

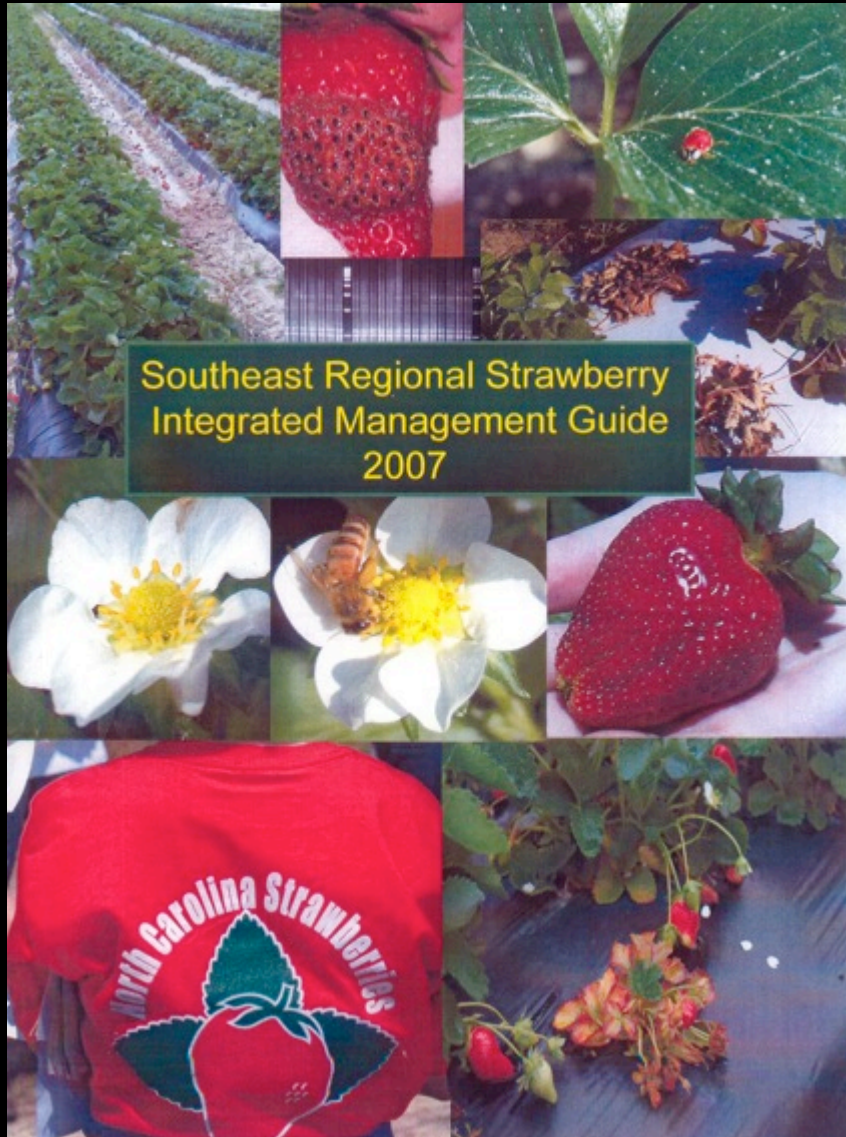
Advanced Row Cover Management for Reducing Winter Injury in Strawberries



Cary L. Rivard, Ph.D.
Dept of Horticulture
Kansas State University



Resources



- *Production of Vegetables, Strawberries, and Cut Flowers using plasticulture*
– NRAES-133
- *Midwest Strawberry Production Guide*
– Ohio State Univ: Bulletin 926
- *Strawberries: Organic Production*
– ATTRA IPO46
- *2010 Southeast Regional Strawberry IPM guide*
– NCSU, UGA, Clemson

