Holland Marsh IPM Program

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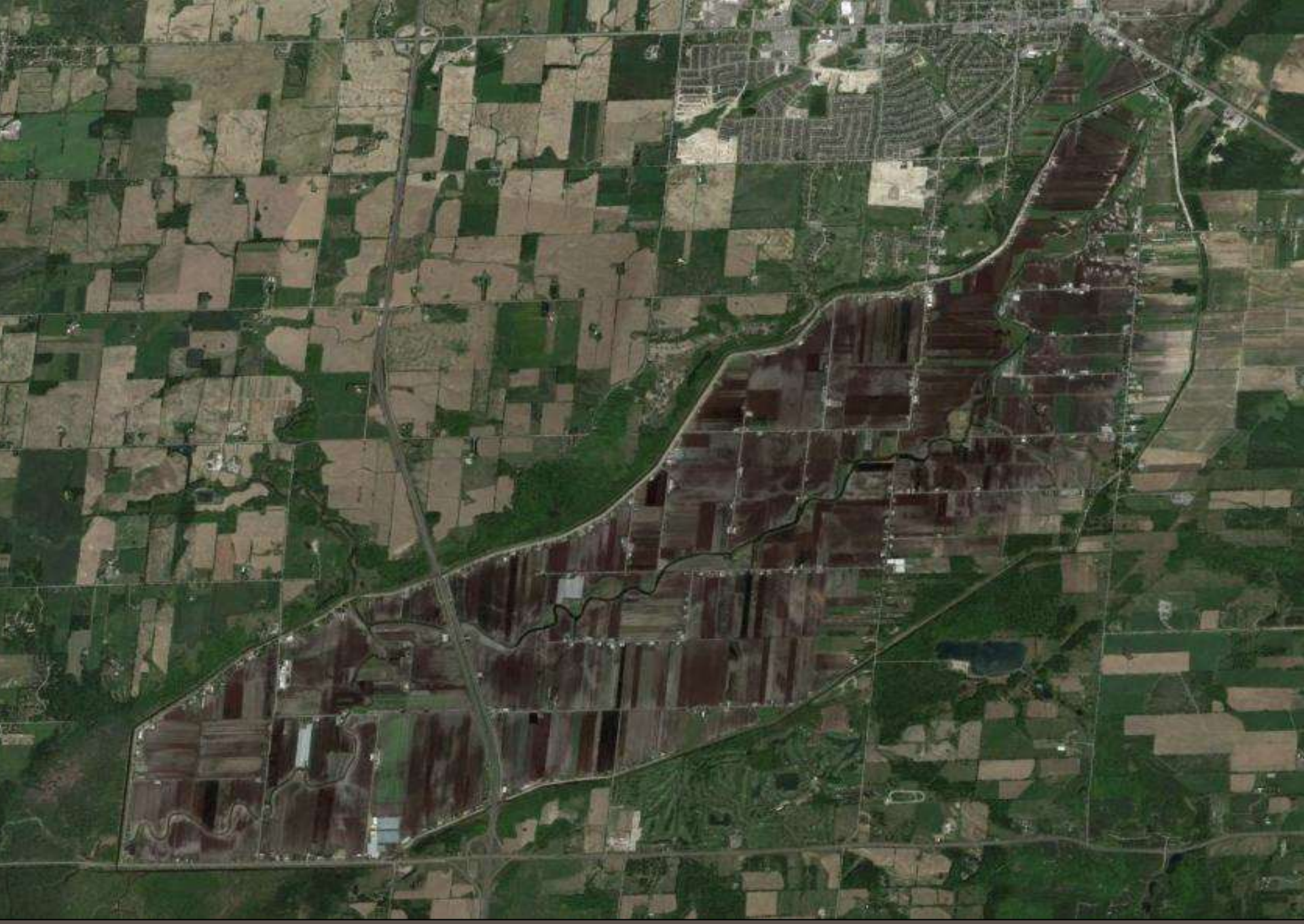
Plant Agriculture

Ontario

Holland Marsh

- 50 km North of Toronto
- Salad bowl of Ontario
- 7000 acres contained within the dyke system
- 2500 acres in surrounding marshes
  - Keswick
  - Cookstown
  - Srebot
  - Colbar



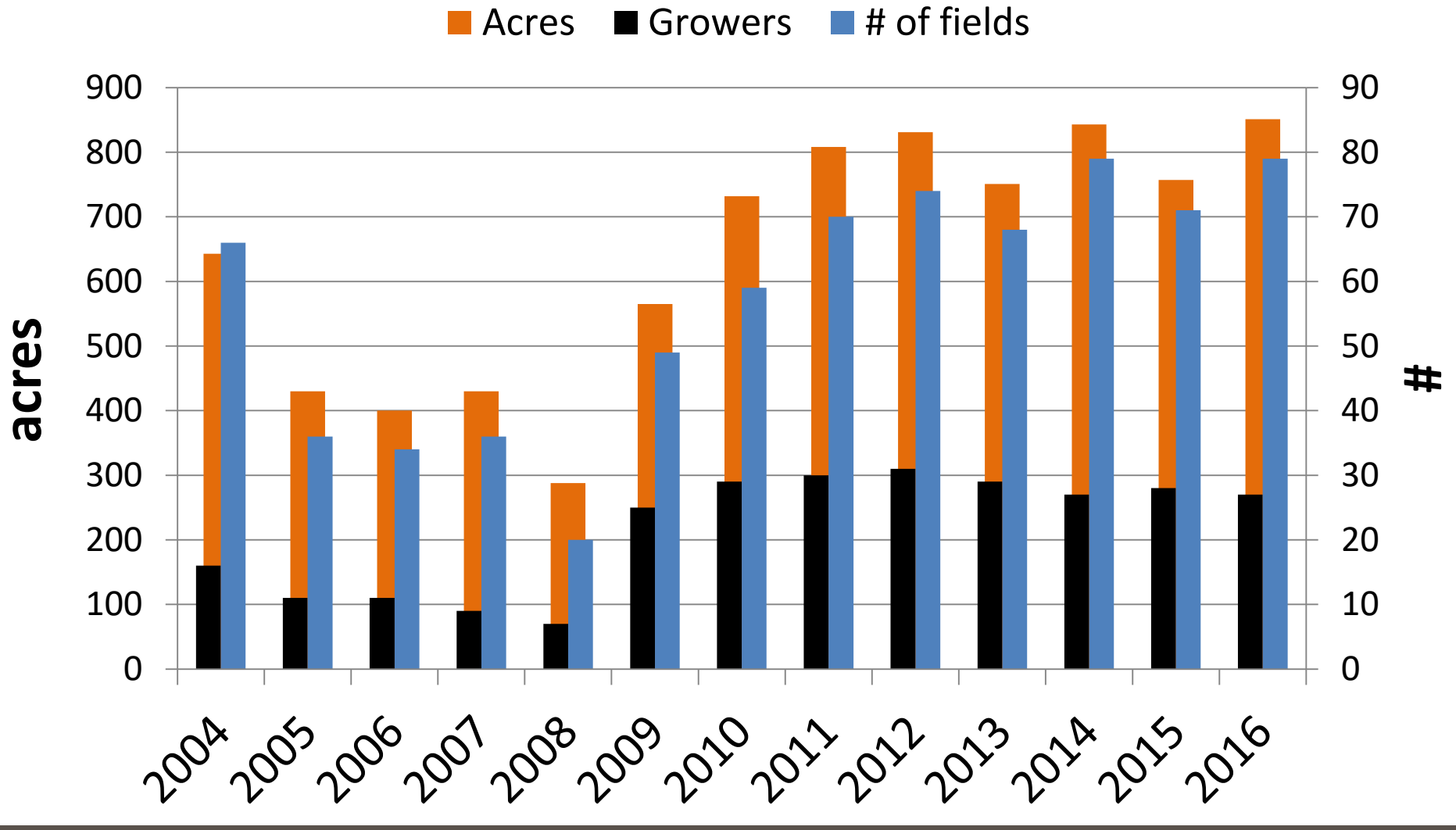
Crops Produced

- Carrots – 3631 acres
- Onions – 2717 acres
- Celery
- Lettuce
- Beets
- Parsnips
- Asian vegetables
  - Bok choy
  - Pak choy
  - Napa cabbage

History of IPM in the Marsh

- 1980-1998
  - Ontario government extension with expertise from the University of Guelph
- 1998-2003
  - Private companies
- 2004-Present
  - Muck Crops Research Station – University of Guelph

Grower Participation



MCRS IPM Program

- Objectives
  - Grower field scouting
  - Disease and insect forecasting
  - Identification/diagnosis of diseases, insects, and weeds
  - Provide growers with timely, accurate and convenient access to insect and disease pest information
  - Update and improve the IPM program

IPM Program Funding

- $ comes from 3 main sources
  1. Project grants
  2. Agrochemical company sponsorships
     - Registered products listed in IPM Updates
     - New product registrations announced
     - Important use information
  3. Participating growers
     - $50/acre

IPM Updates

- Agriphone/Agrifax (IPM Updates)
- Sent bi-weekly from May-September
- Sent to mailing list
  - Growers
  - Extension personnel
  - Researchers
  - Industry reps

Bayer CropScience

DUPONT The miracles of science

syngenta

Dow AgroSciences

ENGAGE AGRO

BASF We create chemistry

BRADFORD CO-OPERATIVE STORAGE LTD.

