

2017

2017 Pesticide Safety - Fruit Rot and Other Diseases

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A close-up photograph of a cranberry plant. The central focus is a single, dark purple, rotting fruit hanging from a stem. The fruit is covered in small, white, fuzzy mold. To the right, a green, unrotted fruit is visible. The background is a soft-focus green field of cranberry plants. The text is overlaid on the image in white and teal boxes.

FRUIT ROT AND OTHER DISEASES

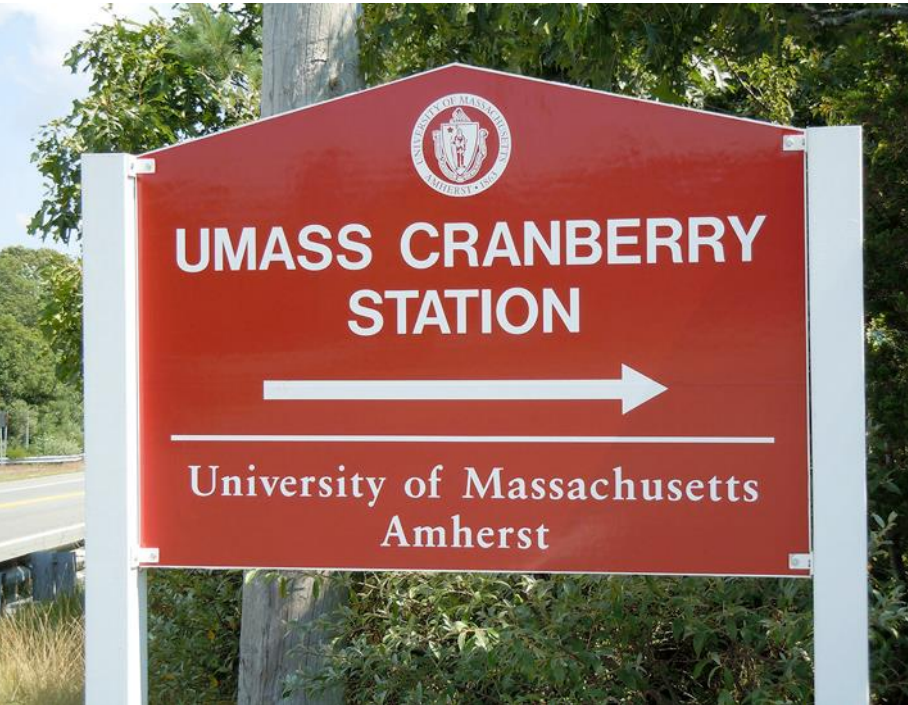
Pesticide safety

Erika Saalau Rojas
Plant Pathology
UMass Cranberry station
Spring 2017

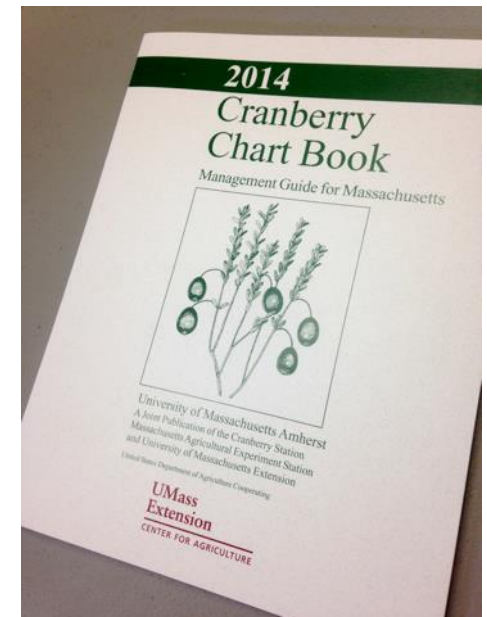
Why do fungicide applications fail?

- **Fungicide ineffective against pathogen**
- **Improper timing**
- **Poor coverage / application method**
- **Fungicide resistance**

How to choose the right product?

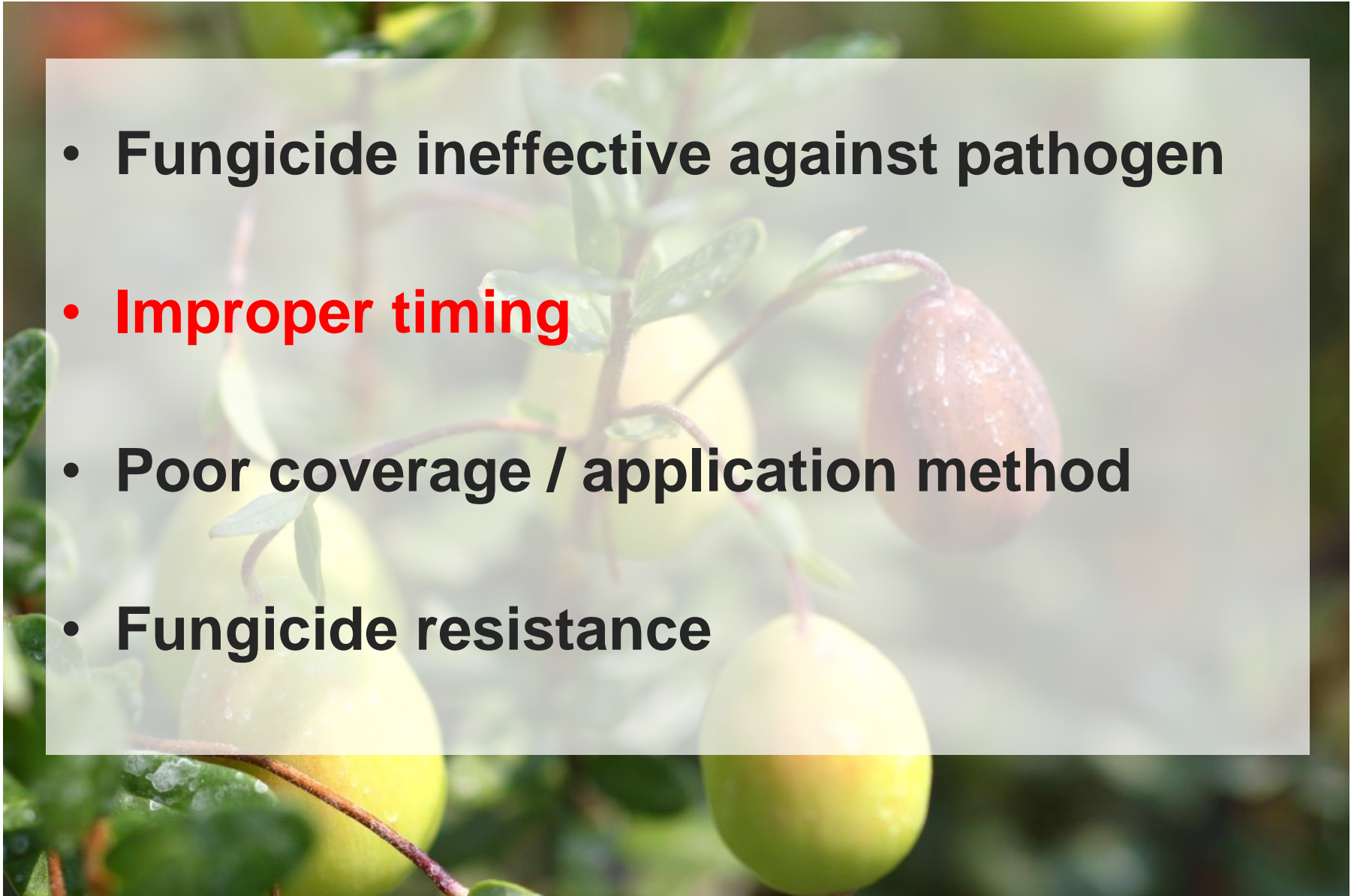


- Proper diagnosis is critical
- Background information
 - History of bed
 - Management practices *****
 - Weather



Why do fungicide applications fail?

- Fungicide ineffective against pathogen
- **Improper timing**
- Poor coverage / application method
- Fungicide resistance





Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

April

May

June

July



Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

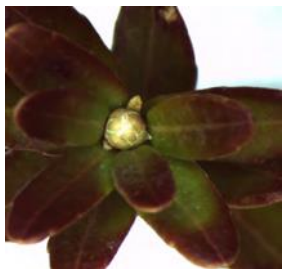
April

May

June

July

Timing for fungicide applications?



Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

April

May

June

July

Fairy ring



Bud Swell

April

Cabbage Head

May

Elongation

June

Roughneck

Bloom

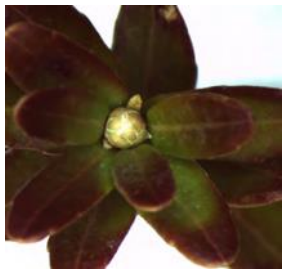
July

Bloom/fruit set

Fairy ring

- Rutgers (Peter Oudemans) research
- Indar or Abound are best options.
- Apps in early summer ineffective
- Drench fungicide into root zone
- Water 0.2 gal/ft² to ring + 10ft buffer
- Repeat for 3 years





Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

April

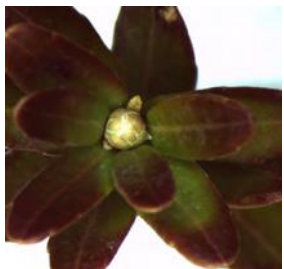
May

June

July

Fairy ring

Upright dieback



Bud Swell

**Cabbage
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Elongation

Roughneck

Bloom

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uit set**

April

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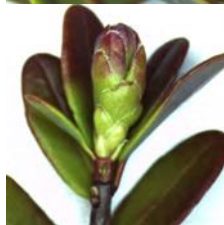
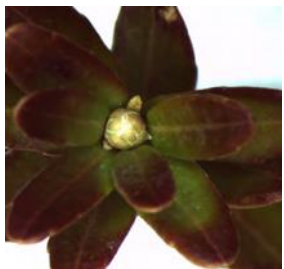
July

Fairy ring

Upright dieback



- Fungicides protect new growth.
- 1-2 apps in spring if disease pressure is high
- Heat stress/drought
- Fruit rot apps will help control disease



Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

April

May

June

July

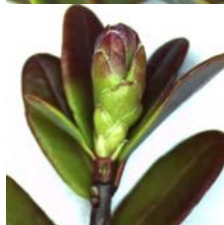
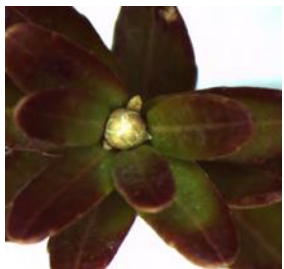
Fairy ring

Upright dieback

Phytophthora root rot



- Applications will NOT be effective unless drainage is improved.
- 2 applications in newly diagnosed beds
- Read label for PHI restrictions.



Bud Swell

**Cabbage
Head**

Elongation

Roughneck

Bloom

**Bloom/fr
uit set**

April

May

June

July

Fairy ring

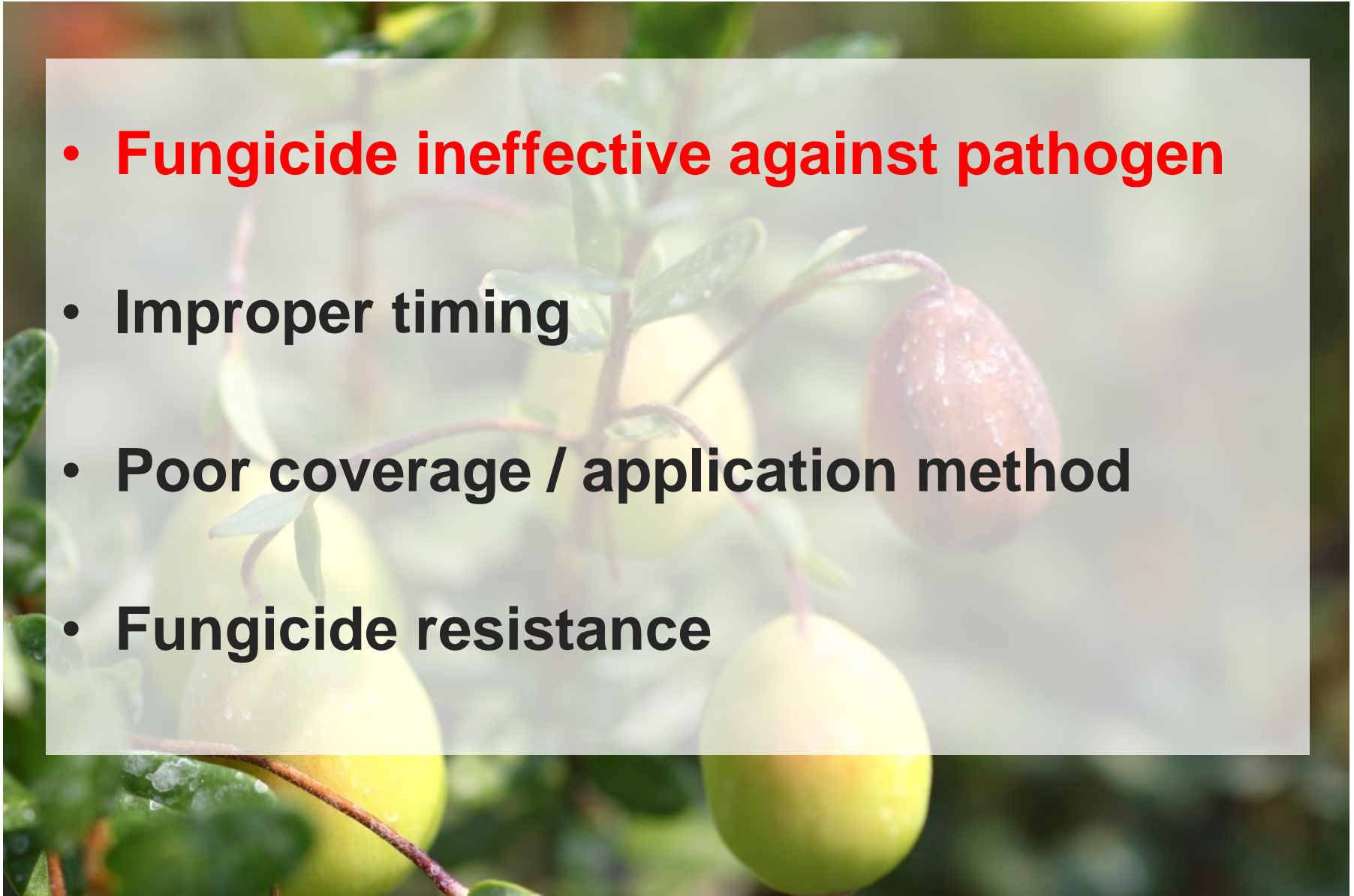
Upright dieback

Phytophthora root rot

Fruit rot

Fruit rot management

- **Fungicide ineffective against pathogen**
- **Improper timing**
- **Poor coverage / application method**
- **Fungicide resistance**



Fungicides available

Group	FRAC	Risk Resistance	Spectrum of Activity	Efficacy
DMI	Indar Proline	M	Gaps	HIGH
QoI	Abound	H	Gaps	HIGH
Polyoxins	Oso, Ph-D	M	Unknown	LOW?
chloronitr	Bravo	L	Broad	HIGH
dithiocar	Dithane, Manzate	L	Broad	HIGH

Fungicides available

Group	FRAC	Risk Resistance	Spectrum of Activity	Efficacy
SDHI	7	M to H	?	?
Biofungicides	Var	Unknown	?	?
DMI	3	M	Gaps	HIGH
QoI	11	H	Gaps	HIGH
Polyoxins	19	M	Unknown	LOW
chloronitriles	M5	L	Broad	HIGH
dithiocarbamates	M3	L	Broad	HIGH

GROUP 7 FUNGICIDE



KENJA 400SC

FUNGICIDE

ACTIVE INGREDIENT: Isofetamid* 36.0%
 OTHER INGREDIENTS: 64.0%
 Total 100.0%

*N-[1,1-dimethyl-2-[2-methyl-4-(1-methylethoxy)phenyl]-2-oxoethyl]-3-methyl-2-thiophenecarboxamide
 Contains 3.33 pounds Isofetamid Per Gallon (400 grams per liter)

**KEEP OUT OF REACH OF CHILDREN
 CAUTION**

See side panel for additional precautionary statements.
 Read entire label carefully and use only as directed.

Distributed by:



Anthracnose (bitter rot pathogen)
Botrytis (miscellaneous rots-storage)

SPECIMEN LABEL



A plant extract to boost the plants' defense mechanisms to protect against certain fungal and bacterial diseases, and to improve plant health.

Active ingredient: Extract of *Reynoutria sachalinensis* 5 %
 Other ingredients: 95 %
 Total: 100 %

EPA Reg. No. 84059-3
 EPA Est. No. 085970-FL-001
 EPA Est. No. 84059-MI-001

GROUP P5 FUNGICIDE

Efficacy Stevens 1

TRT	1 st Application	2 nd Application	3 rd Application
1	Kenja (full rate)	Kenja (full rate)	Kenja (full rate)
2	Kenja+ Regalia	Kenja+ Regalia	Kenja+ Regalia
3	SDHI (full rate)	SDHI (full rate)	SDHI (full rate)
4	Oso (full rate)	Oso (full rate)	Oso (full rate)
5	Ph-D (full rate)	Ph-D (full rate)	Ph-D (full rate)
6	Regalia (full rate)	Regalia (full rate)	Regalia (full rate)
7	Bravo	Bravo	Bravo

Results Stevens 1

TRT	3 Applications	% Field Rot
1	Kenja (full rate)	30.8% a
2	Kenja+ Regalia	39.0% a
3	SDHI (full rate)	18.8% ab
4	Oso (full rate)	26.0% ab
5	Ph-D (full rate)	24.7% ab
6	Regalia (full rate)	37.6% a
7	Bravo	6.8% b

Efficacy Stevens 2

TRT	1 st App.	2 nd App.	3 rd App.
1	Kenja (full rate)	Kenja (full rate)	Bravo
2	Oso (full rate)	Oso (full rate)	Bravo
3	Oso+Regalia (full rate)	Oso+Regalia (full rate)	Bravo
4	Oso (half rate)	Oso (half rate)	Bravo
5	Ph-D (full rate)	Ph-D (full rate)	Bravo
6	Proline	Proline	Bravo
7	Proline	Proline	Manzate



