Figure 1. Technical Officer Sean Kelly inspecting a barley test variety impacted by Pratylenchus quasitereoides (P. quasi) in a 2025 NVT P. quasi field trial located on a grower's paddock near Katanning. Image: DPIRD.

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Contents

Resistance of wheat and barley varieties to root lesion nematode species *Pratylenchus Quasitereoides*

At a glance:

- *Pratylenchus quasitereoides* (*P. quasi*) is a species of root lesion nematode (RLN) that causes yield loss in Western Australian (WA) broadacre crops.
- Wheat, barley, oats and canola are all susceptible to *P. quasi,* while lupins, field peas and serradella are resistant.
- Varietal resistance in crops is an effective management strategy for RLN.
- The National Variety Trials (NVT) program was established in 2005 by the Grains Research and Development Corporation (GRDC). Since then, the NVT program has grown to become the largest coordinated variety trial network in the world.
- The NVT program assists grain growers and their advisers in varietal decision making by providing comparative information of commercially available grain varieties, including yield performance, disease resistance and grain quality.
- Varietal resistance ratings to *P. quasi* have been included in the NVT program for the past 6 years.
- An NVT trial at Kojonup in 2024 identified several wheat and barley varieties that demonstrated some resistance to *P. quasi*.

Root lesion nematodes are plant parasites that invade crop roots to feed and lay eggs, damaging the root system and impairing the plant's ability to absorb water and nutrients, ultimately leading to yield losses. One species, *P. quasi*, is particularly problematic in WA's broadacre cropping systems. It has been detected in approximately 29% of WA's paddocks and is known to cause significant yield reductions. According to the GRDC project DAV00128, even moderate infestations (10–35 nematodes per gram of soil) can reduce wheat and barley yields by 5–20%.

Crop rotation is the most effective management strategy for *P. quasi*, followed by selecting more resistant cereal varieties. To manage *P. quasi* effectively, growers are encouraged to select crop varieties that maintain low nematode populations by the end of the growing season. Wheat, barley, and canola are all susceptible to *P. quasi*, with barley generally supporting higher nematode multiplication than wheat.

Over the past 6 years, the Department of Primary Industries and Regional Development (DPIRD WA), in collaboration with GRDC, has been testing wheat and barley varieties for resistance to *P. quasi* as part of the National Variety Trials (NVT) project. Established by GRDC in 2005, the NVT program has grown into the world's largest coordinated variety trial network. It provides comparative data on commercially available grain varieties, including yield performance, disease resistance and grain quality.

Wheat and barley varieties suited to WA are screened for *P. quasi* resistance under both glasshouse and field conditions. To ensure robust resistance ratings, each variety is field tested over at least two growing seasons across diverse climatic and soil environments. Known control varieties with established resistance levels are included to help rank new varieties on a scale from resistant to very susceptible.

Varieties that consistently reduce *P. quasi* populations across multiple trials are classified as resistant, representing tools for nematode management. Yenda, an older wheat variety, remains the most resistant option for both wheat and barley. It is rated as moderately resistant and is used as a benchmark resistant control. Calingiri wheat variety is used as a susceptible control. Additionally, a weed-free fallow is included in trials to monitor nematode populations in the absence of a food source.

A 2024 NVT trial conducted at Kojonup identified several wheat varieties with resistance to *P. quasi*, including Genie, Scepter, Mohawk, and Mace (Figure 2). However, Scepter is highly susceptible to the root lesion nematode *Pratylenchus neglectus (P. neglectus)* and should be avoided in areas where this nematode is an issue. At least 3 field trials and 2 glasshouse trials are required before a varietal resistance rating is confirmed.

The varieties found to be most susceptible to *P. quasi* were Vixen, Valiant CL Plus, and Denison (Figure 3). While Genie demonstrated strong resistance in this trial, showing a reduction in nematode numbers comparable to weed-free fallow, 2024 was its first inclusion in NVT testing. Further trials are required to confirm this rating.

