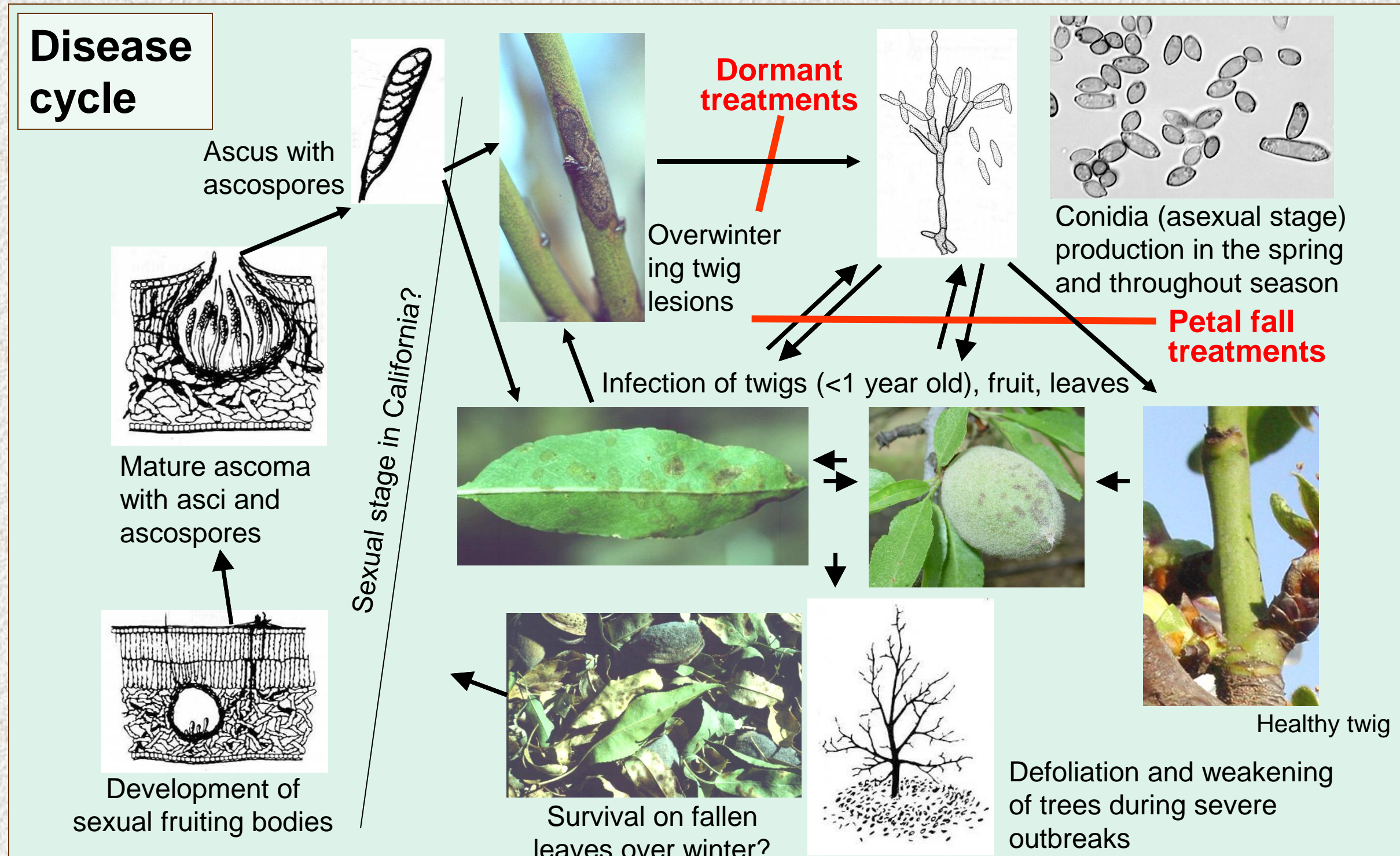