HOLLAND MARSH Growers' Association

IPM Updates

- Weather information
  - Temperature, precipitation, soil temp
- Insect/disease pressure
- Registered products for issues
- Control recommendations
- Insect DD accumulation
- Disease forecasting
- Upcoming events
- New product registrations
- Minor Use updates

MUCK CROPS RESEARCH STATION IPM 2015

This is the Muck Crops Research Station Report and IPM Information for Tuesday July 21, 2015

Onion Downy Mildew Alert

Downy mildew has been confirmed on onions in some of our scouted fields in the Holland Marsh. Growers should monitor your fields regularly for downy mildew. Symptoms are not usually visible until infected areas of leaves sporulate. The best time to see downy mildew symptoms is early in the morning when the leaves are still wet. The first evidence of the disease is a fine, furry, grayish white to purple growth on the surface of older leaves. Leaf tissue under the growth becomes pale green, then yellow, and finally collapses. Large, yellowish, circular clumps of infected plants, a few to many feet in diameter, may be the first symptom noticed in the field. The yellowing patterns often enlarge in the direction of prevailing winds. Infections usually occur in patches within the field. If growers plan to apply Royal MH and store onions it may be important to preserve healthy leaf area for proper application.

At this time growers should spray for downy mildew control regularly. Mancozeb (Dithane, Penncozeb and Manzate), Ridomil Gold, Pristine, Cabrio, Rovral, Aliette, Revus, Serenade Max, Quadris Top, Reason, Zampro and Acrobat are registered for onion downy mildew control. Rotate fungicides with different chemical groups. Aliette should not be tank mixed with other products, especially not with micronutrients.

BREMCAST: The lettuce downy mildew forecasting model predicted three sporulation infection periods in the last 4 days. The risk of downy mildew on lettuce is moderate high.

Onion maggot fly has reached the 2nd generation degree day threshold for emergence. Activity is increasing. The current count on station is 2.5 flies/trap/day and 3.6 flies/trap/day on June street.

Botrytis leaf blight symptoms have been found in some onion fields in the Marsh and the risk for disease is moderate to high. Botrytis leaf blight symptoms have been seen in a few onion fields around the Marsh. The current cumulative disease severity index (CDSI) for botrytis leaf blight is 35. The spray thresholds are when CDSI reaches 30 or when lesion counts exceed 3 lesions/leaf. Most chemicals used to control purple blotch or stemphylium leaf blight can also control botrytis leaf blight. Growers should monitor their fields to determine if lesion counts are increasing. Rovral, Cantus, Pristine, Quadris Top, Scala, Scala+Bravo, Bravo/Echo, Switch, and mancozeb (Dithane, Penncozeb, Manzate) are registered for control of Botrytis leaf blight.

Stemphylium leaf blight continues to be found in scouted onion fields and remains a concern along with purple blotch. As onions start to initiate bulb formation we are seeing tipburn which creates another entry point for stemphylium. Inspire, Fontelis, Quadris Top, Pristine, Cantus, Scala, Switch, Cabrio, Aliette, and Manzate are registered for control of purple blotch on onions.

Onion thrips populations are starting to rise in transplanted onion fields and starting to be found in seeded onion fields, mainly around the field edges. Research conducted in New York state and here at the Muck station has shown the most effective spray schedule is two applications of Movento first, followed by two sprays of other products. For resistance management, always apply two subsequent applications of the same product or group so that each generation of onion thrips is only exposed to one group of chemistry. Onion thrips develop resistance quickly so resistance management is important. Diazinon, Dibrom, Agri-Mek, and Movento are registered for control. Delegate, Success, Entrust, and Exirel are registered for suppression. Matador, Silencer, Mako (Ripcord), UP-Cyde, and Decis are registered but onion thrips have had documented resistance.

IPM Scouting

- May-September
- 2x per week from May – August
- 1x per week in September (carrots/celery only)
- Monday/Thursday or Tuesday/Friday
- 2 full-time scouts and 1 part-time
- Rain or shine
  - Except for celery
  - Except when fields are too wet

IPM Scouting

- Report is filled out for every field visit
  - Insect counts
    - At threshold?
  - Diseases
    - At threshold?
  - Disorders
- Delivered to growers barn/office same day
- Most growers like to talk with their scouts daily

MCRS INTEGRATED PEST MANAGEMENT SERVICES
CARROT & PARSNIP SCOUT REPORT

Grower:_____ **Date:**_____

Field:_____ **Growth Stage:**_____

Scout:_____ **Time in:**_____ **Time out:**_____

CARROT WEEVIL _____ **Cumulative weevil/trap** **Thresholds:** Cumulative/trap = 1.5 – 5 → treat at 2nd leaf stage Cumulative/trap = >5 → treat at 2nd and 4th leaf stage _____ **Current count/trap**	**Threshold Reached:** YES NO
CARROT RUST FLY _____ **Flies/trap/day** **Thresholds:** Fresh market = 0.1 flies/trap/day Processing = 0.2 flies/trap/day	**Threshold Reached:** YES NO
ASTER LEAFHOPPER _____ **Aster Leafhopper/trap** _____ **Sweep net count** **ALH Pressure :** LOW MEDIUM HIGH	**Threshold Reached:** YES NO
ASTER YELLOWS _____ **Location**	**Present:** YES NO
LEAF BLIGHT _____ **% Carrots Infected** **Threshold:** 25% Carrots infected	**Threshold Reached:** YES NO
WEEDS _____ **Type** _____ **Location** _____ **Stage**	**Present:** YES NO
OBSERVATIONS/COMMENTS: Crown Gall, Crown Rot, Damping off, Fusarium Root Rot, Pythium Root Dieback, Scab, Violet Root Rot, Splitting, Forking, Heat Canker, Nutritional disorders, Cutworms, Beneficials, Nematodes Wireworms	

IPM Scouts

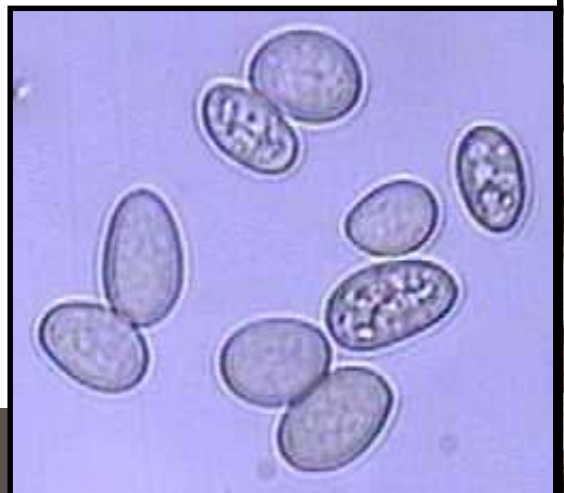
- Grower/Scout relationship is very important
- Trust that is earned
- Communication is key
  - Pesticide use
    - Restricted entry intervals (REI)
  - Issues in the field
  - Issues in the area

Spore Trapping

- Rotorod spore traps (3 areas)
- Collected Mon/Wed/Fri
- Early warning detection

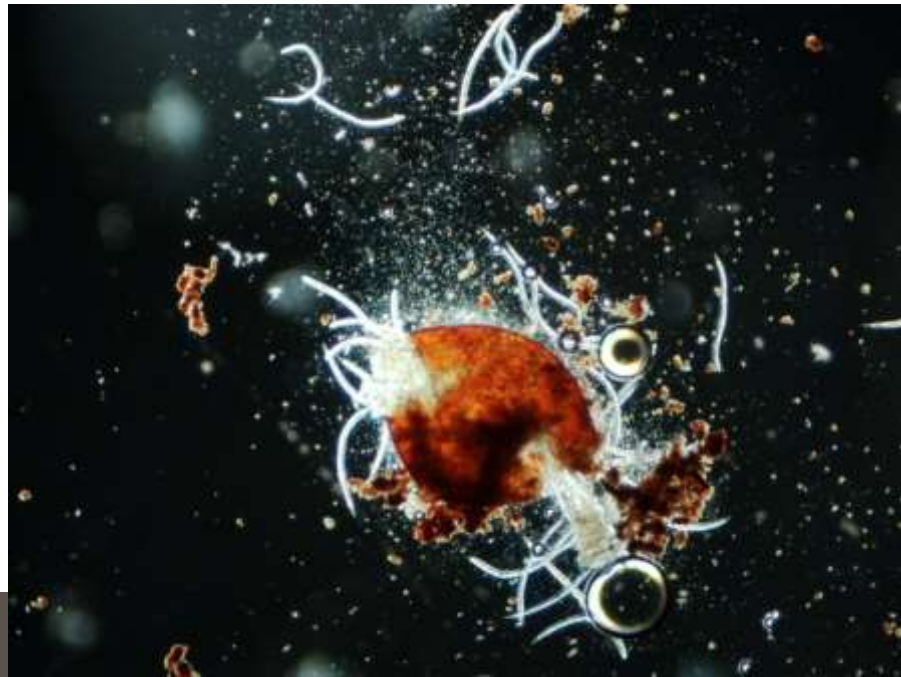
Spore Trapping

- Rotorod spore traps (3 areas)
- Collected Mon/Wed/Fri
- Visually assessed for spores using compound microscope
  - Identified to genus
  - Counts



Diagnostic Lab

- Over 200 submissions each year
- 80% disease/insect damage samples
- 20% abiotic disorders or nutrient deficiency
- Insect ID
- Pathogen identification
  - Spore ID
  - Isolation/Plating
- Inoculum for trials



Disease Forecasting

- DOWNCAST – Onion downy mildew
  - Sporulation Infection Periods (SIP)
- BOTCAST – Onion Botrytis leaf blight
  - Cumulative DSV to initiate spray
- BREMCAST – Lettuce downy mildew
  - Sporulation Infection Period (SIP)

