

## 2009 AWARD OF MERIT ARTICLE

### Fight the Fungus Resistance Movement!

By Jolene Adams, Consulting Rosarian

Have you heard? Did they tell you about this? Do you know that the fungus organisms in your rose garden are joining a resistance movement in order to fight on and infect your plants?

What happened? How does this work? We can all recall the ‘days of yore’ when we had no major problems with fungal infestations - - we sprayed, we conquered, they went away. But something has changed!

Resistance to pesticides was mainly seen in insecticides and miticides in the past – the old style fungicides were “broad spectrum” and acted on many different sites during the life cycle of a fungal organism. It was difficult for the fungus to resist that many forms of toxicity coming all at once. But with modern times has come single-site fungicides that attack only one specific process and the fungus dies from that attack – or maybe not! And therein lies the problem.

When a specific fungus population is exposed for many generations to the same old fungicide, most of them die off leaving only the few who are able to resist the poison. Those few quickly reproduce and repopulate the local environment. Then that fungicide no longer works at all except for the few weak individuals who get killed off. And that makes the pest population just that much stronger and more resistant.

While fungi are fairly simple creatures, their life processes can get complex, and they reproduce so rapidly that any slight change in the way their metabolism works can make them resistant to a single-site fungicide. An example of two fungi that can quickly become resistant to whatever you are spraying is powdery mildew and botrytis. Powdery mildew and botrytis have become a serious problem for producers of ornamental shrubs in greenhouses and in the fields.

However, we are not helpless in the face of the enemy! We can give ‘em the old one-two punch!! We can rotate the sprays we use so the fungus is not continually exposed to the same fungicide time after time. When we rotate fungicides, we are attacking several different metabolic processes of the fungus we are going after. The first spray will kill off most of them, then the ones left behind will get hit by the next spray which will be a different compound. They will die and the few left will then be hit by a third different compound which should effectively reduce the pest population below the noticeable damage level. And we stay with this rotation all during the growing season.

Each spray solution used should work in a different way. For example, the first spray might be a multi-site fungicide. The next time you spray you might use a single-site fungicide. Then the next time you spray you would use contact fungicide. Then next time a systemic fungicide. Contact fungicides stay on the surface of the plant and must actually be sprayed on the fungal organism. Systemics will be absorbed into the tissue of the plant and attack fungus that has also entered the plant itself.

Another way of combating resistance is to use a combination spray – using a single-site and a multi-site fungicide each time, but still rotating next time with different formulations.

Modern fungicides are also now using Mother Nature to fight the disease organisms. Certain fungi and bacteria are toxic to the other fungus organisms we want to eliminate, and they are now available as fungicidal sprays. These biological controls work by competing for food sources, over-stimulating a plant so it puts up a natural defense, producing antibiotics, and attacking the fungal structure itself.

If your garden is regularly infected by blackspot, mildews, rusts and spot diseases caused by fungus, you need to spray preventively. It is almost impossible to eradicate a large population that has gotten a foothold in the garden. Start your spray regimen by using a good dormant spray during the winter and just before breaking dormancy. Then in spring begin regular applications of a fungicide once the new leaves are about 2 inches long.

Always follow the label and use the correct amount of any fungicide, properly applied. It is important to use all the normal precautions if you spray. Wear long-sleeved protective clothing, a face mask, gloves, goggles, hat or scarf, boots – and only spray on windless mornings. Roses should be well-watered the day before and then the day after they are sprayed. Powerful non-chemical tools to reduce diseases include sanitation and good air circulation within the rose bushes.

Here are some commonly available fungicides and what they are used for:

(Notes: “**water molds**” are *Pythium*, *Phytophthora* and downy mildews. “**Broad spectrum**” means the fungicide controls most groups of fungi; exceptions are noted. **M** = multi-site

**S** = single-site)

Mode of action	Chemical common name	Trade Names	Diseases controlled:
Acylalanine (S)	mefenoxam	Quell, Subdue Maxx	Water molds only
Benzamide (S)	flutolanil	Contrast	Specific for rusts, smuts, <i>Rhizoctonia</i> , <i>Sclerotium rolfsii</i> .
Benzimidazole (S)	thiophanate-methyl	Cleary’s 3336, Domain, Fungo Flo, Banrot (mixture with etridiazole), Zyban (mixture with mancozeb)	Broad spectrum systemic. <b>Not</b> for water molds and rusts.
Benzonitrile (M)	chlorothalonil	Daconil Ultrex, Concorde ConSyst (mixed with thiophanate-methyl), Spectro90 (mixed with thiophanate-methyl), Fungi-Gard	Broad spectrum, kills spores on surface. Useful in resistance management rotations and mixtures.
Carbamate (M)	propamocarb	Banol	Water molds
Copper, fixed (M)	copper hydroxide	Kocide, Champ, Junction (mixed with mancozeb), Microcop	Broad spectrum including some bacteria.
Copper, complexes (M)	copper tannate copper salts of fatty & rosin acids	Phyton 27 Camelot Green All	Broad spectrum including some bacteria.
Dicarboximide (S)	iprodione vinclozolin	Chipco26019 Ornalin, Vorlan	<b>Not</b> for water molds. Broad spectrum, esp.

Mode of action	Chemical common name	Trade Names	Diseases controlled:
			<i>Rhizoctonia, Botrytis.</i>
Dithiocarbamate (M)	Mancozeb manganese+zinc	Dithane, Fore, Manzate, Stature (mixed with dimethomorph) Cleary's ProtectTO,	Broad spectrum protectant kills spores on surfaces.
Hydroxanilide (M)	fenhexamid	Decree	<i>Botrytis</i>
Imidazole (S)	triflumizole	Terraguard	<b>Not</b> for water molds. Broad spectrum systemic.
Morpholine (S)	dimethomorph	Stature (mixed with mancozeb)	Broad spectrum, very effective against downy mildews and other water molds.
Oils (M)	Clarified extract of Neem oil, Paraffinic oils	Triact 70 Sunspray Ultrafine	Broad spectrum protectant and controls some insects and spider mites.
Organic Phosphate (M)	fosetyl-AL	Aliette	Water molds and some bacteria.
Phenylpyrole (M)	fludioxonil	Medallion	<b>Not</b> for water molds. Broad spectrum, very good on <i>Rhizoctonia</i> , <i>Alternaria</i> and black root rot.
Potassium bicarbonate (M)	potassium bicarbonate	MilStop, Kaligreen, Armicarb	Powdery mildews, rusts, <i>Botrytis</i> .
Pyrimidine (S)	fenarimole	Rubigan	<b>Not</b> for water molds. Broad spectrum esp. powdery mildews, rusts;
Strobilurin (S)	azoxystrobin kresoxim-methyl trifloxystrobin	Heritage Cygnus Compass	Broad spectrum mesosystemic; especially for foliar diseases.
Thiadiazole (S)	etridiazole	Truban, Terrazole Banrot (mixture with thiophanate-methyl)	Water molds, applied as soil drench.
Triazole (S)	propiconazole triadimefon myclobutanil tebuconazole	BannerMaxx Strike Systhane Lynx, Folicur	<b>Not</b> for water molds. Broad spectrum systemic, esp powdery mildews and rusts.

Some examples of biological fungicides are RootShield, SoilGard, Trichodex, AQ10, Mycostop, GalltrollA, Companion, Serenade, Kodiak and Deny.