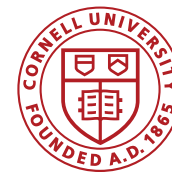


Biofungicides for Brassica *Alternaria* Management – A New Hope?

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The **Eastern New York Commercial Horticulture Program** is a Cornell Cooperative Extension partnership between Cornell University and the CCE Associations in 17 counties.



Outline



- Polyoxin D zinc salt- what's that?
- Optimizing OMRI-listed fungicide applications: nozzles, adjuvants, and boom height
- Biofungicide programs for managing *Brassica alternaria*

Polyoxin D Zinc Salt

Polyoxin D- fermentation product of naturally occurring soil microorganism *Streptomyces cacaoi* var. *asoensis*.

Formulated with a Zinc Salt to decrease solubility

Mode of action: Chitin inhibitor

Chitin is essential component of fungal cell walls

Stops fungus from spreading to new plant tissue

Polyoxin D Zinc Salt

2008-EPA registered for food crops

2020- OSO 5% SC is OMRI -Listed

Registered NY, NJ, PA, throughout NE

4hr. REI and 0day PHI

Suspension Concentrate (SC), 6.5-13oz/acre

Group 19 fungicide- use resistance management strategies

Used in conjunction or alternating with other biofungicides i.e. *Reynoutria sachalinensis* (*Regalia*)

PM & GSB in cucurbits, Botrytis in strawberry, *Alternaria brassicicola*

Brassica Alternaria Management Strategies



1. **Cultural Controls**: Variety selection (domed crowns), crop rotation, plant spacing, drip irrigation
2. **Chemical Controls**: Biofungicides, biorationals, sanitizers, copper formulations
3. **Integrated Management**: Combining the aforementioned cultural and chemical control tactics

Optimizing OMRI-listed Fungicide Applications: Nozzle Selection

- Clean strainers regularly
- Consult the TeeJet catalog
- Maintain proper boom height above the crop canopy
- Turbo TwinJets (TTJ60-1100x) for penetration through dense canopy for contact products (not systemic)
- Watch the PSI range!



Optimizing OMRI-listed Fungicide Applications: Adjuvant Selection

ORO AGRI
GROW WITH CONFIDENCE

What Are Adjuvants? ¿Qué son los adyuvantes?

- “Aid or modify the action of an agrichemical” –ASTM
- Bridge between unlike chemicals
- Lower Surface Tension

- “Ayudan o modifican la acción de un agroquímico” –ASTM
- Enlazan productos químicos diferentes
- Disminuyen la tensión superficial

Credit: Penn State Extension

21:55 / 1:03:38 • What a...

Spray Safe, Spray Well: Reducing Pesticide Use Risks for Organic and Beginning Vegetable Farmers-English Version
Water Quality Considerations and Adjuvants to Optimize Pesticide Applications

