DETERGENTS AND OILS: RATES, MIXTURES, AND PHYTOTOXICITY

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The onset of the Florida Tomato Geminivirus (FTGV) left growers searching for new spray technology and materials for the control of sweet potato whitefly. Among the materials found to be efficacious by the growers in the spring of 1991 were common laundry and dish detergents (soaps). With methodology founded in organic farming literature, growers were largely "experimenting" with these materials.

Horticultural oil technology had been promoted in the fall of 1990, and by spring 1991 tank mixes of detergents and oils were common on some farms. With little university research to back this methodology and application technology, growers took it upon themselves to develop their own application rates, mixtures, and schedules.

The myriad of products on the market combined with numerous tank mix possibilities made research in this arena difficult to address. However, in an effort to develop some guidelines, a study was undertaken at the Southwest Florida Research and Education Center in June of 1991 on double- cropped old tomato beds. The study was designed to identify detergent, oil, and detergent/oil tank mix phytotoxicity on fresh market tomatoes. The intensity of heat and solar radiation during June provided ideal conditions for phytotoxicity. The treatments were applied at approximately 11 AM to further encourage foliar injury. A backpack sprayer calibrated to deliver 50 gpa at 40 psi was used to apply the treatments.

The detergent used in these studies was Tide Liquid (Proctor & Gamble, Cincinnati, OH), and the oil was Ultra-Fine Oil (Mycogen, San Diego, CA). The following treatments were applied:

Control (Water application)

Detergent at 1%, 2%. 4%, 8% by volume

Oil at 0.5%, 1%, 2%, 4% by volume

Tank mixes of:

- 0.67% detergent to 0.33% oil
- 1.33% detergent to 0.67% oil
- 2.67% detergent to 1.33% oil
- 5.33% detergent to 2.67% oil
- 10.67% detergent to 5.33% oil

Plants were established for 1 week, and 12 plants per plot were designated to receive the treatments. They were applied twice weekly for a period of three weeks resulting in six applications. Percent phytotoxicity ratings were taken 24 hrs after each treatment application by visual assessment of the injured foliage of the entire plant. Following termination of the treatments, five "typical" plants from each treatment were removed (above-ground portion only) and assessed for dry matter accumulation. Treatments were replicated four times and the data was analyzed by ANOVA with mean separation by LSD.

DETERGENT Foliar injury that occurred from the detergent treatments appeared as a "burn", resulting in necrotic lesions or to a lesser extent a bronzing on the leaf surface. All stages of foliage development were susceptible.

The only acceptable detergent treatment was a 1% solution (Fig. 1). One application of 1% detergent resulted in a foliar injury level of less than 5%. This level of injury rose to 35% after four consecutive sprays. The injury appeared to lessen with further sprays.

Concentrations of detergent application higher than 1% were considered unacceptable due to the excessive levels of foliar injury that occurred. Foliar damage continued to accrue with the application of 2% detergent; this treatment was discontinued after three applications. The 4% and 8% concentrations resulted in complete foliage loss with the first application, therefore further treatment was discontinued. Plant loss occurred with all detergent rates applied (Table 1).
The 1% rate was four times greater than the rate commonly used by growers (0.25%). Dr. George Butler, visiting entomologist from Arizona, successfully used 0.5% detergent in his studies without mention of phytotoxicity (personal communication). Whereas growers might feel the level of injury observed with a 1% solution was excessive, the rate may prove effective under circumstances of heavy whitefly infestation.

All detergent application concentrations significantly reduced dry matter accumulation of young tomato plants (Table 1). Tomatoes treated with 1% detergent weighed 1/4 to 1/3 of control fruit. Dry matter accumulation with the 4% detergent concentration reflected regrowth following the single application. Dry matter accumulation at the 8% detergent concentration indicated no regrowth occurred following this single application treatment.

OIL Plants receiving all levels of oil application were free from foliar injury in the form of "burn", and no oil application resulted in plant loss. However, the 2% and 4% oil concentrations treatment levels resulted in severe malformation of young foliage. This effect was greatest in the 4% oil

treatment. Further applications would be likely to result in reduced yield or unmarketable fruit.

Both the 0.5% and 1% oil applications were acceptable without the resultant leaf malformation. These rates are within the labeled rate guidelines for most oils.

Tomato dry matter accumulation for oil-treated plants approximated control plant growth at concentrations of 1 and 2% (Table 1). The 4% oil application resulted in plant weights 1/3 of that of the control. The 0.5% oil application resulted in about the same weight reduction as the 4% treatment when compared to the control. This phenomenon is difficult to explain considering the dry matter accumulation of the 1% and 2% oil treatments.

DETERGENT/OIL TANK MIXES Most of the 2:1 detergent to oil tank mix combinations resulted in foliar injury (Figure 2). Significant plant loss occurred with the 5.33% detergent/2.67% oil and 10.67% detergent/5.33% oil treatments after one application, therefore these treatments were discontinued. The 0.67% detergent/0.33% oil mix resulted in 25% injury after three applications, but injury subsided with further growth of the plant. This application mix might be efficacious under heavy whitefly pressure.

