Atlantic Coast Camellias

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Tea Plants at the Charleston Tea Plantation with Picker

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COVER NOTE

The mechanical tea picker can do the work of 500 people. It is used to harvest 30 acres of mature tea plants and was built by Lipton Tea Co. and Mark Fleming who is now co-owner of the Charleston Tea Plantation.

IN THIS ISSUE

PRESIDENT'S MESSAGE

This summer has been the hottest and driest that I can ever remember. We have had temperatures in excess of ninety degrees for over thirty days. Rain has been spotty. We've had very little. In an effort to just keep our camellias and other shrubbery alive, we have been pouring on the water. So far the camellias don't appear to be suffering but there doesn't seem to be any break in sight.

Due to the intense heat and drought, other summer projects planned have been put on hold. Also, my recovery from a broken leg has been much slower than I had anticipated. Bill will be very glad when I am completely healed.

Now is the time to make your plans to attend our annual meeting at Myrtle Beach on October 8 and 9. Rates are $33.00 per night. We are looking forward to a good convention with lots of fun and fellowship. A program on Camellia Diseases will be presented by Ron Jones from N.C.S.U. and Camellia Insects will be discussed by Jim Baker also of N.C.S.U. Sadie Lyon is again donating a camellia painting for our raffle. We will have our usual plant auction but this year we are going to try something different — the auction will be on Saturday morning following our business meeting. Hopefully, this will get us out of the banquet a little earlier on Saturday night. Please plan to join us and make your reservations now.

If you have any ideas about what we may do to promote membership, please let us hear from you. Declining membership in all our local societies is a problem. We need to continue our efforts to interest and attract new members.

We look forward to seeing all of you soon.

Mildred S. Robertson

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Tom Perkins, President of ICS, and Art Landry, new editor of "Gulf Coast Camellian" display "The Camellia Register" published by ICS and soon to arrive.

EDITOR'S NOTE

This is the year of more record setting weather variations than usual beginning with the blizzard of the century on March 13, 1993. Snow and temperature records fell like dominos up the eastern U.S. On return to Marshallville at 3 A.M. March 15th, the temperature was 14 °F and the unheated poly greenhouse was intact after 80 m.p.h. winds. All camellias fared well including Camellia sp. *Chrysantha* but Camellia sp. *Euphlebia* still has beautiful leaves with no new growth due to loss of vegetative buds.

The next weather variation was two months of excessive rain in the midwest and Mississippi and Missouri River watersheds resulting in record flooding. Meanwhile Georgia and the Carolinas were dry with loss of summer crops further aided by record high July temperatures as noted in the president's message. Now unusual tornados in southeastern Virginia and hurricane Bret entering the southern Gulf of Mexico are at hand.

With little to moderate care camellias have come through adverse weather. New growth and bud set are good this year and we'll soon know how our flower buds have developed with our first camellia show at Perry, GA, National Fairgrounds October 16-17, 1993. Dr. Luther Baxter, Jr. has noted that there can be a relative water deficiency to flower buds at temperatures above 97-98°F. as the plant directs water to preserve its vegetative system, perhaps at the expense of flowers. This threat to flower bud development may be corrected by a light foliage hosing or two on such a hot afternoon. Even better is a misting system or nozzle that cools the air more than hosing. Bob Hill was an excellent camellia exhibitor in Pensacola, FL, who made a mister of PVC pipe over his backyard camellias and lowered the air temperature by 20-30°F. By the way, Bob also fertilized his camellias with fresh fish from Pensacola Bay. His dog knew better than to dig up the fish.

Elizabeth gave me a large composter for my birthday. Dr. Bill Ackerman still recommends camellia pot mix made up of ⅓ compost. We loaded the 18 bushel monster 17 days ago with a mid-course heat of over 130°F. Breakdown of grass and stems was not complete in spite of adequate moisture and a "sweet" smell. So we'll add some fresh material, starter and fertilizer. I was dubious of black humus in two weeks. More news of this later.

This has been a good summer except for the weather. The Carolina and Coastal Carolina Camellia Society picnic on Edisto Island were wonderful. We visited the American Classic Tea Plantation on the way to the Columbia picnic as announced in the last and this issue. Two highlights were a 50th anniversary reunion at Miami University, Oxford, OH and graduation of Sam Rumph from the United States Naval Academy at Annapolis, MD.

I hope you have prepared for the early camellia shows beginning Oct. 16th. It is difficult to gib and time blooming accurately. In addition up to half of the blooms may be deformed or not of show quality. It is difficult to force Mother Nature. Incidence of bull-nosing is more frequent with early use of gib formal double blooms. In late July, 1988, I gibbed 100 camellia varieties at Massee Lane Gardens to furnish 19 blooms for Southern Governor's wives at their conference on Sea Island on Sept. 23rd. This produced 22 camellias for this event and four for a wedding the next week.

Under the editorship of Val Bieleski the New Zealand Camellia Bulletin is better than ever. You may join by sending US $12.50 for single membership or US $13.50 for family to Mrs. Bobbie Belcher, 7457 Brydon Rd., LaVerne CA 91750. You will have the added bonus of beautiful camellias in color by world-famous photographer Yvonne Cave.

And again there are two requests that are important to all of us. Please let your enthusiasm for the Atlantic Coast Camellia Society move you to invite friends and other camellia lovers to join us. The second request before your enthusiasm and you subside, is to share your knowledge in our Journal before your editor subsides. Dr. Dan Nathan is preparing a contribution. Join him.

Mildred Robertson has outlined our convention program in the president's message. The scientific program will be of help to all of us and Saturday nights program will be shortened. In addition you'll save money on lodging. It will be a great convention and Elizabeth and I look forward to greeting you there.

Dave Scheibert

THE CHARLESTON TEA PLANTATION

Credit for this article goes to Donna Shepherd who is an editor's joy. After expressing an interest in the tea plantation at the Charleston Camellia Show Donna sent information about the subject as well as Cypress Gardens and Angel Oak. The tours at the Charleston Tea Plantation were scheduled on the first Saturday of each month from May through October as announced in the last ACCS Journal. Our delightful fellow travelers, Cheryl and Warren Thompson, agreed this would fit in well before the Middle Carolina Camellia Society meeting in Columbia, S.C. on May 1, 1993.

