

California Pest Rating Proposal for
***Colletotrichum tabacum* Böning 1932**
(syn. *C. tabaci*)

Tobacco anthracnose

Current Pest Rating: Q

Proposed Pest Rating: B

Domain: Eukaryota, Kingdom: Fungi,
Phylum: Ascomycota, Subphylum: Pezizomycotina,
Class: Sordariomycetes, Subclass: Sordariomycetidae,
Family: Glomerellaceae

Comment Period: 10/30/2023 through 12/14/2023

Initiating Event:

In September 2023, an Agricultural Inspector from San Luis Obispo County collected symptomatic leaves of *Hydrangea paniculata* 'limelight' from an incoming shipment that originated from a nursery in Boone County, Kentucky. The leaves were submitted to CDFA's Plant Pest Diagnostics Center at Meadowview. CDFA Plant Pathologist Wei Belisle isolated *Colletotrichum* spp. from the leaf spots. Using multiple gene sequences analysis, she identified it as *C. tabaci* (syn *C. tabacum*) and assigned it a temporary Q-rating. The risk to California from *C. tabaci* is described herein and a permanent pest rating is proposed.

History & Status:

Background:

A common name for diseases caused by *Colletotrichum* sp. is "anthracnose". Anthracnose is a general term applied to the most common disease symptom of black necrotic spots and is also used for other plant diseases caused by other types of fungi. *Colletotrichum* sp. can act either as a primary pathogen or it can be isolated from deteriorated plant parts as a secondary pathogen. It is found most often in the tropics but has been recorded from a wide range of temperate and subtropical habitats. The genus

is well known as a latent pathogen, infecting during the growing season but not causing problems until post-harvest and endophytic strains that can be isolated from symptomless plant parts (O'Connell et al., 2012).

In the 1920s, an anthracnose disease of tobacco was observed in Germany by Böning. They isolated the pathogen which formed greenish-black colonies in culture with a uniform grey aerial mycelium, and named it *C. tabacum* (1929, 1932). At various times, this pathogen has changed names based on revisions of taxonomy and nomenclature, and host associations. Based on rDNA ITS sequences and morphology, Songhai et al. (2001) classified strains of *C. tabacum* as *C. destructivum*. *Colletotrichum destructivum* is an important plant pathogen, mainly of forage and grain legumes including clover, alfalfa, cowpea, and lentil, and has been reported to cause anthracnose diseases of many other plants worldwide (Farr and Rossman, 2023). Subsequently, *C. destructivum* has been described as a species complex (Damm et al., 2014; Cannon et al., 2012). The inconsistent application of different names to isolates based on outdated species concepts has caused much taxonomic confusion, particularly in the plant pathology literature. Currently, both the names *C. tabacum* and *C. tabaci* are accepted in recently published literature (Wei et al., 2022; Wan et al., 2022).

Hosts: Centella asiatica, Capsicum annuum, Nicotiana rustica, and Nicotiana tabacum (Böning, 1932; Rakotoniriana et al., 2008; Wei et al., 2022; Damm et al., 2014).

Symptoms: On tobacco, *C. tabaci* forms distinct spots with necrotic centers on leaves, stems, and flowers (Wan et al., 2022). It also causes a seedling blight of tobacco (Böning, 1929). On peppers, lesions were mostly found in the middle and upper parts of the leaves, and the symptoms were roughly circular, dark brown patches on the leaves, with yellowish centers (Wei et al., 2022). Fruit lesions are common with *C. tabaci* when it infects peppers. The lesions begin as small and depressed circles. Over time, they become much larger and develop mats of salmon to pink-colored spores. The surface can appear wet and gelatinous. The centers of the lesions can range from tan or orange to brown or black. The colored spore mats seen on the fruit can be a characteristic of this disease. Concentric circles commonly surround the lesions as spores are produced in cycles. Eventually, the entire fruit will rot. Anthracnose can cause a latent infection where immature fruits may not show symptoms of the disease until fully mature, either on the plant or in storage (CABI, 2023; Roberts et al., 2012).

Transmission: No sexual morph is known for this species and no chlamydospores have been observed. During humid or moist conditions, abundant green-brown-colored conidia spore masses form in lesions and are dispersed passively. Conidia are disseminated by wind, rain, cultivation tools, equipment, and field workers. After the conidia are transmitted to host plants, they germinate, penetrate host tissue by means of specialized hyphae (appressoria), and ramify throughout the host tissue. Humid, wet, rainy weather is necessary for infection to occur (Agrios, 2005). These requirements may limit the occurrence of the pathogen in California fields and subsequently, the pathogen may be more of a problem under controlled environments inside greenhouses. *Colletotrichum tabaci* survives between crops during winter as mycelium on plant residue in the soil, on infected plants, and potentially on seeds.

Damage Potential: Infection by *C. tabaci* can result in reduced plant quality and growth. Estimates of yield/crop loss due to this pathogen are limited, but 100% incidence has been reported (Wei et al., 2020). Nursery production of potted plants, or plants growing in greenhouses are particularly at risk as nursery conditions are often conducive to infection by *Colletotrichum* species. In cultivated fields, disease development may be sporadic as it is affected by levels of pathogen inoculum and environmental conditions.