Insect Forecasting

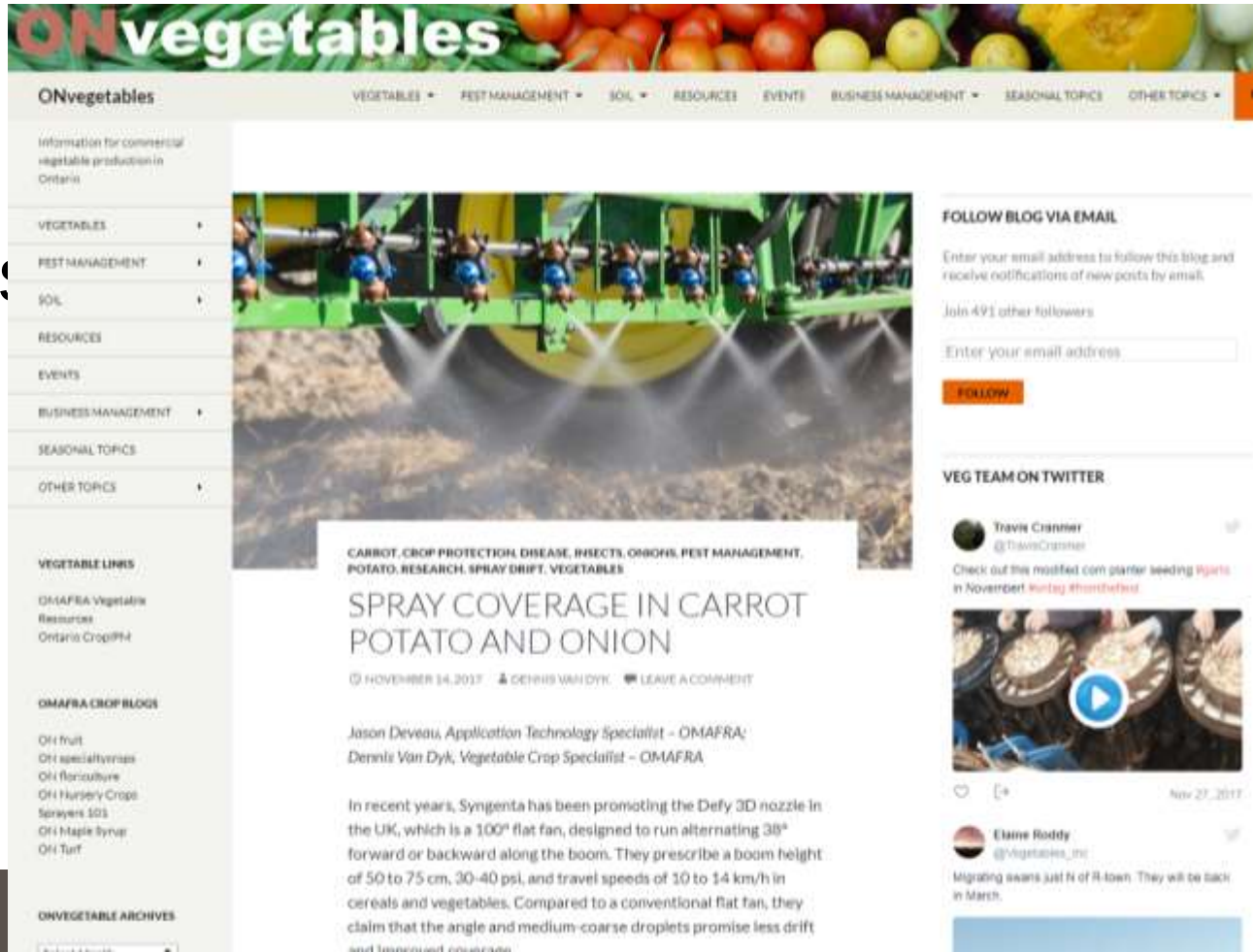
- Degree Day Models
  - Predict overwintering emergence
  - Insecticide application timing
- Information delivered to growers
  - IPM Updates
  - Word of mouth by scouts

Twitter

- @MuckIPM
- Disease alerts
  - Onion downy mildew
  - Stemphylium leaf blight
  - Carrot rust fly generational peak
- Degree day thresholds

Onvegetables blog

- onvegetables.ca
- Research
- Events
- Crop updates
- Minor Use



IPM Program Improvements

- Evaluation of carrot rust fly monitoring methods
  - Colour/Material
  - Angle

IPM Program Improvements

- Evaluation of carrot weevil monitoring method
  - Rotation (overwintering adults)
  - Spatial

CARROTS

Carrot Diseases

- **Cavity spot and Pythium root dieback (rusty root)**
- **Nematodes – Carrot Cyst and Root Knot**
- **Carrot leaf blight –**
  - ***Alternaria dauci***
  - ***Cercospora carotae***
- **White mold/Sclerotinia rot**
- Bacterial leaf blight
- Violet root rot

Carrot Insect Pests

- **Carrot weevil**
  - ***Listronotus oregonensis***
- **Carrot rust fly**
  - ***Psila rosae***

- Aster leafhopper
- Cutworms

Carrot Weevil

- Adult 6 mm in length
- Tan with dark brown blotches
- Larva yellowish cream with brown head, legless
- 1-2 generations/year
- Pea

Carrot Weevil Degree Day Model

- Model is base 7ºC
- Useful to predict egg-laying activity of the 1st generation only
- Timing for monitoring:
  - 1st oviposition is expected at 147 DD
  - 90% oviposition expected by 455 DD

Monitoring Carrot Weevil

- Boivin traps
- Weevil traps - 4 per field
  - 2 sets of 2 traps
- Set out early (May 1) to capture adults

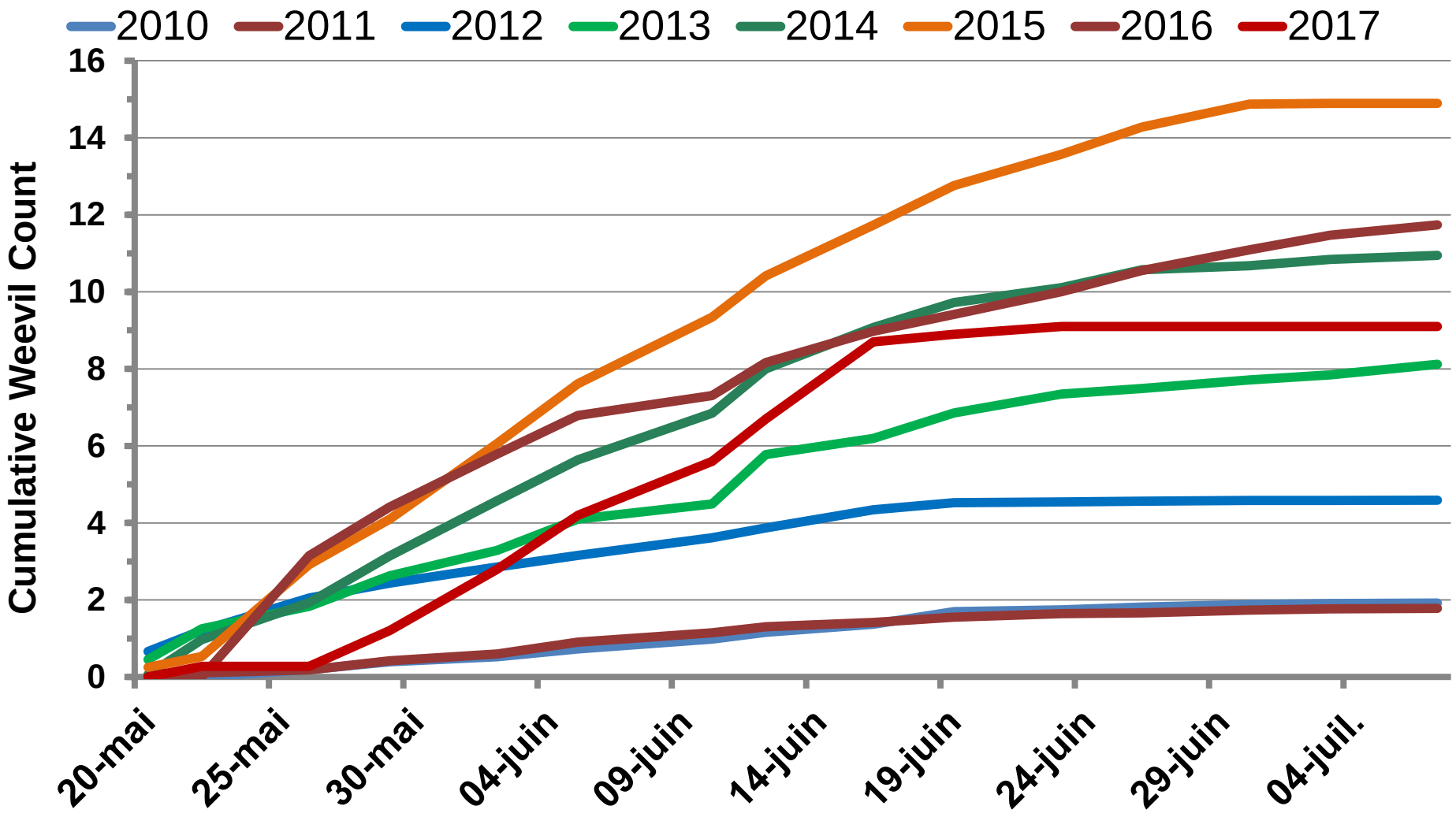
Carrot Weevil Management

- Spray threshold
  - 1.5 cumulative weevils/trap at 2nd leaf stage
  - 5 cumulative weevils/trap at 4th leaf stage
- Imidan (Group 1B - organophosphate)
- Matador (Group 3A - pyrethroid)
- Rimon (Group 15 – benzoylurea)
  - Reduction in damage only

