

**California Pest Rating Proposal for**  
***Alternaria embellisia* Woudenberg & Crous 2013**

**Skin blotch and bulb canker of garlic**

**Current Pest Rating: C**

**Proposed Pest Rating: C**

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

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**Comment Period: 11/13/2023 through 12/28/2023**

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**Initiating Event:**

This pathogen has not been through the pest rating system. The risk to California from *Alternaria embellisia* is described herein and a permanent rating is proposed.

**History & Status:**

**Background:**

A new disease of garlic, characterized by bulbs covered with a black, powdery mass of hyphae and conidia, was described in Italy by Campanile in 1924. It was given the name *Helminothosporium allii* nov. sp. In 1971, Simmons separated *H. allii* out of the genus *Helminothosporium*, which he called “insupportably broad”, naming it *Embellisia allii* (Campan.) Simmons, and establishing it as the type species for this new genus.

In 2013, Woudenberg et al. published a study that delineated phylogenetic lineages within *Alternaria*, and allied genera, based on nucleotide sequence data of parts of the 18S nrDNA, 28S nrDNA, ITS, GAPDH, RPB2, and TEF1-alpha gene regions. Their study placed the genus *Embellisia* in synonymy with the genus *Alternaria*. The new name became *Alternaria embellisia* Woudenb. & Crous and it was

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placed in the Section *Embellisia* (E.G. Simmons) Woudenb. & Crous, comb. et stat. nov. The section *Embellisia* contains *Alternaria embellisia* (type species), *A. chlamydospore*, and *A. tellustris*.

*Alternaria* Nees (1816), is a genus with members that are ubiquitous and includes saprobic, endophytic, and pathogenic species associated with a wide variety of substrates such as seeds, plants, agricultural products, animals, soil, and the atmosphere. *Alternaria* spp. are known to cause major losses on a wide range of crops and can be serious plant pathogens (Agrios, 2005). They are also important postharvest pathogens. *Alternaria* spp. are the causative agents of phaeohyphomycosis in immuno-compromised patients and are airborne allergens.

The first report of *Embellisia allii* causing skin blotch and bulb canker on garlic in California was made by UCCE Plant Pathologist S. T. Koike and CDFA Plant Pathologist S. Rooney-Latham from plants collected in Monterey County in 2011 (Koike and Rooney-Latham, 2012). All isolates they collected were identical and 100% similar to *Embellisia allii* from Genbank. They described the affected plants as having poor quality and noted that they could not be harvested. Affected plants appeared in patches where up to 50% of the plants were diseased. It can produce long-lasting resting spores, called chlamydospores, that remain viable in the soil for extended periods.

**Hosts:** onion (*Allium cepa*), leek (*A. porrum*), hardneck garlic (*A. sativum* var. *ophioscorodon*), and softneck garlic (*A. sativum* var. *sativum*).

**Symptoms:** Disease symptoms start as small water-soaked lesions on the bulbs and develop into brown to black lesions generally underneath the bulb epidermis. On garlic in Monterey County, bulb and stem sheaths were dark, decayed, and sloughing off the plants. Dissection of diseased sheaths revealed black hyphae between layers. Lower leaves wilted became tan and dried up (Koike and Rooney-Latham, 2012). Bulbs collected in Mexico by Ortiz et al. (2019) showed grayish to black scales and clove necrosis. Some were dried and decayed while others contained black hyphae between scales. The outer scales of garlic grown in Montana were dark, decayed, and sloughing off the bulbs (Lonergan and Skoglund, 2013). On onions grown in India, the initial symptom of the disease was greyish spots on the outer scales of the bulb, later becoming enlarged and covering the entire bulb with a dark, blackish color (Mishra et al., 2010).

**Transmission:** *Alternaria* spp. produce short, simple, erect conidiophores that bear single or branched chains of conidia. The conidia are large and multicellular, and detach easily, able to be carried by air currents. *Alternaria embellisia* conidia are produced in large numbers during heavy dews or rains and can be blown in from infected debris or infected plants over short distances. The spores may penetrate susceptible hosts directly or through wounds. New conidia are then produced which can be further spread by wind, splashing rain, and irrigation (Agrios, 2005). Movement of infected onion bulbs and garlic cloves used for planting material is likely responsible for the spread of this disease over long distances. *Alternaria embellisia* likely overwinters as mycelium and chlamydospores in infected plant debris and in or on bulbs or cloves.

