

California Pest Rating Proposal for
***Diaporthe helianthi* Munt.-Cvetk., Mihaljc. & M. Petrov 1981**
(syn. *Phomopsis helianthi* Munt.-Cvetk., Mihaljc. & M. Petrov 1981)

Current Pest Rating: none

Proposed Pest Rating: B

Comment Period: 12/30/2019 through 2/13/2020

Initiating Event:

None

History & Status:

Background:

Phomopsis stem canker on sunflowers (*Helianthus annuus*) was first described in the former Yugoslavia in Eastern Europe in the late 1970s (Muntanola-Cvetkovic et al., 1980). Originally, all cases were believed to be caused by *Diaporthe helianthi*. The rapid appearance of this disease in different countries in Europe did not follow any obvious pattern of geographical spread, and it was assumed to be moving with infected or infested seeds. The disease was first recorded in North Dakota and Minnesota in 1984 (Hajdu et al., 1984). The native distribution of this fungus is not known. Because it was first observed in Europe, it is thought that outbreaks in North America, Asia and South America must be secondary to epidemics in Europe (Mathew et al., 2015). Information is limited regarding seed borne infection as the definitive source of inoculum for new outbreaks, however Masirevic and Gulya (1992) and Gulya et al. (1997) suggest this is possible. Today, *Phomopsis* stem canker is responsible for significant limitations in yield of sunflower worldwide (Harveson et al. 2016).

Sunflower diseases are rare in California seed production fields compared to the oil producing areas of great northern plains. Hybrid planting seed is almost exclusively produced in California (95% in seven CA counties). The climate during the growing season is not conducive to this pathogen due to the lack

of summer rains, and fields are maintained with furrow rather than sprinkler irrigation which keeps the plants dry (Frincik et al., 2003). California-produced seed regularly meets all phytosanitary restrictions imposed by other countries, and seed is typically treated with fungicide prior to export (Guyla et al., 2012).

Advances in molecular analysis have indicated a diversity of *Diaporthe* spp. capable of causing *Phomopsis* stem canker on sunflowers (Thompson et al., 2011; Dissanayake et al., 2017). Three *Diaporthe* spp., *D. gulyae*, *D. kongii*, and *D. kochmanii*, were responsible for disease outbreaks in Australia in 2009 (Thompson et al., 2011), while *D. helianthi* has not been found there. In the Great Plains, *D. helianthi* and *D. guylae* co-occur (Mathew et al., 2015a). To date, there are now 5 pathogenic species of *Diaporthe* on sunflower (Thompson et al., 2018).

Hosts: Sunflower (*Helianthus annuus*), grapevine (*Vitis vinifera*), greater burdock (*Arctium lappa*), European ash (*Fraxinus excelsior*), crepe-myrtle (*Lagerstroemia indica*), cocklebur (*Xanthium italicum* = *Xanthium strumarium*) (Farr and Rossman, 2019).

Symptoms: Infection of leaves, stems, petioles and stipules initiates via spore germination on green tissue. The fungal mycelium quickly spreads to the main stem through the petiole. Light-to-dark brown necrotic lesions begin at the leaf node and can grow up to 15 cm in length and become darker in color. The necrotic lesions can girdle the stem. The pith beneath the stem lesion becomes hollow, the stem loses its strength, and the plant falls over (lodges). This inhibits development of the flower and the seeds, causing a complete loss of yield from that plant. Even if the stem is not completely girdled, the plants with stem lesions can go into early senescence and seed production will be reduced (Vukojevic et al., 2001; Mathew et al., 2015a).

Transmission: Asexual fructifications called pycnidia (the *Phomopsis* state) can be found on the stem cankers by midsummer. The pycnidia may contain only β -conidia, which are usually sterile and non-infective, or α -conidia, which usually are infective, or both. Production of the sexual reproductive spores in the perithecia (the *Diaporthe* state) occurs slowly and unevenly during the autumn and early winter. The fungus overwinters in infected sunflower debris left in the fields after harvest. Under wet conditions in the spring, the perithecia elongates and ascospores, capable of infecting healthy sunflowers, are released (Vukojevic et al., 2001).

Damage Potential: *Diaporthe helianthi* requires free water for spores to germinate and infect sunflower leaves. Generally, California growing conditions are dry with minimal summer precipitation and sprinkler irrigation is not used. In addition, the pathogen has a maximum temperature of 26°C for growth (Vukojevic et al., 2001), and in many California growing areas, summer temperatures regularly exceed this threshold.

