EPPO Datasheet: *Chloridea virescens*

Last updated: 2025-04-07

IDENTITY

Preferred name: *Chloridea virescens*
Authority: (Fabricius)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Lepidoptera: Noctuidae
Other scientific names: *Helicoverpa virescens* (Fabricius), *Heliothis virescens* (Fabricius), *Noctua virescens* Fabricius
Common names: tobacco budworm
view more common names online...
EPPO Categorization: A1 list, Alert list (formerly)
view more categorizations online...
EU Categorization: Emergency measures
EPPO Code: HELIVI

more photos...

Notes on taxonomy and nomenclature

Optional section to be written if considered necessary.

HOSTS

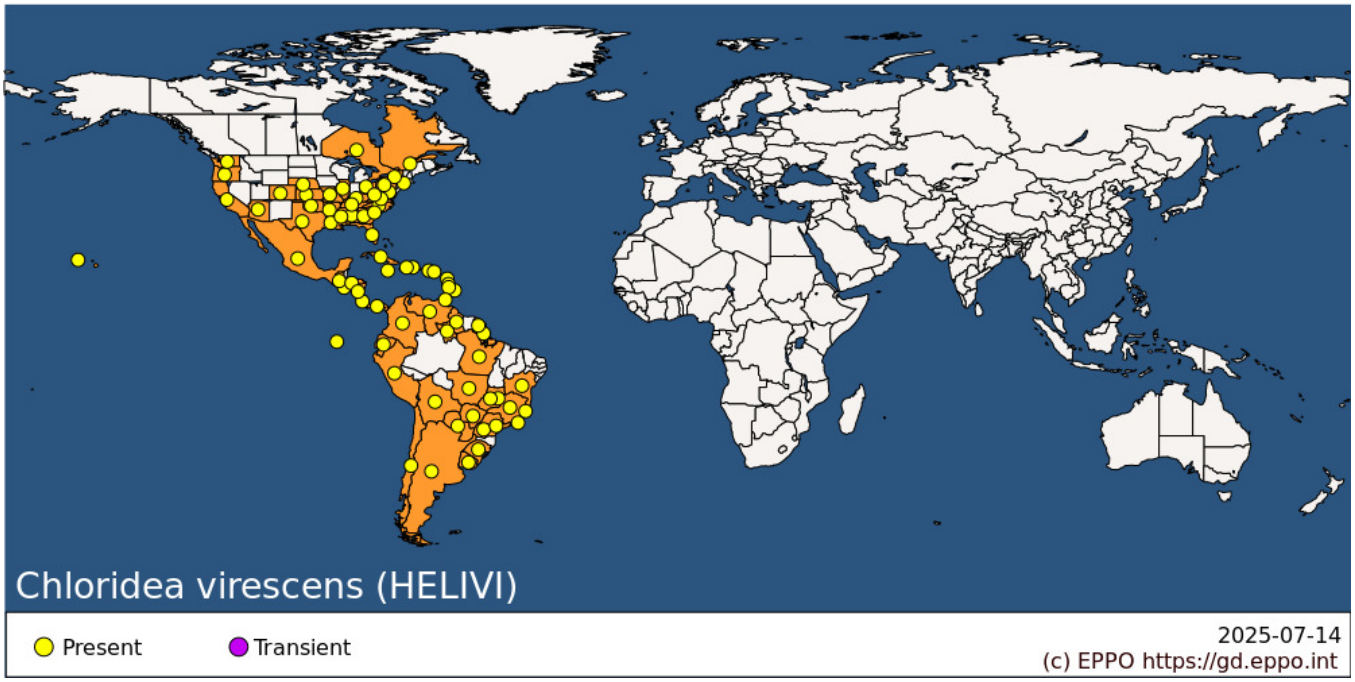
Chloridea virescens has been reported from over 210 plant species. In the EPPO PRA, 65 species have been confirmed as main hosts (i.e. plants that support the complete *C. virescens* development, plants mentioned in the literature as common or preferred hosts, and plants on which impacts have been recorded). Preferred host plants include cotton, tobacco, chickpea and tomato (EPPO, 2024). Hosts belong to 35 families, with Fabaceae (60), Solanaceae (29), Malvaceae (27), Asteraceae (22), Convolvulaceae (9), Euphorbiaceae (7), Cucurbitaceae (5), and Brassicaceae (4) comprising 75% of the host plants.

