Insects on hemp

Luis Cañas,
canas.4@osu.edu
The Ohio State University

Whitney Cranshaw
Colorado State University

CFAES

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Hemp Grown for CBD

CFAES

Most hemp being grown for CBD presently uses transplanted clones.

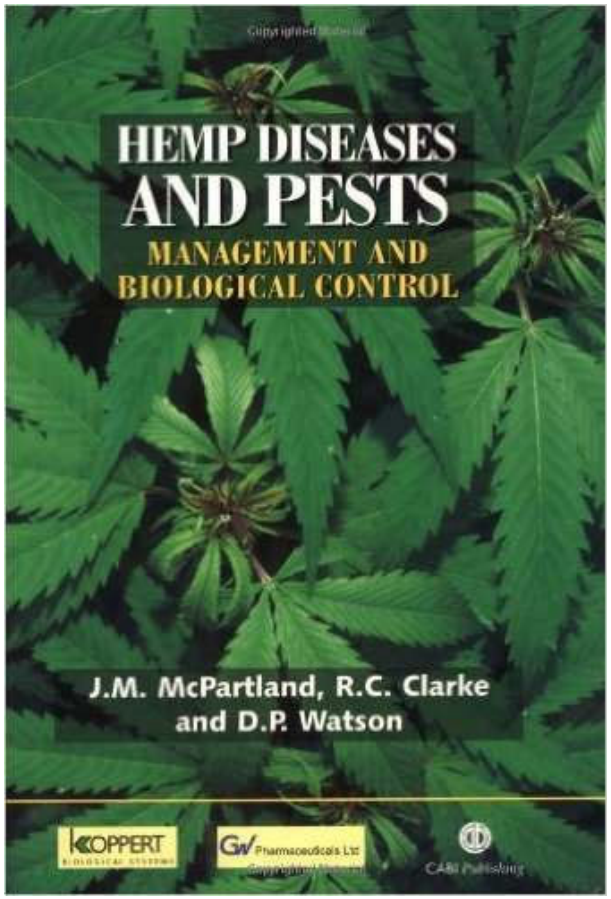
Mother plants

CFAES

What kinds of arthropods will we find associated with hemp in this new era?

CFAES

This book has very well summarized the information known about hemp pests, worldwide, prior to 2000.



CFAES

Journal of Integrated Pest Management, (2019) XX(XX): XX; 1–11
doi: 10.1093/jipm/pmz023
Profile

OXFORD

Developing Insect Pest Management Systems for Hemp in the United States: A Work in Progress

Whitney Cranshaw,[1,5] Melissa Schreiner,[1] Kadie Britt,[2] Thomas P. Kuhar,[2] John McPartland,[3] and Jerome Grant[4]

[1]Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO 80523, [2]Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, [3]Family Medicine Department, University of Vermont College of Medicine, University of Vermont, Burlington, VT 05405, [4]Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, TN 37996, and [5]Corresponding author, e-mail: whitney.cranshaw@colostate.edu