Last application: Broad spectrum, high efficacy

Efficacy Stevens 2

TRT	2 Applications	% Field Rot
1	2XKenja (full rate)+1XBravo	18.1% a
2	2XOso (full rate)+1XBravo	22.2% a
3	2XOso+Regalia (full rate)+1XBravo	14.1% a
4	2XOso (half rate)+1XBravo	15.9% a
5	2XPh-D (full rate)+1XBravo	16.1% a
6	2XProline+1XBravo	17.0% a
7	2XProline+1XManzate	11.1% a



No statistical differences

Main options against fruit rot

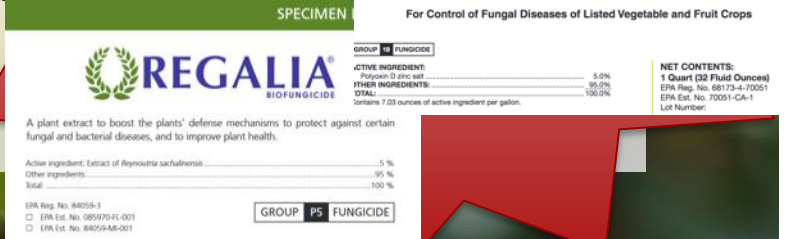
In order of efficacy (best to worst):

- Chlorothalonil - Bravo, Equus, Echo
- EBDC's – Manzate, Dithane, Roper
- Prothioconazole – Proline
- Fenbuconazole - Indar
- Azoxystrobin - Abound
- Ferbam
- Coppers – Champ, Kocide

Main options against fruit rot

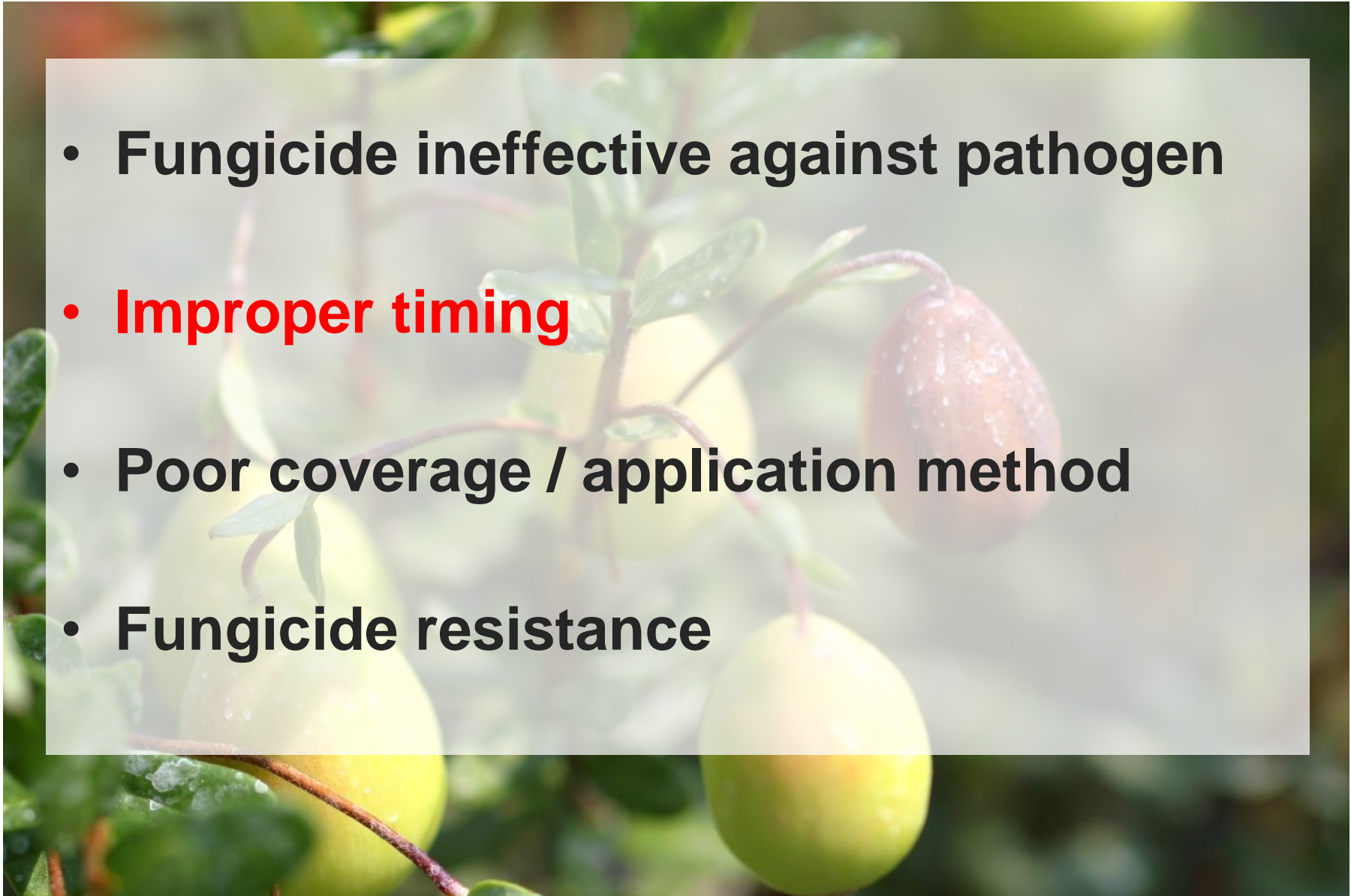
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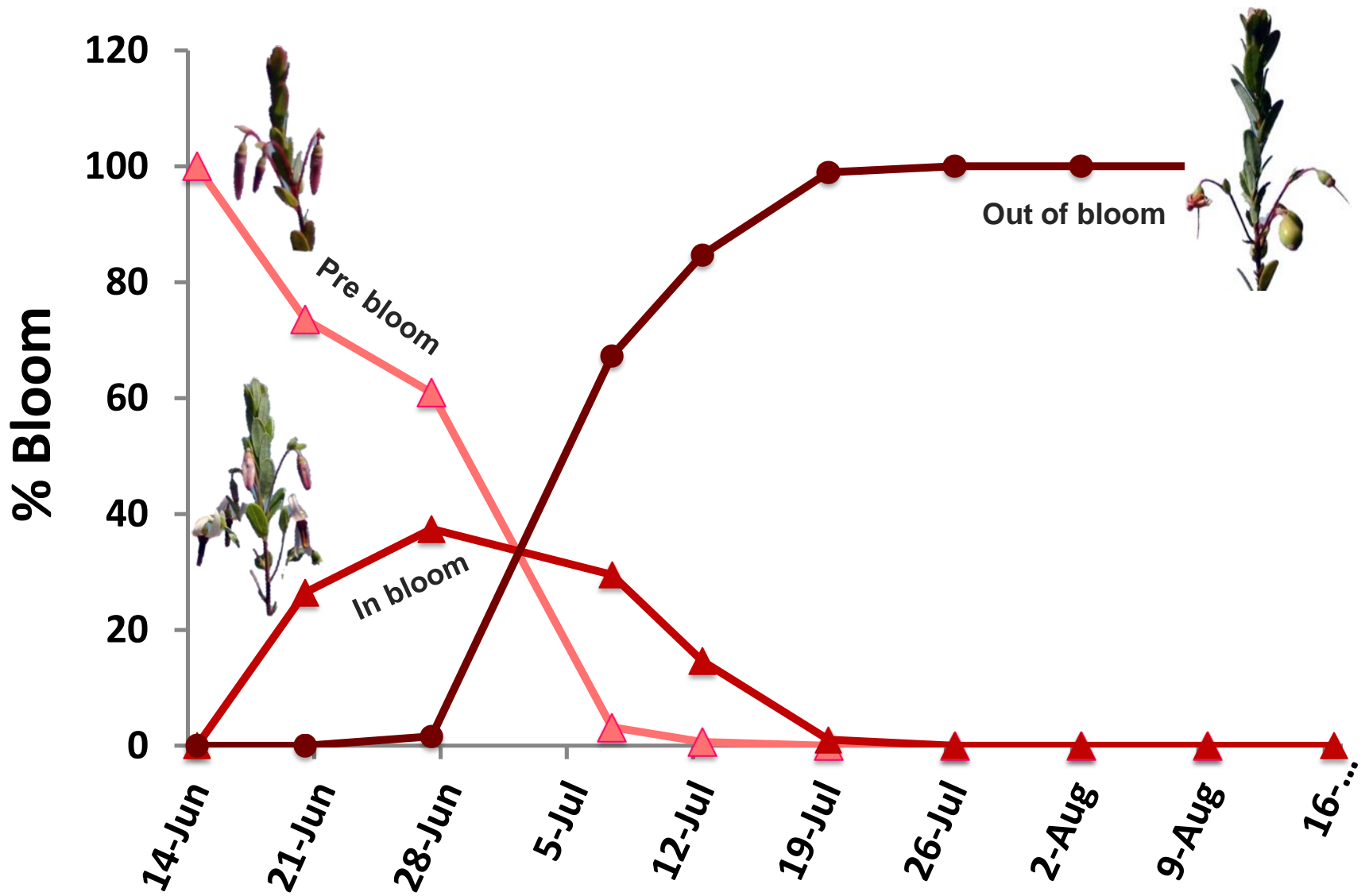


