# EPPO Datasheet: *Draeculacephala minerva*

Last updated: 2024-07-29

## IDENTITY

**Preferred name:** *Draeculacephala minerva*
**Authority:** Ball
**Taxonomic position:** Animalia: Arthropoda: Hexapoda: Insecta: Hemiptera: Auchenorrhyncha: Cicadellidae
**Common names:** grass sharpshooter, green sharpshooter
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**EPPO Code:** DRAEMI

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### Notes on taxonomy and nomenclature

Gibson (1915) studied the natural history of a sharpshooter that he thought to be *Draeculacephala mollipes* but based on studied geographical range, Young and Davidson (1959) believe Gibson (1915) actually studied *D. minerva*. This datasheet includes the observations published in Gibson (1915), except when Gibson notes the observations to be from the true range of *D. mollipes*.

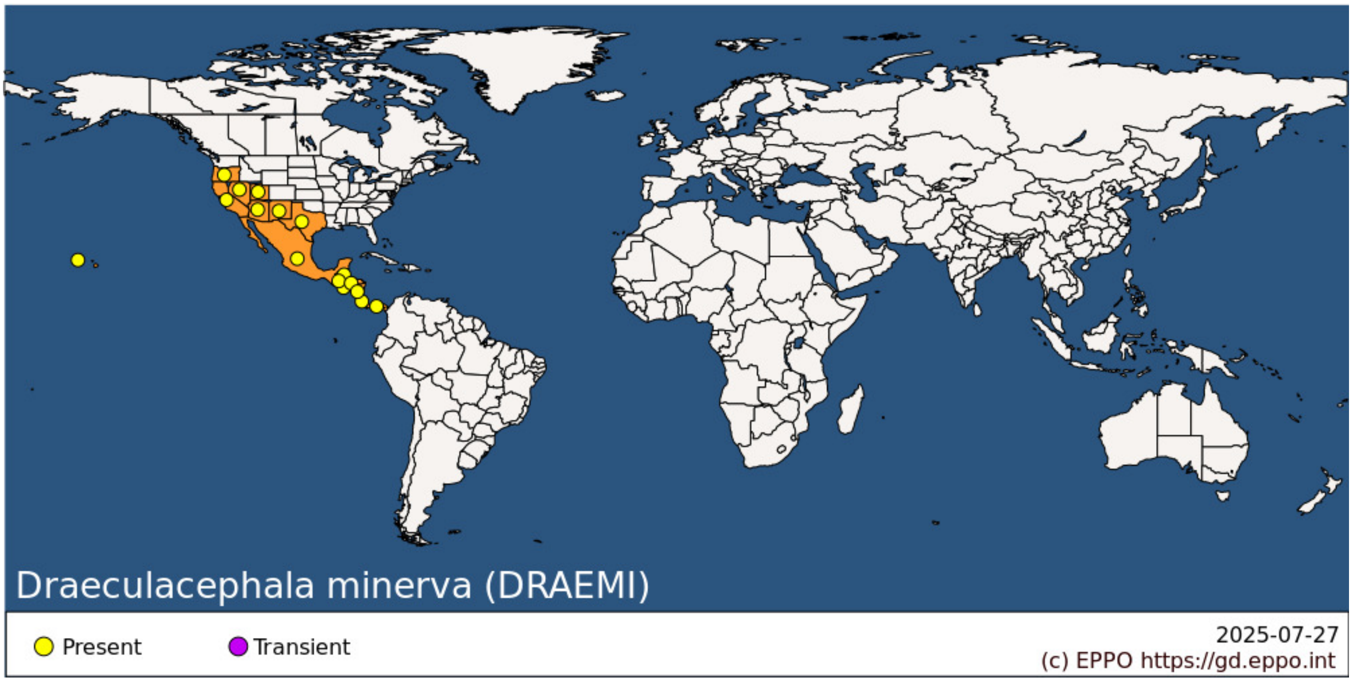
## HOSTS

*Draeculacephala minerva* has been recorded primarily from grasses, sedges, and weedy vegetation in damp or irrigated areas where vegetation is lush but not dense (Purcell & Frazier, 1985). This species is a generalist feeder and has been associated with over 130 plant species, however the most important host, both for feeding and breeding is Bermuda grass, *Cynodon dactylon* (Winkler, 1949, Nielson, 1968). Although not preferred hosts, *D. minerva* has been occasionally recorded from vines, shrubs, and trees (Winkler, 1949). This author suggests that non-typical hosts, including grape, *Vitis vinifera*, are utilised when grasses are not available.

