



HORT MATTERS

OMAFRA Specialists in Horticulture
and Specialty Crops.

VOLUME NO. 7, ISSUE NO. 24 SEPTEMBER 19, 2007

PLANT COVER CROPS TO BUILD SOIL AND SCAVENGE NITROGEN

Anne Verhallen, Soil Management Specialist

It's time to focus on planting fall cover crops. In late summer and early fall, you have a wealth of cover crop choices, from things like oilseed radish and other mustards, to the tried and true with oats and rye. Time is marching on though. The middle of September is the time to start to switch over to rye or wheat. Oilseed radish will not give enough dry matter at this point to be worth it. Oats are still possible but hope for an open, warm fall to get enough growth to actually protect the soil. Oats won't freeze off easily once well established but seedling oats are more tender!

Dry weather conditions and in some areas poor or inconsistent crop yields means that some fields will have considerable soil nitrogen left after harvest. Plant as soon as possible to get the most nitrogen scavenging benefit. Cover crops are just like investing – plant early and often to take advantage of any soil moisture left after harvest and to get the most growth. The last few years of doing a cover crop survey has shown that a cover crop like oats if planted early can accumulate top growth dry matter as much as 7 tonnes. Some of the later planted cover crop oats only made 1.5 tonnes. Not surprisingly, the nitrogen taken up in the above ground tissues reflected the biomass accumulation and varied from 20 to more than 100 kg of nitrogen per hectare. Admittedly we do not see an economic return of nitrogen in the immediate following year – however cover crops are part of a system and do feed into organic matter building. The benefits accrue over time much like the interest rate on a savings account.

If you would like to participate in the 2007 Cover Crop Survey and find out how much nitrogen your cover crop takes up, call and leave your contact details for Anne Verhallen, OMAFRA, Ridgetown 519 674 1614.



IN THIS ISSUE

- Minor Use Updates
- Sources of Online Greenhouse Vegetable Resources
- New Pomology Website
- Exploring Fireblight Management, Part 3: Antagonists of *Erwinia amylovora*
- Exploring Fireblight Management, Part 4: Antibiotics

PARDNER herbicide now registered for dry bulb onions in Canada

Jim Chaput, Minor Use Coordinator

The Pest Management Regulatory Agency (PMRA) recently announced the approval of a minor use label expansion for **Pardner Emulsifiable** Selective Weedkiller (bromoxynil) herbicide for control of redroot pigweed and common groundsel on dry bulb onions in Canada. This herbicide was already labeled on a wide variety of crops in Canada, including garlic and has been a priority for dry bulb onion producers for many years.

Submitted to PMRA in the spring of 2006 by the minor use office of OMAFRA, this new label expansion approval is an important addition to the weed management program for Canadian dry bulb onion producers. Weed control is a critical factor anywhere that onions are grown and this product (known as Buctril) has been available to US producers for many years. Research on the use of bromoxynil on dry bulb onions has been on-going since the late 1980's in both Ontario and Quebec and with the recent support of the University of Guelph and the registrant Bayer CropScience Canada, a successful registration has been achieved.

The following is provided as a general outline only. Users should consult the complete label before using Pardner herbicide.

Pardner herbicide can be used for control of redroot pigweed and common groundsel as follows: Apply 0.5 L per hectare of Pardner herbicide in a spray volume of 200 L water per hectare. A maximum of 2 applications at an interval of 10 to 18 days is permitted. The 1st application should be made

when onions are at the 2 to 3 leaf stage and the 2nd application made when onions are at the 4 to 5 leaf stage. The pre-harvest interval for dry bulb onions is 75 days. NOTE that Pardner herbicide may cause leaf burn in onions if weather conditions have not been conducive to the development of the outer waxy layer of the onion leaf. Pardner will provide good control of redroot pigweed and common groundsel up to the 4th leaf stage of the weeds.

Follow all other precautions and directions for use on the Pardner herbicide label carefully.

Pardner herbicide should be used in an Integrated Weed Management program and in rotation with other management strategies to adequately manage resistance.

