Topics in Subtropics Newsletter

University of California Cooperative Extension

Fresno, Kern, Madera, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Tulare, & Ventura Counties

News from the Subtropical Tree Crop Farm Advisors in California

Volume 8, No. 1
December-March 2010

Editor's Note:

Please let us know if your mailing address has changed, or you would like to add someone else to the mailing list. Call or e-mail the farm advisor in the county where you live. Phone numbers and e-mail addresses can be found in the right column.

Please also let us know if there are specific topics that you would like addressed in subtropical crop production. Copies of Topics in Subtropics may also be downloaded from the county Cooperative Extension websites of the Farm Advisors listed.

Ben Faber
Editor of this issue

Farm Advisors

Gary Bender – *Subtropical Horticulture, San Diego*
Phone: (760) 752-4711
Email to: gsbender@ucdavis.edu
Website: http://cesandiego.ucdavis.edu

Mary Bianchi – *Horticulture/Water Management, San Luis Obispo*
Phone: (805) 781-5949
Email to: mlbianchi@ucdavis.edu
Website: http://cesanluisobispo.ucdavis.edu

Ben Faber – *Subtropical Horticulture, Ventura/Santa Barbara*
Phone: (805) 645-1462
Email to: bafaber@ucdavis.edu
Website: http://ceventura.ucdavis.edu

Neil O'Connell – *Citrus/Avocado, Tulare*
Phone: (559) 685-3309 ext 212
Email to: nvoconnell@ucdavis.edu
Website: http://cetulare.ucdavis.edu

Craig Kallsen – *Subtropical Horticulture & Pistachios, Kern*
Phone: (661) 868-6221
Email to: cekallsen@ucdavis.edu
Website: http://cekern.ucdavis.edu

Eta Takele – *Area Ag Economics Advisor*
Phone: (951) 683-6491, ext 243
Email to: ettakele@ucdavis.edu
Website: http://ceriverside.ucdavis.edu

Jeanette Sutherlin – *County Director, Fresno/Madera*
Phone: (559) 456-7285
Email to: jmsutherlin@ucdavis.edu
Website: http://cefresno.ucdavis.edu

Microirrigation, Fertilizers and Clogging

Ben Faber

Microirrigation (drip, microsprinkler, fan jet) applies water through small openings and can easily be prone to clogging. For this reason, filtration is used to avoid introducing sediments into the system and all fertilizers are injected before the filters to avoid their clogging the system. Before introducing a mixture of fertilizers into an untried system a jar test should be performed to make sure there are no chemical interactions between the irrigation water and anything that is introduced that might cause precipitation and eventual clogging: (http://www.nm.nrcs.usda.gov/technical/handbooks/iwm/NM_IWM_Field_Manual/HandbookPDFs/Section11/R-11.pdf). Depending on the size of emitters openings, some types are more or less prone to clogging. Anytime you use a new brand of fertilizer, make sure you do a jar test, because there have many problems in the past of just reading the label, seeing that it is soluble and then finding out to one's horror that every emitters is clogged. For prevention of chemical and biological clogging see the article by Schwankl in this newsletter.

Microirrigation systems work best with pre-solubilized, liquid fertilizer solutions. In season application of dry fertilizers over the top of micro systems is very inefficient since only a fraction of the soil surface receives water necessary to solubilize the dry material. Very finally ground materials, such as gypsum or potassium sulfate can be suspended in solution by injectors if the materials meet the specifications of the irrigation system. The injectors continuously agitate the materials in the irrigation water to prevent settling out. The irrigation systems should be flushed after every use to prevent the materials from settling the ends of irrigation lines after the system is turned off.

Microirrigation can supply small, frequent does of nutrients throughout the growing season. Plant roots proliferate in the emitter wetted area which makes for a more active zone for taking up nutrients. Many growers have found that nitrogen fertilizer rates can be reduced due to the increased efficiency of uptake. Nutrients that require a larger root system than the microirrigation wetted pattern might need more frequent application than under sprinkler or furrow, such as potassium or micronutrients. Leaf tissue testing is a helpful too to adjust fertilizer applications, especially with a new system.

