

Feeling the burn: An investigation into chemical injury to apples following the application of captan, single-site fungicides, and adjuvants

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Reasons for Russet

- Powdery Mildew
 - On fruit, more problematic during hot, dry summers on susceptible cultivars
 - Blossom infection-protection from pink/bloom to 1st cover
- *Aureobasidium pullulans*
 - “Black yeast”
 - Common epiphyte on apple
 - SweeTango/Golden Del.: leaky lenticels?
- Frost Damage (Spring)
- Chemical Damage (foliage + fruit)
 - Zinc, calcium, captan + oil, sulfur, copper, adjuvants?



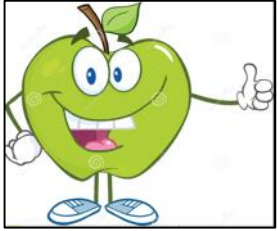
Region-wide russeting: 2013

- 2013 New England, NY, Canada Fruit Management Meeting

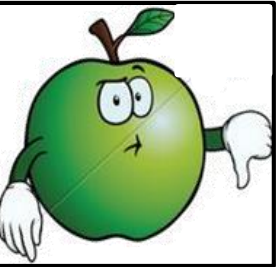


- Greater levels of powdery mildew than normal?
 - Hot and dry weather may have led to higher severity of powdery mildew on “check” trees in our research orchard than in previous years
 - Breakdown of some QoI efficacy for mildew control
- *A. pullulans* causing problems on multiple cultivars?
- Captan applications around petal fall/thinning timings
 - Different captan formulations? Addition of Fontelis?

Captan: The good, the bad, the ugly



- Resistance is not a concern: non-specific fungicide targeting multiple sites



- Must be present on leaves and fruit in order to be effective, minimal activity on powdery mildew and C.A.R, no “kick-back” activity

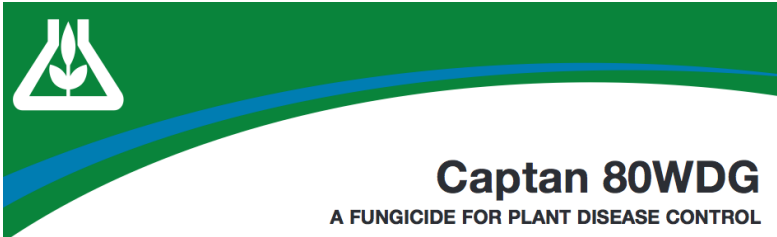


- Phytotoxic if penetrates cuticle and enters plant tissue

Conditions favoring captan damage

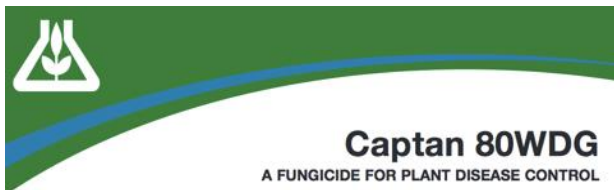
- Applications under slow drying conditions
 - Early morning or evening/night-time, foggy or misty day, high humidity, cloudy, low wind, high application volume
 - Extends contact period on leaf and fruit surface
- Applications following warm, rainy, windless weather
 - Petal fall – 10-14 mm fruit (1st C): Key thinning timings
 - Young, susceptible leaf and fruit tissue without cuticle protection
- Tank mixtures containing surfactants and spreader/stickers that may disrupt waxy cuticle
 - Oils, urea, calcium chloride, LI-700? Regulaid (less product)?

