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ONION MAGGOT MANAGEMENT IN NEW YORK, MICHIGAN, AND WISCONSIN[3]

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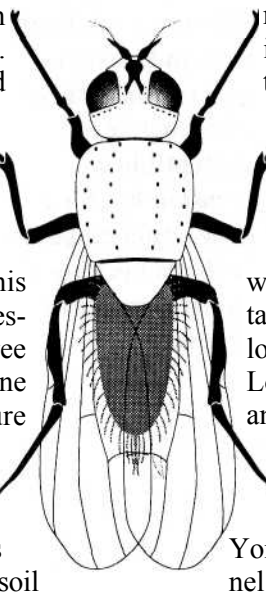

The onion maggot (OM) continues to threaten commercial onion production in New York (ca. 12,000 acres), Michigan (ca. 8,000 acres), and Wisconsin (ca. 2,000 acres). In these states, onions are intensively grown on high organic (muck) soils. Because onion production is specialized and costly, many growers concentrate primarily on the one crop, resulting in minimal rotations to other plant species. This practice invariably increases onion maggot pressure, since this insect usually completes three generations per growing season; and has only one major commercial host in the U.S. Immature stages of the OM dwell within or just outside of underground portions of the onion plant. A system where onions are grown either continuously or in close proximity to last year's plantings must rely heavily upon effective soil chemicals applied at seeding to control the larval stages. In addition, sprays are often applied in an attempt to control the adult fly stage. However, sprays directed at flies cannot be relied upon. This is because flies move in and out of onion fields almost continuously. It has been estimated that a single application of a short-lived insecticide will contact only a small percentage of the total onion fly population.

For more than two decades, the supply of effective, labeled soil insecticides for OM control has been adequate, and has kept up with loss of efficacy due either to regulatory restrictions or to the development of insecticide resistance. However, it is doubtful that a supply of new chemicals will continue because the pesticide regulatory climate has sharply increased costs of new chemical development. This change has greatly impacted plant protection for high-value minor crops like onions. In the future, onion growers will have to adopt more non-chemical control tactics in order to maximize the effectiveness and longevity of the few remaining soil insecticides. Lorsban (chlorpyrifos) has been a most effective and reliable soil insecticide for OM control since it'was labeled for that use in the early 80's. In 1987, Lorsban appeared to be slightly less effective in a few fields in Western New York. At that time, research and Extension personnel at the New York State Agricultural Experiment Station, Geneva, NY (Cornell University) began to examine field collections of OM for Lorsban resistance. Insecticide resistance is the inherited ability by an insect to survive a previously lethal dose of an insecticide. Continued bioassay of field collections over the next several years indicated the existence of a low-intensity (3 to 5X) Lorsban resistance in some OM populations. Field surveys of 10 sites in upstate New York in the late 80' s showed that two isolated locations had the greatest frequency of resistant OM. The sites with resistant OM were

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characterized by continuous onion plantings. By 1993, 20% of New York's commercial onion acreage had detectable levels of Lorsban resistance in resident OM populations. In 1994, field collections from two sites in Michigan and one site in Wisconsin indicated similar low levels of resistance to Lorsban.

The levels of resistance that now occur within the three states are not yet high enough to render Lorsban ineffective providing that the treatments are applied with precision in the seed furrow, and at maximum labeled rates. However, the selection pressure for higher levels of resistance to Lorsban (and perhaps to other labeled chemicals) will continue. Growers are encouraged to incorporate other plant protection practices along with properly applied chemicals. Important practices to use in concert with soil chemicals are listed here:

1	2	3	4	5
Rotate onions with another crop at least every three years to break the cycle of OM buildup. This insect cannot survive in large numbers without an onion crop each year. If possible, when a non-host rotation is planned, no onion crop should be within one mile of the previous crop since it has been demonstrated that OM flies can move about a mile from overwintering New York sites. Rotations involving lesser distances will offer some relief, but with diminishing benefit as the distances from previous plantings to new plantings are decreased.	**Practice clean harvests. Every dropped onion, particularly if it is damaged, is a potential host for third generation maggots that overwinter as pupae in the field and then emerge as flies the following spring. Never disc an unharvested field and then leave the cut bulbs in the field. This practice can increase overwintering OM by over 1000%.**	**If third generation injury to maturing bulbs has been a problem, use an early-maturing variety such as 'Norstar'. Field tests in New York indicate that although this cultivar is susceptible to attack from first and second generation maggots, it is much less susceptible to invasion by third generation maggots, perhaps because of its early maturity characteristics.**	**If more than one effective soil insecticide is still available for a particular region, yearly rotations between unrelated chemicals are advised. This may slow the development of insecticide resistance.**	**If possible, minimize foliar insecticide sprays, particularly during the first portion of the growing season. At this time, significant numbers of beneficial ground-dwelling insects and related arthropods are present in commercial onion fields. The presence of a small wasp that is parasitic on OM has also been noted during the early portions of the growing season. By midsummer, OM natural enemies diminish in number, perhaps because they are more sensitive to insecticide sprays than are onion maggots; thus enabling survival of the pest, but destruction of its natural enemies.**