

# Minimizing the Impact of Pesticides on Pollinators

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NC Cooperative Extension,  
Chatham County Center



# When pesticides must be used, impact can be minimized by:

- Understanding pesticide exposure and toxicity
- Reading pesticide labeling
- Using less toxic products
- Timing sprays to minimize exposure
- Managing drift



# Pesticides and Pollinators

- **Acute Toxicity**  
“lethal effects” = immediate death or death within a few hours of exposure
- **Chronic Exposure**  
“sublethal effects” = exposure to sublethal levels over extended period can impair foraging ability, reduce fertility, increase disease susceptibility



Mass bee death due to  
improper insecticide  
application

# Acute toxicity can occur from:

- **Direct exposure** during application
- **Residues** picked up through foraging (pollen and nectar) and taken back to the hive
- **Residues** from non-target plants (ground cover, weeds, etc.)



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# EPA Pesticide Toxicity Groups: **Acute Toxicity to Honey Bees**

- **Category 1: “Highly Toxic to Bees”**
  - The Acute Contact LD<sub>50</sub> is less than or equal to 2 micrograms per bee
- **Category 2: “Toxic to Bees”**
  - LD<sub>50</sub> is less than 11 but greater than 2 micrograms per bee
- **Category 3: “Relatively Nontoxic”**
  - LD<sub>50</sub> of the pesticide is greater than 11 micrograms per bee; **no bee caution statement is required on the label**

Category 1 & 2 known as “Pollinator Toxic Pesticides”, PTP’s

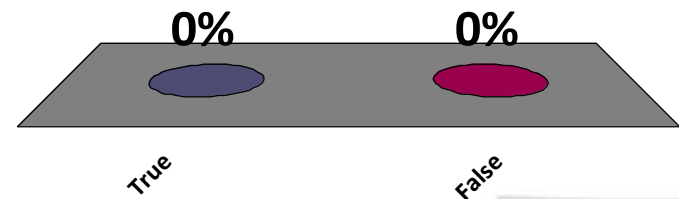
# Acute Toxicity

- Levels are based on **honey bees**, not native bee species
- Many native bees are smaller than honey bees
- Potential for native bees to be harmed at lower levels



# Most pesticides are relatively non-toxic to honey bees

- ✓ A. True
- B. False



# Pesticides Include:

- **Insecticides** – kill insects
- **Miticides** – kill mites
- **Herbicides** – kill plants
- **Fungicides** – control pathogens

Majority of **pesticides** are  
“relatively nontoxic” to bees



# Insecticides

- **Most are toxic to bees**
- For most insecticides, bees are more sensitive than pest insects
- Honeybee genome has **less genes for pesticide detoxification** compared to other insects



# Herbicides and Fungicides

- **Most are “relatively nontoxic” to bees, including:**
  - Glyphosate (Roundup and generics)
  - 2,4-D, Dicamba
- Impact on pollinators is from **loss of forage**
  - “Weeds” provide important forage throughout the year



# Acute Toxicity Ratings

## Highly Toxic

- **Severe bee losses expected if used:**
  - **when bees present**
  - **Bees forage in treated area within a day after application**
  - **applied near hives**

## Moderately Toxic

- Can be used in vicinity of bees if:
  - **Dosage, timing, and method of application are correct**
- **Should never be applied directly to bees in field or hive**

## Relatively Nontoxic

- Can be used around bees with a minimum of injury if:
  - **Dosage, timing, and method of application are correct**
- **Never apply directly to beehive**



# Another type of toxicity:

## **Extended Residual Toxicity (ERT)**

Compounds that remain toxic to bees for an **extended** period of time **(8 hrs +)** following **foliar applications** are referred to as **Extended Residual Toxicity or ERT**



**ERT pesticides may not be applied to blooming crops or weeds.**



# Minimizing Impact

Most bee poisoning incidents occur when insecticides that are **highly toxic** to bees and that have **extended residual toxicity** are applied to bee-pollinated plants during the bloom period.