**Host list:** *Alisma triviale*, *Ammannia coccinea*, *Avena fatua*, *Avena sativa*, *Bromus rigidus*, *Bromus rubens*, *Calandrinia ciliata subsp. menziesii*, *Calandrinia ciliata*, *Cotula coronopifolia*, *Cynodon dactylon*, *Cyperus acuminatus*, *Cyperus esculentus*, *Cyperus niger*, *Cyperus rotundus*, *Cyperus strigosus*, *Digitaria sanguinalis*, *Distichlis spicata*, *Echinochloa crus-galli*, *Echinochloa oryzicola*, *Echinodorus cordifolius*, *Eleocharis montevidensis* , *Eragrostis pectinacea*, *Erigeron bonariensis*, *Eriochloa gracilis*, *Erodium botrys*, *Erodium cicutarium*, *Erodium moschatum*, *Festuca myuros*, *Gnaphalium chilense*, *Hordeum brachyantherum*, *Hordeum marinum subsp. gussoneanum*, *Hordeum murinum subsp. glaucum*, *Hordeum murinum subsp. leporinum*, *Juncus bufonius*, *Leersia oryzoides*, *Leptochloa fusca subsp. fascicularis*, *Lolium multiflorum*, *Lolium perenne*, *Lolium pratense*, *Lolium temulentum*, *Ludwigia repens*, *Malva parviflora*, *Matricaria discoidea*, *Medicago polymorpha*, *Melilotus indicus*, *Paspalum dilatatum*, *Paspalum distichum*, *Persicaria lapathifolia*, *Persicaria maculosa*, *Persicaria punctata*, *Phalaris minor*, *Phyla nodiflora*, *Plagiobothrys stipitatus*, *Poa annua*, *Polygonum aviculare*, *Polypogon monspeliensis*, *Rumex acetosella*, *Rumex crispus*, *Rumex pulcher*, *Salix sp.*, *Schoenoplectus americanus*, *Scrophularia californica*, *Sorghum halepense*, *Sorghum x drummondii*, *Sporobolus niliacus*, *Veronica peregrina*, *Vitis vinifera*, *Xanthium orientale*, *Xanthium strumarium*, *Zea mays*

## GEOGRAPHICAL DISTRIBUTION

*Draeculacephala minerva* is mainly known from Mexico and the south-western United States (Dietrich, 1994) but has been recorded as far north as Oregon (Viguers, 2000) and south as Panama (Young & Davidson, 1959; McKamey, 2001). Young and Davidson (1959) also note the established population in Hawaii is likely to have been introduced. They also note that there is a single specimen from Florida at the Smithsonian Museum of Natural History (USNM) but suggest this specimen was mislabelled. *D. minerva* favours damp areas such as marshes but can be found in drier regions where microhabitats have been created by irrigation ditches, faulty watering systems, or other human activities. *Draeculacephala minerva* is absent from the EPPO region.




**North America:** Mexico, United States of America (Arizona, California, Hawaii, Nevada, New Mexico, Oregon, Texas, Utah)
**Central America and Caribbean:** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama

## BIOLOGY

*Draeculacephala minerva* eggs are deposited into plant leaves and stems. There are several (potentially overlapping) generations per year. Males only survive a few days post copulation, but females can live for several weeks (Gibson, 1915). In the San Joaquin Valley of California there are three main generations with eggs produced in February, May, and July although eggs in the final generation of the year may take an extended time to hatch, with some not hatching until October (Winker, 1949). In more southern parts of the range, additional generations are produced, for example Gibson (1915) reports six generations per year. In this more southern range eggs generally hatch in two to three weeks (range 3-35 days), with the earliest generation taking longer to hatch, presumably due to the cooler temperatures (Gibson, 1915). After hatching, Gibson (1915) found nymphs take 30 days (range 20 to 51 days) to reach maturity depending upon the season. Nymphs congregate on host plants in dense groups (15-20 individuals within 6 $cm^2$) and begin feeding almost immediately after hatching. Adults are found at lower densities although it is typical to see several adults in close proximity to each other.