Worldwide Distribution: Brazil, Canada, China, France, Germany, India, Madagascar, Malawi, Tanzania, Taiwan, Zambia, Zimbabwe (Farr and Rossman, 2023).

Official Control: *Colletotrichum tabacum* is on the USDA PCIT's Harmful Organisms list for Colombia and Zambia (USDA PCIT, 2023). This detection of *C. tabaci* is likely a new United States record and reportable to the USDA. With a Q rating from CDFA, it is subject to the following authorized official control actions: plants and plant products that are found to be infested or infected with, or exposed to, a "Q"-rated pest may be refused entry, held for inspection, returned to the owner, quarantined, treated, or destroyed as specified by the Department or by an authorized representative of the Department prior to the Department determining the appropriate permanent pest rating (3 CCR § 3162. Pest Ratings and Official Control Actions).

California Distribution: None

California Interceptions: See 'initiating event'.

The risk that *Colletotrichum tabaci* would pose to California is evaluated below.

Consequences of Introduction:

1) Climate/Host Interaction:

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 be established in a larger but limited part of California.**
- High (3) likely to establish a widespread distribution in California.

Risk is Medium (2) – Similar to other species of *Colletotrichum*, *C. tabaci* requires humid, wet, rainy weather for conidia to infect host plants. This environmental requirement may limit the ability of the pathogen to fully establish and spread under dry field conditions in California. Limited regions with conducive climates within California could enable the pathogen to establish. In particular, *C. tabaci* can effectively infect and spread to host plants grown under conducive climate conditions in nurseries.

2) Known Pest Host Range:

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.

Risk is low (1) – The host range of *Colletotrichum tabaci* is currently limited to 4 plant species.

3) Pest Reproductive Potential:

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.**

Risk is High (3) – The pathogen has high reproductive potential and conidia are produced successively. They are transmitted by wind, wind-driven rain, cultivation tools, and human contact however conidial germination and plant infection require long, wet periods.

4) Economic Impact:

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

Economic Impact: A, B, C, D

- 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: 3

- 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.**

Risk is High (3) – Under suitable climates, the pathogen could lower plant growth and value and trigger the loss of markets.

5) Environmental Impact:

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.
- High (3) causes two or more of the above to occur.

Risk is low (1) – no environmental impacts are anticipated.

Consequences of Introduction to California for *Colletotrichum tabaci*: 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 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:

Changes in taxonomy increase the uncertainty of historical records of *Colletotrichum* spp. in California.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Colletotrichum tabaci* is **B**.

References:

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

Böning, K., 1929. Die Brennfleckenkrankheit des Tabaks. Praktische Blätter für Pflanzenbau und Pflanzenschutz. 7, pp.36-40.

Böning, K., 1932. Prakt. Blätt. Pflanzenbau Pflanzenschutz. 10, p.89.

CABI, 2023. *Colletotrichum tabacum*. <https://www.cabidigitallibrary.org/doi/10.1079/cabicompendum.14930>

Cannon, P.F., Damm, U., Johnston, P.R., and Weir, B.S., 2012. *Colletotrichum*: current status and future directions. Studies in Mycology, 73(1), pp.181-213.

Damm, U., O'Connell, R.J., Groenewald, J.Z., and Crous, P.W., 2014. The *Colletotrichum destructivum* species complex-hemibiotrophic pathogens of forage and field crops. Studies in Mycology, 79(1), pp.49-84.

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

O'Connell, R.J., Thon, M.R., Hacquard, S., Amyotte, S.G., Kleemann, J., Torres, M.F., Damm, U., Buiate, E.A., Epstein, L., Alkan, N., and Altmüller, J., 2012. Lifestyle transitions in plant pathogenic *Colletotrichum* fungi deciphered by genome and transcriptome analyses. Nature genetics, 44(9), pp.1060-1065.

Rakotoniriana, E.F., Munaut, F., and Decock, C., 2008. Endophytic fungi from leaves of *Centella asiatica*: occurrence and potential interactions within leaves. Antonie van Leeuwenhoek, 93, pp.27-36.

Roberts, P.D., Pernezny, K.L., and Kucharek, T.A., 2012. Anthracnose on pepper in Florida. University of Florida, pp.178.

Songhai, S.H.E.N., Goodwin, P., and Hsiang, T., 2001. Hemibiotrophic infection and identity of the fungus, *Colletotrichum destructivum*, causing anthracnose of tobacco. Mycological Research, 105(11), pp.1340-1347.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Colletotrichum tabacum*. Accessed 10/5/23.

Wan, H., Xue, Y., Wang, N., and Zhang, J., 2022. First report of *Colletotrichum tabacum* causing anthracnose on tobacco in China. Journal of Plant Pathology, 104(4), pp.1549-1549.

Wei, L., Yang, C., Osei, R., Cui, L., Jin, M., Cai, F., and Ma, T., 2022. First Report of anthracnose caused by *Colletotrichum tabaci* on Green Pepper (*Capsicum annuum*) in China. Plant Disease, 106(3), p.1067.

Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

***Comment Period: 10/30/2023 through 12/14/2023**

*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).

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: B
