



TIMOREX ACT® and Regev fungicides

2022 Industry Technology Session (IR-4 meeting July 21)

Eric Tedford, Summit Agro



What is Tea Tree Oil ?

- Derived from the leaves of the tea tree, *Melaleuca alternifolia*
- **Tea tree oil** is an essential **oil** used originally in alternative medicine.
- Not an oil in the classic sense – not phytotoxic, can be used with adjuvants



Extract Composition of Melaleuca alternifolia (Tea Tree Oil)

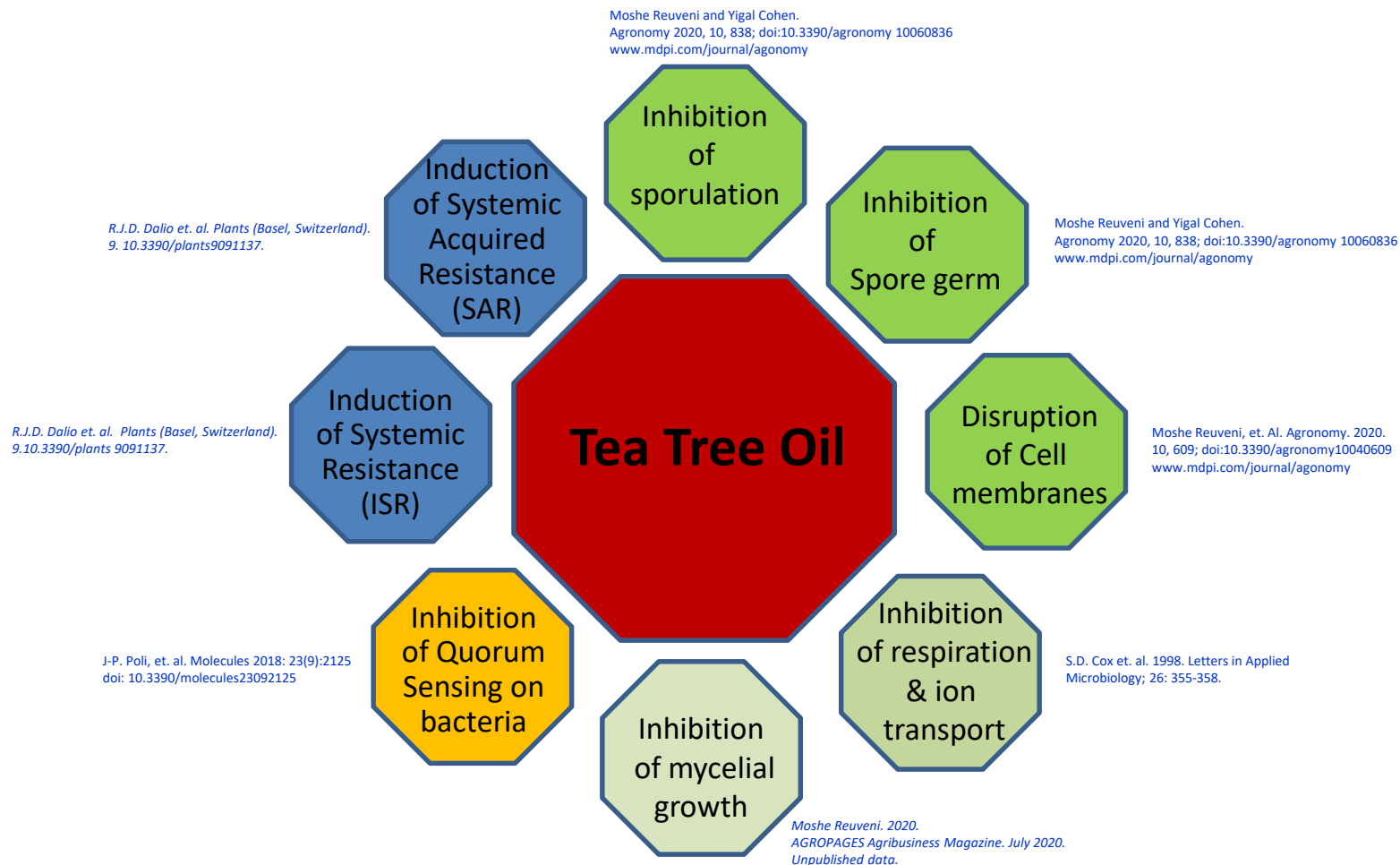
Component	%
Terpinen-4-ol	40.1
Y-Terpinene	23.0
α -Terpinene	10.4
1,8-Cineole	5.1
Terpinolene	3.1
P-Cymene	2.9
α -Pinene	2.6
α -Terpineol	2.4

Overview: General Properties of Timorex ACT

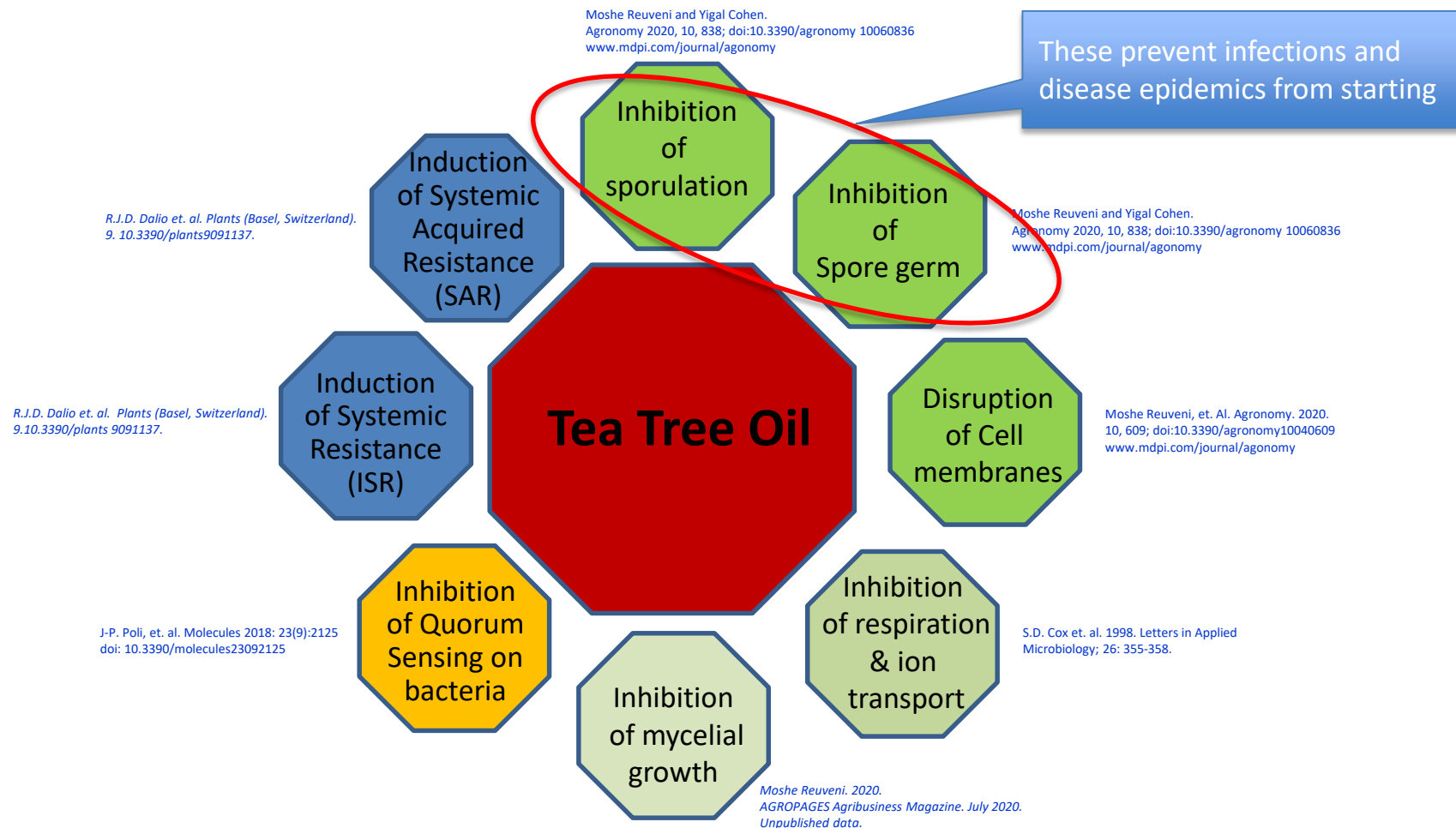


- **Active ingredients:**
 - Tea Tree Oil (TTO)
- **Mode of Action:**
 - Cell Membrane Disruptor
 - Sporulation inhibitor
 - Spore germination inhibitor
 - Respiration and ion transport inhibitor
- **FRAC Group:** BM01
- **REI:** 4 Hours
- **Broad range of Crops**
- **Spectrum of Control:**
 - Bacterial Diseases
 - Fungal Diseases
- **Activities**
 - Preventative
 - Curative
 - Anti-sporulent
- **OMRI-Listed**
 - No residues
 - No MRLs
- **SAR & ISR activity**

