Chase News

Chase Horticultural Research, Inc.
Education for Horticulture

# Mancozeb Review

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In a recent issue of **Plant Disease (94 (9):1076-10870** researchers from Italy (Gullino, Tinivella, Garibaldi and Bacci), the United Kingdom (Kemmitt) and the US (Sheppard) presented a review entitled "Mancozeb—Past, Present and Future". I thought a summary here would be interesting, especially with respect to the possibility of continued use of dithocarbamates as fungicides in agricultural crops.

Dithocarbamates (EBDC) were first used as fungicides in 1934 when Thiram was patented for use on seed (it is still used today) and for turfgrass disease. Many others were investigated with ferbam and ziram soon used in orchards and on vegetables. In 1952, Rohm and Haas, Inc. produced Dithane in a commercial plant in France. Other companies developed their own EBDC fungicides including DuPont and BASF and by the mid-1960s, this group of fungicides represented the most versatile of those yet discovered. Until 2004, mancozeb was the number one fungicide active ingredient based on annual sales worldwide. In 2007 it remained high but was second to tebuconazole only.

The way EBDCs work is classified as multisite and results in inhibition of spore germination. The range of activity extends to one degree or another across all types of fungal diseases from downy mildew to Cercospora to rust, late blight and powdery mildew. Mancozeb has even been shown to be effective on bacterial leaf spots in some cases. Worldwide, 85% of the mancozeb is used in Europe and Asia Pacific with only 4% used in North America. The crops most commonly treated with mancozeb are potatoes and vegetables followed by grapevines and fruit and nut crops.

### Current Limitations/Critical Issues—Use rate and timing

The best use of mancozeb has been as a preventative resulting at relatively high rates. This is in opposition to IPM which seeks to minimize pesticide use in general.

### Safety to beneficials

In general, mancozeb is reported to have a "favorable ecotoxicological profile". Specifically it has a negative impact on phytoseiid predatory mites which may not be significant with the rates currently used.

### Regulatory pressures

Since the 1970s, EBDCs as well as several other chemical groups have been rigorously reviewed worldwide. They have passed these critical reviews and the product continues to be regarded as a viable part of a modern agricultural production system when used according to label directions. It clearly meets many of the definitions for sustainibility as well as an efficacious, safe to the crop and environment and cost-effective choice.

Why should you have any interest in this kind of information? The reason I reviewed this here was that there are virtually no fungicides registered for ornamentals that are only used on this tiny market. As the worldwide agricultural community goes—so goes our ornamental world. If any fungicide is not deemed viable in the bigger picture, nothing we can do will matter.

Margery Daughtrey (Sr. Extension Specialist—Cornell University, LI-HREC)—see last page for details.

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# Woody Ornamental 2010 Isolation Records

In 2010, we isolated quite a few probable pathogens from the woody ornamental sample submitted to our diagnostic laboratory. The tbale to the right shows a brief summary of these isolation results. Pathogens in bold lettering were isolated more than once. Many of the isolations were typical with Pythium root rot and Phytophthora crown and root rot very common. We also found a lot of Fusarium but did to report it unless we saw a very high recovery and crown or stem rot was present as well as root rot. Anthracnose diseases caused by a variety of fungi (*Colletotrichum* and *Phyllosticta* among others) were also quite common. These pathogens cause leaf spots and dieback.

Far and away the most common plant submitted in this category was Mandevilla. Many of these samples had multiple problems including bacterial and fungal leaf spots. Fusarium stem rot continues tom be a serious concern on some mandevilla cultivars but we are seeing more and more bacterial leaf spot caused by Pseudomonas. This disease appears to be more common in cool weather than during the summer. In the summer we saw many samples of Colletotrichum combined with Corynespora leaf spot. The symptoms are nearly identical and often both pathogens were present. Both of these fungi are more typically warm weather pathogens and both affect a great many other plants including tropical foliage plants. There also continues to be galling on mandevilla at times which has been attributed to both crown gall (*Agrobacterium*) and olive knot (*Pseudomonas savastonoi*). Both were confirmed through a variety of techniques.