*Draeculacephala minerva* overwinters as an adult although Winkler (1949) states some nymphs may survive the winter. This likely depends on local conditions as Gibson (1915) exposed nymphs to temperatures of 1.7°C (35°F) for 18 hours and no nymphs survived. *D. minerva* are also sensitive to high temperatures and intense sun. Early instar nymphs do not survive even a few minutes of direct sun on hot days. Although the adults are less susceptible, they will retreat to damp and shady locations when temperatures are especially warm.

## DETECTION AND IDENTIFICATION

### Symptoms

Epidermal blisters occur at oviposition sites and will obscure leaf venation (Boyd *et al*., 2018). Feeding damage and subsequent leaf yellowing from nymphs and adults can be visible, especially if the leafhopper occurs in high densities (Gibson, 1915).

### Morphology

*Eggs:* Multiple eggs are deposited into plant tissue through a single slit. The number of eggs deposited in an individual pocket is extremely variable (between 2 and 20, but often around 6) and possibly linked to physical characteristics of the host (Gibson, 1915). A single female can lay multiple groups of eggs over several days or even multiple weeks. The eggs themselves are laid in rows with the long axis parallel to each other and the head ends slightly bulged. Eggs are transparent when first laid and become more opaque and white while the leafhopper develops. Shortly before hatching, the red eyes of the nymph become visible through the egg. Gibson (1915) reported that eggs are approximately 1.35 mm long and 0.38 mm wide (at widest point), although this was only based on measurements from three eggs. While it isn't clear if these eggs were *D. minerva* or *D. mollipes* (Boyd *et al.*, 2018) both species are of similar size and egg dimensions are likely to be similar.

*Nymphs:* There are five instars. The nymphs emerge headfirst from the end of each egg. First instar nymphs are tiny (1.5 mm long on average) and hold their abdomen slightly curled up over the body, and have a fairly blunt head (Gibson, 1915). They are light greenish yellow with a white stripe running the entire length of the insects, two dark spots on the back of the head (one on each side of the stripe), and white legs which lack spines. The head starts to become pointed and facial markings are visible in the second instar, wingpads are first visible in the third instar, and by the fifth instar the insect is 5mm long, green and has lighter green eyes.

*Adult:* The head color is variable and can be similar to the rest of the body or yellowish-green, extremely pointy (although relatively short) and can be plain or marked. The face darkly lined. The body is bright green but can be brown in overwintering adults (Purcell and Frazier, 1985, Gibson, 1915). In green males the face is typically black, while in females and brown males the face is brown (Young & Davidson, 1959). Brown adults can produce green offspring. Males are between 5.2 and 6.5 mm in length while females are 6.0 to 7.8 mm (Young & Davidson, 1959).

### Detection and inspection methods

Egg masses can be located by the presence of a blister on the plant's epidermis while nymphs and adults can be seen on visual inspection. Gibson (1915) described both adults and nymphs as extremely reactive to disturbance. While the adults will react by jumping, which may make them more noticeable during inspection, the nymphs run away when disturbed, possibly hindering detection. Species level identification of *Draeculacephala* usually requires examination of internal genitalia characters. An identification key is provided in Dietrich (1994) although at least one new species has been described since this publication was released. Several Cytochrome c oxidase subunit I (CO1) sequences exist for this species making barcoding identification possible (see https://qbank.eppo.int/arthropods/taxon/DRAEMI/specimens for CO1 sequences from this species or https://www.ncbi.nlm.nih.gov/ to search for genetic data from this or other species).

