EXAMPLES OF INTEGRATED MANAGEMENT PROGRAMS

SUGARBEET CYST NEMATODE ON SUGARBEETS:
(RASKI & ALLEN. 1948. CALIFORNIA AGRICULTURE)
- PROTECTION OF UNINFESTED LAND
- CLEAN CULTIVATION OF HOST WEEDS
- CROP ROTATION
- EARLY PLANTING (TEMPERATURES TOO LOW FOR INFECTION)

COLUMBIA ROOT-KNOT NEMATODE ON POTATOES:
- PREVENTION
  - WASHING EQUIPMENT
  - CERTIFIED PLANTING STOCK
  - DAMAGE THRESHOLDS (BASED ON FALL POPULATION LEVELS)
- CROP ROTATION
  - ALFALFA  BARLEY
  - WHEAT  ONIONS
  - FALLOW  POTATO VARIETIES
- HARVEST DATES DETERMINED BY ACCUMULATED DEGREE DAYS
- CHEMICAL CONTROL ONLY IN FIELDS WITH LOW POPULATIONS
- ECONOMIC EVALUATION OF ALTERNATIVES
- LONG RANGE COMPUTER ASSISTED PLANNING (3-5 YEARS)

Root-knot and stem and bulb nematode on alfalfa:
- Selection of Planting Site
- Certified Seed
- Clean Equipment
- Irrigation Management (for *D. dipsaci*)
- Weed Management (fall burning for *D. dipsaci*)
- Choice of Variety
- Crop Rotation (for *D. dipsaci*)
- Fallow
- Chemicals
PTSLS (Peach Tree Short Life):

1. Before planting, apply lime to adjust soil pH in the top 20 cm to 6.0-6.5.
2. Subsoil during site preparation to break up the hardpan, thereby improving water infiltration, drainage, root growth, nutrient uptake, and diffusion of nematicides.
3. In sandy soils where peach trees have been grown previously and in other soils where ring and root-knot nematodes are a problem, fumigate the soil before planting trees.
4. Plant trees that have been grown in fumigated soil or in soil free of parasitic nematodes and other diseases.
5. Plant trees propagated on Lovell or Halford rootstocks (both are very susceptible to root-knot nematodes; thus, preplant fumigation often is essential).
6. Apply nutrients and lime as needed based on soil tests, foliar analysis, and local recommendations.
7. Prune as late as possible, never before 1 January and preferably after 1 February. If earlier pruning is unavoidable, prune older trees first. Early pruning is especially hazardous for trees grown on locations where peaches were previously grown. Discontinue summer pruning (including topping and hedging) by 15 September.
8. Use recommended herbicides for weed management. Mechanical cultivation, if used, should be shallow to avoid root injury.
9. In sites where preplant fumigation was necessary, use a postplant nematicide if ring nematode populations increase. Assay soil for nematodes annually.
10. Promptly remove from the orchard and destroy all dead and dying trees.

NEM 204: NEMATODE FIELD TRIALS

What do you want to test (hypothesis)?
- Nematodes.getHosts,
- Chemicals,
- Soil amendments,
- Cover crops,
- Resistant varieties,
- Damage/economic threshold,
- Sampling procedures,
- Population changes over time,
- Hot water or other planting stock treatments,
- Genetic variability

Where do you want to work?
- Microplot/Mesocosm,
- University field station,
- Private field station,
- Grower's field.

Who are your cooperators?
- Farm Advisors,
- PCA’s,
- Growers,
- Industry representatives
- Field station staff.
Before you start, establish presence of nematode population (don't take anyone’s word for it). "Natural" vs "recently" introduced populations. What problems are present besides nematodes. Is the population too high or the problem too bad to correct?
Do as much beforehand as possible
But expect to make changes in the field.
Don’t be afraid to make decisions.

Make a list
Don’t forget the duct tape or the water.
Take extra of everything.

Preliminary plot map,
Rate calculations,
Pre-measuring of materials,
Label plot stakes,
Label flags,
Make labels for samples.

Transportation to the field
Take 2 vehicles if possible
(or 1 vehicle and a cellular phone).
Where are the car keys?
If not on a paved road, consider backing in.
Park away from areas used by farm equipment.

Things to record or collect
plot name, location,
plot map, which way is north,
persons present,
getting back to the same location,
host, nematodes,
number of treatments,
experimental design,
plot size (length and width of each replicate),
crop row width, number of replicates,
soil sample (for soil type, % organic matter, pH, etc.),
soil temperature,
% soil moisture (important for fumigation treatments),
general weather conditions, type of irrigation, fertilizer,
weed and pest control, application dates,
rate calculations,
methods of application and incorporation,
planting date, harvest date,
closest CIMIS or other weather station
previous cropping history, previous nematicide use.
MINIMUM CRITERIA NEEDED TO BE ABLE TO EVALUATE AN EFFICACY TRIAL:
GENUS OF NEMATODE
UNTREATED CONTROL
ESTABLISH PRESENCE OF NEMATODES PRIOR TO TRIAL
COMMON NAME OF TEST PLANT
MINIMUM OF THREE REPLICATES
RANDOMIZED DESIGN
NEMATODE COUNT AT LEAST 6 WEEKS AFTER PLANTING
STATISTICAL ANALYSIS OF RESULTS
OBSERVATIONS ON PHYTOTOXICITY

Applying treatments
Assign one person (two is better) to guide applicators to plots to be treated.
For chemicals record
- type of formulation,
- names and amounts of active ingredients,
- lot number, date received,
- amount of water or other material used to dilute product,
- band width,
- depth of application,
- shank spacing,
- time between application and incorporation,
- application rate,
- rate calculations.

