Organic Fruit Tree Production

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Challenges to Apple Production in the Midwest

• Successful establishment of young trees – competition with weeds
• Protecting trees from insects and diseases prior to fruit production
• Thinning
• Protecting fruit from insects and diseases
Organic Fruit Production

• Organic production is much more common in the western US
• Low humidity = less disease
• Fewer insect pests
  – Washington has no plum curculio, apple maggot, redbanded leafroller or Japanese beetle
Before You Plant Your First Tree

- Attend Peter Hirst’s “Beginning Apple Grower Workshop” at the Indiana Horticultural Congress
  - Knowledge is your best tool
- Choose a site that is suitable for fruit trees
- Preferably choose a site that is not near any other fruit trees
- Choose varieties for which you can receive a premium price
- Choose rootstocks and varieties with as much disease resistance as possible
In 1998, move began from the Hort Farm to the Meigs Farm
Surrounded by corn and soybean fields
In 1999, we began a study to investigate the potential for organic apple production in Indiana
Component studies and organic plot
Organic Apple Studies – Meigs Farm, Lafayette, IN

- Selected two varieties with scab resistance
- Pristine – very early; planted in 2000
- GoldRush – very late; planted in 1999
- Four replications of two treatments – organic and conventional
- Each replication consisted of 4 rows of 8 trees each of the two varieties, for a total of 64 trees per replicate
- Total of 512 trees in study
Tree Establishment

• For conventional trees, used Roundup to kill weeds around base of trees
• For organic trees, attempted to use organic herbicide (Scythe) several times, with little success
• In 2nd season, placed weed mat along organic rows and covered with tree mulch
• Most weeds controlled well; except thistle
Tree Establishment

- Inability to successfully control weeds severely stunted organic trees
- Organic trees were approximately 1 year behind conventional trees in growth and production
- Using weed mats and mulch in first year probably would have reduced losses
- Another option is to use Roundup to establish trees – 4-5 years before fruit production begins
Diseases

- Most important disease is scab
- No effective organic fungicides available that will control scab
- Choice of scab free varieties will greatly increase odds of success
- Sooty blotch and fly speck are common, although not devastating, diseases of fruit
- Sprays of sulfur provided some control
- Sooty blotch and fly speck can be washed off
Apple Scab
Disease Management

- Choose scab free varieties
- Sanitation – pick up drops; prune diseased limbs, etc.
- Proper pruning – allows plants to dry more quickly and better spray penetration
- After fruit formation, regular sprays of sulfur every 10-14 days
- Expect some culls
Insects and Mites

• Japanese beetles
• Plum curculio
• Codling moth
• Apple maggot
• European red mites
• Aphids
Japanese Beetles

• Defoliation is serious threat to young trees
Japanese Beetles

• Defoliation is serious threat to young trees
• Best organic solution is neem
• Neem is a repellent; nontoxic
• Scout regularly and spray as soon as you see the first beetles
• Repeat sprays if beetles don’t leave or if they return
• Can also attack fruit of early varieties
Plum Curculio

• Most serious insect pest in organic production
• Overwinters as adult
• Females lay eggs in young fruit
• Larvae begin feeding within fruit
• Fruit drop from tree
• Larvae complete development in fruit and pupate in soil or within fruit
• Adults move back into trees
Plum Curculio Management

• Weak spot in life cycle – dropped fruit
• Pick up dropped fruit
• Traps and sticky barriers have not worked
Plum Curculio Management

• Weak spot in life cycle – dropped fruit
• Pick up dropped fruit
• Traps and sticky barriers have not worked
• Surround provides some control
  – Make first application (high rate) when king blossoms fall
  – Repeat at least weekly to maintain good coating for at least 3 weeks after petal fall
  – Don’t expect complete control (8-10% damage)
Codling Moth

• Key Insect Pest
• Must be controlled
• 2-3 generations per year
• Moths lay eggs on leaves near fruit
• Upon hatching, larvae immediately enter fruit
• Cannot be controlled after entering fruit
Codling Moth Management Options

• Again, sanitation is key
• Proper pruning
• Surround is not effective
Codling Moth Management Options

- Again, sanitation is key
- Proper pruning
- Surround is not effective
- Entrust
Entrust

- Organic formulation of SpinTor (spinosad)
- Allowed 3 applications per year
- Target first two at 1\textsuperscript{st} generation
- Use pheromone traps and degree days to determine timing
- Last spray for 2\textsuperscript{nd} generation
- Supplement with Pyganic
Monitoring with Pheromone Traps

