the relation or the age of a plant in a flora-district may be determined by its stock of scale-insects.

The several scale-insects-genera are represented as follows :

Aspidiotus by 9 species,
Lepidosaphes ,, 8 ,,
Chionaspis ,, 6 ,,
Leucaspis, Parlatoria, Pseudococcus ,, 4 ,, each

Lepidosaphes and Chionaspis appear to be most remarkable species. The first genus is frequent, although I do not draw any further conclusions thereof. The genus Chionaspis is of course very interesting. There are only two species mediterranean : Chionaspis berlesei and Chionaspis striata, while one species, Chionaspis engeddensis in the Ghor, happens to be endemic. Chionaspis graminis var. aegyptiaca is a south-east-mediterranean variety to an oriental species. It is most astonishing that we find in Palestine on the same plant, Erianthus ravennae, (Gram.) a species so far only known from South-Africa (Chionaspis stanotophri) and another species (Chionaspis herbae) so far only known from Ceylon and India.

This geographic distribution raises the idea, that a centre of origin of Chionaspis may exist in the South-East of Mediterranean in a similar way as already known from North-America.

The Geographic Position of Palestine.

(Climate, character of the territory, fronties)

Climate:

The arid climate of Palestine is an excellent medium for scale-insects. Rain-and-dry season are of vital importance for the biological cycle. These effects are partly caused by changes of temperature. The time of developing of the species is extremely extended by the coldness of the rain-season, while the warmth of the dry season causes the contrary effect. The heavy winter-showers clean the plants and destroy the coccidae, so that from December to March it is generally a thankless task to collect coccidae. This climatic self-cleaning of the trees by heavy showers is of great economical importance, as the rapid increase of the scale insects is hereby considerably reduced. Generally but a very small stock of grown up females outlasts this infavorable period. This stock may then in spring or autumn develop allright under optimal circumstances, while the summer-time means a suppression for a great part of the species.

Zones of Climate:

The 3 climatic zones of the country, the plain of the coast, the hill-country and the Ghor have of course a remarkable influence on the distribution of the species.

A number of species have so far been discovered only in the tropical and nearly rainless Ghor, such as:

Chionaspis stanotophri, Crypthemichionaspis africana, Lecanium nigrum, Lecanium racheli, Pulvinaria sp. Lepidosaphes bicuspis, Chionaspis engeddensis, Aspidiotus herzlianus.

The hill-contry is relatively rich of specific species. Climatically it is characterized by the contrasts in temperature of day and night:

Melanaspis inopinata, Epidiaspis gennadiosi, Targionia distincta, Asterolecanium variolosum, Leucaspis pistaciae, Chionaspis graminis var. aegyptiaca, Kermes sp., Ceroplastis rusci.

No specific species are found on the plain of the coast, which is more cultivated and only contains in a limited degree some cosmopolitan adventitious forms swerved from the hill country. This part is very young from the geografical point of view and has to be added to the Alluvium, while the immigration of the coccidae of Palestine happened in general in prior periods, but nearly almost in close, more or less passive connection with variations in the scenery of the flora.

Characterisation of the surroundings of the territory:

The scale-insect-fauna towards Egypt is very well marked. Not only that there complete groups are missing alltogether, such as pistacia-and oak-coccidae, but specially through quite a different shape of the scale-insects. There are for instance the wallformed galls of Asterolecanium pustulans var. sambuci, only found on 3 different plants in Palestine in very small number. This same scale-insect has been found in Egypt on 35 different plants in such numerous quantity that they belong to the animal-geographic-characteristics of Egypt and Sinai. The following figures show the difference of the two faunas: Of the 56 species of coccidae so far known in Egypt (Hall 1922) there are 20 species i. e. 40 %, which have not yet been found in Palestine. The greater number of these live on tropical plants, such as:

Mangifera, Allbizzia, Acacia ssp., Cajanus, Gossypium, Justicia, Psidium, Phylantus, Kigelia, Lawsonia, Pithyrantus, Poinciana, Poinsettia, several palm-trees, Sapota, Sesbania, Seiadophyllum, Tecoma, Templetonia, Terminalia, Thunbergia, and others, known in Palestine only little or not at all.

Unfortunately we scarcely know any dates as to the Syrian territory in the north. I do not yet know more than 10 species living in that territory and this is really regrettable as a great result may be expected from the rich moun-

tain-forests of these countries (Hermon, Libanon, Taurus) all the more interesting, as the fauna of these mountain-forests will most probably show close relations to the European coccidae-forest-fauna.

The coccidae-fauna of Trans-Jordania is only known superficially (Bodenheimer 1924). But I can resume my impressions of an exploration trip to the result, that several adventitious species such as Ceroplastes floridensis, Icerya aegyptiaca and many others have not yet settled down in this area. It appears that the fauna of this country is a real Palestinean fauna and that many a nice result may be delivered after thorough studies. It would therefore be advisable to go into such thorough studies.

Gall-producing Coccidae of Palestine.

The following gall-producing coccidae have been observed in Palestine: Aspidiotus hederae on Olea europaea: gall shaped alteration of the fruit.

Melanaspis inopinata on Pistacia terebinthus: hollows in the small branches.

Epidiaspis gennadiosi on the same plant evoking similar galls.

Lepidosaphes zlocistii on Persica armeniaca: negative galls on the bark analogous to those known through Aspidiotus ostraeiformis.

Eriococcus araucariae on Araucaria sp.: shortening of the sprouts of needle-leaves.

Asterolecanium pustulans var. sambuci on Ficus carica and F. sycomorus: ringwalls of galls on stem and branches in the middle of which the animal sits.

Asterolecanium variolosum on Quercus lusitanica and Q. coccifera: similar galls on the small branches.

Pollinia pollini on Olea europaea: slits in the bark and protuberances on the branches.

The following of these galls are described for the first time

Melanaspis inopinata on Pistacia terebinthus

Epidiaspis gennadiosi " " "

Lepidosaphes zlocistii " Persica armeniaca
Epiococcus araucariae " Araucaria sp.

Bibliography: Bodenheimer, Marcellia, Vol. 19. 1923. p. 118

Economical important Coccidae of Palestine.

The group of Citrus-Coccidae is of great economic importance. They are the most dangerous injurious insects of the Bojares. I am obliged to Mr. Tolkowsky [1]) for the following particulars as to the age of the different Citrus-species in the country:

The Ethrogus is in the country with certainty since the Babylonian exile. In the 10-th century the arabs imported the bitter oranges, citrons aud limons from Persia to Palestine, from where at the end of the 11-th century they were forwarded to Europe by the Crusaders.

In the beginning oy the 16-ts century the sweet orange was imported from India to Europa and the Portugueses imported same in the Levant. This is the reason for the Arabian name ,,Bortukan" for orange. The Saida and Jericho-oranges also exist since that time. The sweet oranges are in Jaffa since the 18-th century, while the Jaffa-oranges were unknown until the middle of the 18-th century. I shall describe in another place to what extent these dates are of any importance to the history of the Citrus-scale-insects. their distribution and importation to Palestine. The native land of all citrus-species imported is East-Asia.

The followings orange scale-insects exist in Palestine:
Chrysomphalus aurantii,
Chrysomphalus ficus,
Lepidosaphes pinniformis,
Lepidosaphes gloveri,
Parlatoria pergandei,
Parlatoria oleae,
Ceroplastes floridensis,
Saissetia oleae,

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[1]) From his book „The Gateway of Palestine" a history of Jaffa, which will appear in the next future.

Coccus hesperidum,
Pseudococcus citri, and
Icerya purchasi.

The following species have been imported in the latest past:
Icerya purchasi,
Lepidosaphes gloveri,
Chrysomphalus ficus.

Saissetia oleae is to be considered as native and it is almost certain that Chrysomphalus aurantii has been imported into Palestine at the earliest past as this scale insect lives on numerous isolated wild-growing plants (for instance Salix ssp.) and it appears to be completely naturalized.

Lepidosaphes pinniformis appears to have a double history of importation. The infection of the Bojares in Petach-Tikwah may be attributable to an importation of the latest past, while the attack of the wild Charubes (Ceratonia siliqua) and of Styrax in Karmel may be due to a far earlier importation. (Not with citrus!)

Ceroplastes floridensis, Coccus hesperidum and Pseudococcus citri may have been imported in the last few centuries, while Parlatoria pergandei and Parlatoria oleae must be counted to the eldest Citrus-scale insects of Palestine.

The following species have to be considered as most dangerous:

Pseudococcus citri,
Chrysomphalus ficus,
Lepidosaphes pinniformis,
Lepidosaphes gloveri.

The first species on account of the absolute great damage (see below) done by them, the latter ones, as their general importation may be reduced to the utmost limit by energetic measares for suppression and all power must be concentrated hereupon in next future.

The following species are of economical importance in plantations:

On Olea: Aspidiotus hederae and Aspidiotus britannicus. The first one causing great damage to the fruits (see below).

On Ficus: Ceroplastes rusci, Lepidosaphes conchiformis Lepidosaphes minima. Specially the first species is very troublesome in the hills on account of the fumago left behind.

On Pirus: Parlatoria oleae, Ceroplastes floridensis. Specially the young trees have to suffer considerably of the first species.

Vitis: Pseudococcus vitis is of great economical importance in the colonies of Judea where they live subterraneously on the roots in connection with the fungus Bornetina causing great damage.

On Saccharum: Pseudococcus sacchari. Not yet of any economical importance, but important for the future.

The following species are dangerous to forest-trees on account of their attacking them with fumago or smutt

Leucaspis candida and Leucaspis pusilla on Pinus,
Chionaspis striata on Cypressus and Thuja,
Epidiaspis gennadiosi on Pistacia,
Asterolecanium variolosum on Quercus,
Eriococcus araucariae on Araucaria,
Aspidiotus hederae on Ceratonia siliqua, Meliah azederach
Nerium oleander.

The following species are dangerous to ornamental — and indoor plants:

Aspidiotus hederae,
Lecanium hesperidum,
Lecanium hemisphaericum,
Pseudococcus citri,
Icerya purchasi.

The natural Enemies of the Coccidae of Palestine.

Numerous coccinellides or lady birds will be found on plants occupied by scale-insects. Some of them are in great importance for a natural control. The following species were observed as scale-insect destroyers:

Chilocorus bipustulatus L.
Coccinella septempunctata L.
Exochomus auritus Scriba

Halizia duodecimguttata Poda
Novius cardinalis Muls. (imported.)
Novius cruentatus Muls.
Scymnus quadrivulneratus Muls.

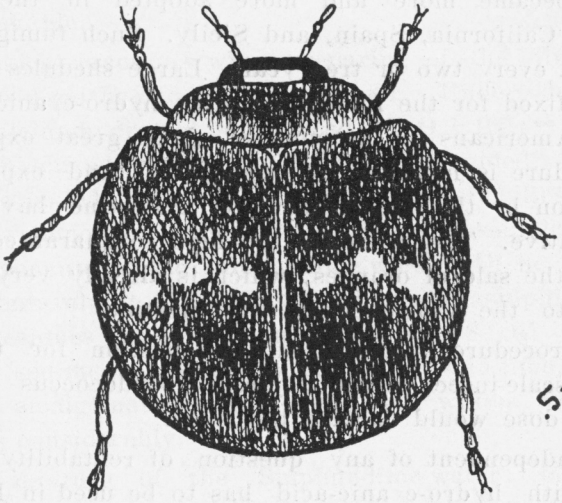


Fig. 1. Chilocorus bipustulatus.

The first species is of special economic importance as same is extremely coccidophagous.

One species of coccophagous lepidopterous larvae occurs on Lecaniinae in a more or less extent, Thalpochares scitula Rbr, observed till now on Lecanium oleae and L. pacheli.

Parasitical hymenoptera are far distributed, often in great intensity, but so far it has been impossible to begin with their breeding for want of breeding-glasses. The greatest attention must be giveu to the study of these parasites in connection with a possible biological control of scale-insects by them.

I have repeatedly noticed spiders and small mites on Bojares, but so far it has been impossible to determine any species.

The Methods of the Control.

The most radical and best control of the scale insects in plantations is the fumigation of the trees with Hydro-cyanic-acid under transportable tents. This procedure became more and more adopted in the orange-gardens in California, Spain, and Sicily. Such fumigation to be repeated every two or tree years. Large shedules of doses have been fixed for the fumigation with hydro-cyanic-acid by the North-Americans on account of their great experience. This procedure is however very expensive, and experiments of fumigation by the Government of Palestine have proved unremunerative. The costs are too high to guarantee a rentability for the sale of oranges, which is already very dificult according to the high exchange of Palestine.

The procedure is quite out of question for the most dangerous scale-insect of the Bojares, Pseudococcus citri, as the mortal dose would damage the trees.

But independent of any question of rentability the fumigation with hydro-cyanic-acid has to be used in Palestine in one case i. e. where Chrysomphalus ficus is found which lives in some Bojares in Galilee. This scale insect has to be kept out as far as possible of the large Orange centres of Samaria and Judea under all circumstances.

It must further be mentioned that the greatest dificulties for the fumigation may arise in many Bojares in Palestine according to the small distance between the plants in the elder Bojares.

When somewhere else a control is required it is advisable to spray with Californian sulphur-lime-solution.

Spraying-time in winter as so called dormant spray. Ready-made chemicals are more convenient, but for districts of 50 Dunam a self-fabrication would pay in any case. The purchase of a boiler of a contents of 50 or 100 liters and a hearth would be required for this purpose representing only one expence. The chemicals and the necessary fuel is cheap. The sulphur must be pure 98 or 99% sulphur flowers. The lime must be fresh burned with a contents of 90% Calcium-

oxyd (CaO.) without containing Magnesiumox d. The lime to be slakable quick or middle. Slaking-experiment: 3 hands full of lime in a boiler covered with water: quick slakable when diluted in 5 minutes, middle slakable when diluted in 5-30 minutes, when diluted in more than 30 minutes slowly slakable.

Chemical reactions when preparing of the lime water; Atfirst the lime has to slaked in water. Under development of heat Calciumhydroxyd is produced: $CaO + H_2O = Ca(O.H.)_2$. Sulphur mixed with some water has to be added. This mixture to be boiled while stirring continuously. Besides some other less important components the two soluble, effective main-components of the sulphur-lime-water will be developed: Calciumpentasulphit (Ca S_5) and Calciumtetrasulphit (Ca S_4). Sulphur-residues and Calciumsulphit (Ca. S. O_3) remain as unsoluble sediments. When magnesia exists in lime, numerous unsoluble amalgamations are developed, which increase the sediments considerably.

The mixture of the Sulphur-lime-water: take 850 gr. pulverized burned lime + 1450 gr. Sulphur-flowers and mix both parts dry, add then 10 liters of water and boil this lime waterwhile stirring permanently $^3/_4$ to 1 hour in an iron-boiler. This is the mother-liquor, which has to be diluted for use. Take therefor 1 part mother-liquor and 35 parts of water for the leaves, 1 part mother-liquor + 10 parts water for stem and branches. Quite a good success has been arrived at for instance when using this sulphur-lime-water in the ICA-garden in Petach-Tikwah against Lepidosaphes pinniformis.

This procedure has to be repeated in the following year by spraying twice. The best spraying-season in the Bojares for general control of the scale-insects is February to the middle of April.

Tobacco-soap-liquor is also very useful in some cases (Cf. text.)

Mixture: Boil some hands full of dry tobacco-leaves + 4 wash or salt-soap in 8 or more liters of water-pounds (coloured as dark tea) add 2 liters of paraffin (petroleum)

after cooling under stirring and add further 100 liter water to distro the scale insects.

The preparation out of nicotin-extract is more simple. 2 % green-soap and 1 % paraffin to be added to an aqueous solution of nicotine-extract of 1 %. The industrial manufacture of nicotine-extract for control-purposes of the plants has been begun with on our impuls in Palestine by way of trial.

In nurseries of young trees and on indoor-ornamental-plants brushing with one of these liquors by means of a supple brush or with a broad paint-brush are more effective while the above mentioned liquors have to be sprayed on to the plants in plantations.

It has to be pointed out as a general rule, that all spraying-mixtures develop their greatest effect against the young larvas and it is therefor advisable to proceed with spraying during the time of the larval development of the young generation.

In the next future the control of the most injurious insect of the sugar-cane-plantations, Pseudococcus citri, will be of great importance for Palestine and I therefore describe herewith shortly the production of paraffin-emulsion into which young slips have to be dipped for 2 minutes before planting them. (According to advice of the Ministry of Agriculture, Egypt): 1 pound of hard soap or 2 pounds of soft soap to be diluted in 5 liters of water and for this purpose to be put on fire for a short time. After taking the boiler off the fire 10 liters of paraffin or petrol to be added, liquor to mixed thoroughly. It must be prevented that paraffin or Petrol gather on the surface. Before using it, one part of this dilution has to be weakened with 30 parts of water and the slips then to be dipped for 2 minutes.

The Fumago-fungus often appears as vassal of the scale insect where it settles down on the sweet excrements of the scale insects and often covers the whole leaves. A special control of this fumago-fungus is unnecessary, as they disappear automatically after successful control of the coccidae. The most important fumago-fungus in Palestine attracted by scale-insects, the names of which I have to thank for to my

colleague Dr. Reichert,, are: on Olea Antenaria elaeophila Mont.; on orange Limacinia penzigi Sacc.; further other species on fig-trees and on Pinus halepensis.

In California and Italy another systematical method is well known besides these methods of technical control: the biological control. The natural enemies of the respective injurious insects, which are bread in special breeding-places, are used against them. There are for instance in California 3 breeding-places engaged with the breeding of the parasites of Pseudococcus citri. The lad-bird Novius cardinalis is bred in other breeding places against Icerya purchasi. The opinion of the Americans is that this biological control is generally a successful one, even if no radical destruction of the injurious insect is arrived at. It would therefore serve the purpose to erect in Palestine a small breeding place for the parasites of Pseudococcus citri.

Native Names of the Scale-Insects.

Between the Jews the scale insects in Hebrew are known as ,,Typhus'' or ,,Kermes''.

Aharoni in connection with the Talmudical word for manna-scale-insect ,,Mann'' gives them the name of ,,Manim''. But I have been unable to get this philological correct expression through.

The Hebrew professional expression is therefore:

,,Knimath hamagen'' (=scale-insect).

The Arabs call the coccidae ,,Djerab'' i. e. smallpose.

So they call for example Ceroplastes rusci on Ficus carica ,,Djerab ettin'' (Smallpose of the fig-tree) Aspidiotus hederae on Olea europaea ,,Djereb elset'' (smallpose of the olive-tree). The Arabs are of the opinion that the scale-insects result from dust (comm. Dr. Liebermann.) The old Arabian word ,,Kermes'' has been taken over by the science for the genus Kermes which infects the oaks and formerly has been used for dyeing-purposes.

Key for Determination of the Sub-families and species of the Scale-Insects of Palestine.

This key is only valid for the sub-families and species of Palestine. It is made to simplify the initiation of Palestine-

an naturalists in this group of animals, and it is based as far as possible on characteristics, which are visible with the naked eye or magnifying-glass, but the help of microscopic characteristics had been inevitable when describing the group of Diaspinae. The parallel with the list of nutritive plants will be almost sufficient for the diagnosis of the species, or else another parallel with systematical characteristics quoted in the text. The key in Lindinger, Afrikanische Schildläuse, V. Hamburg 1913 p. 64 had been used at a large scale for the Diaspinae.

Key for Determination of the Sub-Families.

1. Animals with scale. Analsegment (=P gidium) with special appendages and marginal-glands. Animals dorsiventral flattened, without legs. The scale, which is not connected with the insect bears 2 casted scales of the larva and nympha. Generally small, The adult animal fixed on the nutritive plant.

1. Diaspinae.

2. Animals without scale, of variable size.

I. Analopening with hairbearing ring.

A.) Hind-margin with narrow, more or less long slit.2 triangular, valviform lobes upon the analopening on the inside of the slit. Segment-limits more or less blurred. Animals flat to high-convex, always with flat abdominal-side, naked, often with wax-secretions. Adult animal fixed on the nutritive plant.

2. Lecaniinae.

B.) Abdomen without slit, analopening without lobes.

a.) Animals without legs, fixed, in a glass-like capsule or wax-like integument enclosed. Dorsal-skin characterised by 8-shaped marginal-glands.

3. Asterolecaniinae.

b.) Animals with more or less well developed legs, plainly segmental, generally covered with wax-secretions or enclosed in stringy-felty cover. Dorsal-skin without 8-shaped gland-openings.

4. Coccinae.

II. Analopening without hair-bearing ring.

A.) Without segment-limits, naked more or less spherical, with only a small fastening-spot. Feelers and legs missing.

5. Hemicoccinae.

B.) Segment-limits almost distinct, animal non spherical, generally with wax-secretions and partially with well developed legs and feelers.

a) Legs and feelers (10-11 limbed) distinct developed. Animal oval with large abdomens, attached by a characteristic crenulated ovisac of shaped wax-strings.

6. Monophlebinae.

b.) Animal with short stump-shaped feelers without legs, circular and dorsoventral flattened, with loose, wax-like cover.

7. Dactylopiinae.

Sub-Family-Coccinae.

Key for Determination of the Species.

A.) Body of the adult female always covered with wax-covers. Adult female with 8-limbed antennae.

Pseudococcus.

B.) Body of the adult female not covered with wax-covers, but completely enclosed in a wax-follicle. Adult female with 7-limbed antennae.

Eriococcus.

Sub-Family Lecaniinae.

A.) Adult female completely naked.

a.) Adult female highly convex.

1. Dorsal skin plainly polygonal fielded.

Saissetia.

2. Dorsal skin only incomplete fielded, with wide basis sitting upon the plant.

Eulecanium.

b.) Adult female almost flat. Dorsal skin only incomplete fielded.

Coccus.

B.) The adult female has an ovisac of wax.

a.) The ovisac is plainly formed, attached to the abdomen.

Pulvinaria.

b.) The adult female more or less complete covered by the ovisac.

1.) Adult female with well developed legs and feelers.

Euphilippia.

2.) Adult female with rudimental legs and antennae.

Eriopeltis.

c.) Adult female with large wax-squames on the whole visible surface of the body.

Ceroplastes.

Sub-Family Asterolecaniinae.

A.) Adult femal in a glass-like capsul enclosed, with fringes of short wax-strings on the margin.

Asterolecanium.

B.) Adult female in a felty integument of long wax-strings enclosed.

Pollinia.

Sub-Family Hemicoccinae.

Only genus: Kermes.

Sub-Family Monophlebinae.

Only genus: Icerya.

Sub-Family Dactylopiinae.

Only genus: Sphaerococcus.

Sub-Family Diaspinae.

