CCD Working Group

Florida Department of Agriculture

Penn State

Pennsylvania Department of Agriculture

North Carolina State

The USDA/ARS

Bee Alert Technologies Inc,

University of DE

Colony Collapse Disorder- Information for Growers of Bee Pollinated Crops

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Symptoms

- Adult bee population suddenly gone or reduced to small cluster without accumulation of dead bees
  - Over a few weeks, sometimes a few days
  - In locations where bees are active
- Brood, pollen and honey present
- Little evidence of robbing, or wax moth or small hive beetle attack initially

Previous Reports

- 1896 (Howard)
- 1930 (Burnside)
- 1915 Disappearing Disease
  - Self limiting as disease disappeared
- Other names
  - May disease
  - Spring dwindle, fall dwindle, autumn collapse

Who is being impacted Now?

- Large commercial migratory beekeepers
  - Reporting losses 50-90%
  - CA, FL, TX
- Non-migratory commercial, side-line and hobby beekeepers in the NE and Pacific NW
- Some package and queen producers

When was it discovered and how long has it been going on?

- First “reported” in FL in Nov. 2006
- MANY additional reports followed
- Many beekeepers admit to having high losses in the past year, perhaps longer
- Higher than “normal” reported over the past several years, may or may not be related

Who is working on this problem?

- CCD Working Group
  - Penn State University
  - PA Dept. of Agriculture
  - FL Dept. of Agriculture
  - USDA - Beltsville Bee Lab
  - Bee Alert Technologies Inc.
  - University of NC
  - University of DE

What is being done?

- Surveys - www.beesurvey.com
- Sampling (CA, FL)
  - Colonies and operations experiencing CCD and not experiencing symptoms associated with CCD
  - In-depth case studies of those experiencing CCD

What has been eliminated as a potential cause?

- Honey bee tracheal mites
- Feeding - HFCS, protein supplement
- Chemical use for mite and disease control
- Source of bees
- Source of queens

What potential causes are being investigated?

- Known and unknown pathogens; adult bees and brood
- Parasite load in the bees and brood
- Chemical contamination
  - Beekeeper used pesticides - accumulation in wax
  - Environmental contaminants - pesticides
- Nutritional fitness of the adult bees
- Level of stress in adult bees as indicated by stress induced proteins
- Lack of genetic diversity and lineage of bees

Collaborative Investigation

Sample Collection

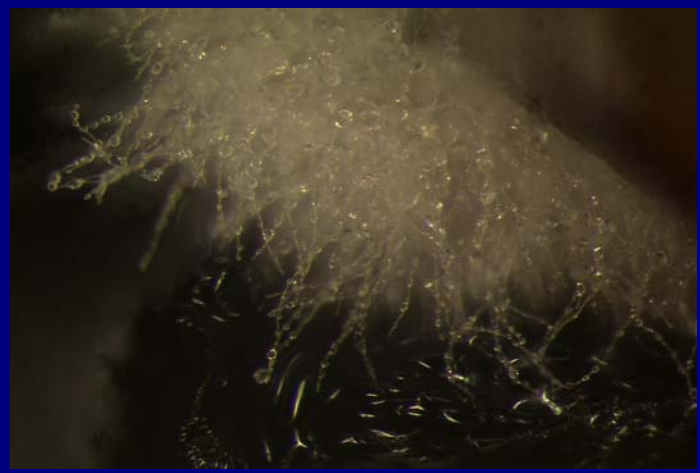
- In FL and CA
- 11 operations
- Representing 10 states
- 102 colonies

NATIONAL HONEY BOARD

Emergency funding $13,000

Collaborative Investigation
Sample Division
(Adult Bees Stored at -80°)

- Penn State
  - Unknown pathogen
  - Fungal analysis
- USDA
  - Known bee diseases
    - Gene chip
- PDA
- NC State
  - Protein analysis
  - Race analysis?



Collaborative Investigation
Sample Division
(Adult Bees in Alcohol)

- USDA
  - Varroa, HBTM, *Nosema*
- PDA/Penn State
  - Digestive system

Collaborative Investigation
Sample Division
(Comb and Honey)