Saturday, May 1st, found us in the true low country of Wadmalaw Island, southwest of Charleston, SC, route 700 or Maybank Highway. The sole producing tea plantation in America is at 6617 Maybank Hwy. Turning left on a country lane through a grassy field we came upon straight rows of flat-topped tea plants appearing to be long 4 feet high and wide hedge rows. The foliage on the plants, camellia sinensis, was light green with new vegetative two inch growth ready for the first picking of the season. A five minute informative television program was presented under a shade tree and 40 visitors then met Mack Fleming, co-owner and tea horticulturist. Mack introduced us to a large mechanical tea picker that did the work of 500 people picking the tender shoots and young leaves by hand.

The next stop under a large oak tree introduced William Barklay Hall, co-owner and English trained tea taster, who is responsible for the expertise that delivers the best possible quality and taste of the finished product. Mr. Hall is a third generation tea taster and has had with Mr. Fleming a combined experience of 40 years. Mack Fleming had directed a Thomas Lipton Tea research facility at the same location for 24 years before he and Hall became co-owners of the renamed Charleston Tea Plantation in 1987.

Flat topped rows of tea plants

Our next stop was for snacks and tea tasting. The emphasis is on tea bags rather than bulk black tea with the final product named American Classic Tea. Two other types of tea, oolong and green tea of China are not produced. Introduction of a subtle lemon flavored tea is under consideration. We then purchased a six box carton of tea bags, 70 tea bags per box that makes 10 gallons of tea per box. We were unable to visit the tea processing area since it was forbidden by the FDA. And now for the information we learned in this interesting hour.

Tea seeds arrived in Charleston, SC, in 1799. Dr. J. Smith started commercial production of tea in 1848 in Greenville, SC, but was stopped by death in 5 years as was the next attempt by Dr. A. Forster in Georgetown, SC, in 1874. Dr. Charles Shepard (Spehard) Summerville, SC, had commercial success with tea from 1888 to 1915. Dr. Shephard's oolong tea won the first prize award at the 1904 World's Fair in St. Louis. In 1903 Major R.D. Trimble and Mr. A.C. Tyler combined in a tea plantation that lasted only 4 years and Trimble then assisted Dr. Shepherd. In 1963 Thomas J. Lipton, using Dr. Shephard's tea plants, established a successful commercial tea operation at the present site of Charleston Tea Plantation on Wadmalaw Island. Here Lipton and Mack Fleming perfected the tea picking machine. Fleming and Hall then became co-owners in 1987.

The culture of tea plants, as with camellias is aided by an acid well-draining soil, in hot humid climate and extra nitrogen to promote rapid growth. Propagation is by means of semi-mature three leaved cuttings or even one leaf cuttings. When rooted in large numbers, the cuttings may be placed in the soil of the fields in tunnels of woven plastic cloth or polyethylene covered with shade cloth and a ground cover of black plastic to control weeds.[1] The Charleston Tea Plantation rooted cuttings for five more acres of tea and planted these last Fall with irrigation. However, their 30 acres of producing plants are not irrigated, having developed a good root system.

The harvest season covers 6 months, May through October, and the 1½ to 2 inch young shoots and leaves

William Barclay Hall, Tea Taster and Co-owner, explains the processing of tea.

are mechanically cut every 15 to 18 days. The plants are fertilized with granular fertilizer 6 times during the growing season. No insecticides or fungicides is used or needed. Each acre produces 4000 lbs. of dried black tea during the 6 month growing season. Occasionally a late frost interferes with the first harvest. At Massee Lane Gardens three outside tea plants were not hurt by —4° F. in January 1985, indicating good cold resistance in the dormant state. The tea plant has a long productive life of as much as 400 years and plants as old as 800 years are reported in China. Rooted cuttings grow to harvesting size in three to five years.

The harvested leaves are taken into the factory and placed in withering troughs which exposes the green leaves to circulating warm air overnight. This process takes 14 hours and reduces moisture content of the leaves from 80% to 68%. The leaves are then macerated (crushed and cut) by grinders which break up the cell walls in the leaves. The leaves are then exposed on mesh cloth to air for 1½ hours which allows oxidation to occur. The leaf color changes from green to coppery brown during exposure to air.

The next step is to stop oxidation and dry the tea by exposure to 248° F air for 28 minutes. This reduces the moisture content of the tea to 2%. The product is then cleaned of fiber and stem by use of static electricity. The greatest part of the is used for making tea bags. The above process results in black tea. The green tea of China is produced by heating the fresh green leaves in large woks to reduce moisture and stop enzyme activity and oxidation. The leaf and brewed tea are light green in color and has a delicate flavor. Oolong tea is made by a shorter process of fermentation than black tea.

Black tea is the primary form used in the U.S. and let us discuss how to get the most enjoyment out of your tea. American Classic Tea can be ready for the consumer on the grocery shelf in four weeks whereas overseas products could take 9-12 months. Freshness results in better smoothness and delicacy of flavor. Tea retains freshness best in a freezer or an air-

Elizabeth S. and Cheryl Thompson about to be picked up.

tight jar in a refrigerator. For hot tea pour fresh boiling water over a tea bag in a cup or bags in a tea pot. Seven tea bags will make one gallon of tea unless you wish it stronger. Steep the tea as long as you wish since the makers say that this will not change the flavor or America Classic Tea and you may squeeze the tea bags if you wish and you may flavor to taste. If you must avoid caffeine (theophylline in tea) you can make "moon tea". This is done by putting seven tea bags in a gallon of fresh water and letting it sit for six hours or overnite, remove bags and use as you wish. This reduces the caffeine-like theophylline in tea by 75-80% as a result of not using heat for brewing but preserves all the flavor. Tea may be flavored with various spices or essences from flowers, other leaves or fruit. American Classic Tea plans to introduce a lemon flavored black tea. It has been noted that Americans may add milk or cream to their hot tea or sugar to make it sweet, lemon to make it sour and ice to make it cold.

It is hoped that you now know more about tea, the most used prepared beverage in the world. American Classic Tea is available at 12 grocery chains in South Carolina as well as fine restaurants and specialty shops. There is some distribution in North Carolina, Virginia and Georgia. It is on the shelf at Piggly Wiggly in Fort Valley, GA and will soon be sold in the gift shop at Massee Lane Gardens. You may also order from the Charleston Tea Plantation, Inc., 6617 Maybank Highway, Wadmalaw Island, SC 29487, Phone (803) 559-0383, Fax (803) 559-3049.

