Keys to Success with PGRs

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Demanding Market Requirements

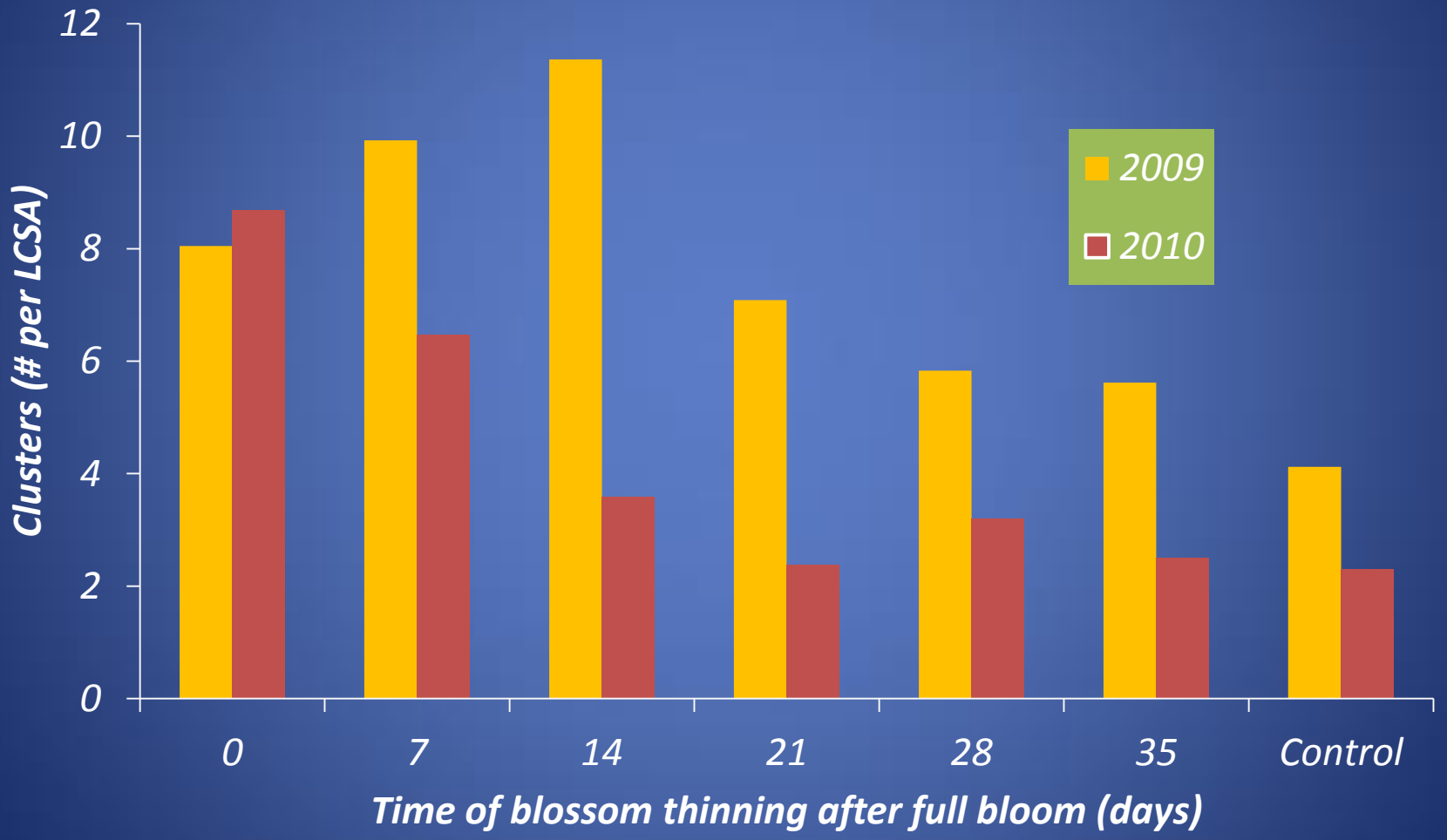
Production Mgt. For Quality

- Nutrient & Water Management
- Light Management
- Crop Load Management
- *Pest Management*
- Harvest / Maturity Management
- *Storage Management*

Why Thin?

