What's Bugging You?
Some Pest Management Issues in Nut Growing

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Photo Mark Hoffman, Milwaukee Journal Sentinel

Some insects and mites associated with tree nuts

Black walnut

- Butternut & black walnut curculio
- Hickory borers (*Megacyllene caryae*, Saperda discoidea)
- American plum borer
- Leopard moth
- Hickory tussock moth
- Forest tent caterpillar
- Walnut bud moth
- Fall webworm
- Spongy moth
- Walnut caterpillar
- Walnut spanworm (*Coniodes plumigeraria*)
- Walnut husk fly (maggot) (*R. suavis*)
- Walnut scale, other scales
- Codling moth
- Giant bark aphid
- Walnut blister mite
- Hairy and smooth leaflet gall mites
- Petiole (velvet) gall mite
- Walnut lace bug
- Leaf gall midge
- Spider mites (Eur. red, others)

Hazelnuts

Larger elm leaf beetle
Webworm (*Dichomeris ligulella*)
Spear-marked black moth (*Rheumaptera hastata*)
Leafrollers – several species
Orangestriped oakworm
Brown marmorated stink bug
Striped alder sawfly
Pitted ambrosia beetle
Dogwood borer
Shothole borer
Alder lace bug
Apple mealybug
Big bud mites (2 spp.)
Linden spider mite (*E. tiliarium*)

Walnut caterpillar (on hickory)

Photos Darcy McDowell, NYS Parks

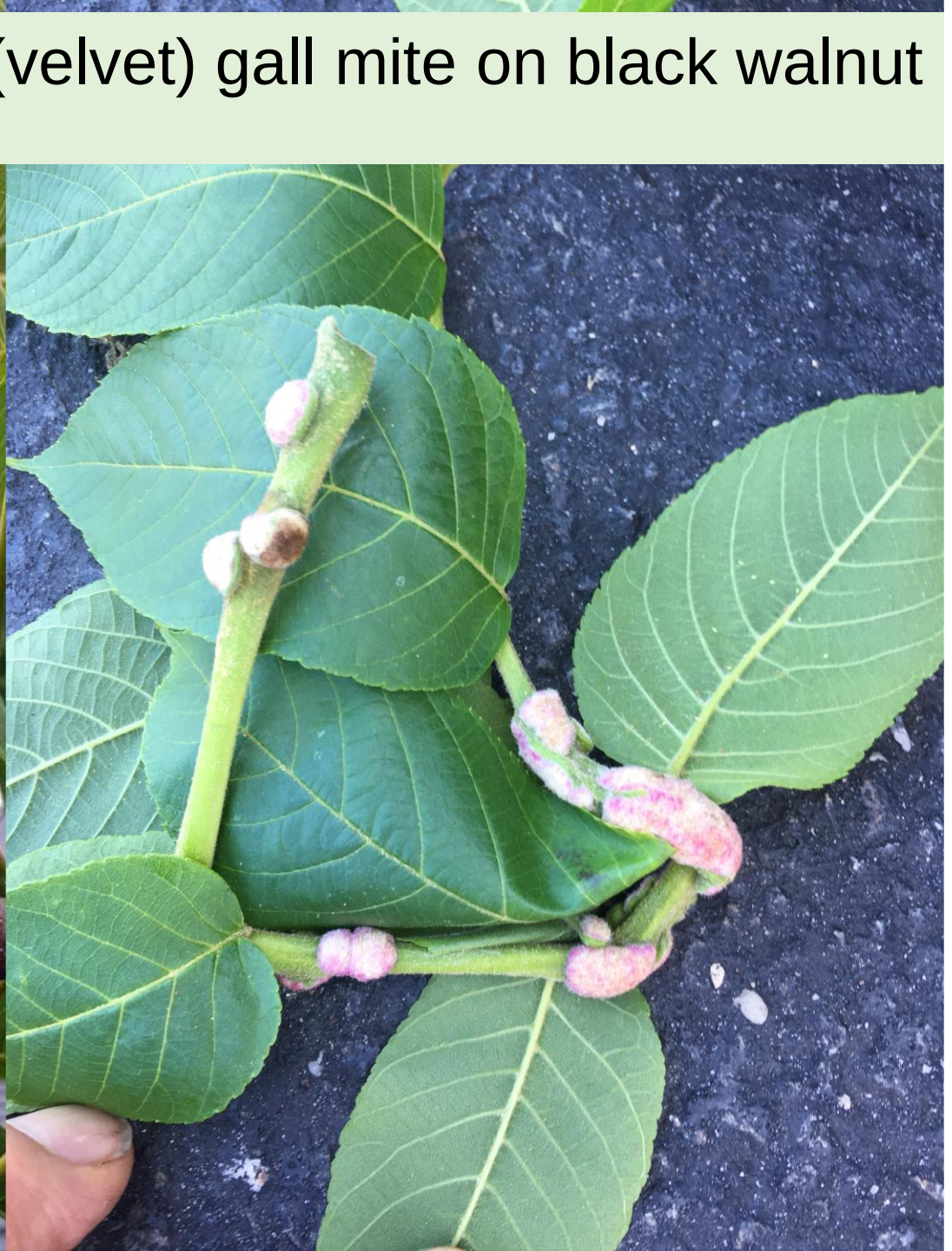
Leaf gall midge on black walnut

probably *Dasineura* sp. on *J. nigra*; *Contarinia* sp. on *J. cinerea*

Walnut petiole (velvet) gall mite on black walnut

Eriophyes caulis

Photo Courtesy V. Drzewucki



Unidentified sawfly on eastern black walnut

Butternut, oaks, hickories, chestnut

Photo Joe Boggs, OSU

Spotted lanternfly

Photo Ken Law

Photos: Eric Day, Virginia Tech

Yellowing, flagging and sooty mold from SLF

Walnut husk fly/husk maggot

Rhagoletis suavis

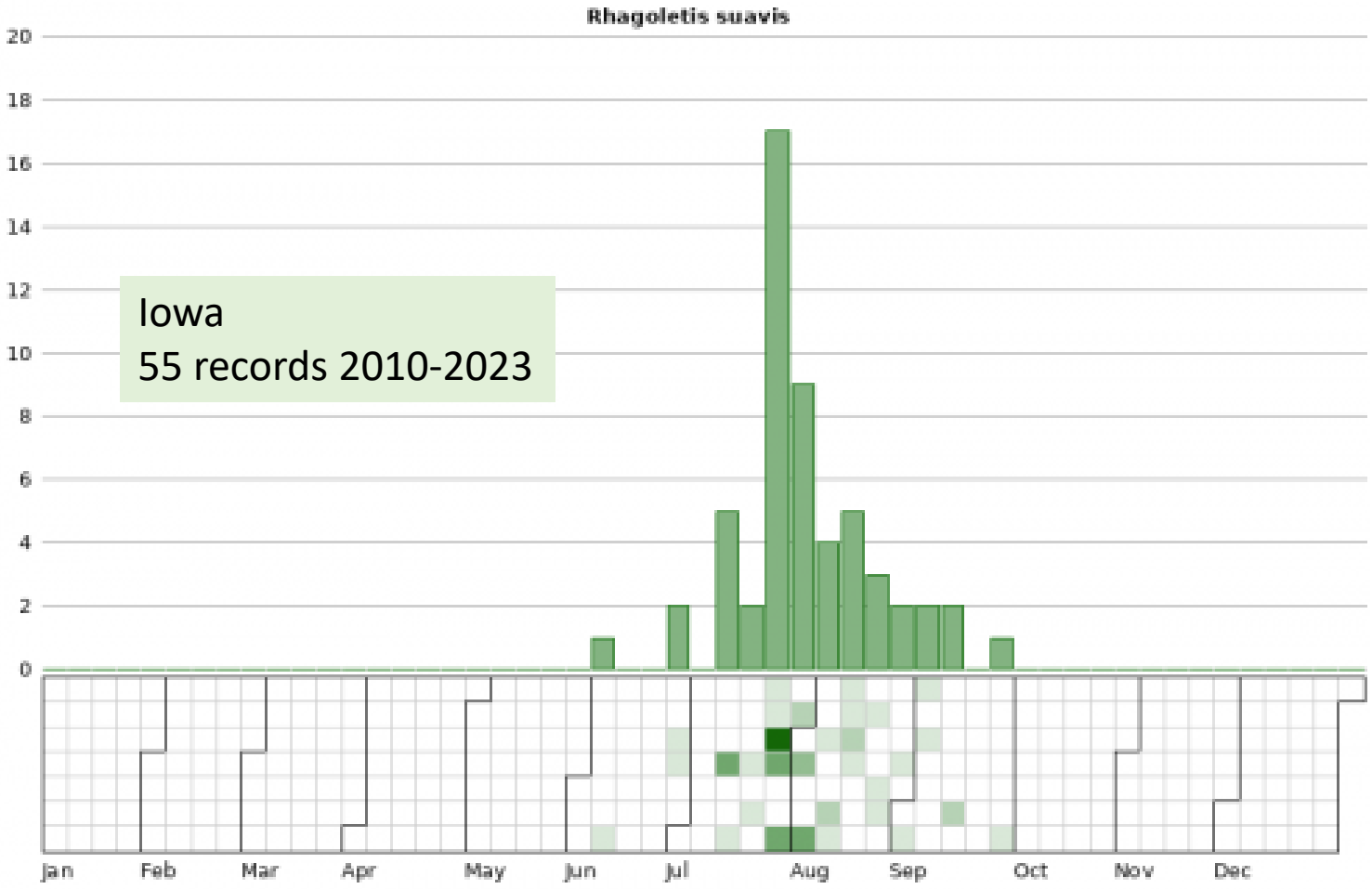
Photos Ken Gray, Oregon State University