# Insecticides With Extended Residual Toxicity

Families of insecticides most commonly associated with ERT include:

- **Organophosphates** (e.g. malathion, chlorpyrifos, acephate, “Orthene”)
- **Carbamates** (e.g., carbaryl, “Sevin”)

**Newer Chemistries:**

- **Neonicotinoids, Pyrethroids**



# Insecticides with ERT:

## Pyrethroids

- **Active ingredients end in “thrin”**
  - Bifenthrin, Permethrin, Cyfluthrin
- **Brands:** Astro, Talstar, Onyx, Ambush, Pounce, Asana . . .
- **Broad spectrum contact insecticides**, harsh on beneficial insects, highly toxic to bees



Pyrethroids are synthetic versions of natural pyrethrins, derived from a species of Chrysanthemum

# Insecticides with ERT: Neonicotinoids



OREGONLIVE  
The Oregonian

## Bee deaths a result of pesticide Safari; count upped to 50,000 dead insects



WILSONVILLE, OREGON – June 18, 2013 – A dead bumblebee clings to a linden tree in a Wilsonville parking lot. The Oregon Department of Agriculture suspects they were killed by improper application of pesticide. Motoya Nakamura/The Oregonian

# Insecticides with ERT: Neonicotinoids

- **Imidacloprid** – Merit, Admire, Gaucho, generics, many homeowner products
  - Most widely used insecticide in the world
- **Dinotefuran** – Safari, Venom
- **Acetamiprid** – TriStar, Assail
- **Thiamethoxam** – Flagship, Cruiser, Platinum and more
- **Clothianidin** – Arena, Clutch

Control most sap feeding insects (scale, aphids, whitefly) and leaf feeding beetles  
DO NOT control caterpillars or ambrosia beetle borers



# Neonicotinoids

- All are moderately or highly toxic– **acute toxicity**
- **Systemic:**  
Transported to all parts of plant, including pollen and nectar – **chronic exposure**



Consumer concern has led some retailers to stop sales of plants treated with neonics.

With so many brand names, how do you know what you are



**BAYER**  
**ADVANCED**

**12 Month**



Active Ingredients:  
Imidacloprid .....2.94%  
Other Ingredients ..... 97.06%  
Total 100.00%

• Prevents new infestations

Active Ingredients:  
Imidacloprid .....2.94%  
Other Ingredients ..... 97.06%  
Total 100.00%

KEEP OUT OF REACH OF CHILDREN

**CAUTION** See back panel for additional precautionary statements

Not for sale into distribution and/or use in Nassau, Suffolk, Kings, and Queens counties of New York



NET CONTENTS 1GAL (3.78L)

# What else can the label tell you?

- **Acute toxicity:**
  - “Highly toxic to bees”
  - “Toxic to bees”
  - **If no bee caution,**  
“relatively nontoxic”
- **Found in:**
  - **Environmental Hazard Statement**
  - Directions for Use

## Sevin® 80 WSP

CARBARYL INSECTICIDE

### ENVIRONMENTAL HAZARDS

**BEE CAUTION: MAY KILL HONEYBEES IN SUBSTANTIAL NUMBERS.**

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area. Contact your Cooperative Agricultural Extension Service or your local Bayer Environmental Science representative for further information.



# If there is residual toxicity

- **If NO:** “Actively visiting the treatment area”
  - Refers to bees you see on plants
- **If YES:** “Visiting the treatment area”
  - Refers to bees that may visit the plants after treatment
- “Visiting” replaced with **“FORAGING”** on newer labels

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# Foraging/Visiting

- Honey bees forage **2-4 miles** from hive, **temps over 55°F**
- **Native bees** typically forage **less than 1 mile** from nest; capable of foraging at lower temperatures
- From **sun-up to sun-down**



**If flowers are present,  
assume pollinators are foraging!**



# Pesticide Labeling

- As long as you know **what words to look for**, you can determine the relative toxicity of a pesticide to honey bees
- **READ THE LABELS**
- **Compare products**
  - Choose least toxic option



Toxicity Group	If <b>Extended Residual</b> Toxicity	If NO Extended Residual Toxicity
<b>I = Highly Toxic</b>	This product is <b>highly toxic</b> to bees exposed to <b>direct treatment or residues</b> on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are <b>visiting</b> the treatment area.	This product is <b>highly toxic</b> to bees exposed to <b>direct treatment</b> on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are <b>actively visiting</b> the treatment area.
<b>II = Toxic</b>	This product is <b>toxic</b> to bees exposed to <b>direct treatment or residues</b> on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are <b>visiting</b> the treatment area.	This product is <b>toxic</b> to bees exposed to <b>direct treatment</b> on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are <b>actively visiting</b> the treatment area.
<b>III = Relatively Nontoxic</b> – No bee caution required		

# New Labeling: Neonicotinoids

- **If contain:**
  - Clothianidin,
  - dinotefuran,
  - imidacloprid
  - thiamethoxam
- And labeled for **outdoor foliar application**



## PROTECTION OF POLLINATORS

**APPLICATION RESTRICTIONS** EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.



Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

**This product can kill bees and other insect pollinators.**

Bees and other insect pollinators will forage on plants when they flower, shed pollen or produce nectar.

