cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Pectobacterium betavasculorum (Thomson et al. 1984) Gardan et al. 2003

Bacterial vascular necrosis and rot of sugar beet

Kingdom: Bacteria, Phylum: Proteobacteria,
Class: Gammaproteobacteria, Order: Enterobacterales,
Family: Pectobacteriaceae

Current Pest Rating: none

Proposed Pest Rating: C

Comment Period: 07/30/2026 through 09/13/2026

Initiating Event:

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

History & Status:

Background:

Sugar beet (*Beta vulgaris* subsp. *vulgaris*), in the family Amaranthaceae (formerly Chenopodiaceae), includes cultivars grown as Swiss chard, fodder beet, red beet, and sugar beet. Beginning in the second half of the nineteenth century, sugar beets were grown for sugar factories throughout California. Panella et al. (2014) reported that the last northern California factory closed in 2008, leaving just one operating factory in the Imperial Valley, and described interest in sugar beet as a biofuel crop.

A pathogenic, pectolytic bacterium was originally reported from California as an *Erwinia* sp. causing bacterial vascular necrosis and rot of sugar beet (Thomson et al., 1977; Whitney and Lewellen, 1977). It was subsequently described as *Erwinia carotovora* subsp. *betavasculorum*, the basonym of the currently accepted name *Pectobacterium betavasculorum* (Thomson et al. 1984) Gardan et al. 2003 (LPSN, 2026).

Hauben et al. (1998) used nearly complete 16S rDNA sequences to divide plant-associated *Erwinia* into phylogenetic groups, restricting *Erwinia* to the group containing species such as *E. amylovora* and transferring the soft-rot group, including *E. carotovora* and its subspecies, to *Pectobacterium*.

Gardan et al. (2003) elevated several *Pectobacterium carotovorum* subspecies to species rank, including subsp. *betavasculorum*. They examined strains from five *P. carotovorum* subspecies using DNA-DNA hybridization, numerical taxonomy of 120 phenotypic characters, serology, and 16S rDNA phylogenetic analysis, and proposed *Pectobacterium betavasculorum* as a species (Gardan et al., 2003; LPSN, 2026).

There was a disease outbreak in 1971 in the Lost Hills area of Kern County. Whitney and Lewellen (1977) reported that an *Erwinia* sp. caused a sugar beet epiphytotic, and that the disease was associated with reduced yield, impaired beet quality, low sugar extraction, and sugar factory problems. Their California field work included trials at Lost Hills, Dos Palos (Merced Co.), Woodland (Yolo Co.), and Salinas (Monterey Co.), and they concluded that the pathogen had probably been present for many years but became conspicuous after more susceptible hybrid cultivars were introduced (Whitney and Lewellen, 1977). The disease was found in most California sugar beet plantings at that time, usually at 3 to 5 percent incidence, but sometimes exceeding 40 percent (Thomson et al., 1977).

Hosts: Sugar beet, *Beta vulgaris*, is the principal crop host (Thomson et al., 1977; Whitney and Lewellen, 1977; Thomson et al., 1981). Gardan et al. (2003) included *P. betavasculorum* strains isolated from sugar beet, sunflower, potato, hyacinth, and artichoke in the subspecies that was elevated to species rank. Thomson et al. (1977) reported greenhouse infection of tomato and chrysanthemum by the sugar beet *Erwinia* strains and typical blackleg symptoms on potatoes grown at 18°C. Borowska-Beszta et al. (2024) compared strains from sugar beet, potato, sunflower, and artichoke and reported pathogenicity assays on potato tubers and chicory leaves. These experimental, taxonomic, and genomic host associations support a host range broader than sugar beet, but field damage has not been widely documented except in sugar beets.

Symptoms: Symptoms in sugar beet include black streaking on petioles, blackened crowns, frothing at the crown, necrotic vascular bundles in roots, pink discoloration of surrounding tissue after cut surfaces are exposed to air, and extensive root rot (Thomson et al., 1977; Whitney and Lewellen, 1977). The disease may appear as vascular necrosis, soft rot, dry rot, or combinations of these symptoms depending on stage of infection and secondary microbial activity (Thomson et al., 1977). In severe infections, root rot and vascular necrosis can reduce beet quality and interfere with sugar extraction and processing (Whitney and Lewellen, 1977; Thomson et al., 1981).

Transmission: Disease development is favored by injury, warm temperatures, excess moisture, and excess nitrogen (Thomson et al., 1977; Thomson et al., 1981). Thomson et al. (1977) reported that injury was necessary for infection in California experiments and that temperatures of 25 to 30 °C favored rapid disease development. The pathogen was not isolated from sugar beet seed, was not detected in soil throughout winter, and declined rapidly after harvest. The reviewed evidence therefore supports local spread associated with wounds and infected plant tissue but does not establish seed transmission or persistent survival in soil.

Damage Potential: Damage potential is documented from California sugar beet production, and early infection caused greater yield effects. Whitney and Lewellen (1977) reported that the 1971 Lost Hills area epiphytotic reduced yield, impaired beet quality, reduced sugar extraction, and caused sugar factory problems. Thomson et al. (1977) reported that root yield declined from 76.8 metric tons per hectare in control plots to 37.9 metric tons per hectare where plants were wounded and inoculated at 8 weeks old, and that early infection caused greater yield effects. Thomson et al. (1981) reported that nitrogen fertilization increased disease incidence and rot in susceptible cultivars and that sugar yield decreased in diseased plants as soil nitrogen increased. These studies support high economic damage potential in susceptible sugar beet cultivars under favorable disease conditions.

