Managing Canker Diseases in Grapevine

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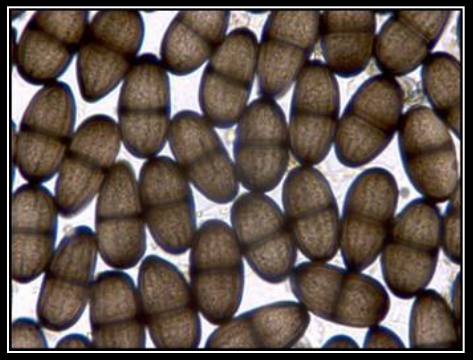
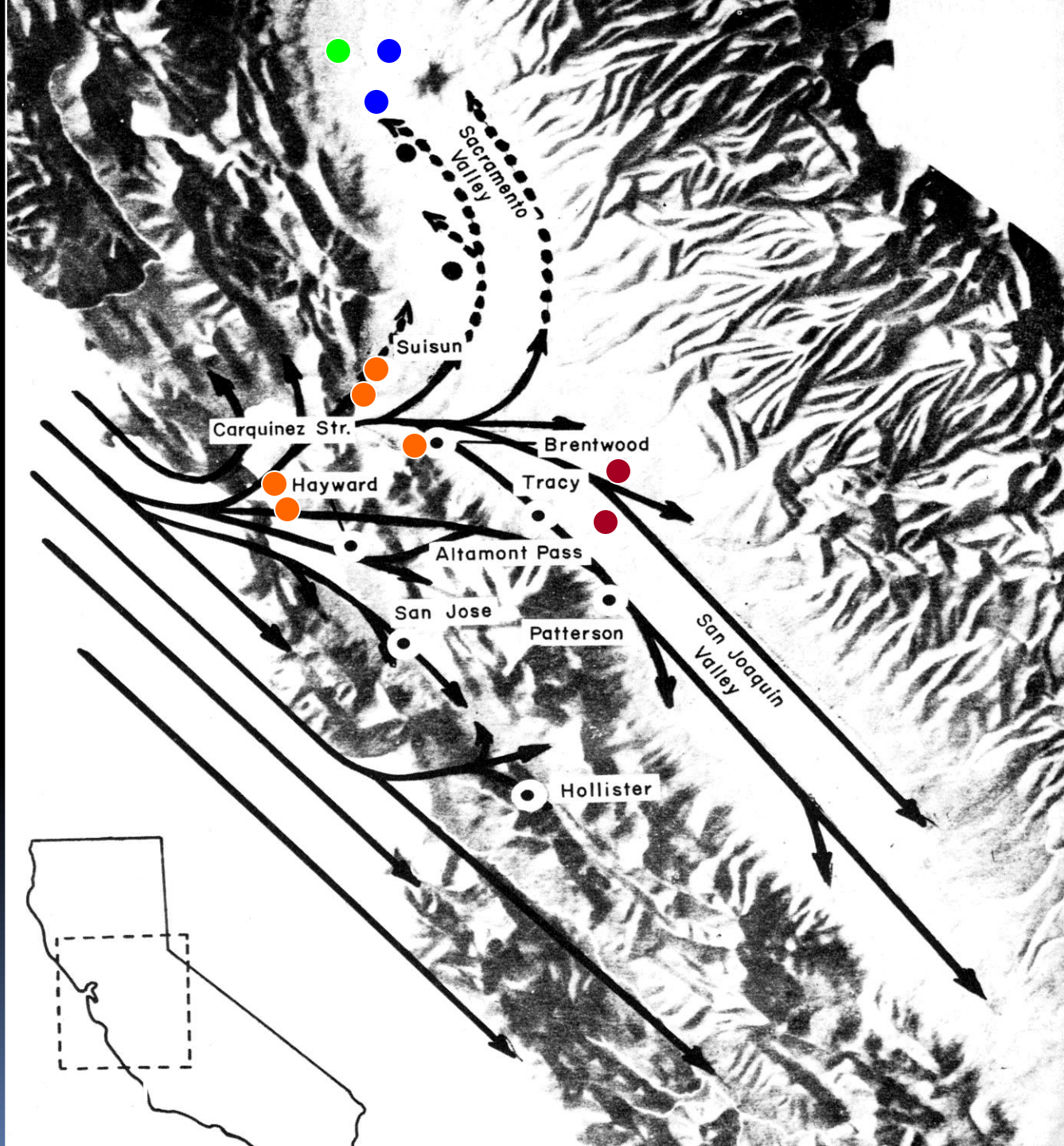


“Bot Canker”
Disease Cycle

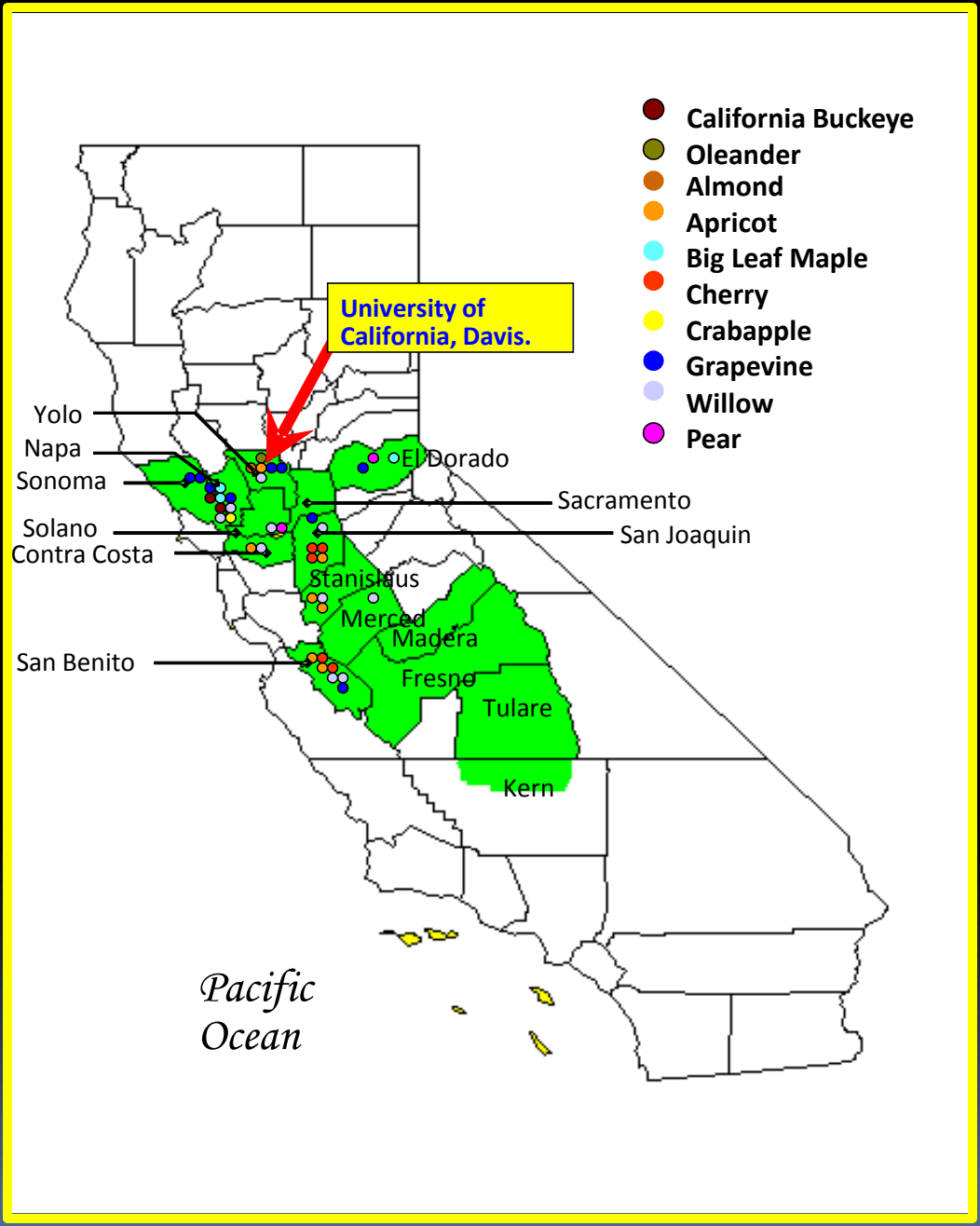
Blockage of vascular system

Inoculum sources for *Eutypa lata*



- More findings:
Sacramento, San Joaquin, and Yolo Counties

- Apricot
- Cherry
- Grapevine
- Almond



Survey for *E. lata*:

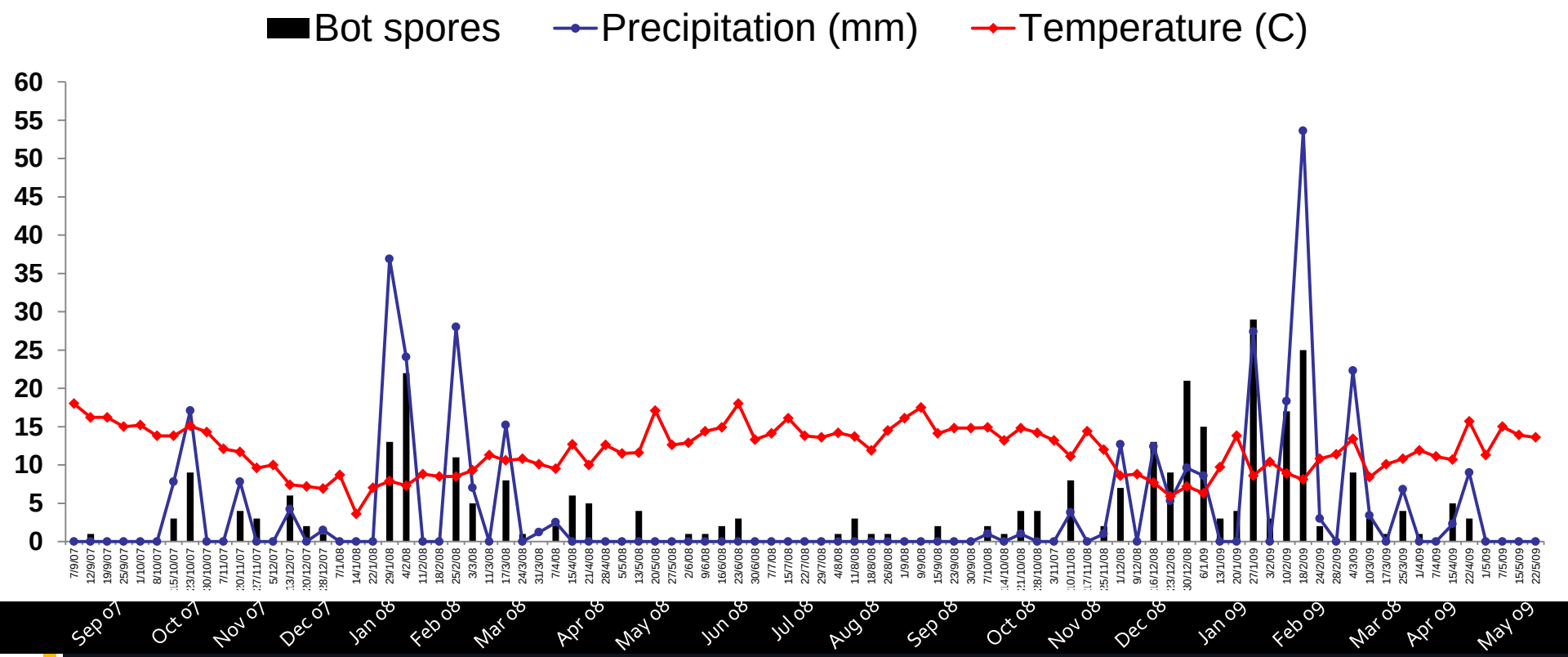
Geographical distribution and host range of the perithecial stage of the pathogen *E. lata* in California.