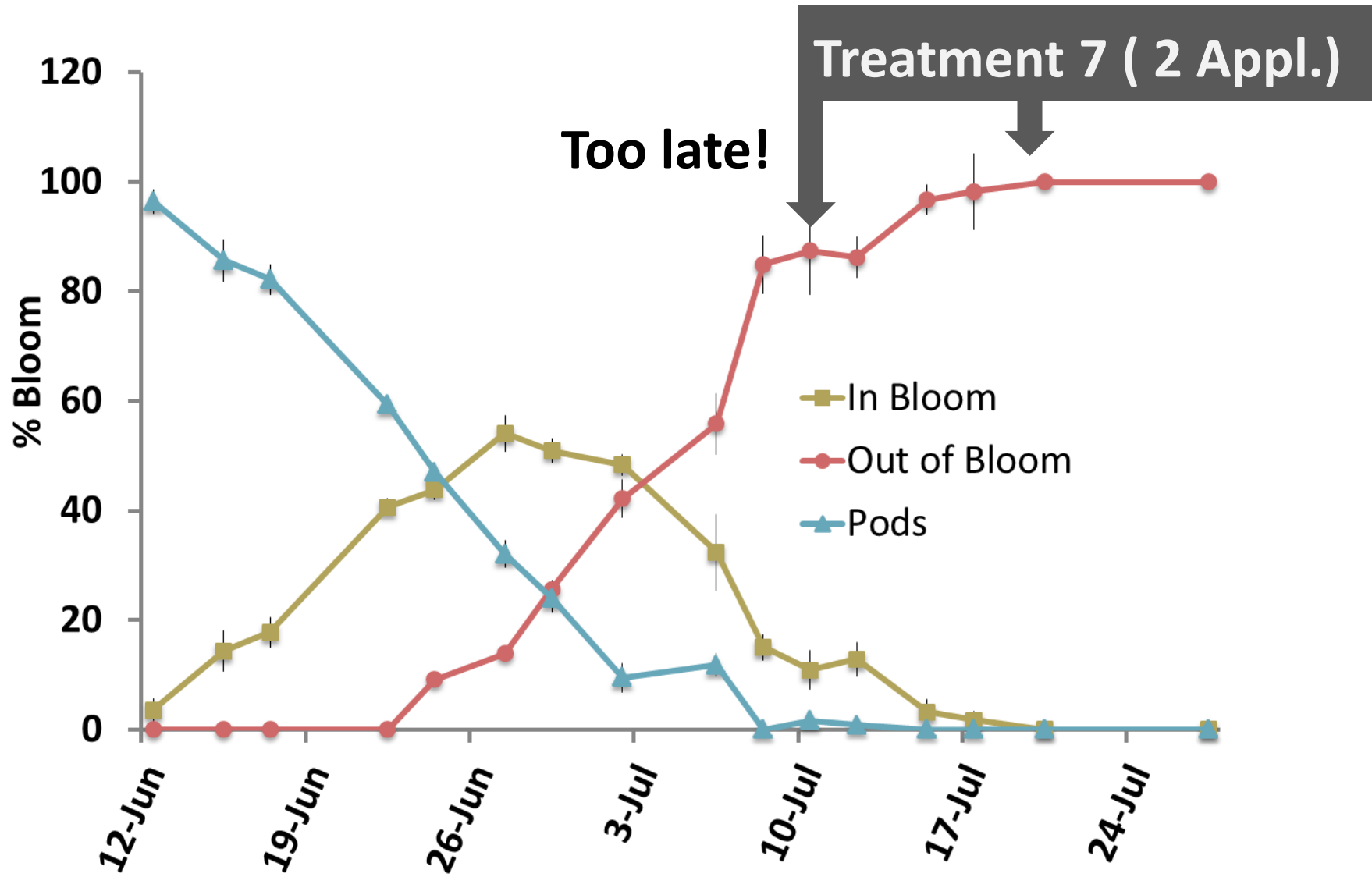
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- Fungicide ineffective against pathogen
- **Improper timing**
- Poor coverage / application method
- Fungicide resistance

