HORT MATTERS

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Don't Forget About the Discards: Managing Onion Cull Piles

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There is a familiar saying "one person's waste is another person's treasure". Well, the same could be applied to the creatures attracted to those onion cull piles left at the side of the field. An onion cull pile, by definition, is a pile of onions comprised of graded out onions, partially rotted onions and onion waste.

Cull piles of any crop can act as a great reservoir for diseases and insect pests. For example, in potatoes, cull management is critical as a mitigation measure against late blight. In onions, cull pile management is important in the control of onion maggot populations. In order for the season's third generation maggots to survive and overwinter in the field, they must have a supply of onions on which to feed. Cull piles can act as an ideal source for this supply.

In addition to managing pests, now that Iris Yellow Spot Virus has been detected in Ontario in both 2007 and 2008, cull pile management will be a critical step in minimizing the green bridge between growing seasons.

Ways to minimize large onion cull piles include fall and winter spreading, and/or the burial of crop debris. It's important to remember that onions are a biennial crop. Discarded bulbs can and will sprout and grow. One way to minimize the growth of volunteer onions in your cull piles is to chop up the onions. Unlike potatoes, onion pieces do not have the ability to regrow.

Field spreading is an option for dealing with cull onions in the fall and winter rather than a large pile at the edge of the field. The key to spreading is depth. Cull onions spread too deep will not allow for adequate freezing. So, piles should be no more than a foot deep.
It's important to think about where you're spreading your culls, if you decide to carry out this control option. Try not to spread culls on land that you plan on growing onions, or other alliums, in the next year or two.

As mentioned earlier, a second management option with cull piles is **field burying**. Again, minimize the depth of the pile to prevent inadequate freezing, ensuring at least a foot or two of soil covers over the onion debris.

At the end of the day, handling your onion waste in the right way now will help with insect and disease management next season.

Bacterial Diseases of Onion

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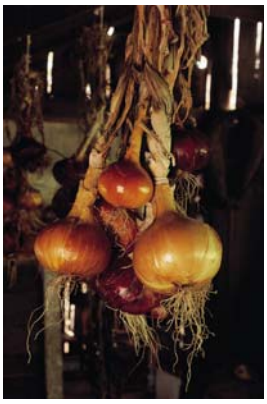
Bacterial diseases in most crops are very challenging to manage and onions are no exception. The three bacterial diseases that occasionally infect onion in Ontario include sour skin, slippery skin and soft rot. Onion plants tend to be tolerant to bacterial diseases during their early growth but become more susceptible later in the growing season after bulb initiation.

The three diseases are caused by three different bacteria with a common biology. They all live in soil and volunteer onions left in the field; they all require rain splashing on to the plants; and they all tend to infect wounded tissue in the field. Bacterial diseases of onion tend to be more severe during a very wet season such as the 2008 growing season or if a severe rain storm or prolonged wet period is followed by hot humid conditions in the field. Fields that are frequently over head irrigated particularly during periods when temperatures are hot (>30°C) are also more likely to become severely diseased if the bacteria is present in the soil. Heavy rain storms or overhead irrigation splash the bacteria contaminated soil onto leaves. The bacteria then infection through natural openings or wounds recently made by thrips, other diseases such as leaf blight or downy mildew or wounds caused by the damaging winds, pounding rain or hail accompanying the storm. Once the bacteria infect the leaves, they multiply inside the tissue and move downward into the bulb killing the tissue as they advance. Very warm temperatures favour the rapid multiplication of the bacteria once inside the tissue resulting in the rapid onset of symptoms. Unfortunately these pathogenic bacteria are capable of multiplying slowly at cool to moderate temperatures. Symptoms develop much slower during cool conditions and often go unnoticed during harvesting and prior to storage. Once in storage, the disease slowly invades the bulb tissue resulting in severe losses in quality.

Symptoms in the field often first appear as one or two wilted or yellow leaves in the center of the leaf cluster. The bulbs of infected plants may appear healthy except for a softening of the neck tissue. One difference observed between these diseases is that Slippery skin tends to move down one scale until it reaches the basal plate before spreading to adjacent scales. The infected scale appears watery or cooked and when pressure is applied to the bottom of the infected bulb the center scales slide out. Sour skin, on the other hand, often appears as a few rotted outer scales with adjacent and center scales remaining firm. Applying pressure to the severely infected bulbs with sour skin can also result in the center scales sliding out. A foul acidic odour usually accompanies this disease hence the name 'Sour skin'. Often, soft rot bacteria invade the diseased tissue resulting in further break down of the infected tissue which also produces a foul odour and complicates the diagnosis of these diseases. Regardless, slippery and sour skin can cause yield losses of up to 50%.

