INTERNATIONAL ORGANIZATION OF CITRUS VIROLOGISTS

NEWSLETTER July 2014/July 2015

In this Issue

Click to jump to page

From the Chairwoman

Juliana Freitas-Astúa, Chairwoman

Dear IOCV friends

Time definitely flies! I am sure we all still remember the good moments we spent during the 19th IOCV Conference in South Africa. However, soon enough we will be meeting in the 20th IOCV Conference. Many of you may remember that, in South Africa, China and Argentina/ Uruguay offered to host the next conference. However, our colleagues from South America had to withdraw their candidacy, while China decided to keep it. Hence, as you will read in details inside this newsletter, the 20th IOCV Conference will be held in Chongqing, in April 2016. It is less than one year from now, and the local organizing committee is already working hard to make this as wonderful as the other IOCV Conferences have been over the years. Our friend Changyong Zhou, chair-elect of the IOCV and president of the next IOCV Conference, will bring you more information on that… and don´t forget to save the date since now, because this will be a meeting that no one should miss!!

In this issue of our newsletter we also have exciting news on an old dream: the Journal of Citrus Pathology is up and running. The editorial board (Josy Bové, Bill Dawson, Tim Gottwald, Mike Melzer, Pete Timmer and Georgios Vidalakis) has put a lot of effort on transforming the ideas and discussions of IOCV into reality and you can read more about it below. Information on how to submit manuscripts to JCP are in the journal´s homepage at https://escholarship.org/uc/iocv_journalcitruspathology.

Additionally, this newsletter brings very interesting texts that go from updates on HLB and the "10th anniversary" of its arrival in the Americas to information on people who have been very important to the IOCV over the years.

We wish our friends who retired a great new life ahead… you will always be part of the history of the IOCV and example to younger generations of citrus virologists and bacteriologists. So keep contacting us, sending us relevant information and helping us to make our organization as relevant as it has always been. Please don´t vanish!!

And to all IOCV members, I am sure you will appreciate reading this newsletter. Enjoy the ride!!!

Juliana

IOCV

XX IOCV Conference Announcement
Chongqing, China
April 10-15, 2016
Post Conference Tour
April 15-19, 2016

Changyong Zhou, Chairman Elect

On behalf of Citrus Research Institute (CRIC) of Southwest University (SWU)/Chinese Academy of Agricultural Sciences (CAAS) and the Local Organizing Committee of the 20th Conference, International Organization of Citrus Virologists (IOCV), we extend warmest welcome to the citrus scientists and producers worldwide to attend the 20th IOCV conference, which will be held in Chongqing, China, in April 10-15, 2016.

Yuzhong, Chongqing

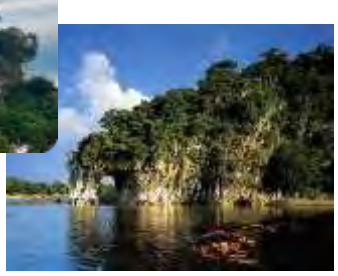
The conference, with the theme of international cooperation and the dissemination in study and control of citrus graft-transmissible diseases, will be organized by the IOCV Committee and CRIC of SWU/CAAS, with the collaboration of Chongqing Agriculture Commission and Guangxi Academy of Agricultural Sciences. The venue of the conference will be at Haiyu Hotspring hotel (5 stars), located in the leisure and conference center of Beibei, Chongqing within walking distance to Jinyun Mountain National Forest Park and 36 km away from Chongqing Jiangbei International Airport.

Accommodation will also be available at Haiyu hotel and Haixu Garden hotel (3 stars) at the rates of $80 and $40 per night, respectively.

Plenty of scientific programs, mid-conference tours, post-conference tours (April 15-19, 2016) and other scenery tours will be organized. Scientific programs are being organized by the Scientific Committee consisting of IOCV members. The mid-conference tour includes a visit to CRIC and a citrus growing area in Changshou, Chongqing (1 hour drive from the conference venue).

Tristeza, tatter leaf, exocortis and blackspot will be observed in this region, and we also believe a boat trip on the Changshou Lake will offer you a chance to enjoy the beautiful local natural scenery. The post-conference tour includes a tour to Guilin, Guangxi to visit well and poorly managed citrus orchards with HLB, Kumquat farms protected by mulch in Yangshuo and virus-free nurseries in Guangxi Citrus Research Institute.

A local tour in Guilin, including Li River, Impression Liu Sanjie Show and Seven-star Cave, will also be arranged. The tours to the Dazu Rock Carvings (nearly



2 hours by coach), the South China (Wulong) Karst (2.5 hours by coach), the Three Gorges (3 days) and Chongqing urban area will also be available to our guests.

During the period of the congress, Sichuan opera and typical Chinese food such as hotpot will be offered. The delegates will be shown to the handmade food street in Hongyadong and have night sightseeing on boat along the Yangtze River in downtown. We are looking forward to meeting you in Chongqing, China in 2016.

With warmest regards.
Changyong Zhou

XX IOCV-Local Organizing Committee

Dr. Weiguo Zhang
President of SWU

Dr. Changyong Zhou
Vice president of SWU
Director of CRIC

Dr. Xiaochun Zhao
Assistant director of CRIC

Dr. Zhongan Li
Assistant director of CRIC

Mr. Zuxiang Xia
Director general of Chongqing Agricultural Committee

Mr. Xianjin Bai
President of Guangxi Academy of Agricultural Sciences (GAAS)

Mr. Renming Zhan
Vice director general of Chongqing Agricultural Committee

Mr. Chongling Deng
Director of Guangxi Citrus Res. Institute, GAAS

The Journal of Citrus Pathology Volume 1 Issue 1 and More is Here

Mike Melzer, Editor

In March 2014, the IOCV membership endorsed the creation of a new, open-access journal to supplant the current IOCV Proceedings publication. With this endorsement, an IOCV working group led by Dr. William Dawson (Florida) started work on the development of the "Journal of Citrus Pathology".

To increase the readership of this journal and perhaps interest in the IOCV, the scope of this journal has broadened in comparison to its predecessor, and will include "all branches of pathogens and diseases of citrus, and any agents affecting citrus biology, invited reviews of significant developments in citrus pathology, and occasional invited autobiographies and biographies of pioneer leaders of the field."

With the help of Dr. Georgios Vidalakis (UC Riverside), this open access journal was established on the University of California's eScholarship system. With the help of Ms. Tomie Vowell

(Hawaii), the first volume was published in late 2014, and consisted of the keynote address and raw abstracts of the 3rd International Research Conference on Huanglongbing.

The second volume, which will include the manuscripts submitted at the 19th IOCV Conference, is undergoing a formatting facelift courtesy of our copy editor, Dr. Sarah Jane Cowell (Florida) and graphics contributed by Drs. Tim Gottwald (USDA-ARS) and Dawson. On behalf of the team who made this new journal a reality, we would like to thank you for your patience as we learn how to run an electronic journal, and we look forward to your submissions.

Journal of Citrus Pathology-Contents

Volume 1, Issue 1, 2014

1. Special Section: IRC-HLB III (3rd International Research Conference on Huanglongbing)

Volume 2, Issue 1, 2015

Letters to the Editor

1. Wang, N.; Jin, T.; Trivedi, P.; Setubal, J. C.; Tang, J.; Machado, M. A. et al. Announcement of the International Citrus Microbiome (Phytobiome) Consortium.

Articles

1. Wulff, N. A.; Teixeira, D. C.; Martins, E. C.; Toloy, R. S.; Bianco, L. F.; Colletti, D. A.B. et al. Sunn hemp, a major source-plant of the phytoplasma associated with huanglongbing symptoms of sweet orange in São Paulo State, Brazil
2. Bar-Joseph, M. Xyloporosis: A history of the emergence and eradication of a citrus viroid disease
3. Graham, J.; Feichtenberger, E. Citrus phytophthora diseases: Management challenges and successes
4. da Graça, J. V.; Kunta, M.; Sétamou, M.; Rascoe, J.; Li, W.; Nakhla, M. K. et al. Huanglongbing in Texas: Report on the first detections in commercial citrus

RETIREMENTS

The last couple of years a number of good friends, colleges and IOCV members have retired. We would like to wish them well, enjoy their time with family, friends, and loved ones and we are looking forward to seeing them in IOCV events and yes, we still expect them to be part of IOCV activities.