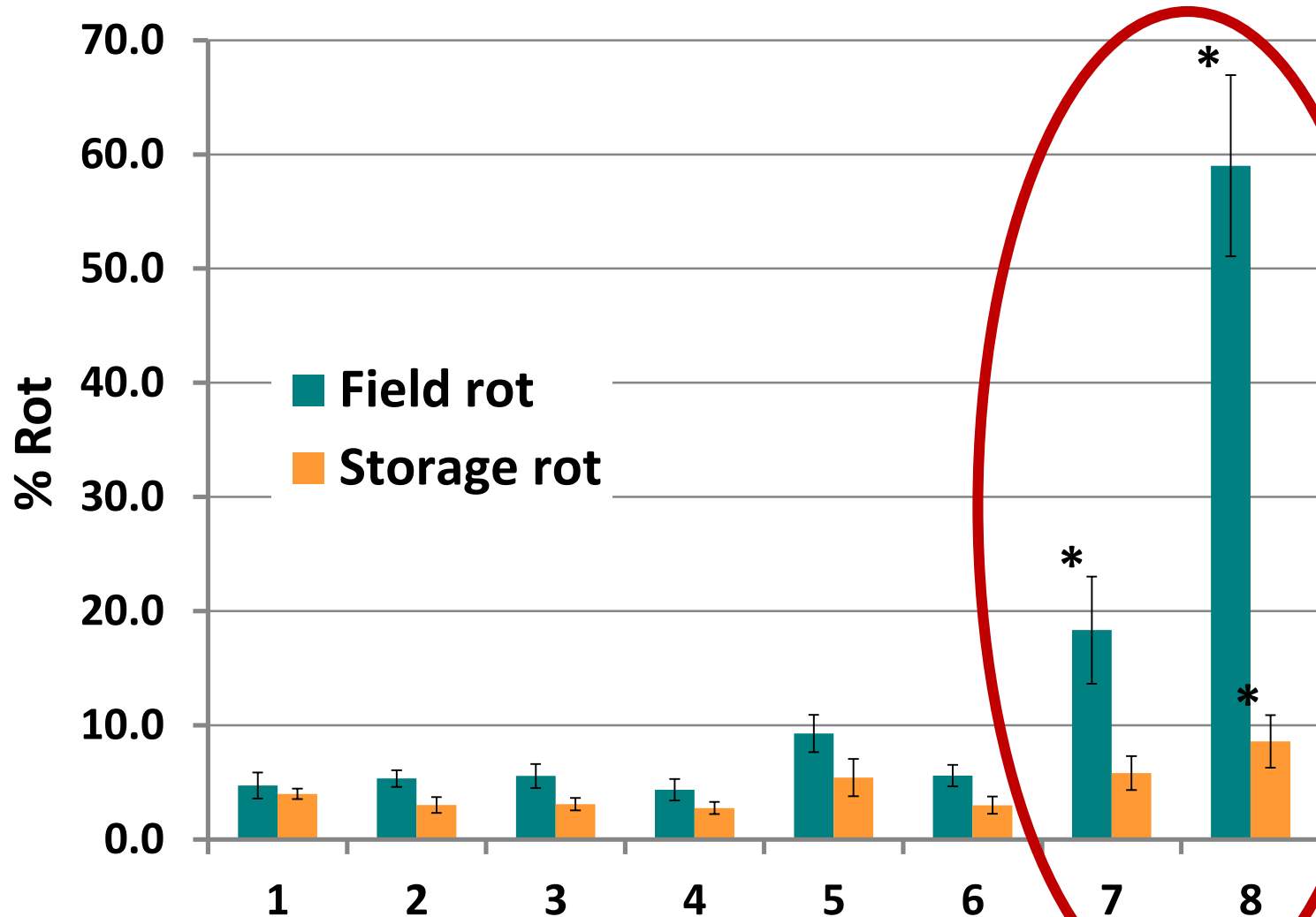


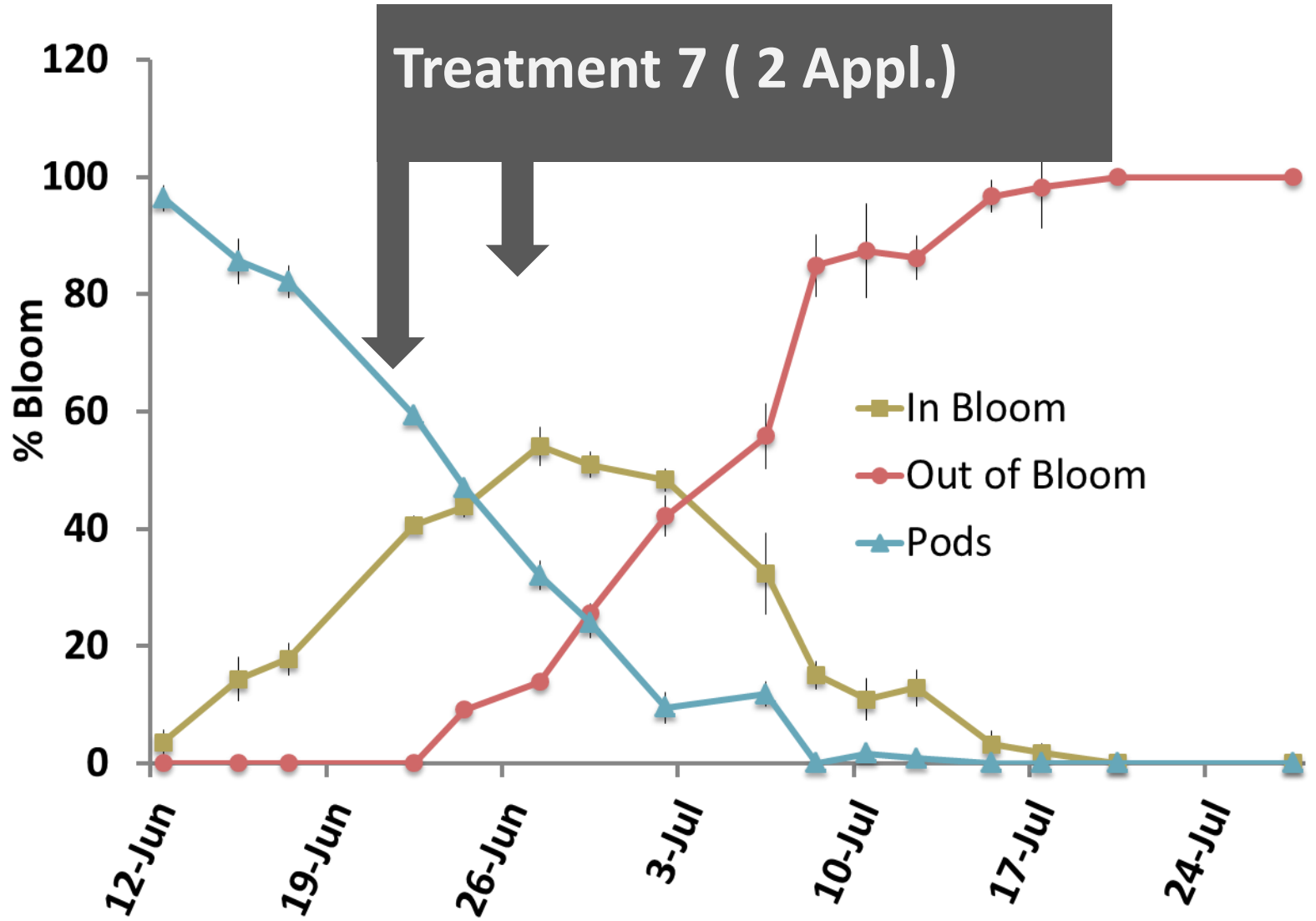
Timing of applications fruit rot



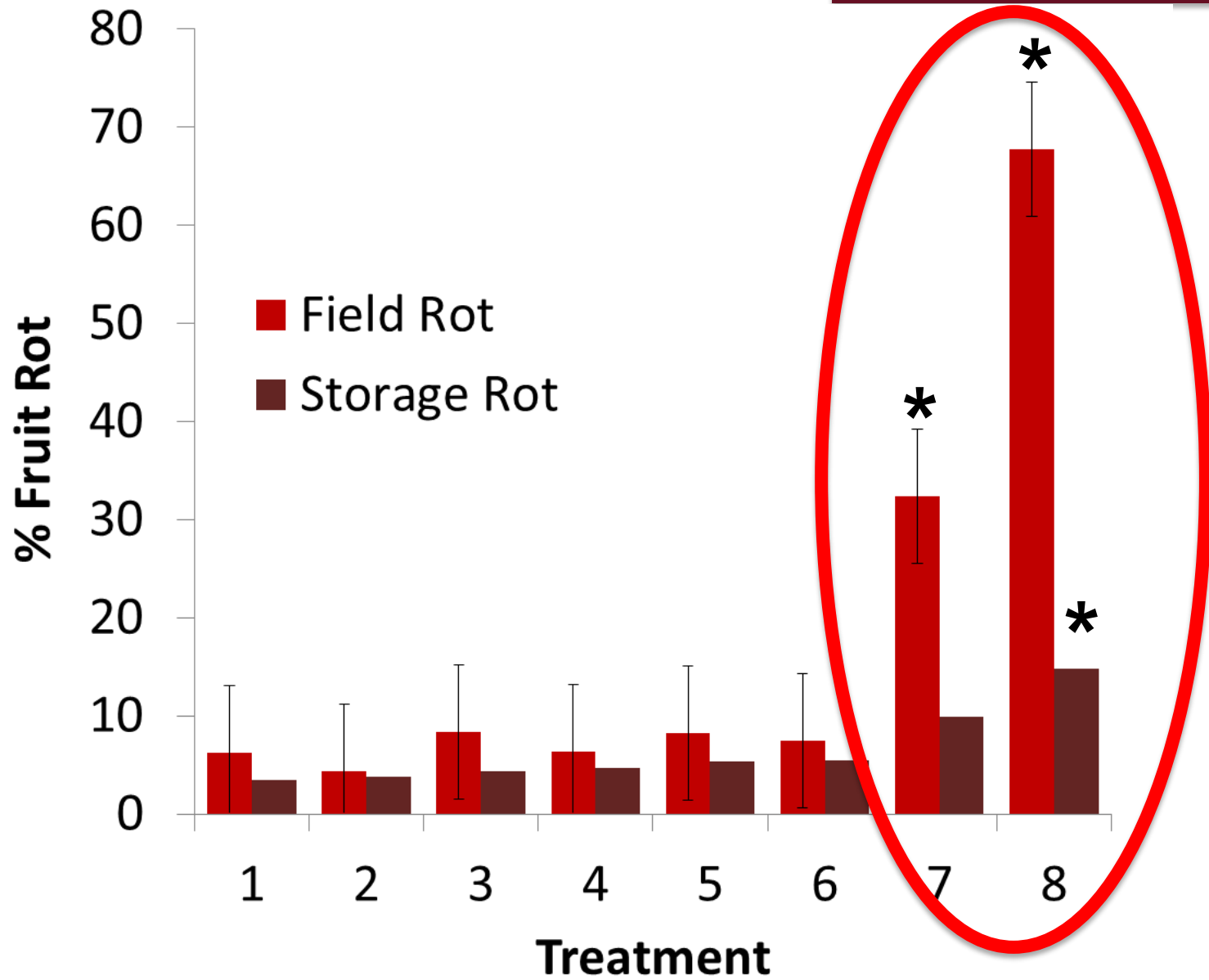


Field and storage rot 2015

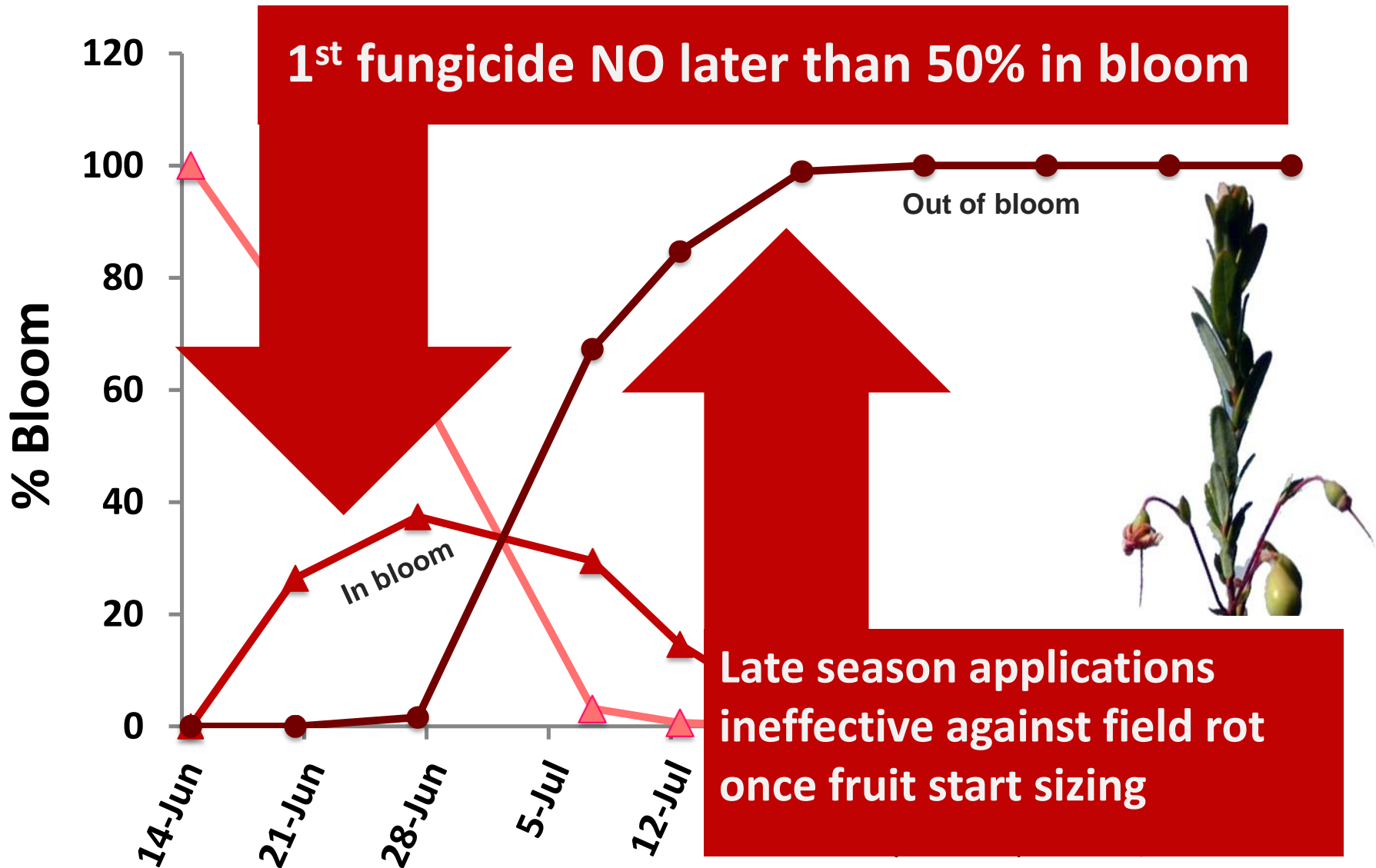




Results 2016

