Tomato Royalty; WFT Battles; PGR Details; Ethylene Damage

Cultural and Technical Information for Greenhouse Professionals

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TECH ON DEMAND brought to you by GROWERTALKS

COMING UP THIS WEEK:

Tomato Video + Podcast
Koppert Corner: Western Flower Thrips
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Echinacea from Seed
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NEW VIDEO & PODCAST: Be the Tomato King or Queen!

Every garden center—big or small—offers tomato plants for the home garden. As a wholesale or retail grower, your key differentiators are varieties, container sizes and quality. It takes work to stand out from the pack when it comes to tomatoes, but if you plan your assortment carefully, create excitement in your market and put amazing quality on the bench, today's shopper is going to notice.

Producing the necessary quality and size options takes planning and attention to detail. By following Dr. Will Healy's tomato production advice, you'll be on a path to success!

In **BE THE LOCAL KING OR QUEEN OF TOMATO PRODUCTION**—the latest Ball Tech On Demand crop-specific video—Will takes you through all the key factors necessary to finish high-quality tomato plants and send them to retail ready to sell. Tips for avoiding stretch and building root mass are covered in detail, along with many more strategies Will has helped growers put into

practice over many decades.

When you're finished watching that video, be sure to check out **At-Risk Crops—Tomato** where Nick Flax goes through a couple key tomato diseases to avoid at all costs.

Once again, because one of my goals is to share this information in any way you (or your team) chooses to consume it, this awesome video is available as a audio podcast, too. Be sure to subscribe to the Tech On Demand podcast on your favorite app so you never miss an episode. And this winter, why not jump back into the archives and get caught up—there are 165 episodes as of today!

- **TECH ON DEMAND ON SPOTIFY**
- **TECH ON DEMAND ON APPLE PODCASTS**

Koppert Corner: Battling the Insidious WFT

Could your dracaena spikes, sprengeri, dorotheanthus and other component plants be harboring harmful insect pests without you knowing?

While most growers in late winter are focusing on controlling fungus gnats to prevent root damage, the more insidious insect pest potentially hiding out in these component plant crops is Western Flower Thrips (WFT).

Why *insidious*? Because they reproduce in the crown and root zone of these plants and rise in numbers unnoticed. It's not uncommon to see no physical damage or evidence of thrips presence on these types of plants, as their activity is taking place between the base of the plant and the top several millimeters of the root zone.

Let's Talk Reproduction

If one female stows away on a newly sown dracaena spike seedling tray on Labor Day, populations will "spike" indeed: 5,000 thrips by Thanksgiving, and up to 12 million by New Years! Thrips reproduce fast, especially in overlooked spaces. Component plugs then become a silent vector for thrips infestations.

In Q1, as planting of large combo planters and hanging baskets commences, without effective thrips management in the months prior to planting component plants into mixed species planters and baskets, you may be effectively inoculating your mixed combo pots with thrips at planting. So, instead of a start clean/stay clean strategy, you're using an inoculate early/infest early one, making it more costly to manage thrips from plant week until ship/sell week.

Control your Enemy

- Hang Yellow Horiver cards throughout all propagation areas and in the stock plant areas as well—and check/change them weekly for accurate monitoring of WFT. If you have dirt floors, hang scouting cards at floor level to know if your thrips are originating from within the house.
- Where greenhouse temperatures are at 65F or more, Isarid is the most effective and economical way to impact thrips at this time of year. Spray applications target adults and larvae in the canopy and sprench/drench applications impact emerging adults and pupae.
- Entomopathogenic nematode *Steinernema feltiae* (Entonem) is the most effective tool to impact thrips larvae and pupae where overwatering isn't a concern.
- Where sprenches/drenches aren't possible, (i.e. crops that don't like wet feet) release *Stratiolaelaps scimitus* (Entomite-M) at curative rates.
- What rates of these thrips tools to use? It depends, so contact your Koppert technical rep to get the information you need to stop the spike!

Nick's Tip of the Week: Think Ahead About PGRs (Part 3)

Each week, I'll work with my buddy Nick Flax, a technical services expert at Ball, to share a concern that's come up during one of his numerous calls with growers across North America. This week, he's wrapping up a 3-part miniseries on PGRs for 2025 spring production.

IMPORTANT: The last two weeks, Nick's tech tips have covered big-picture considerations that need to be made when you've decided to apply a plant growth regulator (PGR). Check them out HERE (Which PGR Is Which?) and HERE (Spray vs. Drench BMPs) before you read ahead, or this week's info might feel like something is missing.

