# BLACK PARLATORIA, *PARLATORIA ZIZYPHUS* (LUCAS)

by

LIANG-CHUAN CHANG & CHIA-CHU TAO

The common black citrus-infesting Parlatoria is the most injurious citrus pest of Taiwan because the scales tightly cover the leaves, fruits or twigs. The infested fruits even after brushing through waxing machine or with fingers, the scales still stick on the peel, therefore, the infested fruits are rejected for export to the market. Moreover, the insect takes seven generations a year, the dead scales accumulated and occupied nearly all over the surface of infested area (fig. 7 & 8) due to the covered area, the photosynthesis was interrupted and the twigs die very quickly.

The scale is very flat and stick firmly on the host, the natural enemies are very difficult to attack and so the chemical control. Before drafting the manuscript, 1% summer oil plus 0.05% malathion or 0.05% parathion is the only method to control it and this method was well accepted by the growers in Taiwan.

Morphology, life history, natural enemies and chemical control of this species have been briefly studied and summarized in below. The writers wish to express their sincere thanks to Dr. T. W. Liu, Head of Plant Industry Division of Joint Commission on Rural Reconstruction and Dr. S. G. Hsu, Director of Taiwan Agricultural Research Institute for their encouragement in this study.

## I. Description of *Parlatoria zizyphus* (Lucas)

*Common names:* The Mediterranean scale, black chaff scale, the common black citrus infesting Parlatoria.

*Hosts:* Many species and varieties of *Citrus*.

*Distribution:* Tropical and subtropical countries of the following area: (See accompanying Fig. 1.)

*Asia:* Burma, Caucasus, Ceylon, Indo-China, Java, Philippine, Siam, South China mainland, South Japan, Straits Settlement, Sumatra.

*Pacific Ocean:* Hawaii, New Zealand.

*Northern Africa:* Algeria, Egypt, Morocco.

*Southern Europe:* France, Greece, Italy, Malta, Portugal, Sicily, Spain.

*America:* British Guiana, Cuba, Dominica, Haiti.

*Egg:* Shiny purple, elliptical, arranged under the posterior end of mother scale, the eggs are usually seen including crawlers under the scale at the same time. Egg stage takes 2 days in summer and 4–5 days in winter.

*Nymph:* Crawler comes out from underneath the scale, takes a short walk for searching suitable place such as leaf, twig or fruit then settles down and secretes

waxy substance to enclose the body posteriorly. The secretion enlarges and thickenes gradually to form scale. The first exuvia is black with longitudinal and transversal carinae. The secretion is pushed out terminally and surrounded. Body of the post stage of second instar of the female is flat and broad, covered with broad secretion membrane. The head of the post stage of second instar of the male has two brownish purple eyes which are visible from above, whenever, the body gradually changes to reddish purple.

*Adult: Male*: After passing second moult, the ecdysis is quite different from the female, it changes to prepupa. The second exuvia does not add to the scale, therefore, the scale just leaves one exuvia which is black and egg shaped. Then the body gradually changes to reddish purple.

*Female:* Second exuvia large, rounded rectagular, occupied the large part of the scale, which is black, there are 2-3 longitudinal carinae. After gravidity, the posterier body becomes swollen and darkened. Just moulting of second exuvia of third instar, there is a secretion membrame which covers around the scale, and breaks in the old adult. However, the caudal membrane is large and visible, this is the difference between stages of the old and young. After oviposition, the body shrinks and dies.

Dr Mc Kenzie illustrated the female body very completely and copied in below.

"Dorsal submarginal macroducts relatively few, ranging from 10-14. Dorsal intermediate macroducts lacking. Microducts situated as indicated in the accompanying Fig. 2. Three pairs of well developed pygidial lobes, practically equal in size, faintly once-notched on either side. Fourth lobes resembling sclerotized spur. Fifth lobes apparently lacking. Plates between median lobes slender, these between third lobes and just beyond fourth lobes broadened, apically fimbriate. Intermediate plate between third and fourth lobes widest; remaining plates narrow, irregularly lanceolate and apically fimbriate. Anal opening situated about mid-pygidium, vulva slightly above this. Perivulvar pores in four distinct groups, anterior laterals with usually 5 or 6 pores, posterior laterals with usually 10 pores. Prosoma membranous with 3 to 7 small, inconspicuous ventral duct tubercles along body margin between anterior and posterior spiracles, 7 to 9 along margin opposite posterior spiracle and 4 to 6 on margin of first abdominal segment. Eyespot greatly enlarged, appearing as ear-like lobes on the anterior margin of the prosoma. Anterior spiracle with 2 to 4 adjacent multilocular disk pores. Derm pocket between posterior spiracle and body margin lacking. Body 0.6-mm. long and 0.60 mm. wide."

The prominent ear-like eyespot on the anterior lateral prosomal margin and the blackish scale readily separate this species from all other related species.

Duration of different stages of female in April to June of 1957 was observed by Mr. S. L. Chang as follow: Egg 3 days, first stadium 7 days, second stadium 16 days, third stadium 13 days total 39 days. Male egg 3 days, first stadium 7 days, second stadium 16 days, prepupa 3 days, pupa 4 days, total 33 days respectively.

Life history

Life cycle of year round from June of 1956 to June of 1957 was shown in the following table.

