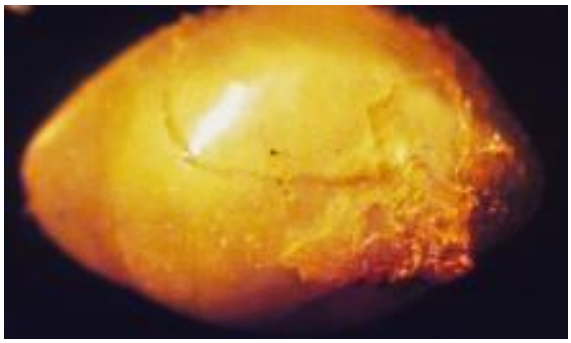
EPPO Datasheet: *Margarodes trimeni*

Last updated: 2022-12-09

IDENTITY

Preferred name: *Margarodes trimeni*
Authority: Giard
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Hemiptera: Sternorrhyncha: Margarodidae
Other scientific names: *Coccionella trimeni* Lindinger
view more common names online...
EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: MARGTR



more photos...

Notes on taxonomy and nomenclature

Six non-European species of *Margarodes* have been recorded on the roots of grapevine, five of them from Southern Africa: *M. capensis* Giard, *M. greeni* Brain, *M. prieskaensis* (Jakubski), *M. trimeni* (Giard) and *M. vredendalensis* de Klerk (de Klerk *et al*., 1983; de Klerk, 1985). The sixth species, *M. vitis* (Philippi), occurs in South America.

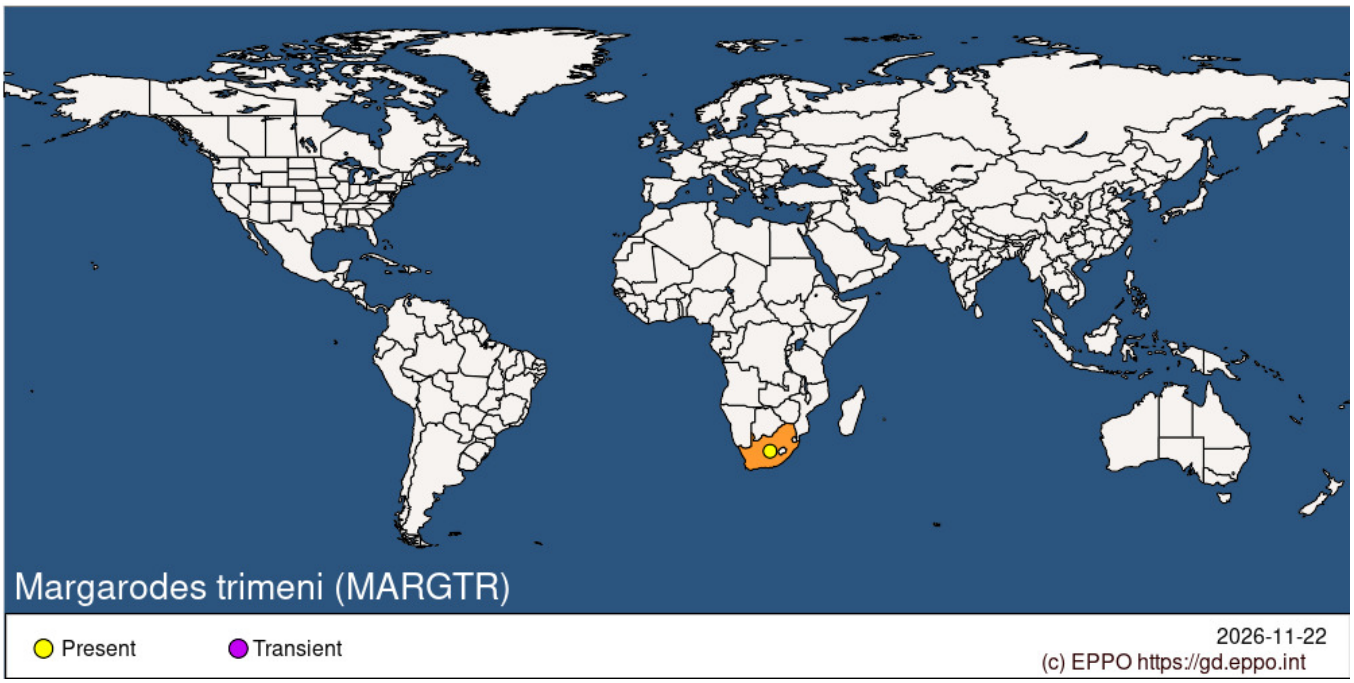
HOSTS

Margarodes trimeni has been recorded feeding on the roots of grasses (Poaceae), and occasionally cysts of this species have been found in ant and termite nests (Giard, 1897; Jakubski, 1965). De Klerk (1978) recorded it feeding on the roots of grapevines (*Vitis vinifera*) in a vineyard. The species has not been collected many times and its full host range is not known. Grapevine would be the main crop at risk in the EPPO region.