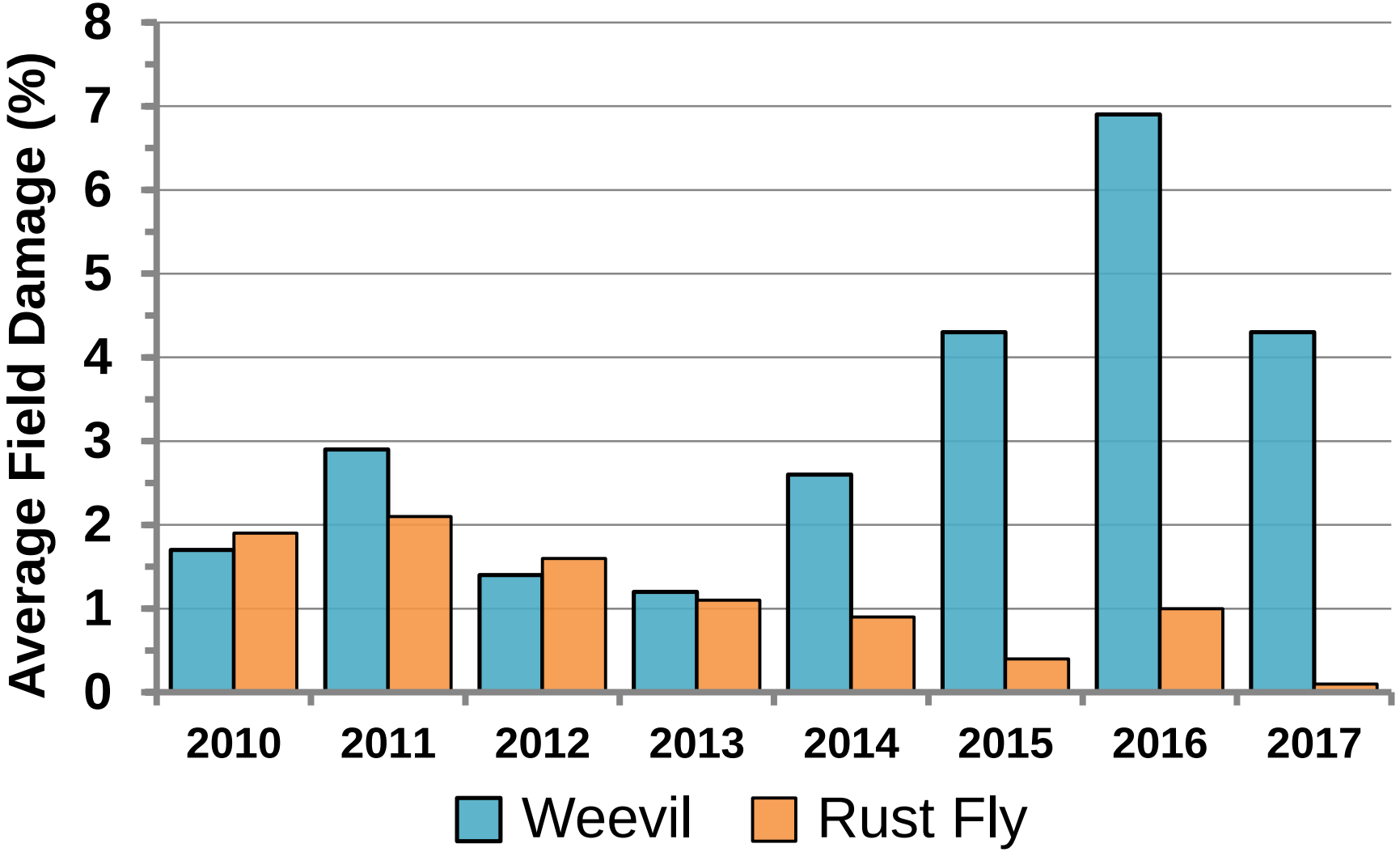
Historical Data

- Important to have long-term data to monitor
  - Changing biology
  - Resistance development
- Carrot weevil oviposition period shifting
- Carrot weevil 2nd generation
- Carrot weevil Imidan resistance
- Changing pest pressure
  - Carrot rust fly

Historical Weevil Counts



Historical Insect Damage

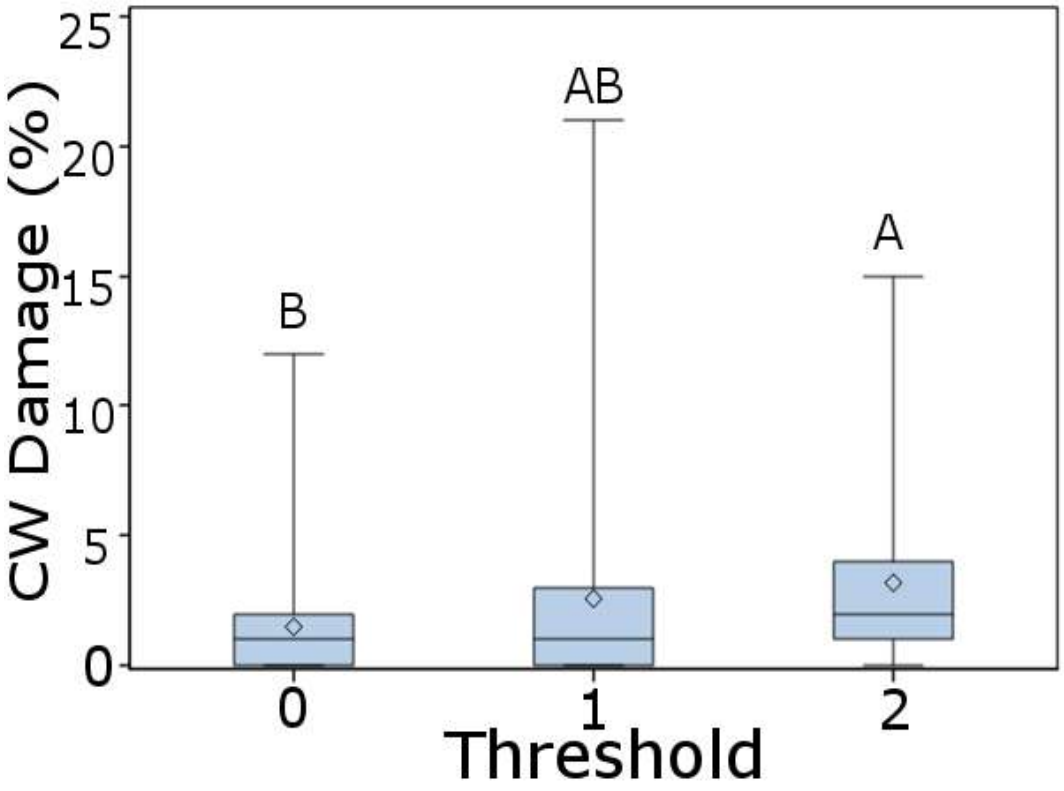


Emerging Issues with Carrot Weevil IPM

- CW attacking carrots plants earlier than expected
- CW attack killing young carrot plants
- Concerns of CW tolerance to Imidan
- CW exhibiting new bivoltine tendencies in Ontario and Quebec

Real Life IPM Analysis

- Data from University of Guelph – Muck Crops Research Station IPM Program over 2005-2015 used for analysis
- Growers fields monitored and assessed for CW damage
- Potential for high damage at no threshold cause for concern



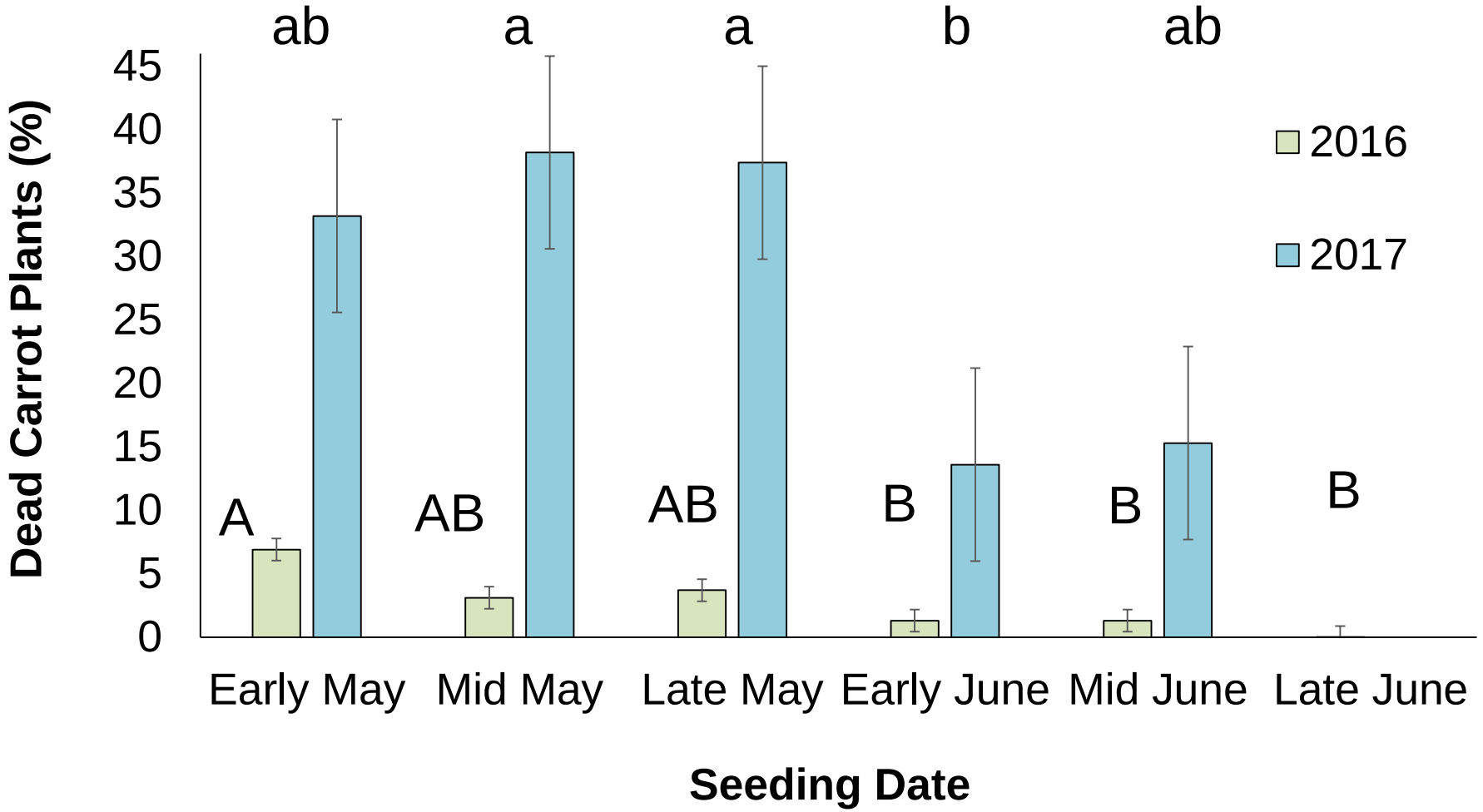
Novel Carrot Weevil Activity

- Early CW pressure has changed in two ways:

•Attacking carrots earlier in season according to established DD model

•Attacking carrots at earlier crop growth stage

Carrot Seeding Date Trial

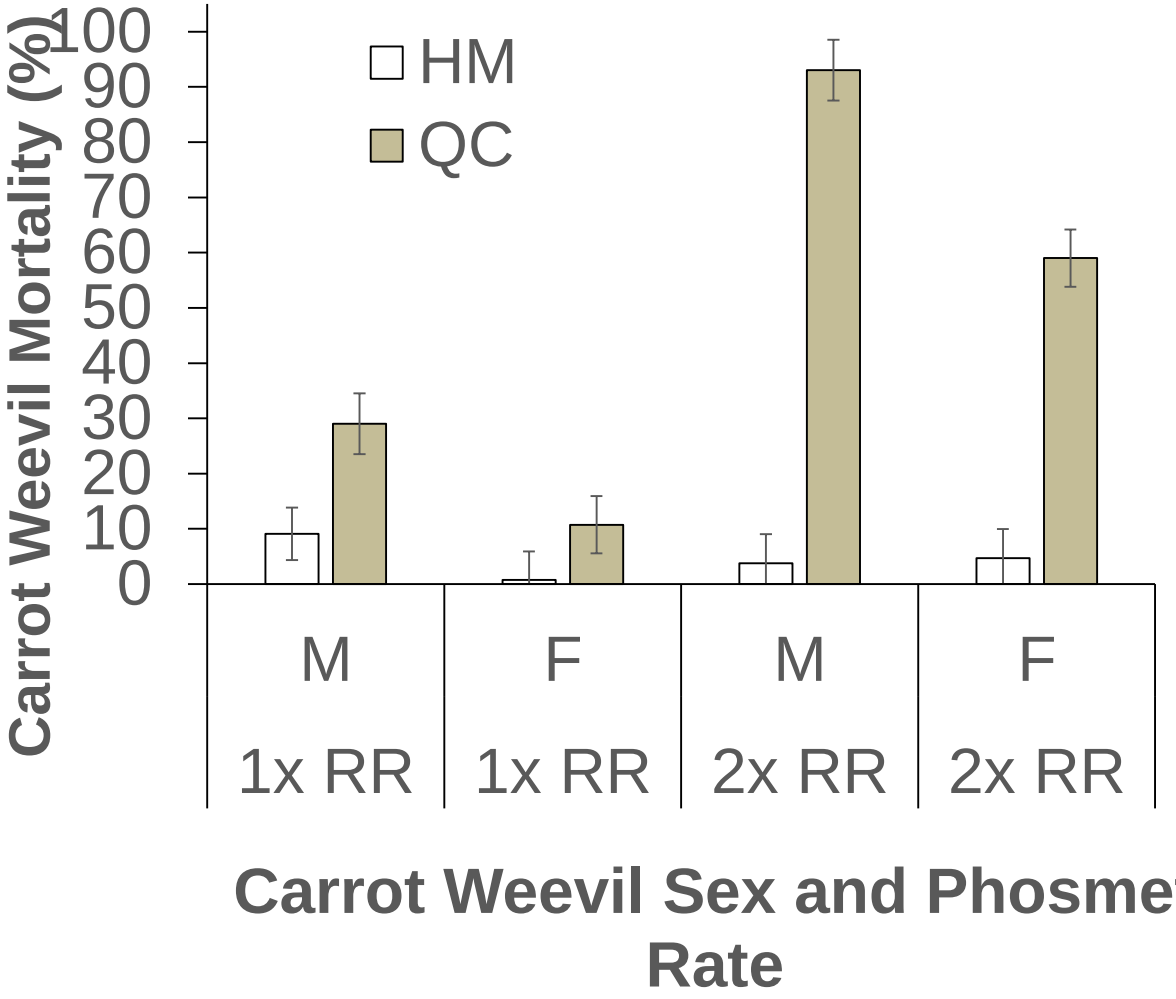


Carrot Weevil Causing Carrot Death

- Currently unreported in scientific literature
- Appears early CW attacks results in carrot death
- Possibility for larvae to attack multiple carrots

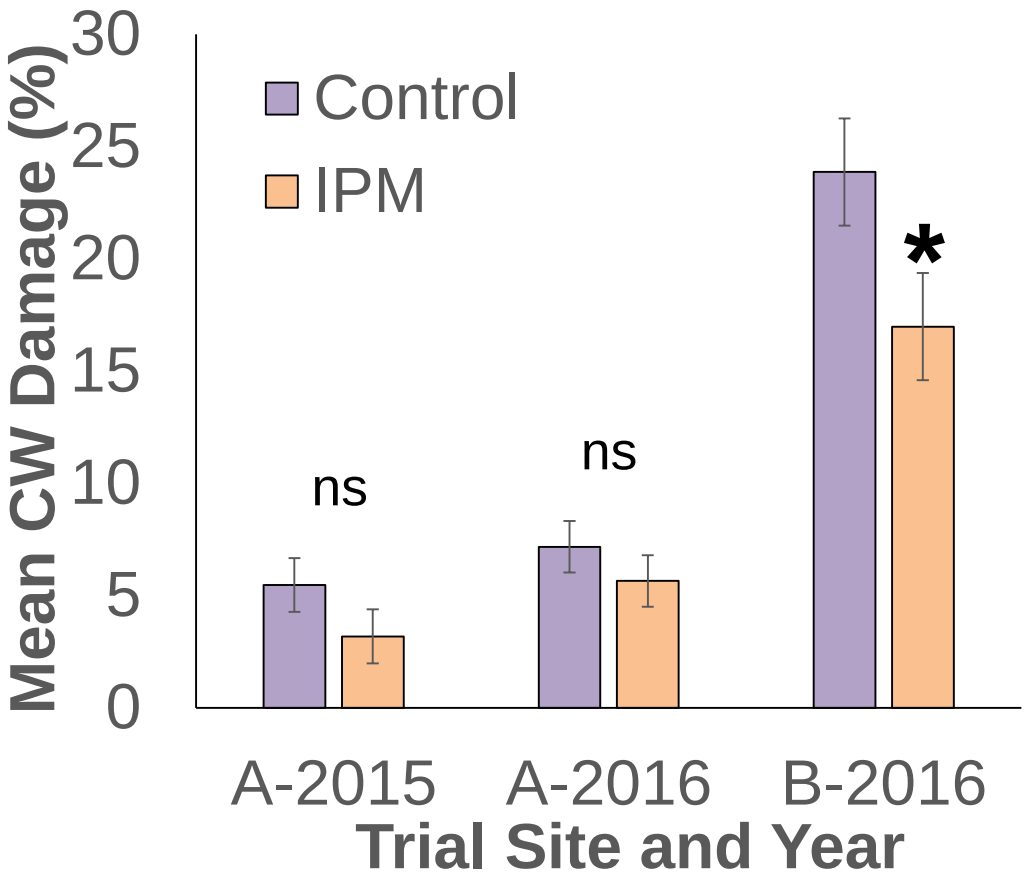
Carrot Weevil Imidan Tolerance

- Using 1/9th scale Potter spray tower, groups of 10 CW
- Compared laboratory strain to field strain of both genders
- 7-fold decrease in mortality at 2x field rate



