

## California Pest Rating Proposal for *Bipolaris cynodontis* (Marignoni) Shoemaker 1959

**Current Pest Rating: C/Q**

**Proposed Pest Rating: C**

Kingdom: Fungi, Phylum: Ascomycota,  
Subphylum: Pezizomycotina, Class: Dothideomycetes,  
Subclass: Pleosporomycetidae, Order: Pleosporales,  
Family: Pleosporaceae

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**Comment Period: 04/12/2023 through 05/27/2023**

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### Initiating Event:

In October 2004, a fungus isolated from declining hybrid Bermuda grass (*Cynodon dactylon*) from a lawn bowling park in Santa Barbara was submitted as an official sample by a County Plant Pathologist to CDFA's Plant Pest Diagnostics Center. CDFA Plant Pathologist Timothy Tidwell confirmed that the fungus was *Bipolaris cynodontis* and assigned an unofficial C-rating. In 2022, inspectors in San Luis Obispo submitted symptomatic *Calathea* plants with leaf spots as part of the regulatory nursery cleanliness program. *Bipolaris* was isolated from the leaf spots by Plant Pathologists Suzanne Rooney-Latham and Wei Belisle, and genetic sequencing showed they were a match to, or cf., *B. cynodontis*, which was given a temporary Q rating. An additional detection was made on *Calathea* plants that were part of an incoming shipment from Florida by San Diego County agricultural inspectors in 2022.

### History & Status:

#### Background:

The genus *Bipolaris* belongs to Ascomycota. Its sexual morph, when it is produced, is in the genus *Cochliobolus*. The anamorph genus *Bipolaris* includes several significant plant pathogens that cause disease on high value field crops in the family Poaceae and are distributed worldwide. *Bipolaris* infections cause leaf spots, leaf blights, melting outs, root rots, and foot rots. Historically, species recognition in the genus was uncertain due to the lack of molecular data from ex-type cultures as well as overlapping morphological characteristics. *Bipolaris* species were formerly described as *Helminthosporium*. In several taxonomic refinements, the *Helminthosporium* species were segregated into four genera: *Bipolaris*, *Curvularia*, *Drechslera*, and *Exserohilum*. These genera were

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morphologically similar and known as helminthosporioid fungi. A revision of the genus *Bipolaris* was done by Manamgoda et al. (2014). They established a phylogenetic species concept for *Bipolaris* providing DNA sequence data for ex-type isolates including epitypes or neotypes and provided modern descriptions and illustrations of species for the genus.

Devastating diseases caused by *Bipolaris* spp. on staple crops such as rice, corn, sorghum, and wheat have been implicated in historical famines in several regions in the world. For example, the Bengal famine in India (1943–1944) was partially the result of a rice disease caused by *Bipolaris oryzae* and the famine led to the deaths of an estimated two million people. Southern corn leaf blight caused by *Bipolaris maydis* in the 1970s resulted in catastrophic losses in maize crops in the USA and UK (Agrios, 2005). *Bipolaris sorokiniana* appears as spots on seedlings, plant crowns, stems, leaves, floral parts, and kernels, causing crown rot and root rot, reducing wheat yields by 30% and barley yields by 60% (Bockus et al., 2010). *Bipolaris* leaf spot caused by *B. cynodontis* is of major importance to some grasses; this species infects during cool wet weather and may cause extensive damage when it attacks crowns, stolons, or rhizomes.

**Hosts:** Main hosts are grasses: *Cynodon dactylon*, *Echinochloa crus-galli*, *Eragrostis pectinacea*, *Miscanthus sinensis*, *Muhlenbergia mexicana*, *Panicum philadelphicum*, and *Zea mays*.

Other hosts include: **Poaceae:** *Arthraxon affinis*, *A. hispidus*, *Axonopus affinis*, *Brachiaria brizantha*, *B. platyphylla*, *Cynodon bradleyi*, *C. plectostachyus*, *C. transvaalensis*, *Cynosurus cristatus*, *Dactylis glomerata*, *Dactyloctenium aegyptium*, *Echinochloa crus-galli*, *Eleusine indica*, *Elymus riparius*, *Eragrostis pectinacea*, *Festuca* sp., *Hordeum* sp., *Hordeum vulgare*, *Heteropogon contortus*, *Leptochloa fascicularis*, *Lolium multiflorum*, *L. × multiflorum-perenne*, *Microstegium vimineum*, *Muhlenbergia schreberi*, *M. sylvatica*, *M. tenuiflora*, *Oryza sativa*, *Panicum maximum*, *Paspalum conjugatum*, *Pennisetum clandestinum*, *P. purpureum*, *P. typhoides*, *Phyllostachys* sp., *Saccharum officinarum*, *Secale cereale*, *Setaria geniculata*, *S. glauca*, *S. pumila*, *Sorghum arundinaceum*, *S. halepense*, and *Triticum* sp. **Non-Poaceae:** *Caladium* spp., *Cardiospermum corindum*, *Eucalyptus* sp., *Ligustrum lucidum*, *Pinus caribaea*, *Rosa* sp., and *Senecio mesogrammoides* (CDFA database, 2023; Farr and Rossman, 2023).