Host list: *Poaceae*, *Vitis vinifera*

GEOGRAPHICAL DISTRIBUTION

Margarodes trimeni has been recorded only from South Africa, mainly in the Western Cape province near the towns of Ceres, Tulbagh, Riversdale, Paarl, and at Slanghoek, near Worcester; also in Gauteng province in Pretoria (Jakubski, 1965; de Klerk, 1978).



Africa: South Africa

BIOLOGY

M. trimeni is assumed to be parthenogenetic, as males have never been recorded (Jakubski, 1965; de Klerk, 1978). There is probably one generation per year, but the biology has never been studied. Its biology may be similar to that of *M. capensis* (de Klerk, 1978) and *M. vredendalensis* (de Klerk, 1980), which were studied under laboratory and field conditions and showed great similarity.

Based on the data for *M. capensis* and *M. vredendalensis*, it is assumed for *M. trimeni* that: the cysts would occur mostly at a depth of 46-60 cm, in the zone of greatest root abundance, but could occur as deep as 120 cm; <20% of cysts would develop into adult females annually, emerging between the end of November and the beginning of March; eggs would be laid in clusters in the soil close to grapevine roots, in pockets lined with secreted wax filaments, and they would hatch after 34-43 days; newly hatched nymphs would disperse through the soil and attach by their mouthparts to rootlets 0.5-1.2 m below the soil surface to feed; nymphs would become sessile and moult to the legless second-instar nymphal cyst stage, which grows before secreting a protective waxy covering and going through multiple moults to form a pearl-like, dormant non-feeding cyst which is resistant to unfavourable conditions. Cysts would remain attached to the roots by the long mouthparts (de Klerk, 2017) and could remain viable in the soil for several years; their maximum longevity is not known.

DETECTION AND IDENTIFICATION

Symptoms

Infestations of vineyards by species of *Margarodes*, including *M. trimeni*, are usually patchy. Over several years the patches increase in size, presumably because of the gradual subterranean dispersal of the first-instar nymphs and adult females. Infested vines exhibit gradual loss of vigour, shoots become thinner and shorter, and the leaves become smaller (Annecke & Moran, 1982) and tend to point downwards (de Klerk, 2017). One or more of the branches may die, followed in severe infestations by the eventual death of the whole plant within five or six years; the duration of this process varies but happens much faster if the vines are stressed by either too much or too little water (de Klerk, 2017). Ground pearl infestation symptoms resemble those caused by grapevine phylloxera (*Daktulosphaira vitifoliae* (Fitch), Hemiptera: Aphidomorpha: Phylloxeridae), but in the case of *M. trimeni* no root or leaf galls are formed.

Morphology

Eggs

The appearance of the eggs has not been documented (Jakubski, 1965; de Klerk, 1978). They are likely to be similar to those of *M. capensis*, which are each 0.43-0.60 mm long, smooth, glossy-white, elongated, with one end more rounded than the other (de Klerk, 1978; de Klerk *et al*., 1982).

Nymphs

The appearance of the first-instar nymphs has not been documented (Jakubski, 1965; de Klerk, 1978). They are likely to be similar to those of *M. capensis*, in which first-instar nymphs are creamy white, elongate, 0.84-0.91 mm long, with antennae and legs clearly visible under the dissection microscope (Jakubski, 1965; de Klerk, 1978, de Klerk *et al*., 1982).

The second-instar cysts (ground pearls) of *M. trimeni* are irregularly ovoid and narrower at one end, up to 6.3 mm long and 4.0 mm wide, brassy yellow or bronze coloured with a coppery or pearly iridescent lustre (Jakubski, 1965; de Klerk, 1978); thick-walled and very hard, constructed of distinct overlapping scales but generally with the outer surface smooth (de Klerk, 1978). Of the *Margarodes* species found in South Africa, *M. trimeni* is the only one whose cyst is iridescent and not spherical (de Klerk, 1978; Watson, 2022). Second instar cysts occur loose in the soil as well as attached to grapevine roots (de Klerk, 1978).