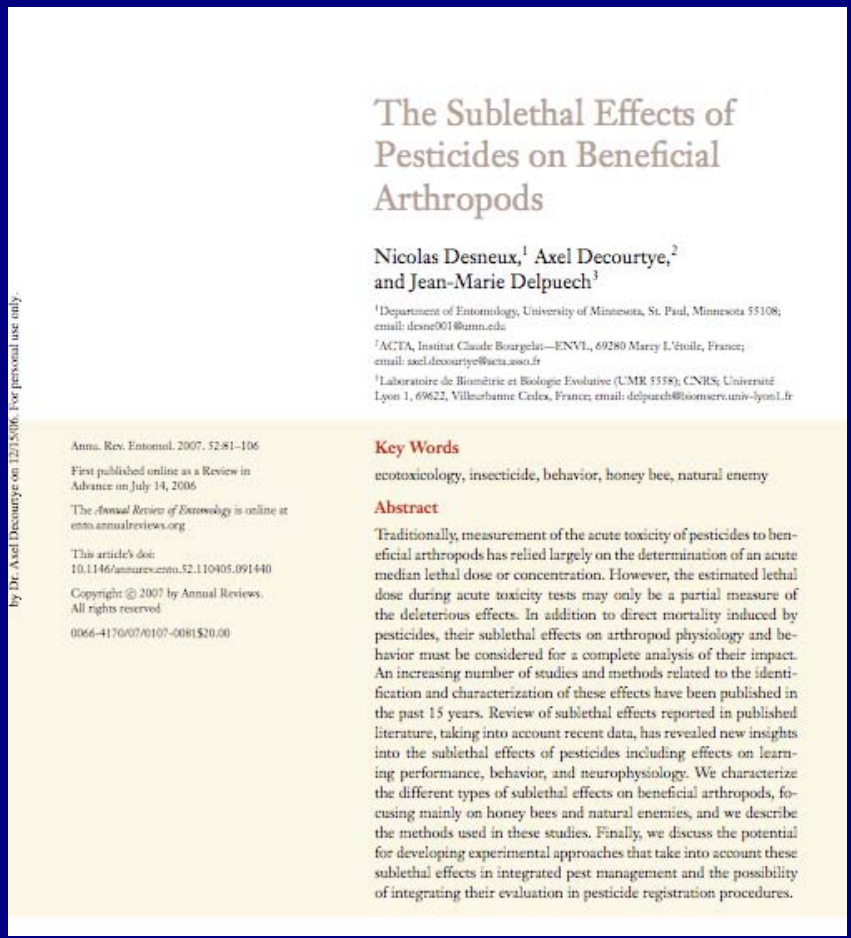
- Penn State
  - Bee bread (stored pollen), honey and bees
    - Neonicotinoids, fungicides
- Outside Lab
  - Wax
    - Chemical residue - pesticides used in beekeeping
- National Honey Board ?
  - HMF, other properties

Why Neonicotinoids and Fungicides?

- Environmental contaminants are a research priority
- Neonicotionoids - a relatively new class of pesticides (imadicloprid introduced in 1991)
  - now very widely used
- Most are known to be highly toxic to bees
  - EPA fact sheet, numerous studies, product labels
- Neonicotinoids and some fungicides are synergistic = more toxic

Funding:
Florida State and Tampa Bay Beekeepers Associations
National Honey Board

Neonicotinoids
Lethal and sublethal effects



The Sublethal Effects of Pesticides on Beneficial Arthropods

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Key Words

ecotoxicology, insecticide, behavior, honey bee, natural enemy

Abstract

Traditionally, measurement of the acute toxicity of pesticides to beneficial arthropods has relied largely on the determination of an acute median lethal dose or concentration. However, the estimated lethal dose during acute toxicity tests may only be a partial measure of the deleterious effects. In addition to direct mortality induced by pesticides, their sublethal effects on arthropod physiology and behavior must be considered for a complete analysis of their impact. An increasing number of studies and methods related to the identification and characterization of these effects have been published in the past 15 years. Review of sublethal effects reported in published literature, taking into account recent data, has revealed new insights into the sublethal effects of pesticides including effects on learning performance, behavior, and neurophysiology. We characterize the different types of sublethal effects on beneficial arthropods, focusing mainly on honey bees and natural enemies, and we describe the methods used in these studies. Finally, we discuss the potential for developing experimental approaches that take into account these sublethal effects in integrated pest management and the possibility of integrating their evaluation in pesticide registration procedures.

- Physiological
  - Enzyme activity = impairment of olfaction memory
- Behavioral
  - Motor activity
  - Navigation and orientation
  - Feeding behavior

What Can Growers do?

- Know the pesticides being used and their toxicity to bees
  - do not depend on third-party interpretation.
- READ AND FOLLOW THE LABEL DIRECTIONS
  - do not depend on third-party interpretation.
- **NEVER** use neonicotinoid pesticides on blooming crops
- The use of a neonicotinoid pesticide pre-bloom, just before bees are introduced , **IS NOT RECOMMENDED**. If one of these materials **MUST** be used pre-bloom (for example at pink in apples), select a material that has a lower toxicity to bees (acetamiprid or thiacloprid) and apply only when bees are not foraging, preferably late evening.

What Can Growers do? (cont.)

- Blooming time varies depending on variety. Bees pollinating one variety or crop may be at risk while another post-bloom crop or variety is being treated with insecticides. Also while crops may have completed blooming, bees may be visiting blooming weeds in and around crops. Be aware of these situations and avoid the application of pesticides on a non-blooming crop if there is risk of drift onto blooming crops and weeds if bees are present. If a spray must be applied, use the least toxic material and apply only when bees are not foraging (late evening.

- Protect water sources from contamination by pesticides. If necessary, provide a clean source of water close to colony locations prior to their arrival in the orchard or crop.

For more information visit the Mid-Atlantic Apiculture Research and Consortium website:

MAAREC.org