Walnut husk fly/husk maggot

Rhagoletis suavis

Photo Steve Scholnick

Photo Joanna Brichetto, Sidewalk Nature



Iowa
55 records 2010-2023

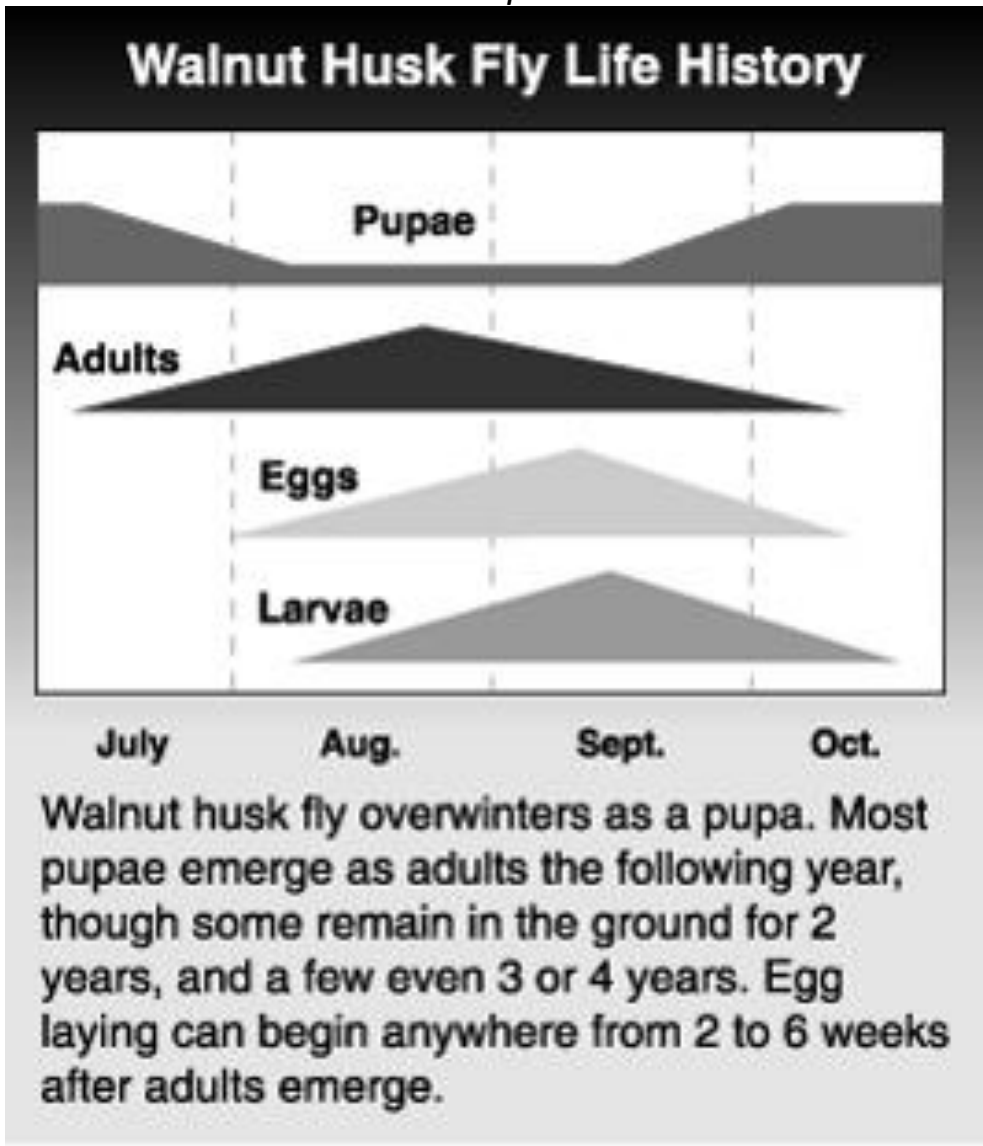
https://www.insectsofiowa.org/taxon/rhagoletis_suavis