There are three informative references since July 1992, all appearing in the New Zealand Camellia Bulletin edited by Val Bieleskil.

1. Smale, P.E.: A Tea Industry in New Zealand, 17, No. 5, pp. 25-30, July 1992

2. Donnan, Bill: Tea, 17, No. 6, pp. 2-4, November 1992

3. Ferguson, A.R.: The Most Popular Camellia of All, 18, No. 2, pp. 13-16, July 1993.

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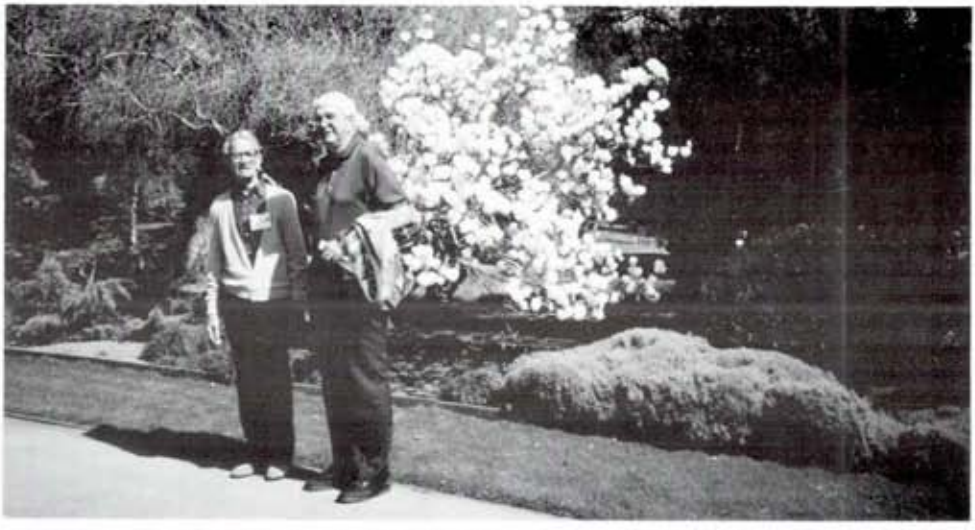

Bill Shepherd and Lew Fetterman at Fioli Gardens, CA, at March 1993, ACS Convention.

MULCH TOXICITY

*American Nurseryman
January 15, 1989

Prevent plant damage by carefully processing and storing organic mulch

By Sven E. Svenson and Dr. Willard T. Witte*

Nurserymen and landscapers occasionally report chlorosis, leaf scorch and plant mortality immediately after using organic materials as container media or landscape mulch. Why would liners be severely injured or killed when potted in pine bark? Why would container stock be burned or defoliated when mulched with hardwood bark during winter? And why would bedding plants die less than 24 hours after being planted?

Although fertilizer or pesticide misuse is often blamed for such damage, improperly stored or handled organic mulch may be the real cause (2). Improper processing and stockpiling create sour or "acid" mulch that can quickly damage plant tissues and alter soil pH.

In addition, container-grown plants potted in pine bark from old piles, or from piles that accidentally caught fire, can exhibit reduced growth. Therefore, careful production and storage of media and mulch can prevent damage caused by toxic organic materials.

The cheapest way for sawmills, contractors and garden centers to stockpile organic mulch is to create huge piles in outdoor storage lots, bins or pits. Although this control costs, damaged plants can be the expensive result for growers, consumers or landscapers if the mulch sours.

Although it may be several days before symptoms appear, spreading sour mulch can damage plants immediately. Because the toxins produced by sour mulch have usually dissipated by the time plant injury is apparent, the problem has been difficult to diagnose and is often confused with pathogen or herbicide injury, or with nutritional deficiencies.

Bedding and low-growing woody plants, which are most easily damaged, exhibit a white marginal chlorosis, leaf scorch or defoliation. Because damage occurs so rapidly, the only way to protect plants is to avoid using toxic mulch.

How can you determine if organic mulch has soured? The quickest way is to smell it. Sour mulch usually has a penetrating odor much like vinegar, ammonia, sulfur, or silage. In contrast, good mulch smells like freshly cut wood or fertile garden compost.

Another way to identify sour mulch is to check its pH. Sour mulch has a pH of 1.8 to 2.5, which is too acidic to be economically neutralized by liming.

Several factors are involved in mulch souring: aeration, pile size, storage site, moisture and particle size.

Mulch piles need to "breathe" to prevent infestations of anaerobic microorganisms (mostly bacteria) that produce toxic fermentation substances, such as methanol, acetic acid, ammonia gas and hydrogen sulfide gas. The larger the pile, the harder it is for fresh air to reach its center.

In addition, the weight of large piles causes the mulch to compress itself, further reducing the air supply.

Compression occurs even more rapidly if mulch becomes wet or soggy from precipitation or irrigation. This problem is compounded when mulch is stored in bins or pits that inhibit water drainage. Plastic spread over mulch also cuts off the air supply.

Mulch should be ground or shredded until it contains enough large and small

particles to prevent rapid packing. Some compression is needed to prevent mulch from washing away in the landscape. One favorable characteristic of hard wood bark mulch is its ability to mat. However, it is difficult to water plants through strongly matted mulch (7).

Proper particle size varies with mulch type. Too many small particles clog the spaces through which air and excess water travel to the plants' roots. A sufficient mixture of large particles prevents this from happening.

Fine-textured mulches are similar to large piles in that they compress very easily (5). Sawdust and mushroom compost typically have very fine textures. Some storage yards are now amending these materials with chunky bark to help prevent souring.

Bark mulches typically contain particles that are 1 inch or larger. Bark is usually milled and screened with a ½-inch screen. Particles smaller than ½ inch are used for container media; larger particles are used for mulch (4, 6).

What's the best way to store mulch? If it is sold or used fast enough to empty a bin before it is refilled, it can be safely stored in bins. Never dump new mulch on top of mulch already in a bin. If the old mulch is sour, it will soon sour the new material.

Store mulch on a crowned (not sunken) surface that allows excess moisture to drain quickly. Flat surfaces, bins and pits create soggy mulch in rainy or irrigated areas. In regions with heavy rainfall, store much under a roof or similar cover. But remember, never cover piles with plastic.