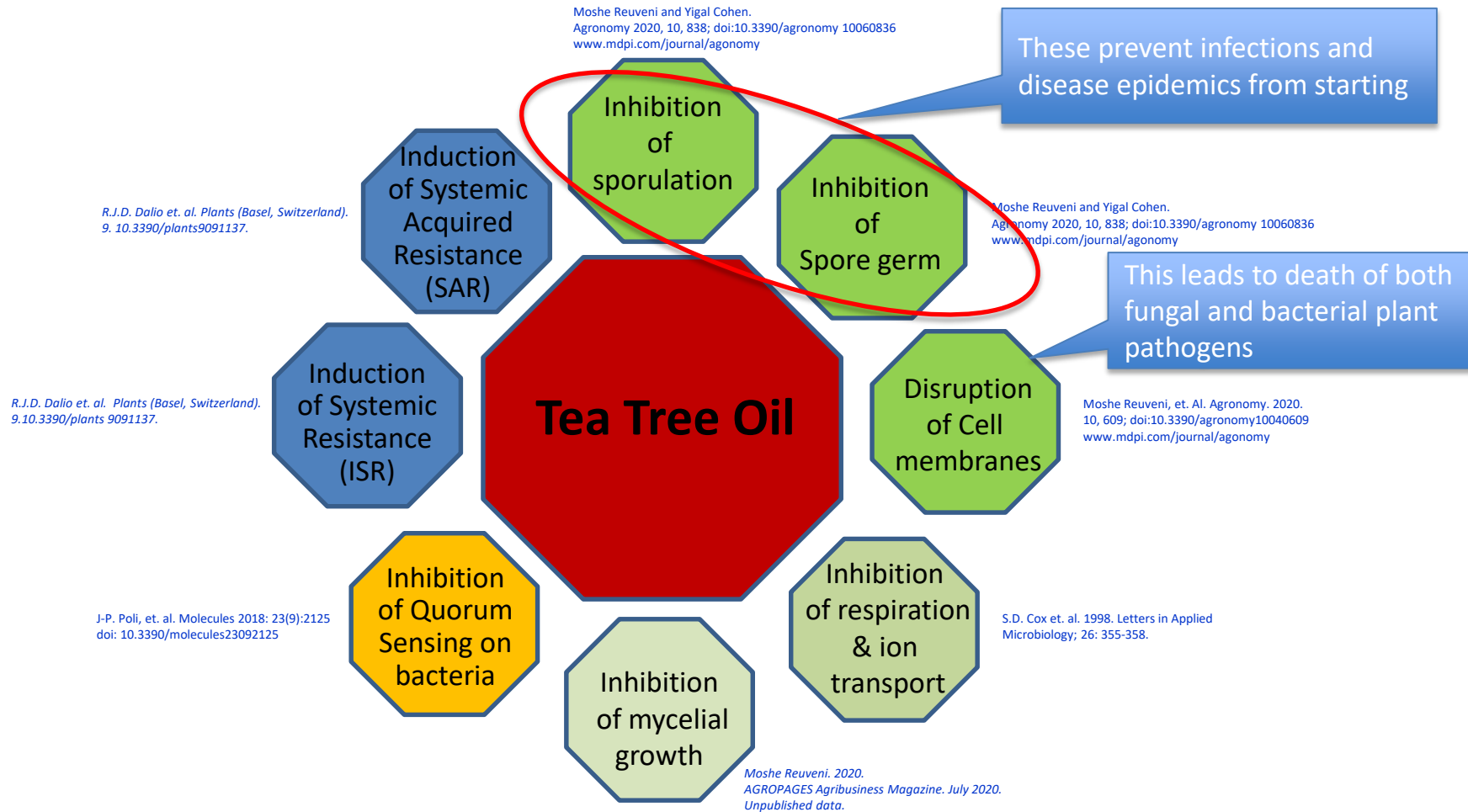
TTO Multiple Mechanisms Activity



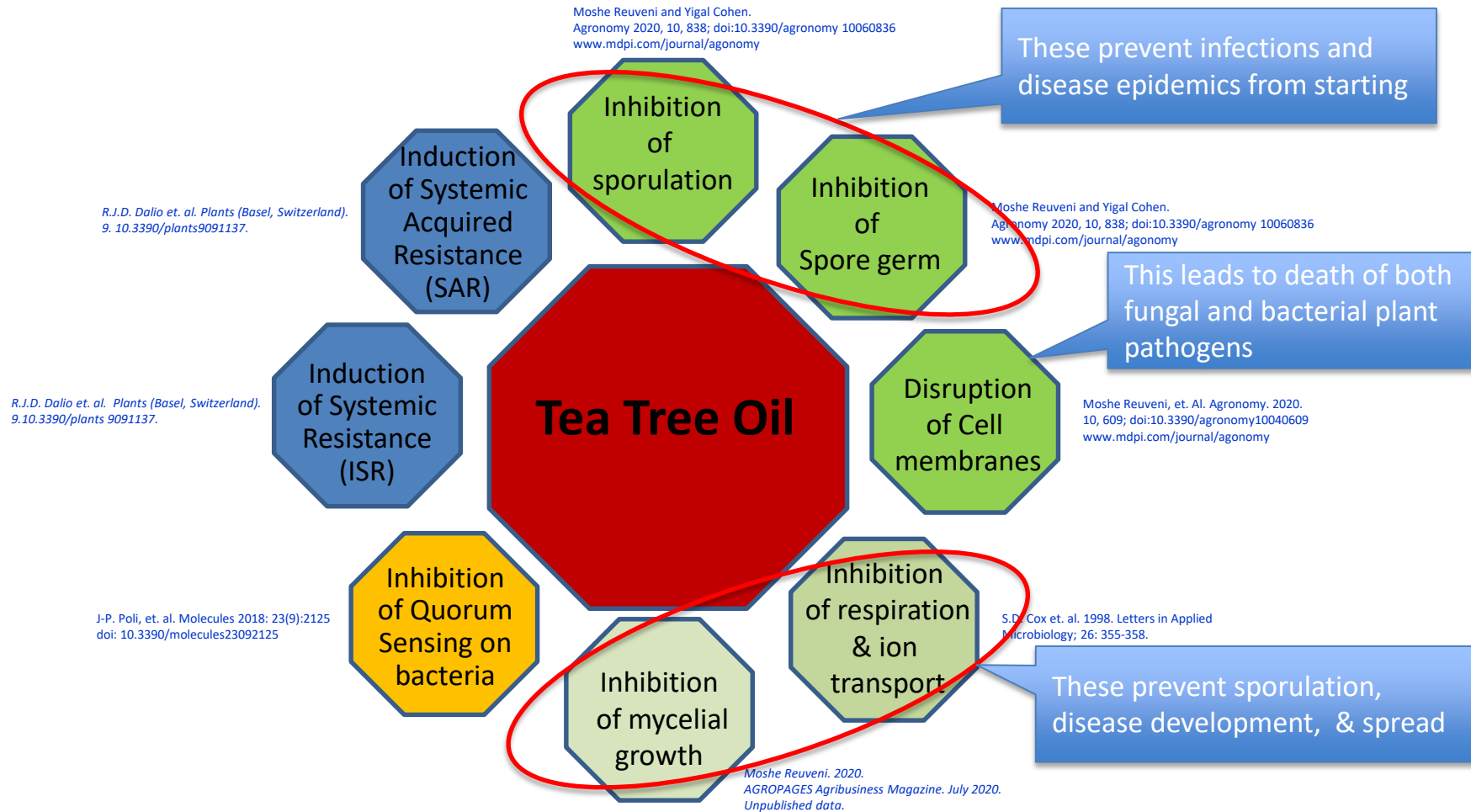
TTO Multiple Mechanisms Activity



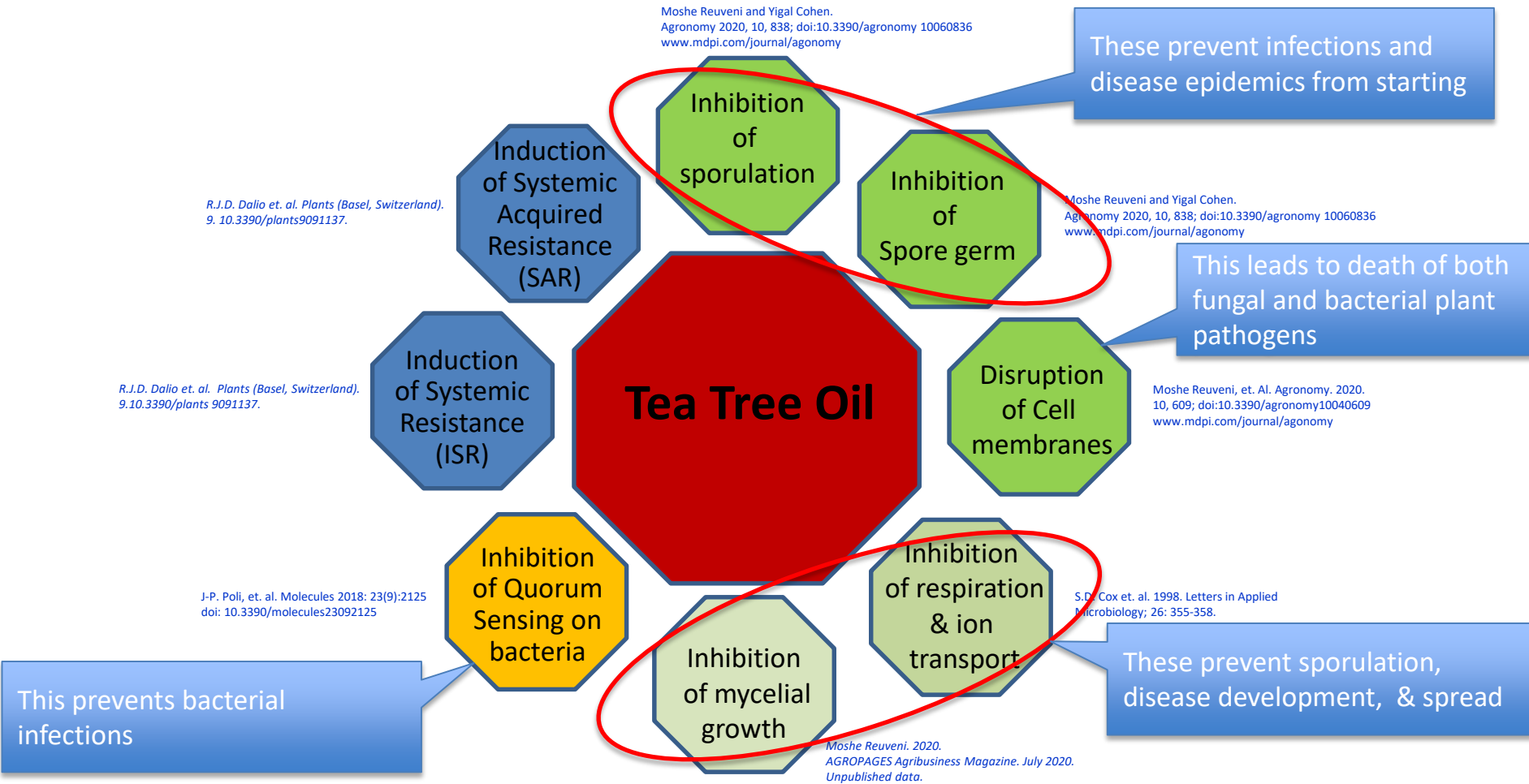
TTO Multiple Mechanisms Activity



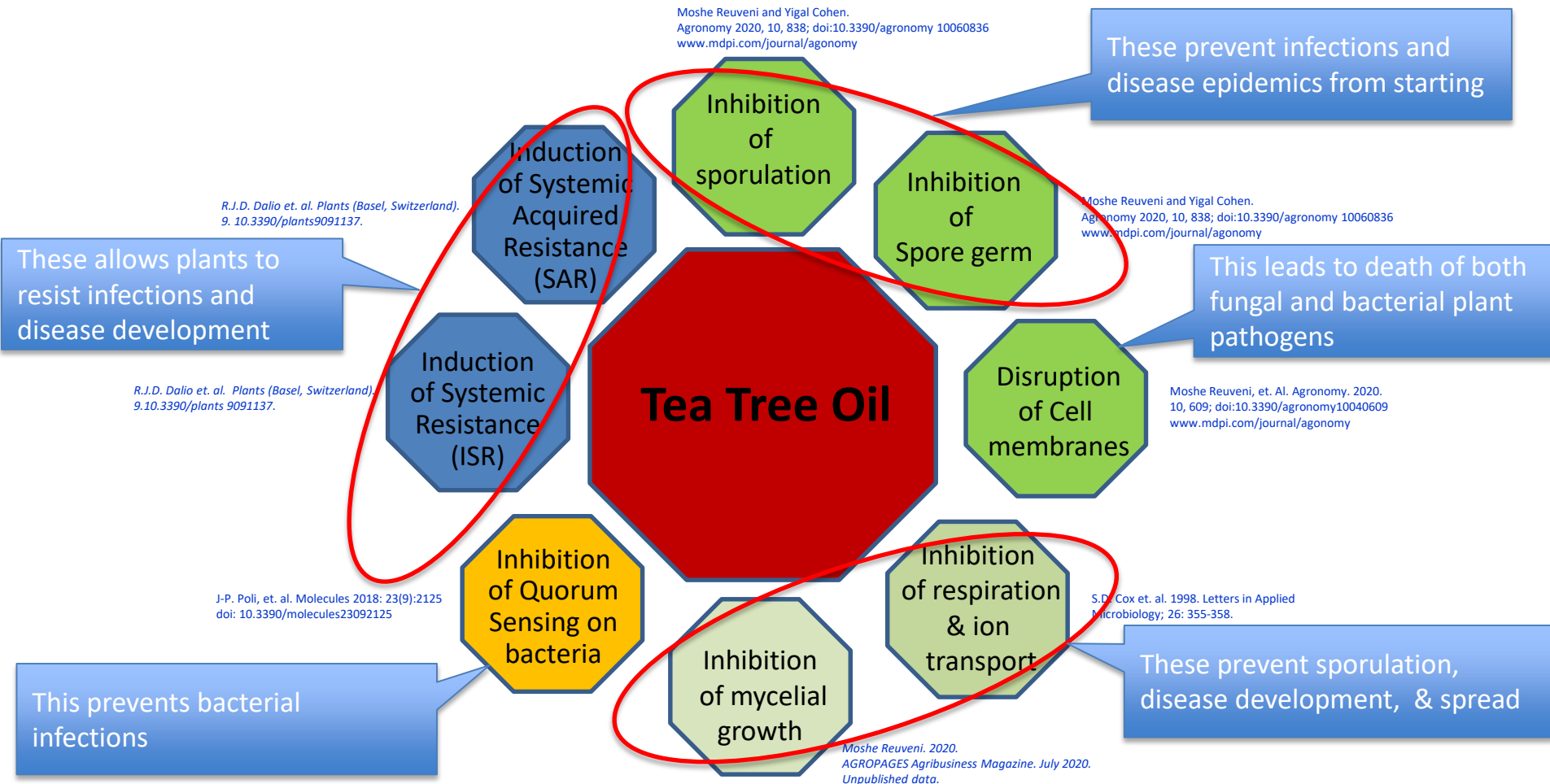
TTO Multiple Mechanisms Activity



TTO Multiple Mechanisms Activity