Eutypa dieback Canker

BOTRYOSPHAERIA PYCNIDIA FOUND IN CALIFORNIA GRAPEVINES.

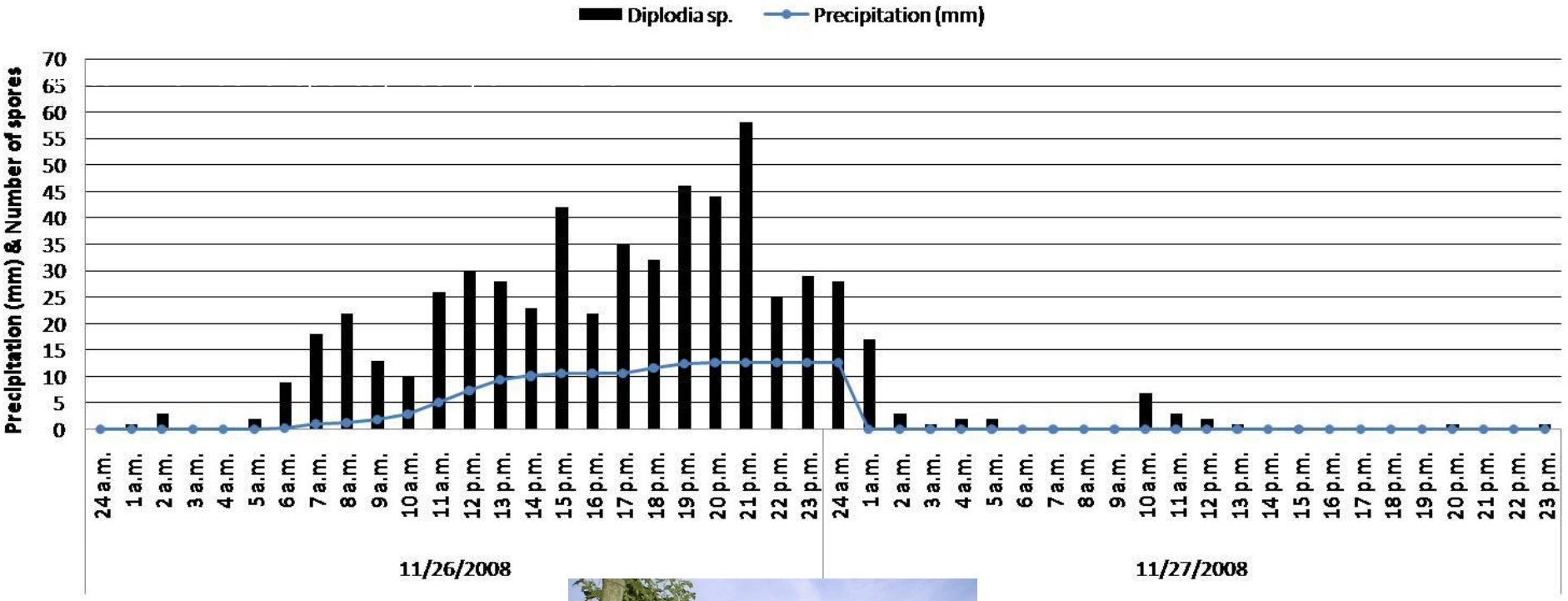
• Pycnidia of *Lasiodiplodia theobromae* found in Coachella Valley grapevines.

Vaseline slides spore trapping results in Monterey County



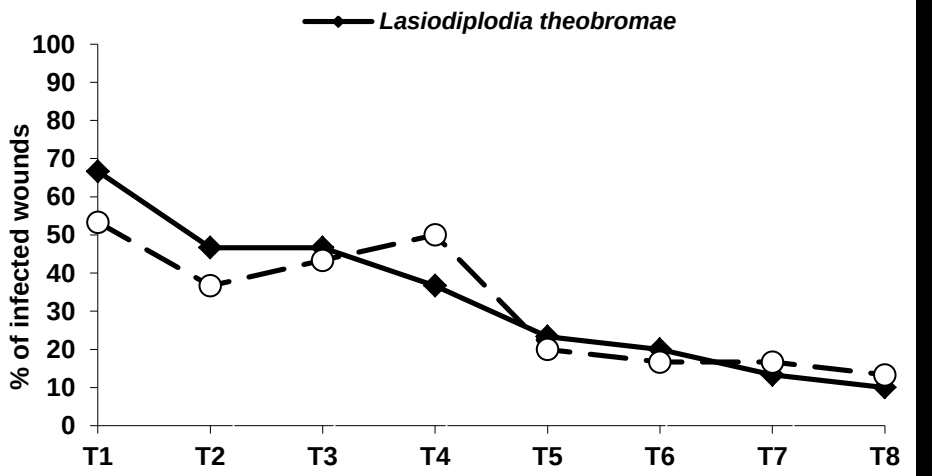
Bot spores values = Total spores / 2 ml of H_2O

Volumetric spore trapping results in Monterey County from midnight October 26th to midnight October 27th, 2008