Photo above Steve Scholnick

Walnut husk fly/husk maggot

Rhagoletis suavis

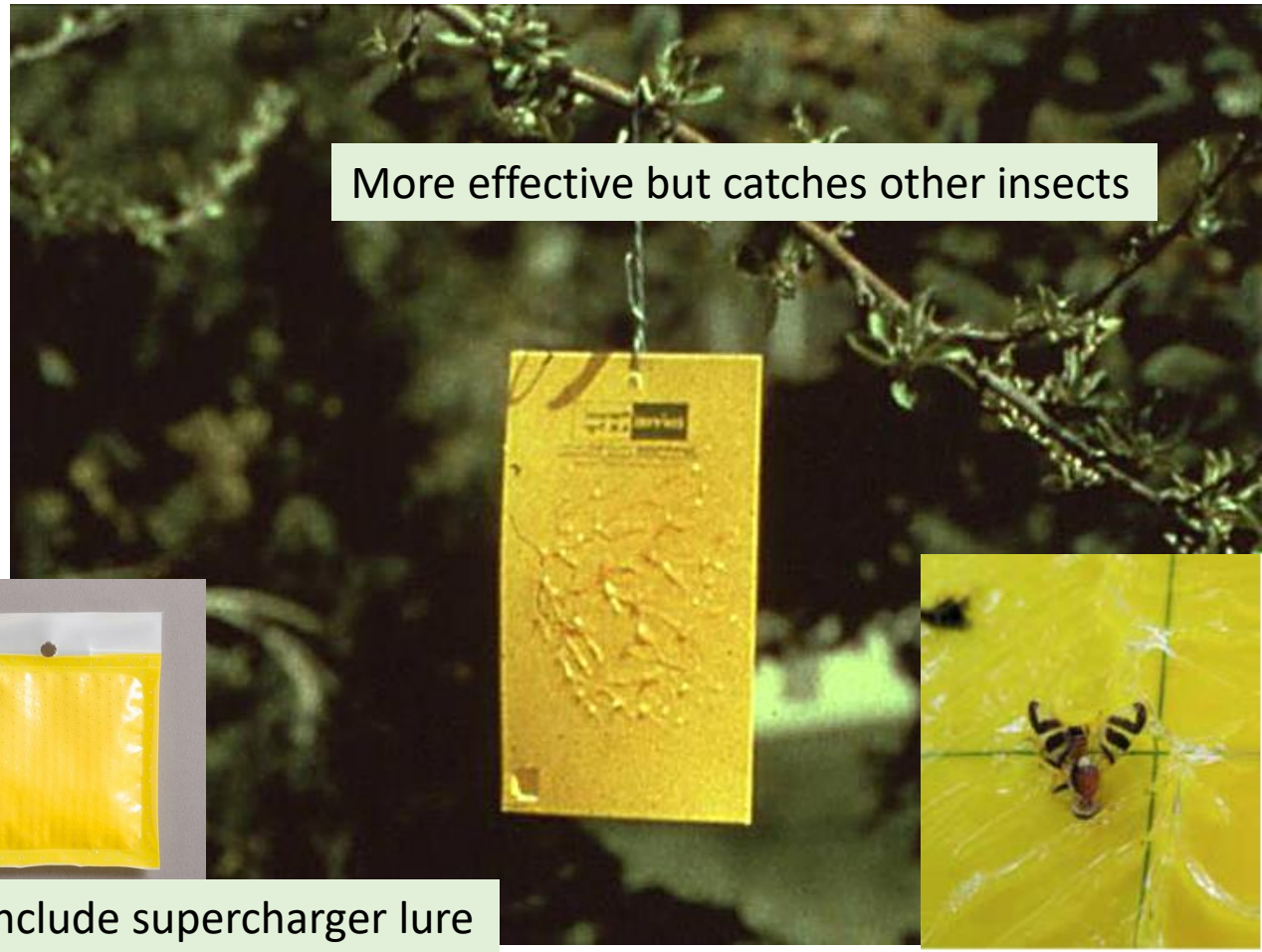
R. completa



Traps for monitoring walnut husk fly

Set out ~late June/early July, N side of tree
6’ above ground in tree, shady spot
1 trap/tree (home garden) or 2/A (commercial)

More specific but less effective



More effective but catches other insects

Include supercharger lure

5.5” x 9”

GF120 applied at first adult, repeat every 2 -3 wk, OR

Insecticide applied w/in 10 days as numbers increase
- repeat after 10 days if problem also in prior year
- 3rd application after 3 -4 wk
Include protein bait

https://treefruit.wsu.edu/crop-protection/opm/walnut-husk-fly/

Treatments for walnut husk fly

Insecticides

- GF-120 NF Naturalyte Fruit Fly Bait (spinosad + bait)

- Azadirachtin (Aza-Direct, Molt-X, etc.)
- Cinnamon oil (Cinnerate, Seican)
- Spinosad (Entrust, home garden versions: Conserve, others)
- Pyrethrins (PyGanic, Tersus, EverGreen)
- Grandevo
- Kaolin (Surround/Surround at Home)

- Acetamiprid (Assail etc.)
- Pyrethroids (cyfluthrin, bifenthrin, cyhalothrin, …)
- Spinetoram (Delegate)
- Malathion

Cultural/Biological

- Sanitation – remove/destroy fallen walnuts
- Ground barrier – landscape fabric, tarp
- Less susceptible cultivars (Eng. walnut) ‘Howard,’ ‘Chandler’
- Chickens?
- Beneficial nematodes?

Baits (not insecticides)

- Molasses (4-6 T/gal)
- Nu-Lure (hydrolyzed corn gluten meal)
- Brandt Insect Bait (corn steep liquor)

GF120 Insecticide/Bait droplets sprayed for control of walnut husk fly

Photo R. Van Steenwyk

https://treefruit.wsu.edu/crop-protection/opm/walnut-husk-fly/

Low volume (25 GPA)

Abamectin & e. benzoate trunk injections control husk maggot (*R. completa*)

Avermectin Trunk Injections: A Promising Approach for Managing the Walnut Husk Fly (*Rhagoletis completa*)

by Máté Kiss [1,*,†], Csilla Sörös [2,†], Ádám Gutermuth [3,†], András Ittzés [4,5,†] and Árpád Szabó [1,*,†]

Horticulturae **2023**, *9*(6), 655; https://doi.org/10.3390/horticulturae9060655
June 1, 2023

Figure 1. Infestation rate and husk pesticide residue content (mean ± SE). Trial I. For treatments in columns marked with the same letter, the Marascuilo comparison shows that the infestation rate is not significantly different ($p > 0.05$). Location: Taksony, injection date: 4 June 2020, sampling date: 20 September 2020 (108 DAT); detection limit (DL): 1.2 ng/g ABA, 0.1 ng/g EMA. AI = active ingredient; ABA = abamectin; EMA = emamectin benzoate. * <DL, ** trace.