Annual Strawberry Production

Fall planting



Winter row covers



Spring harvest



Annual Strawberry Production

Summer cover crop



Plastic removal



Clean-up



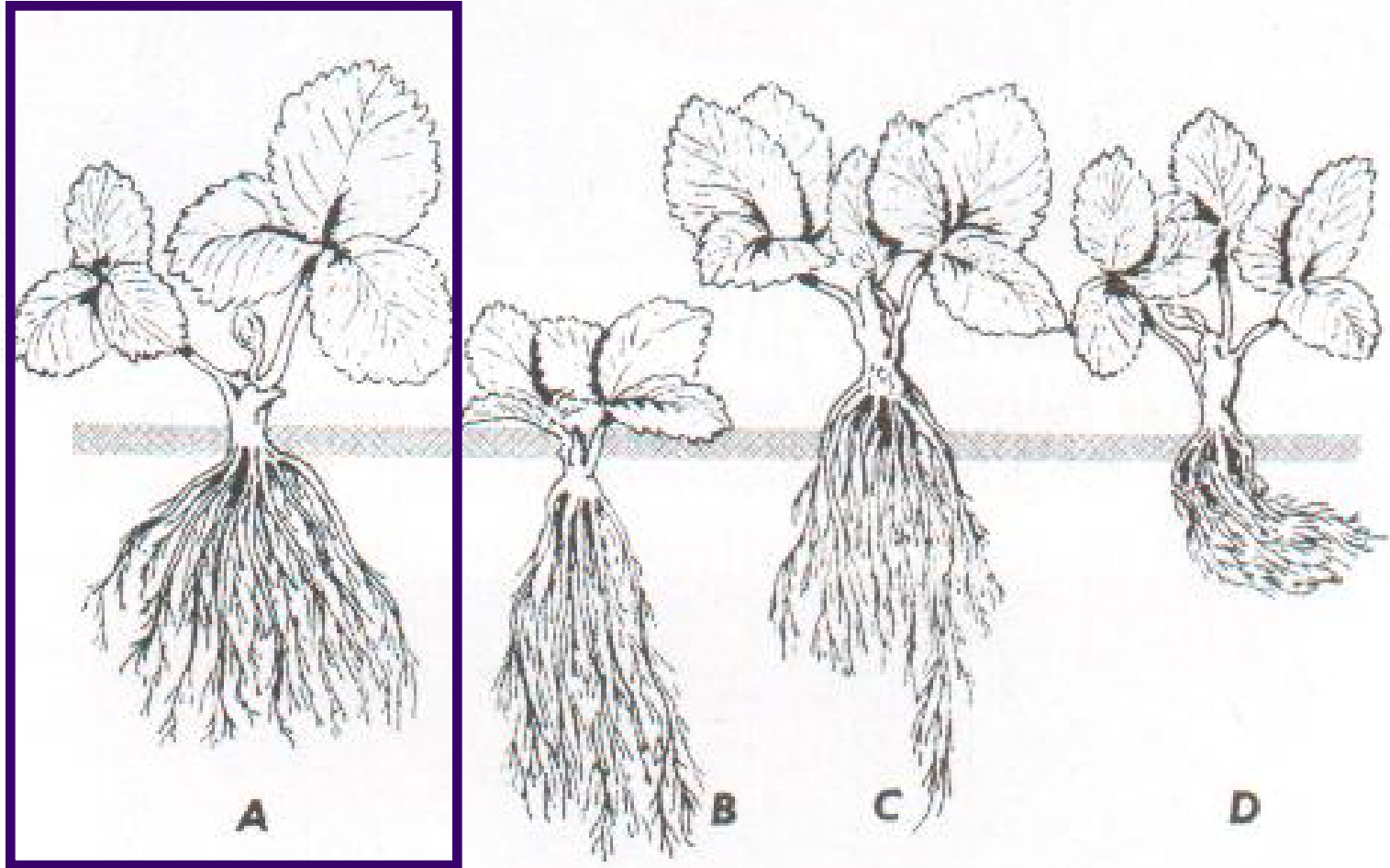
General Cultural Info

Fragaria x ananassa

- Perennial plant in an annual system
 - 190 frost-free days
- Optimum soil pH = 6.0
- High OM (>1%)
- Nutrition (½ pre-plant, ½ drip-applied)
 - 90-120 lbs N
 - 200-250 lbs K
 - Boron
 - MAGNESIUM!!!
- Well-drained soil
 - Raised beds



Planting Depth



Proper planting depth is essential for high yields





Sorghum Sudan Video





Planting date is very IMPORTANT



Fall Management



Mazzei Injector (Venturi-type)

- Water, Water, and more water
 - Drip applications 2x-3x per week
- 1-2 Magnesium Applications
 - 10 lbs/acre
 - Foliar application or drip
- IPM Scouting
 - Cutworms
 - Aphids
 - Others
- Grow baby grow!!
- Start looking for pickers