All pressurized irrigation systems require a certain amount of time to fill all laterals with water and achieve operating pressure. Injected fertilizer also requires a certain amount of time to distribute throughout the irrigation system. The ideal time to inject fertilizer is in the middle of the irrigation set. If injection takes place before the system is fully pressurized, there is a lack of uniformity if fertilizer placement (see: http://cesantaclara.ucdavis.edu/files/19603.pdf). If the irrigations system is shut down before the fertilizer is fully distributed, fertilizer remains in the laterals, encouraging microbial growth that can lead to plugging. During long irrigation sets, soil mobile nutrients, such as nitrate-nitrogen should be applied near the end of the, while still allowing adequate time for system flushing.

And the mantra with all microsystems to avoid clogging is flush, flush, flush.

Chemical Treatment to Prevent System Clogging

Larry Schwankl, Irrigation Specialist, UC Kearney

Chemical treatment of water for microirrigation systems is required when the water may cause chemical precipitate or biological clogging of the microirrigation drippers or microsprinklers. The chemical treatment varies depending on the clogging source.

Biological Clogging
Biological clogging problems are most often associated with surface waters—waters that have been stored in reservoirs or ponds, or transported in canals, rivers, etc. While it is often difficult to identify the biological contaminant, algae and biological slimes are often major contributors to biological clogging.

Groundwaters high in iron may also be a biological clogging hazard for microirrigation systems. The dissolved iron in the water provides an energy source for the iron bacteria. The gelatinous slime produced by the iron bacteria can clog emitters, often in conjunction with particulates (silt or clay particles, chemical precipitates, or other contaminants) for which they can provide a "glue" to bind particles together.

Levels of Concern
Certainly any waters that appear "green" prior to use are capable of causing biological clogging but even surface waters which appear clean may be a clogging hazard. Since surface water quality can change drastically across the season, often caused by rising temperatures and falling water levels, it is often not worthwhile to attempt to quantify the biological clogging hazard. It is better to monitor the microirrigation system for any sign of biological clogging and if it appears, treat the water. Often there is a history of biological clogging problems and the manager knows that treatment is required.

Treatment
Biological treatment methods involve using a biocide that kills the biological contaminant. The two most common biocides used with microirrigation systems are chlorine and copper. Historically, chlorine products have been most frequently injected into microirrigation systems while copper products have been used to control biological growth in ponds and reservoirs. This has changed somewhat with the availability of new copper-based formulations developed for injection into microirrigation systems.

The following are recommended levels of chlorine for biological contaminant control:

Injection Method and chlorine concentration at the end of the last lateral

Continuous injection	1-2 ppm
Periodic injection	10-20 ppm

Contact time between the water with chlorine and biological contaminant is important. Periodic chlorine injections should be at least 4 hours and longer is better. Chlorine injections can continue up to system shutdown, with the chlorinated water left sitting in the lines. This may have limited effect on above-ground lines since they tend to drain out at the lowest point(s), but it may help clean up other parts of the system.

Copper levels to provide effective biocide protection are also quite low, often copper levels less than 5 pm are effective. Follow manufacturer's recommendation for formulations containing copper.

Chemical Precipitate Clogging
Most chemical precipitate clogging problems are associated with groundwater sources. Elements in solution in the groundwater may precipitate above ground and the precipitates may clog the microirrigation system's small emitter passageways.

There are many potential chemical precipitates which can cause clogging problems, but calcium carbonate (lime) and iron are two of the more common problems. Lime precipitation is the most common and can occur when calcium and bicarbonate levels in the water are 2 meq/l or higher and the water pH is 7.5 or higher.

The most common treatment for lime precipitation clogging is to lower water pH to 7.0 or below. A pH in the range of 6 to 6.5 is effective in removing the calcium carbonate precipitate while not being of risk to system components.

Iron precipitate clogging is not as common as lime precipitation but it is more difficult to deal with. Iron precipitate clogging can occur when the iron levels are 0.2 ppm or higher, although most problems occur when iron levels are 1 ppm or higher. Water pH only needs to be 4.0 or higher for iron precipitation so this pH level includes nearly all waters.

Most people deal with iron precipitation problems by pumping the groundwater into a pond or reservoir where the iron precipitates and settles out. Adequate time is needed for the small precipitates to settle. This dictates an adequately sized pond.

A relatively new way of dealing with iron and calcium carbonate precipitation problems is to continually inject a product containing phosphonate or phosphonic acid. The phosphonate (or phosphonic acid), injected at rates of 5 ppm or less, interferes with the precipitation. There are a number of anti-clogging formulations on the market which contain phosphonate or phosphonic acid as their active ingredient. Phosphonate or phosphonic acid products may be very beneficial for iron clogging problems, for which only aeration/precipitation and settling are currently the only solutions.

