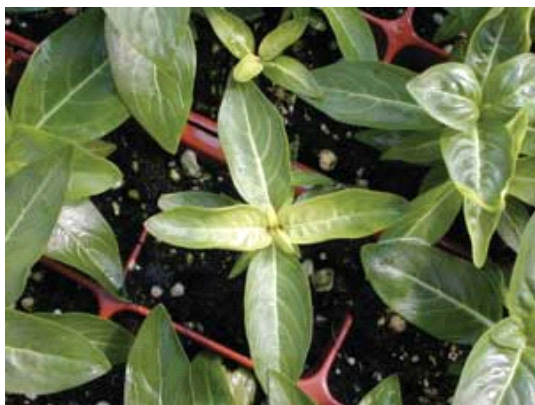


Features

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How to Diagnose Plug Problems

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I'm continually challenged to solve plug growers' problems. Some days the problems are pretty obvious, other days I feel like Sherlock Holmes. Lab tests, recordkeeping, looking for patterns and asking questions about what was done to the crop are all very important in diagnosing plug problems.

Many times, growers will jump to a conclusion without having enough information to make the right move, thereby making the problem worse. Often, they don't understand how key factors are interrelated and that changing one thing affects something else. For instance, using a different brand of plug mix affects not only

moisture management but also media pH and EC, root development and disease control.

With more and more emphasis on reducing production costs, you must avoid having major problems on your plug crops. So, let's review some problem-solving techniques I frequently use.

Germination

When looking into germination problems, I always look for patterns or trends. First, seed placement is critical. If your seeder doesn't get the seed into the plug cell, then you won't get a plant. Sounds simple, doesn't it? But if you have an inexperienced seeder operator or one who isn't paying attention, you'd be surprised at how poorly seeding can be done.

Covering seed properly is another critical area. If using coarse vermiculite, you need a uniform size with proper popping. No matter what your covering, make sure you don't see the seed afterwards and that you can see the ribs of the plug trays after watering. Dibbling to a proper depth is important not only for seed placement but also for the amount of covering the seed needs. For marigolds, you need a deeper dibble than for impatiens.

Moisture management in Stages 1 and 2 is as important as temperature for best germination and rooting in. Verbena needs far less moisture than begonias. But begonias need to be uniformly moist for a longer period of time, not only for germination but also for uniform growth. I can identify problems with moisture management by looking for patterns within the trays and benches. Loss of germination around edges, stripes from booms or whole sections of trays with little or no germination are indicators of poor moisture management.

Too often, growers blame the seed suppliers. But when you do have a poor seed lot, you won't see patterns within trays or benches. However, you may see that one or two varieties germinate less than others, which is an indicator of poor seed quality.

Some crops like it cooler than others for best germination. For instance, ranunculus likes 60F but takes two weeks to even show some germination. Germinating this crop at 70F or higher will give poor results.

On the other hand, vinca germinates better with warmer temps, preferably over 75F. Check your soil temps in your plug trays to find out exactly what temperature you're running for germination. Remember, if you're watering with well water during the winter, you're dropping soil temps rapidly and taking a long time to get them back up. So, temper your water to 70F for best results.

Finally, there are some varmints that like to eat the seed you so diligently sowed. Mice, birds and slugs can present some interesting results. Again, look for patterns. Mice will show some droppings, and perhaps winding patterns of no germination within trays. They definitely like red salvia, verbena and pepper seeds. Birds are usually pretty easy to spot. They may eat seed or just nip off seedlings. Slugs will leave a slimy trail on trays.

Root Growth

Always, always check your roots! Look for quantity of roots throughout the plug cell, along with color and appearance. Do they look healthy? Can you pull the plug out easily by the time of transplanting? Are the roots winding around just in the bottom of the plug cell?

Root growth is controlled by several factors, most importantly moisture management. Temperature, media EC and pH, calcium, light levels and root rots can also affect roots.

Moisture management is a continuous process from the time of sowing until transplanting. You could have a good grower paying close attention to watering for five or six days a week, but your weekend waterer can mess up the crop. Watch how your growers water the plugs. Do they spot-water correctly? If using booms, do they overuse them, thereby causing problems with algae or too much moisture in the middle of the trays? I recommend using ventilated plug trays for better and more uniform drying, regardless of weather conditions, type of benching or heating, or time of year. High humidity in the greenhouse will cause more stretching and less roots. Plugs staying too wet due to poor air porosity in the plug mix will have less roots or roots only at the bottom of the cells. Some crops like it drier for better roots, such as vinca.

