

## California Pest Rating Proposal for

*Xanthomonas campestris* pv. *campestris* (Pammel 1895) Dowson 1939

**Black Rot of Crucifers**

**Current Pest Rating: B**

**Proposed Pest Rating: B**

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**Comment Period: 12/17/2019 through 1/31/2020**

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### Initiating Event:

On August 9, 2019, USDA-APHIS published a list of “Native and Naturalized Plant Pests Permitted by Regulation”. Interstate movement of these plant pests is no longer federally regulated within the 48 contiguous United States. There are 49 plant pathogens (bacteria, fungi, viruses, and nematodes) on this list. California may choose to continue to regulate some or all these pathogens with state plant pest permits. In order to assess the need for a state permit, a formal risk analysis for *Xanthomonas campestris* pv. *campestris* (Xcc) is given herein and a permanent pest rating is proposed.

### History & Status:

**Background:** The majority of xanthomonad bacteria are plant pathogens. They are found in tropical and temperate climates. They live as plant pathogens and epiphytes and can survive only a short time in the soil. Some, like the pathogen that causes black rot of crucifers, are very aggressive primary pathogens while others are limited to secondary invasion after infection by a different primary bacterial pathogen (Agrios, 2005; Hayward, 1993).

*Xanthomonas campestris* pathovar (pv.) *campestris* causes black rot of plants in the family Brassicaceae. The term pathovar is used to refer to a strain or set of strains with the same or similar characteristics that are differentiated below the level of subspecies. They are separated from other strains based on distinct pathogenicity to one or more plant hosts. Usually pathovars are named after their primary or originally described host (Young et al., 1991). *Xanthomonas campestris* was first described as a disease of cabbage in the United States (Garman, 1894) and it affects all members of the brassica family, often causing severe crop losses worldwide (Williams, 1980).

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*Hosts: Brassica juncea* var. *juncea* (indian mustard), *Brassica napus* var. *napobrassica* (swede), *Brassica napus* var. *napus* (rape), *Brassica nigra* (black mustard), *Brassica oleracea* var. *alboglabra* (Chinese kale), *Brassica oleracea* var. *botrytis* (cauliflower), *Brassica oleracea* var. *capitata* (cabbage), *Brassica oleracea* var. *gemmifera* (Brussels sprouts), *Brassica oleracea* var. *gongylodes* (kohlrabi), *Brassica oleracea* var. *sabauda* (Savoy cabbage), *Brassica oleracea* var. *viridis* (collards), *Brassica rapa* cultivar group *Mizuna*, *Brassica rapa* subsp. *chinensis* (Chinese cabbage), *Brassica rapa* subsp. *oleifera* (turnip rape), *Brassica rapa* subsp. *pekinensis*, *Brassica rapa* subsp. *rapa* (turnip), *Capsella bursa-pastoris* (shepherd's purse), *Crambe*, *Erysimum cheiri* (wallflower), *Lepidium sativum* (garden cress), *Lepidium virginicum* (Virginian peppercress), *Matthiola incana* (stock), *Raphanus raphanistrum* (wild radish), *Raphanus sativus* (radish), and *Sinapis arvensis* (wild mustard) (CABI, 2019).

*Symptoms:* Black rot symptoms vary depending on the environmental conditions (Alvarez and Cho, 1978). The most severe losses from black rot in California have occurred in cabbage and cauliflower, but brassicas grown for seed production crops can also be damaged (Koike and Subbarao, 2007). Severe disease development is favored by warm, humid conditions. Early in disease development, typical symptoms consist of angular or V-shaped chlorotic lesions along the leaf edges. With time these lesions will dry up and turn tan or brown. Black veins are often seen within these tan lesions, though they may not always develop. Severely infected leaves may wither and drop off the plant. If systemic infection has taken place, the vascular tissues in petioles and main stems can also turn black. If temperatures are cool, however, symptoms may not be observed. Atypical symptoms, such as small, brown specks, may also occur and mimic other bacterial diseases (Agrios, 2005).

*Transmission:* Black rot can enter the field on transplants or seeds and can stay in the soil for over a year where it survives on infected crop debris that breaks down slowly. Pathogen movement within the field is with water – from rain or irrigation. It moves into the plant through natural openings such as stomates or wounds caused by hail, insects, and mechanical injuries. It can also be spread by workers and equipment moving through the field. Many brassicaceous weeds are susceptible to black rot and must be eradicated to prevent continued contamination of crop plants (Koenraad et al., 2019).

*Damage Potential:* *Xanthomonas campestris* ranks as one of the most important bacterial plant pathogens and *X. campestris* pv. *campestris* causes large yield losses on brassicas worldwide on an annual basis (Vicente et al., 2013).

**Worldwide Distribution:** This pathogen is widely distributed in Africa, Asia, Oceania, Europe, North America, Central America, the Caribbean, and South America (CABI, 2019).

**Official Control:** *Xanthomonas campestris* pv. *campestris* is a quarantine pest in Mexico and on the A2 quarantine list for Jordan. It is on the harmful organisms list for Colombia, India, Israel, Jordan, Namibia, Panama, and South Africa. It is listed in the CDFA Phytosanitary Field Inspection guide as a pest of crucifers known to occur in California. To qualify seed for federal phytosanitary certification,

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some countries require freedom from Xcc by field walk inspections of the plants during bolting and flowering.

**California Distribution:** Widespread and frequently detected along central coast on crucifers including broccoli, cauliflower, arugula, and mustards grown for export seed and commercial vegetable production.

**California Interceptions:** None.

The risk *Xanthomonas campestris* pv. *campestris* would pose to California is evaluated below.

### Consequences of Introduction:

- 1) Climate/Host Interaction:** Black rot is detected in California during most spring seasons, in the coastal counties where mild, wet spring weather favors disease development, and the majority of susceptible hosts are grown. The need for leaf wetness for infection and water for dissemination may limit disease development in more arid parts of the state.

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 many important brassicas grown for food and many weedy relatives plus some ornamental brassicas.

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:** Bacterial plant pathogens can increase exponentially under highly favorable conditions. This pathogen can spread with rain and sprinklers, and can be moved with contaminated seed and transplants. It is also spread by equipment and people in the fields.

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.
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- **High (3) has both high reproduction and dispersal potential.**

- 4) **Economic Impact:** Severe economic losses are reported to be caused by black rot epidemics but mainly in the warm, humid tropics. In California, there are losses when any level of disease in the field prevents seed exports. Some countries allow seed to be treated with hot water to reduce pathogen levels.

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

**Economic Impact: A, B, C, G**

- 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: 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.**

- 5) **Environmental Impact:** Evaluate the economic impact of the pest to California using the criteria below. Impact to native cresses, cabbages, and mustards is possible

**Environmental Impact: D, 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: 3**

- 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 *Xanthomonas campestris* pv. *campestris* is High:**

Add up the total score and include it here. **13**

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- 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'.** The pathogen is established in coastal counties where most of the brassica production takes place

**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:

**Final Score:** *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 13-2=11*

**Uncertainty:** None.

**Conclusion and Rating Justification:**

Based on the evidence provided above **the proposed rating for *Xanthomonas campestris pv. campestris* is B.**

**References:**

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### Responsible Party:

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**\*Comment Period: 12/17/2019 through 1/31/2020**

**\*NOTE:**

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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 \[a\]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: B**

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