Captan 80WDG label



COMPATIBILITY AND PLANT SAFETY: CAPTAN 80WDG can be combined safely and effectively at recommended dosage rates with most commonly used fungicides and insecticides, with the exception of oil and strongly alkaline materials. Alkaline materials such as spray lime, lime-sulfur, and Bordeaux mixture will reduce the fungicidal activity of CAPTAN 80WDG. Do not apply CAPTAN 80WDG in combination with or immediately before or closely following oil sprays. Do not allow oil sprays on adjacent crops to drift onto crops which have been or will shortly be treated with CAPTAN 80WDG. The time factor governing the safe interval between CAPTAN 80WDG and oil sprays varies due to general climatic conditions, therefore, consult local agricultural spray programs and authorities to determine the proper timing. The use of spreaders which cause excessive wetting is not advised. Combinations with solvent formulations of organic phosphates should not be used. Combinations of CAPTAN 80WDG and sulfur should not be used on crops sensitive to sulfur. Used at high rates or in drenching sprays, CAPTAN 80WDG may cause a necrotic spotting of tender, immature leaves of certain varieties of apples, peaches, plums, and cherries. This type of injury is most likely to occur in the early cover sprays during long periods of warm, cloudy, humid weather. To avoid the hazard of leaf spotting under such conditions, use CAPTAN 80WDG and other spray materials at lowest recommended rates and avoid drenching trees.

Captan 80WDG Compatibility



“The use of spreaders which cause excessive wetting is not advised”

SPECIMEN LABEL

Regulaid®

General Information

Regulaid is a nonionic spreader-activator for use in improving the effectiveness of foliar applied plant growth regulators or streptomycin applications.

Regulaid provides superior wetting of the spray solution, uniform spray coverage and improved foliar penetration.



GENERAL: LI 700® is a non-ionic, low foaming penetrant. LI 700 may be used to enhance the activity and effectiveness of agricultural and industrial chemicals. LI 700 provides more uniform coverage of spray solutions and aids in penetration. LI 700 may be used to

Chemical Damage: Why now?

Apple scab, powdery mildew, rusts, GLS
Captan + 1-2 other fungicide chemistries

Shoot Blight
Apogee, Kasumin, coppers?

Insect control (plum curculio, oriental fruit moth, etc.)
Calypso, Provado, Intrepid

Urea

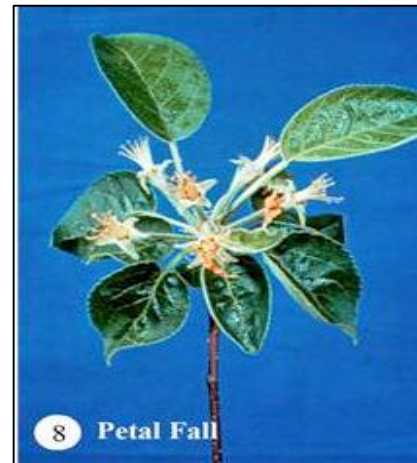
Surfactant
Regulaid, LI-700, Silwet

Chemical thinner
Sevin XLR (PF), Fruitone (~1st cover)

Foam reducer (i.e. Fome-Kil)

Magic Potion/Snake Oil

**How many of these formulated
products contain their own
surfactant???**



Chemical damage to foliage and fruit: Objectives

1. Determine the extent of chemical injury to apple foliage and fruit caused by applications of Captan Gold 80WDG made in combination with Fontelis alone or in the presence of penetrating enhancers (adjuvants) under slow drying conditions and key fruit thinning timings (Geneva trial)
2. Determine the extent of apple foliar and fruit injury following applications of Captan Gold and Red Eagle Captan in tank mixtures with adjuvants, thinning materials, Fontelis, and/or urea (Western NY trial)

Evaluation of chemical damage

- Geneva Trial
 - 10 year old 'Buckeye Gala' on B.9 rootstock
 - Petal fall application: 23 May 2014
 - Cloudy, negligible wind, temp=51F, RH=88%
 - Light precipitation (<0.2 in.) for 5 hrs following application
 - 10-14 mm fruit application: 2 June 2014
 - Partly cloudy, temp=68-77F,
 - RH=54-67%

Calendar-based applications of protectant fungicides, insecticides, herbicides applied for plot maintenance to all trees throughout duration



