

The background of the slide is a photograph of an apple tree branch. In the center, a green apple is shown with several brown, necrotic spots and a larger, irregular brown stain, indicating chemical injury. To the right, another apple is partially visible, appearing more reddish. Green leaves are scattered around the apples, and a brown branch runs horizontally across the upper part of the image.

Chemical injury on apples following tank mixtures of captan, single-site fungicides, and adjuvants

Sara M. Villani & Kerik D. Cox

Plant Pathology and Plant-Microbe Biology Section

Cornell University

and

Deborah Breth

Cornell Co-op Extension: Lake Ontario Fruit Program

Reasons for Russet

- Powdery Mildew
 - On fruit, more problematic during hot, dry summers on susceptible cultivars
 - Blossom infection-protection from 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

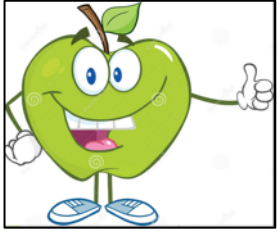
- 2013 New England, NY, Canada Fruit Management Meeting



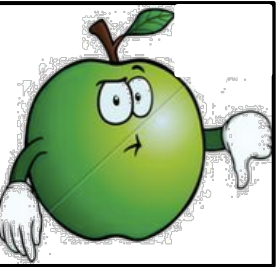
- Greater levels of powdery mildew than normal?
 - Hot and dry weather may have led to higher severity of powdery mildew on “check” trees in our research orchard than in previous years
 - Breakdown of some QoI efficacy for mildew control
- *A. pullulans* causing problems on multiple cultivars?
- Captan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



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

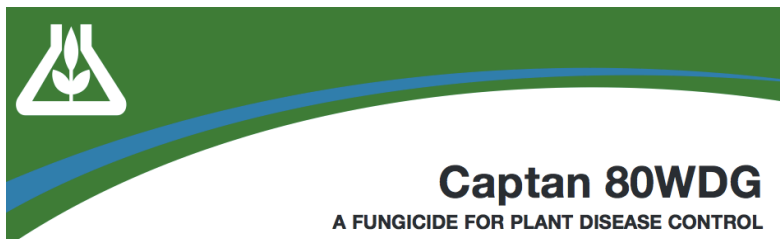


Conditions favoring captan damage

- 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)
 - Young, susceptible leaf and fruit tissue with cuticle protection
- Tank mixtures containing surfactants and spreader/stickers that may disrupt waxy cuticle
 - Oils, urea, calcium chloride, LI-700? Regulaid?



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.



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



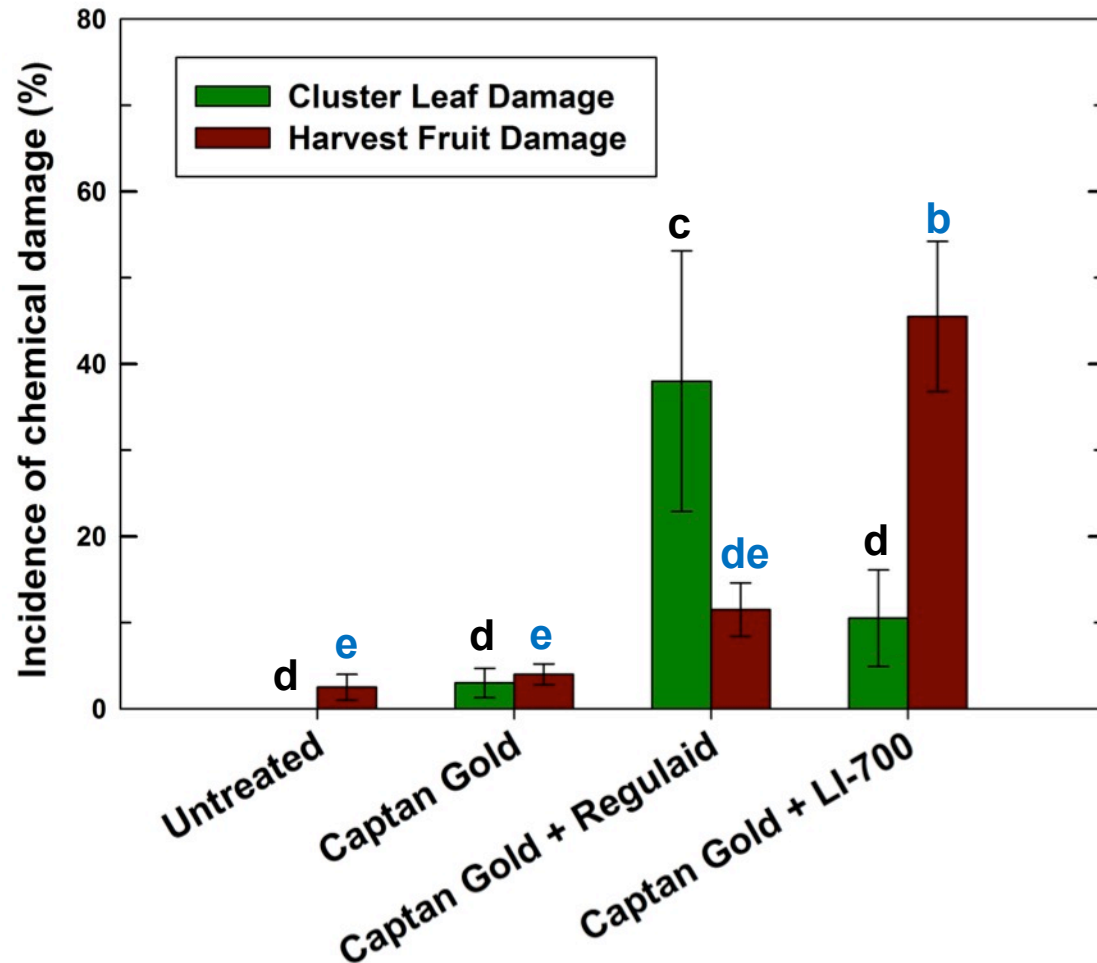
Evaluation of chemical damage: Captan + JMS Stylet Oil



