California Pest Rating Proposal for

Fusarium concentricum Nirenberg & O'Donnell 1998

Current Pest Rating: Q

Proposed Pest Rating: B

Domain: Eukaryota, Kingdom: Fungi,
Phylum: Ascomycota, Subphylum: Pezizomycotina
Class: Sordariomycetes, Subclass: Hypocreomycetidae
Order: Hypocreales, Family: Nectriaceae

Comment Period: 02/21/2023 through 04/07/2023

Initiating Event:

In April 2016, San Luis Obispo County agricultural inspectors collected unthrifty *Dracaena* plants from an incoming nursery shipment from Florida. The plants showed symptoms of stem dieback. CDFA plant pathologist Suzanne Rooney-Latham identified *Fusarium concentricum* by culturing from roots and stems and she assigned it a temporary Q rating. In December 2022, a block of *Dracaena* plants was sampled by San Luis Obispo County, this time as part of a regulatory inspection of California nursery stock. An identification of *F. concentricum* was made by CDFA plant pathologist Wei Belisle. This pathogen has not been through the current pest rating process. The risk to California from *Fusarium concentricum* is described herein and a permanent rating is proposed.

History & Status:

Background:

Fusarium is a genus of filamentous fungi that are important to both phytopathologists and clinical microbiologists due to its abundance in species, heterogeneity, and ubiquity. The sexual morphs of *Fusarium*, if they occur, are often in the genus *Gibberella*. The fusarioid taxa are adapted to a wide range of climatic zones and inhabit a variety of environments and hosts, as pathogens and saprophytes. The genus is thought to have around 400 phylogenetically different species, 23 monophyletic species complexes, and several additional monotypic lineages (Crous et al., 2022).

It has always been difficult to discriminate closely related *Fusarium* species through macro-or microscopic characteristics due to the high interspecific and intraspecific morphological variability.

Historical species with broad host ranges are being re-described as species complexes. One large complex is *F. fujikuroi* sensu lato (*G. fujikuroi*). Modern methods use a polyphasic approach to the taxonomy, which combines morphology-based identification and genealogical concordance among portions of multiple phylogenetically informative genes. Several new species have been further delineated within the *F. fujikuroi* complex, including *F. concentricum*. Neirenberg and O'Donnell described it in 1998 from *Musa sapientum* (banana) and *Nilaparvata lugens* (Asian brown leaf hopper). These new techniques have led to a major improvement in the fusarioid fungi taxonomy and nomenclature (Crous et al., 2021).

Hosts: Capsicum annuum (pepper), *Citrus reticulata* (tangerine), *Dendrobium officinale*, *Hibiscus sabdariffa* (roselle), *Lilium longiflorum* (Easter lily), *Musa sapientum* (banana), *Musa* sp., *Oryza sativa* (rice), *Paris polyphylla* var. *chinensis* (love apple), *Podocarpus macrophyllus* (Japanese yew), *Sansevieria trifasciata* (mother-in-law's tongue), *Triticum aestivum* (wheat), *Vanilla planifolia* (flat-leaved vanilla), *V. tahitensis* (vanilla), and *Zea mays* (corn).

Symptoms: *Paris polyphylla* var. *chinensis* infected with *F. concentricum* showed stem rot symptoms. Plants developed stem cracking, shriveling, yellowing, stunting, and finally wilting (Xiao et al., 2019). Symptoms of fruit blotch and fruit rot on roselle (*Hibiscus sabdariffa*) and pepper (*Capsicum annuum)* have been described (Huda-Shakirah, et al., 2021; Wang et al., 2013). Tangerines (*Citrus reticulata*) can develop post-harvest rot from *F. concentricum* and suffer losses after weeks in storage (Xiao et al., 2022).

Shoot blight was observed on *Podocarpus macrophyllus*, which resulted in rapid and synchronized death of leaves on individual branches. Eventually the whole plant wilted. Leaves and stems turned dark blue to brown (Qin et al., 2022). Dieback has also been reported on *Dendrobium*. The symptoms appeared as chlorotic, blighted, and wilted leaves of the apical meristem with the shoot tip showing dark brown necrosis, dieback, and eventually shoot death (Mirghasempour et al., 2022).

Transmission: Fusarium can be transmitted through spores (micro and macro conidia and chlamydospores), which can be spread by wind or water. Another way is through infected plant material, such as seeds or cuttings. *Fusarium* can be transmitted through contaminated soil or other growing mediums, through equipment, tools, or hands that have come into contact with infected plants. It is also known that some insects can transmit the fungus, especially in greenhouses.

Damage Potential: For *Paris polyphylla* var. *chinensis* in the field, approximately 10 to 15% of plants surveyed by Xiao et al. (2019), showed stem rot symptoms. For peppers, fruit rot symptom incidence ranged from 5 to 20% in individual fields (Wang et al., 2013). *Podocarpus macrophyllus* stands had approximately 15% of plants with symptoms of this disease. For *Dendrobium officinale*, high temperature, high humidity, and poor ventilation accelerated the incidence of this disease, which was 40 to 60% based on the number of plants observed with dieback disease symptoms (Mirghasempour et al., 2022).

Worldwide Distribution: China, Costa Rica, French Polynesia, Guatemala, Japan, Korea, Madagascar, Malaysia, and United States (New Jersey) (Farr and Rossman, 2023; Rajmohan et al., 2011).

Official Control: With a temporary Q rating, both incoming shipments were and subject to authorized official control actions including refused entry, holding for inspection, return to the owner, quarantine, treatment, or destruction. It is not a regulated or quarantine pest in other countries (USDA PCIT, 2023; EPPO, 2023).

California Distribution: none

California Interceptions: none

The risk *Fusarium concentricum* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Fusarium concentricum* is most often found in tropical or subtropical climates, conditions that are often replicated inside protected structures such as greenhouses

   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 host range includes plants in multiple families

   Evaluate the host range of the pest.

   Score: 3
   - Low (1) has a very limited host range.
   - Medium (2) has a moderate host range.
   - High (3) has a wide host range.

3) **Pest Reproductive Potential:** *Fusarium concentricum* produces both macro and micro conidia that could be airborne, however chlamydospores that persist in the soil have not been observed.

   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:** Under favorable environmental conditions, significant losses from stem rot or fruit rot have been reported.

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

Economic Impact: A

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: 1

- 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:** This disease is problematic in greenhouses where humidity and temperatures are higher.

Evaluate the environmental impact of the pest to California using the criteria below

Environmental Impact: 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: 2

- 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 *Fusarium concentricum:* Medium

Add up the total score and include it here. 10
-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 consequences of introduction score minus the post entry distribution and survey information score: (Score)

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 10***

Uncertainty:

This species has recently been separated out of the *F. fujikuroi* complex. More hosts are likely to be identified in the future.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Fusarium concentricum* is B.

References:

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Responsible Party:

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***Comment Period: 02/21/2023 through 04/07/2023**

***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.

Proposed Pest Rating: B
