California Pest Rating Profile for

Maize chlorotic mottle virus

Pest Rating: B

Realm Riboviria, Kingdom Orthornavirae, Phylum Kitrinoviricota, Class Tolucaviricetes, Order Tolivirales, Family Tombusviridae, Genus Machlomovirus

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Comment Period: 07/16/2026 through 08/30/2026

Initiating Event:

This pathogen has not been through the pest rating process. It is an important pathogen for export seed certification for corn. The risk to California from maize chlorotic mottle virus (MCMV) is described herein, and a permanent rating is proposed.

History & Status:

Background:

Maize chlorotic mottle virus is the common and widely used name for the virus currently classified as *Machlomovirus zeae* in the genus Machlomovirus, family Tombusviridae. Current ICTV-style binomial nomenclature uses *Machlomovirus zeae* for the virus species. MCMV has positive-sense single-stranded RNA and isometric virions, and it has historically been treated as the only member of *Machlomovirus*, although formal species naming has changed under current virus taxonomy, and *M. liegense* has been added (Gordon et al., 1984; ICTV, 2026; EPPO, 2026).

MCMV was first described from maize in Peru in the early 1970s and was later detected in the central United States, where it was associated with corn lethal necrosis in Kansas (Castillo and Hebert, 1974; Niblett and Claflin, 1978; Uyemoto et al., 1980; Uyemoto, 1983; Gordon et al., 1984). Since then, MCMV has been reported from additional maize-growing regions in the Americas, Asia, Africa, and Europe. Its importance has increased because it can cause disease as a single infection and is also the required component of maize lethal necrosis when maize is co-infected with a compatible potyvirus, most commonly sugarcane mosaic virus, maize dwarf mosaic virus, or wheat streak mosaic virus

(Niblett and Claflin, 1978; Uyemoto et al., 1980; Uyemoto et al., 1981; Mahuku et al., 2015; Redinbaugh and Stewart, 2018; Stewart, 2022).

Hosts: The primary economic host of MCMV is corn with natural or field infection. In addition, cultivated or wild hosts, and several grass or sedge species have been detected in field surveys: *Digitaria* (crabgrass), *Eleusine coracana* (finger millet), *Saccharum officinarum* (sugarcane), *Setaria* (Foxtail millet), *Sorghum halepense* (Johnson grass), *Zea diploperennis*, and *Zea mays* (maize) (CABI, 2026; Wang et al., 2014; Kusia et al., 2015; Huang et al., 2016; Achon et al., 2017; and Regassa et al., 2021).

Symptoms: Symptoms of MCMV infection in maize include chlorotic mottling, mosaic, chlorotic streaking, necrotic streaking, leaf necrosis, stunting, poor ear development, malformed ears, and premature plant death. Symptom severity depends on maize genotype, plant age at infection, environment, virus isolate, and whether another virus is present (Uyemoto et al., 1981; Gordon et al., 1984; Nelson et al., 2011; Redinbaugh and Stewart, 2018). In mixed infections that cause maize lethal necrosis, symptoms are generally more severe than in single infections, and early infection can result in systemic necrosis, severe stunting, plant death, and high yield loss (Uyemoto et al., 1981; Mahuku et al., 2015; Redinbaugh and Stewart, 2018; Stewart, 2022).

Transmission: MCMV is transmitted mechanically, by insect vectors, and at low frequency through seed. It has also been associated with survival or movement in crop residues, soil, or water, but those pathways are less precisely quantified than mechanical, vector, and seed pathways (Nault et al., 1978; Bockelman et al., 1982; Jensen, 1985; Jensen et al., 1991; Nelson et al., 2011; Cabanas et al., 2013; Bernardo et al., 2023). Chrysomelid beetles shown to transmit MCMV include several corn rootworm or leaf beetle species, and later Hawaiian work demonstrated transmission by corn thrips, *Frankliniella williamsi,* which is a C-rated pest in California (Nault et al., 1978; Jensen, 1985; Jiang et al., 1992; Cabanas et al., 2013). Regional vector biology is important because the vector complex documented in the central United States is not identical to the vector complex implicated in Hawaii (Nault et al., 1978; Jensen, 1985; Jiang et al., 1992; Cabanas et al., 2013; Nelson et al., 2011).