Bees and other insect pollinators can be exposed to this pesticide from:

- Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications.
- Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.

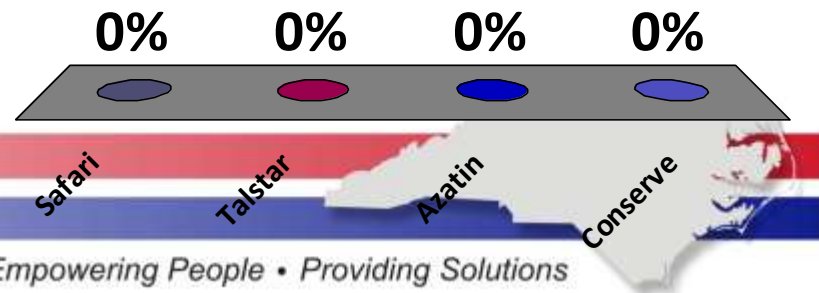
# Insecticide Labels

- **Safari**
  - **Talstar**
  - **Azatin**
  - **Conserve**
- Which is a neonic?
  - Which is relatively nontoxic to bees?
  - Which has ERT?
  - Which is toxic to bees but does not have extended residual toxicity?



# Which is a neonic?

- ✓ A. Safari
- B. Talstar
- C. Azatin
- D. Conserve



GROUP

4A

INSECTICIDE



# Safari®

20 SG INSECTICIDE



FOR FOLIAR AND SYSTEMIC INSECT CONTROL  
IN ORNAMENTAL PLANTS AND VEGETABLE  
TRANSPLANTS IN ENCLOSED STRUCTURES.  
FOR GREENHOUSE, NURSERY, INTERIOR PLANT-  
SCAPE AND OUTDOOR LANDSCAPE USE ONLY

Active Ingredient:

Dinotefuran, [N-methyl-N'-nitro-N''-  
((tetrahydro-3-furanyl)methyl)guanidine]..... 20%

Other Ingredients ..... 80%

Total: ..... 100%



## PROTECTION OF POLLINATORS

**APPLICATION RESTRICTIONS** EXIST  
FOR THIS PRODUCT BECAUSE  
OF RISK TO BEES AND OTHER  
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Bees and other insect pollinators will forage on  
plants when they flower, shed pollen or produce  
nectar.

Bees and other insect pollinators can be exposed  
to this pesticide from:

- Direct contact during foliar applications, or con-  
tact with residues on plant surfaces after foliar  
applications.
- Ingestion of residues in nectar and pollen when  
the pesticide is applied as a seed treatment, soil,  
tree injection, as well as foliar applications.

## PROTECTION OF POLLINATORS (continued)

When Using This Product Take Steps To:

- Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
- Minimize drift of this product onto beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives or off-site to pollinator attractive habitat can result in bee kills.

Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at: <http://pesticidestewardship.org/PollinatorProtection/Pages/default.aspx>.

Pesticide incidents (for example, bee kills) should immediately be reported to the State/Tribal lead agency. For contact information for your State, go to: [www.aapco.org/officials.html](http://www.aapco.org/officials.html). Pesticide incidents should also be reported to the National Pesticide Information Center at [www.npic.orst.edu](http://www.npic.orst.edu) or directly to EPA at: [beekill@epa.gov](mailto:beekill@epa.gov).

## DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

**READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH PRECAUTIONARY STATEMENTS AND DIRECTIONS, AND WITH APPLICABLE STATE AND FEDERAL REGULATIONS.**

**FOR COMMERCIALLY GROWN ORNAMENTALS NOT UNDER CONTRACT FOR POLLINATION SERVICES BUT ARE ATTRACTIVE TO POLLINATORS**



- Do not apply this product while bees are foraging.
- This product is toxic to bees exposed to residue for more than 38 hours following treatment.
- Do not apply this product to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period, unless the application is made in response to a public health emergency declared by appropriate state or federal authorities.