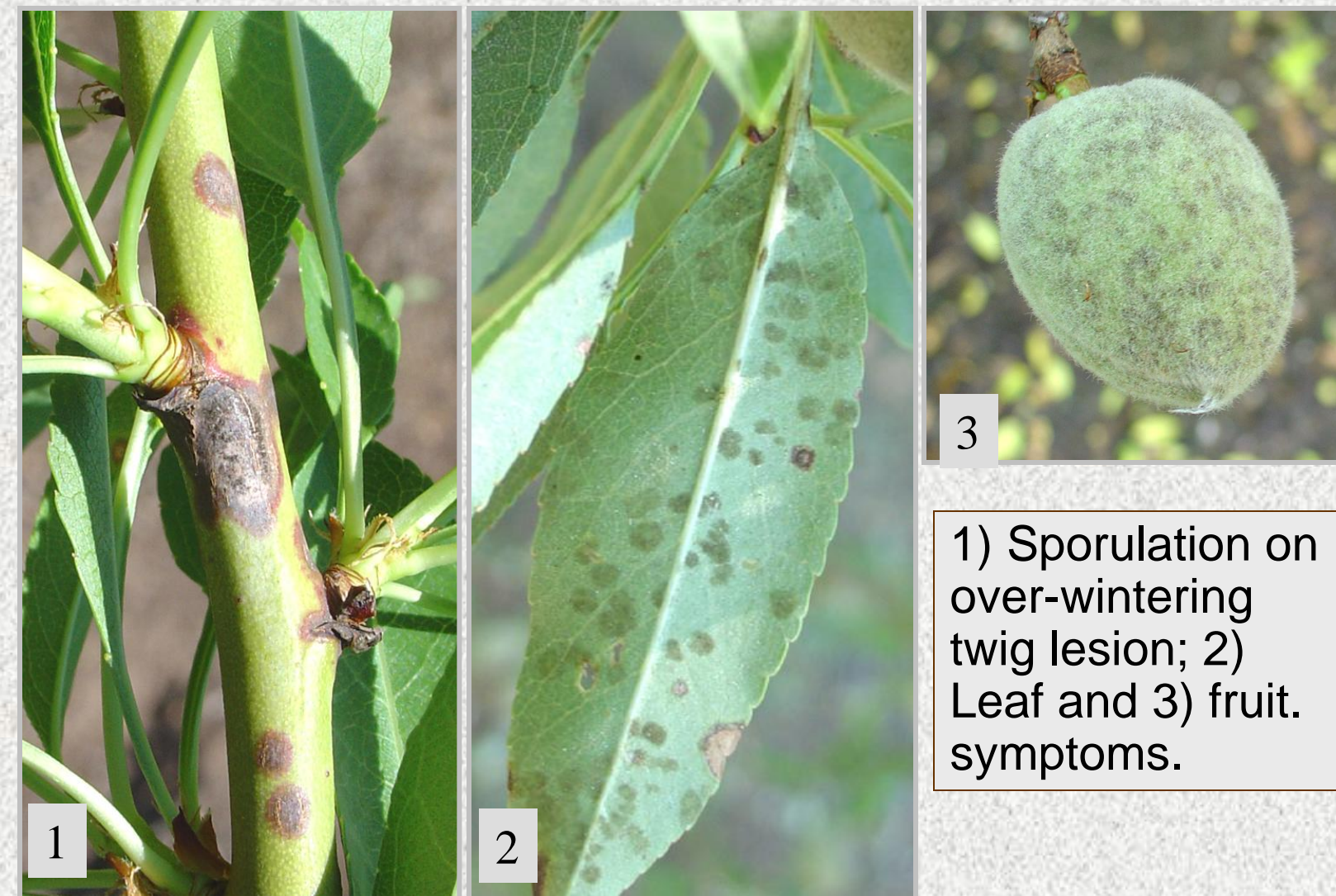


