# Pesticide Applicator Training Program: Insect Pests on Vegetables & Fruit



#### Celeste Welty Extension Entomologist November 2019



# **Insect Management News**

- Products
  - -New products
  - –Expanded uses
  - Modified uses
- Pests
  - -New invasive pests
  - -2 old pests

# new: Inscalis = common name of a.i.

- Products
  - -Versys
  - -Sefina
- a.i. = afidopyropen
- Group 9D
  - Affect feeding of aphids & relatives
    Related to Fulfill (9B), Beleaf (9C)
- From BASF
- October 2018

## new: Versys

- 0.83 DC (dispersible concentrate)
- Pests
  - -Aphids (low rate)
  - -Whiteflies (high rate)
- Veg Crops, 0-day PHI
  - Cabbage & other Brassica head/stem veg.
  - Celery & other leaf petiole veg
  - Lettuces & other leafy vegetables
- Fruit Crops, 7-day PHI
  - Pome fruit
  - Stone fruit



## new: Sefina

- 0.42 DC (dispersible concentrate)
- Pests
  - -Aphids (low rate)
  - -Whiteflies (high rate)
- Crops
  - -Cucurbits (0-day PHI)
  - Tomato, peppers, & other fruiting vegetables (0-day PHI)

# **Sefina**<sup>®</sup>

Insecticide Powered by Inscalis

#### new: PQZ

- a.i. = pyrifluquinazon
- Group 9B
  - -Closely related to Fulfill (9B)
  - -Related to Beleaf (9C)
- Aphids, whiteflies, leafhoppers
- From Nichino America
- August 2018



## **PQZ: registered uses**

Site	PHI
Brassica head & stem	1 day
Cucurbits	1 day
Fruiting veg	1 day
Leafy petiole veg	1 day
Leafy veg	1 day
Tuber & corm veg	14 days
Pome fruit	14 days
Stone fruit	7 days
Grapes	3 days

#### **Highlights of previous 3 years**

- Harvanta (2017)
- Sivanto (2015 & 2016)

### new: Harvanta

- A.I.: cyclaniliprole
- IRAC group 28 (diamides)
   Related to Coragen & Altacor
- Formulation: 50SL
- 50 grams/liter = 0.42 lb a.i./gal
- By Summit Agro USA
- Federal label: September 2017



#### Harvanta

Year	Crop	PHI, in days	Target
2017	Leafy veg.	1	caterpillars,
	Brassica	1	flea beetles,
	Fruiting veg.	1	cucumber beetle,
	Cucurbits	1	Col. potato beetle, Japanese beetle,
2019	potato & tuber/corm	7	whiteflies, some thrips,
	strawberry	1	some aphids

## new: Sivanto Prime

- A.I.: flupyradifurone
- IRAC group 4D (butenolides)
   'cousin' to neonicotinoids (4A)
- Systemic action
- Liquid: 1.67 lbs a.i./gal
- Federal label: January 2015
- New uses: Sept. 2016
- By Bayer



## Sivanto on veg crops

Target:

leafhoppers

aphids

- whiteflies
- squash bug

Colorado
 potato beetle

Crop	PHI (days)		
	foliar	soil	
Brassica head & leafy	1	21	
Cucurbits	1	21	
Fruiting veg.	1	45	
Leafy veg.	1	21	
Legumes	7	-	
Root veg.	7	-	
Tuber/corm veg.	7	-	

# Sivanto on fruit crops

#### Target:

- leafhoppers
- aphids
- San Jose scale
- pear psylla
- blueberry thrips
- blueberry maggot

new

Crop	PHI (days)		
	foliar	soil	
Blueberry	3	-	
Strawberry	0	-	
Grape	0	30	
Apples, pears	14	-	
Hops	21	-	
<b>Peaches</b>	14		
1 Brambles	0		

# **Expanded uses**

#### Products with registration expanded to additional crops

## expanded: sulfoxaflor

Products:

 Closer SC
 Transform WG



- Group 4C (related to neo-nics)
- Since July 2019, allowed again on: – cucurbits
  - -strawberry
- These uses had been cancelled in 2016
- Pests:
  - Controls aphids, whiteflies, plant bugs
  - Suppresses thrips
- From Corteva

# expanded: Magister SC

- a.i. = fenazaquin
- Group 21 (related to Portal, Nexter)
- Pests:
  - -Two-spotted spider mite
  - –Rust mites
  - -Whiteflies
  - -Psyllids
- From Gowan



- Was allowed on cherry & hops
- As of April 2019, more crops

### expanded: Magister SC

New crops	PHI, in days
Cucurbits	3
Fruiting vegetables	3
Legumes	7
Pome fruit	7
Stone fruit	7
Blueberries	7
Caneberries	7
Strawberries	1
Grapes	7