Don't assume a biological or natural product is safe, use same precautions as when applying chemicals.
Don't assume a chemical is as safe as its current label indicates.
Work upwind of products being applied.

Liquids
- hand injection gun,
- hand sprayers,
- drench (sprinkler can),
- soil vs foliar applications,
- calibration.
Granules, powders.
Methods of incorporating liquids,
- granules and powders.
Application in irrigation water,
- flood, basin, furrow, sprinkler, drip.
Location of established irrigation systems.
Recontamination of treated areas.
Safety
Never assume an equipment operator can see you or hear you.
For chemical trials
gloves, Tyvek suits, rubber boots, respirator, cleaning up.
Accidents - where's the nearest telephone/hospital?
Shade
Water

SOIL SAMPLES

One day sampling could = 8 Weeks processing/counting

Nematode Samples (the greatest cost in a trial):
Consider -
number of subsamples per sample, sampling method, depth, extraction method, storage time and temperature.
Pretreatment
PI, from every plot vs from untreated checks vs from each block, etc.
Posttreatment but preplant (depends on initial population).
Postplant (depends on expected rate of change of nematode population).

Harvest

Pf,
grading nematode damage to crop quality above or belowground,
root-gall ratings (no best method, record what you do).
Crop Samples
- Standcount
- Phytotoxicity
- Midseason assessments

Harvest
- hand harvest
- semicommercial with experimental sized equipment
- combination of experimental and grower equipment

Interactions of treatments with other pathogens.
Effects of treatments on nontarget organisms.
Potential for nematode treatments to affect other pathogens.
Plot designs.
There is no single correct way or best way to do an experiment.
Plot size for nematode evaluation vs plot size for crop yield evaluation.
Statistical analysis programs (SAS, JMP).
BIOFUMIGATION:
EVALUATION OF BROCCOLI RESIDUE FOR
SUGARBEET CYST NEMATODE (SBCN) CONTROL
BROCCOLI IS A HOST FOR SBCN
BRASSICACEAE PRODUCE GLUCOSINOLATES
BROCCOLI DEGRADATION RELEASES
ISOTHIOCYANATES
WHY IS SBCN A PROBLEM ON BROCCOLI?

TREATMENTS:
TELONE II 1X (9 GPA)
TELONE II 2X (18 GPA)
1X BROCCOLI
2X BROCCOLI
NONE
TARP
COMBINATIONS
RCB
4 REPS
2 WEEKS TOTAL BETWEEN CROPS

BROCCOLI MOVED AND CHOPPED
FIELD TILLED, BEDDED, AND TARPED

2000 - YIELD INCREASES WITH BIOFUMIGATION
2000 - NEMATODE REDUCTION WITH BIOFUMIGATION

ERROR BARS INDICATE 1 STANDARD ERROR

Egg Hatch PF/PI

OLYMPIC CLUB TURFGRASS TRIAL

NUMBER TREATMENT
1. UNTREATED
2. NEMACUR 10G
3. DITERA DF
4. A-1641 HIGH
5. A-1641 LOW
6. QUILLAJA LOW
7. QUILLAJA HIGH
8. XRM 555
9. FORE
10. POSTHABATE

SUGAR BEET Cyst Plot

Plots 800ft South SIDS

1. ANGELA (MAGANA)
2. NEMEX (RABBIT)
3. NAMEX (POWDER)
4. PRIEGO (BUCHEWIT)
5. FALL CROPS

RATES:

Plot 1: 8-20-91

Planter 1

Field 1

Field 2

Field 3

FALL

10 FEET

40 FEET

GROWS

3 ROWS

95/40

OYMPIC
TEHAMA COUNTY PRUNE TRIAL - PACIFIC FARMS - DRIIP IRRIGATED ORCHARD - FIELD 56
FRENCH PRUNE ON 25C - PLANTED 1984 - TREE SPACING 20' X 20' - 109 TREES/ACRE
A GY-81 (ORANGE FLAT); B NEMACUR 3 (BLUE FLAT); C TELONE SL (GREEN FLAT); D UNTREATED (WHITE FLAT)

NORTH

REPLICATE NUMBER
EMITTER SPACING: 41.2" (DELIVERING 0.75 GALLONS/HOUR). PLOT SIZE: 1 ROW X 8 TREES LONG.
TREATMENT DATES AND RATES: MAY 8, 1989 - GY-81 (750 PPM CS2 FOR 8 HOURS);
NEMACUR 3 (1 GAL/TREATED ACRE, OR 340 ML IN 3 HOURS), TELONE SL (50 PPM FOR 3 HOURS,
OR 153 ML IN 3 HOURS).

GY-81 - DRENCH TRIAL ON PRUNES - PACIFIC FARMS - TEHAMA COUNTY

<table>
<thead>
<tr>
<th>TREATMENT NO.</th>
<th>DATE</th>
<th>FLUID</th>
<th>COLOR</th>
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<tbody>
<tr>
<td>GY-81</td>
<td></td>
<td></td>
<td>RED</td>
</tr>
<tr>
<td>CHECK</td>
<td></td>
<td>1 GAL OF G-10 TO 250 MILLIONS OF WATER/FREE</td>
<td>GREEN/BLUE</td>
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</tbody>
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REP 6

REP 5

REP 4

REP 3

REP 2

REP 1

A B C

15M 80 88 7B 9B 2B 1B 4C 8C

149 13H 10H 3A 56 48 3B 6A 9A

12H 4A 50 2C 60 1A 5A 2A 60

68 7A 10 3D 6C 3C 5C 1C 8A

FOLIAR APPLIED CVDATE L - MCKINLEYVILLE - FORTUNE DAFFODIL
PLOT SIZE 3 FEET X 10 FEET