Nematode resistance of stone fruit rootstocks and cover crops

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Growing Fruit IQ

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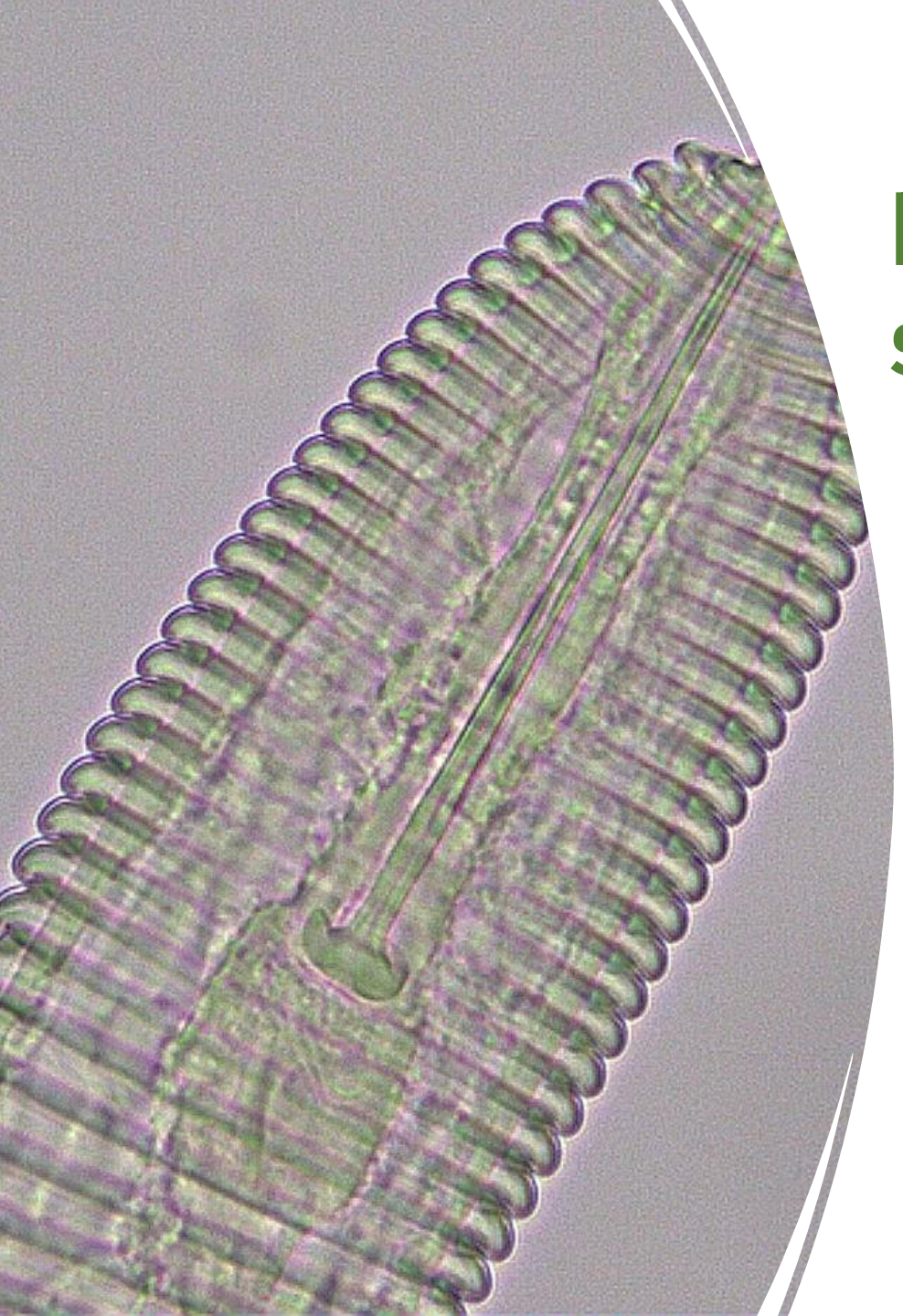

Plant-parasitic nematodes impacting stone fruit production

- Ring nematodes (*Criconemoides xenoplax*)
- Root-knot nematodes (*Meloidogyne* spp.)
- Dagger nematodes (*Xiphinema* spp.)
- Root lesion nematodes (*Pratylenchus* spp.)