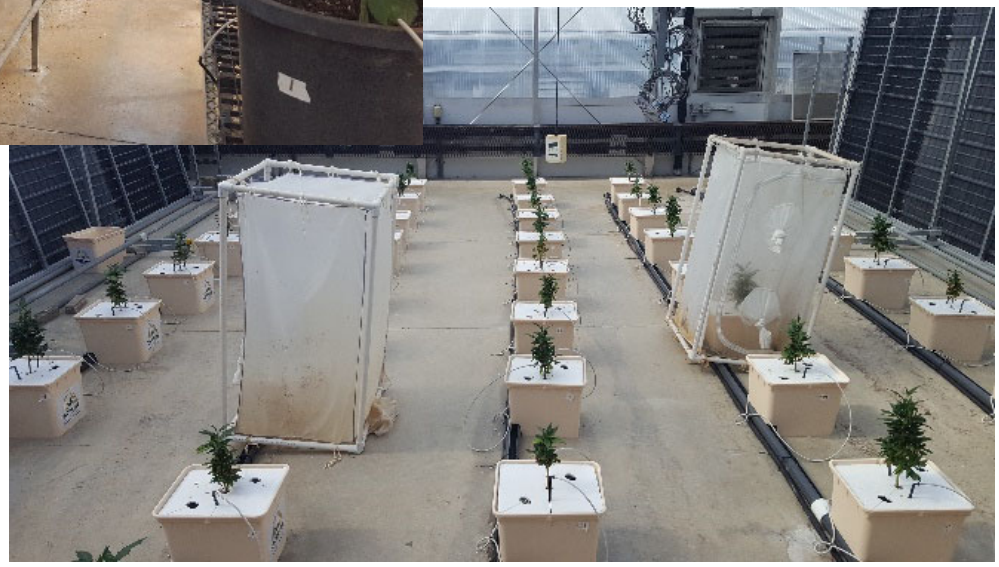
Subject Editor: Carlos Bogran

Received 9 April 2019; Editorial decision 2 July 2019

CFAES

https://hempinsects.agsci.colostate.edu/

Experiments at OSU



CFAES

When hemp was last produced in major quantities, during World War II, only one insect was mentioned as significant to production

(Willsie et al. 1942)

European corn borer

Ostrinia nubilalis

Photograph from the website of the Canadian Hemp Trade Alliance

Photographs courtesy of Frank Peairs

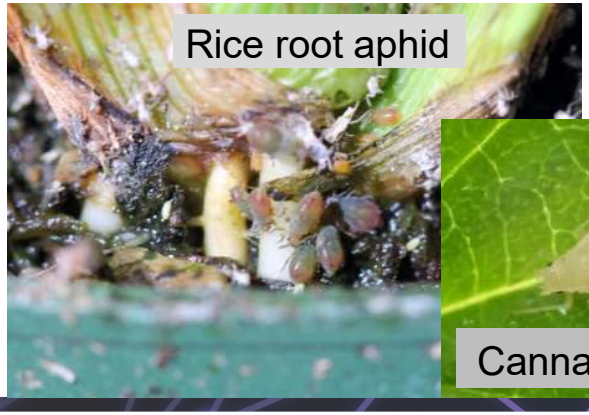
CFAES

Key Arthropod Pests of Indoor Grown Cannabis

Twospotted spider mite

Hemp russet mite

Fungus gnats



Rice root aphid

Cannabis aphid

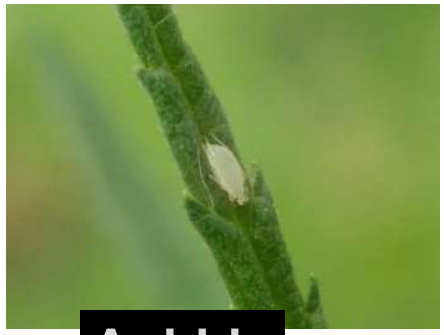
Onion thrips

Pests problems associated with outdoor grown hemp will likely have little overlap with those affecting it when the plant is grown in confined conditions.

This will happen from increased activities of natural controls combined with dispersal of pest species.