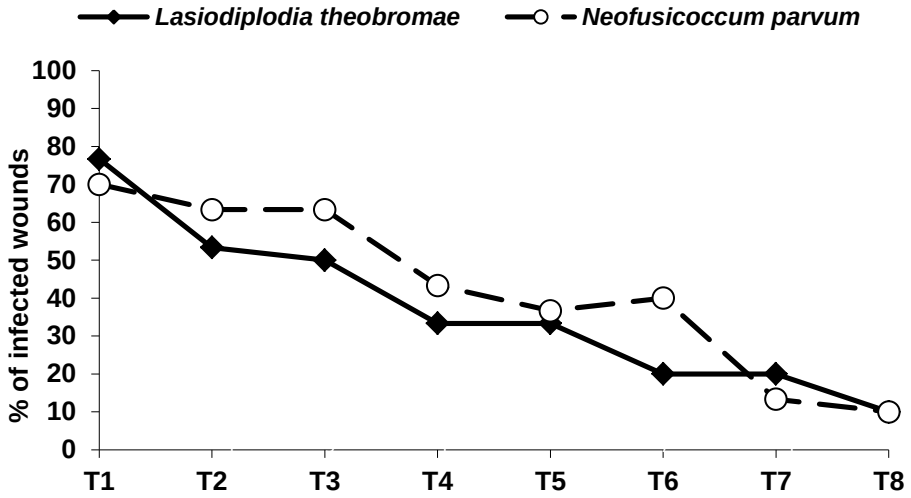


Chardonnay 2008-2009 Time Course Inoc

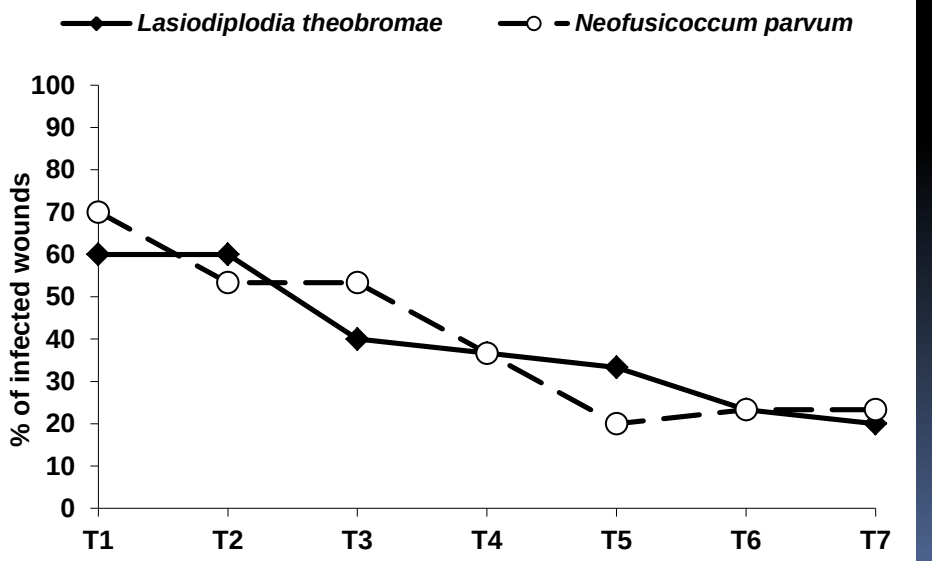
November



December

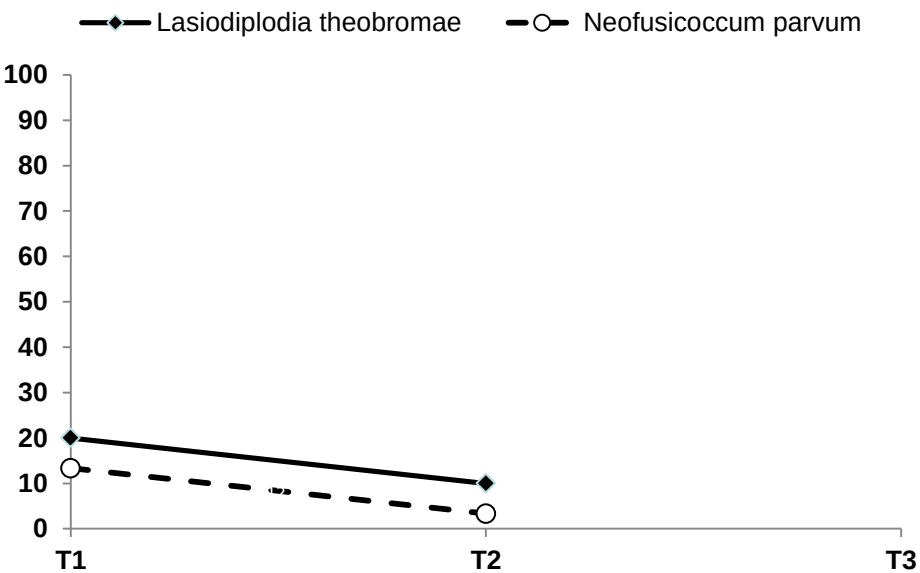


January

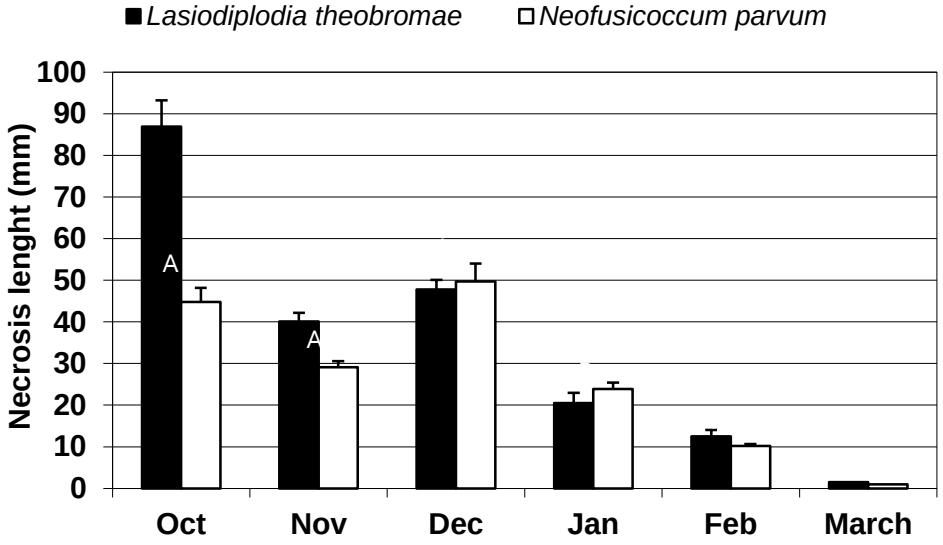


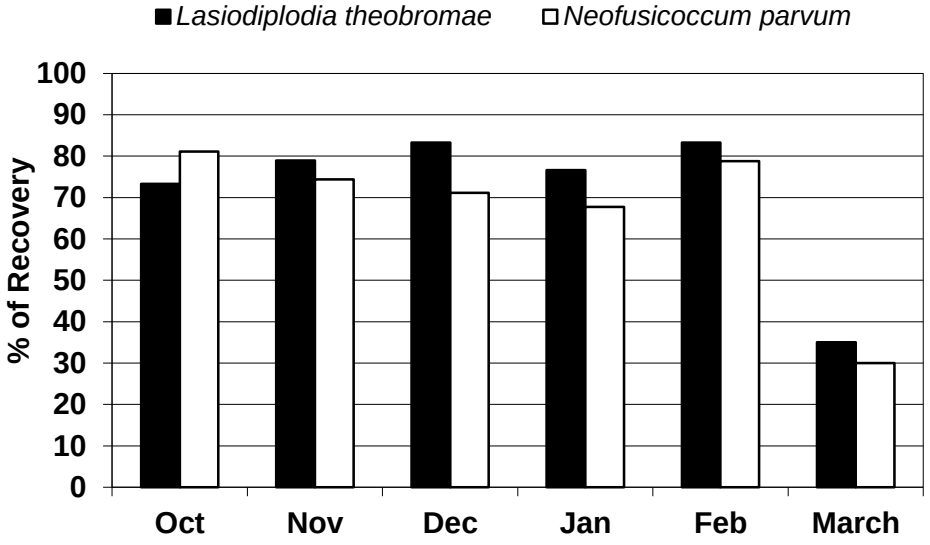
February

March

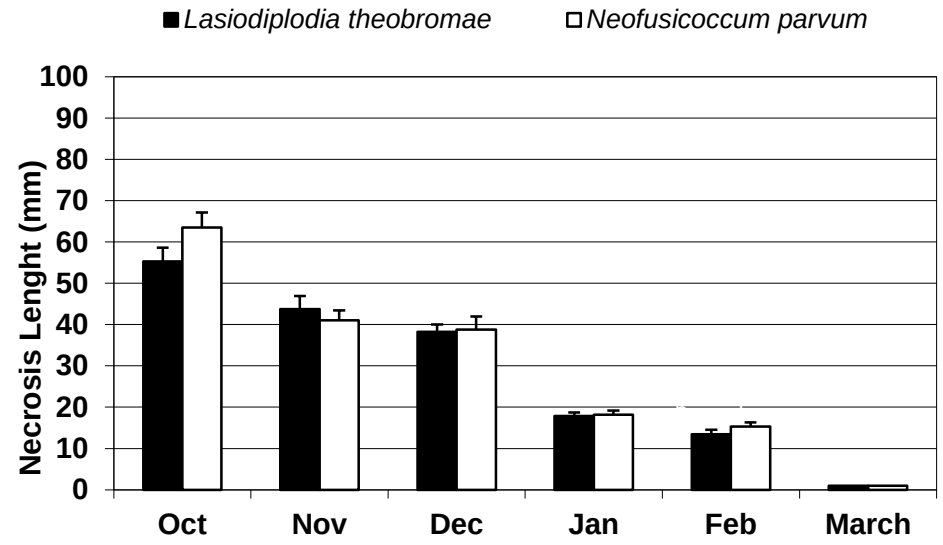


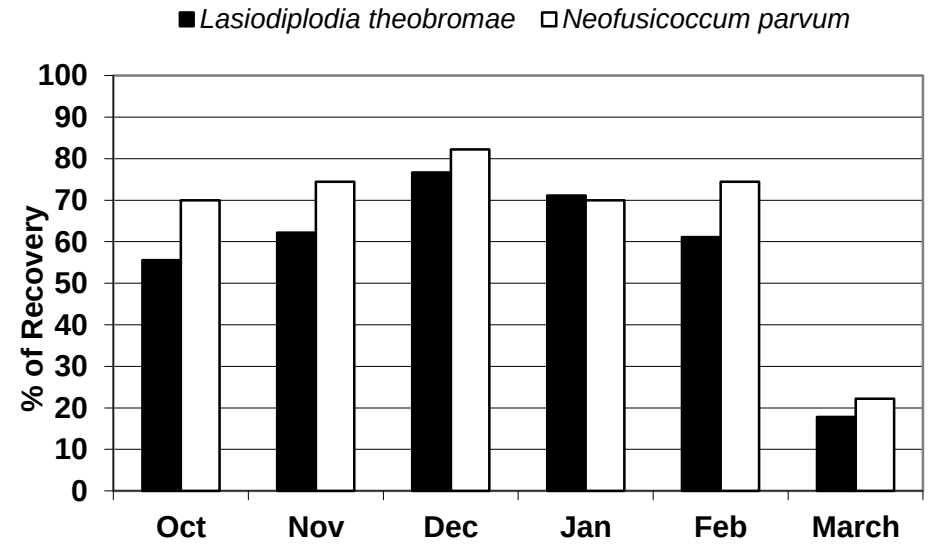
Susceptiblity of wood-Chardonnay 20072008





Susceptibility of wood-Cabernet Sauvignoln





Fungal species were not re-isolated 1 inch below end of necrosis

Cultural Control

- Cultural
  - Retraining from cordon or trunk
  - Late pruning
    - Mid to late February-early March
    - Wounds less susceptible
    - Inoculum decreased
    - Wound healing is faster
  - Double pruning (Weber et al. 2007. Am. J. Enol. Vitic. 58:61-66)
    - First pruning done with tractor mounted rotary saw
    - Second pruning done in late winter (Feb-early March)
    - Allows large acreage to be pruned late due to speed of second pruning
    - Excellent efficiency & economics
    - Should give at least 90-95% control

Double/Late Pruning

Final pruning (2 buds) late February - early March


Canes Collected
In March
1000 canes / vineyard


ASV


PAK-TANK

What are Effective Products Against Canker Pathogens?

