

**STATE MARKETING BOARDS
GRANT AGREEMENT
SIGNATURE PAGE**

AGREEMENT NUMBER

JIN-23

1. This Agreement is entered into between the Grantor and the Recipient named below:

GRANTOR

CALIFORNIA CITRUS NURSERY RESEARCH AND EDUCATION BOARD

RECIPIENT'S NAME

The Regents of the University of California on Behalf of UC Riverside **(campus name or ANR)**

2. The term of this Agreement is: One Year

The project term as identified in Attachment 1, Scope of Work and Budget is: 1/1/23 to 12/31/23

To extend the project term, the Recipient **must** obtain written approval from the GRANTOR in accordance with the terms of this Agreement.

3. The maximum amount of this Agreement is \$ 57,736

4. The parties agree to comply with the terms and conditions of the following exhibits which are by this reference made a part of the Agreement:

Exhibit A - Contacts/Notifications 1 Page

Exhibit B - Budget & Payment Provisions 2 Pages

Exhibit C – General Terms and Conditions 6 Pages

Attachment 1 – Scope of Work and Budget

Name of Project: Develop HLB-Resistant Varieties by Generating SAMP Cis-Genic Citrus Rootstocks and Scions for Citrus Huanglongbing Control

IN WITNESS WHEREOF, this Agreement has been executed by the parties hereto.

RECIPIENT

RECIPIENT'S NAME (Organization's Name) **The Regents of the University of California**

BY (Authorized Signature)



Karen Garcia (May 11, 2023 16:37 PDT)

DATE SIGNED (Do not type)

PRINTED NAME AND TITLE OF PERSON SIGNING Karen Garcia, Senior Contract and Grant Officer

ADDRESS Sponsored Research Administration, 245 University Office Building, Riverside CA 92521-0217

STATE OF CALIFORNIA

STATE ENTITY'S NAME **California Citrus Nursery Research and Education Board**
(GRANTOR)

BY (Authorized Signature)



Don Dillon (May 11, 2023 15:46 PDT)

DATE SIGNED (Do not type)

PRINTED NAME AND TITLE OF PERSON SIGNING
Don Dillon, Board Chairman

ADDRESS

531-D North Alta Avenue, Dinuba CA 93618

EXHIBIT A**RECIPIENT AND PROJECT INFORMATION**

1. The Grant Manager/Principal Investigator for this Agreement are:

FOR GRANTOR:	FOR RECIPIENT:
Name: John Gilstrap , Manager	Name: Hailing Jin
Section/Unit: Grants Management Office	Department/Program: Microbiology & Plant Path
Address: 531-D North Alta Avenue	Address: University of California
City/Zip: Dinuba CA 93618	City/Zip: Riverside CA 92521
Phone: 559-591-9005	Phone: 951-827-7995
Email Address: john@tabcomp.com	Email Address: hailingj@ucr.edu

The ***Grant Specialist/Administrative Contact*** for this Agreement are:

FOR GRANTOR:	FOR RECIPIENT:
Name: Kim Sakamoto , Grant Administrator	Name: Karen Garcia, Senior Contract and Grant Officer
Board Name: California Citrus Nursery Research Board	Office: 245 University Office Building
Address: 531-D North Alta Avenue	Address: 245 University Office Building
City/Zip: Dinuba CA 93618	City/Zip: Riverside CA 92521-0217
Phone: 559-591-9005	Phone: 951-827-3692
Fax: 559-591-5744	
Email Address: kim@tabcomp.com	Email Address: karen.garcia@ucr.edu

FISCAL CONTACT (If different from above):

Name:	Bobbie McCracken,
Office	Extramural Funding
Address:	900 University Blvd
City/Zip:	Riverside CA 92521-9800
Phone:	951-827-3303
Email Address:	EMF@ucr.edu

2. For a detailed Scope of Work and Budget, see Attachment 1.

EXHIBIT B

PAYMENT PROVISIONS AND BUDGET

1. Invoicing and Payment

- A. The Recipient may not invoice for work performed prior to the commencement date or completed after the Project term date of this Agreement, unless prior approval from GRANTOR (Grant Manager) is obtained, and the Project term date is amended.
- B. For activities satisfactorily rendered and performed according to the attached Scope of Work and Budget (Attachment 1), and upon receipt and approval of the invoices, the GRANTOR agrees to reimburse the Recipient for actual allowable expenditures incurred in accordance with this Agreement and stated herein, which is attached hereto and made a part of this Agreement. Approval of invoices shall not be withheld based on scientific differences between Recipient and GRANTOR in the interpretation of the research data and final conclusions.
- C. Invoices shall be submitted to the Grant Manager within sixty (60) days after the end of each quarter or month in which work under this Agreement was performed. Should GRANTOR require additional documentation supporting an item of expense on RECIPIENT's invoice, Recipient shall provide the documentation within 15 days of receipt of GRANTOR's request.
- D. A final invoice shall be submitted for payment no more than 60 calendar days following the expiration date of this Agreement, or 60 calendar days after the project is complete, whichever comes first. Recipient's invoice should be clearly marked "Final Invoice," indicating that all payment obligations of the GRANTOR under this Agreement have ceased and no further payments are due or outstanding.
- E. At least ten percent of the total amount awarded in this Agreement will be withheld until receipt, review and acceptance of the Final Performance Report for one-year projects, and the Annual Progress Report for multi-year projects.

