# Chase News

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## PLANT DISEASE TOUR OF CENTRAL FLORIDA THEME PARKS

Mike and I recently spent our vacation in Orlando. We were able to visit old friends, the Mid-Florida Research and Education Center in Apopka where I worked in the 1980s and a few theme parks. We had a great time and of course I am always looking at plants so found more than the normal theme park attractions. I was interested to see how many familiar diseases I found in the landscapes. The weather was unusually hot and humid (at least for early May) so many diseases had a chance to start early. In addition, the exceptionally cold winter had resulted in quite a bit of damage to landscape perennials and woody shrubs.

Of course I am making educated guesses about these diseases but I did work on quite a few of them. Starting at the top left is Entomosporium leaf spot on *Raphiolepis* (also occurs on Photinia, loquat and some pears). On the top right is Helminthosporium leaf spot (or maybe Drechslera leaf spot or another closely related fungus) on banana. In the next row (left) is Colletotrichum leaf spot on split leaf philodendron and Cordyline (right). To the right, I have a picture of Erwinia blight on philodendron and finally immediately below is an unknown virus on crown-of-thorns.

Next time you think that once your plants leave a greenhouse or nursery that all disease disappear, think of these examples. And by the way, you do not need to be in the tropics to find diseases in the landscape—I see them everywhere.

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# WOODY ORNAMENTAL FOCUS — ROSE DOWNY MILDEW—with Gary Osteen

It has been a banner year for rose downy mildew all over the United States. We have seen some of the most impressive symptoms on so-called disease-resistant roses. In the midst of this disease bumper crop, the IR-4 program continues to focus on downy mildew. This month I am presenting work we completed on a rose downy mildew on field-grown plants in Bakersfield, CA. Our cooperator in the area, Gary Osteen, started the trial on 19 February. Plants were treated weekly (in most cases) until the trial was completed on 24 April. The rose used was 'Pink Double Knock -Out' and plants were naturally infected with downy mildew (*Peronospora sparsa*). Disease severity was low to moderate during the trial due to unfavorable weather until near the end of the trial.

The rating on 24 March (5 weeks after initiation) did show the best prevention with Regalia SC (Marrone Innovations) at 1% although this treatment did cause phytotoxicity and did not last until the end of the trial. Regalia is an extract of Giant knotweed (previously called Milsana in a different formulation). Mandipropamid at 4 oz/100 gal (Syngenta Professional Products) and Disarm O (fluoxastrobin form OHP) were also significantly better than the water sprayed control at the first rating. Adorn (Valent USA) is a new product for *Phytophthora*, downy mildew and *Pythium*. It is a new chemical class and the active ingredient is fluopicolide. As a monthly drench it did not perform well in this field trial. BAS 651 is an experimental product from BASF Corp. that also did not perform well in this trial.

At the end of the trial (10 weeks after initiation) there were significant differences between treatments based on the analysis of variance but differences could not be separated using Student-Newman-Keuls test for mean separation. (data not shown). Nevertheless, the lowest levels of downy mildew were found on plants treated with Disarm O (4 oz/100 gal) and Heritage at both 7 and 14 day intervals as well as Stature SC (dimethomorph from BASF Corp.—used at a very low rate in my opinion). The strobilurins have not been as effective on rose downy mildew as other products in some previous trials but clearly Disarm O and Heritage were superior in this trial. Finally, Stature SC has performed better on downy mildew in most of the trials we have performed or reviewed than other products included.

**Effect of fungicides on severity of rose downy mildew**

| Treatment | Trt. Interval | Rate/100 gal. | Disease severity |
|---|---|---|---|
| Water | 7 days spray | ----- | 3.3 d |
| Adorn | 28 days drench | 1 oz | 3.4 d |
| Adorn | 28 days drench | 2 oz | 2.7 abcd |
| BAS651 | 14 days spray | 11 oz | 3.3 cd |
| BAS651 | 14 days spray | 13.4 oz | 3.0 abcd |
| Disarm 480SC | 14 days spray | 2 oz | 2.6 abc |
| Disarm 480SC | 14 days spray | 4 oz | 3.1 bcd |
| Heritage/Bond Max | 7 days spray | 4 oz/4 oz | 2.7 abcd |
| Heritage/Bond Max | 14 days spray | 4 oz/4 oz | 2.8 abcd |
| Mandipropamid/ Bond Max | 7 days spray | 4 oz/4 oz | 2.5 ab |
| Mandipropamid/ Bond Max | 7 days spray | 8 oz/4 oz | 2.8 abcd |
| Regalia SC | 7 days spray | 0.5 % | 2.8 abcd |
| Regalia SC | 7 days spray | 1 % | 2.3 a |
| Subdue MAXX | 14 days spray | 1 oz | 2.9 abcd |
| Stature SC | 14 days spray | 6.12 oz | 2.7 abcd |