So what can growers do to avoid losses caused by these bacterial diseases? Unfortunately there are no silver bullet bactericide sprays to control these diseases. Disease management relies on the integration of cultural practices in the field to keep the disease at bay. Since the bacteria are soil-borne pathogens, crop rotation with non host crops such as cereals for at least 3 years will significantly reduce soil population levels. Above all, avoid planting near cull piles or in fields with a history of these diseases for at least 3 years, particularly if the disease was slippery skin. Although the susceptibility of different varieties to these diseses are not known, avoid planting varieties that have been severely affected by the diseases in the past and plant resistant varieties where known. Always provide adequate plant and row spacing so that air movement can dry the crop quickly and reduce conditions favourable for infection after a severe storm or heavy irrigation. Use a moderate fertilizer program and do not apply nitrogen after bulb initiation since this can exacerbate disease development and losses. Cultivate infested debris, volunteer onions and cull piles in the fall and spring. If possible, avoid over head irrigation in fields with a history of the disease particularly during very hot summer days. Often these diseases go unnoticed during harvest. Infected onions that are not allowed to cure in the field properly after a very wet season often rot in storage. Be sure that the bulbs are cured and the necks are closed before placing them in a cool dry storage facility.



What are those grey circles on my lavender leaves? Septoria Leaf Spot of Lavender

Sean Westerveld, Ginseng and Medicinal Herbs Specialist;
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Lavender is typically thought of as a hearty plant with few pest problems when grown under the proper conditions. While this is generally true, lavender is not completely immune to insect and disease problems. Recently, we have observed greyish, circular lesions on the leaves of a number of varieties of lavender in southern Ontario. The culprit is a fungal disease called Lavender Leaf Spot.

What is it?

Also known as Septoria leaf spot, this disease is caused by the fungus *Septoria lavandulae*. It is only known to attack members of the lavender family including the common angustifolia varieties as well as the lavendin hybrids and has been reported from Africa, Europe and North America. The disease is spread by spores which are moved from infected bushes and plant debris by wind or by splashing during heavy rains. The fungus overwinters on lavender tissues and new spores are produced any time during the growing season. The disease is promoted by long and repeated periods of leaf wetness and high humidity, which are required for the spores to germinate and infect leaves. As a result, it is more commonly a problem in the late summer and fall. However, the disease is known to affect lavender at any time during the year in Europe, and it is likely that extended wet periods in the spring and summer can result in significant disease early in the season.

What does it look like?

Lavender leaf spot is primarily found on older leaves lower on the stem or in protected and shaded areas of the canopy. It first appears as small spots close to the leaf edges that eventually grow in size and may coalesce to form larger, irregular shaped lesions. The spots are 2-5 mm in diameter and appear grey with a purple/brown border (Figure 1). Eventually, affected leaves fall off the plant. In addition, weakening of the plant as a whole will occur and cause premature defoliation, even in less affected parts of the plant. As a result, diseased plants appear to have a thinner canopy and may be stunted compared to healthy plants. However, close examination of the plants is required to identify the disease, since it can be difficult to notice from a distance (Figure 2).

What does it do to lavender?

Depending on the time of year that the disease becomes established on the foliage, lavender leaf spot has the potential to cause considerable damage. Due to premature defoliation, the disease can retard the growth of the plant. One research study in Europe found that infected plants produced 24% fewer flowers and 13% less oil than healthy plants. Some research even suggests that the disease can also change the quality of the essential oils. We do not know how the disease will affect plant growth, flower yield or oil quality in Ontario.

Figure 1. Lavender leaf spot appears as small circular lesions with a grey centre and purple/brown border mainly on older leaves.

Figure 2. Although this plant looks healthy, many of the older leaves are covered in lavender leaf spot. Closely inspect all new plants to ensure they are free of disease before planting them in your field.

What can be done?

There is not much that can be done to eliminate the disease once it is established in your field. Therefore, the key to man-

aging lavender leaf spot is to avoid getting it in the first place. This can be achieved by appropriate site selection and by culling out diseased plants before planting them in the garden.