2. Suspension of Payments

This Agreement may be subject to suspension of payments or termination, or both, and Recipient may be subject to debarment if the GRANTOR determines that:

- A. Recipient or Subgrantees, as defined in Exhibit C, Article 11(F), have made a false certification, or
- B. Recipient or Subgrantees violates the certification by failing to carry out the requirements noted in this Agreement.

3. Budget Contingency Clause

If funding for any fiscal year is reduced or deleted for purposes of this program, the GRANTOR will have the option to either terminate this Agreement in accordance with the Right to Terminate (Paragraph 16) or offer to amend the Agreement to reflect the reduced amount.

4. Prompt Payment Clause

Payment will be made in accordance with, and within the time specified in, California Government Code Title 1, Division 3.6, Part 3, Chapter 4.5, commencing with Section 927 – The California Prompt Payment Act.

5. Allowable Expenses/Fiscal Documentation

- A. The GRANTOR will reimburse Recipient only for allowable expenses in accordance with the Scope of Work and Budget and applicable State and Federal laws.
- B. GRANTOR shall have no obligation to reimburse Recipient under this Agreement until Recipient has satisfied the following condition (if applicable):
 - 1. For the term of this Agreement, Recipient shall submit timely Progress Reports as specified in Attachment 1 – Scope of Work and Budget. If Progress Reports are not received per Attachment 1, the GRANTOR may invoke the Disputes Clause, Exhibit C, Paragraph 7. When Progress Report is received, payment will not be withheld. If Disputes Clause is not invoked by GRANTOR, timely payment will be made to Recipient.

- C. The Recipient must maintain adequate documentation for expenditures of this Agreement to permit the determination of the allowability of costs under this Agreement. If the GRANTOR cannot determine expenditures are allowable under the terms of this Agreement because records are nonexistent or inadequate, the GRANTOR may disallow the expenditures. These records shall be kept for three (3) years after project completion, or final invoice, or resolution of a dispute or litigation, whichever comes last.

6. Budget

For a detailed Budget for all work to be performed under the Scope of Work, see Budget (Attachment 1).

7. Budget Flexibility

Budget revisions between identified budget categories in cost reimbursement agreements that are within the total contract amount are allowed as described below:

Up to 10% of each annual budget amount or \$10,000, whichever is less, is allowed with approval of the Grant Manager.

Exceeding 10% or \$10,000, whichever is less, of the last approved budget will require: the Grant Manager's prior approval; and a formal amendment to this Agreement. The Recipient shall submit a revised budget to the GRANTOR for approval.

Budget transfers that would cause any portion of the funds to be used for purposes other than those consistent with the original intent of this Agreement are not allowed. Notwithstanding the above provision, the GRANTOR may proceed with a formal amendment to this Agreement for budget revisions.

EXHIBIT C**GENERAL TERMS AND CONDITIONS****1. Approval**

This Agreement has no force or effect until signed by both parties.

2. Governing Law

This Agreement is governed by and will be interpreted in accordance with all applicable California laws.

3. Recipient Commitments

Recipient accepts and agrees to comply with all terms, provisions, conditions and commitments of the Agreement, including all incorporated documents, and to fulfill all assurances, declarations, representations, and statements made by the Recipient in the application, documents, and amendments that were provided and authorized by the Administrative Contact in support of its request for funding.

4. Performances and Assurances

Recipient agrees to faithfully and expeditiously perform or cause to be performed all project work as described in Attachment 1 – Scope of Work and Budget, and to apply grant funds received only to allowable project costs.

5. Assignment

This Agreement is not assignable by the Recipient, either in whole or in part, without the written consent of the GRANTOR.

6. Liability/Indemnification

A. The Recipient agrees to indemnify, defend and save harmless the GRANTOR, its officers, agents and employees from any and all liability, loss, expense, attorneys' fees or claims for injury or damages in the performance of this Agreement, but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of the Recipient, its officers, agents, or employees.

The GRANTOR agrees to indemnify, defend and save harmless the Recipient, its officers, agents and employees from any and all liability, loss, expense, attorneys' fees or claims for injury or damages in the performance of this Agreement, but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of the GRANTOR, its officers, agents, or employees,

7. Disputes/Default**A. Dispute**

The Recipient shall continue with the responsibilities under this Agreement during any dispute, except in the event of a substantial breach. In the event of a dispute, a "Notice of Dispute" is filed with the [GRANTOR/Recipient] within 30 calendar days of discovery of the problem. The Notice of Dispute must contain the Agreement number. Within 30 calendar days of receipt of the Notice of Dispute, GRANTOR and Recipient will meet for the purpose of resolving the dispute. In the event of a dispute, the language contained within this Agreement prevails.

B. Default Provisions

Subject to Article 10. Force Majeure, Recipient will be in default under this Agreement if any of the following occur:

1. Substantial breaches of this Agreement or any supplement or amendment to it.
2. Knowingly making any false representation, or statement with respect to this Agreement or the application filed to obtain this Agreement.
3. Failure to operate or maintain project in accordance with this Agreement.
4. Failure to make any remittance required by this Agreement.

Should an event of default occur, GRANTOR shall provide in writing a Notice of Default to the Recipient within 30 calendar days. Recipient shall have at least 30 calendar days to cure the default from the date the written notice is sent to the Recipient. If the Recipient fails to cure the default within the time prescribed by this Agreement, GRANTOR may terminate the Agreement according to the Right to Terminate (Paragraph 16).