# Epidemiology and Control of Almond Scab and Alternaria Leaf Spot

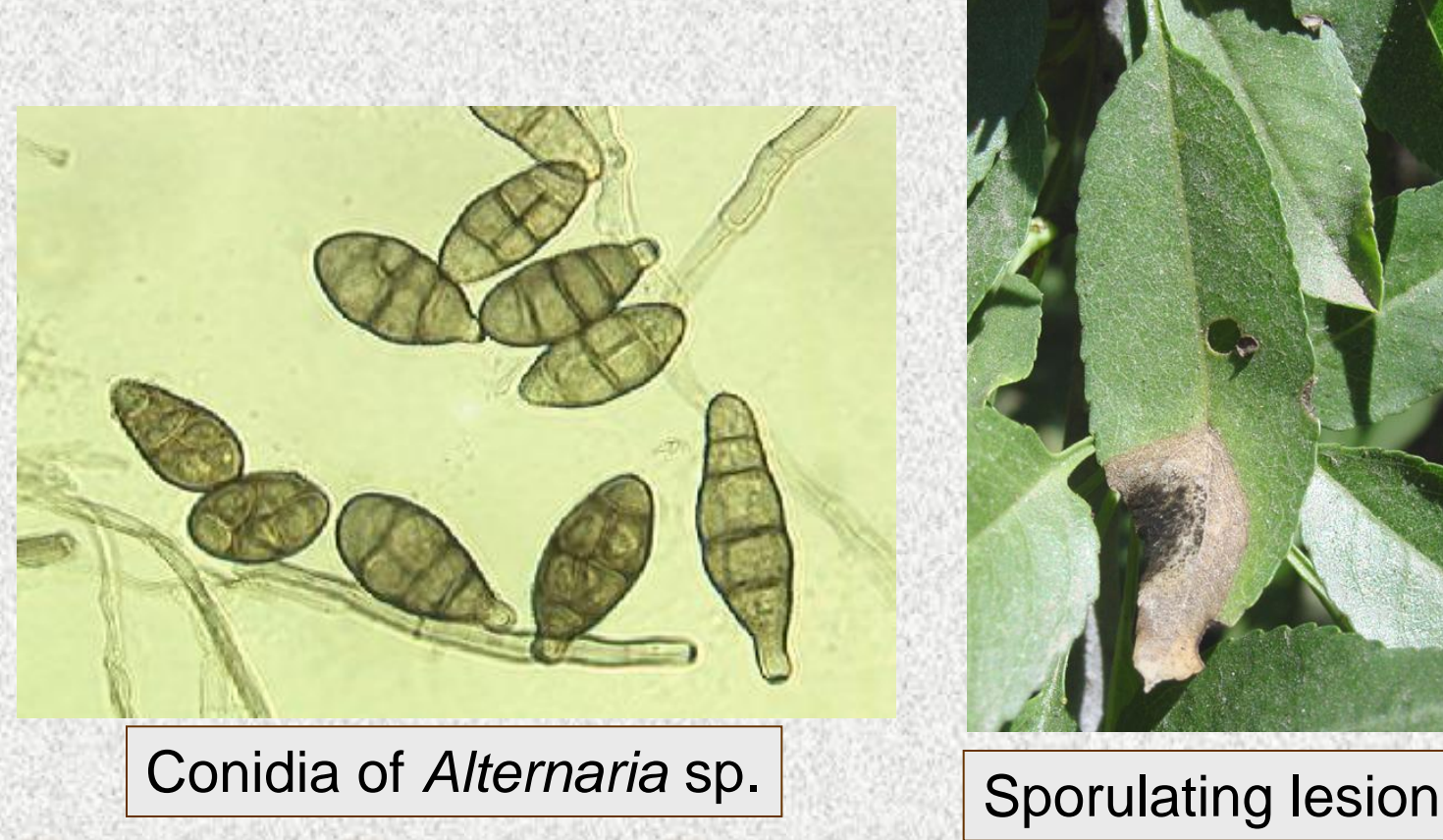
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## Management of Scab (*Venturia carpophila*, *Fusicladium carpophilum*)