- Increase **fruit size / quality**
- Increase **return bloom**
- Maintain tree health, hardiness, structure
- Chemical thinning is rapid
  - Earlier thinning gives best responses
  - **Cost effective**

Honeycrisp Return Bloom



Weather Matters

- Sunlight and temperature:
  - Strength of fruit set
  - Tree response to thinner
  - Weathering of thinner residue
  - Slow drying conditions will max absorption
- The 2 days preceding, and esp the 4 days following the thinner matter most

Spray Application

- Best results at high water volume.
  - 100 GPA
- Coverage
  - 2/3 in the top
  - Every row
- Surfactants, esp oil, will boost absorption
  - Not just thinner…

6-benzylaminopurine (6BA)

- One of several cytokinins.
- Growth Promoters in plants:
  - cell division,
  - bud initiation.
- 6BA spray thins & sizes apple.
  - Thins crop,
  - Promotes cell division in fruit.

6BA: Keys

- **Highs in 70s for 3-4days**
- 75 -150 PPM (1.5 – 3 qt. / A)
  - 100 PPM (2 qt) good for most varieties & moderate thinning
- Best window: 9-13 mm fruit diameter
  - Activity out to ~16 – 17 mm max
- Return bloom is linked to thinning
  - No direct promotion of flower formation.
- Don't apply 6BA and NAA on Delicious or Fuji.
- **Best results when tank-mixed with Sevin.**
- Hard-to-thin varieties based on NAA not hard to thin with 6BA + carbaryl

Napthaleneacetic acid (NAA)

- Synthetic auxin (growth promoter)
- Causes transient stress (Pn)
- Stimulates ethylene production
- Works best in warm temperatures but less specific than 6BA

NAA: Keys

- Wide range of rates: 2.5 to 20 PPM
  - 1 oz to 8 oz / 100 gallons
- Best window: 9-13 mm fruit diameter
  - Milder activity at PF (with low rates)
  - Activity out to ~17 - 18 mm max
  - Late + High Rate + Heat = Mummies
- Best results when tank-mixed with Sevin
- Use acidifier / buffer with high pH well water
- Don’t apply 6BA and NAA on Delicious or Fuji.