- DMI's- some have activity against Eutypa (Rally)
- Strobilurins- no activity
- Benzimidazole- Excellent activity against all pathogens (Topsin M)
- B- excellent activity against Eutypa (B-LOCK)
- Vitiseal with or w/o Rally + Topsin M
  - Paint
  - Spray (1: 9 dilution)
- Biological's- good activity if on wound 2 weeks before inoculation (Trichoderma, Cladosporium)

Control

- Double pruning or late pruning has been shown to be effective in significantly reducing infection by:
  Eutypa spp., Phaeo spp., and Botryosphaeriaceae spp.
- B-LOCK
- Vitiseal
- Currently Rally and Topsin M registered for tractor application
- Recommend Rally + Topsin in tank with non-ionic spreader i.e. Freeway/Pentra Bark
  - Application by machine is relatively fast and highly effective in control
  - Topsin M and Rally have been shown to be a good pruning wound protectants against Botryosphaeriaceae, Eutypa lata (Diatrypaceous), Pal and Pc infection

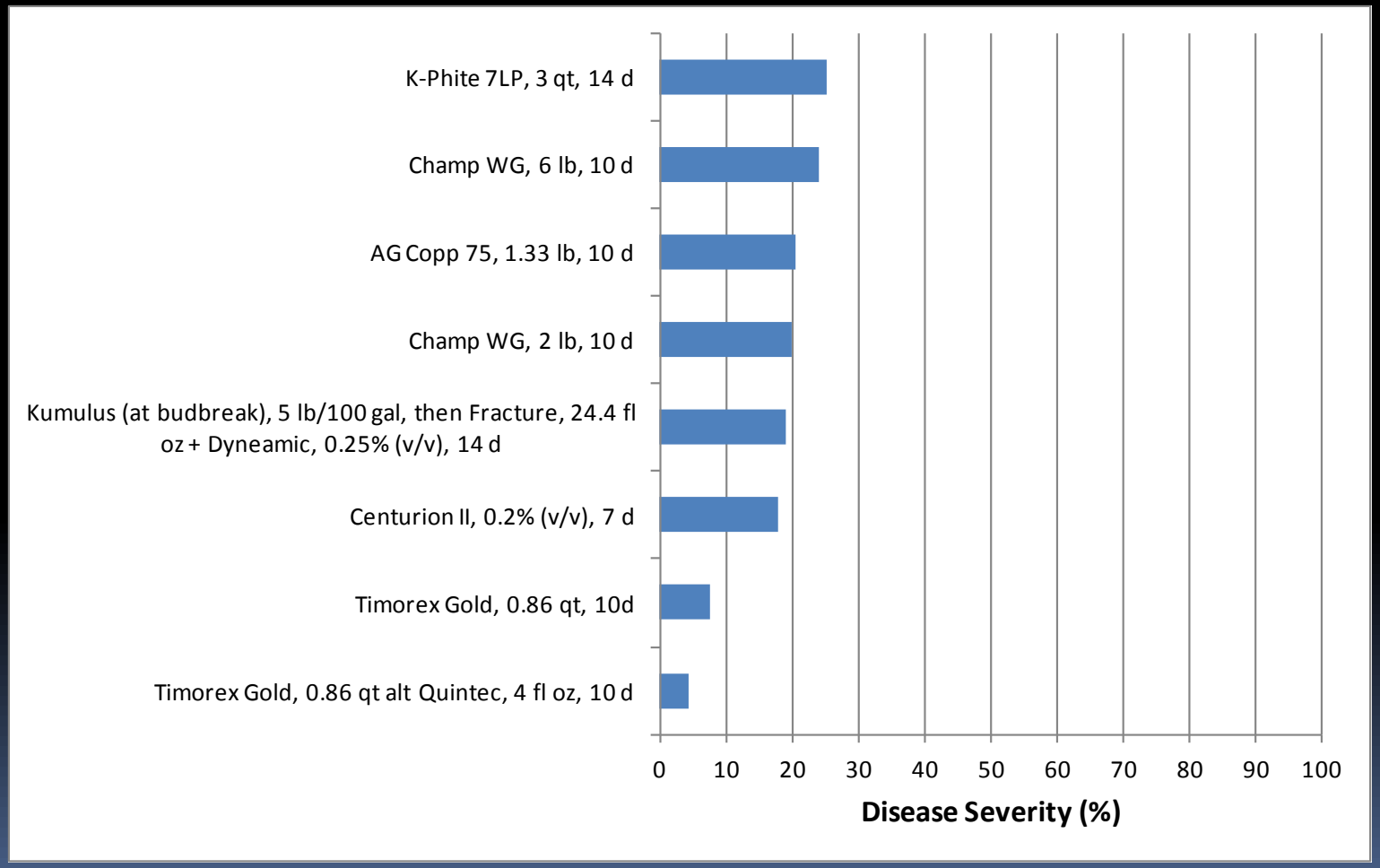
Safecoat VitiSeal™

- Natural waterborne co-polymer emulsion with other NOP (National Organic Program) approved ingredients.
- It is marketed not as a unique crop management tool that creates a protective resistant barrier against the typical point of entry for wood canker disease pathogens including Eutypa, Botryosphaeria and Phaeo group.
- VitiSeal™ is applied either through painting, daubing or spraying directly over pruning cuts onto vines, trunks, and tree bases.
- The proprietary formulation is water based, environmentally safe containing no hazardous materials or HAPs (hazardous air pollutants), has no re-entry wait restrictions after treatment, and has been proven effective through multiple years of university research center testing.
- California Certified Organic Farms has been approving materials request forms for VitiSeal use by organic and biodynamic growers.

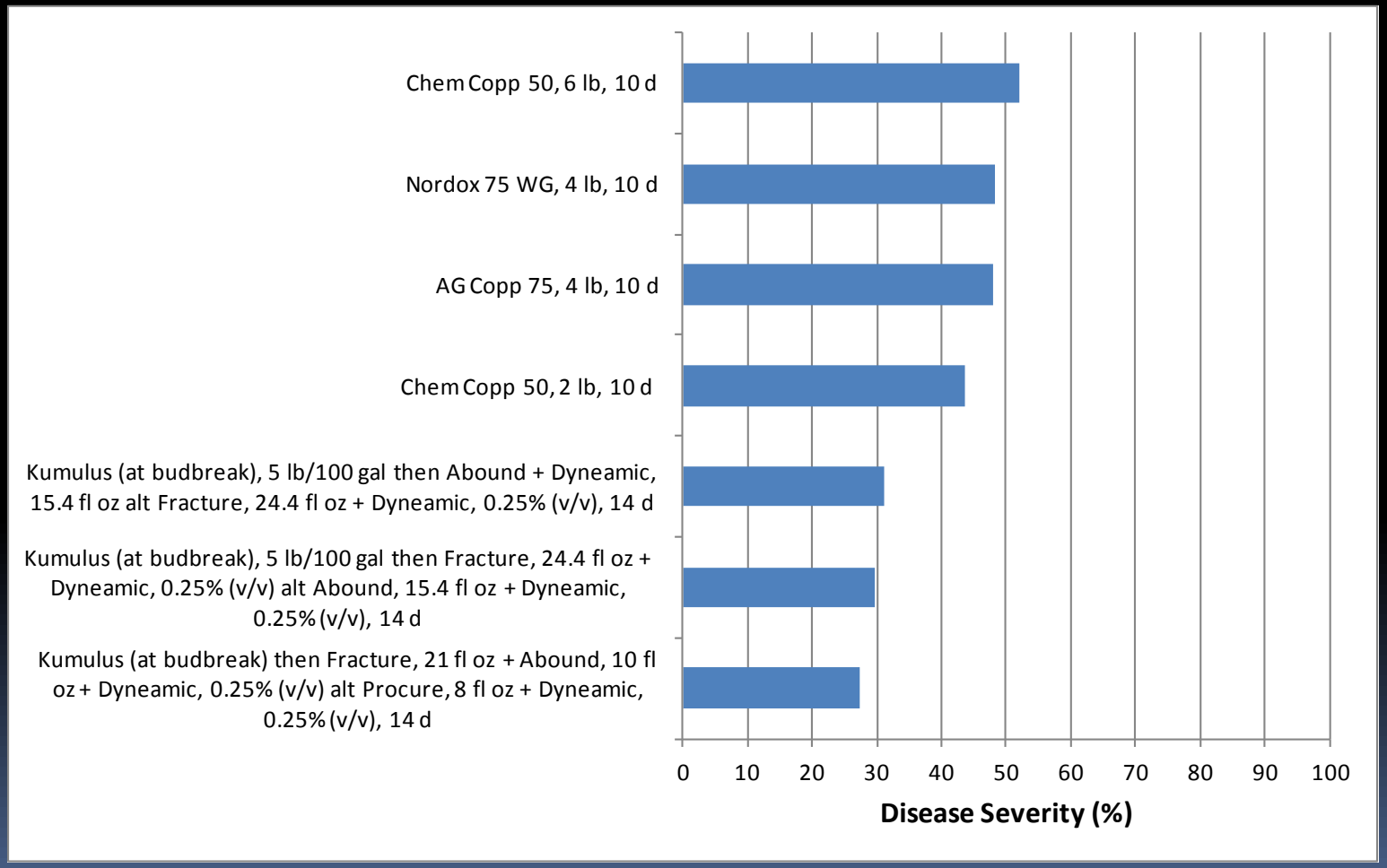

Vitiseal wet


Vitiseal dry

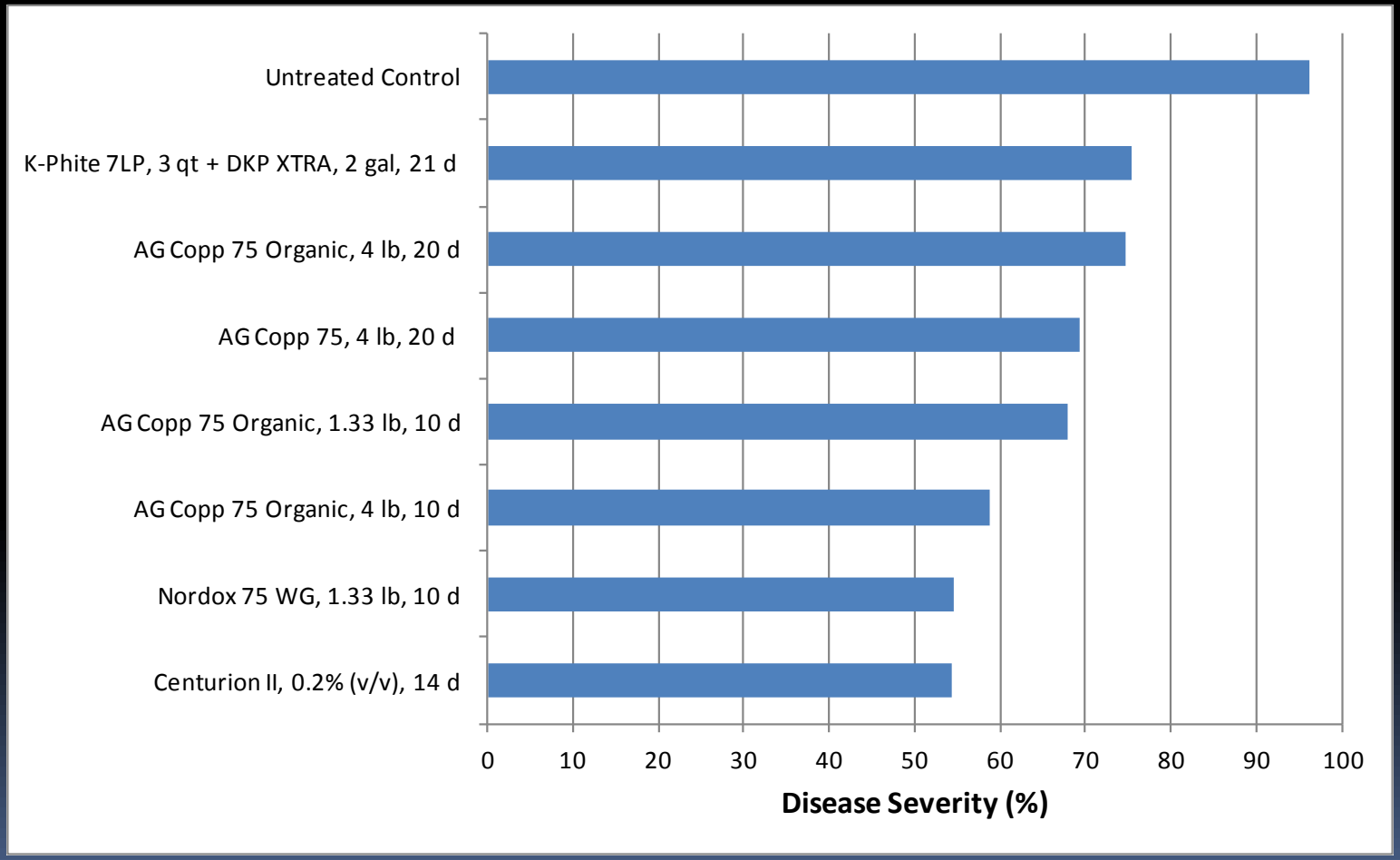
Grape PM Trial 1 Disease Severity (Part 1)