Although moist mulch is easy to handle because dampness controls dust, excessive moisture also restricts air movement. Keep moisture below 40 percent of the total weight of the pile (4). This will help avoid souring and also eliminate the extra cost of transporting heavier soggy mulch as well.

Mulch is best stored in windrows that are 4 to 6 feet tall, 6 to 12 feet wide at the base and 6 to hundreds of feet long (1, 3, 6). Smaller piles are fine, but they are not very economical. Large piles are economical, but they risk souring the mulch.

Domed or semicurcular windrows maximize rainwater runoff. However, windrows that are too wide do not allow sufficient air movement. Avoid driving equipment onto mulch piles when forming windrows because it causes compaction and subsequent fermentation (4).

Pile size, particle size and storage site are all interrelated. Coarse mulch stores better in bins and can be stacked in larger windrows than fine-textured mulch (4)

Therefore, use mulch with a sufficient amount of large particles. It is better to have too many large pieces than too few.

If a particular pile has too many small or powdery particles, find a pile that has most large pieces, and mix them together. Avoid problems with fine-textured mulch piles by adding coarse, lightweight aggregates, such as large bark chunks, pumice or expanded shale (4).

Mechanically turn or mix stored mulch regularly. Turning it once or twice a month is usually sufficient to avoid air supply problems. However, if mulch is soggy, turn it more frequently. Most sawmills, store yards and garden centers do not turn bark piles during storage because of the expense, but this is probably the only way to prevent souring.

Like bulk mulch, packaged mulch can cause problems. Exercise precautions to assure quality packaged mulch. First, make sure that packages, such as plastic bags, have air holes allowing mulch to breathe and to be physically inspected.

Second, because moisture accumulates during storage as decomposi-

tion occurs, make sure the mulch has less than 40 percent moisture before packaging it (4). Third, do not add fertilizers before packaging. They encourage rapid decomposition and increase the chance of sour mulch.

Fourth, use stabilized mulch within a year after packaging. Unstabilized mulch (mulch that produces heat) should be used within a few months.

Finally, do not stack packaged mulch too high. Allow space for adequate ventilation.

*Sven E. Svensen is a doctoral horticulture student at Texas A&M University, College Station.

Dr. Willard T. Witte is a professor in the department of ornamental horticulture and landscape design, University of Tennessee, Knoxville.

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IMPROVING RHODODENDRON BLOOM

By John Finney
and Dr. Willard T. White

Some Rhododendrons cultivars have sparse blooms on young plants, especially when they are intensively container-grown in the mid-South. More buds and shorter shoots contribute to a more compact plant, which is generally considered desirable.

We compared some newer growth retardants to B-Nine and an untreated control group of plants. In addition, we also tested two fertilizer treatments with equal amounts of nitrogen coupled with either a high or low amount of phosphorus.

We chose three Rhododendron cultivars for their reputed differences in ability to set flower buds while growing in #2 containers: 'Scintillation' (good), 'Nova Zembla' (fair) and 'Catawbiense Boursalt' (poor).

We potted nursery-propagated plants in #1 containers in June 1986 with a pine-bark medium and added nutrients. We followed common commercial maintenance practices and transplanted the plants to #2 containers after a year. We broadcast Ronstar 1G for weed control.

We then selected uniform plants and set up five replications. At the end of the second growth flush in late July, we fertilized half the plants with Lesco Sulfur-Coated Starter and Bud Set fertilizer (14-26-6) at 16.15 grams per container, yielding 2.26 grams nitrogen and 4.20 phosphorus.

We fertilized the remaining plants with Scott's SREF sulfur-coated fertilizer (19-3-10) at 11.9 grams per container, yielding 2.26 grams nitrogen and 0.36 grams phosphorus.

We tested the following growth retardants at the following rates: A-Rest (25, 50 and 100 parts per million); B-Nine (2,500, 5,000 and 10,000 ppm); Bonzi (62.5, 125 and 250 ppm); and Sumagic (12.5, 25 and 50 ppm).

We sprayed growth retardants (approximately 25 to 30 milliliters per plant) on the foliage to the point of runoff immediately before the last growth flush.

In November, we recorded plant height, flower bud number and terminal bud number. Then we overwintered the plants in a poly house. In May '88, we recorded the number of bloom trusses per plant. In June, we measured the five longest new shoots per plant and recorded their average length.

Height and growth responses were essentially the same for all three cultivars. Bud and bloom data for

'Catawbiense Boursalt' was similar to that of 'Nova Zembla' with minor variations, while 'Scintillation' flowered poorly.

A-Rest and B-Nine were ineffective in controlling height growth at the rates used. A-Rest did not increase the number of flower trusses per plant, while B-Nine-treated plants flowered slightly better than the control plants except for the 5,000 ppm rate.

All Sumagic rates and all but the lowest rate of Bonzi reduced height. Both Sumagic and Bonzi retarded growth the following spring. All Bonzi and Sumagic rates more than doubled flowering of the control plants. Bonzi at 125 ppm was significantly better than all of the Sumagic rates.

Using the high phosphorus rate with the growth retardants caused more, but shorter, shoots to form during the spring growth flush. This produces a more compact plant.

We could visually observe a positive flowering response but did not obtain the proper data to verify this. Plants receiving the high phosphorus rate appeared to have more flowers per truss.

John Finney is a bachelor's of science graduate, and Dr. Willard T. Witte is associate professor of ornamental horticulture, University of Tennesse, Knoxville.

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PREVENTING ROOT ROT OF FIELD-GROWN AZALEAS WITH ALIETTE AND SUBDUE

By Dr. D.M. Benson*

Phytophthora root rot caused by the soil-borne fungus Phytophthora cinnamomi can limit the development of susceptible ornamentals. Broadcasting fungicides is one successful prevention method. My objective was to evaluate the effectiveness of Aliette as a foliar spray on Phytophthora root rot of field-grown azaleas.

I set up four treatments in a randomized block design. For each of the four treatments, I used for 6- by 10-field plots naturally infested with P. cinnamomi. For the first treatment, I prepared a solution of Aliette 80 WP (5 pounds to 100 gallons) and used it as a foliar spray, applying it to runoff.

