

Assessing the Effect of Spotted Tentiform Leafminer Injury to Apples

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College of Agriculture and Life Science

Assessing the Effect of Spotted Tentiform Leafminer Injury to Apples

Sponsorship

National Research Initiative
Competitive Grants Program
(NRICGP)

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**New York State
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Spotted tentiform leafminer (STLM)

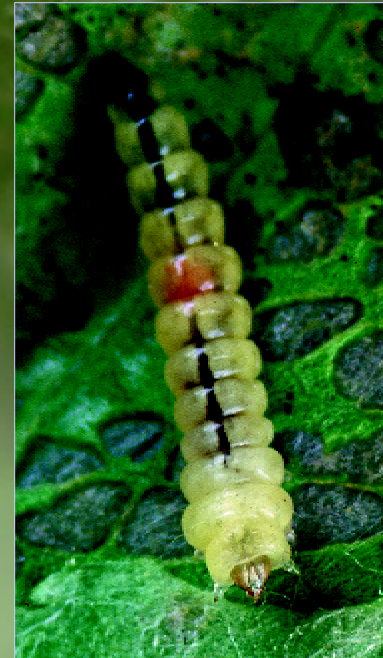
Phyllonorycter blancardella

P. crataegella

P. malimalifoliella

P. sorbi

P. mespilella



STLM injury to apples



STLM injury to apples



Injuries

Defoliation

Suppression on fruit and
shoot growth

Premature ripening and
fruit drop

Reduction in fruit size and
fruit set

Prone to spray injury

STLM injury to apples



Mechanisms

Reduction in
photosynthetic ability?

Changes in endogenous
hormonal balance?

Integrated pest management (IPM) recommendation for STLM control



Action thresholds

First generation:
ONE mine per leaf

Second generation:
TWO mines per leaf

Integrated pest management (IPM) recommendation for STLM control



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Objectives

To quantify the reduction in single and whole canopy leaf area due to STLM

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Objectives

To determine leaf and whole canopy photosynthesis ability after injury by STLM alone or in combination with European red mite (ERM)

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Objectives

To identify STLM effects on fruit growth, size, pre-harvest drop, and fruit quality

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Objectives

To establish a model for leaf or canopy photosynthesis in response to STLM and ERM injury

