# Discovery of the Cereal Cyst Nematode, *H. filipjevi*, in Eastern WA

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1. Cereal cyst nematodes (CCN) occur in wheat-producing areas worldwide. The most widely distributed and well-known CCN species, *Heterodera avenae*, was first discovered in Washington State in 1984. Research since has demonstrated that it is widespread in the wheat-producing areas of eastern Washington and Oregon. In early summer 2014, another closely related CCN species, *Heterodera filipjevi*, was discovered at three locations in southeastern Whitman County. This is only the second known discovery of *H. filipjevi* in the U.S., the first being Union County, Oregon in 2008.

2. *Heterodera filipjevi* is a quarantine pest in the U.S., meaning that it is regulated by the USDA-Animal and Plant Health Inspection Service (APHIS). Since 2011, APHIS has been conducting a national survey for *H. filipjevi* that has focused on North Dakota, Montana, Minnesota, Nebraska, and Oregon (http://pest.ceris.purdue.edu/map.php?%20code=NEFBCCC). APHIS has stated their goal is to detect and eradicate *H. filipjevi*; we do not know how APHIS will respond to this discovery at this time.

3. Eggs in cysts of the CCN remain viable for a long period of time in soil and eradication is nearly impossible once CCN become established in a field.

4. Nematodes in the genus *Heterodera* are listed as harmful organisms in Australia, Chile, Madagascar, Namibia, Nauru, South Africa, and Syria. It is unknown whether the detection of *H. filipjevi* in Washington will have trade implications; however, CCN live entirely below ground and neither live nematodes nor cysts are found or transmitted in harvested grain. To date, there have been no trade restrictions resulting from the discovery of *H. filipjevi* in Oregon.

5. CCN can reduce yield of winter wheat by up to 50% when nematode density in soil is high; however, density of nematodes across fields is highly variable and field-wide yield reduction is usually 10% or less. ***There is no reason to believe that H. filipjevi will cause greater damage to wheat or be more difficult to control than H. avenae.*** Both species of CCN are parasitic only to small grains and a few grasses; they do not attack dicotyledonous plants nor do they reproduce without a susceptible monocot host or in bare soil.

6. Plants infected with CCN may be stunted, pale in color, and appear generally unthrifty. These above-ground symptoms resemble other diseases including Rhizoctonia root rot, take-all or Barley yellow dwarf, and abiotic problems such as shallow soil, nutrient problems, soil pH and light or compacted soil patches. Below-ground symptoms of CCN include shallow, stunted root systems with excessive branching in areas where female CCN are feeding. White, swollen female root know nematodes may be visible near points of excessive branching about the time when plants are flowering. Symptoms of *H. avenae* and *H. filipjevi* are indistinguishable.

7. Knowing which CCN species are present in a field is useful in making management decisions. Determining which CCN species is present in a field is based on molecular lab tests and/or examination of mature female nematodes by an expert. Four nematode testing labs are listed below for those interested in submitting samples.

8. Reducing damage from CCN relies on crop rotation and resistant cultivars. Nematode density is greatest when susceptible crops are grown frequently; growing susceptible crops less frequently, growing resistant crops, or some combination of these can reduce nematode density and crop damage substantially.

   Some options include:

   - 3-year rotation with winter wheat grown once and non-host crops grown twice, or one non-host crop and one year of fallow;
   - 3-year rotation with winter wheat, spring cereal, and a non-host crop or fallow. In this rotation, either the winter wheat or spring cereal, must be a resistant variety. Having both resistant cereals would be even better.
   - 2-year rotation with winter wheat and fallow. In this rotation, the winter wheat should be a resistant variety.

   Several varieties of spring cereal with resistant to *H. avenae* have been identified. Less is known about *H. filipjevi* because its distribution is limited; however, variety trials were unknowingly conducted in a field infested with *H. filipjevi* and the spring wheat SY Steelhead is highly resistant. Research conducted in China has demonstrated that winter wheat Madsen is also highly resistant to Chinese populations of *H. filipjevi*.

**Nematode Testing Labs**

Kuo Testing Labs (two locations), 1300 6th Street, Umatilla, OR 97882 and 337 South 1st Avenue, Othello, WA 99344. 800-328-0112. *http://kuotesting.com*

Oregon State University Nematode Testing Service, 1090 Cordley Hall, Corvallis, OR 97331. 541-737-5255. *http://www.science.oregonstate.edu/bpp/Nematodes/contact.htm*

University of Idaho, Parma Research and Extension Center, Parma, ID 83660.208-722-6701.

Western Laboratories, 211 Highway 95, Parma, ID 83660. 208-722-6564. *http://www.westernlaboratories.com*

**Additional Information**

Visit the WSU Small Grains Website http://smallgrains.wsu.edu; photographs of the disease and publications are available for download.

**Publications**

Li H, Cui L, Li H, Wang X, Murray TD, et al. 2012. Effective resources in wheat and wheat–*Thinopyrum* derivatives for resistance to *Heterodera filipjevi* in China. *Crop Sci.* 52:1209-17.

Smiley RW, Marshall JM, Gourlie JA, Paulitz TC, Kandel SL, et al. 2012. Spring Wheat Tolerance and Resistance to *Heterodera avenae* in the Pacific Northwest. *Plant Disease* 97:590-600.

Smiley RW, Yan GP. 2010. Cereal Cyst Nematodes. Biology and management in Pacific Northwest wheat, barley, and oat crops. In *Pacific Northwest Extension Publication*, ed. OS University: Oregon State University Extension.

Sullivan M, Mackesy D. 2010. CPHST Pest Datasheet for *Heterodera filipjevi*. In *https://caps.ceris.purdue.edu/survey/cyst-nematodes/reference/2014*, ed. USDA-APHIS-PPQ-CPHST.

USDA-APHIS. 2014. USDA-Animal and Plant Health Inspection Service. Survey status of cereal cyst nematode - *Heterodera filipjevi*. Online at http://pest.ceris.purdue.edu/map.php? code=NEFBCCC