Cultural Practices to Reduce Pest and Disease in Avocado and Citrus

Ben Faber, Farm Advisor Santa Barbara/Ventura Counties,
669 County Square Dr., Ventura 93003, 805-645-1462, bafaber@ucdavis.edu

In many ways our pest and disease management of fruit tree crops are exacerbated by our cultural practices. Avocado and citrus offer some very clear demonstrations of how managing our trees can lead to reduced pesticide use. From the beginning, our selection of rootstock and scion can help lessen pest and disease problems. In both avocado and citrus we have good rootstock selections which can handle problems, such as root rot more effectively than seedling rootstocks. Starting off with the right, healthy rootstock helps if you know that drainage will be a problem. Scion selection can have a major impact, as well. For example, 'Lamb' avocado is much less prone to persea mite than is 'Hass'. This pest can significantly impact a spray program and planting 'Lamb' could mean virtually no sprays for this pest. There are similar examples in citrus where one variety is more prone to a pest or disease than another.

Irrigation is probably the most important cultural factor in managing tree disease. Over-, under- and improperly timed irrigations result in the conditions necessary for many root diseases. The *Phytophthora spp.* fungi are looking for distressed root systems brought on by waterlogging and other stressful situations. Other conditions, such as wetted trunks can also bring on some trunk diseases, like gummosis in citrus and crown rot in avocado. Simply preventing irrigation water on the trunks can limit these diseases. Other diseases, such as black streak, stem blight and bacterial canker in avocado are bought on by soil moisture stress.

Nutrients, especially nitrogen management, have been long known to affect levels of insects, such as scale, mealy bug and aphid. Lush growth helps sustain these insects, so reducing this growth tends to lower their numbers. Managing when canopy growth occurs can affect pest severity. Avocado thrips build their populations in the spring and moves easily from leaf to fruit causing significant scarring. Promoting leaf growth at flowering time with a nitrogen application, keeps the insect on the leaves and reduces fruit scarring. This also promotes growth to replace leaves that have been damaged by persea mite. In citrus, the incidence of citrus leaf miner damage can be reduced by avoiding summer pruning, so that a flush of growth does not occur at the same time as the population is building. Time of pruning is important in lemons to reduce the spread of hyphoderma wood rot fungus. Hyphoderma fruiting bodies are active during wet periods of rain and fog.

Pruning can change pest pressure by lowering the humidity in the canopy, introducing light and changing the microclimate supporting disease and pests. Pruning allows more thorough spray coverage, reaulting in a more effective application. Modified skirt pruning can have significant effects on mealy bug and scale control, fuller rose weevil incidence, ant colonization and snail damage. It's important that the trunk be protected as an avenue of movement for snail and ant control to get the best effects of this pruning. Copper and sticky banding can be applied to improve their control. Skirt pruning also reduces problems with such weeds as bladder pod and the ladder effect of brown rot in citrus – fungal propagules splashed from the ground onto low-hanging fruit, which in turn is splashed to higher fruit.

Keeping a canopy clean of dust and fire ash has multiple pest management benefits. Because predators are slowed in their search, they are less efficient in controlling pests. They may spend more time grooming their sensory organs, and less time searching for prey Parasites such as wasps are actually slowed by the physical abrasion to their tarsi. Dust also creates a drier environment, which is more hospitable to our pest mites. Watering picking rows, roads and even the trees themselves can lessen mite populations. Use of cover crops can reduce dust and potentially provide pollen and nectar for predators and parasites. Of course cover crops create a whole new set of management issues, such as colder winter orchards and habitat for gophers, meadow mice and snails.

Finally harvest timing to avoid pest and disease is often overlooked. In avocado, fruit is often set in clusters. Greenhouse thrips love the microclimate created within fruit clusters, and, if in a size-pick the cluster is reduced, greenhouse thrips will often not be a problem. Harvest timing is also important in citrus. Fruit left too long on the tree can often develop septoria fungal spot. Picking in a timely manner reduces the incidence of this disease.

These are just a few examples of how cultural practice at the right time can reduce pest and disease problems.

Laurel Wilt Update

Ben Faber

A recent symposium in Florida (11/3/09) described some of the results of research that has been conducted there over the last 18 months. This work is being done in Florida, but researchers across the country have collaborated, including people from California. Avocado and other members of the laurel family are being studied, many of which are native to the southeast. Research has evaluated host response (plant size, inoculum threshold, cultivars), disease management (effect of various fungicides) and host volatiles for both attracting and deterring the ambrosia beetle carrying the disease-causing fungus.

