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DRENCHING DILEMMAS

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We wish to thank Fowler's Nursery, Raleigh N.C. for donating the plant materials, Wetsel Seed Company, Harrisonburg, Va. for contributing the containers, W.A. Cleary Chemical Corporation, Somerset, N.J. for supplying the Cleary's 3336F, and Ciba-Geigy, Greensboro, N.C. for supplying the Subdue used in this study.

One major component of disease control in floriculture production is substrate drenching with fungicides to prevent/control root rot diseases. Concern has been raised over mixing two liquid formulations of fungicides together for a broad-spectrum drench application. More specifically, it has been suggested that mixing two liquid fungicides together can lead to plant damage due to excess soluble salts or temperature (Powell, 1991). The concern is that mixing two liquid chemical formulations together will raise the inert ingredient dose to a level that causes plant damage; wetting agents may also be involved in causing this problem along with the fungicide mixture (Powell, 1991).

To address this issue, we conducted a study with five bedding plant species, celosia 'Kewpie Red', impatiens 'Accent Red Star', marigold 'Pineapple Crush', petunia 'Double Mix', and vinca 'Bright Eyes' to examine the possibility of damage from a drench combination of Subdue plus Cleary's 3336F.

Plugs of each species were potted into sheets of 606's (six groups of 6 cells/flat) using a 2 vermiculite : 1 peat moss : 1 pine bark : 1 perlite (by volume) substrate amended with 10 lb/yd³ dolomitic limestone, 2.25 lb/yd³ treble superphosphate, 1.5 lb/yd³ gypsum, 1 lb/yd³ Micromax®, 1 lb/yd³ calcium nitrate, and 1 lb/ yd³ potassium nitrate (derived from Nelson, 1991). Since wetting agents were implicated as a possible cause of salts toxicity along with the mixture of liquid fungicides, we used three concentrations of wetting agent in the substrate-- 0, 3, 9 oz/ yd³ Aqua Gro® equating into 0, 1×, and 3× the recommended rates (Boodley and Sheldrake, 1982). The pH and electrical conductivity (EC) of each of the three substrates was measured prior to planting using a 2 water : 1 substrate (by volume) dilution. There was no effect of the three levels of wetting agent on either, and the substrates had an initial pH of 5.1 ± 0.1 and an EC of 140 ± 13 mho × 10⁻⁵/cm. The plugs were transplanted into the 606's on 15 April 1992.

After the plants were watered in with clear water, they were drenched with 0, 1×, or 3× rates of the two fungicides: 0 fl. oz/100 gallons Cleary's 3336F + 0 fl. oz/100 gallons Subdue; 20 fl. oz/100 gal Cleary's 3336F+0.5 fl.oz/100 gal Subdue; or 60 fl.oz/100 gal Cleary's + 1.5 fl.oz/100 gal Subdue.

Drenches were applied with a sprinkler can at the rate of 1 pint/ft² of bench area. Plants were rinsed lightly with clear water after drenching. The treatments were replicated three times, and each replicate consisted of 6 plants (one six-pack). After the fungicide treatments were applied, the replicates were randomized on benches in a 65°F/75°F (night/venting) glass greenhouse here at N.C. State. The plants were fertilized with 100 ppm nitrogen at each irrigation throughout the experiment using a 20-10-20 formulation amended with micronutrients injected through a hozon. We selected this slightly immoderate fertilization program to "stack the deck" in favor of salts buildup in the substrate. Two weeks after the first drench (29 April 1992), plants received a second drench at the same concentrations. This was a deliberate attempt to over-treat the plants with the fungicides, as a reapplication should not occur for at least four weeks after the first application. The plants were again randomized and allowed to grow two more weeks; plants were harvested for final data collection 14 May 1992. At harvest, the pH and EC of the substrate was measured for each replicate, and shoot fresh weight was measured for one plant of each replicate to evaluate any effects of the fungicide and/or wetting agent treatments on substrate pH, soluble salts, and plant growth.

Fungicide drench concentration and wetting agent concentration did not affect substrate EC or pH nor did either factor affect shoot fresh weight for any of the five species tested (Table 1). However, species did differ in substrate EC with the petunias having the lowest and the marigolds having the highest readings. The species also differed in shoot fresh weight, and petunias had the greatest and the celosia had the least fresh weight at harvest. The difference among species

Table 1. Effects of Subdue + Cleary's 3336 drenches at 0, 1× (0.5 fl. oz + 20 fl. oz per 100 gallons), and 3× (1.5 fl. oz + 60 fl. oz per 100 gallons) on substrate solution electrical conductivity, substrate pH, and shoot fresh weight for five species of bedding plants grown in substrate amended with 0, 1× and 3× the recommended rate of Aqua Gro® wetting agent.