Host list: *Abelmoschus esculentus, Abutilon theophrasti, Abutilon trisulcatum, Abutilon viscosum, Acalypha alopecuroides, Acalypha infesta, Acalypha persimilis, Acalypha sp., Acanthospermum hispidum, Aeschynomene americana, Aeschynomene ciliata, Aeschynomene rudis, Ageratum sp., Alcea rosea, Antirrhinum majus, Antirrhinum sp., Arachis hypogaea, Asparagus officinalis, Brassica carinata, Brassica oleracea var. capitata, Brassica oleracea var. viridis, Brassica oleracea, Cajanus cajan, Calendula officinalis, Calopogonium mucunoides, Camonea umbellata, Caperonia palustris, Capsicum annuum, Carya illinoinensis, Cassia patellaria, Cassia reticulata, Castilleja indivisa, Cenchrus americanus, Chamaecrista nictitans, Chamaecrista rotundifolia, Chenopodium quinoa, Chrysanthemum sp., Cicer arietinum, Cichorium intybus, Citrullus lanatus, Cleome spinosa, Corchorus orinocensis, Cordia globosa, Coronilla varia, Croptilon divaricatum, Crotalaria pallida, Crotalaria retusa, Crotalaria sp., Croton hirtus, Ctenodon brasilianus, Cucumis melo, Cucurbita maxima, Cucurbita pepo, Cydonia oblonga, Dalea pogonathera, Desmodium canescens, Desmodium incanum, Desmodium obtusum, Desmodium scorpiurus, Desmodium strictum, Desmodium tortuosum, Distimake cissoides, Eirmocephala brachiata, Erigeron canadensis, Funastrum clausum, Galactia tenuiflora, Galinsoga quadriradiata, Gardenia sp., Geranium carolinianum, Geranium dissectum, Geranium maculatum, Glycine max, Gossypium hirsutum, Helianthus annuus, Heliotropium indicum, Heterotheca subaxillaris, Hibiscus moscheutos, Hibiscus rosa-sinensis, Hibiscus sp., Hyptis suaveolens, Indigofera hirsuta, Indigofera suffruticosa, Ipomoea cordatotriloba, Ipomoea hederacea, Ipomoea nil, Ipomoea purpurea, Ipomoea triloba, Jacquemontia sp., Jacquemontia tamnifolia, Lablab purpureus, Lactuca sativa, Lagascea mollis, Lathyrus hirsutus, Lathyrus odoratus, Leonotis nepetaefolia var. africana, Lespedeza bicolor, Linum usitatissimum, Lonicera japonica, Lupinus sp., Lupinus texensis, Malachra alceifolia, Malus domestica, Malva neglecta, Malva parviflora, Malvastrum americanum, Malvastrum coromandelianum, Medicago arabica, Medicago lupulina, Medicago polymorpha, Medicago sativa, Melilotus albus, Melochia pyramidata, Mimosa diplotricha, Mimosa pigra, Mimosa somnians, Mucuna deeringiana, Nicandra physalodes, Nicotiana alata, Nicotiana debneyi, Nicotiana glutinosa, Nicotiana kawakamii, Nicotiana paniculata, Nicotiana repanda, Nicotiana rustica*