More OMRI-listed adjuvants on the market

Bios tend not to want acidification

Spreader-sticker types for most fungicides, but careful with coppers and oils

Need for more research on how adjuvants impact fungicide efficacy

OMRI-listed Fungicide Program Evaluation

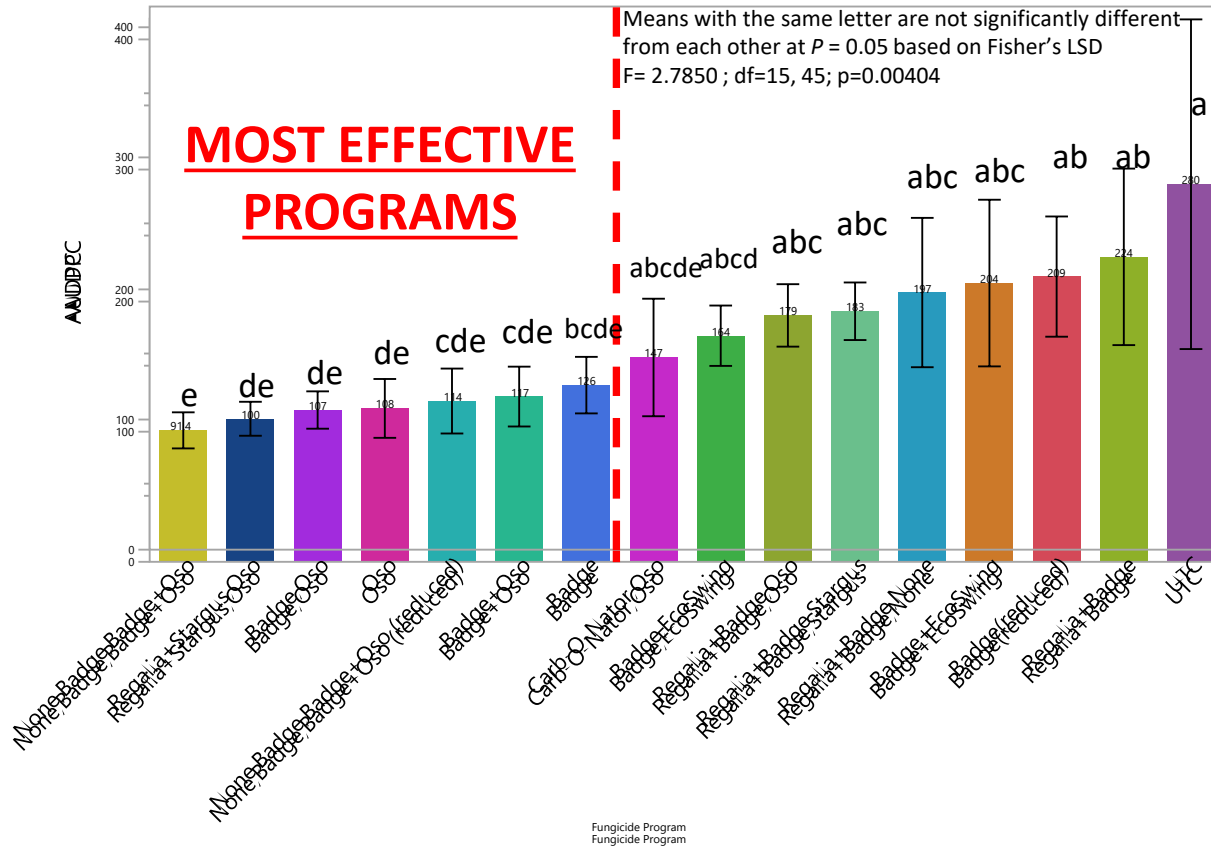
- Trialed 15 different OMRI-listed fungicides alone, in tank mix with copper, and in alternation over 3 years
- Focus in year 3 on evaluating 7-week long programs built on best performers following best resistance management practices



Top Fungicide Programs (after three years of trials)

	% Crown Disease Severity					Leaf Disease Severity	
Week 1	None	None	Regalia+Stargus	Oso	Badge+Oso	Badge	Badge
Week 2	None	None	Regalia+Stargus	Oso	Badge+Oso	Badge	Badge
Week 3	Badge	None	Regalia+Stargus	Oso	Badge+Oso	Badge	Badge
Week 4	Badge+Oso	None	Oso	Oso	Badge+Oso	Oso	Badge
Week 5	Badge	Badge	Regalia+Stargus	Oso	Badge+Oso	Badge	Badge
Week 6	Badge+Oso	Badge+Oso	Oso	Oso	Badge+Oso	Oso	Badge
Week 7	Badge+Oso	Badge+Oso	Oso	Oso	Badge+Oso	Oso	Badge