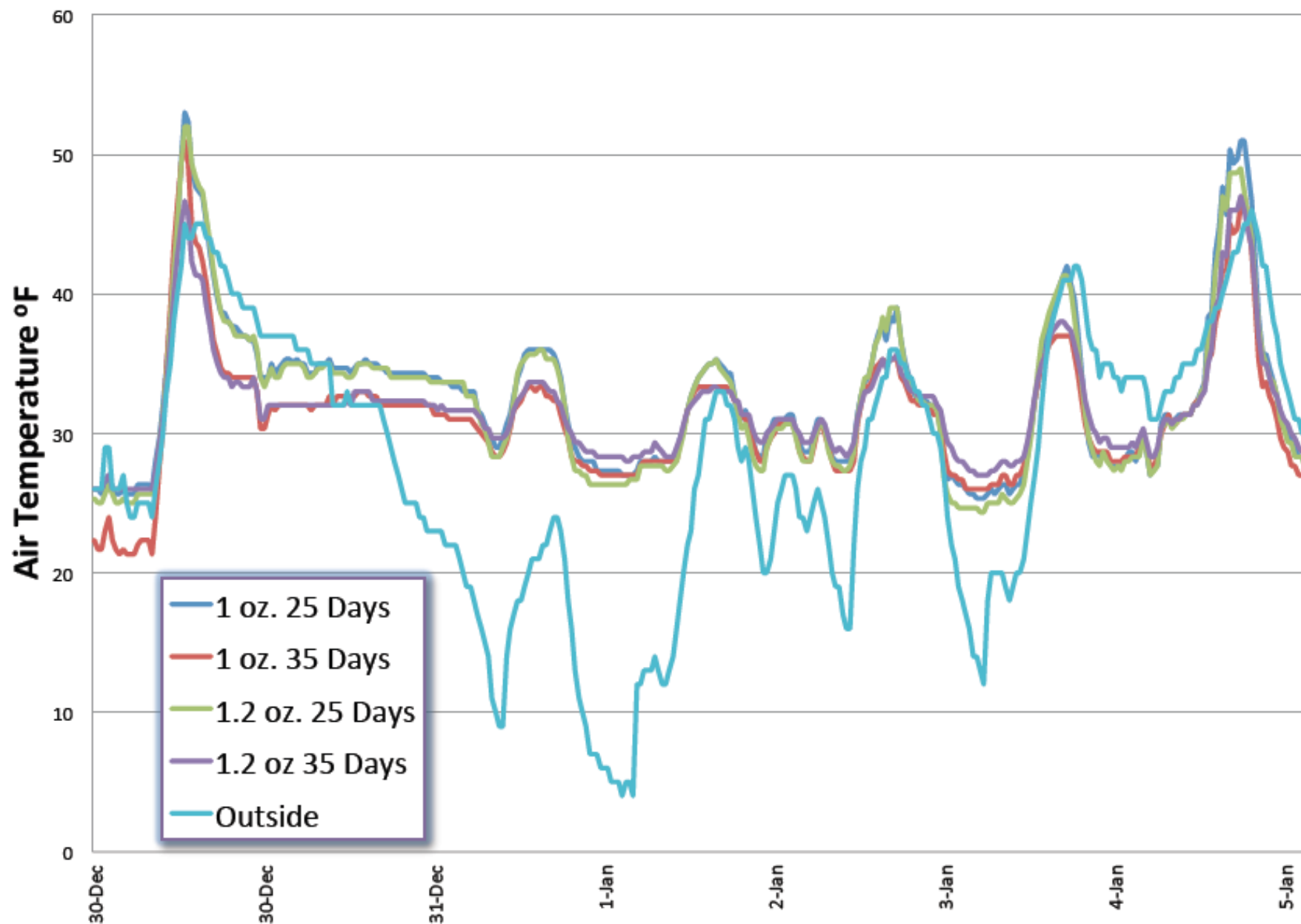
30 days with <30 degree (F) temps





Managing Winter Injury

Canopy Temperature During Cover Period : Dec 30-Jan 5



Spring frost protection



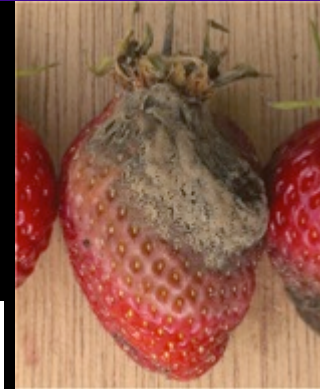








Disease and Pest Management



Organic Management



OMRI-approved Fung. & Pest.

