

## Alternative Methods for Nematode Management for the 2010 Potato-growing Season

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Nematodes are minute worm-like animals able to move between soil particles, between folded leaves of plant buds, in the air spaces of leaves and stems or in plant tissues themselves. More than 68 species of plant parasitic nematodes belonging to 24 genera are associated with potatoes from different parts of the world. The discovery of root-knot nematode on potatoes in the U.S. dates back to 1889 when Neal reported *Meloidogyne arenaria* on a potato crop in Florida. Jensen discovered stubby-root nematode, *Paratrichodorus allius*, in 1963 from an Oregon potato field. Later, it was demonstrated that *P. allius* transmits the tobacco rattle virus (TRV) that causes the corky ringspot disease of potatoes. The earliest record of lesion nematode, *Pratylenchus* spp., on potato in the U.S. was by Cobb, who found that *P. penetrans* was causing pustules over the surface of potato tubers. In the U.S., the potato-rot nematode, *Ditylenchus destructor*, was first found in Idaho on six farms in the vicinity of Aberdeen. In 2006, pale cyst nematode, *Globodera pallida*, was first detected in the U.S. in Idaho (Bingham County). Among all the nematodes, most important to potato production in Idaho are root-knot nematode (*Meloidogyne* spp), stubby-root nematode (*Trichodorus* and *Paratrichodorus* spp.), root-lesion nematode (*Pratylenchus* spp.), stem nematode (*Ditylenchus* spp.) and pale cyst nematode (*Globodera pallida*).

### Root Knot Nematode (*Meloidogyne* spp.)

Root-knot nematodes (*Meloidogyne* spp.) have been recognized as a major nematode pest on potato and are frequently found in abundance, especially in sandy soils. They severely damage potatoes and cause significant losses, in both warm and

cool climates, depending upon the nematode species. Although there are several species of root knot nematodes, the two most common on potatoes in Idaho and eastern Oregon are the Columbia root-knot nematode (*M. chitwoodi*) and Northern root-knot nematode (*M. hapla*).

If the root-knot nematode population in the field is 10 or more per 500 cc soil following alfalfa, a fumigant type nematicide can be applied alone or along with a non-fumigant nematicide. Application of the fumigant, Telone II®, at the rate of 18-26 gal/ac in the fall is one of the best options. Metam sodium products such as Vapam® or Kapam are good contact biocides and can also be applied at the label rate in combination with other non-fumigant nematicides such as Mocap®, Vydate® and Temik®. Preliminary research with products like Admire® and Movento™, which are labeled for insect control in potatoes, has shown these products reduce nematode numbers and yield loss as well. However, more research is needed to determine if there is consistent nematode control before these products could potentially be labeled for such use. In combination treatments, Temik should only be used in areas where the growing season is 150 days or more.

Movento is a new chemistry from a different class of compounds called tetramic acids. It has the unusual ability, once absorbed, to move well both up and down within many dicot plants like potatoes. It has exhibited both insecticidal and nematocidal activity against endoparasitic nematodes in testing. Movento can be applied to potatoes as a foliar application for aphids and psyllids using a maximum of 10 fl oz/ac for the season. It has not been registered as a nematicide to date. Mocap is a contact organophosphate nematicide,

which can be applied at labeled rates as a preplant, broadcast incorporated and used in conjunction with Vydate, Temik, Admire or Movento.

### Root-Lesion Nematodes (*Pratylenchus* spp.)

Root-lesion nematodes (*Pratylenchus* spp.), are migratory endoparasites and are of concern to potato growers because they reduce yield indirectly by weakening and increasing stress on the plants and by making them more susceptible to fungal and bacterial diseases. There is also a positive correlation between root-lesion nematodes with the incidence of Verticillium wilt (early die). Although more than 15 species of root-lesion nematodes are reported to parasitize potato, *Pratylenchus neglectus* is the predominate lesion nematode species in Idaho.

Two species of root-lesion nematode, *Pratylenchus neglectus* and *Pratylenchus penetrans*, can increase susceptibility of potato plants to the potato early-die complex. They cause significant yield loss to potato if the crop rotation is short or includes planting susceptible host crops such as cereals, beans or alfalfa. Among the three species of lesion nematodes, *P. penetrans* is more virulent, hence the field should be treated with nematicides if the population of this nematode is 100 nematodes/500 cc soil.

Although the other two species, *P. neglectus* and *P. thornei*, cause yield loss, the economic threshold level will be higher, at 2000 nematodes/500 cc soil. The field should also be treated if it has a history of early dying. Lesion nematodes are easily controlled by the use of non-fumigant nematicides such as metam sodium products at the label rate or Temik 15G at the label rate of 20 lbs/ac where the growing season

is 150 days or more. Vydate can be applied at planting and multiple post-plant applications according to label rates. Testing has shown Admire results in some suppression of lesion nematode when applied as a seed treatment (7 oz/ac) or at planting in seed furrow (8.7 oz/ac). Limited testing indicates Movento (10 oz/ac maximum for the season) also provides some level of control of lesion nematode. Again, this product is currently only registered as a foliar applied insecticide, but exhibits some control of endoparasitic nematodes like lesion from foliar applications.

### Stubby-Root Nematodes (*Paratrichodorus* and *Prichodorus* spp)

Stubby-root nematodes (*Trichodorus* spp. and *Paratrichodorus* spp.) are migratory ectoparasites that cause deformation of potato tubers and are found in sandy, moist, cool soils. Damage is profoundly influenced by soil moisture and is greater in wet seasons. These nematodes are important parasites of potatoes, not so much for the direct damage they cause but as vectors for tobacco rattle virus, which they transmit to potatoes. This virus causes a disease of potato tubers called corky ring spot. Rusty, brown, irregularly shaped lesions that have a corky texture appear in the flesh of infected tubers. Corky ring spot

problems occur mostly in isolated sandy soil areas of southern Idaho. These nematodes have wide host ranges, making management with crop rotation difficult and relatively ineffective.

Stubby-root nematodes are difficult to control with fumigants because of their mobility in the soil. These nematodes are highly sensitive to change in soil moisture and temperature. Fluctuation in these two factors causes the nematode to move up and down in the soil profile. Stubby-root nematodes can reside at soil depths of more than 40 inches. Telone II must be applied at high rates to treat deeper in the soil profile.

Stubby-root nematodes have been controlled effectively with non-fumigant nematicides in different parts of the world, but metam sodium does not work well. Non-fumigant, systemic, carbamate nematicides like Temik, when applied at planting, remained active for 8-12 weeks after application. Non-fumigant nematicides such as aldicarb (Temik) and oxamyl (Vydate) are usually the products of choice for controlling stubby-root nematode in Idaho. Temik moves up and down in the potato hill with the waterfront, reaching nematodes as they move in the soil. Temik and Vydate's systemic activity also affects nematodes as they feed on the root system of

potato plants. Temik applied as an in-furrow at planting, modified in-furrow at planting or in-furrow at planting in combination with foliar applications of oxamyl (Vydate) resulted in the lowest incidence of corky ring spot disease and had the highest total and marketable yields.

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### Did You Know?

Some of the smallest known nematodes are only 0.004 inches long (0.1 mm), which is about the thickness of one sheet of paper.

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