

Organic Growth-Stage Pest Management Guide



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DISCLAIMERS



- Growth stage-based does **not** imply that monitoring and knowledge of field history can be substituted
- Focus = rabbiteyes
- Focus = diseases and insects (weeds not considered here)
- Control products mentioned are OMRI-listed, but you need to check with certifier about restrictions
- Limited amount of efficacy data available for most OMRI-listed products
- Remember: focus on prevention, not treatment

1) DORMANT



- Mummy berry (soil cultivation, mulching)
- Scale (dormant oil application)

MUMMY BERRY

(*Monilinia vaccinii-corymbosi*)

Summer



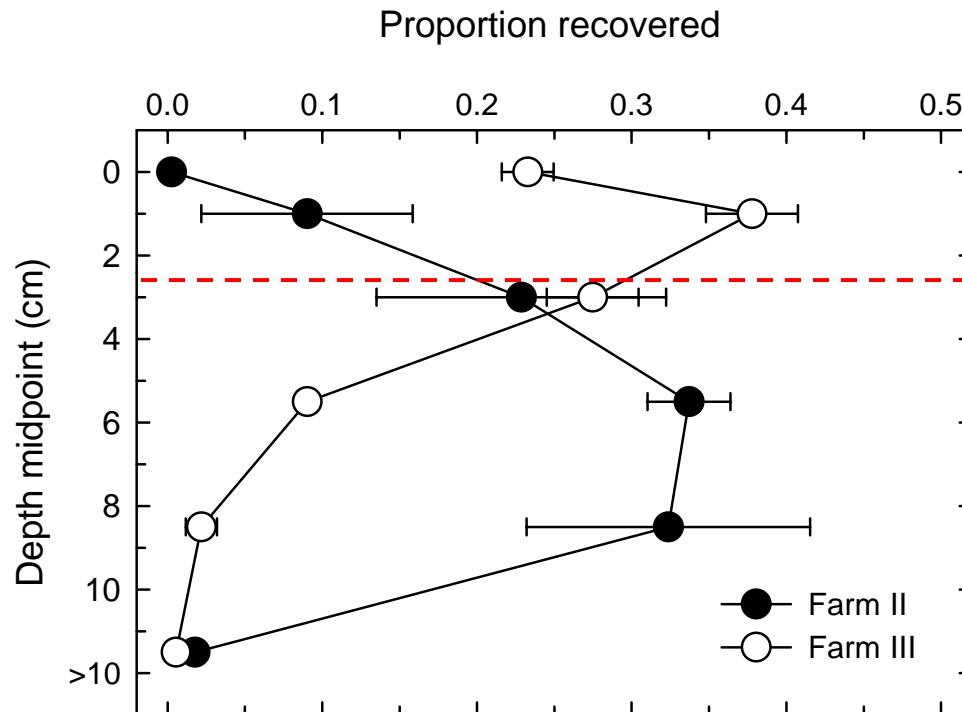
Fruit mummies on the ground are the only overwintering site for the pathogen

Winter/ early spring



Mummies buried below 2.5 cm (1") fail to germinate

Mummy Burial Following Cultivation on Commercial Farms



Farm II: V-plow, followed by single passes with rotary cultivator and rotary hoe

Farm III: rototiller (single pass)

Key: combine implements with large depth of operation with those having good access near the crowns of the plants

Mummy Burial With Organic Mulches May or May not Work

- ☺ Mulch layer >2.5 cm will prevent germination of mummies on the ground
- ☹ But: mulch will decompose or erode, allowing buried mummies to germinate...
- ☹ ... and mummies that fall on mulch may find ideal moisture conditions for germination



ORGANIC SCALE CONTROL OPTIONS

Dormant Oil Application each winter or as-needed; 2 Dormant Oils Provides Reliable Scale Control

Occasional Soft Scale Infestations may be Controlled with Verdant Oil to Crawlers

Many Organic (OMRI) Oils are Verdant:

Saf-T-Side

Glacial Spray Fluid

JMS Stylet Oil

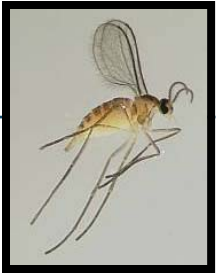
Pure Spray

2) DELAYED DORMANT-BUD SWELL



- Gall midge
- Twig blight (lime sulfur)