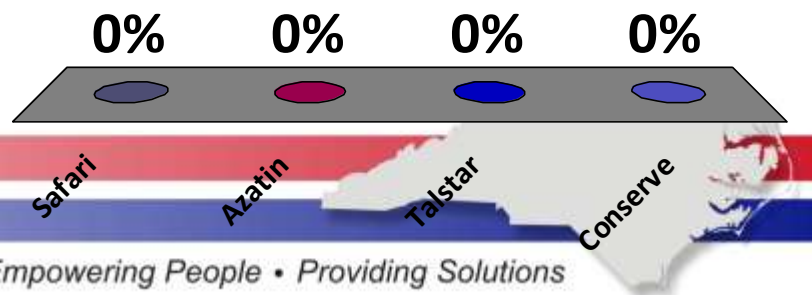


**Do not apply Safari® 20 SG Insecticide while bees are foraging. Do not apply Safari 20 SG Insecticide to plants that are flowering. Only apply after all flower petals have fallen off.**

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

# Which is relatively nontoxic to bees?

- A. Safari
- ✓ B. Azatin
- C. Talstar
- D. Conserve



# AZATIN<sup>®</sup> XL

BIOLOGICAL INSECTICIDE

SPECIMEN LABEL

FOR INDOOR AND OUTDOOR USE ON ORNAMENTALS, TURF, AND HORTICULTURAL CROPS  
INSECT GROWTH REGULATOR

**ACTIVE INGREDIENT:**

Azadirachtin\* ..... 3.0%

**OTHER INGREDIENTS:** ..... 97.0%

**TOTAL:** ..... 100.0%

\*Contains 0.265 pounds (120 grams) of azadirachtin per gallon.

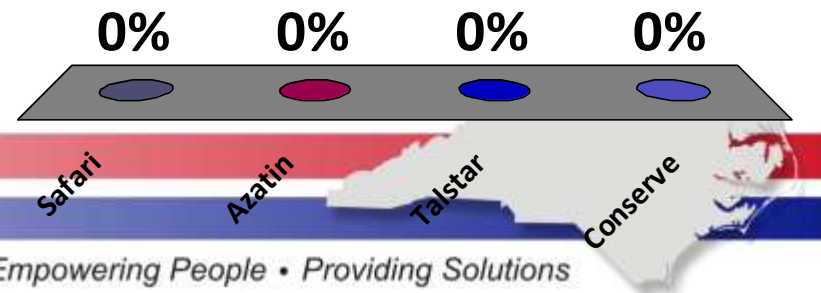
If you have questions or comments regarding the use of this product, please call 1-800-356-4647.

## ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic invertebrates. For Terrestrial Uses: Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Do not contaminate water when disposing of equipment washwaters or rinsate.

# Which has Extended Residual Toxicity (ERT)

- A. Safari
- B. Azatin
- ✓ C. Talstar
- D. Conserve



# Talstar®

## PROFESSIONAL

### INSECTICIDE

To control pests indoors and outdoors on residential, institutional, public, commercial, and industrial buildings, greenhouses, animal confinement facilities/livestock premises, kennels, food handling establishments, and lawns, ornamentals, parks, recreational areas and athletic fields.

When used as a termiticide, individuals/firms must be licensed by the state to apply termiticide products. States may have more restrictive requirements regarding qualifications of persons using this product. Consult the pest control regulatory agency of your state prior to use of this product.

Provides up to 1 month residual control of house flies  
Kills fleas for up to 3 months

EPA Reg. No. 279-3206	EPA Est. 279-NY-1
Active Ingredient:	By Wt.
Bifenthrin* .....	7.9%
Other Ingredients: .....	92.1%
	100.0%

## Environmental Hazards

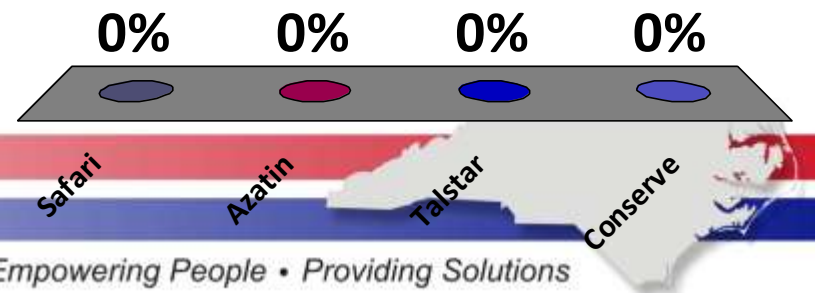
This pesticide is extremely toxic to fish and aquatic invertebrates. Drift and run-off from treated areas may be hazardous to aquatic organisms in neighboring areas. Care should be used when spraying to avoid fish and reptile pets in/around ornamental ponds.