The slide-mounted second-instar cyst of *M. trimeni* has 6 pairs of abdominal spiracles, decreasing in size posteriorly, the posterior-most pair being inconspicuous; cicatrices number only 2 on each side, arranged in line between the anus and the last pair of abdominal spiracles (de Klerk 1978). For detailed morphological description and illustration of the cyst stage of *M. trimeni*, see de Klerk (1978).

Adults

According to Brain (1915), live adult females of *M. trimeni* resemble those of *M. capensis*, which are ovoid, dirty white to yellowish, with bodies sparsely covered with short hair-like setae and segmentation clearly visible (de Klerk, 1978; de Klerk *et al*., 1982); but they are slightly smaller (3.9-5.0 mm long and 2.5-4.0 mm wide (de Klerk, 1978)). Like other *Margarodes* species, they have characteristic enlarged fossorial (digging) forelegs with heavily sclerotised dark-brown claws, and 6 pairs of abdominal spiracles (Jakubski, 1965; de Klerk, 1978). The abdominal spiracles are relatively short and robust; bluntly pointed spines are absent from the medial areas but present on the margins and submargins of wider parts of the body (de Klerk, 1978). Multilocular pores are absent from surfaces of the head and prothorax but are present on other parts of the venter; and mid- and hind-leg claws are each long (182?201 ?m) and only slightly curved, with the inner surface smooth (Watson, 2022). For a detailed morphological description and illustration of the adult female stage, see de Klerk (1978). Apparently parthenogenetic, this species has not been recorded producing any males.

Authoritative identification requires detailed microscopic study of the cysts and/or adult females by a scale insect specialist. Prior to identification, specimens may be preserved in 70% ethanol. De Klerk *et al.* (1983) and Watson (2022) provide morphological keys to live cysts, slide-mounted cysts and adult females of ten South African *Margarodes* spp. including the five species that infest grapevine roots (*M. capensis*, *M. greeni*, *M. prieskaensis*, *M. trimeni* and *M. vredendalensis*). The adult female of the South American species, *M. vitis*, is described by Jakubski (1965) but there is no key provided to identify the species, so it is very difficult to use for identification purposes. Foldi & Soria (1989) provide descriptions and illustrations of the adult female and cyst stage of *M. vitis* but no identification key.

Detection and inspection methods

In vineyards, patches of possible infestation can be detected visually by looking for groups of vines exhibiting poor growth, small leaves curling downwards and dieback. Adult female *M. trimeni* do not appear at the soil surface because they do not need to mate (de Klerk, 1978, 2017). To confirm the presence of *M. trimeni*, the vine roots and

surrounding soil down to a depth of 1.2 m should be inspected. If root galls are found, then vine phylloxera (*Daktulosphaira vitifoliae*) or root-knot nematodes (*Meloidogyne* spp.) may be responsible for the damage. If root galls are not found, the inspection should look for brassy yellow or bronze-coloured, smooth, iridescent ovoid cysts each up to 6.3 mm long (de Klerk, 1978; Watson, 2022). Cysts attached to roots or free in the soil are present throughout the year and are easily detected.

Crop inspection procedures for grapevine plants for planting (EPPO, 2018) have been developed. EPPO (2007) mainly covers a diagnostic protocol for *Margarodes prieskaensis*, *M. vitis* and *M. vredendalensis* but also provides detection and identification methods for *M. trimeni* based on morphology (see also Morphology above); Watson (2022) provides identification keys to immature cysts and adult females.

PATHWAYS FOR MOVEMENT

Natural dispersal of *M. trimeni* is extremely limited due to the subterranean habit of the insect; the first-instar crawlers and adult females within the soil are the only natural dispersal stages. However, infestation can be spread within and between vineyards or blocks of vines within a vineyard on soil cultivation implements (de Klerk, 2017). All the developmental stages may be transported over long distances from infested areas via human-assisted spread on grapevine plants for planting (when moved with roots and soil attached) and / or in soil.

