

ALIFORNIA DEPARTMENT OF OOD & AGRICULTURE

California Pest Rating Profile for

Choanephora cucurbitarum (Berk. & Ravenel) Thaxt., (1903) Choanephora Rot

Pest Rating: B

Kingdom: Fungi, Phylum: Zygomycota Division: Mucoromycota, Class: Mucoromycetes, Order: Mucorales, Family: Choanephoraceae

Comment Period: 01/21/2025 through 03/07/2025

Initiating Event:

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

History & Status:

Background:

Zygomycetes are fungi that have well-developed mycelia without cross walls and produce nonmotile spores in sporangia. Their resting spore is a thick-walled zygospore, produced by the union of two morphologically similar gametes. Zygomycetes are strictly terrestrial fungi. Three genera of Zygomycetes are known to cause disease in plants or plant products and are considered weak parasites. They grow mostly as saprophytes on dead or processed plant products. When they infect living plant tissues, they first attack injured or dead plant parts. When starting on injured plants, they build up large masses of mycelium. This secretes enzymes that diffuse into the living tissue, disrupting and killing the plant cells.

Sporangiospores of *Choanephora* spp. float in the air and can attack the withering floral parts of many plants. If they land on wounds of fleshy fruits and germinate, the mycelium does not seem to invade cells, instead it grows in the surrounding dead cells and on nonliving organic substances, acting more like a saprophyte than a parasite. The fungus emerges through the wounds and produces aerial sporangiophores, sporangia, stolons, and rhizoids, the latter capable of piercing the softened epidermis. Hyphae secrete pectinolytic enzymes, which break down and dissolve the pectic substances of the middle lamella that hold the plant cells in place in the tissues. This results in a loss of cohesion



among the cells and the development of "soft rot." This can be pre- or post-harvest. Important hosts of *C. cucurbitarum* are summer squash, pumpkins, peppers, and okra (CABI, 2024).

Low temperatures or humidity, or an insufficient maturity of the fruit, slows down the growth and activity of the fungus. This allows some hosts to form layers of cork cells and other histological barriers that slow or completely inhibit further infection by the fungus. When the food supply in the infected tissues begins to diminish and compatible strains are present together, zygospores are produced (Agrios, 2005).

Hosts: Abelmoschus esculentus (okra), Amaranthus (amaranth), A. cruentus (red amaranth), A. hybridus (smooth pigweed), A. retroflexus (redroot pigweed), A. viridis (slender amaranth), Beta vulgaris var. saccharifera (sugarbeet), Brassica oleracea (cabbages, cauliflowers), B. oleracea var. botrytis (cauliflower), Cajanus cajan (pigeon pea), Capsicum (peppers), C. annuum (bell pepper), C. frutescens (chili), Carica papaya (pawpaw), Catharanthus roseus (Madagascar periwinkle), Chenopodium quinoa (quinoa), Citrullus lanatus (watermelon), Colocasia esculenta (taro), Crotalaria breviflora, C. juncea (sunn hemp), C. spectabilis (showy rattlepod), Croton bonplandianus, Cucumis sativus (cucumber), Cucurbita (pumpkin), C. maxima (giant pumpkin), C. pepo (marrow), Dahlia pinnata (garden dahlia), Desmodium (tick clovers), Euphorbia pulcherrima (poinsettia), Ficus carica (common fig), Glycine max (soybean), Gossypium (cotton), Hemerocallis (daylilies), Hibiscus rosa-sinensis (Chinese rose), Hosta plantaginea, Ipomoea batatas (sweet potato), Lablab purpureus (hyacinth bean), Lactuca sativa (lettuce), Lagenaria siceraria (bottle gourd), Malvaviscus arboreus (wax mallow), Manihot esculenta (cassava), Moringa oleifera (horse radish tree), Nasturtium officinale (watercress), Oryza sativa (rice), Petunia hybrida, Phaseolus vulgaris (common bean), Phlox paniculata (summer perennial phlox), Pinellia ternata (east African arum), Piper nigrum (black pepper), Pisum sativum (pea), Psidium guajava (guava), Psophocarpus tetragonolobus (winged bean), Ricinus communis (castor bean), Sesamum indicum (sesame), Solanum lycopersicum (tomato), S. melongena (aubergine), S. tuberosum (potato), Sorghum bicolor (sorghum), Spinacia oleracea (spinach), Tagetes erecta (Mexican marigold), Vigna (cowpea), V. aconitifolia (moth bean), V. mungo (black gram), V. radiata (mung bean), V. unguiculata (cowpea), Vinca minor (common periwinkle), Withania somnifera (poisonous gooseberry), Zea mays (maize) and Zinnia (CABI, 2025; Farr and Rossman, 2025).