Table I: Life Cycle of Black Parlatoria in 1956–1957, Taipei, Taiwan.

| Number of generation | Duration of | | | | | | |
|---|---|---|---|---|---|---|---|
| | egg | Ist instar | 2nd. instar | 3rd. instar | oviposition period | one generation | Months Occupied |
| 4 | 2 | 6 | 13 | 11 | 7 | 42 | June-Aug. |
| 5 | 2 | 6 | 14 | 11 | 8 | 45 | Aug-Sept. |
| 6 | 3 | 8 | 19 | 16 | 12 | 62 | Sept-Nov. |
| 7 | 3 | 13 | 30 | 24 | 18 | 93 | Oct-Jan. |
| 1 | 4 | 9 | 18 | 15 | 15 | 65 | Jan.-March |
| 2 | 4 | 8 | 16 | 13 | 10 | 55 | March-May |
| 3 | 3 | 7 | 16 | 13 | 8 | 51 | April-June |

## II. Comparision of related species infesting on the same host

Other than *Parlatoria zizyphus* (Lucas) there are another two species infesting on the same host, namely *Parlatoria pergandii* Comstock and *Parlatoria proteus* (Curtis). They may be separated by the following key:

A. Scale of adult female black .....*zizyphus* (Lucas)

AA. Scale of adult female whitish or grey, circular or oval .....B.

B. Pygidium with 3 pairs of lobes, the fourth lobe replaced by a fringed plate .....*proteus* (Curtes)

*Parlatoria proteus* (Curtis), Common name: Proteus or Sanseveria scale; Synonym: *Aspidiotus proteus* Curtis, *Diaspis parlatoris* Targioni-Tozzetti, *Parlatoria orbicularis* Targioni-Tozzetti, *Aspidiotus targionii* del Guercio, *Parlatoria* (*Euparlatoria*) *proteus* (Curtis), *Syngenaspis proteus* (Curtis). Adult female scale elongate oval, slightly convex, very thin and delicate, semitransparent, second exuvia quite large, general color yellowish-brown. Male scale elongate, white, exuvia yellowish brown.

BB. Pygidium with 4 pairs of lobes .....*pergandii* Comstock

*Parlatoria pergandii* Comstock, Common name: chaff scale, Synonym: *Parlatoria sinensis* Maskell. Adult female scale oval, whitish, gray or little brown, the exuvia darker not usually enlarged. Male scale elongate oval and the same color as that of adult female.

## III. Natutal enemies

There are two groups of natural enemies, one is parasitic wasps and another is parasitic fungi. 4 Species of the parasitic wasps have been recorded, namely *Aphytis chrysomphali* (Mercet), *A. proclia* (Walker), *Aspidiotiphagus citrinus* Craw and A. *lounsburyi* (Berlege and Paoli), all of them belonging to Aphelinidae. Due to the

scale so flately and tightly covering the whole body, it is not favourable for the parasites, the percentage of parasitism is very low. according to examination of 186,870 scals, 3314 individuals only 1.07% were parasited. The morphology of each species may be outlined as below.

1. *Aphytis chrysomphali* (Mercet) (Fig. 3), Common name: golden chalcid, Synonym: *Aphelinus chrysomphali* Mercet, *Aphelinus quaylei* Rust, *Aphelinus mytilaspidis* Le Baron. Other hosts in Taiwan: *Chrysomphalus aonidum* (Linne), *Lepidosaphes gloveri* Packard and *Aonidiella aurantii* Maskell. Distribution: Spain, California, South Africa, Southen Rhodesia, Letaba Estates, Transvasl, China mainland, Japan.

*Adult:* Pale lemon yellow to pallid, including setae on the head, thorax, and abdomen. Integument very soft. Mesosternum with a pronounced black line down the middle; posterior margin of the scutellum narrowly black (The small sclerites at the bases of the front wings are dusky or blackish in all species). Mandible brown. Front wings with a faint dark cloud beneath the stigma and a more distinct cloud more or less across the disc beneath the union of the marginal and submarginal veins. Front wings most often with five rows of hairs basad of the speculum. Longest marginal fringe of the front wings ranging from one-fourth to one-fifth of the greatest width of the disc. Mesoscutum generally with 10 setae, rarely with either 8 or 12 setae. Propodeum with small, weak, separate crenulae. Pupae pale yellow or pallid, without any dark markings, with some possible exceptions. Males without microscopic stippling on the venter of thorax. Males exceedingly rare.

2. *Aphytis proclia* (Walker) (Fig. 4), Common name: golden chalcid. Synonym: *Aphelinus proclia* Walker, *Aphelinus diaspidis* Howard, *Aphelinus fuscipennis* Howard, Other hosts in Taiwan; *Parlatoria pergandii* Comstock, *Aonidiella aurantii* Maskel. Distribution: South Africa, South China, Florida, California.

*Adult:* Antennal club three times as long as wide, flagellum uniformly dark, but the club not blackish at the apex; mesoscutum and scutellum completely brownish, or nearly so, except for a pale longitudinal stripe down the middle; mesoscutum on the average, with 16 setae; abdomen with dark spots and coarse setae on the sides, and sometimes with weak dark bands across the dorsum; front wings with a distinct cloud beneath the stigma and the union of the submarginal fringe about one-sixth as long as the greatest width of the disc.

These two *Aphytis* have the same generic characters as the adult has an oblique hairless streak transversely from the stigma to the posterior margin of the front wings; a fusion of the dorsal remnant of the ninth tergum to the tenth tergum to form a syntergum at the apex of the abdomen; the restricted ovipositer seemingly lying in a grove, with the basal part enclosed by the sterna and the apical part exposed; the antennae 6-segmented; the body not conspicuously mottled; the wings generally without hyaline spots or bands of transparent hairs in combination with fuscous spots or bands of dark hairs; the body and legs not usually long and

slender.