**Disease severity was rated as follows:1 (none), 2 (slight), 3 (moderate), 4 (severe) and 5 (dead). Numbers followed by the same letter are not statistically different using Student-Newman-Keuls method.**

# OPTIMAL USE OF COPPER ON CALLAS

We have been working on calla lilies off and on over the past 8 or 9 years. Sometimes we have worked on *Erwinia* and sometimes on *Pythium*. We never really know what to expect on a batch of bulbs. In many of our trials, we have seen that using too many fungicide/bactericide applications has resulted in crop damage. Over the past few years we have also been hearing that bulb sprays with copper is gaining ground as a popular choice for control of bacterial soft rot on callas.

We obtained bulbs of *Zantedeschia* 'Hot Chocolate' from a southern California cut flower grower and set up two trials to evaluate copper bactericide/fungicides applied as bulb sprays or drenches. Trials were performed over the past winter.

Bulbs were sprayed by laying them out in a single layer on a greenhouse bench and allowed to dry one day. They were planted in either 5 or 6 inch pots containing Fafard Mix 2B and top-dressed with the recommended rate of Osmocote Plus 15-9-12 and irrigated as needed. Each trial ran 5 months and plants were kept in a heated greenhouse with a minimum temperature of 55 F. We recorded the emergence date for each bulb but did not find that treatments affected emergence date significantly.

**Trial One**—The table below shows the exact treatments used as well as the final root growth. None of the treatments affected the top growth of these plants. There was slight root rot in some pots but it was not related to treatment. The first trial showed best root development for the plants treated with a bulb spray of either Phyton 27 or Camelot resulted in less root growth compared to the other treatments. The best root growth was found on plants drenched either once or monthly with Phyton 27 or monthly with Camelot.

**Trial Two**—The second trial was started about a month after the first and employed slightly different treatments. The same cultivars of calla lily was used.

The table to the right shows the treatments we used in Trial Two as well as the data on healthy looking roots. Once again, top grade was unaffected by treatment but there was really no root rot found on any bulbs in this trial. In this trial, none of the treatments were better than doing nothing (water control). The best roots were found on plants treated with Kocide as a bulb spray perhaps because it had the best residual effect. This time, some of the treatments resulted in significantly less roots than the water treated plants—Kocide as a bulb spray and monthly drench. It appears that callas can be damaged (root growth) if too much copper is applied. The timing of the copper may also be important since sometimes a bulb spray results in apparent damage. The date of planting and therefore the temperature and irrigation needs are involved in this effect even when plants are grown in a heated greenhouse. When callas are started under colder temperatures, they are subject to disease that even a month later they are able to outgrow.

**TRIAL TWO—Effect of bulb sprays and drenches on root growth of Callas . The numbers followed by the same letter were not significantly different.**

| Treatment | Bulb spray | Drench | Percent good roots |
|---|---|---|---|
| Water | No | No | 64 bc |
| Phyton 27 | Yes—35 oz/100 gal | No | 57 ab |
| Phyton 27 | Yes—35 oz/100 gal | Yes—35 oz/100 gal monthly | 64 bc |
| Kocide | Yes—16 oz/100 gal | No | 71 c |
| Kocide | Yes—16 oz/100 gal | Yes—16 oz/100 gal monthly | 48 a |
| Camelot | Yes—48 oz/100 gal | No | 56 ab |
| Camelot | Yes—48 oz/100 gal | Yes—48 oz/100 gal monthly | 62 bc |

Our research indicates that avoid most bactericide or fungicide use on callas is best. When the weather (temperature and cloud cover) keeps the pots too wet, managing water is more effective in reducing losses than applying bactericides or fungicides.