In this IOCV newsletter issue we will present a small portion of the long, productive, influential and transformative career of Luis Navarro. In the upcoming issues we will highlight the carriers and service of Nuria Duran-Vila, Mariano Cambra, Pedro Moreno, Richard Lee, and Pete Timmer.

Luis Navarro Retires

Robert Krueger

Luis Navarro retired early in 2015 after many years of work with citrus pathology and biotechnology. Luís obtained a degree as an Agronomic Engineer from the la Universidad Politécnica de Valencia and his PhD from the Instituto de Agroquímica y Tecnología de Alimentos del CSIC. After his postdoctoral work at UC Riverside, as detailed below by Chet Roistacher, Luís in 1974 incorporated into the Instituto Valenciano de Investigaciones Agrarias (IVIA), where he worked for the rest of his career. At the time of his retirement, Luís was Director of the Centro de Protección Vegetal y Biotecnología at IVIA.

His work at IVIA was oriented towards the development of biotechnological tools for the genetic and phytosanitary improvement of plants, especially citrus, and their application in solving production problems for citrus. His development of shoot-tip grafting to obtain pathogen-free propagation materials, as applied particularly in Spain, lead to a great renovation of the Spanish citrus industry and became a model for programs in many other countries. Luís also had an active research program in ploidy manipulation, somatic fusion, genetic transformation, and their utilization for varietal development. He has published more than 200 papers in journals, books, and proceedings, and has released 25 new citrus varieties.

Luís is a Commissioner of the National Program for the Conservation and Utilization of Genetic Resources; Member of the French National Academy of Agriculture; Honorary Member of the International Society of Citrus Nurserymen and of the Latinamerican Phytopathological Society; and Founder and First President of the Spanish Tissue Culture Society. He has been awarded the Medal of the Order of Merit for Agriculture, the Jaime I Prize

for New Technology, and the Wilson Popenoe Award of the American Society for Horticultural Science, the latter for his work on shoot-tip grafting. Luís served as President of the International Society for Citriculture from 2008 – 2012 and was the chief organizer of the very successful XII Congress held in Valencia in 2012. Luís has been active in IOCV, serving as President from 1986 – 1989, and elected a Fellow in 2007.

Luís Navarro ranks as one of the major citrus scientists of our time. His career is one of service and accomplishment. We wish Luís well in what appears will be an active retirement.

(This bio was condensed from http://www.uv.es/prometeo/masInfo15o.htm and Phytoma No 170, June/Jul 2005. Thanks to Dras Gema Ancillo and MariCarmen Vives for their assistance)

Luis Navarro and Shoot Tip Grafting. The Early History of the Magic Cut for Eliminating Viruses from Citrus.

Chet Roistacher

By decapitating the microscopic growing tip of a young shoot with a rapid stroke of the tip of a razor blade and then grafting this almost invisible tip onto a toothpick sized seedling, the course of citrus virology and citrus industries throughout the world was dramatically altered. This procedure eliminated most if not all of the known graft-transmissible diseases of citrus and succeeded in the production of virus-free citrus trees with the subsequent savings of many millions of dollars to citrus growers worldwide. I should like to relate the story behind this momentous development in plant pathology and I am proud that I had been intimately involved in its history

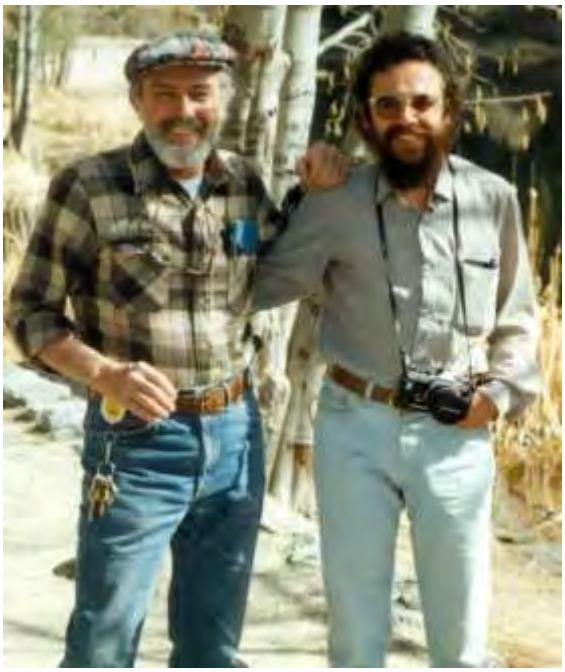
THE BIRTH OF SHOOT TIP GRAFTING.

Early in 1972 my first introduction to shoot tip grafting came when my co-worker, Mr. Ed Nauer came to me and asked if I would index certain plants which were produced by his colleagues in the Department of Horticulture, specifically Dr. Toshio Murashige, Dr. Bill Bitters and T.S. Rangan. He mentioned that research was being done on a new technique developed by Dr. Murashige who was the world's foremost tissue culture specialist. I proceeded to index the budwood he gave me to specific indicator plants and to my great surprise the exocortis viroid, which previously could not be eliminated by heat therapy, was eliminated by this new technique. This information was published (1) and for a few years I had heard nothing more about this work.

Dr. Luis Navarro receiving the Rey Jaime I Prize for New Technology

At one of our monthly meetings of the committee responsible for the Citrus Variety Improvement Program in California, Dr. Murashige was invited to address our group on his new technique. Many of the important individuals from the Departments of Plant Pathology and Horticultural Science, the

USDA, the University Extension Service and representatives of the California Department of Agriculture were present. Dr. Murashige lectured on the new procedure he had developed which he called "shoot apex" or "shoot tip" grafting for the possible elimination of viruses. I sat in amazement as he described how, using a binocular microscope, he would decapitate the tiny tip of a little shoot and carefully transfer this tip to the top of a cut seedling, size of a toothpick. He then put the newly grafted miniature plant in a sterile test tube containing a nutrient solution and produced a small grafted plant in the test tube. Dr. Murashige explained that when a tiny rootstock seedling is cut, exposing the fresh cut surface, and a small shoot-tip is placed on this cut surface, a union or graft of the two surfaces develops and the tiny tip will grow and produce a miniature grafted plant. This work was all done under a hood and under sterile conditions. This seemed to me to be a very remarkable scientific achievement. I also realized that the budwood was the same as that I had previously indexed for Mr. Nauer which came from this new process and which I had found to be free of the exocortis viroid.



Chet Roistacher and Luis Navarro 1986

Dr. Murashige explained how he had tried to culture the citrus tips on an artificial media, a tissue culture technique used with many other plants in forestry and floriculture where new improved clones of certain pines or carnations could be propagated by the thousands by growing small plant tips on an artificial culture medium. However, no matter how hard he tried, and no matter what nutrient formulations he used, he could not grow citrus tips directly on any of his culture media. I believe that the genius of Dr. Murashige was in conceiving the idea that what better culture media could there be but the cut surface of a small seedling rootstock which contained all of the natural vitamins, nutrients and substances need to support the growth of the small decapitated shoot tip.

After his talk I went to his office and introduced myself, having never formally met him before. I told him that I believed that his work was possibly one of the most important discoveries in the history of citrus virus disease control and I felt it should be vigorously pursued. I asked him if he could teach me the technique of making these miniature grafts. I said that I would be willing to work nights to do this work. My interest and enthusiasm was backed by my knowledge that we had eliminated the exocortis viroid by this technique, and I believed that it might be possible to eliminate other citrus viroids and viruses by this new technique. I also knew by my previous research that the viroids could not be eliminated by thermotherapy. He then told me that there was much research that still needed to be done in perfecting the new technique since the success of his grafts were quite low. He mentioned that there was a possibility that a young post doctorate student, then in Spain, might be coming to Riverside to do this needed research work. Dr. Walter Reuther, who was in Spain at that time, had written to him about this prospective post graduate student and believed that he might be well suited to follow up on this research. Dr. Murashige assured me that when and if this student came, and at the appropriate time, he would introduce him to me and we might work together.

