Pacific Pests, Pathogens, Weeds & Pesticides - Online edition

Vedalia (Rodolia) ladybird beetle (397)

Common Name

Vedalia beetle, cardinal ladybird

Scientific Name

Rodolia cardinalis; previously known as *Vedalia cardinalis*

Distribution

Asia, Africa, North, South and Central America, the Caribbean, Europe, Oceania. It is recorded from Australia (it is native), American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, New Caledonia, New Zealand, Palau, Tuvalu, and Vanuatu.

Prey

Icerya species. especially *Icerya aegyptiaca* (breadfruit mealybug, Egyptian fluted scale), *Icerya purchasi* (citrus or cotton cushion scale) and *Icerya seychellarum* (Seychelles scale, breadfruit mealybug).

Description & Life Cycle

The vedalia beetle (Photo 1) is renowned for its control of the citrus (cotton) cushion scale, *Icerya purchasi* (Photo 2) in California in the late 19th century. Specimens were sent from Australia.

Eggs are bright red, laid singly or in small groups under the scale or on (or even into) the large egg-sac (Photo 2). Upon hatching the larvae enter the egg-sac of the scale (if not already there) and feed on the eggs; later, also feeding on crawlers and larvae of *Icerya*. The larvae of *Rodolia* are about 5 mm long when mature, greyish with black spots (Photo 3). The pupae are red, darkening with age, and found enclosed in the skin of the last moult attached to stems or leaves. The adult is hemispherical, 2-4 mm long; the head and wing covers are red-brown with large dark patches, the pronotum (the area behind the head), is black. Short white hairs cover the body giving it a grey appearance. Females lay between 150-200 eggs. Adults feed on eggs, crawlers, larvae and adults.

The vedalia beetle is spread over short distances by its active larvae, and adults which fly. From egg to adult is about 18 days.

Impact

The introduction of *Rodolia cardinalis* to California to control *Icerya purchasi* on citrus was an immediate success (although later it was thought that the parasitoid fly, *Cryptochaetum iceryae*, also played a part, being more active in cooler seasons). Within 18 months the pest was under control. Such was the impact that first-year production of oranges rose from 700 to 2000 carloads. The cost of the introductions was $1500! Since then, it has been introduced to more than 50 countries covering a range of climates, with similar beneficial results.

Photo 1. Adult *Rodolia cardinalis*. Note colour patterns and white short hairs over the body.

Photo 2. Adult citrus cushion scale, *Icerya purchasi*. Note that the fluted part is the eggsac.

Photo 3. Larva of *Rodolia cardinalis*.

Photo 4. The ladybird beetle, *Rodolia cardinalis*, feeding on a colony of the citrus cushion scale, *Icerya purchasi*.

Detection & inspection

Look for red hemispherical beetles, some with large black spots on the wing cases and where the wings fold together.

Management of Biocontrol Agents

INSECTICIDES

Avoid the use of broad-spectrum insecticides, those in the organophosphate, carbamate and synthetic pyrethroid groups. Tests have also shown that neonicotinoids are toxic to *Rodolia cardinalis* feeding on citrus (cushion) scale that had ingested these insecticides. Growth regulators too should be avoided. Some biorational products, such as spinosad and abamectin can be used.

SPECIFICITY OF *RODOLIA*

Rodolia cardinalis has a very narrow host range on only a few margarodid scales. The scales, however, are found on *Acacia*, boxwood *(Buxus)*, *Casuarina*, magnolia, *Nandina*, olive, *Pittosporum*, rose wood *(Dalbergia)*, among others. Apart from citrus, they are also pests on guava and mango. Apart from *Icerya* species, *Rodolia cardinalis* also eats aphids and mites.

There are two advantages which result from *Rodolia cardinalis* having a narrow host range: (i) there is less likelihood that the beetle will attack non-host species; and (ii) the beetle concentrates its efforts on its host, *Icerya* species, because it cannot attack and breed on other species.

PEST RISK ASSESSMENT

Notwithstanding the specificity of *Rodolia cardinalis* for *Icerya* species, and *Icerya purchasi* in particular, safety tests need to be considered to ensure that introduction of the beetle poses no significant threat to non-target species. Such tests were carried out in recent years before introductions were made to the Galapagos islands, which also considered whether *Icerya purchasi* was a food source of any other organism of consequence.

INCREASING NATURAL POPULATION OR INTRODUCTIONS

Sleeve cages can be very useful for protecting ladybird beetle populations initially. They can be used for native populations as well as introductions to protect them from parasitoids, predators and ants. The beetles are kept close to their prey where they can immediately start to feed and lay their eggs.

ANT CONTROL

Some scale insects produce honeydew, and ants collect this as food. In the process they defend the ants from natural enemies, *Rodolia* in particular. To prevent this, do the following:

- Use hot water at 47°C (and above)to kill the ants in their nests. Hot water up to 49°C will not damage plants.
- Use 'Tanglefoot'. This is a sticky inert substance that is applied over duct tape wrapped around the trunk of the tree. Replace when it becomes covered in debris or dead ants.
- Prune any low hanging branches or remove any weeds that low ants to bridge the gap between ground and branches which might allow them to reach the scale insects on the trees.
- Use a bait.

In general, three types of chemicals are used against ants: (i) stomach poisons. e.g., Maxforce® (fipronil), Amdro® (hydramethylnon), and borax (commercial products and home-made - add 4 teaspoons borax, 1 cup of sugar and 3 cups water); (ii) insect growth regulators (e.g., Engage® (methoprene), and Distance® (pyriproxyfen); and (iii) poisons that work on the nervous system, that is, neurotoxins, e.g., bifenthrin, fipronil, and imidacloprid. Stomach poisons kill all queens, intercastes and workers; insect growth regulators stop the queens from laying eggs, whereas neurotoxins disrupt insects' central nervous system. It is likely that future products will combine toxins that cause rapid death and insect growth regulators, e.g., Extinguish Plus® (hydramethylnon and methoprene).

A note of caution: Although it is possible to combine a lure (such as peanut butter, fish, sugar, etc.) with a pesticide as an ant bait, it is not recommended because of the danger in leaving concentrated pesticides unattended in the environment, including dwellings.

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[1]Swaine G (1971) *Agricultural Zoology in Fiji*. Her Majesty's Stationery Office. London; and *Rodolia cardinalis*. Wikipedia. (https://en.wikipedia.org/wiki/Rodolia_cardinalis); and Martin NA (2016) Cardinal ladybird - *Rodolia cardinalis*. (https://nzacfactsheets.landcareresearch.co.nz/factsheet/InterestingInsects/Cardinal-ladybird---Rodolia-cardinalis.html); and Hoddle M (2013) Biocontrol of *Icerya* with *Rodolia* in the Galapagos. UC Riverside. (https://biocontrol.ucr.edu/rodolia/rodolia_icerya_biocontrol_galapagos.html); and from Pacific Invasive Ant Toolkit. (http://piat.org.nz/index.php?page=getting-rid-of-ants). Photo 1 Katja Schulz, *Rodolia cardinalis*. Els Poblets, Alicante, Spain. (https://commons.wikimedia.org/wiki/File:Vedalia_Beetle_(15959056801).jpg). Photo2 Vijay Cavale, *Icerya purchasi*, found on a lemon tree in our garden in Bangalore City, India.(https://commons.wikimedia.org/wiki/File:Scale_insect.jpg#file). Photo 3 Hectonichus, A larva of *Rodolia cardinalis*. Genova, Italy. (https://commons.wikimedia.org/wiki/File:Coccinellidae_-_Rodolia_cardinalis.JPG). Photo 4 Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org.

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