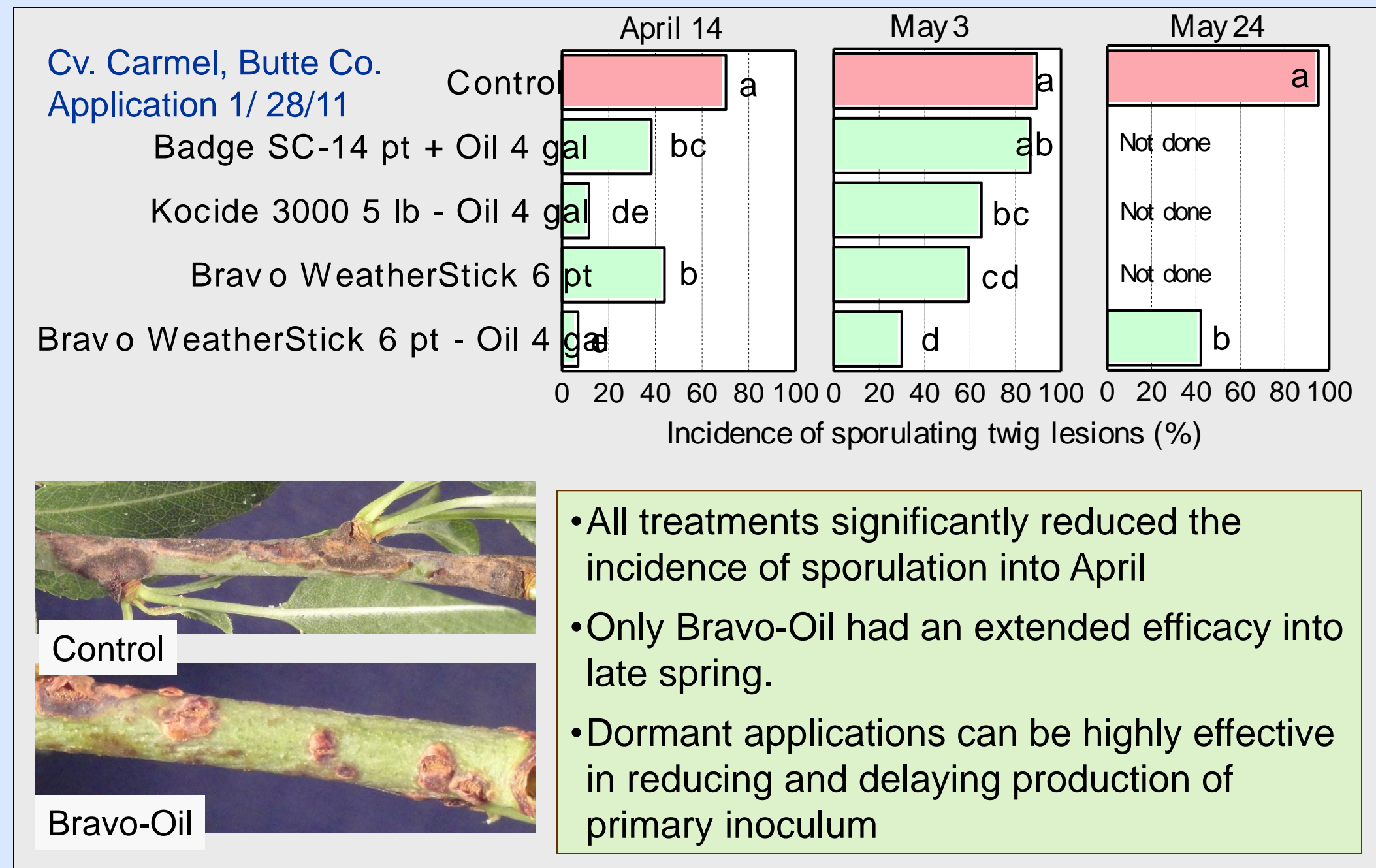


## Management of Alternaria Leaf Spot (*Alternaria* spp.)



## Field trials on disease management in 2011

### 1. Dormant applications to reduce inoculum in the spring



### 2. In-season applications

cv. Peerless, Butte Co.