ENTER LUIS NAVARRO FROM SPAIN.
About a year had passed since Dr. Murashige's lecture and my subsequent discussion with him. Then, one day in 1973, I received a telephone call from him reminding me of our last meeting. He mentioned that he was now ready to introduce me to the young man from Spain who had been working in his laboratory for the past eight months. He said that this Post-Doctorate fellow was now ready to transplant and grow out the many plants he had developed by shoot tip grafting which were now in

test tubes. He asked if it was convenient to bring him down to the Rubidoux greenhouse and introduce him to me, and perhaps the both of us could work together to transplant and then index these test tube plants. I told him I was available and Dr. Murashige arrived at our Rubidoux greenhouse shortly after his call. I was then introduced to a short, bearded, hippie type young man with curly, bushy hair and beard. Although he appeared very alert, his eyes looked tired. He was dressed in faded blue jeans and an open collared shirt. We looked at each other and there was mutual admiration at first sight. This was Dr. Luis Navarro, the post doctorate student who had been working very hard on improving the technique developed by Dr. Murashige. Shoot tip grafting is a most difficult and tiring procedure, and Navarro had been working many long nights, sometimes without sleep, and into the early morning hours doing these numerous grafts. He had produced a large number of grafted plants, all in test tubes, and they were now ready for transplanting to the soil. However, he had looked into the Department of Horticulture greenhouses on campus and was discouraged for he felt that the conditions in these greenhouses were not of the best and realized that all of his hard work might come to naught if his plants should die by Phytophthora, which he believed was present. At this point he went to Dr. Murashige and wondered how he could make his plants survive after he removed them from the test tubes and transplanted them to the soil under conditions which he found unsatisfactory in the Horticultural Sciences greenhouses. It was at this moment that I had received the telephone call from Dr. Murashige and their subsequent visit to our Rubidoux greenhouse.

I took Luis Navarro for a tour of our facility and explained our UC system for growing plants free of soil organisms and pests. He was deeply impressed by what he saw. I assured him that we could transplant his miniature plants from the test tubes to the soil and make them survive and grow and we could later index them. Dr. Murashige excused himself and Luis and I sat down and began to plan our future work. We thought alike in research matters in many ways as we outlined a plan of operation to index his plants for viruses and viroids to see if shoot tip grafting had eliminated them.

For the next year, we collaborated and worked in harmony. We were very excited at what we were doing and we virtually filled the greenhouse at Rubidoux with our index plants. It was a labor of love and enthusiastic excitement and one of the most creative and inspiring periods of my research life and I also believed his. I could not have found a more dynamic, creative and thoughtful person than that of Luis Navarro, who has remained a good friend, collaborator and confidant in research for over 40 years.

Dr. Navarro had worked for one year to refine the methods developed earlier by Dr. Murashige. His improvements included detailed experiments for locating the best place for placing the decapitated shoot tip. He found that if he made an inverted T-cut just below the top of the cut off seedling, and place the small shoot tip on the shoulder of the cut, he could observe the young growing shoot emerging out of this area and be assured it was the grafted tip that was growing and not an adventitious shoot. He refined the precise vitamins and chemicals needed in the culture medium and found that if he added a high amount of sugar to the medium, he achieved a greater number of successful grafts. He also discovered that if he grew his seedlings in the dark prior to grafting he would also substantially increase the number of successful grafts. Also, if he put his newly grafted plants under high light intensity he could again increase the efficiency of the operation. Thus by hard, tedious and excellent research did Navarro succeed in increasing the efficiency of the earlier work done by Dr. Murashige, and he had increased the percentage of successful grafts from 5% to as high as 60%.

We now proceeded to make these little grafted plants grow into small trees by transplanting them to soil

Luis Navarro at the 2012 International Citrus Congress

and then indexing them for the elimination of viruses and other pathogens which we knew were present before shoot tip grafting.

Shown in this historic series of pictures taken in 1975 is Luis Navarro transplanting the first shoot tip grafted plants from the test tubes to the soil (Figs.1&2). The newly transplanted plants in small containers were covered with plastic and placed under shade (Figs. 3). Fig. 4 shows that nearly all of the plants which we removed from the test tubes and transplanted to the soil had lived. We achieved over 95% success in transplanting from the test tubes to the soil. Fig. 5 shows Luis and I writing up our paper and this was published in the Journal of American Society for Horticultural Science. As shown in Fig. 6 (next page) this paper was given the prestigious Wilson Popenoe award for Excellence in Research in 1976.

References cited:
1) Murashige et al., T., W.P. Bitters, T.S. Rangan, E.M. Nauer, C.N. Roistacher and P.B. Holliday. 1972. Hort. Science 7:118 119.
2) Navarro, L., C. N. Roistacher, and T. Murashige. 1975. J. Amer. Soc. Hort. Sci. 100:471-479.

Fig. 1.

Fig. 2

Fig. 3

Fig. 4.

Happy retirement

Steve and Rosalee Garnsey
Dear Luis,
We would like to wish you a happy retirement and to congratulate you on the incredible accomplishments which you have made during your "citrus" career. The email I received from Tania in early January informing us of your pending retirement brought back a flood of pleasant memories.

First of all, I feel lucky to have been involved for many years in the US-Spain Cooperative Project and become acquainted with IVIA in action. I not only learned a great deal during each visit, but even more valuable were the collaborations that arose (including our shoot-tip grafting project at Beltsville where I watched masters in action). In addition, there are life-long personal friendships, and insights into Spanish culture and history that remain precious to Rosalee and me to this day. We still reminisce about living in your apartment in Valencia for a month, and the insights which it

gave us into daily Spanish life.

Somehow, your retirement, along with those of Pedro, Mariano, and Nuria, brings a sense that a golden era is coming to an end for IVIA but I hope that the next generation will work hard to maintain what you and your colleagues built.

Your technical contributions to the development of shoot-tip grafting as a means to obtain pathogen-free citrus cultivars are certainly impressive by itself. However, I think that even more impressive was your vision and your ability to incorporate this technology into a broader program for citrus improvement that has benefited the citrus nurserymen and commercial growers world-wide.

I know and appreciate also the time and effort you invested in building IVIA into a world class institution staffed with outstanding scientists and support staff along with state of the art laboratories and plant growing facilities. Your abilities to convince government administrators to invest in your visions were amazing.

In summary, you have left a mark in science and citriculture that will live on, and, somehow, I suspect that even though you may be formally retired, there may be still more to come with your new freedom to choose how to use your time (the time that Amalia has not already programmed for you). We certainly hope that this will also include another visit to the ranch in the near future.

January 31, 2015

Fig. 5

Fig. 6

AROUND THE WORLD

All Meyer Lemons Are My Children

Chester Roistacher

A few days ago while walking my back yard and admiring the yard, feeding the birds and looking at my fruiting citrus trees, I noticed that the fruit on my Meyer lemon tree is now glowing in color with its winter coat of yellow. I also realized there is a story here to write. Would you believe that for the past 40 or more years, all virus-free Meyer lemon trees grown worldwide are my children and came from a single budstick that I treated with moist-hot

Chet Roistacher with one of his beloved Meyer Lemon tree.

air to rid it of viruses? Please forgive - I expect that with age, senility is setting in and I start bragging!

I am working on this history now telling the story of the research leading to how we give a fever to a Meyer lemon budstick similar to when your temperature rises to rid your body of virus or bacteria and so successfully rid the budstick of its virus. However, the technology for this treatment came from a Chinese professor and by my honoring him and giving due credit to him, I did not realize that I had liberated him and his family. This is a most interesting and historical story.