A.) Squames, if existing, dagger-like. Marginal-glands with diagonal, generally blunt-coniform fortstanding opening, standing almost vertical to the segment margin in question. Lobes (with exception of L_1) generally double. Animal yellow or orange-red.

Group Diaspides.

B.) Squames rarely dagger-like. Marginal-glands never with diagonal or vertical standing opening, but this never coniform forthstanding. Lobes not double.

1. Colour of the anim al generally yellow or greenish Squames and marginal-glands limited on the analsegment. Squames almost longer than wide, pointed, with serrated and dentated side-margins.

Group Aspidioti.

2. Colour of the animal generally wine-red (more or less violet) rarely colourless, never yellow. Marginal-glands and often squames also on abdominalsegments adjoining the analsegment. Squames often wide with comb-shaped dentated top.

Group Parlatoriae.

Group Aspidioti.

A.) Lobes in 2—3 couples, besides some squames, but no hint of a fourth lobe.

Aspidiotus.

B.) Lobes in 4 couples, the fourth lobe at least hinted.

a. Scale with light-diaphanous, reddish or yellow exuviae. The fourth lobe only hinted.

Chrysomphalus.

b. Scale with dark, black exuviae, thick. 4 couples of lobes.

Melanaspis.

c. Only one couple of lobes, squames missing.

Targionia.

Group Diaspides.

A.) Scale of the adult female less longer than wide. Animal cryptogynous.

Crypthemichionaspis.

B.) Scale much longer than wide. Exuviae on the narrow front-end. Animal not cryptogynous.

a. Scale of male and female nearly equal formed, except the number of skins and the size.

Lepidosaphes (+ Pinnaspis).

b. Scale of male and female different. Female scale ham-or comma-shaped, more or less smooth, white or brownish; male scale white, carinated with parallel longitudinal margins.

Chionaspis.

C.) Scale of the adult female more or less circular.

a. Exuviae excentric. Animal circular. Pygidium with caudal margin convex, never concave, with a median couple of lobes, situated in concavity.

Epidiaspis.

b) Exuviae almost centric or subcentric. Pygidium with caudal margin deep concave, with a median couple of lobes situated in a concavity.

Diaspis.

Group Parlatoriae.

A.) Pygidium of adult female without lobes. Scale of adult female never with second exuvia. Cryptogynous.

Adiscodiaspis.

B.) Pygidium of adult female with lobes.

a. Scale long, narrow, with diminishing headpiece, widest in the last third, sometimes with longitudinal carination, white, exuviae on the head-piece. Animal oblong, cryptogynous.

Leucaspis.

b. Scale oblong, widest in the centre, exuviae on the head-piece or circular with more or less marginal-standing exuviae, brownish or greenish. Animal rather short, widest behind the middle, not cryptogynous.

Parlatoria.

c. Scale of the adult female oviform, widest in front. Exuviae of the second stage orange-yellow. Animal wide oviform, widest in the centre.

Pseudotargionia.

II. Special Part.

Sub-family Diaspinae.

Tribus Aspidioti.

1. Aspidiotus aharonii n. sp.

Description: Scale of the adult female very variable: circular to short-pyriform or elliptic, strong convex. Colour:

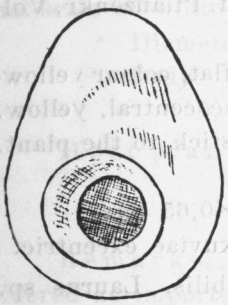


Fig. 2. Aspidiotus aharonii. Female Scale.

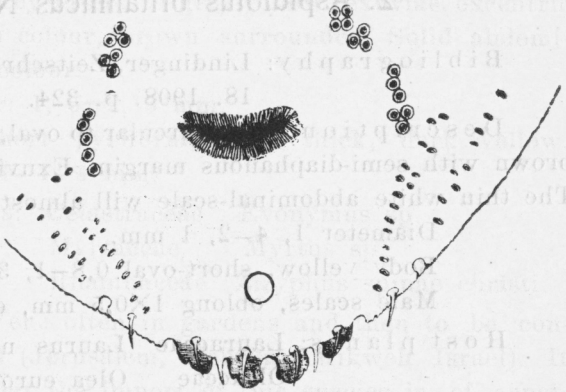


Fig. 3. Aspidiotus aharonii. Female Pygidium.

light grey-brown. Exuviae subcentric, circular. Exuviae of the first stage dark-red-brown, of the second stage light-red to light yellow-brown.

Diameter: 1, 2—1, 8×0, 9—1, 2 mm.

Body: short-oval, on both ends more or less pointed circular. Body: citry yelowish, pygidium dark yellow. Greatest width approximately in the middle.

Diameter: 0,60×0 43 mm.

Microscopic characteristics:

Circumgenital-glands: 4—6 : 4—8 : 4—8 : 4—6.

Structure of pygidium: L 1, P 1, L 2.

Lobe 1 large, wide circular and slightly notched. Plate 1 daggerlike. Lobe 2 much more slender and smaller.

Host plants: Leguminosae, Ceratonia siliqua.

Remarks: In connection with Aspidiotus lataniae and Lepidosaphes pinniformis on wild Carob trees in thick incrustation on the middle and small branches in the mountains near Benjamina.

This species pends systematically between Aspidiotus bavaricus Ldgr. and Aspidiotus ostraeiformis Curtis.

I dedicate this species to Mr. I. Aharoni of Rechoboth, whose merits with regard to the zoological exploration of Palestine are greatly esteemed.

Distribution: Palestine. Endemic.

2. Aspidiotus britannicus Newst.

Bibliography: Lindinger, Zeitschr. f. Pflanzenkr. Vol. 18. 1908. p. 324.

Description: Scale circular to oval, flat, colour yellow-brown with semi-diaphanous margin. Exuviae central, yellow. The thin white abdominal-scale will almost stick to the plant.

Diameter 1, 4–2, 1 mm.

Body yellow, short-oval 0,8–1, 3×0,65 mm.

Male scales, oblong 1×0,5 mm, exuviae excentric.

Host plants: Lauraceae Laurus nobilis, Laurus sp.
Oleaceae Olea europea, Olea sp.

Remarks: Found near Jaffa and Jericho on Laurus, distributed over the whole country on Olea. On the leaves, but rarely on small branches. It has two generations a year. The adult females to be found in June—July and October—November, but the generations are note quite simultaneous.

This insect does not cause any considerable injury, except yellow discolorations upon the leaves of Laurus.

According to our observations Lindinger is in his right, when he states that the olive-scale-insect,—distributed so far over the native land of the olive tree—is of East-Mediterranean origin, but the same observations contradict the supposition of the Author that Aspidiotus britannicus secondary and later passed over from shrubs of macchies to Olea. This species is to be found on the isolated, wild or cultivated Olea-

trees in whole Palestine. This fact shows that very old connections exist between scale insect and olivetree.

Distribution: Origin: Mediterranean territory, imported into North-America, Middle-Europe and England.

3. Aspidiotus camelliae Sign.

Synonymy: A. rapax Comst., Hemiberlesia camelliae (Sign.) Leon.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 90.

Description: Scale strong convex to conic, one-side displaced, colour grey-brown to grey-yellow, exuviae excentric of almost the same colour, brown surrounded. Solid abdominal-scale of white colour.

Diameter: 1, 5—2, 3 mm.

Body: short pyriform, very thick, dark yellow. 0, 8—1, 4 mm.

Host plants: Celastraceae Evonymus sp.
Myrtaceae Myrtus sp.
Rhamnaceae Ziz/phus spinae christi.

Remarks: Very often in gardens and then to be considered as imported (Jerusalem, Hebron, Mikweh Israel). It is almost certain that the import of this species is of considerable age with regard to its existing on wild Zizyphus near Benjamina.

Distribution: Cosmopolitan, sub-tropic.

(Aspidiotus confusus Froggatt).

Bibliography: Froggatt, Descript. Cat. Scale Insect Australia I, 1915, p. 13.

Description: I annexe here copy description of this species, new for the palaeartic region:

„Diameter of adult female puparium 1/25 in (=1 mm); circular, convex, of dullgrey tint, the pellicles are usually covered with the grey secretion, so that they appear as a simple white dot in the centre.

Adult female yellowish-brown, turbinate with the pygidium very finely marked with parallel striae and determinating at the extremity in two large rounded lobes separated from each other with a deep cleft with a similar smaller lobe separated in the same manner on each side, followed by a serrate depression and a smaller point on the side. Rows of pores running up on both sides of the abdominal segments from the tip of the body."

Host plants: Thymelaeaceae Thymelaea hirsuta.

Remark: On the stems and branches of this plant in the beaches north of Jaffa up to the Audscha now and then in dense occupation. I thought this species as A. labiatarum March; a well-known Mediterranean species, but I humbled myself before the authority of Mr. E. E. Green who has fixed this species as A. confusus.

As I was interested on the distribution Australia-Palestine I decided to study this species thoroughly, especially as Mac Gillivray (1921 p. 386) has declared the original-description as insufficient, when I received the following lines from Mr. E. E. Green: „I now find that Aspidiotus confusus Froggat inseparable from A. hederae".

This species is therefore to be inserted as synonym to A. hederae.

4. Aspidiotus hederae (Vall.) Sign.

Synonyms: A. nerii Auct., A. ceratoniae Sign., A. oleae Colv. etc.

Aspidiotus confusus (see there).

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 31.

Description: Scale of the adult female circular, plain convex, light-milk-coffee-brown. Exuviae excentric, yellow-brown.

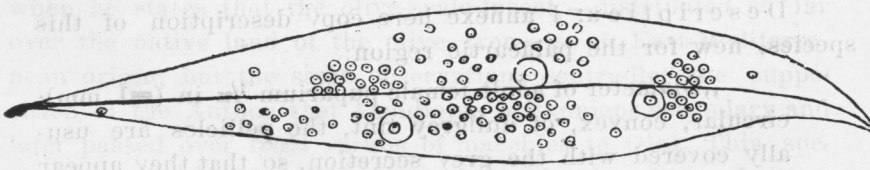
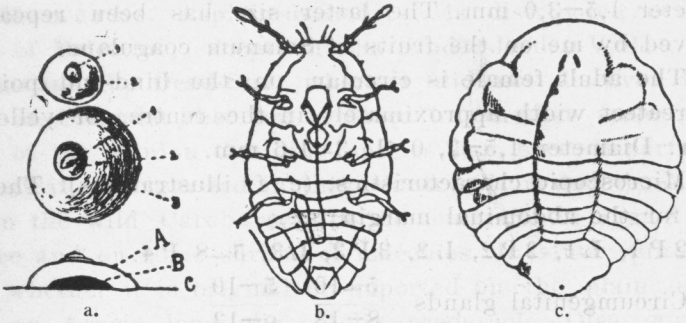


Fig. 4. Aspidiotus hederaeon. Oleander leave.



a. b. c.

Fig. 5. Aspidiotus hederae.
a. Larval and Female Scale. b. Female Larva. c. Adult Female.

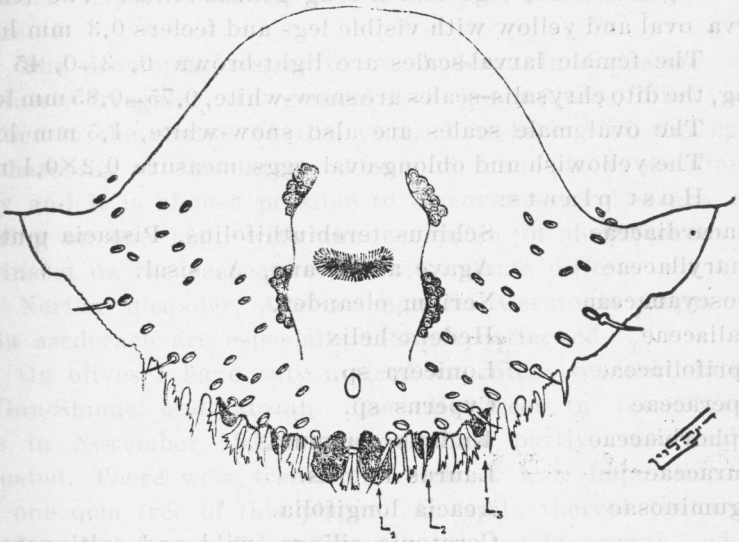
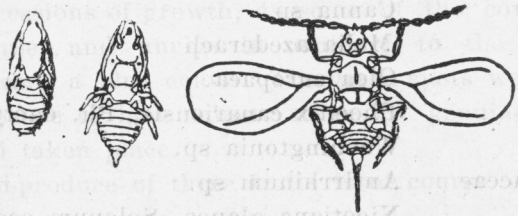


Fig. 6. Aspidiotus hederae. Female Pygidium.



a. b. c.

Fig. 7. Aspidiotus hederae.
a. b. Male larval and Nympha. c. Adult Male.

Diameter 1,5—3,0 mm. The latter size has been repeatedly observed by me on the fruits of Solanum coagulans.

The adult female is circular, on the hind-end pointed, the greatest width approximately in the centre, of yellowish colour. Diameter 1,5—2, 0×1, 3—1,6 mm.

Microscopic characteristics: (c. f. illustrations): The formula for the abdominal margin is:

2 P 1, L 1, 2 P 2, L 2, 3 P 3, L 3, 5—8 P 4.

Circumgenital glands $\frac{5—10}{8—13}$ $\frac{5—10}{8—13}$

Male yellow, winged, 0,75 mm long (without stilus) with big antennae, legs and a long genital-stilus. The female larva oval and yellow with visible legs and feelers 0,3 mm long.

The female larval-scales are light-brown 0, 3—0, 45 mm long, the dito chrysalis-scales are snow-white, 0,75—0,85 mm long.

The oval male scales are also snow-white, 1,5 mm long.

The yellowish and oblong-oval eggs measure 0,2×0,1 mm.

Host plants:

Anacardiaceae	Schinus terebinthifolius, Pistacia mutica.
Amaryllaceae	Agave americana, A, sisal.
Aposcyanaceae	Nerium oleander.
Araliaceae	Hedera helix
Caprifoliaceae	Lonicera sp.
Cyperaceae	Cyperus sp.
Euphorbiaceae	Ricinus communis.
Lauraceae	Laurus nobilis.
Leguminosae	Acacia longifolia.
	Ceratonia siliqua (wild and cultiuvated).
Liliaceae	Dracaena sp., Asparagus repens,
Marantaceae	Canna sp.
Meliaceae	Melia azederach
Oleaceae	Olea europaea.
Palmaceae	Phoenix canariensis, Ph. dactylifera,
	Washingtonia sp.
Scrophulariaceae	Antirrhinum sp.
Solanaceae	Nicotiana glauca, Solanum coagulans.
Thymelaeaceae	Thymelaea hirsuta.
Vitaceae	Vitis vinifera.

Remarks: Aspidiotus hederae is distributed over all parts of Palestine, except in the Under-Jordan-Valle , near Jericho and the Dead-Sea, where I did not discover them. Even on Oleander the are replaced b. another scale-insect. I am of the opinion that this species has been imported as well, as it is originated in this country. It is doubtless original on the wild Carob-trees in the mountains of Samaria and Galilee and on some shrubs of macchies. It is not quite certain, whether it is original or imported on the plain of the coast on Acacia longifolia, Melia azederach, Olea europea, cultivated charubs and oleander. It is quite certain that it has been imported on the numerous ornamental-and indoor-plants.

The developing-stages of A. hederae in Palestine are absolutely irregular. In general 2—3 generations follow one another in the course of the year. The la ing of the eggs and hatching of the larvas does not take place simultaneously and it is almost possible to discover several stages coexisting on one leaf, with the exception of development of the insect on the respective nutritive plants differs.

Nerium oleander, Acacia longifolia, Ceratonia siliqua and Melia azederach are especially intensive attacked.

On olives I have only noticed an intensive incrustation in Gan-Shmuel and Mozah. The olive-trees in Gan-Shmuel were in November 1922 at harvest-time partly considerably incrusted. There were trees, on which it was impossible to find one qcm free of this plague. In spite thereof the tree, branches and leaves did not appear stunted in growth, while the more than ample incrusted fruits produced partly considerable repressions of growth, as some of the covered spots were still green and unripe in contrary to the ripe fruit, showing already a blue colour. The green spots were also less thick than those of blue colour, so that a genuine gall-development had taken place.

The oil-produce of these fruits is of course considerably reduced.

The leaves on Oleander, Carob (cultivated form), Acacia longifolia, Hedera helix are specially heavy covered. The latter

plant shows chlorotic discolourations, when very heavy attacked. Stem and branches are heavily incrusted on wild Carob in the mountains and the fruits on Melia azederach.

It is interesting that this species does not appear to be on citrons and oranges in Palestine and Egypt, while the same A. hederae is considerably injurious to the like plants at Cyprus, S ria and other Mediterranean countries.

The injur caused by A. hederae to the respective plants is of no influence to their vital-power, while a strong reduction of beanty has been observed on Oleander, cultivated Carob, Acacia longifolia and Melia azederach. The olive-trees show considerable reduction of the oil-produce; but the effect of a control with h drocyanic-acid-fumigation or sulphur-lime water would not pay when the costs herefore are considered, specially as in the rain-period these plants are cleaned automaticall, by the rain.

The loss of beauty on indoor-plants is of course of greater importance. Here it would be advisable to wash the attacked parts of the plant with warm water, to which 5% soap and 2% petroleum have been added, while using a strong brush. This control to be repeated 2 or 3 times a year.

As natural enemies work: Lady-birds, specially Chilocorus bipustulatus and parasitic hymenoptera, but with still insufficient success.

Distribution: Origin most probably Mediterranean territory, to-day cosmopolitan, subtropic.

5. Aspidiotus herzlianus n. sp.

Description: Scale of the adult female more or less circular, little convex, on the exuviae raised to a point. Colour dull-white with light brownish touch. Exuviae sub-to excentric. Exuviae of the first stage elliptic, shining black-brown, of the second stage, shining red-brown, circular.

Diameter 1,5 — 2,2 mm.

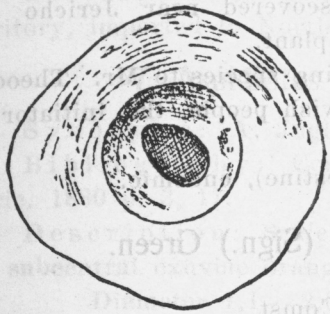


Fig. 8. Aspidiotus herzlianus Female Scale.

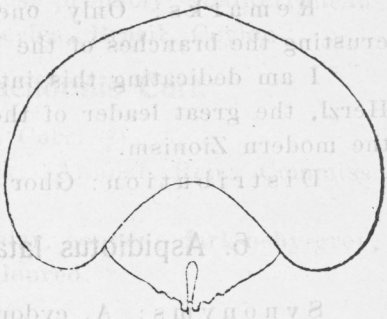


Fig. 9. Aspidiotus herzlianus. Female Body.

Body in form and size very variable, generally kidney-shaped, only the pointed pygidium, which is wide-circular, forthstanding, somewhat wider than long, greatest width in the middle. Colour dull-yellow, colour of the pygidium intensive yellow.

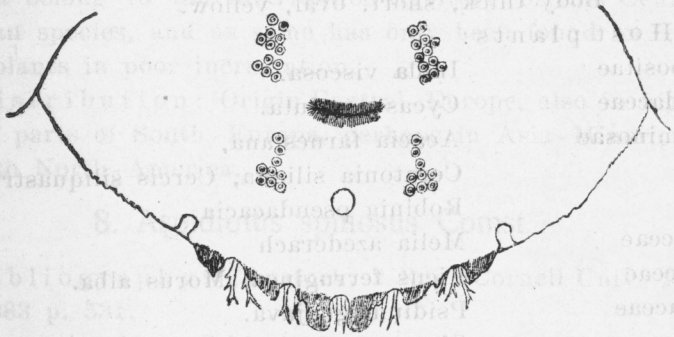


Fig. 10. Aspidiotus herzlianus. Female Pygidium.

Diameter 0,37 — 0.59 × 0,41 — 0,61 mm.

Microscopic characteristics: formula of the margin of the pygidium P_1, L_1, $2P_2$, L_2, 2 — 3 P_3, L_3.

Lobe 1 wide circular, notched, Lobe 2 wide and notched, Lobe 3 running to a point. Plate 1 and Plate 2 dagger-like, all other plates crenated.

Circumgenital glands: 9 : 12 : 12 : 9

Hostplants: Liliaceae. Asparagus aphyllus.

Remarks: Only once discovered near Jericho incrusting the branches of the host-plant.

I am dedicating this interesting species to Mr. Theodor Herzl, the great leader of the Jewish people, the initiator of the modern Zionism.

Distribution: Ghor (Palestine), endemic.

6. Aspidiotus lataniae (Sign.) Green.

Synonyms: A. cydoniae Comst.

Bibliography: Hall, Observations on the Coccidae of Egypt 1922 p. 25.

Description: Scale visible convex, circular, but on one side displaced, the highest convexity on the front end; colour generally grey or grey-brown, on the margin more or less diaphanous. The blackish-yellow exuviae excentric. Abdominal-scale white.

Diameter 1,0 — 1,5 mm.

Body thick, short, oval, yellow.

Host plants:

Compositae	Inula viscosa.
Cycadaceae	Cycas revoluta.
Leguminosae	Acacia farnesiana, Ceratonia siliqua, Cercis siliquastrum Robinia pseudacacia.
Meliaceae	Melia azederach
Moraceae	Ficus ferruginea, Morus alba.
Myrtaceae	Psidium guajava.
Oleaceae	Olea europaea.
Platanaceae	Platanus orientalis
Rosaceae	Eriobotrya japonica
Solanaceae	Solanum coagulans
Sterculiaceae	Brachychiton sp.
Thymelaeaceae	Thymelaea hirsuta.

Remarks: This species frequently to be discovered on native herbs, such as Thymelaea, Inula, Solanum coagulans and on imported plants

Common in the whole country, except the Sub-Jordan-Valley.

Distribution: Origin most probably Mediterranean-territory, imported to North-America, Brazil, Ceylon.

7. Aspidiotus ostraeiformis Curt.

Synonyms: A. Juglandis Colv. (?)

Bibliography: Comstock, Annual Rep. Commiss. Agric. 1880 p. 3, 11.

Description: Scale circular, convex, dark-ashy-grey, the subcentral exuviae orange-coloured.

Diameter 1,1 — 2,0 mm.

Body circular, yellow, about 1 mm. long.

Host Plants: Juglandaceae Juglans regia.
Rosaceae Pyrus malus.

Remarks: I have been surprised to meet this scale insect — which is well known to me from the Rheingau — twice in Palestine, but in very small degree: In Ness-Zionah on Juglans and in Petach-Tikwah on apple trees. An importation in the latest past is most probable, as Palestine does not belong to the distribution-territory of this Central-European species, and as same has only been found on cultivated plants in poor incrustation.

