Topics in Subtropics Newsletter

University of California Cooperative Extension

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News from the Subtropical Tree Crop Farm Advisors in California

Volume 1 No. 3 July-September, 2003

Editor's Note:

This is the third edition of our quarterly newsletter. Dr. Ben Faber is the editor for this issue.

If you would prefer to receive this newsletter electronically, without having to wait for the printer and the postal service and have it in full color, go to http://ceventura.ucdavis.edu/Custom_Program294/subtropicnl.htm . At this page you can subscribe and unsubcribe to Tropics in Subtropics and receive the newsletter directly by email.

This will save us the cost of printing and mailing the newsletter.

Best regards, Ben Faber

Fall Leaf Tissue Samples Important For Maintaining Citrus Growth, Fruit Quality and Yield

Craig Kallsen

University of California (UC) researchers and private industry consultants have invested much effort in correlating optimal citrus tree growth, fruit quality and yield to concentrations of necessary plant nutrients in citrus (especially orange) leaf tissue. The grower can remove much of the guesswork of fertilization by adhering to UC recommendations of critical levels of nutrients in the tissues of appropriately sampled leaves. Optimal values for elements important in plant nutrition are presented on a dry-weight basis in Table 1. Adding them in appropriate rates by broadcasting to the soil, fertigating through the irrigation system or spraying them foliarly may correct concentrations of nutrients in the deficient or low range. Compared to the cost of fertilizers, and the loss of fruit yield and quality that can occur as a result of nutrient deficiencies or excesses, leaf tissue analysis is a bargain. At a minimum, the grower should monitor the nitrogen status of the grove through tissue sampling on an annual basis.

Leaves of the spring flush are sampled during the time period from about August 15 through October 15. Pick healthy, undamaged leaves that are 4-6 months old on non-fruiting branches. Select leaves that reflect the average size leaf for the spring flush and do not pick the terminal leaf of a branch. Typically 75 to 100 leaves from a uniform 20- acre block of citrus are sufficient for testing. Generally, the sampler will walk diagonally across the area to be sampled, and randomly pick leaves, one per tree. Leaves should be taken so that the final sample includes roughly the same number of leaves from each of the four quadrants of the tree canopy. Values in Table 1 will not reflect the nutritional status of the orchard if these sampling guidelines are not followed. Typically, citrus is able to store considerable quantities of nutrients in the tree. Sampling leaves from trees more frequently than once a year in the fall is usually unnecessary. A single annual sample in the fall provides ample time for detecting and correcting developing deficiencies.

The sampled leaves should be placed in a paper bag, and protected from excessive heat (like in a hot trunk or cab) during the day. If possible, find a laboratory that will wash the leaves as part of their procedure instead of requiring the sampler to do this. Leaf samples can be held in the refrigerator (not the freezer) overnight. Leaves should be taken to the lab for washing and analysis as quickly as is feasible.

Often separate samples are taken within a block if areas exist that appear to have special nutrient problems. The temptation encountered in sampling areas with weak trees is to take the worst looking, most severely chlorotic or necrotic leaves on the tree. Selecting this type of leaf may be counter-productive in that the tree may have already reabsorbed most of the nutrients from these leaves before they were sampled. A leaf-tissue analysis based on leaves like this often results in a report of general starvation, and the true cause of the tree decline if the result of a single nutritional deficiency may not be obvious. Often in weak areas, it is beneficial to sample

Table 1. Mineral nutrition standards for leaves from mature orange trees based on dry-weight concentration of elements in 4 to 7 month old spring flush leaves from non-fruiting branch terminals.

element	unit	deficiency	low	optimum	high	excess
N	%	2.2	2.2-2.4	2-5-2.7	2.7-2.8	3.0
P	%	0.9	0.09-0.11	0.12-0.16	0.17-0.29	0.3
K (Calif.*)	%	0.40	0.40-0.69	0.70-1.09	1.1-2.0	2.3
K (Florida*)	%	0.7	0.7-1.1	1.2-1.7	1.8-2.3	2.4
Ca	%	1.5	1.6-2.9	3.0-5.5	5.6-6.9	7.0
Mg	%	0.16	0.16-0.25	0.26-0.6	0.7-1.1	1.2
S	%	0.14	0.14-0.19	0.2-0.3	0.4-0.5	0.6
Cl	%	?	?	<0.03	0.4-0.6	0.7
Na	%	?	?	<0.16	0.17-0.24	0.25
B	ppm	21	21-30	31-100	101-260	260
Fe	ppm	36	36-59	60-120	130-200	250?
Mn	ppm	16	16-24	25-200	300-500?	1000
Zn	ppm	16	16-24	25-100	110-200	300
Cu	ppm	3.6	3.6-4.9	5 - 16	17-22?	22

