cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Colombian Datura Virus

Current Pest Rating: Q

Proposed Pest Rating: C

Realm: Riboviria; Phylum: incertae sedis

Family: Potyviridae; Genus: Potyvirus

Leaf mottle symptoms on Angel's Trumpet 'Pink"
Photo credit: Ivan Godwyn

Comment Period: 5/22/2020 through 7/6/2020

Initiating Event:

On March 3, 2020, an agricultural inspector from Contra Costa County submitted a sample of small *Brugmansia* plants variety 'Pink trumpet' with virus symptoms detected during a regulatory nursery inspection. The samples were analyzed at CDFA's plant diagnostics center by plant pathologist Tongyan Tian. On April 9, 2020, with RT-PCR and sequencing, he determined that the plants were infected with two viruses, Brugmansia latent virus, a member of the Tobamovirus group, and Colombian datura virus (CDV), a member of the Potyvirus group. Additional sampling was done at the nursery on March 20, 2020 and Colombian Datura Virus was detected in these additional varieties: 'Suncrest Vulsa', 'Double Apricot', 'Charles Grimaldi', and 'Scarlet'. As this was the first confirmation of CDV in California, a temporary Q rating was applied.

Similar samples of *Brugmansia* with virus symptoms have been submitted to the CDFA lab from Santa Barbara County nurseries over many years. ELISA tests have been positive for Potyvirus and flexuous rod-shaped virus particles were observed in the sap, but further identification to viral species could not be made. Although it is not possible to be certain these were all Colombian datura virus, there are reasons to assume that the virus is already exceptionally widespread in the United States, in California, and around the world. The risk to California from Colombian datura virus is described herein and a permanent rating is proposed.

History & Status:

Background: *Brugmansia* is a plant genus in the family Solanaceae. Originally from South America, it is a widely used ornamental in landscapes. They are shrubs or small trees with large and striking flowers that are single, pendent, trumpet-like or funnel-shaped, white, yellow, pink, purple, or scarlet in color, and up to 30 cm long. *Brugmansia* spp. have the common name of "angel's trumpet" and are closely related to the genus *Datura* with the common name of "devil's trumpet". *Brugmansia* spp. and *Datura* spp. are both highly poisonous, and their consumption can cause respiratory depression, arrhythmias, hallucinations, psychosis, and even death. Both are prized for their large scented flowers. Some species of *Datura* are weedy.

Colombian datura virus (CDV) is a potyvirus that was originally reported and described from *Datura candida* and *D. sanguinea* (species later reclassified as *Brugmansia*) in Colombia (Kahn and Bartels, 1968). It was found soon after in Bolivia and Ecuador (Kahn and Monroe, 1070). There were no additional reports until 1996 when Lesemann et al. identified CDV-infected plants in private and commercial European *Brugmansia* collections. A subsequent survey in Germany and Netherlands confirmed CDV in multiple *Brugmansia* hybrids*, Juanulloa aurantiaca,* and *Petunia* hybrids. Also in 1996, CDV was detected in tomatoes growing in greenhouses in the Netherlands (Verhoeven et al., 1996). In the 2000s, the host range expanded with additional detections of field grown tobacco with virus symptoms in Poland, Germany, and Hungary (Schubert et al., 2006). Another report from Poland (Chrzanowska et al., 2005) indicates CDV is also capable of infecting some potato cultivars.

Chellemi et al. (2011) discusses the lack of diversification within studied strains of CDV. Perhaps worldwide movement of clonally propagated infected plant material has spread a single isolate of virus

rapidly, coinciding roughly with the first European collections of *Brugmansia* in Colombia, and distribution of those plants in Europe, North America, and Asia.

Chellemi et al. (2011) showed that 82% of Brugmansia plants tested from commercial nurseries in the United States were positive for potyvirus by ELISA and later were confirmed by RT-PCR and sequencing to be positive for CDV. That study included 11 positives from 15 plants from California nurseries collected in June of 2005 testing positive for both potyvirus and CDV. None of the California samples were positive for Tobamovirus.The virus has now been reported from Australia, India, Italy, Korea, Japan, Canada, and the United States and reported hosts are mostly Solanaceae, including *Brugmansia* spp.

Both the European Plant Protecttion Organization (EPPO) and the North American Plant Protection Organization (NAPPO) have issued an Emerging Pest Alerts for CDV citing its ability to be symptomless, the wide prelavence of the aphids that transmit it, and its expansions of host range into additional solanaceous hosts (NAPPO, 2006; EPPO, 2008).