C. Failure to Mutually Resolve Dispute

If both Parties cannot agree upon a resolution after following the processes described in this Agreement for Disputes or Default, both Parties retain the right to bring a lawsuit or seek any other legal or equitable remedy either Party may have.

8. Accounting and Deposit of Grant Funding

- A. **Separate Accounting of Funding Disbursements:** Recipient shall account for the money disbursed pursuant to this Agreement separately from all other Recipient funds. Recipient shall maintain audit and accounting procedures that are in accordance with generally accepted accounting principles and practices, consistently applied. Recipient shall keep complete and accurate records of all receipts and disbursements. Recipient shall require its Subgrantees to maintain books, records, and other documents pertinent to their work in accordance with generally accepted accounting principles and practices. Records are subject to inspection by GRANTOR during regular business hours.
- B. **Fiscal Management Systems and Accounting Standards:** The Recipient agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit tracing of grant funds to a level of expenditure adequate to establish that such funds have not been used in violation of State or Federal law or this Agreement.
- C. **Disposition of Money Disbursed:** All money disbursed pursuant to this Agreement shall be deposited, administered, and accounted for pursuant to the provisions of applicable law.

9. Equipment

Any equipment purchases must be included in the Scope of Work and Budget, and must contain:

- A description of the equipment
- How the equipment will be used
- A justification in support of the equipment's necessity
- The disposition of the equipment at the end of the project

Equipment is defined as:

- Non-expendable (having a normal life expectancy of one year or more);
- Tangible (can be appraised for value);
- Free standing (complete in itself, does not lose its identity when affixed to or installed in other property); and
- Having an acquisition cost of \$5000 or more.

10. Force Majeure

Neither party shall be liable to perform as required by this agreement to the extent such failure to perform is caused by any of the following: labor disturbances or disputes of any kind, accidents, failures of any required governmental approval, civil disorders, acts of aggression, acts of God, energy or other conservation measures, failure of utilities, mechanical breakdowns, material shortages, disease, or similar occurrences.

11. Subgrantees

- A. Recipient agrees to comply with all applicable Federal, State, and local laws and regulations during the term of this Grant Agreement. All Subgrantees must have the proper licenses/certificates required in their respective disciplines.
- B. Recipient must follow its documented procurement procedures when contracting with a Subgrantee. The procedures must reflect applicable Federal, State, and local laws and regulations.

- C. Recipient shall comply with all applicable laws and regulations regarding securing competitive bids and undertaking competitive negotiations in Recipient's contracts with other entities for acquisition of goods and services, with grant funds under this Agreement.
- D. A subgrant under this Agreement must be a written agreement between the Recipient and the Subgrantee, and must state the activities to be performed, the time schedule, the policies and requirements that apply to the Subgrantee, the amount of the subgrant, and a justification determining allowable costs.
- E. The subgrant must not affect the Recipient's overall responsibility for the management of the project, and the Recipient must reserve sufficient rights and control to enable it to fulfill its responsibilities under this Agreement.
- F. If the Recipient provides funds to any third party ("Subgrantee"), excluding any agency or department of the United States, to accomplish any of the work of this Agreement, the Recipient shall first enter into a written agreement with each Subgrantee by which the Subgrantee agrees to indemnify and hold harmless the GRANTOR and the State of California, and its officers, agents, and employees from any and all liabilities, losses, claims, demands, damages, or costs, including without limitation litigation costs and attorney's fees, resulting from or arising out of the Subgrantee's performance under its agreement with the Recipient, but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of the Subgrantee, its respective officers, agents or employees. The foregoing does not limit any breach of contract action that the GRANTOR may have against the Recipient. Nothing contained in this Agreement or otherwise creates any contractual relation between the GRANTOR and any Subgrantee, and no contract relieves the Recipient of its responsibilities and obligations hereunder. The Recipient's obligation to pay its Subgrantee is an independent obligation from the GRANTOR's obligation to make payments to the Recipient. As a result, the GRANTOR has no obligation to pay or to enforce the payment of any moneys to any Subgrantee.
- G. Recipient will perform their standard due diligence review of all Subgrantees before executing subgrants.

12. Audits

GRANTOR reserves the right to conduct an audit at any time between the execution of this Agreement and the completion of the project, with the costs of such audit borne by GRANTOR. After completion of the project, GRANTOR may require Recipient to conduct a final audit to GRANTOR's specifications, at GRANTOR's expense, such audit to be conducted by and a report prepared by an independent Certified Public Accountant. Failure or refusal by Recipient to comply with this provision shall be considered a breach of this Agreement, and GRANTOR may elect to pursue any remedies provided in the "Default Provisions" section of this Agreement,

Pursuant to Government Code Section 8546.7, the Recipient shall be subject to the examination and audit by the GRANTOR for a period of three years after final payment under this Agreement with respect to all matters connected with this Agreement, including but not limited to, the cost of administering this Agreement. All records of Recipient or its Subgrantee shall be preserved for this purpose for at least 3 years after project completion or final billing, whichever comes later.

13. Non-Discrimination Clause

With respect to this section, "contract" means this Agreement; "contractor" means University; and "subcontract" means Subaward.

During the performance of this contract, contractor and its subcontractors shall not unlawfully discriminate against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status. Contractors and subcontractors shall insure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination. Contractors and subcontractors shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code, § 12900 et seq.) and the applicable regulations promulgated thereunder (Cal. Code Regs., tit. 2, § 11000 et seq.). The applicable regulations of the Fair Employment and Housing Council implementing Government Code section 12990, set forth in Subchapter 5 of Division 4.1 of Title 2 of the California Code of Regulations are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

14. Unenforceable Provision

In the event that any provision of this Agreement is unenforceable or held to be unenforceable, then the parties agree that all other provisions of this Agreement have force and effect and will not be affected thereby.