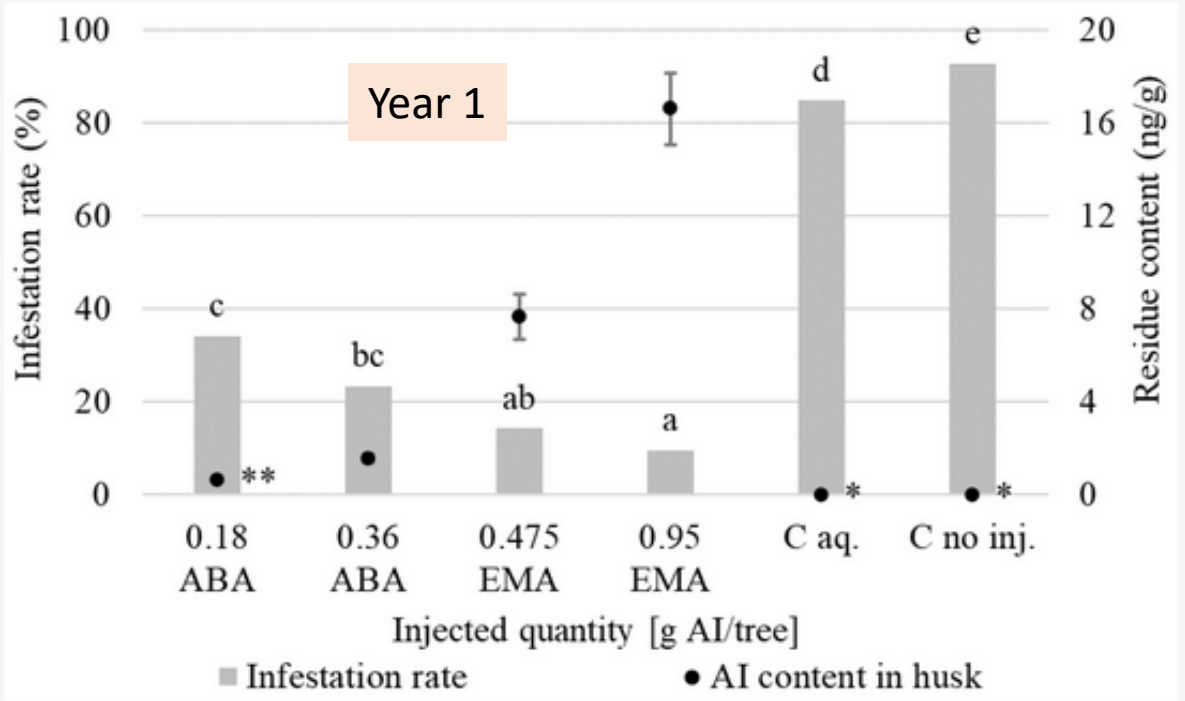
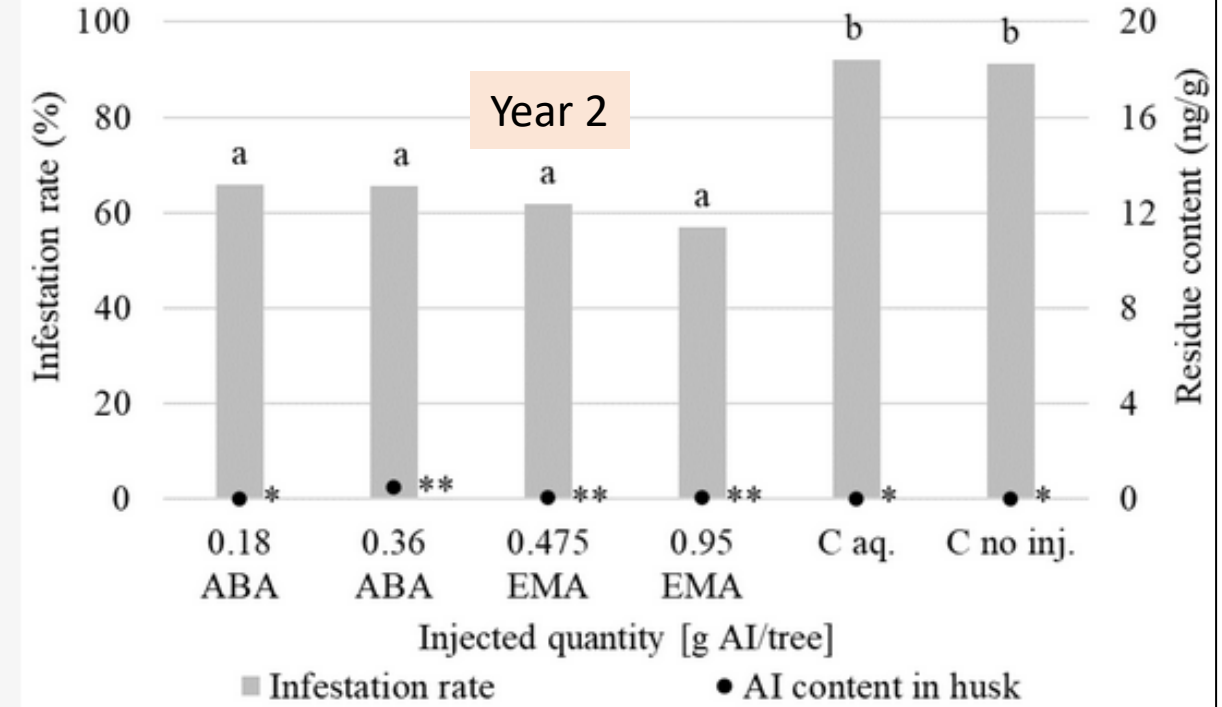
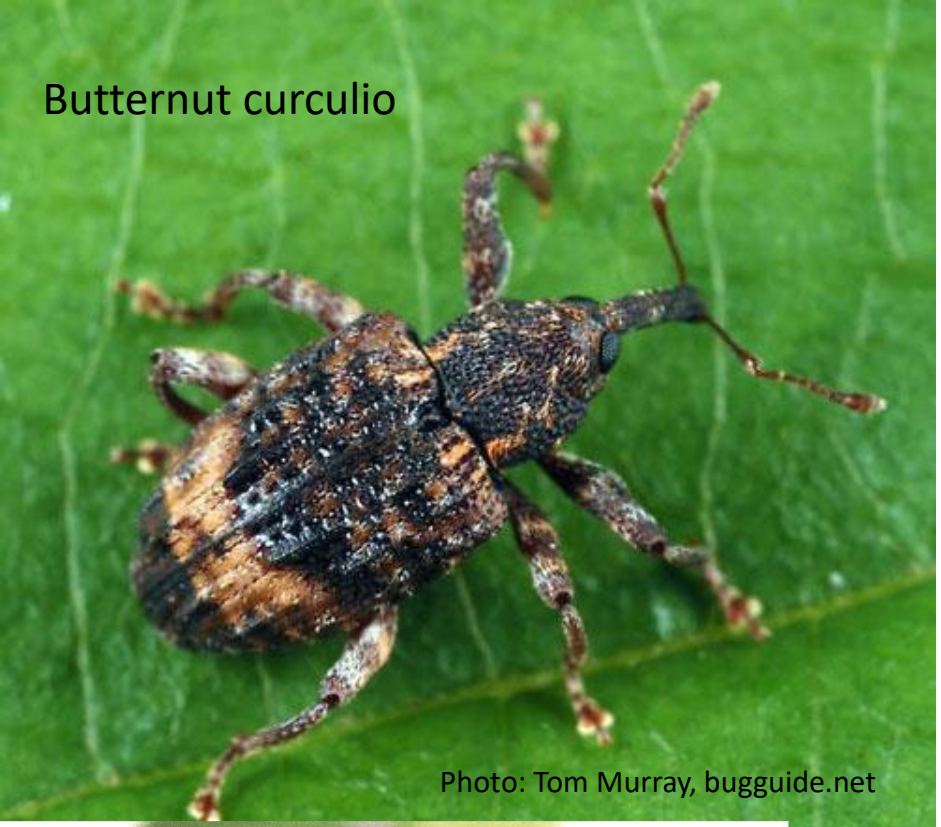


Figure 6. Infestation rate and residue content in the husks (mean ± SE) in the second year following the trunk injections. Trial I. For treatments in columns marked with the same letter, the Marascuilo comparison shows that the infestation rate is not significantly different ($p > 0.05$). Location: Taksony, injection date: 4 June 2020, sampling date: 30 September 2021 (483 DAT); detection limit: 1.2 ng/g ABA, 0.1 ng/g EMA. AI = active ingredient; C aq. = injected with distilled water; C no inj. = no injection was performed; ABA = abamectin; EMA = emamectin benzoate. * <DL, ** trace.





Butternut and black walnut curculios

Conotrachelus juglandis, C. retentus

Black, English, butternut, heartnut

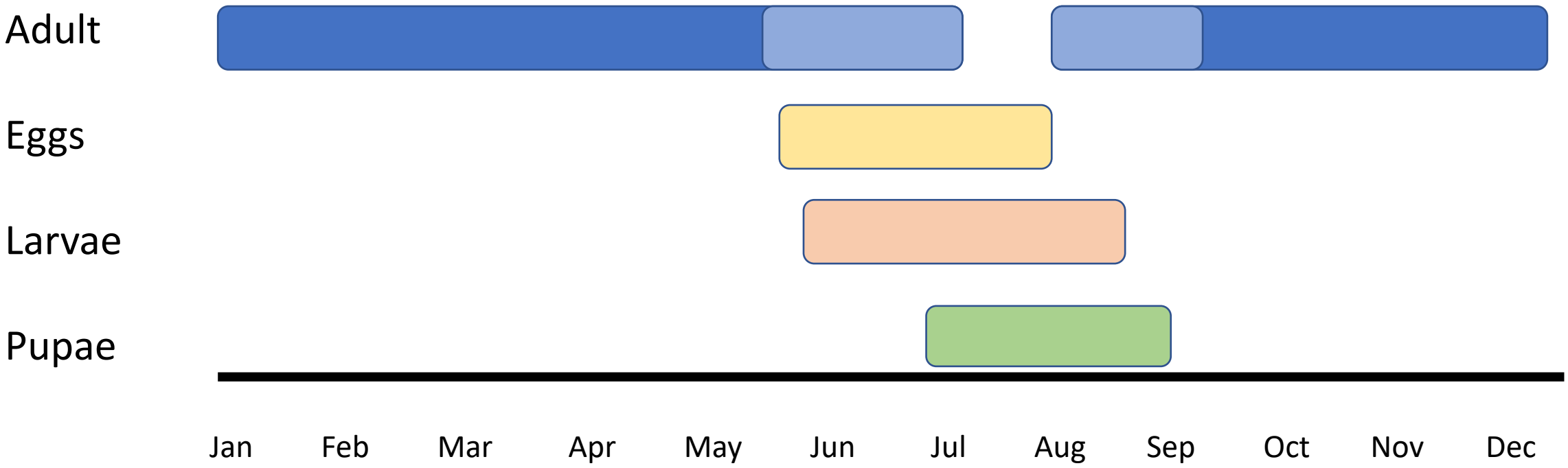
Leaf drop
Twig dieback
Spring fruit drop

Butternut curculio damage

- Feed on new shoots, leaf petioles; leaf drop
- Tunnel in shoots
- Adults skeletonize leaves
- Feeding in husks causes nut drop

Louis Tedders, USDA Agricultural Research Service, Bugwood.org

Life cycle of butternut curculio in Michigan



Life history of the butternut curculio, *Conotrachelus juglandis* **in Michigan**
Jeffrey A. Corneil and Louis F. Wilson
Great Lakes Entomologist 1979 12(1):13-15

Controls for curculios in walnut

Insecticides

- Pyrethrins (PyGanic, etc.)
- Carbaryl/Sevin *not labeled for this pest*
- Imidan *not labeled for this pest*
- Azadirachtin (Molt-X, Aza-Direct, etc.)