Blueberry Gall Midge - A Key Rabbiteye Pest

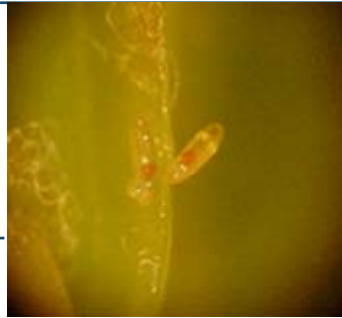


Larval feeding:
Aborts flower buds
Deforms leaves
Aborts vegetative buds

**Adults lay eggs between the floral
& vegetative bud scales of stage 2 & 3 buds**

**Flower bud injury easily
mistaken for frost injury**





% Dissected Buds with Blueberry Gall Midge Eggs and/or Larvae (Gulfport, MS)

15 Jan- 0% flower buds
1 Feb- 07% flower buds
15 Feb- 20% flower buds
01 Mar- 27% flower buds
15 Mar- 60% flower buds
1 Apr- 123% flower buds
15 Apr- 193% flower buds
1 May- 206% vegetative buds
15 May- 183% vegetative buds



Collection & Observation of Buds-

Collect flower buds 2- to 3-Xs/week, placing them in zip-lock bags to monitor for larval infestation. This is the simplest, most farmer-friendly midge monitoring technique



Organic Midge Control Options:

Surround (kaolin clay)

Entrust (spinosad) effective, but spinosad products have a short residual which can lead to frequent sprays; spinosad is a resistance-prone insecticide

Midge insecticides are protectant-only, do not clean up existing larval infestations

Flower Bud Stage-2 to Fruit Set is the Window of Vulnerability

***Spray to Protect Buds you think can be carried to harvest;
Petal-Fall Sprays Protect Late Blooms***

Delayed Dormant-Bud Swell Application of Sulforix/ Lime Sulfur Can Aid Suppression of Twig Blight

Treatment and Rate/A	Application timing*	Mummy berry fruit infection 24 May		Phomopsis twig blight		Fruit rots for all harvest dates combined	
		Number of mummies per bush	Yield loss at 1st harvest (%)	Yield loss (%)	Ripe rot (%)	Phomopsis rot (%)	
Untreated check	--	69 ns	19.9 a**	49.0 a	2.3 ab	15.1 a	
Sulforix 1 gal	1	52	13.7 ab	24.6 b	1.2 b	16.6 a	
Indar 75 WSP 2 oz Captan 50 WP 4 lb	1, 2, 4, 5 3	42	7.8 b	15.1 c	3.3 a	13.6 a	
Sulforix 2 qt	1, 2, 3, 4, 5	64	10.6 b	28.3 b	3.3 a	8.9 b	

Cline *et al.* 2004
(cv. 'Harrison' North Carolina)



3) PRE-BLOOM-BLOOM-PETAL FALL



- Flower Thrips



- 1 = no visible swelling, bud scales completely enclose the flowers;
2 = visible swelling of bud, scales separating, flowers still completely enclosed;
3 = bud scales separated, apices of flowers visible;
4 = individual flowers distinguishable, bud scales abscised;
5 = individual flowers distinctly separated, corollas elongated but closed;
6 = corollas completely expanded and open;
7 = corollas dropped. Adapted from J. M. Spiers, 1978, J. Amer. Soc. Hort. Sci. 103 (4): 452-454.





**Flower Thrips are Primarily a Rabbiteye Pest
Often Very Injurious in Dry Springs
Blueberries are Pollination Sensitive**

**Sample by Bagging Bloom Clusters 2-3Xs/Week > Stage 4
Adults & nymphs rasping and sucking mouthparts
Feed on style, filaments, anthers & developing fruit
Protected by feeding within blooms**

Injury Symptoms:

distorted berries

flower & fruit abortion

puncture wounds on ovary



Sample beginning with Stage 4 to 5 by placing bloom clusters in sealed bags to drive thrips from blooms