To protect the environment, do not allow pesticide to enter or run off into storm drains, drainage ditches, gutters or surface waters. Applying this product in calm weather when rain is not predicted for the next 24 hours will help to ensure that wind or rain does not blow or wash pesticide off the treatment area. Rinsing application equipment over the treated area will help to avoid run off to water bodies or drainage systems.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow to drift to blooming crops if bees are visiting the treatment area.

# Which is toxic to bees but does not have extended residual toxicity?

- A. Safari
- B. Azatin
- C. Talstar
- ✓ D. Conserve





**Conserve<sup>®</sup> SC**

**Turf and  
Ornamental**

**Insect Control**

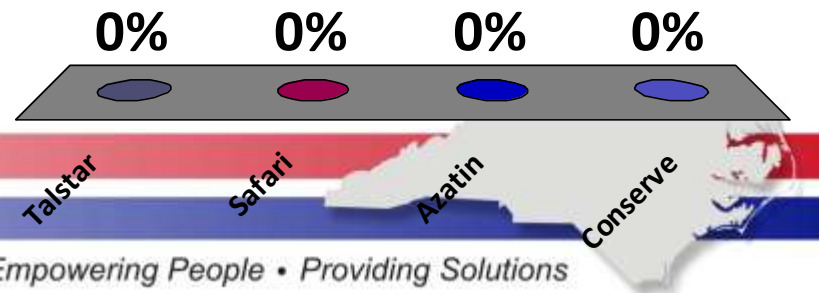
## **Environmental Hazards**

This product is toxic to bees exposed to treatment during the 3 hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. This product is toxic to aquatic invertebrates. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or when disposing of equipment washwaters. Do not apply where runoff is likely to occur. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Apply this product only as specified on the label.

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# Which could be applied to bee pollinated flowering plants?

- A. Talstar
- B. Safari
- ✓ C. Azatin
- D. Conserve



# Minimize Impact

**Identify pest** – if treatment necessary:

- **Identify all control options**
  - Cultural, mechanical, biological, chemical
  - Identify all products labeled for use
- Choose products that are **relatively nontoxic** if available
  - Check **environmental hazard statement** and **directions for use**
- **Time applications to avoid bee activity and minimize drift**



**Read and follow  
all directions!**

# Identify All Products

NC STATE UNIVERSITY

CAMPUS DIRECTORY | LIBRARIES | MYPACK PORTAL | CAMPUS MAP

NC STATE UNIVERSITY



NC Cooperative Extension Resources

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## 2015 North Carolina Agricultural Chemicals Manual Introduction

2015 North Carolina Agricultural Chemicals Manual

### Recommendations

*These recommendations apply only to North Carolina. They may not be appropriate for conditions in other states and may not comply with laws and regulations outside of North Carolina. Unless otherwise noted, these recommendations were current as of November 2014. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county Cooperative Extension Service agent. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the North Carolina Cooperative Extension Service nor discrimination against similar products or services not mentioned.*

### Printed Manual

[Click here](#) to order copies of the printed version of this manual.

### Table of Contents

[ABBREVIATIONS](#)

[I. PESTICIDE USE AND SAFETY INFORMATION](#)

<http://content.ces.ncsu.edu/north-carolina-agricultural-chemicals-manual/>

Caterpillars (such as armyworm, budworm, eastern tent caterpillar, fall webworm, orangestriped oakworm, leafrollers)

acephate (Orthene)
acetamiprid (Tri-Star)
azadirachtin (Azatin)
<i>Bacillus thuringiensis kurstaki</i> (DiPel)
bifenthrin (Onyx, Talstar)
bifenthrin + imidacloprid (Allectus)
bifenthrin + clothianidin (Aloft)
carbaryl (Sevin)
chlorantraniliprole (Acelepryn)
indoxacarb (Provaunt)
insecticidal soap (various)
novaluron (Pedestal)
permethrin (Astro, Perm-up, Permethrin Pro)
spinetoram + sulfoxalor (XXpire)
spinosad (Conserve SC)
tebufenozide (Confirm)

## Chapter V: Insect Control

*Table 5-15: Arthropod  
Management for  
Ornamental Plants  
Grown in Nurseries  
and Landscapes,*  
Page 154

# Relatively Nontoxic

- **Organic/natural insecticides** do not have ERT; some are relatively non-toxic:
  - Soaps, Oils, Neem/Azadirachtin, B.t.
- Some newer synthetic products



# Xxpire

## spinetoram + sulfoxaflor



- Whiteflies, Aphids, Mealybugs, Lepidopterans (caterpillars), Lacebugs, Certain Scales, Thrips, others
- Controls chewing and sap-feeding insects
- Can be used in nurseries, greenhouses and commercial landscapes





GROUP 28 INSECTICIDE

syngenta.