CFAES

Everywhere there will be some suite of hemipterans feeding on foliage



Aphids

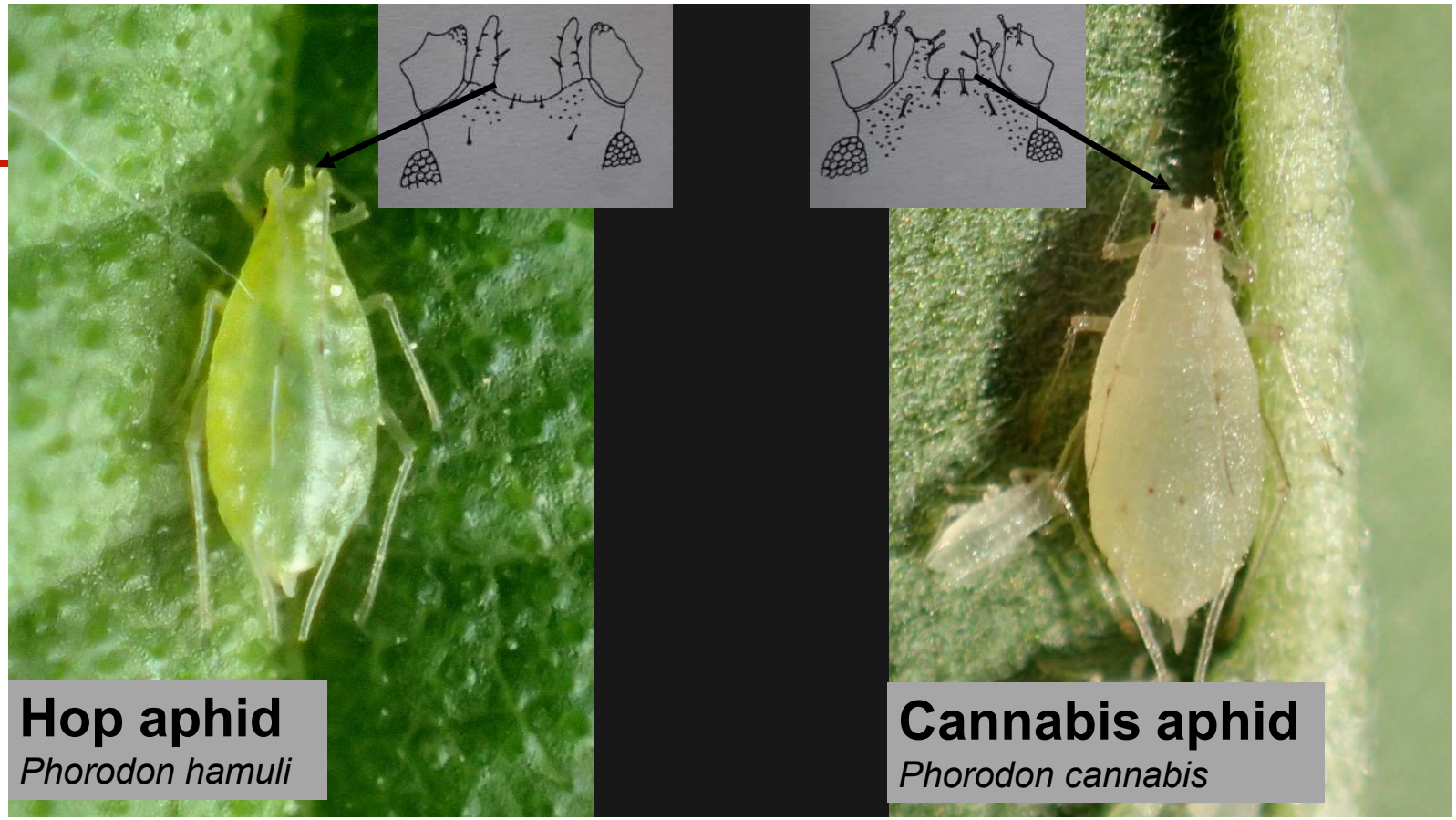
Leafhoppers

CFAES

Cannabis Aphid

Phorodon cannabis

CFAES



Hop aphid
Phorodon hamuli

Cannabis aphid
Phorodon cannabis

CFAES

More obvious will likely be the insects that chew leaves of the plant **(defoliators)**

Caterpillars

Beetles

Grasshoppers

CFAES

Various caterpillars chew leaves of the plant (defoliators)

Yellowstriped caterpillar

Yellow woollybear

Beet webworm

Thistle caterpillar

Beet armyworm

Zebra caterpillar

CFAES

Grasshoppers (at least three species)

CFAES

Stem feeding seems to cause the most injury by grasshoppers

CFAES

Hemp response to hail injury can give some insight on how the crop may respond to grasshopper injuries

CFAES

There will be stem boring species that will be important in some areas

European corn borer
Ostrinia nubilalis

Photograph from the website of the Canadian Hemp Trade Alliance

Photographs courtesy of Frank Peairs

CFAES

An insect that surprised me when found in Colorado

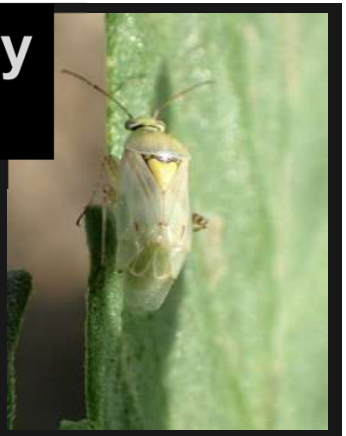
Eurasian hemp borer

Grapholita dilineana

CFAES

Several hemipterans may primarily feed on developing seeds

Stink bugs (4 species)



Lygus bugs (2-3 species)

CFAES

Hemipteran seed feeders

False chinch bugs

Hyaline grass bug

CFAES

Most significant potential pest of the crop in Colorado?