Among barley varieties, Titan AX showed the highest resistance, with minimal nematode multiplication. In contrast, Combat and Cyclops were the most susceptible, with nematode populations increasing approximately threefold.

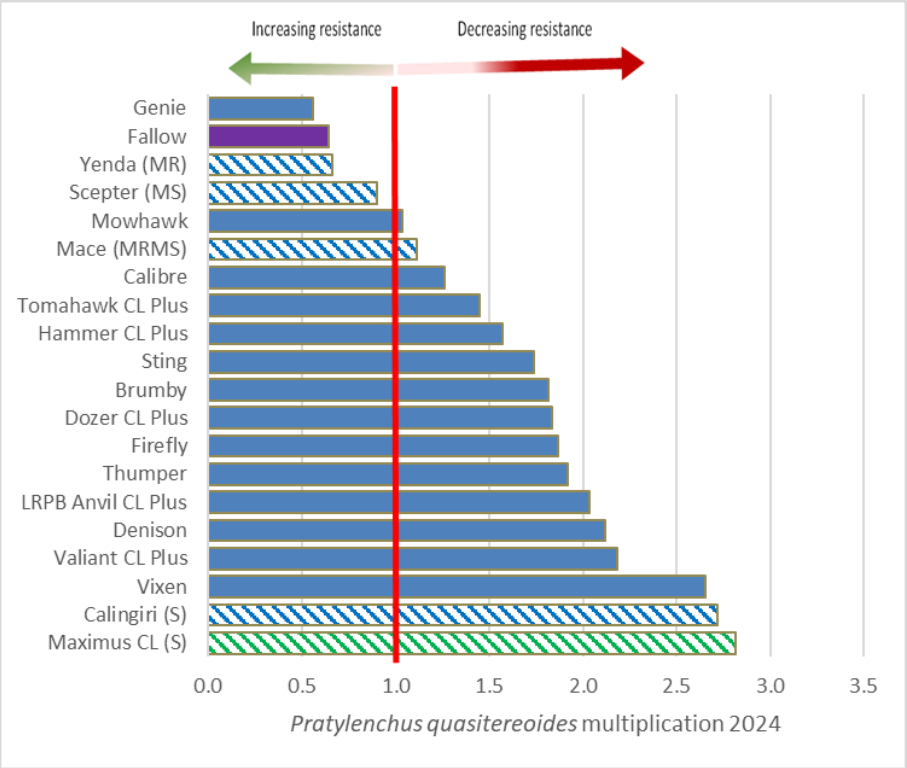

Figure 2. Pratylenchus quasitereoides (P. quasi) multiplication in wheat after a growing season, Kojonup NVT trial 2024 (replicates=6)[1].