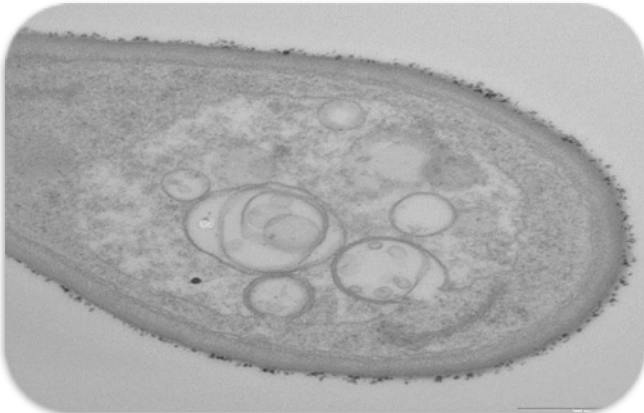


TTO Multiple Mechanisms Activity



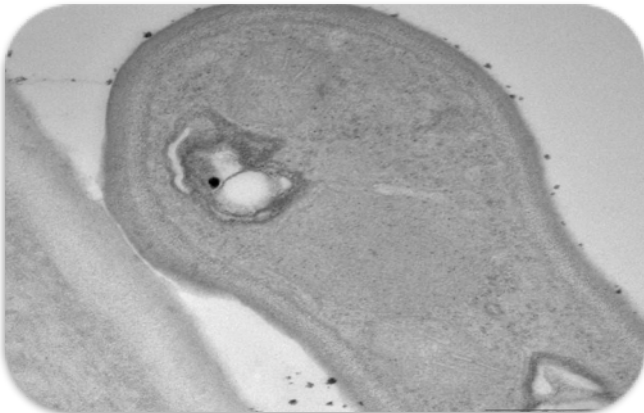
Unique Mode of Action of TTO kills both fungi + bacteria

Untreated



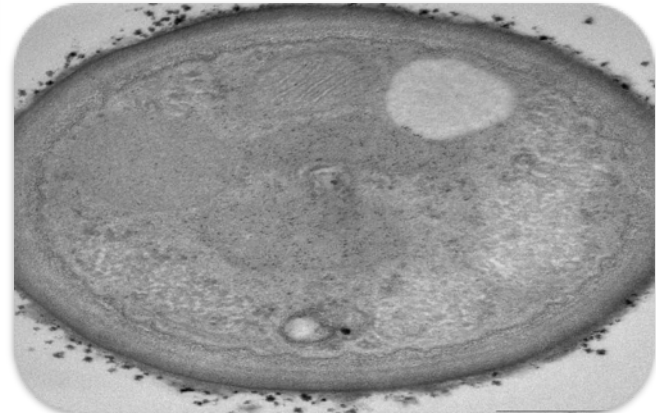
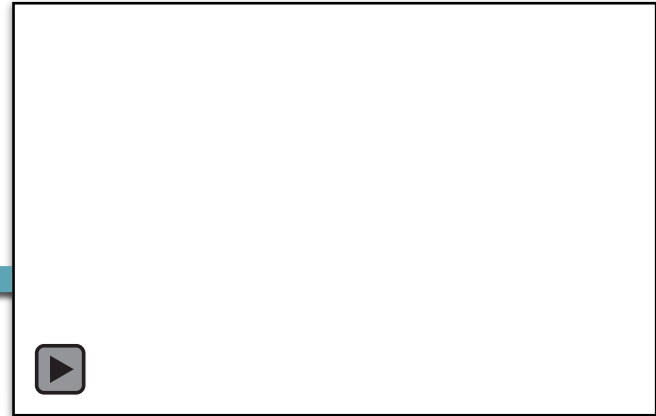
TTO breaks
the cell wall
and cell
membrane of
the fungus

