Title: Avocado Breeding Program: meeting the production challenges in the 21st century.
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Executive summary:

- Maintenance of germplasm, elite avocado, and international material required for avocado breeding. These avocado material harbor avocado important agricultural traits including disease and salinity tolerance.
- Maintenance of current personnel of the UCR avocado breeding programs.
- Maintenance of the Gwen Mapping Population to assess its utility to generate molecular markers that can be used for genomic selection. This Mapping population will be used as proof of concept experiments to test several molecular platforms to assess the genetic diversity of our material as well as for genotyping our material.
- Evaluate the status of the UCR rootstock program to adjust the activities that need to be done to increase its efficiency.

Overall objective:
The overall research efforts for this proposed project is to maintain the plant material (scion and rootstock) that the UCR avocado breeding program currently has as well the personnel required to continue all the research and field activities related with the breeding program. This project will allow us to maintain the program and some of the activities related with the PRR and salinity rootstock screening until the full proposals are submitted to the California Avocado Commission on March 2015.

Summary of the milestone accomplished during this period:

- All avocado plant material was maintained at all the locations (UCR greenhouses, AgOPs, SCREC, etc)
- Travel money was used to visit all the AgOPs sites and SCREC in order to assess the status of our rootstock material. In addition, we initiated the travels to some of the active plots (rootstock trials) in the South in order to reconnect the communication with growers.
- We initiated the soil and root material collections at the active field sites to standardized our techniques for *Phytophthora cinnamomi* isolation from soil and roots. We have starting implementing the protocol for pathogen isolation and soil baiting.
- We have continued the screening from seedling of elite rootstock material for *Pc* tolerance.
- We visited different Nurseries to determine the different clonal material we can obtain from each one.

Results from the prelimiary evaluations and activities from this period:

These adjustments are proposed based on our preliminary evaluation of all the UCR rootstock material at AgOPs and SCREC done during this funded period

Current situation	Proposed adjustments	Outputs
Traditional breeding approach	Traditional breeding complemented with molecular-breeding approaches	More targeted genomic selection resulting in an efficient program
No periodic evaluation of germplasm collections	Eliminate unnecessary material	Enhance program sustainability
No maintenance of germplasm trees in the collection	Repropagate and transfer material to a new field; prune and maintain reasonably sized trees	Enhance program sustainability
Rootstock collection grafted to a different variety	Microclonal grafted on their own rootstocks	Improved maintenance and assessment of horticulture characteristics of rootstocks
Approximately 50% of UCR plant material has been tested for sunblotch viroid	100% material will be tested for Sunblotch infection	Eliminate infected material and work with clean material (germplasm and breeding blocks)
Incomplete or no characterizations of field trials in terms of pathogen population and soil salinity	Characterization of current and new field sites in relation to disease pressure and salinity.	More accurate, improved efficiency of the field testing
Greenhouse seedling screening performed with a single pathogen isolate	Diverse number of isolates representing the current pathogen population will be used for screening	The resistance of the advance selections will be effective against a broad range of isolates
Lack of communication or inconsistent communication with cooperators	Improved and consistent communication and engagements with growers. First visits to fields sites were done.	Increase the grower interest to cooperate with UCR
Greenhouse screening are performed in seedlings with different size and root development	Use of germination bags in order to sort and inoculate seedlings similar size and root development	Using seedling of different size and root development could potentially results in wrong assessment of the PRR disease
Daily fertilization before inoculation during greenhouse screening	Biweekly fertilization	Fertilization could increase soil salinity and also some nutrients like nitrogen could affect the disease severity
No cycles of wet and dry periods	No cycles of wet and dry periods	In order to get good *Phytophthora* infection a series of wet and dry cycles is recommended (Brisbane Australia)
Disease resistance assessment based on % of healthy root tissue (40% up)	Disease resistance assessment based on % of healthy root tissue (60% up)	Disease resistance cut off is to low (less than 50%). This need to be increase to 60% and also complemented with other methods to assess pathogen growth

Conclusions:

Preliminary assessment of the UCR rootstock program indicates that several adjustments and changes need to be done in order to increase the sustainability and efficiency of the program. We need to establish specific activities in order to increase the program efficiency. Some of these milestones have been proposed in the recent 5-year proposal that was submitted to CAC ("**Development of new avocado rootstock varieties resistant to *Phytophthora cinnamomi* and salinity by the implementation of molecular breeding approaches for genomic selection").**