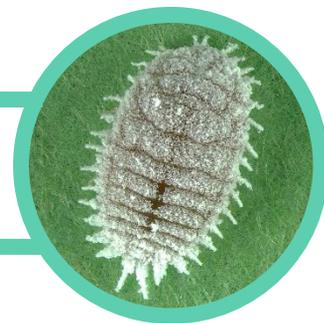


Grapevine mealybug



Planococcus ficus

Common names: vine mealybug, grape mealybug, wingerdwitluis
Higher taxon: Insecta: Hemiptera: Sternorhyncha: Pseudococcidae
Synonyms: *Coccus vitis*, *Dactylopius ficus*, *Dactylopius vitis*
EPPO code: PLANFI

Grapevine mealybug is a key economic pest of table and wine grapevines in South Africa as it vectors the grapevine leafroll virus. Mealybugs also excrete honeydew which can lead to growth of sooty mould and to grape bunches becoming unmarketable. Mealybug juveniles and adult females suck sap from all parts of the grapevine plant. They exist in a mutualism with native ants, which protect the mealybugs from predators while feeding on the honeydew.

Control of grapevine mealybug is currently accomplished through an integrated pest management approach that includes chemical, biological and cultural control techniques. Monitoring is accomplished through visual inspections and pheromone trapping of males. Many natural enemies of parasitoids and predators are available naturally and commercially for control of the species. Under high infestations, chemical controls are sometimes necessary. Any successful control programme must also target the mutualistic ants which tend the mealybugs.

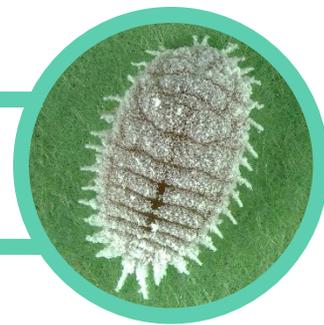


Grapevine mealybug infestation on vine.



Grapevine mealybug adult female.

Grapevine mealybug



Planococcus ficus

BIOLOGY

Number of generations per year: 3-7

Length of generation: 3-4 weeks in summer, longer in winter

Threshold for development: 16.59°C (lower), 35.61°C (upper).

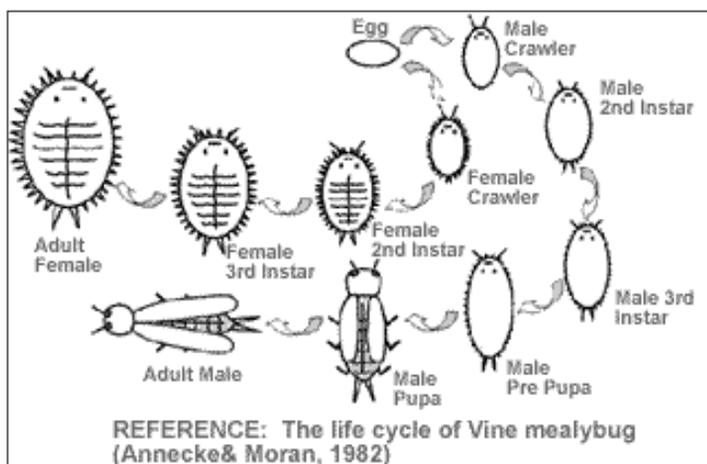
Eggs are laid in waxy egg sacs. As soon as temperatures start to rise in spring, crawlers emerge and disperse in search of new plant growth with high nutritional quality. Crawlers of both sexes that emerge from the eggs are the dispersal stage, charged with spreading the population to new localities. However, after the crawler stage, the life cycle is very different for males and females.

Female nymphs go through three instars before becoming adults. At each moult, the nymph becomes slightly larger and more sedentary, and excretes more wax. The female adult mates with a male and then goes through a long pre-oviposition period. After this, eggs are laid in a waxy egg sac over the course of a few weeks to a few months.