Evaluation of chemical damage

- Geneva Trial

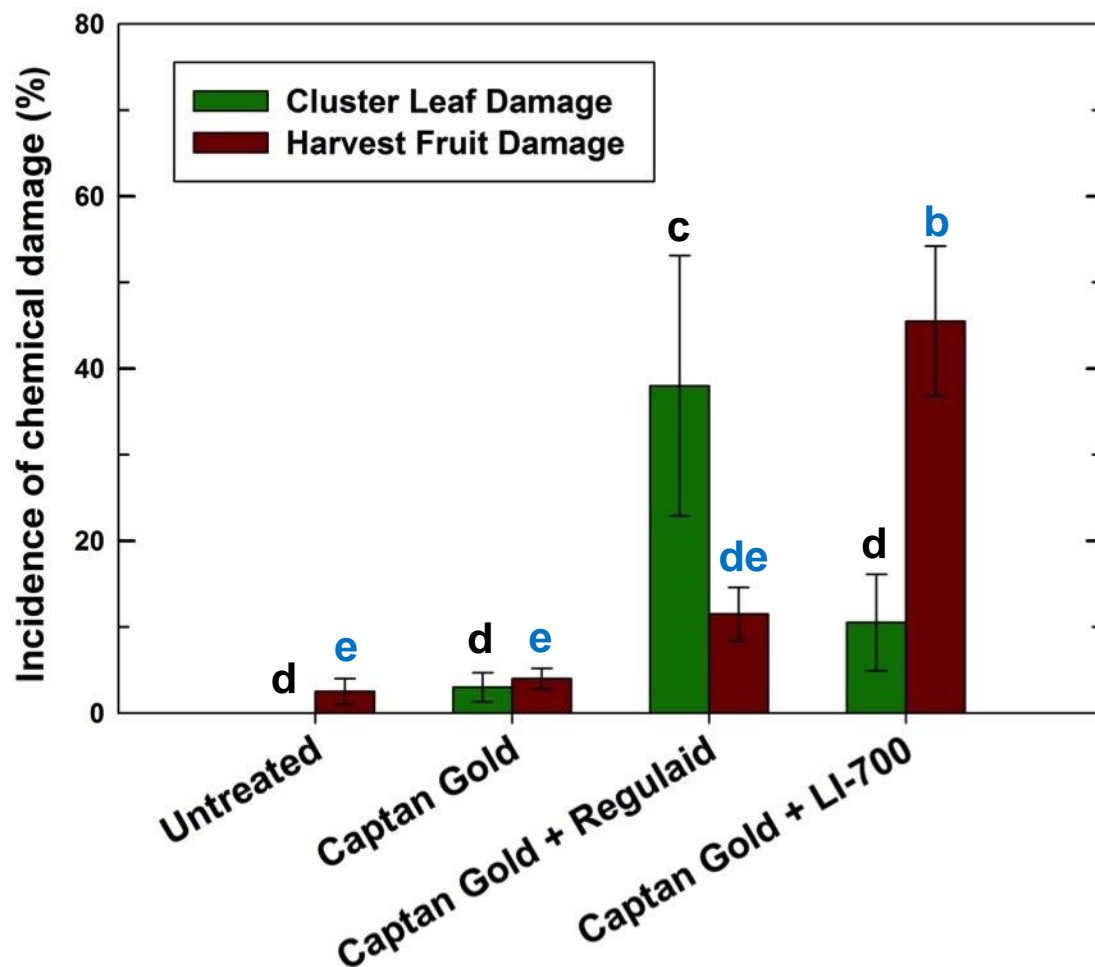
1. Captan Gold (5 lbs/A)
2. Captan Gold (5 lbs/A) + Regulaid (32 floz/100 gal)
3. Captan Gold (5 lbs/A) + LI-700 (32 floz/100 gal)
4. Fontelis (20 floz/A)
5. Captan Gold (2.5 lbs/A) + Fontelis (20 floz/A)
6. Fontelis (20 floz/A) + LI-700 (32 floz/100 gal)
7. Captan Gold (2.5 lbs/A) + Fontelis (20 floz/A) + LI-700 (32 floz/100 gal)
8. Captan Gold (2.5 lbs/A) + Fontelis (20 floz/A) + Regulaid (32 floz/100 gal)
9. Captan (5 lbs/A) + JMS Stylet Oil (256 floz/A)