3. *Aspidiotiphagus citrinus* (Craw) (Fig. 5), Common name: yellow scale parasite. Synonym: *Coccophagus citrinus* Craw, *Encarsia citrinus* Riley and Howard, *Aspidiotiphagus citrinus* Howard, *Prospaltoides howardi* Brethes, *Aspidiotiphagus schoeversi* Smits van Burgst. Other hosts in Taiwan: *Aspidiotus destructor* Signoret, *Lepidosaphes becki* Newman, *Lepidosaphes gloveri* Packard, *Parlatoria pergandii* Comstock. Distribution: Europe, Africa, Australia.

*Adult:* Submarginal vein with two small setae. First funicle joint not the shortest, the funicle and club plainly usually differentiate. the longest marginal fringe of the fore wings are longer than the greatest width of the blade.

4. *Aspidiotiphagus lounsburgi* (Berlese and Paoli) (Fig. 6), Common name: yellow scale parasite. Synonym: *Prospaltella lounsburgi* Berles and Paoli. Other hosts in Taiwan: *Chrysomphalus aonidum* Linne. Distribution: Europe, Africa, Australia.

*Adult:* Occipt, checks, lower part of face, pronotum, axillae, sides of thorax, abdomen except the sixth and seventh tergites are definitely dark brown to blackish; remainder of the head and thorax are yellow. Scape and apical club joints faintly dusky. Legs faintly suffused with fuscous in parts, the darker coloration rather too indefinite to describe in detail. Submarginal vein with one small seta. Fore wings especially narrow with a slight inflexion of the posterior margin. Club joints comparatively long, the three together as long as the funicle joints united, pedical, and one-half of the scape. The three funicle joints usually subequal in length.

These two species belong to *Aspidiotiphagus* Howard, its generic characters as usually having narrow forewings with long fringe, a bare spot beneath the stigma, and the hind wings pedunculate.

Parasitic fungi: Prof. David Fung-yean Yen has listed four species of Ascomycetes namely *Hypocrella aleyrodis* (Webb) Sawada, *Ophinoectria tetraspora* Miyabe et Sawada, *Sphaerostilbe aurantiicola* (B. et Br.) Petch S. *fujikuroi* Miyabe et Sawada and S. *coccophila* Tul. Four species of Fungi Imperfecti are *Aschersonia aleyrodis* Webbar, *A. marginata* Ell. et Ev. *Cephalosporum lecanii* Zimmerman and *Verticillis parlatoriae* Sawada respectively. The writers did not make any survey about these fungi but we belief these parasitic fungi are very abundant during the wet season especially in the North of Taiwan.

## IV. Chemical control study

The field trial of chemical control against black Parlatoria was carried out at Hsinten County near Taipei. Citrus variety was Tankan, seven year old. Before spraying, carefully examination of the infested tree, because the distribution of black Parlatoria was uneven, each treatment contained two trees including untrested (Check) ones totally 98 trees were selected. This experiment was subdivided into

two trials. The first trial was sprayed on August 23, 1962 and the second was sprayed on November 5, 1962 respectively, each tree was received 5 litter of spraying liquid both upper ane lower surfaces of leaves were sprayed completely as possible. After 10, 20, 30 days of spraying, 10 leaves of each tree were picked at randon and kept in refrigerator ready for examination.

When examining, the leaf was put under the binocular and the scale were taken off with needles from both sides of the leaf. If the scale body was fresh and light purplish in color as the alive and the body shrank, color changed and dried as dead.

The tested insecticides and their tested percentage of active ingredient were showed in tables I and II. Due to the dead scale still adhesiving on the leaf even though after heavy storm. Moreover, it took 7 generations a year and the dead scale accumulated so heavy on the same leaf, the alive scale was not so much, according to this examination of untreated 120 leaves, the mortolity of scale was around 70.57%. Therefore it was adopted Abott's formula to compute exact mortality due to receiving of each chemical treatment since the untreated or check plot was not computed in these tests.

According to the first trial, it showed that dimethoate 0.05, 0.075, 0.10%, parathion 0.05% and malathion 0.05% in combination with summer oil 1% were the best, the mortality was at least above 96%.

The second trial showed that summer oil 3% and parathion 0.05% with or without solvent were the best. The mortality was over 95%.

For safe, economic, efficacy, dimethoate 0.05% may be first recommended to control the black Parlatoria. However, summer oil 3% was also good but it was too expensive and may harm to the tree since the high content of oil. Parathion 0.05% was good but it was very dangerous to the operators, the next was malathion 0.05% in combination with summer oil 1% as had been accepted by the citrus growers for control this scale and other citrus pests already.