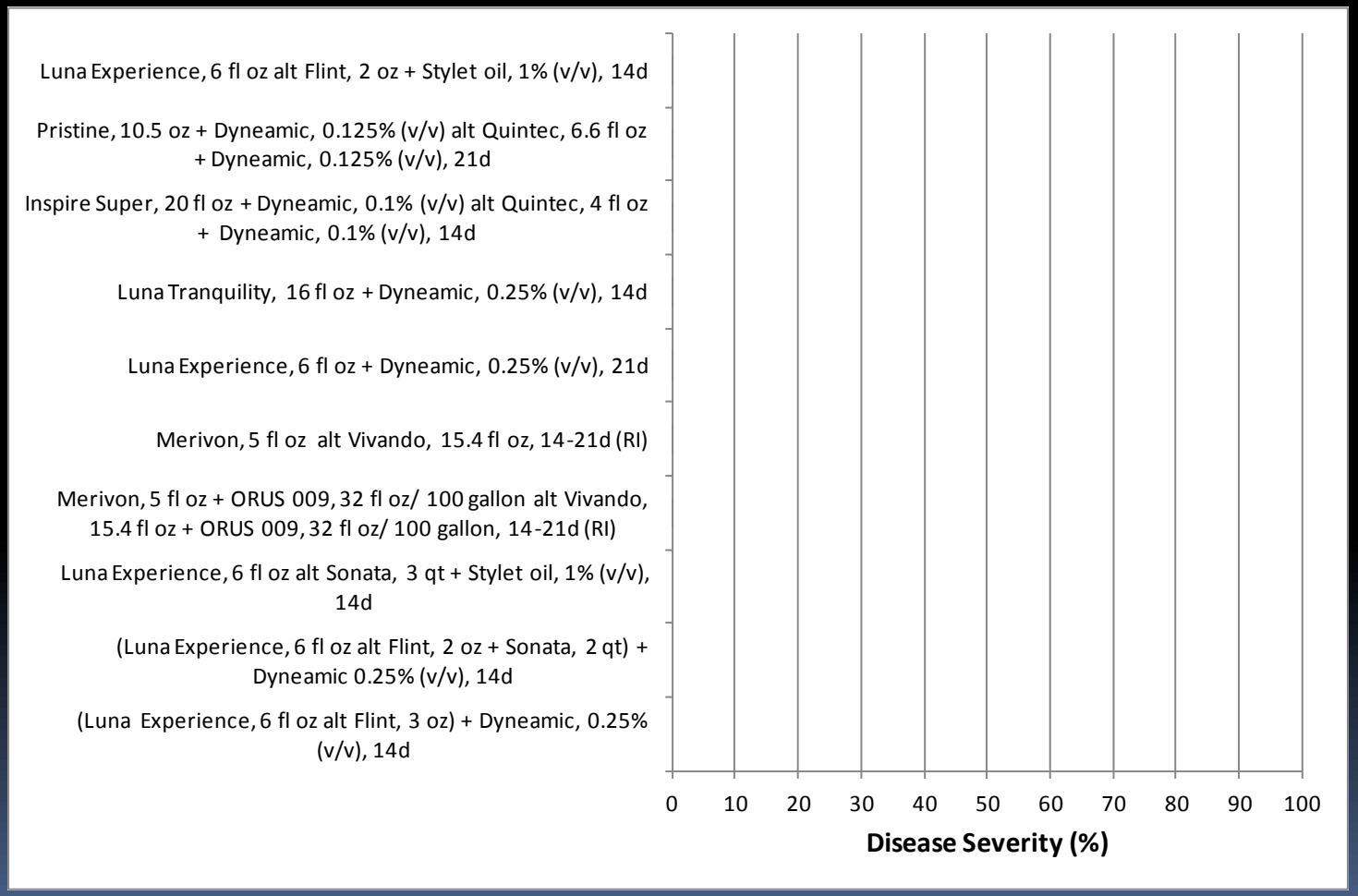
Grape PM Trial 1 Disease Severity (Part 2)



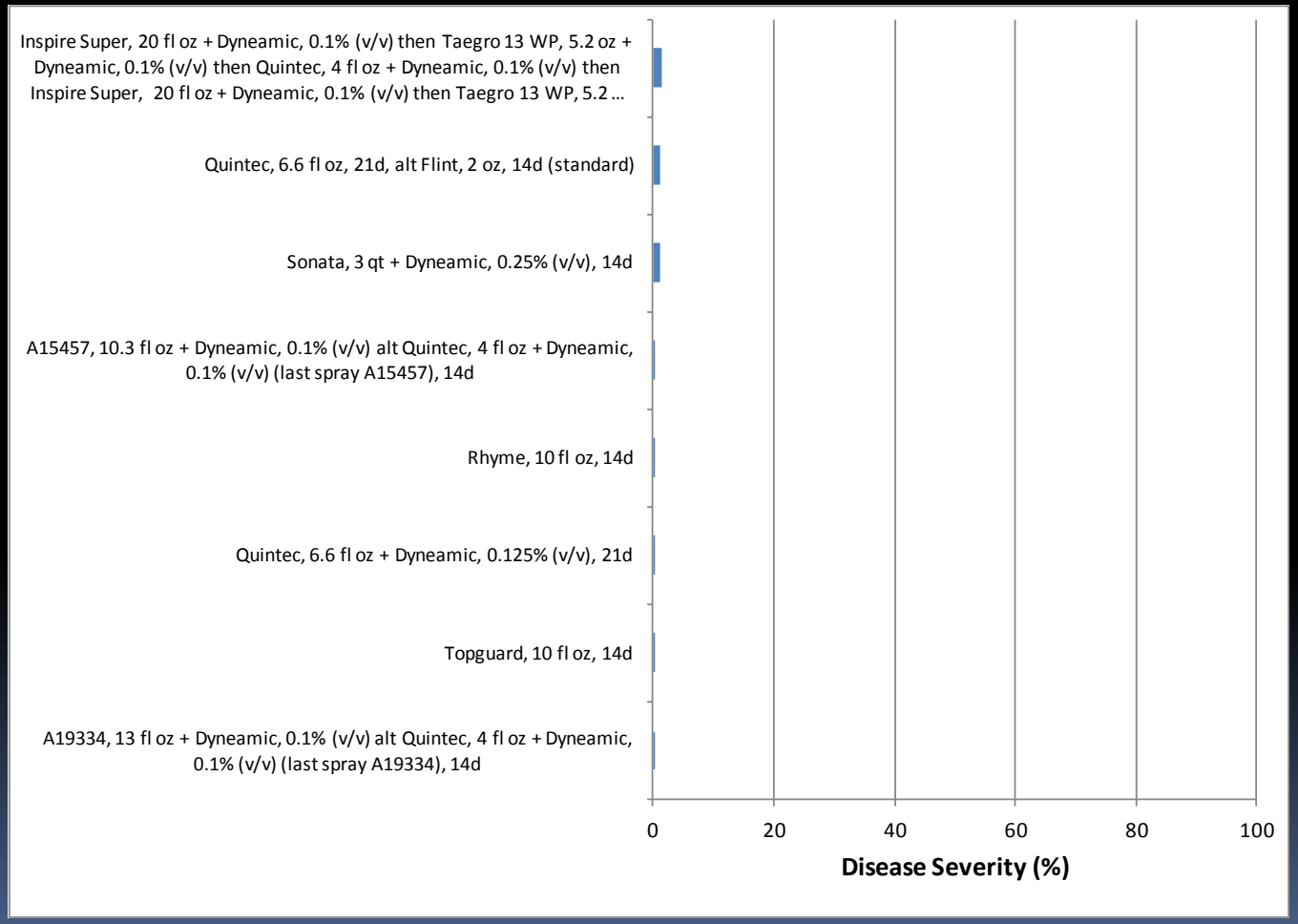
Grape PM Trial 1 Disease Severity (Part 3)