Distribution: Origin Central-Europe, also in higher situated parts of South-Europe, perhaps in Asia-Minor; imported to North-America.

8. Aspidiotus spinosus Comst.

Bibliography: Comstock, 2 Rep. Cornell Univ. Exp. Stat. 1883 p. 531.

Description: Scale little convex, oval, colour smutty whitish-grey, with yellow-brown, subcentric to centric Exuviae, sometimes with white margin.

Diameter 0,9 — 1,5 mm.

Body yellow, pyriform, most wide before the centre.

Diameter 0,8 — 1,2 mm.

Host-Plants. Araliaceae Hedera helix.

Remarks: Once discovered on the surface of ivy-leaves in the garden of Hotel du Parc, Jaffa. It is most probable, that this species has been imported.

Distribution: Central-Mediteranean-territory, probably imported to North-America.

9. Aspidiotus zonatus Fraenfeld.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 54.
Lindinger, Schildläuse Europas 1922 p. 278.

Description: Scale circular, little convex, smooth, grey-brown Exuviae generally excentric, light-brown-red.

Diameter 0,8 — 1,5 mm.

Body short, oviform, widest before the middle, of light-yellow, on the pygidium brown-yellowish colour. Diameter till 1,3 mm.

Host-Plants:

Fagaceae	Quercus coccifera, Q. lusitanica.
Moraceae	Ficus carica (?)
Rhamnaceae	Zizyphus spinae christi (?)

Remarks: On Quercus coccifera and lusitanica near Nahalal with Asterolecanium variolosum and Targionia distincta together in typical exemplars on the middle branches.

Dr. Lindinger is not sure if the other specimens on Zizyphus near Semakh and Ficus in Sarona belong to this species. Further exploration-material with regard to this question will be still necessary, but it appears to me, that these animals should be counted to this species.

Distribution: Central-Europe, Pyrenees, Italy, but females only south of Tyrol. A. zonatus must therefore be considered as a Mediterranean species.

10. Chrysomphalus aurantii (Mask.) Ckll.

(The red scale)

Synonyms: Aonidiella aurantii (Mask.) Berl. et Leon.

Bibliography: Comstock, Annual Rep. Commiss. of Agric. for 1880 p. 239.

Description: Scale circular, flat, only in the middle raised pointed. Colour reddish-grey. Exuviae orange-coloured till reddish, central, often being their colour covered.

Diameter about 2 mm.

Body: kidney-shaped, with forthstanding abdomens, orange-yellow, Diameter 1,0 — 1,2 mm.

Host Plants:

Anacardiaceae	Pistacia lentiscus
Euphorbiaceae	Ricinus communis.
Lauraceae	Laurus nobilis.
Leguminosae	Acacia farnesiana, A. longifolia, Ceratonia siliqua.
Musaceae	Musa sapientium.
Rosaceae	Rosa sp., Pirus pirus.
Rutaceae	Citrus aurantium, C. limonum, C. ssp.
Salicaceae	Salix. sp.
Tamaricaceae	Tamarix articulata (one the stem).

Remarks: All over Palestine with exception of the Jordan-Valley. Especially distributed on Citrus ssp., Salix ssp. and Rosa ssp., a distribution known in the whole world. The insect attacks stem, leaf and fruits. This very fertile species has 2-3 generations a year.

Found on oranges, which are not sufficiently watered, specially on bigaradies and lemons, where they often produce chlorotic discolourations on the leaves, and where they densly incrustate the stem. They are of no great influence to oranges. which are well cultivated, even not in case of dense incrustation. They are also occasionally a plague to Rose-stems. If control should be necessary, it is advisible to

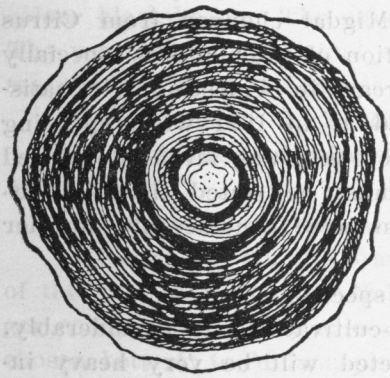


Fig. 11. Chrysomphalus aurantii.

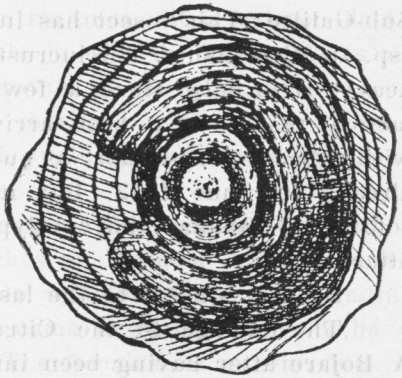


Fig. 12. Chrysomphalus ficus.

spray with sulphur-lime-water or with petroleum emulsion, eventually by brushing the stems at the same time with this liquor.

Distribution: Origin likely Australia, now cosmopolitan tropical and subtropical.

11. Chrysomphalus ficus Ashm.

Synonyms: Aspidiotus aonidum L.

Bibliography: Comstock, Annual Rep. Commiss. of Agric. for 1880 p. 236.

Description: Scale very much like the last species, but almost blunt-conical, blackish-broun with reddish-brown to orange coloured exuviae.

Diameter about 2 mm.

Body: kidney shaped, with forthstanding abdomen, yellow; Diameter 1,0 — 1,4 mm.

Host-Plants:

Leguminosae	Acacia longifolia,
Musaceae	Musa sapientium,
Myrtaceae	Eucalyptus globulus,
Oleaceae	Olea europea (P. A. Buxton comm.)
Palmaceae	Washingtonia sp.
Rutaceae	Citrus aurantium, C. limonium, C. ssp.

Remarks: Found by me only so far in Migdal (on the bank of the lake of Galilee), but I am informed that this species has also been found locally in other orange plantations in Sub-Galilee. This insect has in Migdal changed from Citrus ssp. to other plants. The incrustation of the plants is especially heavy. It is only since a few years in Palestine. No satisfactory results have been arrived at in 1921 when spraying with tobacco soap-liquor, as numerous young larvas developed already in June 1922. But it must be stated that the uncontrolled bananas and eucalyptus were considerably heavier attacked.

Biology similar to the last species.

The damage to the Citrus-cultivations is considerably. A Bojare after having been infected will be very heavy incrusted already within 2 years according to the experience in

Egypt and Syria where this species happens to be very injurious. The value of the harvest of such Bojares will be reduced to one third of its original value. Many of the attacked fruits drop off untimely. It is duty of the Government to prevent by ample precautions the infection of the maincentres of the orange-cultivation in Chederah and Jaffa — district, as this plague is so far only known in Sub-Galilee. As only a fumigation with hydrocyanic-acid secures a satisfactory result, all attacked gardens should be fumigated under control of the Government. I am informed that this will now be done for instance in the Bojare of Migdal, which has been heavily attacked. An economical catastrophe of the orange-gardens will be sure if this scale insect is further distributed over the country. It should be strictly forbidden to forward oranges from Bojares attacked by Chr. ficus to other parts of the country. It will be of great importance to report such places where this scale-insect has been found, to me at the Agricultural Experiment Station, Tel-Aviv, P. O. B. 121.

Distribution: Cosmopolitan, tropical and sub-tropical

12. Melanaspis inopinata (Leon) Ldgr.

Synonyms: Aonidiella inopinata Leon; A .robusta Grassi et Berl.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 83.

Description: Scale circular, strong, much convex; colour black-brown. The subcentric to excentric exuvia black. The very strong abdominal scale is whitish. The scale is often covered by an epidermis-stratum of the bark.

Diameter: 1, 7—2, 3 mm.

Body oblong oval, wine-red, pygidium red-brownish, about 1 mm long.

Host plants: Anacardiaceae Pistacia terebinthus.

Remarks: On the branches of Pistacia on the banks of the lake of Merom, at Nahalal and Jerusalem. Dr. Lindinger counts this insect, whose „name Leonardi could not have chosen better" to Melanaspis. The females sit on the bigger branches in a gall-like hollow and are quite overgrown by an epidermis-stratum of the bark. The shallow hollows caused by

the insects to the bark can be easily seen after stripping off the bark by the remaining white abdominal scales.

This species is injurious to Amygdalus and Pyrus in Italy. and Egypt.

Distribution: Mediterranean: Italy, Egypt, Palestine.

13. Targionia distincta Leon.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 114. Lindinger, Schildläuse Europas 1912 p. 278.

Description: Scale circular, convex; grey-black. Exuviae centric, orange-coloured. With visible white abdominal scale.

Diameter 0,95—1,4 mm.

Body oblong-oval, with pointed hind-end, wine-red with yellow pygidium. 0,72×0,6 mm. wide.

Host plants: Fagaceae Quercus lusitanica, Q. coccifera.

Remarks: Near Nahalal in dense incrustation on the middle and small branches of the oak-kind mentioned.

Dr. Lindinger fixed this species for me as T. distincta Leon, while I thought it was T. vitis Sign. However vary sizes and colours somewhat with the descriptions of Lindinger and Leonardi.

Distribution: Mediterranean: France, Italy, Palestine.

(Targionia nigra Sign.)

Bibliography: Bodenheimer, Bull. Soc. Entom. d'Egypte 1923.

Remarks: This species may also be exspected for Palestine, as I have discovered it closed to the south-frontier near El-Arish on a desert-shrub.

Distribution: Central Mediterranean territory, Sinai.

Tribus Diaspides.

14. Diaspis echinocacti (Bché) Fern.

(The Cactus Scale.)

Synonyms: D. cacti Comst., D. calyptroides Costa.

Bibliography: Lindinger, Schildläuse Europas 1912 p. 235.

Description: Scale of the adult female more or less circular, convex, whitish. Exuviae excentric, brown-black.

Diameter 1,8 — 2,1 mm.

Animal short pyriform, yellow. Diameter 1 —1,2 mm.

The male scales oblong, with a longitude carination, white, exuviae yellowish, diameter 0,9 mm.

Host Plants:

Cactaceae Opuntia ficus indica and other species of Prickly Pears.

Remarks: Very common in Palestine, except in the under Jordan-Valley, where I have been unable to find it (Jericho, Dead Sea). I cannot agree with Mr. Essig that they do any important injury to the infected plants, which it attacks on leaves and fruits. The species is very prolific.

Distribution: Cosmopolitan tropical and subtropical. Origin: America.

15. Diaspis visci (Schr.) Löw.

Synonyms: D. juniperi (Bché) Sign.; D. carueli Targ.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 192.

Description; Scale of the adult female oblong oval to circular, strong convex, white. Exuviae excentric, yellow-brown.

Diameter 1,5 — 2,0 mm.

Animal short pyriform,, yellow or brown, diameter 0,8 — 1,0 mm. long.

The male scales oblong with three longitudinal carinations, colour white, exuviae yellowish. Diameter 0,8 — 1,0 mm.

Host Plants; Coniferae Cupressus sp., Thuja sp.

Remarks; Occuring now and again in Tel-Aviv and Mikweh-Israel. Found side by side with the scales of Chionaspis striata, generally on the fir-cone, rarely on the needle-leaves. This species has only one generation a year and appears to have a very small increase.

Distribution; Europe, Mediterranean, imported to North-America.

16. Chionaspis berlesei Leon.

Bibliography; Leonardi, Cocciniglie italiane 1920 p. 236.

Description; Scale of the adult female mussel-shaped, long and straight, little convex. Colour white, colour of the exuviae on the front-part yellowish.

Diameter 1,5 — 2,1 × 0,3 — 0,5 mm.

Animal oblong oval, of wine-red colour, diameter 1,0 × 0,3 mm.

Host Plants; Liliaceae Aspargus sp.

Remarks: Lives on leaves and branches, generally in dense incrustation. Once found on the Audja near Jaffa, another time in the Transjordanean mountains on the way to Es-Salt.

Distribution; Mediterranean Territory.

(Chionaspis citri Comst.)

Froggat (Journ. of Dept. of Agric. of Victoria, Melburne Vol. 6, 1908 p. 489) writes; „On Syrian oranges was pretty thick Chionaspis citri."

In spite of my special attention with regard to this insect I have been unable to trace this species, known from Australia and North-America, so that Lindingers suspection it may be a mistake, probably meets the fact. An incrustation the orange-groves in Palestine by this species would not have been overlooked by me. Mr. Froggat was kind enough to forward me typical material from Australia; but after inspecting this material, I must repeat my suspection that there is a mistake.

17. Chionaspis engeddensis n. sp.

Description: Scale of the adult femal wide hand shaped, flat, greyish white. Exuviae excentric, situated on the front margin. Exuviae of the first stage short oval, almost concentric over that one of the second stage, but smaller darkbrown. Exuviae of the second stage oblong oval with the top pointed to the front, redbrown.

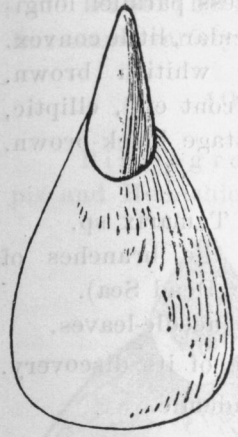


Fig. 13. Female Scale of Chionaspis engeddensis

Diameter:
2,5 × 1,8 mm.
Animal oblong pyriform, on the pygidium wide circular, greatest width in the last third. Colour dull-yellow, as pygidium is coloured somewhat more intensive.

Diameter:
0,84 × 0,43 mm.
Microscopic charakteristics: Formula of the pygidiummargin:

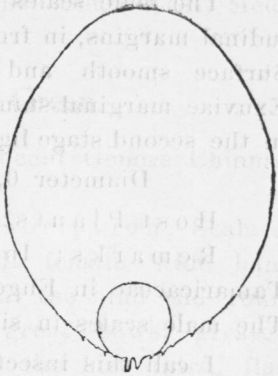


Fig. 14. Female of Chionaspis engeddensis

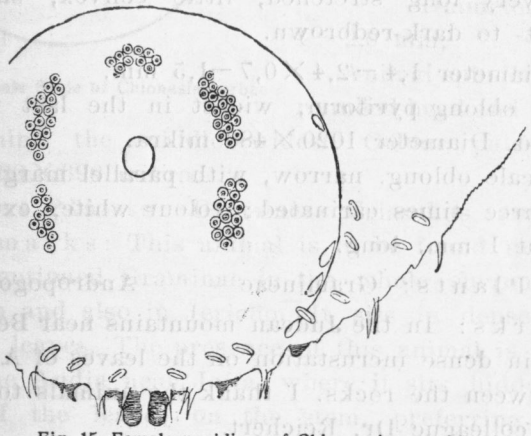


Fig. 15. Female pygidium of Chionaspis engeddensis

L1, P1 — 3, L2 P4 & 5, L3, P6 — 8

Lobe 1 far drawn forth and wide circular, on the basis of the outside notched. Lobe 2 on the outside notched. Lobe 2 on the outside notched, both tips very pointed. Lobe 3 wide circular. All plates long and daggerlike.

Perivaginal-glands: 10 — 13 : 16 — 19 : 10 : 19 — 16 : 13 — 10

The male scales oblong, with more or less parallel longitudinal margins, in front and at the back circular, little convex. Surface smooth and uncarinated. Colour whitish brown. Exuviae marginal-standing, situated at the front end, elliptic, in the second stage light-brown, in the first stage black-brown.

Diameter 0,9 – 1,0 mm.

Host Plants: Tamaricaceae Tamarix sp.

Remarks: In single exemplars on the branches of Tamaricaceae in Engeddi (West-bank of the Dead Sea). The male scales in single exemplars on the needle-leaves.

I call this insect according to the place of its discovery.

Distribution: Ghor (Palestine) endemic.

18. Chionaspis graminis var. aegyptiaca Hall.

Bibliography: Hall, Coccidae of Egypt 1922 p. 28.

Description: Scale of the adult femal short hammershaped to very long stretched, little convex, snow-white, exuviae light- to dark-redbrown.

Diameter 1,4 – 2,4 × 0,7 – 1,5 mm.

Animal oblong pyriform, widest in the last third. Colour wine-red. Diameter 1020 × 480 mikra.

Male scale oblong. narrow, with parallel margins, often distinctly three times carinated; colour white, exuviae redbrown, about 1 mm. long.

Host Plants: Gramineae Andropogon sp.

Remarks: In the Judean mountains near Ben Shemen once found in dense incrustation on the leaves of Andropogon growing between the rocks. I thank the animals to the kindness of my colleague Dr. Reichert.

Mr. Hall wrote my in his letter: „Your Chionaspis graminis var. incerta on Andropogon is very close to my var. aegyptiaca; the only difference I can see is in the size of the Median lobes, which are smaller and of rather different shape to the median lobes in my variety“ As I am not yet in possesion of an exact description of this new variety, I shall in the meantime determine the animal to this variety.

Distribution: Egypt, Palestine. South-East Mediterranean variety of an oriental species.

19. Chionaspis herbae Green.

Bibliography: Cooley, The Coccid Genera Chionaspis and Hemichionaspis 1899 p. 37.

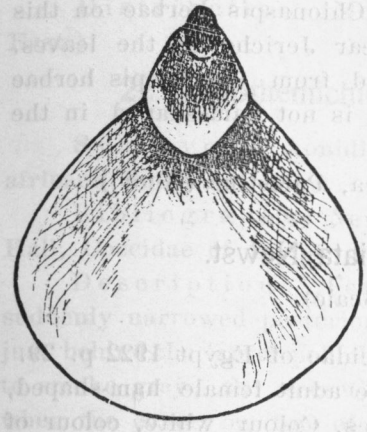


Fig. 16. Female Scale of Chionasis herbae

Description: Scale of the adult female wide ham-shaped, at the hind end rounded in great bows, greatest width in the last third, flat. Colour greywhite, the forth-standing exuviae of the second stage wide spindle-shaped, dull-yellowish brown, of the first stage elliptic, shining yellow-brown.

Diameter 2,0 — 3,5 × 4 — 2,0 mm,

Animal spindle-shaped, with rounded head and pointed hind-end, behind the middle widest. Colour pale-yellow. Diameter 1320 × 696 mikra.

Host Plants: Gramineae Erianthus ravennae.

Remarks: This animal is to be found in the remains of the mentioned Graminae in the whole surrounding of the Dead Sea and also in Jericho. It sits in dense incrustation upon the leaves. The presence of this animal is very interesting on the Audja near Jaffa, where it sits hidden under the covers of the leaves on the stem, preferring thereby the knots.

Distribution: Oriental. (Ceylon, India, Palestine, Transjordania.)

20. Chionaspis stanotophri Cooley.

Bibliography: Cooley, The Coccid Genera Chionaspis and Hemichionaspis 1899 p. 35.

Distribution: Scale of the adult female oblong, wi
est behind the middle, plainly convex, colour white. The fort
standing exuviae are of citron-yellow-colour.

Diameter: 2,5 × 0,6 — 0,8 mm.

Animal oblong oviform, widest in the second hal
yellowish.

Host Plants: Gramineae Erianthus ravenna

Remarks: Together with Chionaspis herbae on th
Graminea on the Dead Sea and near Jericho on the leave
This species is easily differentiated from Chionaspis herb
by the much narrower scale which is not ham-shaped in t
second half.

Distribution: South-Africa, Palestine (Ghor.)

21. Chionaspis striata Newst.

(The Snow Scale).

Bibliography: Hall, Coccidae of Egypt 1922 p. 29

Description: Scale of the adult female ham-shape
distinctly convex, with cross-strapes. Colour white, colour
the spot on the front-end yellow brown.

Diameter 1,0 — 2,0 x 0,7 — 1,0 mm.

Animal long, oviform, widest behind the middl
0,8 — 1,5 mm. long.

Male scale long, narrow, three times carinated. Colo
snow white. Spot yellowish. Diameter 1,0 — x 0,4 mm.

Host Plants; Coniferae Cupressus sp., Thuja s

Remarks: This species is distributed over the wh
of Palestine and very common, so that there is scarcely o
cypress or Thuja, which is free of it. The trees are in spri
snow white covered with it and the females of the seco
generation ripen in July and August. I cannot yet state wi
surety whether there is a third generation in the beginning
winter.

It is a great nuisance to nursery cultivations, as t
needle-leaves grow brown and the little will be delayed
their growth To elder trees it is an injury by brown d
colouration of the needle-leaves, but a control is not wo

its while. The best control for plantations is spraying or still better brushing with tobacco-soap-liquor or sulphur-lime-water, especially in February-March, against the young larvae of the spring-generation.

My microscopic preparations show the same characteristics, as those described and illustrated by Hall from Egypt (loc. cit.)

Distribution: Mediterranean (predominating in the East.)

22. Crypthemichionaspis africana Newst.

Synonyms: Aonidia parlatoroides Newst.; Fiorinia africana Newst.

Bibliography: Newstead, Bull. Ent. Res. 1911 p. 90. Hall, Coccidae of Egypt. 1922 p. 35.

Description: „Female puparium somewhat oval, but suddenly narrowed posteriorly, widest and very highly convex just behind the larval pellicle. Colour varying from pure white to smoke grey; the secretionary matter is pure white, but when the cover on top of the exuviae of the second stage of the female (second pellicle) is thin, the dark colour of the insect sheines through, givining the puparium a smoky grey tinge. Overcrowded examples of the puparia become distorted and irregular in shape as in other Diaspinae under similar conditions. Larval pellicle usually ochreous buff, often with a small bottle green spot at the caudal extremety. Second pellicle piceous or dark castaneous, sometimes with a dull crimson field in the centre; The colour is, nowever, very variable.

Length: 1,75 — 2 mm.

Male puparium relatively large, sides more or less parallel, convex for the greater part, but with the posterior extremity flattened. Pellicle usually bottle green, but a few examples are dull greenish yellow: in some instances they occupy an almost oblique position; in others they are parallel with the secretionary portion. Normally they are straight, but in a very large percentage of cases they are curved or contorted owing chiefly to overcrowding or to the nature of the bark upon which they are fixed."

(From Newsteads original description.)

Adult female short pyriform, distinctly segmental, greatest width in the first third. Colour darkbrown.

Diameter: 0,41 × 0,25 mm.

Host Plants:

Salicaceae Populus euphratica, P. canescens, P. nigra var. italica
Salix babylonica

Oleaceae Olea europea.

Remarks: In the Ghor (Jericho, Beisan, Gisr Geranyia) everywhere common. Only incrusting stem and branches. I found numerous male scales on the leaves of an apricot-tree in Jericho, which may belong to this species. But I leave the determination of the species over until I will found the corresponding females.

Distribution: Egypt, Palestine (Ghor).

23. Epidiaspis gennadiosi (Leon) Ldgr.

Bibliography: Lindinger, Schildläuse Europas. 1912 p. 265.