PROBLEM: The old saying "the devil is in the details" holds especially true when it comes to PGR applications. Seemingly small factors can drastically affect the outcome of a PGR spray or substrate drench.

NICK'S TIP: Keep the following in mind before you make your next application.

Mind Your Moisture Levels

Water status in a plant before you apply PGRs will affect the magnitude of growth suppression:

- Drought-stressed plants will exhibit stronger responses to PGR active ingredients. This can result in greater levels of growth suppression than desired.
- Never apply PGRs to plants that are wilted or to growing media that is dry (moisture level 1–2 on the 1–5 scale; 1 = air dry, 5 = saturated)

Facilitate Appropriate "Residency Time" On Your Crops
In part 1 of this series, I mentioned that different PGR active ingredients (a.i.s) have a range of absorption times. This means it's critical for foliar spray solution to sit on the surface for an appropriate minimum length of time to achieve maximum efficacy. Drench-applied PGRs should remain in the media for as long as possible to ensure adequate uptake by roots.

- Ancymidol, flurprimidol, paclobutrazol and uniconazole are absorbed quickly by leaf and stem tissue. Spray solution should remain wet on the plant surface for at least 30 minutes after an application is made to ensure good absorption.
- Chlormequat chloride (CCC) and daminozide are absorbed more slowly. Target a minimum of 4 hours of residency time on the leaf surface for maximum effect; longer for daminozide, if possible.
- Time PGR sprays to facilitate slower drying of spray solution. Apply sprays in the early morning, early evening/after sundown, or on cloudy, overcast days to keep the spray solution from drying too quickly.
- Manipulate your environmental parameters to keep spray solution from drying too quickly.
- Turn off fans, pull the shade/energy curtains, close vents, and consider wetting your greenhouse floors before a spray application is made to slow the drying time—especially if you are in a dry climate or at high elevation.
- For substrate drenches, ensure that media moisture is moderate (about level 3 on the 1–5 scale) before it is applied. This will help ensure that the PGR solution doesn't channel through the pot and run out the bottom before it can diffuse out into the media and be taken up by roots. While most drench-applied PGR a.i.s are absorbed quickly by roots, it's good practice to avoid watering/feeding for at least 24 hours after a drench is applied.

Mix, Apply & Be Done on Day 1
Many growers mix up a sprayer of PGR solution and use it over a few days to save time, but *this is not good practice:*

- Most PGRs should be used within 24 hours of mixing because the a.i. starts to break down. Alkaline hydrolysis is largely responsible for this degradation, so the higher your water's alkalinity, the quicker this tends to occur. Reduced efficacy means you may have to reapply PGR again or more frequently to achieve a desired level of growth suppression. This costs you time and extra money in total PGR used.
- Additionally, a sprayer with PGR solution sitting in it for several days can become a liability. If someone uses the sprayer for a pesticide application, for example, and doesn't realize there's already PGR in the water, they could accidentally mess up an otherwise perfect crop with an accidental application.

Know The Risks With Different A.I.s
Just as power tools can be dangerous if used recklessly, so too can PGRs (metaphorically speaking), so be aware of the risks that come with different a.i.s and how to minimize those risks before you use them on a given crop:

- **Misapplication of ancymidol, flurprimidol, paclobutrazol and uniconazole can result in crop issues or even crop failures.** These are high-activity a.i.s, so if your math is off (for example, mix to higher than your desired concentration), application volume is too high, or you apply it to a "taboo crop" (such as generally avoiding flurprimidol, paclo-, and uniconazole on *Begonia spp.*), you may have a hard time getting the crop to finish on time to hit your desired sales window. *Make sure the a.i. you want to use is safe for a given crop, double-check your math or have someone else review it before you mix up PGR, and dial-in that 2 qts./100 sq. ft. spray volume to ensure proper coverage.*
- **Chlormequat chloride has some phytotoxicity risks.** Among bedding plants where CCC is commonly used, phytotoxicity can occur when it is applied at 1,000 ppm or higher.