Table II: First Trial of Chemical Control Black Parlatoria

| Chemicals and percentage of active ingredient | | 1st Exam. | | 2nd Exam. | | 3rd Exam. | | Average |
|---|---|---|---|---|---|---|---|---|
| | | No. of Obs. | Morty. | No. of Obs. | Morty. | No. of Obs. | Morty. | |
| Summer oil of CPC | 1.00% | 1013 | 12.07 | 960 | 22.29 | 1475 | 65.46 | 33.27 |
| Summer oil of CPC | 1.25% | 964 | 21.77 | 1849 | 28.55 | 1443 | 46.36 | 32.23 |
| Summer oil of CPC | 1.50% | 2158 | 28.09 | 1259 | 72.88 | 1492 | 48.66 | 49.88 |
| Summer oil of Ihara | 1.00% | 1507 | 44.47 | 2273 | 28.15 | 1679 | 48.35 | 40.32 |
| Summer oil of Ihara | 1.25% | 1503 | 41.70 | 849 | 41.50 | 1343 | 46.86 | 39.68 |
| Summer oil of Ihara | 1.50% | 1129 | 57.04 | 919 | 55.75 | 1306 | 75.88 | 62.89 |
| Base oil -S-2686 | 1.00% | 1884 | 42.24 | 2174 | 61.04 | 1867 | 81.06 | 61.44 |
| Base oil -S-2686 | 1.25% | 1496 | 19.07 | 828 | 69.47 | 1685 | 83.47 | 57.33 |
| Base oil -S-2686 | 1.50% | 1230 | 10.06 | 752 | 65.82 | 936 | 76.31 | 50.73 |
| Scalecine of Nihhon | 1.00% | 1399 | 33.51 | 1254 | 39.34 | 3191 | 80.24 | 51.03 |
| Scalecine of Nihhon | 1.25% | 1007 | 46.48 | 936 | 52.72 | 1349 | 72.62 | 60.61 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Scalecine of Nihhon | 1.50% | 1426 | 69.25 | 1045 | 84.47 | 1894 | 60.99 | 71.57 |
| Triona Medium Soluble | 1.00% | 1551 | 22.20 | 1280 | 69.87 | 984 | 73.90 | 55.32 |
| Spray oil of Shell Triona Medium Soluble | 1.25% | 1078 | 48.02 | 1137 | 74.99 | 1015 | 67.79 | 63.60 |
| Spray oil of Shell Triona Medium Soluble | 1.50% | 1697 | 71.62 | 1173 | 73.05 | 1156 | 75.46 | 73.37 |
| Spray oil of Shell Dimethoate | 0.05% | 852 | 62.46 | 1038 | 98.29 | 987 | 96.46 | 90.51 |
| Dimethoate | 0.075% | 1165 | 86.49 | 910 | 99.30 | 1012 | 99.26 | 96.71 |
| Dimethoate | 0.10% | 1089 | 70.33 | 1451 | 99.56 | 1830 | 100.00 | 93.95 |
| Malathion | 0.06% | 932 | 44.11 | 951 | 66.65 | 1221 | 64.33 | 58.36 |
| Malathion | 0.10% | 751 | 51.22 | 773 | 71.68 | 1368 | 77.25 | 66.72 |
| Malathion 0.05%+Summer oil of CPC | 1.00% | 772 | 77.66 | 1191 | 99.12 | 1056 | 98.63 | 94.67 |
| Sumithion | 0.05% | 712 | 56.61 | 826 | 85.34 | 969 | 83.94 | 80.22 |
| Sumithion | 0.10% | 877 | 83.19 | 636 | 90.48 | 890 | 88.64 | 89.91 |
| Lebaycid | 0.05% | 912 | 68.50 | 974 | 62.58 | 1655 | 60.52 | 60.08 |
| Lebaycid | 0.10% | 1593 | 79.92 | 1269 | 59.54 | 1016 | 65.15 | 65.58 |
| Parathion | 0.05% | 1460 | 95.33 | 1058 | 99.35 | 1584 | 98.02 | 98.05 |
| Check | | 1207 | | 1163 | | 1416 | | |

L.S.D. for Treatment 0.05=7.87, 0.01=10.50.

Table III: Second Trial of Chemical Control Black Parlatoria

| Chemicals and percentage of active ingredient | | 1st Exam. | | 2nd Exam. | | 3rd Exam. | | Average |
|---|---|---|---|---|---|---|---|---|
| | | No. of Obs. | Morty. | No. of Obs. | Morty. | No. of Obs. | Morty. | |
| Summer oil of CPC | 2.00% | 1709 | 32.17 | 2217 | 68.46 | 1531 | 66.17 | 55.60 |
| Summer oil of CPC | 2.50% | 1222 | 31.90 | 1379 | 79.12 | 1145 | 86.17 | 65.73 |
| Summer oil of CPC | 3.00% | 693 | 91.61 | 791 | 96.39 | 862 | 100.00 | 96.00 |
| Dimethoate | 0.025% | 1589 | 28.87 | 1739 | 87.98 | 1312 | 71.26 | 62.70 |
| Dimethoate | 0.0375% | 1523 | 42.02 | 1629 | 94.59 | 789 | 89.68 | 75.43 |
| Gusathion | 0.025% | 1271 | 20.57 | 1955 | 21.83 | 1155 | — | 21.20 |
| Gusathion | 0.05% | 1004 | — | 1016 | 64.19 | 959 | 68.31 | 66.25 |
| Gusathion | 0.10% | 1066 | 57.21 | 1136 | 81.05 | 1101 | 79.79 | 72.68 |
| Folithion | 0.05% | 1525 | — | 1218 | 23.09 | 987 | 11.48 | 17.26 |
| Folithion | 0.10% | 1624 | 18.73 | 1066 | 52.80 | 926 | 45.44 | 38.99 |
| Diazinon | 0.025% | 1116 | 36.54 | 1100 | 66.06 | 975 | 46.85 | 49.87 |
| Diazinon | 0.05% | 1207 | 21.59 | 987 | 72.13 | 765 | 48.48 | 47.40 |
| Nuvan (DDVP) | 0.05% | 1570 | — | 1258 | 48.69 | 1554 | — | 48.69 |
| Nuvan (DDVP) | 0.10% | 1086 | — | 1170 | 45.11 | 1126 | 24.33 | 33.10 |
| Parathion | 0.025% | 1192 | 45.03 | 923 | 78.39 | 1513 | 71.13 | 64.85 |
| Parathion solvent less | 0.025% | 1365 | 12.91 | 1057 | 91.02 | 922 | 85.14 | 63.02 |
| Parathion solvent less | 0.05% | 908 | 39.06 | 854 | 95.19 | 918 | 95.80 | 76.68 |
| Parathion solvent | 0.025% | 874 | 67.78 | 840 | 87.19 | 788 | 80.43 | 78.46 |
| Parathion solvent | 0.05% | 1288 | 64.19 | 998 | 98.25 | 1115 | 95.72 | 85.05 |
| Dimecron | 0.05% | 1398 | 14.60 | 1470 | 29.20 | 1713 | 8.27 | 17.35 |
| Dimecron | 0.10% | 1674 | — | 1330 | 36.73 | 1264 | 5.82 | 21.27 |
| Check | | 1533 | | 1531 | | 1850 | | |