As egg masses are deposited below the epidermal surface, they may be undetected prior to transportation of an infested plant. Close visual inspection for epidermal blisters is required to detect egg masses. Adults and nymphs may also travel in vegetation (both cut plants and plants for planting) but will be visible upon inspection.

## PATHWAYS FOR MOVEMENT

*Draeculacephala minerva* is not known to migrate and any dispersal is localized. Winker (1949) reported that adults were most active during the hour after sunset on warm summer days. During this period the insects would move short distances although the authors could not rule out longer travel by some individuals. However, Gibson (1915) stated they were most active at midday and that at night individuals would remain close to the ground or hidden under dried leaves. Both adults and nymphs attempted to hide during periods of strong wind, although Gibson (1915) noted nymphs can be frequently blown up to several metres by gusts of wind. Although the main reliance on local dispersal makes natural colonization over long distances unlikely, this leafhopper spread to Hawaii suggesting accidental introduction.

## PEST SIGNIFICANCE

### Economic impact

*Draeculacephala minerva* vectors the bacterium *Xylella fastidiosa* (EPPO A2 List of pests recommended for regulation as quarantine pests) which is a serious threat to many agriculturally important species (EFSA, 2019; Cabrera-La Rosa *et al*., 2008). Although *D. minerva* primarily feeds on grasses and weeds (rather than grape and other cultivated non grass species) it is considered to be an important vector of Pierce's disease of grapevine within its native range. Conversely, while it has been suggested to be a common vector of almond leaf scorch (Mircetich et al. 1976) laboratory and field studies have suggested it is not typically a vector (Purcell, 1980, Danne *et al*., 2011). Danne *et al.* (2011) found slightly over 1 % of *D. minerva* collected near almond orchards and 4.5 % collected from irrigated pastures tested positive for *X. fastidiosa*. Although *D. minerva* has been demonstrated to not only transmit *X. fastidiosa* between individual hosts of the same species but also between species (e.g. from grape to almonds), studies have shown it to be a relatively inefficient transmitter and likely not the primary vector of leaf scorch of almond in its native range.

### Control

Control focuses on removing potential host plants. Winkler (1949) suggests keeping irrigation systems maintained to prevent development of moist, weedy areas. Gibson (1915) suggests cutting host vegetation when the first three instars of *D. minerva* are present as the nymphs cannot relocate to a new host plant and will starve. However, later instars and adults can easily move from plant to plant so this approach is not useful at later times. Keeping grasses and weeds trimmed around ditches, roadsides, and other unmanaged areas will also help keep the insect from establishing a population. Similarly, when working in grain producing areas, leaving bare ground post-harvest can promote the growth of weedy vegetation, if these areas cannot be replanted immediately, pre planting they should be ploughed frequently (Gibson, 1915). In grassy areas, Gibson (1915) describes the use of a hopperdozer. This device is driven through the field and as insects attempt to escape, they are caught up in the apparatus and killed.

Several species of parasitoid wasps in the families Trichogrammatidae and Mymaridae attack *D. minerva* eggs. Parasitism rates, especially by the mymarid *Gonatocerus mexicanus* can be high (over 70% of field collected eggs) in some areas (Boyd *et al*., 2018).

### Phytosanitary risk

*Draeculacephala minerva* transmits *X. fastidiosa*, the xylem-limited plant pathogen that causes several diseases in a wide range of cultivated and wild host plants (EFSA, 2019; Cabrera-La Rosa *et al*., 2008). Within its range, *D. minerva* is considered to be one of the most important vectors of Pierce's disease of grapevine, a vector of dwarf disease of alfalfa and a possible vector of leaf scorch of almond (Purcell & Frazier, 1985, Nielson, 1968). *D. minerva* has become established in Hawaii, far beyond its native range. If it were to be transported to the EPPO region, it could potentially colonize regions with conditions similar to those found in its native range (weedy grasses in damp locations with relatively mild winters). Once established, further spread may be likely. This species can occur in high densities and as an extremely active leafhopper can spread from field to field although movement over larger distances is not documented for this species. Additionally, since eggs are laid inside plant tissue and may not be noticed during a cursory inspection its possible for *D. minerva* to spread through cut plants or plants for planting.