Soil temperature plays an important role in root growth. At cooler temps, roots grow slower. Remember, soil temperature may be three to five degrees lower than air temperature. Under-bench heating is great for keeping soil temperature close to air temperature. Buy an infrared thermometer, which will quickly allow you to measure soil temperature.

If media EC or soluble salts are too high for whatever reason, roots will be damaged and may be more susceptible to root rots such as pythium. High media pH will cause problems with vinca, pansy, dianthus, petunia, snaps, and primula. It can also increase susceptibility to black root rot (thielaviopsis) on pansy, petunia, and vinca. Low media pH adversely affects growth of pentas, lisianthus, New Guinea impatiens, seed geraniums and African marigolds. You should be testing these key indicator crops at least every other week to prevent problems with pH and EC.

Fertilizers containing some calcium will help improve root growth, but be aware of changes to media pH. During lower light periods, you need to use a higher calcium/lower NH₄ and P fertilizer to get better roots and control shoot

growth.

Root rots can occur on a number of crops. Do you have a fungicide drench schedule set up for those susceptible crops? Reusing plug trays without sufficient disinfection will increase root rots every year. Vinca is especially susceptible to a number of root rots, primarily due to low temperatures and high moisture.

Shoot Growth

When looking at problems with shoot growth, the question I always ask is which leaves are showing the problem first? If the problem is with lower leaves, then check the roots first. If roots are bad, see the discussion on root growth. If roots are good, then check media EC to find out if you need more feed. After that, check soil temperature and moisture levels. If you still don't have an answer, then send in a media sample for lab testing.

If the problem is with upper leaves, also check the roots first! Pythium can cause upper leaf yellowing and stunting in snaps, vinca, pansy and petunia. If the roots are good, then check media pH. Many crops don't like media pH greater than 6.5. Reduce the media pH, if needed, with an acid fertilizer, acid injection or iron sulfate drench (rinse off the plants afterwards!). If media pH is fine, then check soil temperature, moisture or send in a media sample for lab testing.

Plugs grown too wet will have soft, stretched shoots and thin leaves. If you're more of a wet grower, you will have this problem, especially when weather conditions are poor. Learn to become a drier grower, and adjust your moisture management for weather conditions, type of greenhouse and benching and depth of plug cells.

Shoot growth increases with increasing temperature. If it's too cool, leaves emerge more slowly. Warm days and cool nights will cause more stretch due to a positive DIF. Low light levels or too much shade will cause soft, stretched plugs. However, too high light can burn tender leaves or dry out plugs too fast. High light can also act as a growth regulator. Fertilizers high in NH₄ and P will cause faster shoot growth, bigger and greener leaves, and more stretch. I see problems with growers using 20-10-20 during the lower-light months (leaves get too big and plants stretch) and also with using 13-2-13 during higher-light months (not enough leaf expansion).

A common problem I run into involves overdosing certain crops or varieties with chemical growth regulators. Learn to recognize fast and slow-growing varieties, and adjust your growth regulator program for each. If you overdose, you can either push out with more feed or spray with Fascination. Taking good notes as you go through the season helps immensely with matching up your growth control with all the varieties you grow.

Phytotoxicity

With many plug crops, making a mistake with chemical applications or even with feeding can cause damage to leaves and roots. Phytotoxicity is a catch-all term for this area. Symptoms on crops could include burning on leaves, stunting, spotting, margin damage, loss of roots, loss of growing tip or death. To determine if phytotoxicity is the problem, rule out the areas we previously covered. Go over:

1. What was sprayed within the last three days on the crop?
2. What were the weather conditions?
3. Were the plugs under moisture stress or high-light stress?
4. Was the spray tank rinsed out properly?
5. Was the chemical measured and mixed accurately?
6. Who sprayed the crop?

I've also seen problems with burning growing tips on young salvia, coleus and ageratum with feeding on a sunny day and not rinsing off plants.

Paying attention to all of the above areas will help keep big problems from occurring on your plug crops. Learn to write down what was done to the plugs each week, such as feeding, chemical applications and so forth. Adjust your watering, feeding and growth regulators by your weather conditions. Look for patterns and trends. Watch your seeder operators, closely inspect plug trays, monitor your watering and measure chemicals accurately. Oftentimes, it's the simplest thing that causes a problem with plugs.

To learn more about plug and cutting production, including seminars by Roger Styer, be sure to attend the 2008 Plug & Cutting Conference. www.ofaconferences.org

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