Description: Scale of the adult female irregular circular, convex Colour pale yellow, with white irregular margin. Exuviae sub to excentric. Second larval skin shows about the shape of the adult animal and the notch on the back margin. Colour yellow, on the margin brownish. The first larval skin short oval, yellowish.

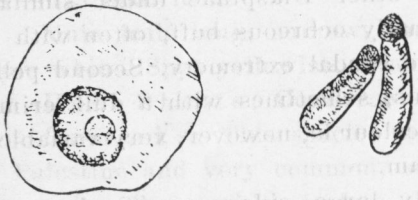


Fig. 17. Scale of Epidiaspis: at left of adult Female at right of male Nympha.

Diameter 2,0 — 2,5 mm,

Animal circular to pyriform, somewhat before the middle widest, redbrown with yellow wide triangular analsegment. Diameter 0,7 × 0,6 mm.

Male scales oblong narrow, with parallel longitudinal-margins. Colour white, spot lightbrown. Diameter 1,1 × 0,4 mm.

Host Plants:

Anacardiaceae Pistacia lentiscus, P. terebinthus, P, vera, P, mutica.

Remarks: Everywhere in the mountains and on the macchie-shrubs where Pistaceae are growing (i. e. Lake of Huleh, Nahalal, Karmel, Athlith, Chederah, Jerusalem.) The male scales sit in crowds on the leaves, while the female scales are only found in singular exemplars on leaves and branches. Formations of fumago often turns up in succession of them.

A plant gall not well known, is produced by this species on Pistacia ssp. Lindinger (1912 p. 265) writes that it causes somtime irregular, flat deepenings. On my samples there are more or less regular deepenings from the form and diameter of the scales. These galls are very common on the small branches, whilst this scale insect may not produce deformations on the leaves. All deformations are only produced by the females.

Distribution: East Mediterranean.

24. Lepidosaphes bicuspis Hall.

Bibliography: Hall, Further observations. Cairo 1923 p. 22.

Description: Scale of the adult female wide, comma-shaped to ham-shaped, also often elliptic. Generally a little curved, only slightly convex. Colour greyish white. Exuviae of the second stage elliptic, longitudinal situated of the same colour as the scale and therefore difficult to recognize. Exuviae of the first stage elliptic oblique situated, yellow. A strong thick abdominal scale of greyish colour is in tight connection with the scale.

Diameter 1,7 × 1,2 mm.

Animal pyriform, distinctly segmental, greatest width in the last third, colour yellow when alive, dried darkbrown.

Diameter 0,66 × 0,41 mm.

Host Plants: Tamaricaceae Tamarix sp.

Remarks: In partially crustaceous attack on the branches of Tamarix sp. on the way from Jericho to the Jordan Bridge (Gisr Geranyia).

Distribution: Egypt, Palestine (Ghor)

25. Lepidosaphes conchiformis (Gmel). Sign.

(The Greater Fig Musstl Scale.)

Synonyms: Mytilaspis ficus Sign.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 163.

Description: Scale of the adult female similar to the one of L. pinniformis, narrow, straight or curved, convex, distinctly oblique striped. Colour black-brown, spot dull orange-coloured, often covered.

Diameter 1,5 — 2,5 mm. long.

Animal oblong pyriform, behind the middle widest. Colour when alive redbrown, later grey-yellow 0,8 — 1,5 mm long.

Host Plants: Leguminosae Ceratonia siliqua.
Moraceae Ficus carica
Styracaceae Styrax officinale

Remarks: These animals are common in the whole country on the young and middle branches of their host-plants, in winter also numerous on the leaves. Incrusting the branches without causing any serious injury. It appears that this species has two generations a year. The insects on Ceratonia have been found on a stem near Jericho and showed a remarkable colour of their scales and an extraordinary curve of same.

Distribution: Mediterranean.

26. Lepidosaphes gloveri (Pack.) Kirk.

Synonyms: Mytilaspis gloverii Pack.

Bibliography: Leonardi, Cocciniglie italiane 1920, 168.

Description: Scale of the adult female very narrow, generally straight, with more or less parallel longitudinal margins. Colour red to grey-brown, spot yellow.



Fig 18.
Female Scale
Lepidos. glove

Diameter 2 5 — 3,0 × 0,5 mm.

Animal very long pyriform, widest behind the middle, reddish-yellow with yellow pygidium, 1,0 × 0,3 mm. long.

Host Plants:

Rutaceae Citrus aurantium, Grape fruit.

Remarks: This species being similar to L. pinniformis, is easily to differentiate by its scale only being half as wide, is found with the mentioned species together in the Ica Garden in Petach Tikwah. It did not reach such a tremendous encrease than L. pinniformis and is only found isolated. All specimens so far discovered in Palestine were found in this Garden.

Discription: Cosmopolitan tropical and subtropical.

27. Lepidosaphes minima Newst.

(The Minor Fig Mussel Scale).

Synonyms: Mytilaspis ficifoliae Berl. (?)

Bibliography: Hall, Coccidae of Egypt 1922 p. 39. Leonardi, Cocciniglie italiane 1920 p. 173 (L. ficifoliae).

Description: Scale of the adult female very narrow, long, generally slightly curved, often somewhat irregular formed and folded. Colour yellow-brown, in the back often dull, spot yellowish.

Diameter 0,5 — 1,5 mm.

Animal oblong pyriform, colour red-brownish.

Diameter 0,3 — 0,7 mm.

Host Plants: Moraceae Ficus carica.

Remarks: These animals are distributed over the whole country and sit in crowds on leaves and young branches of the fig trees, without causing any considerable injury. They have 2 — 3 generations a year.

Dr. Lindinger thinks L. minima a stunted form of L. conchiformis. Setting asside, if morphologic reasons agree with the theoree it appears unlikely to me because of biological reasons, as there are trees incrusted by this species, which do not show any L. conchiformis scales. It would be

strange however, if such a stunted form would be of such an immense fertility, as this is the case with L.minima.

Distribution: Mediterranean, imported to Chile(?.) (M. ficifoliae).

28. Lepidosaphes palaestinensis n. sp.

Description: Scale of the adult female 2-3 mm long, 0,4 — 0,5 mm wide, oblong narrow, often sligtly crooked, always stretched when sitting on the main-rib of the leaves. Colour black-brown to dark-red-brown, on the underside of the leave, perfectly covered by the whitish felt of such underside of the leaves of the olives.



Fig. 19. Scale ot adult Female of Lepidosaphes palestinensis

Scale of the nymphae 0,65 × 0,3 mm

Scale of the larvae 0,12 × 0,19 mm, both somewhat lighter then the groundcolour, so that the spot appears grey. The larva-scale is often oblique to the longitudinal-axis situated.

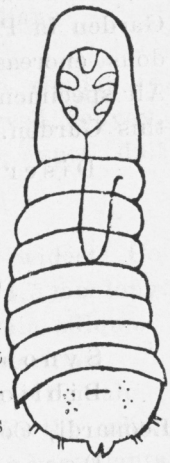


Fig. 20. Female of Lepidosaphes palestinensis

The adult female is narrow oblong, somewhat wider at the hind-end. Colour wine-red, the analsegment yellow.

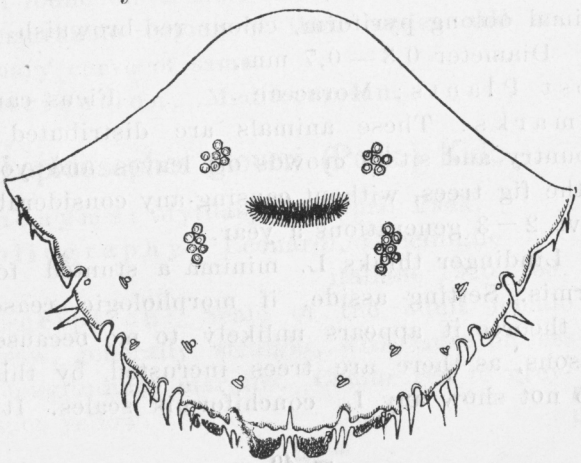


Fig. 21. Female pygidium of Lepidosaphes palestinensis

Diameter 0,73 — 0,77 × 0,21 mm.

Microscopic characteristics:

Formula of the pygidium: P1, L1, P2+3, L2+3, P4 — 9.

The pygidium shows between the wide crenulated middle-lobes 2 short, pointed, dagger-like plates. Lateral follow 2 dagger-like plates and a gland-opening, two short lobes, 2 dagger-like, big plates with one gland-opening on each, 2 alike plates with gland-openings situated one after the other, 2 dagger-like plates with one gland-opening.

Circumgenital glands: 5 — 7 : 4 — 6 : ? : 4 — 6:5 — 7

I could not find out if there is another gland-group on top of the vagina-opening, because of strong chitinisation.

Larvae oblong oval, wine red, with sharp segmentation.

Diameter 0,14 — 0,17 × 0,03 — 0,06 mm.

Host Plants: Oleaceae Olea europaea.

Remarks: Found only on one tree in great number on the leaves (surface and underside) near Tel-Aviv.

I have at first mixed up this species with Leucaspis riccai, externally somewhat like it, but there is at last a distinct difference in colour, size and microscopic habitus. L. palaestinensis is easily to discern from Lepidosaphes pinniformis var. oleae Leon, living in Italy on the roots of olea: The adult female of Lepidosaphes pinniformis is wide oval, and that of L. palaestinensis narrow, oblong of similar size.

Distribution: Palestine: endemic.

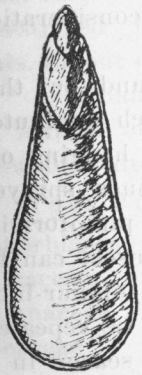


Fig. 22. Female Scale of Lepidosaphes pinniformis

29. Lepidosaphes pinniformis (Bché) Kirk.

(The Citrus Mussel Scale).

Synonyms: L. (Mytilaspis) becki Newm.; L. (M) citricola Pack.

Bibliography: Lindinger, Schildläuse Europas 1912 p. 107.

Description: Scale of the adult female oblong musselshaped, streight or slightly crooked, convex, distinctly crossstriped. Colour red to grey-brown, spot yellow-brown.

Diameter: 2 — 3 × 1 mm.

Animal oblong oval, widest behind the middle, with distinct abdominal segmentation, whithe with yellow pygidium, about 1 mm. long.

Host Plants:

Leguminosae	Ceratonia siliqua
Rutaceae	Citrus aurantium, C. limonum
	Grape fruit.

Remarks: So far only observed in Palestine the Orange-groves of Petach Tikwah. This species is also found on wild Carob trees and shrubs of macchies in the mountains. I have found them here in dense incrustation near Chederah and Benjamina. These places are in a far distance from the before mentioned Bojares away and the animals have so far not spread over to them. It appears that to this species also belong those animals, described by Lindinger (1912 p. 100) as L. ulmi? of Cypre.

A heavy incrustation was so far only observed by me in the Ica Garden at Petach Tikwah on Grape fruit and Valencia orange. In single specimens in the other Bojares of Petach Tikwah.

The position of the matter is, that once in a private house of Tel-Aviv and another time in a shop of Jerusalem I found heavy incrustation on oranges with L. pinniformis, and in both cases I have been able to find out that the source of the infection was the Ica Garden in Petach Tikwah. A further distribution in Palestine can only be prevented, when the ICA-Direction is sensible enough to accomplish fumigation with hydro-cyanic-acid, without any consideration of rentability.

When visiting Petach Tikwah again I found out that Lepidosaphes pinniformis in the meantime is much diminuted and I have only found same on a few central hanging old leaves. In the end of March 1923 it has been once sprayed with Californian sulphur-lime-liquor against L. pinniformis. It is therefore the evidence given that this scale insect can be controlled by repeated energetic spraying with sulphur-lime water in Palestine. The spraying in March has to be repeated at least 2 or three times in the coming winter season in a most intensive way.

L. pinniformis has 2-3 generations a year. They lay lots of eggs in the big space free under the scale. Duration of development: 4-6 months.

The injury caused by strong incrustation is considerable.

Lady-birds are of course very useful, but are quite insufficient for a natural control.

A successful control can be completed with security by fumigation with hydro-cyanic-acid, and even against this they prove exceptionally able to offer resistance. The Californian dosis, shedule I, has to be given in spaces of always one hour twice, and this procedure has to be repeated after one year. Besides this repeated spraying with Californian sulphur lime liquor is of good use.

In other countries, for instance Egypt, every orange export of attacked districts is forbidden, An energetic control would therefore be much advisable. The import of fruits attacked by L. pinniformis is also forbidden in some other countries.

Distribution: Cosmopolitan tropical and subtropical.

30. Lepidosaphes ulmi L.

(The Apple Mussel Scale).

Synonyms: Mytilaspis pomorum Bché.

Bibliography: Leonardi, Coccinigliе italiane 1920 p. 158.

Description: The scale of the adult female oblong mussel-shaped, convex, generally a little curved, distinctly cross-striped. In whole very much like the scale of L. pinniformis. Colour dark to blackbrown, exuviae dull orange-coloured.

Diameter: 1,8 — 2,1 mm.

Animal oblong pyriform, greatest width in the last third, yellowish white with strong yellow pygidium, about 1 mm long.

Host Plants:

Euphorbiaceae	Ricinus communis
Punicaceae	Punica granatum
Rhamnaceae	Zizyphus spinae christi
Salicaceae	Salix sp.

Remarks: This species is apparently far distribut in the country, although so far only found near Jerusale Gazah, Nahalal and El-Arish (Sinai). On Salix in very hea incrustation an the branches near Gazah and El-Arish, e only in weak incrustation on the nutritive plants. Stran to say, that I have never found this species on apple,-pea and plum-trees.

The animals prefer the branches. They have only o generation a year. They do not cause any injury in lestine. The limited variation in size and colour of the sca in Palestine is most astonishing.

Distribution: Origin Europe and Asia Minor, presence Cosmopolitan in the temperate zones of the wh world.

31. Lepidosaphes (Coccomytilus) zlocistii n. sp.

Description: Scale of the adult female oblo streight or slightly crooked, little convex, widening by a by toward the hind end and in the last third reaching greatest width. Oblique lines distinctly visible. The yell



Fig. 23. Female Scale of Lepidosaphes zlocistii

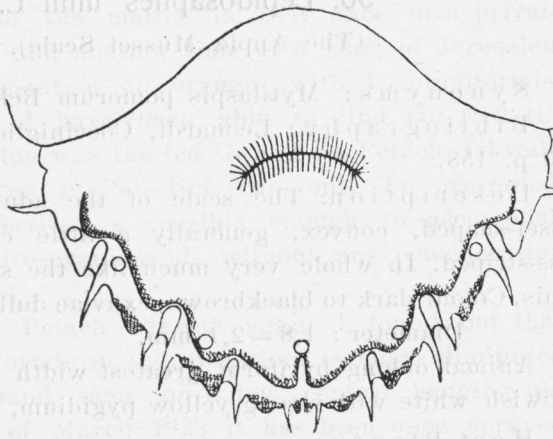


Fig. 24. Female pygidium of Lepidosaphes zlocistii

brown, dull growing colour of the scale is generally cov with a whith wax-cower. Exuviae of the first and se stage situated on the front end, more or less elliptic, shi redbrown.

Diameter 1,0 × 0,4 mm.

Animal oblong, spindle shaped, on the front end wide curved, at the hind end growing pointed, greatest width in the last third. Colour yellow,

Diameter 0,40—0,45×0,15—0,2 mm.

Microscopic characteristics:

Formula of the pygidium: L1, P1, L2, P2, Dr, L3, P3, Dr, P4, L4, P5, Dr, P6. The middle lobes are short and narrow, lobe 2 and 3 slightly double crenulated, lobe 4 single crenulated. The plates are all dagger-like.

I have been unable to find out the circumgenital glands,

Larva wide spindle-shaped, yellowish, with clear segmentation. Diameter 66 — 78 × 39 — 48 mikra.

Host Plants: Rosaceae Persica vulgaris.

Remarks: In Ben Shemen on the stem of peaches in weak incrustation. The animal sits in lumps hidden under the extreme bark, so that it is hardly to recognize from the outseide. It forms negative bark-galls much like those of Aspidiotus ostraeiformis. An injury has not been observed.

I dedicate this species to Dr. Zlocisti, the zealous promoter of naturalists work in Palestine.

Distribution: Endemic: Palestine.

32. Pinnaspis aspidistrae (Sign.) Ldgr.

Synonyms: Hemichionaspis aspidistrae (Sign.) Cost.

Bibliography: Cooley, Massach. Agr. Exper. Stat., Spec. Bull.; 1899 p. 45.

Description: Scale of the adult female oblong ham-shaped with slight circular hind end, thin. Colour yellow-brown. The forthstanding exuviae light-yellow.

Diameter: 2 — 3 × 1 — 1,5 mm.

The second half of the oblong-oval animal is wider, yellowish.

Host Plants:

Liliaceae Unknown ornamental species.

Remarks: Only once found in Palestine at Tel-Aviv on the leaves of an unknown liliacea in middle incrustation.

Distribution: Cosmopolitian, subtropical.

Tribus Parlatoriae.

33. Adiscodiaspis tamaricicola Malenotti.

Bibliography; Hall, Coccidae of Egypt 1922 p. 23.

Description: Scale short to oblong oval, very strong convex, strongest convexity on the front end, greywhite. Exuviae excentric, the yellow-brown larval skin quite irregular situated (oblique, wry or in the longitudinal axis). The scale of the second stage covered by a grey-white secret-mass over the whole scale.

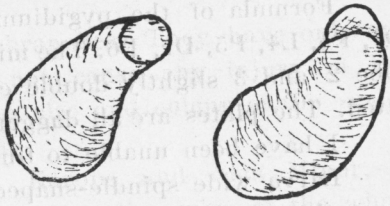


Fig. 25. Females Scale of Adiscodiaspis tamaricicola

Diameter:
0,9 — 1,2 × 0,7 — 0,9 mm.

Scale of the second stage circular, very strong convex with yellowbrown, sub-to excentric, oval exuviae.

Diameter: 0,3 — 0,5 × 0,3 — 0,5 mm.

The adult female is short oval and brownyellow. Th hind end shows only wide, flat lobes and is bare of all ch racteristics of a Diaspineous-pygidium.

Host Plants; Tamaricaceae Tamarix ssp.

Remarks: On the middle branches of Tamarisces ne Jaffa, Jericho, Gazah and El-Arish (Sinai). Hall calls it a co paratively rare species. Here in Palestine it is very comm in the surrounding of Jaffa.

Distribution: South East Mediteranean to oriental Egypt, Palestine, Sinai. Lindinger communicavit in litter Beludschistan or else a very far East situated found-place.

34. Leucaspis candida. (Targ.) Sign.

Synonyms: L. affinis Leon (??).

Bibliography: Lindinger, Schildlausgattung Leu pis 1906 p. 28.

Description: Scale of the second stage, in wh the female is included, distinctly convex. It widens slo and narrows only short before the curved hind end. Whit

the exuviae one mm. long, in the front black, behind a cross-seam brownish. The animal lives cryptogynous.

Diameter: 2,5 — 3,0 × 0,7 — 0,9 mm.

Animal oblong, stretched, oval, brownish to wine-red, about 1,5 mm. long (variable).

Host Plants: Coniferae Pinus halepensis, P. pinea.

Remarks: Near Jericho, Jerusalem, Ben Shemen, Haifa. Together with L. pusilla, from which it can easily be differentiated by the black exuviae, and the slow widening. Strong formation of fumago often follows these two Pinus-coccidae.

Distribution: Central Europe, Mediterranean territory.

35. Leucaspis pistaciae Ldgr.

Bibliography: Lindinger, Schildlausgattung Leucaspis 1906 p. 40.

Description: Scale of the adult female oblong elliptoid, widest about the middle, in the front and in the back slowly narrowing and there curved, distinctly convex. The elliptic exuviae blackbrown, colour of the scale whitish. The animal is cryptogynous.

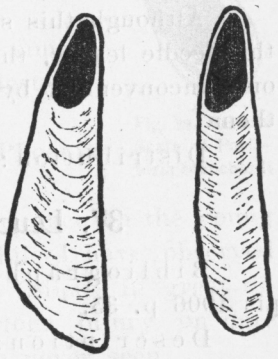


Fig. 26. Female Scale of Leucaspis pistaciae

Diameter: up to 1,3 mm long, up to 0,4 mm. wide.

Scale of the second female stage oblong, slowly widening to the hind end and short before the curved hind margin growing more narrow, generally rectilinear, more or less flat.

Diameter: up to 1,2 mm. long, up to 0,4 mm. wide.

Animal oblong oval, palebrown to wine-red.

Host Plants: Anacardiaceae Pistacia lentiscus.

Remarks: On the branches and leaves of the nutritive plant in the macchies near Atlith and Chederah, and in the mountains; on the Carmel near Haifa and Benjamina and on the Mount Gilboah.

Distribution: South East Mediterranean; Cypre, Palestine.

36. Leucaspis pusilla Loew.

Bibliography: Lindinger, Schildlausgattung Leuca pis 1906 p. 44.

Description: Scale of the second stage, in whi the adult female is enclosed, oblong, little convex, curved the hind end, white. Strong widened behind the yellowi transparent exuviae. The animal is cryptogynous.

Diameter 1,3 — 2,1 × 0,5 — 1,0 mm.

Animal oblong stretched, greatest width at the limit the 2-nd and 3-rd third of the body, brownish to wine re about 1 mm. long (variable).

Host Plants: Coniferae Pinus halepensis, P. pinea

Remarks: This species is distributed almost over t whole country (Jerusalem, Jaffa, Gazah, Haifa etc., but nev observed in Jericho).

Although this species like L. candida often owercrow the needle leaves, they are not really injurious, and they a only inconvenient by the formation of fumago which follo them.

Distribution: Mediterranean territory, Central Europ

37. Leucaspis riccae (Targ.) Leon.

Bibliography: Lindinger, Schildlausgattung Leuca pis 1906 p. 35.

Description: The scale of the second stage, in whi the adult female is enclosed, is long, narrow, convex, gen rally slightly curved, with more or less parallel margin Colour white, with blackish spot.

Diameter 1,8 — 2,3 × 0,5 — 0,6 mm.

Animal wine-red, oblong oval to blunt-spindle-shape Diameter 0,9 — 1,0 × 0,4 — 0,5 mm.

Host Plants: Gnetaceae Ephedra alta.

Remarks: On stem and branches of E· alta near Ga zah; so far not found on Olea.

I at first thought L. ephedrae March for a synonym t L. riccae Targ. But in the meantime I was informed b Mr. E. E. Green that these species are distinctly differe

tiated. „The adult insects are practically indistinguishable; but the nymphs of ephedrae have only two pygidial lobes, while those of riccae (and of your Palestine specimens) have four". This example shows again that the second female stage is of much greater importance for the systematic of the genus Leucaspis than the redeveloped adult females.

