

The downside of combination fungicides

Pre-packaged fungicide mixes can elevate the risk of developing pathogens that are resistant to treatment



This pansy is infested with powdery mildew. In some cases, combination fungicides can encourage the development of pathogens that are resistant to treatment.

By Jay W. Pscheidt

Several new fungicides have been or are soon to be registered for the ornamental industry. Some of these fungicides contain two active ingredients. A few fungicides for use on turf or for seed treatments may have three or more.

These are called pre-packaged mixes or combination fungicides.

Many of the new ingredients are at high risk of encouraging the

development of resistant fungal pathogens. These new combinations represent a challenge for sustained plant disease management.

Fungicide trade names do not make it easy for growers to implement anti-resistance tactics. Combination fungicides generally have active ingredients from two different chemical groups.

The Fungicide Resistance Action Committee (FRAC) has grouped fun-

gicides based on mode of action. Therefore, combination fungicides have two different modes of action. In theory, this should automatically help with resistance management.

Resistance risk

Combination fungicides are nothing new to the ornamental industry. A few fungicides that have a high risk of resistance development have been premixed with other multi-site materials, which have a lower resistance risk.

For example, Spectro (manufactured by Cleary Chemical Corporation) is a mix of thiophanate-methyl (Fungicide Group 1) and chorothalonil (Group M5). The thiophanate-methyl is at high resistance risk since it has a single mode of action. It is similar to Benlate (also Group 1), which was overused when it first came out.

You can still find many *Botrytis* isolates resistant to this group of chemistry. The chorothalonil in Spectro has a low resistance risk since its mode of action

Registered combination fungicides for the ornamental industry

Trade name	FRAC group number indicating Mode of Action
Armada	Group 3 and 11
Banrot	Group 1 and 14
Clevis	Group 3 and M3
Concert	Group 3 and M5
Consyst	Group 1 and M5
Hurricane	Group 4 and 12
Pageant	Group 7 and 11
Palladium	Group 9 and 12
Spectro	Group 1 and M5
Stellar	Group 28 and 43
Zyban	Group 1 and M3

affects multiple critical fungal systems. In theory, one should get good disease management even if the pathogen is resistant to the group 1 material.

Newer combination fungicides, however, may have two materials that have different but single modes of action. For example, the fungicide trade name Pageant (manufactured by BASF) contains two fungicides: boscalid (group 7) and pyraclostrobin (group 11). As you would expect, use of either alone for a disease like powdery mildew would quickly lead to resistant fungi. Used together, it lowers the overall risk for the development of powdery mildew fungi resistant to both materials.

But wait, there's more! There is a large range of fungal diseases you can manage with both a group 7 and 11 material. These include *Botrytis*

blights, leaf spots, anthracnose, rusts, scab and even some diseases caused by oomycetes, such as foliar *Phytophthora* pathogens or downy mildews. It would seem these are wonderful materials that manage many diseases while also managing fungal resistance development.

And so when this same material, called Pristine, first came out in fruit markets, it garnered a large share of the market. Other companies noticed and have or are about to follow suit with similar combination materials. For example, the Luna brand suite of fungicides from Bayer may hit market soon and DuPont is scheduled to launch their versions this spring.

But there are problems with using these combinations. For Pageant, only the group 7 (boscalid) material is very effective against diseases caused by



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Botrytis. So even though there are two materials in the package, it is more like using a single-use material when used against *Botrytis*.

Botrytis isolates resistant to boscalid have emerged throughout the world. There's some concern that indiscriminate use of these newer combination fungicides will encourage the development of more fungi resistant to these materials at a faster pace.

Management guidelines have not been developed for these combination materials. For example, in a crop that needs to be managed for both powdery mildew and *Botrytis*, use of these materials must be re-evaluated. The conditions that favor these fungi are different and occur at different times of the year.