Carbaryl

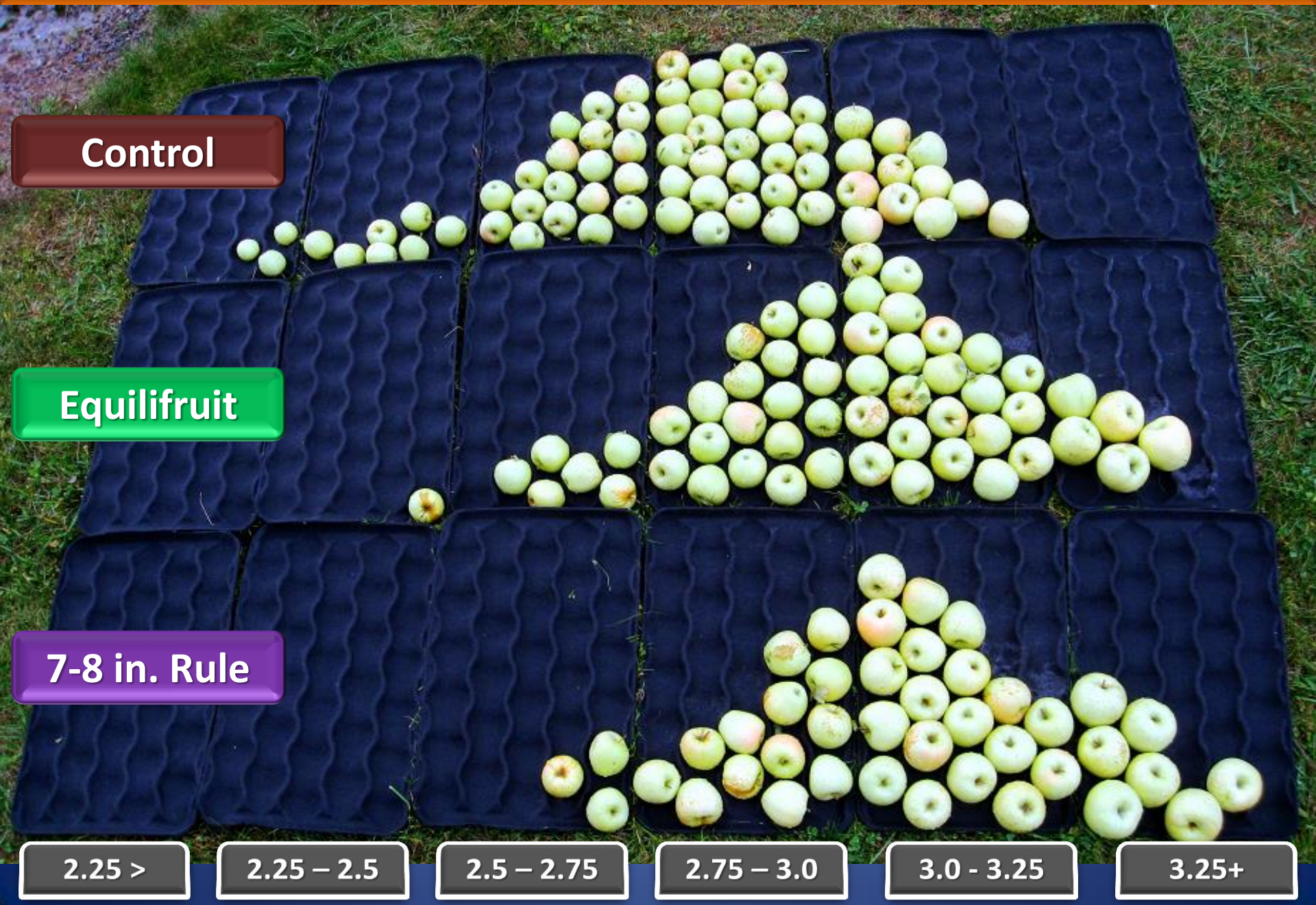
- Mild thinner used alone at 1/2 lb a.i. / 100 gal
- Rate insensitive…
- Tank mix to increase thinning
  - With 1 qt. /100 oil
  - With NAA, 6BA or ethephon

Ethephon

- Ethylene-Releasing Material
- Best window: 18-24 mm fruit diameter
- Response is temperature-dependant
- Use acidifier / buffer with high pH well water
- Tank mix with carbaryl to increase thinning