## PHYTOSANITARY MEASURES

There are a range of phytosanitary measures that may be taken to reduce the risk of introduction and spread of *D. minerva* including: inspections to ensure that consignments of host plants for planting are pest free; sourcing imports (host plants) from pest free areas or in a pest-free place of production and phytosanitary certificates and plant passports.

## REFERENCES

**REFERENCES**

Boyd EA, Triapitsyn SV & Hoddle MS (2018) Parasitism of *Draeculacephala minerva* Ball, 1927 (Hemiptera: Cicadellidae) eggs by three species of Trichogrammatidae and Mymaridae (Hymenoptera) in California, USA. *The Pan-Pacific Entomologist* **94**(3), 147-150.

Cabrera-La Rosa JC, Johnson MW, Civerolo EL, Chen J & Groves RL (2008) Seasonal population dynamics of *Draeculacephala minerva* (Hemiptera: Cicadellidae) and transmission of *Xylella fastidiosa*. *Journal of Economic Entomology* **101**, 1105-1113.

Daane KM, CM Wistrom, EB Shapland & MS Sisterson (2011) Seasonal abundance of *Draeculacephala minerva* and other *Xylella fastidiosa* vectors in California almond orchards and vineyards. *Journal of Economic Entomology* **104**, 367–374. https://doi.org/10.1603/EC10226

Dietrich CH (1994) Systematics of the leafhopper genus *Draeculacephala* Ball (Homoptera: Cicadellidae). *Transactions of the American Entomological Society*, 87-112.

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques M-A, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, Van der Werf W, Civera AV, Yuen J, Zappal_a L, Malumphy C, Lopes JRS, Czwienczek E, MacLeod A (2019) Scientific Opinion on the pest categorisation of non-EU Cicadomorpha vectors of Xylella spp. EFSA Journal 2019;17(6):5736, 53 pp. https://doi.org/10.2903/j.efsa.2019.5736

Gibson EH (1915) The sharp-headed grain leafhopper (No. 254). US Department of Agriculture.

McKamey SH (2001) Checklist of leafhopper species 1758-1955 (Hemiptera: Membracoidea: Cicadellidae and Myserslopiidae) with synonymy and distribution (catalogue of the Homoptera, Fascicle 6, Abridged). USDA, Agricultural Research Service, Systematic Entomology Laboratory, 516 pp.

Mircetich SM, SK Lowe, WJ Moller & G Nyland (1976) Etiology of almond leaf scorch disease and transmission of the causal agent. *Phytopathology* **66,** 17.

Nielson MW (1968) The leafhopper vectors of phytopathogenic viruses (Homoptera, Cicadellidae): taxonomy, biology, and virus transmission (No. 1382). US Agricultural Research Service.

Purcell AH (1980) Almond leaf scorch: leafhopper and spittlebug vectors. *Journal of Economic Entomology* **73**(6), 834-838.

Purcell AH & Frazier NW (1985) Habitats and dispersal of the principal leafhopper vectors of Pierce's disease bacterium in the San Joaquin Valley (Vol. 53). Davis, CA, USA: California Agricultural Experiment Station.

Viguers LM (2000) Survey of leafhoppers (Homoptera: Cicadellidae) in integrated production and non-integrated production vineyards of western Oregon using yellow sticky traps and sweep net methods. Thesis, Oregon State university.

Winkler A (1949) Pierce’s disease investigations. *Hilgardia* **19**(7), 207-264. https://doi.org/10.3733/hilg.v19n07p207

Young DA & Davidson RH (1959) A review of leafhoppers of the genus *Draeculacephala*. USDA Technical Bulletin, No. 1959, 38 pp.

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## How to cite this datasheet?

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## Datasheet history

This datasheet was first published online in 2023. It is maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

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