L.S.D. 0.05=19.08, 0.01=25.53.

## Summary

The black Parlatoria, *Parlatoria zyziphus* (Lucas) was the most difficult to control by insecticides owing to its scale was so flat and firmly stick on the leaf, twig or fruit peel lack of effective parasitic wasps or other groups of natural enemies. In consequence of its infestation was severe over other scale insects infested at present. Therefore the writers reviewed and tried insecticlede control of this species, the results may be summaried in the following.

Species and its generic characters had been described and differences among other species belonging to the same genus were presented in the key. The hosts seemed to limit various varieties of Citrus only on this island.

It took 7 generations a year, morphology of each stage was briefly described. Durations of egg, 1st, 2nd, 3rd stadium, oviposition period and one generation were 2–4, 6–13, 13–30, 11–24, 7–18, 42–93 days respectively.

There were 4 species of parasitic wasps namely *Aphytis chrysomphali* (Mercet) *A. proclia* (Walker), *Aspidiotiphagus citrinus* Craw and *A. lounsburyi* (Berlese and Paoli) recorded but the percentage of parasitism was very low and not over 2%. The morphology of each parasitic wasps was also briefly described.

1, 1.25, 1.5% of five sauces of summer oil, 2, 2.5, 3% of CPC summer oil, 0.015, 0.0375, 0.05, 0.10% dimethoate, 0.05, 0.1% malathion alone, 0.05% malathion plus 1% CPC summer oil, solvent less and solvent parathion 0.025, 0.05, 0.1%, 0.05, 0.1% lebaycid, folithion, dimecron, nuvan (DDVP) and gusathion, diazinon, nuvan (0.025% each extra) were teated in the field, Among them, only 0.05% parathion, dimethoate and 0.05% malathion plus 1% summer oil or 3% summer oil alone were good and the mortality of the adult was over 95% and could be accepted for recommendation to control this species in Taiwan except parathion in present condition.


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# 黑點介殼蟲

張良傳　陶家駒

## 中文摘要

黑點介殼蟲 Parlatoria zizyphus (Lucas) 爲目下本省最難防治之柑橘害蟲，因其介殼扁平，堅固枝，葉或果上，雖用力或經塗蠟手續，均不易擦去，寄生蜂亦難寄生，一年發生代數多達七代，疊積果皮，葉片或嫩枝上，不但有損外觀，果實不能出口或上市，且被害之枝葉，往往枯落，損害不少。

防治方法：現用 1%夏油加用 0.05% 馬拉松乳劑 ，或用 0.05% 巴拉松防治，可以成功，但前者成本高而後者對使用者有危險。本文所述將市上現有之有機磷殺蟲劑，作一田間比較試驗，發現 0.05% 大減速乳劑，可以代替極毒之巴拉松或與夏油加用馬拉松之煩，將來如能對於大減速作合理價格之調整，可資採用防治。

黑點介殼蟲之種屬特徵與其同屬共害柑橘之種類特點，黑點介殼蟲四種寄生蜂之種屬特徵與黑點介殼蟲之生活習性，地理分布均有扼要說明，末附參考文獻，可助經濟昆蟲學者不少參考之處。