Magnification
x50,000



Mineral Oil

Tea Tree Oil

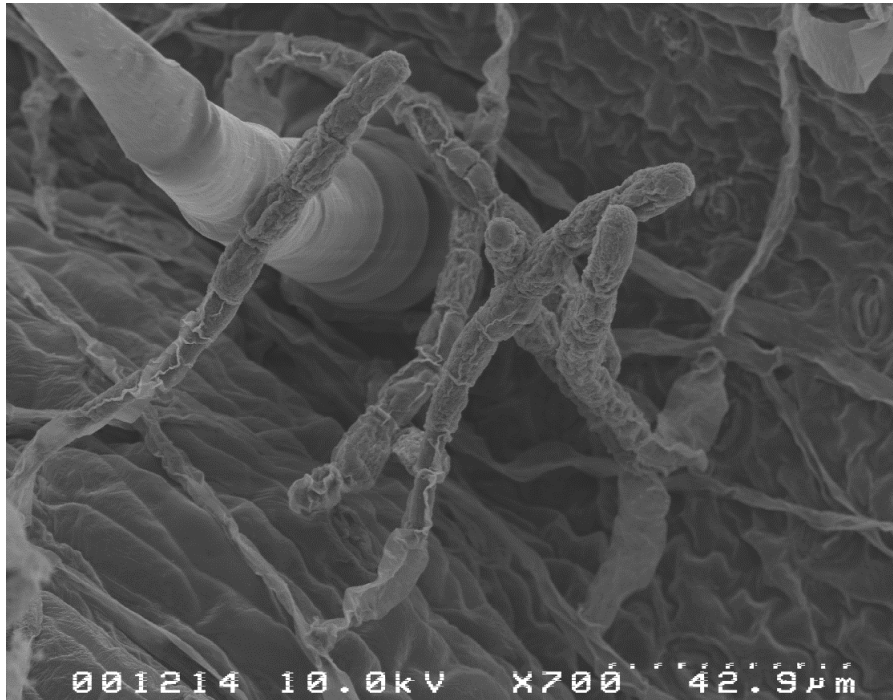


Triazole

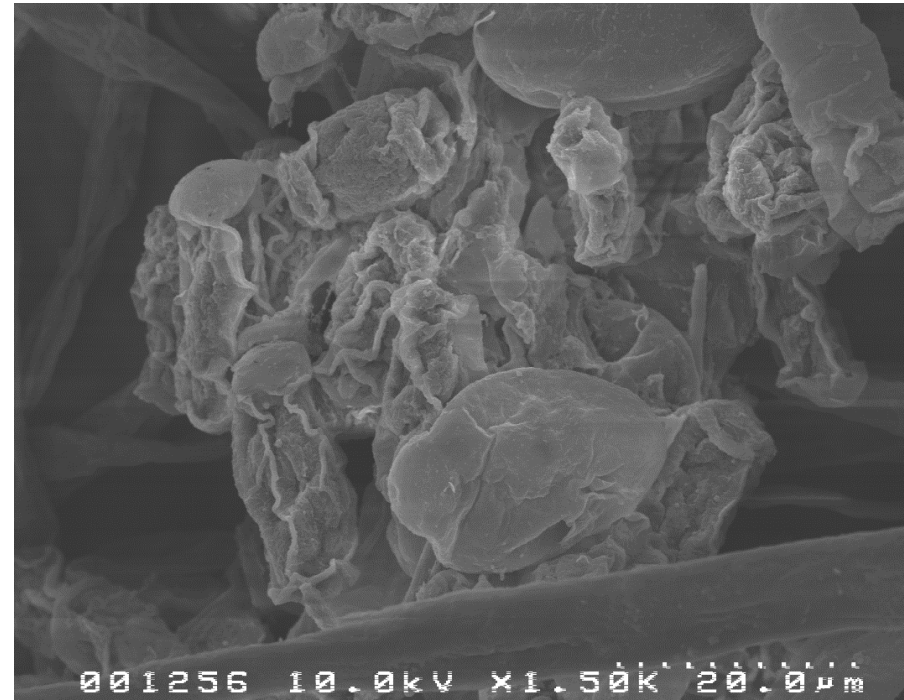
Hyphae of *Mycosphaerella fijiensis*. M. Reuveni, E. Sanches, and M. Barbier.
Curative and Suppressive Activities of Essential Tea Tree Oil against Fungal Plant Pathogens. *Agronomy* 2020, 10, 609; doi:10.3390/agronomy10040609

Effects of TTO on hyphae and conidia of the cucurbit powdery mildew

Untreated



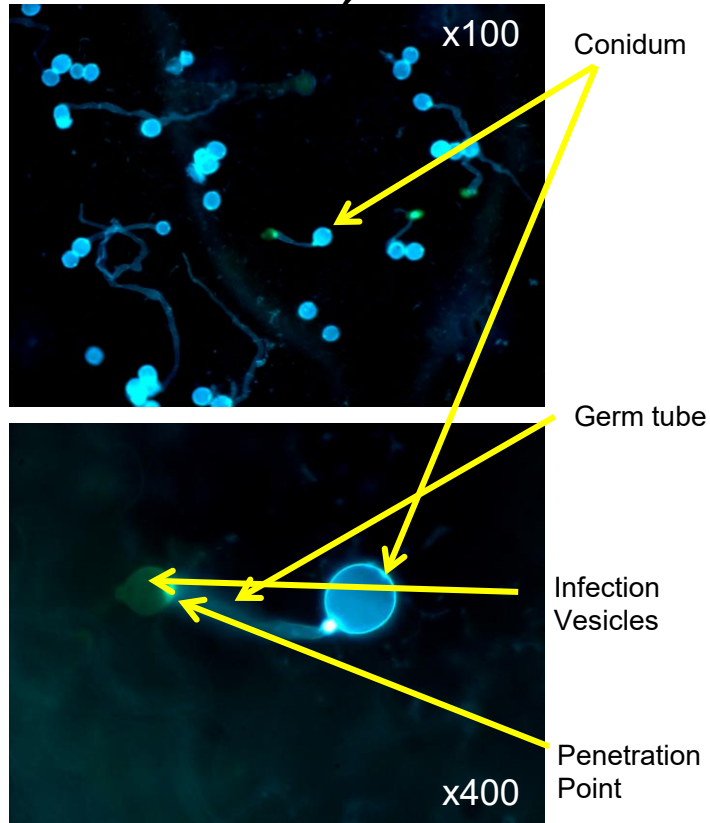
TTO Treated



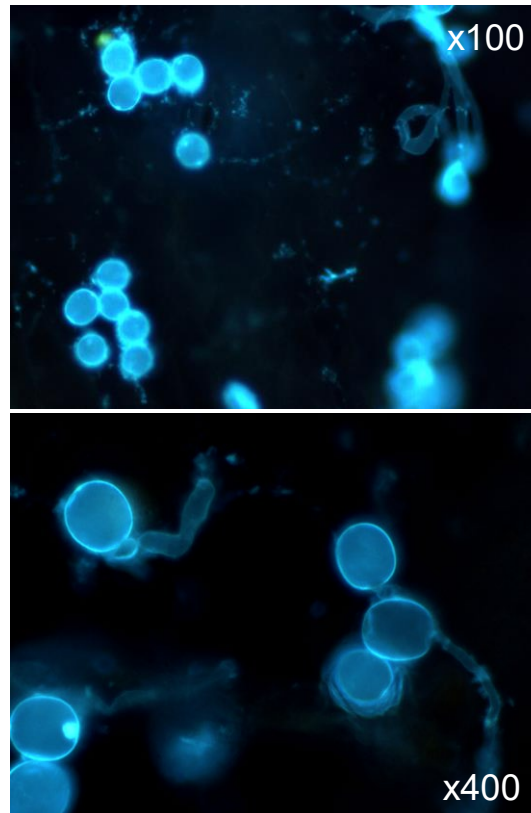
Moshe Reuveni, et. al. *Agronomy*. 2020.
10, 609; doi:10.3390/agronomy10040609
www.mdpi.com/journal/agronomy

TTO disrupts spore germination & infection vesicle formation

Untreated, 2 DAI



TTO treated, 2 DAI

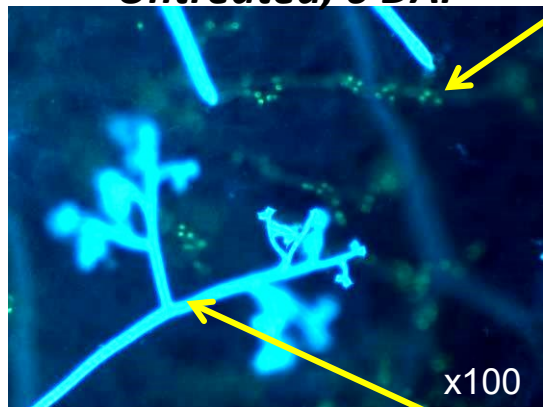


Conidia with low germination and no infection vesicle formation

Moshe Reuveni and Yigal Cohen.
Agronomy 2020, 10, 838; doi:10.3390/agronomy10060836 www.mdpi.com/journal/agronomy

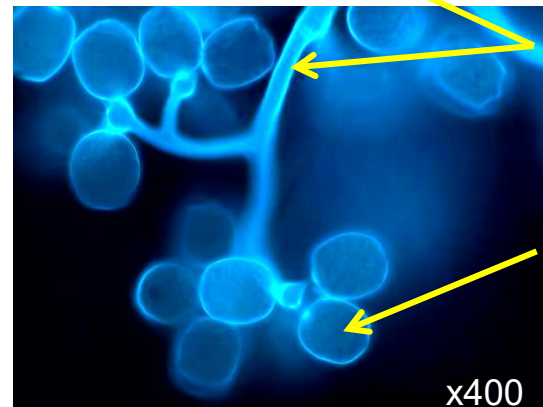
TTO disrupts infection, colonization, and sporulation

Untreated, 6 DAI



Hyphae and AS

x100

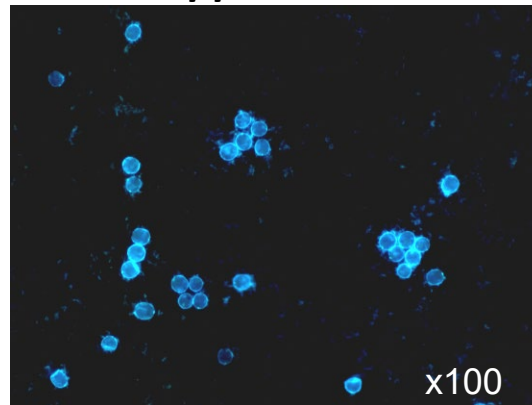


Conidiophore

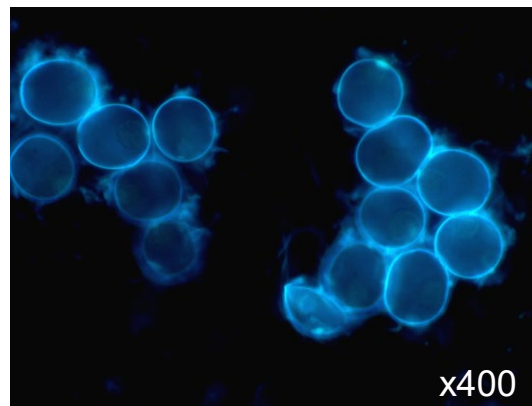
Conidia

x400

2500 ppm TTO, 6 DAI



x100



x400

No conidia (spore) germination

No Infection structure development

No colonization nor sporulation

Moshe Reuveni and Yigal Cohen.
Agronomy 2020, 10, 838; doi:10.3390/agronomy
10060836 www.mdpi.com/journal/agronomy

Spectrum of Activity: Fungal & Bacterial

TIMOREX^{ACT}
ADVANCED NATURAL PLANT
DISEASE CONTROL

OMRI
LISTED
Group BM01
For Organic Use

Bacterial Diseases	Alternaria	Botrytis	Anthracnose	Powdery Mildew
✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓



This is a huge advantage because:

- There aren't many products registered to control bacterial diseases.
- Bacterial diseases can cause significant losses.
- You never know what might come in, so this is a one shot covers all option



Bacterial diseases controlled

Crop	Disease	Pathogen
Berries	Bacterial canker, Angular leafspot	<i>Pseudomonas syringae</i> , <i>Pseudomonas fragariae</i>
Brassica (cole) leafy veg	Xanthomonas leaf spot	<i>Xanthomonas campestris</i>
Cereals	Bacterial blight & streak	<i>Xanthomonas</i> spp.
Citrus fruits	Bacterial blast Bacterial canker	<i>Pseudomonas syringae</i> <i>Xanthomonas</i> spp.
Coffee	Bacterial blight	<i>Pseudomonas</i> spp.
Fruiting veg	Bacterial blight Bacterial speck Bacterial spot Bacterial canker	<i>Xanthomonas</i> spp. <i>Pseudomonas syringae</i> <i>Xanthomonas</i> spp. <i>Clavibacter michiganensis</i>