*California and Florida recommendations for K are sufficiently different that they are presented separately. The California standards are based on production of table navels and Valencias, and those for Florida were developed primarily for juice oranges like Valencia.

normal appearing or slightly affected leaves. If the problem is a deficiency, the nutrient will, generally, be deficient in the healthy-looking tissue as well.

Groves of early navels that are not normally treated with copper and lime as a fungicide should include an analysis for copper. Copper deficiency is a real possibility on trees growing in sandy, organic, or calcareous soils. For later harvested varieties, leaves should be sampled before fall fungicidal or nutritional sprays are applied because nutrients adhering to the exterior of leaves will give an inaccurate picture of the actual nutritional status of the tree.

Usually leaf samples taken from trees deficient in nitrogen will overestimate the true quantity of nitrogen storage in the trees. Trees deficient in nitrogen typically rob nitrogen from older leaves to use in the production of new leaves. Frequently, by the time fall leaf samples are collected in nitrogen deficient groves, these spent spring flush leaves have already fallen. Nitrogen deficient trees typically have thin-looking canopies as a result of this physiological response. Since the spring flush leaves are no longer present on the tree in the fall when leaves are sampled, younger leaves are often taken by mistake for analysis. These leaves are higher in nitrogen than the now missing spring flush leaves would have been and provide an inaccurately higher nitrogen status in the grove than actually exists.

Critical levels for leaf-nitrogen for some varieties of citrus, like the grapefruits, pummelos, pummelo x grapefruit hybrids and the mandarins, have not been investigated as well as those for oranges. However, the mineral nutrient requirements of most citrus varieties are probably similar to those for sweet oranges presented in Table 1, except for lemons, where the recommended nitrogen dry-weight percentage is in the range of 2.2-2.4%.

A complete soil sample in conjunction with the leaf sample can provide valuable information on the native fertility of the soil with respect to some mineral nutrients and information on how best to amend the soil if necessary to improve uptake of fertilizers and improve water infiltration.

Invasive Species: What About the Seemingly Innocuous?

Phil Phillips

The avocado thrips, *Scirtothrips perseae* Nakahara, in southern California - A case history

Situation:

Prior to 1997, commercial orchards were treated only occasionally for greenhouse thrips, mites or lepidopterous pests, relying primarily on naturally occurring biological controls supplemented with releases of Trichogramma.

The invasion:

It was first discovered in southern California avocados in 1996 in Ventura County.

It was a species unknown to science, only being described in 1997.

By 1997, populations had spread throughout the southern part of the state.

Heavily infested orchards in Ventura County experienced 50 to 80% crop damage in 1997.

Within 2 years of its introduction, it was costing $12-14 million per year in losses to the California avocado industry.

Currently this insect infests 59% of the state's 59,000 acres, with approximately 80% of the commercial orchards requiring pesticide applications.

The solution- A team approach:

A team consisting of Experiment Station and Cooperative Extension scientists was formed from the start. Research priorities were discussed with industry leaders, the avocado industry provided the necessary research funding, and a division of research responsibilities was agreed upon between team members. Frequent industry meetings were held and research reports published to keep the California avocado industry apprised of the team's progress.

Accomplishments:

Through the foreign exploration efforts of two team members (Experiment Station and Cooperative Extension), we now know the area of origin of the avocado thrips and have compiled an inventory of other potential pest thrips species on avocados in Mexico and Central America.

Through trials conducted by all team members, we have identified several selective insecticides and their most efficacious use in treating avocado thrips within an IPM framework within commercial avocado orchards.

Through laboratory (Experiment Station) and field (Cooperative Extension) studies, we have determined the relationship between thrips densities on leaves and fruit scarring and have developed an economic threshold for treatment.

Within 5 years of its introduction, a solid IPM program has been developed for the avocado thrips through a team effort involving UC Riverside and UC Cooperative Extension scientists.

The future:

Cultural and biological control practices are currently being studied for use within an evolving IPM program for California's avocado industry.