Evaluation of chemical damage: Captan + JMS Stylet Oil



- Nearly 100% incidence of damage to leaves when oil applied in tank mixture with Captan Gold
- Incidence of chemically damaged fruit at harvest: $72.4 \pm 6.5\%$
- Severe defoliation and fruit drop

Evaluation of chemical damage



- Chemical damage to leaves was significantly greater ($P < 0.05$) when Regulaid was applied in tank mixture with captan
- Chemical damage to fruit was significantly greater when LI-700 was applied in tank mixture with captan

Evaluation of chemical damage:

Captan + adjuvants



**Captan Gold
5 lbs/A**

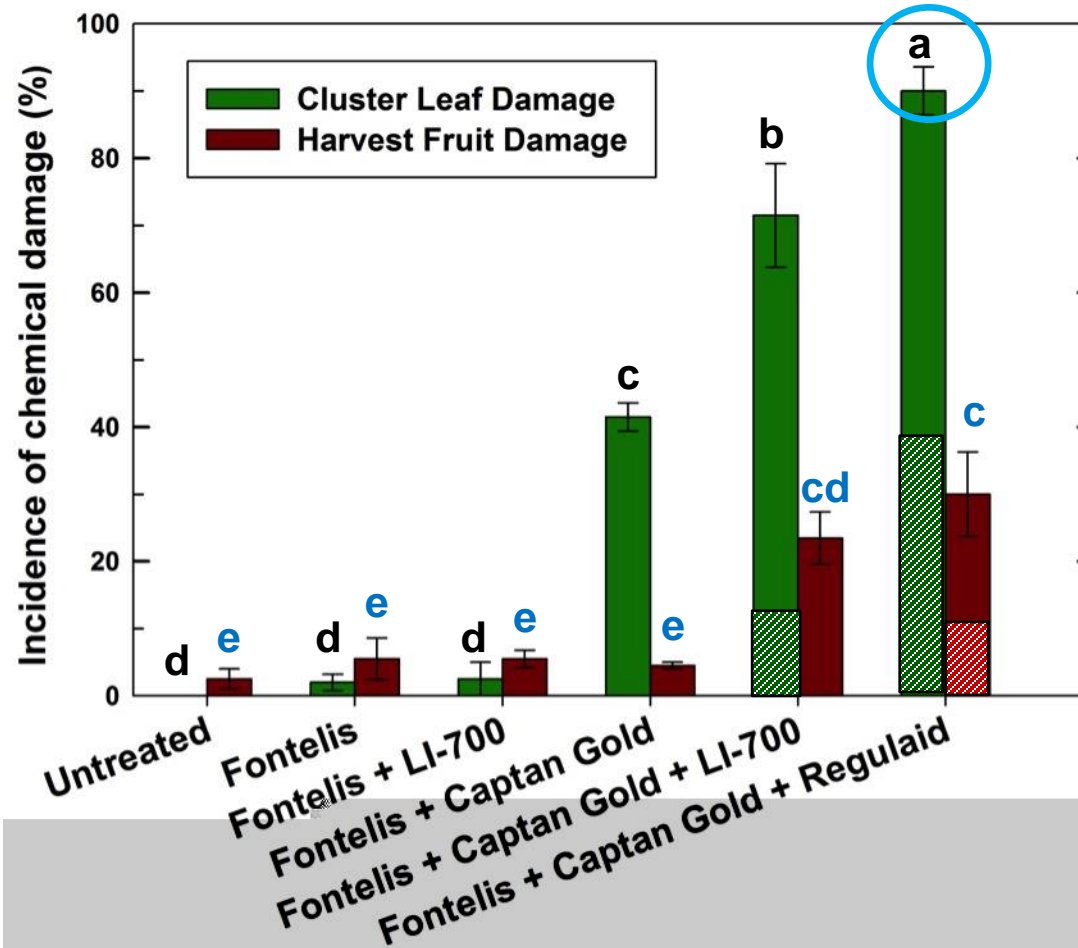


**Captan Gold
+ Regulaid**



**Captan Gold
+ Li-700**

Evaluation of chemical damage



- Fontelis in tank mixture with captan caused significantly greater chemical damage to cluster leaves compared to either fungicide applied alone, however effect not observed on fruit
- Addition of either adjuvant to the Fontelis + captan tank mixture significantly enhanced foliar damage and fruit damage

Evaluation of chemical damage: Fontelis, captan, adjuvants



**Captan Gold
+
Fontelis**