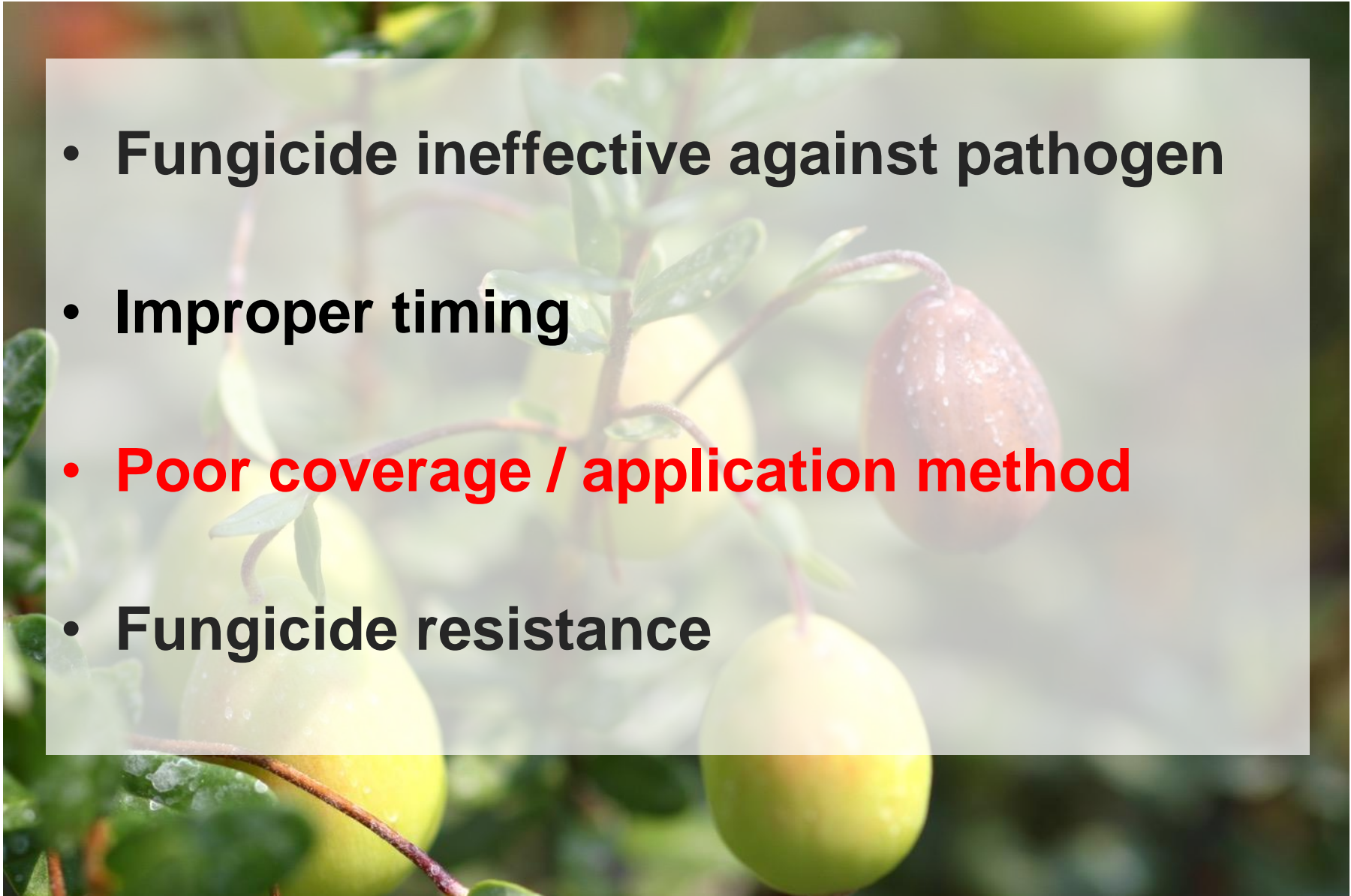


Timing of applications



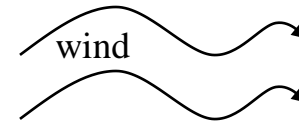
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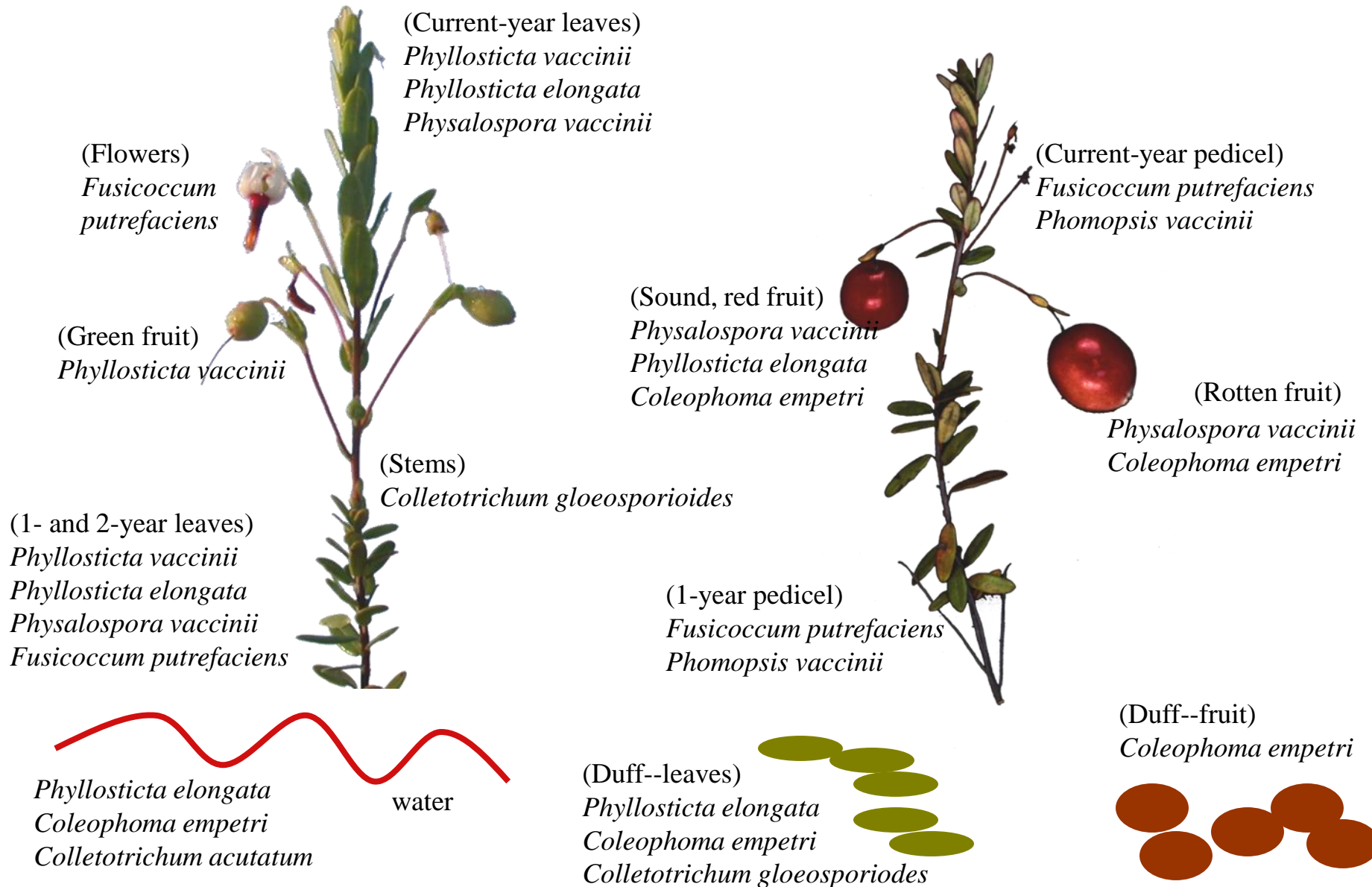
Where are the pathogens hiding?