Foreign exploration for natural enemies will continue with trips planned for winter 2003 and spring 2004.

An innocuous species at home:

The avocado thrips is not recorded as a pest of avocado within the native home range of the avocado, but is merely an innocuous species with avocado as its only known host.

Through this author's sabbatical leave (2002) to Mexico and Guatemala, we have a clearer understanding of why avocado thrips is an innocuous species in these countries. A shift in the synchrony of the avocado tree's growth flush and bloom/fruit set cycles occurs when it is moved from a subtropical to a temperate climatic zone as in southern California. There is greater overlap of new flush growth (the preferred thrips feeding substrate) and the appearance of young susceptible avocado fruitlets (February through March) in the avocado's native environment within Mexico and Guatemala. The avocado thrips remains feeding on the succulent new foliage in the presence of new, tender fruitlets. Thus Mexican and Guatemalan fruit escape the temperate climate situation of southern California where the flush growth matures and leaf tissue hardens just at the critical time when young fruit have been set (late May and June), causing the thrips population to move to the young fruit and create fruit rind feeding scars.

Temperature appears to be the limiting factor in the hotter, low land regions of the avocado's home range. Temperatures above 30^{o} C result in thrips population decline due to mortality factors and a sex ratio shift. This would explain our lack of success in recovering the avocado thrips from the low elevation Yucatan peninsula region of Mexico and Trinidad and the Dominican Republic in the West Indies.

The message:

Most of our commercial agriculture is based on non-native plant and animal species. Do we do enough to protect our borders from the "unknown" and seemingly innocuous organisms of the world that pose a potential threat to our IPM programs and to our agriculture's well being?

Avocado Planting Holes

Ben Faber

Introduction

In numerous publications world-wide, planting hole recommendations for avocado and other subtropical crops are made for large holes from 2 feet by 2 by 2 to as much as a cubic yard. These recommendations also include incorporation of manures or composts comprising 25% by volume with the native soil. I have noted the use of large holes and amendments in several countries, including New Zealand, Guatemala, Brazil, Costa Rica, Mexico and the United States.

The various reasons given for making these large holes are to disrupt any compaction or limiting soil layers and to create a more conducive environment for root growth. In the case of replanting deciduous orchards, McKenry found it to be beneficial in actually replacing the native soil in the hole with pathogen free soil. In many cases, research has shown that holes much larger than the planting ball and using organic amendments can cause problems for many tree species. Improper mixing of the organic amendment can cause anaerobic conditions and settling due to amendment decomposition. Soil that has not been properly firmed in the hole can also lead to plant settling and stems can drop below grade leading to crown rot.

Nonetheless, on the basis of recommendations made in many countries there could be some value in these planting practices, especially in the light of the effect organic matter has on avocado root rot. Numerous studies have shown organic matter suppresses the causal agent of root rot. This study evaluated the effect of hole size and amendments on avocado growth in an ideal environment with excellent soil conditions and in a more harsh one with heavy soil texture and the presence of the root rot pathogen.

Materials and methods

On the north island of New Zealand in the Bay of Plenty, 20 trees each were planted to one of four treatments: a) small holes (12 by 18 inches) without amendment; b) small holes with 25% by volume compost; c) big holes (60 deep by 30 wide by 24 wide inches) without amendment and d) big holes with 25% by volume compost. Big holes were dug with a backhoe, while small holes were dug by shovel. Trees were approximately 2 feet tall at planting. Soil was a deep sandy loam at both sites. Trees were irrigated by drip irrigation. Trees were 'Hass' on 'Zutano' seedling rootstock. Trees were planted the second week of spring 2000. Tree height, trunk caliper and canopy volume were measured on a monthly basis for eight months and then twice a year for the next year. In Carpinteria, California a similar trial was established using 'Hass' on 'Toro Canyon' rootstock. Trees were approximately 2 feet tall at planting. The grove had a heavy clay loam soil and a history of root rot. The trees were on drip irrigation. The trees were planted summer 2001 and monitored for 18 months after planting.

Results and discussion

Figures 1and 2 show the results of the different planting treatments at sites in New Zealand on ideal soils and on the heavy soil infected with root rot in California. Only tree height is shown; trunk girth and canopy volume followed similar patterns. From planting onwards, there were no differences in tree growth in any of the treatments at any of the sites. This would lead one to the conclusion that there is no value in and a great expense in making big holes and incorporating amendment. This is especially so in hillside situations where moving equipment and amendments on steep slopes would be very difficult.