Captan Gold + Fontelis + Regulaid



Evaluation of chemical damage

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- Western NY Trial (Gasport)
 - ‘Golden Delicious’ tall spindle planting
 - Petal fall application: 27 May 2014
 - Cloudy, negligible wind, temp=71-75F, RH=64%
 - 10-14 mm fruit application: 4 June 2014
 - Partly cloudy, temp=64-67F,
 - RH=50%



Calendar-based applications of protectant fungicides, insecticides, herbicides applied for plot maintenance to all trees throughout duration

Evaluation of chemical damage

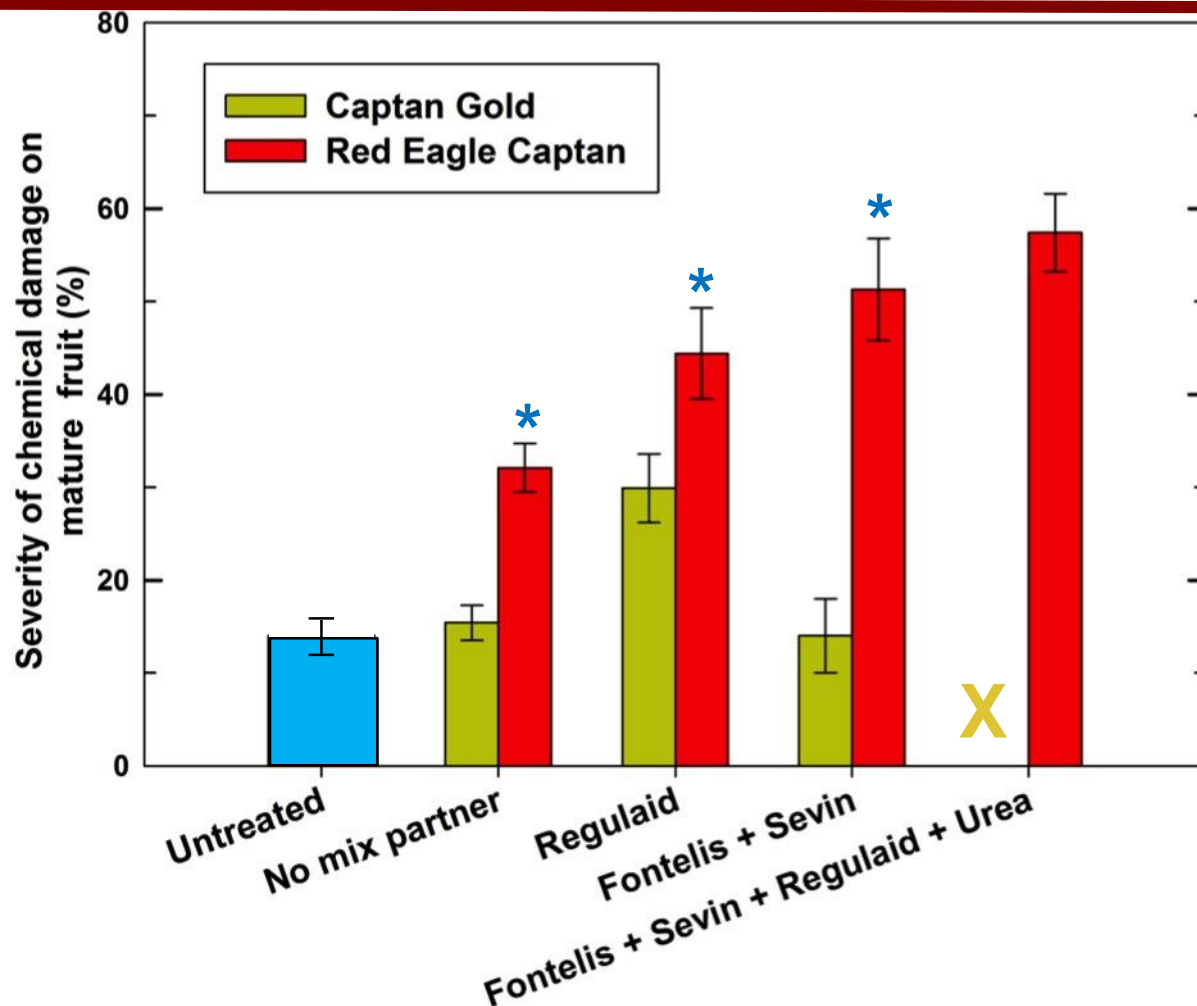
- Western NY Trial: Selected Treatments
 1. Captan Gold 80WDG (2.5 lbs/A)
 2. Red Eagle Captan 80WDG (2.5 lbs/A)
 3. Captan Gold 80WDG (2.5 lbs/A) + Regulaid (32 floz/100 gal)
 4. Red Eagle Captan 80WDG (2.5 lbs/A) + Regulaid (32 floz/100 gal)
 5. Captan Gold 80WDG (2.5 lbs/A) + Fontelis (20 floz/A) + Sevin XLR (48 floz/A)
 6. Red Eagle Captan 80WDG (2.5 lbs/A) + Fontelis (20 floz/A) + Sevin XLR (48 floz/A)
 7. Red Eagle Captan 80WDG (2.5 lbs/A) + Fontelis (20 floz/A) + Sevin XLR (48 floz/A) + Regulaid (32 floz/100 gal) + Urea