Biological control

Sanitation

Cultural control

Environmental control

Genetic resistance

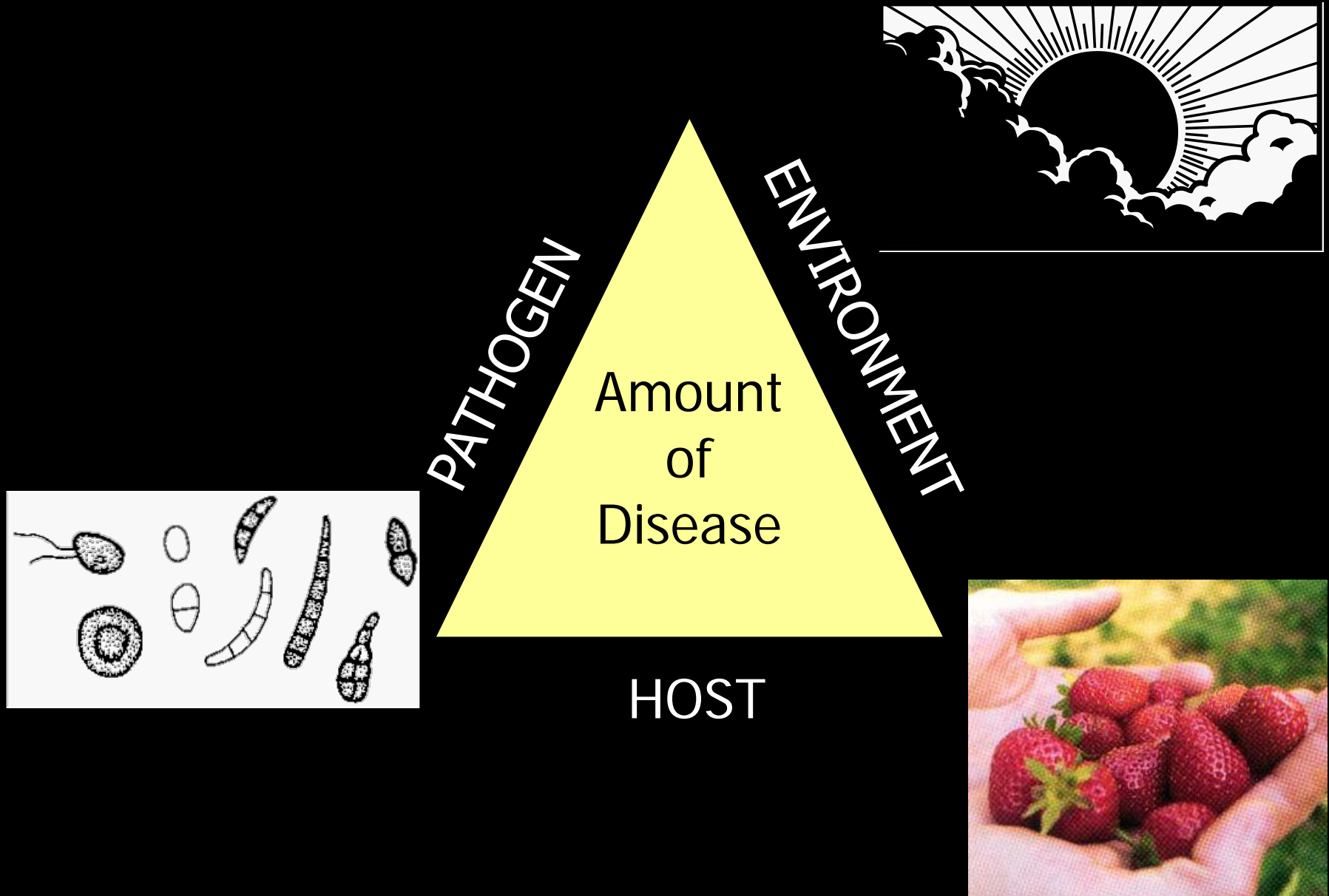
Crop Selection

Growing system

Site Selection

Knowledge/Experience

Plant Pathology 101



Gray Mold

- *Botrytis cinerea*
 - Necrotrophic fungi
 - Cool, wet weather
 - Very wide host range
 - Ubiquitous pathogen
 - SANITATION







Anthracnose



- *C. acutatum* (and others)
 - Hemi-biotrophic
 - Latent infections
 - Favored by hot weather
 - CLEAN TRANSPLANTS



Why Fumigate?



Healthy



Black Root Rot Complex

Black Root Rot

- *Isolated and characterized over 1200 fungi*
 - *Fungal complex varies with crop production site*
 - *Clean plants are difficult to obtain*
- *Rhizoctonia fragariae : AG-G, AG-A, AG-I*
- *Pythium irregulare, Pythium spinosum, Pythium artotrogus, Pythium HS*
- *Fusarium solani and Fusarium oxysporum*
- *Described new Phytophthora species*



Alternatives to Fumigation

What are some alternatives to soil fumigation?

- Bio-Fumigation
- Suppressive Cover Crops
- Compost
 - Disease Suppression
- Biocontrol products
 - *T. Hamatum* T382
- Anaerobic disinfestation
- Crop rotation



Compost-based Systems



John Vollmer

- on-farm research
- organic transition

Michelle Grabowski
MS student



Treatments

Compost

Methyl Bromide

Telone C35

Unfumigated Control



- Plots (4 beds 40 ft long)
- Data collection inner 20 ft of inner 2 beds
- Latin Sq. design
- Same location for 3 consecutive years (i.e. no crop rotation)
- Fall plant. Harvest=April - June

(Grabowski and Louws, NCSU)

Compost-based Systems

- Management intensive system
- Compost pile monitored and adjusted daily for temperature, moisture and CO₂ content



Recipe: 30 % Dairy manure
30% Waste Hay
30% Waste Silage
5% Finished compost
5% Clay soil



(Grabowski and Louws, NCSU)



Year 1: 30 yd³/acre

Year 2: 20 yd³/acre

Year 3+: 15-20 yd³/acre

(Grabowski and Louws, NCSU)