Seed transmission is sporadic, and this is a major uncertainty for regulatory evaluation. Bockelman et al. (1982) did not detect seed transmission in tested maize and grass materials, while Jensen et al. (1991) reported seed transmission. More recent studies found that MCMV can be detected in maize seed lots and that seed-to-seedling transmission can occur, but at very low frequency (Zhang et al., 2011; Bernardo et al., 2021; Bernardo et al., 2023; Kimani et al., 2023). Bernardo et al. (2023) reported seed-to-seedling transmission at approximately 0.004 percent in a large grow-out study of more than 85,000 seeds and found that the virus was mainly localized in maternal seed tissues such as pericarp and pedicel rather than embryo or endosperm. These results support a cautious interpretation: MCMV is not efficiently seed-transmitted, but seed lots remain a credible long-distance pathway because maize seed is moved over long distances and planted directly into production fields (Jensen et al., 1991; Bernardo et al., 2021; Bernardo et al., 2023; Kimani et al., 2023).

Damage Potential: MCMV can reduce maize yield as a single infection, and losses can be much greater when MCMV occurs with compatible viruses in the maize lethal necrosis disease complex. In single and mixed inoculation studies, disease severity and yield effects depended on virus combination and plant response, with mixed infections producing more severe symptoms than single infections. Regional outbreaks of maize lethal necrosis have been associated with severe crop losses, especially where MCMV overlaps with sugarcane mosaic virus or other compatible viruses. The highest damage potential in California would therefore depend on introduction of MCMV, local vector efficiency, maize genotype, timing of infection, and co-occurrence of compatible viruses (Uyemoto et al., 1981; Mahuku et al., 2015b; Prasanna et al., 2020; Redinbaugh and Stewart, 2018; Stewart, 2022).

Worldwide Distribution: Africa: Republic of Congo, Ethiopia, Kenya, Mozambique, Rwanda, Tanzania, and Uganda. Asia: China, Taiwan, Thailand. Europe: Spain. North America: Mexico, United States (Hawaii, Kansas, Nebraska, Texas). South America: Argentina, Brazil, Ecuador, Peru (CABI, 2026).

Official Control*:* MCMV is on the USDA PCIT's harmful organism list for: China, Colombia, Egypt, El Salvador, Guatemala, Indonesia, Japan, Morocco, New Zealand, Nicaragua, Panama, Syrian Arab Republic, Taiwan, Timor-Leste, and Venezuela (USDA PCIT, 2026). It is on the EPPO's A1 list for Egypt, and a Quarantine pest for China (EPPO, 2026).

California Distribution: none

California Interceptions: none

The risk that maize chlorotic mottle virus would pose to California is evaluated below.

Consequences of Introduction:

1. Climate/Host Interaction:

MCMV occurs in diverse maize production systems, including tropical, subtropical, irrigated, and temperate maize-growing areas (CABI, 2026; Mahuku et al., 2015; Redinbaugh and Stewart, 2018). California has irrigated corn production, including grain corn, silage corn, and sweet corn, and therefore has suitable hosts and production conditions for potential establishment in at least some corn-growing areas (USDA NASS, 2026).

Evaluate if the pest would have suitable hosts and climate to establish in California.
Score: 2

A. Low (1) Not likely to establish in California, or likely to establish in very limited areas.
B. Medium (2) May be able to establish in a larger but limited part of California.
C. High (3) Likely to establish a widespread distribution in California.

2. Known Pest Host Range:

The host range is not limited to a single host, but documented natural or field host records are concentrated primarily in Poaceae, with some Cyperaceae records reported in surveys or compiled host summaries. Maize is the primary economic host (Bockelman et al., 1982; CABI, 2026; Wang et al., 2014; Kusia et al., 2015; Huang et al., 2016; Achon et al., 2017; Regassa et al., 2021).

Evaluate the host range of the pest.

Score: 2

A. Low (1) Has a very limited host range.
B. Medium (2) Has a moderate host range.
C. High (3) Has a wide host range.

3. Pest Reproductive and Dispersal Potential

MCMV replicates systemically in infected plants and can spread through mechanical inoculation, insect vectors, and seed at low frequency. Chrysomelid beetles and corn thrips have been shown to transmit MCMV, though vector importance appears to vary by region. Although seed transmission is rare, maize seed movement is a plausible long-distance pathway because very large numbers of seed are moved commercially (Nault et al., 1978; Jensen, 1985; Jensen et al., 1991; Jiang et al., 1992; Cabanas et al., 2013; Bernardo et al., 2021; Bernardo et al., 2023; Kimani et al., 2023).