To evaluate the current IPM active threshold for STLM

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Materials

McIntosh

Red Delicious

Empire

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Measurements

Leaf area reduction

Photosynthesis

Fruit growth

Fruit size

Pre-harvest fruit drop

Fruit quality

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Fruit size

Fruit quality

Pre-harvest fruit drop

Leaf ethylene production

Effect of STLM on leaf area

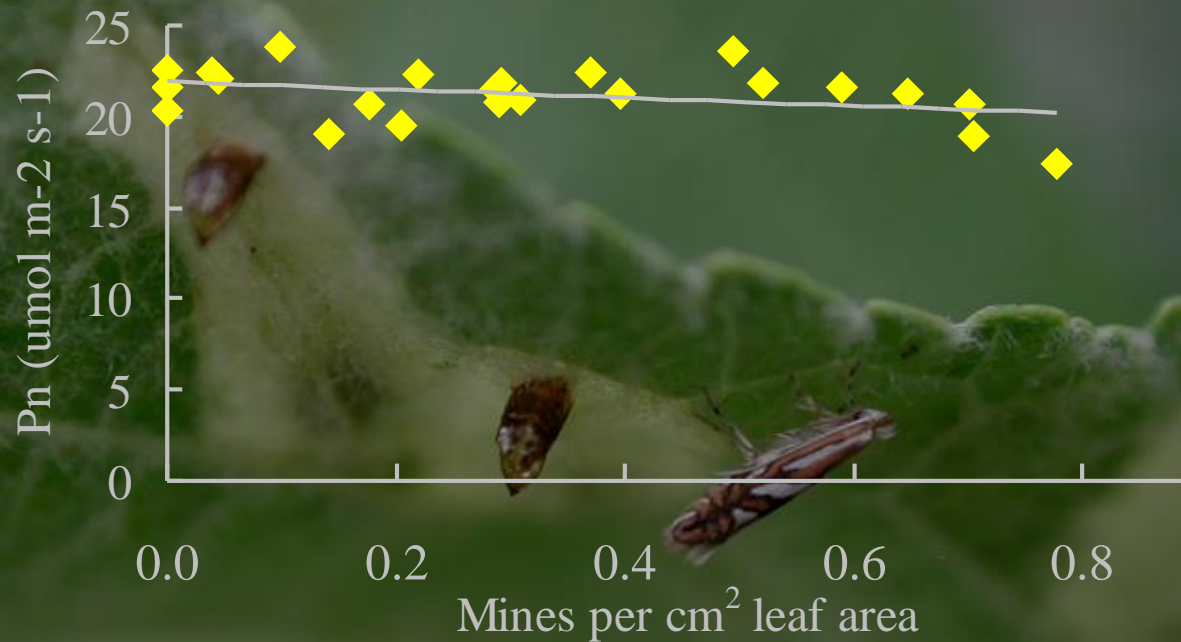
Average mine size

0.5 cm²

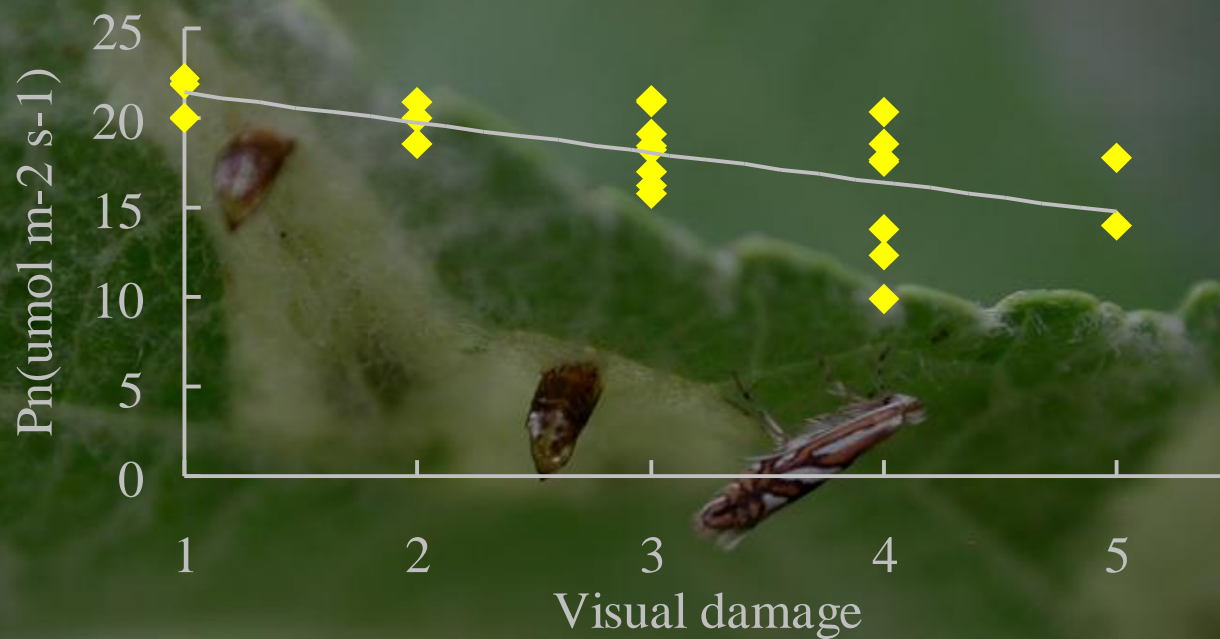
2% to 2.5% leaf area



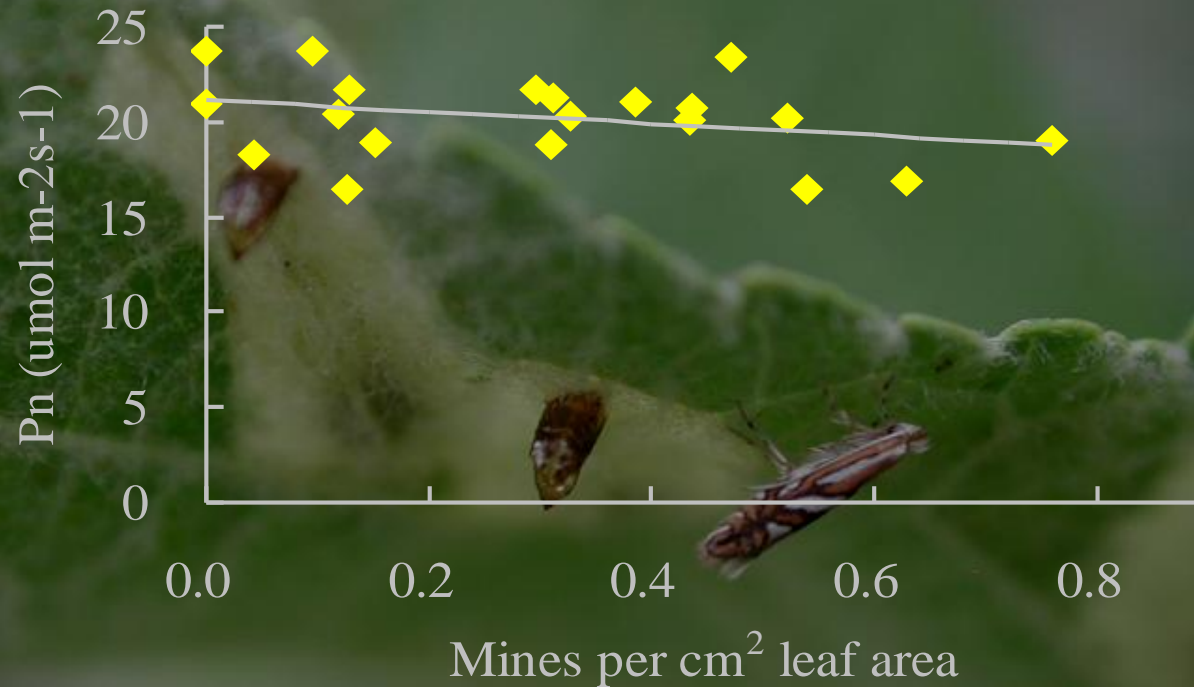
Effect of STLM on leaf photosynthesis