Rotary Spader



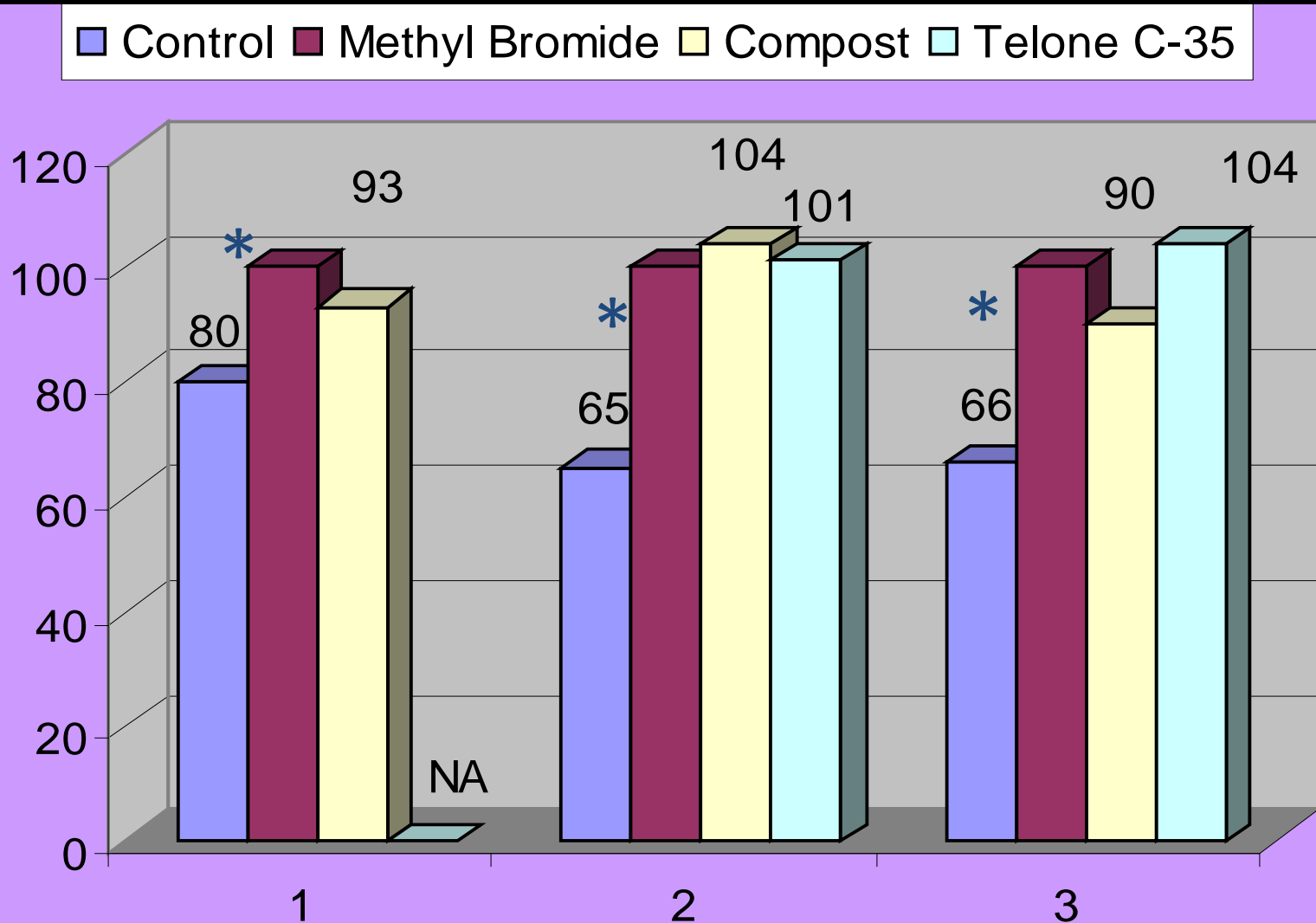
Raising of the Beds



Crop Establishment

(Grabowski and Louws, NCSU)

Marketable Yield



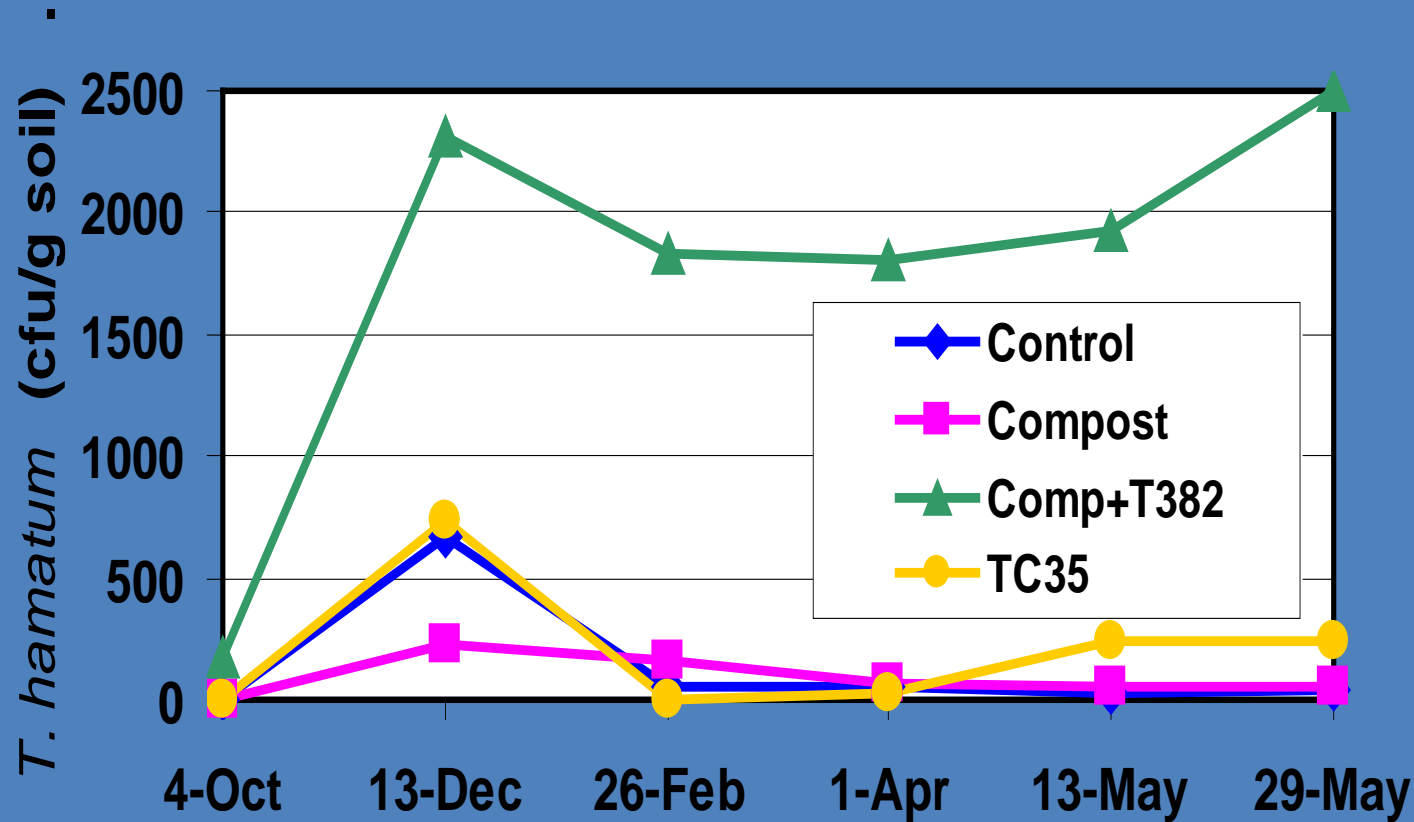
* Indicates yield is significantly different than MB