Corn earworm

Helicoverpa zea

CFAES

A robust complex of natural enemies can be expected to be found in hemp

CFAES

Hemp may be a very heavily used by many bees as a pollen sources late in the season

CFAES

What is the potential value of hemp as a pollen resource in agricultural regions?

CFAES

Hemp grown for seed or fiber – potentially very useful mid-late summer pollen source

Hemp grown for extractable compounds (e.g. CBD) – not a potential pollen source

CFAES

Pollinator use may complicate controls if there are insects that are pests of the crop during flowering

CFAES

The Pesticide Conundrum with Cannabis

- All registered pesticides can only be legally applied to sites (e.g., crops) for which they are labeled
- Presently the agency overseeing pesticide labeling (EPA) does not recognize cannabis as a crop site

CFAES

Phases of Pesticide Use Regulation in Cannabis Production

- Phase I - “Wild West” Phase
- Phase II - State Finesse Phase
- Phase III - Normalization Phase
  - –*Cannabis* sp. crops are federally recognized as a crop site
  - –*Cannabis* sp. crops are regulated as are normal crops

CFAES

“Wild West Phase”

- All registered pesticides are illegal
- Pesticide regulation and enforcement is ignored by state and federal agencies
- Growers are unaware of pesticide laws or ignore them in the absence of direction
- All pest management information sources devolve to the internet and hearsay

CFAES

Spider Mite Management on the Internet

"….Consider this situation, you spray your chemicals, the mites may not die right away depending on the mode of action, what happens next is the mites panic and start laying eggs like crazy. Before you know it, the mites have become twice as bad as before you hit them……"

Information from Legal Hydro web site

CFAES

Spider Mite Management on the Internet

"….The best method to control this pest is to **switch your mode of attack each and every day**. Never spray them with the same stuff twice in a row, if you choose the chemical approach, you want to use a Neem Oil along with as many other forms of Miticides as you can get your hands on…"

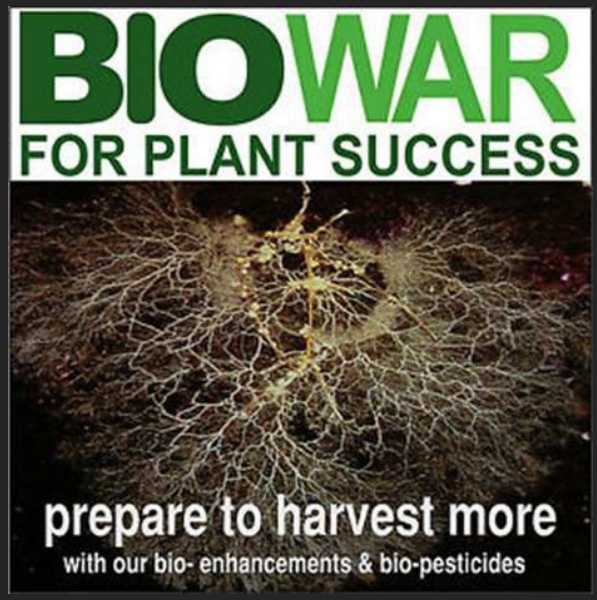
Information from Legal Hydro web site

CFAES

August 14 Letter from a Cannabis Producer
Checklist of treatments July 18-August 12

- BioWar (unspecified “beneficial soil microbes)
- Sulfur/pyrethrins

His question was what to do for “cyclamen mites” – he said he saw the eggs



CFAES

August 14 Letter 2013 from a Cannabis Producer
Checklist of treatments July 18-August 12

- BioWar (unspecified “beneficial soil microbes)
- Sulfur/pyrethrins
- Abamectin (Avid)
- Chlorfenapyr (Pylon)
- Abamectin/bifenazate (Scirocco)
- Fenpyroximate (Akari)
- Abamectin
- Fenazaquin (Magister)

Note: An examination of the sample indicated that the purported cyclamen mite eggs were glandular hairs.