The trees at the Carpinteria site, although infested with root rot, all looked good. The addition of organic matter in conjunction with the clonal rootstocks did not apparently provide any greater disease resistance. This is in accordance with work done by John Menge which shows that the greatest benefit derived from mulching are seedling rootstocks. The effect of mulch on disease suppression diminishes with the rootstock's resistance to root rot.

Figure 1. Tree height (meters) at site 1 in New Zealand 20 months after planting. No differences were found at the 5% level of significance.

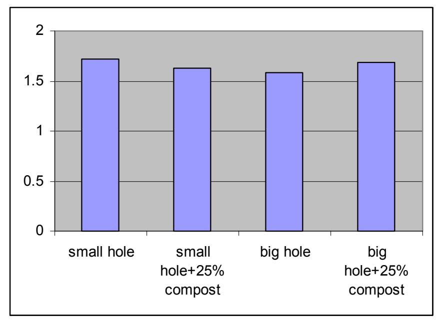
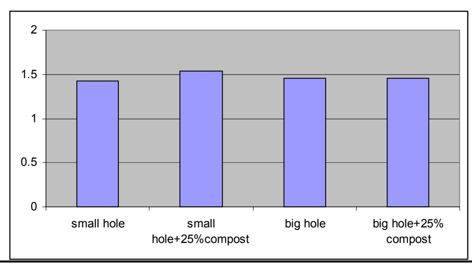


Figure 2. Tree height (meters) in California 18 months after planting. No differences were found at the 5% level of significance.



Production Quiz – A Challenge for Growers

Mary Bianchi

We'd like to challenge you to take the following quiz. Take a minute to place a check mark next to all the practices you regularly employ in your operation. Go ahead – we won't be collecting them!
Part 1

□ **Yes No** □ I know what the nitrogen requirements (lbs actual N/acre/year or /tree/year) are for my crops

 Yes No I know what the nitrogen levels are in soil amendments I use in my operation (compost, manure, crop residues, etc.)

 Yes No I have lab analysis of my well/irrigation water.

 Yes No I monitor tissue levels of nitrogen in my crops to help with fertilizer decisions.

 Yes No I have put together a nutrient budget that considers all sources of nitrogen for the crops I produce.

Part 2

 Yes No When I do apply nitrogen, applications are timed according to crop requirements.

 Yes No I use fertigation to apply nitrogen.

 Yes No Applications of nitrogen are split into smaller doses to improve efficiency of uptake.

 Yes No I use cover crops that help manage nitrogen availability.

 Yes No I manage irrigations to avoid nutrient loss below the rootzone of the crop.

If you marked yes to these as regular activities, you've just taken steps in showing how your production decisions can protect water quality. The combined activities noted in Part 1 constitute a Management Practice that protects water quality by developing a nutrient budget to help apply only the appropriate amounts of fertilizer. Activities in Part 2 may alone or in combination constitute Management Practices that help ensure fertilizers are applied efficiently.

Every grower uses 'management practices', many of which are meant to generate the best possible product for market. Depending on who you're talking with, the term 'management practice' can be something your Farm Advisor recommends (i.e., pruning to control tree height), your produce buyer suggests (protect avocados in bins from sun scald), or the term can have regulatory connotations.

You've all probably heard the term Best Management Practices*.* *Best Management Practice* (BMP) is defined in the Federal Clean Water Act of 1987, as "a practice or combination of practices that is determined by a state to be the most effective means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals." The term "best" is subject to interpretation and point of view. In recognition of this, the Coastal Zone Reauthorization Amendment (2000) substituted the terms *Management Measures* and *Management Practices.*

How can you tell if any individual activity constitutes a Management Practice that meets the needs of a regulatory program to protect water quality? Ask yourself this question: Can the activity stand alone and result in water quality benefits? Just knowing the nitrogen requirements of your crop doesn't result in any water quality benefits – developing and using a nitrogen budget for your crop can. A nitrogen budget that takes into account the nutrients applied in amendments, irrigation water, and fertilizers in meeting the requirements of your crop does have the potential to protect water quality from nitrogen pollution from your operation.

Some Management Practices can have water quality benefits as a stand alone activity. Cover crops are recognized as a Management Practice that can help manage both sediment and nutrients to reduce the potential of pollution when used appropriately.

