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## QUESTION BOX

The Southern Region Question Box was moderated by Dr. Richard Stadtherr.

MODERATOR STADTHERR: Which is more harmful to plants after a 6°F temperature, a fast thaw or a slow thaw?

DR. JAKE TINGA: If the root ball is frozen, slow thawing of the shoots would be more compatible with the slow thaw of the roots. If you could thaw the roots as fast as the shoots, there would be no problem. Slow thawing of the shoots would reduce transpiration. Turn the water on before freezing starts; keep the water on until all ice has melted. This layer keeps the surface at 32°F (cell damage begins at 28°F) and also prevents desiccation. If the sun hits a dry leaf and it transpires, and there is no available liquid water to come through the frozen root and stem, the leaf desiccates and dies. However, I do not think you can hold a plant at 6°F. I think the limit is about 20°.

CHARLIE PARKERSON: Dr. Robert Wright told us today that roots freeze before the tops. How can roots freeze first?

MODERATOR STADTHERR: Roots do not have the ability to go into rest. They do not withstand as low temperatures as the tops, but in the ground they have protection from the soil warmth. Roots of canned plants have less protection.

GARY HUTT: Is it better to leave plants jammed or leave them apart to thaw out quickly?

KERMIT NORRIS: In the Mobile area the temperature went down to 10°F. I didn't jam anything except young material that was potted up early in the fall. Winter damage was noted on this young material. Other plants that were left spaced came

through with very little damage except on the north side where the wind hit.

DR. RAY SELF: What was the soil mix and treatment of plants before the freeze? Did you have windbreaks?

KERMIT NORRIS: We did not have any windbreaks. We have a very porous mix: 3 parts pine bark, 1 part shavings and 1 part topsoil. We had a very high nutrient level in the soil and also applied  $\text{KNO}_3$  in October and Ureamide in November.

BRAD MAY: Ray Self, I understand you apply lime to help prepare plants for winter. Do you apply lime to azaleas and rhododendrons also?

DR. RAY SELF: We are now using dolomitic lime on azaleas and have no trouble. In the early sixties we believed that you should not use lime on azaleas, but now we believe that was a large part of the trouble with growing them. The pH will start at 6 or 6.5 but will drop as the calcium and magnesium are leached out.

ROB HOLLINGS: What is the physiological explanation for stem splitting?

DR. JAKE TINGA: With the ordinary onset of fall, temperatures become cooler and cooler. Water content goes down and sugar content goes up in the cells. If temperatures do not go down gradually, the stem remains high in water content. The cambial area contains the most water. Therefore, when a freeze comes, water in the cambium expands, the cambium ruptures and pulls away from the xylem. When everything thaws, the cambium collapses leaving a split; splitting occurs on the sunny side as it was warmer and the least hardened. It is not that the sun hits that side of the stem first, the damage is done when the ice crystals form. Twenty years ago at the Arnold Arboretum there was an experiment with mulches. It was found that when the mulch was scratched away the first of October and the ground heat could get to the lower branches, there was no stem split. When the mulch was there, it insulated the ground heat from the stems, and the stems above the mulch split.

MODERATOR STADTHERR: I would also like to comment on that. In North Carolina, sawdust mulch was being used in azalea cuttings. I believe the heat from the mulch kept the plants from going into the rest. The cells close to the ground and those in the cambium are always the last ones to go into rest. When they removed the mulch, there was no problem. I definitely think the stems split because they had not gone into rest.

DR. RAY SELF: We grow most of our azaleas without mulch and we find that bark splitting is usually a varietal situation; 'Mrs. G.G. Gerbing' azalea splits most readily.

CHARLIE PARKERSON: John Wight, would you turn water on plants as soon coming out of a period at 6°F as after 32°F?

JOHN WIGHT: We ordinarily do not use icing. We had a group of high quality *Ilex crenata* 'Helleri' plants in containers that we could not jam together without breaking them so we lost 50 to 60% of the root system from freezing. We found that it helped to syringe them frequently on windy days following the freeze. We did not keep them soggy. The Kraft paper around the plants may keep temperatures about 15° higher than the surrounding air for short periods.

RONALD COPELAND: One year we did not jam a block of *Ilex crenata* 'Helleri' holly plants and I was prepared to accept 100 per cent loss. However, that particular block had a higher survival percentage than the blocks that had been jammed with a plastic strip around them. I think the plants could thaw more rapidly with the air movement around them. We found the same situation with rhododendrons. The leaves were yellow, but we did not lose many that were not jammed.

DAVID TANKARD: Does it do any good to put anti-transpirants on plants? How late in the fall can you apply these materials and still get the effect?