**< 2/bloom OK, > 2/bloom sample twice a week,
> 6/bloom quite injurious**

Surround 1 or 2 Xs early, then alternate between Entrust & Surround

3) BLOOM



- Mummy berry
- Botrytis blossom blight

Mummy Berry Suppression With Biofungicides

- Open bloom only infection court leading to fruit mummification
- Pre-bloom sprays often not needed, except in early-leafing cultivars (e.g., Brightwell)
- Start at 10% bloom and continue through 85-90% cumulative bloom every 7 days
- Stopping too early generally worse than starting too late

Mummy Berry Suppression With Biofungicides

Product	State and year	Blueberry cultivar and type	Disease pressure		Rel. disease reduction (%)	
			Blight	Mummies	Blight	Mummies
Citrex	GA 2005	Brightwell (R)	Low	Moderate	n.s.	n.s.
	GA 2005	Tifblue (R)	Low	Moderate	n.s.	n.s.
	MI 2005	Rubel (H)	Very low	Very low	n.s.	n.s.
	MI 2004	Jersey (H)	Very low	Low	57.5	66.1
Sulforix	MI 2005	Jersey (H)	Low	Low	82.7	n.s.
	MI 2004	Jersey (H)	Very low	Low	38.9	n.s.
	MI 2004	Jersey (H)	Very low	Low	68.1	n.s.
	NC 2004	Harrison (H)	...	High	...	n.s.
	NC 2004	Harrison (H)	...	High	...	n.s.
Serenade	MI 2005	Rubel (H)	Very low	Very low	94.7	n.s.
	GA 2004	Brightwell (R)	Very low	Moderate	n.s.	58.7
	MI 2003	Jersey (H)	Very low	Low	n.s.	45.2
	MI 2002	Jersey (H)	High	Very high	32.6	47.7
	MI 2001	Jersey (H)	High	High	n.s.	n.s.
	MI 2000	Rubel (H)	Moderate	High	56.1	53.4

Source: various issues of *Fungicide & Nematicide Tests*

4) COVER & POST HARVEST SPRAY PERIODS



- **Cranberry Fruitworm** - shortly after fruit set, seldom important
- **Yellow Necked Caterpillars** - post harvest
- **Blueberry Bud Mite** - post harvest, a propagation-linked pest
- **Leaf & Flea Beetles** - protect young plants, especially terminal growth
- **Leaf Diseases** - prevent premature defoliation



Yellow Necked Caterpillars

Produce Localized Defoliation in Late Summer

Seldom Produce Yield Loss in Mature Rabbiteyes

**Can Delay Canopy Filling In Young Orchards which
Reduces Early Yields**

**Organic Control Options: Prune Out Infested Branches,
Asa-Direct, Entrust,**

***Bacillus thuringiensis* (Deliver, Javelin, XenTari)**



Blueberry Bud Mite (BBBM) appears to be a propagation-linked pest

**Do not propagate from bushes which might have BBBM
Vigorous Hedging Post-Harvest, followed by 2 Dilute,
Verdant Oil Applications should offer Substantial Control in
BBBM Infested Blocks**



Flea/Leaf Beetles are most damaging when feeding damages terminal growth. Mature Rabbiteye bushes are little impacted by flea beetles, however, early bearing of young rabbiteyes, or especially southern highbush, can be severely delayed by beetles. Treat as needed with Entrust.