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Ring nematodes (RN)

- Occurs in high numbers in apricots, peach, nectarine and plum
- Causes serious damage to roots, which leads to poor tree growth
- Often associated with branch die-back caused by bacterial canker
  - 'Peach tree short-life'
  - 'Plum tree death'

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Root-knot nematodes (RKN)

- Characteristic galls on roots
- Can cause severe damage to peach trees
  - Premature leaf fall
  - Die-back of small shoots
  - Deficiency symptoms
- Apricot and plum rootstocks are regarded as tolerant or immune

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Root lesion nematodes (RLN)

- Regarded as economically important in stone fruit crops worldwide
  - *P. vulnus* on almond in California
  - *P. penetrans* on cherry in Canada
- Destroys the cortical parenchyma of the root
  - causing extensive lesions
  - reduction of feeder roots
  - predisposing tissue to secondary infections
- Most abundant nematode pest in stone fruit orchards in SA
  - Their impact possibly underestimated

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Susceptibility of stone fruit rootstocks

- Rootstocks differ in their suitability as a host to different nematodes e.g.
  - 'Nemaguard' has highly durable resistance to RKN, but not to *M floridensis*
    - 'Flordaguard' now the only recommended rootstock in Florida
    - However, 'Flordaguard' highly susceptible to ring nematodes

- Other factors needs to be taken into consideration
  - Susceptibility to other soil-borne pathogens
  - Sensitivity to soil pH, waterlogging etc.
  - Anchorage in high wind areas

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Rootstocks available to SA growers

Rootstock	RKN	RN
Atlas	Resistant	Tolerant
Cadaman	Resistant	Tolerant
Flordaguard	Resistant	Susceptible
Garnem	Resistant	Tolerant
GF 677	Susceptible	Susceptible
Guardian	Resistant	Tolerant
Kakamas seedling	Susceptible	Susceptible
Katera	Susceptible	Susceptible
Marianna	Resistant	Susceptible
Maridon	Resistant	Susceptible
Nemasun	Susceptible	Susceptible
Royal seedling	Tolerant	Susceptible
SAPO 778	Tolerant	Susceptible
Viking	Resistant	Susceptible

Rootstocks host status against RLN

- Rootstocks resistant to RKN are susceptible to *P. vulnus*
  - Considered to be most important in Mediterranean climates
  - pathogenic diversity among *P. vulnus* populations appears to be high
- Host resistance to *P. penetrans* has been found
  - Occurs in temperate environments
- Screening of rootstocks used in SA against the specific populations of lesion nematodes present is still lacking
  - Important to establish the species diversity

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Cover crops. Why use them?

- Reduce soil erosion
- Improve soil health organic matter
- Decrease soil erosion
- Improve water infiltration
- Improve soil structure
- Furnish nutrients
- Increase soil microbial activity
- Suppress weeds

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Implementation considerations

- Host status of cover crop candidates to prevalent nematodes
- The influence of soil temperature on nematode reproduction
- Planting window
- Incorporation into other management strategies

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Determination of host status

- Greenhouse screening experiments
- Selection of cover crops
  - Legumes
  - Brassicas
  - Other
- Nematode selection
  - RKN
  - RN
  - RLN