Caruso, McManus, Oudemans
2003



wind

Phyllosticta elongata
Colletotrichum acutatum



Where are the pathogens hiding?

Caruso, McManus, Oudemans

2003



Phyllosticta elongata

Colletotrichum acutatum

Cultural practices that impact pathogens

– Sanding + trash flood (eliminates infection

from old woody tissues, leaf debris, cull fruit)

– Pruning and fertilization (better coverage)

– Late water (even bloom, better coverage)

(1- and 2-year leaves)

Phyllosticta vaccinii

Phyllosticta elongata

Physalospora vaccinii

Fusicoccum putrefaciens

Colletotrichum gloeosporioides

(Sound, red fruit)

Physalospora vaccinii

Phyllosticta elongata

Coleophoma empetri

(Current-year pedicel)

Fusicoccum putrefaciens

Phomopsis vaccinii

(Rotten fruit)

Physalospora vaccinii

Coleophoma empetri

(Duff--fruit)

Coleophoma empetri

water

Phyllosticta elongata

Coleophoma empetri

Colletotrichum acutatum

(Duff--leaves)

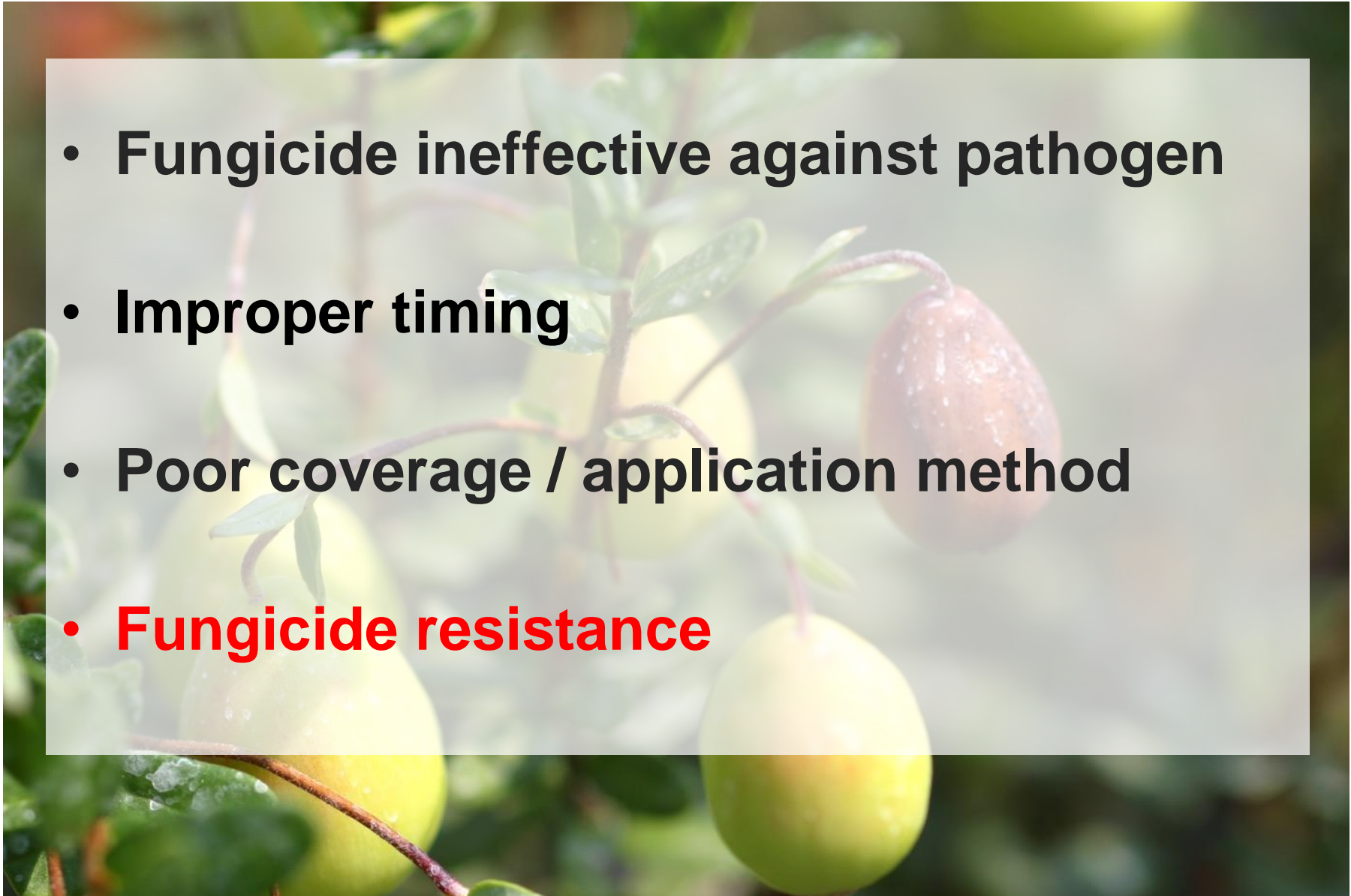
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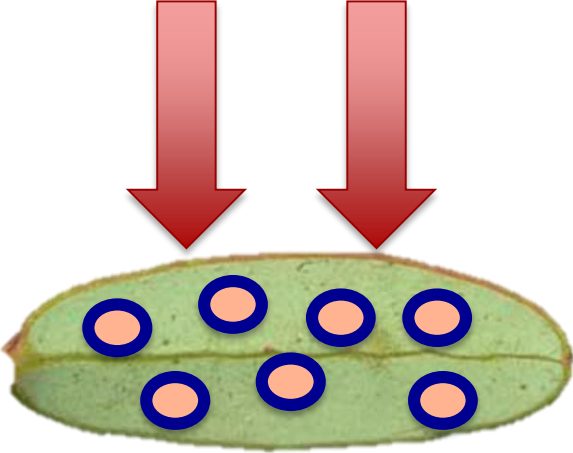


Fungicides available

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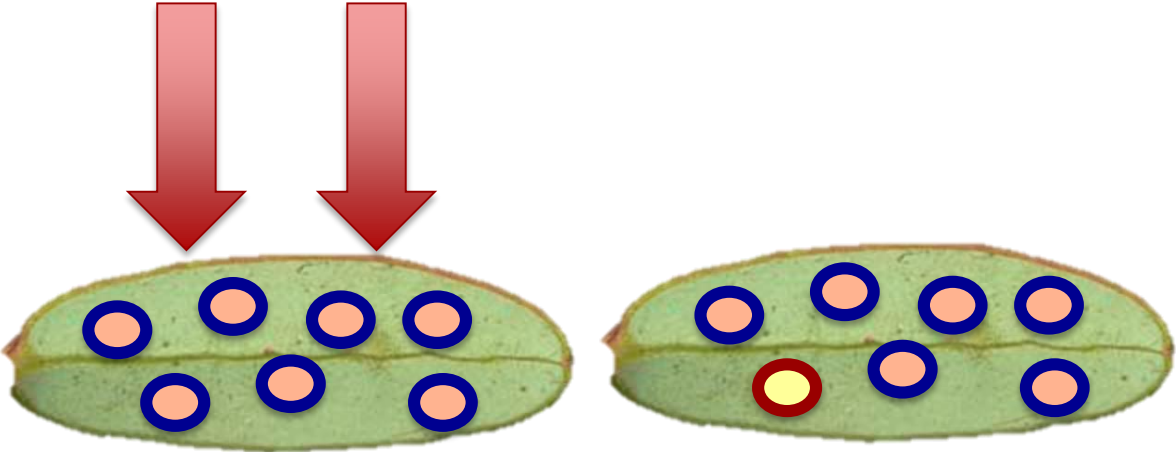
Single-site fungicides (Indar, Abound, Proline)

Medium-high risk of resistance



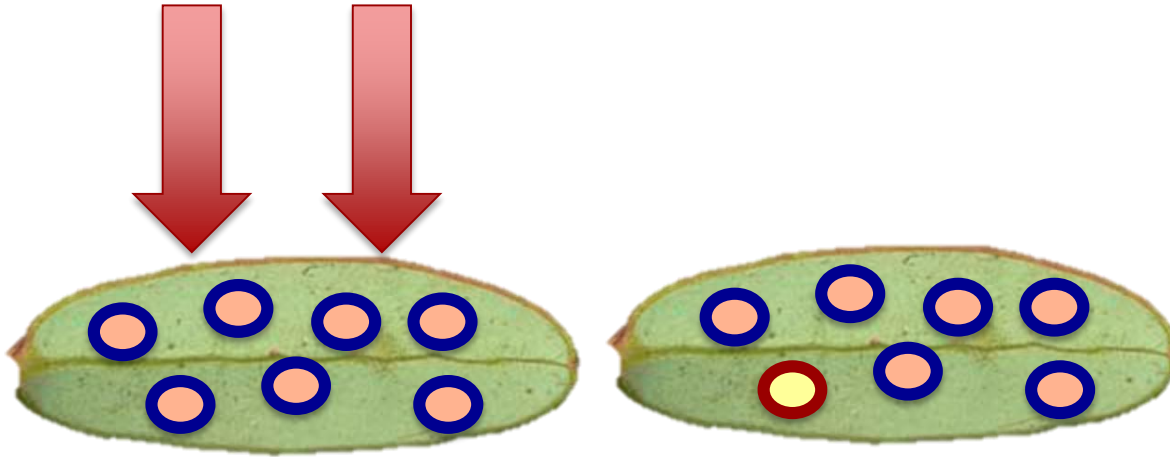
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Medium-high risk of resistance