Water quality protection is being asked of all industries in California. You have the opportunity to take credit for all of the activities you already do, like the ones listed above, that protect your local water bodies and/or groundwater from nonpoint source pollution from your operation. Look for additional articles in the coming issues to help you in this effort.

For additional background information on water quality legislation, and nonpoint source pollution from agriculture you can download the following free publications from the University of California's Farm Water Quality Program:

Water Pollution Control Legislation
http://anrcatalog.ucdavis.edu/pdf/8088.pdf

Nonpoint Sources of Pollution from Irrigated Agriculture
http://anrcatalog.ucdavis.edu/pdf/8055.pdf

Puncture Vine Resurgence

Neil O'Connell

Puncture vine has been been more obvious in orchards and in non-cropped areas recently. Puncture vine, frequently referred to as goathead, has a dubious reputation because of its thorny burs which when contacted are capable of inflicting a painful puncture wound.(figure 1). The spines are capable of puncturing some tires on farm equipment as well.(figure 2). The plant has a unform green color with yellow blossoms and prostrate growth with the fruit(seed) consisting of five nutlets each with a spiny burr. It is a warm season annual reproducing by means of seeds. It is frequently found in dry, disturbed areas or areas where rainfall is supplemented by additional moisture as in irrigated cropland. Seeds are dispersed by clinging to equipment, shoes, animals. Seeds require six months to a year before germinating. Seeds in the soil can remain viable for several years. Plants can bear several hundred seeds. Puncture vine may have been introduced into this country from the Mediterranean region into the midwestern United States on the wool of imported sheep. It was first reported in California in 1902.

Management of puncture vine is often accomplished by means of a preemergence herbicide application applied in late spring. Escape seedlings are contolled with postemerence herbicide sprays. Management can also be accomplished by tillage operations, however seeds that are buried during tillage may remain viable for years as previously mentioned. Mowing is not highly effective due to the prostrate nature of growth.

Another management factor has been by means of biological agents, in this case two weevils, the stem mining weevil,<u>Microlarinus lypriformis</u> and the seed feeding weevil, <u>Microlarinus lareynii</u> These two weevils were originally introduced from Italy into California in 1959, and laboratory and field studies between 1959-1961 demonstrated that they fed on puncture vine and were capable of completing their life cycle on this plant. Adult weevils were then released into the field in July 1961. The weevils established quickly aided by transfers from one area to another. The larva of seed weevil feeds in the seed and surrounding tissue, destroying the seeds. Pupation occurs in the seed and the adult chews an emergence hole in an adjacent sector of the seed. The eggs of the stem mining weevil are laid on the underside of the older portions of the stem, branches and crown. The larvae mine in these tissues, and the adults eventually emerge by means of chewing circular holes. Both species produce a generation each month in the summer. Both species overwinter as adults in reproductive surface debris, plant litter and on or around associated nonhost plant species. In 1978 Kirkland and Poeden assessed the effects of both wevils acting in concert on irrigated and nonirrigated plants. Their results showed that water stress was the principal cause of early season plant mortality but weevil attack caused a 60 % reduction of flower producdtion on surviving plants in nonirrigated plants. In addition, only half of these flowers on nonirrigated plants produced fruit late in the growing season. Huffaker reported in 1983 that fifteen years after introduction of the weevils, puncturvine coverage and seed production declined in more than eighty percent of the one thousand two hundred field plots monitored in California. The biological control of puncture vine in California is considered a substantial success under field conditions where weevil attacks intensify moisture stress on nonirrigated plants.

Punturevine is intolerant of freezing temperatures. The severe freezes of 1990 and 1998 undoubtedly had an impact on overwintering puncture vine populations. Since 1998 minimum winter temperatures generally have been above average providing a more favorable condition for survival. Sufficient punturevine density is a critical factor necessary to support substantial weevil populations. With a loss of puncturevine hosts the number of weevils would likely have declined. In addition weevil establishment is favored by warm temperature areas associated with mild winters. The very low winter temperatures associated with the freezes would in all likelihood had an additional negative effect on numbers of the weevils.

As the level of the puncturevine host rebounded following the freezes, the numbers of weevils would be expected to increase as well and increase their level of control on populations of the weed.