To compare treatments, I broadcast Subdue 2E with a sprinkling can at 0.2 ounces product per gallon water per 60-square-foot plot. I also fumigated four plots with methyl bromide as a phytophthora-free control treatment and left four plots as an infested control.

I transplanted 'Hinodegiri' azaleas from 3-quart containers to the plots in October 1984. I applied the two treatments at planting and then monthly from May through September 1985; April through November 1986; and May through October 1987. I rated the plants for growth, disease symptoms, infection and mortality for four years.

I measured growth by dividing the sum of the plant height and width by two. I rated the disease symptoms with the following scale: 1 - apparently healthy, 2 - initial foliar symptoms of root rot, 3 - advanced foliar symptoms of root rot and 4 - dead.

I assessed infection by culturing a portion of a root sample from each plant in each plot on a selective medium. I determined the inoculum density of P. cinnamomi from soil samples collected from around the plants' driplines.

Growth was similar for plants in the treated plots over the four-year study but

was significantly less for the infested-control plants. The severity of symptoms increased over time in the infested-control plots, while remaining low on plants in the other plots.

Ninety-four percent of the plants in the infested-control treatment were infected, while none of the plants in the Subdue plots were. Infection reached 57 percent in the Aliette plots and 69 percent in the fumigated plots.

The mortality in the infested-control plots reached 56 percent in June 1988; mortality was 13 percent or less in the other plots. Mortality was related to infecton percentage, and levels might have increased over time had I discontinued the fungicide applications.

The inoculum density was very low in Subdue plots, moderate in Aliette plots and high in the infested-control and fumigated plots.

These results indicate that Aliette as a foliar spray was effective in preventing the severe symptoms of Phytophthora root rot on azaleas. Aliette was not as effective as Subdue, however, since over 50 percent of the plants in Aliette plots became infected compared with none in Subdue plots.

Dr. D.M. Benson is professor of plant pathology, North Carolina State University-Raleigh, Raleigh.

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REDUCING HIGH SOLUBLE SALTS IN CAMELLIA CONTAINERS AND SOILS

BY J. CARROLL REINERS

CAUSES: Water may be high in salts; the soil may be high in salts; over-fertilizing may be the cause; poor drainage exacerbates the problem; incorrect watering increases the toxicity; and lastly never use chemically softened water.

SYMPTOMS: Nutrient and water uptake is impaired or ceases; plants wilt; leaf tips and margins may die and usually begin at the top on down toward the roots, at this point the plant dies. Parenthetically, the lower the moisture in the soil, the more toxic are the effects of the salts. These water stressed plants are more susceptible to pest and disease problems by the chemical changes within the plant. An example in camellias is the high susceptibility to spider mite when there is combined high salt plus low soil moisture.

GENERAL SOLUTIONS: 1 — If water is suspect, get analysis from the Water Department and ask for interpretative info relative to residual toxicity. 2 — Improper watering (superficial) will bring salts to the surface, and if severe, these salts must be skimmed off the top inch of soil periodically. Water heavily and infrequently, rather than light and frequent. 3 — Don't be gullible to amateur suggestions unless your soil chemistry is identical. Avoid recommendations to use specialty fertilizers such as ammonium sulphate, blood meal, 0-10-10, etc. unless you have a professional analysis which calls for these. Stick to the so called COMPLETE FERTILIZERS, with Nitrogen-Phosphorus-Potassium (N-P-K) in proper balance such as RAC, Pentrex, and many others. Don't use more than directed on the package, but probably less, such as one-half.

SPECIFIC REMEDIAL PROCEDURES: 1 — **Bare-root** container plants to a new soil mix. 2 — **Withhold all fertilizers** for one or more periods, especially P & K. 3 — **Water Correctly** as mentioned above. 4 — **Add Surfactant** (soil penetrant), it reduces surface tensions as illustrated by the duck which will sink and drown in water containing a

surfactant. There are many types available, some are better than others. Follow the directions. Remember that a surfactant will gradually leave the soil and must be renewed at least once every three months, if it is needed. A surfactant increases leaching potential of all salts if there is good drainage. The product "Water-In" is a good product. 5 — **Leach** — The needed ingredients are water plus surfactant. Surfactant is also absolutely needed in White Alkali soils. First build a 6" dyke around the root run to hold 6" of water with added surfactant. Repeat flooding once per week for a month, then once per month until the soil has loosened and drainage is again sharp. Never superficially water plants in White Alkali soils but thoroughly saturate or flood irrigate to constantly leach. Treatment for other salt buildups, such as overfertilizing may be treated accordingly as for the alkali. Remember that the surfactant is necessary to improve drainage and release the salts from the soil. 6 — **Add Gypsum** ($CaSO_4$) is especially good to leach calcium, magnesium, and sodium salts. The gypsum will flocculate the soil to increase drainage and hence better leaching. It may be used in conjunction with a surfactant, in certain conditions. Apply it in the powdered form to the soil surface, work it in the surface if it is possible before leaching begins. Gypsum comes in many percentages of purity, get only 75% purity or better. Use 1 Tbs. per sq. ft. or 5-10 lbs. per 100 sq. ft. If condition is very severe, apply with frequency as outlined for surfactant, and flood. 7 — **Sugar**: Use the bacteria in the soil to neutralize the high salt foxicity by adding 1 to 2 lbs. to 10 gal. water, applied at 2 pints per sq. ft. of surface. A rapid growth explosion of soil microorganisms results and ties up a large amount of the excess salts in the soil, thus reducing the toxicity. Good for overfertilized camellias with good organics.

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Tubby Habel, Herb Racoff, Carl Allen and Jim Pinkerton at Fayetteville, NC Camellia Show.

Cold: Its Effect on Camellias and Their Blooming

H. S. WOLFE *

Few are the camellia growers, except, of course, greenhouse producers, who do not wonder at some time every winter whether they will lose flowers or even plants because of cold. This is equally true of the camellia fan in Orlando, Florida, in Sacramento, California, or in Yonkers, New York. Size and quality of bloom may be seriously affected by malnutrition, unsatisfactory soil moisture, or pest attack, but rarely is complete loss of blossoms or bushes due to some cause other than cold. Yet it seems paradoxical that camellia bushes may endure without injury several inches of snow and temperatures well below 0° F. in some places, and be badly injured—at least the blossoms—by 25° F. in other places. The explanation lies largely within the plant itself, although external factors play an important secondary role.