Single-site fungicides (Indar, Abound, Proline)

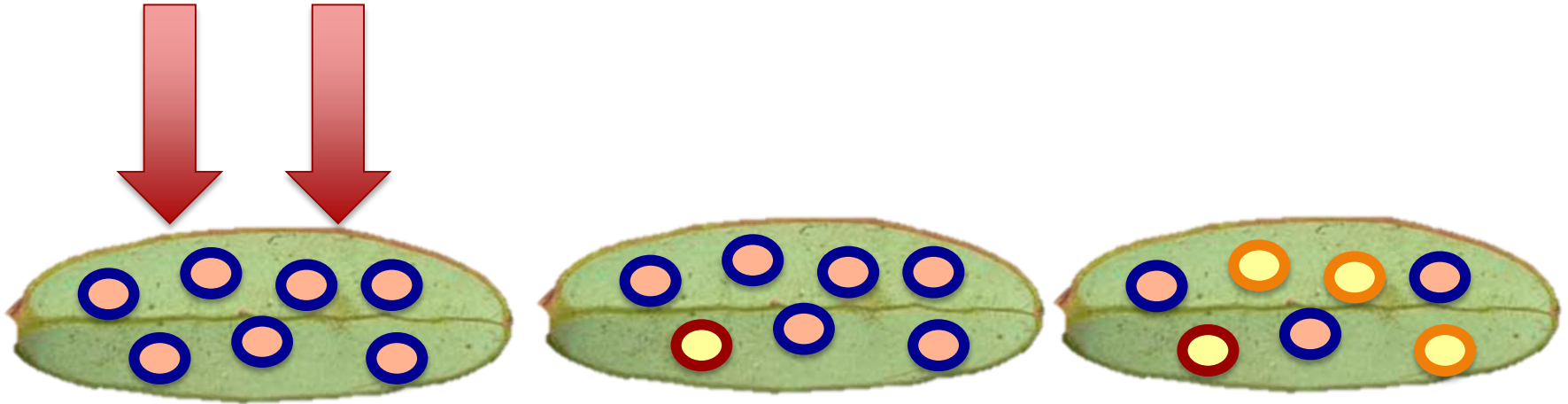
**Medium-high risk of
resistance**



**Indar (FRAC 3) + Abound (FRAC 11)
or
Proline (FRAC 3) + Abound (FRAC 11)**

Single-site fungicides (Indar, Abound, Proline)

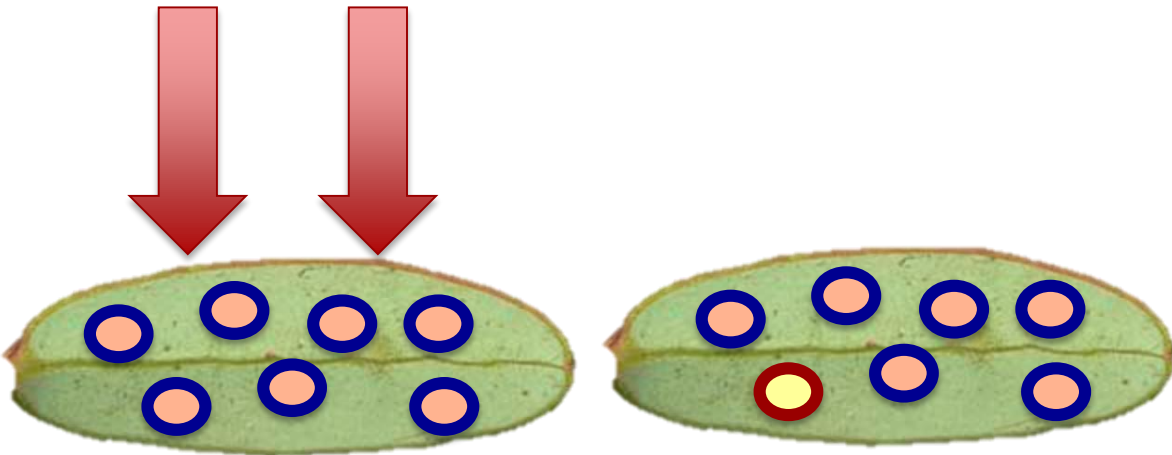
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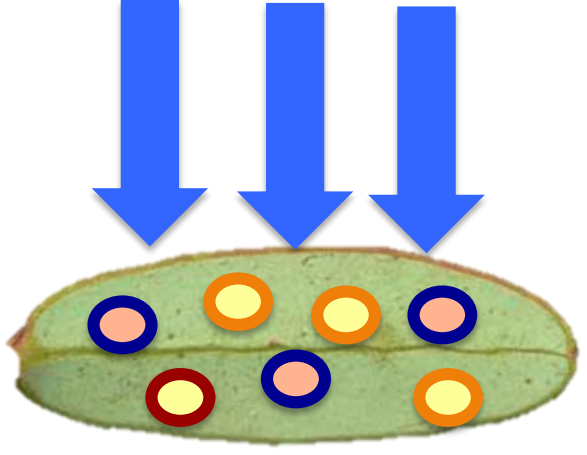
Single-site fungicides

Medium-high risk of resistance (Indar, Abound, Proline)



Multi-site fungicides

Low risk of resistance
'cleanup application'



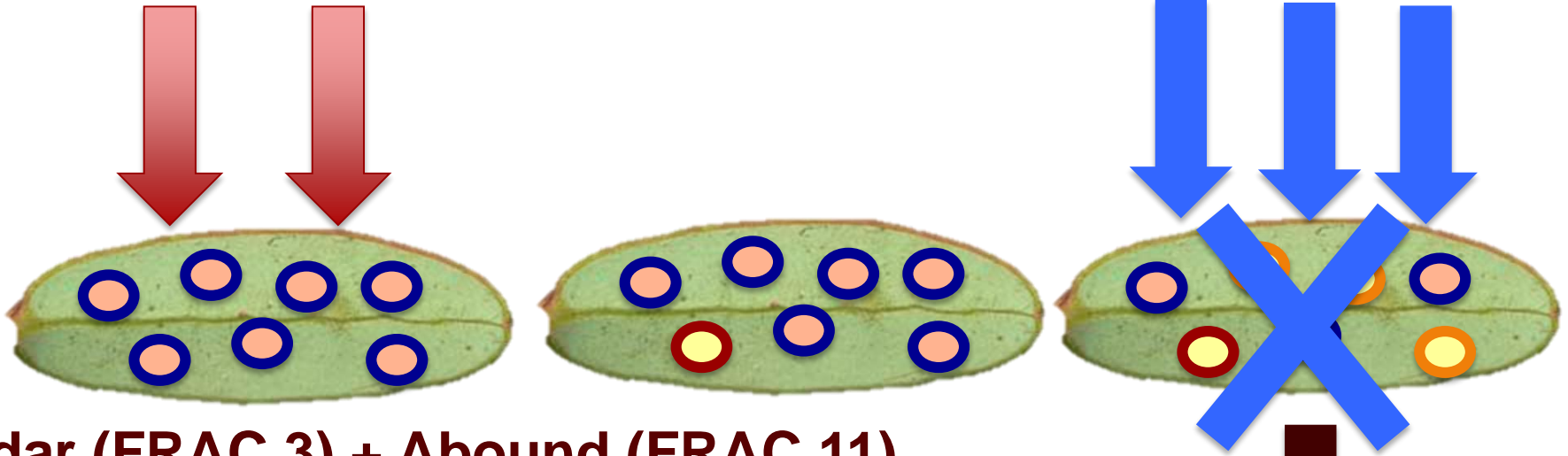
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or
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Combine or alternate modes of action
Use FRAC codes for guidance

Single-site fungicides (Indar, Abound, Proline) **Multi-site fungicides**

Medium-high risk of resistance

Low risk of resistance
'cleanup application'



Indar (FRAC 3) + Abound (FRAC 11)

or

Proline (FRAC 3) + Abound (FRAC 11)

Combine or alternate modes of action

Use FRAC codes for guidance

No carryover of resistant pathogens to next growing season

Single-site fungicides (Indar, Abound, Proline)

Medium-high risk of
resistance



Multi-site fungicides

Low risk of resistance
'cleanup application'



**Last application of the growing season
should be a multi-site fungicide
(Bravo or Mancozeb)**

Combine or alternate modes of action
Use FRAC codes for guidance



No carryover of resistant
pathogens to next growing
season

Acknowledgements

2015 Summer Crew

- Tom Giorgio
- Jessica Braley
- Jared Hass
- Michael Kwang

Collaborators Fruit Firmness

- Matt Beaton
- Peter Beaton, Rob Rubini
- Gary Garretson, John Mason
- Glenn Reid, Louis Lemmert
MakePeace
- Rod Serres and David Nolte (OS)

Cranberry Station team

- Funding and Resources



THE
CRANBERRY
INSTITUTE