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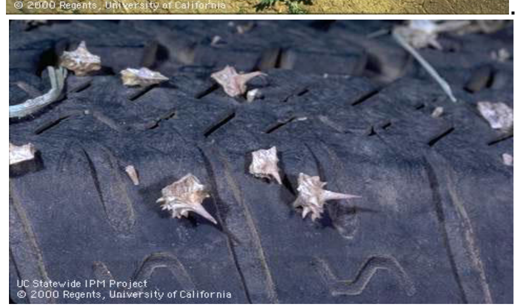


Rootstocks

Gary Bender

Characteristics of Avocado Rootstocks
Commercially Available to Growers in California

	Topa Topa	Lula	G-6	Duke 7	Thomas	G755 A, B, C (Martin Grande)	Barr Duke	Toro Canyon	D-9	Borchard
Normal Propagation Method	seed	seed	seed	clonal	clonal	clonal	clonal	clonal	clonal	clonal
Productivity "clean" soil - a	3	?	3	4	2	1	3	3	2.5	4
Productivity "root rot" soil - b	1	?	3.5	3	3	2	3	3.5	3	2
Tree size "clean" soil - a	5	?	5	5	5	5	5	4	4	5
Tree size "root rot" soil - b	0.5	0.5	1	2	4	1.5	1.5	3	2.5	0.5
Tolerance to Phytophthora cinnamomi (root rot) - c	0	0	2	3	4.5	5	3.5	2.5	3.5	0.5
Tolerance to Phytophthora citricola (trunk canker) - d	3	?	3	4	2	3	3	5	4	3
Salinity tolerance - e	2	3?	2	3	1	2	2	3	3	3
Frost tolerance - f	4.5	1	4.5	4	4.5	1	4.5	4.5	4.5	4.5
Tolerance to Dothierella stem canker - g	5	?	2	5	2	?	5	5	5	5
Horticultural Race	Mexican	Guat. X West Indian	Mexican	Mexican	Mexican	Hybrid P.shiedeana x P.americana	Mexican	Mexican	Mexican	Mexican
Parentage			Collection seedling	Duke	escape tree	market collection	Selfed Duke 6 seedling	escape tree	irradiated Duke seedling	escape seedling
Geographic Origin	Mexico	Florida	Antigua, Guatemala	UC Riverside	Escondido, CA	Guatemala	Fallbrook, CA	Carpinteria, CA	UC Riverside	Oxnard, CA

Rating Scale 0 = worst, 5 = best

Footnotes:
a. Yield and canopy volume expressed as percentage in comparison to Topa Topa (Mexican seedling), based on 7 yrs of data (6 yrs for Thomas) at South Coast Field Station (Arpaia, Bender and Witney, 1993)
b. Yield and canopy volume expressed as comparison to Thomas (consolidated data from J.A. Menge, 2002)
c. Consolidation of performance of young replant trials, ratings by J. A. Menge
d. Results from greenhouse trials by A. Alizadah and J.A. Menge (unpublished)
e. Rootstock trial in sand tanks treated with three levels of saline water (Oster and Arpaia, 1991)
f. Observations by G. Bender and J.A. Menge after freezes in 1988-1991.
g. Results from greenhouse trials by A. Alizadah and J.A. Menge (unpublished).

Characteristics of Avocado Rootstocks
New Rootstocks that may become Commercially Available to Growers in California

	Dusa (Merensky 2)	Latas (Merensky 1)	Zentmyer (PP4)	Uzi (PP15)
Normal Propagation Method	clonal	clonal	clonal	clonal
Productivity "clean" soil - a	4	?	2	3.5
Productivity "root rot" soil - a	4	4	5	5
Tree size "clean" soil - a	5	5	5	5
Tree size "root rot" soil - a	4	4	4	5
Tolerance to Phytophthora cinnamomi (root rot) - b	5	4.5	5	5
Tolerance to Phytophthora citricola (trunk canker) - c	?	?	3	4
Salinity tolerance - d	4	5	1	4
Frost tolerance - e	4.5	4.5	5	?
Tolerance to Dothierella stem canker - f	5	5	4	3
Horticultural Race	Mex x Guat	Mex x Guat	Mexican	Mexican
Parentage	escape seedling	escape seedling	breeding plot	breeding plot
Geographic Origin	South Africa	South Africa	U. C. Riverside	U.C. Riverside