The most important effect of cold on camellias is that of more or less serious injury, but this is not the only way it affects them. A certain amount of coolness is necessary for proper opening of camellia buds. Likewise the color intensity of camellia flowers is affected to some extent by temperature, and the season of bloom is delayed greatly by continued cold, even though no injury is done. Completely double flowers opening after warm weather sets in tend to show some development of the innermost petals, so that they no longer have a tight center. Cold which fails to have any effect on leaves may injure the petals of swollen or partly opened buds, and sometimes even of apparently tight buds, so that the petals are somewhat brown. In very double varieties the youngest, innermost petals are injured when the older, outer ones are normal. White or light pink petals show browning most easily and are disfigured more by small amounts of browning. Cold may kill flower buds completely without injury to leaf buds, or it may kill leaves and twigs progressively with decrease in temperature, until plants are dead to the ground.

INTERNAL FACTORS AFFECTING COLD INJURY

It is desirable, first of all, to make clear the nature of cold injury itself. The low temperature to which the plant is subjected is not in it-

self harmful, which explains why the same plant is unhurt by 15° F. at one time and is badly hurt at 20° F. at another. Injury to plant cells results only from formation of ice within plant tissues. Although ordinary water usually turns to ice at 32° F., it is well known that the cell sap in plant cells often contains substances which prevent ice formation until the temperature is several degrees below freezing. Then again, the cells may not have these antifreeze materials in them.

Ice can never form in plant tissues under normal atmospheric pressures unless the temperature is at or below 32° F., but ice may form without injury to cells or it may kill them, depending in part on where the ice forms. Ice crystals may form within living cells or they may form between cells. In the former case the cells are always killed; in the latter, they may survive uninjured or they may die. Formation of ice crystals within living cells seems to take place only when the temperature falls very rapidly—perhaps more rapidly than often occurs naturally—or when plant tissues are in a very tender condition. Usually, ice formation takes place in the spaces between cells, which are usually somewhat separated to permit more ready gas exchange. In this case the degree of injury to the cells varies with the tendency of the cells to lose water to the growing ice crystals. Depending on factors within the cell itself, there is a limit to the amount of water which the cell protoplasm—the living part of each cell—can lose without injury. When this limit is exceeded, the cell dies. Cells of the same plant tissue differ greatly at different times in the amount of water loss which can be endured, and cells of different tissues of the same plant—or of the same tissue in different plants—likewise differ greatly.

Plant tissues which are well matured can usually endure more cold than plant tissues which are tender and succulent, although the difference may be very small in many tropical plants. Plants of all kinds are readily hurt by temperatures little below freezing when they have tender new shoots. Later in the season these shoots mature and when winter comes they may be able to endure without injury very low temperatures. The fact that camellias survive winter temperatures below 0° F. in New York and New Jersey indicates that the plant has the inherent ability to form in its cells the substances which enable them to resist water loss beyond the recovery point even when the tissues are frozen hard at these temperatures. It is largely a matter of how well matured the tissue cells are, or as it is often phrased, how dormant the plant tissues are during the period of critical temperatures.

Dormancy is affected by many factors, especially if we include in this term the concepts more accurately differentiated into rest period (due

to internal factors) and dormancy proper (due to external factors). Previous temperature conditions play the most important role, although dormancy in some areas and with some plants may be solely due to drought. In regions where temperatures decrease slowly in autumn to a point well below freezing and stay below this point all winter, the plants remain quite dormant all winter and will endure minimal temperatures uninjured. In regions where temperatures during the winter are frequently well above freezing—even above 60° F. for long periods alternating with occasional drops to points below freezing, the plants may be far from dormant and may be injured more or less seriously by such drops.

Under the same conditions of temperature, different camellia plants of the same variety may differ in degree of dormancy; and camellia plants of different varieties quite commonly show differing degrees of dormancy, as indicated by differing degrees of cold injury. Under identical conditions of temperature and moisture, some varieties tend to start growth in spring sooner than others, and even more striking differences are commonplace in the opening of flower buds. The expansion of flower buds involves multiplication and growth of cells, so that opening buds are more easily injured than dormant buds. Even with apparently similar degrees of dormancy—and it is almost impossible to know when cells first start growth in buds—there seem to be some differences between camellia varieties which are inherent in the varieties themselves—genetic differences.

It has frequently been suggested that varieties with dark-colored flowers are hardier than those with light blossoms. While there are many exceptions, this does seem to be true as an average. An analysis of the reports of cold injury by many people in different areas for some sixty-five common varieties indicated that five out of thirty red varieties were considered very hardy while only one out of thirteen whites was so rated, and one of twenty-two pinks. Conversely, three of the thirteen white varieties were rated very tender, against two of the thirty red varieties and three of the twenty-two pinks.

Double-flowered varieties are often said to be more tender than single or semidouble types, and this concept also has some validity as an average statement, although it is not always true. Analysis of the same sixty-five varieties for flower type showed that only six of the thirty-three classed as hardy were completely doubled, while six of the seven tender varieties were of this type, and the other was an incomplete double. Yet three completely doubled reds rated high for hardiness.

It should be stressed that these analyses are based on reports from

the southeastern states, where large numbers of camellia varieties are grown. They represent responses to winter conditions of fluctuating temperatures. The lowest temperatures recorded for camellias are those given by Dr. P. W. Zimmerman at Yonkers, N. Y., and he found relatively few differences among varieties. Such complete doubles as Purity and Eleanor Hagood, which are rated usually as tender, survived –5° F., as well as the semidoubles Berenice Boddy and Lady Clare, commonly reported as very hardy. Such early fall bloomers as Alba Plena proved very tender at Yonkers because they were not dormant when the first autumn freezes came, but with winter temperatures so low that all were equally dormant, there were rather small differences between the few varieties tested. Most surprisingly, opening buds in February were not hurt by 0° F.

Season of bloom seems to have relatively little to do with cold hardiness, except as the subfreezing temperatures are experienced during a given season. In some areas the early bloomers may escape cold injury more often than the later ones, while in other areas the reverse is true. In general it is probably safe to say that the further north camellias are grown, the more hazard is found for early varieties. Conversely, in the extreme southern part of their range, late varieties may open poorly because the weather is too warm.

