

## WIREWORM BIOLOGY AND CONTROL options in potatoes

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Wireworms are the subterranean larval stage of click beetles (Coleoptera: Elateridae) and have been a primary pest of potatoes in Virginia. In Virginia, three important pest species of agricultural crops are the corn wireworm, *Melanotus communis* (Fig. 1), the tobacco wireworm, *Conoderus vespertinus* (Fig. 2), and a related species, *C. lividus*. The corn wireworm accounts for 80% of the wireworms found on the Eastern Shore of Virginia.

Wireworms often spend multiple years in the soil and a complete life cycle from egg to adult may take 2 – 5 years depending on food and environmental conditions (temperature, soil moisture).

Figure . Corn wireworm

****Research has shown that wireworms move vertically through the soil on a seasonal basis. They can be found near the surface when temperatures are moderate, at least 70°F, and burrow deeper in the soil during extreme heat and cold. In late spring, fully mature and well-fed larvae will pupate in earthen cells in the upper 4 inches of the soil. Pupae (Fig. 3) are white to cream- colored, becoming darker just before adult emergence. Adults (click beetles) emerge from the soil and are active during the summer. Beetles are most active in the evening and night and typically hide in vegetation or ground litter during the day. Egg-laying females prefer weedy or grassy fields. Eggs are deposited in the soil usually in batches. A female *M. communis* can deposit between 50 and 130 eggs in her lifetime.

Figure . Tobacco wireworm

Figure 3. Wireworm pupa

Wireworms will tunnel into potato tubers that can lead to rot. Wireworms are attracted to high moisture; and densities are often higher in (low-lying) wetter portions of fields. Moreover, during extended hot, dry weather, wireworms may seek out the potato tubers for moisture in addition to food; exasperating the damage. It has been well documented that wireworm damage to potato tubers increases the longer tubers are left in the ground.

**Chemical Control**

Organophosphates and carbamates have historically provided significant control of wireworms in potatoes, but labeling restrictions have led to the loss of registrations of many of these insecticides. As of 2014, Mocap EC or 15G and Thimet 20G (in a LocknLoad) granular formulation remain the only organophosphates available for at-planting or pre-planting use on potatoes. Pre-plant broadcast and incorporation of Mocap appears to work best for wireworm control. Other insecticide options for controlling wireworms have emerged over the past decade including Regent, neonicotinoids, and the pyrethroid bifenthrin (Capture LFR, Bifenture, or Sniper). A list of currently registered products and rates is shown in Table 1. A summary of insecticide efficacy trial results from 2006 to 2013 on the Eastern Shore of Virginia indicates reduced wireworm damage with the use of several different neonicotinoids at-planting, or with the pyrethroid bifenthrin at-planting and post-emergence (Capture LFR, Bifenthrin), or a mixture of bifenthrin + imidacloprid (Brigadier), as well as with Mocap (Tables 2). Various combinations of the aforementioned have also performed well.

Additional information on wireworm biology and management in potatoes can be found in our Virginia Coop. Extension fact sheet at: <https://pubs.ext.vt.edu/2812/2812-1026/2812-1026.html>