Next month I will present a photo spread on possible diseases of mandevilla.

| Plant | Pathogens (bold were isolated multiple times) |
|---|---|
| arborvitae | pythium, fusarium |
| arbutus | phytophthora |
| aucuba | anthracnose |
| azalea | phytophthora, pythium, colletotrichum |
| pinus | phytophthora, fusarium |
| Bougainvillea | phytophthora |
| boxwood | pythium, phytophthora |
| buddleia | slime mold, downy mildew, phyllosticta, sclerotinia, fusarium, rhizoctonia |
| cedar | fusarium, phytophthora |
| chinese elm | diplodia |
| cornus | anthracnose |
| cupressocyparis | fusarium |
| cypress | fusarium |
| deutzia | pythium |
| dogwood | nectria, colletorichum |
| eucalyptus | pythium, fusarium, alternaria, fusarium |
| euonymus | colletotrichum, fusarium |
| chamaecyparis | pythium |
| forsythia | phytophthora |
| fraxinus | fusarium |
| gardenia | fusarium, phytophthora, myrothecium |
| hebe | pythium |
| helleborus | coniothyrium, pythium |
| hibiscus | phyllosticta, fusarium |
| holly | pythium, fusarium |
| inkberry | phyllosticta |
| juniper | fusarium |
| kalmia | phytophthora |
| leucodendron | fusarium, pythium |
| leucothoe | cylindrocladium |
| lilac | fusarium, phytophthora, pythium |
| loropetalum | botrytis, pythium, phytophthora, cylindrocladium |
| mandevilla | phytotoxicity, spider mites, pseudomonas, fusarium, pythium, colletotrichum, Corynespora |
| manzanita | xanthomonas, fusarium |
| maple | nectria, phytophthora, botryosphaeria, diplodia |
| photinia | entomosporium |
| physocarpus | fusarium, phyllosticta |
| pieris | pythium, phytophthora |
| prunus | fusarium, pythium |
| pyrus | fireblight |
| rhododendron | botrytis, pythium, phytophthora, colletotrichum, pestalotia |

# Update on Black Root Rot Control

We just finished another trial on fungicide prevention of black root rot. This time we used annual vinca which is very susceptible to *Thielaviopsis basicola*. We used *Catharanthus roseus* 'Pacifica Burgundy Halo' planted in 3.5 inch pots containing Fafard Mix 2B and top-dressed with Osmocote Plus 15-9-12. They were drenched with different fungicides three times on a 14 day interval and inoculated with the pathogen 1 day before the first fungicide drench (about 1 oz/pot). Treatments are shown in the table below. Symptoms appeared about 3 weeks after the test started. We usually record height and top grade several times during a trial to determine efficacy of products for black root rot.

KleenGrow is a quaternary ammonium from PACE 49 recently labeled as a fungicide for much of the US. We have been testing it alone and in combination for control of a variety of different diseases. KleenGrow has been effective in some trials for foliar and root pathogens but in this case, it did not provide any control of black root rot either alone or with Medallion fungicide. X3 is a disinfectant in the same category as ZeroTol and is registered for use on ornamentals by Phyton Corp. It also gave little control of black root rot on vinca. In contrast, 3336 gave very good control as did the newer product Veranda O (polyoxin D, OHP). We will be testing Veranda O again soon on pansy and vinca since it show excellent promise.

I also found a report by Dr. Mary Hausbeck and Blair Harlan at Michigan State University. They performed a trial on black root rot prevention on pansy. The details of applications were not given but the treatments were: inoculated control, OHP-6672 (20 oz/100 gal), Terraguard (4 oz/100 gal), Endorse (1.6 lb/100 gal), Pageant (8, 12.5 or 18.5 oz), Insignia (16 oz) and ZeroTol 150 oz). The best control was seen with OHP-6672 which is a thiophanate methyl fungicide (like 3336). This active ingredient is nearly always most effective in black root rot control and in this case was 100% effective. Terraguard was also very effective and Endorse gave about 60% control. The three rates of Pageant, Insignia and ZeroTol did not provide any control in their trial. Dr. Hausbeck recommends the following for black root rot control: Cleary's 3336 or OHP-6672, Terraguard and Medallion.