(Grabowski and Louws, NCSU)

Compost-based Systems



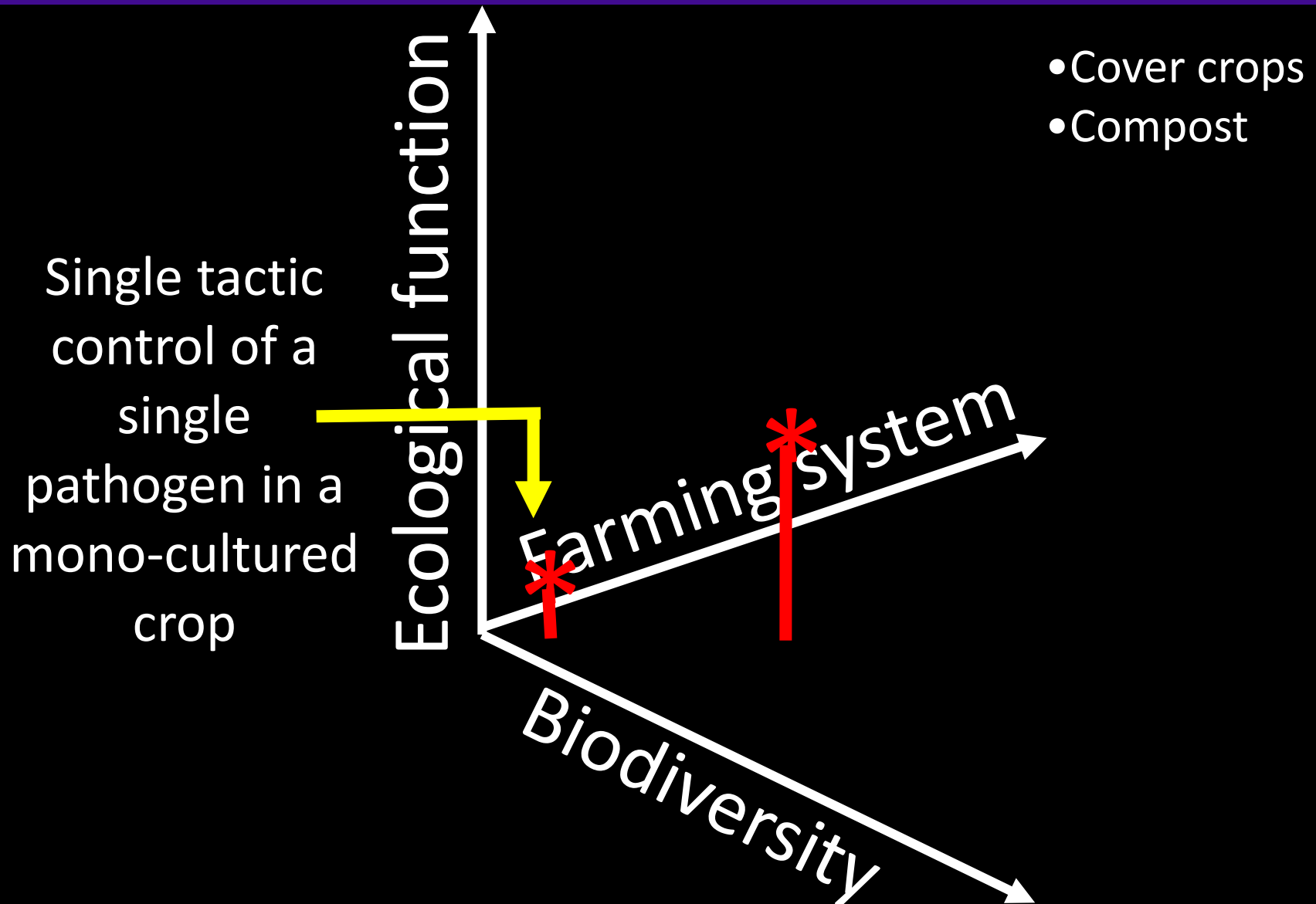
Biological Control



Population of *T. hamatum* in field soil. Compost was inoculated with T382 and incorporated into field soil after two weeks.

(Leandro and Louws, NCSU)