Treatments	4-6-11	5-24-11	Scab Inc. (%)
Control	---	---	a
Ph-D 11.2DF org. form. 6.2 oz	@	@	b
Syllit 65W 32 oz	@	@	b
Fontelis (DPX LEM 17) 1.67SC 2 pt	@	@	b
Quash 50WG 3.5 oz	@	@	b
Adament 50WG 6 oz	@	@	b
Luna Sensation 5 fl oz	@	@	b
Luna Experience 6 fl oz	@	@	b
Inspire Super 20 fl oz	@	@	b
Quadris Top 14 fl oz	@	@	b
Pristine 38WG 14.5 oz	@	@	b
Merivon (BAS703) 6.8 fl oz	@	@	b

Scab can be effectively managed with single-site mode of action fungicides that are currently available, but these should be rotated with multi-site mode of action compounds (Bravo, Captan, Ziram).

## Summary: Management of scab

- **New fungicides registered or planned :**
  - Single-site MOA fungicides: Ph-D, Quash, Inspire, Syllit (*pending*)
  - Pre-mixtures: Inspire Super, Quilt Xcel, Quadris Top, as well as Luna Sensation & Merivon (*pending*)
- **Fungicide programs:**
  - A highly effective three-spray program should include dormant applications and two petal-fall (around twig infection sporulation) applications with chlorothalonil, possibly mancozeb, captan, or ziram (i.e. multi-site fungicides with low resistance potential).
  - Because maneb has been voluntarily canceled (2008/2009), mancozeb (e.g., Dithane) fungicides are being tested and are planned for future registrations.
  - **Single-site fungicides should not be applied once disease is developing.**
- **Cultural practices: IPM and the Disease Triangle**



## Field trials on disease management

cv. Monterey, Kern Co., 2011

Treatment	5/13	6/2	6/23	Defoliation rating (0-4)
Control	---	---	---	a
CX10440 (polyoxin-D) 3.75 fl oz	@	@	@	bc
Ph-D 11.2DF org. 6.2 oz	@	@	@	c
Quash 50WG 3 oz	@	@	@	bc
Luna Experience 6 fl oz	@	@	@	d
Luna Sensation 5 fl oz	@	@	@	c
Inspire Super SC 20 fl oz	@	@	@	b
Quadris Top 14 fl oz	@	@	@	b
Pristine 38WG 14 oz	@	@	@	b
BAS703 (Merivon) 6.8 fl oz	@	@	@	d
Ph-D org. 6.2 oz + Quash 3 oz	@	@	@	cd
Ph-D org. 6.2 oz	@	---	---	c
Quash 3 oz	---	@	---	bc
Ph-D + Quash 3 oz	@	---	@	c
Ph-D org. 6.2 oz	@	---	---	c
Inspire Super 20 fl oz	---	@	---	c
BAS700 (Xemium) 4.5 fl oz	---	---	@	c

