Goals of IPM in Pecans

- Exceed or maintain yields equivalent to conventional
- Identify best method of pest control
- Conserve natural enemies
- Use pesticides only when necessary and at the proper time
- Minimize insecticide resistance
- Increase net profits
An Ideal IPM Program

- Early detection of potential pests
- Assessment of pest density relative to the pest’s ability to attack and cause damage
- Detect changes in density prior to next monitoring period
- Consider all pest management strategies
• Evaluate control tactics
• Calculate direct and indirect costs
• Use plan to implement IPM decisions
“Pest management is a highly individualized and specific activity”
Key to Insect IPM in Pecans

- Manage around the key pests
- Treat other pests as the need arises
- Most insect management programs will require three insecticide applications
  - Pecan nut casebearer shortly after pollination
  - Hickory shuckworm at half shell hardening and again 10 to 14 days later
Seasonal Occurrence of Pecan Pests

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Phylloxera
Pecan nut casebearer
Pecan weevil
Hickory shuckworm
Honeydew aphids
Black pecan aphid
Characteristics of New Insecticides

- Usually specific target site
- Limited pest range
- Safe to people
- Limited persistence
- Safer than pyrethroids to natural enemies
- Low use rates
Neonicotinoids

• Mode of Action
  – Differs from nicotinoids
  – Potent interaction with insect nicotinic receptors
  – Hyper-excitation of nervous system

• Three different groups
• Chloronicotinyl
  – Imidacloprid - Bayer
    • Provado®
  – Thiacloprid - Bayer
  – Acetamiprid – Aventis
    • Assail ®

• Nitromethylene
• Chlorothiazole

  - Thiamethoxam - Syngenta
    • Cruiser® - Seed treatment
    • Platinum® - Soil
    • Actara® - Foliar
Activity of Neonicotinoids

• Primarily sucking insects
  – Homoptera - Aphids, phylloxera
    • No grazing
• Excellent oral activity
  – Limited contact
• Xylem mobile - Root uptake, plant systemic
Macrocyclic Lactones

• Mode of action
  – Binds glutamate channel @ skeletal muscle
  – Binds GABA channel in central nervous system
  – Feeding cessation and rapid paralysis
Activity of Macrocyclic Lactones

• Spinosad - Dow AgroSciences
  – SpinTor®

• Mode of action
  – Binds @ post-synaptic nicotinic acetylcholine receptor
  – Hyper excitation

• Good lepidopteran material
  – Grazing permitted
Diacylhydrazine

• Mode of action
  – Non-steroidal ecdysone agonist
  – Induces premature molt in caterpillars

• Different chemistries
  – Tebufenozide – Dow AgroSciences
    • Confirm® - No grazing
  – Methoxyfenvozide – Dow AgroSciences
    • Intrepid®
Pecan nut casebearer

- Overwinters as a small larva in a cocoon called a “hibernaculum”
- Larva becomes active at budbreak
  - Tunnels into rapidly growing shoot
  - Pupates and emerges as adult
• Moth lays egg on nutlet
• Egg hatches in 4 days, feeds on tender buds 1-2 days
  – 3 to 4 generations per year
Management of Pecan nut casebearer

• Day degree method
• Accumulate day degrees
  – Start at 50% budbreak
  – 38 ° F
Management of PNC (slide 2)

- Scout at 1730 day degrees
- Sample again at 1810 day degrees
- Significant nut entry at 1831 day degrees
• Pecan nut casebearer pheromone
• Place one trap per tree
  – Traps should be 50 feet apart
  – 6-8 feet high
  – Unwrap septa saturated with pheromone and place inside trap
  – Replace pheromone every 4 weeks
• Use 3 to 5 traps per 50 acres
Management of PNC (slide 4)

- Traps must be placed in the orchard early
  - Zeroes are significant
  - 4 weeks prior to spraying
- Order extra traps and pheromone
  - Can be lost in a storm
  - Pheromone will last two seasons when stored in the freezer
• Begin scouting for eggs 7-10 days after first moth capture

• No substitutes for actual scouting
  – Reassess applications after 5 days
Pecan weevil

• Uncultivated situation
  – Nut production occurs every 4 to 8 years
  – Weevil exists in low numbers
  – In heavy production year, a crop is produced
    • Too many pecans for the weevil
  – Weevil starved in succeeding years
• Cultivated situation
  – Nut production occurs every 1 to 2 years
  – Weevil initially exists in low numbers
    • Poor fliers
  – Nut production is constant, so weevils continue to increase

• Weevil problems are due to good production management but poor pecan weevil management
• Female lays eggs from gel stage to shuck split
  – Feeding prior to this time causes nut to drop
  – A male damages 6 nuts in his lifetime
  – Female requires a pre-oviposition period of 5 to 6 days. A female will damage 23 nuts in her lifetime
• Larva requires 42 days to mature inside nut
  – Larva chews out of nut and drops to the ground
  – Larva can be underground in 2 to 4 minutes
  – Larva is cream colored with a reddish head
  – Remains in larval stage for 1 to 2 years
Management of Pecan weevil