The best approach is to avoid moist conditions which promote infection and spread of the disease. Increasing air movement through lavender fields is very important. Consider orienting beds in the direction of prevailing winds and spacing plants far enough apart to allow room for air movement. Avoid planting lavender in protected locations with limited airflow, such as adjacent to woodlots or hedges, and try to choose sites with exposure to full sun. Any straw put onto beds for winter protection should be removed as early as possible in the spring to allow for rapid drying.

Research in Europe has found that, although no varieties have been identified as being resistant to the disease, the cultivar 'Munstead' may be the most tolerant. However in Ontario we have seen the disease on 'Munstead'. Growers evaluating lavender varieties under Ontario conditions may find it useful to record incidence and severity of this disease among the different varieties they are trying.

It is important to carefully inspect all new plants for lavender leaf spot, and other pests, before introducing them to your fields. If possible, keep new plants separate for a week or two and re-inspect before planting.

In a nutshell, while at present this disease does not seem to be having a serious impact, it does serve as a reminder that pests can impact lavender and should emphasize the importance of scouting for pests and employing preventative tactics.

If you see this disease or other pests on your lavender plants, please contact Melanie Filotas, OMAFRA's Integrated Pest Management Specialist, Specialty Crops at 519-426-4434 (email: melanie.filotas@ontario.ca) or Sean Westerveld, OMAFRA's Ginseng and Medicinal Herbs Specialist at 519-426-4323 (email: sean.westerveld@ontario.ca).

Pesticide Resistance – How it happens and how you can delay it

Wendy McFadden-Smith, Tender Fruit & Grape IPM Specialist

It is a common misconception that using pesticides causes resistance. This is not the case -- resistance to fungicides arises as a result of random mutation. Think of it this way. Our *Homo sapien* ancestors likely all had brown eyes. Mutations in the genes that cause brown eye colour resulted in lack of melanin production in the iris and a small number of individuals were born with blue eyes. Having blue eyes does not jeopardize the ability of those of us with them to survive. So the frequency of this particular gene combination slowly spread throughout parts of Europe and then to North America, although it's still at a relatively low frequency compared to brown eyes. If, for some reason, having blue eyes were to make people more resistant to say, a fatal disease of global proportions, brown-eyed people would succumb and, eventually, the proportion of the world's population that has blue eyes would gradually increase so that there would be far more people with blue eyes than brown. The same idea applies to pesticide resistance.

A random mutation in the pathogen or insect pest population results in a small number (less than 1%) of individuals who can survive a particular pesticide or group of pesticides with a particular mode of action, such as the strobilurin fungicides (Flint, Sovran) or the organophosphate (OP) insecticides (Guthion, Lorsban, Imidan). In many cases, if an individual is resistant to one member of a chemical group, it is resistant to all of them: this is called "cross-resistance". As long as products in this group are not used, there is no benefit to having this resistance but also no detriment, so these individuals remain a small proportion of the population. However, once these products start to be used, some of the susceptible individuals, those without the resistance mutation, will be killed while those with the resistance mutation will survive. This shift may happen rapidly for some families and target pests and gradually for others. If products of the chemical group are used repeatedly and exclusively, the shift toward more and more resistant individuals will occur more rapidly and eventually the pesticide won't control disease at the labeled rate. If coverage or timing of the spray is less than optimal, control failure due to resistance will occur even faster.

The potential for the development of resistance to these site-specific products is high. So what can you do to delay it? Here are a few resistance management strategies:

Rotation

Do not exceed the maximum number of consecutive applications of products in a chemical family. Tables 2-7 and 2-8 in Publication 360 (2008-2009) list the chemical groups. Using a different product within the same group is not rotation. Fungicide groups with an "M" in the designation (such as captan) have multi-site activity and are not prone to resistance development: they can be used repeatedly without risk of resistance. Rotation strategies are different between fungicides and insecticides. The reason for this will be covered in a subsequent article.

Tank mixes

One strategy used in fungicide resistance management is to tank mix a resistance-prone product with one that is multi-site and not prone to resistance. For example for apple scab control, Nova is tank-mixed with a half-rate of a mancozeb product.