Septoria



AFTER-HARVEST LEAF DISEASE CONTROL

- Minimize premature leaf drop
- Optimize flower bud set and return bloom

Gloeosporium



Rust



J. Clark

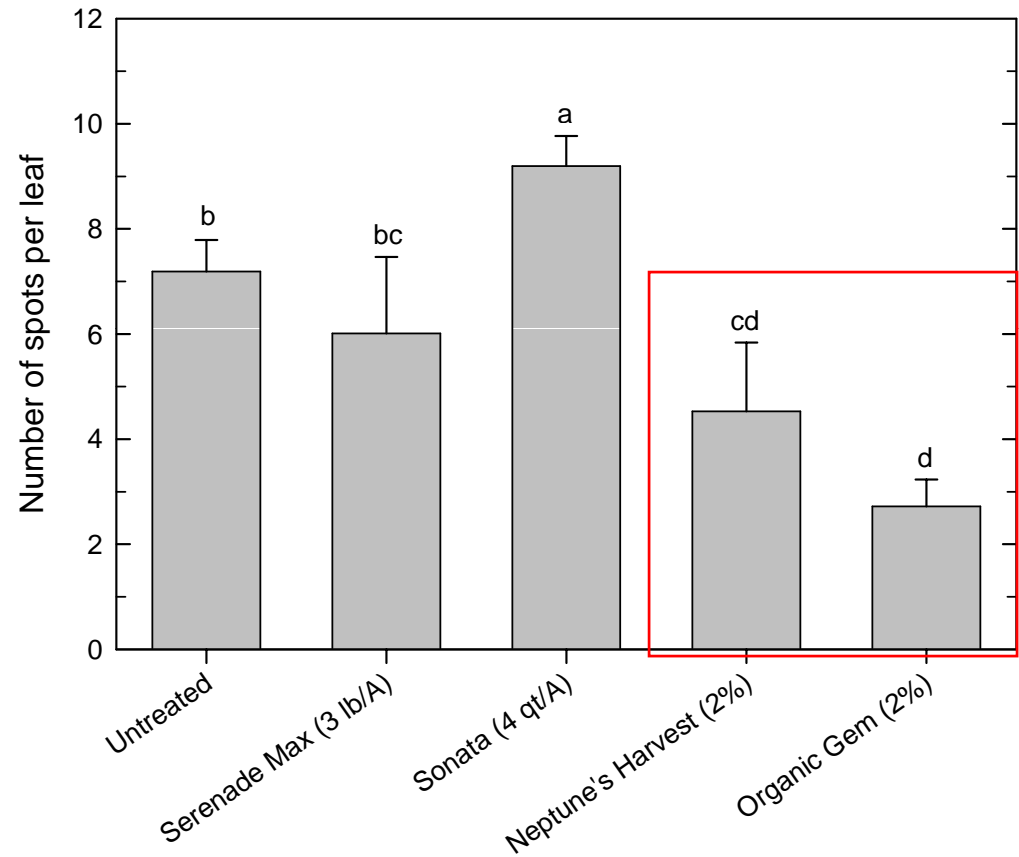
Host Resistance = First Line of Defense

(ranking based on 2002-03 leaf spot survey)

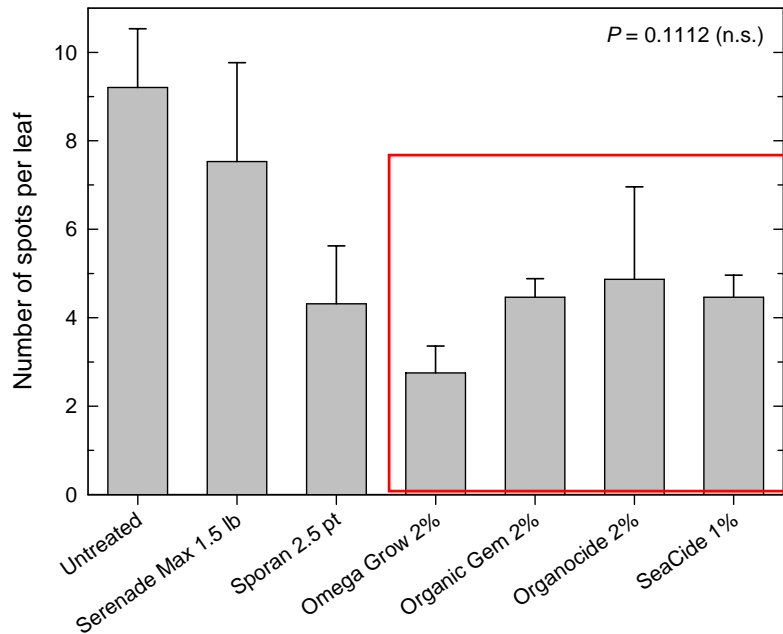
- Powderblue
 - Lowest level of foliar diseases overall
- Climax
 - Little **Septoria**, but some **rust** in wet years
- Premier & Tifblue
 - Intermediate disease levels overall
- Brightwell
 - Often high levels of **Septoria** and/or **Gloeosporium**
- Delite
 - Extreme **rust** susceptibility