The research group comprises over 30 individuals and the pathology work is being headed up by Randy Ploetz at the University of Florida. In the area of susceptibility, they have found that younger trees with less woody tissue (3 gallon trees vs.15 gallon trees) are less susceptible to the disease. For susceptible trees, it takes an extremely small amount of inoculum to cause disease. And there is a difference in cultivar response, with Mexican race types ('Bacon') being less susceptible than West Indian (e.g. 'Simmonds', 'Russel'l, 'Waldin'). These preliminary results indicate that 'Hass' is intermediate in susceptibility to these two races of avocado. They have also evaluated different families of fungicides and application methods – trunk injection, soil drench, foliar and trunk paint, and found that the triazoles (e.g., propiconazole, triadimenol, prothioconazole) as drenches and trunk paints can significantly reduce infection. None of these materials are currently registered for use on avocado, but could potentially be registered.

Lastly, Paul Kendra from USDA-ARS has been working with a group looking at host volatiles that attract and deter the ambrosia beetle. The idea is to develop attractants both for monitoring the insect, but also to attract and kill the insect. They have been successful in identifying at least two volatiles, manuka and phoebe oils, which will attract the beetle. These results will now allow them to determine what traps are best and at trap position in an orchard that would be most effective at attracting and killing the beetle.

A lot of money and a lot of people are being put into this research effort to control this lethal disease of avocado and other members of the laurel family. Hopefully by the time the insect with its disease-causing fungus arrives in California we will have some good methods for controlling the damage. So far the beetle has been trapped in southern Florida, although at this time (2/25/2010), the disease has not been reported in avocado. To follow the activities in Florida see: http://www.doacs.state.fl.us/pi/enpp/pathology/laurel_wilt_disease.html

As of 3/8/2010, the red bay ambrosia beetle has been found in Miami-Dade County.


Red Bay Ambrosia Beetle


Laurel Wilt Disease

The Parent Washington navel orange tree – Part 2. Its decline and recovery

Chester N Roistacher
Retired Citrus Virologist, University of California, Riverside.

The early history of the parent navel orange was presented in the last issue of Topics in Subtropics as "The Parent Washington navel orange tree - Its first years". Included in that article were the early shipments of budwood and trees of a navel orange from Bahia, Brazil to the gardens and grounds of the Department of

Agriculture in Washington D.C. From there shipment of trees were made by rail and horse drawn wagon to the home of Eliza and Luther Tibbets in Riverside California.

When the trees fruited at the Tibbets' home yard there was much interest and excitement in this new orange. Greater recognition came when the fruit were exhibited at the local fairs. Shortly thereafter a new industry was born, beginning in Riverside and extending to surrounding communities. What was it about this navel orange that made it become such a popular and important fruit? This was a citrus unlike any of the seedy oranges that existed at the time from seedling trees. The navel orange was larger, contained no seed, had a superb sweetness and flavor, peeled easily, had a bright orange color and matured for the winter and spring months especially around Christmas and New Year period.

In the concluding part of the previous article, two pictures were shown of the parent Washington navel orange tree in the early 1900's. One picture, taken about 1910 in its dedicated park at the corner of Magnolia and Arlington avenues and showed the tree in apparent good health. The second picture taken about five to seven years later showed the tree declining with yellowing leaves and suffering from disease which was later confirmed as Phytophthora (gummosis) root rot. This declining tree was one of the original two trees which had been transplanted from the Tibbets' home yard. We show again this declining tree in Fig. 1. The possible loss of this historic tree would have been tragic, since its sister tree at the Mission Inn was also showing signs of decline. This sister tree, also taken from the home of Luther and Eliza Tibbets, had been transplanted in 1903 to the world famous Mission Inn in Riverside. Fig. 2 shows this tree at the Mission Inn about 1920. On December 4th, 1922 the Riverside Daily Press reported that the tree at the Mission Inn had died and had been removed. It was noted by local townspeople that the tree had begun to fail rapidly after the death of President Theodore Roosevelt in 1919 who had assisted in the transplanting ceremony (Fig. 3 - upper left).