Worldwide Distribution: Africa: Egypt. Asia: Iran, Turkey. Europe: Croatia, France, Romania. North America: Canada, Mexico, United States (Arizona, California, Montana, Texas, Utah, and Washington) (CABI, 2026).

Official Control: *Erwinia carotovora* subsp. *betavasculorum* is on the USDA PCIT's Harmful Organisms list for the Dominican Republic and Israel (USDA PCIT, 2026). *Pectobacterium betavasculorum* is on the EPPO's A1 list for Egypt (EPPO, 2026).

California Distribution: Historical studies documented *Pectobacterium betavasculorum* in multiple California sugar beet-growing areas, including Kern, Merced, Yolo, and Monterey counties (Thomson et al., 1977; Whitney and Lewellen, 1977).

California Interceptions: none

The risk that *Pectobacterium betavasculorum* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Historical disease occurrence and experiments show that *Pectobacterium betavasculorum* had suitable hosts and warm-season conditions in several California sugar beet-growing regions.

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

   Score: 2

   - Low (1) Not likely to be established 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:** Sugar beet is the principal documented field host, while strains or experimental infections have also been reported from plants in multiple 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:** *Pectobacterium betavasculorum* can multiply in wounded sugar beet tissue under warm, wet conditions. It was not isolated from sugar beet seed or detected in soil through winter in a California study (Thomson et al., 1977).

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 reproductive and dispersal potential.

4) **Economic Impact:** California field and inoculation studies documented reduced root yield, beet quality, sugar extraction, and processing performance under favorable disease conditions.

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

Economic Impact: A, B, 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.

5) **Environmental Impact:** No documented impacts to California native plant communities, threatened or endangered plants, natural ecosystems, or ecological processes were found.

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.

Consequences of Introduction to California for *Pectobacterium betavasculorum:* Medium

Add up the total score and include it here. **11**
-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.

Pectobacterium betavasculorum is historically documented from California sugar beet-growing areas. ***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 is 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* ***= 8***

Uncertainty:

There is uncertainty in the host range under California conditions and in the pathogen's current statewide distribution. Pathogenicity on sugar beet is clearly documented. Other hosts are supported by strain sources, greenhouse tests, or recent genomic and phenomic comparisons, but the reviewed

evidence does not show that those hosts are important California field hosts. Historical records cover multiple sugar beet-growing areas, but no recent statewide survey has been published.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for *Pectobacterium betavasculorum* **is C.**

References:

Borowska-Beszta, M., Smoktunowicz, M., Horoszkiewicz, D., Jonca, J., Waleron, M. M., Gawor, J., Mika, A., Sledzinski, T., Waleron, K. and Waleron, M. 2024. Comparative genomics, pangenomics, and phenomic studies of Pectobacterium betavasculorum strains isolated from sugar beet, potato, sunflower, and artichoke: insights into pathogenicity, virulence determinants, and adaptation to the host plant. Frontiers in Plant Science 15: 1352318. https://doi.org/10.3389/fpls.2024.1352318

CABI Crop Compendium. 2026. *Pectobacterium betavasculorum* https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.21911 Accessed 7/7/26

EPPO. 2026. Pectobacterium betavasculorum (ERWIBV), Categorization. EPPO Global Database. European and Mediterranean Plant Protection Organization, Paris. https://gd.eppo.int/taxon/ERWIBV/categorization (accessed 22 July 2026).

Gardan, L., Gouy, C., Christen, R. and Samson, R. 2003. Elevation of three subspecies of Pectobacterium carotovorum to species level: Pectobacterium atrosepticum sp. nov., Pectobacterium betavasculorum sp. nov. and Pectobacterium wasabiae sp. nov. International Journal of Systematic and Evolutionary Microbiology 53: 381–391. https://doi.org/10.1099/ijs.0.02423-0

Hauben, L., Moore, E. R. B., Vauterin, L., Steenackers, M., Mergaert, J., Verdonck, L. and Swings, J. 1998. Phylogenetic position of phytopathogens within the Enterobacteriaceae. Systematic and Applied Microbiology 21(3): 384–397. https://doi.org/10.1016/S0723-2020(98)80048-9

LPSN. 2026. *Pectobacterium betavasculorum* (Thomson et al. 1984) Gardan et al. 2003. List of Prokaryotic names with Standing in Nomenclature. https://lpsn.dsmz.de/species/pectobacterium-betavasculorum (accessed 22 July 2026).

Panella, L., Kaffka, S. R., Lewellen, R. T., McGrath, J. M., Metzger, M. S. and Strausbaugh, C. A. 2014. Sugarbeet. In: Smith, S., Diers, B., Specht, J. E. and Carver, B. F. (eds.), Yield Gains in Major U.S. Field Crops. CSSA Special Publication 33. ASA, CSSA and SSSA, Madison, Wisconsin, pp. 357–396. https://doi.org/10.2135/cssaspecpub33.c13

Thomson, S. V., Schroth, M. N., Hills, F. J., Whitney, E. D. and Hildebrand, D. C. 1977. Bacterial vascular necrosis and rot of sugarbeet: general description and etiology. Phytopathology 67: 1183–1189. https://doi.org/10.1094/Phyto-67-1183

Thomson, S. V., Hills, F. J., Whitney, E. D. and Schroth, M. N. 1981. Sugar and root yield of sugar beets as affected by bacterial vascular necrosis and rot, nitrogen fertilization, and plant spacing. Phytopathology 71: 605–608. https://doi.org/10.1094/Phyto-71-605

Whitney, E. D. and Lewellen, R. T. 1977. Bacterial vascular necrosis and rot of sugar beet: effect on cultivars and quality. Phytopathology 67: 912–916.

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***Comment Period: 07/30/2026 through 09/13/2026**

***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