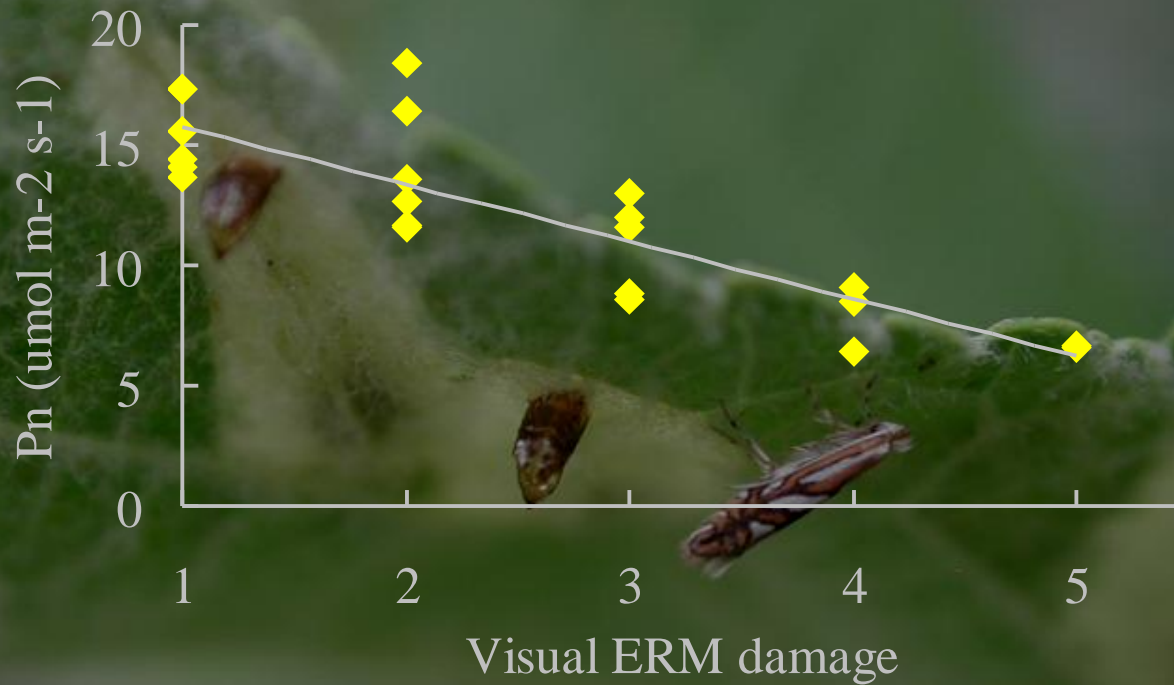
Effect of ERM on leaf photosynthesis



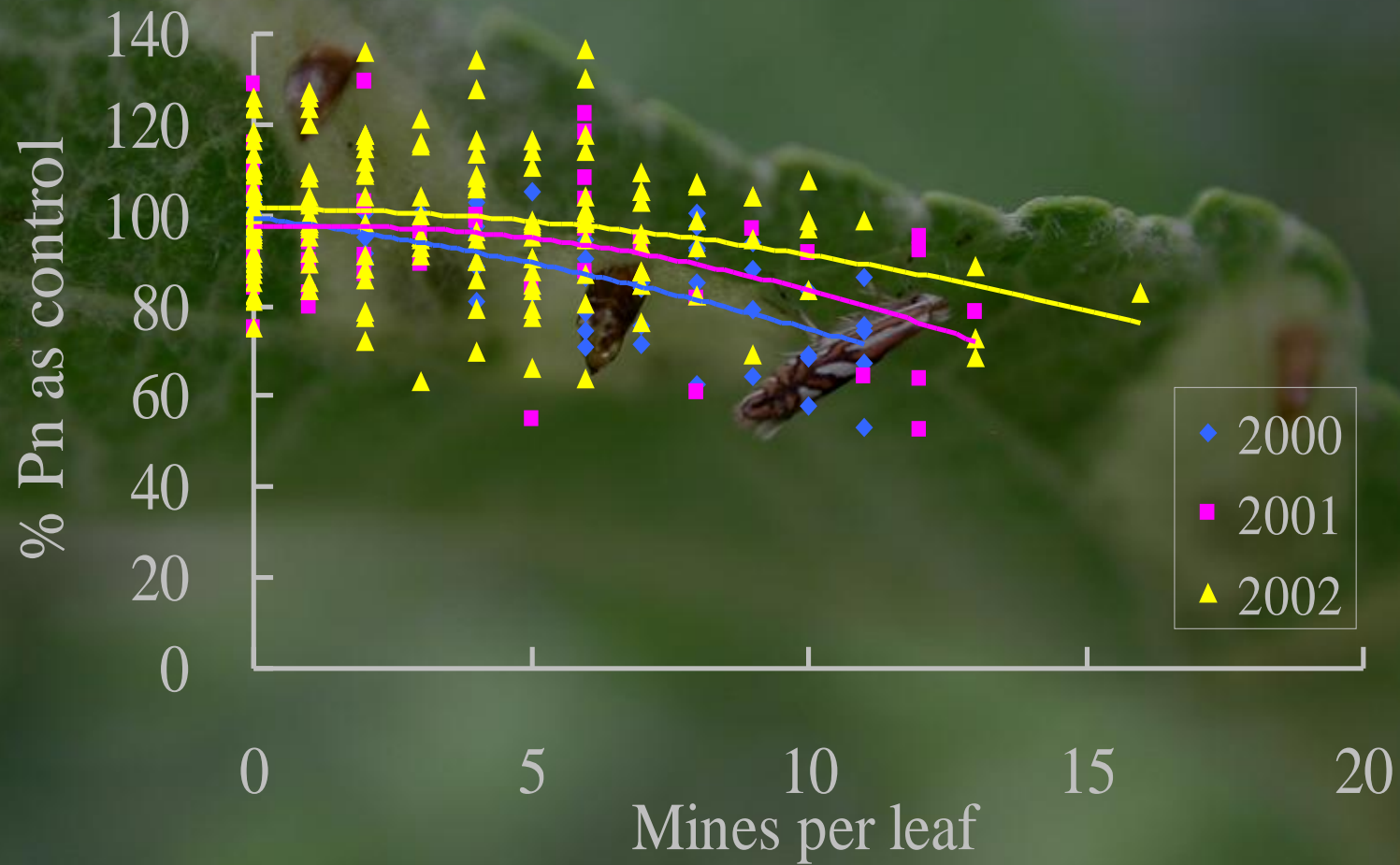
Effect of STLM on leaf photosynthesis



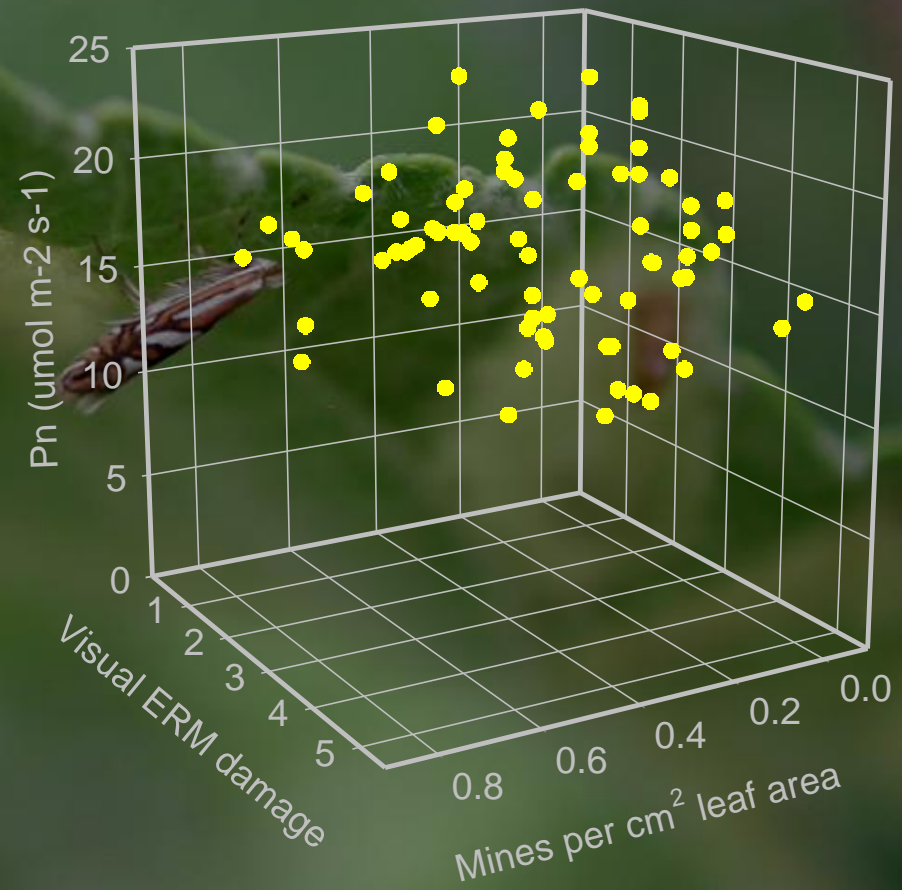
Effect of ERM on leaf photosynthesis



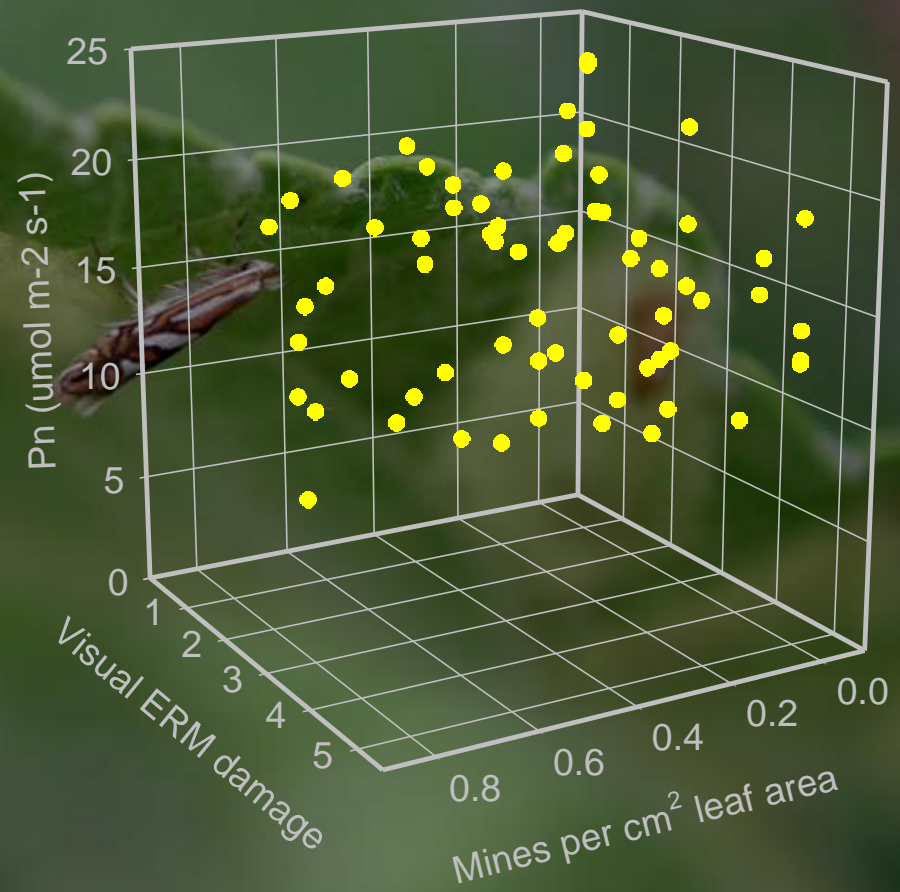
Effect of STLM on leaf photosynthesis



STLM+ERM effect on leaf photosynthesis



STLM+ERM effect on leaf photosynthesis



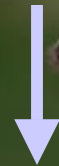
STLM+ERM effect on leaf photosynthesis

$$Pn = b_0 + b_1(STLM) + b_2(ERM) + b_3(STLM \times ERM)$$

Mac	22.5	-9.6	-1.42	1.44
<i>p</i>		<0.001	<0.001	0.11
<i>VIF</i>		4.01	3.66	6.19
Red D	23.3	-11.72	-1.76	1.31
<i>p</i>		<0.001	<0.001	0.13
<i>VIF</i>		4.87	2.75	5.73