**TRIAL ONE—Effect of bulb sprays and drenches on root growth of Callas . The numbers followed by the same letter were not significantly different.**

| Treatment | Bulb spray | Drench | Percent good roots |
|---|---|---|---|
| Water | No | No | 41 ab |
| Phyton 27 | Yes—35 oz/100 gal | No | 34 ab |
| Phyton 27 | Yes—35 oz/100 gal | Yes—35 oz/100 gal monthly | 47 ab |
| Phyton 27 | No | Yes—35 oz/100 gal once | 61 b |
| Phyton 27 | No | Yes—35 oz/100 gal monthly | 60 b |
| Camelot | Yes—48 oz/100 gal | No | 28 a |
| Camelot | Yes—48 oz/100 gal | Yes—48 oz/100 gal monthly | 33.6 ab |
| Camelot | No | Yes—48 oz/100 gal once | 46 ab |
| Camelot | No | Yes—48 oz/100 gal monthly | 57 b |

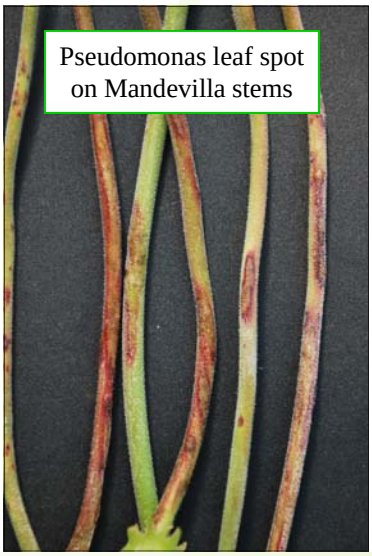
# CONTROL OF PSEUDOMONAS LEAF SPOT ON MANDEVILLA

Over the past 3 or 4 years, the IR-4 program has been funding trials on a wide range of bactericides including systemic acquired resistance (SAR) products like Actigard, antibiotics like Kasumin, biological agents like Taegro and naturally derived products like Citrex and Regalia.

Pseudomonas leaf spot on Mandevilla

We received another sample of bacterial leaf spot on *Mandevilla* (above) last winter and when it proved to be pathogenic we decided to run a trial. The plants used in the trial were *Mandevilla* 'Alice Dupont' obtained from a plug and cutting producer in Southern California. Liners were planted in 4 inch pots containing Fafard Mix 2 B and top-dressed with Osmocote Plus 15-9-12 on 25 February. Plants were grown in a greenhouse with a 55 F minimum.

The trial was started on 29 March and plants were sprayed on a 7 days interval (most treatments). The trial was conducted under intermittent mist to promote bacterial leaf spot after inoculation on 17 April. The table above shows the exact treatments included as per the IR-4 protocol. We recorded the final number of spots on leaves and stems on 12 May, after six applications of the test products. In this trial, we noted development of stem spots as well as leaf spot—leaf spots were severe enough that leaf drop had started by the end of the trial (about a month after inoculation). The most effective treatments were Kasumin (OHP) and the combination of SP2015 (SePRO) and CuPRO. Products that failed to give significant reduction of leaf spot were: Citrex, SP2015 (alone), Taegro, Cg100, Regalia SC and Protect. Some products were a little better at preventing stem spots than the leaf spots such as Citrex, Cg100 and Protect.



Pseudomonas leaf spot on Mandevilla stems

Phyton 27 was very effective in preventing both leaf and stem spots but did cause some slight phytotoxicity on leaf undersides. This phytotoxicity was very similar to the initial symptoms of the Pseudomonas leaf spot creating a confusing situation. Unfortunately, the most effective product, Kasumin, also caused severe stunting on the Mandevilla. We have tested this active ingredient a number of times and have never seen a negative response. Perhaps Mandevilla are especially sensitive to this antibiotic.

Look for a summary article on these new bactericides for ornamentals in a grower magazine soon.

**Effect of bactericides on Pseudomonas leaf spot on Mandevilla. The numbers followed by the same letter were not significantly different.**

| Treatment (interval used) | Rate/100 gal. | # of spots on leaves | # of spots on vines |
|---|---|---|---|
| Water noninoculated | ----- | 0.0 a | 0.0 a |
| Water inoculated | ----- | 32.1 c | 10.4 b |
| Actigard drench (28 days) | 0.25 oz | 12.5 ab | 5.8 ab |
| Actigard spray (7 days) | 1 oz | 13.3 ab | 2.5 a |
| Citrex spray (7 days) | 0.15 ml/L | 20.4 bc | 2.9 a |
| HM-0736 spray (7 days) | 14.4 oz | 15.0 ab | 6.2 ab |
| Kasumin spray (7 days) | 45 oz | 1.2 a | 0.1 a |
| SP2015 spray (7 days) | 12 oz | 20.8 bc | 4.2 ab |
| SP2015 and CuPRO spray (7 days) | 8 oz and 32 oz | 9.6 ab | 0.4 a |
| Taegro alternate Drench/spray (14 days) | 3.5 oz | 23.5 bc | 4.6 ab |
| Cg100 spray (7 days) | 0.3% | 22.1 bc | 2.1 a |
| Regalia SC spray (7 days) | 1 % | 18.7 bc | 2.9 a |
| NAI-4201 drench (14 days) | 5 oz | 13.7 ab | 5.8 ab |
| Phyton 27 spray (7 days) | 25 oz | 13.3 ab | 0.4 a |
| Protect spray (7 days) | 24 oz | 19.6 bc | 1.2 a |