DR. RAY SELF: When I put anti-transpirants on in one experiment in early November, I did not get as good response as when I put them on just a few days before the predicted freeze.

DR. JAKE TINGA: David, we think that the anti-transpirants flake off in a short time and that the effect is really short term. I do not have confidence in them; but if you do, you should spray several times, beginning as soon as a bad freeze is predicted and continuing until just preceding it.

JOHN WIGHT: I furnished 100 camellias for a test of anti-transpirants on Long Island. The check, with nothing applied, did better than those sprayed with anti-transpirants.

RICHARD VAN LANDINGHAM: Stanley Foster, how cold does it get in your over-wintering houses in Oklahoma?

STANLEY FOSTER: Most of them do not go below freezing. The houses basically are not heated, but if we have a prediction of extremely cold weather, we use kerosene in "Salamander" heaters. Even with temperatures of 20°F below zero, the houses went only down to 15°F above zero. This was partly because we had 15 inches of snow. The amount of damage would depend upon how long the temperatures remained low.

CHARLIE PARKERSON: Is anyone using a plant with quick growth to block some of the wind? I don't have much room and

would rather not purchase snow fencing and then have to drive it into the ground and then remove it. A quick growing plant could be mowed down in the spring.

ROB HOLLINGS: We, at one time, planted sorghum to protect our azaleas and broke it over for winter protection.

RANDY HEFNER: I planted sudex the last of August to protect late-planted liners. We broke it down about halfway. Half of the block has sudex planted and half does not, which will provide a good test of protection.

RICHARD AMMON: Should we wait until the first frost to cover structures with plastic? My argument is that frost is important to temper the plants, but another nurseryman told me he covers before frost and has no problem.

DR. JAKE TINGA: Can you guarantee the first frost is going to be a gentle frost? The air space under the plastic will be a gradualizing influence for hardening.

BILL CURTIS: I have a small operation and a small crew. When the temperature drops to 28°F, with a prediction of 20°F, we cover immediately. When the temperature goes back up, we open the house.

LES CLAY: Early this fall we had Japanese azaleas in two houses. One was not quite sealed when the temperature dropped to 26°F. Everything came through perfectly in the sealed house, while we had tip damage on all the young azaleas in the unsealed house.

RICHARD AMMON: Then the conclusion is that we don't need the frost?

MODERATOR STADTHERR: You do not need conditioning temperatures. You cannot drop from 60° and 70°F to 22°F without having some damage. Dry conditions will also help bring on rest, while excess nitrogen will delay the process.

GERALD SMITH: What are the maximum and minimum rates of Osmocote 18-6-12 on one gallon containers, surface applied, for a cubic yard of potting mix — and for a propagating mix? Some growers say it is too expensive and want to use minimal quantities.

DR. RAY SELF: You can achieve the same results without using Osmocote; there are other slow release methods. But for Osmocote, I would suggest 5 pounds per cubic yard for greenhouse production, or 7-1/2 pounds for outside. The 18-5-11 formulation would last longer but would require 10 pounds inside and 15 pounds outside per cubic yard. We suggest you use a preplant mix along with Osmocote to give a complete program. Then you would not need to add minor elements later.

OLIVER WASHINGTON: The recommended rate on the bag for one gallon, surface applied, is 5 grams — about 1 teaspoon.

GERALD SMITH: Is there general agreement with these rates?

DR. RAY SELF: We do not always agree with other recommendations, including those on the bag.

DR. JAKE TINGA: I would use less and liquid feed since Osmocote is expensive.

MODERATOR STADTHERR: John Machen, please comment on your observation of callus formation as affected by hormone treatment.

JOHN MACHEN: It seemed to us that when we got maximum root production we got very little callus formation and, on the contrary, when we got a great deal of callus, we got very little rooting. We feel hormone concentration in an alcohol dip should be increased until there is slight tissue burn. Then roots will form above the burned tissue instead of callus.

VIVIAN MUNDAY: Then you believe it is the hormone and not water relationships that affect callus formation?

JOHN MACHEN: Based on what we have seen — yes. The camellias which callused heavily were definitely not too wet.

DR. BRYSON JAMES: I disagree with you. I think water relationship has a lot more to do with callus formation than hormone concentration.

MODERATOR STADTHERR: *It is really difficult to say just what causes callus. Callus and root formation compete for the same materials. I have seen instances when high concentrations of IBA in a talc preparation on wet plant material gave a tremendous amount of callus, but no root formation whatever. If there are optimum amounts of hormone and proper environmental conditions, including aeration, roots may appear ahead of callus. If aeration is poor, callus will often form.*

JOHN MACHEN: *Did you get tissue burn?*

MODERATOR STADTHERR: *No, not at all.*

JOHN MACHEN: I'm suggesting that you were not at the upper level of this hormone.