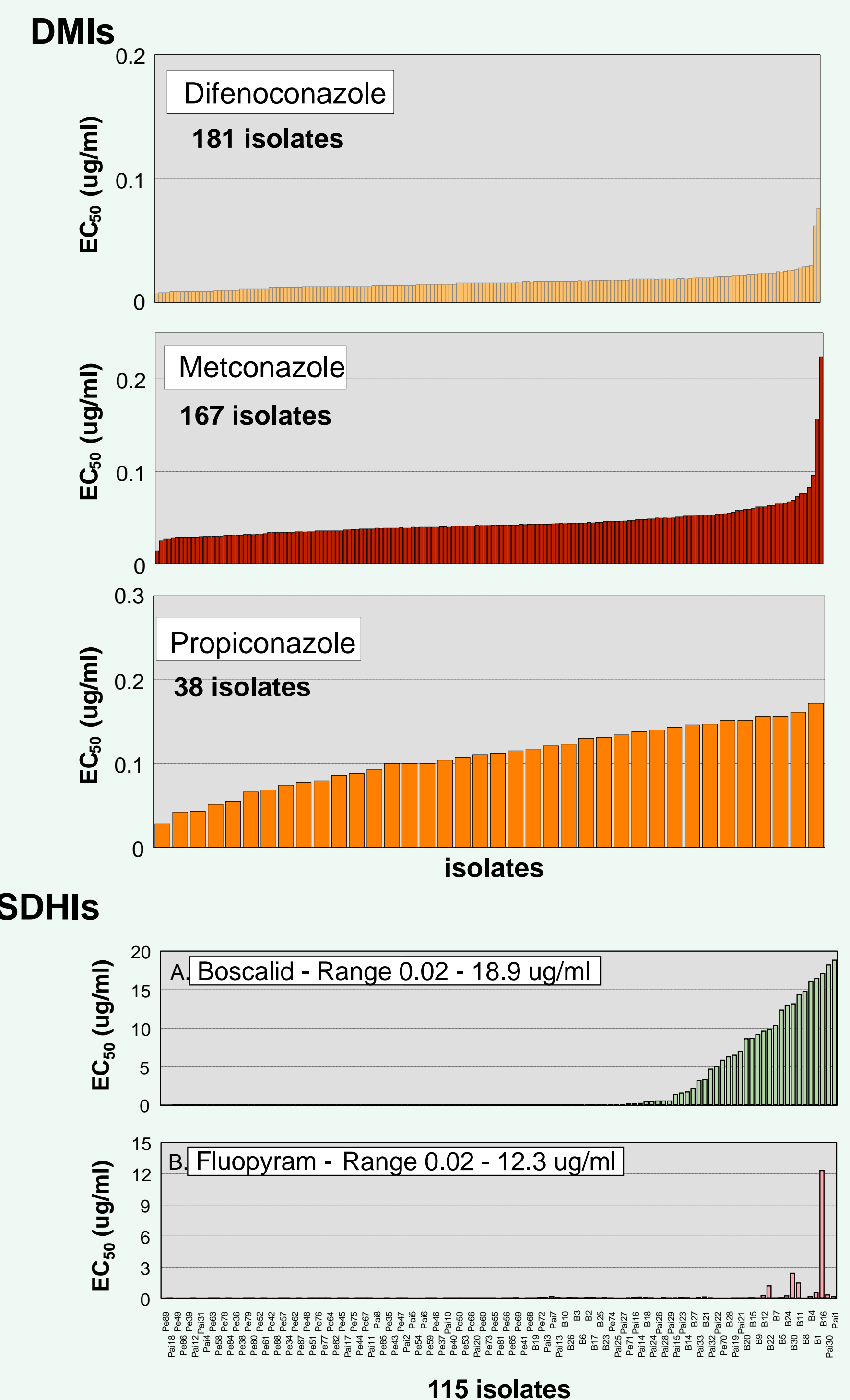
Data are representative for several trials conducted in 2011



## Summary: Management of Alternaria Leaf Spot

- **Most effective treatments:**
  - Mixtures of the Group 19 Ph-D (polyoxin-D) and the Group 3 fungicides (i.e., Inspire, Quash).
- **Other new fungicides with high activity:**
  - Luna Sensation, Adament, Quadris Top, Quilt Excel, Merivon. These all have a Qol component and thus, will exacerbate Qol resistance.
- **Fungicide resistance:**
  - Resistance against Qols is common, resistance against older SDHIs (i.e., boscalid) only at some locations at high levels.
  - Cross resistance within Qols (Abound, Gem, etc.)
  - Newer SDHIs (fluopyram, fluxapyroxad) more effective than older ones (boscalid), but some cross-resistance occurs.
- **Fungicide programs:**
  - Programs should start with petal fall applications that include Rovral and Bravo (performance is variable and depends on the occurrence of favorable conditions).
  - Late-spring/early-summer applications (based on the DSV model) with other materials.
  - New materials will have to be strictly used in rotations and mixtures for resistance management.
  - Other components of an integrated approach in disease management are highly critical for management of Alternaria leaf spot.