2022 Broccoli Biofungicide AUDPC Values

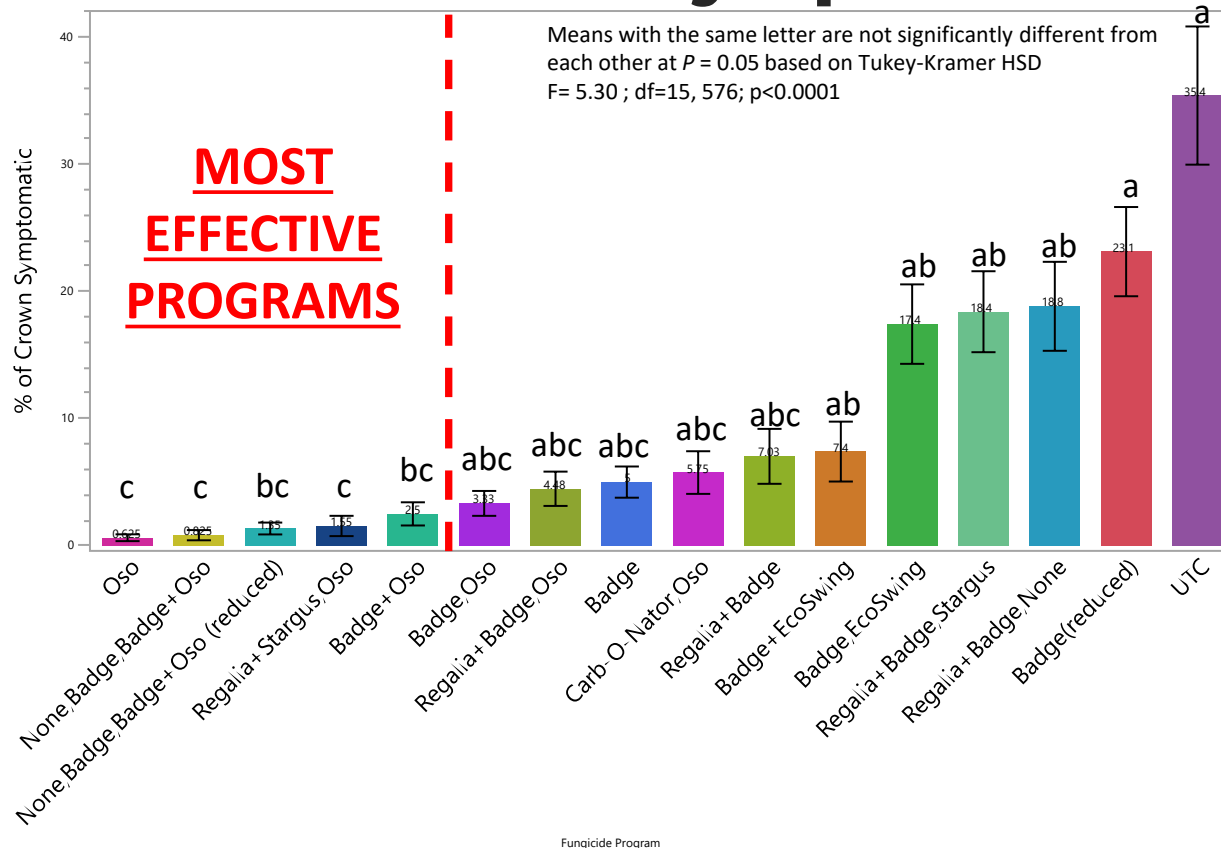


Grundberg and Rusinek 2022, unpublished

Crown Disease Severity Ratings



% of Crown w/ Disease Symptoms at Harvest



Grundberg and Rusinek 2022, unpublished



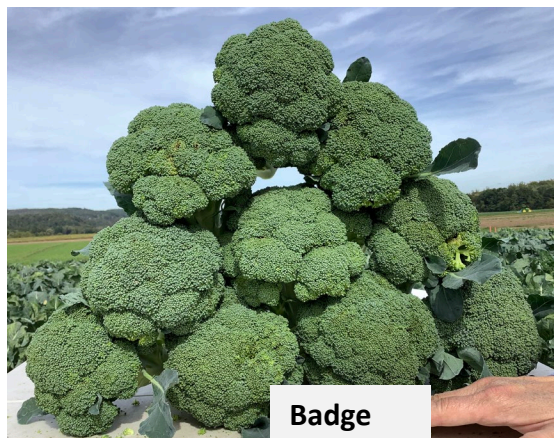
Oso



**Regalia+Stargus,
OSO**



**Badge,
Badge+Oso**



Badge

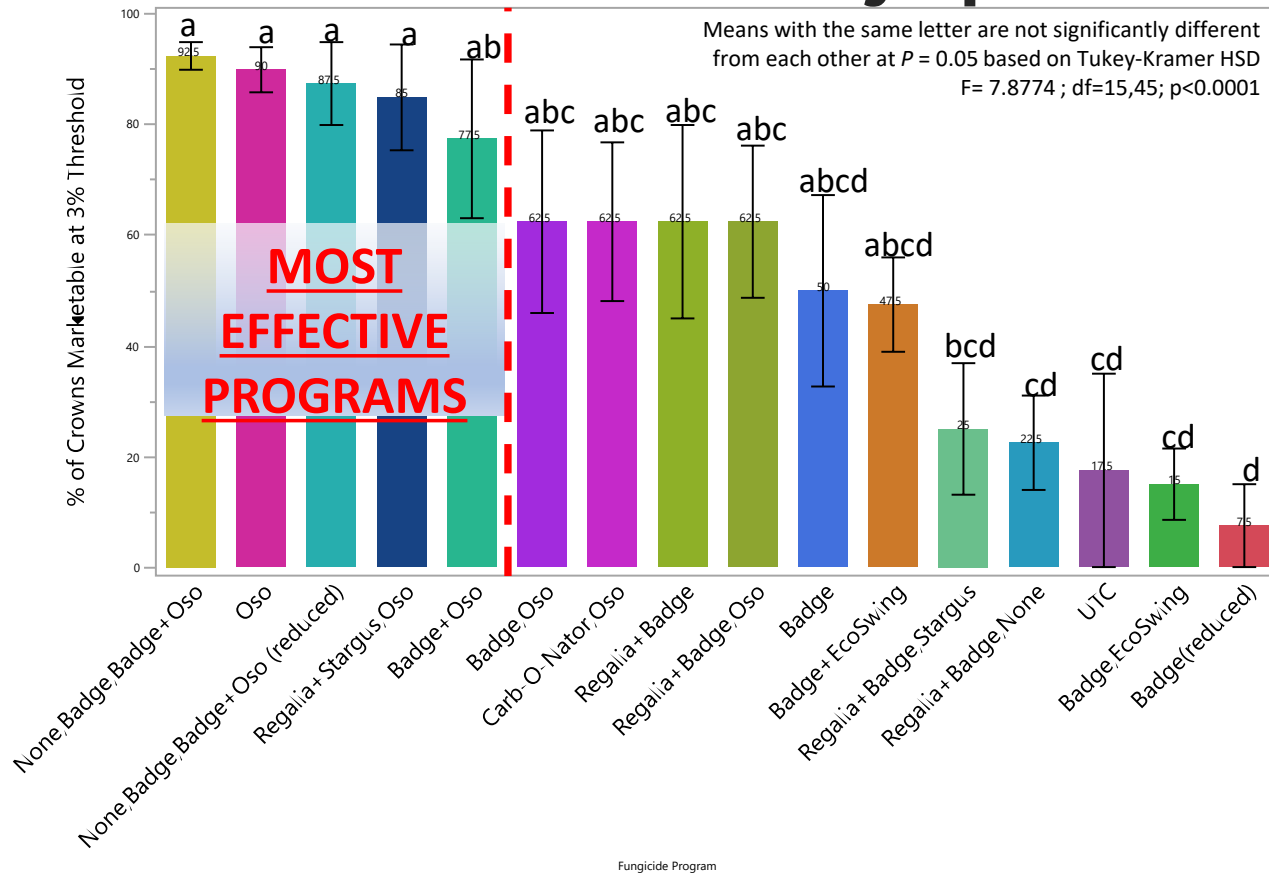


UTC



**Reduced Badge,
Badge+Oso**

Marketable Crowns at 3% Visual Symptoms Threshold



Grundberg and Rusinek 2022, unpublished

Organic Fungicide Spray Program Cost Estimate for Alternaria Management in Brassicas

% Marketable Crop (3% Crown Disease Threshold)	92.50%	90%	87.50%	85%	50%
Week 1	None	Oso	None	Regalia+Stargus	Badge
Week 2	None	Oso	None	Regalia+Stargus	Badge
Week 3	Badge	Oso	None	Regalia+Stargus	Badge
Week 4	Badge+Oso	Oso	None	Oso	Badge
Week 5	Badge	Oso	Badge	Regalia+Stargus	Badge
Week 6	Badge+Oso	Oso	Badge+Oso	Oso	Badge
Week 7	Badge+Oso	Oso	Badge+Oso	Oso	Badge
Fungicide Sum	\$183.00	\$225.50	\$117.10	\$449.98	\$102.90
Sticker Cost	\$8.80	\$15.40	\$6.60	\$15.40	\$15.40
Total Program Cost Per Acre	\$191.80	\$270.90	\$123.70	\$465.38	\$118.30

Fungicide	Cost/Acre/App
OSO 5% SC	\$36.50
Regalia	\$39.04
Stargus	\$46.08
Badge X2	\$14.70
NuFilm P	\$2.20