, Nicotiana tabacum, Nicotiana x sanderi, Nuttallanthus canadensis, Nuttallanthus texanus, Origanum vulgare, Passiflora foetida, Paulownia tomentosa, Pavonia sp., Pelargonium peltatum, Pelargonium x hortorum, Penstemon laevigatus, Persicaria pensylvanica, Petunia integrifolia, Petunia sp., Phaseolus lunatus, Phaseolus vulgaris, Physalis angulata, Physalis heterophylla, Physalis lagascae, Physalis peruviana, Physalis pubescens, Physalis sp., Physalis viscosa, Pisum sativum, Portulaca oleracea, Priva lappulacea, Proboscidea louisianica, Pseudelephantopus spicatus, Pyrrhopappus carolinianus, Rhexia alifanus, Rhexia mariana, Rhexia nashii, Rhynchosia edulis, Rhynchosia minima, Ricinus communis, Rosa sp., Ruellia ciliatiflora, Ruellia runyonii, Rumex crispus, Salvia misella, Salvia occidentalis, Salvia officinalis, Scoparia dulcis, Senna occidentalis, Senna tora, Sesamum indicum, Setaria italica, Sicyos angulatus, Sida abutilifolia, Sida acuta, Sida cordifolia, Sida glomerata, Sida glutinosa, Sida rhombifolia, Sida spinosa, Sida urens, Sidastrum paniculatum, Solanum carolinense, Solanum hirtum, Solanum lycopersicum, Solanum melongena, Solanum rostratum, Solanum sessiliflorum, Solanum sisymbriifolium, Solanum torvum, Solanum tuberosum, Strelitzia reginae, Stylosanthes guianensis, Tridax procumbens, Trifolium incarnatum, Trifolium pratense, Trifolium repens, Trifolium resupinatum, Trixis cacalioides, Trixis inula, Turnera ulmifolia, Vaccinium corymbosum, Verbena neomexicana, Verbena sp., Vernonanthura brasiliana, Vicia lens, Vicia villosa, Vigna unguiculata subsp. unguiculata, Vitis vinifera, Waltheria americana, Xanthium orientale, Xerochrysum bracteatum, Zinnia sp.

GEOGRAPHICAL DISTRIBUTION

The current distribution range of *Chloridea virescens* covers most of the American continents, from occasional specimens trapped in southern Canada, to Chile, Argentina, and Uruguay. In North America, the well-established populations may be found at latitudes below 37°N (Poole *et al.* 1993; Hernandez & Blanco, 2010). In South America, the southernmost records are at a latitude of 34°S (EPPO, 2024). The migratory nature of this pest (Hendricks *et al.*, 1993; Schneider 2003; Boiça Júnior *et al.*, 2022) facilitates the temporary invasion to areas outside its natural range. In North America, *C. virescens* moths are observed to disperse annually northwards by migration. It is believed that permanent populations would not occur in areas where soil temperatures reach subfreezing temperatures at a depth of 5 cm for more than 50 days (Eger *et al.*, 1982; EPPO, 2024).



North America: Canada (Ontario, Québec), Mexico, United States of America (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, Nebraska, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, West Virginia)
Central America and Caribbean: Barbados, Costa Rica, Cuba, Dominican Republic, El Salvador, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Nicaragua, Panama, Puerto Rico, Saint Lucia, Trinidad and

Tobago, Virgin Islands (US)
South America: Argentina, Bolivia, Brazil (Amapa, Bahia, Distrito Federal, Espirito Santo, Goias, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Para, Parana, Rio de Janeiro, Rio Grande do Sul, Roraima, Sao Paulo), Chile, Colombia, Ecuador (Galapagos), French Guiana, Guyana, Paraguay, Peru, Uruguay, Venezuela

BIOLOGY

Most knowledge about the biology of *C. virescens* comes from studies conducted on cotton (*G. hirsutum*). *Chloridea virescens* females lay hundreds of single eggs on the surface of terminals of cotton, or on tender leaves of chickpea (*C. arietinum*) and other crops and weeds. Two to four days later a neonate emerges and feeds on foliage for 4-7 days. Second instar larvae search for pre-blooming structures of cotton (squares) and third-fifth instar larvae move down into the plant to feed on post-blooming structures (bolls). Similar behaviour occurs on chickpea and tomato (*S. lycopersicum*), while the damage on tobacco (*Nicotiana tabacum*) is on flowers and foliage (C. Blanco, pers. obs.). On cotton and chickpea one to three generations can develop in a crop season, depending on environmental conditions. Tomatoes grown in greenhouses may have continuous generations of tobacco budworm throughout the year. In agricultural fields, uncultivated plants (weeds) may be the hosts of the first and last *C. virescens* generations in a year (Stadelbacher, 1981; Blanco *et al.*, 2008). Generations of this pest move from host to host throughout the year when the temperature conditions are favourable for its development, while conditions outside the upper and lower tolerance range in summer or winter trigger pupation in the soil. This pupal diapause lasts a few weeks in temperate and hot climates, to several months under cold and humid conditions (Schneider, 2003; Hernandez & Blanco, 2019). In North America, pupal diapause in winter occurs only in the southern part of the USA, with a northern limit that may be at a latitude of approximately 37°N (Poole *et al.*, 1993; EPPO, 2024). Further north, there may be individuals or few generations over the summer, and pupae generally cannot survive over winter except in mild winters or in sheltered locations. Larvae established in one crop (e.g. cotton or chickpea) do not move to another crop when the current host (cotton or chickpea) is killed, showing a strong affiliation for the host that they first started feeding on. Is not uncommon to find *C. virescens* established on one crop (e.g. chickpea) and not in another (e.g. cotton, tobacco) when these crops are grown side-to-side (C. Blanco, pers. obs. over multiple years), indicating a strong female preference for certain hosts. This fact may facilitate areawide controls destroying early populations on weeds (Stadelbacher, 1981).
The dispersal capacity of *C. virescens* adults by flight is high. Short range movements are important in the seasonal dynamics of the pest. Long-distance flight and migration also occur. Based on data available on the literature, the EPPO PRA noted that adults can fly approximately 10 km in their lifetime, but a minority may be able to engage in longer flights. Migratory flights (passive) may occur in favourable wind systems (EPPO, 2024).