Crop	Disease	Pathogen
Leafy veg	Bacterial blight Bacterial leaf spot	<i>Xanthomonas</i> spp. <i>Pseudomonas syringae</i>
Legume veg	Bacterial pustule	<i>Xanthomonas</i> spp.
Peanut	Bacterial diseases	<i>Pseudomonas solanacearum</i>
Root & tuber veg	Bacterial leaf blight Bacterial leaf spot Bacterial soft rot	<i>Xanthomonas campestris</i> <i>Xanthomonas</i> spp. <i>Erwinia carotovora</i>
Tree nuts	Bacterial canker	<i>Pseudomonas syringae</i>
Tropical & sub-tropical fruit	Bacterial blight Bacterial canker	<i>Pseudomonas syringae</i> <i>Xanthomonas campestris</i>

Pseudomonas
Xanthomonas
Clavibacter
Erwinia

**Please see the TIMOREX ACT label
for a complete list of crops and
diseases**

Disease Spectrum (Abbreviated)

TIMOREX ACT
ADVANCED NATURAL PLANT
DISEASE CONTROL



Group BM01

Fungal

- Alternaria
- Anthracnose
- Ascochyta Blight
- Asian Soybean Rust
- Black Mold
- Botrytis
- Cercospora Leaf Spot
- Downy Mildew
- Early Blight

- Fruit Rots

Fungal cont'd

- Leaf Blight
- Leaf Spots
- Phytophthora
- Powdery Mildew
- Pythium
- Rhizoctonia
- Rusts
- Scab
- Sclerotinia

Bacterial

- Blight
- Canker
- Leaf Spot
- Pustule
- Soft Rot
- Speck
- Streak

**Please see the TIMOREX ACT label for
a complete list of diseases controlled**

Broad Range of Crops

TIMOREX ACT
ADVANCED NATURAL PLANT
DISEASE CONTROL

OMRI
LISTED
Group BM01
For Organic Use

- Bananas
- Berries* (CG 13-07)
- Citrus (CG 10-10)
- Bulb Vegetables (CG 3-09)
- Cereal Grains (CG 15)
- Hops
- Cucurbits* (CG 9)
- Fruiting Vegetables* (CG 8-1)
- Grass Seed Production Crops
- Leafy Vegetables* (CG 4-16)
- Legume Vegetables (CG 6)
- Peanuts
- Pomegranate
- Root & Tuber Vegetables (CG 1)
- Tree Nuts (CG 14-12)
- Inedible Peel Tropical & Subtropical Fruit (CG 24)
- Coffee

* Including greenhouse crops

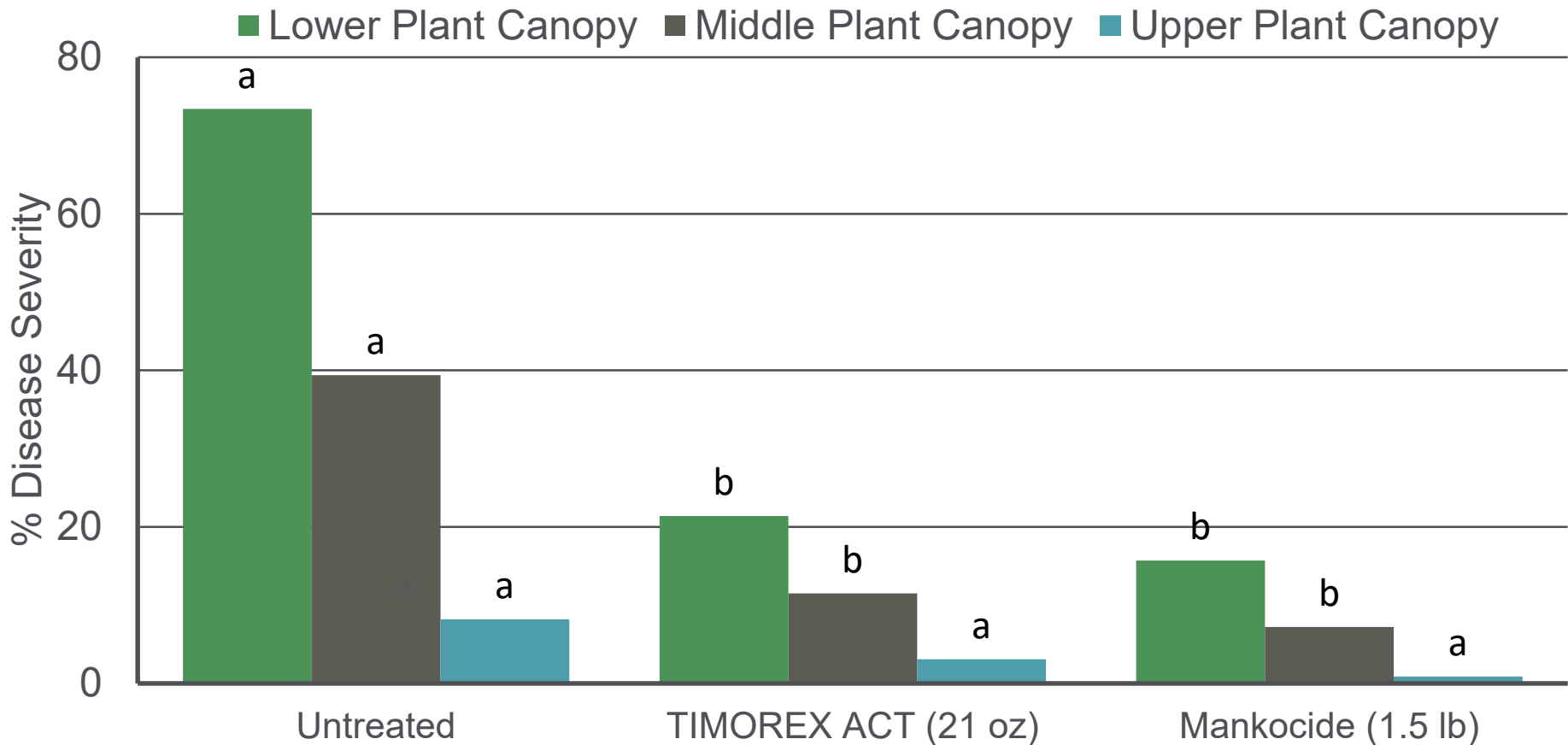
FRAC Reclassification of TTO

A.I.	TARGET SITE & CODE	GROUP NAME	CHEMICAL GROUP	COMMON NAME	COMMENTS	FRAC Group
TTO	cell membrane disruption, cell wall	plant extracts	terpene hydrocarbons, terpene alcohols and terpene phenols	extract from <i>Melaleuca alternifolia</i> (tea tree)	Resistance not known (previously F7)	BM01
	Induced plant defense mechanisms			plant oils (mixtures): eugenol, geraniol, thymol		



- TTO was recently reclassified by FACT from Group 46 to Group **BM01**
- BM01 is seen as a low risk for resistance category

Bacterial Spot Control on Tomato

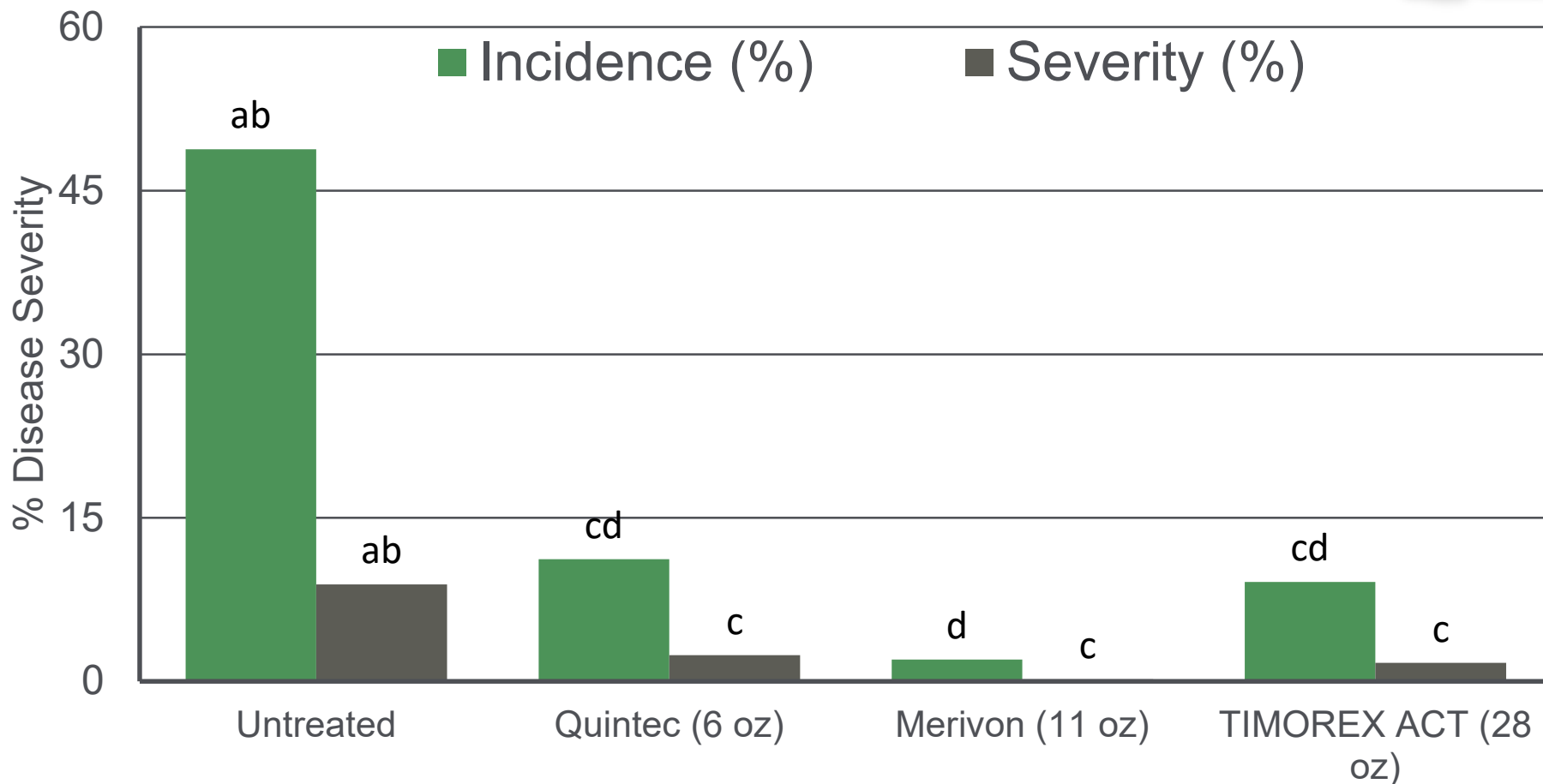


GLC Consulting | 2017 | Quitman, GA | Bacterial spot: *Xanthomonas euvesicatoria* | RCB: 7 reps; 6 apps

