CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Botrytis porri N.F. Buchw. 1949
≡ *Botryotinia porri* (H.J.F. Beyma) Whetzel 1947

garlic neck rot

Current Pest Rating: Z

Proposed Pest Rating: C

Domain: Eukaryota, Kingdom: Fungi,
Phylum: Ascomycota, Subphylum: Pezizomycotina,
Class: Leotiomycetes, Subclass: Leotiomycetidae,
Order: Helotiales, Family: Sclerotiniaceae

Comment Period: 08/26/2022 through 10/10/2022

Initiating Event:

This pathogen has not been through the current pest rating process. The risk to California from *Botrytis porri* is described herein and a permanent rating is proposed.

History & Status:

Background: California is the nation's top producer of garlic, accounting for nearly 100% of domestic production. Garlic crops are produced on 24,000 acres with a farm value in 2021 of $260M. Although the city of Gilroy in Santa Clara County is known as the garlic capital of the world, most of the commercial garlic production is in the western San Joaquin Valley, which includes the counties of Fresno and Kern and represents 96.5% of the total state garlic acres. Fresno County has most of these acres. Some garlic is grown in the southeastern desert counties of Riverside and San Bernadino. California garlic growers obtain most of their seed from growers in Nevada and Oregon, although there is a limited acreage of seed garlic in northern and eastern California (National IPM Database, CDFA Crop Statistics, CDFA Nursery Services).

Botrytis is a genus of anamorphic fungi. Although it mostly reproduces asexually, occasionally the telemorph is found and it belongs in the genus *Botryotinia*. To date, well over 30 species have been identified and placed in the genus *Botrytis*. Most of the species have been shown to only infect a few

hosts with some only affecting very specific hosts. The exception is *B. cinerea*, which has been shown to affect well over 200 plant hosts ranging from monocots and dicots to macro algae. When it attacks thin skinned grapes, *B. cinerea* causes them to become partially raisined, this results in "Nobel rot" and leads to the production of extra sweet, "botrytized" wines.

Disease symptoms may become visible in the pre-harvest period or remain symptomatic and quiescent inside stems, leaves, flowers, fruits, or seeds until after harvest. *Botrytis* is also the most extensively studied necrotrophic fungal plant pathogen. A necrotrophic phase commonly follows the quiescent phase once plant organs start to senesce or ripen, during which *Botrytis* causes the rapid decay of the infected tissues. *Botrytis* can be pleomorphic with several anatomical forms. It is predominantly found in the asexual "gray mold" form, occasionally producing a *Botryotinia* perfect stage. From a sclerotium, infective ascospores are produced in an apothecium.

During the winter, *Botrytis* can produce sclerotia, which are melanized resting bodies. Compared to the normal conidia produced in spring or warmer conditions, sclerotia are more hardened (due to the presence of melanin), which allows the spore to survive the extreme environmental conditions (overwintering). Inside this dark, hardened cover, the sclerotia contain a mass of hyphal threads that start to grow and produce conidiophores when environmental conditions improve. Following the death of the host plant, *Botrytis* spp. have been shown to live as saprophytes (or nectotrophs) where they continue living and feeding on the cells of the dead plants.

Botrytis porri was first found on garlic in California by UC Davis plant pathologists in 1983 (Somerville et al., 1984) and all official records to date are from garlic. Swett et al. (2019) reports that *B. porri* causes botrytis neck and bulb rot on garlic wherever they are grown in California and that this fungus is a common colonizer of senescent tissues, with infection also occurring through wound sites on the bulbs. Symptoms appear either in the field towards the end of the season, or during storage. The first detection of naturally infected onions was made from Washington in 2001; this was evidence that the pathogen could be seedborne on onions (du Toit et al., 2007). One recent report is a detection of *B. porri* on cannabis grown in British Columbia (Punja and Ni, 2021).

Hosts: Allium ampeloprasum (wild leek), *A. ascalonicum* (shallot), *A. cepa* (onion,), *A. fistulosum* (Welsh onion), *A. porrum* (leek), *A. sativum* (garlic), *Allium* sp., *A. vineale* (wild garlic), and *Cannabis sativa* (cannabis) (Farr and Rossman, 2022).

Symptoms: Initial infections may not be noticeable, and symptoms may develop only when leaves senesce and become necrotic. It is also a common colonizer of senescent tissues. Infection can also occur through wound sites on the bulb. In both onion and garlic, symptoms appear either in the field towards the end of the season or during storage. Plants infected in the field may be stunted, with dead and dying outer leaves. Affected tissue is initially water-soaked, but later turns dry and necrotic. The rot may spread to the whole of the bulb, with abundant production of sclerotia. Sclerotia form in the neck or adhere to the rotten outer scales of the bulb (Swett et al., 2019).