# a.i.: tolfenpyrad products: Torac & Apta

- Group 21A (related to Portal, Nexter)
- Changes 2019 & 2018
- From Nichino America



## expanded: Torac SC

Registered	Сгор	PHI, in days
2014	Leafy veg	1
	Brassica head & stem	
	Brassica leafy	1
2018	Fruiting veg	1
	Potatoes (E. of Miss.)	14
	Cucurbits	1
2010	Onions & bulbs	7
2019	Celery & leaf petiole	1

## expanded: Torac SC

- Low rate:
  - Leafhoppers
  - Colorado potato beetle
  - Broad mite
- Medium rate:
  - Aphids
  - Diamondback moth
  - Flea beetles
  - Pepper weevil
  - Lygus plant bug
- High rate:
  - Thrips 🔺
  - Cabbage maggot

## expanded: Apta SC

Registered	Сгор	PHI, in	
		days	
2015	Stone fruit	14	
2018	Pome fruit	14	
	Strawberries	1	
2019	Raspberries	1	Supplemental
	Blueberries	3	

## expanded: Apta SC

#### • Low rate:

- leafhoppers
- cherry fruit fly
- Medium rate:
  - aphids
- High rate:
  - thrips 🔺
  - plant bug
  - plum curculio
  - pear psylla
  - pear rust mite
  - apple maggot
  - leafrollers

#### expanded (2017): Agri-Mek SC for mite & leafminer control

New crops	Pre-harvest interval (PHI), in days
Caneberries	7
Sweet corn	7
Succulent beans	7
Greenhouse tomato	1
Green onions	7



# Products with modified uses

# **Delegate WG**

- a.i. = spinetoram
- Group 5 (related to Radiant)
- For peach
  - -PHI reduced from 14 days to 1 day
- For plum
  - -PHI reduced from 7 days to 1 day
- From Corteva (Dow)



## **Entrust SC**

- a.i. = spinosad
- Group 5 (related to Radiant)
- For blueberries & other bushberries

   Add suppression spotted-wing Drosophila
   PHI reduced from 3 days to 1 day
- For peach
  - PHI reduced from 14 days to 1 day
- For plum

- PHI reduced from 7 days to 1 day

From Corteva (Dow)



### Assail 30SG

- a.i. = acetamiprid
- Group 4A (related to Admire)
- For grapes
  - -PHI reduced from 7 days to 3 days
- From UPI



# Belay

- a.i. = clothianidin
- Since April 2017:
- No longer for tomato, peppers,
   & other fruiting veg.
- Additional restrictions:
  - -cucurbits
  - -potato
  - -grapes



## Pests of recent concern

- Potential pest:
  - -Spotted lanternfly
- New pests:
  - -Brown marmorated stink bug
  - -Spotted-wing Drosophila
- Old pests:
  - -Thrips
  - -Corn earworm

# Potential pest of fruit crops in Ohio: Spotted lanternfly



# **Spotted lanternfly**



- 1" long
- A planthopper
- Sucks sap
- Poor flier
- Strong jumper

# Spotted lanternfly: hosts

- Feeds on:
  - -Grape
  - -Apple
  - -Cherry
  - -Hops
- Key host in fall: – Tree of Heaven
- Congregate on trunk at base





# Spotted lanternfly: damage

- Weeping wounds of sap on bark
- Excrete large amounts of fluid
- Mold grows on sweet fluid









# Spotted lanternfly: spread?

- In SE Pennsylvania since 2014
  - –Now in 15 counties
- Established:
  - Delaware (Nov. 2017)
  - –Virginia (Jan. 2018)
  - -New Jersey (July 2018)
- Detections:
  - -New York (Nov. 2017) Maryland (Oct. 2018)
  - -Maryland (Oct. 2018)



# Spotted lanternfly: where to look?

- In evening or night: on trunk
- In day: at base of plant
- Eggs: on smooth surfaces (bark, brick, stone, dead plant tissue)

# **Spotted lanternfly: Ohio?**

- Any sightings or suspicions?
  - Please let us know!
  - Me
  - or
  - Your OSU county extension educator
  - or
  - OSU Dept. of Entomology
  - or
  - Ohio Dept. of Agriculture

## Brown marmorated stink bug









- Attacks fruits & seed pods
- Invading Ohio since 2007



#### Insecticides for stink bug

Product	Apple		Peach		Raspberry	
	PHI	Limit	PHI	Limit	PHI	Limit
Brigade, Hero	-	-	-	-	3	2-4 ap.
Danitol	14	2-4 ap.	3	2-4 ap.	3	2-3 ap.
Baythroid	7	1 ap.	7	2 ap.	-	-
permethrin	Not after petal-fall	2 ap.	14	3 ар.	-	-
Venom	-	-	3	1-2 ap.	-	-
Belay	7	1 ap.	21	2 ap.	-	-
Assail	7	4 ap.	7	4 ap.	1	5 ap.
Actara	35	3 ар.	14	2 ap.	3	2-3 ар.
Lannate	14	5 ap.	4	6 ap.	-	-

