THE ROLE OF COVER CROPS IN SUSTAINABLE NEMATODE SUPPRESSION IN VINEYARDS

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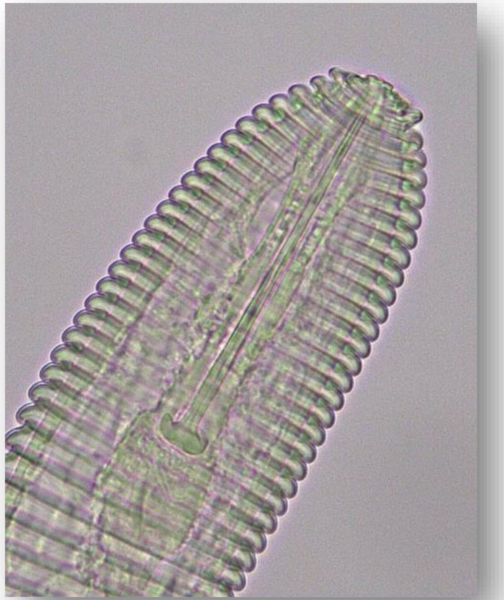
The Nematode Challenge in SA Vineyards

- ~15% estimated yield loss
- Concentration in Western and Northern Cape
- Sandy soils = ideal nematode conditions
- Long-term monoculture increases persistence
- Impact on root health, water/nutrient uptake

Major Nematode Groups

Group	Example Species	Notes
Root-knot	*Meloidogyne incognita, M. javanica*	Gall formation, reduced vigor
Lesion	*Pratylenchus hippeastri*	Necrosis, replant decline
Ring	*Mesocriconema xenoplax*	Chronic decline
Dagger	*Xiphinema index*	Virus vectors
Stubby-root	*Paratrichodorus* spp.	Short roots, virus vectors

	RLN*	RKN*	RN*	DN*	CN*
P%	73.33	38.10	96.19	45.71	10.48
MPD	121.33	103.54	850.48	17.50	108.19
RPD%	10.10	8.62	70.81	1.46	9.01



Current Management Strategies

- Certified plant material
- Resistant rootstocks
- Cultural practices
- Chemical control

The Need for Alternatives

Chemical control limitations:

- Expensive fumigants
- Environmental concerns
- Variable treatment response
- Consumer and regulatory pressures
- Urgent need for sustainable solutions

Cover Crops - Direct Benefits

- Improved water holding capacity
- Enhanced soil structure
- Increased nutrient cycling
- Biodiversity promotion
- Pest/disease suppression
- Erosion reduction
- Weed management

Cover Crops - Indirect Benefits

- Allelopathic effects
- Biofumigation
- Soil microbial community interactions
- Climate change mitigation/adaptation
- Ecosystem services

"NOT ALL COVER CROPS ARE EQUAL"

- Some may act as hosts
- Temperature influences susceptibility
- Low-moderate pressure: mixtures work
- High pressure: careful selection essential

Research Findings - Lesion Nematodes

- 32 cultivars tested against *P. hippeastri*
- 75% = poor hosts ✓

- AVOID these 4 good hosts:
    - Bitter lupine 'Azuro'
    - Indian buckwheat
    - Phacelia 'Balo'
    - Vetch 'RM4'

Host Status - Root-Knot Nematodes

- Sunn hemp: Poor host for *Meloidogyne*
  - but good for lesion!
- Brassicas: Variable, biofumigation potential
- Grasses/small grains: Rye, oats may reduce levels

- Poor hosts for BOTH *Pratylenchus* & *Meloidogyne*:
  - Rhodes grass
  - Tall fescue
  - brown mustard
  - Saia or black oats
  - Marigold

Cover crops with nematicidal effects - Marigolds

- Produce α-terthienyl
- Multiple suppression mechanisms
- Research results in apple orchards:
  - suppressive effect on RLN population densities in pots and orchard
  - *T. erecta* most effective
  - Living roots most effective

Brassicas - Biofumigation

- Glucosinolates → isothiocyanates
- Fumigant-like nematicidal effects
- Effective species:
    - White mustard (*S. alba*)
    - Brown mustard (*B. juncea*)
    - Rocket (*E. sativa*)

- Biofumigation + Solarization = Biodisinfestation
    - Synergistic effect
    - Requires 25-35°C soil temperature

- In long-term vineyard trials (3 seasons) in South Africa, cover crops like canola and *B. juncea* significantly reduced *C. xenoplax* populations.
- *Sinapis alba* (white mustard) actually showed constant increases in *C. xenoplax* in some cases.

Sorghum & Sudangrass

- Produce dhurrin (cyanogenic glycoside)
- Releases hydrogen cyanide when incorporated
- Trap and biofumigant properties
- Effective against root-knot nematodes

Critical implementation considerations – Soil temperature

- Critical seasonal differences:
  - Winter: protects against root-knot, less against lesion
  - Spring warming: may increase lesion nematodes
  - Biofumigation optimal: 25-35°C

Critical implementation considerations – Planting windows

Planting Windows for SA Conditions

- Winter cover crops (preferred):
  - Utilize winter rainfall
  - Main crop dormant
  - Lower temperatures reduce nematode risk
- Summer cover crops:
  - Capitalize on nematode suppressivity
  - Tagetes allelopathic effects
  - Intermittent mulching possible
  - Must be non-/poor hosts

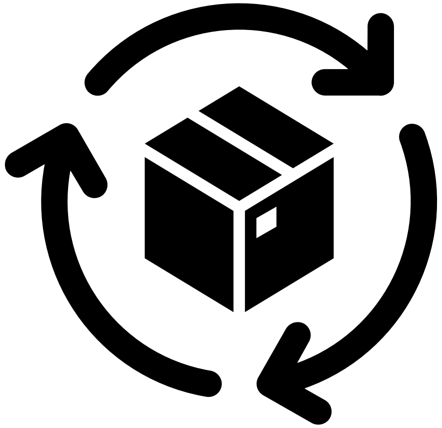
Host Status Assessment

- Identify nematode species present
- Consider mixed populations
- Select poor hosts for ALL species
- When uncertain → multi-species poor hosts

Integration is Key

Key strategies include:

- Combining poor-host cover crops with resistant rootstocks
- Rotating cover crop families
- Incorporating cover crops at optimal times
- Maintaining continuous ground cover to suppress weeds
- Building soil organic matter
- Using certified planting material



Key Takeaways

- Temperature significantly influences success
- *Tagetes* & Brassicas provide active nematicidal effects
- Integration essential for optimal results
- Informed selection critical

Future Research Directions

- Field validation under commercial conditions
- Long-term sustainability studies
- Beneficial microbial community effects
- Economic analysis vs. conventional management

Thank you

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