California's Citrus Clonal Protection Program (CCPP) and the Citrus Nursery Stock Pest Cleanliness Program

Georgios Vidalakis

The past few years have been truly transformative for the CCPP. The retirements of veteran personnel John Bash, Jim Diaz and Raul Gonzales, whom I thank for many years of service; the renovations and expansions of the Rubidoux Quarantine Facility and the Lindcove Foundation Block, respectively; the upgrades of the UC Riverside Citrus Diagnostic & Research Laboratories; the move to new offices in the 1907 Citrus Experiment Station building; the building of a 19 members strong CCPP team of undergraduate and graduate students, senior and junior researchers and staff; the launch of the online "CCPP Data Management System" that include applications for budwood ordering, inquiry for citrus variety introductions and variety evaluation data; the monthly budwood distributions, the revival of the "UC Riverside CCPP Advisory Committee"; and last but not least the establishment of the Citrus Clean Plant Network, one of the biggest networks of the National Clean Plant Network are just some of the recent CCPP transformative developments.

You can find more details on the recent CCPP developments on the Citrograph articles online at:

http://citrusresearch.org/citrograph/citrograph-winter-2014-2/

http://citrusresearch.org/citrograph/citrograph-summer-2014/

You can also visit:

http://citrusresearch.org/citrograph/citrograph-may-june-2010-2/

http://citrusresearch.org/citrograph/citrograph-july-august-2010/

for an overview of the citrus quarantine, sanitary, and certification programs in the USA.

Citrograph is a valuable free access magazine that you can find interesting high value information on a variety of different topics including reports on citrus research sponsored by the California Citrus Research Board.

I would like to take this opportunity however to highlight one recent success story that demonstrates in real life a basic plant pathology principal.

Citrus scion and seed material that has been tested and found free of graft-transmissible diseases consistently produces the high quality fruit necessary for the continued productivity and growth of the California citrus industry. Diseases present in California that could cause serious problems to the citrus industry are spread through propagations using infected nursery stock. To counteract this problem, a disease testing program, to systematically eliminate diseased registered budwood and seed source trees owned by California nurseries has been in place since the 1930s. Originally the "Psorosis Freedom Program" was based on visual examination of budwood and seed source trees for psorosis symptoms. Later on and with the development of biological indexing and immunological assays such as ELISA, the citrus nurseries entered the "Registration Testing Program" (Calavan et al. 1978, Wallace 1978, Timmer et al. 2000). Today the California citrus nursery germplasm sources disease testing program is named "Citrus Nursery Stock Pest Cleanliness Program" and is mandatory and executed fully in the laboratory using real time quantitative PCR (qPCR) assays.

More specifically, prior to May 17, 2010, the registration program (active since 1962) included annual mandatory testing for the citrus tristeza virus (CTV) and voluntary testing for the psorosis (Citrus psorosis virus, CPsV) and psorosis-like diseases and citrus viroid diseases every five years. The mother

seed tree sources were tested for the psorosis and psorosis-like diseases every six years, also on a voluntary basis. The reason for the mandatory CTV testing had nothing to do with the registration program per se but it was enforced on citrus movement and propagations due to the CTV State Interior Quarantine. Increase blocks propagated from registered source trees budwood could be used for the propagation of certified trees for commercial groves for 18 months without any additional testing and for 24 months with one CTV test. After 18 (or 24) months, the increase block had to be destroyed and new registered budwood had to be obtained to produce new increase blocks.

On May 17, 2010, regulations for a mandatory Citrus Nursery Stock Pest Cleanliness Program were filed as an emergency action, based on the authority conveyed in Food and Agricultural Code, Sections 6940-6945 (http://www.cdfa.ca.gov/plant/pe/nsc/nursery/citrus.html). The new registration program includes the use of protective nursery structures and the testing for huanglongbing, tristeza, psorosis (and psorosis-like), and citrus viroids.

On May 21, 2012, a comprehensive protocol for the high throughput semi-automated robotic nucleic acid extraction and purification for citrus tissues and the RT-qPCR universal detection of citrus viroids was submitted to the CDFA by the CCPP research team.

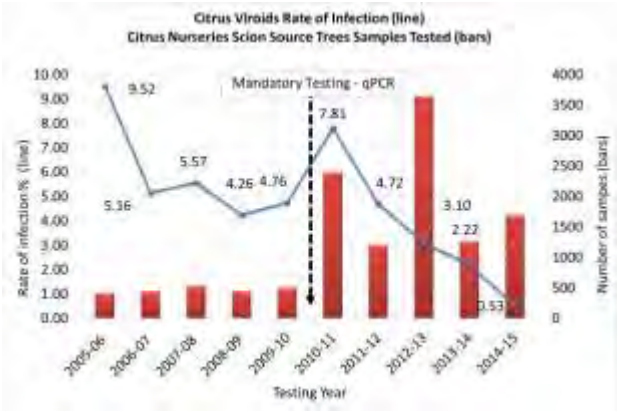
On September 10, 2012, CDFA issued the "NO. QC 1354, Permit For PCR Protocol For Viroid Testing In Citrus Nursery Stock Pest Cleanliness Program" approving the use of the above technology in the mandatory Citrus Nursery Stock Pest Cleanliness Program.

On January 14, 2014, CDFA issued the "NO. QC 1388, Permit For PCR Protocol For Virus Testing In Citrus Nursery Stock Pest Cleanliness Program".

Today, the CDFA approved test for tristeza, Huanglongbing, citrus viroids, psorosis and leaf blotch is qPCR. The testing is performed by the CCPP personnel and CDFA approved laboratories. Budwood is collected at the nurseries by CDFA Biologists. Budwood is harvested from the four quadrants (NSEW) of all nursery owned registered trees during fall or spring when pathogen titers are expected to be high. This budwood is labeled by CDFA field staff and is submitted for testing.

Briefly, budwood from nursery source trees is processed (bark removal, chopping, and freeze-drying) in the lab and stored at -80°C. The frozen citrus tissue is used for the extraction of total nucleic acids (DNA and RNA) using the newly developed semi-automated protocol "Cryo-station, Geno Grinder 2010, and MagMAX Express-96 -Nucleic Acid Extraction and Purification Protocol for Citrus Tissue". Quality of the nucleic acid extracts is assessed by spectrophotometry. The nucleic acids are used as template for RT-qPCR reactions that provide detection of different citrus graft-transmissible pathogens (Osman et al. 2015).

The benefits to the nursery testing program from the use of just one of the newly developed methods i.e. universal detection of citrus viroids (Vidalakis and Wang 2013) since 2010-11 are clearly visible in the presented graph. The testing capacity of the program has increased dramatically, as shown by the bars in the graph below. As a result a trend of reduced viroid infection is developing, as shown by the line. In other words, during the years of biological indexing (2005-2010) the number of samples tested was limited (~500, bars 2005-2010). As a result the program was always behind the infection curve and the presence of viroids in nursery sources was maintained stable (~9-8%, line 2005-2010).



From 2010 forward and with the number of samples tested dramatically increased (~1000-3500) the program is getting ahead of the curve and the viroid infection is moving downwards. Today we are at 0.5% citrus viroid infection rate in the tested nursery samples versus 7.8% infection rate in 2010-11.

If this trend continues and in combination with best management nursery practices the viroids will be completely eliminated from California's nurseries.

References cited:

1. Calavan C.E., Mather S.M., and McEachern E.H. 1978. Registration, certification, and indexing of citrus trees. In Reuther W., Calavan C. E., and Carman G. E. (eds.). The citrus industry Vol. IV. Crop protection. Chapter 3, pages 185-222. University of California, Division of Agricultural Sciences.
2. Osman F, Hodzic E, Kwon S-J, Wang J, Vidalakis G 2015. Journal of Virological Methods 220: 64-75
3. Timmer, L. W., Garnsey, S. M., and Graham, J. H. (eds.). 2000. Graft-Transmissible, Systemic Diseases. In: Compendium of citrus diseases. Second Edition. Pages 51-69. APS press, St. Paul, Minnesota.
4. Vidalakis, G., Wang, J. 2013. Molecular method for universal detection of citrus viroids, US Patent 20,130,115,591.
5. Wallace, J. M. 1978. Virus and viruslike diseases. In Reuther W., Calavan C. E., and Carman G. E. (eds.). The citrus industry Vol. IV. Crop protection. Chapter 2, pages 67-184. University of California, Division of Agricultural Sciences.