Stem canker has been one of the primary limiting factors for sunflower production in Europe, where yield losses up to 50% and losses in oil content in excess of 10% have occurred (Masirevic and Gulya, 1992). In past decades, yield and oil losses due to *Phomopsis* stem canker in the United States have been minimal (Kandel 2012). However, in 2010, a *Phomopsis* stem canker epidemic occurred on

sunflowers in the Northern Great Plains, with incidence of 50% of the crop affected and a 40% loss in the crops (Kandel 2012).

Worldwide Distribution: Asia: *Pakistan*; Europe: *Bulgaria, Croatia, France, Hungary, Italy, Moldova, Romania, Russian Federation, Serbia, Slovakia, Spain, Ukraine*; Africa: *Morocco*; South America: *Argentina, Venezuela*; North America: *United States* (Illinois, Minnesota, North Dakota, Ohio, South Dakota, Texas), *Mexico, Canada* (Farr and Rossman, 2019; Mathew et al., 2015b; CABI-CPC, 2019).

Official Control: The following countries list *Diaporthe helianthi* on their Harmful Organism lists: Azerbaijan, Chile, China, Egypt, Eurasian Customs Union, French Polynesia, Georgia, Israel, Moldova, Morocco, Nicaragua, Oman, Panama, Tajikistan, Turkmenistan, Ukraine, United Arab Emirates, Uzbekistan (USDA-PeDX, 2019).

California Distribution: None

California Interceptions: None

The risk *Diaporthe helianthi* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:**

This pathogen is widely established across a variety of temperate areas worldwide. In the Great Plains region, summers have more precipitation and humidity, with lower temperatures. Growing regions in California are generally dryer and hotter.

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

Score: 2

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- **Medium (2) may be able to establish in a larger but limited part of California.**
- High (3) likely to establish a widespread distribution in California.

2) **Known Pest Host Range:** The main host is sunflower, but grapevines are also a reported host along with some ornamental trees and several weedy species in the genus *Xanthium*.

Evaluate the host range of the pest.

Score: 2

- Low (1) has a very limited host range.
 - **Medium (2) has a moderate host range.**
 - High (3) has a wide host range.
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- 3) Pest Reproductive Potential:** Generally only the ascospores are infective and they are only produced from overwintering perithecia. In some studies, α - conidia are also capable of causing new infections but these conidia are not always produced. Spores are spread by wind and wind blown rain.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 2

- Low (1) does not have high reproductive or dispersal potential.
- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

- 4) Economic Impact:** Losses are variable and range from less than 1% to 50% depending on the area and the year. In general, epidemics are increasing on the Northern Great Plains. *Diaporthe* is a quarantine pest of sunflower for many countries

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

Economic Impact: A, B, C,

- A. The pest could lower crop yield.**
- B. The pest could lower crop value (includes increasing crop production costs).**
- C. The pest could trigger the loss of markets (includes 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:** Sunflower (*Helianthus annuus*) is native to California and distributed statewide. Other native sunflowers include Bolander's sunflower (*H. bolanderi*), California sunflower (*H. californicus*), Cusick's sunflower, (*H. cusickii*), serpentine sunflower, (*H. exilis*), slender sunflower (*H. gracilentus*), Newhall sunflower (*H. inexpectatus*), desert sunflower (*H. niveus*), Algodones dunes sunflower (*H. niveus* ssp. *tephrodes*), Nuttall's sunflower (*H. nuttallii*), gray desert sunflower (*H. petiolaris* ssp. *canescens*), and Winter's sunflower (*H. winteri*) (Calflora, 2019). Many of these are classified as rare and their host status for this pathogen is unknown.

Environmental Impact: A, D.

- A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.**
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- 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 *Diaporthe helianthi* is Medium: 12

Add up the total score and include it here.

-Low = 5-8 points

-Medium = 9-12 points

-High = 13-15 points

- 6) Post Entry Distribution and Survey Information:** Sunflowers growing for export seed have been surveyed annually statewide with negative results. A recent single detection of a *Diaporthe* spp. (not *D. helianthi*) was made in Solano County and this field is going to be subject to abatement and a host free period.

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 consequences of introduction score minus the post entry distribution and survey information score:**

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 12*

Uncertainty:

With the discovery of new species of *Diaporthe* that cause similar Phomopsis-type symptoms on sunflowers, the influence of each on past epidemics is now unknown. Although no effect on wild

Helianthus spp. has been documented in other parts of North America, the effect on California species is unknown. The degree to which this *Diaporthe* species or any other can cause disease in California or can be transmitted with sunflower seeds is also uncertain.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Diaporthe helianthi* is B.**

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Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, California Department of Food and Agriculture, 204 West Oak Ave, Lompoc, CA. Phone: 805-736-8050, permits [@]cdfa.ca.gov.

***Comment Period: 12/30/2019 through 2/13/2020**

***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 \[a\]cdfa.ca.gov](mailto: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.
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Proposed Pest Rating: B