Cultural/Biological

- Sanitation: quickly remove/destroy dropped nuts
- Drop cloth collection : tapping branches to collect weevils
- Resistant cultivars?
- Beneficial nematodes?

Susceptibility and injury of hybrid walnuts by the butternut curculio
Louis F. Wilson, Jeffrey A. Corneil, and Walter A. Lemmiem
Great Lakes Entomologist 1979 12(1): 17-21

Table 1. Susceptibility and injury to various walnut progeny by the butternut curculio, 1975-1976.

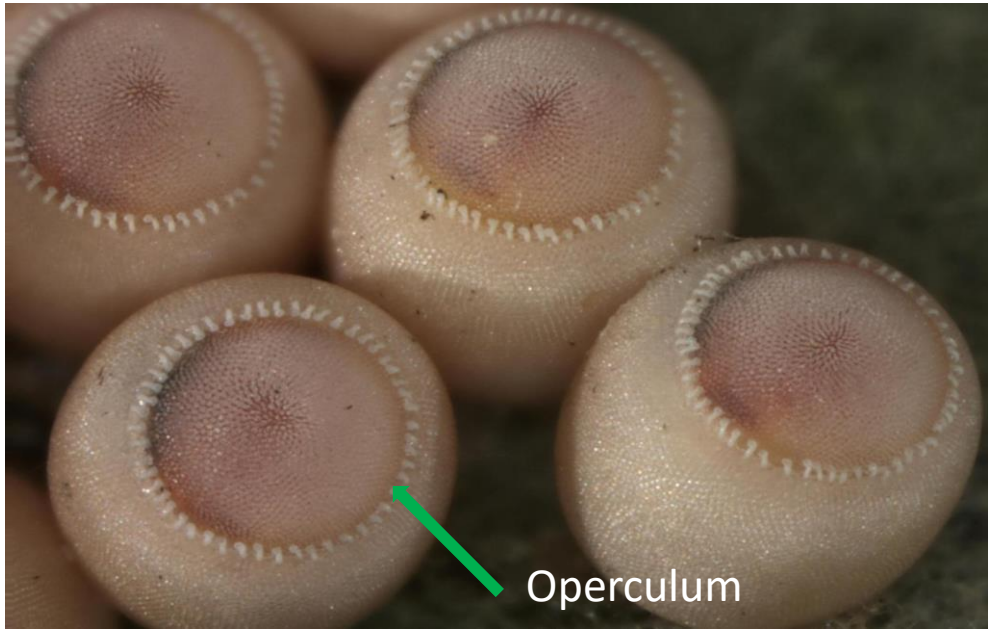
Juglans–Female Parent (Male open-pollinated	Seed Sources (No.)	Progeny Trees 1976 (No.)	Tree Mean Height 1976 (Meter)	Trees Attacked 1975 (Percent)	Trees Attacked 1976 (Percent)	Mean Injury Index 1976[a]
nigra × *sieboldiana*	1	20	4.4	100	100	24.0 a
sieboldiana	1	14	5.6	100	100	14.3 b
sieboldiana × *cinerea*	7	243	4.8	90	90	8.9 c
regia × *nigra*	4	57	2.7	88	81	7.8 c
regia	1	19	2.1	95	71	4.3 d
cinerea	2	55	4.7	42	48	2.8 d
nigra (within stand)	10	41	4.8	15	17	2.3 d
nigra (adjacent stand)	10	160	4.9	0	0	0 e

[a]Indices followed by the same letter are not significantly different at the .05 level.

Brown Marmorated Stink Bug

Halyomorpha halys

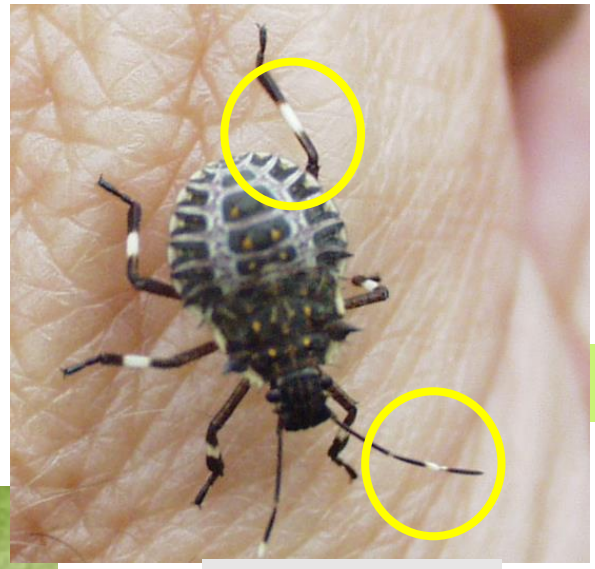
Eggs – newly laid



Photos: (*Top Left and Right*) - Ashley Poplin, University of Florida; (*Bottom Left*) - Susan Ellis, Bugwood.org #5443485

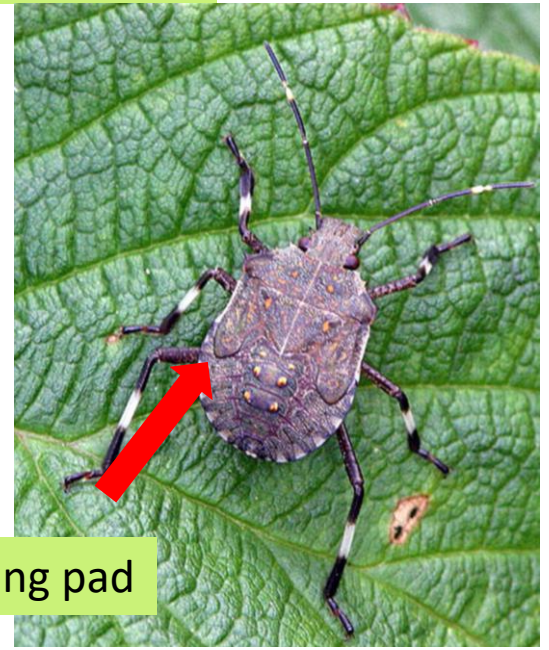
Nymphs

First instar (stage) nymphs, just hatched



White bands on legs, antennae distinctive

Later instars



Wing pad

First & second instar nymphs

Photos:
(*Top and bottom left*) - David R. Lance, USDA APHIS PPQ, www.bugwood.org, #UGA1460052; #UGA1460051. (*Bottom right*) - Gary Bernon, USDA APHIS, www.bugwood.org, #1113015