Powdery Mildew Control on Strawberry

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ADVANCED NATURAL PLANT
DISEASE CONTROL

OMRI
LISTED
Group BM01
For Organic Use



Cal Poly Strawberry Center | San Luis Obispo, CA | 2018

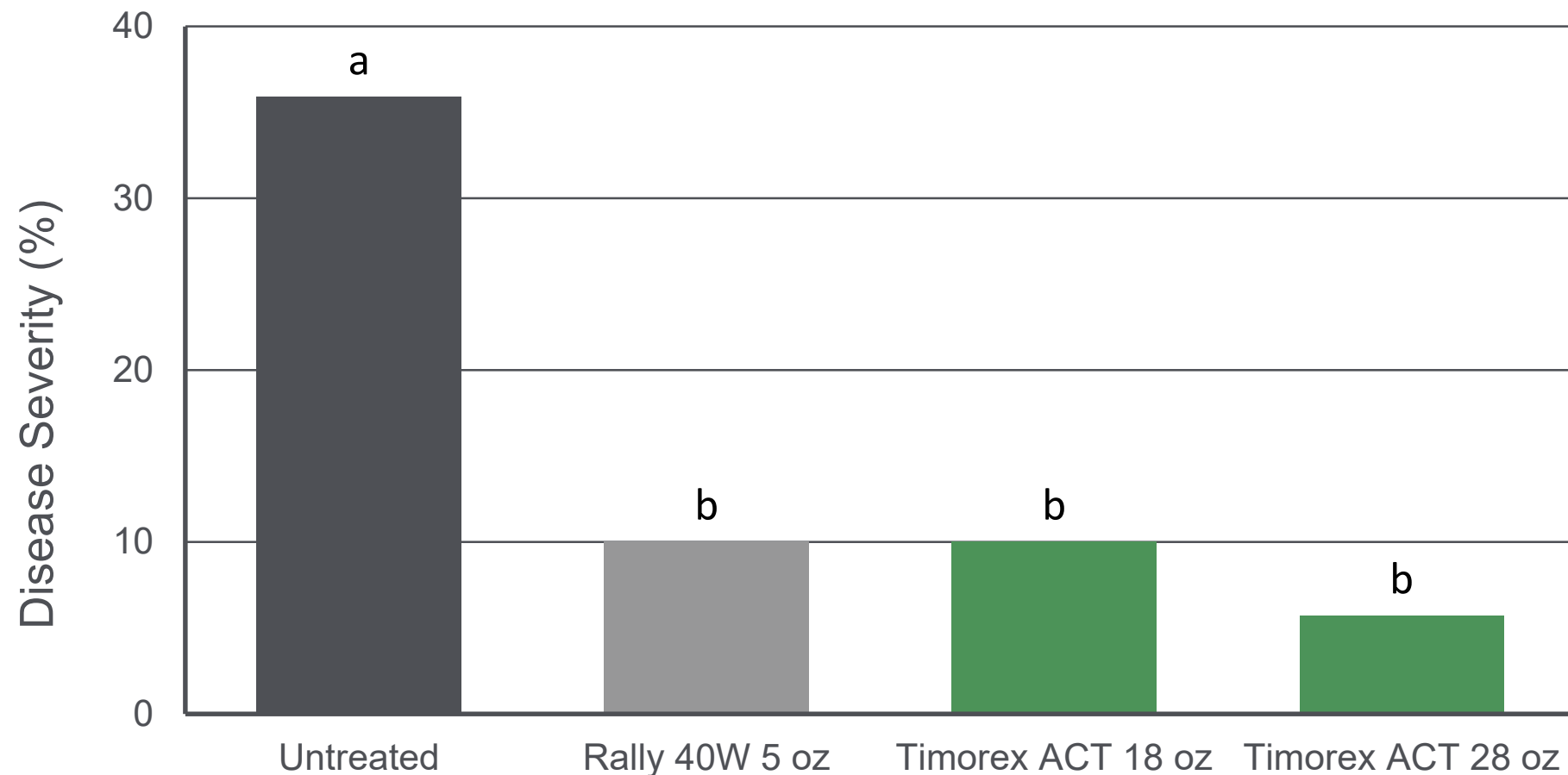
First app: Feb 21 | First rating: 6 days after first spray | RCB: 4 reps; assessments on Mar 20

Downy Mildew Control on Broccoli

TIMOREX^{ACT}
ADVANCED NATURAL PLANT
DISEASE CONTROL



Group BM01

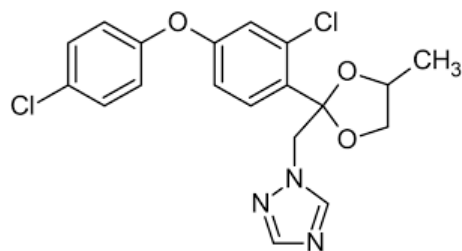


Blaine Turner | Yuba City, CA | 2018 | Pathogen: *Hyaloperonospora brassicae* | 2 apps; 7 day schedule; 30 GPA

