

Huanglongbing (Citrus Greening)

The group reviewing the recovery plan for Huanglongbing has proposed the following corrections and or changes to the plan:

Specific corrections, addenda:

Page	Comment
1	Insecticides manage or control the vectors (not 'eliminate'). Change elsewhere. More states are now doing surveys (pathogen and vector) In the sentence beginning 'Improvement of survey methods...include', add vector-plant interactions .
2	Should be phloem inhabiting or phloem-resident (not phloem limited).
3	Add in second paragraph (now a <i>new</i> Candidatus species, <i>L. africanus</i>). Change "This new pathogen" to "This newly discovered pathogen" First sentence under Symptoms : Change causing to cause.
5	First paragraph: both vectors transmit all <i>three</i> species, <i>at least experimentally</i> (Jim, natural transmission of all combinations has not been documented)
6	Fix species name. (Maybe show both species of vector in figure); Alabama survey; Survey any area with citrus (including ornamentals) Para #1. First sentence should be plurals ("interactions" and "are") Should also describe the African psyllid. Mention ornamental citrus as a possible reservoir. Under <u>Current Surveys</u> , <i>Arizona</i> : Surveys in AZ are now being done.
7	Add Alabama and Louisiana to list of states doing surveys. In para beginning "A purely molecular....", last sentence, add <i>serology</i> after "electron microscopy." Mention importance of method validation .
8	In list of items needing development, add - psyllid traps
9	Compensation for ornamentals lost (due to roguing). Also, the complexity of interconnections of different controls (some controls will affect other diseases or insects). Side effects of some controls. – make available. Need practical analyses of risks vs. benefits of chemical sprays. Is there compensation for lost plants (or for those contributed for testing).
10	Under <u>Chemical control of vectors</u> , <i>Insecticides</i> , first sentence, change "eliminate" to "manage". Somewhere in paragraph, add language on the need for vector-related research.
12	Soften criticism of biological control. Remove ornamentals because they are reservoirs for vectors (and maybe pathogen). Mention Cooperative Extension under Education. Homeowner education should be brought up. Make a strong point that Eradication is not possible. Mention important differences between management in orchards vs. dooryards. Mention sterile males, bacteria, fungi and Baculoviruses.to control insects. Under Cultural control, sentence 3, delete "and techniques." In the next sentence, add phrase "or their vectors" after "HLB pathogen." Between sections on "Education" and "Eradication" add another section on "Extension". Consider homeowner education.
13	Germplasm: change first sentence (not rated routinely for HLB); In sentence beginning "Surprisingly," change "Florida strain" to "Florida isolates"; Change "Integrated Pest Management" title to "Integration of Mitigation and disease

- management strategies.” Maybe rework the paragraph (emphasizing integration, not individual tactics). Mention need for more broadly-trained personnel to educate industry about IPM and related issues. Last sentence, change end to read “may yield results much sooner *if a source of resistance can be identified* (18).
- Under Other controls, mention that there is a difference in effectiveness of heat treatment between Asian and African HLB. Last sentence, change “is” to “may be”. Mention antibiotics as another control for specimen trees.
- Next section, change sub-heading to “Integration of Mitigation and Disease Management.” Mention scouting. Need for personnel trained in practical and interdisciplinary plant pathology. Grove self-inspection.
- Under Current Infrastructure and Needs, add new paragraph indicating that plant pest permits from APHIS are required for researchers working with citrus psyllids, in states where they do not already occur.
- 14 Maybe consider new locations for nursery locations (outside traditional citrus or psyllid range)
Top of page, change to “A citrus (lower case c) infrastructure exists” (rather than “does exist”).
Consider having reserach done in areas that lack all three components: citrus, psyllid and pathogen.
- 15 Para 2: Ft. Pierce (not Rt.). Add LANL to the list of active project locations.
Bullet starting “Determine complete genomic..” change “a forensic technique” to “a forensic approach”, and add “ or isolates” after “strains.”
Under Needs Evaluation, Bullet beginning “Evaluate time required,” consider rewriting as “Evaluate time and parameters required for psyllid transmission; this will help in developing effective disease management strategies based on psyllid hiology and disease epidemiology.
Next bullet: Determine threat of “*fruit-mediated*” transmission
Next bullet: Suggest editing to “—*Communicate* importance of HLB to the citrus industry to justify research *priorities*.”

Research needs:

Vector-pathogen relations and disease spread

- Role of acquisition of pathogen by nymphs
- Transmission modes (incubation/latent period in vector)

Epidemiology – spread, vector movement, vector control

- Does vector control lead to disease control?? (depends on mode of transmission)
- Overuse of insecticides (resistance to pesticides).

Genus specific primers or serological tags needed

Practical kits for detection or diagnosis

More on symptomatology (strains, etc.), also symptomless hosts

Ways to speed up the budwood testing protocols

Should survey any area (any state) with *any* citrus (broadly defined)

- E.g., Alabama.
- Ornamental citrus in various areas...(National ornamental companies would be places to look)

Traps for vector?

Biocontrol

Look for source of resistance (including other species).

Heat therapy for nursery material (maybe combined with antibiotics [temporary]) for producing clean material; also more on shoot tip grafting.

Resources for research (culture and germplasm collections), international cooperation