Systems Approach

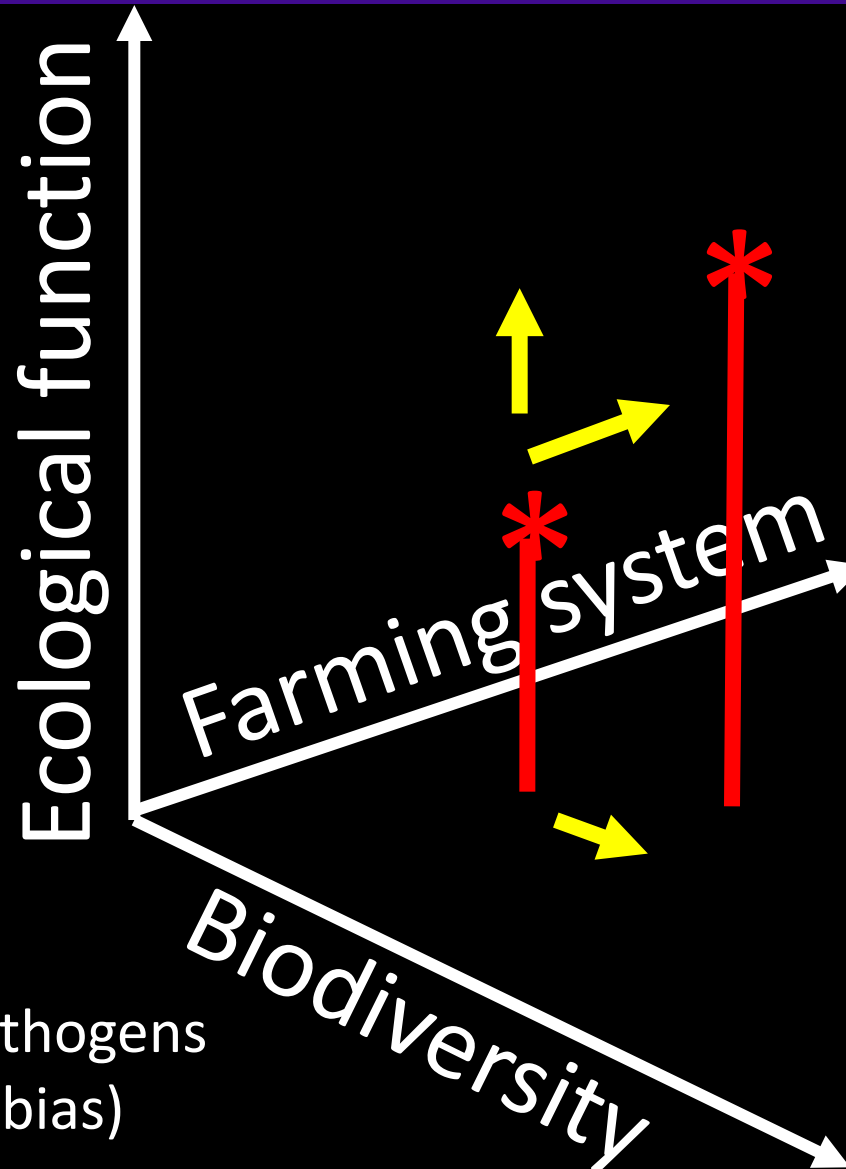


Systems Approach

- Disease suppression
- Plant growth promotion
- Good yields

- Cover crops
- Compost
- Certified plants
- Crop rotation
- Nutrient mgmt

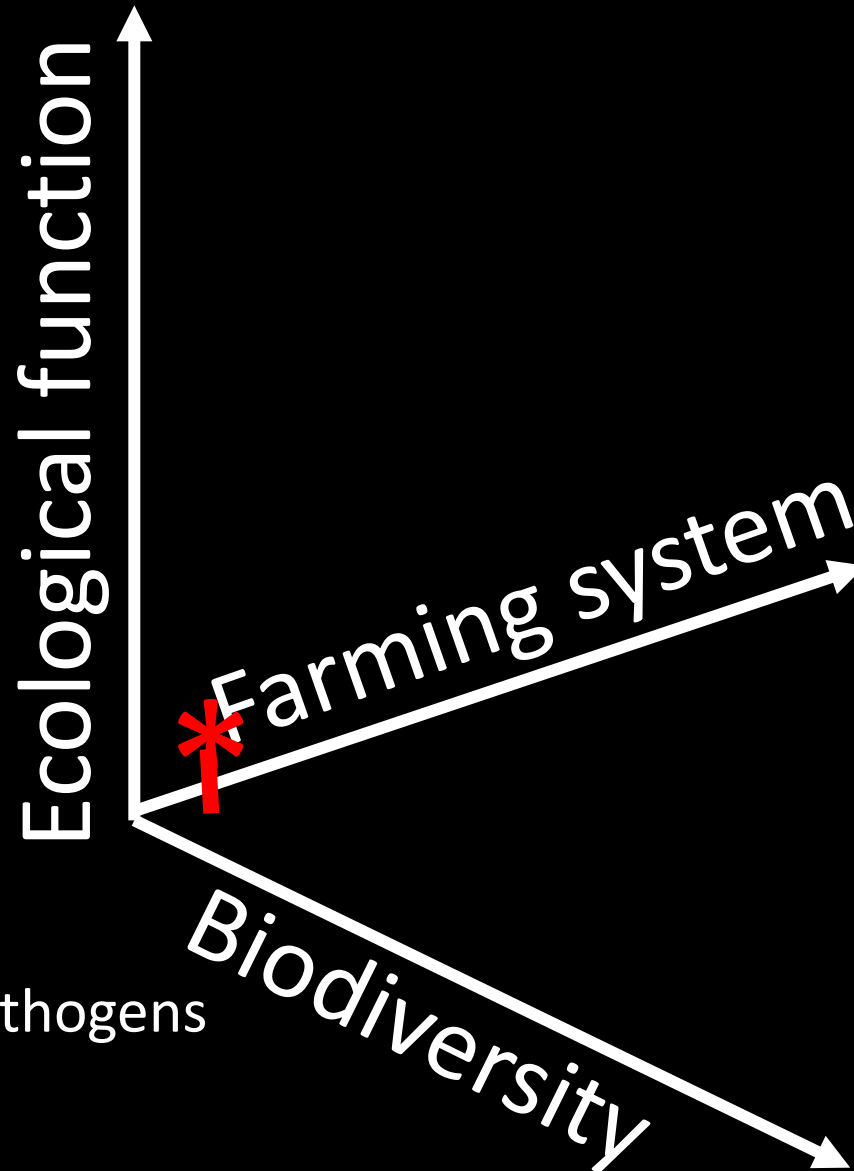
- Biologicals
- Knowledge of pathogens
- Soil community (bias)



Systems Approach

- Disease suppression
- Plant growth promotion
- Good yields
- Weed suppression
- Nutrient cycling/CEC

- Biologicals
- Knowledge of pathogens
- Soil community
- Crop diversity



Multiple crops over time and space to foster high biodiversity, multi-pest suppression, and vigorous plant health

Black River Organic Farm

- ½ Acre Certified Organic
- ‘Camarosa’
- Soil pH = 6.5
- Fertility
 - Feathermeal (150 lbs N/A)
 - Sulfate of Potash
- Rotation
 - Rye/Vetch CC
 - Sorghum sudan grass CC
 - After sweet corn
- Weed Management
 - Wheat straw (row middles)
 - Hand weeding (mid-February)
- Pest Management Practices
 - Clean up at first spring growth



*Stefan Hartmann
Black River Organic Farm*

**Variety Selection –
Shelf life, yield**

Maple Spring Gardens

- ½ to 1 Acre Organic