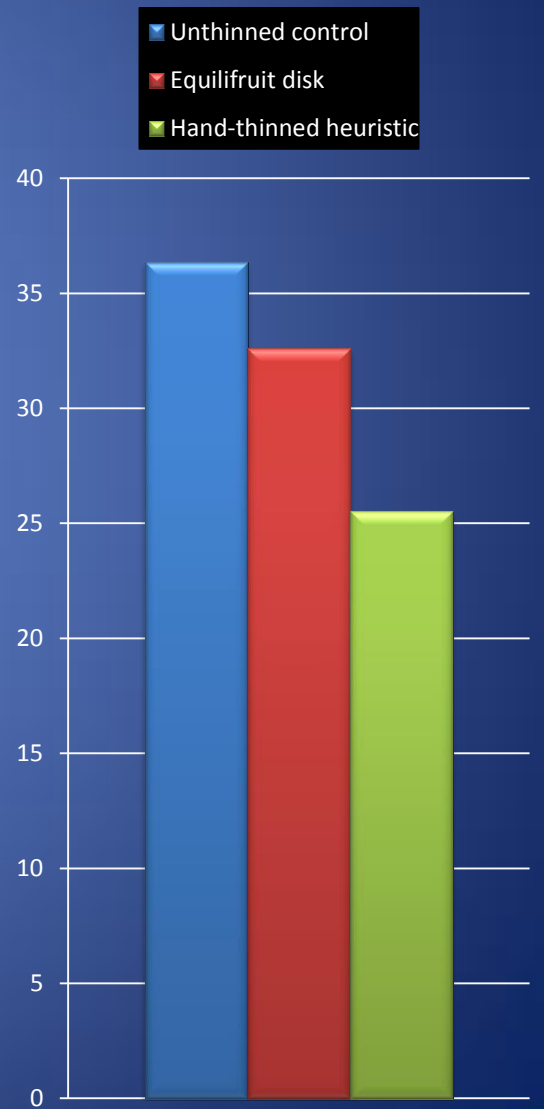
Using the Equilifruit Disk

Fruit Size Distribution



2010 Golden Delicious Equilifruit Trial: Crop load, mean fruit weight, and whole tree yields

Treatment	Cropload (#fruit/TCSA)	Mean Fruit Weight (g)	Yield (kg)
UTC	16.2a	129a	36.4a
Equilli-F	10.3b	169b	32.6ab
Heuristic	6.4c	195c	25.5b



Managing Fruit Maturity

- Maintain fruit quality and storage life
- Marketing: early and late
- Managing harvest:
  - Scheduling labor
  - Juggling varieties with similar harvest dates
- **Preventing losses to Pre-harvest drop**

Plant Growth Regulators

- Pre-harvest treatments:
  - Advance maturity: Ethephon
  - Delay maturity: AVG (ReTain)
  - Stop-drop: NAA
  - Combinations
- (Post-harvest treatment: SmartFresh)

Ethephon: Ethylene-Releasing Material

- Promotes ripening:
  - Red color development
  - Stem loosening
  - Fruit softening, starch-sugar conversion
- Response is temperature-dependant
  - Hot = rapid ripening without red color
- Use with NAA to regulate drop
  - Harvesting in ~7 days: tank mix them
  - Harvesting later: spray NAA 2-3 days after

Getting Results with Ethephon

- Apply 2-3 weeks before normal harvest for 1-2 week advance in maturity
- Apply with adequate water and a non-ionic surfactant
- Monitor maturity carefully after spray
- Apply to only enough of crop to meet the early market
- Don’t put ethephon-treated fruit in long-term storage

ReTain (AVG): Ethylene Production Inhibitor

- Delays maturity:
  - Red color development
  - Stem loosening
  - Flesh softening, starch-sugar conversion
  - Delays stem-end cracking, water core
- Delays Pre-harvest drop

ReTain: Keys to Success

- Timing of spray
  - Split applications don't help
- Coverage and absorption
  - Use 100% organosilicone surfactant
  - 100 GPA or 2X spray volume
  - Best results in smaller trees
- Stressed trees are poor candidates

Timing ReTain Sprays

- 4-3 weeks before anticipated harvest
- Early varieties: adjust harvest date estimate in early seasons
- Wait for good spray conditions and
  - 6 hour drying time
  - Slow drying, but:
  - dry foliage

NAA: Keys to Success

- Monitor drop and time spray accordingly
- Good coverage and non-ionic surfactant
- Avoid spraying in hot weather
- Split sprays can help

NAA Blocks Stem Loosening

- Maturity is not delayed
  - Maturity is often advanced, esp when its hot
- Fruit respond in 2-3 days
  - “Rescue” option, but
  - Doesn’t firm up those already loose
- 2 timings:
  - Just before drop starts
  - “pre-loading” 3-4 weekly sprays

Impact of Stop-Drops on Storage

- Predictable, based upon maturity effect
- “Garbage in – garbage out”
- Monitoring fruit maturity
  - Always a good idea
  - Absolutely essential with complex tactics
- Can you have your cake and eat it too?

Consistent Size & Quality?

- Water and nutrient **management**
- Canopy and light **management**
- Cropload and return bloom **management**
- Harvest and maturity **management**
- **Consistent + management!**
- **As always, you the grower are the Key**