15. Excise Tax

The State of California is exempt from Federal excise taxes and no payment will be made for any taxes levied on employees' wages. The State will pay for any applicable State of California or local sales or use taxes on the services rendered or equipment or parts supplied pursuant to this Agreement. California may pay any applicable sales and use tax imposed by another State.

16. Right to Terminate

- A. Both parties reserve the right to terminate this Agreement for Good Cause upon thirty (30) days written notice. Good Cause is defined as impossibility of performance or frustration of purpose. Good Cause does not include substantial breach (defined under the Disputes/Default clause above) or termination for convenience. Upon receipt of the GRANTOR's notice of termination or upon Recipient providing GRANTOR a notice of termination, the Recipient shall take reasonable efforts to limit or terminate all financial commitments and shall not incur new obligations under this Agreement. The GRANTOR shall reimburse the Recipient for costs incurred up to the effective date of termination and for costs incurred due to non-cancellable obligations, up to the undisbursed balance of funds authorized in this Agreement.
- B. In the case of early termination, the Recipient will submit, within ninety (90) days of the termination date, an invoice and a report covering services up to the termination date. Any deliverable as described in Attachment 1 to this Agreement that is fully or partially completed up to the termination date (work product), shall be provided to the GRANTOR.
- C. Upon receipt of the invoice, progress report, data, and work product, a final payment shall be made to the Recipient. This payment shall be for all costs incurred in accordance with this Agreement, and shall include labor and materials purchased or utilized (including all Non-cancellable Obligations) up to the termination date, and pro rata share of indirect costs as specified in the proposal budget.
- D. Pursuant to a Governor's Executive Order or equivalent directive, such as a court order or an order from a federal or state regulatory agency, the GRANTOR may issue a Suspension Notice. The Notice shall identify the specific Executive Order or directive and the Agreement number(s) subject to suspension. Work charged to the GRANTOR shall stop immediately upon receipt of the Notice. The Recipient retains the right to reimbursement of costs incurred to date, including non-cancellable obligations, and reserves the right to seek reimbursement through administrative or legal action.
- E. The Recipient shall include in any contract with any Subgrantee retained for work under this Agreement a provision that entitles the Recipient to suspend or terminate the agreement with the Subgrantee for any reason on written notice and on the same terms and conditions specified in this section.

17. Amendments

Changes to Scope of Work, Budget or the Project term, shall be requested in writing to the GRANTOR Grant Manager via letter, fax or email. GRANTOR Grant Manager shall respond in writing via letter, fax or email as to whether the proposed changes are accepted prior to implementing any change. Any accepted changes to the Scope of Work, Budget, or Project term must be subsequently approved by GRANTOR and an amendment signed by both Parties within 90 days of acceptance by the Grantor Grant Manager.

18. Confidentiality and Public Records

The Recipient and the GRANTOR understand that each party may come into possession of information and/or data which may be deemed confidential or proprietary and marked "Confidential" by the person or organization furnishing the information or data ("Confidential Information"). Such information or data may be subject to disclosure under the California Public Records Act, commencing with Government Code, Section 6250, or the Public Contract Code. The GRANTOR agrees not to disclose such information or data furnished by the Recipient and to maintain such information or data as confidential when so designated by the Recipient in writing at the time it is furnished to the GRANTOR, only to the extent that such information or data is exempt from disclosure under the California Public Records Act and the Public Contract Code.

19. Right to Publish

- A. Subject to any restrictions on the publication, disclosure, dissemination and use of Confidential Information set forth in this Agreement or under any applicable law, the Recipient shall have the right to publish, disclose, disseminate and use, in whole and in part, any data and information received or developed under this Agreement.
- B. The Recipient will provide publications, presentations and other public releases directly resulting from work performed under this Agreement to the GRANTOR for review at least thirty (30) calendar days prior to publication and will identify the proposed recipient(s). During the first fifteen (15) calendar days of such review period, the GRANTOR may provide notice to the Recipient that it intends to rebut some or all aspects of the presentation, publication or other public releases. Upon Recipient's public disclosure of the presentation, publication or other public release, the GRANTOR may prepare and submit such rebuttal to the recipient(s) identified by the Recipient. Within the review period, the GRANTOR may provide feedback to the Recipient; the Recipient shall give good faith consideration to such feedback, but has no obligation to make any changes in said material, other than the removal of any material whose disclosure is prohibited or restricted by this Agreement or by any applicable law. Any of the above referenced time periods may be modified upon agreement of both Parties. Neither Party may unreasonably deny such requests.
- C. At the GRANTOR's sole discretion, the GRANTOR will require the Recipient to use one of the following disclaimers in any publication, presentation or other public release:
 - 1. "This project was funded by the <GRANTOR>. The contents may not necessarily reflect the official views or policies of the <Grantor> or the State of California."
 - 2. "This project was funded by the <GRANTOR>. The contents do not represent the official views or policies of the <GRANTOR>, or the State of California."