The stump of the parent Washington navel orange tree which had died at the Mission Inn was given as a gift by Archibald Shamel, a leading horticulturalist, to Sir Percy Fitzpatrick who was visiting Riverside at that time. Sir Percy Fitzpatrick was a famous writer and owner of Amanzi Citrus Estate near Port Elizabeth, South Africa. The plaque on the stump reads:

> "Parent Washington navel orange tree planted at Riverside, California -1873; died and removed -1922-. This section of trunk 2 ft above ground is presented to Sir Percy Fitzpatrick as a memento from California. A.D. Shamel, the Mission Inn, Riverside, December, 1922."

This historic stump of the parent Washington navel orange tree now resides at the home of Patrick and Marina Niven at the Amanzi Estate in Uitenhage, South Africa. Shown holding the stump in Fig. 3 is Patrick Niven, grandson of Sir Percy Fitzpatrick. Patrick Niven was a highly respected citrus nurseryman in South Africa who passed away in 2009. Note the distinct lesion of Phytophthora on the sweet orange stump shown in the lower left in Fig. 3.

Inarching. Facing the inevitable loss of the parent navel orange tree in its dedicated park, a decision was made by the University of California scientists to try to save this tree by inarching. Fig. 4 (left) shows the original inarches from a photograph taken by Dr. L.J. Klotz in 1918. The tree had been girdled by gummosis and was rapidly deteriorating. The inarching was done by Dr. H. J. Webber, H. W. Mertz and Glenn Blackman. They inarched with seedlings of sweet orange, rough lemon and sour orange. The gummosis lesions can be seen in the lower trunk just above the top of the protective cylinder. Dr. Klotz again photographed the inarches on July 17, 1944, twenty six years after the initial inarching was done in 1918 and the inarches are shown on the right in Fig. 4. In 1951, it was noted that some of the original inarches showed lesions of Phytophthora. Therefore, in that same year, a second inarching was done using three seedlings of Troyer citrange and one of trifoliate orange. The grafting was done by Denard C. Wylie, Senior Superintendent of Cultivations at the Citrus Experiment Station.

The inarches in 2009. The survival and preservation of the parent 'Washington' navel orange tree was dependant on the successful inarches made in 1918 and repeated again in 1951. Shown on the left in Fig. 5 is a view of the inarches as they appeared in 2009. On the right in Fig. 5 is a close up view of the inarches and showing the distinct bark lesions of Phytophthora on the original sweet orange rootstock in the center of the picture. These lesions were responsible for the decline of the tree in 1915-1917 as shown in Fig. 1. This same fungus killed its sister tree at the Riverside Mission Inn in 1922. However, the timely inarches saved this historic tree. Fig. 6 shows the 136 year old parent ‘Washington’ navel orange tree as it appeared in December, 2009. The tree was in good health and bearing a good crop of fruit. In the foreground in this picture is a plaque honoring Mrs. Eliza Tibbets. The plaque reads:

"To honor Mrs. Eliza Tibbets and commend her good work in planting at Riverside in 1873, THE FIRST WASHINGTON NAVEL ORANGE TREES in California, native to Bahia, Brazil, proved the most valuable fruit introduction yet made by the United States Department of Agriculture. 1920"

A sign on the lamppost adjacent to the parent Washington navel orange tree reads “Historical Landmark No. 20. Although it is marked as number No. 20, it has been reported to be the first Historical Landmark so designated by the State of California.

Conference on the health of the parent navel tree Sept. 2006. At the request of Robert Johnson and Alisa Sramala with the Planning and Design Division of Riverside Park and Recreation Department, a meeting was organized at the parent ‘Washington’ navel orange tree with the objective of studying the general health of the tree and obtaining directions on the best way of maintaining it to ensure its longevity. In response to this request, Dr. Tracy Kahn organized a meeting of concerned individual at the tree site on September 29, 2006. Those present at this meeting are shown in Fig. 7. At that time the tree was in excellent health, with large leaves and a good crop of large sized fruit. Discussion was held on various aspects for the continued maintenance and improvements for the health of the tree.

The impact of the Parent navel. In the early 1900's the impact that this single tree had on the city of Riverside and on the surrounding area was profound. Considering that Riverside had been founded in 1870 and that most of the cities in the region were also founded about this same time, the commercial impact of this tree was of great importance on the development of a number of cities in the region and also throughout southern California. One can still see the large two storied homes when traveling from Riverside to Redlands. These homes were designed so that one could see above the orange groves which filled much of area in the region at that time. The population of Riverside in 1880 was only 368 and a little over 1000 in the surrounding areas. Citrus orchards increased and flourished throughout the region and the navel orange became its most important major agricultural crop. The region around Riverside and its surrounding areas was ideally suited for this tree. The small trees sent from Washington D.C. and nurtured in the Tibbets home yard could not have been planted in a more favorable environment for the full development of the deep orange color and superb flavor of the fruit.