Evaluate the natural and artificial dispersal potential of the pest.

Score: 3

A. Low (1) Does not have high reproductive or dispersal potential.
B. Medium (2) Has either high reproductive or dispersal potential.
C. High (3) Has both high reproduction and dispersal potential.

4. Economic Impact

Introduction of MCMV into California could affect silage corn, grain corn, sweet corn, and seed corn (California Department of Food and Agriculture, 2022; USDA NASS, 2026; USDA PCIT, 2026). MCMV can reduce maize yield as a single infection but can cause much greater losses as part of maize lethal necrosis when present with compatible viruses (Uyemoto et al., 1981; Mahuku et al., 2015; Prasanna et al., 2020; Redinbaugh and Stewart, 2018; Stewart, 2022). Because MCMV is included on harmful organism or quarantine pest lists for multiple trading partners, its detection could affect phytosanitary certification or market access for corn seed or other regulated maize commodities (USDA PCIT, 2026; EPPO, 2026). MCMV is also vectored by insect pests, including chrysomelid beetles and corn thrips (Nault et al., 1978; Jensen, 1985; Jiang et al., 1992; Cabanas et al., 2013).

Evaluate the economic impact of the pest on California using the criteria below.

Economic Impact: A, B, C, E

A. The pest could lower crop yield.
B. The pest could lower crop value, including increasing crop production costs.
C. The pest could trigger the loss of markets, including quarantines.
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: 3

Low (1) Causes 0 or 1 of these impacts.
Medium (2) Causes 2 of these impacts.
High (3) Causes 3 or more of these impacts.

5. Environmental Impact:

The direct environmental impact of MCMV in natural California plant communities is uncertain. MCMV host records are concentrated in grasses and sedges, and field reports from non-maize hosts show that the virus can occur outside maize in some production landscapes (Wang et al., 2014; Huang et al., 2016; Achon et al., 2017; Regassa et al., 2021). However, there is not enough evidence to conclude that MCMV would cause major direct damage to California native plant communities or threatened and endangered plants.

Environmental impacts could occur indirectly if detection of MCMV led to increased official or private treatment programs for insect vectors, increased weed or grass host management, sanitation measures, volunteer maize control, or changes in corn production practices. Some of these programs could involve the use of insecticides or herbicides. These impacts are most likely to occur in agricultural or seed production settings rather than in unmanaged natural ecosystems (Nault et al., 1978; Jensen, 1985; Cabanas et al., 2013; Mahuku et al., 2015; Prasanna et al., 2020; Redinbaugh and Stewart, 2018).

Evaluate the environmental impact of the pest on California using the criteria below.

Environmental Impact: D, E

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening, or ornamental plantings.

Environmental Impact Score: 3

Low (1) Causes none of the above to occur.
Medium (2) Causes one of the above to occur.
High (3) Causes two or more of the above to occur.

Consequences of Introduction to California for Maize chlorotic mottle virus*:* high

Add up the total score and include it here. **13**
-Low = 5-8 points
-Medium = 9-12 points
-**High = 13-15 points**

6) Post-Entry Distribution and Survey Information: Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication or have been delimited with no further detections should not be included.

Evaluation is 'not established'.

Score: 0

-Not established (0) Pest never detected in California or known only from incursions.
-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7)The final score is the consequence of the introduction score minus the post-entry distribution and survey information score: 13

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 13***

Uncertainty:

The severity of disease in California is uncertain because it would depend on local vectors, crop phenology, maize genotype, irrigation practices, seed pathways, presence of volunteer maize or alternate grass hosts, and co-occurrence of compatible potyviruses. MCMV alone can cause yield loss, but the highest damage potential depends on the maize lethal necrosis disease complex.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for **Maize chlorotic mottle virus is B.**

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***Comment Period: 07/16/2026 through 08/30/2026**

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*NOTE:

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at permits[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

  Example Comment:

  Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.
- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Pest Rating: B