**Symptoms:** Brecht et al. (2007) evaluated the pathogenicity of *Bipolaris cynodontis* specifically on Bermuda grass. They showed it can cause considerable leaf spotting on both juvenile and mature grass leaves. Leaf lesions formed quickly, usually within 24 h. Mycelia were observed macroscopically emerging from the cut leaf tip 48 h after inoculation with all the fungi tested, and conidia of *B. cynodontis* quickly germinated and produced leaf lesions within 24 to 48 h of inoculation by forming appressoria, usually over stomata; necrosis occurred in the immediate surrounding cells, resulting in small dark brown lesions that did not continue to expand.

This fast-acting lesion formation may be due to a phytotoxic reaction caused by bipolaroxin, a toxin secreted by some isolates of *B. cynodontis* (Sugawara et al., 1985). This toxin has been proposed as a potential control for Bermuda grass in situations where it is a weed.

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**Transmission:** *Bipolaris cynodontis* produces asexual conidia that can be moved by wind and rain splash and can be transmitted by seed.

**Damage Potential:** *Bipolaris* leaf spot caused by *B. cynodontis* is an important disease in many areas on Bermuda grass and other turf grasses, causes significant leaf blighting in cool wet weather, and may cause extensive damage to crowns, roots, and stolons (Smiley et al., 2005). *Calathea* spp. are grown for their ornamental foliage and when infected by *Bipolaris* spp., they develop brown leaf spots, which decrease their aesthetic value (Chase, 1987).

**Worldwide Distribution:** Argentina, Australia, Bangladesh, Brazil, Brunei, Darussalam, Ghana, Guinea, Hungary, India, Italy, Kenya, Malaysia, Myanmar, New Guinea, New Zealand, Nicaragua, Pakistan, Papua New Guinea, South Africa, Tanzania, Thailand, Turkey, United States (California, Florida, Mississippi), Venezuela, Zambia, Zimbabwe (Farr and Rossman, 2023).

**Official Control:** *Bipolaris cynodontis* is on the USDA PCIT's harmful organisms list for the Republic of Korea (PCIT, 2023).

**California Distribution:** In Santa Barbara County on outdoor Bermuda grass sport fields, and in San Luis Obispo, two detections on greenhouse nursery stock (see 'initiating events').

**California Interceptions:** There has been one interception on high risk *Calathea* nursery stock from Florida.

The risk *Bipolaris cynodontis* would pose to California is evaluated below.

## Consequences of Introduction:

- 1) **Climate/Host Interaction:** Disease caused by *B. cynodontis* is favored by cool, wet conditions that are found along the coast, and in protected culture 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 is large, including plants from 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.
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- **High (3) has a wide host range.**

- 3) Pest Reproductive Potential:** This pathogen spreads with airborne spores and can be seed borne. It can be moved with infected nursery stock.

Evaluate the natural and artificial dispersal potential of the pest.

**Score: 3**

- 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:** There is documented damage to Bermuda grass sport fields, and to *Calathea* grown as foliage plants.

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

**Economic Impact: A, B**

- 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: 2**

- 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 pathogen could be difficult to control in ornamental plantings and in production greenhouses.

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.**
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**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 *Bipolaris cynodontis*: Medium**

Add up the total score and include it here. **12**

-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 'low'.***

**Score: -1**

-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 = 11*

**Uncertainty:**

This pathogen was given an unofficial C rating in 2004 and has not been under official control in California, so the distribution may be wider than is currently known.

**Conclusion and Rating Justification:**

Based on the evidence provided above the proposed rating for *Bipolaris cynodontis* is C.

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## References:

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- Sugawara, F., Strobel, G., Fisher, L.E., Van Duyne, G.D. and Clardy, J., 1985. Bipolaroxin, a selective phytotoxin produced by *Bipolaris cynodontis*. Proceedings of the National Academy of Sciences, 82(24), pp.8291-8294.
- USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Bipolaris cynodontis*. Accessed 3/10/2023.

## Responsible Party:

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**\*Comment Period: 04/12/2023 through 05/27/2023**

## **\*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](mailto:permits[@]cdfa.ca.gov).

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## Comment Format:

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- ❖ 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: C**

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