Absolute rating for hardiness is hardly possible because the conditions to which camellias are exposed are not uniform. Reports on varietal behavior for closely adjacent areas often differ from grower to grower. Among the sixty-five varieties above mentioned which a dozen growers in a half-dozen states had rated for hardiness, only two were quite uniformly agreed upon. Flame, a semidouble red, was in every list as very hardy, and Alba Plena, a completely double white, was always rated very tender. Mention should be made of a careful study of cold injury made by F. S. Batson at Mississippi State College in 1951. He exposed cuttings of a large number of varieties to subfreezing temperatures in a uniform procedure, and reported on injury to flower and leaf buds. As a measure of the resistance of the plants to cold in January, 1951, these results are sound, but they do not necessarily indicate relative ability to endure cold at other times and they are at some variance with reports of cold injury to the same varieties elsewhere in Mississippi during the same season.

EXTERNAL FACTORS INFLUENCING COLD INJURY

For any given variety, injury from cold will vary with the conditions of its environment. Temperature is, of course, the most important en-

vironmental factor, but degree of injury will not necessarily be correlated with readings of an air-thermometer. Apart from the variations in degree of dormancy just mentioned, there is the question of the temperature actually reached by the plant cells, how long this temperature was maintained, and other external factors.

For convenience in discussing these matters, the distinction between a *frost* and a *freeze* must be made clear. On clear, still nights in winter, the ground loses heat to the sky by radiation, the air is cooled next to the ground by conduction to the ground, and air temperatures are lowest next to the ground and are higher as one measures them upward for many feet. Frost forms on the ground when air temperature a few feet above the ground is above freezing, and this type of cooling of air and plants is called a frost. Leaves and buds of camellias lose heat by radiation also under these conditions and may be colder than the air. When a mass of air of subfreezing temperature moves into an area, plants are chilled by conduction to the air temperature. This is called a freeze, and occurs on a windy night (or day), with or without clouds. A frost can occur only at night with no clouds, and will usually bring temperatures only a few degrees below freezing.

Under frost conditions, any object that is between the plant and the sky will retard or prevent radiation of heat. Camellias under trees are largely protected from frost injury, and temporary covering has the same effect if the foliage does not touch the cover. Air drainage is important as a means of decreasing frost injury in some locations. Chilled air is heavier than warm air and flows down slopes much as water does. If camellias are planted in a depression with no outlet, chilled air may fill this depression and the plants in it become much colder than those on the slopes above.

When there is a freeze, an overhead covering is of no help in avoiding low temperatures, but a windbreak may retard the movement of chilled air, decreasing the length of time the plant is exposed to minimum temperature. Plants on the lee side of a house are favored in a freeze, but air drainage means little because all air is equally cold. Shade may be very helpful if it prevents the sun from shining on frozen tissues, for this may cause severe injury.

Mulch on the ground under the plant may be either good or bad, so far as cold injury is concerned. In a freeze, it may insulate the roots from the cold air and prevent injury to them, but under frost conditions, when temperatures are not low enough to injure roots, the mulch may increase the injury suffered by leaves and buds, because it retards the radiation of heat from the ground to the foliage directly above it.

Mulch on frozen ground also is helpful in reducing heaving and in making soil moisture more available to plants. With temperatures well below freezing, even with leaves frozen solid, transpiration of water continues from the leaves and stems. Heavily mulched ground is not frozen so deeply as unmulched soil, and roots under the mulch supply more water, helping prevent desiccation of the frozen twigs. A windbreak is also valuable under the same conditions because it decreases the rate of water loss in a cold wind. With or without severe cold, adequate soil moisture is an important factor in cold hardiness of camellias. Mulches and windbreaks help the plant conserve moisture, but there must be plenty of moisture in the soil to be conserved.

Vigor is another factor in survival of cold by camellias. Plants of low vigor because of poor nutrition, deficient root systems, insect attack, drought, hail, or disease are less able to endure winter cold than vigorous specimens, provided the latter are well matured and dormant. An oil spray applied in autumn makes foliage more subject to damage by cold.

Avoiding cold injury to camellias has several aspects, therefore. In part it may involve selecting varieties found by experience to be above average in hardiness for a given area. In part it rests upon providing a protected location, with shade from winter sun and windbreaks to mitigate winter winds. It may or may not require mulching of the ground, depending on whether the soil is likely to freeze deeply or not. And it involves getting vigorous and healthy plants into well matured condition of dormancy before freezing temperatures develop. Application of nitrogen late in the summer and pruning at this time are practices likely to delay maturity. Unless one can enclose a camellia bush completely, it is not likely to be profitable to attempt using artificial heat for keeping temperatures above the danger point; and using water spray to keep camellia leaves and flowers from freezing is feasible only when frosts a very few degrees below freezing threaten open flowers.

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From "Camellia Culture", Edited by Tourje, Published by Southern California Camellia Society, 1955.

CAMELLIA NEWS

Greetings after a record breaking summer. We and others could have done without the heat and drought records as well as the flood records in mid and upper Mississippi River drainage area. But we were able to enjoy the Coastal Carolina Camellia Society Edisto Island picnic hosted by Amy and Parker Connor who reside on my favorite picnic site. Their relaxed, gracious hospitality is greatly appreciated.

Another enjoyable picnic was hosted by Dr. and Mrs. Ben Stands in Columbia, SC, for the Mid-Carolina Camellia Club. The Stands excel in putting their beautiful home and very well landscaped garden to good use and are relatively new and avid members of the Columbia Club. In fact, she was Show Chairman of the February 1993, Columbia Camellia Show.

The Beaufort stew picnic on the shores of Lake Marion was a wonderful event which Elizabeth and I missed this year. It is hosted by a dedicated group of Carolina camellia and people lovers who generate as much fellowship as Beaufort stew. It warms your heart and soul to relax with camellia friends in the cool shade with a lake view and breeze, watermelon sculptures and serving the delicious stew from a long authentic homemade container usually found down on the farm. Some camellia clubs have a picnic but over in Carolina they enjoy the entire summer.

Our camellia show season is fast approaching and camellia buds are hoping for gib in order to be dressed in their best. The Middle Georgia Camellia Society will have two shows this autumn. The first is at the Georgia National Fairground, Perry, GA on

Officers and Directors of ACCS at Colulmbia, SC Meeting May 1, 1993.