SUMMER SPRAYS OF BIOFUNGICIDES

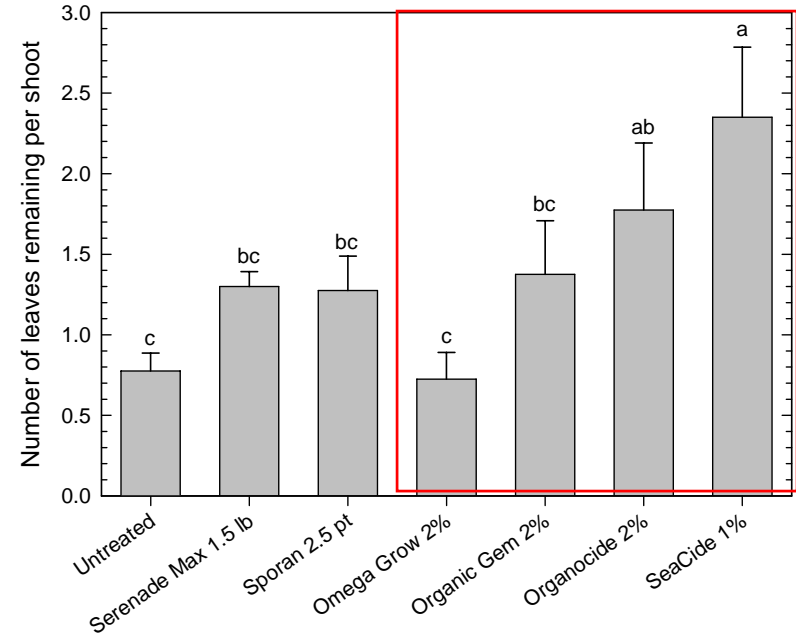
- 2007 trial in Appling County
- Septoria leaf spot on Brightwell
- 4 applications, 8/24 through 10/8
- **Fish oils** (Organic Gem, Neptune's Harvest) significantly lowered leaf spot severity



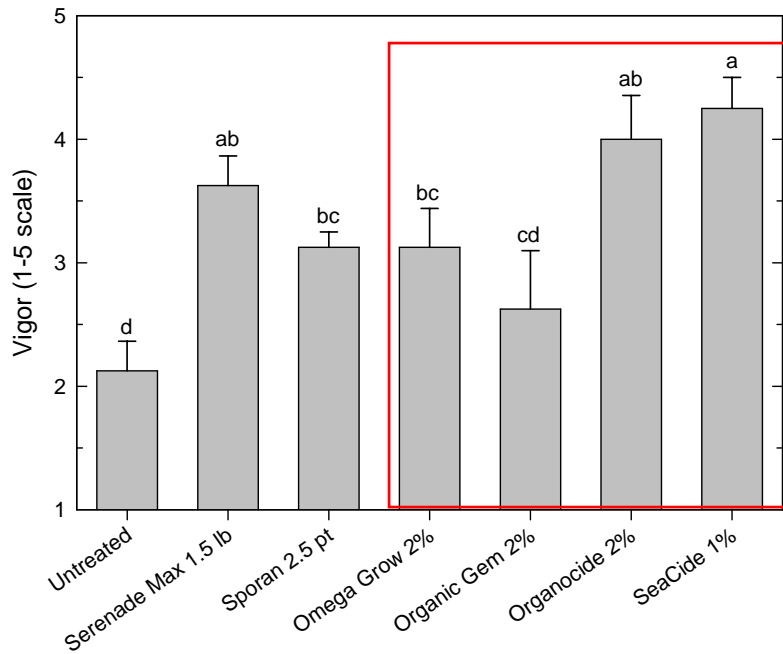
SEPTORIA (29 OCT. 2009)



LEAF RETENTION (4 DEC. 2009)



VIGOR RATING (29 OCT. 2009)



- 2009 trial in Appling County
- Septoria leaf spot on Brightwell
- 6 applications, 7/28 through 10/7
- **Fish oils** (SeaCide, Organocide) significantly improved vigor and leaf retention

CONCLUSIONS - DISEASES



- **Before planting:**
 - Cultivar selection (leaf spot resistance)
- **Dormant:**
 - Prune out dead wood (twig blight), soil cultivation and mulching (mummy berry)
- **Delayed-dormant and pre-bloom:**
 - OMRI-listed lime sulfur/ sulfurix (twig blight?)
- **Bloom:**
 - Mummy berry and Botrytis (Serenade Biofungicide)
- **After-harvest:**
 - Fish products to suppress leaf diseases and defoliation