BMSB infesting tomatoes

Photos courtesy T. Leskey

BMSB Late-Season Injury on Apple

Photos courtesy T. Leskey


BMSB damage to pepper

BMSB and injury to *Paulownia* foliage

Photo: G. Bernon, USDA APHIS

How to Recognize Brown Marmorated Stink Bug Damage in Commercial Hazelnuts

Photos by Chris Hedstrom, © Oregon State University

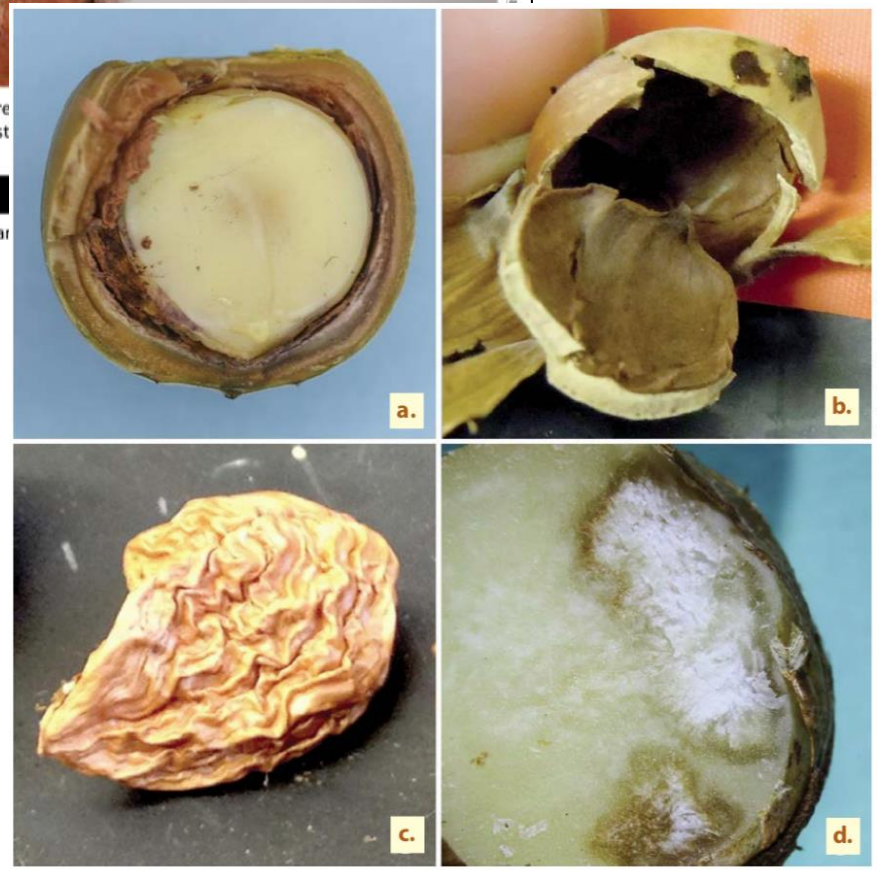
Figure 1. *Halyomorpha halys* prepares to feed on a mature sucking mouthparts that penetrate tissues and inject digest tissues.

EM 9102 • December 2014

Chris Hedstrom, Vaughn Walton, Nik G. Wiman, Peter W. Shear

Brown marmorated stink bug (BMSB; *Halyomorpha halys*) likely entered the United States in the mid-1990s in Pennsylvania via a shipping container. It has since spread throughout the United States. BMSB was first detected in Oregon in 2004 in the Portland area, and has spread throughout the Willamette and Columbia River valleys over the last decade. This insect is now found in commercial agricultural areas. When disturbed, the insect releases volatile defense compounds that have an unpleasant odor—hence its name.

In urban areas, BMSB is considered a nuisance pest. It aggregates in and on buildings, and can feed on ornamental and garden plants. In agricultural areas, it is a serious pest because it feeds on a wide variety of host crops. In Oregon, economically important specialty crops, including tree fruits, tree nuts, berries and grapes, vegetables, and ornamentals, can be damaged. The Willamette Valley produces virtually all commercial hazelnuts (*Corylus avellana L.*) grown in the U.S. BMSB was



Photos by Chris Hedstrom, © Oregon State University

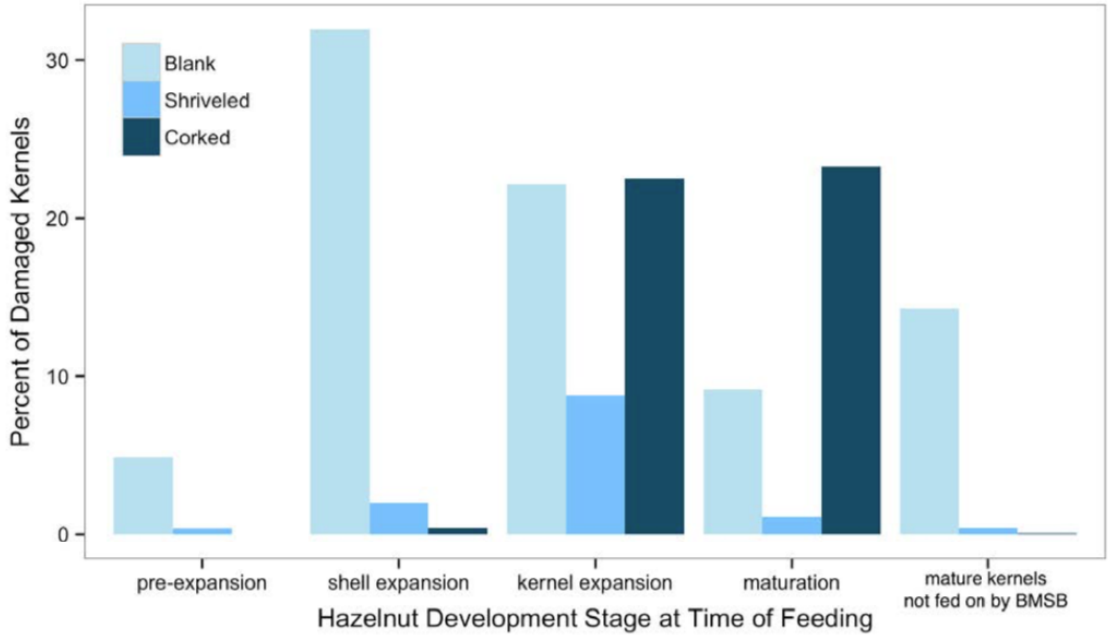


Figure 2. Primary damage symptoms associated with kernel feeding by BMSB on hazelnut kernels: a. healthy kernel (in shell); b. blank nut (empty shell); c. shriveled kernel; d. corking damage.

Type of damage depends upon when feeding occurs

https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/em9102.pdf

Filbert (big) bud mite

Phytoptus avellanae
Cecidophyopsis vermiformis

Photos by: R.S. Byther

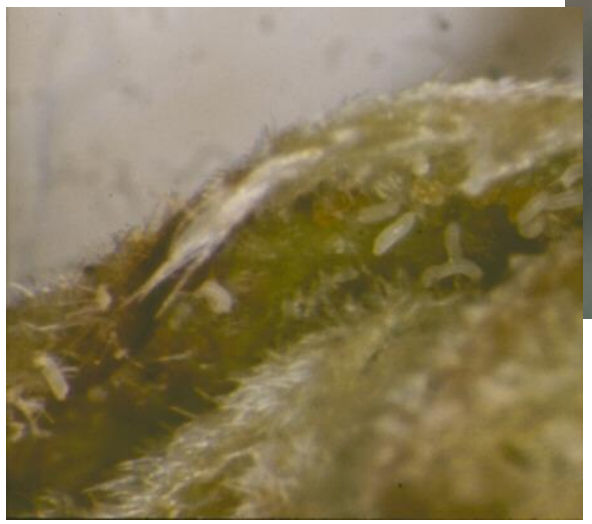


Photo steve_mcwilliam, iNaturalist NZ

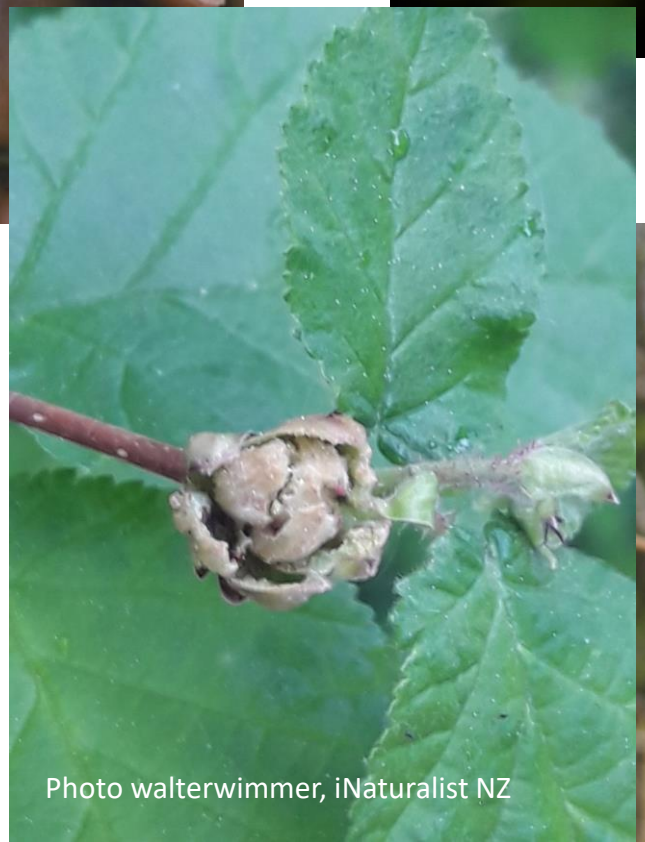


Photo walterwimmer, iNaturalist NZ

Photo gen_ok, iNaturalist NZ

"Tight-budded" varieties ('Barcelona') less susceptible. Loose-budded varieties 'Daviana' and 'Royal' more susceptible. 'Yamhill,' 'McDonald,' Casina,' 'Ennis,' 'Lewis,' 'Clark' highly susceptible