CFAES

“State Finesse Phase”

- Some pesticides are identified by State agencies as allowable in *Cannabis* production
- Uneasy alliance with Federal agencies as *Cannabis* remains unrecognized as crop category
- Pest management information sources are provided minimal support by state and local agencies

CFAES

2013 Washington State Finesse on the Subject of Pesticide Use on Cannabis

- Pesticides that require federal registration under Section 3 of FIFRA
  - Active ingredient is exempt from the requirements of food crop tolerance, *and*
  - Label has directions for use on unspecified food crops, including unspecified food crops grown as bedding plants
  - EPA and WSDA registration is required
- Section 25b minimum risk pesticides (exempt from federal registration)

CFAES

Criteria for Pesticides Allowed to be Used on Cannabis in Colorado

- Pesticides that require federal registration under Section 3 of FIFRA
  - Active ingredient is exempt from the requirements of food crop tolerance, *and*
  - Label has directions for use on unspecified food crops, including unspecified food crops grown as bedding plants
  - EPA and CDA registration is required
  - Pesticide is registered on tobacco
- Section 25b minimum risk pesticides (exempt from federal registration)

CFAES

Criteria for Pesticides Allowed to be Used on Cannabis in Colorado

- Pesticides that require federal registration under Section 3 of FIFRA
  - Active ingredient is exempt from the requirements of food crop tolerance, *and*
  - Label has directions for use on unspecified food crops, including unspecified food crops grown as bedding plants
  - EPA and CDA registration is required

  –Pesticide is registered on tobacco
- Section 25b minimum risk pesticides (exempt from federal registration)

CFAES

Kentucky

A pesticide registered with KDA may be used in accordance with its label directions for the cultivation of hemp in Kentucky under the following conditions:

a. The label allows for use on unspecified crops and/or plants (such as other crops);
b. The label allows for use at the intended site of application (such as greenhouse or field);
c. The label directions do not prohibit use on crops or plants for human consumption;
d. The licensed hemp grower/pesticide applicator has a pesticide applicator's license; and
e. Use of the pesticide complies with rules promulgated by KDA governing pesticide use on hemp.

KDA has compiled a list of pesticides that may be used on hemp. Inclusion on this list is not an endorsement of a pesticide company's claim nor a recommendation of a product. This list will be updated as needed and is available at the end of this document.

CFAES

EPA pesticides approved on hemp

Pesticide Products Registered for Use on Hemp

In December 2019, EPA approved adding hemp to the use sites of 10 pesticides. Nine of the products are biopesticides and one is a conventional pesticide. As EPA receives additional applications to amend product labels to add use on hemp, the agency will process those applications on an ongoing basis and update this list.

Biopesticides

- EPA Registration Number: 70310-5. Applicant: Agro Logistic Systems, Inc. Active ingredients: Azadirachtin and Neem Oil. Product type: Insecticide, Miticide, Fungicide, and Nematicide.
- EPA Registration Number: 70310-7. Applicant: Agro Logistic Systems, Inc. Active ingredients: Azadirachtin and Neem Oil. Product type: Insecticide, Miticide, Fungicide, and Nematicide.
- EPA Registration Number: 70310-8. Applicant: Agro Logistic Systems, Inc. Active ingredients: Azadirachtin and Neem Oil. Product type: Insecticide, Miticide, Fungicide, and Nematicide.
- EPA Registration Number: 70310-11. Applicant: Agro Logistic Systems, Inc. Active ingredient: Neem Oil. Product type: Insecticide, Miticide, and Fungicide.
- EPA Registration Number: 84059-3. Applicant: Marrone Bio Innovations, D/B/A Marrone Bio Innovations, Inc. Active ingredient: Extract of Reynoutria sachalinensis. Product type: Fungicide and Fungistat.