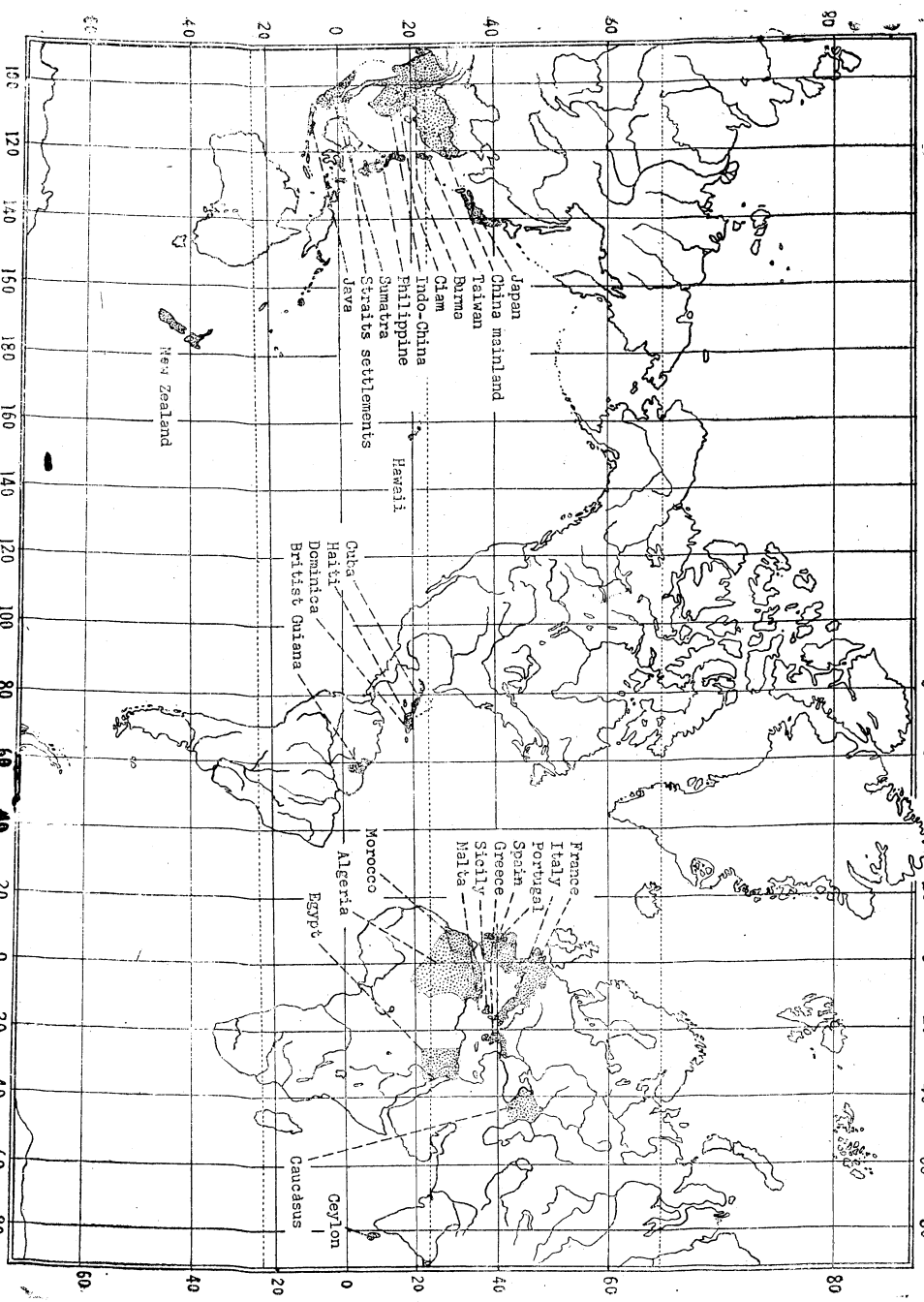



Fig. 1. Pariatoria *zizyphus* (Lucas) distributional map.