All detergent/oil tank mixes resulted in a reduction of tomato dry matter accumulation when compared to the control (Table 1). The 0.67% detergent/0.33% oil mix showed the least overall weight reduction resulting in 55% of the control weight.

It should be emphasized that these applications were applied on a twice-weekly schedule to young, newly-established plants, applied with a backpack sprayer at 40 psi. Plant response to these treatments under spray pressures greater than 100 psi is subject to debate. These preliminary results need further corroboration to ascertain if such dramatic weight loss by detergent treated plants was truly an effect of the treatment. The study will be repeated in a fall '91 trial at SWFREC.

Carson, Julie A

From: Mendez Martinez,Joel A
Sent: Monday, August 20, 2012 9:03 AM
To: Carson, Julie A
Subject: BIOCHEMIST BOOK

Hi Julie,

I'm wondering if you please can get the book **Lehninger's PRINCIPLES OF BIOCHEMISTRY fifth edition** by David L. Nelson and Michael M. Cox and the book titled Ecology and behavior of the ladybird beetles (Coccinellidae) by I. Hodek[3], H. F. van Emden[4], A. Honěk[5] J. P. Michaud[1] and James D. Harwood[2] from the library.

By the way, my biochemist class will be offered on line, so I won't have to use the polycom for this purpose.

Thank you very much.

Have a nice day. ☺

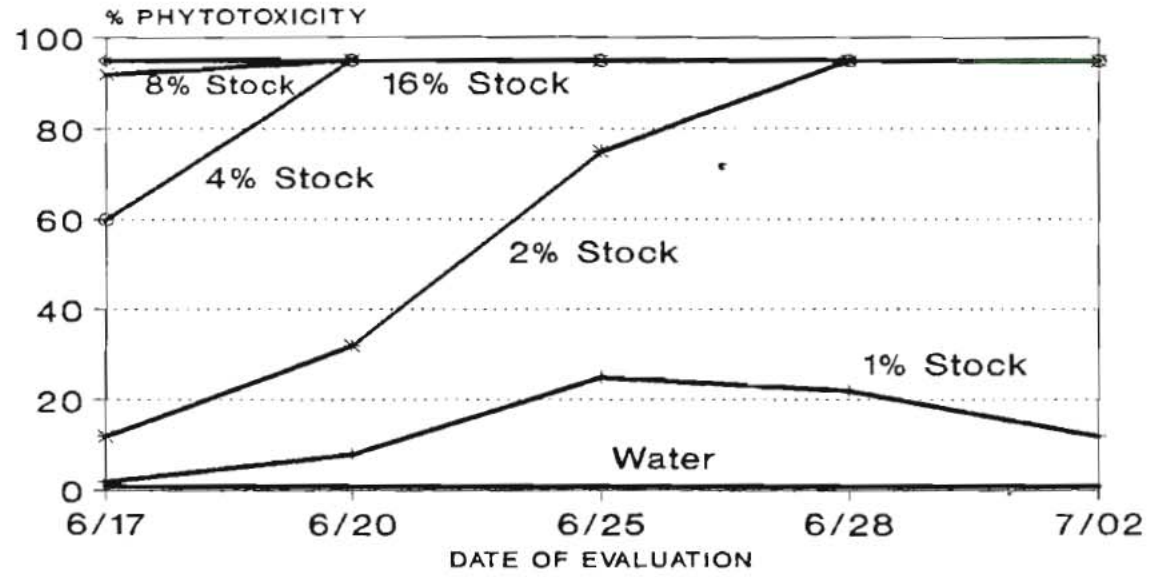
Joel.

Table 1. Tomato seedling dry weights, 1 month after planting and after receiving detergent, oil, or detergent/oil sprays twice weekly.

Treatment	Rate	Dry Weight Per Plant[a]	Sample Size
		--(grams)--	(no.)
Water	Check[e]	6.377	5
Detergent	1 %[e]	1.779	4
	2 %[d]	0.640	4
	4 %[c]	2.003	4
	8 %[c]	0.669	1
Oil	0.5 %[e]	1.740	5
	1 %[e]	5.158	5
	2 %[e]	5.507	5
	4 %[e]	2.277	5
Detergent/Oil[b]			
	0.67%/0.33%[e]	3.563	5
	1.33%/0.67%[d]	1.574	5
	2.67%/1.33%[c]	1.231	5
	5.33%/2.67%[c]	0.0	0
	10.67%/5.33%[c]	0.0	0
LSD 5%		2.96	1

[a] Averaged from a 5 plant sample when available
[b] Stock solution = 2:1 detergent:oil
[c] Plants received one spray
[d] Plants received three sprays
[e] Plants received six sprays

Fig. 2 DETERGENT/OIL SPRAYS ON TOMATO



STOCK = 2:1 DETERGENT:OIL