

Update on Fungicides

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Although I am not a plant pathologist, I hope my practical experience from custom spraying and exchanging information with nurserymen and researchers for more than 18 years have given me enough knowledge to make my presentation worthwhile. I especially want to thank Dr. Ron Jones at North Carolina State University and Dr. Jerry Walker with the University of Georgia for their help over the years and their suggestions for this update.

Integrated pest management (IPM), or Integrated Crop Management (ICM), and record keeping should be foremost in our plans for plant protection.

INTEGRATED PEST MANAGEMENT (IPM)

Many practices a grower can follow will reduce the likelihood of severe disease problems. The philosophy of IPM is to apply any pesticide (fungicide, insecticide, or herbicide) only when justified and to integrate its use with all other cultural practices that could reduce the conditions favoring pest development. This does not necessarily mean to avoid preventive fungicide applications. It does not mean fungicides should be applied according to a calendar schedule. Use fungicides protectively on small populations rather than spraying everything. Use mixtures with residual properties, and alternate fungicides from different classes of compounds to help reduce resistance buildup.

INTEGRATED CROP MANAGEMENT (ICM)

ICM describes practices that I recommend better than does IPM. ICM and IPM include such things as 1) practicing sound sanitation, 2) avoiding sites that would increase disease pressure, 3) using cultivars that are disease resistant, and 4) optimizing nutrient levels rather than trying to maximize growth with high nitrogen.

RECORD KEEPING

How many times have you wished you had recorded how, when, and what you did so that you could avoid doing the same thing again or so that you could repeat a past success? For once maybe the regulators have done something that will help us. Effective 10 May 1993, certified private pesticide applicators have been required to keep records of federal restricted-use pesticide applications. I encourage you to keep the same type records for all pesticide and fertilizer applications, whether restricted-use or not. Here is what is required:

- The **brand or product name** of the federal restricted-use pesticide and its EPA registration number.
- The **total amount applied**. Amount does not refer to percent active ingredient. It means pints, ounces, or pounds of product, however the label directions are stated.
- The **size of the area treated**.

- The **crop or site** on which the pesticide was used. It is best to refer to the label for guidance to record this information. If the label is broad and says ornamentals, then you should use this term; but if the label itemizes cultivars and species, then so should you.
- The **location of the application**. Maps, charts, or the legal property description are acceptable.
- The **month, day, and year** of the application.
- The **certified applicator's name and certification number**.

In addition to these requirements you should record weather conditions, including temperature, wind speed and direction, cloud cover, and rainfall or irrigation before and after application.

FUNGICIDE RESISTANCE

Following the ICM and IPM practices mentioned above is the best way to reduce the possibility of fungicide resistance. I especially want to emphasize the importance of alternating fungicides and using mixtures with good residual action.

COMBINATION PRODUCTS

When there appears to be more than one disease problem or if the pathogen is not positively identified, use a combination product that will give control of a broad spectrum of pathogens.

- **Banrot** controls a broad spectrum of stem and root-rot diseases. It combines the effectiveness of Truban (Terrazole) against pythium and phytophthora with the systemic activity of thiophanate methyl (SysTec 1998, Domain, and Cleary's 3336) against fusarium, rhizoctonia, and thielaviopsis.
- **Zyban** or **Duosan** combines thiophanate methyl and mancozeb (Dithan M45, Dithan DF, Fore 80w, Manzate 200DF). Mancozeb is good against a variety of leaf-spot diseases, stem and twig blights, mildews, scab, and rust.
- **A Tank Mix** of mancozeb and copper hydroxide (Kocide) has proved to be very effective against most leaf-spot diseases, including bacterial leaf spot and fire blight, as well as scab, mildew, and rust.

OTHER GOOD FUNGICIDES

Banner gives broad-spectrum and systemic control of powdery mildew, rust, scab, black spot of roses, and anthracnose.

Daconil 2787 has been around a long time but still is excellent against a variety of leaf spot diseases including entomosporium, scab, and rust.

DORMANT SPRAY

I think that dormant sprays are the most important preventive sprays in the year's program. Dormant oil plus a fungicide will eliminate or minimize many early season pest problems, insects as well as diseases. The fungicides I use most

often in dormant sprays are Dithane DF or Kocide 101. Oil, as well as the fungicide, kills or suppresses development of the overwintering stages of the pathogens.

NEW OR DIFFERENT

Dr. Jerry Walker sent me a reprint of an article by Horst et al. (1992) who reported effective control of powdery mildew and black spot of roses with a combination of oil and sodium bicarbonate. Their effectiveness was good when applied singly but improved when used in combination. On sales yards or other areas where re-entry may be a problem with conventional pesticides, this could be of interest. Additional work needs to be done to determine if other pathogens are controlled with baking soda. Hagan et al. (Hagan et al., 1991) found two ergosterol biosynthesis inhibitor fungicides, Nova and Flusilazol, that were as effective as Daconil 2787 (chlorothalonil) and better than Funginex (triforene) in controlling black spot of roses. To my knowledge these EBI fungicides are not labeled for ornamentals as yet, but we need additional systemic fungicides such as these.

Ronilan and Ornalin have been excellent for control of *Botrytis* spp. and *Sclerotinia* spp. In March 1993 Hammer et al. (1993) reported that pyrrolnitrin, an antibiotic isolated from *Pseudomonas cepacia*, a bacterium, gave comparable control of botrytis.

Dr. Ron Jones at North Carolina State University told me about Mycostop, a biofungicide, that now has a full federal label for a wide range of floral and foliage crops as well as azaleas, other rhododendron, fir, and several other woody ornamental species. It controls seed rot and root and stem rots such as fusarium, alternaria, and phomopsis and suppresses botrytis, pythium, and phytophthora.

Mycostop can be used as a drench; dip for transplants, seeds and cuttings; or as a foliar spray. It is a streptomycetes, and the commercial product from Finland is distributed by Ag-Bio Development, Westminster, Colorado. Many streptomycetes have been the source of antibiotics used in medicine.

Terragard, from Uniroyal, now also has a full label. In addition to Banner, Ciba expects to have another new fungicide in 1993. New from ISK Biotech, is a product with the common name fluazinam. It is labeled for a wide range of crops, including turf and poinsettias.

SUMMARY

I would like to emphasize the importance of using ICM or IPM practices extensively but also to remind you that even well-managed crops often need treatments with fungicides. It would be a dangerous gamble for a grower to let any disease get a headstart.

LITERATURE CITED

- Hagan, A.K.** 1991. Application rates and spray schedules of ergosterol-biosynthesis inhibitor fungicides for control of black spot of rose. *Plant Dis.* 75:1143-1146.
- Hammer, P.E.** 1993. Postharvest control of *Botrytis cinerea* on cut rose flowers with pyrrolnitrin. *Plant Dis.* 77:283-286.
- Horst, R.K.** 1992. Effect of sodium bicarbonate and oils on the control of powdery mildew and black spot of roses. *Plant Dis.* 76:247-251.