# A new pest of fruit crops in Ohio: Spotted wing Drosophila

- Invading Ohio since 2011
- Looks like common vinegar flies on overripe, fallen, decaying fruit



- The new species attacks <u>healthy</u> ripening fruit
- Larvae feed inside fruit

Photo by G. Arakeliar

# Insecticide choices for SWD

Category	Product
Most effective	a diamide: Exirel
	spinosyns: Delegate, Radiant Entrust [OMRI]
	organophosphates: Imidan, Diazinon, Malathion
	pyrethroids: Mustang Maxx, Brigade, Pounce, Hero, Danitol, Baythroid, Warrior, Asana
	a carbamate: Lannate
Moderat- ely eff.	a neonicotinoid: Assail a carbamate: Sevin
Slightly effective	Grandevo [OMRI], Pyganic [OMRI]

#### **Beware of number of sprays allowed** Example: raspberries

Product	Pre-harvest interval	Maximum number of applications allowed (if used at max rate)
Delegate	1 day	3
Mustang Maxx	1 day	6
Malathion	1 day	3
Entrust [OMRI]	1 day	4
Brigade	3 days	2
Danitol	3 days	2
Hero	3 days	2

# **Revisit an old pest: Thrips**

- Eastern flower thrips – Strawberry
- Western flower thrips

   Greenhouse & high tunnel
- Onion thrips
  - Onion
  - Cabbage







# Thrips



- Small (1/16" long)
- Narrow oblong body
- Yellow-brown
- Active; run fast
- Weak fliers



2. First and second larval instars plus adult of western flower thrips.

Older larva Younger larva

adult

# Eastern flower thrips: injury on strawberry

- Berries dull color
- Berries small, seedy, fail to enlarge or ripen



Uneven maturity



### Eastern flower thrips: insecticides for strawberry



Thrips control	Thrips suppression	Thrips not listed on strawberry label but listed for thrips control on other crops
Apta	Closer	Admire
Assail	Exirel	Brigade
Entrust #	Transform	Danitol
Neemix # & Aza-Direct #		Harvanta
Radiant		Lorsban
Sivanto		

**# OMRI-listed** 

## Flower thrips on tomato



Figure 8. Thrips egg-laying scars on tomato

## Flower thrips on pepper



Figure 5. Thrips feeding damage on pepper leaves.

Figure 7. Egg-laying scars and feeding damage on sweet pepper.

## Flower thrips on cucumber



Figure 4. Thrips feeding damage on cucumber leaves.



# **Thrips:**



#### insecticides for pepper & tomato

control	suppression	Thrips not listed for pepper, tomato
Assail #	Closer #	Admire
Brigade, Warrior	Exirel	Lannate
Entrust ##	Harvanta #	
Neemix # & Aza-Direct #	Movento #	
Radiant #	Sivanto #	
Torac	Transform #	
Venom	Baythroid, Mustang Maxx	
Vydate		

**# OMRI listed # not allowed in greenhouse or high tunnel** 

# **Onion thrips**

#### on onion





#### on cabbage





# Onion thrips: insecticides for onion

control	suppression		
Admire	Entrust #		
Assail	Exirel		
Lannate	Transform		
Movento			
Neemix # & Aza-Direct #			
Radiant			
Torac			
<b>Mustang Maxx &amp; Warrior</b>			
Venom			



**# OMRI listed** 

# Onion thrips: insecticides for cabbage



control	suppression	thrips not on cabbage label
Admire	Closer	Lannate
Assail	Exirel	Sivanto
Baythroid	Harvanta	Venom
Brigade	Movento	
Entrust #	Warrior	
Mustang Maxx		
Neemix # & Aza-Direct #		
Radiant		
Torac		

# Revisit an old pest: Corn Earworm Tomato Fruitworm





- One species
- Two key host plants

# Corn earworm on sweet corn: pyrethroid resistance?

- Field trials 2007-2015 & 2018
- Clark County in SW Ohio
- Start spray program at 1<sup>st</sup> silk
- 6 sprays at 3- to 4-day intervals



#### Year-to-year differences in damage



# Decisions on insecticide for control of corn earworm during silking



- When to apply first spray?
- How often to spray?
- How to get adequate coverage?
- & What product to spray?