We wish to thank Kevin Chandler, Dr. Clarence Swanton and the staff of the Muck Crops Research Station, Kettleby as well as personnel of the Quebec Ministry of Agriculture and Food (MAPAQ) for helping to generate the necessary field data supporting this registration. We also wish to thank the personnel of **Bayer CropScience 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 supplemental label contact Jennifer Allen, OMAFRA, Guelph (519) 826-4963, Jim Chaput, OMAFRA, Guelph (519) 826-3539 or visit the Bayer CropScience Canada Inc. website at www.bayercropscience.ca



Redroot pigweed



Common groundsel

Tanos 50 DF granted minor use registration for several diseases of caneberries

Jim Chaput, Minor Use Coordinator

The Pest Management Regulatory Agency (PMRA) recently announced the approval of an URMULE registration for **TANOS 50 DF Fungicide** for control of caneberry spur blight (*Dydimella applanata*), cane blight caused by *Botrytis*, caneberry anthracnose and preharvest fruit rot caused by *Botrytis* on caneberries (raspberries, blackberries, loganberries) in Canada.

Tanos was previously labeled in Canada on potatoes and tomatoes and this minor use registration is the 1st significant addition to the label in Canada. Tanos is a combination of two active ingredients, famoxadone and cymoxanil and offers growers an excellent disease and resistance management tool.

These diseases have been identified in both the US and Canada for several years on both countries' minor use priority lists. This project was initiated in late 2002 as a joint project with the US IR-4 program and the data requirements were jointly conducted by Agriculture and Agri-Food Canada's Pest Management Centre (AAFC-PMC) and the US IR-4 program.

The following is provided as a general outline only. Users should consult the complete Tanos label before using the product.

Tanos 50 DF can be used for control of caneberry spur blight, cane blight caused by *Botrytis*, caneberry anthracnose and preharvest fruit rot caused by *Botrytis* at a rate 840 grams product per hectare applied in 250 - 800 L water per hectare. A maximum of 6 applications per year at 7 day intervals is permitted with a pre-harvest interval of 0 days.

Follow all other directions for use on the Tanos label carefully.

Tanos should be used in an integrated pest management program and in rotation with other management strategies to adequately manage resistance.

This minor use project was jointly sponsored by AAFC-PMC and the US IR-4 program. We also wish to thank the personnel of **E. I. du Pont 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 label contact Pam Fisher, OMAFRA, Simcoe (519) 426-2238, Jim Chaput, OMAFRA, Guelph (519) 826-3539 or visit the E. I. du Pont Canada Inc. website at www.dupont.ca/ag

OMAFRA's website – Online Source of Information for Greenhouse Vegetables

The website of the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) is a rich source of information for greenhouse vegetable growers. Some of the information available through this website include the following:

Minor use updates (<http://www.omafra.gov.on.ca/english/crops/minoruse>) – this site provides general information on Canada's Minor Use Program, the program through which pest control products are registered for minor crops such as greenhouse vegetables. The site also describes the submission process for the registration of new products, historical and active submissions, national projects, and emergency use registrations.

Factsheets - (<http://www.omafra.gov.on.ca/english/crops/hort/greenhouse.html>) - this site provides downloadable factsheets on various topics including many important pests and diseases. A recently available factsheet that is only available through this site is one that describes the biology and management of downy mildew (<http://www.omafra.gov.on.ca/english/crops/facts/downy-mildew-b.htm>)

Recent Supplement to Publication 371 - <http://www.omafra.gov.on.ca/english/crops/pub371/p371order.htm> - this supplement contains tables of products that are fully registered (as of Spring 2007) for use on greenhouse tomato, cucumber, pepper and lettuce. The French version is also available to order and can be found on line at: <http://www.omafra.gov.on.ca/french/crops/pub371/p371order.htm>. One recent registration that is not included in these tables is that of Decree for management of *Botrytis cinerea* or gray mold on lettuce.

Ontario Greenhouse Vegetable Newsletter – this is a recently available newsletter that growers can receive via email when they subscribe for it at <http://www.omafra.gov.on.ca/english/subscribe/index.html>. The first edition was produced in June. A second one will be emailed out in September.

Ridomil Gold MZ 68WP fungicide label for downy mildew of grapes expanded to include a post-bloom application

Jim Chaput, Minor Use Coordinator

The Pest Management Regulatory Agency (PMRA) recently announced the approval of an URMULE registration for **RI-DOMIL GOLD MZ 68WP Fungicide** for control of downy mildew as a post-bloom application on grapes in Canada.