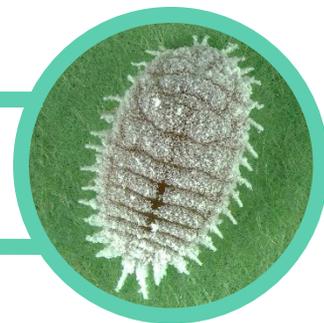
Crawlers and adult females all have syringe-like mouthparts which they use to pierce the plant and suck sap from the phloem. They feed on grapevine trunks, branches, shoots, leaves, stems and berries. While feeding, they excrete honeydew which is eaten by ants. In order to protect their food source, the ants tend the mealybugs and protect them from predators.

Male crawlers moult once to become second instar nymphs. The nymph then spins a cocoon and the third instar, pre-pupal and pupal life stages all occur within the cocoon. Winged male adults emerge from the cocoon. They cannot feed and live for a very short time, during which they mate with females and then die.

Generations of the grapevine mealybug overlap and all stages can be present simultaneously. In winter, mealybugs shelter beneath loose bark or on grapevine roots and weeds, although the latter two should still be verified. In January and February population numbers peak.



Grapevine mealybug



Planococcus ficus

IDENTIFICATION

Egg

Size: 0.5 mm long

Duration: 7-10 days at 25° C

Eggs of grapevine mealybug are small, oval, and yellow. They are laid in a sac of wax threads.

Nymph

Crawler (first instar) size: 1 mm long

Female late instar size: 2.5-3.0 mm long

First instar nymphs (crawlers) are tiny and move very actively to disperse. Later stage female nymphs produce waxy filaments around the edges of their bodies. Third instar male nymphs develop into pre-pupae and pupae inside a cocoon.

Adult

Male size: 1.5 mm long

Female size: 4 mm long

Duration: males: 1-3 days; females: several weeks to months

Number of eggs laid by single female: ≤750 eggs

Adult females are wingless, soft, oval and covered in a white, powdery wax which forms longer filaments on the sides of the body. Males are winged with long, white waxy filaments at the tip of the abdomen.

Recognition

Grapevine mealybug is closely related to citrus mealybug, *Planococcus citri*. In order to differentiate the two species, they must be slide mounted and viewed under a stereo-microscope. However, citrus mealybug has not yet been found on vines in South Africa.

In California, grapevine mealybug is confused with grape mealybug, *Pseudococcus maritimus*, and with obscure mealybug, *Pseudococcus viburni*. It is important to differentiate the species because they have different life histories, necessitating different chemical control programmes.

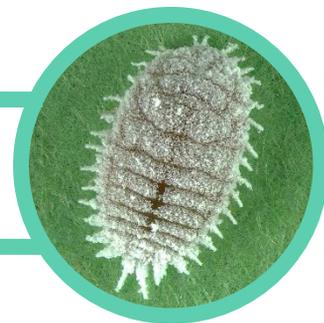


Grapevine mealybug male (white arrow) mating with female. Source: <http://www.wineland.co.za/wp-content/uploads/2017/03/supplimentary-wynboer-july-2003-integrated-vine-mealybug-planococcus-ficus-control-with-the-use-of-pheromone-trapping-in-south-african-vineyards-2.jpg>



Grapevine mealybug adult secreting honeydew. Source: <http://www.tfrec.wsu.edu/pages/pearent/Mealybug>

Grapevine mealybug



Planococcus ficus

ECONOMIC IMPORTANCE

Grapevine mealybug is of key economic importance on South African table and wine grapes. Perhaps the most costly damage is caused by the vectoring of grapevine leafroll virus which leads to grapevine leafroll disease which debilitates infected vineyards.

Large infestations of grapevine mealybug also cause early leaf loss and weakening of vines following infestations in successive years. Wine grapes are also susceptible to direct damage due to desiccation of grape bunches. On table grapes, honeydew excretion causes the growth of sooty mould which makes the grapes unsuitable for sale and human consumption.



Grapevine mealybug on vine leaf.

HOST PLANTS

Grapevine mealybug is polyphagous and hosts from at least 20 plant families have been recorded. Below is a partial list of known hosts.