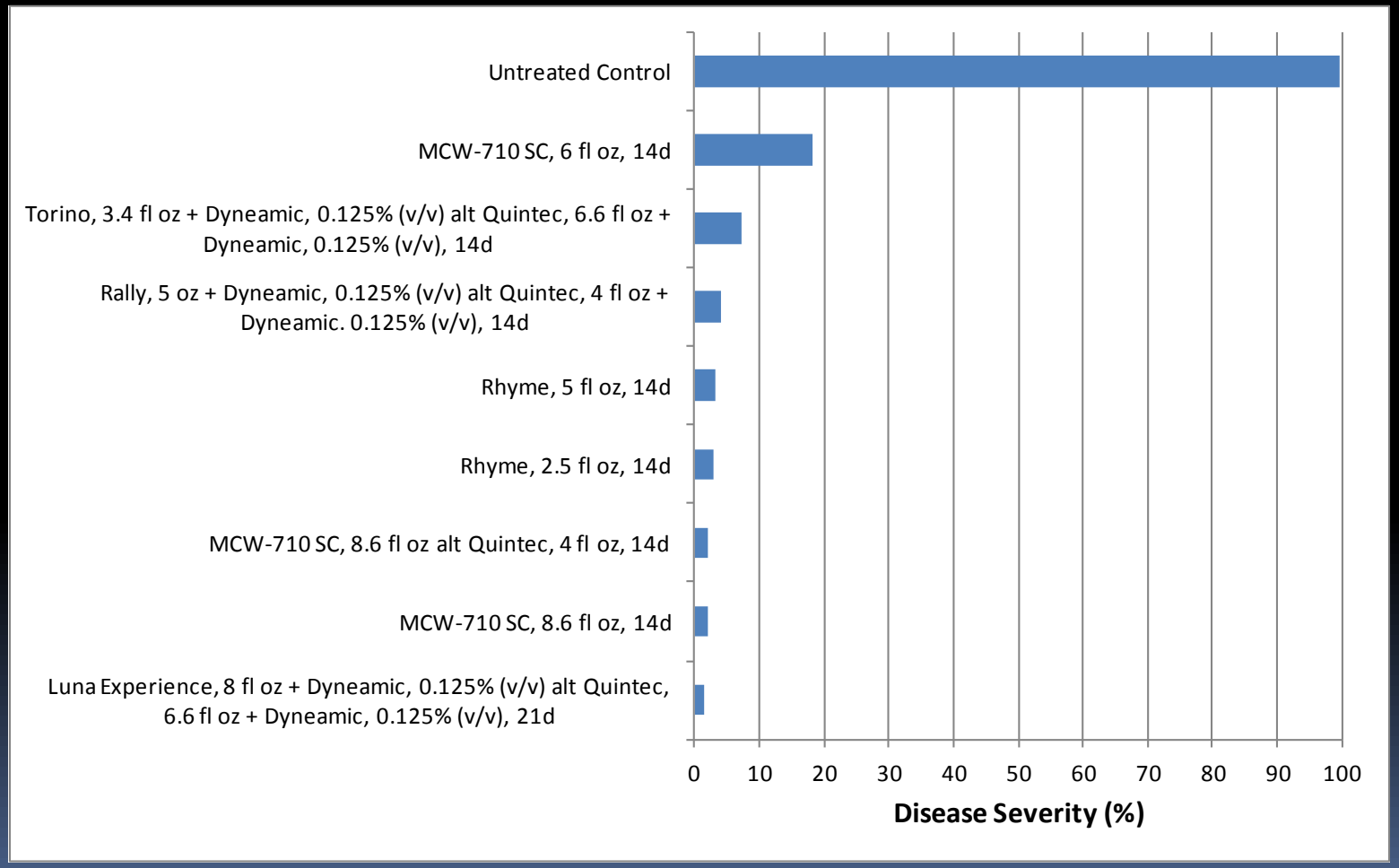
Grape PM Trial 2 Disease Severity (Part 1)



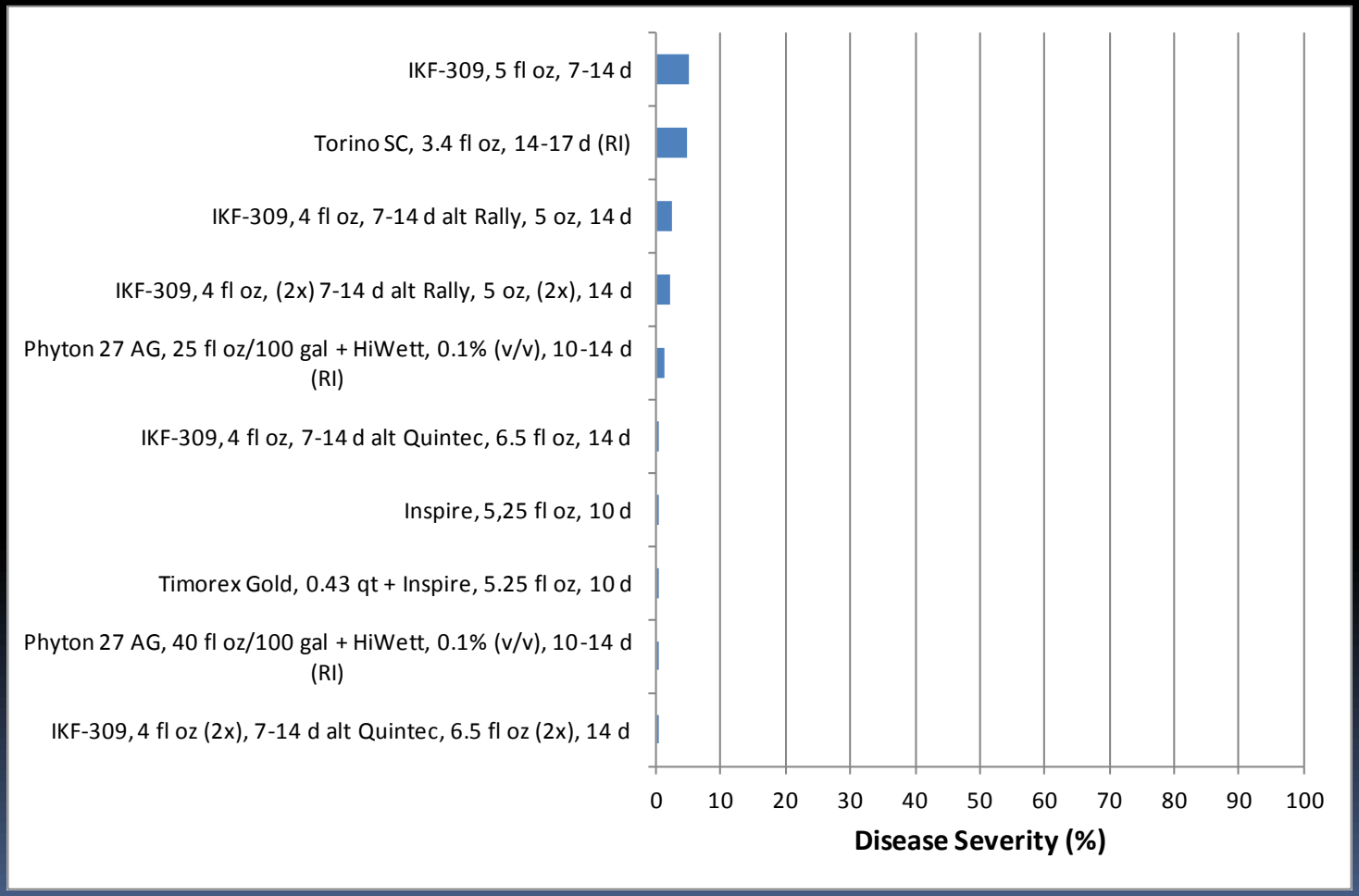
Grape PM Trial 2 Disease Severity (Part 2)



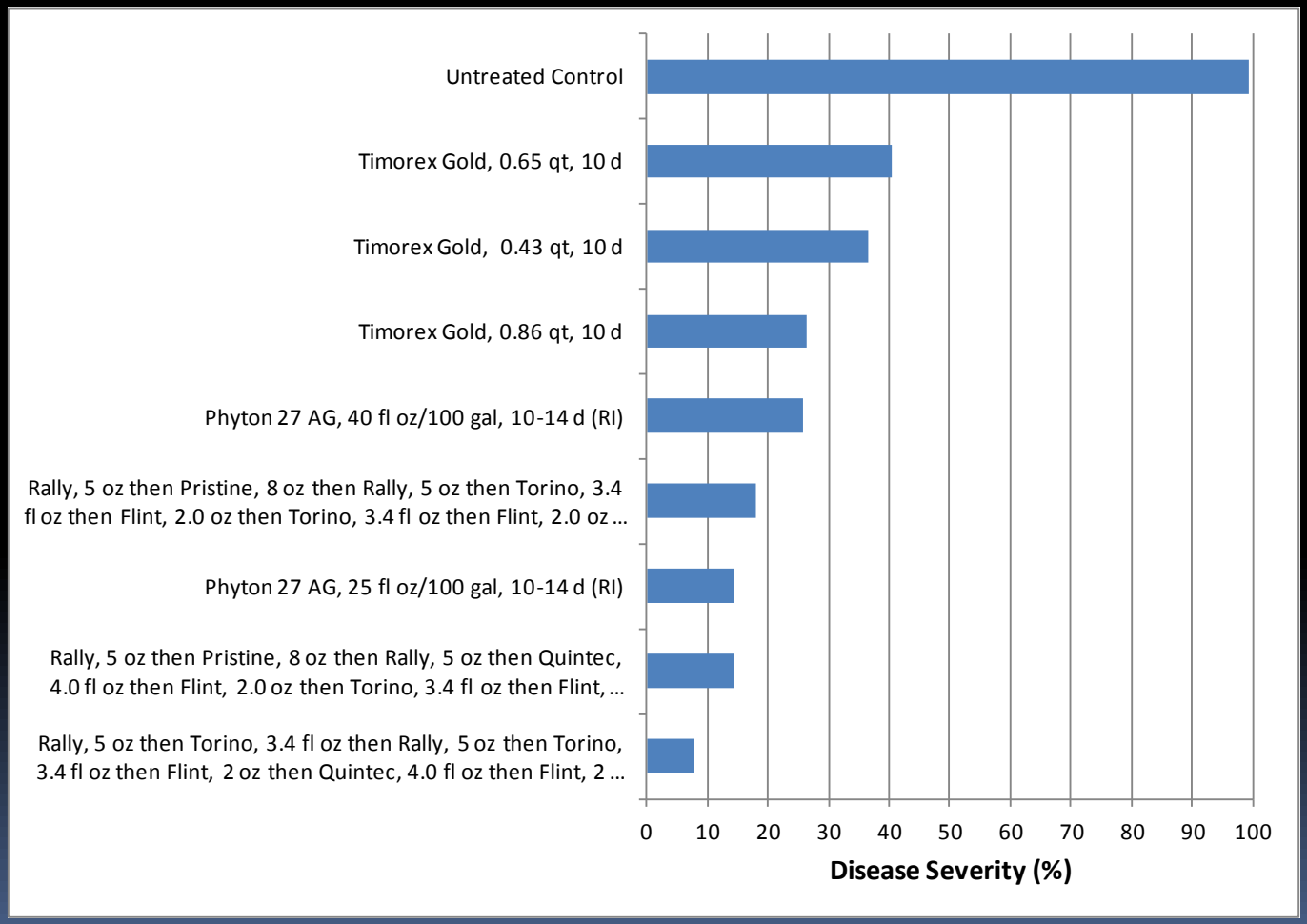
Grape PM Trial 2 Disease Severity (Part 3)