Ridomil Gold MZ 68WP Fungicide was previously labeled in Canada on grapes for control of downy mildew only as a pre-bloom application. Historically this was followed by a recommended application of Ridomil Gold Copper as a post-bloom spray; however this latter product is no longer available in the marketplace. Because of the established effectiveness of metalaxyl-m and mancozeb against grape downy mildew, growers required a post-bloom disease management tool.

This minor use submission was submitted to PMRA in early 2007 by the Grape Growers of Ontario and the minor use office of OMAFRA.

The following is provided as a general outline only. Users should consult the complete Ridomil Gold MZ 68WP Fungicide label before using the product.

Ridomil Gold MZ 68WP Fungicide can be used for control of downy mildew as a post-bloom spray at a rate 2.5 kilo-

grams product per hectare applied in sufficient water to obtain thorough coverage of the foliage. A maximum of 1 post-bloom application per year is permitted with a pre-harvest interval of 66 days.

Follow all other directions for use on the Ridomil Gold MZ 68WP label carefully.

Ridomil Gold MZ 68WP fungicide should be used in an integrated pest management program and in rotation with other management strategies to adequately manage resistance.

This minor use project was sponsored by the Grape Growers of Ontario. 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 label contact Neil Carter, OMAFRA, Vineland (905) 562-3833 or visit the Syngenta Crop Protection Canada Inc. website at www.syngenta.ca/en/

NEW POMOLOGY WEBSITE

Dr. John A. Cline, Associate Professor of Pomology, University of Guelph

In on ongoing to extend research information to tree fruit producers of Ontario, the Pomology Research Program at the University of Guelph -- based in Vineland (and Simcoe --- has updated its website to make available our research and extension activities to interested growers and stakeholders. The website is located at:

<http://www.plant.uoguelph.ca/treefruit>

The site is searchable and includes information on existing research projects, current and archived articles, presentations made to growers, stakeholders, and scientific audiences, links to a wide array of other tree fruit related websites, as well as information about our research program and facilities in Simcoe and Vineland. The site will also be used to inform growers of upcoming seminars, field events, workshops, and twilight meetings

I would like to thank Mr. Andy Tallman, (Summer Student, University of Guelph, Vineland), Mr. Mike Peppard (University of Guelph, Plant Agriculture) and Jonah Hu (Summer Student, University of Guelph, Guelph) for designing and developing this site. I'd also like to acknowledge the funding of the Ontario Summer Experience Program is helping make this possible. For further information contact Dr. John Cline, Department of Plant Agriculture, Simcoe at Jcline@uoguelph.ca or 519-426-7127 ext 331.



Exploring Fire Blight Management, Part 3: Antagonists of *Erwinia amylovora* Neil Carter, Tender Fruit & Grape IPM Specialist

Fire blight reached epidemic proportions in Switzerland in 2007 and much of the rest of Europe as well (Duffy *et al.* 2007). Early, warm weather was conducive for fire blight infections during a long synchronous bloom, exposing many more blossoms than usual to the causal pathogen, *Erwinia amylovora*. Losses were significant across Europe and were compounded by strict regulations on antibiotic sprays. The European Union has a strong stance against the use of antibiotics for horticultural production which has encouraged the search for alternative management strategies. Many areas around the world, including in North America, have witnessed the increase in various antibiotic-resistant strains of *E. amylovora*. This has also hastened the search for new methods of limiting fire blight.

One area of research has focused on finding organisms that are antagonistic to the *E. amylovora* bacteria. Antagonistic organisms are intended to out-compete the disease-causing bacteria where they occur in blossoms. There is a limited amount of resources where infection can occur, so bacteria or fungi that can grow quickly and deprive *E. amylovora* of food or space and, at the same time, not cause disease are helpful for fire blight suppression. It is not nearly as simple a process as that sounds though. Recent research shows that having some virulent *E. amylovora* present on the nutrient-rich flower stigma actually enhances the yield of other non-disease causing bacteria (Johnson *et al.* 2007). Johnson *et al.* suggest that *E. amylovora* actually modify their habitat by the expression of “pathogenesis-related genes” and increase resources (nutrients) available to themselves and co-occurring bacteria and fungi. A suppression of host resistance could also be occurring, but in any case, it is not just a simple situation of resource competition. The fact that *E. amylovora* create a “biofilm” (Koczan *et al.* 2007) which is a complex aggregation of bacteria, other molecules and sugars, also makes the process of antagonistic competition even more complicated. *E. amylovora* thrive in the biofilm they create but the biofilm also provides a niche for many other bacteria and microorganisms.

