Parasitism Genes as Novel Targets to Control Root-lesion Nematodes in Cereals

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Justification:
Root-lesion nematodes (*Pratylenchus* spp.) have been detected in 90% of fields in dryland cropping regions of the Pacific Northwest (PNW) and represent a serious, and previously unrecognized, constraint to grain production in Washington. They have very wide host ranges and can infect all cereals and dryland rotation crops grown in the PNW. Root-lesion nematodes have been shown to reduce winter and spring wheat yields by up to 70% in the PNW and to form disease complexes with pathogenic fungi. Root-lesion nematode populations may further increase by shifts to more intensive cereal cropping systems. Commonly used varieties are not resistant against these nematodes. Natural resistance found in landraces or wild grass species is rare and based on complex traits. This makes any introduction into modern breeding lines extremely labor-intensive and offers only limited protection against mixed populations of rootlesion nematode species, from which new resistance-breaking nematode strains rapidly evolve. Pesticide applications to control nematodes in dryland crops are prohibitive due to economic constraints. **Our ultimate goal is to develop wheat and barley lines with durable resistance to root-lesion nematodes that could be integrated into breeding programs.**

Process Description:
Plant-parasitic nematodes express parasitism genes in their secretory gland cells. These genes are essential for successful parasitism and nematode survival. Recent studies have shown that hostinduced downregulation of nematode parasitism genes through RNA interference (RNAi) technology can inhibit the infection process and provide resistance against plant-parasitic nematodes. To employ this strategy in cereals, root-lesion nematode parasitism genes need to be identified. To achieve this goal, we propose to microaspirate gland cell contents of root-lesion nematodes, which will be used to generate libraries of gland-expressed genes. We will sequence these libraries and identify putative root-lesion nematode parasitism genes that can be used as control targets. This finding will be an enabling discovery for the development of improved wheat and barley lines with durable RNAi-mediated resistance against several species of rootlesion nematodes. This strategy allows for the targeting of multiple root-lesion nematode parasitism genes at once to pre-empt and react to new nematode strains. This represents a significant step toward a novel and economic method to control root-lesion nematodes and will improve the competitiveness of Washington's wheat and barley production.

Budget Estimate:

Salaries and wages	$30,000	(1.0 PhD student, 12 months)
Supplies and user fees	$8,000	
Total	$38,000	