Optimum timing

Do not rely on "kick-back" activity of fungicides, rather, apply them protectively whenever possible. Be aware that many of the new insecticides (Altacor, Delegate) work differently than OP's or synthetic pyrethroids (Pounce, Matador, Decis) so their timing will be different from our old work horses.

Use label rates

Using rates below those recommended on the label will expose the pest population to below-lethal doses of active ingredient and promote the proliferation of resistant individuals. This is especially the case for many of the newer products with very low rates per ha.

Spray coverage

A fungus spore or an insect doesn't care what's in the tank, only what's on the plant. You could have the most effective product in the world in your spray tank but if it doesn't reach the target, it can't do its job. This is especially true with the new chemistries that use g per ha instead of kg. With the old products, there was some "wiggle room": if the rate on the target wasn't quite right there was still enough there to do the job. New pesticides are labeled at the lowest effective rate based on efficacy trials. This lowest rate does not take into account the potential for less than optimal coverage or timing or the risk of resistance. Take a low rate and apply it with less than complete coverage and you're not applying enough to take care of business.

Despite what you may believe, there isn't an endless source of products available. We've been fortunate to get some great new pesticides in the past few years. There is no guarantee that we will continue to get new products as quickly in the future so it's up to you to keep the ones we have as viable as possible!

Managing OFM in Apples with New Products

Hannah Fraser, Entomology Program Lead – Horticulture

The tool box for managing oriental fruit moth (OFM) in apples continues to be filled with new products, offering growers more options for pest management. While these new insecticides are efficacious, their timing of application may differ from older conventional products targeting newly hatched larvae. Many reduced- risk products must contact the target insect life stage directly or be ingested. Good coverage, timing, and accurate monitoring are all essentials in managing pests in apple orchards today, and this certainly applies to a serious direct pest such as OFM.

In the past, recommendations for timing application of insecticides have been based on pheromone trap catch data, between 3 and 6 days following peak activity (6-10 days following rapid upswing in numbers) depending on the time of year. Several of the new products need to be applied much earlier – in some cases shortly after adults emerge and begin to lay eggs, or before eggs begin to hatch. For this reason, the use of degree day developmental models and egg hatch prediction models are now required to ensure appropriate timing.

Recall that there are 3 generations of OFM in Ontario. A partial fourth generation may develop in some years, with adult flight and egg-laying activity extended into October. The insect overwinters as a late stage (4th or 5th instar) larva within a cocoon under bark scales, crevices and other protected areas on the tree or on the ground. They pupate in the spring and emerge as adults in late April or early May. Pheromone traps are used to track their emergence and flight.

Fluctuating spring temperatures can affect trap catch data. Just as there is a base temperature below which no development occurs in larvae, there is also a minimum temperature required for activities including adult flight, searching for a mate and egg-laying. During cool nighttime periods often experienced early in the growing season, adult OFM may not be active in the orchard for periods of several days. When warmer temperatures resume, so does flight activity. This may give the impression that the flight of the second generation has begun, when in fact the activity represents a split or bimodal peak of the overwintering generation. Bimodal peaks often carry-over to the next generation.

Pheromone traps will provide information on insect activity, but in order to understand what is actually happening at a population level will also require the use of degree-day models to verify that enough heat units have been accumulated to drive the pest to the next generation. A phenology model to predict development of OFM from egg to adult (generation time) is available. Oriental fruit moth have a base developmental temperature of 7.2ºC and require an accumulation of approximately 550 DDC base 7.2ºC to go from an egg to an adult (generation time). If you are seeing a fresh flush of adults but have not yet accumulated enough heat units, then the new activity likely represents a bimodal peak rather than the beginning of the next generation.

A degree day-model to predict the percent egg-hatch for OFM is also available. Both models have been used with success in apple IPM programs in several production areas to help time insecticide sprays. Note that while degree day models can provide important information for predicting the timing of insecticide applications, they are not a replacement for continued monitoring of pest activity with pheromone traps and field scouting for damage.

When using the OFM model, begin accumulating degree days (base 7.2ºC) at the first sustained moth catch (biofix) of the overwintering generation in pheromone traps placed in apple orchards and continue to calculate these for the remainder of the season.