Symptoms: Symptoms vary considerably on different crops. In general, symptoms are seen as watersoaked lesions, rapidly soft rotting fruit, and tissues with abundant sporulation of the pathogen. Host tissues have a hairy or fuzzy appearance resulting from the tall sporangiophores that produce a cluster of brown sporangia. On peppers, the disease originates on declining flowers and spreads to the stems and leaves producing water-soaked lesions and a wet rot. Older lesions turn necrotic and appear dried out. The entire plant may wilt. Young fruit can be infected. Wet rot of flowers and fruit of cucumbers and melons begins with symptoms developing on the vine, flowers, blossoms, and fruit, later showing whitish fungal growth of white stalks with white to brown heads developing on the infected surface. The plant tissues become translucent, water-soaked, and rotten. The fungus was usually confined to the end of the fruit, but during periods of wetness, the entire fruit can be decayed. Affected fruits drop off prematurely (Kehinde, 2013). Choanephora flower and fruit rot can also occur on legume crops where it causes pod blights, wet rot, blossom blight, and whisker rot (Kacharek et al., 2003).



Transmission: Zygomycetes are nonmotile: they do not have flagella. However, zygomycetes spores produced in huge numbers and are easily airborne, facilitating their transmission with wind and wind-driven rain. Zygospores help the fungus survive periods of starvation and adverse temperature and moisture. *Choanephora cucurbitarum* has been found on seeds and has an effect on inflorescence health and seed production (Adebanjo, 1990).

Damage Potential: Choanephora cucurbitarum mostly attacks tissues that have been damaged by insects or mechanical means, or crops that are poorly adapted to a hot humid climate. Squash fruit that are near or on the ground are more likely to become diseased and incidence of 50-60% of blossoms or fruit with Choanephora fruit rot symptoms have been observed (Kumar et al., 2022). Blossom blight, flower abortion, and soft rot of fruits were seen on zucchini fruit in greenhouses in Mexico with a disease incidence of 70% and severity of nearly 90% (Garcia-Estrada et al., 2023).

Worldwide Distribution: Africa: Benin, Republic of the Congo, Egypt, Ghana, Guinea, Kenya, Malawi, Mauritius, Nigeria, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Zimbabwe; Asia: Bangladesh, Brunei, Cambodia, China, India, Indonesia, Iraq, Japan, Malaysia, Oman, Pakistan, Singapore, South Korea, Sri Lanka, Taiwan, Thailand; Europe: Slovenia.; North America: Jamaica, Mexico, Panama, Puerto Rico, Trinidad and Tobago, U.S. Virgin Islands, United States (Connecticut, Delaware, Florida, Georgia, Hawaii, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Virginia, West Virginia, Wisconsin); Oceania: Australia, Fiji, French Polynesia, New Caledonia, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu; South America: Brazil, Colombia, Peru, Venezuela (CABI, 2025).

<u>Official Control</u>: Choanephora cucurbitarum is on the EPPO's quarantine pest list for Mexico (EPPO, 2025), and on the USDA PCIT's harmful organisms list for the Dominican Republic, Ecuador, Guatemala, Mexico, Nicaragua, Panama, the Islamic Republic of Iran, and Uruguay (USDA PCIT, 2025). It is a pest of concern for CDFA's export seed program for cucurbits.

California Distribution: none

California Interceptions: none

The risk that *Choanephora cucurbitarum* would pose to California is evaluated below.

Consequences of Introduction:

1) Climate/Host Interaction: Choanephora blight has a very wide host range, and its distribution includes a range of climates, from temperate to tropical, though it appears to be a requirement for this species that the climate be hot and humid for at least part of the year, which is a limiting factor for establishment in California.



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

Score: 1

- 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: Choanephora cucurbitarum has been recorded as a pathogen of at least 48 species of plants, representing 37 genera and 17 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:** Zygospores germinate under favorable conditions when there is high moisture, and warm to high temperatures, to produce a sporangium containing sporangiospores. Spores are spread by wind and water.

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 conditions with high temperatures and high humidity, losses on cucurbit fruit can be near total. It is also damaging to legumes and peppers in Florida. It is listed as a quarantine pest for many countries and for export seed.

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. It could impact home/urban gardening.

Evaluate the environmental impact of the pest on 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 Choanephora cucurbitarum: 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 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 = **10**

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Choanephora cucurbitarum* is B.

References:

Adebanjo A, 1990. An inflorescence disease of *Amaranthus* spp. in Nigeria associated with *Choanephora cucurbitarum*. Journal of Phytopathology, 128(2):146-152

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USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. *Choanephora cucurbitarum*. Accessed 1/3/2025.

Responsible Party:



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*Comment Period: 01/21/2025 through 03/07/2025

*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.

Pest Rating: B