**Damage Potential** *Alternaria* diseases are more prevalent in older, senescing tissues, particularly on plants growing poorly because of some kind of stress. In Monterey, Koike and Rooney-Latham (2012)

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observed patches of garlic fields with as much as 50% disease incidence, however, overall field incidence was less than 1%. On onions, storage losses of 30% have been reported (Mishra et al., 2010). Lee et al. (2002) describe *E. allii* as both a canker disease and a post-harvest or storage disease of garlic cloves. They explain that even if the pathogen is just growing superficially on outer bulb layers, it can leave the bulb unacceptable to consumers. Johnson (2011) described the damage to garlic bulbs as mainly cosmetic. However, left unchecked, the disease may progress into cankers on the cloves.

**Worldwide Distribution:** Argentina, Australia, Brazil, Bulgaria, Chile, China, Egypt, Greece, Hungary, Israel, India, Italy, Japan, Korea, Mexico, Morocco, New Zealand, Puerto Rico, Romania, Slovenia South Africa, Spain, United Kingdom, United States (*California, Louisiana, Massachusetts, Montana, Oregon, New Mexico, Texas*) Venezuela, and Zimbabwe (Farr and Rossman, 2023).

**Official Control:** The following are listed on the USDA PCIT's harmful organisms reports: *Alternaria embellisia*, Ecuador; *Embellisia allii*, India; *Helminthosporium allii*, Thailand.

**California Distribution:** Monterey, Mono, Santa Cruz, Shasta, and Ventura counties (CDFA PDR Database, 2023).

**California Interceptions:** none

The risk that *Alternaria embellisia* would pose to California is evaluated below.

## Consequences of Introduction:

- 1) Climate/Host Interaction:** *Alternaria embellisia* has been reported from diverse climates around the world. It is likely to be found wherever its host can grow.

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

**Score: 3**

- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- Medium (2) may be able to be established 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 limited to *Allium* spp.; onion, garlic, and leek.

Evaluate the host range of the pest.

**Score: 1**

- **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:** The pathogen has airborne spores and can move with infected plants.
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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:** Garlic and onion bulbs can be damaged in the growing season and post-harvest. This is a pest of concern for some countries.

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

**Economic Impact: A, C**

**A. The pest could lower crop yield.**

B. The pest could lower crop value (including increasing crop production costs).

**C. The pest could trigger the loss of markets (including 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 on 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.
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- High (3) causes two or more of the above to occur.

### **Consequences of Introduction to California for *Alternaria embellisia*: 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.

***Evaluation is 'high'.***

**Score: -3**

-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 the 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 = 6***

**Uncertainty:** none

### **Conclusion and Rating Justification:**

Based on the evidence provided above the proposed rating for *Alternaria embellisia* is **C**.

### **References:**

Agrios, G. N. 2005. Plant Pathology, 5th Edition. Elsevier Academic Press. 922 pg

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Farr, D.F., and Rossman, A.Y. 2023. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved from <https://nt.ars-grin.gov/fungaldatabases/>

Johnson, S. B. 2011. Embellisia skin blotch of garlic. Bulletin #1204. University of Maine, Cooperative Extension Publications.

Koike, S.T., and Rooney-Latham, S. 2012. First Report of *Embellisia allii* Causing Skin Blotch and Bulb Canker on Garlic in California. Pl. Dis. 96:291.

Lee, H.B., Kim, C.J. and Yu, S.H., 2002. First report of bulb canker of garlic caused by *Embellisia allii* in Korea. Mycobiology, 30(4), pp.240-243.

Loneragan, E. and Skoglund, L.G., 2013. First Report of *Embellisia allii* Causing Skin Blotch and Bulb Canker on Garlic in Montana. Plant Health Progress, 14(1), p.40.

Mishra, R.K., Sharma, P., Singh, S. and Gupta, R.P., 2010. First report of *Embellisia allii* causing skin blotch or bulb canker of onion from India. Plant Pathology, 59(4).

Ortiz, J.D., Chávez, E.C., Fuentes, Y.O. and Beache, M.B., 2019. First Report of *Alternaria embellisia* (syn. *Embellisia allii*) Causing Bulb Canker or Skin Blotch on Garlic in Mexico. Plant Disease 103 (5)

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Alternaria embellisia*, *Embellisia allii*, and *Helminthosporium allii*, Accessed 10/18/23.

### **Responsible Party:**

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**\*Comment Period: 11/13/2023 through 12/28/2023**

### **\*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:**

- ❖ 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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