Typical symptoms are marginal chlorosis or necrosis, but severe damage is rare below 1,000 ppm; most crop culture recommendations call for 500 to 750 ppm to reduce this risk. Plants are typically able to recover from mild symptoms about 1 week or so after they first appear, and any necrosis that may occur is often covered up by new growth. As such, it's generally advisable to use CCC early in the crop cycle for mild growth suppression. You can reduce phyto risk even further by tank-mixing CCC with daminozide to lower concentration even further while still achieving desirable growth suppression. ***NOTE**: Don't let this deter you from using CCC—it is a valuable tool in the PGR toolbox!*

- **Daminozide is known to affect flowering in many bedding plants.** The stage of floral initiation or development at the time of a daminozide application can slow time to flower, shorten peduncles (flower stalks), or even change flower color or shape, depending on the crop. Some crops have strict guidance on cutoff times for daminozide applications that you should be aware of before a spray is applied. For example, on gerbera daisies, daminozide should only be applied up until visible buds are no greater than about 1/8-in. in diameter. Application later than this can shorten the peduncle significantly and result in flowers buried in the leaves, depending on the concentration used. *Reduce the likelihood of "bad timing" and read the crop culture sheet for new crops/varieties that you need to growth-regulate before you use daminozide. If you are unsure whether you are past a cutoff for a given crop, consult the breeder/product rep or run in-house trials on a small number of plants before you treat an entire crop.*

Lastly, never apply PGRs in a rush!
Doing so rarely ends well. If you are under pressure to make a PGR application before a certain date/time, make it a priority—not the last thing on your to-do list for the day/week. Rushing often leads to incorrect calculations, too much or too little spray/drench volume, overspray onto off-target crops, and generally poorer observance of personal safety precautions, PPE usage, and proper sprayer/injector cleanup afterward.

A Plan for Seed-Raised Echinacea

Fall is a fantastic time to offer echinacea in bloom to grab attention at retail and give shoppers something fresh to put in their containers and landscapes. With all of the new colors and forms, the appeal of and demand for echinacea continues to grow.

Producing echinacea from seed or plugs can be challenging, but the experts at PanAmerican Seed and Kieft Seed have conducted a ton of research in the past few years to help you and your perennial production team nail the crop with excellent, repeatable results.

Not too long ago, Darwin and Kieft perennials guru Chris Fifo wrote an article for *GrowerTalks* titled **PERENNIAL SEED SUCCESS**. In it, he touched on a handful of popular seed-raised perennials, including echinacea. I pulled out Chris' echinacea tips for you:

These can be challenging … Sow one to two seeds per cell into a 288. A slightly recessed or dibbled plug tray is preferred, allowing for a light covering of the seed without media or vermiculite covering the surface of the tray. Germinate seeds at a constant 70 to 75F (21 to 23C). Pretty straight forward.

The *critical factor* for echinacea germination is moisture. Not too wet. I prefer the plug trays go into the germination area at a 4.5 for moisture. (If you're not familiar with the 1 to 5 watering scale: 5 is saturated, 3 is on the verge of turning light brown on the surface, 1 is near wilt.)

A 100% humidity germination room is not ideal for echinacea. After the first 48 hours, the trays have to begin to dry down. By Day 3, the seeds have absorbed as much moisture as they need for germination and trays should be maintained at a 3 to 3.5 to avoid losses and poor uniformity. By Days 7 to 9, germination should be complete.

An alternative method I've used when I was struggling with maintaining the proper moisture was to germinate the seeds uncovered. This way, they could tolerate a higher humidity chamber (though not saturated) without being overly wet from covering. And I could see what's going on with the seed. When germination was complete (cotyledons beginning to develop), I would then add the normal amount of media or vermiculite covering, leaving the cotyledons exposed and the ribs of the plug tray visible.

For growing on, I've always believed if you avoid the extremes in temperature and moisture, you can avoid the majority of problems in most crops. Echinacea are no different; they like to be grown on the warmer (65 to 75F/18 to 23C) and drier side.

Echinacea prefer a pH around 6.2 to 6.5 and Cal/Mag type fertilizers such as 15-5-15. Begin feeding after germination is complete with 75 to 100 ppm. Feed can be continuous at a lower rate, but I prefer feeding twice a week, with clear water in between. Increase feed to 150 to 200 ppm as needed for growth.

Of particular note with feed: If purpling is noticed on the lower leaves, it can be a sign of phosphorous deficiency. If left alone, the symptoms can progress and become very unsightly. Switching to a higher phosphorous fertilizer, such as 20-10-20, will prevent further symptoms.

My theory on feeding plugs has always been "you are what you eat." The more you can feed, and

manage moisture, the more bulk you'll have. However, we need to control the top growth.