While *Candidatus* Liberibacter africanus, *Ca.* L. asiaticus and *Ca.* L. americanus are the three α-proteobacteria species associated with HLB (huanglongbing or yellow shoot disease) of citrus, several phytoplasmas also are individually associated with HLB symptoms.

Wulff, N.A., Teixeira, D.C., Martins, E.C., Ayres, A.J., Bové, J.M.

Before 2004, citrus huanglongbing (HLB) was known in (i) Africa, where only *Candidatus* Liberibacter africanus (Laf) was detected as the associated agent and only the African citrus psyllid, *Trioza erytreae*, as the insect vector, and (ii) in Asia, where only *Ca.* Liberibacter asiaticus (Las) was the involved agent and only the Asian citrus psyllid, *Diaphorina citri*, the vector. Laf and Las were new α-proteobacteria species. They are closely related phylogenetically and a Gondwanan ancestry has been proposed for both. The region from where, in 2004, HLB was reported for the first time in America was São Paulo State (SPS), Brazil. Two *Candidatus* Liberibacter species were identified: Las, the known Asian species, and *Ca.* Liberibacter americanus (Lam), a new species. In SPS, both Las and Lam are vectored by the Asian citrus psyllid, reported in Brazil in 1942. Lam, after its discovery in SPS in 2004, has been reliably detected, in 2013, in only one other region, southern Texas, USA, in agreement with its previously proposed Laurasian origin. A report of Lam from China in 2008 could not be confirmed. In SPS, in 2004 and 2005, most HLB-affected trees were infected with Lam. Since 2006, the proportion of trees infected with Las has increased while the proportion of Lam-infected trees has sharply decreased. In 2013, most trees became infected with Las and it was difficult to find trees newly infected with Lam. Since 2005, HLB associated with Las and *D. citri*, has been reported from many regions in North, South and Central America.

In 2007 in SPS, sweet orange trees with characteristic symptoms of HLB (leaves with blotchy mottle and lopsided fruits with color inversion) tested PCR-negative for Laf, Las and Lam, but were found to be infected with a phytoplasma of group 16Sr IX, *Ca*. P. ??? The same phytoplasma was identified in sunn hemp (*Crotalaria juncea*) where it induces witches' brooms and virescence. In SPS, sunn hemp is widely used in citrus and sugar cane crops. Similarly, citrus infected with the phytoplasma of group 16SrIX is also widely distributed in SPS, but in affected orchards the percentage of phytoplasma infected trees is very low. In 2009, a group 16SrI phytoplasma (*Ca*. P. asteris) was reported to be associated with HLB in China. Recently, both the phytoplasma of group16SrIX from SPS and the phytoplasma of group 16SrI from China were also reported from Mexico to be associated with HLB symptoms in citrus. Finally, in 2013, a phytoplasma of group 16SrIII (*Ca.* P. pruni) has been detected in citrus with HLB symptoms from SPS and Minas Gerais, Brazil.

The molecular characterization of the group 16SrIX phytoplasma from sweet orange and sunn hemp in SPS was performed with sequences from the 16SrDNA gene and the rpsC_rplV genes. Both phytoplasmas were found to be identical. A real

time, quantitative PCR protocol was designed to quantify specifically group 16Sr IX phytoplasmas in plant and insect samples. On the basis of this qPCR, the phytoplasma titer was found to be higher in sunn hemp than that in citrus. This result was in agreement with (i) the higher number of phytoplasma cells in sunn hemp than in citrus, as seen by electron microscopy, and with (ii) the higher capacity of the leafhopper *Scaphytopius marginelineatus* to acquire the phytoplasma from sunn hemp rather than from citrus. *S. marginelineatus* is, most probably, vector of the group 16SrIX phytoplasma, acquiring the phytoplasma on sunn hemp and transmitting it to sunn hemp as well as, occasionally, to citrus. Although group IX phytoplasma is widespread within the citrus belt in São Paulo and Minas Gerais states, it was found in average in only 1.3% of the citrus leaf samples analyzed at the Diagnostic Facilities of Fundecitrus, Araraquara, SPS, over the last six years.

Finally, one other mollicute induces HLB-like symptoms in citrus: *Spiroplasma citri*, the agent of citrus stubborn disease. Fruit symptoms of stubborn resemble those of HLB (lopsided shape; color inversion; brownish, necrotic seeds), but shoot internodes are short, leading to rosetting, and leaves on stubborn trees are more cupped and less mottled than those on HLB trees.

Liberibacters and phytoplasmas associated with HLB, and *S. citri* have two common properties: they induce HLB or HLB-like symptoms and, as endogenous bacteria, they have the same plant habitat: they are all endogenous bacteria restricted to the phloem sieve-tubes. They might also have similar pathogenicity mechanisms, possibly based on deviations of sugar metabolism, rather than on specific pathogenicity genes, knowing that HLB is characterized by starch accumulations and stubborn, by high increases of glucose.

HLB is Here to Stay

L.W. "Pete" Timmer
We are republishing here the introduction and conclusion sections of the article published in CITRUS INDUSTRY • September 2014. The full article is available at *http://www.crec.ifas.ufl.edu/extension/trade_journals/2014/2014_September_HLB.pdf*

By now, most growers have realized that the trees affected by HLB (huanglongbing or greening) are not likely to recover and probably will continue to decline. The current situation in the industry has become very difficult, and most growers are in a quandary about how to move forward.

The Florida citrus industry has survived some very damaging events. The freezes of the 1980s and the hurricanes of the 2000s caused drastic losses. The tristeza epidemic resulted in the loss of all of the trees on sour orange rootstock and about a third of the groves had to be replaced over a period of 10 to 15 years. But, in those cases, trees could be replanted and expected to mature and produce a viable crop in a few years. None of these disasters required a basic restructuring of the industry and no major change in operations. There have been many changes in the industry since its beginning, but the basic structure has remained the same from the outset.

Now it is time to start over again. If you look at my predictions for 20 years in the future in my January 2010 Citrus Industry article, you´ll see that they are quite optimistic. Eventually we will have resistant varieties and new generation methods for dealing with the disease and the vector. But, we can't just sit around and wait for those to be developed as we have for the last few years. The industry is capable of restructuring and moving ahead, but it will take grit, determination and lots of money. But, there will be rewards for those who undertake the effort. I don´t think we´ll be without Florida orange juice, grapefruit and tangerines in 20 years.

Update on Huanglongbing Situation in China

Changyong Zhou
Citrus Huanglongbing (HLB) has been distributed in 254 counties of 10 provinces in China since its first occurrence records in Taiwan in 1913 and in Guangdong in 1919. Before the 1990s', the prevalence period was every 10 years, followed by 15 years afterwards in Guangdong province. The planting of quite a few well-known Guangdong-local cultivars, such as Jiaogan tangerine, Xinhuicheng and Hongjiangcheng sweet oranges, has declined due to the heavy prevalence of HLB in the past

decades. Based on a recent inspection on HLB occurrence, over 20 million HLB-affected trees should be pulled within three years in Guangdong, where ca 300,000 hectares of citrus are planted, 60% of which are Shatangju mandarin.

Another unfortunate situation is HLB's threat to citrus producing areas due to the northward movement of the citrus psyllid. Quite a few years ago, such a possibility was predicted. This situation is now occurring in Ganzhou, Jiangxi province, where a little over 10 million trees were pulled in 2013, ca 8 million infected trees are planned to be pulled within two years based on our recent survey. In this area 160,000 hectares of citrus are planted, 80% of which are navel sweet orange. Fortunately, the state and local governors have paid close attention on HLB management and as a result the disease appears to be under control in this area.