Distribution: Central-and East-Mediterranean territory.

38. Parlatoria blanchardi (Targ.) Leon

Bibliography: Hall, Coccidae of Egypt 1922 p. 42.

Description: Scale elliptic to oval, flat, generally with more or less parallel margins. Colour white to whitegrey. Spot light brown, on the blackbrown exuviae of the second stage very difficult to recognize with the bare eye.



Fig. 27. Female Scale of Parlatoria blanchardi

Diameter: 1,1 — 1,5 × 0,6 — 0,8 mm.

Animal pale yellow, long oval, widest behind the middle.

Host Plants: Palmaceae Phoenix dactylifera,

Remarks: In Palestine only found once on the young leaves of a Date Palm near Gazah, while I have observed same in the date-palm-oasis of El-Arish (Sinai) in great distribution on leaf-stalks and leaves. Serious injury on date palms, as reported from America, I have never seen.

Distribution: South Mediterranean, imported into North-America, Australia and the tropical Africa.

39. Parlatoria judaica n. sp.

Description: Scale irregular, more or less short oval to ham-shaped, little convex, lightbrown yellow. Exuviae marginal standing: the scale of the second stage circular dull blackbrown: of the first stage elliptic, smooth black-brown.

Diameter 1,4 — 1,6 × 0, 9 — 1,1 mm.

Animal nearly circular, somewhat wider than long, only the wide circular pygidium somewhat withdrawn. Greatest

width behind the middle, more or less thick. On the dorsum of the metathorax remarkable by a prominent hump. Colour violet-red with brownish-yellow pygidium.

Diameter
0,57 × 0,6 mm.

Microscopical Characteristics:

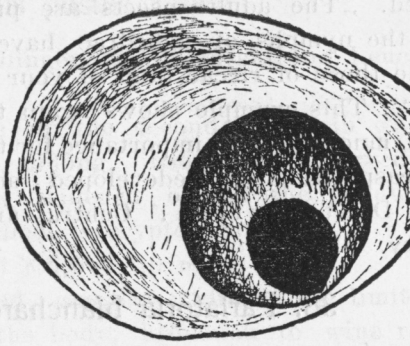


Fig. 28. Female Scale of Parlatoria judaica

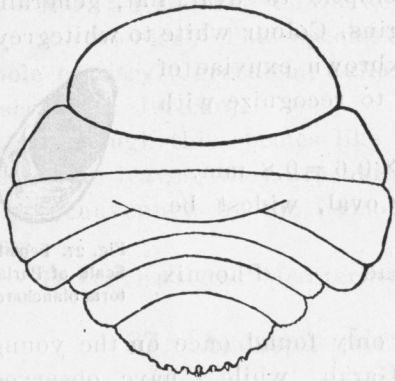


Fig. 29. Adulte Female of Parlatoria judaica

Cricumgenital glands 15:9:?:9:15. Formula of the gin of the pygidium: P1, P2+3, L2, P4+5, L3, P6 L4, P8 — 10. Lobes 1 — 3 al stinctly crenulated on the side, the fourth lobe is sm The middle plates dagge the other crenated.

Host Plants: Ros Prunus armenica (Mishmi

Remarks: Only onc served in little incrustatio

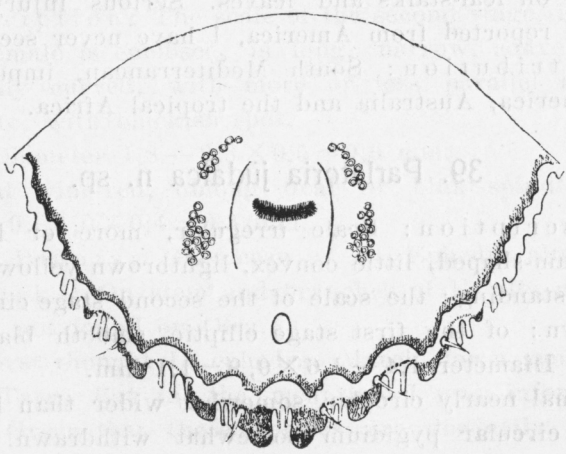


Fig. 30. Female Pygidium of Parlatoria judaica

an orchard near Tel-Aviv, which in the meantime has been altered into a building-plot. The animals sit on the small branches, in single exemplars on the angle of the buds, very much like P. oleae, with which the scale has a great likeness.

Distribution: Endemic: Palestine.

40. Parlatoria oleae (Colv.) Ldgr.

Synonyms: P. calianthina Berl. et Leon.

Bibliography: Leonardi, Coccinigliе italiane 1920, 137.

Description: Scale more or less circular, convex. Colour whitish grey to brownish grey, the circular, sub-to excentric exuviae are olive-green to black.

Diameter 1,8 — 2,5 mm.

Animal short oval. Colour wine-red, pygidium yellow, Diameter 1,0 — 1,4 mm.

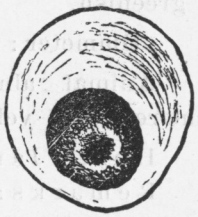


Fig. 31. Female Scale of Parlatoria oleae

Host Plants:

Apocynaceae	Nerium oleander
Aquifoliaceae	Ilex aquifolium
Moraceae	Morus alba
Oleaceae	Olea europaea
Rosaceae	Pyrus malus, P. pyrus, Prunus amygdalus, P. armenica, P. domestica. P. persica.
Rutaceae	Citrus aurantium.

Remarks: In Palestine distributed everywhere. In special strong incrustation on the branches and stems of Pyrus and Prunus. It does not injure much the elder trees, but injures the young ones considerably. The young green sprouts are often spotty and red discoloured from the sucking of this scale insect, which delays their growth remarkably when, much incrusted. It is therefore advisable to clean the young sets carefully by brushing with tobacco soap liquor to which some petroleum is added.

Distribution: Mediterranean, also found in the Himalaya mountains. (cf. Lindinger).

41. Parlatoria pergandei Comst.

Bibliography: Comstock, Annual Rep. Comm. A
1880 p. 327.

Description: Scale variable, circular to ham-shaped, flat. Colour greyish, often transparent. Exuviae excentric, marginal standing, brownish to greenish.

Diameter: 0,6 — 0,9 mm.

Animal almost circular, wine-red with yellow pygidium.

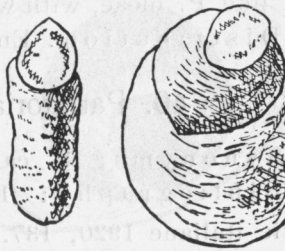


Fig. 32. Female (right) and Male (left) Scale of Parlatorea pergandei

Host Plants: Rutaceae Citrus aurantium, C. s

Remarks: In Palestine everywhere, where Citrus tations are found. With Chrysomphalus aurantii togethe most common Citrus-coccid. It lives on leaf and fruit.

This species is very fertile and has several gener a year. The animal prefers on the fruit the pores and c recognized as a greyish spot on them.

It is a harmles species in spite of the far distril and partially strong incrustation and I have never see noticeable injury caused by it.. A control is therefore question.

Distribution: Cosmopolitan tropical and subtro According to Lindinger of Mediterranean origin.

42. Pseudotargionia glandulosa (Newst.) Ldgr.

Synonyms: Aonidia gl. Newst.

Bibliography: Newstead, Bull. Ent. Res. 1911 p Lindinger, Schildläuse Europas 1912 p. 50.

Description: Scale short oval, strong convex, yellow with orange-coloured spots, exuviae brown. The female cryptogynous.

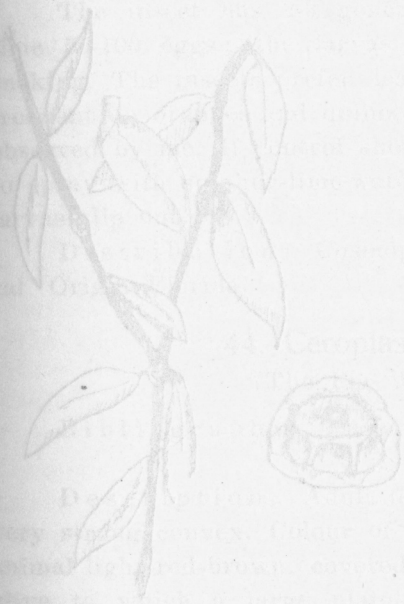
Diameter to 1,6 × 1,2 mm.

Animal wide oviform, yellow up to 1 mm. long.

Host Plants: Leguminosae Acacia farnesia

Remarks: On the young stems and branches, on slits and on damaged spots. Only twice found in small number near Ness-Zionah and near Jaffa.

Distribution: South-East; Mediterranean; Egypt, Palestine.



Sub-Family Lecaniinae.

43. Ceroplastes floridensis Comst.

(The Florida Wax Scale.)

Bibliography: Comstock, Ann. Rept. of Com
of Agric. 1880 p. 331.

Description: Adult female in contour elliptic. I
hight more or less hemispherical. The surface is covered with a thick wax-stratum. On this stratum is a large central middle-scale surrounded by several smaller marginal-scales. Surroundings of the single scales more or less distinct. The wax-stratum is on the margin plainly roll-shaped. Colour of the naked animal red-brown. The wax-stratum of the middle-scale pink-red, the remaining scale cream-white.

Diameter
3,0 — 4,0 × 1,5 — 2,0 mm.



Fig. 33. Female of Ceroplastes floridensi
and Females sitting on a myrtle branch

Host Plants:

Apocynaceae	Nerium oleander
Anacardiaceae	Pistacia lentiscus, Schinus molle
Compositae	Hieracium sp.
Lauraceae	Laurus nobilis

Leguminosae	Ceratonia siliqua
Meliaceae	Melia azederach
Moraceae	Ficus italica, F. carica
Musaceae	Musa sapientium
Myrtaceae	Myrtus sp.
Punicaceae	Punica granatum
Rosaceae	Cydonia vulgaris, Prunus persica, Pyrus malus, Eriobotrya japonica
Rutaceae	Citrus aurantium, C. limonum, C. ssp.

Remarks: In Palestine everywhere with the exception of the Sub-Jordan-Valley and in the plain of the coast together with Aspidiotus hederae the most common scale-insect. So far not found outside of cultivations on wild or isolated places. I have also collected this species in Tripoli (Syria).

The insect has 2-3 generations a year and lays each time 50-100 eggs; the larvas attach soon after slipping by sucking. The insects prefer leaves and small branches. Very frequent on oranges and quinces, but no real injury has been observed by me. If control should be required it is advisable to spray with sulphur-lime-water at the time when the young larvas slip out.

Distribution: Cosmopolitan tropical and sub-tropical. Origin Florida.

44. Ceroplastes rusci L.

(The Fig Wax Scale.)

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 356.

Description: Adult female short elliptic in contour, very strong convex. Colour of the body of the naked, smooth animal light-red-brown, covered by a thick wax-stratum, when alive to which a large, plainly surrounded central-scale and 8 small marginal-scales also distinctly surrounded, contrast. Colour yellow-white.

Diameter 4×3×3 mm.

Host Plants:

Anacardiaceae	Schinus terebinthifolius
Apocynaceae	Nerium oleander

Aralaceae	Hedera helix
Moraceae	Ficus carica, F. infectoria, F. comorus

Remarks: This species is especially very heavy d buted in the mountains, Not collected in the sub-vall Jordan and in the greater part of the plain of the c Found places Metulla, Artuf, Jerusalem, Mozah, He Tel-Aviv and others. C. rusci seriously attacks the fig-t where it in winter incrusts leaves and branches in cr more rarely the fruits. There appears to be only one g ation a year in the mountains. The number of the eg one femal pends between 800-1500. The reaction of the i on fig-trees is minimal, but a strong fumago will be l succession. Control, where necessary, by spraying with phur-lime-water.

Distribution: Cosmopolitan. (Mediterranean, A lia, Japan, Guyana.)

45. Eriopeltis sp.

Dr. Lindinger showed me in the scale-insect-colle of Hamburg on the root of a wheat-stalk an Erio sp. (festucae?) from Afule, wich he had received from during the war. In spite of keenest attention I have unable to discover any Eriopeltis in this district and i lestine.

46. Euphilippia olivina Berl. et. Silv.

Bibliography: Leonardi, Cocciniglie italiane 1920 p.

Description: Adult female in front oval, at th not quite hemi-spherical. Colour grey, brown-veined. Ant 8 limbed, legs well developed.

Diameter about 5×3×3 mm., but I have also obs much smaller specimens.

The animal sits hidden in a white irregular egg-s double size.

Host Plants: Oleaceae Olea europaea.

Remarks: On the small branches, on the ribs of the leaves, and on the fruit-buds, as well as on the underside of the leaves of the olea-tree in irregular loose white wax-flakes in May till July. The scale-insect is contained in these flakes. It is of no economical importance at all. Collected at Migdal (lake of Galilee), Petach-Tikwah and Rechoboth, but surely far distributed. It appears to have only one generation a year.

Distribution: Mediterranean; Italy, Palestine.

47. Lecanium (Coccus) hesperidum L.

(The Soft Scale.)

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 319.

Description: Adult female irregular oblong-oval, almost flat, in the front thiner than on the incised hind-end. Colour yellow-brown, often with irregular dark-brown exuviae. In unripe stage colour green yellow, dead red-brown to dark-brown.

Diameter in vivo:
3—5×2—3×1 mm.

Host Plants;

Amaryllaceae	Agave americana
Anacardiaceae	Schinus molle
Araceae	Arum italicum
Aralaceae	Hedera helix
Asclepiadaceae	Callotropis procera
Begoniaceae	Begonia sp.
Cactaceae	Echinocactus sp.
Caprifoliaceae	Lonicera sp.
Labiatae	Coleus sp.
Lauraceae	Laurus nobilis
Leguminosae	Robinia pseudacacia
Moraceae	Ficus carica
Nyctagineae	Bougainvillea sp.
Rosaceae	Rosa sp.
Rutaceae	Citrus aurantium, C. limonum, C. ssp.

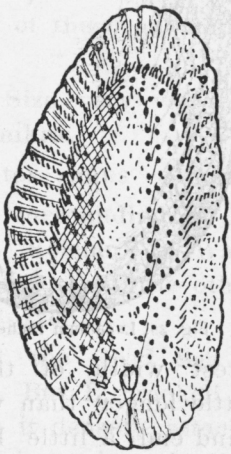


Fig. 34. Female of Coccus hesperidum

Remarks: In Palestine everywhere distributed. This species has 2-3 irregular generations a year. The larvas already

completely developed slip out of the laid eggs. L. hesperi generally prefers young plants. Branches and the ribs of leaves are preferred parts of the plants.

The injury on Citrus is only minimal, but this spe is often troublesome by its strong fumago-development. L. hesperidum through its preference of young plants de them somewhate in their first growth when it attacks t heavily. Troublesome to the indoorplants mentioned. Con with snlphur-lime-water (indoorplants should be brushed) necessary at rare occasions.

Distribution: Cosmopolitan, tropical and sub-trop

48. Lecanium (Eulecanium) racheli n. sp.

Description: Adult female somewhat more than mi-spherical convex so that the sole is smaller than the

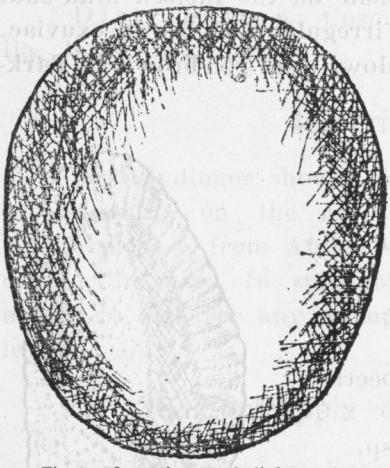


Fig. 35. Lecanium racheli from above

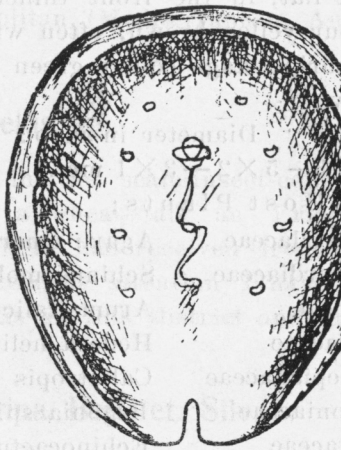


Fig. 36. Lecanium racheli from belo

atest width of the body, a little longer than wide, at the kind end a little higher than in the front. The animal sits on the host-plant in oval basis. White, stringy, wax-secretions are visible on the margin in small number.

The anal-incision about 1-2 mm. long, plain, comparati-

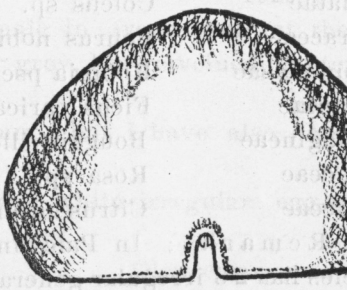


Fig. 37. Lecanium racheli from behi

vely wide. The carinated margin shows a more plain, carination in the surrounding of the anal-incision. The 2 anal-squames are very small, triangular. The lateral parts close above the margin, slightly waved, like a loose taken up stuff. On the margin itself in a narrow lighter zone single-cellular elliptic wax-glands of about 20 mikra diameter, which stand in a distance of 120-250 mikra from eachother. On the lateral parts no fields, in the centre polygonal, irregular, generally unclosed fields. Skin of the body comparatively very thin. I have been unable to prepar the antennae and very rudimental legs on of the insufficient material at my disposal, but I hope to complete this at a later occasion.



Fig. 38. Marginal glands of Lecanium racheli

Surface of the living animal smooth, of the dead animal much shriveled. Colour of the living animal light-yellow to red-brown with dark red-brown irregular spots on the back and black-brown on the underside. Colour of the dead animal regular black-brown.

Diameter $5-8 \times 4-7 \times 2-4$ mm. Size very variable. Egg elliptic, yellow, Diameter 420×275 mikra.

Host Plants: Verbenaceae Vitex agnus castus.

Remarks: Twice collected in the surrounding of Jericho. Once found by my colleague Dr. Reichert at Wadi Audja, who accidentally lost his exemplars, and the other time in the same district by Mr. P. A. Buxton.

Vitex astus castus grows all about the Dead Sea in dense stocks of man's high in great lots. But L. racheli is so far only known from this place, where it densely attacks the plants. Only very few animals remained for examination as this species has been very much parasited by a Braconid, and another part has been consumed by a microlepidoptereous caterpillar.

I dedicate this species to my dear wife Rachel.

Distribution: Endemic: Palestine (Ghor.)

49. Lecanium (Saissetia) hemisphaericum Targ.

(The Hemispherical Scale.)

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 281

Description: Adult female in contour short oval more or less hemispherical. Surface smooth. On the unrip animal a slight H-shaped crenature is visible upon the dorsa which on the ripe animal disappears more or less. Colou light-brown, of the dead animal dark-brown.

Diameter 3,0 × 2,0 — 2,5 × 1,5 mm.

Host Plants: Amaryllaceae — Agave americana
Liliacea — Asparagus repens
Rosaceae — Eribotrya japonica

Remarks: In dense incrustations on the branches ar leaves of Eriobotrya in a garden of Tel-Aviv, and at th same place now and then on ornamental plants. Without ar economical importance. One generation a year, ripeness ar oviposition in spring (June-July.)

Distribution: Cosmopolitan tropical and sub-tropica

50. Lecanium (Saissetia) nigrum Nietner.

Bibliography: Hall, Coccidae of Egypt 1922 p. 2

Description: Adult female short oval and very co vex, surface smooth. Colour dark-red-brown. Dorsal polyedr divided with a dark-brown band on the margin.

Diameter 4 × 3 × 3 mm.

Host Plants:

Magnoliacea — Magnolia sp.
Moraceae — Ficus carica, F. sycomorus

Remarks: Only found in the Sub-Jordan-Valley n Jericho. Very frequent in the gardens there, without do any injury. On the small branches and leaves.

Distribution: Cosmopolitan tropical and sub-tropi (Palestine, India, New-Zealand, Australia).

51. Lecanium (Saissetia) oleae (Bern.) Walk.

(The Black Scale.)

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 278.

Description: Adult female in contour short ovalt more or less hemispherical, upon the dorsal a big H-shaped crenature, skin rough, grained. Young animals with a thin white wax-cover. Colour up to black-brown.

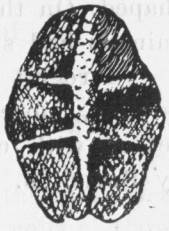


Fig. 39. Saissetia oleae

Diameter $3-4 \times 2-3 \times 2$ mm.

Host plants:

Apocynaceae	Nerium oleander
Cycadaceae	Cycas revoluta
Lauraceae	Laurus nobilis
Oleaceae	Olea europaea
Rutaceae	Citrus aurantium, C. limonium, C. ssp.

Remarks: On olea in the whole of Palestine, on citrus injurious only in the Jaffa-district. L. oleae lives generally on branches rarely on leaves. Number of eggs: 50-3000. Apparently only one generation a year. Period of attacks: April to June. I am unable to state yet, that a second generation in about Septembre-October may be possible. Not of great injury to Olives, but much more in the Bojares in the Jaffa-district by heavy „honey-dew" and fumago-development. Control, where necessary, by spraying with sulphur-lime-water March to April, also on Oleander.

Lindinger's observation, that this species is far better developed in the East-Mediterranean-territory, does not prove correct for Palestine. The paramount number of exemplars, I have seen, were far below the limit of the quoted measures.

Distribution: Cosmopolitan tropical and sub-tropical.

52. Pulvinaria sp.

This species attacked the roots of Rhus oxyacanthoides (Anacardiaceae) subterranously in the mountains near Mas-

sadah on the west-bank of the Dead-Sea. My collegue Dr. Pi
ner observed them by the fact that numerous ants approache
this root. About 5 red-brownish animals, at a size of 5 m
long and 2-3 mm high, had attacked the root of the collecte
plant. The margin were flat and the centre-field raised hum
shaped. On the hind-margin a plain and deep incision. T
animals had started to form an ovisac.

I regret I cannot describe this species, which apparent
is new, more carefully, as it has been stollen from me t
gether with other belongings, at the instance of an assau
by Bedouins.

Sub-Family Asterolecaniinae.

53. Asterolecanium bambusae Boisd.

(The Bamboo Scale.)

Bibliography: Hall, Coccidae of Egypt 1922 p. 3.

Description: Capsule semitransparent, elliptic, becoming somewhat narrower at the hind-end. On the margin a fragile wreath of cilias of wax-threads of reddish colour. Capsule green to yellow.

Diameter 2 — 3 × 1,25 mm.

Animale of wide oviform shape, 1,5 × 1,0 mm long. The animal, when old, contracts itself in the front-half of the capsule and becomes dark-brown, like all Asterolecaniinae.