Aqua Gro® (oz/yd ³)	Electrical conductivity*			Substrate solution pH			Shoot fresh weight (g)		
	0	1×	3×	0	1×	3×	0	1×	3×
Celosia 'Kewpie Red'									
0	60	70	47	5.7	5.7	5.8	3.3	1.7	2.8
3	70	60	47	5.6	5.6	5.8	3.3	2.2	2.1
9	50	60	70	5.7	5.7	5.6	2.6	1.5	2.7
Impatiens 'Accent Red Star'									
0	47	37	67	5.7	5.8	5.6	5.9	9.4	4.4
3	53	60	63	5.5	5.6	5.6	11.6	5.0	5.1
9	50	33	47	5.7	5.9	5.7	6.3	4.6	8.4
Marigold 'Pineapple Crush'									
0	93	30	70	5.4	5.9	5.5	7.7	6.3	5.9
3	93	80	83	5.4	5.4	5.4	6.8	5.4	7.0
9	97	50	57	5.3	5.6	5.6	7.2	7.3	7.4
Petunia 'Double Mix'									
0	37	43	40	5.6	5.5	5.5	16.8	18.9	16.9
3	37	30	33	5.5	5.8	5.5	16.3	17.3	17.9
9	27	33	30	5.6	5.5	5.4	15.7	17.0	16.7
Vinca 'Bright Eyes'									
0	70	63	63	5.4	5.4	5.5	5.0	4.6	5.3
3	90	67	60	5.5	5.5	5.6	3.9	4.8	5.5
9	50	60	50	5.7	5.6	5.7	4.8	5.2	4.7

*EC reported in mhos × 10⁻⁵. A 2 water : 1 substrate (by volume) dilution was used to measure the EC and pH of the substrate.

is expected as each species should grow at a different rate and utilize fertilizer differently (leaving different levels of soluble salts in the substrate). No damage due to fungicide and/or wetting agent treatments was evident on any of the plants. There was no apparent difference in growth rate, color, or vigor between any of the fungicide and wetting agent treatments. The lack of any treatment effects on plant growth is confirmed by no significant differences among treatments within each species (Table 1).

From these results, we have concluded that under normal temperature conditions, combining Subdue and Cleary's 3336F and applying as a drench at the recommended concentrations is a safe treatment for controlling root rotting organisms in bedding plant production. Perhaps there are some cases where another wetting agent, different from the one used in this study, can interact with the combined fungicides to result in excess salts and subsequent salts injury, but we

did not observe any evidence of such an interaction with 3x the recommended rate of Aqua Gro® even after two applications of 3x the recommended rates of Cleary's 3336F + Subdue.

A similar experiment using these two fungicides on poinsettias is scheduled for this autumn. Those results will be printed in the Bulletin after completion of the research.

Literature Cited

- Boodley, J.W., and R. Sheldrake, Jr. 1982. Cornell peat-lite mixes for commercial plant growing. New York State College of Agr. and Life Sci. Ext. Info. Bul. #43.
- Nelson, P.V. 1991. Greenhouse operation and management. Fourth edition. Prentice Hall, Englewood Cliffs, N.J. p. 171-208.
- Powell, C.C. 1991. Drenches on potted crops: watch the formulations. Ohio State Grower's Hotline No. 3.

COMING EVENTS

<u>Event</u>	<u>Date</u>	<u>Time</u>	<u>Location and Contacts</u>
North Carolina Association of Nurserymen Summer Short Course and Trade Show.	Tuesday-Wednesday August 29-30		Asheville Civic Center, Asheville, N.C. Contact the N.C. Association of Nurserymen at (919) 266-3322 for more information
SAF's Annual Convention, "Something New Under the Sun."	Wednesday-Saturday September 23-26		Westin La Paloma, Tucson, Ariz. Contact Nancy Lawler at (800) 336-4743 for further information
25th International PPGA Conference and Trade Show	Tuesday-Saturday October 6-10		Grand Rapids, Mich. Contact PPGA at (517) 694-7700 for further information
45th Annual North Carolina Commercial Flower Growers' Short Course and Trade Fair	Sunday-Tuesday October 11-13		Four Seasons Convention Center, Greensboro, N.C. Contact Doug Bailey for further information
The 1992 International Plug Conference	Thursday-Saturday November 5-7		Buena Vista Palace, Orlando, Fla. Contact Julie A. Stewart at (708) 208-9080 for more information
5th Annual National Conference on Specialty Cut Flowers	Friday-Monday November 6-9		Sheraton Burlington Hotel, Burlington, Vt. For more information contact the ASCFG at (216) 774-2887
N.C. State University Poinsettia Open House	Wednesday December 2	10:00 am-3:00 pm	University Research Unit 4, Beryl Road, Raleigh, N.C. Contact Roy Larson or Doug Bailey for further information.
North Carolina Floral Marketing Expo	Tuesday-Wednesday January 26-27, 1993		Benton Convention Center, Winston-Salem, N.C. Contact Doug Bailey or any NCCFGA Board Member for more information