**Table 1. Insecticides currently labeled for wireworm control on potatoes in VA – 2015.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Insecticides labeled for wireworms on potatoes** | **Active Ingredient** | **Chemical Class** | **In-furrow**  **(rate / acre)** | **Lay-by/at cultivation (rate / acre)** | **Foliar**  **(rate / acre)** | **Note** |
| **Admire Pro** | imidacloprid | neonicotinoid | 5.7 - 8.7 fl. oz |  |  |  |
| **Platinum 75** | thiamethoxam | neonicotinoid | 1.66 - 2.67 oz |  |  |  |
| **Regent 4SC** | fipronil | phenyl pyrazole | 3.2 fl. oz |  |  |  |
| **Brigadier** | bifenthrin / imidacloprid | pyrethroid / neonicotinoid | 16 - 25.6 fl. oz |  |  |  |
| **Bifenthrin 2EC, Bifenture EC** | bifenthrin | pyrethroid | 19.2 fl. oz | 3.2 fl. oz | 2.1 - 6.4 fl. oz | foliar for control of adult beetles only |
| **Capture LFR** | bifenthrin | pyrethroid | 12.75 – 25.5 fl. oz | 12.75 – 25.5 fl. oz |  |  |
| **Brigade, Sniper** | Bifenthrin | Pyrethroid | 9.6 – 19.2 fl. oz | 3.2 – 9.6 fl. oz | 2.1 – 6.4 fl. oz | foliar for control of adult beetles only |
| **Thimet 20G** | phorate | organophosphate | 8.5 - 11.3 oz / 1000 row ft | 8.5 - 11.3 oz / 1000 row ft |  |  |
| **Mocap 15G** | Ethoprop | organophosphate | 27 - 40 lbs (broadcast) |  |  | prior to or at planting or prior to crop emergence |
| **Mocap EC** | Ethoprop | organophosphate | 2/3 to 1 gallon (broadcast) |  |  | prior to or at planting or prior to crop emergence |
| **Movento** | spirotetramat | ketoenol |  |  | 5 fl. oz | apply twice + NIS |
| **Belay** | clothianidin | neonicotinoid | 9 - 12 fl. oz | 9 - 12 fl. oz |  |  |

**Read all labels prior to use on any crops**

**Table 2. Wireworm control (% damage reduction) of selected insecticides and mixtures used in Virginia potato insecticide efficacy trials (2006-2013 ESAREC, Painter, VA).**

|  |  |  |
| --- | --- | --- |
| **Treatments** (IF = in-furrow, PPI = preplant incorporated, PE = postemergence application prior to cultivation) | **% wireworm damage reduction in comparison to untreated control** | **No. of times tested** |
| **Single insecticide options** |  |  |
| Admire Pro 8.7 fl. oz (IF) | 47 | 9 |
| Admire Pro seed treatment (9.36 g ai/cwt seed) | 98 | 1 |
| Belay 12 fl. oz (IF) or (PPI) | 86 | 3 |
| Capture LFR 12.8 fl. oz (IF) | 96 | 1 |
| Mocap EC 4 qts (IF) | 89 | 3 |
| Movento 5 fl. oz + NIS (foliar sprays at flowering) | 83 | 3 |
| Platinum 75SG 2.7 oz (IF) | 73 | 6 |
| Regent 4SC 3.2 fl. oz (IF) | 66 | 12 |
| Seduce bait 22 lbs (PE) | 55 | 1 |
| Verimark 13.5 fl. oz (IF) | 73 | 6 |
|  |  |  |
| **Combinations and mixtures** |  |  |
| Admire Pro 8.7 fl. oz (IF) + Thimet 20G (11.3 oz/ 1000 ft (PE) | 90 | 1 |
| Admire Pro 8.7 fl. oz (IF) + Movento + NIS 5 fl. oz (foliar spray) | 65 | 1 |
| Belay 12 fl. oz (IF) + Regent 1.6 fl. oz (IF) | 92 | 1 |
| Brigadier 2SC 25.6 fl. oz (IF) | 67 | 9 |
| Brigadier 2SC 38.4 fl. oz (IF) | 93 | 2 |
| Brigadier 2SC 32 fl. oz (IF) + 6.4 fl. oz (PE) | 93 | 2 |
| Brigadier 16 fl. oz (IF) + Admire Pro 5.22 fl. oz (IF) | 88 | 3 |
| Capture LFR 25.5 fl. oz (IF) + Admire Pro 3.5 fl. oz (IF) | 89 | 2 |
| Capture LFR 25.5 fl. oz (IF) + Admire Pro 5.22 fl. oz (PE) | 95 | 3 |
| Regent 4SC 3.2 fl. oz (IF) + Brigadier 2SC 6.4 fl. oz (PE) | 91 | 2 |
| Regent 4SC 3.2 fl. oz (IF) + Capture LFR 6.4 fl. oz (PE) | 94 | 1 |