On cannabis, *B. porri* causes bud rot. Diseased inflorescences show tan to dark brown necrosis, often with internal decay and sometimes with visible sporulation (Punja and Ni, 2021). On leek, *B. porri*

causes a neck rot, which may cause all the aboveground parts of the plant to die. Typical Botrytis conidia form on the neck of the bulbs, followed by sclerotia. With leek, plants usually decay in storage (CABI-CPC, 2021).

Transmission: This fungus spreads by wind or rain dispersal of ascospores and conidia, and it can also be seedborne at least in onion, with one very low rate detected in 0.75% of seed (Toit, 2012). *Botrytis porri* may be spread by planting material (bulbs of garlic or onion, possibly young seedlings of leek). Internationally, it could also be introduced into new areas with bulbs.

Damage Potential: The greatest incidence of infection occurs in persistent cool (50° to 75°F) and moist weather with frequent rain and high relative humidity. Infections are favored by excessive use of nitrogen fertilizer, applications of nitrogen after bulb initiation, and poor drying of the tops and curing of the necks (Swett et al., 2019). The disease is relatively little reported or studied in the areas where it occurs, which shows that it is in general only of minor importance. In California, garlic is mostly grown in areas with a hot dry summer, which limits the potential impact of *B. porri*. If cooler and moister conditions do occur, however, *B. porri* can cause damage to garlic. On leek, the disease is mainly post-harvest rather than in the field (CABI-CPC, 2022).

Worldwide Distribution: Asia: *China, Iran, Japan*. Europe: *Finland, Germany, Hungary, Norway, United Kingdom*; North America: *Canada, United States* (California, Nevada, Oregon, Washington); Oceania: *Australia, New Zealand*; South America: *Chile, Venezuela* (Farr and Rossman, 2022; CABI CPC, 2022).

Official Control: *Botrytis porri* is a quarantine pest in Mexico (EPPO, 2022) and is on the USDA PCIT's harmful organism list for Ecuador and Panama (USDA, 2022).

California Distribution: All official detections are from regulatory nursery samples from Shasta County. There are unofficial reports from the University of California that this disease is more widely distributed in California (Swett et al., 2019).

California Interceptions: None

The risk *Botrytis porri* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:**

This disease is favored by cool, wet conditions such as are found in coastal areas. It is probable that on average, conditions are too hot and dry in the main commercial acreages of garlic in Fresno and Kern County to see much disease.

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 hosts are all in the genus *Allium* with exception of a detection in *Cannabis*.

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:** *Botrytis porri* reproduces mainly with asexual conidia and these can be produced in huge numbers under appropriate environmental conditions. The spores spread with air currents and windblown 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:** The disease is relatively little reported or studied, which shows that it is only of minor to moderate importance. Garlic is mostly grown in areas with a warm dry summer period, which limits the potential impact of *B. porri*. If grown at the coast, where cooler and moister conditions do occur, *B. porri* could cause considerable damage to garlic. On leek, the disease is mainly of concern post-harvest rather than in the field. There are only a few reports of disease on onion and cannabis. It is a quarantine pest for Mexico, Ecuador and Panama.

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

Economic Impact: A, 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: **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:** None have been reported

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

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 *Botrytis porri:* Medium

Add up the total score and include it here. **9**
-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.

From official records and University of California reports, this pathogen is detected periodically in nurseries and commercial fields.

Evaluation is 'medium'.

Score: -2
-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:

Botrytis porri may be confused with other species of *Botryotinia*/*Botrytis* on *Allium*. *Botrytis allii* also occurs on garlic, and *B. cinerea* may occur on any of the *Allium* species.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Botrytis porri* is C.

References:

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Somerville, P.A., Hall, D.H., and Greathead, A.S. 1984. Dry rot of garlic caused by *Botrytis porri*. In: Phytopathology, 74 829.

Swett, C. L., Aegerter, B. J., Turini, T. A., and Putman, A. I. 2019. Botrytis neck and bulb rot. UC IPM Pest Management Guidelines: Onion and Garlic. UCANR Publication 3453.

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Zhang, J., Li, G.Q., and Jiang, D.H. 2009. First report of garlic leaf blight caused by Botrytis porri in China. Pl. Dis. 93: 1216.

Responsible Party:

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***Comment Period: 08/26/2022 through 10/10/2022**

***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