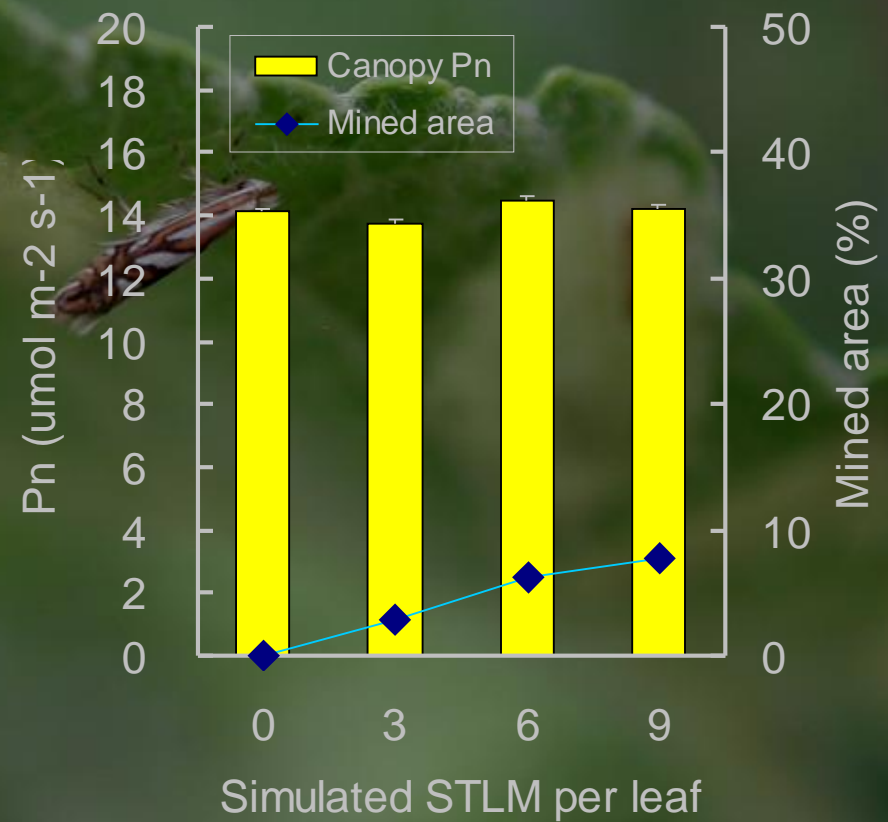
STLM+ERM effect on leaf photosynthesis

$$Pn = b_0 + b_1(STLM) + b_2(ERM) + \cancel{b_3(STLM \times ERM)}$$

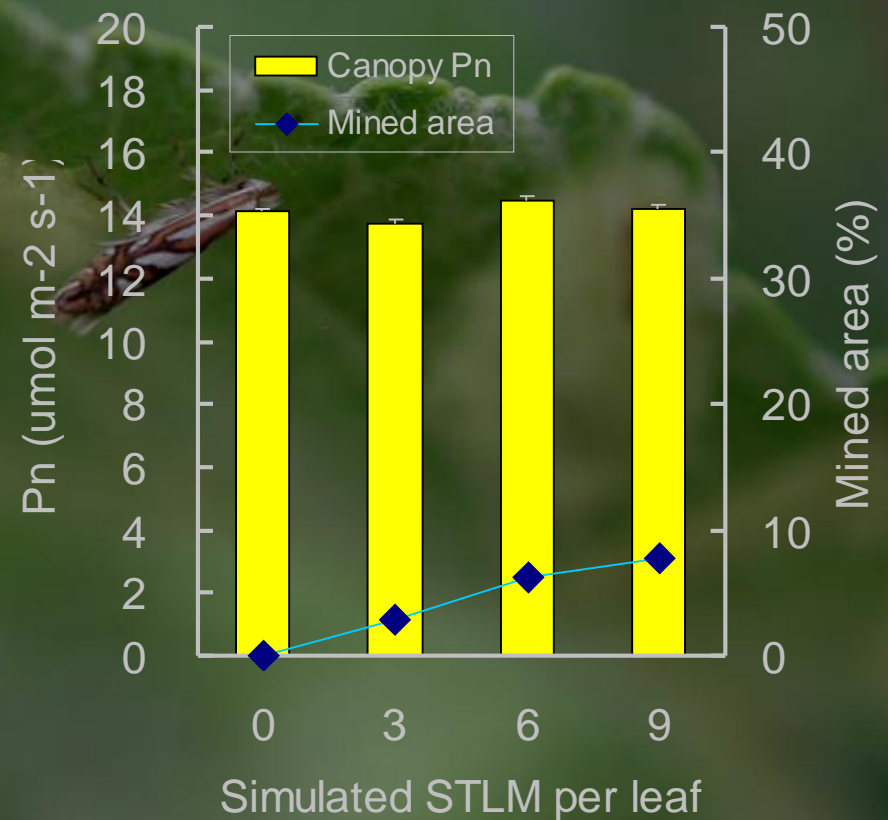


$$Pn = b_0 + b_1(STLM) + b_2(ERM)$$

Effect of simulated STLM on whole canopy leaf area and photosynthesis



Effect of simulated STLM on whole canopy leaf area and photosynthesis



Effect of STLM injury on fruit growth & fruit quality



Fruit growth & size

Carbohydrate supply



Fruit demand

Effect of STLM injury on fruit growth & fruit quality



