MEETING THE CHALLENGE of Fungicide Rotations

Botrytis blight on rose

HOW CAN YOU LIMIT RESISTANCE DEVELOPMENT AND ENSURE HEALTHY CROPS BY PRACTICING ROTATION?

By Margery Daughtrey and A.R. Chase

Resistance management of fungicides by using different MOA (mode of action) groups is one of the basic issues faced by growers. These MOA groups are also called FRAC groups, referring to the information compiled by the Fungicide Resistance Action Committee to help with rotation choices (see www.FRAC.com). Some of the rotation decisions are being dictated now. Requirements are showing up on fungicide labels in the form of maximum applications per crop (sometimes only two are allowed) — or in a restriction on how many applications may be made before switching to another MOA group. There are even requirements to tank-mix different MOA groups (check out the Adorn and Subdue MAXX labels — the Subdue MAXX restrictions relate to downy mildew only). Research on agronomic crops has shown that both rotation and tank-mixing are effective means of limiting resistance development.

We are both asked for the "ideal" number of products a growers should rotate in order to achieve protection from fungicide resistance. Sometimes growers' protocols show a different product every week and the list goes for more than eight weeks without a repeat. This seems like overkill!

Many growers appear to doubt efficacy of the products in general and think if they use virtually everything that might work, they will hit the one that does it. But occasionally using the right material does not give control; only repeatedly using the right materials will keep diseases properly managed. We think the perfect number of products in a rotation is two or three. This simpler strategy will allow growers to interpret what has happened from their efforts. Using more than three pretty much ensures that you will not know which ones worked, which ones failed — or which one hurt your crop.

Simpler Rotations Are Best

If there are too many products being used, it's hard to tell what the weak links are in the program. Sometimes a long list of products indicates many effective salespeople doing their job. But some of the fungicide labels throw growers into this behavior: when you follow the label on some of products, e.g. a strobilurin such as Heritage, you are limited in how many times you can use the product before rotating to a product with another mode of action. It becomes even more of a chess game when you keep reading the label and realize that you can only use a product eight times per season. In some cases this will mean that a strobilurin material with a different active ingredient will need to be used after those eight treatments are up. Amount of product per acre per year can also be a limitation

Top: *Powdery mildew can attack flower too.*
Bottom: *Symptoms of downy mildew on coleus.*

in some circumstances.

The regulators may be losing sight of the fact that the purpose of the fungicides is to prevent or minimize losses. The complex rules, although admittedly important for preserving the length of time that an at-risk fungicide will be effective, can make it difficult to run a greenhouse. In the future it will take some pretty talented interpreters to be able to use disease control products effectively as well as legally. Following the letter of the law (as we are each mandated to do) may end up making disease control less satisfactory — and certainly will make it more complicated. Designing your disease control program will require navigating the complications of different product effectiveness, different re-entry levels, label restrictions and so forth, so having a clear idea of exactly what time of year a disease is most threatening will be a big help.

Constructing a Successful Program for a Disease Like Powdery Mildew

The specifics of rotation choice depend entirely upon what crop you are growing. For any crop, a grower needs a mental image of what diseases could be a problem. Rather than applying 50 materials out of paranoia, many of the diseases can be scouted for, and responded to *if* they appear. For easily anticipated diseases (such as powdery mildew on a verbena crop) a preventive program will make sense during the time of year that experience has shown the disease to occur in the past. When in prevention mode, you could treat with less expensive contact-action materials first, in rotation, starting at the time of year when the problem appeared last year. Biological controls with efficacy against powdery mildew could be rotated with chemical contact-action fungicides. However, if disease symptoms appear in spite of this mild program, you should quickly move to a strobilurin with strong efficacy against powdery mildew such as Compass O or Pageant to get the best possible control — and use Strike or Terraguard (DMI fungicides) in rotation with the risk-prone but highly effective strobilurin.

But what would you do if you had one of those crops *really* vulnerable to powdery mildew to manage, such as gerbera? In this case, we would definitely suggest that you skip using products that give a lower degree of protection. If the disease is typically hard to control — like powdery mildew on gerbera or rose, or almost any downy mildew — bring out active ingredients that research has shown to be of highest effectiveness in the first place. (Pay attention to research on the exact crops you grow: the powdery mildews on rose and gerbera, for example, are two different fungi, and will not respond the same to fungicides).

Recent research done by Dr. Mike Matheron (University of Arizona) on controlling powdery mildew on cantaloupes verifies this "use-the-big-

guns" approach. He compared using highly efficacious products and rather poorly effective products in rotation with one another and found that skipping a spray was better than alternating with something that had low efficacy.

One systematic approach would be to use protectants as preventives (not waiting until the first sign of disease, since that will be asking for curative action). Switch into highest efficacy products if the disease starts to express itself. If your crop is prone to downy mildew (think roses, coleus and impatiens here) use very effective materials from the beginning, because the disease epidemic moves too quickly to manage it in two phases. Applying low efficacy products makes us feel that we are doing something against the disease, and we may be lulled into thinking that we can somehow get the same results as with the best products. But who among us can actually predict low disease pressure vs. high? It is all a guessing game — it requires predicting the weather, and knowing whether invisibly small but threatening inoculum has been introduced to your greenhouse cuttings or plants. And of course there are a lot of other factors involved in designing a rotation.

Any grower reading this is thinking, "That's easy for them to say, but I have a lot more to worry about than powdery mildew." True. You have to juggle re-entry times, fungicide cost, insect and mite management, and many other factors besides fungicide rotations. But there are crops, and you know which ones they are, for which certain diseases can spell complete crop loss. Manage for these, and then work in compatible choices for the other concerns. Experiment to see which thrips insecticides can be safely tank-mixed with your spring powdery mildew or downy mildew treatments. If a crop is prone to both powdery mildew and Botrytis, include some Decree or Palladium or Veranda O, for example, in between your treatments aimed directly at powdery mildew. Replacing Decree for an ace powdery mildew fungicide within a rotation intended to protect against powdery mildew can be risky, since Decree has less activity against powdery mildew than some other products do.

If you make it your business to know what diseases could threaten your crop, and to know the report card of the materials that could be used against them, you will be able to make wise management decisions. You will need to practice rotation when using the most effective systemic fungicides that have been introduced in the past few decades, but try to keep the rotations simple so that you can evaluate their effectiveness as you go along.

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