CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Ceratobasidium cereale D. Murray & L.L. Burpee 1984

Yellow patch of turfgrass/sharp eye spot of cereals

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Fungi; Phylum: Basidiomycota

Class: Agaricomycetes; Subclass: Agaricomycetidae

Order: Ceratobasidiales; Family: Ceratobasidiaceae

Comment Period: 3/24/2020 through 5/8/2020

Initiating Event:

On 1/29/2020, a regulatory sample for nursery cleanliness from a commercial sod farm was submitted by an agricultural inspector in San Joaquin County to the CDFA plant diagnostics center. The turf was grown from a 90% tall dwarf fescue and 10% bluegrass seed mix. On February 10, 2020, CDFA plant pathologist Suzanne Rooney-Latham detected *Ceratobasidium cereale* (syn. *Rhizoctonia cerealis*) in culture from yellow leaf blades. This fungus causes yellow patch disease on turfgrass. Due to previous reports of this pathogen from University of California farm advisors, it was assigned a temporary Z rating. The risk to California from *Ceratobasidium cereale* is assessed herein and a permanent rating is proposed.

History & Status:

Background:

The name *Ceratobasidium cereale* was proposed by Murray and Burpee in 1984 after they were able to induce otherwise sterile isolates that had been classified as *Corticium gramineum* or *Rhizoctonia cerealis* to form the basidia (sexual state) on agar. Their work resulted in the name *Corticium gramineum* being reduced to a nomen dubium (doubtful name). However, because the production of basidia has not been observed under field conditions, many still use the name *Rhizoctonia cerealis* to

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describe a pathogen that does not produce spores and is composed only of sterile hyphae and sclerotia. The name *Rhizoctonia* means “root killer” and in its current sense, this genus is restricted to the type species of *R. solani* and its synonyms. Although used in literature*, R. cerealis* is not a validly published name (Index Fungorum, 2020).

Turf disease caused by *C. cereale* has not been diagnosed very often in California and is sometimes confused with another disease with similar symptoms, brown ring patch, caused by *Waitea circinata* var. *circinata* (de la Cerda et al., 2007; F. Wong, *pers. comm.*). Whereas *C. cereale* is a cool weather pathogen with maximum symptom expression between 5 to 18^{o}C, *W. circinata* var. *circinata* is a warmer weather pathogen with maximum symptoms between 15 and 35^{o}C.

Hosts: Avena sativa (oats), *Hordeum vulgare* (barley), *Oryza sativa* (rice), *Secale cereal* (rye), *Triticum aestivum* (wheat), turfgrasses specifically annual bluegrass, Kentucky bluegrass, bermudagrass, perennial ryegrass, zoysiagrass, and bentgrass (Downer and Harivandi, 2009; CABI-CPC, 2020).

Symptoms: Yellow spot of turfgrass is typically only a cosmetically damaging disease and it rarely causes severe turf damage or death of grass plants. Symptoms include the development of yellow or tan-colored rings or patches in the turf, which may not be acceptable for golf courses or sports fields. On the individual leaves, there is a yellow to tan chlorosis that extends down from the leaf tips. Dark-bordered, gray-tan lesions may develop on lower leaf portions on stem bases. Some leaves may turn reddish or reddish purple. Periods of extended cool, wet weather favors disease development and affected leaves may become necrotic. On creeping bentgrass and annual bluegrass putting greens, individual patches may coalesce to form large, irregularly shaped yellow areas. The symptoms on cereals are like those on turfgrass and can occur on young or mature plants. Affected plants may appear as large patches and can lodge over. Sclerotia may be formed between the lower leaf sheath and stem or within the stem lumen of severely infected shoots. The fungus may cause pre- and post-emergence damping off and shoot death of seedlings (Wiese 1987; Downer and Harivandi, 2009; Lemańczyk and Kwaśna, 2013).

Transmission: Ceratobasidium cereale is a soil-borne pathogen. It can move with infested soil and from sod farms to new sod plantings. It is not seed-borne but the sclerotia could potentially contaminate seed lots. When weather conditions are not favorable for disease development, it can survive as dormant sclerotia in the thatch and soil or as quiescent mycelia in plants and debris. Under favorable conditions, mycelium from infected plant debris or from germinating sclerotia serves as primary inoculum. The fungus does not form any asexual spores and the sexual stage is rare in nature. Infection of plant roots can occur at any time during the growing season (Lemańczyk and Kwaśna, 2013).

Damage Potential: On turfgrass, the disease can develop when air temperatures are from 50° to 65°F and there is high humidity or extended periods of leaf wetness. In many cases, the turf will recover when temperatures go above or below this range. Low incidence of sharp eyespot tends to have little effect on yield of small grains and historically and worldwide, the reports of losses in cereals has been consistently low. (Clarkson and Cook, 1983; Cromey et al., 2002). The disease is favoured by neutral to slightly acid, dry, sandy soils (Pitt, 1964). Cool autumn or spring may result in earlier infection and more severe attacks. Disease incidence tends to be greater in continuously cropped cereals and practices

that help reduce the effects of the disease include crop rotation and late sowing in autumn. Severe infection of mature shoots may result in small, shriveled grain and can induce lodging at the second or third internode and cause premature spike senescence or ripening (white heads). More recently in Oregon, this disease on wheat stems has increased and caused severe and extensive epidemics (Liu and Mundt, 2019).

Worldwide Distribution: Austria, Australia, Bermuda, Belgium, Canada (British Columbia), Chile, China, Egypt, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, Poland, , Russia, South Africa, Sweden, Switzerland, United Kingdom, and United States (California, North Carolina, Ohio, Oregon, Pennsylvania, Washington) (Farr and Rossman, 2020; CABI-CPC, 2020).

Official Control: *Ceratobasidium cereale* is on the EPPO A1 list for Brazil (EPPO, 2020) and on the USDA PCIT harmful organisms list for Brazil and India (USDA-PExD, 2020).

California Distribution: One detection at a sod farm in San Joaquin County.

California Interceptions: none

The risk *Ceratobasidium cereale* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Maximum growth of this pathogen is when temperatures are cool and the leaves are kept wet from rain, fog, or irrigation for extended periods of time. These conditions might only occur in the winter, near the coast, or in a nursery situation.

   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 multiple types of grasses and small grains.

   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.

3) **Pest Reproductive Potential:** This pathogen does not usually produce any spores but it does produce sclerotia which are resistant survival structures that can spread with soil and infected plants.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 1

- 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:** Although mainly a cosmetic problem on turfgrasses, there are situations such as putting greens that are intolerant of damage from this pathogen. Historically it has only caused a low level of damage to cereal crops but recently there have been more serious epidemics in Oregon.

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:** It is possible that *C. cereale* could infect California native grasses but there are no reports in literature.

Environmental Impact:

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: 1

- 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 *Ceratobasidium cereale* is Low

Add up the total score and include it here. **8**
-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 'medium'. There is one official sample from a sod farm in San Joaquin but UC publications expand its known distribution in California.

   Score: -1 (score followed by bolded bullet)
   -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* ***= 7***

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Ceratobasidium cereale* is C.**

References:

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Responsible Party:

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***Comment Period: 3/24/2020 through 5/8/2020**

***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[@]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: C