The timing of insecticide applications varies depending on the products being used. For products targeting newly hatched larvae such as Delegate, Calypso, Assail, Altacor*, timing is approximately 194-208 DDC for the first brood (generation), 805-833 DDC for the second brood, and for the third brood two applications at 1361-1389 and 1611-1667 DDC to cover extended activity (where required). Check residual activity of products and re-apply as required where extended flight occurs. For products that need to be applied before eggs are laid (residues under eggs) such as Rimon, application should occur at least 100 DDC earlier for each generation. For products that need to be applied prior to egg hatch (residues over eggs and /or timed for first hatch) such as Intrepid or Altacor*, application should occur 50-80 DDC earlier for each generation. Monitor flight for each generation, check residual activity for each product and re-apply product if necessary.

Keep in mind that larvae enter the fruit within 24 hours of hatching. Rapid entry into the fruit means that there is a very narrow window of opportunity for contact with insecticides on the surface, and many newer products must be ingested. Adequate spray rates and good coverage are essential for growers using insecticides to manage OFM.

When using insecticides, each generation should be managed as separate units. Use products from a single chemical group to manage a given generation of a pest. If emergence and/or activity for that generation is prolonged (for example, due to bimodal or split peaks), apply a second application of the

same product. This exposes each generation to only one chemical group. Rotate to another chemical group for each subsequent generation.

Mating disruption of Oriental fruit moth is a highly effective alternative to insecticides. The technology is readily incorporated into IPM programs for apples, offering season-long protection against OFM damage (depending on product choice), and without the need to time insecticide spray applications. Dispensers must be applied prior to flight. Mating disruption is a key tool in preventing / delaying the development of resistance to insecticides.

True armyworm (*Pseudaletia unipuncta*) on potatoes and Tarnished plant bug (*Lygus lineolaris*) on LEAF lettuce added to Matador/Warrior insecticide labels via Minor Use Program

J. Chaput, Minor Use Coordinator

The Pest Management Regulatory Agency (PMRA) recently announced the approval of URMULE registrations for potatoes in Canada for **MATADOR** & WARRIOR (cyhalothrin-lambda) insecticides for control of the true armyworm species *Pseudaletia unipuncta*. The PMRA also announced the approval of URMULE registrations for LEAF LETTUCE for these products for the control of tarnished plant bug. The active ingredient cyhalothrin-lambda was already labeled on a wide range of crops including grains, oilseeds, vegetables and fruits. Note that Warrior will eventually replace Matador in the marketplace.

Management of true armyworm has become a more serious problem affecting potatoes in Ontario and other nearby provinces such as Quebec. Tarnished plant bug is an annual, serious pest of LEAF Lettuce wherever lettuce crops are grown and Matador/Warrior were only labeled previously on Head Lettuce. These minor use registrations of Matador and Warrior insecticide are a significant addition to the pest management toolkit for these pests on these crops.

The following is provided as a general outline only. Users should consult the complete label before using Matador or Warrior insecticides.

Matador or Warrior insecticide can be used for control of true armyworm on potatoes at a rate of 83 mL product per hectare in 100 to 200 L water per hectare. The application interval is 4 - 7 days depending on the presence of significant populations as determined by local monitoring. Do not make more than 3 applications per season by ground or 2 applications per season by air (Matador only).

Do not apply within 7 days of harvest for potatoes.
Matador or Warrior insecticide can be used for control of tarnished plant bug on LEAF lettuce at a rate of 83 mL product per hectare in 500 L water per hectare. The application interval is 7 days depending on the presence of significant populations as determined by local monitoring. Do not make more than 3 applications per season.

Do not apply within 3 days of harvest for lettuce.

Follow all other directions for use on the Matador and Warrior insecticide labels carefully.

Matador or Warrior insecticides should be used in an integrated pest management program and in rotation with other management strategies to adequately manage resistance.

This minor use project for potatoes was sponsored by the minor use office of OMAFRA. The minor use project for leaf lettuce was sponsored by the Quebec Horticultural Council (CQH) in collaboration with the Quebec Ministry of Agriculture and Food (MAPAQ). We also wish to thank the personnel of **Syngenta Crop Protection Canada Inc.** for their support of this registration and the personnel of the Pest Management Regulatory Agency for evaluating and approving this important pest management tool.

For copies of the new minor use labels contact Jim Chaput, OMAFRA, Guelph (519) 826-3539, Eugenia Banks, OMAFRA Potato Specialist at Guelph (519) 826-3678 or visit the Syngenta Canada website at www.syngenta.ca