Host Plants: Gramineae Bambusa ssp.

Remarks: Found at Jaffa, Petach-Tikvah and in Migdal on the lake of Galilee. At the first two places on the leaves, in Migdal on the stem, hidden under the base of the leaves. The size of the capsule is almost constant (2,25 — 2,5 mm long), while Hall has observed in Egypt a considerable variableness on 1 — 3 mm length.

Distribution: Cosmopolitan tropical and sub-tropical.

54. Asterolecanium pustulans var. sambuci Ckll.

(The Pustule Scale)

Bibliography: Hall, Coccidae of Egypt 1922 p. 4.

Description: Capsule of the adult female circular, glassy semitransparent. Colour green-yellowish. On the margin of the young animals a dense wreath of short, glassy cilias of pale-reddish colour.

Diameter of the capsule 1,5 — 2 mm.

Host Plants:

Moraceae	Ficus sycomorus, F. carica
Leguminosae	Acacia farnesiana

Remarks: It is most astonishing that this spec which is so common distributed and much polyphagic in Eg has only been found in Palestine on these few plants at zah and Jaffa. I have seen even in El-Arish (Sinai) fig-t much deformed by heavy incrustation of this scale ins while in Palestine I have noticed scarcely any gall-alterati

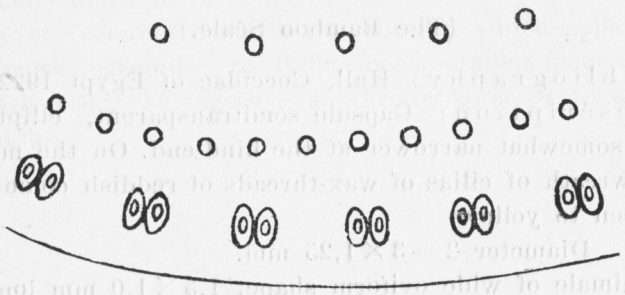


Fig. 40. Marginal-glands of Asterolecanium pustulans var. sambuci.

This remarkable difference of the attack-intensity of scale insect between Egypt and Palestine is a splendid ani geographic characteric of both countries.

The insect attacks, as on Acacia farnesiana, the mi branches, on Ficus sycomorus the bark of the main-s A. p. cannot be considered as injurious in Palestine. gall-alteration, which is caused by this species consists ring-shaped wall in the middle hollow of which the insect

Dr. Lindinger has fixed the here existing material a fimbriatum Boyer de Fonsc. Mr. H. Morrison has also w to me that the material forwarded had been insufficie separate A. fimbriatum and pustulans from each-other. after a microscopic test I share with Mr. E. E. Gree gether the opinion of Hall and Delski (Mem. Soc. Ent. d'Eg 1918 pp. 11, 18).

The following glands being in existence on anima Ficus sycomorus in Tel-Aviv.

1. A row of double glands of short elliptic shape d on the margin. Diameter 6 — 9 mikra, interval 18 mikra couples with each other 2 mikra.

2. 2 rows of single circular glands, central situated, of 5 — 6 mikra, Diameter, the outside one in distances of 7 — 9 mikra, the inside one of 18 mikra.

It is not yet quite sure, whether the described insect belongs to A. pustulans Ckll. or to A. p. var. sambuci Ckll., in the meantime I share Hall's view with regard to the latter species.

Distribution: South-East-Mediterranean: Egypt, Palestine, notoriously imported into North-America with Egyptian plants together.

55. Asterolecanium variolosum (Ratz.) Ckll.

(The Pit Making Oak Scale.)

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 250. Lindinger, Schildläuse Europas 1912 p. 280.

Description: Capsule circular and convex, glassy semitransparent. Colour green-yellowish. The young animals generally with a wreath of cilias on the margin. The exemplars belong doubt-less to this species as the size of the capsule does not exceed 1050 mikra.

Body wide oviform, about 0,8 mm long, brownish.

Host Plants:

Fagaceae Quercus coccifera, Q. lusitanica

Remarks: Found in the surrounding of Nahalal, forming the typical galls (annular swellings) on the little and middle branches, in the mid of which they are sitting. The attacks have been of middle strength and no injurious effect had been observed.

Distribution: Europe, Anterior Asia, North-America.

56. Pollinia pollini (Costa.) Ckll.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 259.

Description: Animal in a more or less spherical capsule of a light-to-blackish-grey felty wax-mass. The outside capsule is hard. The shading of colours suiting more or less the next surrounding. Generally appearing in lumps.

The animal sitting in this capsule is short, oviform, wi
before the middle. Colour brown-yellow.

Diameter 1,0 – 1,5 × 0,7, – 0,9 mm.

Host Plants:

Moraceae	Ficus carica (comm. Hall.)
Oleaceae	Olea europaea

Remarks: In Palestine everywhere, where the olea-t
grows. The origin of this species must be here, according
its constant attacking even the most isolated wild trees.

P. p has two generations a year. It has been gener
determined in slits of the bark of the smaller or mi
branches, which are caused by the insect itself. Chan
brown by decay of microbes lead from the suction places i
the inside of the branch. It sits in bulks, covered b
greyish to blackish wax-stratum. I have often observed
insect of the wild olea-tree incrusting in bulks the unburs
bark. No control is essential, as this species does not ca
any injury.

Distribution: Mediterranean territory (predom
ating in the East) imported into North-America.

Sub-Family Coccinae.

57. Eriococcus araucariae Mask.

Bibliography: Leonardi, Cocciniglie italiane 1920 p. 427. Bodenheimer, Marcellia, Vol. 19, 1923, p. 118.

Description: Animal oblong oviform, thick, characterized by 2 forthstanding anal-lobes with one long hair each. Colour yellow-green.

Diameter 1,5 — 1,9 × 0,7 — 1,1 mm.

The adult female is enclosed in a felty capsule of oval to ellipsoid shape. The eggs are also laid into this whitish-grey capsule.

Diameter of the capsule 2,5 — 3,0 × 1,5 mm.

The insect moves as a larva or female and gets fixed at the moment of laying the eggs.

Host Plants: Coniferae Araucaria sp. (orientalis?)

Remarks: Only once determined in heavy incrustation in the Town-Garden of Tel-Aviv. They produced there a single deformation of numerous needle-sprouts. In the upper half of the needle-producing branches I saw a lacing produced by a short, more or less scale-like-growing of these sprouts. The inspection showed that the needles on this place were heavy infected with the greenish-grey felt of the above named scale insect and some of its white larvae. As they are absent on the other places of the stem, not showing this deformation, and as no other reason for this needle-shortening can be given, Eriococcus araucariae must be considered to be the producer of this Cecidium, notwithstanding the fact, that I have been unable to find any remarks with regard to a plant-gall produced by this far distributed scale-insect in the literature about Coccidae, which is here available.

The tree in question is in the meantime withered, which is doubtless partially caused by the attacks of E. araucariae.

A strong „honey-dew" formation with following fumago been temporarily observed.

Only one generation has been stated in the cou of last year.

Distribution: Cosmopolitan, subtropical and tropi

(Ericoccus mannifer (Hard.) Ldgr.)

Synonyms: Gossyparia mannifera Giard, G.mar parus Sign.

Bibliography: Kaiser, Die Sinaiwüste, Thurgau, 19

The Arabs gather the exsudations of this scale-in from Tamarix mannipara near the Katharinenkloster in Sinai-Mountains as Manna. Lindinger (1912 p. 319) qu the distribution of this species as follows: Egypt, Alge Anatolia, South-Russia. Hall (1912) does not quote E. betw the scale-insects of Egypt.

I have done my best to find this scale-insect in the Tam isk thickets on the lower Jordan and on the Dead Sea, but h been unsuccessful in spite of day-long searches and thoro investigations in connection with Greek and Arabian Fis man, who are specially qualified as observers of nature.

It is quite certain that the only genuine Manna has b found in the central mountains of Sinai. A revision toge with new material would be essential whether the Eriocc found in Algeria, Anatolia and South-Russia is really ind ical with the Sinai-Eriococcus.

58. Pseudococcus citri (Risso) Fern.

(The Citrus Mealy Bug.)

Synonyms: Dactylopius citri Sign.

Bibliography: Leonardi, Cocciniglie italiane 1920 p.

Descripion: Animal thick, oviform. Natural co reddish-brown with a more dark middle-line upon the do but looking almost whitish in order of numerous wax-stratu On the margin 34 cylindrical wax-appendages of which two anals are a little longer than the others. Legs and 8-limbed feelers well developed. On the praeanalsegment

either side one long hair, on the analsegment on either side 2—3 short hairs.

Diameter 3—4×2—2—2,5 mm.

Host Plants:

Aizoaceae	Mesembryanthemum sp.
Cucurbitaceae	Cucumis melo
Labiatae	Coleus sp.
Moraceae	Ficus carica
Oleaceae	Olea europaea
Rosaceae	Cydonia vulgaris
Rutaceae	Citrus aurantium, C. limonum, Ethrog, C. ssp.

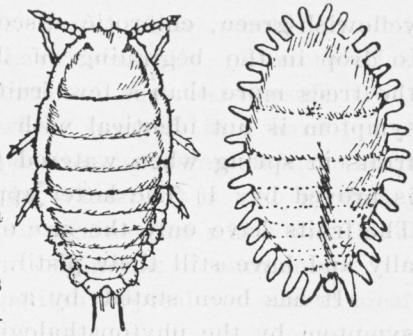


Fig. 41. Pseudococcus citri. Adult female, at right, covered by the usual wax-stratum.

Remarks: In the whole of Palestine, but not found in the lower Jordan-Valley. Partially considerable injurious to the fruits of oranges, lemons, Ethrogim. It causes the great white flakes, which are often visible on the oranges from the middle of summer and which cause, that the fruits fall off before their time of ripeness. It generally lives in lots under wool-haired wax-cover or on those places, where the stalk of the fruit sits. Shadowy places, with dense foliage and spots where two fruits are in contact are preferred. This insect is far less distributed in well ventilated and spacious cultivated orange groves. Pseudococcus citri has 3 generations a year, which hatch irregularly, two in Summer and Autumn, one in Winter and Spring. Number of ovums: 300-600. The heat kills a great number of the young larvas.

The injury caused to some Bojares in Petach-Tikwah in the latter part of the Summer in 1922 was a considerable one, as many fruits more or less ripe dropped down untimelly. Generally a heavy fumago is the consequence of it.

An extensive calamity of another kind had been observed in the second half of May 1923, besides this injury-symptom, which recurs every year in an extension more or less varying. Many oranges of a side of beans up to the size

of walnuts dropped from the trees in the Bojares of Petac Tikwah when watered the third time. I have counted up 150 fruits under one tree. The dropped fruits showed yellowish-green, chlorotic discolouration. The fruits stopp to drop in the beginning of June and I could not find the trees more than a few fruits with chlorotic marks. Tl symptom is not identical with the normal fall of the sm fruits in spring when watered the first or second time. Tl is proved by: 1) The latter appearance, 2) the abnormal si The fruits have only the size of a bean when falling off nor ally and have still their pistil.

It has been stated by a thorough investigation of t symptom by the phytopathalogic and entomologic departme of the Agricultural Experimental Station, Tel-Aviv, that injury by fungus or bacteriums is out of question. But merous larvas of the Citrus-scale-insect Pseudococcus ci have been discovered on those spots where the stalk of t fruit sits. These larvas were found on the place mention on nearly 90% of the chlorotic and dropped fruits. A conn tion between the calamity and the Pseudococcus-attack m be all the more expected, as the Pseudococcus-larvas ha hardly even discovered on healtly fruits. But it is alm certain that some other factors, such as heat, lack on wat surplus of water or similar things have been of more or l secondary influence.

A control of the insects, sitting at the time unapp achable in clefts was unnecessary, as the fall of the fru stopped already in the beginning of June automatically. T last symptom of this kind has been observed in spring 19 The incrustation is equally distributed on heavy and l bearing trees.

The natural enemies, the parasitic hymenopteron Tana mastix abnormis and the lady-bird Cryptolaemis montrouzi are breed up for the control of these mealy-bugs in great l in 3 special breeding places in California and they have be distributed there in the attacked Bojares with the best succe It will be essential to begin with the erection of such breeding place in spite of the costs connected therewith,

this control, although not radical, is the only one which is to some extent effective. This will be inevitable to prevent injuries as in the last Spring.

The fumigation with hydro-cyanic-acid is out of question for a technical control, as the deadly dose would also kill the trees. Spraying-niixtures have generally no more effect than water, as they do not permeate the wax-capsule. They clean the fruits mechanically when sprayed in a hard jet. A real success would only be possible by using tobacco-soap-liquor, which may be sprayed in Winter. It is also necessary to spray with tobacco-soap-liquor against the white wax-flakes in the end of summer or in the beginning of autumn.

Distribution: Cosmopolitan tropical and sub-tropical.

59. Pseudococcus lindingeri n. sp.

Description: Animal oval, in the last third reaching the greatest width. Abdominal-side flat, dorsal callote-shaped, very strong convex. Body segments plainly visible.

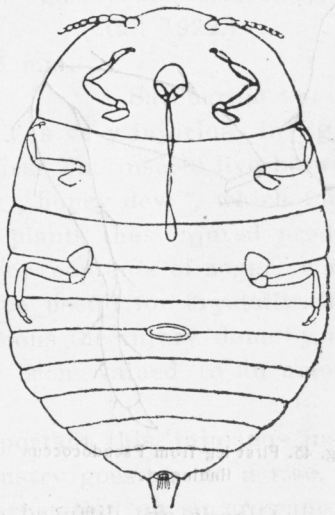


Fig. 42. Adult female from Pseudococcus lindingeri.

Antenae 8-limbed, 384 mikra long. The succession of the limbs is as follows:

72, 78, 48, 42, 36, 30, 42, 36 = 384 mikra

2, 1, 3, 4 & 7, 5 & 8, 6.

See the attacked designs with regard to shape of the antennae and the leg-couples. Length of the leg-couples in stretched position:

Length of the first leg-couple 624 mikra
,, ,, ,, second ,, ,, 624 mikra
,, ,, ,, third ,, ,, 1092 mikra.

2 anallobes on the segment before the last one, of the top of which a 220 mikra long hair rises. The short anal-segment

is situated between the two anal-lobes. The analopening surrounded by 6 about 60 mikra long hairs in wreat shape

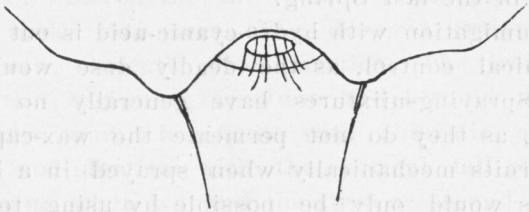


Fig. 43. Abdominal Segment from Pseudococcus lindingeri.

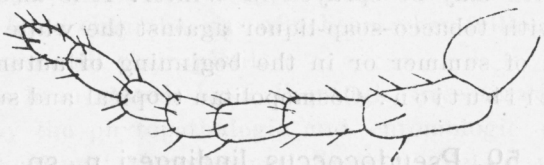


Fig. 44. Antenna from Pseudococcus lindingeri.

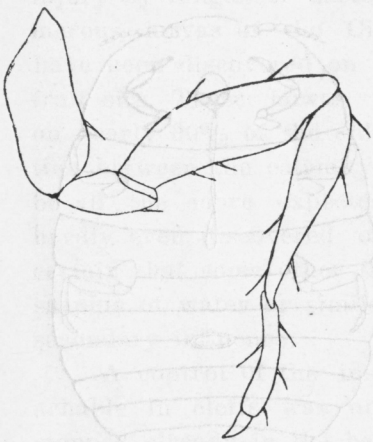


Fig. 45. First leg from Pseudococcus lindingeri.

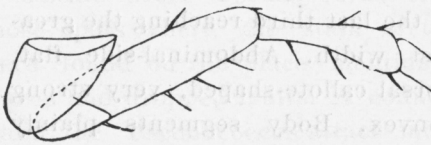


Fig. 46. Second leg from Pseudococcus lindingeri.

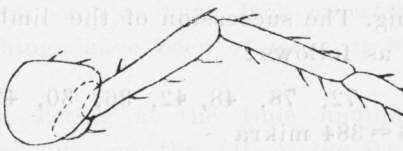


Fig. 47. Third leg from Pseudococcus lindingeri

Glands are diffused over the whole of the skin.

The colour of the animal is reddish-brown, but cover by white wax-stratums.

Diameter: 3,0—3,5 mm long: 2,0 mm wide; 1,0—1,2 m high.

Ovum oval, of brownish colour, Diameter 0,35 — 0,45 0,2 — 0,25 mm.

Host Plants: Gramineae Panicum colonum.

Remarkss: The adult females and larvae in October numerous on the roots of Panicum colonum in the orange-grove of Mikweh Israel, from where I received them through the kindness of Mr Cicik. The animals are mobile in all stages.

I dedicate this species to my dear teacher, the merited scale-insect explorer, Dr. Lindinger in Hamburg.

Distribution: Endemic. Palestine.

60. Pseudococcus sacchari (Ckll.) Fern.

(The Sugar Cane Mealy Bug.)

Bibliography: Hall, Coccidae of Egypt 1912 p. 13.

Description: The adult femal is large, oblong, oval, decidedly plump, and of light pink colour; it is but very sparsely mealy and the segmentation is distinct. It is ovoviviparous and gives rise to a vary loose mass of white fibrous secretion and much „honey dew". The young female is not very active, unless disturbed." (Hall 1922.)

Diameter 6 — 10 × 3 — 5 mm.

Host Plants: Gramineae Saccharum sp.

Remarks: This scale insect is very injurious in Egypt and many other sugar-cane-countries. The insects live between the leave-covers and excrete much „honey dew", which forms a sticky mass on the leaves. The plants thus injured produce in the factory a considerable minor contents of sugar, which even occasionally may not at all be useful for crystallisation. With reference to Hall's investigations the injury done by this insect in 1921 in Sub-Egypt has been valued to an amount of L 100.000.

It is quite obvious how important this injurious insect will be as soon, as the sugar industry goes up to a rise. So far only found twice in weak incrustation on sugar cane in Palestine. The first time it had been discovered by Mr Hall, in a garden of Jaffa, the second time by myself near Sarona. This little incrustation is not of great importance as so far the sugar cane has only been cultivated for own use. But there is still the possibility to prevent an importation into other districts. The following measures are necessary for this purpose and with regard to the future importance.

Sets should not be imported from the foreign countri unless they are paraffined and accompanied by a certifica of health from the government. Other consignments shou either be destroyed by fire or paraffined here in the countr Expeditions of sets from attacked districts to other distric within Palestine must be forbidden or they would have to b under the same regulations as foreign shipments. The Jaf district has to be described as infected in this sense.

The prophylactic control of this scale insect consist o the following measures: The sets should be cleaned, befor setting them, carefully from all leave-covers and then the have to be dipped for 2 minutes into a paraffin emulsion (di uted 1 in 30.) This paraffination has proved in Egypt as quit effective with reference to Hall (1922 p. 14)

Leaves and other wastes should be immediately after th harvest destroyed by fire on the field.

The strong increase of P. sacchari in Egypt has its caus in the temporary neglect of these measures. Further detail of the control will be discussed when industrial sugar-cane plantations will be established in Palestine.

Distribution: Cosmopolitan tropical and subtropical

61. Pseudococcus vitis Niedl.

(The subteranean Vine Mealy Bug.)

Synonyms: Coccus vitis Niedl., Dactylopius vitis Licht

Bibliography: Mangin et Viala, Paris 1913.

Description: The adult female is oval, the greates width in the last third, plainly segmental. Antennae 8-limbed Instead of the 34 plain wax-cylinders, which are to be found for instance on P. citri as marginal-appendages, only short irregular wax-sediments of the same number are found on this species.

Colour yellow-reddish, covered with white wax-sediments.

Diameter $2-3{,}5 \times 1{,}2-1{,}9$ mm.

Host Plants: Vitaceae Vitis vinifera.

Remarks: This scale insect lives subterranean in the gardens of the Judean viticulturists (Ekron, Rechoboth, Rishon Lezion, Mikweh Israel,) and is considerably injurious.

The wine-gardens attacked by the ,,Phthiriose" look like the well known injury-picture of the phylloxera. In the course of some years at first one stem of vine withers accompanied by stunting symptoms. This disease is distributed, more and more radiating, from one year to another.

The diagnosis is easily fixed after laying open the root. The roots are surrounded by a dense grey-black felt, which has been formed by the hyphen of the fungus Bornetina corium. When cutting this fungus, the white insects are to be found in the inside between felt and roots. The insects suck and excrete a lot of ,,honey dew" on which the above mentioned fungus settles down. Some undermining mites of secondar importance live in company with Bornetina and Pseudococcus. The fungus lives entirely of the ,,honey dew" of Pseudococcus and does not attack the fibre of the root of the vine stem in the least. But it cuts same off in such a high degree from all water- and gas-assimilation so that the attacked stem dies off after several years of malady. (According to more or less trustworthy informations 5-15 years.)

Almost in every elder vine-yard bare spots are found which are caused by this symbiosis of Bornetina and Pseudococcus, so far not discovered outside of Palestine.

Lindinger considers P. vitis Niedl as a synonym to P. citri Risso, but obviously he was not in possession of any material of this species. A more specialised technical paper about this Mealy Bug of great importance to vine-culturists will be prepared.

Attacked stems most be torn out and immediately destreyed by fire in a surrounding of 3-7 meters (according to the age of the attacks). A repeated desinfection of a soil-ring of a width of 3 m. with carbonic disulphide (effective only against the young fungus-hyphen and Pseudococcus) as well as a similar desinfection of the cleared soil, wich should remaine uncultivated for at least 3 years, will be effective.

Distribution: Mediterranean. In Italy and France more overground, in Palestine, Algeria and Tunis more on the roots. In Palestine so far only found on the roots.

Sub-Family Hemicoccinae.

62. Kermes sp.

I have found a Kermes sp. on Quercus coccifera nea Nahalal, which had settled down on the bark of the stem.

Measures: 3 – 5 mm long, 2 — 3 mm high, 2—3 mm wid

The colour was deep redbrown and the animal was c vered with callosity and humps. I regret the insects hav been destroyed past recognition on the transport, so that final determination must be postponed.

Kermes species were formerly of great importance, as th holy garments of the priests were dyed with crimson-re won from them. The purple dyer's trade was displaced b them, according to Ritters informations. The crimson-dy have only lately been replaced by aniline-dyes. The nam „Kermes" is an old Arabean indication for these insects.

Bibliography: Munk, Reise nach dem Heiligen Lan 1871 p. 63. Killermann, Die Blumen des Heiligen Land I Leipzig 1915 p. 26.