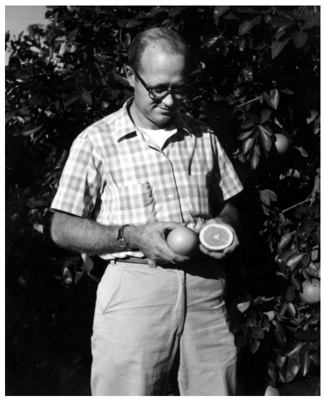
Rating Scale 0 = worst, 5 = best

Footnotes:
a. All ratings are based on preliminary data in California by UC researchers, observations by Brokaw Nursery and from South Africa
b. Ratings are considered preliminary, (consolidated data from J.A. Menge, 2003, unpublished)
c. Ratings are considered preliminary, ratings by A. Alizadah and J. A. Menge (unpublished)
d. Preliminary ratings based on a field trial using saline water, (D. Crowley, M.L. Arpaia and G. Bender)
e. Ratings are very preliminary and may change
f. Ratings based on greenhouse trials (A. Alizadah and J. A. Menge unpublished)

The Charles W. Coggins, Jr. Scholarship Fund

Dr. Charles W. Coggins, Jr., Professor Emeritus of Plant Physiology, officially retired from the University of California, Riverside after 37 years conducting research on citrus crop production. In 1997, he received the National Award for Agricultural Excellence from the National Agri-Marketing Association in recognition of the beneficial impact of his work on growers. In 2003, he received the Albert G. Salter Memorial Award, given by the California Citrus Quality Council. He is one of only two people ever to be chosen as a Fellow of the International Society of Citriculture. Recently he initiated a scholarship carrying his name that will benefit student scientists pursuing citrus research.

Where would California citrus be without the scientific research of Charlie Coggins? Charlie was a driving force behind innovative advances with plant growth regulators, beginning with gibberellic acid and continuing with programs to retain 2,4-D. His research has been described "as the single most economically beneficial research result of the last century." The use of plant growth regulators is of particular value to growers, packers, and marketers of lemons and navel oranges. Accomplishments this fundamentally important we often take for granted but, make no mistake, Charlie forever changed citrus practices and profitability.



Dr. Coggins in a Hemet grapefruit grove in 1963.

The great promise of science is that, regardless of how far any one person has advanced knowledge, succeeding generations will continue to build upon that strength. But it takes financial support to attract the most highly qualified students into areas of research that will address problems facing California citrus. Charlie is creating this citrus research scholarship because it will foster the cycle that ultimately will bring real-world benefits to the citrus industry.

The only criterion Charlie has placed upon his scholarship is that the scholar demonstrate academic excellence, quality research, and benefit to the citrus industry. The threshold endowment amount for this type of scholarship is $50,000. This is an ambitious goal, but it will ensure that *earnings alone* will provide in perpetuity an annual gift large enough to help a deserving student. If you care to contribute, the specific process is described on the form below.

Please consider joining Charlie in creating this scholarship. It is an appropriate legacy to acknowledge Charlie's contributions that have benefited the industry and perhaps you personally. If you know Charlie, you know he'd be the first to downplay his personal role in aiding the citrus industry, but please take a moment to reflect on the man and what his work has meant. Any gift you make will be truly appreciated and will help us reach our total. Donations are fully tax-deductible. Some things are just the *right* thing to do. I hope you feel honoring Charlie through this scholarship is one of these. Thank you for your consideration.

Steven R. Angle

Dean, College of Natural and Agricultural Sciences, UC Riverside

YES! I want to help endow a scholarship in honor of Charlie Coggins!

Name____ Phone ____________________

Address ____

City __________________________________ State__________ Zip ____________

Amount of Gift ❑ $5,000 ❑ $1,000 ❑ $500 ❑ $250 ❑ $100 ❑ Other__________

Credit Card Payment ❑ Visa ❑ MasterCard ❑ Discover Expiration Date ______________

Account Number __________________________ Signature ____________________________

Please acknowledge and credit my gift in the following way (e.g. Mr. J. Public, John Q. Public, John and Jane Public, etc.):

____

Please make any checks out to The UC Riverside Foundation and note on the comment line in the lower left corner of your check Charles W. Coggins, Jr. Scholarship. This will ensure your gift is restricted according to your wishes.

PLEASE MAIL THIS FORM TO:
UC RIVERSIDE, COLLEGE OF NATURAL & AGRICULTURAL SCIENCES, OFFICE OF THE DEAN, RIVERSIDE, CA 92521
If you have any questions or comments, please contact Cynthia Giorgio at (909) 787-3325, cynthia.giorgio@ucr.edu

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