# Spray Coverage

Direct spray to ear zone
Drop nozzles helpful



## **Corn earworm: behavior**

![](_page_58_Picture_1.jpeg)

- Moths migratory from South
- Arrival time varies, usually August
- Eggs laid on corn silk
- Eggs hatch in 48 hrs

# Trap to Monitor Corn Earworm

- Pheromone lure
- Attracts male moths
- Highly effective

![](_page_59_Picture_4.jpeg)

![](_page_59_Picture_5.jpeg)

![](_page_59_Picture_6.jpeg)

#### **Corn Earworm Insecticide Spray Schedule**

Number moths	Spray interval		
per pheromone trap per day	Maximum daily temp. <80 F	Maximum daily temp. >80 F	
< 0.2	No spray	No spray	
0.2 - 0.5	Every 6 days	Every 5 days	
0.5 - 1	Every 5 days	Every 4 days	
1 - 13	Every 4 days	Every 3 days	
>13	Every 3 days	Every 2 days	

![](_page_61_Figure_0.jpeg)

# Timing of first spray

- Depends on pest pressure
- Spray when 25-50% of plants show silk if moth catch is high
- Spray when 50-75% of plants show silk if moth catch is low

#### Conclusions from 10 years of field trial data

#### 1) pyrethoids still fine in some years

- when trap catch low-moderate
- but max rate needed

#### 2) new a.i.s are alternatives

- Coragen & Besiege
- Radiant
- Blackhawk

# 3) Concern about variability in performance of new a.i.s

- but whole-field better than small plot

- 4) Confirms utility of traps
  - to track trends in moth populations
  - in deciding spray schedule

# **Tomato Fruitworm**

#### Host preference

- Prefers corn more than tomato
- Uses tomato when corn too dry
- Prefers green fruit over red
- Also bell peppers, lettuce, beans, potatoes, cole crops, cucurbits, & weeds
- Larvae often feed on 1 fruit for short time then move to another fruit
- Damage in fruit: deep wet cavities
- Eggs usually laid on leaf below highest flower cluster

![](_page_64_Picture_9.jpeg)

# **Tomato Fruitworm**

![](_page_65_Picture_1.jpeg)

- Alternatives to pyrethroids
  - -Avaunt
  - -Coragen
  - -Exirel
  - –Intrepid
  - -Lannate
  - -Radiant
  - -Rimon
  - -Sevin

# Problem in 2019 with earworm/fruitworm?

- Moth flight much <u>earlier</u> than usual
- Large catches in late May, led to local generation
- Large catches in August & September from migration + local

### Additional info on corn earworm

- Website:
  - u.osu.edu/pestmanagement/
- Trap reports for Ohio locations
- How to use pheromone traps
- Suppliers of traps and lures
- Reports on field trials with various older and newer a.i.s

# **On-line trap reports**

#### u.osu.edu/pestmanagement/

CORN EARWOR	M: NUMB	ER OF MO	JTHS CA		TRAPS, S
County:	Clark	Clark	Franklin	Franklin	Wayne
Location:	South Charleston	Springfield	Columbus	Columbus	Andy Yoder
Trap type:	Hartstack	Scentry "Heliothis"	Hartstack	Scentry "Heliothis" ;;	Scentry "Heliothis"
Date					
May 6-12			set	set	
May 13-19			3	1	
May 20-26			1	1	
May 27-June 2	set		4	1	
June 3-9	3		8	0	
June 10-16	4	set	7	0	
June 17-23	11	0	1	1	set
June 24-30	1	1	6	0	3
July 1-7	3	0	5	0	1
July 8-14	18	0	0	0	1
July 15-21	1	0	3	0	0
July 22-28	1	0	28	2	11
July 29-Aug 4	1	0	23	0	3
August 5-11	800	2	476	57	2

#### CORN EARWORM: NUMBER OF MOTHS CAUGHT IN T County: Clark Clark Franklin Franklin South Location: Charleston Springfield Columbus Columbus Scentry Scentry Trap type: "Heliothis" Hartstack Hartstack "Heliothis" Date May 5-11 May 19-25 set (set 5/22) (set 5/22) May 26-June 1 59 120 63 June 2-8 138 161 32 June 9-15 11 Set 35 3 June 16-22 4 0 21 0 June 23-29 56 125 1 6 June 30-July 6 135 0 85 13 July 7-13 25 0 7 1 July 14-20 1 44 5 12 July 21-27 51 1 21 0 July 28-Aug 3 13 0 4 1 August 4-10 2 1 9 0 August 11-17

36

555

August 18-24

2

1

12

43

2

7

#### the end

![](_page_69_Picture_1.jpeg)

#### Info on fruit & veg. pests u.osu.edu/pestmanagement

#### Questions? e-mail: welty.1@osu.edu office phone: 614 292 2803