# Greenhouse Evaluation of Rootstocks Against the Northern Root-Knot Nematode (*Meloidogyne hapla*)

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The northern root-knot nematode (*Meloidogyne hapla*) is the most prevalent plant parasitic nematode found in Washington State wine grape vineyards[1]. The use of rootstocks could result in improved longer-term management of *M. hapla* in Washington State vineyards[2].

## The Rootstocks

Chardonnay and Cabernet Sauvignon were selected as susceptible controls. Paulsen 1103 (1103P), Malègue 44-53 (44-53 M), Ruggeri 140 (140RU) and Richter 99 (99R) were selected for their reported drought tolerance. Schwarzmann (SW) and 1616 Couderc (1616C) have been reported to be low vigor rootstocks, while Oppenheim (SO4) and Kober 5BB (5BB) were selected as rootstocks that do well cooler climates. Minotaur was chosen as it was bred for root-knot nematode resistant but had not been trialed against *M. hapla*.

## The Experiment

Rootstocks and *Vitis vinifera* controls were individually potted into 1-gallon pots. Vines were inoculated with 5,000 *M. hapla* eggs. After 12 weeks vines were destructively harvested. Roots were retained and processed for *M. hapla* eggs. Roots were then oven-dried for root weights and *M. hapla* eggs microscopely quantified.

Inoculating potted, greenhouse grown vines with 5,000 *M. hapla* eggs. Eggs were injected directly into the root-zone of the growing vines.

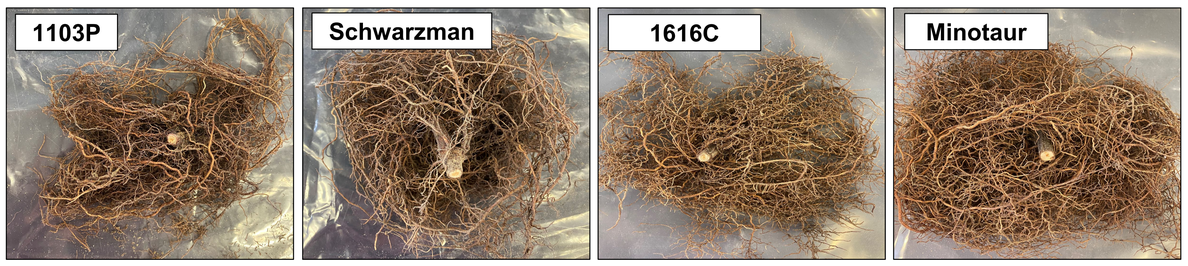
## Interpreting Results

- Reproduction factor ($R_f$): Final nematode population ÷ initial nematode population. $R_f$>1 indicates the plant is a good host.
- Eggs per gram root: Number of eggs counted/weight (g) of the root system. Eggs indicate that *M. hapla* was able to reproduce.

## Results

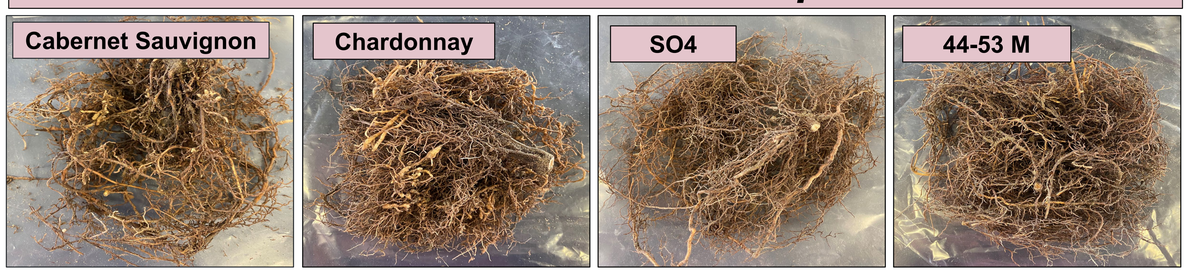
All non-*vinifera* rootstocks hosted less *M. hapla* than *V. vinifera*. 44-53M did host some *M. hapla* and may be considered a susceptible rootstock. It is important to consider the potential of tolerance (hosting populations without drawbacks) and to further investigate rootstocks with long-term field trials.

**Hosted the least *M. hapla***




**Hosted some *M. hapla***


**Hosted the most *M. hapla***




## Rootstocks - Results

**Rootstock: Chardonnay $R_f$ > 75**


**Rootstock: 1103P $R_f$ = 0**

Left: Root systems of susceptible *Vitis vinifera* with characteristic galls (Chardonnay), and potentially-resistant rootstock (1103P) without galls. Right: *M. hapla* eggs (small, pink-stained ovals) extracted from the associated roots.

**2021 Experiment 1**

| Rootstock | Avg *M. hapla* eggs/g of root | $R_f$ |
|---|---|---|
| Chardonnay | 69,773.9 a | 134.7 a |
| 44-53 M | 21,910.9 b | 34.7 b |
| SO4 | 1,181.3 b | 2.5 b |
| 5BB | 79.6 b | 0.1 b |
| Schwarzman | 0 b | 0 b |
| 1103P | 0 b | 0 b |
| 140 RU | 0 b | 0 b |
| 1616C | 0 b | 0 b |
| *p* values | ***<0.0001*** | ***<0.0001*** |

**2022 Experiment 1**

| Rootstock | Avg *M. hapla* eggs/g of root | $R_f$ |
|---|---|---|
| Chardonnay | 14,069.9 a | 17.5 a |
| 44-53 M | 1,073 b | 1.6 b |
| SO4 | 98.7 b | 0.1 b |
| 5BB | 0 b | 0 b |
| Schwarzman | 11 b | 0.01 b |
| 1103P | 0 b | 0 b |
| 140RU | 203.6 b | 0.3 b |
| 1616C | 5.1 b | 0.01 b |
| *p* values | ***<0.0001*** | ***<0.0001*** |

**2021 Experiment 2**

| Rootstock | Avg *M. hapla* eggs/g of root | $R_f$ |
|---|---|---|
| Cabernet Sauvignon | 518.3 a | 1.34 a |
| 99R | 28.6 b | 0.1 b |
| Minotaur | 0 b | 0 b |
| *p* values | ***<0.0001*** | ***<0.0001*** |

**2022 Experiment 2**

| Rootstock | Avg *M. hapla* eggs/g of root | $R_f$ |
|---|---|---|
| Cabernet Sauvignon | 8,144.8 a | 14.8 a |
| 99R | 5.6 b | 0.01 b |
| Minotaur | 5.7 b | 0.01 b |
| *p* values | ***0.0006*** | ***0.0033*** |

# Rootstocks can host *M. hapla*, but they do so at lower rates than own-rooted *Vitis vinifera*.

## Literature Cited

(1) Zasada et al. 2012. Plant-parasitic nematodes associated with grapevines, *Vitis vinifera*, in Washington and Idaho. Am J Enol Vitic 63:522-528.
(2) East et al. 2021. Field performance of wine grape rootstocks and fumigation during establishment phase in Washington vineyards. Am J Enol Vitic 72:113-125.

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