DETECTION AND IDENTIFICATION

Symptoms

Neonates and L1-L2 larvae are less than 1 cm in length and can be hard to find, especially on plants with a complex structure, such as asparagus (*Asparagus officinalis* or chickpea. Small larvae range in colour from creamy to dark brown, which allows them to ‘blend in’ on foliage and prevent their detection. Incipient damage of L1-L2 is easier to detect on plants and fruits with smooth surfaces such as tomatoes (*Solanum lycopersicum*). The foliar and surface damage of tobacco budworm may be more easily detected than when larvae feed inside fruits. Large larvae tend to drill approximately 0.4 cm diameter holes and expulse their faeces outside the fruit. Frass on the surface of fruits can be another indication of their presence.

Morphology

Eggs: Spherical with flattened base, approximately 0.5-0.6 mm wide and high (Capinera, 2001; Blanco *et al.*, 2019). Unfertilized eggs remain green-whitish, while fertilized eggs turn from whitish green to dark coloured three days after oviposition, and develop a reddish-brown band just prior to hatching (NCSU, 2016; C. Blanco, pers. obs.).
Larvae: At emergence, L1 neonates are creamy to brownish with a brown head. They range in size between 1-4 mm (Capinera, 2001; Neunzig, 1964). Right after eclosion L1 larvae move about and may return to eat the egg chorion. L2 range between 3-8 mm, L3 from 9 to 15 mm; L4 from 18-26 mm, and L5 from 23-45 mm (Capinera, 2001;

Neunzig, 1964). L1 to L4 larvae are cream/brown in colour with a brown head, and usually the last larval stage (L5) presents a wider range of colours, from pale green, red, to dark brown with a brown head.
Pupae: Differentiation between sexes in *Chloridea virescens* is based on the presence the genital orifice in male pupae, but morphological differences between tobacco budworm pupae and other heliothines are still undetermined. Pupae are dark brown and shiny, measuring approximately 21±1 mm.
Adults: Brownish to brownish olive or olive (Capinera, 2001; NCSU, 2016). Three transversal dark bands (dark olive or brown) on the forewings (Capinera, 2001; NCSU, 2016), each often accompanied by a whitish/cream- coloured border (Capinera, 2001). Whitish hind wings present a dark band on the distal margin (Capinera, 2001).

Detection and inspection methods

In crops, monitoring by inspection is essential for the detection of *C. virescens*. All life stages can be observed without magnification. In some hosts, life stages may be hidden/protected in a plant organ. Sex pheromone lures and traps are available commercially to trap males, however their effectiveness may be related to the commercial lures used and their efficiency on different populations (EPPO, 2024).
On commodities, *Chloridea virescens* eggs may be the most abundant and easiest to perceive of the life stages on infested commodities. But due to their small size (~0.5 mm) and possible placement under leaves and inside of plant parts with restricted visibility, eggs can be unnoticed. Eggs are more noticeable against green or dark colour foliage or fruit skin. Larvae tend to hide on plant structures and their size (particularly in early stages) may make detection difficult. Damage to produce and the presence of frass may be another indication of the possible presence of tobacco budworm in a commodity. Pupae may be only present in commodities moved with soil, because generally pupae develop inside the soil, but under laboratory conditions they can develop on top of the food provided to them. This indicates that *C. virescens* might pupate at the bottom of shipping boxes / pallets. Adults are active fliers and disturbance to the commodity packages or exposing them to light, would trigger their flight.
Eggs, larvae and adults can be identified by morphological methods although differentiation between heliothine species may be difficult in some cases. Pupae should be raised to adults for morphological identification (EPPO, 2024). There are simple ways to distinguish *C. virescens* eggs from those of other heliothines (Blanco *et al.*, 2019). Molecular methods have been developed (EPPO, 2024).