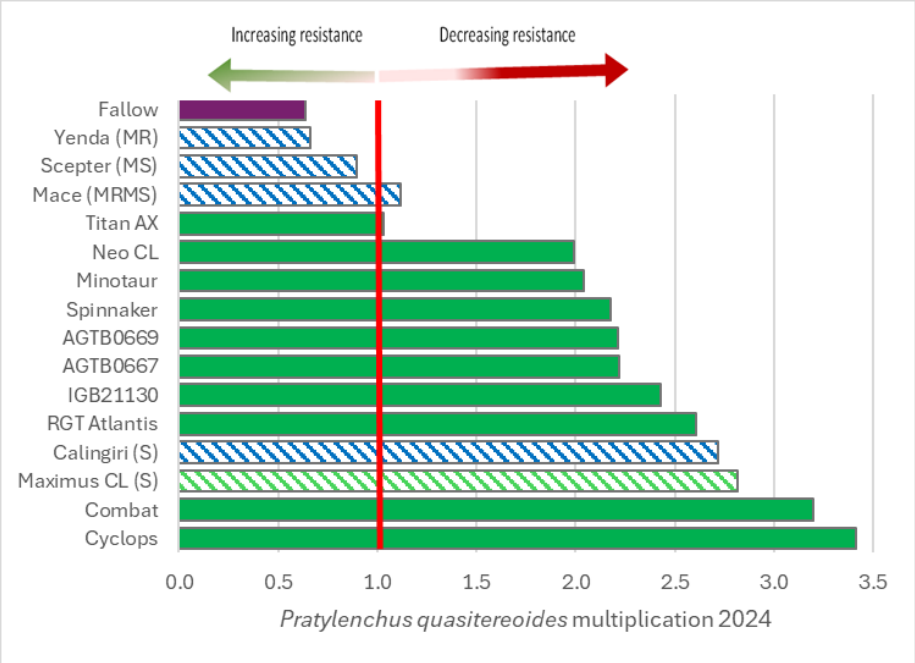

Figure 3. Pratylenchus quasitereoides (P. quasi) multiplication in barley after a growing season, Kojonup NVT trial 2024 (replicates=6)[1].

[1]Key for graphs - red line represents no multiplication point, blue solid bars test varieties, hashed blue are wheat and hashed green are barley control varieties and solid purple is weed free fallow.

Despite high average yields at the site (5 t/ha for both wheat and barley), the presence of *P. quasi* led to yield penalties of around 1 t/ha for every 10 *P. quasi*/g soil. In areas free from *P. quasi* at the start of the season, yields were higher. All varieties experienced similar yield losses as nematode levels increased, indicating that no variety has a tolerance to *P. quasi*. This aligns with current understanding, as varietal tolerance to *P. quasi* has yet to be demonstrated.

High nematode populations not only impact current yields, but they also increase the risk of yield loss in subsequent crops. With no cost-effective chemical control options currently available for RLN in broadacre cropping, crop rotation and varietal choice remains the most effective management strategies. Rotations with lupins, field peas, and serradella have been shown to reduce *P. quasi* populations.

This NVT trial highlights the critical role of varietal resistance research in supporting growers to manage nematode pests and reduce yield losses. Updated resistance ratings for *P. quasi* will be included in the 2026 Western Australian Crop Sowing Guide, which will be released soon. GRDC also publishes ratings online at nvt.grdc.com.au.

For more information on RLN refer to:

- DPIRD's Root lesion and burrowing nematodes and their management factsheet
- GRDC's Root lesion nematode – Western factsheet
- GRDC's Root lesion nematode – West Australia YouTube video.

Acknowledgements

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Meet the Crop Protection Team – Dr Daniel Hüberli

Dr Daniel Hüberli is a Senior Research Scientist with DPIRD where he leads a team focused on fungal soilborne diseases of cereal crops, such as Rhizoctonia root rot and crown rot. He contributes to several GRDC research projects, including the national Soilborne Disease Initiative, where he serves as Western Node Leader and National Rhizoctonia Leader.

Daniel's path to plant pathology began with a deep curiosity about nature and a lifelong fascination with what keeps plants and ecosystems healthy. He initially planned to become a veterinarian but realised along the way that he had simply become a different kind of doctor — a plant doctor. He completed his PhD at Murdoch University in 2002, investigating *Phytophthora* jarrah dieback, a disease devastating WA's iconic forests. He then spent four years at the University of California, Berkeley, researching Sudden Oak Death. Returning to Australia, Daniel shifted his focus from trees to grain crops, applying his forest pathology expertise to the soilborne challenges faced by the agricultural sector.

Daniel grew up partly in Switzerland, near Lake Constance, and later moved to Australia; first in Melbourne, then in Perth. In Switzerland, his maternal grandparents were dairy farmers, and he was captivated by rural life - the sound of cowbells across the valley and the smell of freshly made Swiss cheese. As an immigrant, he remains inspired by the vastness and beauty of Australia's landscapes, from its open skies and ancient soils to its soulful trees. Outside of work, Daniel enjoys sampling local restaurants that celebrate WA's produce, discovering art that tells regional stories, and exploring WA's diverse landscapes. He is also a keen Instagram photographer, still guided by the same curiosity and creativity that first led him into science.

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