Saturday and Sunday, October 16 & 17, 1993. Note that flower entry will be Saturday, October 16th 7-10:30 AM. The second MGCS show will be in the barn at Massee Lane Gardens on Saturday and Sunday, November 13 & 14, 1993.

On October 23-24, 1993 the Mid-Carolina Camellia Society will have its' fall show at the South Carolina State Fairgrounds with flower entry 7:30-10:30 AM October 23, 1993. The Coastal Carolina Camellia Society will have its fall show at Hilton Head, SC, at Shelter Cove Mall on November 6, 1993. Please refer to the list of Show Dates for further information and camellia shows.

At this time the Middle Georgia Camellia Society plans to have a Beaufort Stew welcome on Friday evening, October 15, 1993, at the home of Mary and Wilbur Rumph.

This is a time of change for area camellia publications. Mr. Art Landry has just completed his first issue of "The Gulf Coast Camellian" and we look forward to many more excellent issues quarterly. Jean Comber will not miss the Gulf Coast since we're delighted to have her continue as editor of the "International Camellia Journal" which she has done so well.

Pat Greutart is another seasoned gentle intelligent person who is leaving the editorship of "The Camellia Review" published by the Southern California Camellia Society. Mel Belcher is just succeeding Pat and he comes very well qualified and capable.

Elizabeth and I anticipate the pleasure of greeting you in Myrtle Beach, S.C. October 8-9, 1993 when our convention is the headline news.

Auctioneers Bill Robertson and Buck Mizzell at the Columbia Picnic at Dr. & Mrs. Ben Stands home.

SHOW DATES
(ACS COOPERATIVE SHOWS)

PLACE, LOCATION, SPONSOR	DATE
Perry, GA; Agricenter; Middle Georgia Camellia Society	October 16-17, 1993
Columbia, SC; South Carolina State Fair; Mid-Carolina Camellia Society	October 23-24, 1993
Chesapeake, VA; Chesapeake Square Mall; Virginia Camellia Society	November 6, 1993
Hilton Head Island, SC; Shelter Cove Mall; Hilton Shelter Cove Mall Merchants' Assn. & Coastal Carolina Camellia Society	November 6-7, 1993
Fort Walton Beach, FL; Westwood Retirement Community; Fort Walton Camellia Society	November 13, 1993
New Iberia, LA; Live Oak Gardens; Texas Camellia Society	November 13, 1993
Fort Valley, GA; Massee Lane Gardens; Middle Georgia Camellia Society	November 13-14, 1993
Waycross, GA; Trust Co. Bank of SE GA; Federated Garden Clubs of Waycross and Trust Co. Bank	November 17-18, 1993
Valdosta, GA; Valdosta Garden Center; Valdosta Camellia Society	November 20-21, 1993
Biloxi, MS; Gulf Coast Medical Plaza; Mississippi Gulf Coast Camellia Society	November 20-21, 1993
Brookhaven, MS; Brookhaven Camellia Society	November 27, 1993
Jacksonville, FL; Swaim Memorial United Methodist Church; Camellia Society of North Florida	December 4, 1993
Jacksonville Beach, FL; Jacksonville Beach Women's Club; Island of Beaches Camellia Society	December 4-5, 1993
Slidell, LA; Slidell Municipal Auditorium; Ozone Camellia Club	December 4-5, 1993
Houston, TX; Herman Park Garden Center, Houston Camellia Society	December 4-5, 1993
Apopka, FL; Fran Carlton Recreation Center; Apopka Parks Department	December 11-12, 1993
Pensacola, FL; The Wright Place; Pensacola Camellia Club	December 11-12, 1993
Lafayette, LA; University of Southwestern LA Campus; South Louisiana Camellia Society	December 11-12, 1993
Tampa, FL; Tampa Garden Center; Tampa Bay Area Camellia Society	January 8, 1994
New Orleans, LA; Clifton L. Ganus School Gym; Camellia Club of New Orleans	January 8, 1994
Gainesville, FL; Oaks Mall; Gainesville Camellia Society	January 8-9, 1994
Aiken, SC; University of South Carolina-Aiken; Aiken Camellia Club	January 8-9, 1994
Conroe, TX; Coushatta Camellia Society	January 8-9, 1994
Mobile, AL; Springdale Mall; Camellia Club of Mobile	January 15-16, 1994
Tallahassee, FL; Tallahassee Mall; Tallahassee Camellia and Garden Club	January 15-16, 1994
Winter Park, FL; Camellia Society of Central Florida	January 15-16, 1994
Ruston, LA; Lomax Hall, Louisiana Tech; Ruston Camellia Society	January 15-16, 1994
Charleston, SC; Citadel Mall; Citadel Mall Merchants' Assn. & Coastal Carolina Camellia Society	January 22, 1994
Ocala, FL; Appleton Culture Center, Ocala Camellia Society	January 22-23, 1994
Tuscaloosa, AL; West Alabama Camellia Club	January 29-30, 1994
Lakeland, FL; First Federal Florida; First Federal Florida	January 29-30, 1994
Jackson, MS; Deposit Guaranty National Bank Plaza; Jackson Camellia Society	February 5-6, 1994
Atlanta, GA; Atlanta Botanical Garden; North Georgia Camellia Society	February 19-20, 1994
Warner Robins, GA; Houston Mall; Middle Georgia Camellia Society	March 5, 1994
Fresno, CA; Fashion Fair Mall; Central California Camellia Society	March 12-13, 1994
Norfolk, VA; Norfolk Botanical Garden; Virginia Camellia Society	March 26-27, 1994

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How To Plant Camellias

DO YOU KNOW HOW TO PLANT CAMELLIAS?

It is easy if you do it right. The first thing you do is fill a plant pot with dirt halfway, then you put the seed in. After that, fill it up the rest of the way. If you want to plant a seedling go to a full grown Camellia tree and take a branch off and plant it in the same way that you planted the seed.

DO YOU KNOW HOW CAMELLIA'S LOOK?

Camellias can be very dark red, pink or white with pink or peach streaks. They are pretty and very colorful . . .

DO YOU KNOW HOW TO TAKE CARE OF CAMELLIAS?

You sprinkle water on their leaves if they have any leaves. Put water in the plant every week and keep it in the shade.

Special thanks to Col. Edwin L. Atkins, who taught me all of this.

Rachel London

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