Big bud mite controls

- Less susceptible cultivars
- *Galendromus* predator mite releases
- Remove buds by hand (early spring)
- Miticides
  - Pyridaben (Nexter) *Not on Long Island*
  - Hort. oil
  - Lime Sulfur (Brandt, etc.)
  - Fenpyroximate [Fujimite (2(ee) in PNW or 20SC form]
  - Insecticidal soap (M-Pede, others)
  - Abamectin (Agr-Mek, etc.)? *Not labeled for this pest*
  - Sulfur (spring) (24(c) label in PNW)
  - Kaolin (Surround/Surround at Home)
  - Sevin 4F (special labeling?) *not labeled for this pest*

Photo: https://www.chukar.com

Phenology of hazelnut big bud mites in Canterbury and implications for management

J. Webber • Published 2007 • Biology

P. avellanae

	Susceptibility to hazelnut big bud mite							
Cultivar	England	NZ	France	USA[1]	USA[2]	USA[3]	USA[4]	Australia
Appleby		Moderately susceptible						
Alexandra								
Barcelona	Very resistant			1	High	Resistant	1	Moderate tolerance
Butler	Sensitive	Susceptible		3	Moderate	Highly susceptible		
Campanica		Susceptible		3				
Daviana	Very sensitive	Sensitive	Very sensitive	4	Low	Highly susceptible		
Ennis	Resistant	Moderately sensitive		3	Moderate	Highly susceptible	3	
Lansing				2				
Merveille de Bollwiller			Tolerant					
MT18-114/MT12-23								
Nocchione								
Plowright								
Tonda di Giffoni	Resistant		Rather sensitive	2		Resistant	1	Good tolerance
Tonda Gentile delle Langhe	Sensitive	Susceptible		3		Highly susceptible		
Tonda Romana	Very resistant	Slightly susceptible				Resistant		
Webbs Prize Nut				1				
Whiteheart		Susceptible						
Whiteskinned filbert		Susceptible						
Wispit								
Nottingham								

Phenology of hazelnut big bud mites in Canterbury and implications for management

J. Webber • Published 2007 • Biology

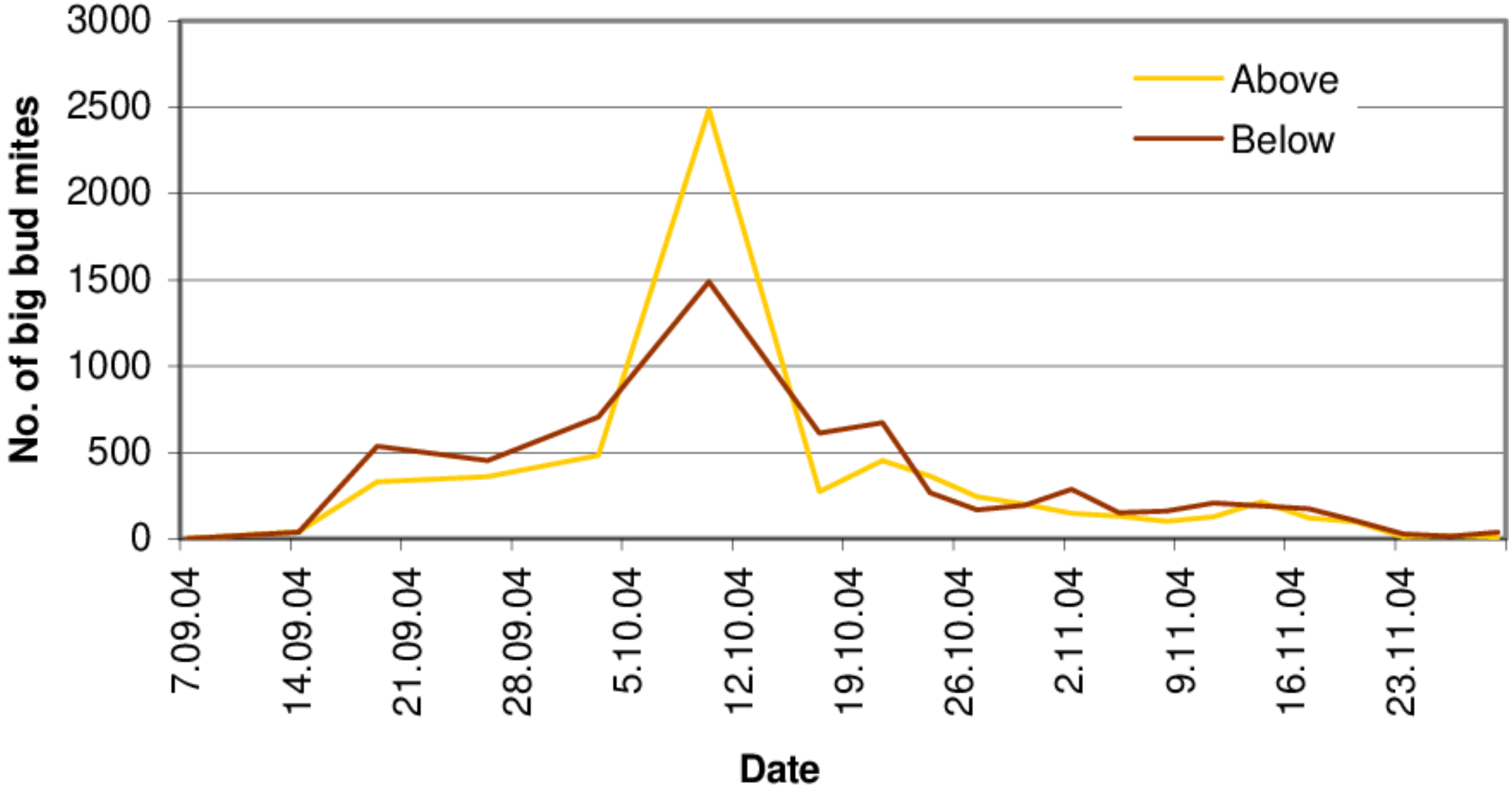


Fig. 9 Emergence of big bud mites above and below the big bud at Lincoln on ‘Whiteheart’, 2004.