CFAES

EPA pesticides approved on hemp

- EPA Registration Number: 84059-28. Applicant: Marrone Bio Innovations, D/B/A Marrone Bio Innovations, Inc. Active ingredient: Bacillus amyloliquefaciens strain F727. Product type: Fungicide.
- EPA Registration Number: 91865-1. Applicant: Hawthorne Hydroponics LLC, D/B/A General Hydroponics. Active ingredients: Soybean Oil, Garlic Oil, and Capsicum Oleoresin Extract. Product type: Insecticide and Repellent.
- EPA Registration Number: 91865-3. Applicant: Hawthorne Hydroponics LLC, D/B/A General Hydroponics. Active ingredient: Bacillus amyloliquefaciens strain D747. Product type: Fungicide and Bactericide.
- EPA Registration Number: 91865-4. Applicant: Hawthorne Hydroponics LLC, D/B/A General Hydroponics. Active ingredient: Azadirachtin. Product type: Insect Growth Regulator and Repellent.

Pesticide Products Registered for Use on Hemp | Pesticide Registration | US EPA

- EPA Registration Number: 91865-2. Applicant: Hawthorne Hydroponics LLC, D/B/A General Hydroponics. Active ingredient: Potassium Salts of Fatty Acids. Product type: Insecticide, Fungicide, and Miticide.

CFAES

IPM for mites: Some Insecticides Available for Rotations on Vegetables

MOA	Trade Name (each row is a mode of action)	PHI (days)	Impact on Biologicals
20D	Acramite (bifenazate)	3-5	
6	Agri-Mek (abamectin)	1	Toxic as spray
20B	Kanemite (acequinocyl)	1	Toxic as spray
	Insecticidal soap (K salts of fatty acids)	0	Toxic as spray
UN	Neemix (azadirachtin)	0	Toxic as spray
23	Oberon (spiromesifen)	0-7	Toxic as spray
10B	Zeal (etoxazole)	7	Toxic as spray

CFAES

IPM for mites: Some Insecticides Available for Rotations on Vegetables

MOA	Trade Name (each row is a mode of action)	PHI (days)	Impact on Biologicals
	Aza Direct (azadirachtin) - OMRI	0?	
	Botanigard Maxx (Beauveria bassiana GHA) Velifer (B. bassiana PPRI) - - OMRI	0?	
	Ancora (Isaria fumosorosea Apopka 97) - OMRI	0?	
	Grandevo (Chromobacterium subtsugae PRAA4-1) - OMRI	0?	

CFAES

Amblyseius swirskii

Biobest = http://www.biobest.be/

CFAES

Mite biological control

Table 1. Summary of information about biological control agents

Biological Control Agent	Temperature Range (°C)	Optimal Temperature (°C)	Relative Humidity (%)	Generalist / Specialist
Predatory mites				
Amblyseius andersoni	6 – 40[a]	26[b]		generalist
Mesoseiulus longipes	12 – 32[cd]	25[c]	> 43[e]	specialist
Neoseiulus californicus	15 – 35[f]		> 33[gh]	generalist
Phytoseiulus persimilis	15 – 27[ij]	24[ik]	> 60[j]	specialist
Predatory midges				
Feltiella acarisuga	15 – 30[l]	27[l]	> 64[l]	specialist
Predatory beetles				
Stethorus punctillum	14 – 34[m]		any[n]	specialist

[a] Beneficial Insectary, Inc, 2015; [b] Kolodochka, 1979; [c] Ferrero et al., 2007; [d] Allen, 2009; [e] Ferrero et al., 2010; [f] Gotoh et al., 2004; [g] Rott and Ponsonby, 2000a; [h] Weintraub and Palevsky, 2008; [i] Stenseth, 1979; [j] Raworth, 2001; [k] Coombs and Bale, 2013; [l] Gillespie et al., 2000; [m] Roy et al., 2002; [n] Rott and Ponsonby, 2000b

CFAES

Mite biological control - release

CFAES

Releasing predatory mites - and compatibility with insecticides

Insecticide Use Disclaimer

It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used

The authors and Ohio State University assume no liability resulting from the use of these recommendations

CFAES

Thanks!

Address:

- Dr. Luis Cañas
- 1680 Madison Ave., Wooster, OH 44691
- canas.4@osu.edu

Funding:

- USDA-NIFA
- AFE