Common name	Scientific name	Family
Fig	<i>Ficus carica</i>	Moraceae
Ash trees	<i>Fraxinus</i> spp.	Oleaceae
Mulberry trees	<i>Morus</i> spp.	Moraceae
Pomegranate	<i>Punica granatum</i>	Punicaceae
Grapevine	<i>Vitis vinifera</i>	Vitaceae
Apple	<i>Malus domestica</i>	Rosaceae
Walnuts	<i>Juglans</i> spp.	Juglandaceae
Date palm	<i>Phoenix dactylifera</i>	Palmae
Avocado	<i>Persea americana</i>	Lauraceae
Mango	<i>Mangifera indica</i>	Anacardiaceae
Oleander	<i>Nerium oleander</i>	Apocynaceae

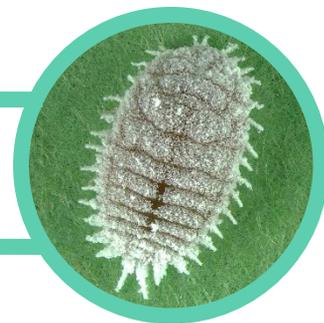


Grapevine mealybug on grapes.



Grapevine mealybug on bark.

Grapevine mealybug



Planococcus ficus

MANAGEMENT

Monitoring

Grapevine mealybug should be monitored continuously throughout the grape-growing season using visual inspection of vines for mealybugs and ants. Pheromone traps baited with female sex pheromone complement the visual inspections and can be used as an initial course-scale monitoring tool to identify infested vineyards.

Areas with high levels of human activity (roads, packsheds, etc.) should be monitored most intensively as these are often areas of origin for new mealybug infestations. Mealybug infestations often originate in old vineyards where vines were removed and replaced. These types of vineyard blocks should be monitored extensively.

Prevention and thresholds

If less than 2% of grapevines are infested with grapevine mealybug, natural enemies should be purchased and released. Ants should be controlled if visual inspections reveal more than 20% of vines are infested with mutualistic ants.

Control measures

Due to the mutualism between ants and mealybugs, a key to controlling mealybugs is the control of ants. To control ants, chemicals should be applied to the stems of vines to produce a barrier to prevent ants from moving into the vine canopy.

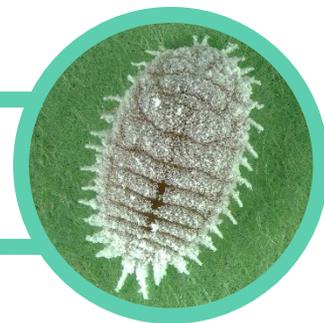
Once ants are controlled, appropriate controls of mealybug depend on the season. During winter, grapevine mealybug overwinters so can be controlled by application of a suitable insecticide before budding. During the growing season, spot sprays can be applied to infected vines in order to support the population of natural enemies. Cover sprays are effective but should be avoided as they can be detrimental to natural enemy populations.



J. de Waal

Grapevine mealybug on bark.

Grapevine mealybug



Planococcus ficus

MANAGEMENT

Natural enemies (biological control)

Natural enemies of grapevine mealybug include a number of parasitic wasps as well as beetle (ladybird) and lacewing larvae predators. In South Africa, the parasitoid *Coccidoxenoides perminutus* and *Anagyrus nr. pseudococci* are available commercially, as is the predator *Cryptolaemus montrouzieri*. Additional naturally occurring enemies include the parasitic wasps *Leptomastix dactylopii* as well as predatory ladybirds *Nephus* sp., *Exochomus* sp. and *Hippodamia variegata*.

Attractants and trapping (pheromonal control)

Attraction of male grapevine mealybugs to pheromone extracts from females was first demonstrated in 1980. In 2001, the possible components of this pheromone were identified as monoterpene alcohol lavandulol and its ester, lavandulyl senecioate. In 2002, Millar et al. tested blend ratios and doses of the various components. They found that synthesized racemic lavandulyl senecioate was as attractive to males as extracts from virgin females.