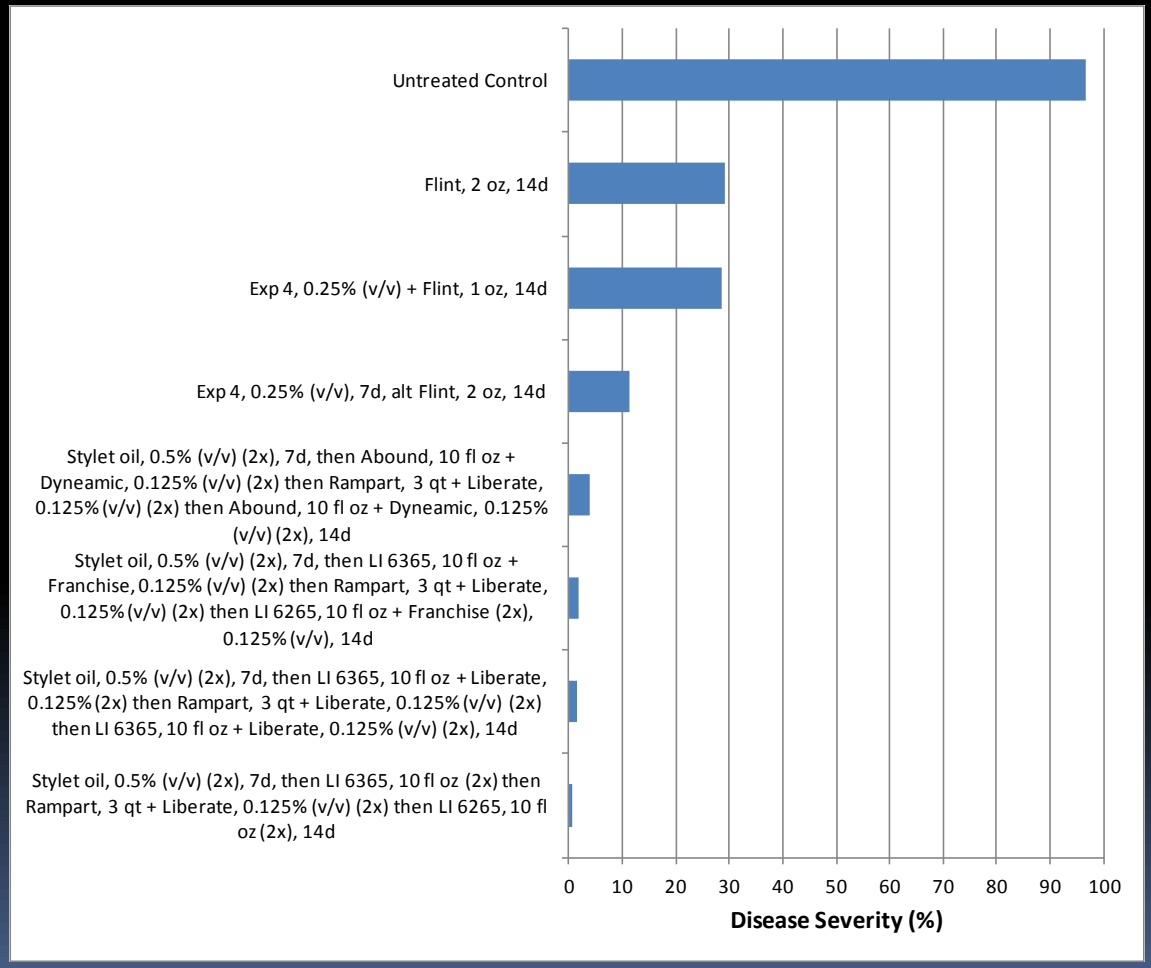
Grape PM Trial 3 Disease Severity (Part 1)



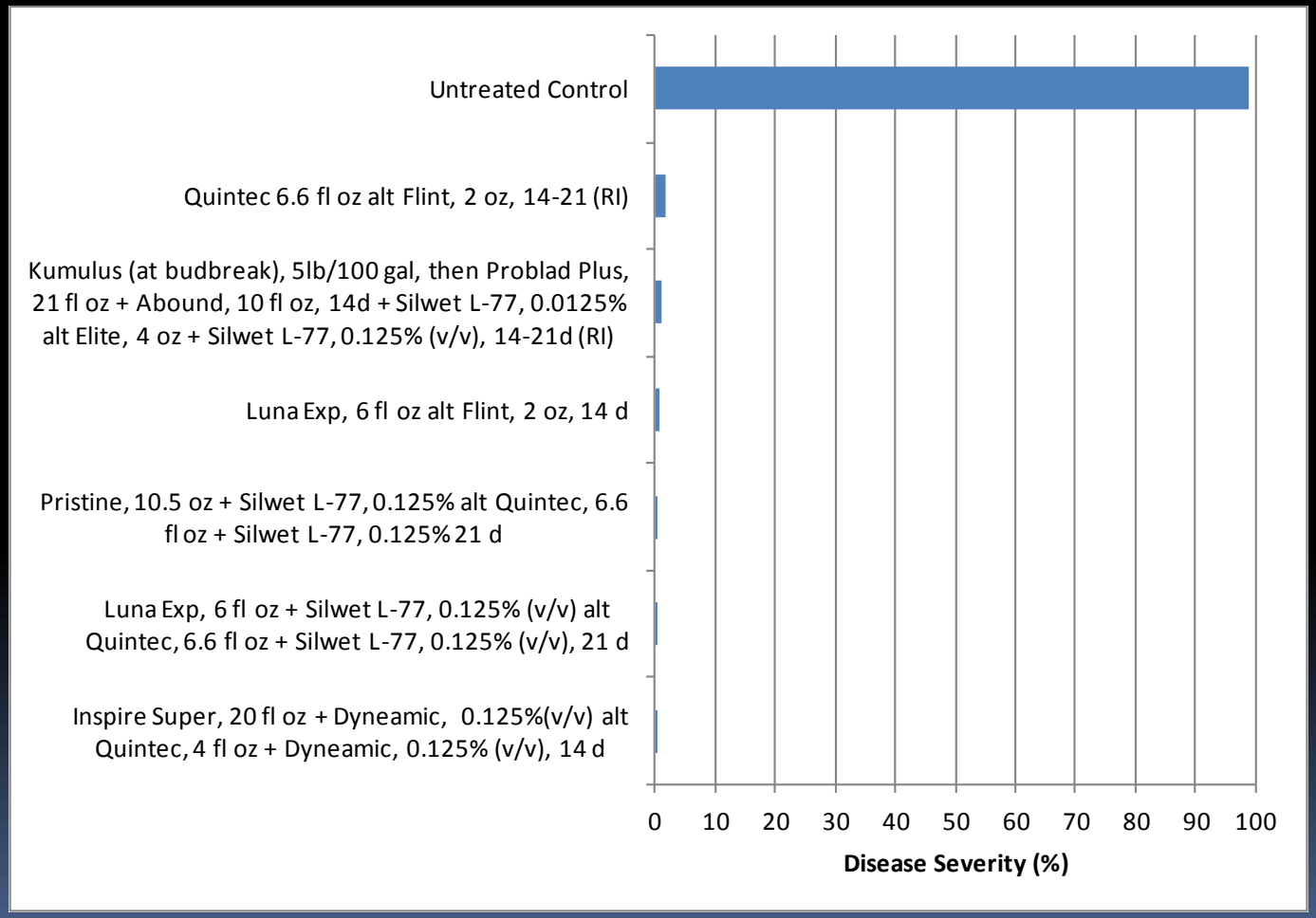
Grape PM Trial 3 Disease Severity (Part 2)