- Active ingredient: Chlorantraniliprole
- Landscapes and turf (professional applicators)
- Systemic activity
- Caterpillars, Beetles, Leafminers, some Borers
- Sucking pests: lacebugs, aphids
- Granular formulation – white grubs in turf





## Insecticide

A water dispersible granular insecticide for the control of lepidopterous larvae (including armyworms, cutworms, sod webworms, bagworms, fall webworms, gypsy moth caterpillars, tent caterpillars, tussock moth caterpillars and yellownecked caterpillars) and other listed pests infesting landscape and recreational (including golf courses) turf grass and landscape ornamentals.

### Active Ingredient

Indoxacarb\*

(S)-methyl 7-chloro-2,5-dihydro-2-[[[methoxycarbonyl][4(trifluoromethoxy)phenyl]amino]carbonyl]indeno[1,2-e][1,3,4]oxadiazine-4a-(3H)-carboxylate ..... 30.0%

Other Ingredients ..... 70.0%

Total: ..... 100.0%

\*Indoxacarb belongs to the oxadiazine chemical class.

**Active Ingredient:**  
Indoxacarb

**Controls:**  
Caterpillars on landscape  
ornamentals and turf



Caterpillars (such as armyworm, budworm, eastern tent caterpillar, fall webworm, orangestriped oakworm, leafrollers)

## Relatively Nontoxic Options?

### Chapter V: Insect Control

*Table 5-15: Arthropod Management for Ornamental Plants Grown in Nurseries and Landscapes,*  
Page 154

acephate (Orthene)
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# Minimize Impact

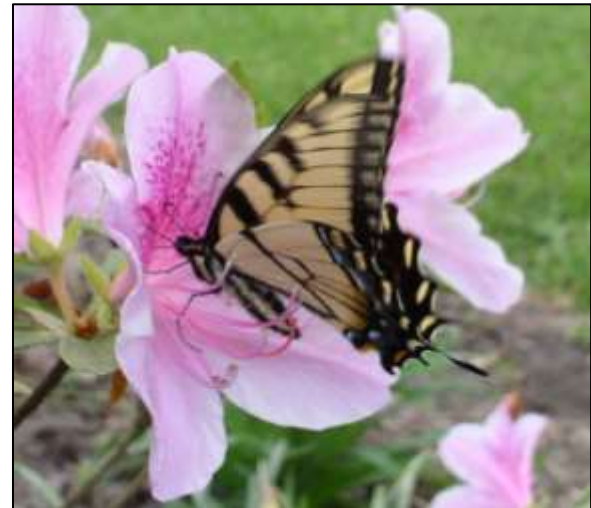
- **Never spray plants in bloom with highly or moderately toxic pesticides!**
- **Check adjacent plants and weeds**
  - Mow weeds
  - Prune off flowers if necessary



Holly blossoms

# Minimizing Impact: Neonicotinoids

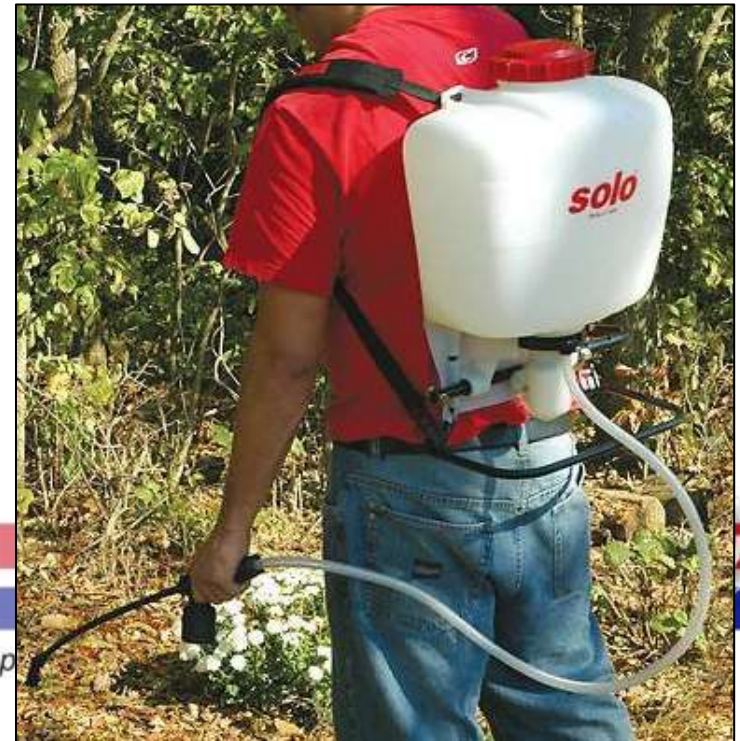
- **Never apply to plants in bud or bloom**
- If necessary, apply only after flowering complete
  - **petals have shed**
- Beware of soil residual build up