20. Copyrights

- A. All rights in copyrightable works first created by the Recipient in the performance of the Scope of Work, Attachment 1, under this Agreement are the property of the Recipient. The Recipient shall grant the GRANTOR a royalty-free, nonexclusive, irrevocable license to use, reproduce, prepare derivative works, and distribute copies of the Deliverables identified in Attachment 1 to fulfill the GRANTOR's State purposes.
- B. Notwithstanding the above, if the purpose of the Scope of Work is specifically to create a copyrightable work for use by the State and that fact is indicated as a deliverable in Attachment 1, which may be amended upon mutual agreement of the Parties, then all rights in such copyrightable work will be the property of the State, subject to a reserved right for the University to use the copyrightable work for educational and research purposes and to allow other educational and nonprofit institutions to do so for educational and research purposes.
- C. Upon written request and subsequent amendment, the State may request delivery of computer software that is not identified as a deliverable on Attachment 1, but was first created in the performance of the Scope of Work. To the extent the University is legally able to do so, University shall grant a fully paid-up, royalty-free, nonexclusive, sublicensable, irrevocable license to use, reproduce, prepare derivative works, and distribute copies, to fulfill the State's government purposes, subject to restrictions, if any, identified on Attachment 1.

21. Patents

Patent Rights – Recipient

- A. Subject to the requirements of law, all rights to any patentable inventions or discoveries conceived and first actually reduced to practice in the performance of the Scope of Work, Attachment 1, conducted under this Agreement ("Patentable Inventions") shall belong to the Recipient. The State shall have a nonexclusive, sublicensable, irrevocable, paid-up license to practice or have practiced such Patentable Invention for government purposes.
- B. A State Confirmatory License (attached) will be executed by the Recipient to provide said license to any such Patentable Invention, within ninety (90) days after filing of patent application.
- C. Recipient shall file, prosecute and maintain a patent application claiming a Patentable Invention described in paragraph A above within two years of disclosure of a Patentable Invention to Recipient by inventors and will diligently pursue broad application of such Patentable Invention. If State notifies University of a need that is not being met by Recipient, Recipient will take steps to meet such need or will offer sufficient field-of-use rights to State to address such unmet need.

- D. If Recipient decides not to file a patent application within such two-year period or decides to abandon a patent or patent application claiming such Patentable Invention, and determines that it does not intend to pursue commercialization of such Patentable Invention, then Recipient will notify the State in sufficient time to preserve patent rights, and upon State agency request, Recipient agrees to assign title to State, subject to requirements of law, outstanding rights in third parties, and a reserved right to use the Patentable Invention for educational and research purposes and to allow other educational and nonprofit institutions to do so.
- E. Copyrightable works that may be patentable are also subject to the Patent Rights clause, which will take precedence in case of a conflict.

22. Travel

Travel and reimbursement for Recipient employee travel costs shall be in accordance with the Recipient's travel policy in effect as of the date the cost is incurred. The Recipient's travel policy is found at: <http://policy.ucop.edu/doc/3420365/BFB-G-28> [UC].

23. Closeout

The grant will be closed out after the completion of the project, receipt and payment of the final invoice and receipt and acceptance of the final report, resolution of any audit/desk review findings, and resolution of any performance or compliance issues.

Attachment 1 Scope of Work and Budget

Project Title: Develop HLB-Resistant Varieties by Generating SAMP Cis-Genic Citrus Rootstocks and Scions for Citrus Huanglongbing Control

Project Summary:

See Title

Deliverables:

List all items that will be delivered by Recipient to GRANTOR under this Scope of Work:

Identify deliverable	Date due	Specify in this column if the deliverable is a copyrighted work subject to GRANTOR ownership as set forth in Exhibit C, Paragraph 20(B). If not checked, default is for Exhibit C, Paragraph 20(A) to control.
1. Annual Report	November 1, 2023	
2.		
3.		
4.		

Third-Party data, materials or IP:

Will any data, materials or intellectual property owned by a third party be knowingly utilized by Recipient in the performance of the project?

If Yes, list third party data, materials and/or intellectual property here.

Will GRANTOR be restricted from its use of any deliverables, as identified above, due to any third-party encumbrance? If yes, describe restriction.

Detailed Project Description – see attached additional pages.

Budget – see attached additional pages.

**CALIFORNIA CITRUS NURSERY BOARD
PROJECT PLAN - RESEARCH GRANT PROPOSAL FOR FY2023-2024**

Project Title: Develop HLB-resistant varieties by generating SAMP cis-genic citrus rootstocks and scions for citrus Huanglongbing control

Fiscal Year: 2023-2024

Anticipated Duration of Project: 3 years

This Project is: New project (Year 1 of 3)

Project Leaders: Hailing Jin, UCR

Kris Godfrey, UCD

Affiliation: Department of Microbiology & Plant Pathology
Center for Plant Cell Biology
Institute for Integrative Genome Biology
University of California
Riverside, CA 92521