HUNTER BUOLO: There was some fertility work on photinia, in which some cuttings callused without rooting, but at higher fertility levels, rooting improved.

OLIVER WASHINGTON: It is difficult to say that improved rooting was due only to fertility. It is very difficult to get root formation on photinia in an alkaline mix such as vermiculite or perlite. I get rooting when I go to a lower pH mix. The addition

of fertilizer would lower pH, so it is hard to say whether it is the pH or fertility.

DR. BRYSON JAMES: I doubt that the increased fertility in the medium is affecting root formation. It may be affecting root growth once roots are initiated.

HUNTER BOULO: We've decreased propagation time two weeks by fertilizing the medium. However, the percentage of rooting has not increased.

LES CLAY: We have had some heavy callus problems with *Prunus laurocerasus* 'Otto Luyken'. However, when we increased bottom heat, callus formation was less, indicating that temperature might be a factor.

DICK AMMON: Would Charlie Parkerson give his results of propagation in the greenhouse with plastic heating pipe in the floor?

CHARLIE PARKERSON: We did not root there, just carried plants over the winter. However, it is quite efficient for heating. It took approximately half as much fuel as it did to heat a similar size house using hot air. I think providing bottom heat with CPVC pipe in porous concrete plus plastic skirts around the benches would give an ideal method for heating a propagation or grafting bench.

LES CLAY: We get very uniform heat using "PVC 40" in concrete benches.

CHARLIE PARKERSON: We are using CPVC, a hot water pipe, to avoid any chance of deterioration, since we send 150°F water into the pipe. We did have trouble with expansion of the pipe.

RICHARD AMMON: What is the advantage of cement covered pipe over gravel covered pipe?

LES CLAY: We are using both as a comparison. We get a much more uniform heat with the concrete and have cut our rooting period by a week to 10 days. The pipes were covered 3 inches and are about 8 inches apart.

DR. JAKE TINGA: If the sand is left out of an ordinary concrete mix (3 parts gravel, 2 parts sand, 1 part cement), the finished material is drainable. Simply use 3 parts gravel and 1 part cement.

JERRY HODGES: The Van Wingerten Greenhouses have about 12 acres of porous concrete floor 3-1/2 inches deep imbedded with poly pipe. Van Wingerten uses styrofoam below the pipe and provides a 4 inch drainage line below the insulation. He avoids pipe expansion by arranging a cold water injection valve to maintain a water temperature of 90°F.

MODERATOR STADTHERR: Will 50% isopropyl alcohol surface sterilize the stems of cuttings dipped into it?

DR. ROBERT LAMBE: Seventy per cent is the concentration used as a surface disinfectant for eradicating bacteria, and it will probably work on fungi. Any higher concentration may give leaf damage and even 70 per cent could give some leaf damage. However, it does not penetrate very deep and you would probably not really hurt tissue as the dip is usually for 1 or 2 seconds.

MODERATOR STADTHERR: Hugh Strain, could you describe your method of fertilizer injection.

HUGH STRAIN: The equipment company installed and calibrated our injector for us. We are using 2 tanks and a small pump to inject 8-4-4 and liquid nitrogen into the water line. We use 8-4-4 twice a week for three weeks and then nitrogen twice a week for one week each 4-week period. In addition we use Sta-green #3, lime and gypsum in our soil mix. We feel we cannot afford the labor cost of top dressing with dry fertilizer.

SUE CURD: We have a problem with algae on the cement floor of our propagating house at Callaway Gardens.

CHARLIE PARKERSON: The fungicide "Cyprex" does a good job on controlling algae.

MODERATOR STADTHERR: We have used just lime, but Clorox does a good job, too.

DR. BRYSON JAMES: Any of the standard household bleach preparation could be used. The bleach is 5% sodium hypochlorite and can be diluted to 5 or 10% concentration.

LYNN TABOR: If you have a high calcium content and low pH, how do you bring up the pH?

DR. GEORGE McVEY: I think this is a rare situation. First check the basic ingredients of your potting medium.

DR. BRYSON JAMES: If you run a buffered pH, I believe you will find you do not need lime. "Buffered pH" gives a measure of total soil acidity rather than just active acidity. A salt solution is used rather than water to make the measurement.

JOHN MACHEN: "Buffered pH" is a measurement of the soil's resistance to pH change. The active pH reading does not tell this.

WYLIE ROACH: I have a tremendous amount of 3 year old bark compost with a pH of about 8. Would adding fertilizer such as 13-13-13, with a high potassium content, cause more problems?

DR. GEORGE AVERY: It is very difficult to bring down the pH of hardwood bark. Using sulfur is one method.