Fruit quality

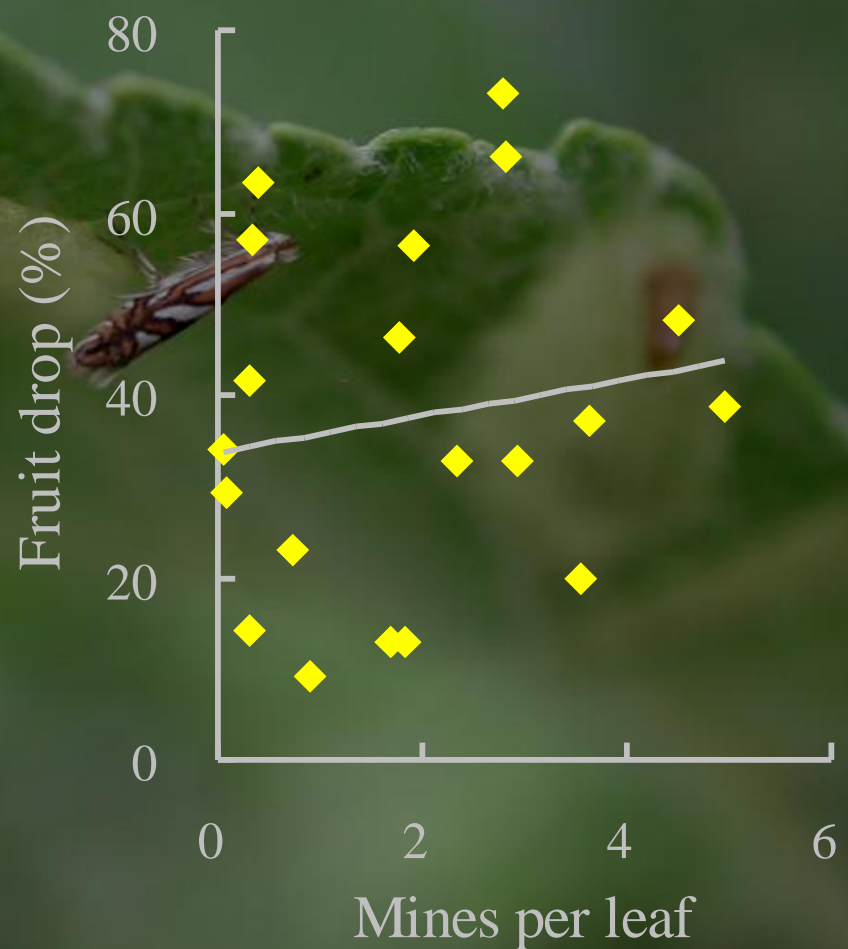
No effect on

Total soluble solids

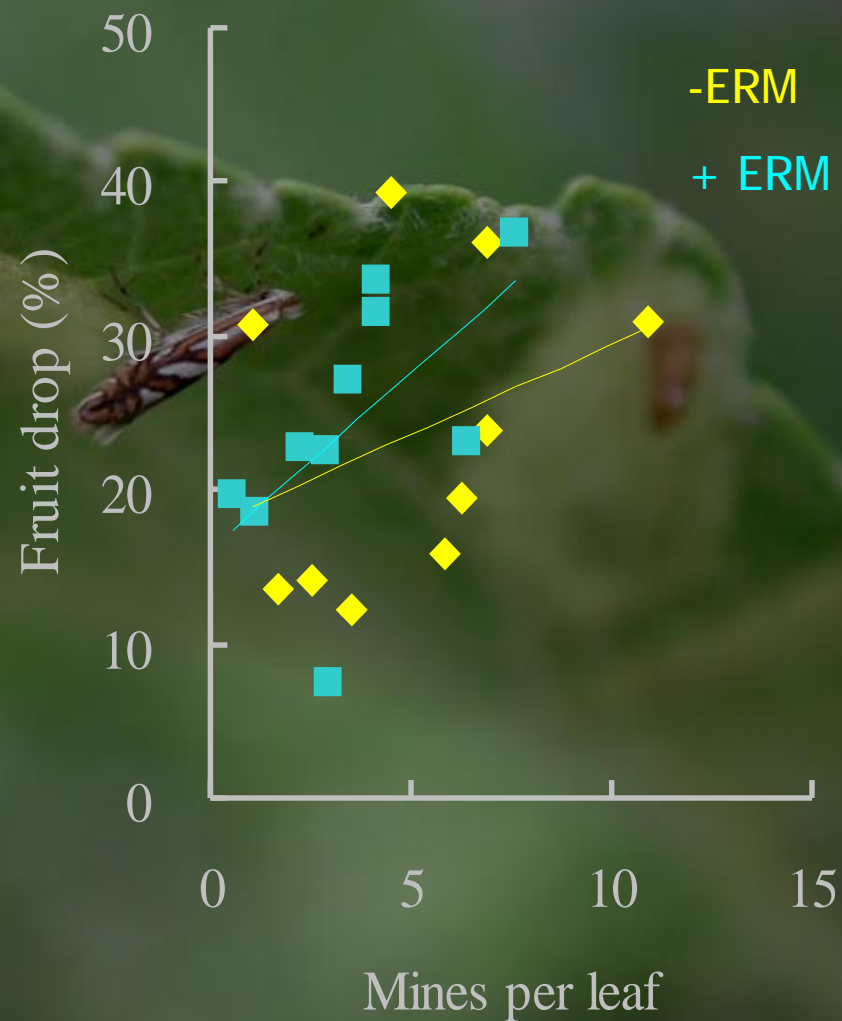
Firmness

Starch

Effect of STLM injury on pre-harvest fruit drop

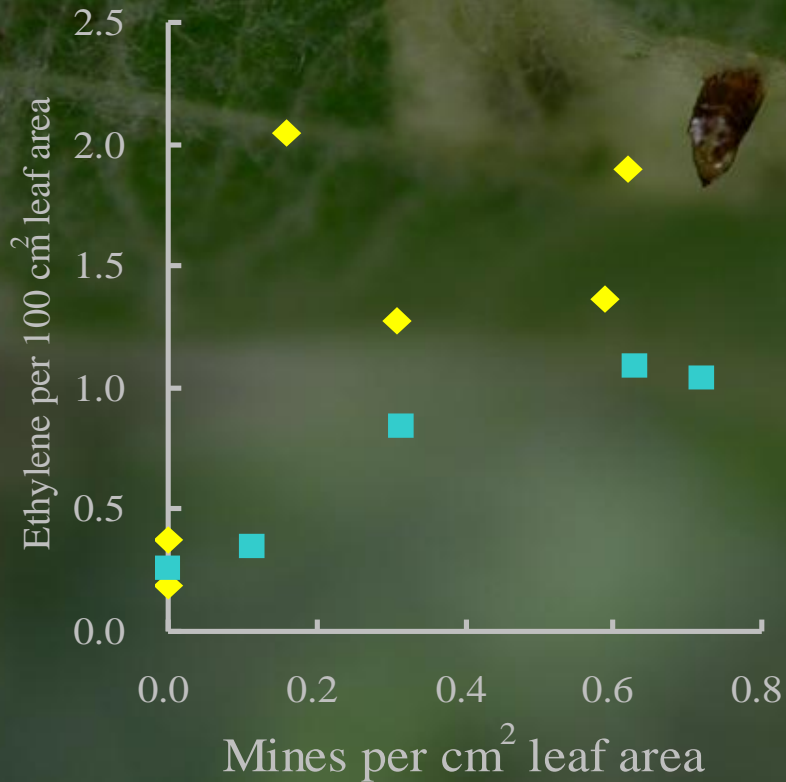


Effect of STLM injury on pre-harvest fruit drop

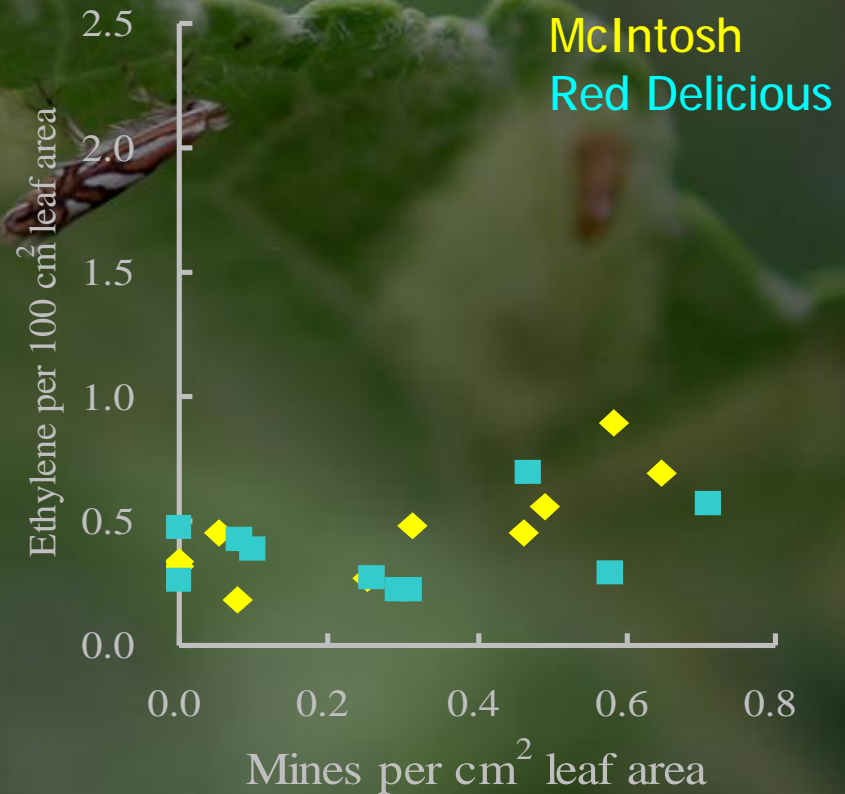


Effect of STLM injury on leaf ethylene production

Sep 16



Sep 30



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Summary

STLM does not significantly
affect leaf and canopy
photosynthesis

STLM does not affect fruit
growth and quality

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Summary

Severe STLM increased pre harvest fruit drop in McIntosh apple

IPM active threshold overestimates STLM injury to apple trees

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Acknowledgements

National Research Initiative
Competitive Grants Program

Rick Piccioni

Karen Wentworth

Michelle Rose

W. Harvey Reissig

Terence Robinson

Chris Watkin

Jackie Nock

Joe Ogrodnick

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