Dissolving Red Eagle Captan 80WDG

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Evaluation of chemical damage



- Application of Red Eagle Captan 80WDG either alone or with mix partners resulted in significantly greater of damage severity to mature fruit
 - Cluster leaf damage incidence: 4%(untreated) - 99% (RedEagle+Fontelis+Sevin)
- Russet on untreated apples could result from *A. pullulans*, *HOWEVER*.....

Evaluation of chemical damage: Captan vs. Captan

**Captan Gold
+
Fontelis
+
Sevin XLR**



**Red Eagle
+
Fontelis
+
Sevin XLR**



“Kitchen Sink” w/ Red Eagle



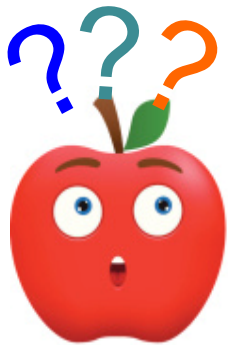
Lessons learned regarding tank mixtures

- Application of captan in tank mixture with adjuvants has the potential to cause chemical damage to leaves, fruit, or both (depending on adjuvant)
 - Effect of other adjuvants?
- Fontelis applied with captan caused severe damage to cluster leaves, however fruit were not affected (Captan Gold only)
- Avoid captan applications during applications at petal fall and first cover
 - Period of rapid leaf and shoot expansion, small fruit when cells are rapidly dividing, excessive tank mixtures!
- Beware of Red Eagle Captan around thinning periods, especially on more russet prone cultivars (if you want to market your fruit)

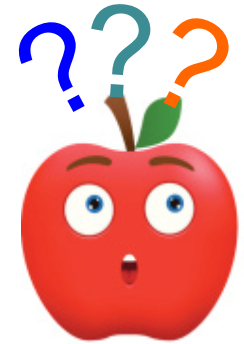
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Questions



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