Our indebtedness to this mother tree. Little did Eliza or Luther Tibbets fully realize or could have predicted the impact that this tree would have, not only on the development of southern California, but on world citriculture. This tree was responsible not only for the creation of a citrus industry in California, but for the establishment of the world famous Citrus Experiment Station. It was responsible for the iced railroad cars, for the creation of the Sunkist and other cooperative marketing organizations, for the introduction of various insects to control serious pests, for research on decay control, for the creation of packing houses and the many jobs and small industries associated with citrus. In many ways it was also responsible for the growth and early development of many cities in southern California extending from Ventura by the sea to Yucaipa at the foot of the San Bernardino mountains and extending north to the cities in the rich farmlands of central California. We in California and throughout the world have been indebted to this remarkable tree, listed as the most important plant introduction made into the United States!

For a full picture history of this extraordinary and famous tree visit the United Nations website. This URL will get you directly to this slide show #79 on the parent Washington navel orange:

http://ecoport.org/ep?SearchType=slideshowView&slideshowId=79.
After checking in click on pictures, then click on slide shows and then click on Slide show 79 on the Parent navel orange.

Fig. 1.
The parent Washington navel orange tree in its small park in Riverside began to show decline about 1915-1917. We can see the tree in very poor condition and suffering from Phytophthora (gummosis) root rot. This tree was on a sweet orange rootstock and sweet orange is highly susceptible to gummosis root rot. The lesions of Phytophthora on the original sweet orange rootstock can be seen in Fig. 5 on the right.

Fig. 2.
The Parent Washington navel orange tree at the Glenwood Mission Inn about 1920. This tree was one of the two original trees removed from their original site at the home yard of Luther and Eliza Tibbets. One tree was transplanted in 1902 at a dedicated park at the corners of Arlington and Magnolia avenues in Riverside and this tree was transplanted at the Mission Inn in 1903 by then President Theodore Roosevelt (see Fig. 3 upper left). However, in 1922 this tree died of Phytophthora gummosis

Fig. 3.
The upper left shows President Theodore Roosevelt assisting in the transplanting of one of the two parent navel orange trees taken from the yard of Eliza and Luther Tibbets and transplanted to the courtyard of the Glenwood tavern, now known as the Mission Inn. The picture was taken on May 8th, 1903. This tree at the Mission Inn died in 1922 and the stump was given as a gift to Sir Percy Fitzpatrick who was visiting Riverside about that time. Shown is this historic stump at the home of Patrick and Marina Niven at the Amanzi Estate in Uitenhage, South Africa. Patrick Niven, grandson of Sir Percy Fitzpatrick is shown holding the stump. Note the distinct lesion of Phytophthora on the sweet orange trunk.