Sub-Family Dactylopinae.

63. Sphaerococcus marlatti (Ckll.) Newst.

Synonyms: Phoenicococcus marlatti Ckll.

Bibliography: Essig, Injur. and benefic. Insects of California, 1915 p. 123.

Description: The adult female is circular to oval, immovable, more or less hemispherical; abdominalside flat. No segmentation, no legs, feelers generally reduced (to 7 limbed, generally only button-shaped). The colour of the alive animal is red-brown, of the dead animal yellow-brown, they are generally covered by white wax-secretions.

Diameter 1,0 — 1,5 mm.

Host Plants: Palmaceae Phoenix dactylifera.

Remarks: Under the remaining leave-stumps of cut leaves generally in large groups together. Near Gazah, Jaffa, Jericho and on the bank of the Dead Sea.

In the date-oasis El-Arish (Sinai) found in strong incrustation.

In no way injurious.

Distriution: South-Mediterranean: Egypt, Algeria, Tripolis, Palestine; imported to Italy and North-Amerika.

Sub-Family Monophlebinae.

64. Icerya aegyptiaca (Dougl.) Ril. et How.

(The Egyptian Mealy Bug.

Bibliography: Douglas, Ent. Mon. Mag. XXVI p 79 (1890.) Lindinger, Schildl. Eur. 1912 p. 155.

Description: The adult female is orange-yellow, o a size of 6×4 mm, oval, and free-movable. Feelers and leg black. On the abdomen a wreath of thick, white, more o less curved, fragile wax-strings 3—5 mm long, the anterio ones double as thick and half as long as the posterior ones The ovi-sac situated thereunder contains the orange-red ovule in a stringy white mass and has longitude stripes, generally a long as wide.

Larvae and males much like Icerya purchasi.

Host Plants:

Moraceae	Ficus infectoria, Morus alba.
Leguminosae	Parkinsonia aculeata.
Tamaricaceae	Tamarix orientalis.

Remarks: In Palestine only found at one place in th garden of the Hotel du Parc, Jaffa, whereto it probably ha been imported one ore two decades ago together with foreig ornamental trees, may be with Ficus infectoria. The incrust ation is but minimal. The climate seems to be unfavourabl for this species and a large distribution is therefore not t be suspected and will be controlled by some Coccinellides.

Distribution: Originally found in Egypt, but th origin may be in India. In the subtropics and tropics of th whole world. Only lately imported to Palestine.

65. Icerya purchasi Masc.

(The Australian Fluted Scale)

Bibliography: Comstock, U. S. Dep. of Agr. 188p. 47

Description: The wide oviform, dark-red females ar continuous free-movable, they have brown spots on th

dorsal. Size 5 — 6 × 4 mm. The ripe female bears the narrow growing ovisac on the underside, which is easy recognized by the surrounding, characteristic, regular crenulated, thick

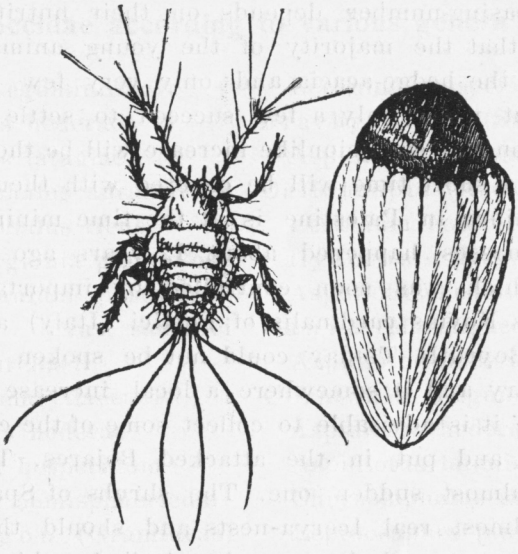


Fig. 45. Icerya purchasi. At left: Larva. At right: Adult female from behind, showing the ovisac.

wax-appendages, which are secreted from the abdominal marginal-glands. The pink-red ovules are therein in white-stringy mass. Maximal length of the ovisac 10 mm.

The delicate males much smaller and light-red are winged and posses long wax-strings on the hind-body.

The larvae are distinguished by especial large legs and feelers with long hairs.

Host Plants:

	Citrus aurantium, C. limonum,
Rutaceae	Ethrog, Grape fruit, sweet lemons.
Leguminosae	Acacia farnesiana, A. longifolia,
	Spartium junceum, Gleditschia sp.
Punicaceae	Punica granatum (Pomegranate)
Pittosporaceae	Pittosporum sp.
Rosaceae	Rosa sp. (Rose), Fragaria sp.
Geraniaceae	Geranium sp.
Anacardiaceae	Schinus molle, Sch. terebinthifolius,
Compositae	Hieracium sp.
Euphorbiaceae	Ricinus communis.

Remarks: This species is very fertile, as every female lays 400-900 eggs. They develope in Palestine under favourable conditions in summer 2 generations, in winter one generation. Their increasing-number depends on their nutritive plants. It appears that the majority of the young animals die for instance on the hedge-acacia and only very few develope to puberty ; but when only a few succeed to settle down on a Sweet Lemon, an explosionlike increase will be the result and the tree in a short time will be covered with them.

The injury in Palestine is at the time minimal. An increase in masses happened about 12 years ago in Petach-Tikwah, which was soon controlled by importation of the coccinellides Novius cardinalis of Portici (Italy) and N. cruentatus of Beyruth. To-day could not be spoken of a considerable injury and if somewhere a local increase in masses should arise it is advisable to collect some of the coccinellides in question and put in the attacked Bojares. The success will be an almost sudden one. The shrubs of Spartium junceum are almost real Icerya-nests and should therefore not be used as ornamental plant or when it is found in Bojares be teared out and destroyed by fire. Strong attacked single trees for instance of Sweet Lemon, should be considerable recu Another control against Icerya is at the time out of questio

Distribution: Origin Australia or East-Asia, nowadays tropical and subtropical in the whole world. Importe to Palestine about 15 years ago and everywhere distribute with exception of the Ghor.

List of Coccidae according to various genera of plants.

Acacia (Leguminosae)
Aspidiotus hederae
Aspidiotus lataniae
Chrysomphalus aurantii
Chrysomphalus ficus
Pseudotargionia glandulosa
Asterolecanium pustulans var. sambuci
Icerya purchasi

Agave (Amaryllaceae)
Aspidiotus hederae
Lecanium hesperidum
Lecanium hemisphaericum

Andropogon (Gramineae)
Chionaspis graminis var. aegyptiaca

Antirrhinum (Scrophulariaceae)
Aspidiotus hederae

Araucaria (Coniferae)
Eriococcus araucariae

Arum (Aralaceae)
Lecanium hesperidum

Asparagus (Liliaceae)
Aspidiotus hederae
Aspidiotus herzlianus
Chionaspis berlesei
Lecanium hemisphaericum

Bambusa (Gramineae)
Asterolecanium bambusae

Begonia (Begoniaceae)
Lecanium hesperidum

Bougainvillea (Nyctagineae)
Lecanium hesperidum

Brachychiton (Sterculiaceae)
Aspidiotus lataniae

Callotropis (Asclepiadaceae)
Lecanium hesperidum

Calycotome (Leguminosae)
Aspidiotus hederae

Canna (Marangaceae]
Aspidiotus hederae

Ceratonia (Leguminosae)
Aspidiotus hederae
Aspidiotus lataniae
Chrysomphalus aurantii
Lepidosaphes pinniformis
Lepidosaphes conchiformis
Ceroplastes floridensis

Cercis (Leguminosae)
Aspidiotus lataniae

Citrus (Rutaceae)
Chrysomphalus aurantii
Chrysomphalus ficus
Lepidosaphes gloveri
Lepidosaphes pinniformis
Parlatoria pergandei
Parlatoria oleae
Ceroplastes floridensis
Lecanium hesperidum
Lecanium oleae
Pseudococcus citri
Icerya purchasi

Coleus (Labiatae)
Lecanium hesperidum
Pseudococcus citri

Cucumis (Cucurbitaceae)
Pseudococcus citri
Cycas (Cycadaceae)
Aspidiotus lataniae
Lecanium oleae
Cydonia (Rosaceae)
Ceroplastes floridensis
Pseudococcus citri
Cyperus (Cyperaceae)
Aspidiotus hederae
Cypressus (Coniferae)
Diaspis visci
Chionaspis striata
Dracaena (Liliaceae)
Aspidiotus hederae
Echinocactus (Cactaceae)
Lecanium hesperidum
Ephedra (Gnetaceae)
Leucaspis riccae
Erianthus (Gramineae)
Chionaspis herbae
Chionaspis stanotophri
Eriobotrya (Rosaceae)
Aspidiotus lataniae
Ceroplastes floridensis
Lecanium hemisphaericum
Eucalyptus (Myrtaceae)
Chrysomphalus ficus
Chrysomphalus aurantii
Evonymus (Celastaceae)
Aspidiotus camelliae
Ficus (Moraceae)
Aspidiotus lataniae
Aspidiotus zonatus?
Lepidosaphes conchiformis
Lepidosaphes minima
Ceroplastes floridensis
Ceroplastes rusci
Lecanium hesperidum
Lecanium nigrum
Asterolecanium pustulans
var. sambuci
Pollinia pollini
Pseudococcus citri
Icerya aegyptiaca
Fragaria (Rosaceae)
Icerya purchasi
Geranium (Geraniaceae)
Icerya purchasi
Gleditschia (Leguminosae)
Icerya purchasi
Gramineae
Chionaspis herbae
Eriopeltis sp.
Hedera (Aralaceae)
Aspidiotus hederae
Aspidiotus spinosus
Ceroplastes rusci
Lecanium hesperidum
Hieracium (Compositae)
Ceroplastes floridensis
Icerya purchasi
Ilex (Aquifoliaceae)
Parlatoria oleae
Inula (Compositae)
Aspidiotus lataniae
Juglans (Juglandaceae)
Aspidiotus ostraeiformis
Laurus (Lauraceae)
Aspidiotus britannicus
Aspidiotus hederae
Chrysomphalus aurantii
Ceroplastes floridensis
Lecanium hesperidum
Lecanium oleae
Icerya purchasi

Liliacea sp. (Liliaceae)
Pinnaspis aspidistrae
Lonicera (Caprifoliaceae)
Aspidiotus hederae
Lecanium hesperidum
Magnolia (Magnoliaceae)
Lecanium nigrum
Melia (Meliaceae)
Aspidiotus hederae
Aspidiotus lataniae
Ceroplastes floridensis
Mesembryanthemum (Aizoaceae)
Pseudococcus citri
Morus (Moraceae)
Aspidiotus lataniae
Parlatoria oleae
Icerya aegyptiaca
Musa (Musaceae)
Chrysomphalus aurantii
Chrysomphalus ficus
Ceroplastes floridensis
Myrtus (Myrtaceae)
Aspidiotus camelliae
Ceroplastes floridensis
Nerium (Apocyanaceae)
Aspidiotus hederae
Parlatoria oleae
Ceroplastes floridensis
Ceroplastes rusci
Lecanium oleae
Nicotiana (Solanaceae)
Aspidiotus hederae
Olea (Oleaceae)
Aspidiotus britannicus
Aspidiotus hederae
Aspidiotus lataniae
Chrysomphalus ficus
Lepidosaphes palaestinensis
Parlatoria oleae
Euphilippia olivina
Lecanium oleae
Pollinia pollini
Pseudococcus citri
Opuntia (Cactaceae)
Diaspis echinocacti
Panicum (Gramineae)
Pseudococcus lindingeri
Parkinsonia (Leguminosae)
Icerya aegyptiaca
Persica (Rosaceae)
Lepidosaphes zlocistii
Ceroplastes floridensis
Phoenix (Palmaceae)
Aspidiotus hederae
Parlatoria blanchardi
Sphaerococcus marlatti
Pinus (Coniferae)
Leucaspis candida
Leucaspis pusilla
Pirus (Rosaceae)
Aspidiotus ostraeiformis
Chrysomphalus aurantii
Parlatoria oleae
Ceroplastes floridensis
Pistacia (Anacardiaceae)
Aspidiotus hederae
Chrysomphalus aurantii
Melanaspis inopinata
Epidiaspis gennadiosi
Leucaspis pistaciae
Ceroplastes floridensis
Pittosporum (Pittosporaceae)
Icerya purchasi
Platanus (Platanaceae)
Aspidiotus lataniae

Populus (Salicaceae)
Crypthemichionaspis africana
Prunus (Rosaceae)
Parlatoria judaica
Parlatoria oleae
Ceroplastes floridensis
Psidium (Myrtaceae)
Aspidiotus lataniae
Punica (Punicaceae)
Lepidosaphes ulmi
Ceroplastes floridensis
Icerya purchasi
Quercus (Fagaceae)
Aspidiotus zonatus
Targionia distincta
Asterolecanium variolosum
Kermes sp.
Rhus (Anacardiaceae)
Pulvinaria sp.
Ricinus (Euphorbiaceae)
Aspidiotus hederae
Chrysomphalus aurantii
Lepidosaphes ulmi
Icerya purchasi
Robinia (Leguminosae)
Aspidiotus lataniae
Lecanium hesperidum
Rosa (Rosaceae)
Chrysomphalus aurantii
Lecanium hesperidum
Icerya purchasi
Saccharum (Gramineae)
Pseudococcus sacchari
Salix (Salicaceae)
Chrysomphalus aurantii
Crypthemichionaspis africana
Lepidosaphes ulmi
Sambucus (Caprifoliaceae)
Aspidiotus hederae
Schinus (Anacardiaceae)
Aspidiotus hederae
Ceroplastes floridensis
Ceroplastes rusci
Lecanium hesperidum
Icerya purchasi
Solanum (Solanaceae)
Aspidiotus lataniae
Spartium (Leguminocae)
Icerya purchasi
Styrax (Styracaceae)
Lepidosaphes conchiformis
Tamarix (Tamaricaceae)
Chionaspis engeddensis
Chrysomphalus aurantii
Lepidosaphes bicuspis
Adiscodiaspis tamaricicola
Icerya aegyptiaca
Thuja (Coniferae)
Diaspis visci
Chionaspis striata
Thymelaea (Thymelaeaceae
Aspidiotus hederae
Aspidiotus lataniae
Viscum (Loranthaceae)
Lecanium hesperidum
Vitex (Verbenaceae)
Lecanium racheli
Vitis (Vitaceae)
Aspidiotus hederae
Chrysomphalus aurantii
Pseudococcus vitis
Washingtonia (Palmaceae
Aspidiotus hederae
Chrysomphalus ficus
Zizyphus (Rhamnaceae)
Aspidiotus camelliae
Aspidiotus zonatus ?
Lepidosaphes ulmi

Part III.

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Errata.

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Addenda:

Since I have finished this paper (September 1923), I hav found two other species of Scale Insects in Palestine:

1) Aulacaspis pentagona on wild Rubus nea Dagania.

2) Aonidia lauri an Laurus nobilis in Mikweh Jsrael

Table Explication.

Table I. Aspidiotus hederae. Fig. 1. On stem, branches, leaves and fruits of Olive trees. Fig 2. The same. Attacked fruits magnified.

Table II. Fig. 3. Chrysomphalus aurantii on Orange leave and fruit. Fig. 4. Chrysomphalus ficus on Orange fruit.

Table III. Fig. 5. Lepidosaphes palaestinensis n. sp. on Olive leaves. Fig. 6. Lepidosaphes conchiformis on a Fig branch. Fig. 7. Leucaspis pistaciae on branches of Pistacia lentiscus. Fig. 8. Leucaspis ephedrae on the stem of Ephedra sp.

Table IV. Fig. 9, Fig. 10. Lepidosaphes bicuspis on Tamarix branches. Fig. 11. Aspidiotus herzlianus n. sp. on Asparagus aphyllus. Fig. 12. Crypthemichionaspis africana on the bark of a Salix tree.

Table V. Fig. 13. Chionaspis stanotophri on Erianthus ravennae. Fig. 14. Chionaspis berlesei on Asparagus sp.

Table VI. Fig. 15. Asterolecanium pustulans var. sambuci on Fig. branches. Fig. 16. Parlatoria oleae on the branch of Pyrus malus. Fig. 17. Lepidosaphes zlocistii n. sp. on Apricot bark.

Table VII. Fig. 18. Lecanium (Saissetia) oleae on young Orange branches. Fig. 19. Lecanium (Eulecanium) racheli n. sp. on Vitex agnus castus. Fig. 20. Lecanium (Coccus) hesperidum. Young animals on Orange branches.

Table VIII. Fig. 21. Pseudococcus sp. on the roots of a palme tree. Fig. 22. Lecanium (Saissetia) hemisphaericum on Albizzia lebbekh.

Table IX. Pseudococcus citri. Fig. 23. on ripe Oranges. Fig. 24. On young Oranges, which dropped before time.

Table X. Pseudococcus vitis. Fig. 25. Bare root of Vine, showing the sucking Mealy-Bugs. Fig. 26. Root of Vine

covered by the felt of Bornetina corium. Fig. 27. The sam
as Fig. 25.

Table XI. Fig. 28. Pseudococcus lindingeri n. sp. on th
roots of Panicum colonum. Fig. 29. Aspidiotus aharonii
sp. on a Carob branch, together with Aspidiotus hederae an
Lepidosaphes pinniformis.

Table XII. Fig. 30. Gall produced by Eriococcu
araucariae on the needle sprouts of Araucaria sp. Fig. 3
Euphilippia olivina on Olive leaves.

ציור 1

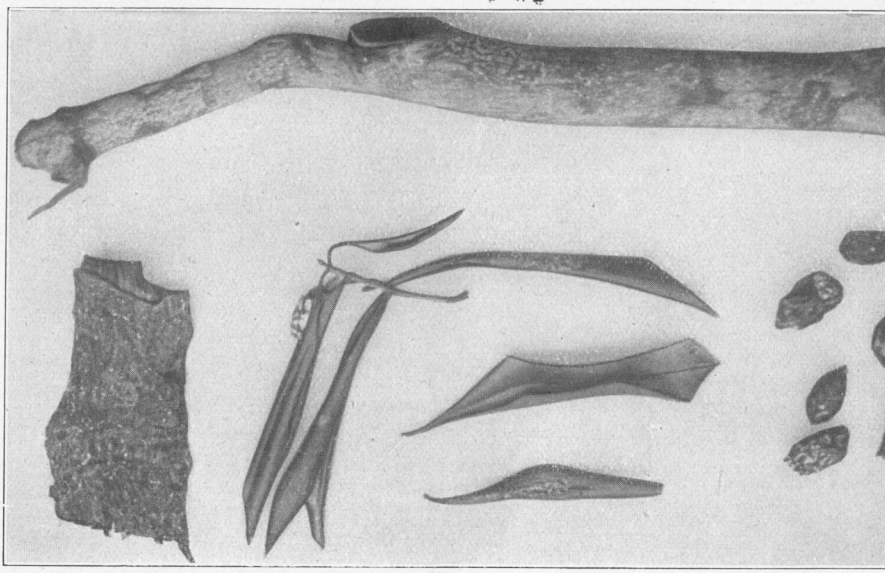


Fig. 1

ציור 2

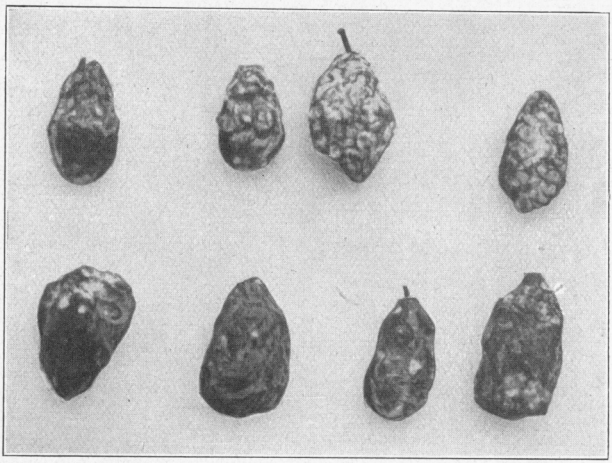
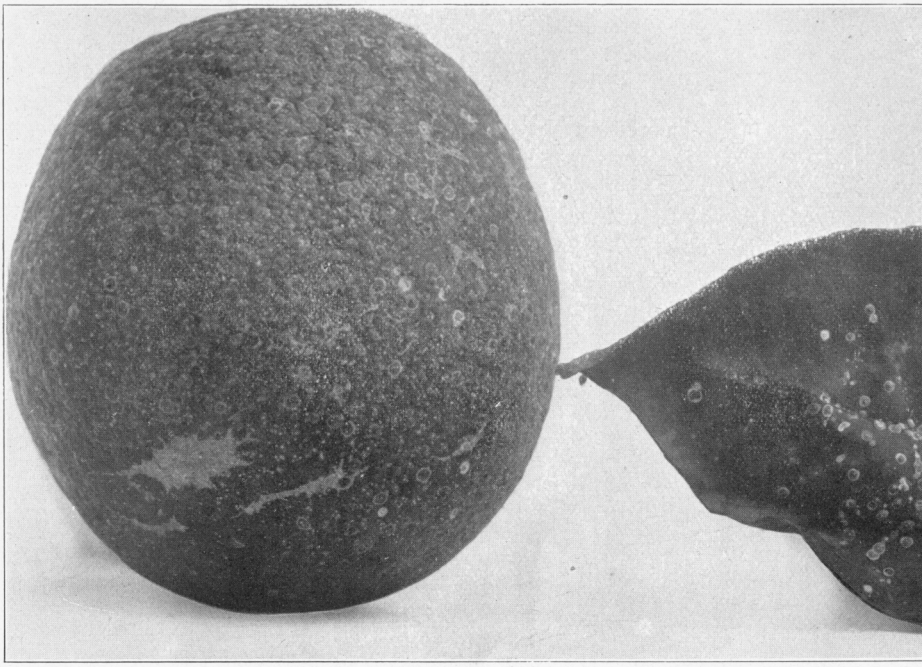