Phenology of hazelnut big bud mites in Canterbury and implications for management

J. Webber · Published 2007 · Biology

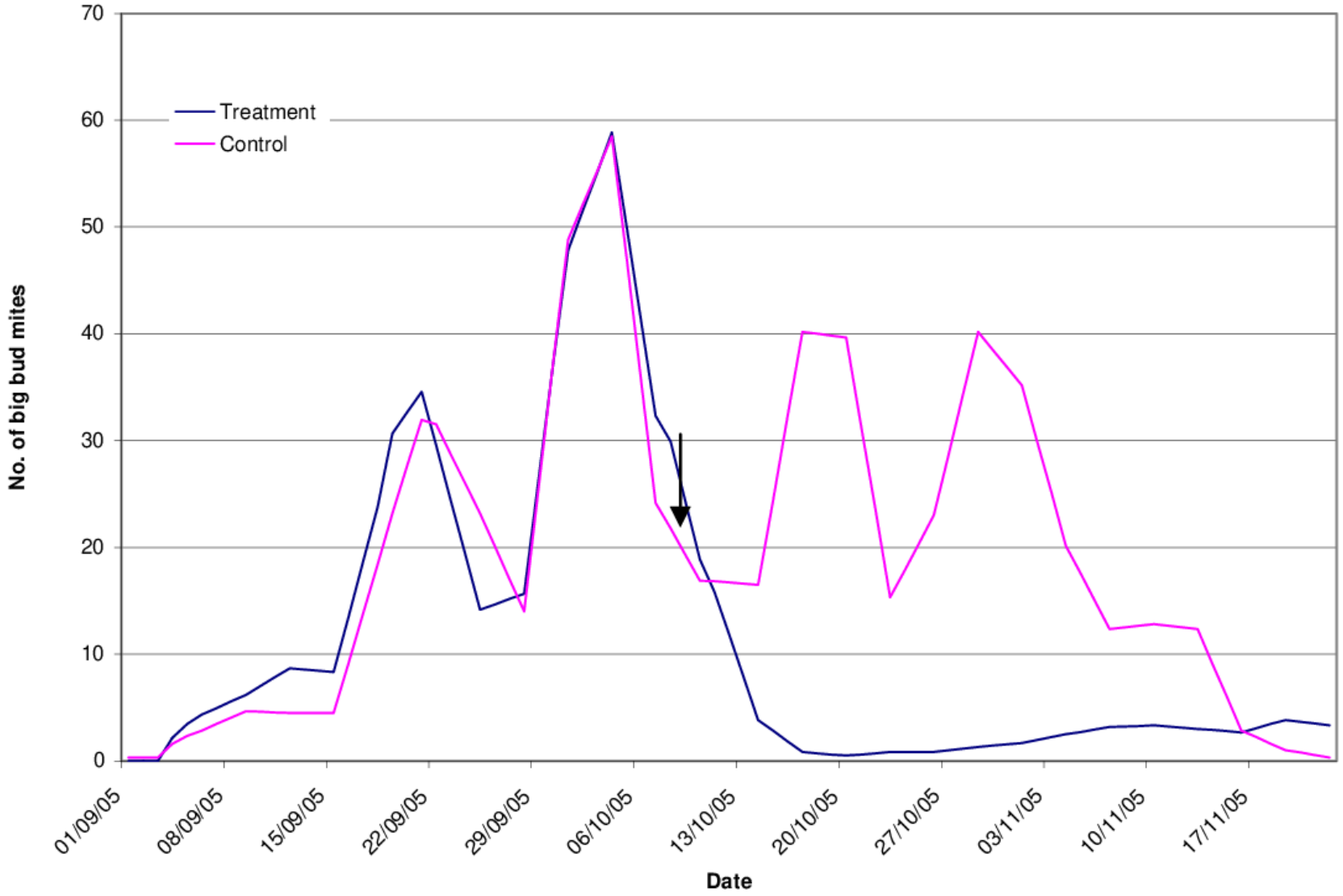


Fig. 33 Comparison of effect of Treatment (spray applied 09 October 2005, 503 accumulated degree-days above a lower threshold of 4oC, predicted 50% emergence) and Control on the number of emerging big bud mites (smoothed over 6 days). Arrow indicates date of spray application

Sulfur treatment in early Oct reduced mites but not big buds next year

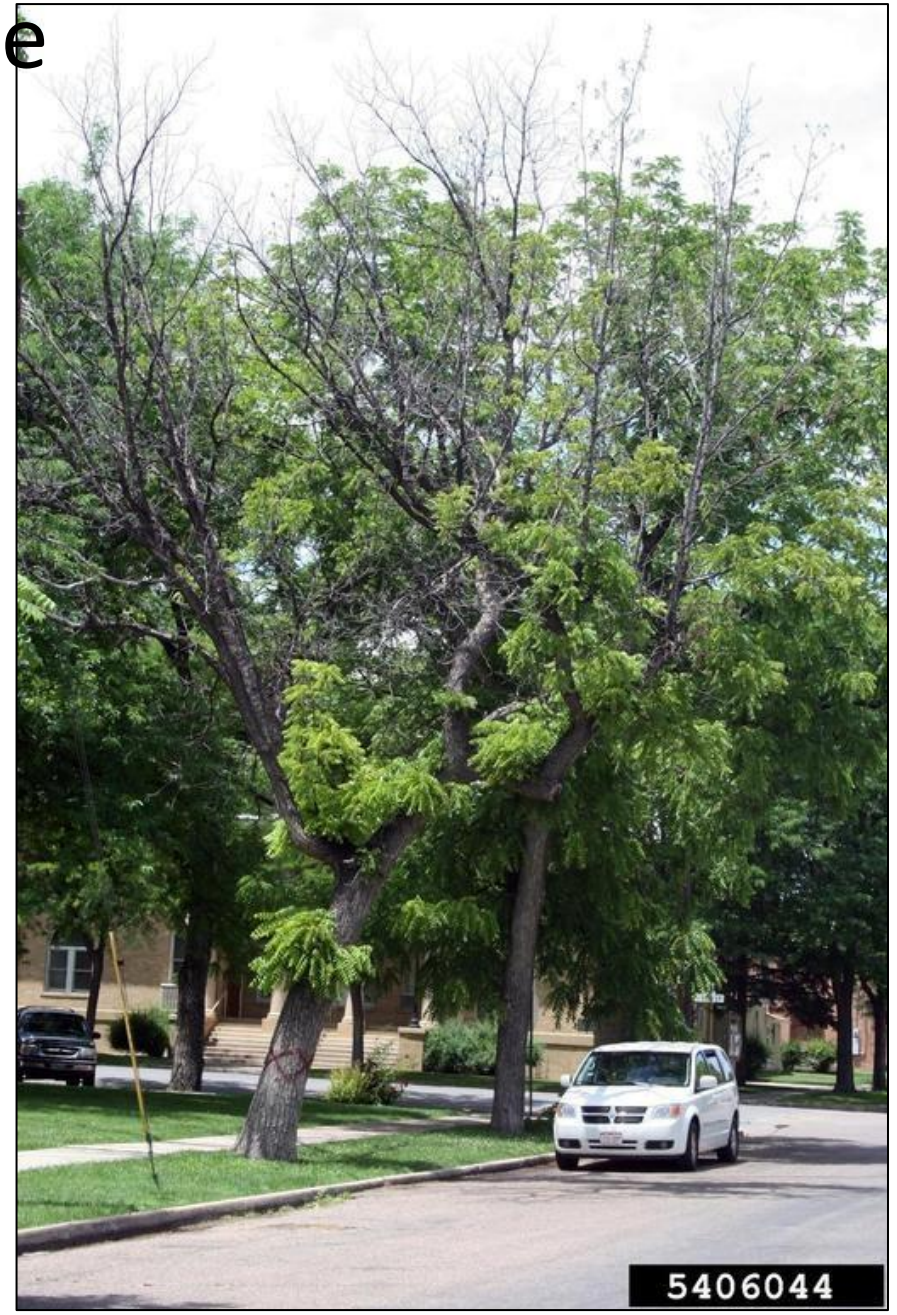
Paul Wray, Iowa State Univ., Bugwood org

Thousand Cankers Disease of Black Walnut

(and other *Juglans* spp.)

Caused by walnut twig beetle (*Pityophthorus juglandis*) transmitting a fungal pathogen (*Geosmithia morbida*)

Found in parts of the west US, recently Knoxville, TN



Whitney Cranshaw, Colorado State University, Bugwood.org

Walnut twig beetle

Whitney Cranshaw, Colorado State University
Bugwood.org

Thousand canker symptoms under bark of black walnut

Ned Tisserat, Colorado State University
Bugwood.org

Exit holes of walnut twig beetle in black walnut

Ned Tisserat, Colorado State University
Bugwood.org