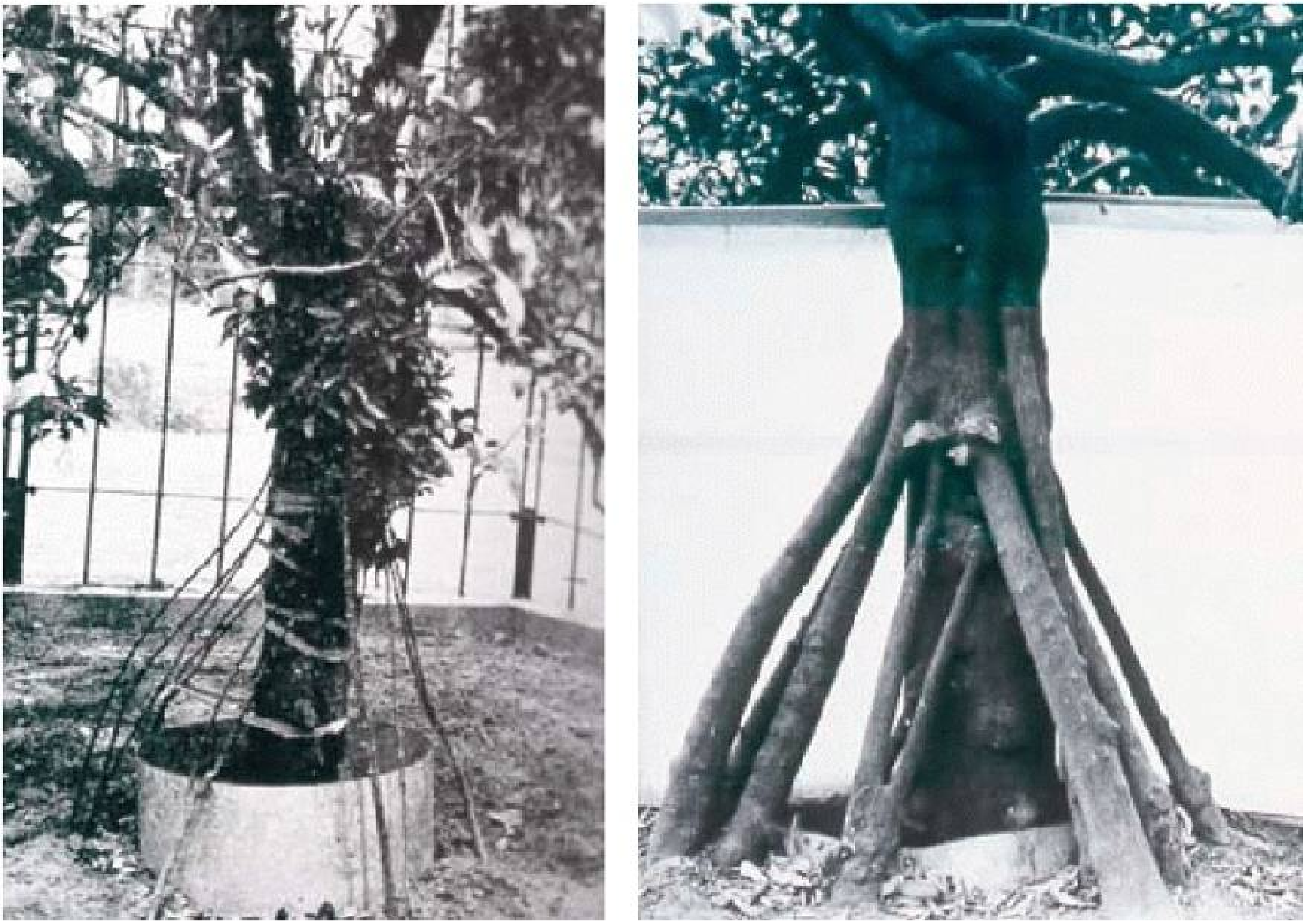

Fig. 4.
Shown on the left is a picture of original inarches taken by Dr. L.J. Klotz in 1918. The parent tree had been girdled by Phytophthora gummosis and was rapidly deteriorating. Seedlings used were sweet orange, rough lemon and sour orange. Dr. Klotz again photographed the inarches (right) on July 17, 1944, twenty six years after the initial inarching.

The trunk of the Parent navel orange tree in Riverside, California in 2009 showing the inarches (left) and the severe lesions of Phytophthora on the original sweet orange trunk (right). The inarching saved this historic tree!

Fig. 5
Shown on the left is a view of the inarches as they appeared in 2009. Looking at the picture on the right, notice the upright trunk in the center surrounded by the other inarches. This is the original sweet orange trunk showing the distinct bark lesions of Phytophthora which had been responsible for the decline of the tree in 1915-1917 (see Fig. 1). Without the inarches the parent navel tree would surely have died as had its sister tree at the Mission Inn.

Fig. 6.
Showing the 136 year old parent Washington navel orange tree as it appeared in December 2009. The tree was in good health and bearing a good crop of fruit. In the foreground is a plaque honoring Mrs. Eliza Tibbets. A sign on the lamppost adjacent to the parent Washington navel orange tree reads “Historical Landmark No. 20".

Fig. 7.
At the request of Robert Johnson and Alisa Sramala with the Planning and Design Division of Riverside Park and Recreation Department, a meeting was organized by Dr. Tracy Kahn at the Parent Washington navel orange tree with the objective of studying the general health of the tree and obtaining directions on the best way of maintaining it to ensure its longevity. Concerned individual at the tree on September 29, 2006 are from left to right: Toni Siebert, Tom Shea, Robert Johnson, Chet Roistacher (kneeling), Alisa Sramala, Robert Krueger, Tracy Kahn and Ralph Nuñez