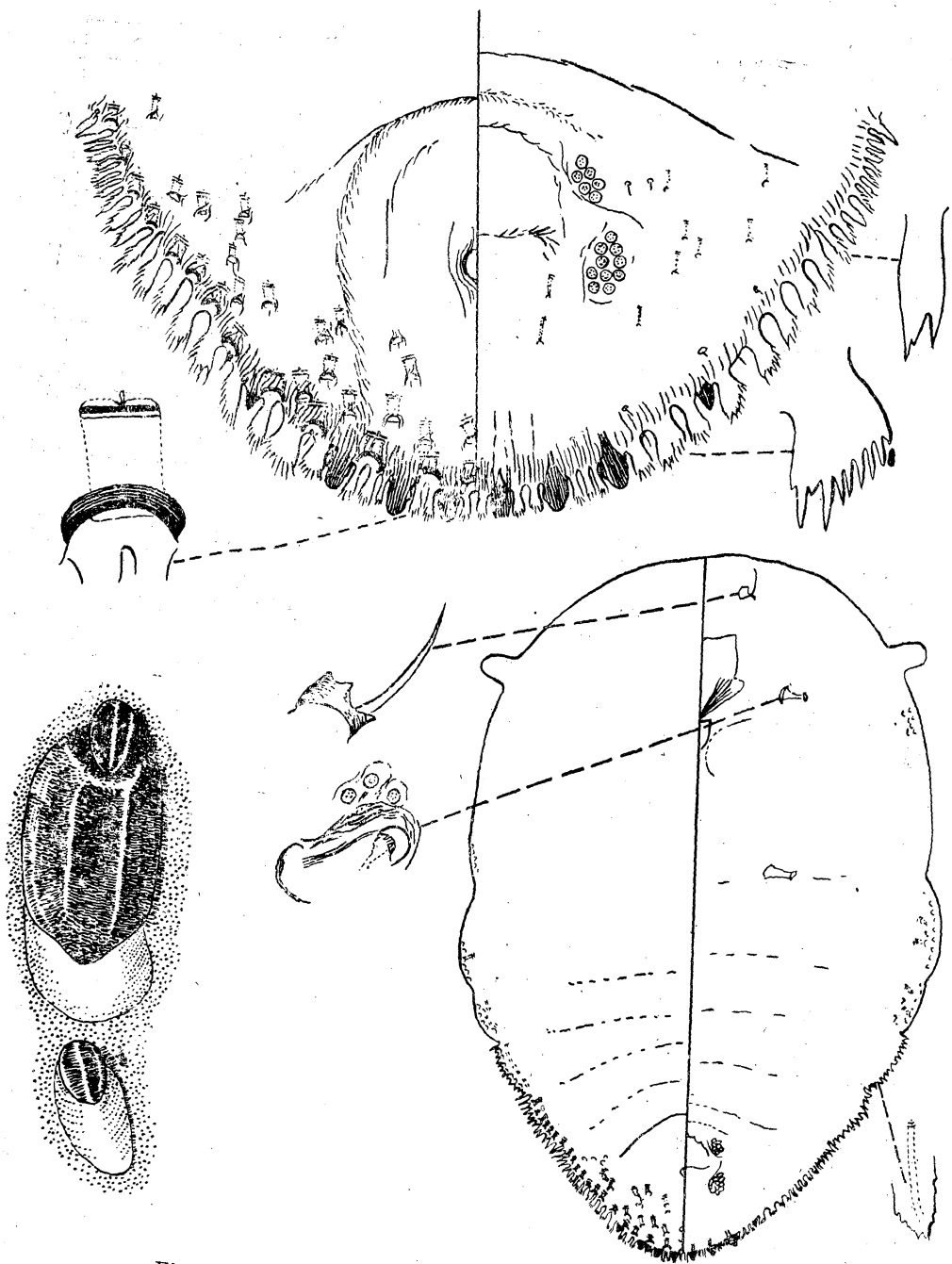


Fig. 2. Parlatoria zizyphus (Lucas) (after Ferris, 1948)

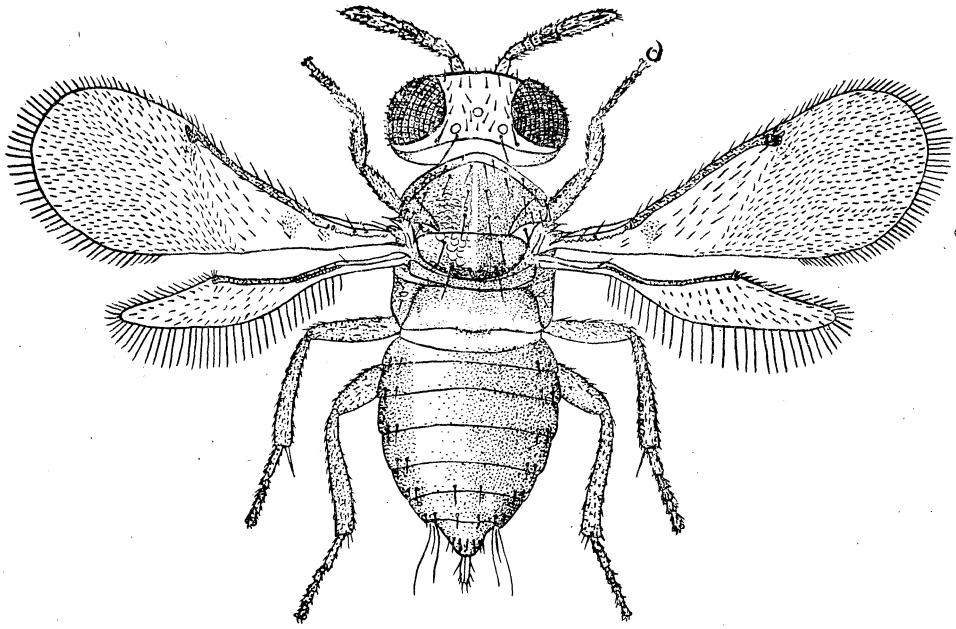


Fig. 3. Aphytis chrysomphali (Mercet) (after Compere, 1955)

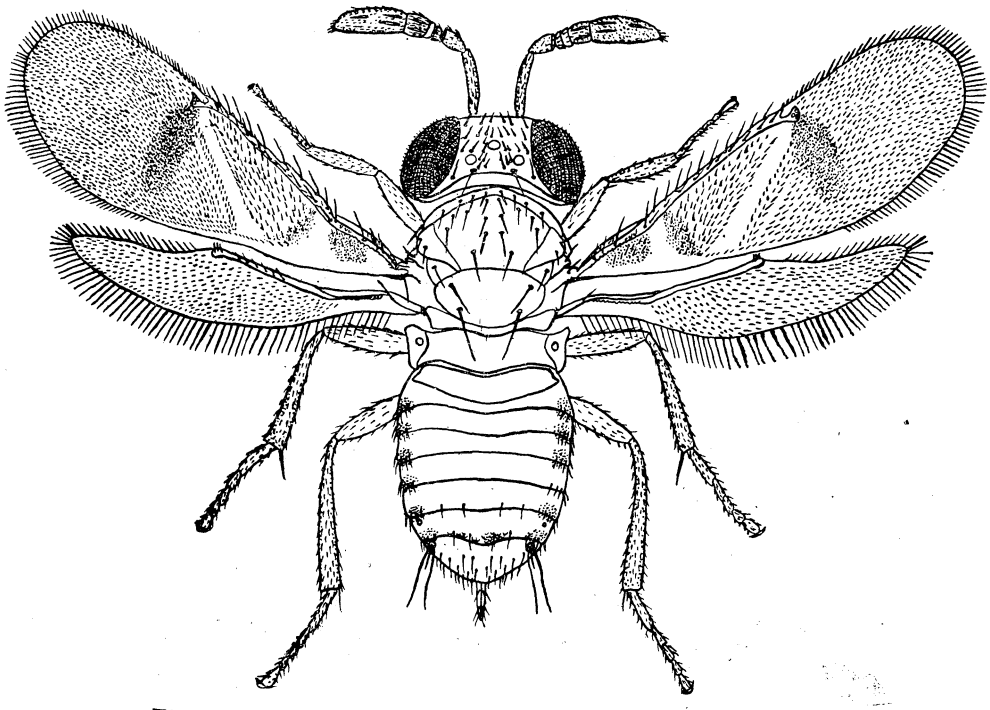


Fig. 4. Aphytis proclia (Walker) (after Compere, 1955)