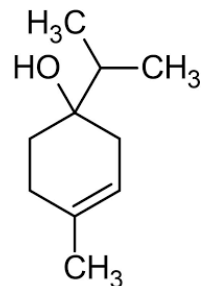
Regev hybrid fungicide



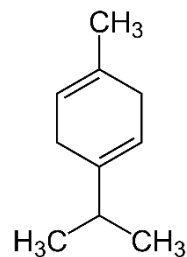
Difenoconazole



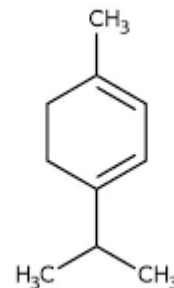
Terpinen-4-ol



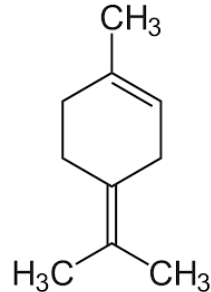
γ -Terpinene



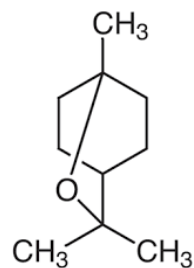
α -Terpinene



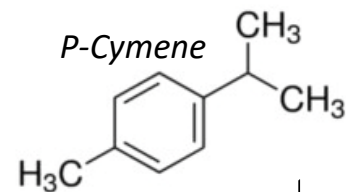
Terpinolene



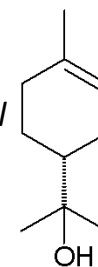
1,8 - Cineole



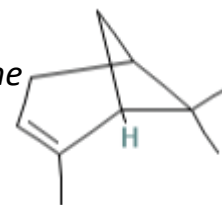
p-Cymene



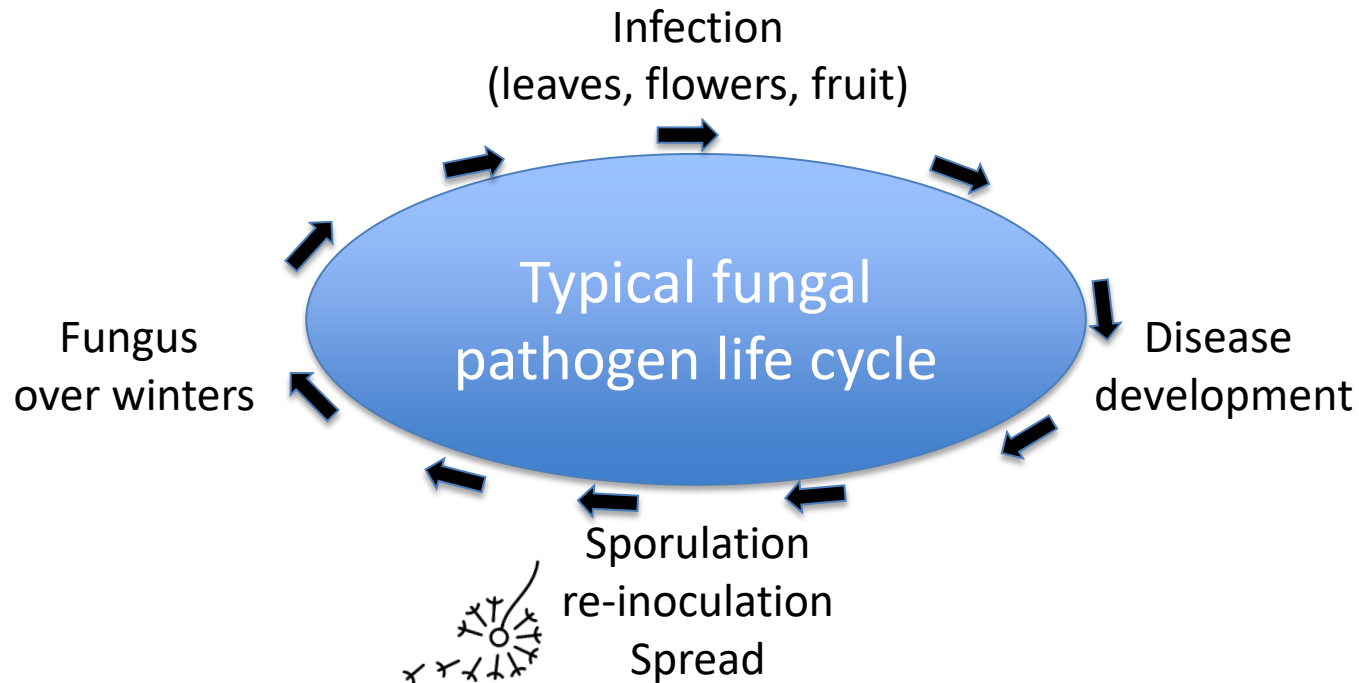
α -Terpineol



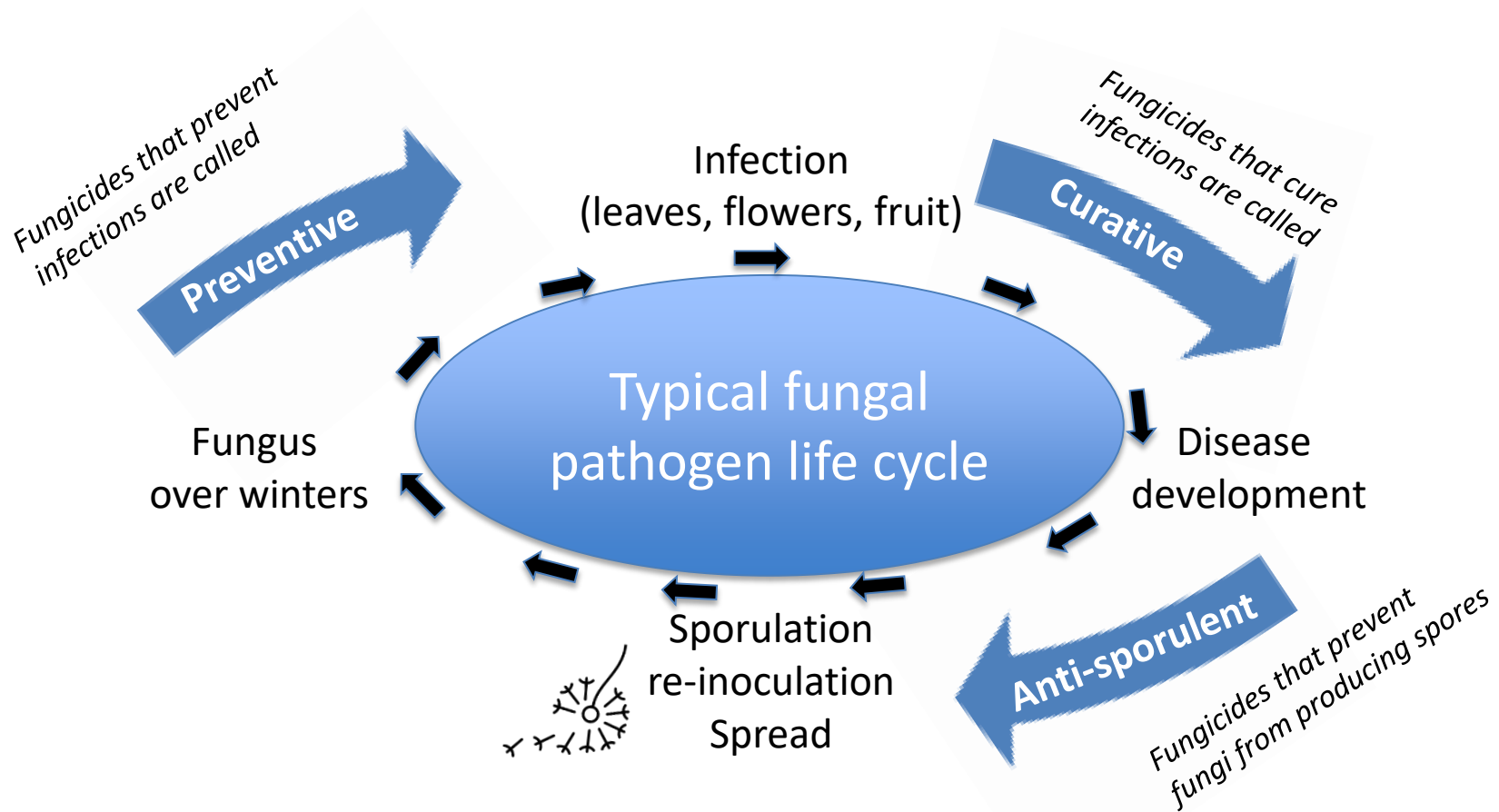
α -Pinene



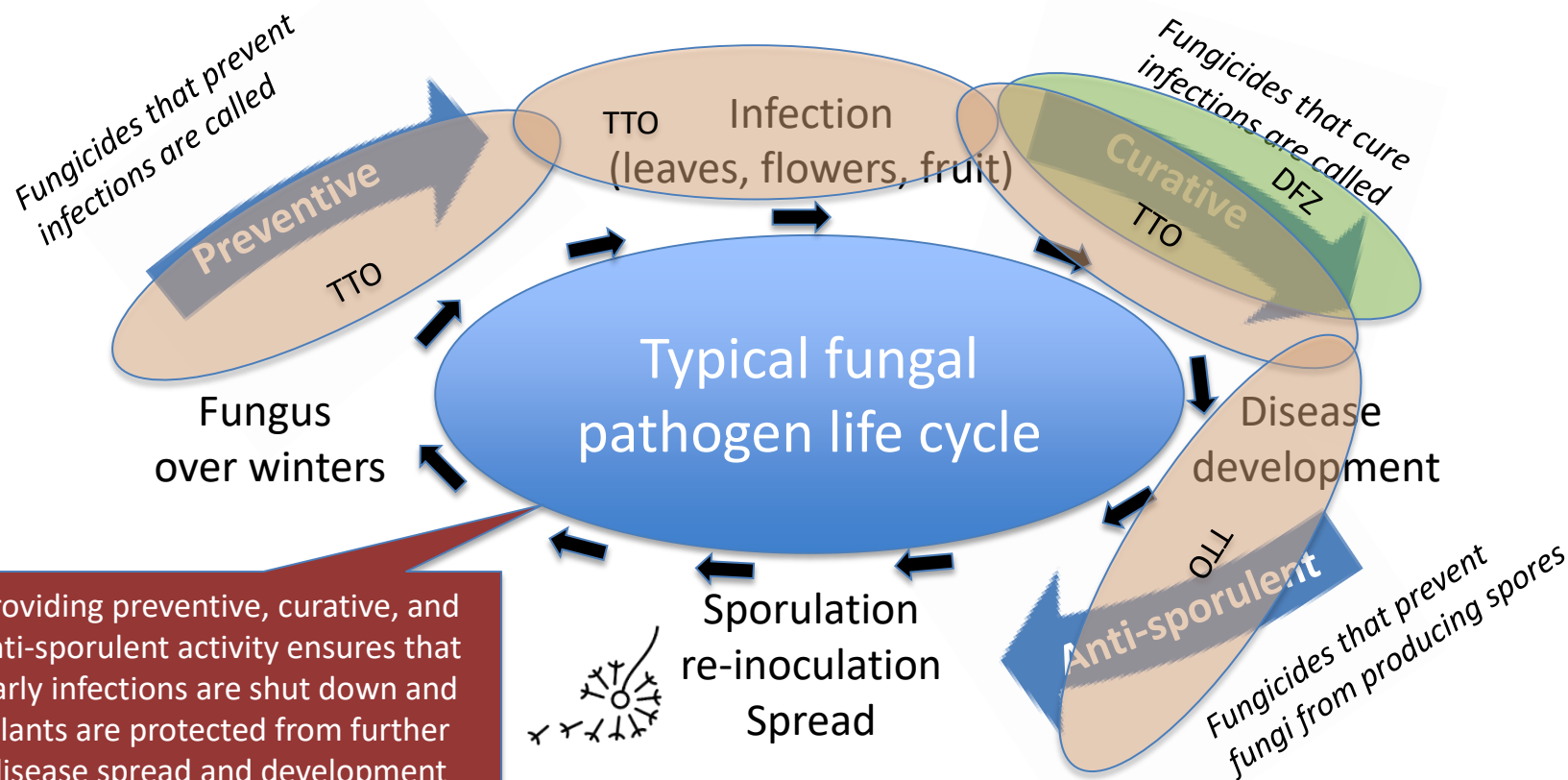
Regev provides preventive protection, double kick-back curative and anti-sporulant activity



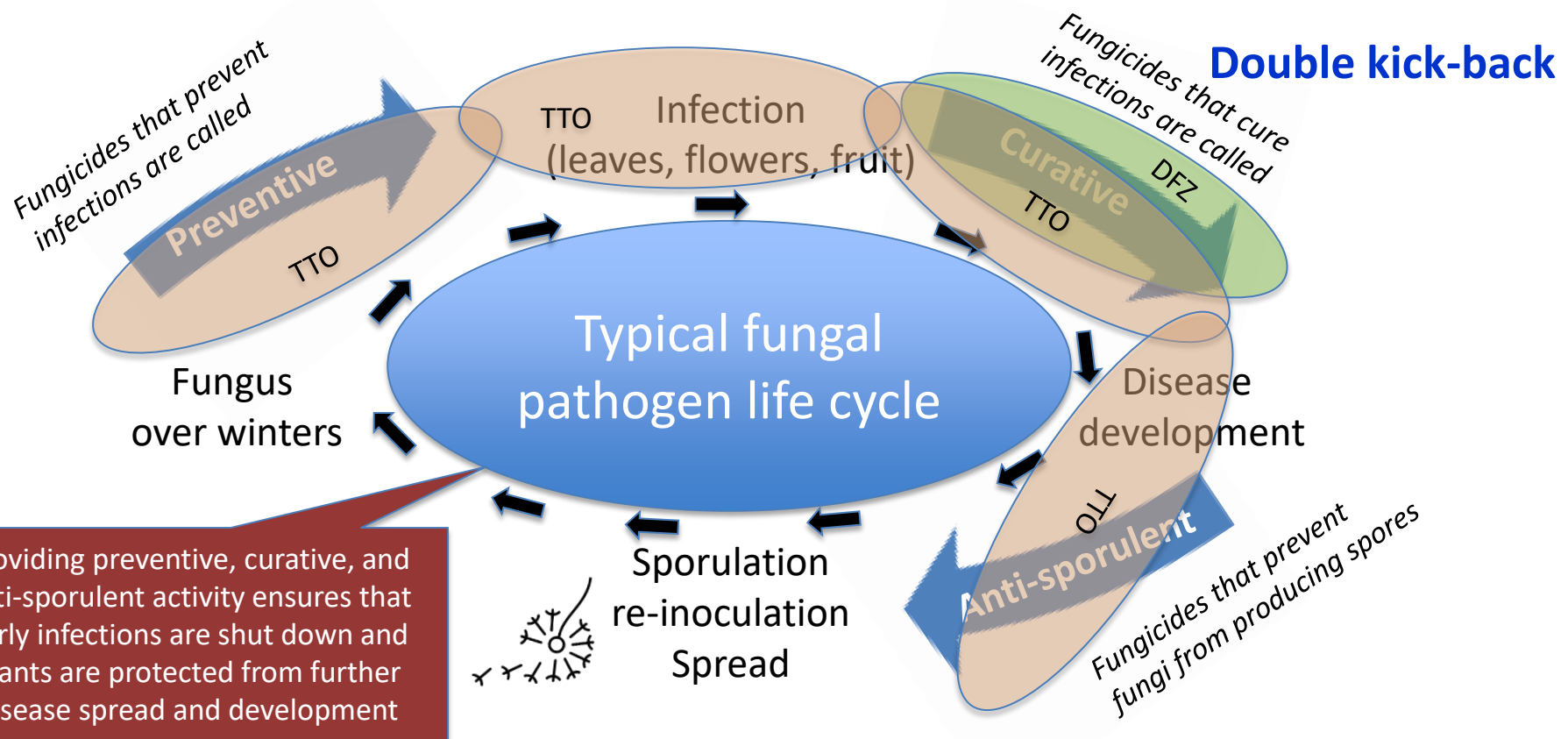
Regev provides preventive protection, double kick-back curative and anti-sporulant activity