Guangxi province has been a good example of successful HLB management through the traditional "three-element-system" (i.e. strict control of the psyllid in a large area, promptly removal of HLB trees and planting HLB-free nursery trees). Since 2005, over 20 million infected trees have been pulled in Guangxi and the percentage of HLB has dropped to less than 1% from 6.5%. The citrus production area grew to 250,000 hectares in 2013 from 160,000 hectares in 2005.

In June 2014, the Ministry of Agriculture (MOA), PRC held a national official meeting on this issue in Guilin, Guangxi. During that meeting it was requested that the HLB survey and management are to be officially executed by the local governments organized by the MOA. Although some compensation funds have been available, the shortage of funds and regulatory issues are still big challenges for the HLB management in China.

One Decade of Huanglongbing in Brazil

Renato Beozzo Bassanezi
Photos from Cambuhy Farm-Fernando Tersi

In 2014, the first report of citrus Huanglongbing (HLB) in Sao Paulo State, Brazil, is now 10 years old. Considered as the most devastating disease of citrus, it was responsible for the elimination of many citrus groves but so far did not come close to threating the citrus industry in Sao Paulo as it did in other parts of the world. This is because the joint work of researchers and citrus growers is slowing the progression of the disease and maintaining the citrus production of the State.

The concern with HLB began long before the disease reached Sao Paulo groves. Identified since 1890s in Asia, the "yellow shoot disease" advanced by the continent and it was a matter of time until it reached the Americas. The insect vector, the Asian citrus psyllid (ACP) *Diaphorina citri*, has been present in Brazil since 1942, so the researchers paid attention to any suspicion. The first of these was recorded in 1967 when symptoms very similar to those of HLB appeared in Araraquara and Bebedouro groves. The case was investigated by the researcher Victoria Rossetti from Sao Paulo Biological Institute, but the microscopic tests, the only existing at the time, were not enough to confirm the disease. The case became known as "Mal de Araraquara" or "Araraquara's evil". The groves were eradicated and the symptoms were gone.

In 1987, when citrus variegated chlorosis (CVC) emerged, once again it was first suspected of being HLB. Tests that discarded the occurrence of that disease were made at the National Institute for Agricultural Research (INRA), Bordeaux, France.

Although it was not HLB, in 1999, during a visit to study on CVC, Dr. Joseph M. Bové, responsible for the testing and a leading expert on HLB in the world, proposed that Fundecitrus to alert citrus growers in Sao Paulo about the disease. The suggestion resulted in the first educational materials on the disease published in Brazil.

After the first warning in the late 1990s Fundecitrus held a series of symposia on HLB for agronomists, engineers, and technicians. That was the right decision because the trained professionals found, in early 2004, several plants in groves of the Araraquara region presenting an unusual yellowish appearance and warned Fundecitrus. A later survey identified the same symptoms on citrus trees in 14 municipalities.

A group of representatives of Fundecitrus, Centro de Citricultura 'Sylvio Moreira' and citrus consultants visited the properties and agreed that the symptoms resembled those of HLB. Immediately, Fundecitrus contacted Dr. Bové, who came to Brazil bringing specific primers for the detection of the two species of bacteria of HLB reported up to that point, *Candidatus* Liberibacter asiaticus (Las) and *Candidatus* Liberibacter africanus (Laf). Hundreds of samples were processed at the Fundecitrus laboratory in an attempt to identify the agent responsible for the symptoms, but all tests were negative.

Due to the immediate need for further study to identify what was causing the symptoms, Fundecitrus researchers went to France with material collected in Sao Paulo groves and found a new species of bacterium named Candidatus Liberibacter americanus (Lam) because of its origin. To complement the work, samples from orange jasmine and psyllids collected from the same region where the symptoms were observed were also subjected to analysis, resulting in positive results. Thus the presence of HLB in Brazil was associated with a new kind of Liberibacter. At the same time, researchers at the Centro de Citricultura 'Sylvio Moreira' were able to identify Las in some samples from central region of Sao Paulo state, but the proportion of the two species was 98% Lam to 2% Las. After a few years, Las became the predominant species because it has higher heat tolerance, multiplication in citrus trees, and transmission by the vector than Lam.

In 2007, the producers were faced with the challenge of analyzing leaves with the typical symptoms of HLB, but negative for the tests with known bacteria. The material from Barretos region aroused the fear that a new bacterium had appeared. But what the investigations found was not a new Liberibacter but a group IX phytoplasma. With the discovery, Sao Paulo became the only place where three pathogens related to HLB symptoms coexist.

After the evidence of the presence of the two liberibacters, in July 2004, the Ministry of Agriculture published a note recording the existence of HLB in Sao Paulo citrus groves. In 2005, the first normative instruction (IN) for HLB control was created, which mandated the compulsory eradication of diseased plants. From this law Fundecitrus, through an agreement with the state Department of Agriculture, was responsible to inspect the groves in search of the disease. The Fundecitrus inspections ended with the publication of IN 32, which gave the growers the responsibility to do the surveys in their orchards at least twice a year. This law remained in force until October 2008, when it was replaced by IN 53, which is still in effect and mandates that the growers make quarterly inspections. Between March 2005 and June 2014 about 36 million HLB-symptomatic citrus trees were officially eradicated in Sao Paulo.

The previous experience of growers on regular scouting and inoculum elimination for citrus canker and CVC-affected trees helped accomplish the recommended suppression of HLB at the beginning. The manifestation of HLB is seasonal, being more visible, in Brazil, from February to August. This feature, as well as the orientation of the use of

platforms for inspections (which facilitates the identification of symptoms in the higher branches, where they are most frequent), helped the growers to improve the inspection. Life with diseased trees is not an option for the long term due to the inefficacy of pruning, thermotherapy and the nutritional/hormonal treatments tested so far to avoid

increased crop loss and decreased of fruit quality in infected trees. Also there is the possibility of increasing the rate of disease progress keeping the source of inoculum where the vector is not strongly controlled.

Other two measures to control HLB were recommended and are part of the three pronged system for HLB management: planting of healthy nursery trees produced under insect-proof nurseries and controlling the insect vector. Fortunately, Sao Paulo growers were already used to such measures because of previous presence of CVC. Since 1999 a plan has been in place for mandatory production of citrus trees in closed screenhouse nurseries after 2003. Additionally, the management of CVC sharpshooter vectors with regular monitoring by yellow sticky traps and applications of contact and systemic insecticides was very useful for *D. citri* control.

Fighting ACP has become the biggest concern of citrus growers in the last ten years and the need to control the insect has changed the profile of citrus production. Insecticide applications have become increasingly common and the search for more sustainable and inexpensive practices became a priority. These practices include the use of more selective and systemic insecticides in non-bearing trees, adequacy and reduction of spray volumes, selection of entomopathogenic fungi as biological control agents, and mass release of the parasitoid *Tamarixia radiata* in residential areas and abandoned citrus groves where there is no chemical control to prevent them from becoming breeding sites for ACP, that end up migrating to commercial groves.

The behavior of the psyllid to concentrate in the outer 50 to 150 meters of an orchard during its migration from one orchard to another, called the "edge effect", contributed greatly to HLB control. It has been proven that this area should receive more stringent control and be constantly maintained and reset, serving as a natural barrier which prevents ACP spread into the orchard.

Fundecitrus has invested in the dissemination of knowledge to growers to make them aware of the problem and teach them how to fight the disease. The disclosure was made by technical manuals, radio and TV campaigns, outdoors, orange stickers on trucks, press and lectures. As part of this communication policy, Fundecitrus and collaborators, organized in 2006, the first global event targeted exclusively to discuss the HLB in Ribeirão Preto, Sap Paulo.

Nowadays, even with all recommendations and awareness campaigns, the disease has become widespread in the entire citrus belt of Sao Paulo State. Unfortunately, the eradication law has not been enforced by the government agents and it has not been easy to convince growers to remove HLB-symptomatic trees, especially the older and still productive ones. In 2014, about 70% of the Sao Paulo citrus belt groves had the presence of at least one HLB-infected tree, the center and eastern regions being the most affected. However, the incidence of symptomatic trees in the field remains relatively low (about 15% in Sao Paulo) compared with other countries. The disease is still progressing and the growers continue to report the mottled leaves and misshapen fruits in their groves. Besides Sao Paulo, the disease was found in the north and northern regions of Paraná and the south of Minas Gerais, other important citrus producing States in Brazil.