PEST SIGNIFICANCE

Economic impact

There is no data available on the actual economic impact of *M. trimeni*. Ground pearls devitalize the host directly by sap and nutrient depletion, and vines sometimes die within five or six years (de Klerk, 2017). Infestation of vines stressed by drought or nematode infestation can result in them dying in patches. De Klerk (1978) recorded *M. trimeni* causing patches of dieback of grapevines in a vineyard. Ground pearls are difficult to control due to their subterranean habit and even after an interval of several years, vineyards replanted in infested soils are readily reinfested. Once infested, land may become unsuitable for commercial vineyard cultivation indefinitely (de Klerk, 1978, 2017).

Control

Although many European and American varieties of *Vitis vinifera* have been tested, no cultivars resistant to *Margarodes* have been found; nor have any natural enemies of *M. trimeni* been documented. Consequently, the only possible control has been with insecticides, which presents technical problems because the target insects live up to 1.2 m underground. Soil drenches of systemic insecticides applied to control *Planococcus ficus* mealybugs shortly after harvest (in autumn), when the annual population of new cysts starts feeding and translocation in vines is still active, can reduce ground pearl infestations. As cysts can survive in the soil for years without feeding and only a certain percentage of cysts annually develop into adult females (de Klerk, 1978), follow-up treatments in successive years are essential. Fumigation for nematodes before planting could reduce numbers of females if done at the time when the females are active (but this method is not officially registered). After first treatments, annual re-evaluation of pest presence is necessary to decide on the need for any follow-up treatments (de Klerk, 2017).

Where an infestation of *M. trimeni* has resulted in removal of the vines, the pest might be eliminated eventually by growing a series of annual crops over four or more years, because the cyst stage probably lasts longer than one year (de Klerk, 2017). However, since the native hosts of *M. trimeni* are not known, there is uncertainty as to what type of annual crops would not serve as hosts for the ground pearls.

As *M. trimeni* is assumed to be parthenogenetic and males have never been recorded, there is no sex pheromone to exploit to monitor population levels by trapping males or for mating disruption.

Phytosanitary risk

There are no *Margarodes* species occurring in the EPPO region on grapevine, nor any grapevine pest with similar biology. Accordingly, ground pearl species recorded on grapevine in South Africa and South America present a serious phytosanitary risk to vineyards in the EPPO region. Non-European ground pearl species recorded feeding on grapevine roots are: *M. capensis*, *M. greeni*, *M. prieskaensis*, *M. trimeni* and *M. vredendalensis* from South Africa; and *Dimargarodes meridionalis* Morrison from California and the closely related *Eurhizococcus brasiliensis* (Hempel in Wille) from Brazil; however, the ground pearl species most damaging to grapevines is *M. vitis* in South America.

Margarodes trimeni occurs mainly in the Western Cape province of South Africa, including in the vicinity of Ceres, Tulbagh, Paarl, Slanghoek (near Worcester) and Riversdale, although it has also been recorded in Pretoria (Gauteng province). The climate in the Western Cape varies from warm, dry temperate *(*Köppen-Geiger climate type Csa) to cold, arid steppe (Köppen-Geiger climate type BSk), based on De Klerk (1978). Across the EPPO region a variety of soil types and climates occur, and grapevines are widely cultivated, so it is assumed that *M. trimeni* would be able to establish in the EPPO region (EFSA, 2019), particularly in drier Mediterranean areas. *Margarodes trimeni* can remain dormant as cysts in the soil for many years, making it extremely difficult to eradicate, so it is important to exclude it from the EPPO region.

PHYTOSANITARY MEASURES

A number of EPPO countries already ban the import of *Vitis* plants for planting (other than seeds) (e.g. EU countries: Annex VI, point 10 of Regulation /2072 (EU, 2019)) and prohibit the import of soil. Other appropriate phytosanitary measures to regulate import of *Vitis* (other than seeds) with roots into the EPPO region could require that these plants are produced in a pest-free area (including for the whole country) or in a pest-free place/site of production for *M. trimeni*, established according to EPPO Standard PM 5/8 *Guidelines on the phytosanitary measure 'Plants grown under physical isolation'* (EPPO, 2016). Rooted grapevine plant material destined for export from South Africa has to be treated with both hot water and insecticide before shipment, to reduce the risk of infestation, and additional treatments are sometimes required on arrival in the country of destination. Host plants for planting could also be imported using post-entry quarantine (in the framework of a bilateral agreement).

REFERENCES

Annecke DP & Moran VC (1982) *Insects and mites of cultivated plants in South Africa*, Butterworths, Durban (SA).