A summertime battle against powdery mildew might be very effective using a combination fungicide, but result in the non-target *Botrytis* becoming resistant. My recommendation is that if you use products such as Pageant for powdery mildew control, then they should NOT be used for *Botrytis* management. Likewise, if you use them for *Botrytis* then use different fungicide groups for powdery mildew.

Avoiding resistance

You can use fungicides and still avoid building up resistance from non-targeted threats. The key is knowing what groups of fungicides you are using and what diseases your crop is likely to encounter.

When you begin to use the same group of fungicides three or four times during the production of a crop, the risk of resistance increases. You may not realize you are doing this if you go solely by trade names. Many different trade names may be from the same fungicide group.

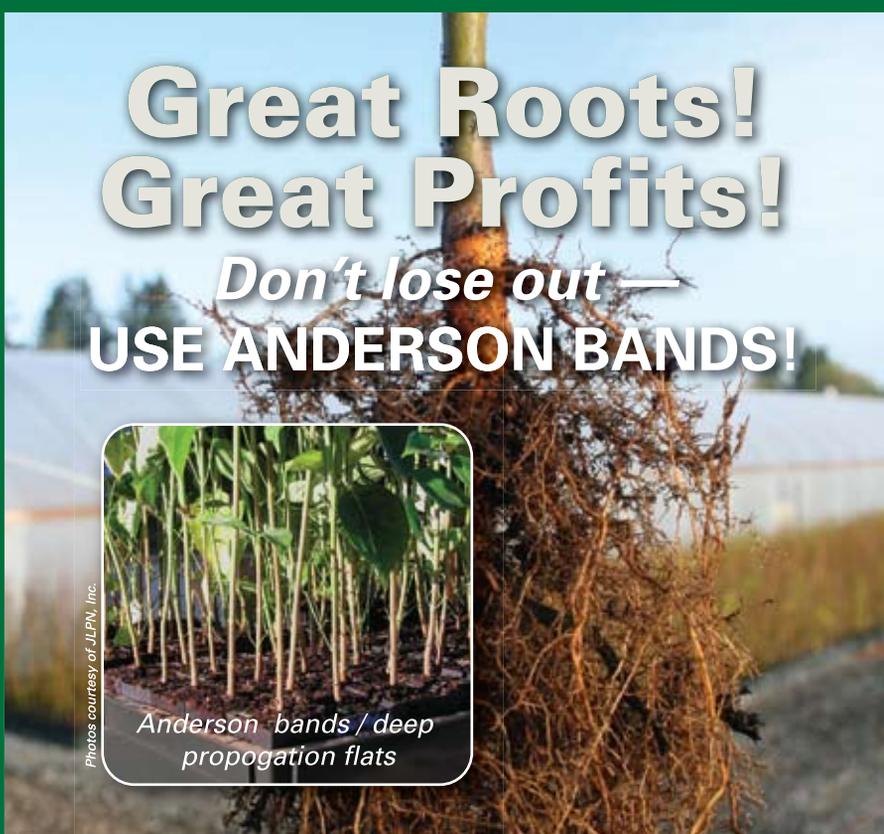
One might expect combination fungicides to make disease management easier, but often, they just make it more complex.

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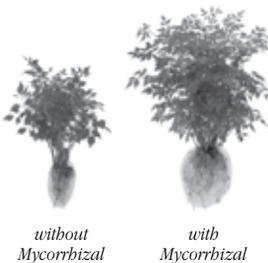
▲ COMBINATION FUNGICIDES

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Here is the challenge. Can you use only one fungicide group once throughout the production of your crop? OK, I might let you use one group twice but that is the limit.

If this sounds like a difficult challenge, then we have to think more broadly. There are many other tactics for managing plant diseases from cultural to biological controls.

Integrating many tactics together is the best way to successfully sustain plant disease management from year to year or from crop to crop.

Judicious use of combination fungicides or making your own tank mix may be more effective in the long run for your operation. ©

Jay W. Pscheidt is an extension plant pathology specialist with Oregon State University in Corvallis, Ore. He can be reached at pscheidj@science.oregonstate.edu.

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