In South Africa, a protocol is available for pheromone trapping of grapevine mealybug. This involves baiting a yellow delta trap with a sticky pad with the lure on top. Delta traps should be hung at or above the cordon at a density of one trap per hectare. Lures are very attractive for a distance of 50 m. Therefore trap counts should be compared with visual stem counts of female grapevine mealybug to avoid counting mealybugs from nearby vineyard blocks. Visual scouting entails monitoring 20 plots of 5 vines each/vineyard block. Vines are classified as infested or uninfested.

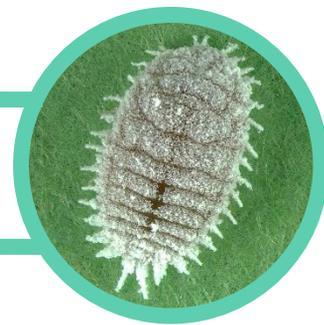
Sticky pads can be sent to ARC Infruitec-Nietvoorbij for counting. Results are then emailed to the client. Trapping should begin in October and traps should be checked every second week until harvest. After harvest, traps should be checked once per month. The action threshold of 2% grapevine mealybug infestation is equivalent to 65 males per pheromone trap in a biweekly trap count. Once this number is found, visual scouting should be initiated.

QUARANTINE REGULATIONS

Grapevine mealybug has already established in most grape producing regions in the world so is not considered a quarantine pest.



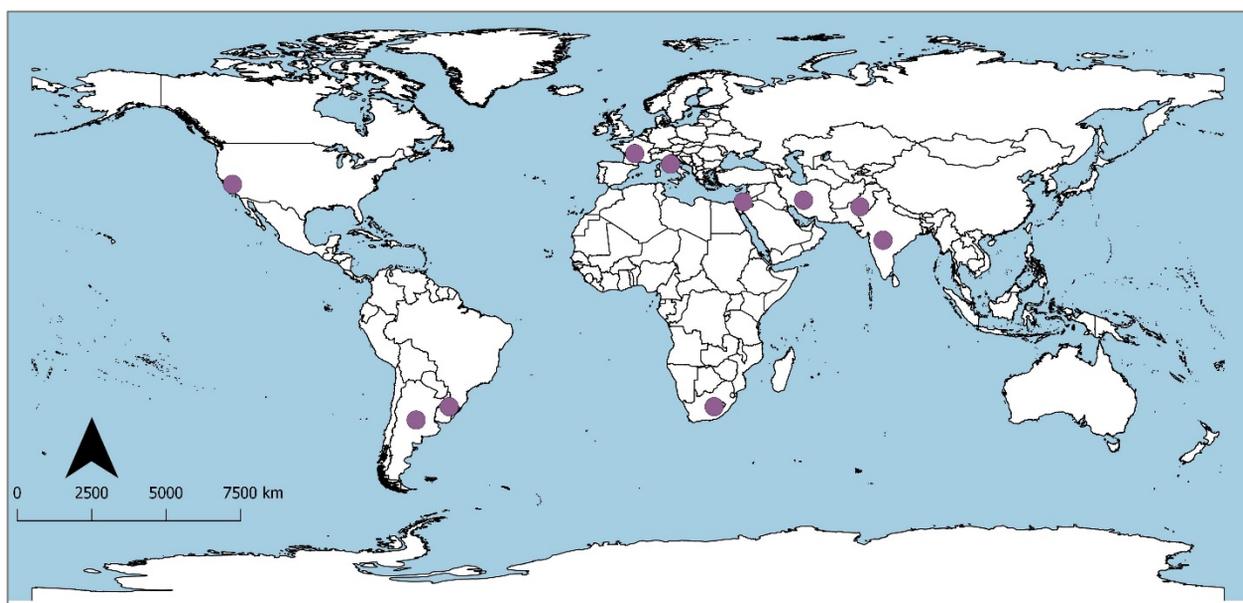
Grapevine mealybug



Planococcus ficus

DISTRIBUTION

Grapevine mealybug was first observed in the Western Cape in 1930. It originates from the Mediterranean and Europe. It has now become established in most grape growing regions in Europe, India, North and South America, the Middle East and South Africa..



Grapevine mealybug, *Planococcus ficus*, distribution. Data from CABI (2017). Map drawn by C.S. Bazelet.

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