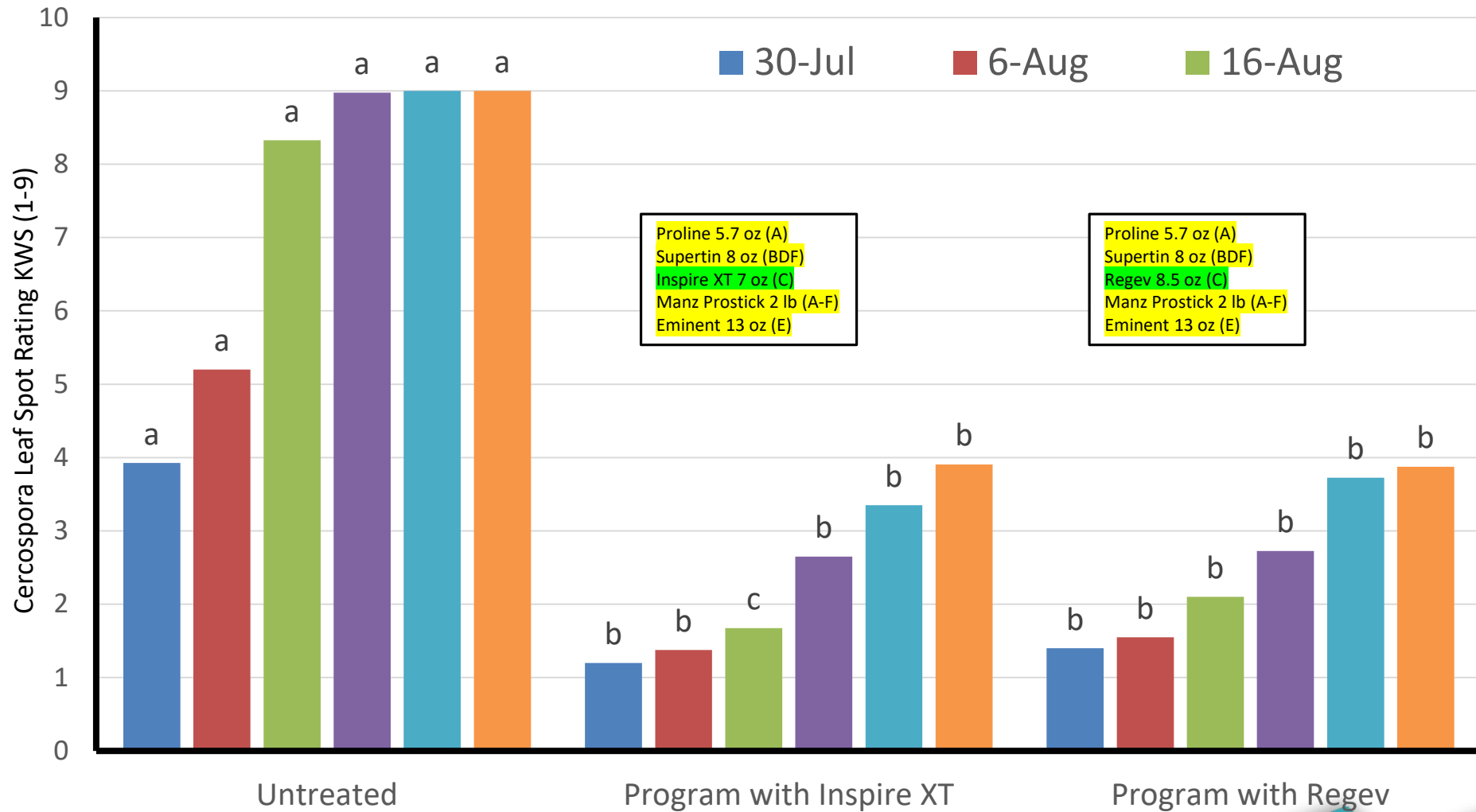
Regev provides preventive protection, double kick-back curative and anti-sporulant activity



Regev provides preventive protection, double kick-back curative and anti-sporulant activity

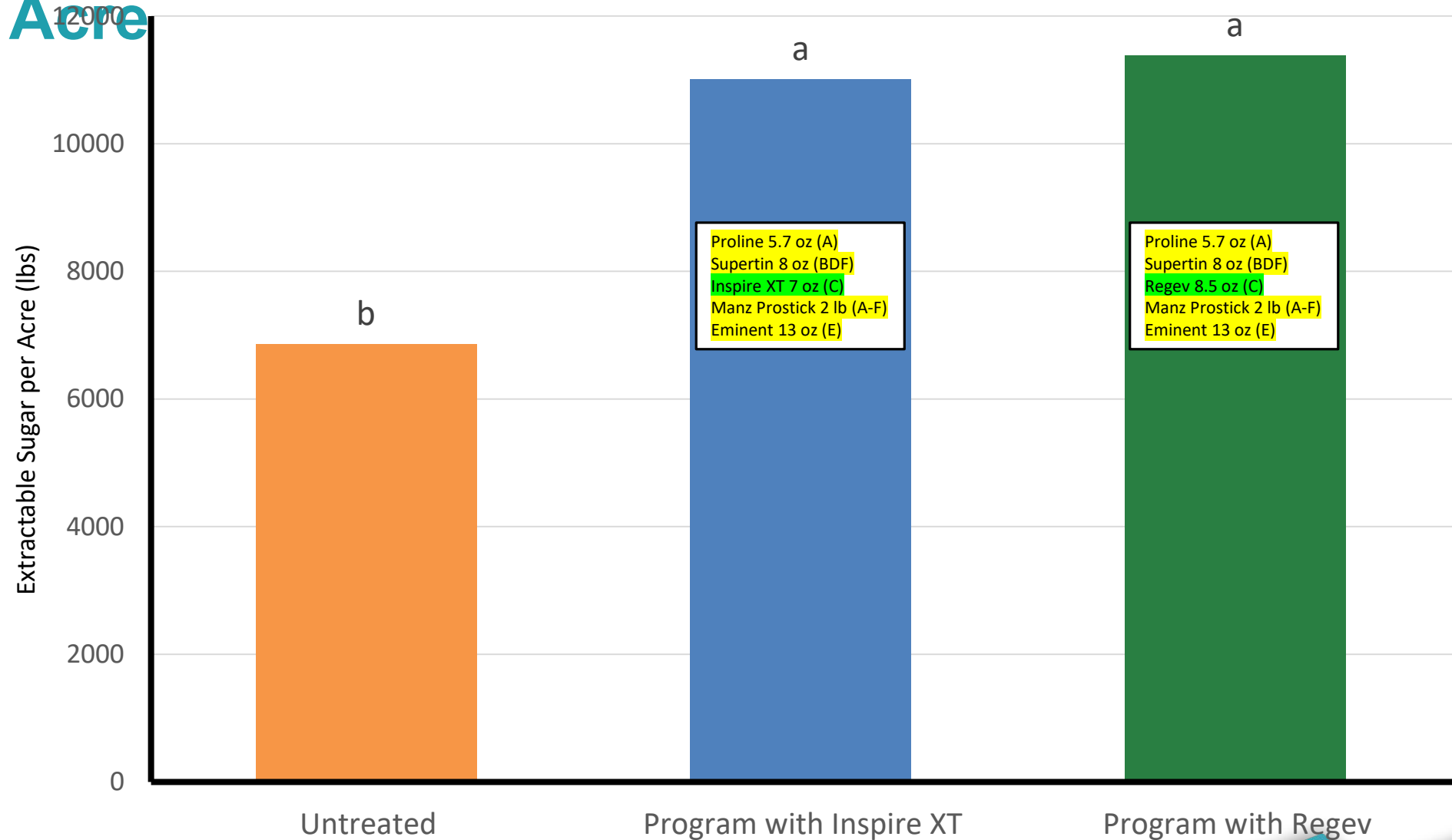


Efficacy against Cercospora Leaf Spot on Sugar beet



Trial conducted by SMBSC near Hector, MN 2021

Effects on Pounds of Extractable Sugar per Acre



Crops on the current label

- Berry, Low Growing Subgroup 13-07G
- Small Fruit Vine Climbing Subgroup 13-07F
- Bulb Veg; Crop Group 3-07A
- Crop Group 3-07B
- Citrus Fruit: Crop Group 10-10
- Cucurbit Veg: Crop Group 9
- Brassica Leafy Veg: Crop Group 4-16B
- Watercress
- Rice
- Wild Rice
- Fruiting Veg: Crop Group 8-10
- Legume Veg: SubGroup 6C
- Soybean
- Chickpea
- Root and Tuber Veg: Subgroup 1C
- Carrots
- Sugar beets
- Ginseng
- Tree Nut Crops: Crop Group 14-12

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