- ‘Chandler’, a few ‘Sweet Charlie’
- Soil pH = 6.0
- Fertility
 - Compost & Manure (mature)
 - Sulfate of potash
 - Chilean nitrate (5 lbs N/A, weekly)
- Rotation
 - No set place
 - After early tomatoes, potatoes (buckwheat)
- Weed Management
 - Hand weeding (mid-february)
- Pest Management Practices
 - Clean-up at first growth
 - Certified plants



*Ken Dawson
Maple Spring Gardens*

**High Biodiversity =
No Spider Mites**

Cottle Farms

- 6-10 Acres Certified Organic
- 'Camarosa'
- Soil pH = 6.2
- Fertility
 - 8 tons/acre chicken litter
 - Epsom Salt (MgSO_4)
- Winter CC – Austrian Winter Pea
- Weed Management
 - Wheat straw (row middles)
 - Hand weeding (mid-february)
- Pest Management Practices
 - Mid-February clean-up
 - Maintenance Sprays
 - Ecotec, Sporotec, Saf-T-cide
 - As Needed
 - Spinosad, Pyganic, Neem Oil



Summary



- Highly Marketable!!
- Fertility
 - 5 lbs/acre per week N
 - MAGNESIUM
- Pest Management
 - Diversify your system
- Planting date is critical
- Be ready to pick

QUESTIONS??

**Por la sanidad de
las fincas aledañas:
Lavarse bien las
BOTAS en la ZONA
DE DESINFECCIÓN**