# Minimize Impact

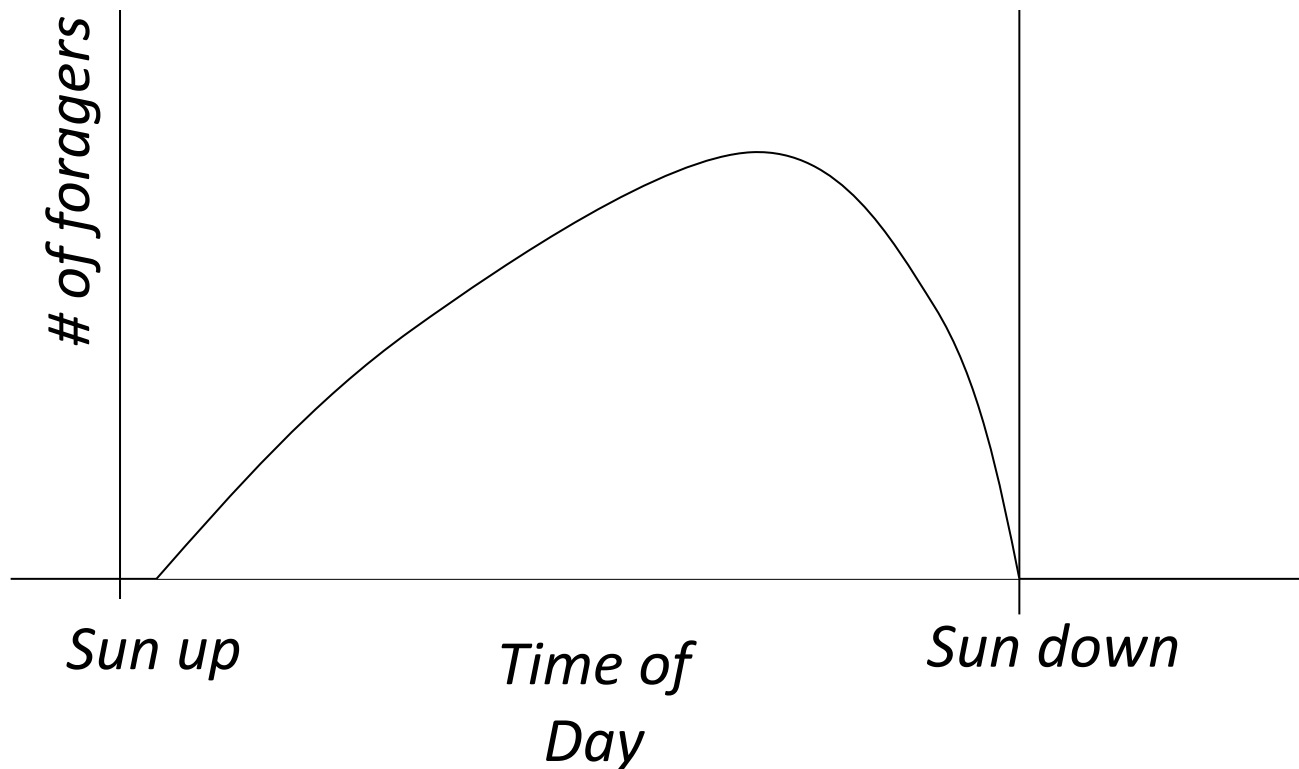
## Minimize Drift

- Coarse droplet size, lower pressure
- Hold nozzle close to target
- Check forecast
- **Don't spray if winds over 5 mph; temps over 85 F**