# RESEARCH REVIEW

**BACTERIAL WILT PREVENTION WITH ESSENTIAL OILS—** Paret et al. at the University of Hawaii report on the effects of plant essential oils on bacterial wilt on ginger caused by *Ralstonia solanacearum*. Palmarosa, lemongrass and eucalyptus oils were evaluated for ability to reduce growth of *R. solancearum*. They were also tested at various rates for fumigation effects on potting medium infested with *R. solancearum* and finally tested ability of the essential oils to reduce disease development in ginger after treatment of the potting medium.

Lab tests showed that these Palmarosa and lemongrass oil significantly reduced growth of the bacterial wilt pathogen while eucalyptus oil was significantly less effective. These two essential oils were also very effective in killing cells of *R. solancearum* in potting media. After treatment, development of bacterial wilt in ginger was significantly reduced or delayed. The essential oil treatments were safe on the ginger at the rates tested. One drawback that the researchers mention is the "exorbitant" price of these oils in the US market. Large scale application of these oils is cost prohibitive at this time.

For a complete report see: Plant Disease 94:521-527.

**SAGE EXTRACT AND PREVENTION OF GRAPE DOWNY MILDEW**—A group of researchers (Dagostin et al.) from Italy and Germany tested the ability of *Salvia officinalis* extract to protect grapes from downy mildew. In greenhouse trials where leaf wetting could be controlled, sage extract gave up to 94% control. However, when 1/2 inch of rainfall occurred control was significantly reduced. Control was statistically the same as a copper hydroxide treatment in a year with little rainfall but was much lower (only 30%) in a year with heavy rainfall.


Grape downy mildew

For a complete report see: Plant Disease 94:575-580.

**DROUGHT STRESS TOLERANCE IN BEDDING PLANTS**—Waterland, Campbell, Finer and Jones (The Ohio Agricultural Research and Development Center—Wooster, OH) completed a series of trials on abscisic acid (ABA) applications to reduce drought stress in bedding plants. ABA has been found to mediate stomate closure and thus reduce transpiration and water loss. ConTego (ABA from Valent) was applied as a spray or drench to impatiens, petunia, geranium, marigold, salvia and pansy. Some plants developed chlorosis after treatment which was related to drought stress. Shelf life was extended from 2-4 days on the majority of these plants when sprayed with ConTego and was a little longer when applied as a drenched.

For a complete report see: HortScience 45(3):409-413.

**CULTIVAR RESISTANCE TO AZALEA POWDERY MILDEW**—Long, Krebs and Koksana working at three Mid-western Universities reported on field and lab testing of deciduous azaleas for resistance to powdery mildew. This disease occurs often on deciduous azaleas and has been worked on since the 1980's. The pathogen is *Erysiphe azalea* where it can attack leaves, fruits, flowers and stems. These researchers tested 41 cultivars in the field in Ohio and Minnesota over a 3 year period. Their results were moderately consistent with those of previous reports for the same cultivars. A summary of some of their results from the field trials is shown in the table to the right.

For a complete report see: HortScience 45(5):784-789.

| **Immune or very resistant** |
|---|
| Fragrant Star |
| Garden Party |
| Millenium, Parade |
| Popsicle, June Flame |
| Snowbird, Magic |
| Late Lady |
| Pink and Sweet, Lollipop |
| **Resistant** |
| Jane Abbott |
| Northern Hi-Lights |
| Homebush, Golden Lights |
| Apricot Sunrise |
| Jolie Madame, Tri-Lights |
| Crimson Tide |
| Mandarin Lights |
| **Susceptible** |
| Molalla Red, White Lights |
| Yellow Pom Pom |
| Fireflash, Fireball |
| George Reynolds |
| Klondyke, Gibraltar |
| Rosy Lights, Orchid Lights |
| Cannon's Double |
| Western Lights |
| Lemon Lights, Cheerful Giant |
| **Very Susceptible** |
| Mount Saint Helen |
| Arneson Gem, |
| Strawberry Ice |
| Arneson Ruby |
| Orange Jolly, Yellow Cloud |
| Irene Koster |