Mailing Address: as above

Phone: 951-827-7995

E-Mail: hailingj@ucr.edu

Executive Summary

Citrus HLB is the most devastating disease currently threatening US citrus production. HLB is associated with a phloem-limited bacterium *Candidatus Liberibacter asiaticus* (CLas) and transmitted by the Asian citrus psyllid (ACP, *Diaphorina citri*). Huanglongbing (HLB) causes approximately 70% of citrus production losses compared to peak production levels prior to introduction in Florida (NAAS, 1997-98 season vs. 2017 & 2021). The disease has spread to most citrus production areas, including California. The quarantine area in southern California has been expanding in recent years. Despite years of research on solutions, cost-effective and sufficient therapeutics for treating trees infected with CLas and preventing new infections transmitted by the ACP vector remain unavailable. The disease management relies primarily on vector management via insecticides, with resistance to mainstay chemistries looming, or using antibiotics, which have significant health and environmental side effects. We have developed a novel HLB management solution – **a stable antimicrobial peptide (SAMP), which is derived from HLB-resistant/tolerance citrus relative, the Australian finger lime** (Huang et al., 2021). It can function either as an **effective pre-treatment preventive to prevent infections from establishing or as a post-treatment therapy to inhibit existing infections** in greenhouse tests including ‘Washington Navel’ sweet orange, ‘Lisbon’ lemon, ‘Tango’ Mandarin, *Citrus macrophylla* and ‘Madam Vinous’ sweet orange. We have recently discovered that **SAMP also suppresses CLas in ACP through acquisition by plant feeding and that SAMP application suppresses ACP egg laying and nymph development**. Potato plants with the transgenic introduction of the SAMP gene show more resistance to *Candidatus Liberibacter solanacearum* (CLso) infection, which is transmitted by potato psyllid and causes potato Zebra Chip disease. Citrus HLB and potato Zebra Chip disease are caused by the same genus bacterial pathogen and are both transmitted by psyllids. Since SAMP-expressed potato is more resistant to CLso, we expected the SAMP-expressed citrus might be also resistant to HLB. We proposed using internal synthesis via cis-genetically transformed plants, which could be exempted from the rigorous regulations of GMOs. We have generated **cis-genetically transformed citrus trees, including rootstocks US942 and Kuharske (nematode resistant/tolerant version of Carrizo), and scion Hamlin** with the mature citrus facility at the University of Florida. We would like to test the CLas-resistant ability of the SAMP cisgenic citrus trees in this project. Using HLB-resistant rootstocks or scions is necessary for the most sustainable and economic management of HLB. We propose to create cisgenic HLB-resistant rootstocks and scions which fit the CCNB research priority 6, development and evaluation of HLB-resistant or ACP-resistant citrus. We expect to deliver HLB-resistance and/or ACP-resistance rootstocks and scions for distribution by the nursery industry in California.

Summary of the specific objectives of this project are:

Objective 1. Generated SAMP cisgenic rootstocks US942 and Kuharske, and scion Hamlin.

Objective 2. Verify the SAMP expression level in cisgenic US942, Kuharske, and Hamlin by evaluating mRNA and protein accumulation.

Objective 3. Test the HLB-resistant ability of cisgenic US942, Kuharske, and Hamlin.

Objective 4. Test the HLB-resistant ability of cisgenic US942, Kuharske, grafted with scions of important commercial varieties of California.

At the end of this project, we expect to provide HLB-resistant or ACP-resistant citrus as the most economical and sustainable strategy for HLB management. California citrus nurseries could sell HLB-resistant and/or ACP-resistant citrus cuttings or seedlings to growers to sustain the California citrus industry.

Project's Benefit to Citrus Nursery Industry

Huanglongbing (HLB) is threatening citrus production globally. Using HLB-resistant and/or ACP-resistant citrus is the most effective, economic and durable HLB management. In the United States alone, it has caused annual multibillion-dollar losses. Since its detection in 2005, Florida has lost approximately 162,200 acres of citrus and 7,513 jobs (<http://edis.ifas.ufl.edu>). The cases of HLB-positive trees and CLas-positive ACPs is increasing in southern California, and the quarantine area is expanding. In many cases, such as in Florida, where 80% of citrus trees are infected, it is no longer practical to remove all diseased trees. In order to effectively and economically manage this disease, using HLB-resistant and/or ACP-resistant citrus is necessary. This proposal aims to provide this strategy.

The antimicrobial peptide SAMP has a bactericidal activity that can directly kill *C. Liberibacter* strains much more rapidly and efficiently than antibiotics. It is also much more heat stable, which makes it more suitable in the hot citrus growing area. In addition, SAMP can also induce citrus immune responses, which can protect the plants from future infection (Huang et al., 2021). To generate citrus plants that naturally and systemically express SAMP with HLB-resistance would be the most cost-effective and sustainable way for citrus production. This project is to generate and select citrus plants, including rootstock US942 and Kuharske, and scion Hamlin, which naturally and systemically express SAMP with HLB-resistance and/or ACP-resistance.

We propose to develop HLB-resistance and/or ACP-resistance rootstocks and scions for use by California citrus nurseries using a cis-genic transformation approach which may be exempted from rigorous GMO regulations. It is essential that citrus nurseries supply healthy and disease-resistant trees to growers. We expect to deliver user-friendly HLB-resistance and/or ACP-resistance rootstocks and scions for distribution by the nursery industry in California.

Objectives

The ultimate goal of this project is to provide HLB-resistance and/or ACP-resistance

rootstocks and scions for citrus nurseries in California. We have already started the tasks for objective 1 in the past years and will continue on to complete all the objectives.

A summary of the specific objectives are:

Objective 1. Generated SAMP cisgenic rootstocks US942 and Kuharske, and scion Hamlin.

We have generated SAMP expression cassettes containing only citrus promoter, terminator and SAMP genes for creating SAMP-expressed citrus.

Objective 2. Verify the SAMP expression level in cisgenic US942, Kuharske, and Hamlin by evaluating mRNA and protein accumulation.

The trees confirmed containing SAMP expression cassettes will be future verified for their SAMP mRNA and protein accumulation.

Objective 3. Test the HLB-resistant ability of cisgenic US942, Kuharske, and Hamlin.