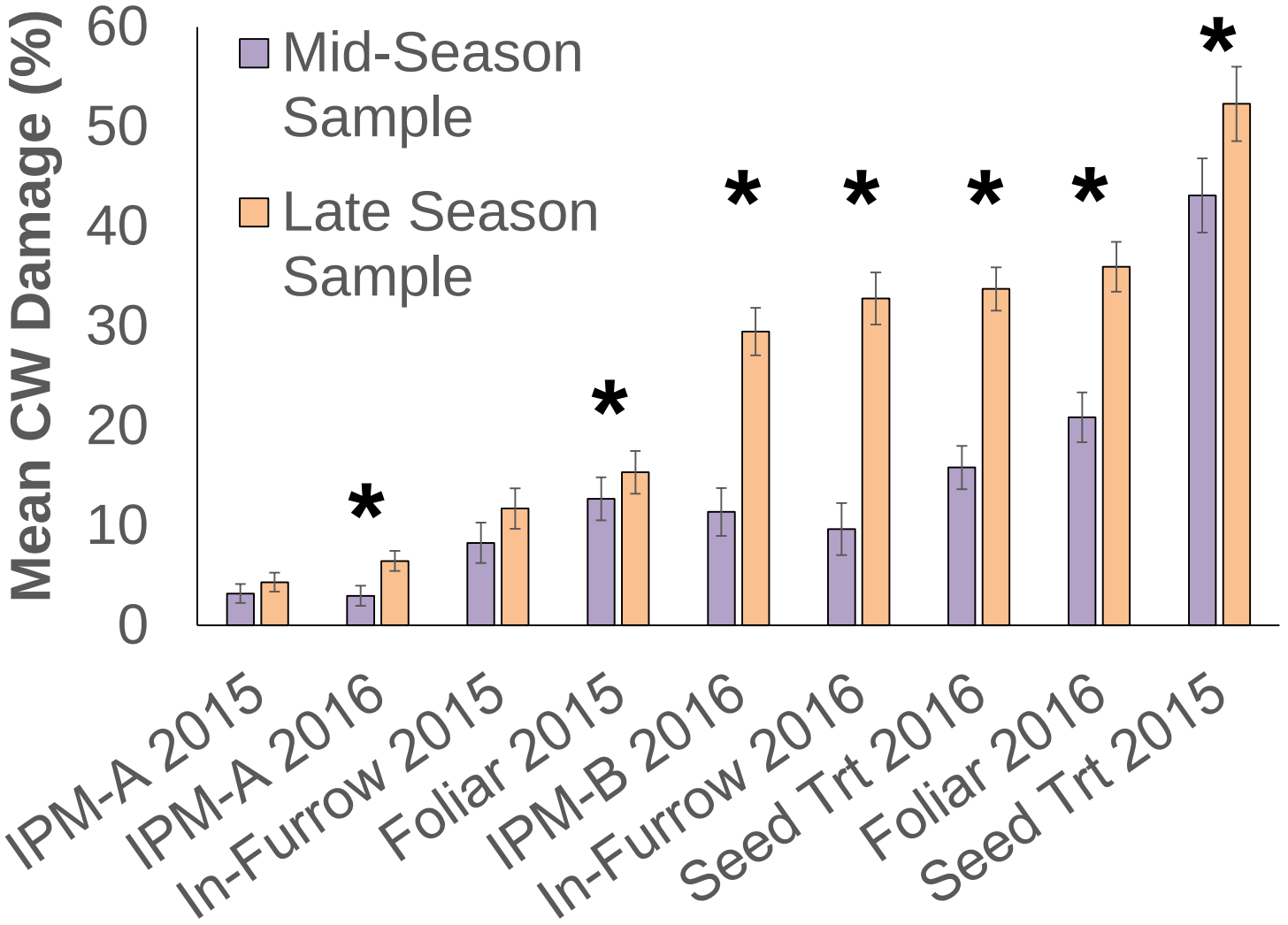
Imidan Tolerance – Field Trials

- Large plots (25x14 m or 15x14 m) used to assess IPM Program
- According to recommendations, IPM plots received 1 phosmet spray
- No significant differences under regular CW pressure

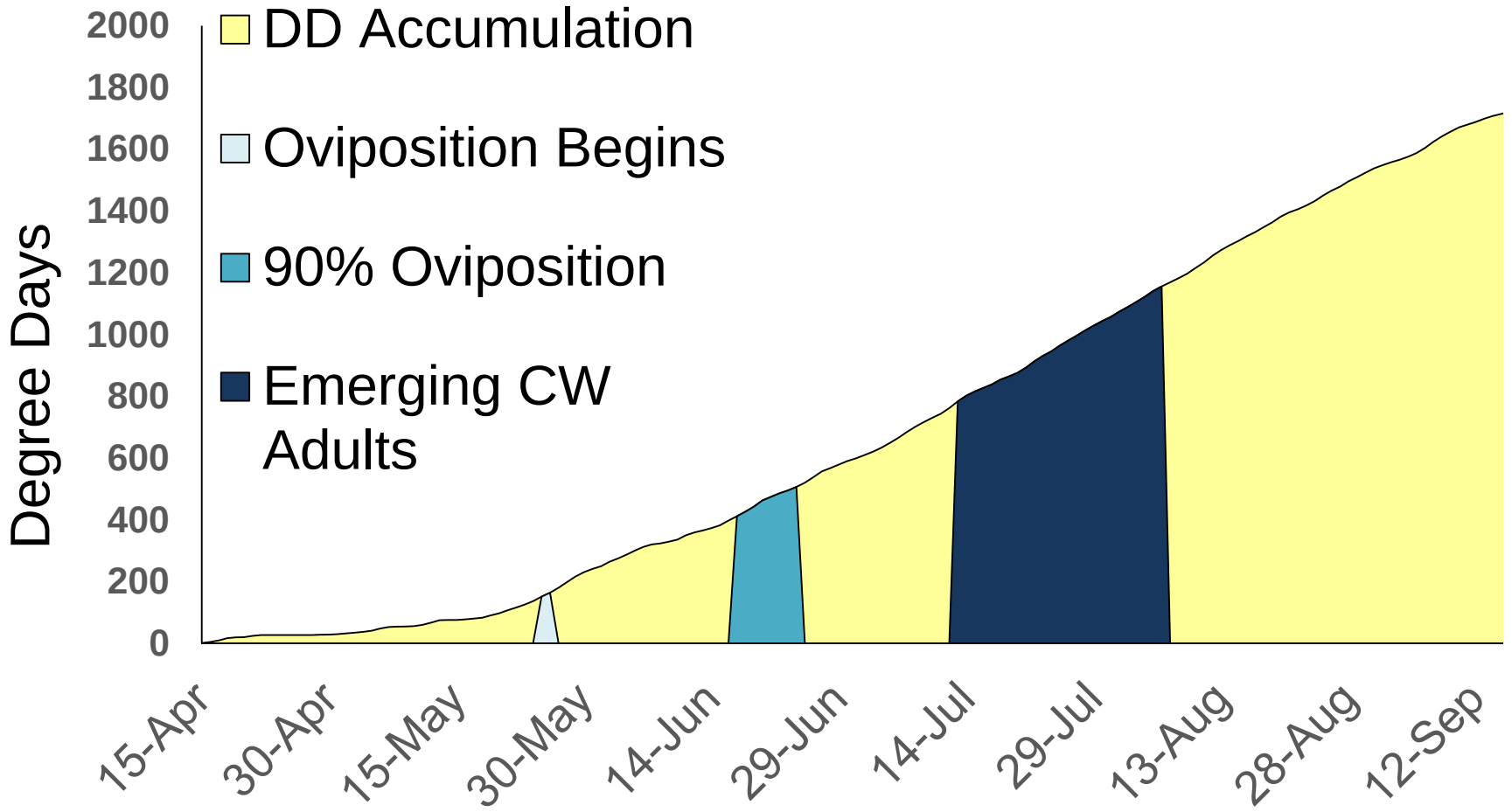


Partial Second Generation

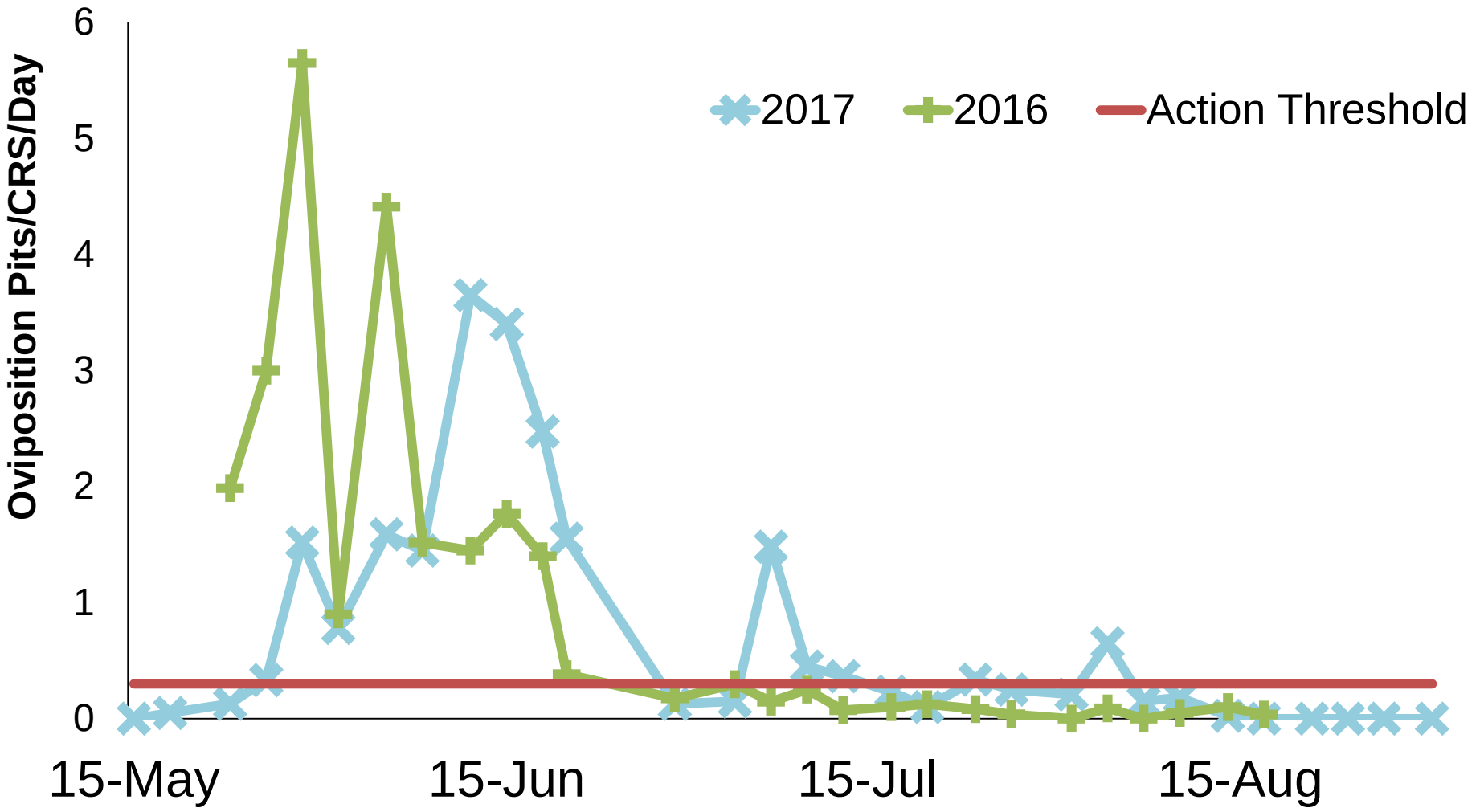
- Two 1.5 m row sections sampled in late July (2016) or early August (2015) and mid October (both years)