PATHWAYS FOR MOVEMENT

Trade of agricultural commodities and moth flights (Vickers & Baker, 1997) are the mechanisms for the dispersal of *C. virescens*. The EPPO PRA considered that host plants for planting (except bare-rooted plants, seeds, bulbs, corms, rhizomes, tubers, pollen, tissue cultures) and associated packaging material are the most likely pathways for entry of *C. virescens* in the EPPO region. The likelihood of entry is lower on above-ground fresh cut plant parts of hosts intended to be used fresh (such as leaf vegetables, stem vegetables, flowers) and host fruit, as well as associated packaging materials. Asparagus (as a stem vegetable) was considered to represent a low likelihood of entry, mostly because of difficulties of transfer of the early life stages that may be present on this commodity. In the EPPO region, live eggs and larvae of *Chloridea virescens* have been intercepted on exported commodities from the Americas (asparagus as a stem vegetable, okra (*Abelmoschus esculentus*) fruit and *Physalis* and *P. peruviana* fruit) (EPPO, 2024).

Experiments were conducted using laboratory colonies of *C. virescens* to study the survival of life stages in transportation and storage at different temperatures. Air and ground transportation of eggs, larvae and pupae for about 24 h at 13-24°C had a limited effect on life stages. Under storage at 0°C, all eggs had become unviable after 60 h, while all larvae had died after 48 h. Storage at 3±2°C for 3-6 days had a significant negative effect on egg hatching and larval survival, while nearly all individuals died within 2 days following 9-day storage at 3±2°C (Blanco *et al.*, 2024). Eggs and larvae were able to survive exposure to a few days at 3°C without food, and transportation and storage of *C. virescens*-infested commodities would have a limited effect on the complete development of the pest at least for commodities transported at such temperatures and transport times.

PEST SIGNIFICANCE

Economic impact

From the 1930s to the late 1990s the tobacco budworm and the corn earworm (*Helicoverpa zea*) were the most destructive insect pests of cotton in North America (Blanco, 2012). These species were considered 'one-billion dollars pests in the United States', because of the damage they cause to cotton, tobacco and horticultural crops (Blanco, 2012). With the introduction of genetically engineered cotton cultivars that express proteins from the bacterium *Bacillus thuringiensis* (Bt cotton), the damage to cotton, especially by *C. virescens*, has been substantially reduced.
Cotton, tobacco and chickpea are hosts throughout the distribution range of the pest and are frequently reported as being damaged in the literature. Other hosts are also attacked depending on the location, such as tomatoes, asparagus, and pigeon pea (*Cajanus cajan*) (EPPO, 2024).

Control

Control of *C. virescens* in commercial crops currently relies on integrated pest management (IPM) combining different types of control methods such as the use of transgenic cultivars, cultural control, the use of chemical and microbial plant protection products (such as *Bacillus thuringiensis* and nuclear polyhedrosis viruses) and augmentative and conservative biological control (EPPO, 2024). Genetically engineered cotton (Bt cotton) is believed to be the main tool in IPM programs that have practically eliminated tobacco budworms from this crop. Before the adoption of Bt cotton in the Americas, no less than a dozen insecticide applications per growing season targeted the tobacco budworm (Nava-Camberos *et al.*, 2019). Bt cotton has effectively controlled this pest reducing its damage and environmental impact in the Americas (Blanco *et al.*, 2016; Rocha-Munive *et al.*, 2018). Currently, IPM programmes are implemented and the pest appears to be under control in most crops in some countries where it occurs (such as USA and Mexico). When *C. virescens* recently became a problem in a new crop (e.g. blueberry in Peru or grapevine in Brazil), suitable combinations of control methods had to be developed in the framework of IPM (EPPO, 2024).
It can be expected that *Chloridea virescens* may be susceptible to active ingredients and rates of already approved insecticides for the control of *Helicoverpa armigera*. These two pests utilize the same important plant hosts in the EPPO region, except for maize (*Zea mays*) and wheat (*Triticum aestivum*) that are damaged by the latter and not by the former. However, these two pests have demonstrated resistance to a great range of mode of action of synthetic insecticides (IRAC, 2024). To date, no *Bacillus thuringiensis* resistance has been detected in *C. virescens* in the field.