The trees confirmed to have SAMP accumulation rootstocks will be propagated by making cutting for the HLB-resistance test.

Objective 4. Test the HLB-resistant ability of cisgenic US942, Kuharske, grafted with scions of important commercial varieties of California.

Different scions will be grafted on SAMP-expressed and wild-type rootstocks for HLB resistance testing.

Workplans and Methods

Objective 1. Generated SAMP cisgenic rootstocks US942 and Kuharske, and scion Hamlin.

Task 1. All the DNA sequence in the SAMP expression cassette is from citrus or citrus relatives. Here we used a phloem-specific promoter, CsSUS1p, for SAMP expression.

Task 2. The SAMP expression cassette was introduced to US942, Kuharske, and Hamlin using particle bombardment, which was performed by the Mature Citrus Facility at the University of Florida. The DNA of the expression cassette was verified by PCR in the SAMP cisgenic trees.

Year 1 -- Generated SAMP cisgenic rootstocks US942 and Kuharske, and scion Hamlin. We have already started to transform the citrus. We expect to have the citrus tree for verification in the first year.

Milestones 1: Acquired cis-genic rootstocks US942 and Kuharske, and scion Hamlin verified by DNA insertion detection.

Objective 2. Verify the SAMP expression level in cisgenic US942, Kuharske, and Hamlin by evaluating mRNA and protein accumulation.

The trees confirmed containing SAMP expression cassettes will be future verified for their SAMP mRNA and protein accumulation.

Task 1. The SAMP mRNA level in cisgenic trees will be tested by RT-qPCR.

Task 2. The SAMP accumulation will be evaluated by western blot using an anti-SAMP antibody.

Task 3. Different scions will be grafted on SAMP-expressed and wild-type rootstocks. The SAMP accumulation in scions that graft on SAMP-expressed rootstocks will be evaluated by western blot.

Year 1 - Year 1.5 -- Verify the SAMP expression level in cisgenic US942, Kuharske, and Hamlin by evaluating mRNA expression and protein accumulation

Milestones 2: Acquired cisgenic rootstocks US942 and Kuharske, and scion Hamlin with good expression level of SAMP.

Objective 3. Test the HLB-resistant ability of cisgenic US942, Kuharske, and Hamlin.

The trees confirmed to have SAMP accumulation rootstocks will be propagated by making cutting for the HLB-resistance test.

Task 1. Make cuttings of SAMP-expressed rootstocks

Task 2. Graft SAMP-expressed Hamlin on SAMP-expressed or wild-type rootstocks.

Task 3. HLB-resistant ability test for cis-genic US942, Kuharske, and Hamlin. We will inoculate CLas by exposing the SAMP-expressed and wild-type trees to ACP-carrying CLas. The CLas titer will be evaluated by quantitative Real-Time PCR after 3, 6 and 12 months after exposure.

Year 1.5 - Year 2 -- Making the cuttings of SAMP-expressed US942, Kuharske and Hamlins

Year 2 - 3 --Test the HLB-resistant ability of cis-genic US942, Kuharske, and Hamlin in the greenhouse test in Contain Research Facility at UC Davis.

Milestones 3: Evaluate the HLB-resistant ability of cis-genic US942, Kuharske, and Hamlin

Objective 4. Test the HLB-resistant ability of cisgenic US942, Kuharske, grafted with scions of important commercial varieties of California.

Different scions of important commercial varieties, including ‘Washington Navel’ sweet orange, ‘Lisbon’ lemon, and ‘Tango’ Mandarin, will be grafted on SAMP-expressed and wild-type rootstocks for HLB-resistance testing.

Task 1. Make cuttings of SAMP-expressed rootstocks

Task 2. Graft ‘Washington Navel’ sweet orange, ‘Lisbon’ lemon, and ‘Tango’ Mandarin on SAMP-expressed or wild-type rootstocks.

Task 3. HLB-resistant ability test for ‘Washington Navel’ sweet orange, ‘Lisbon’ lemon, and ‘Tango’ Mandarin, grafted on cis-genic US942 or Kuharske. We will inoculate CLas by exposing the trees to ACP-carrying CLas. The CLas titer will be evaluated by quantitative Real-Time PCR after 3, 6 and 12 months after exposure.

Year 1.5 - Year 2 -- Making the cuttings of SAMP-expressed US942 and Kuharske.

Year 2 - 3 --Test the HLB-resistant ability of Navel' sweet orange, 'Lisbon' lemon, and 'Tango' Mandarin grafted on cis-genic US942, Kuharske, and Hamlin in the greenhouse test in Contain Research Facility at UC Davis.

Milestones 4: Evaluate the HLB-resistant ability of different scions grafted on cis-genetically SAMP-expressed US942 and Kuharske.

Project Management and Evaluation

One goal is to provide HLB-resistance and/or ACP-resistance rootstocks and scions for citrus nurseries in California. Inform and communicate with citrus nursery industry citrus growers about our findings during the course of the project and incorporate their feedback into ongoing work. Dr. Jin will coordinate all of the necessary aspects of this project and organize quarterly and annual reports to ensure the research milestones, interstate extension communication and activities, and quarterly updates are reasonably met within the desired projected timeline.