2016 Degree Day Accumulation



Carrot Bait Stations – Oviposition Pits

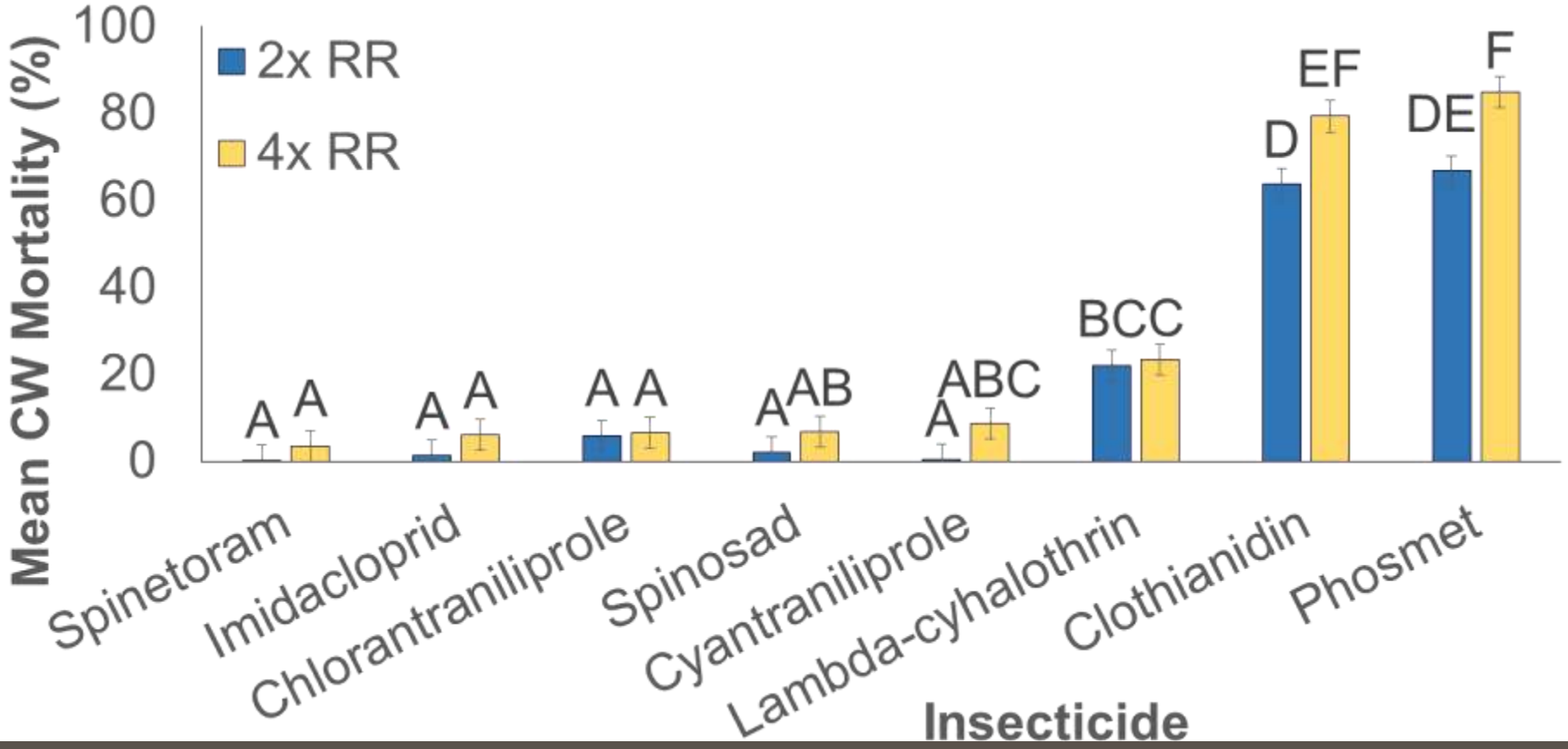


Improvements Needed

- Monitoring methods and thresholds require more research
- CW biology information lacking, degree day model needs revision
- Chemical control requires more rotation, new insecticide options

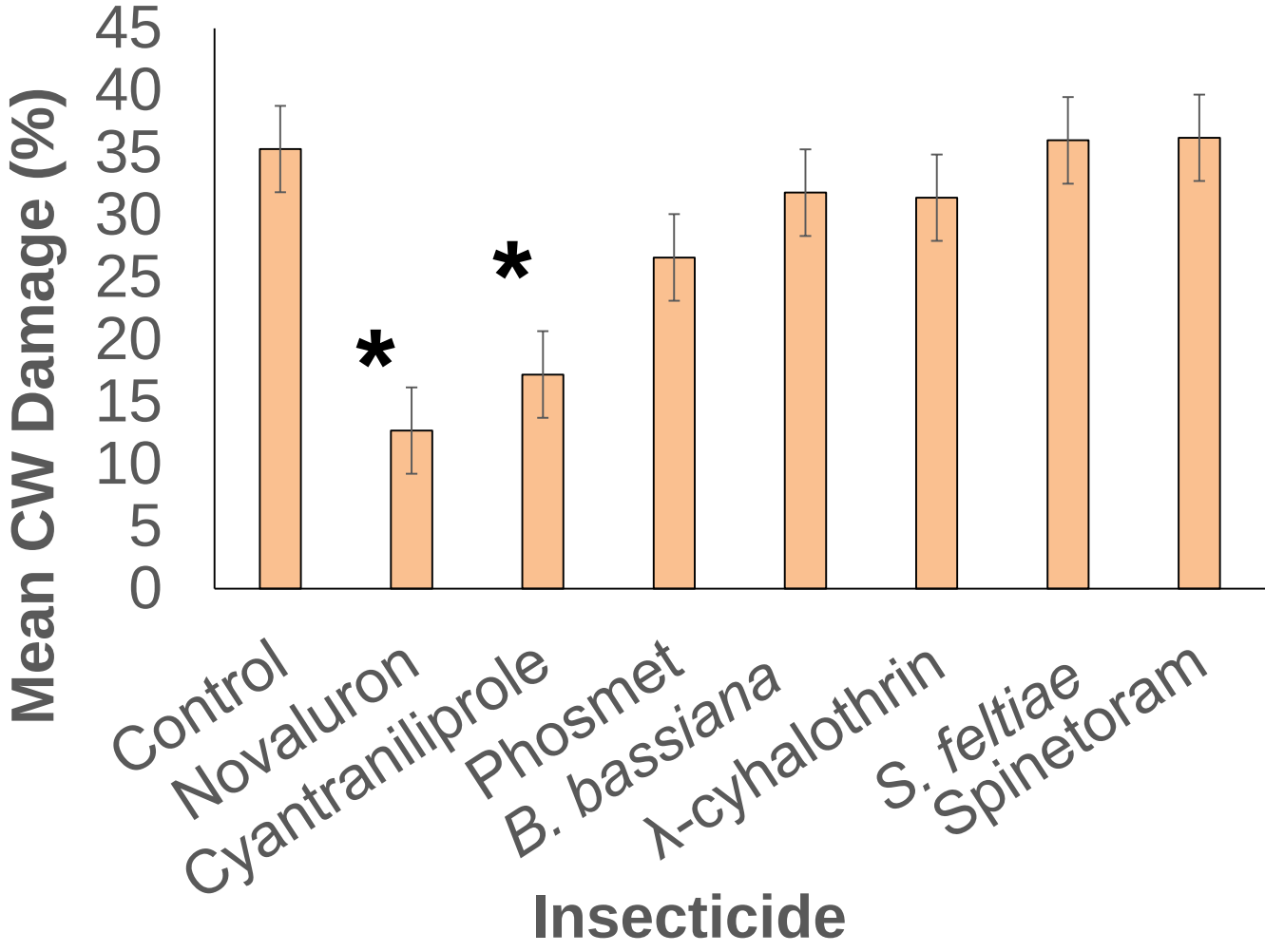
Laboratory Control Studies

- Groups of 10 adult CW from laboratory strain
- Insecticides applied with a 1/9th scale Potter spray tower



Carrot Weevil Control

- Four 5 m rows with 5 reps/trt
- Foliar applications on June 23, July 7 2016, 11 August at highest RR



Conclusions

- Combination of issues demand a revision of the CW IPM program in southern Ontario
- Improving monitoring can allow for better predicted CW pressure/thresholds, allow for quantification of second generation
- Cyantraniliprole (Exirel) and novaluron (Rimon 10 EC) provided the best control in 2016

ONIONS

Onion Insect Pests

- Primary Pests
  - Onion Maggot
  - Onion Thrips
- Secondary Pests
  - Cutworms
- Occasional Pests
  - Leek Moth
  - Leafminers

Onion Diseases

- **Stemphylium leaf blight**
- **Onion downy mildew**
- Onion white rot
- Botrytis leaf blight
- Purple blotch
- Onion smut
- Pink root
- Bacterial diseases
- Iris yellow spot virus
- Aster yellows