HLB was responsible for changing the way of working of the grower. For the first time, there was a need for producers to come together to fight a disease. In 2007, a scientific study carried out by Fundecitrus showed higher chances of success in controlling the disease when HLB management is done over large areas. Such regional management includes area-wide removal of inoculum source and ACP control in a short period of time. Then, to help small and medium growers, it was created an alert system for coordinated area-wide control of D. citri

as the Citrus Healthy Management Areas (CHMAs) in Florida (USA) and Areas Regionales de Control (ARCOs) in Mexico. Besides the area-wide psyllid control, individual private actions outside the grove, such as removing infected trees and controlling ACP in the neighboring groves, by agreements or its own expanses have been stimulated and have resulted in a high cost-benefit measure to reduce the HLB primary infection in the grove.

Tremendous effort has been expended on research trying to find a more sustainable solution for HLB in Brazil. There has been considerable progress in the science and technology areas related to HLB and its vector made by Fundecitrus, Centro de Citricultura 'Sylvio Moreira', Embrapa, University of Sao Paulo and other research institutions. However, research needs time in order to become applied to the field, and there will not be only one solution for HLB management.

The future of the Brazilian citrus industry, and perhaps the citrus industries of other countries as well, depends on the ability of organization of all elements of this business chain (growers, researchers and government) and the integration of all available measures in the field at regional scale.

News from the National Clonal Germplasm Repository for Citrus & Dates (NCGRCD), Riverside, CA

Richard Lee and Robert Krueger

Mahesh Yandigeri, National Bureau of Agriculturally Important Insects, Karnataka, India was hosted as a visiting scientists by Dr. Richard Stouthammer, UC Riverside Department of Entomology, and Dr. Manjuanth Keremane, NCGRCD, and Dr. Chandrika Ramadugu, Dept. of Botany and Plant Sciences, UCR, from September through December 2013. Dr. Yandigeri conducted research on the metagenomic of microflora of Hemiptera and bioinformatics of a microbial symbiont of Hemiptera, utilizing a BAC library available at the Repository.

Tien Van Vu, Scientist from the National Key Laboratory for Plant Cell Biotechnology, Vietnam, visited UCR at the invitation of Prof. Mikeal Roose, UCR Dept. of Botany and Plant Sciences, and Richard Lee, NCGRCD for three weeks in December 2013. The purpose of the visit was to establish collaboration among the Agricultural Genetics Institute in Vietnam, UCR, and the USDA ARS NCGRCD. Dr. Vu presented a seminar on the use of siRNA for control of *Citrus tristeza virus*.

Rozina Aslam and Muhammad Sarwar Yaqub, Ph. D. students from the University of Agriculture, Faisalabad, Pakistan, were hosted by M. Roose, UCR Dept. of Botany and Plant Sciences. They conducted research on huanglongbing as part of their studies for the Ph.D. They returned at the end of June 2014 after spending five months in Riverside.

Tien Van Vu, Agricultural Genetics Institute, Vietnam, Mahesh Yandigeri, National Bureau of Agriculturally Important Insects, India (rear) with Manjunath Keremane and Richard Lee at the USDA ARS National Clonal Germplasm Repository for Citrus and Dates, Riverside, CA in December 2013.

Dr. Richard Lee retired from USDA-ARS in November, 2014, after serving as Research Leader for 10 years. Richard is well-known to IOCV members and his accomplishments will be presented in an upcoming newsletter. Richard is thanked for his service to the Repository and we are wishing him the best in his retirement.

The current Acting Research Leader is Dr John Preece. John is the Research Leader for the Davis and Parlier germplasm repositories and is temporarily overseeing the Riverside Repository until a permanent Research Leader is selected. He may be reached at john.preece@ars.usda.gov.

Florida Bureau of Citrus Budwood Registration

Peggy Sieburth and Mike Kesinger
The Bureau continues to expand, reorganize and modernize. The Chiefland Foundation completed its second expansion in 24 months and now has a total of 129,600 sq ft of growing area. Budwood sales from the foundation facility were 528,000 eyes last year and are on a similar pace this year. The Florida citrus nursery industry has expanded as well with new nurseries under construction and additional greenhouse space built at many existing sites. Florida citrus tree production is expected to approach 5 million trees this year as tree demand seems to be strong.

The Winter Haven laboratory released 103 new cultivars this past year and has been receiving new parent candidates from in-state breeding programs at a record pace. The bureau's laboratory conducted 34,545 PCR tests last year. The third liquid handling device, funded by the Citrus - Clean Plant Network (C-CPN) has been installed and incorporated into our procedures. These robotic devices have helped us to keep up with processing these large numbers of samples, and reduce hand fatigue.

The Citrus Germplasm Introduction Program which had been independent from the Budwood Bureau, but also a program in the Division of Plant Industry, is now an integral part of the Budwood Program. It will be under the direction of Dr. Peggy Sieburth. A new facility to house this program is nearing completion in North Central Florida near Gainesville. The office building/laboratory is slightly over 5,200 square feet connected to 22,716 square feet of greenhouses. This expanded facility is the site of the program for introduction of citrus germplasm from outside of the state and country.

The database initially funded by the Clean Plant Network, but continuing development by the Division is now undergoing Beta testing. This versatile program has been programmed to handle certification needs from the beginning to end. It was developed to allow modifications by the end user to customize the program for individual program's changing needs for citrus certification and tracking.

LaCrosse Facility

The budwood bureau continues to work with Florida Breeders to clean up scion and rootstock selections for testing in today's difficult HLB – growing environment.

Reemoon Technology

Hill Zhou
Reemoon Technology, the biggest manufacturer of electronic sorters in China, is looking for opportunity to enter the Morocco/Egypt/Cyprus/Turkey/South Africa/Chile market. One of their major products is a sorting line for citrus. They installed more than 400 sorting lines in China and 250 of them are for citrus. They conquered more than 80% market share of citrus sorting line in China.

Reemoon was established in 2001 and is leading the innovation of sorters in China. They design and manufacture the first electronic sorter, the first optical sorter, the first internal quality sorter in China; and they sold the first internal quality sorting line for mandarin in 2014. So the sorting machine is their strength. They can sort citrus, kiwi, apples, stone fruit and some other fruits by weight, color, shape, size, blemish, brix and internal quality.

Reemoon can provide reliable and high quality products like European's but with very competitive price. That is why they are no.1 in China market and their sales volume is triple time of Maf Roda in China now.

Reemoon is looking for partnership or dealership for their products. If you or your friends who are interested in sorting line or dealership, please contact

Mr. Hill Zhou at overseas@reemoon.com.cn 0086-18879730010

Thank you and best regards.

Hill Zhou
Overseas Business Manager
Reemoon Technology holdings Co., Ltd.
CELL: +86-18879730010
TEL: +86-797-3338899 Ext 6001
EMAIL: overseas@reemoon.com.cn
WEB: http://www.reemoon.com.cn

On the risks to be a plant pathologist

Jean-Pierre Thermoz
Dear Georgios,
I would like to bring to the attention of the IOCV and its members the following report in a recent news article in Nature (http://www.nature.com/news/italian-scientists-vilified-in-wake-of-olive-tree-deaths-1.17651).

Our colleagues in Bari, Italy that are focusing their efforts to fight the epidemic of Xylella in olives have been under attacked and accusations for been responsible of the introduction / the spread / wrong solutions / inefficient research on the problem...

Best regards,
Jean Pierre

Obituaries
A Tribute to Colette Bové
Born Dumeau
1927-2014

Josy Bové

Colette along the beach at Tel Aviv, end of March 2014.