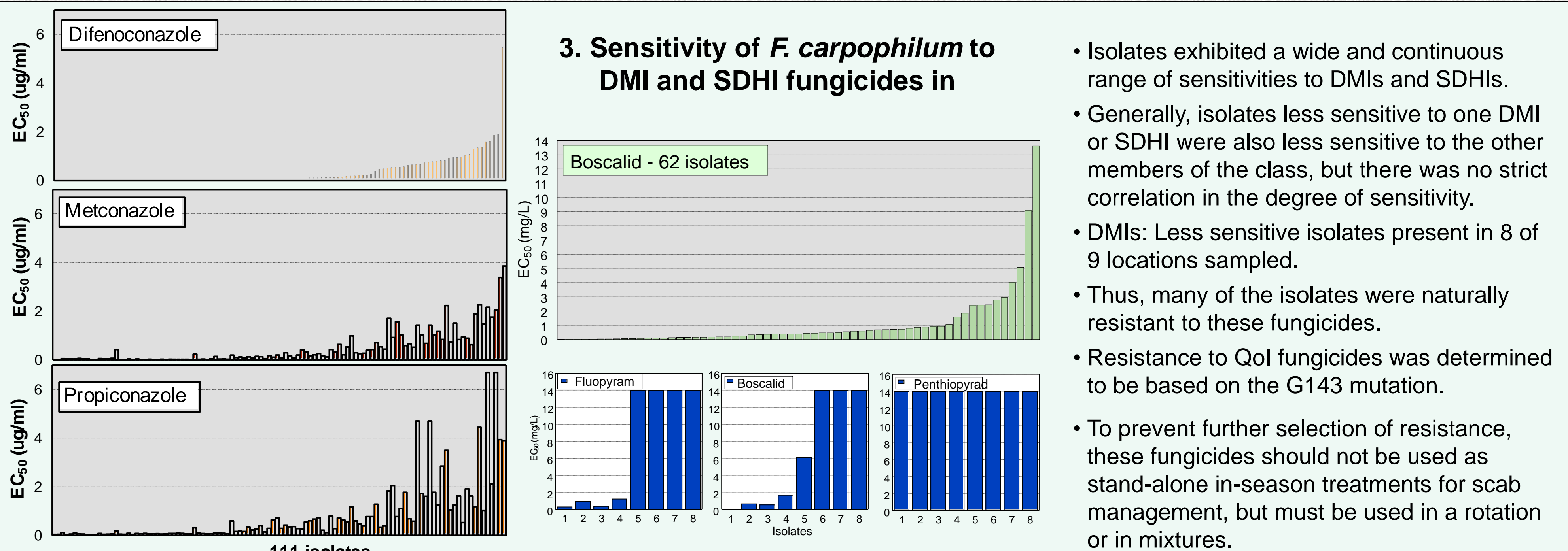
## Sensitivity of *Alternaria* spp. to DMI and SDHI fungicides



## Summary

- **DMIs:**
  - All isolates evaluated were sensitive
  - Populations showed a narrow range of variability within two tenths of a ppm.
- **SDHIs:**
  - High levels of resistance against boscalid at some locations
  - Cross resistance between the older SDHI boscalid and newer SDHIs (e.g., fluopyram) for some isolates.
  - Populations showed a high level of variability (>100X in sensitivity between isolates).

## 3. Sensitivity of *F. carpophilum* to DMI and SDHI fungicides in



- Isolates exhibited a wide and continuous range of sensitivities to DMIs and SDHIs.
- Generally, isolates less sensitive to one DMI or SDHI were also less sensitive to the other members of the class, but there was no strict correlation in the degree of sensitivity.
- DMIs: Less sensitive isolates present in 8 of 9 locations sampled.
- Thus, many of the isolates were naturally resistant to these fungicides.
- Resistance to Qol fungicides was determined to be based on the G143 mutation.
- To prevent further selection of resistance, these fungicides should not be used as stand-alone in-season treatments for scab management, but must be used in a rotation or in mixtures.