One bacterial antagonist of *E. amylovora* that is already registered for use in Ontario is *Pantoea agglomerans*. Two different strains of *P. agglomerans* are registered as “Bloomtime” and “BlightBan” and since I’ve written about those products recently (Carter and Celetti 2006), I won’t go into any great detail on them here. Researchers in Oregon (Stockwell *et al.* 2007) are exploring ways of integrating antibiotic sprays with antagonists (*P. agglomerans* and *Pseudomonas fluorescens*) for improved control of the blossom blight phase of fire blight. Preliminary work suggests that antagonists applied at around 70% bloom followed by antibiotic spray (in this case oxytetracycline) later in bloom may provide reasonable control with reduced antibiotic use from standard management practices.

Another antagonist that is undergoing field tests in Europe is “Blossom Protect”, which contains two yeast strains (*Aureobasidium pullulans*) antagonistic to fire blight bacteria (Ertl *et al.* 2007). A suitable formulation is now in limited use after many years of work, not least of which was the determination of a fermentation process capable of producing commercial amounts of the yeasts. These particular yeasts must be applied early and frequently through flow-

ering since they propagate in the flower and prevent infections by *E. amylovora*. Preventative use at 10%, 40%, 70% and 90% open blossoms may be lowered to two applications as more is known about the biology of the yeasts. Work continues to lessen fruit russetting if the product is used too late and to reduce the relatively high cost of the product.

With the number of antagonists under study now, it’s very likely that some form of *Erwinia* antagonists will become a standard recommendation in the future for management of fire blight in Ontario. Integrating their use with antibiotic applications will be an area requiring a great deal of field work in the future.

References:

- Carter, N. and M. Celetti. 2006. 11 questions about using “Bloomtime” and “BlightBan” to suppress fire blight. Hort Matters, Vol. 6, Issue 30, Dec. 7, 2006
- Duffy, B., J. Vogelsanger, B. Schoch and E. Holliger. 2007. Swiss situation and the 2007 fire blight epidemic. 11th International Workshop on Fire Blight, Paper P101.
- Ertl, C., G. Mogel, S. Kunz, C. Donat and H. Danner. 2007. From the laboratory to the market – The success story of Blossom Protect. 11th International Workshop on Fire Blight, Paper O65.
- Johnson, K.B., T.L. Sawyer, V.O. Stockwell and T.N. Temple. 2007. Comparison of the epiphytic fitness of a pathogen and an avirulent strain of *Erwinia amylovora* on pear and apple flowers as it relates to biological control. 11th International Workshop on Fire Blight, Paper O4.
- Koczan, J.M., M.J. McGrath, Y. Zhao, and G.W. Sundin. 2007. Biofilm formation in *Erwinia amylovora*: Implications in pathogenicity. 11th International Workshop on Fire Blight, Paper O6.
- Stockwell, V.O., T.N. Temple, K.B. Johnson and J.E. Loper. 2007. Integrated control of fire blight with antagonists and oxytetracycline. 11th International Workshop on Fire Blight, Paper O63.

Exploring Fire Blight Management, Part 4: Antibiotics

Neil Carter, Tender Fruit & Grape IPM Specialist

Fire Blight, the most serious disease of pear and apple in Ontario, is normally suppressed by the combination of cultural management techniques and antibiotic sprays. Some antagonists are now registered (Carter and Celetti 2006) and the plant growth regulator prohexadione-calcium (“Apogee”) has also been added to our short list of fire blight management products (Cline 2006).

Antibiotics are a traditional approach to managing bacterial diseases of horticultural crops but there is strong pressure against their use in some areas including the European Union. The United States has had other antibiotics registered for use against fire blight for some time (e.g. oxytetracycline) but there are continuing concerns with their use in horticulture. Since streptomycin and oxytetracycline have uses in human medicine, there are concerns with development of resistance by human pathogens. More disturbing from a horticultural perspective is that there has been widespread resistance developed in many regions to streptomycin by *Erwinia amylovora*, the causal agent of fire blight (McGhee *et al.* 2007, Russo *et al.* 2007, Adaskavag 2007, Evans 2007, Sholberg and Boulé, 2007).