**Response of Vinca infected with black root rot to various fungicide treatments.**

| Treatment | Rate/100 gal. | Top grade 8-11-10 | Height (cm) 8-25-10 |
|---|---|---|---|
| Water Noninoculated | ----- | 3.2 c | 9.6 c |
| Water Inoculated | ----- | 2.9 ab | 7.8 abc |
| Cleary's 3336 | 16 oz | 3.1 bc | 9.0 c |
| Medallion | 4 oz | 2.8 ab | 6.0 a |
| KleenGrow | 2ml/L | 2.9 ab | 8.2 abc |
| Medallion and KleenGrow | 4 oz and 2ml/L | 2.7 a | 6.5 ab |
| X3 | 5 oz | 2.9 ab | 7.4 abc |
| X3 | 25 oz | 3.0 abc | 7.4 abc |
| Veranda O | 8 oz | 3.1 bc | 8.6 bc |

**Numbers in the same column followed by the same letter are not statistically different (Student Newman Keuls Method).**

Watch the following crops for possible black root rot:

Pansy and viola, vinca, poinsettia, fuchsia, cyclamen, impatiens, kalanchoe, nicotiana, petunia, begonia, daphne, gaillardia, scabiosa, primula, salvia, sweet pea, snapdragon and verbena, Ilex (holly), lithodora, Calibrachoa, geranium, heuchera and phlox

# Fusarium Wilt Control on Lisianthus

We have been trying to find new diseases to use in evaluating fungicides and bactericides and this year we received a number of samples of lisianthus with Fusarium stem rot or Fusarium wilt. We started two trials and can report our results from the first in this issue.

The plants were obtained as plugs and we planted them (one each) in a 3.5 inch pot containing Fafard Mix 2B on 15 July 2010. They were top-dressed with Osmocote 15-9-12 the next day and fungicides were applied on a 14 day interval starting on 28 July. We inoculated the plants on 6 August with an isolate of *Fusarium oxysporum* (this causes Fusarium wilt). The treatments were applied as sprenches (20 ml/pot) and included were:

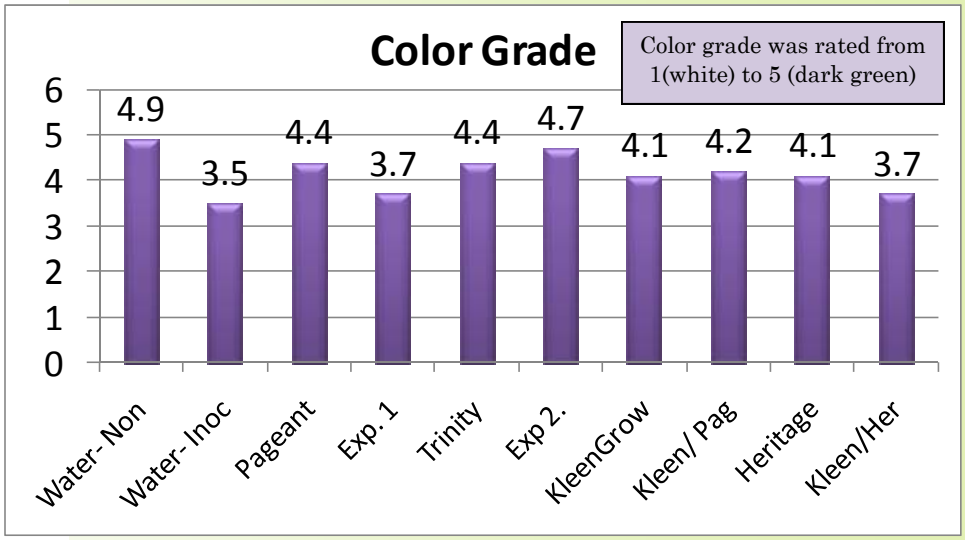
1. Noninoculated
2. Inoculated
3. Pageant (12 oz/100 gal)
4. Experimental 1
5. Trinity (12 oz/100 gal)
6. KleenGrow (25.6 oz/100 gal)
7. Experimental 2
8. KleenGrow and Pageant (rates above)
9. Heritage (4 oz/100 gal)
10. KleenGrow and Heritage (rates above)