Fig. 2



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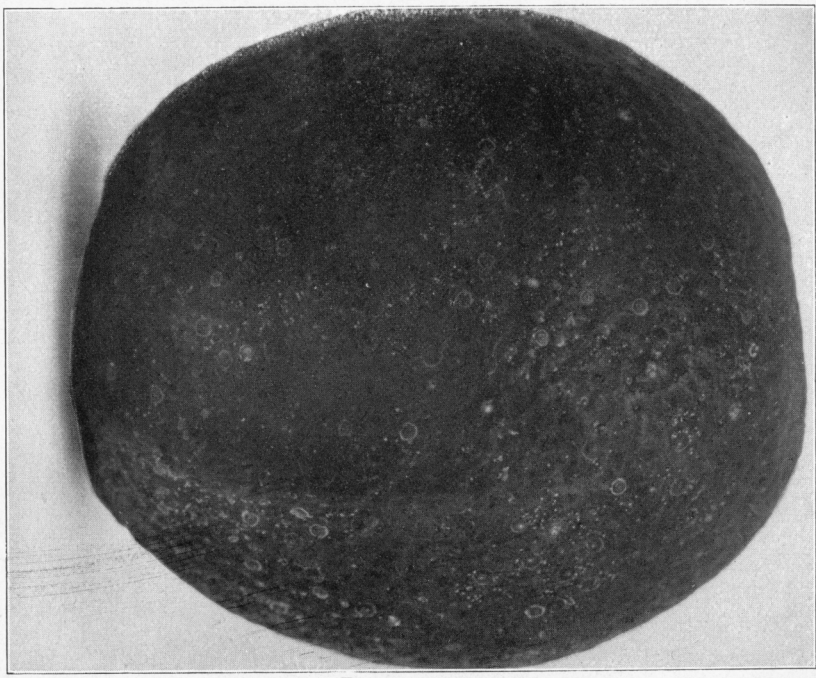
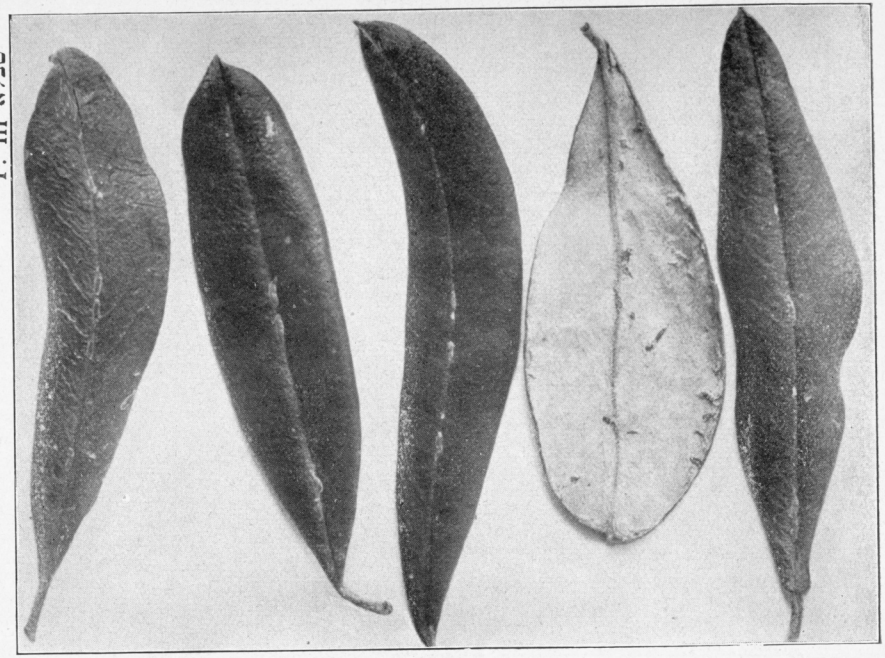


Fig. 4 ציור

T. III טבלא



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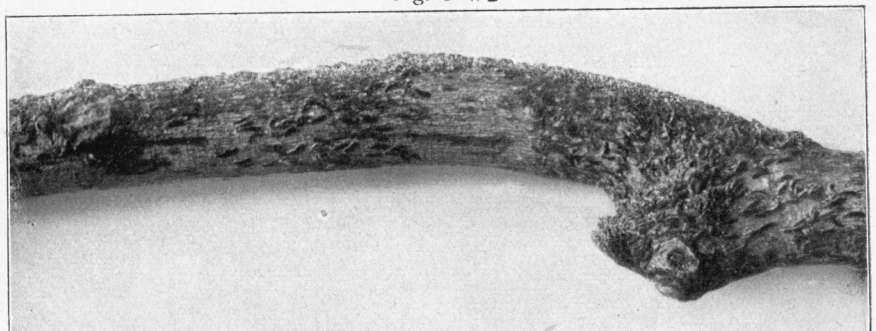

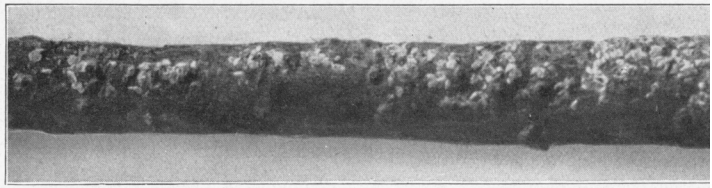

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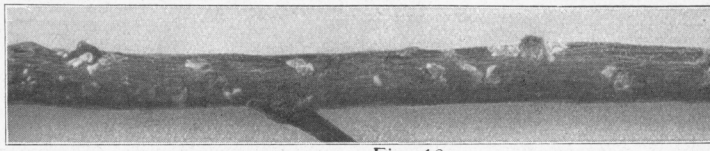

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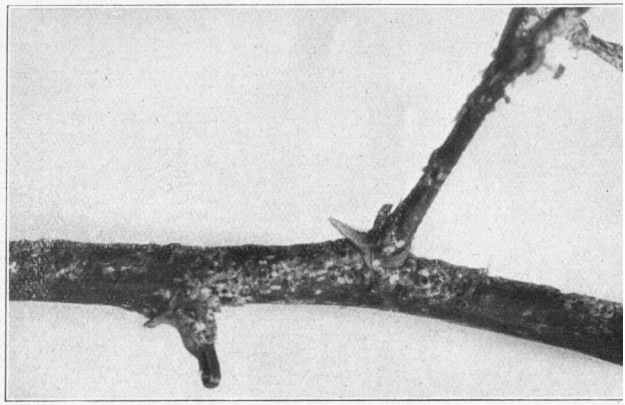

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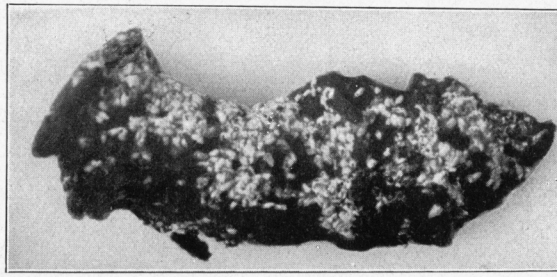

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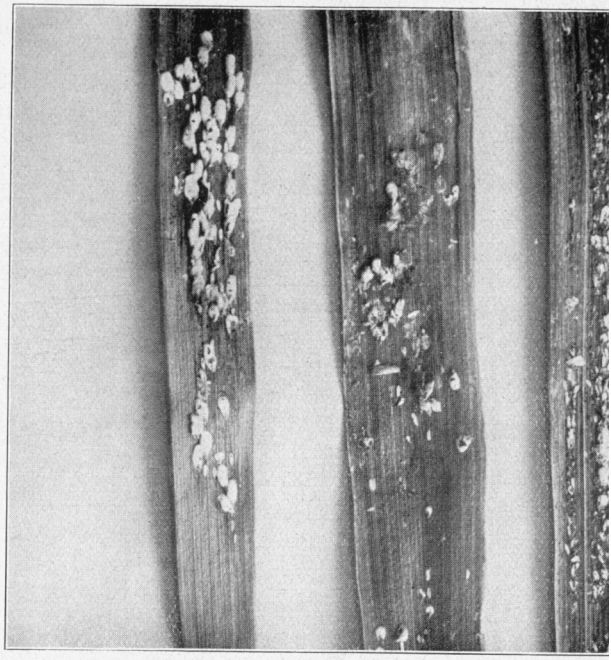

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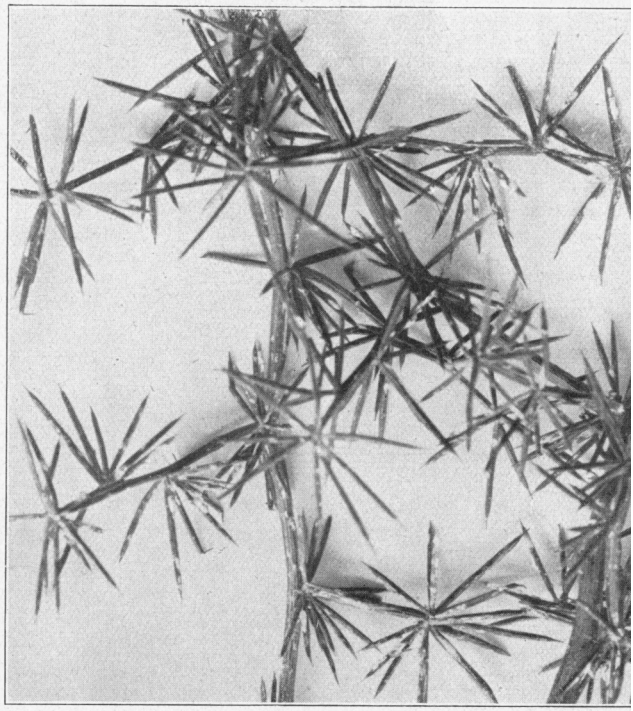

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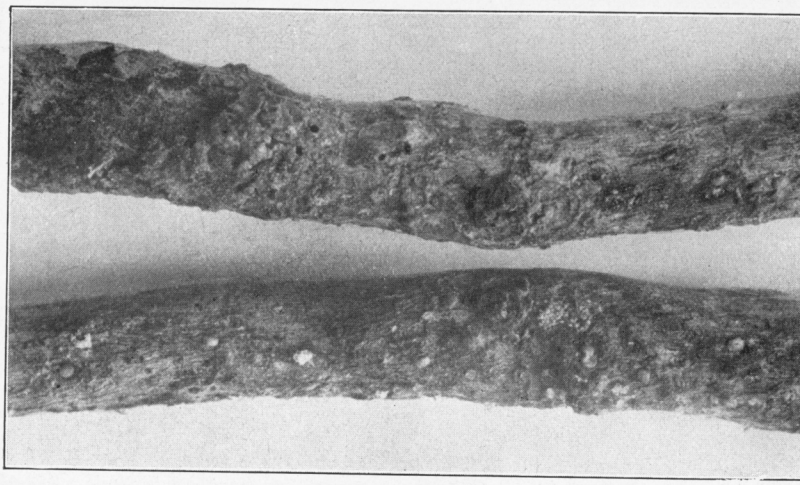

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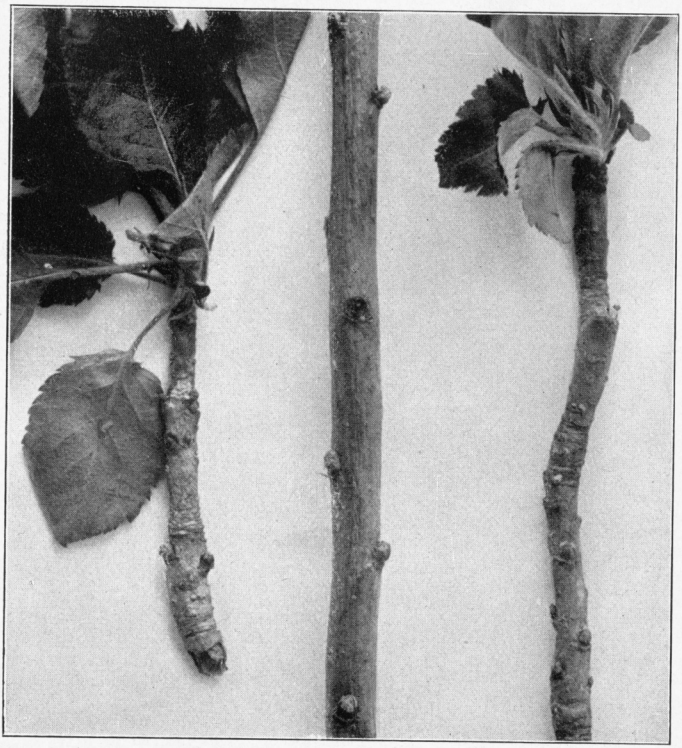


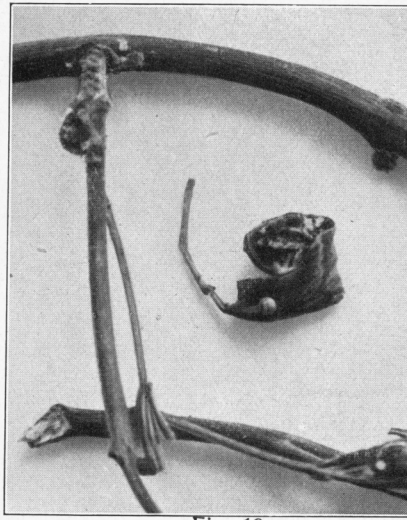
Fig. 16 ציור



Fig. 17 ציור



Fig.



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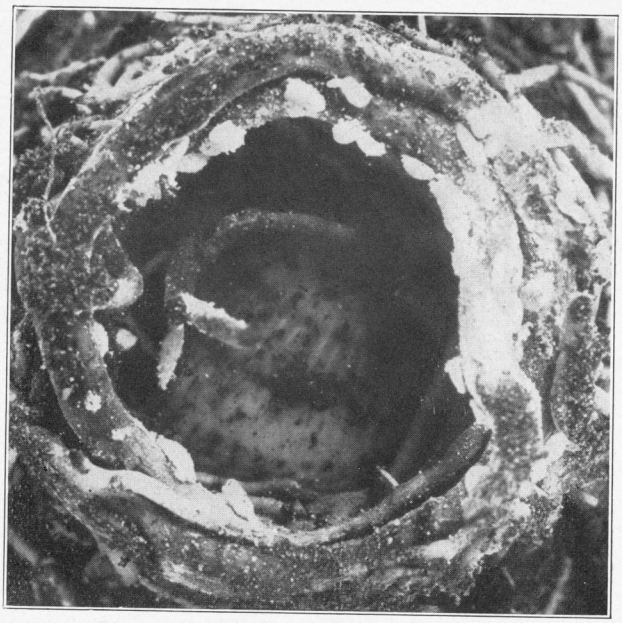

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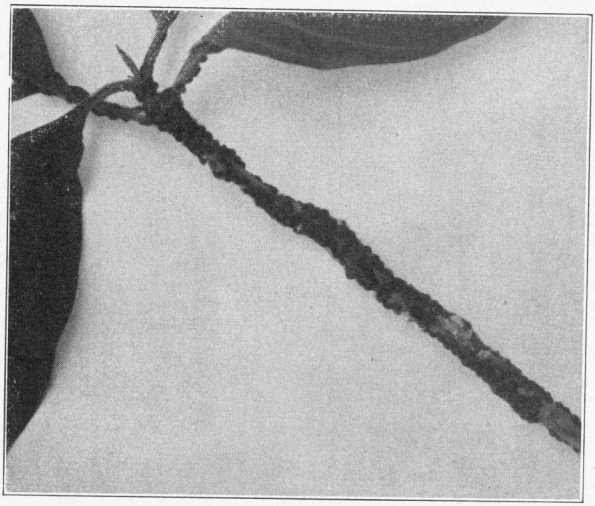

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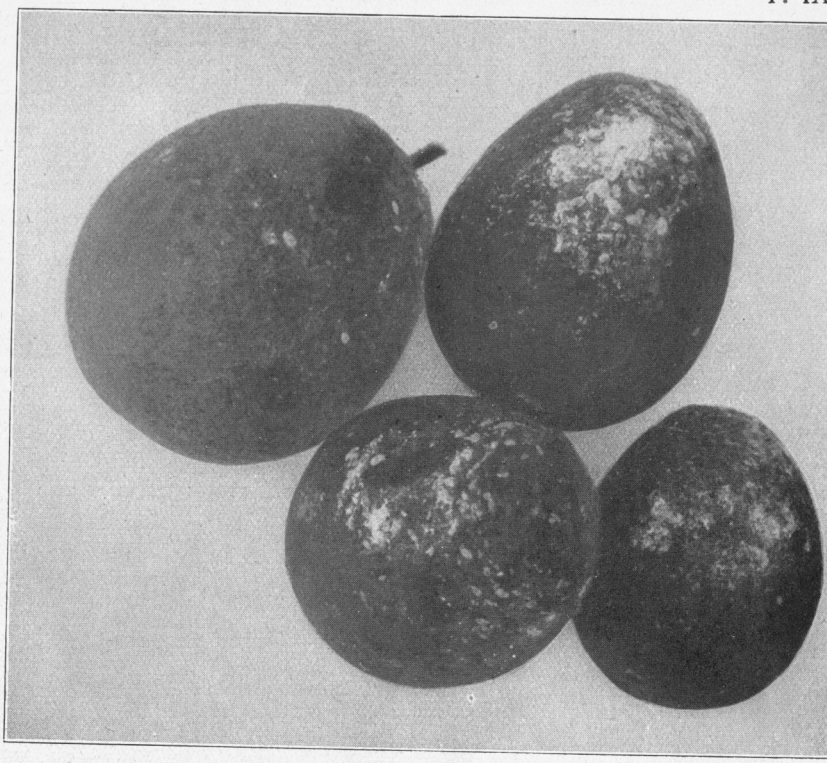

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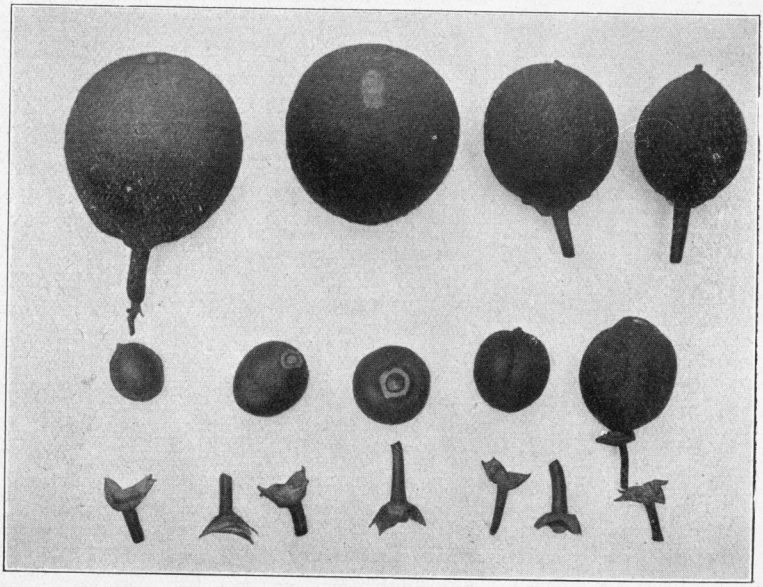

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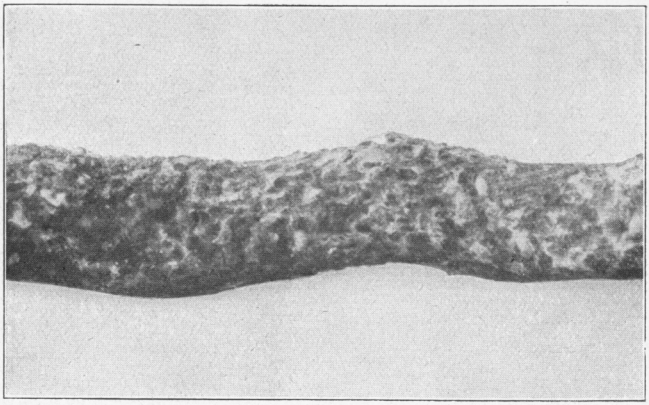

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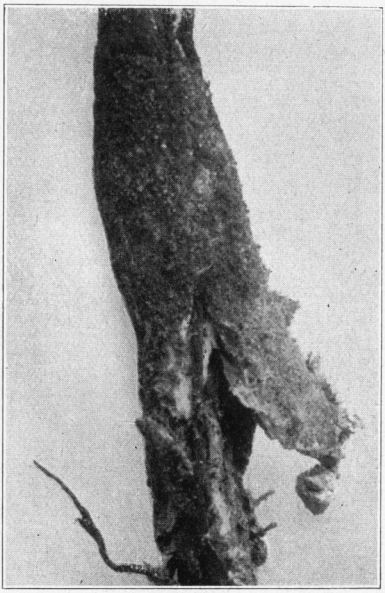

Fig. 26 ציור

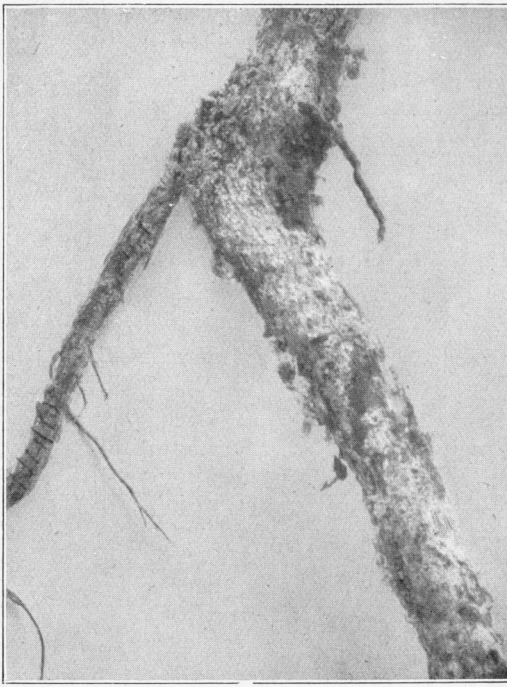

Fig. 27 ציור



Fig. 28 ציור

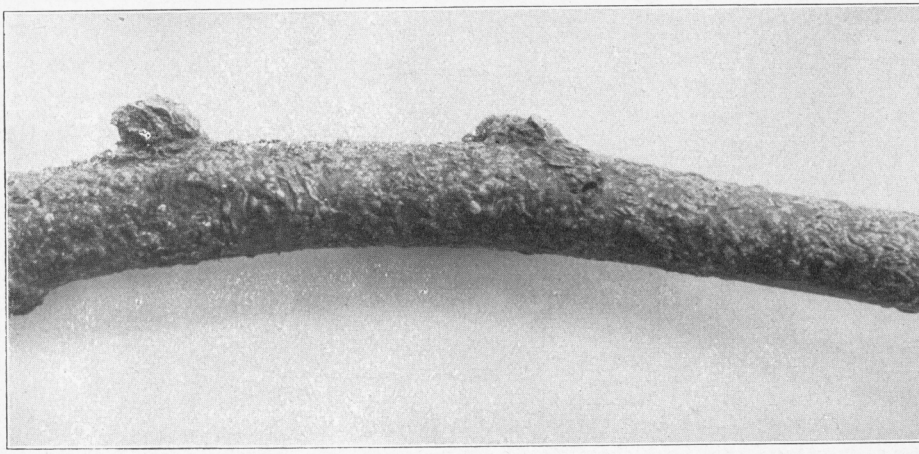

Fig. 29 ציור

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