Phytosanitary risk

Chloridea virescens is more likely to establish in the EPPO region from the Mediterranean area through to the Black Sea coast, Caucasus, south-west Russia and Central Asia, especially in areas where the preferred hosts (including cotton, tobacco, chickpea and tomato) are grown. In these areas, there may be several generations per year. The pest may also establish and cause damage indoors throughout the EPPO region. If introduced into the EPPO region, *C. virescens* is likely to spread with host commodities, through natural spread, or as pupae contaminating machinery and soil.
In the area where the pest can establish outdoors, many hosts are grown including cotton, tobacco, soybean, chickpea, asparagus and tomato. *C. virescens* may have high impact, especially in an initial phase until management measures can be fully developed and implemented. Overall, impact may be higher in countries where the main hosts are cultivated over large areas (such as cotton in Uzbekistan or Türkiye) However, the pest may have an impact on a wide range of hosts (EPPO, 2024). Transgenic Bt crops may prove critical to potential impact in the EPPO region, but such crops are currently not authorized for cultivation in many EPPO countries, for example major cotton producers of the EPPO region. There may also be more impact in organic crops than in conventional agriculture, as fewer control options are available (EPPO, 2024).
In cotton-growing regions of Türkiye and Central Asia, which have a substantial production area, controlling *C. virescens* may increase the use of insecticide currently employed to control similar pests such as *H. armigera*. It is important to realize that the introduction of an exotic pest may temporarily increase the use of insecticides until farmers are more accustomed to its control, the action of biological control organisms stabilize the pest population, and local research yield results and growers get re-educated. A potential introduction of tobacco budworm in the EPPO region may follow a similar path as the recent invasion of the fall armyworm (*Spodoptera frugiperda*) in Africa, Asia, and Europe (Mendesil *et al.*, 2023). Initially a heavy infestation destroying multiple crops, that later diminished due to the competition with other established pests, the action of natural enemies that will eventually lower its population, and better control methods employed by farmers. It is expected that similar tactics for the control of *H. armigera* on cotton, chickpea, and vegetables in the EPPO region could be adapted for *C. virescens*.

The EPPO PRA noted that the area of potential establishment and spread in the EPPO region may increase with climate change as environmental conditions would become more favourable to *C. virescens* (EPPO, 2024).

PHYTOSANITARY MEASURES

The EPPO PRA (EPPO, 2024) recommended phytosanitary measures for host plants for planting (except seeds, bulbs, corms, rhizomes, tubers, pollen, tissue cultures), above-ground fresh cut plant parts of hosts intended to be used fresh, and host fruit. Common options for all pathways were pest free area, as well as pest free place of production/production site established according to EPPO Standard PM 5/8 Guidelines on the phytosanitary measure 'Plants grown under physical isolation' with storage and transport in conditions preventing infestation (EPPO, 2016). In addition, host plants for planting could be traded without soil or growing media attached (or the growing medium has been changed), and without leaves, flowers, buds and fruits, or they could be subject to a post-entry quarantine. For above-ground fresh cut plant parts and fruit, additional options were: an irradiation treatment with a dose of minimum 150 Gy; import for processing or direct consumption at specific time of the year; a systems approach combining no signs of *C. virescens* at the place/site of production during the last 3 months prior to export, treatment(s) of the crop at appropriate time(s) to ensure freedom from *C. virescens*, and inspection prior to export showing absence of the pest.
Some of the phytosanitary measures above also require that the commodities are stored and transported using new or cleaned packaging.

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 2025. 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.
EPPO (2025) Datasheets on pests recommended for regulation. *Chloridea virescens*. *EPPO Bulletin* 55(1), 75-80. https://doi.org/10.1111/epp.13079