Dr. Jin, in consultation with project scientists, will design an evaluation report on research and overall project progress. Each report will include clear expectations for objectives and activity of participants. A management plan in each report will include a quarterly timeline table and scoring scale (0: incomplete, 1: in progress, and 2: completed) to evaluate the progress of research projects and extension outcomes. In addition to the progress scoring scale, outcomes will be qualitatively evaluated as being an expected result (E) or unexpected result (UE). The report scores will be included in the progress report for CCNB. Dr. Godfrey will oversee and conduct the studies at the UC-Davis Contained Research Facility. She will consult with Dr. Jin to design the studies and provide her with samples and data to satisfy the evaluation and reporting requirements. Dr. Jin will oversee the project and monitor its progress using these evaluation metrics. We expect we will develop HLB-resistance and/or ACP-resistance rootstocks and scions from this project which will be recommended to the nursery industry and citrus growers.

Using disease-resistant hosts is the most sustainable and cost-friendly disease control. These HLB-resistance and/or ACP-resistance rootstocks or scions generated by cis-genetically introducing SAMP antimicrobial peptides could aid the citrus nursery in its mission to provide healthier and stronger seedlings for growers, which plays an important role in HLB disease management.

Literature Review

We identified a stable antimicrobial peptide (SAMP) from HLB-resistant/tolerance citrus relative, the Australian finger lime. It can function either as an effective pre-treatment preventive to prevent infections from establishing or as a post-treatment therapy to inhibit existing infections in greenhouse tests. The test result with 'Lisbon' lemon, *Citrus macrophylla* and 'Madam Vinous' sweet orange was published in peer reviewed journal *PNAS* in 2021 (Huang CY, Araujo K, Sánchez JN, Kund G, Trumble J, Roper C, Godfrey KE, and Jin H. 2021. A stable antimicrobial peptide with dual functions of treating and preventing citrus Huanglongbing. *PNAS* 118: e2019628118. DOI: 10.1073/pnas.2019628118).

BUDGET PROPOSAL

Year 1

Project Title/Description: Develop HLB-resistant varieties by generating SAMP cis-genic citrus rootstocks and scions for citrus Huanglongbing control

Project Leader: Hailing Jin

Proposed Fiscal Year: 01/01/2023 – 12/31/2023

A. PERSONNEL SERVICES:

Individual's classification @ 40% effort \$ 34,711

Staff Benefits = 28.34 % \$ 9,025

TOTAL PERSONNEL SERVICES \$ 43,736

B. OPERATING EXPENSES:

Laboratory Supplies \$ 10,000

Travel \$ 1,000

Postage \$ _____

Other: Citrus Seedlings \$ 1,000

UCR Facility Charge \$ 2,000

C. TOTAL OPERATING EXPENSES: \$ 14,000

D. TOTAL BUDGET REQUESTED: \$ 57,736

Signature of Requestor:  Date: 11.22.2022

Signature of Cooperator:  Date: 11/22/2022

Department Chair:  Date: 11.22.2022

BUDGET PROPOSAL
Year 2

Project Title/Description: Develop HLB-resistant varieties by generating SAMP cis-genic citrus rootstocks and scions for citrus Huanglongbing control

Project Leader: Hailing Jin

Proposed Fiscal Year: 01/01/2024 – 12/31/2024

A.	<u>PERSONNEL SERVICES:</u>	
	Postdoctoral Researcher level 1 @ 60% effort for 9 months	\$ <u>26,903</u>
	Staff Benefits = <u>25.70</u> %	\$ <u>6,995</u>
	TOTAL PERSONNEL SERVICES	\$ <u>33,898</u>
B.	<u>OPERATING EXPENSES:</u>	
	Laboratory Supplies	\$ <u>10,000</u>
	Travel	\$ <u>1,000</u>
	Postage	\$ _____
	Other: Citrus Seedlings	\$ <u>1,000</u>
	UCR Facility Charge	\$ <u>2,000</u>
	UCD Subaward – Kristine Godfrey	\$ <u>26,799</u>
C.	<u>TOTAL OPERATING EXPENSES:</u>	\$ <u>40,799</u>
D.	<u>TOTAL BUDGET REQUESTED:</u>	\$ <u>74,697</u>

Signature of Requestor: _____ Hailing Jin _____ Date: 11.22.2022

Signature of Cooperator: _____ Kristine Eln Godfrey _____ Date: 11/22/2022

Department Chair: _____ Howard Jacobson _____ Date: 11.22.2022

BUDGET PROPOSAL
YEAR 3

Project Title/Description: Develop HLB-resistant varieties by generating SAMP cis-genic citrus rootstocks and scions for citrus Huanglongbing control

Project Leader: Hailing Jin

Proposed Fiscal Year: 2025 - 2026

A. PERSONNEL SERVICES:

Postdoctoral Researcher level 2 @ 60% effort for 8.4 months \$ 26,903

Staff Benefits = 25.70 % \$ 9,327

TOTAL PERSONNEL SERVICES \$ 45,197

B. OPERATING EXPENSES:

Laboratory Supplies \$ 10,000

Travel \$ 1,000

Postage \$ _____

Other: Citrus Seedlings \$ 1,000

UCR Facility Charge \$ 2,000

UCD Subaward – Kristine Godfrey \$ 28,072

C. TOTAL OPERATING EXPENSES: \$ 42,072

D. TOTAL BUDGET REQUESTED: \$ 74,879

Signature of Requestor: Hailing Jin Date: 11.22.2022

Signature of Cooperator: Kristine Eln Godfrey Date: 11/22/2022

Department Chair: Howard Jacobson Date: 11.22.2022

JIN-23

Final Audit Report

2023-05-11

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