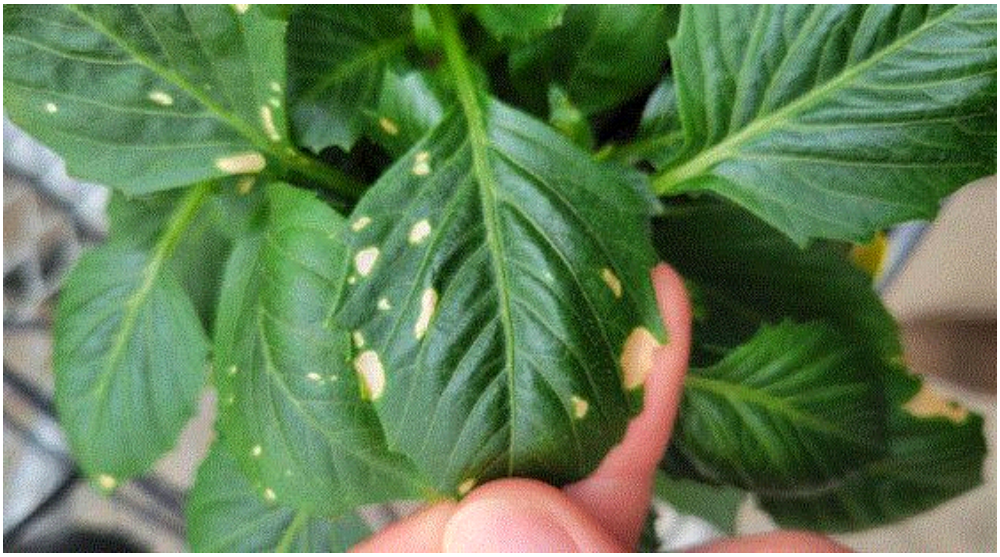
A combination of B-Nine (3,750 ppm) and Cycocel (500 ppm) works very well as a spray. The first application can be made as the crop has consistently developed the first true leaf. After this, it can be applied as needed. Sometimes it's every two weeks. If necessary, something stronger like uniconazole (Sumagic, Concise) can be sprayed at 3 to 5 ppm.

Echinacea have a photoperiodic response for growth. Under long days, they'll grow fast and upright, often requiring more PGRs. Under short days, they grow much more slowly.

The best way I've found to grow these is under long days until about Day 28. Then I move them to short days and feed them heavy for five weeks until finish. This gives me strong initial growth but then slows and stacks the leaves for the remainder of the crop cycle. This long-day/short-day approach has an additional benefit with the Kieft echinacea in particular. If the plugs are grown to a minimum of seven leaves under short days and then transplanted into long days, they'll flower very uniformly the first year. No cold treatment required.

Pesticide Application: It's All About Timing

Here's a heads-up for those of you using insecticidal soaps: Like most chemicals and sprays, avoid applying them in the middle of hot, sunny days. Check out what one grower observed on their dahlia crop:



They reached out with questions about this random necrosis on recently matured leaves and the Tech On Demand experts donned their CSI hats and worked with the grower to identify the problem. Sure enough, they had applied insecticidal soap in blazing sun.

I found a concise recommendation from University of Florida Extension that suggests the best (and worst) time to apply pesticides:

Avoid spraying under extremely hot, sunny conditions. Spray in the mornings, when possible, preferably between 6 and 10 a.m. When air or plant tissue temperature is approximately 90F or higher, damage will likely occur. On bright sunny days, leaf tissue temperatures may be 5 to 15 degrees higher than the surrounding air, thus increasing the possibility of injury. Also, slow-growing plants due to cool weather or other conditions (such as overcast or low light conditions) are more likely to be damaged. Avoid temperature extremes, either high or low.

Finish Line … Ethylene & Geraniums

Here's something our Tech On Demand team encounters each spring: growers report that some geranium cuttings are struggling to root, while the other varieties from the same week are doing fine. Have you ever seen this phenomenon?

One of the reasons for variation in rooting is different sensitivity levels for ethylene damage during shipping. This could happen with unrooted (URC) and callused cuttings.

When helping growers deal with this problem, the advice is as follows. For susceptible varieties, consider applying 1 to 2ppm Fascination/Fresco within 48 hours after cuttings are stuck. This will limit the ethylene damage.

And, if the production team *failed* to apply Fascination/Fresco after sticking and are facing rooting problems, feed the liners with at least 200 ppm N (calcium nitrate is preferred), as long as the heart and smaller leaves look okay. The callus will still pick up the feed. If this feed is not applied, the risk is that the geraniums could be starved as the old leaf stores are no longer accessible. The feed is to push the liners to expand and regrow.

Unfortunately, there is nothing that can be done to correct the damaged older leaves. But be sure to keep up with fungicide sprays to prevent botrytis from infecting the leaves.

Until next week, stay warm! I'm so done with this cold weather …

Please feel free to send your comments, constructive criticism and topic ideas to me at bcalkins@ballhort.com.

Bill Calkins
Editor - Tech On Demand

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