Stemphylium leaf blight

- First found in the HM in 2009
- Very difficult to control
- Often starts as a tipburn
- Long lesion on inside of leaf
- Brown/olive coloured lesions
- Rest of the leaf yellows and dies

Stemphylium Research Summary

- Fungicide efficacy
- Fungicide spray timing
  - Disease forecasting models
- Cultivar susceptibility
  - Differences but all susceptible
- The role of stress in susceptibility
  - Surfactants
  - Herbicides
- Overwintering structures

Onion Downy Mildew

- Can wipe out a field in weeks
- Takes 10 days from infection until sporulation

- Forecast with DOWNCAST
  - Predicts Sporulation Infection Periods (SIP)

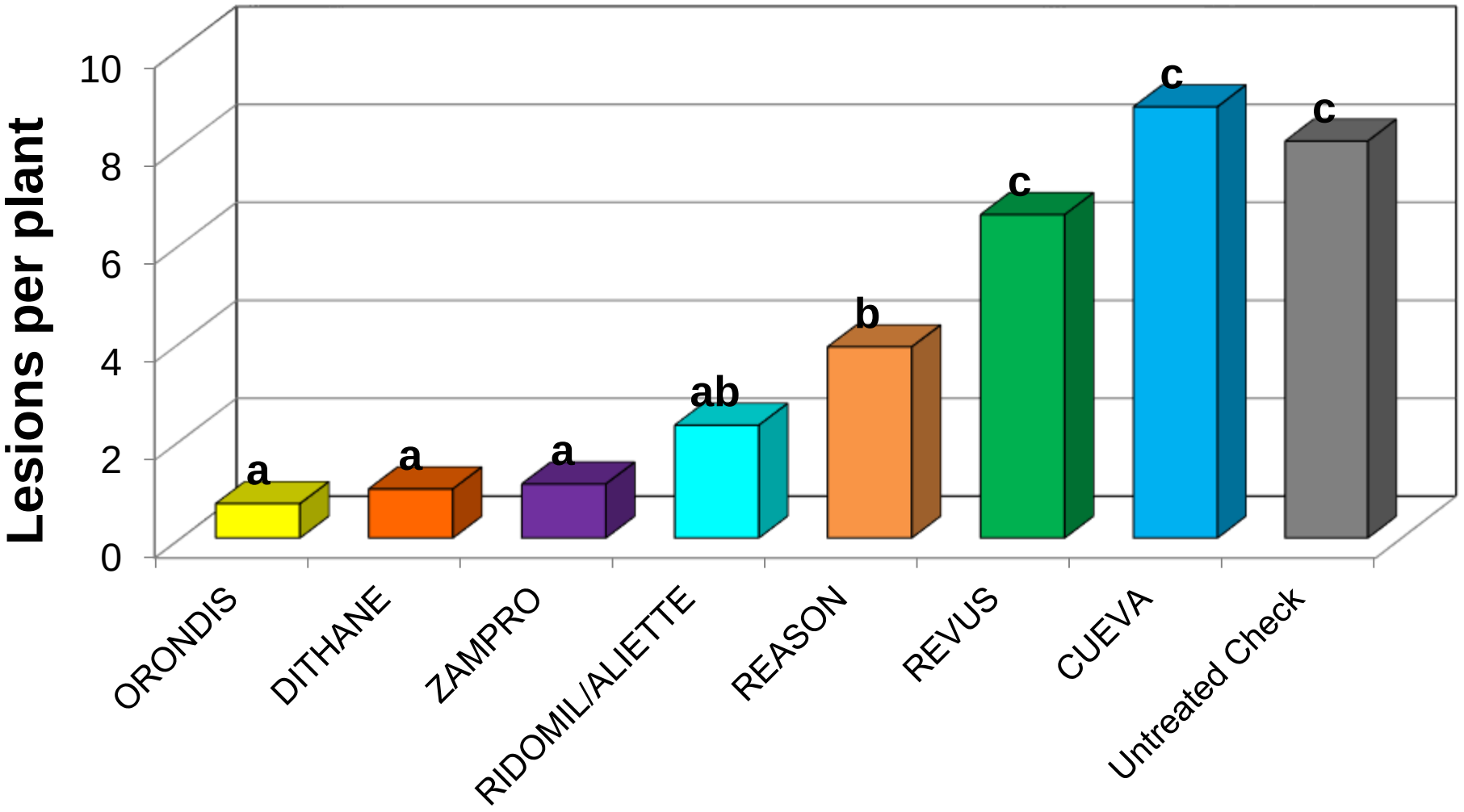
2017 Weather Summary

Month	Temperature (ºC)			Rainfall (mm)		
	2016	2017	10 yr Avg.	2016	2017	10 yr Avg.
May	13.8	12.1	13.2	45	120	66
June	18.7	18.3	18.9	39	206	75
July	22.0	20.7	20.9	51	70	94
Aug	22.6	19.1	19.6	58	60	69
Sep	17.4	17.3	15.5	25	38	85

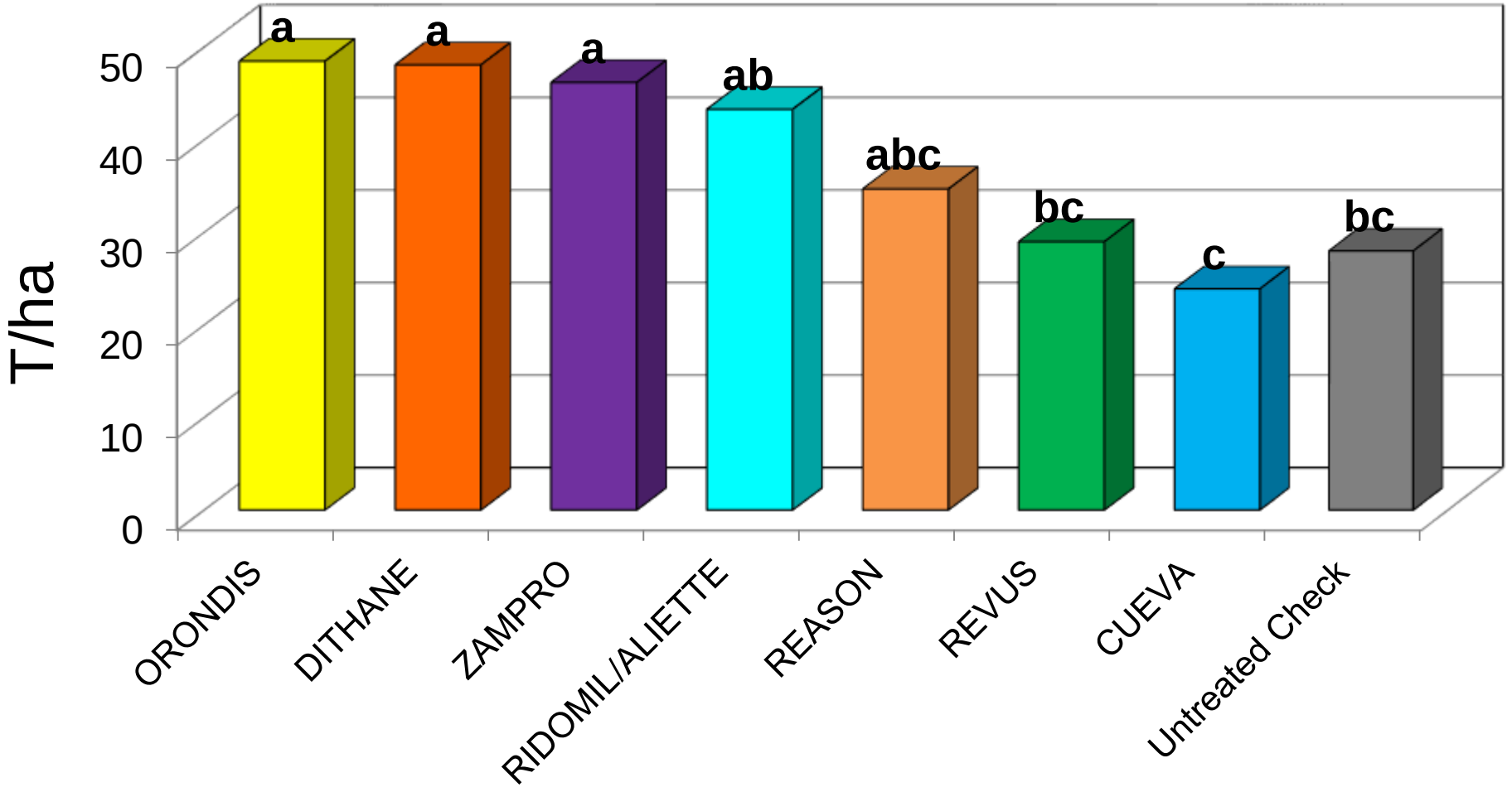
Downy Mildew Fungicide Trial 2017

Treatment	Active Ingredient	Rate/ha
CUEVA	copper octanoate	2 %
ORONDIS ULTRA + LI700	oxathiapiprolin + manipropamid	350 mL +0.2%v/v
REASON	fenamindone	
RIDOMIL or ALIETTE	mefenoxam or fosetyl-al	2.5/2.8 kg
REVUS	manipropamid	
DITHANE	mancozeb	3.25 kg
ZAMPRO + SYLGARD	ametoctradin + dimethomorph	1.0 L + 0.25 v/v

Downy Mildew Trial Results 2017



Downy Mildew Trial Results 2017



UNTREATED

ORONDIS + LI700

UNTREATED

ZAMPRO + Syl

Onion Downy Mildew

- Fungicides most effective when applied before infection takes place,
- DOWNCAST forecasting and spore trapping worked well in 2014-2016 but not in 2017.
  - Underestimated the risk in 2017
- Zampro, Orondis look very promising to rotate along with Ridomil MZ/Aliette
- Dithane providing a surprising amount of control on its own

Questions?