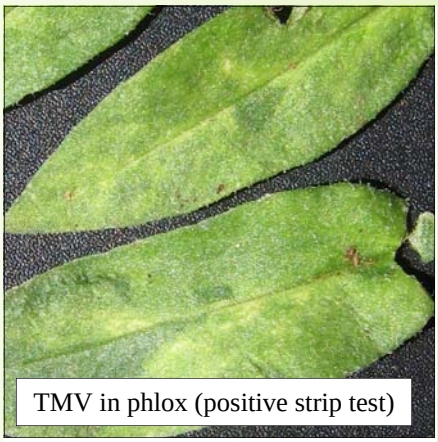
# DISINFECTANTS FOR TOBACCO MOSAIC VIRUS (TMV) CONTROL

Tobacco mosaic virus is one of the most common and difficult to control viruses on ornamentals. Symptoms range from mosaic to ring spots, zig-zag patterns, dark green blisters on leaves, necrotic spots and deformity of leaves. TMV can readily be transmitted by touching infected plants, and by propagating from infected plants. The virus also "lives" or remains infective for long periods of time on surfaces like benches even when they are free of plants and dry.

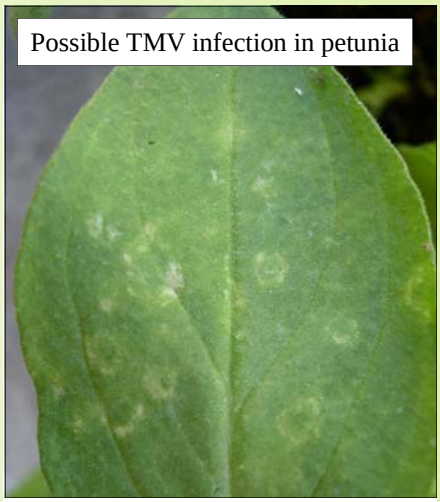
Recommendations on control strategies include using virus-free seed, certified virus-free cuttings, screening new plant materials for TMV using test kits or a lab and removing infected material as soon as it is found and destroying it. Recommendations also include washing and disinfecting all surfaces where infected plants may have been in contact.

Lewandowski and Hayes (The Ohio State University) and Adkins (USDA—Ft. Pierce, FL) recently reported on a series of trials they performed on TMV transmission. During their trials, the researchers found that one strain of TMV (originally from tobacco) and four closely-related viruses were able to infect petunias without showing any symptoms at all. A petunia strain of TMV was able to produce symptoms in the majority of petunias tested with symptoms including necrotic spots and mosaic on leaves and flower break (white patterns in normally solid colored petals).

They also tested transmission of TMV to petunia using razor blades finding it could be transmitted up to the twentieth cut. This indicates the potential for contaminating stock plants in vegetative petunias and other ornamentals is very high.



TMV in phlox (positive strip test)



Possible TMV infection in petunia

Preliminary testing eliminated some disinfectants and those listed in the table below were most effective. Those that were not sufficiently effective in preliminary tests included: Flame, Lysol, MENNO Clean and TwinOxide). For the large scale trial, razor blades were dipped for varying times based on product labels (usually 1-3 minutes) or commercially manageable times. They tested these disinfectants in separate trials using different petunia cultivars. Their data showed that all of the disinfectants significantly reduced transmission of TMV but the most effective products were Virkon S, bleach and nonfat dry milk (NFDM). In two final trials, NFDM with Tween (20% and 0.1% respectively) and bleach (0.6% NaOCl) were 100% effective in stopping transmission of TMV with contaminated razor blades. While the products were very effective, none were 100% effective in each trial making their use of limited value for propagators where control must be 100%. This is further complicated by the fact that symptoms could take more than two months to develop after infection allowing virus to spread extensively prior to detection.

**Average transmission of TMV in petunias after disinfesting the cutting tool**

| Treatment | Rate | Percent TMV transmission |
|---|---|---|
| Water | —— | 46 a |
| ZeroTol | 1% | 13 b |
| Trisodium phosphate (TSP) | 3% | 9 b |
| GreenShield | 2 tsp/quart | 9 b |
| GreenShield | 1 tsp/quart | 8 b |
| Virkon S | 1% | 2 c |
| Bleach | 10% (0.6% NaOCl) | 2 c |
| Nonfat dry milk (NFDM) and Tween | 20% and 0.1% | 2 c |
| NFDM | 20% | 1 c |

**Numbers followed by a different letter are statistically different.**

**Partial listing of some TMV hosts**

| | |
|---|---|
| Calibrachoa | Pepper |
| Celosia | Petunia |
| Cyclamen | Phlox |
| Delphinium | Poppy |
| Impatiens | Snapdragon |
| Lisianthus | Spinach |
| Marigold | Squash |
| Muskmelon | Tomato |
| Nicotiana | Zinnia |

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