cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Bean common mosaic virus

Current Pest Rating: C

Proposed Pest Rating: C

Comment Period: 12/30/2019 through 2/13/2020

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 Bean common mosaic virus (BCMV) is given herein and a permanent pest rating is proposed.

History & Status:

Background:

Bean common mosaic virus (BCMV) is the most common and most destructive virus known to naturally infect beans (McKern et al., 1992.) It is in the potyvirus family. The single stranded genomic RNAs are encapsidated by subunites of the capsid protein to form long, flexuous rod-shaped virions. It can be seed transmitted and occurs in many bean-producing countries worldwide. Initially it was believed that there were different strains of BCMV that were differentiated based on their ability to cause either "common mosaic" symptoms that included leaf malformations or "black root" symptoms that include vascular necrosis and death of the plants (Drijfhout and Bos, 1977). In 1992, McKern et al. separated BCMV into two different potyviruses using serology, and classifying the "black root" strains as bean common mosaic necrosis virus (BCMNV). If a bean variety has the dominant I gene, it is resistant and has no reaction to strains of the BCMV but is hypersensitive to strains of BCMNV and develops the necrosis symptoms (Frate et al., 2018). Both BCMV and BCMNV are related to two other potyviruses that infect beans in California, Bean yellow mosaic virus (BYMV) and Clover yellow vein virus (ClYVV).

Mixed infections are often found in the field (Frate et al., 2018). In California, BCMV is more prevalent than BCMNV. Both can be spread by infected seed and with an aphid vector (Hampton, 1975).

Hosts: Arachis hypogaea, *Crotalaria incana, C. juncea, C. pallida, Cudrania tricuspidata, Lablab purpureus, Lupinus luteus, Macroptilium atropurpureum, Macrotyloma axillare, Phaseolus coccineus, P. vulgaris, Rhynchosia minima, Vigna angularis, V. radiata, V. unguiculate, V. unguiculata subsp. sesquipedalis*, *and V. vexillata*. (CABI CPC, 2019) and *Passiflora* spp. (Bos and Gibbs, 1995)

Symptoms: When it infects susceptible bean cultivars without the dominant I gene or other hosts, BCMV causes mosaic patterns of light green-yellow leaf tissue, dark green tissue, or both light and dark mosaics together on the trifoliolate leaves. Other common symptoms include leaf rolling or blistering, chlorotic vein banding, and growth reduction. Mottling and malformation of the primary leaves is an indication that the infection likely occurred through infected seed (Galvez, 1980). Some cultivars that develop common mosaic may also have distinct chlorotic or necrotic local lesions that are not associated with the vascular system. The intensity and severity of the symptoms depends on the strain of the virus, the bean variety, and the age of the plant when infected. Plants infected at a young age may be stunted and distorted (Frate et al., 2018).

Transmission: The virus is transmitted in a non-persistent manner by several aphid species. After aphid vectors acquire the virus from BCMV infected plants, BCMV can be efficiently transmitted to other host plants during probing activity by the aphids within a short period time. The high incidence of seed transmission is probably the most important factor affecting initial crop infection and the world-wide distribution of the virus. The virus retains its infectivity in sap outside of its vector for 1-4 days at room temperature and can be transmitted by mechanical inoculation (Bos, 1971).

Damage Potential: Yield losses due to BCMV can be as high as 100% (Singh and Schwartz, 2010). During 1977 and 1981, there were major epidemics caused by BCMV in the northwestern US and western Europe (Hampton et al., 1983).

Worldwide Distribution: Widespread worldwide in Africa, Asia, Europe, Oceania, North America, Central America, and South America (CABI-CPC, 2019).

Official Control: Bean common mosaic virus is on the harmful organism list for Australia, Egypt, French Polynesia, Georgia, Honduras, Israel, Japan, Nauru, New Caledonia, New Zealand, Paraguay, and Taiwan (USDA PCIT, 2019). It is a quarantine pest in the United States and Morocco, on the A1 List in East Africa and Bahrain, and on the A2 list for Jordan (EPPO Global Database, 2019). Bean common mosaic virus is in CDFA's Phytosanitary Field Inspection manual as a disease of concern for common, adzuki, lima and mung bean seed grown for export.

California Distribution: Bean common mosaic virus has been detected on *Phaseolus* spp. and *Vigna* spp. in Butte, Colusa, Glenn, Monterey, Placer, San Diego, San Joaquin, Santa Barbara, Stanislaus, and Tehama counties. It has also been detected on *Passiflora* sp. nursery stock in Santa Barbara County.

California Interceptions: none

The risk Bean common mosaic virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** The virus and its vectors can survive anywhere hosts are grown in California.

   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 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 species of beans and peas plus ornamentals.

   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:** This virus can spread with infected seed, mechanically with infected sap, and with insect vectors

   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**.

4) **Economic Impact:** This disease has reached epidemic levels and caused complete crop loss where infected seeds of highly susceptible varieties are planted. Secondary aphid spread can increase epidemics. Clean seed programs and improved varieties have greatly improved disease management. It remains a pest of concern in California's export seed program.

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

   Economic Impact: A, C, E
   - **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:** No environmental impacts have been reported.

Environmental Impact: None
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 *Bean common mosaic virus* is Medium

Add up the total score and include it here. **12**
-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'. Records show BCMV is already widespread in California

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 introduction score minus the post entry distribution and survey information score: 12-3

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* **= 9**

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Bean common mosaic virus is C*.**

References:

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Responsible Party:

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*Comment Period: 12/30/2019 through 02/13/2020

*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