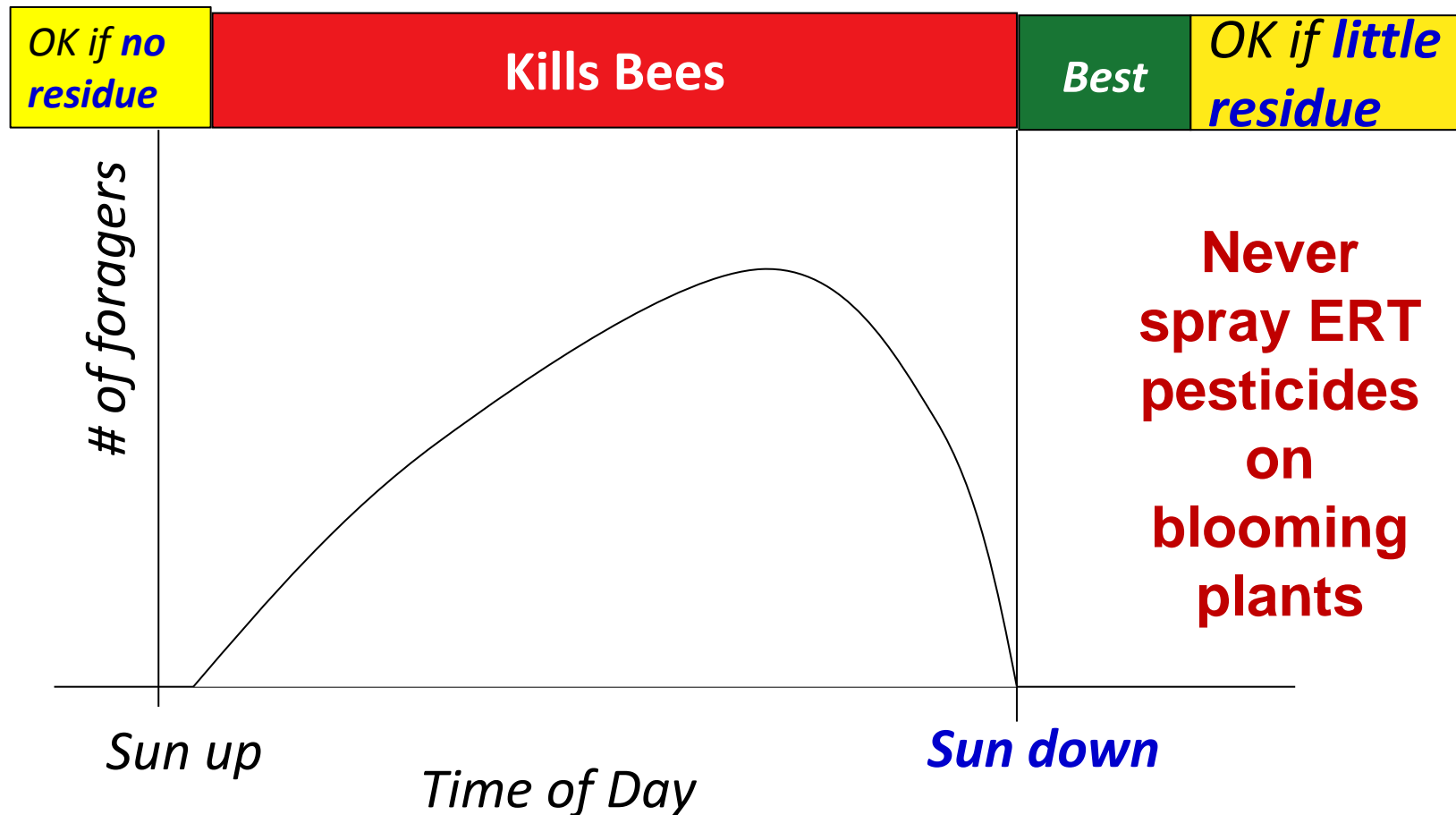


# Minimize Impact: Application Timing

**Honey bees forage sun up to sun down unless it's raining**



# Best time for pesticide application: Just after sun down



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# Minimizing Impact

Use **Integrated Pest Management** to reduce the need to spray and consider:

- **What you spray**
  - Consider acute and residual toxicity
  - Choose relatively nontoxic options when available
- **When you spray**
  - Time of day; Bloom cycle
  - Only when necessary – no calendar sprays
- **Where you spray**
  - Never open blossoms



# North Carolina Cooperative Extension

We have an Extension center in every county!

<http://ces.ncsu.edu>



to submit questions to our '**Ask an Expert**' widget and  
to find your local Extension center

## Chatham County Center

<http://chatham.ces.ncsu.edu>

919-542-8202

[\*\*charlotte\\_glen@ncsu.edu\*\*](mailto:charlotte_glen@ncsu.edu)