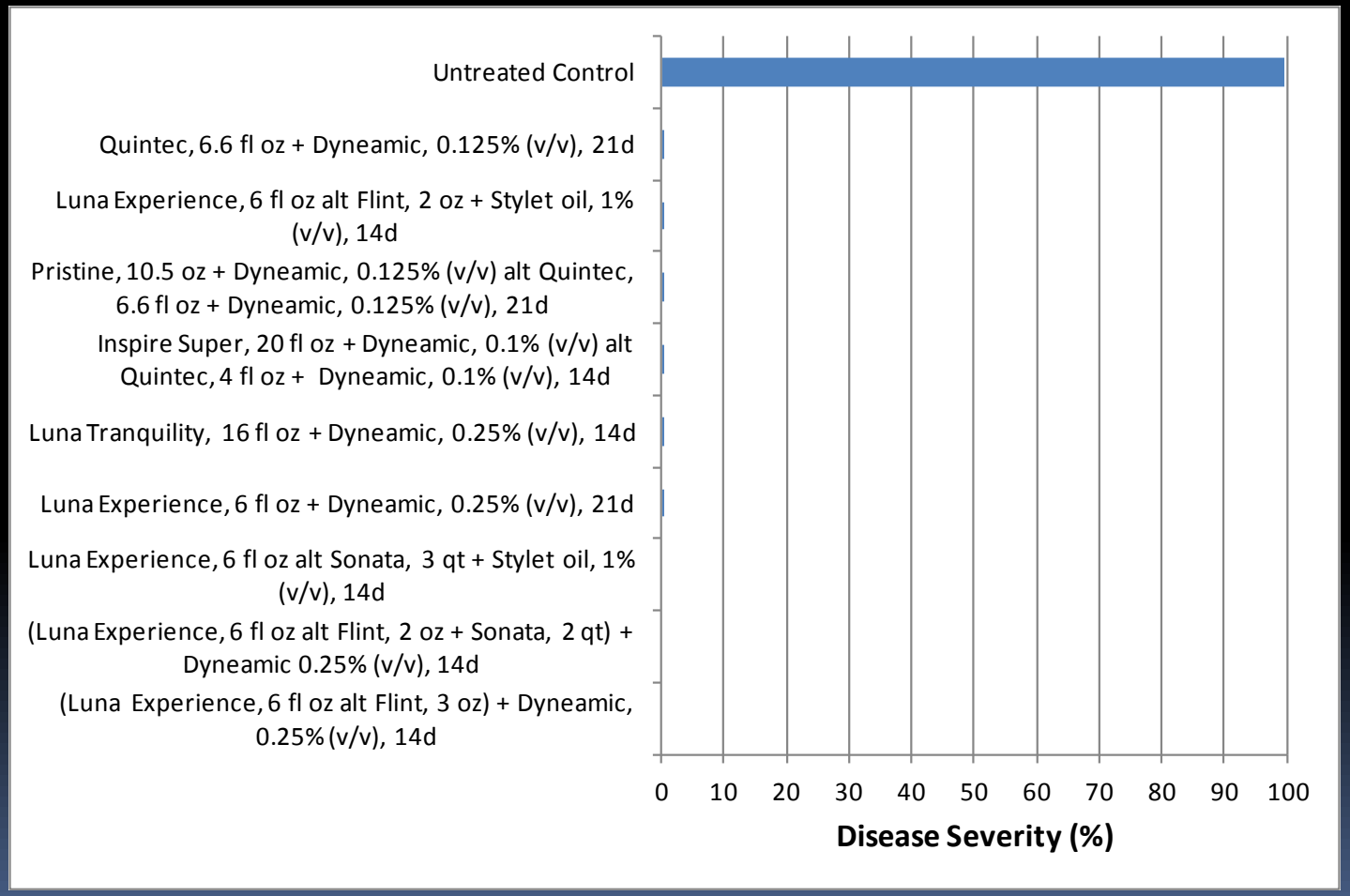
Grape PM Trial 4 Disease Severity



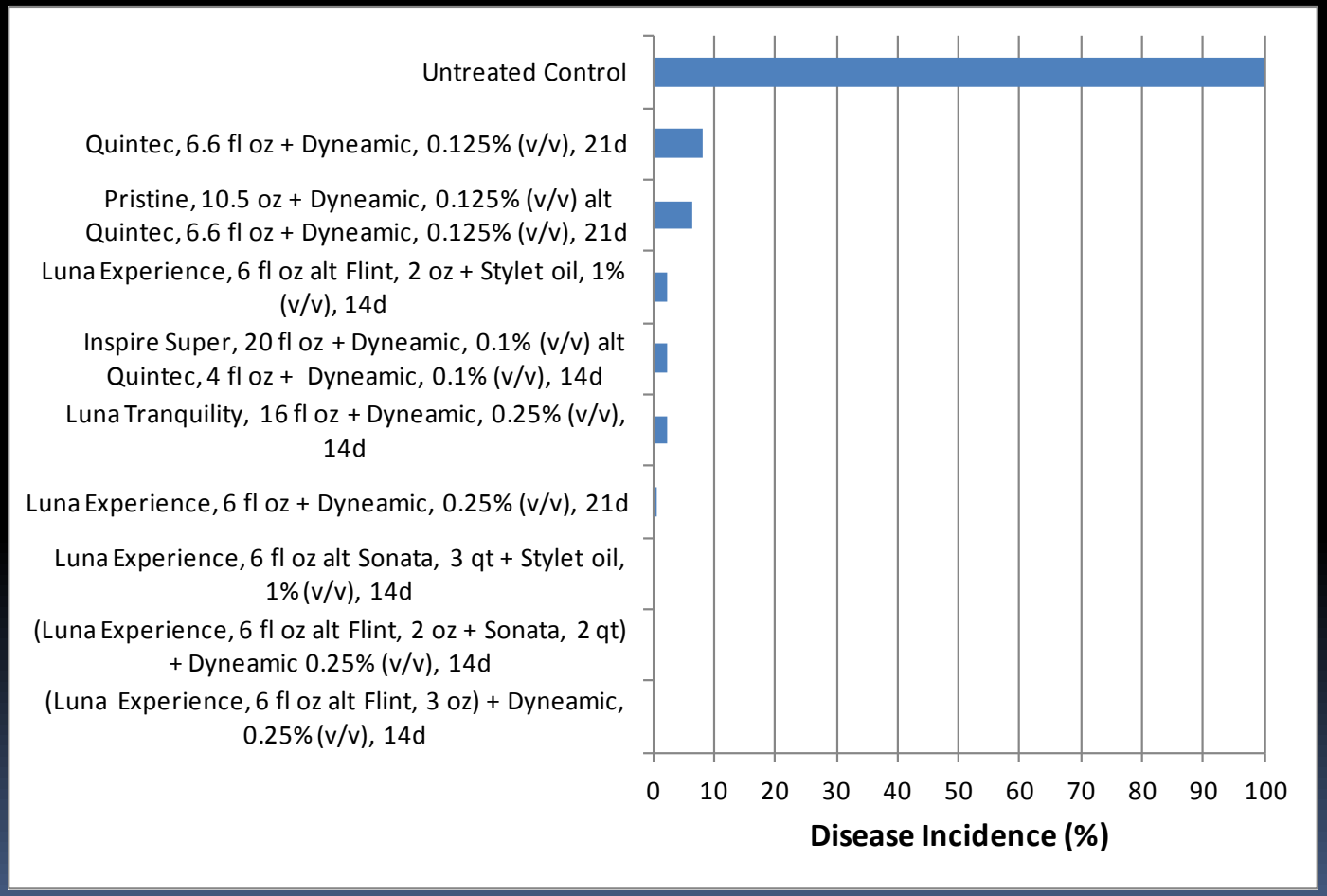
Grape PM Trial 2012: Treatments for comparison-Disease Severity



Grape PM Trial 2013: Treatments for comparison-Disease Severity



Grape PM Trial 2012: Luna (with other treatments for comparison) Disease Incidence



LI 6365	proprietary	proprietary	N/A
Liberate	lecithin, methylesters of fatty acids, and alcohol ethoxylate (100%)	Loveland Products, Inc.	adjuvant
Luna Experience	fluopyram (17.54%), tebuconazole (17.54%)	Bayer	DMI-triazole/ N/A
Luna Tranquility	fluopyram (11.3%) pyrimethanil (33.8%)	Bayer	SDHI/AP
MBI-10605	proprietary	proprietary	N/A
MCW-710 SC	proprietary	proprietary	N/A
Merivon	fluxabyroxad (21.26%) pyraclostrobin (21.26%)	BASF	SDHI + QoI
Nordox 75 WG	cuprous oxide (75% copper)	American Chemet Corporation	copper
ORUS 009	proprietary	proprietary	N/A
Phyton-27 AG	copper sulfate pentahydrate (21.27%)	Phyton Corporation	other
Pristine	pyraclostrobin (12.8%) boscalid (25.2%)	BASF	QoI + carboxamide
Procure 480SC	triflumizole (42.14%)	Crompton Manufacturing Company (Chemtura Corp.)	DMI
Quintec	quinoxyfen (22.6%)	Dow AgroSciences LLP	quinoline
Rally 40 WSP	myclobutanil (40%)	Dow AgroSciences LLP	DMI
Rampart	mono- and dipotassium salts of phosphorous Acid (53%)	Loveland Products, Inc.	phosphonates
Rhyme	flutriafol (12%)	Cheminova	DMI
Sonata	*Bacillus pumilus* QST 2808 (1.38%)	Agraquest	biological
Taegro 13 WP	*Bacillus subtilis* Strain FZB24	Syngenta Crop Protection, Inc	biological
Timorex Gold	oil derived from the tea tree, *Melaleuca alterniflora* (23.8%)	Biomor Israel Ltd.	oil
Topguard	flutriafol (12%)	Cheminova	DMI
Torino	cyflufenamid (10%)	Gowan Co.	N/A
Vivando	metrafenone (300g/L)	BASF	benzophenone

Merivon	fluxabyroxad (21.26%) pyraclostrobin (21.26%)	BASF	N/A + QoI
NUP-12033	copper hydroxide (46.1%)	Nufarm Americas Inc.	N/A
Phyton-27 AG	copper sulfate pentahydrate (21.27%)	Phyton Corporation	other
Pristine	pyraclostrobin (12.8%) boscalid (25.2%)	BASF	QoI + carboxamide
Problad Plus	protein extracted from the plant of the genus Lupinus, 20%	FMC Corporation	N/A
Procure 480SC	triflumizole (42.14%)	Crompton Manufacturing Company (Chemtura Corp.)	DMI
Quadris Top 2.71	azoxystrobin (18.2%), difenoconazole (11.9%)	Syngenta Crop Protection, Inc	DMI-triazole/QoI
Quintec	quinoxyfen (22.6%)	Dow AgroSciences LLP	quinoline
Rally 40 WSP	myclobutanil (40%)	Dow AgroSciences LLP	DMI-triazole
Regalia	*Reynoutria sachilinensis* extract	Marrone BioInnovations	biological
Silwet L-77	polyalkyleneoxide modified heptamethyltrisiloxane	Helena Chemical Co.	unknown
Sonata	*Bacillus pumilus* QST 2808 (1.38%)	Agraquest	biological
Sovran	kresoxim-methyl (50%)	Chaminova, Inc	QoI
Sylgard 309	polysiloxane (80%)	Dow Corning Corp	adjuvant
Topguard	flutriafol (12%)	Cheminova	DMI
Torino	N/A	Gowan Co.	N/A
Tranquility	fluopyram (11.3%) pyrimethanil (33.8%)	Bayer	N/A
Tri-Tek	petroleum oil (80%)	Brandt, Inc.	oil
Viticure 4 SC	triflumizole (42.14%)	Crompton Manufacturing Company (Chemtura Corp.)	DMI
Vivando	metrafenone (300g/L)	BASF	N/A