• Nut feeding prior to the gel stage is insignificant to overall problem

• Goal is to prevent egg laying
  – No insecticides can kill larva in the nut
  – No insecticides can kill larva and pupa in ground
Management of pecan weevil (slide 2)

• **Treatment based on various factors**
  – Monitor kernel development
  – Monitor soil hardness
  – Monitor adult emergence
Management of pecan weevil (slide 3)

- **Use traps**
  - Indicate weevil emergence is starting
  - Indicate emergence continues so re-treatment is necessary
  - Indicates late emergence

- **Weevil emergence cones**

- **Tedder's trap**
  - Easier to use
  - Paint tree trunks white
Adult Pecan weevil Emergence

Cumulative Percent Emergence

Date

Aug 10
Aug 30
Sept 20
Sept 30
Oct 10

0 20 40 60 80 100
• Treatment regime
  – If weevils are present treat at gel stage
    • Do not assume you trapped first weevils
    • Treat immediately; Usually Aug 22-25
  – Empty traps after 4 days
    • If no emergence in next 4 days treatments can stop
    • Continue trapping until shuck split and treat if late emergence occurs
Hickory shuckworm

• Least understood of all the pests
  – Difficult to predict

• Overwinters as nearly mature larva
  – In fallen shucks

• Larvae pupate in March

• Adults emerge about a month later
Hickory shuckworm (slide 2)

- Early in season eggs deposited on leaves
  - See some feeding in phylloxera galls
- Later generations deposit eggs on nuts
• Larvae tunnel in shuck
  – Interrupts flow of water and nutrients
  – Pupates in shuck
• Damage includes “stick tights” and poor quality
Management of Hickory shuckworm

• Shuckworms present all season

• Increased population at time of shell hardening
  – Some evidence of delayed overwintered emergence
• Treat at half-shell hardening
  – Reapply 10 to 14 days later
  – Sanitation can help
• Watch earliest varieties in the orchard
Aphid Complex

• Black aphid
  – Most devastating of the aphids
  – Not an early season problem
  – Protect foliage in the late season
    • Easy to control with dimethoate
    • Three aphids per compound leaf
• Honeydew aphids
  – Actually a combination of aphids
    • Black-margined aphid
    • Yellow pecan aphid
  – Cheyenne may be only tree that needs treatment
    • 25 to 30 aphids per compound leaf
    • Cure is worse than the disease
  – Resistance and resurgence problems
Stink bug Complex

• Feed from nut set to harvest
  – Prior to shell hardening, pecans fall from tree
  – Black spots are bitter
Stink bug Management

- Control weeds in and around orchard
- Plant trap crops
  - Single row of peas
    - Black-eye, purple hull, Crowder
  - Last week in July
    - Need irrigation
Fire ants in Pecans

- Considered a pest in pecans
  - Indiscriminate predator
  - Protect aphids
  - A pest at harvest time
Control Options

• Eradication
• Quarantines
• Natural and biological
• Physical and mechanical
• Organic
• Chemical
Eradication

- Will not work
- Ants infest extensive area
  - Massive resources
- Multiple colonies
- Pesticide limitations
- Chemicals never end
- Will not work
Quarantines

- Brown County on western edge
  - Tom Green County

- Limit movement
  - Nursery stock, turfgrass, hay and other items

- Store hay on treated pads
  - Limit soil contact
Natural and Biological

• Weather
  – Drought and winters

• Newly mated queens attacked
  – Birds
  – Lizards

• Predators
  – *Steinernema* spp.
Natural and biological (slide 2)

• Pathogens
  – *Thelohania*
  – *Beauveria bassiana*

• Parasites
  – *Solenopsis daguerri*
  – *Pseudacton spp.*
  – *Caenocholax fenyesi*

• Other ants
Ant Competition

Big-headed ant

Red harvester ant

Carpenter ant

Little black ant
Organic

• Citrex™
  – d-limonene
• Insecto® Formula 7
  – Pine oil
• Organics Solutions™
  – Pyrethrum
Using Baits

• Broadcast a bait
  – Preferably twice/year
  – Spring and fall
  – Baits do not prevent re-infestation
Tree Treatments

• Treat trunk

• Better method to preserve competitive ant species

• Products
  – Lorsban®
  – No grazing
Advantages of Baits

• No need to find mounds
• Long-lasting control
  – 6-12 months
• Least expensive method
• Not labor intensive
• Low human toxicity
• Few environmental hazards
Disadvantages of Baits

- Slow to work
  - Weeks to months
- 80-95% control
- Expensive
  - Low populations (<10/acre)
- Works only on active ants
- Requires spreader
- Harm non-target ants
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