- 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**

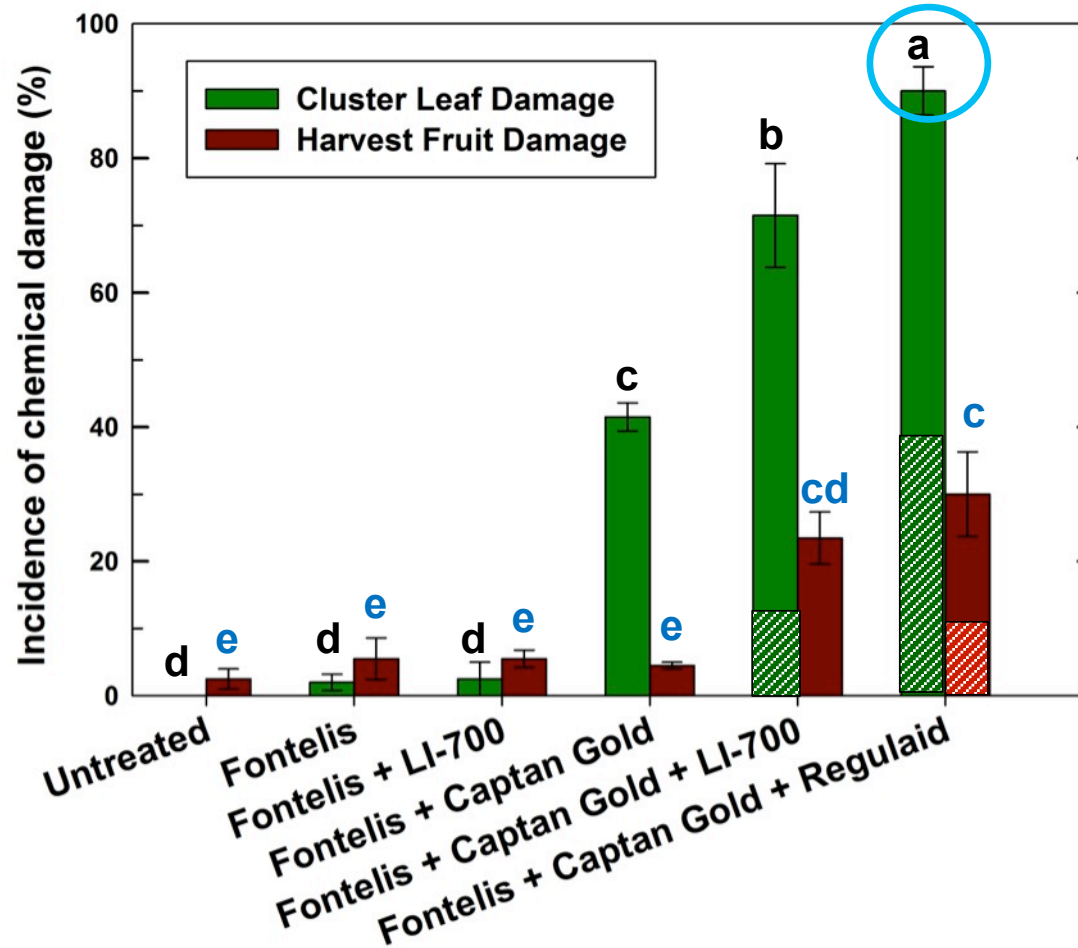


**Captan Gold
+ Regulaid**



**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

- 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



Cornell University
College of Agriculture and Life Sciences

Evaluation of chemical damage

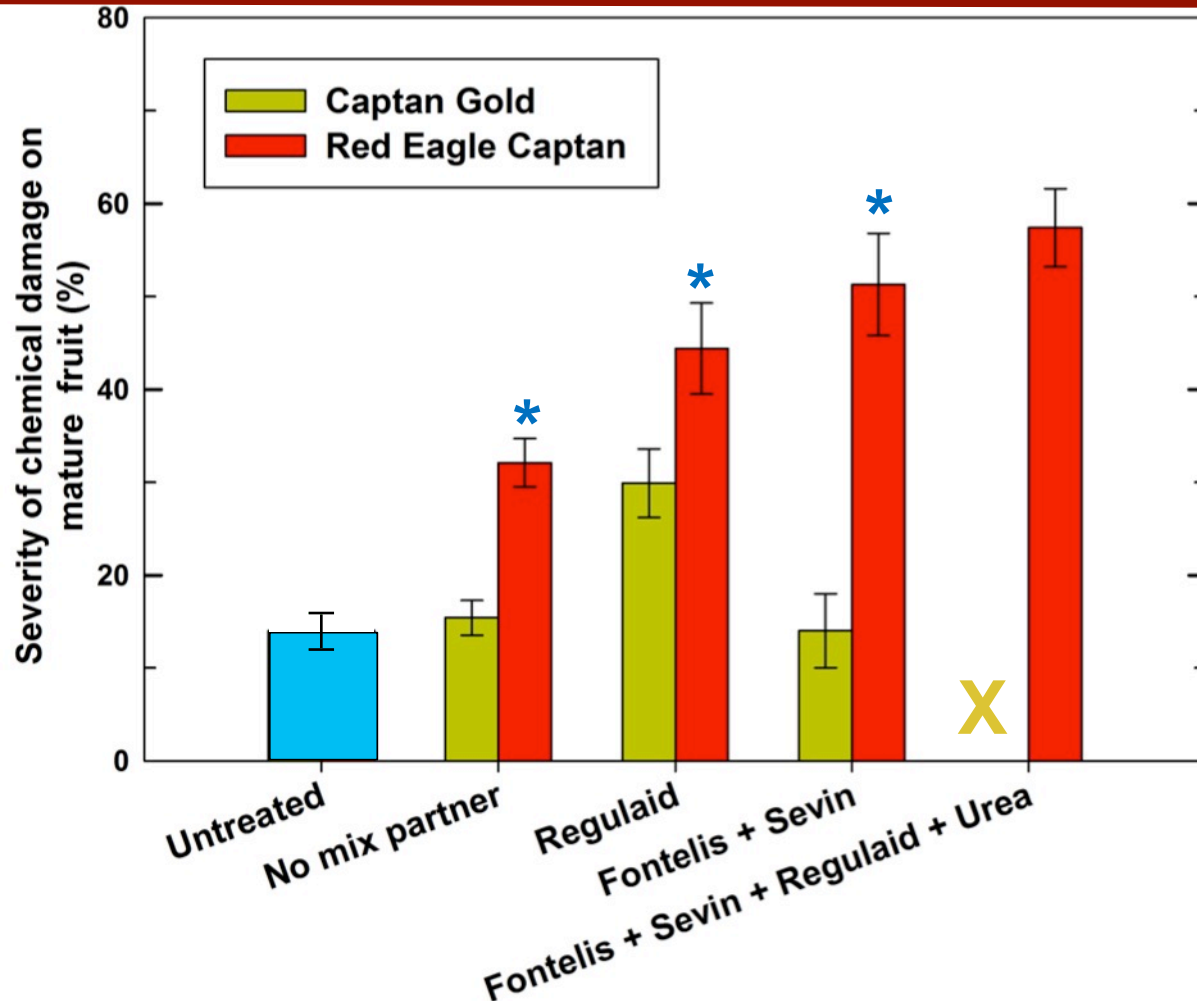
- Western NY Trial: Selected Treatments
 1. Captan Gold 80WDG (2.5 lbs/A)
 2. Red Eagle Captan 80WDG (2.5 lbs/A)
 3. Captan Gold 80WDG (2.5 lbs/A) + Regulaid (32 fl oz/A)
 4. Red Eagle Captan 80WDG (2.5 lbs/A) + Regulaid (32 fl oz/A)
 5. Captan Gold 80WDG (2.5 lbs/A) + Fontelis (20 fl oz/A) + Sevin XLR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



Dissolving Red Eagle Captan 80WDG



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
 - No trend in foliar chemical damage between Red Eagle and Captan Gold
- Russet on untreated apples could result from *A. pullulans*, *HOWEVER*.....

Summary

- There was great success in creating chemical damage to apple foliage and fruit when captan applications were made during thinning timings
- Application of captan in tank mixture with adjuvants has the potential to cause chemical damage to leaves, fruit, or both (depending on adjuvant)
- Fontelis applied with captan caused severe damage to cluster leaves, however fruit were not affected
- Beware of Red Eagle Captan around thinning periods, especially on more russet prone cultivars (if you want to market your fruit)



Thank you to.....

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