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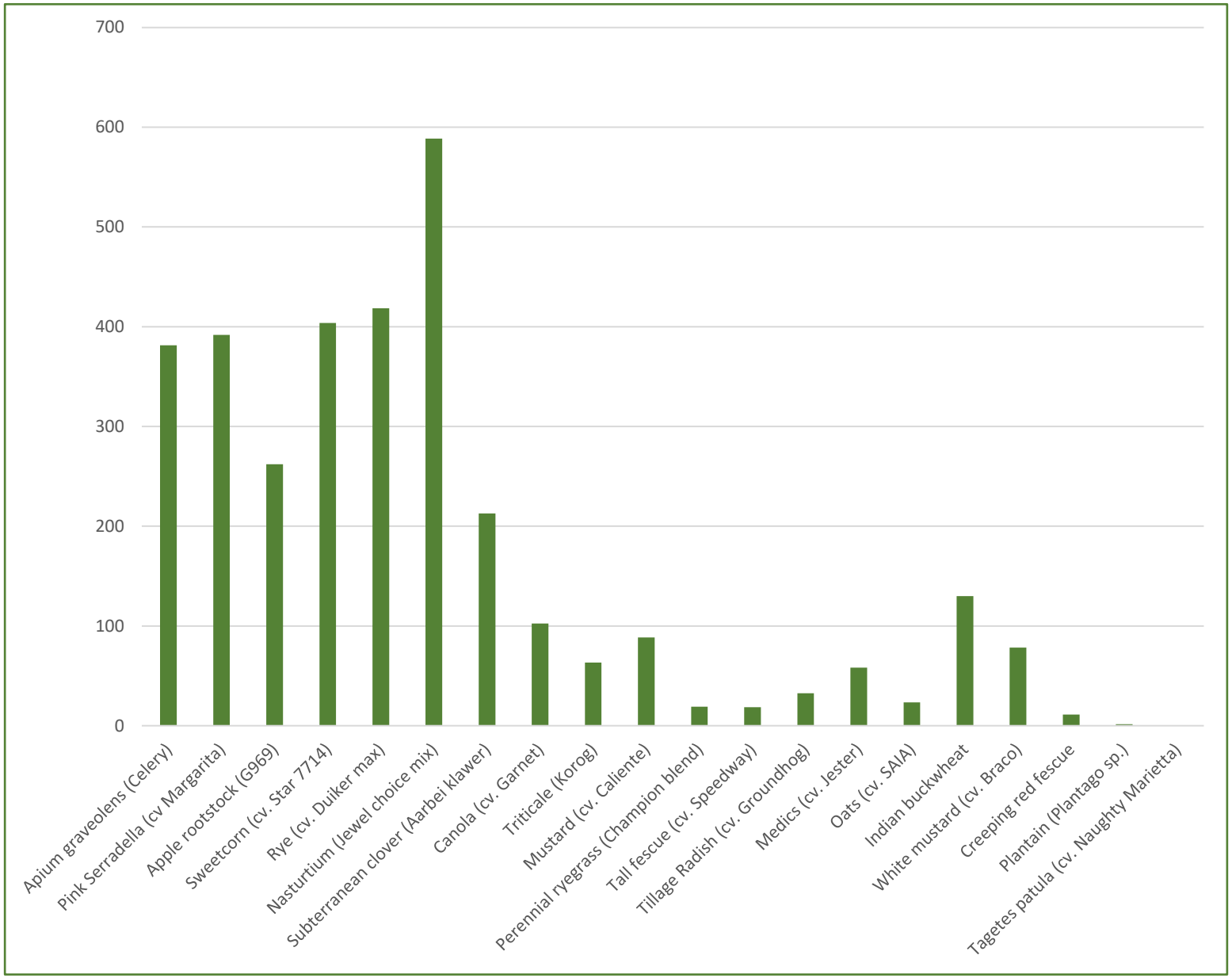
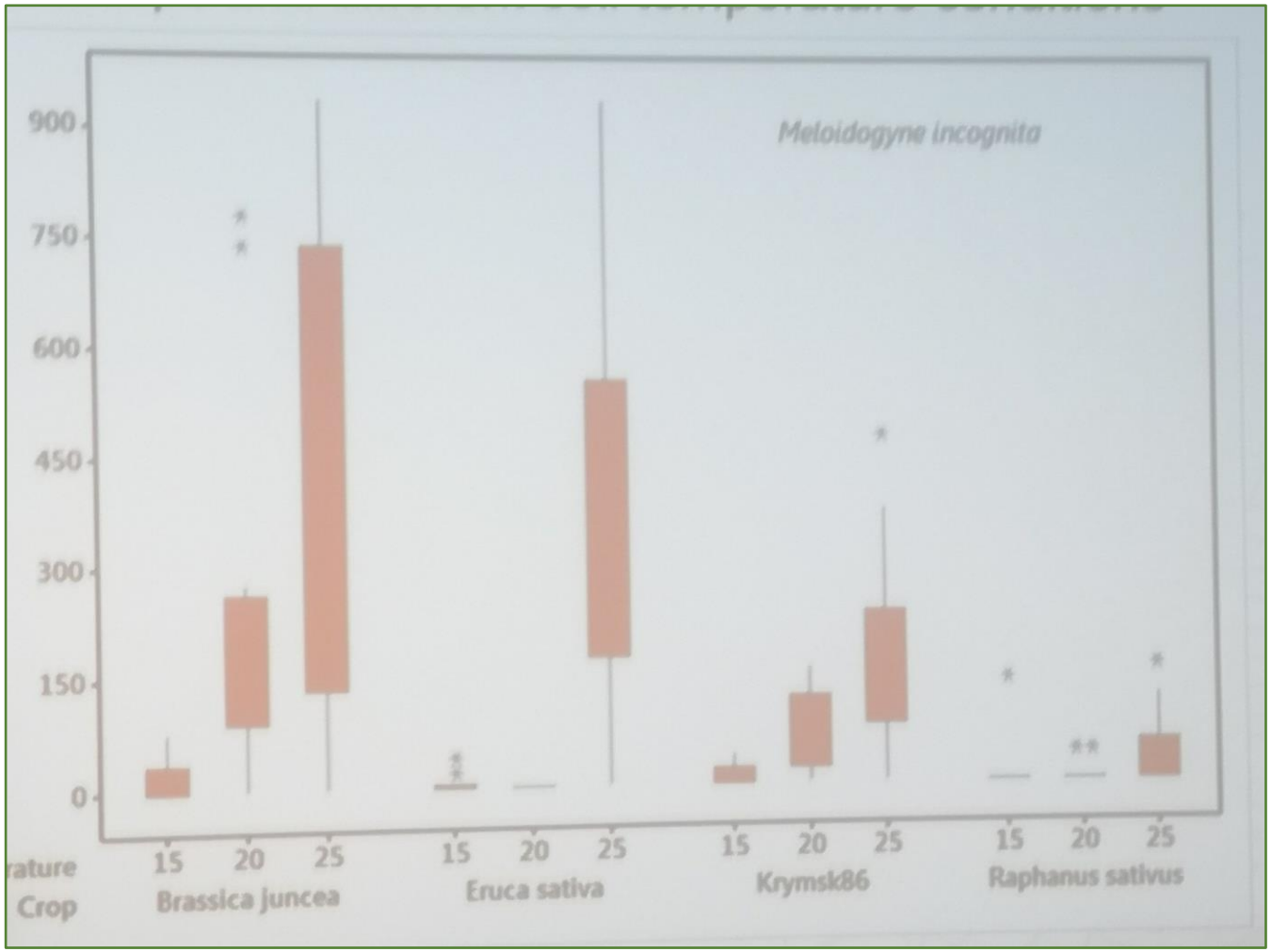
Experimental results

- Example of screening done with apple RLN species on cover crops
- No data for RN and RKN for these crops



Soil temperature

- Increases in soil temperature may influence nematode reproduction on certain cover crops
  - Winter cover cropping have the potential to protect from RKN build-up, but not RLN infections (Westphal, 2022)
  - Certain cover crops can increase *P. penetrans* numbers if cover crops are left to grow well into springtime (Knoetze, 2022)



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Planting window

- Winter cover crops favoured
  - allows for use of winter rains
  - Main crop is going dormant.
  - Cover crop can be terminated in time

- However in summer rainfall regions
  - Cover crops can be planted in summer
  - Can utilize crops with allelopathic effects
  - Eg. Orange River production area (grapevine)

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Management strategies

- Extension of time of cover crop growth in non-bearing orchards
  - Take better advantage of the nematode suppression characteristics
- Intermittent mulching of the cover crop
  - Continuous organic matter and carbon added to the soil
- Can also take advantage of crops with allelopathic effects
  - *Tagetes*

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Future projects

- Survey to determine RLN species
- Screening of rootstocks with RLN
- Screening of cover crops with PPNs important to stone fruit
- Field trials to determine optimum planting windows and integration of cover crops with management strategies

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