Colette Dumeau was born in Talence, near Bordeaux, on February 4, 1927. She married Josy Bové on November 18, 1952 in Bordeaux. They would have celebrated their 62nd wedding anniversary last year. She passed away on August 13, 2014, at the age of 87 years from pulmonary emboli, following a fall in the stairs of the family house at La Brède. Even though she studied mathematics and physics at the University of Bordeaux and taught these subjects for a couple of years at high school, she entered in 1953 the institute for which Josy was working after having graduated from the school of Agronomy in Paris: the French Institute for Tropical Fruit and Citrus Research (IRFA). From then on, Colette and Josy will always work together in the same laboratories for the rest of their lives.

To get more training in basic plant biology, the couple received a grant to spend almost three years at the University of California, Berkeley, first with Prof. Daniel Arnon and later with Prof. Paul Stumpf and Eric Conn. With their first son, José, born in 1953, they stayed in California from 1956 to 1959. These exceptional years were devoted to science and research, but also to traveling, and camping in, National Parks and Monuments. Colette becomes famous for the fantastic meals she would cook on these camping trips.

Back to France, Colette and Josy are joining the Plant Physiology department of Professor Georges Morel at the French National Center for Agricultural Research located on the grounds of the Versailles Palace. Colette takes a very active part in basic studies of plant virus multiplication. On a more applied basis, Colette and Josy are supposed to study the etiology of citrus stubborn and citrus greening (huanglongbing) diseases, thought to be due to two different strains of the same virus. By 1970, they showed that the agent of stubborn is not a virus, but a helical mollicute to be named *Spiroplasma citri*, and greening is associated with a walled bacterium of the new genus *Candidatus* Liberibacter. In the meantime, the Versailles laboratory has grown with the arrival of new researchers, PhD students and trainees. Through her kindness, her continuous availability to help, her good judgment, her patience, and her professional skill, Colette will become an invaluable guide for students and trainees, who appreciate her unfailing support and her so motherly presence. The family has also enlarged: Hugues was born on March 21, 1965, and Henri on March 31, 1967. Colette copes with the situation because of her unique sense of organization.

In 1970, Josy is appointed director of the new INRA Laboratory for Cellular and Molecular Biology at

Villenave d'Ornon, near Bordeaux. The family settles down in La Brède, a little town, South of Bordeaux. Colette keeps her position at IRFA and becomes responsible for INRA/IRFA collaboration in the field of pathology of tropical fruits. She continues to invest a great deal of work in basic studies of virus replication, but turns also to a new subject: citrus tristeza virus (CTV). She identifies for the first time, within the Corsica citrus experiment station founded in 1958, trees infected with CTV, and, more specifically, a new strain of the virus. CTV is one of the most feared viruses of citrus. Colette was one of the first researchers to obtain polyclonal antibodies against CTV by injecting purified CTV into goats. She had to go to the island of Reunion, in the Indian Ocean, to collect CTV-infected plant material for purification of the virus. Colette loved to travel. She visited 47 countries. Her last trip abroad, with Josy, was to Israel, end of March 2014. She enjoyed walking along the beach at Tel Aviv, visiting Caesarea, Jerusalem and Bethlehem. A trip to Croatia was planned for September 2014…

The picture of Collete and Josy Bové was taken on March 24, 2014 some minutes before Prof. Bové's invited Monselize and Bar-Akiva memorial lecture at the ARO Volcani Center. Photo by Moshe Bar-Joseph.

Colette had a strong relationship with the IOM (International Organization for Mycoplasmology) and, in particular, with the many "mycoplasma" meetings and courses that were organized in Bordeaux, from 1974, when the IOM was founded, to 1994, when IOM celebrated its 20th anniversary.

She always tried to make the many participants feel at home and many participants, with their accompanying person, have taken the way to La Brède for a glass of wine… Colette had also many friends at the IOCV (International Organization of Citrus Virologists). She attended many of the IOCV conferences.

Colette loved working in the laboratory, whether in Paris, Berkeley, Versailles or Bordeaux. She refused to take an early retirement and continued working until 1992, when she became 65. Retired, she continued to be active. In 1989, she was elected for six years a member of the municipal council of La Brède. Two additional institutions kept her also very busy and very happy: the "Resto du Coeur" and "SOS-amitié". "Resto du Coeur" or "Restaurants of the heart" are a non-government, nationwide organization receiving food from various donors (supermarkets, farms, …) and redistributing this food to people in need. The organization is run by voluntary workers. Colette joined the "Resto du Coeur", covering the area of La Brède and neighboring towns, from 1992 to 2010. "SOS-amitié" or "SOS-friendship" is also a nationwide, non-government organization, with a well-known telephone number, which people in distress can call day or night; their call is picked up by a so-called "listener". Colette was a "listener" from 1998 to 2010. Genuine, generous and capable of immediately perceiving what people were feeling, she was a unique "listener".
Her work in the Laboratory, the municipal council, the Resto du cœur and SOS-amitié, all this didn't count in comparison with what Colette gave her family, her children, her husband. She brought up her three children, José, Hugues and Henri, and made sure that they receive a good education. However, it is Josy who owes her the most. She allowed him to devote himself entirely to his work; she looked after him for 66 years; she cleared away from his road all the stones that could slow him down. All what Josy might have accomplished before his retirement in 1998 or thereafter, would not have been possible without Colette's love and the many sacrifices she imposed on herself.

So long Colette, I love you.

Lewis G. Weathers
1926-2015

Monday, March 9, 2015
Dear Colleagues,

I am saddened to announce that Professor Emeritus of Plant Pathology Lewis G. (Lew) Weathers passed away Thursday, March 5, 2015. He was 89 years old. Prof. Weathers came to Riverside in 1953 to serve as a principal laboratory technician and junior plant pathologist at the Citrus Experiment Station. He was named assistant professor of plant pathology at UC Riverside in 1955 and served in a variety of faculty and administrative roles in the College of Biological and Agricultural Sciences and College of Natural and Agricultural Sciences. He retired and was granted emeritus status in 1988.

Prof. Weathers earned his B.S. and M.S. degrees at Utah State University and his Ph.D. in plant pathology at the University of Wisconsin at Madison. As a specialist in citrus diseases, he was a member of, and served in leadership roles with, the California Citrus Research Board, International Society of Citriculture, the International Organization of Citrus Virologists, American Phytopathological Society, the American Association for the Advancement of Science, Sigma Xi and the American Institute of Biological Sciences. He was awarded a Guggenheim Fellowship in 1961-62, a Rockefeller Fellowship in 1963 and a NATO Postdoctoral Fellowship in 1972.

Prof. Weathers served as vice chair of the Department of Plant Pathology from 1971-72 and as chair from 1973-78; and as associate dean of research in CNAS from 1976-77 and as associate dean of academic affairs in 1977. In 1989 Weathers together with then-chair of UCR's program in creative writing Harry W. Lawton authored, "The Origins of Citrus Research in California", which chronicled the emergence of the "Citrus Belt" in Southern California and the 80-year history of the Citrus Experiment Station (1907).

His wife Pauline preceded Prof. Weathers in death in 2008. He is survived by two daughters, two sons and several grandchildren and great-grandchildren.

Sincerely,
Marylynn V. Yates Dean
College of Natural and Agricultural Sciences
University of California, Riverside

Tuesday March 10, 2015
Dear Georgios,
Could you, please, transmit my most sincere condolences to Lew Weathers' family. I met him for the first time in Riverside in 1957, at the occasion of the first citrus virus conference, which he helped organize. I also remember him showing me beautiful symptoms of yellow vein, enhanced by synergism with vein enation virus. When I think of him, I also see Pauline. I still remember having enjoyed my first brunch at their house. My wife Colette met them during her stay in Riverside in 1980 and was very fond of both of them. So long, Lew and Pauline!
Warmest regards,
Josy Bové.

Monday March 9, 2015
Thank you Georgios for this news.

I often wondered about Lew as I would pass near his home off of Central Avenue. I visited him at times and we talked old times.

I hold so many memories of our association which goes back a long time.

I have many pictures of our IOCV adventures.

I will miss him and hold dear the memories I have of him and Paulina.
Chet