Summary

Optimize Fungicide Application:

- Nozzle (Turbo TwinJets) and strainer maintenance
- Non-acidifying spreader-sticker for most biofungicides

Fungicide Programs for Reducing Brassica Alternaria Severity:

- Programs with Oso (polyoxin D zinc salt, Certis USA) at 6.5 fl oz/ac significantly reduced Alternaria severity and increased marketable yield
- Reducing the applications from 7 to 3 did not result in decreased control in 2022 (dry year) when using Oso
- Rotate Oso with Badge (1.8 lbs/ac) or tank mix of Stargus (3 qt/ac) + Regalia (2 qt/ac) for resistance management



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Comprehensive Treatment List

Year 1: Regalia, LifeGard, Cueva, Badge X2, Trilogy, Double Nickel, Stargus, Serenade ASO, PerCarb

Year 2:

	Program 1*	Program 2	Program 3	Program 4	Program 5	Program 6	Program 7	Program 8	Program 9
Week 1	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 2	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 3	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 4	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 5	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 6	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
Week 7	UTC	Badge	Badge + Regalia	Badge + LifeGard	Badge + Stargus	Badge+ Double Nickel	Badge+OSO	Badge + Howler	Badge + Theia
	Program 10	Program 11	Program 12	Program 13	Program 14	Program 15	Program 16	Program 17	Program 18
Week 1	None	Regalia	LifeGard	Stargus	Double Nickel	Oso	Howler	Theia	PerCarb
Week 2	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge
Week 3	None	Regalia	LifeGard	Stargus	Double Nickel	Oso	Howler	Theia	PerCarb
Week 4	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge
Week 5	None	Regalia	LifeGard	Stargus	Double Nickel	Oso	Howler	Theia	PerCarb
Week 6	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge	Badge
Week 7	None	Regalia	LifeGard	Stargus	Double Nickel	Oso	Howler	Theia	PerCarb
	Program 19	Program 20	Program 21	Program 22					
Week 1	Regalia	Regalia	Badge+ Double Nickel	Badge+ Double Nickel					
Week 2	Badge + Stargus	Badge + Double Nickel	Badge+ Double Nickel	Badge+ Double Nickel					
Week 3	Regalia	Regalia	Badge+ Double Nickel	Badge+ Double Nickel					
Week 4	Badge + Stargus	Badge + Double Nickel	Badge+ Double Nickel	Badge+ Double Nickel					
Week 5	Regalia	Regalia	Badge+ Double Nickel	Badge+ Double Nickel					
Week 6	Badge + Stargus	Badge + Double Nickel	NONE	Double Nickel					
Week 7	Stargus	Double Nickel	NONE	Double Nickel					

Comprehensive Treatment List

Year 3:

	Program 1*	Program 2	Program 3	Program 4	Program 5	Program 6
Week 1	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 2	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 3	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 4	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 5	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 6	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing
Week 7	UTC	Badge	Oso	Badge+OSO	Regalia+Badge	Badge+EcoSwing

	Program 7	Program 8	Program 9	Program 10	Program 11	Program 12	Program 13	Program 14
Week 1	Badge	Badge	Carb-O-Nator	Badge	Regalia+Badge	Regalia+Badge	Regalia+Badge	Regalia+Stargus
Week 2	Badge	Badge	Carb-O-Nator	Badge	Regalia+Badge	Regalia+Badge	Regalia+Badge	Regalia+Stargus
Week 3	Badge	Badge	Carb-O-Nator	Badge	Regalia+Badge	Regalia+Badge	Regalia+Badge	Regalia+Stargus
Week 4	None	Oso	Oso	EcoSwing	NONE	Stargus	Oso	Oso
Week 5	Badge	Badge	Carb-O-Nator	Badge	Regalia+Badge	Regalia+Badge	Regalia+Badge	Regalia+Stargus
Week 6	None	Oso	Oso	EcoSwing	NONE	Stargus	Oso	Oso
Week 7	None	Oso	Oso	EcoSwing	NONE	Stargus	Oso	Oso

	Program 15	Program 16
Week 1	None	None
Week 2	None	None
Week 3	Badge	None
Week 4	Badge+Oso	None
Week 5	Badge	Badge
Week 6	Badge+Oso	Badge+Oso
Week 7	Badge+Oso	Badge+Oso