- Place traps in orchard at bloom
- Check daily
- Biofix occurs when 3-5 moths have been caught in trap
Timing Sprays for Codling Moth

- Once biofix is achieved, assume eggs are being laid
- Entrust should be applied 150 degree days after biofix
Calculating Degree Days

- Codling moths don’t develop when temperatures are below 50°F – base
- For every degree above 50 on average for a day, you accumulate 1 degree day
- If high < 50, no degree days
- If low <50, set it to 50 for calculation
Example

- Low = 40
- High = 48
- No degree days accumulated
Example

- Low = 60
- High = 70
- Average = 65
- 15 degree days accumulated
Example

- Low = 44
- High = 70
- Reset low to 50
- Average is 60
- Accumulate 10 degree days
Timing Sprays for Codling Moth

- Accumulate degree days each day after biofix until the sum is 150
- Make Entrust application
- Make second application 2 weeks later
- Monitor again for 2nd generation
- Make 3rd application 150 degree days after 2nd generation biofix
- Again, don’t expect perfect control
Codling Moth Management Options

- Again, sanitation is key
- Proper pruning
- Surround is not effective
- Entrust
- Mating disruption
Mating Disruption

- Inundate orchard with sex pheromone
- Males are unable to find and mate with females; no eggs laid
- Place approximately 400 Isomate CM tubes per acre
- Don’t use in blocks that have large populations of codling moths
- Commonly used by conventional growers in the Northwest
Apple Maggot

- More common in northern 2/3 of Indiana and Illinois
- Less serious than codling moth and plum curculio
- Present from late June until end of season
Apple Maggot Management

• Sanitation
• Sticky Traps
Apple Maggot Management

- Sanitation
- Sticky traps not effective
- Weekly sprays with low rate of Pyganic
- Little rate effect with Pyganic; better to put on more applications at a low rate than fewer applications at a higher rate
European Red Mite

• Secondary pest
  – Natural enemies usually keep it under control
  – Becomes a problem when we do something to upset natural control or extreme weather conditions
  – Experiences with conventional growers
European Red Mite

- Secondary pest
- Not likely to be a problem for organic growers
- Predatory mites usually will take care of the problem
- If necessary, summer oils or soap can be used
Aphids

• Several aphid species attack apples
• Most serious is rosy apple aphid
• Woolly apple aphid becoming more important
• Natural enemies usually keep them under control
Aphid Management

- “Dormant” oil spray
- Conserve natural enemies
- Pyganic will clean up most aphid infestations
Thinning

• Proper thinning results in larger fruit and more even fruit load over years
• Avoid biennial bearing
• Organic thinners
  – Salt
  – Fish oil/lime sulfur
Organic Thinners

• Must be applied at bloom
• Risky because you don’t know what your fruit set will be
Hand Thinning

- Begin after June drop
- Thin to one fruit every 6 inches
- Low risk – you know your fruit load and little risk of frost
- Low reward – not as much effect on fruit size or fruit bud formation
Results of Our Studies

- Yields were suppressed early in the study in organic trees because of weed competition.
- Better early weed management would have eliminated most of yield differences in the early years of harvest.
- Peter Hirst – yields of both organic and conventional trees are acceptable.
- Insect damage is somewhat higher in organic trees.
- Sooty blotch and fly speck are much more common in organic plots.
Conventional GoldRush
Organic GoldRush
Organic Apple Production
My Recomendations

- Start from scratch
- Choose site well
- Choose rootstocks and varieties with as much disease resistance as possible
- Get the trees off to a good start – weed control – Roundup?
- Start small
- Plan on hand thinning
- Don’t think that disease and insect management mean replacing conventional pesticides with organic pesticides
Disease Management

• Scab free varieties make life much easier
• Keep trees well pruned
• Regular sprays of sulfur
• Wash fruit to remove sooty blotch and fly speck
• Pick up dropped fruit
Insect Management

• Sanitation is key
• Multiple applications of Surround beginning during bloom until good coating is obtained for plum curculio
• Use pheromone traps to time codling moth spray
• Apply Entrust 150 DD after biofix and 2 weeks later
• Apply Entrust 150 DD after 2\(^{nd}\) flight begins
• Consider mating disruption for codling moth
• Apply low rate of Pyganic weekly beginning mid-June
• Neem for Japanese beetles
Questions?