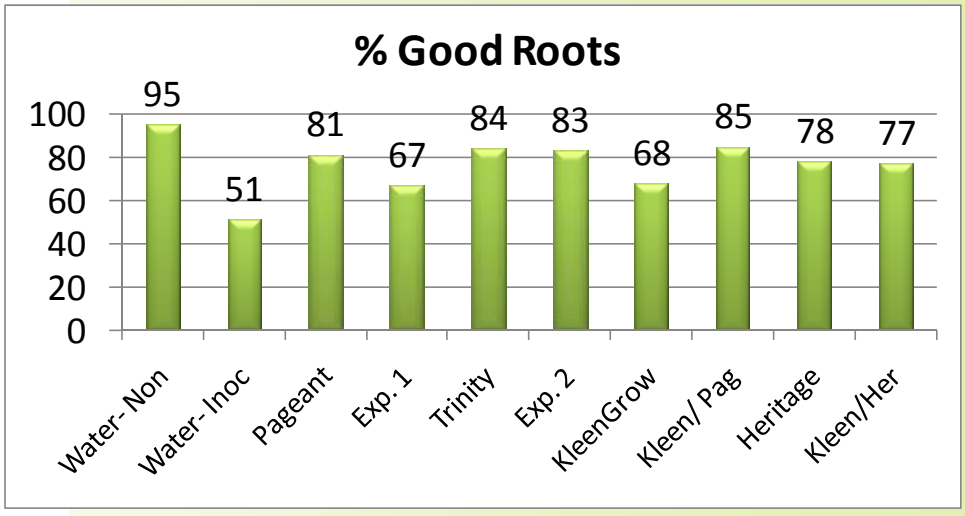
We ended up treating the plants five times and saw slight obvious symptoms of Fusarium wilt. We did note moderate yellowing (also a sign of Fusarium wilt) and evaluated roots at the end of the trial. In this trial, we did see pronounced root rot as well as the chlorosis. The data are shown in the graph below (purple bars).

The best control of chlorosis caused by Fusarium wilt was seen with Exp. 2, Pageant and Trinity. Trinity is a DMI fungicide being developed for ornamentals by BASF Corp.

The root growth was also affected by treatment. The percentage of healthy appearing roots was estimated and is shown in the bottom graph (green bars). All treatments resulted in significant control of Fusarium root rot in this trial. The best roots were found on the lisianthus plants treated with Pageant (alone or with KleenGrow) and Trinity. Heritage also gave significant control of the root rot and KleenGrow alone was less effective but still significantly better than the inoculated controls. This quaternary ammonium product from PACE 49 is showing real promise for use on a variety of diseases on ornamentals alone or in combination with fungicides.

I visited an operation recently and found a significant outbreak of Fusarium wilt on cyclamen. With a new *Fusarium oxysporum* fsp. *cyclamenis* isolate we plan to trial some of the effective treatments from this lisianthus trial in a cyclamen trial in the next few months.



# Outside Research Reports

**Botrytis Update by Hausbeck and Harlan—**MSU Plant Pathologists reviewed their work on Botrytis control in April of 2010. Their most recent trials were conducted on poinsettia and geranium. They summarized this work as well as many previous trials and gave the following control strategies.

**Fungicides to Consider—Protectant**

- Daconil
- Decree
- Dithane, Protect T & O and Mancozeb
- Veranda O

**Fungicides to Consider—Systemic**

- Chipco 26GT
- Heritage
- Compass O
- Insignia
- Pageant

**The Botrytis "A" Team**

- Daconil
- Decree
- Chipco 26019 or Chipco 26GT
- Pageant
- Veranda O

**The Botrytis "B/B" Team**

- Compass
- Heritage
- Insignia
- Dithane

They then go on to describe three strategies. The first is to alternate between protectant and systemic products. The second is to use protectants. The final strategy is to tank mix a systemic with a protectant (for example: Chipco and Decree or Heritage and Daconil). You can find the complete report on the MSU website—Hausbeck ornamental page.

**Fusarium Research from the American Floral Endowment—** Elmer, McGovern and Geiser reported on a series of research trials conducted on *Fusarium* spp. with funding from AFE. Some of the trials evaluated fungicidal control with corm soaks (gladiolus) or drenches while others concentrated on cultivar resistance in China aster and Hiemalis Begonia. The results for the asters are shown in the table below. As you can see the majority of the cultivars tested were susceptible to Fusarium wilt caused by *Fusarium oxysporum* fsp. *callistephi*.