Even though there are streptomycin resistant *E. amylovora* in some regions, streptomycin is often still the standard against which other control measures are evaluated. However, in all cases and for all products used to manage fire blight, one should be very cautious of putting too much stock in any single field trial or experiment.

Stockwell *et al.* (2007) presented an excellent summary of 16 years of fire blight trials in Oregon at the 11th International Workshop on Fire Blight in Portland, Oregon in August 2007. All products, whether antagonists or antibiotics - including streptomycin, showed a wide variability in level of control when examined over the long term. This summary of trials was a good reminder that seasons, plants, bacteria and applications are all variable, and you can't expect anything to work perfectly in every case. The other side of that coin is that limited field trials that show success should be viewed cautiously since there may have been low levels of *E. amylovora* to start with, or environmental conditions that did not favour infection, or any number of other reasons for unusual or unexpected results.

A relatively new antibiotic that is not yet available in Ontario holds good promise as an alternative fire blight management tool. Kasugamycin (“Kasumin”) is a fermentation product of *Streptomyces kasugaensis* and can be a useful adjunct to other antibiotics for several reasons. Kasugamycin has no uses in human medicine, so concerns over human pathogen resistance are immaterial. Also, it appears that almost all streptomycin-resistant strains of *E. amylovora* are not resistant (at present) to kasugamycin. This fact would make kasumin an excellent rotational tool for antibiotic-based fire blight management (Evans 2007). The integration of kasugamycin with bacterial antagonists (see part 3 of this series of articles) in fire blight management programs will require further investigation since it appears that kasugamycin may be a stronger inhibitor of bacterial biocontrol agents than streptomycin (Johnson *et al.* 2007).

Other antibiotics continue to be studied for use against *E. amylovora* as do various plant extracts such as sea buckthorn juice (Sholberg and Boulé, 2007). For now though, streptomycin remains as our primary chemical method for fire blight control and following resistant management strategies is critical to maintain its effectiveness. The addition of new antibiotics to our available products would be an excellent way to keep streptomycin effective and help to manage fire blight sustainably.

References:

- Adaskavag, J.E., W.D. Gubler, H. Forster and L.M. Wade. 2007. Detection of *Erwinia amylovora* strains with reduced sensitivity to currently registered antibiotics and management of fire blight of pome fruits using kasugamycin in integrated strategies. 11th International Workshop on Fire Blight , Paper O62.
- Carter, N. and M. Celetti. 2006. 11 questions about using “Bloomtime” and “BlightBan” to suppress fire blight. Hort Matters, Vol. 6, Issue 30, Dec. 7, 2006
- Cline, J.A. 2006. Apogee® – A New Plant Bioregulator for Apples. Ontario Ministry of Agriculture Food, and Rural Affairs. Agdex 24/211. Order No. 06-045. <http://www.omafra.gov.on.ca/english/crops/facts/06-045.htm> [August 2006]
- Evans, K. 2007. Survey results of *Erwinia amylovora* in Utah for resistance to streptomycin and investigations comparing kasugamycin (Kasumin) to streptomycin and oxytetracycline for control of fire blight. 11th International Workshop on Fire Blight , Paper P74.
- Johnson, K.B., V.O. Stockwell and T.N. Temple. 2007. Evaluation of kasugamycin as a component of an integrated biological and chemical strategy for suppression of blossom blight. 11th International Workshop on Fire Blight , Paper P75.
- McGhee, G.C., L. Bellomo, S.E. Blumer and G.W. Sundin. 2007. Emergence and progression of streptomycin resistance in *Erwinia amylovora* in Michigan. 11th International Workshop on Fire Blight , Paper O61.
- Russo, N.L., D.I. Breth, T.J. Burr and H.S. Aldwinckle. 2007. Spread and identification of streptomycin resistant isolates of *Erwinia amylovora* in New York. 11th International Workshop on Fire Blight , Paper P71.
- Sholberg, P. and J. Boulé. 2007. Evaluation of antibiotics and plant extracts for control of streptomycin-resistant *Erwinia amylovora*. 11th International Workshop on Fire Blight , Paper P72.
- Stockwell, V.O., T.N. Temple, K.B. Johnson and J.E. Loper. 2007. Integrated control of fire blight with antagonists and oxytetracycline, 11th International Workshop on Fire Blight , Paper O63.