Hosts: Brugmansia spp. (angel's trumpet), *Datura inoxia* (sacred datura), *Datura metel* (devil's trumpet), *Juanulloa aurantiaca* (gold finger plant), *Lycopersicon esculentum* (tomato), *Mandragora autumnalis* (mandrake), *Nicotiana tabacum* (tobacco), *Petunia* spp., *Physalis alkekengi* (Chinese lantern), *Physalis peruviana* (cape gooseberry), *Solanum muricatum* (pepino), *Solanum tuberosum* (potato), and *Spiranthes ceruna* (nodding lady's tresses). (Fry et al. 2004; Schubert et al. 2006; Rott et al., 2009; Pacifico et al., 2016; Chellemi et al., 2011; Lesemann et al., 1996).

Symptoms: *Brugmansia* and *Datura* spp. show symptoms including mosaic (patterns of light and dark green), rugosity (wrinkling), with faint chlorotic (yellow) spots in addition to stunting of leaves and plants and occasionally flower discoloration. CDV infections may remain symptomless until plants are stressed, then leaf mottling and mosaic patterns may appear (Salamon et al., 2015). Infected tomato plants show reduced growth, mosaic on young leaves, and fruit discoloration (Verhoeven et al., 1996; Tomitaka et al., 2014). Flexuous, filamentous rod-shaped particles typical of potyviruses can be observed by electron microscopy of sap preparations (Steele and Thomas, 2009; Pacifico et al., 2016).

Transmission: Ornamental *Brugmansia* are vegetatively propagated and this is the main way that virus is spread from mother to daughter and around the world in the nursery trades (Chellami et al., 2011) Similar to other potyviruses, CDV can be vectored by *Myzus persicae* (green peach aphid) and likely many additional aphid species non-persistantly, and also by mechanical inoculation that transfers sap (Salamon, 2005). Verhoeven et al. (2006) showed that aphids could spread CDV from angel's trumpet to tomatoes inside a greenhouse.

Damage Potential: Where *Brugmansia* is grown as an ornamental, viral symptoms are a cosmetic problem that become damaging when they stunt the leaves and plants and cause damage to the flowers. Because *Brugmansia* are woody perennials, they can be a persistant source of virus that threatens agronomic plants including tomato, tobacco, potato, and pepino. Some potyviruses are seed-borne, but it it is not known if this is the case for CDV. Infected tomato plants showed reduced growth, mosaic on young leaves, and fruit discoloration in Europe (Verhoeven et al., 2006). Only a mild mottle

was reported on tomato in Japan, but 72,000 plants at one facility displayed this symptom (Tomitaka et al, 2014).

Worldwide Distribution: Australia, Canada, Colombia, Germany, Hungary, India, Italy, Japan, Netherlands, Poland, United States (*California, Florida, Oregon, South Carolina, Wisconsin)* (Fry et al., 2004, Chellimi et al., 2011; Adkins et al., 2005; Pacifico et al., 2016; Rott et al., 2009; Schubert et al., 2006; Steele and Thomas, 2009; and Tomitaka et al., 2014.

Official Control: Colombian datura virus is on the USDA PCIT harmful organism list for Georgia, Japan, Republic of Korea, and Taiwan (PExD, 2020).

California Distribution: CDV is confirmed from Contra Costa County and is suspected to occur in Santa Barbara County. Research reports suggest that CDV is widespread in California.

California Interceptions: None

The risk Colombian datura virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Brugmansia* is frost-sensitive perennial that cannot tolerate sub-zero temperatures in the colder parts of California. However, in cold areas it can be grown as an annual and infected plants are in the nursery trades. There is less certainty with the other annual hosts and it is unknown if the virus will be able to infect weeds in agricultural areas.

   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 plants from multiple families including multiple important members of Solanaceae

   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 Dispersal Potential:** Potyviruses can be spread multiple ways, through propagation, mechanically, with aphids, and occasionally with seeds.

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:** There are no curative treatments for CDV infection. Brugmansia mother plants should be screened and only virus-free plants should be used for propagation. Infected plants should be rogued and not allowed into the nursery trade due to the risk of spread to healthy Brugmansia and other solanaceous hosts.

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

Economic Impact: A, B

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: **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:** Several *Datura* spp. are native to California including pricklyburr (*Datura inoxia*), jimsonweed (*Datura wrightii*), and small datura (*Datura discolor*) (Calflora; 2020). *Datura inoxia* is a confirmed host of CDV.

Environmental Impact: A

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 *Colombian datura virus* is 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 'medium'. Although the only confirmed samples were collected from a nursery in Contra Costa County, presumptive positives have been submitted from multiple nurseries in Santa Barbara County and to other research projects.

   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* **= 8**

Uncertainty:

The susceptiblility of native California daturas to Colombian datura virus is unknown. Field and greenhouse grown solonaceous hosts could be at risk for infection.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for Colombian datura virus is C.**

References:

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Responsible Party:

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*Comment Period: 5/22/2020 through 7/6/2020

*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