Trials on Hiemalis begonias for reaction of *Fusarium foetens* showed that all those tested were susceptible ('Devils Paradise', 'Flamingo Shoals', Hurricane Bay', 'Rum Painkiller', 'Silver Sands', 'Trade Winds' and 'Tropical Breeze'). They also demonstrated that fungus gnats could spread the disease. In trials to test the ability of disinfectants to eradicate the spores of this Fusarium, the researchers found optimal control was achieved with bleach or GreenShield but some escaped when ZeroTol or Sanidate were used.

Further testing of these products on stryfoam showed that best eradication occurred with bleach, peroxyacetate, Physan and Lysol. Ethanol was less effective with ZeroTol least effective in these trials.

Fungicide trials showed best results with triflumizole (Terraguard) followed by fludioxinil (Medallion), azoxystrobin (Heritage), iprodione (Chipco 26019) and finally thiophanate methyl (like 3336 or OHP-6672).

Finally gladiolus corm dips 20 min showed no control with Cleary 3336, MycoStop, Actinovate, Companion or PlantShield. Heritage helped in some trials but not others. The most effective labeled products were Medallion and Terraguard. The systemic acquired resistance product Actigard (experimental from Syngenta) provided the best control.

## Cultivar Reactions to Fusarium wilt—Asters

| Moderately Resisant | Moderately Susceptible | Susceptible | | |
|---|---|---|---|---|
| Bouquet Puff Mix 2080 | Benary's Prin. Form. Mix | Powderpuff Mixed colors | Aster Duchess Mixed 6123 | Aster Milady Mixed 1447 |
| Stokes Aster Stany Mix | SC Matsumoto Form. Mix | Fan Mix Aster 2089, Opus | Asteroid Rose 625B, Asteroid Mix 625S | Powderpuff |
| Finest Mixed 684 | SC Serenade Mix | Matsumoto Salmon 637L | Pot N' Patio Pink 628D, Pot N' Patio White 628D | Dwarf Queen White 617F, Asteroid Light Blue |
| Astoria 2 087 | Matsumoto Yellow 637E | Early Ostrich Plume 1454 | Stokes Aster Serenade Mix | Rubens Improved Pompon Mixed, |
| | Astoria Mix 632 | Tiger Paws Mixed 635, Unicum Mix | Mini Lady Mixed, Lilliput Blue Moon 6993 | Mini-Lady Blue 65 2, Crego Finest |
| | Starlight Mix 629D | Giant Ray Mid Blue 2555 | Pot N' Patio Mix 628M | Irresistible Mix |
| | | Aster Crego Mixed Colors | Dwarf Queen Mixed 617 | Duchesse Formula Mix 639 |

# Hitting the Road in September

I spent so much time traveling in September that many routine things did get put on hold (like this newsletter). I thought I would show you some of the diseases I encountered across the country as I flew from California to Kansas City to St. Louis and back to California. Then I went from California to North Carolina to Florida to North Carolina, back to St. Louis and finally back to California. While I was away, the poinsettia samples continued to arrive and the most common problem this year has been Xanthomonas leaf spot.

Margery and I started out at the Missouri Botanic Gardens in St. Louis. First we found Verticillium wilt in a ground bed of Impatiens at our hotel. Peeling back the epidermis showed black vascular streaking.

We also saw lots of very cool insects but I will stick to diseases. The image to the left shows anthracnose (*Colletotrichum*) on *Amsonia* (new to Marge and me). The plant was labeled luckily and we collected a sample to check out back in our California lab.

We ended our tour with a gigantic display of coleus (and coleus downy mildew) (see right). I have never seen so much downy mildew on Coleus. The Midwest appears to be it chosen home. I have only seen this in California in greenhouse production.

I found some Cercospora leaf spot on pansy in one Midwest greenhouse (right) as well as my first vision of Xanthomonas on poinsettia in a production setting (below). This disease has been very bad in this year's crop and can be very hard to control during propagation since overhead irrigation makes most bacterial diseases explode.

Don't forget about some older, less common diseases. A single poinsettia plant with scab was seen in one greenhouse (right). This plant showed typical puckered leaf spots, stem scabs and the excessive growth on an affected shoot. The scab fungus (*Spaceloma* sp.) makes a hormone that results in internode stretching. If we can find a local isolate, we will test some of the newer fungicides for control this disease.

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**www.chasehorticulturalresearch.com or archase@chaseresearch.net.**