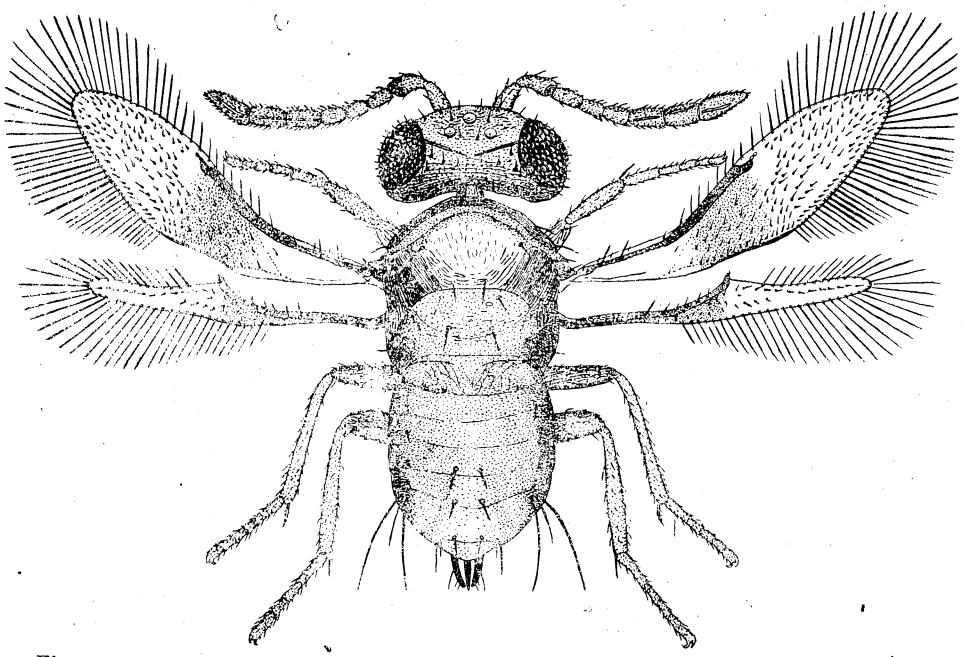


Fig. 5. Aspidiotiphagus citrinus (Craw.) How. (after Malenotti Ettore, 1918)

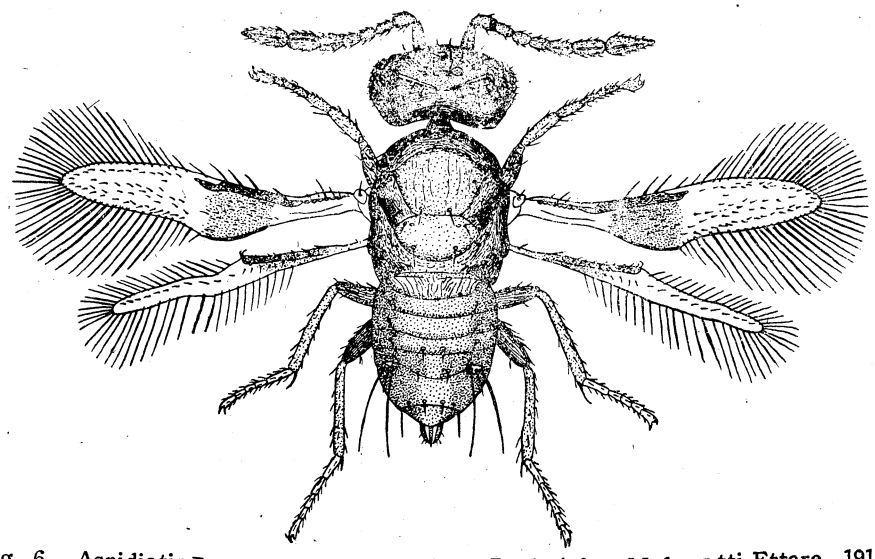


Fig. 6. Aspidiotiphagus lounsburyi Berl. et Paol. (after Malenotti Ettore, 1918)

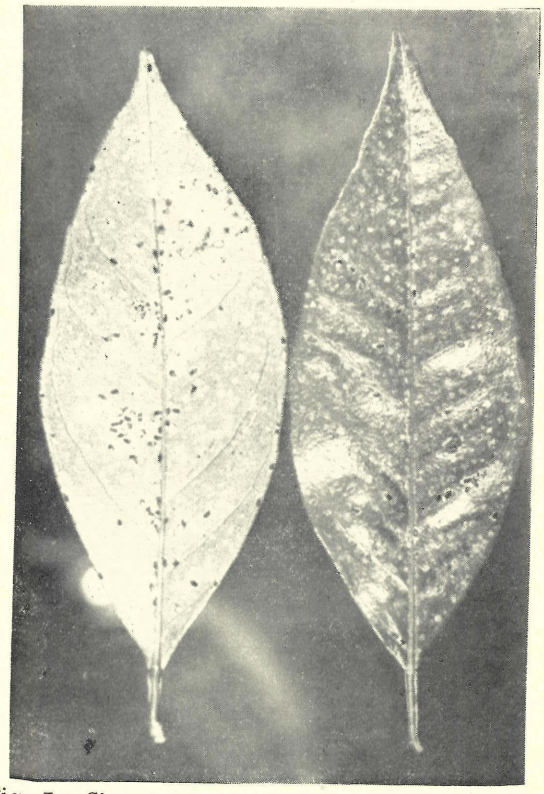


Fig. 7. Citrus leaf infested with black parlatoria



Fig. 8. Citrus fruit infested with black parlatoria