Brain CK (1915) The Coccidae of South Africa. *Transactions of the Royal Society of South Africa* **5**, 65-194.

de Klerk CA (1978) *Morphology and taxonomy of the South African species of the genus Margarodes (Hemiptera: Margarodidae), with detailed studies on the biology of two vine infesting species. PhD thesis*, Stellenbosch University, (SA).

de Klerk CA (1980) Biology of *Margarodes vredendalensis* De Klerk (Coccoidea: Margarodiae) in South Africa. *South African Journal of Enology and Viticulture* **1**, 47-58.

de Klerk CA (1985) Occurrence of South African species of *Margarodes* Guilding (Homoptera: Coccoidea: Margarodidae) with special reference to vine infesting species. *Phytophylactica* **17**, 215-216.

de Klerk CA (2017) Identification, control and management of grapevine *Margarodes*. Viticulture research, Winetech Technical, available at https://www.wineland.co.za/identification-control-management-grapevine-margarodes/ (accessed 29 September 2022).

de Klerk CA, Ben-Dov Y & Giliomee JH (1982) Redescriptions of four vine infesting species of *Margarodes* Guilding (Homoptera: Coccoidea: Margarodidae) from South Africa. *Phytophylactica* **14**, 61-76.

de Klerk CA, Ben-Dov Y & Giliomee JH (1983) General morphology of South African species of *Margarodes* Guilding (Homoptera: Coccoidea: Margarodidae) with keys to nymphs and adult females. *Phytophylactica* **15**, 133-144.

EFSA (2019) Pest categorisation of non-EU Margarodidae. *EFSA Journal* **17** (4), 5672, 1–42. Available from: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2019.5672 (accessed 29 September 2022).

EPPO (2007) PM 7/82 (1) *Margarodes prieskaensis, Margarodes vitis, Margarodes vredendalensis. EPPO Bulletin* **37**, 560–570. Available from: https://gd.eppo.int/download/standard/206/pm7-082-1-en.pdf (accessed 29 September 2022).

EPPO (2016) EPPO Standard PM 5/8 (1) *Guidelines on the phytosanitary measure 'Plants grown under physical isolation'. EPPO Bulletin* **46**, 421–442. Available from: https://onlinelibrary.wiley.com/doi/epdf/10.1111/epp.12340 (accessed 29 September 2022).

EPPO (2018) PM 3/85 (1) Inspection of places of production – *Vitis* plants for planting. *EPPO Bulletin* **48**(3), 330–349. Available from: https://gd.eppo.int/download/standard/738/pm3-085-1-en.pdf (accessed 29 September 2022).

EU (2019) Commission Implementing Regulation 2019/2072 of 28 November 2019 establishing uniform conditions for the implementation of Regulation (EU) 2016/2031 of the European Parliament and the Council, as regards protective measures against pests of plants, and repealing Commission Regulation (EC) No 690/2008 and amending Commission Implementing Regulation (EU) 2018/2019. Annex VI, points 10. Available from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R2072 (accessed 29 September 2022).

Foldi I & Soria SJ (1989) Les cochenilles nuisibles à la vigne en Amérique du Sud (Homoptera: Coccoidea). *Annales de la Société entomologique de France* **25**(4), 411-430.

Giard A (1897) Sur la distribution géographique de cochenilles du genre *Margarodes* et sur deux espèces nouvelles de ce genre. *Comptes Rendus des Séances de la Société de Biologie* **4**, 683-685.

Jakubski AW (1965) *A critical revision of the families Margarodidae and Termitococcidae (Hemiptera, Coccoidea)*, 187 pp Trustees of the British Museum (Natural History), London (GB).

Watson GW (2022) Towards identification of the scale insects (Hemiptera: Coccomorpha) of continental Africa: 2. Checklists and keys to six archaeococcoid families. *Zootaxa* **5105**(3), 301-356.

ACKNOWLEDGEMENTS

This datasheet was prepared in 2022 by Elleunorah Allsopp, ARC Infruitec-Nietvoorbij Fruit, Vine and Wine Institute, South Africa, and Gillian W. Watson, Natural History Museum, London, UK. Their valuable contribution is gratefully acknowledged.

How to cite this datasheet?

EPPO (2026) *Margarodes trimeni*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published online in 2022. 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.

Co-funded by the European Union