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PLANT SCIENCE SCAN

Edition 2, August 2012

BACKGROUND: The Plant Health Science Division of the Canadian Food Inspection Agency routinely scans external sources to identify information that might be of possible regulatory significance or interest to Canada's national plant health. This Plant Science Scan report was prepared by the Canadian Food Inspection Agency's staff as a mechanism to highlight potential items of interest, raise awareness and share significant new information related to plant health.

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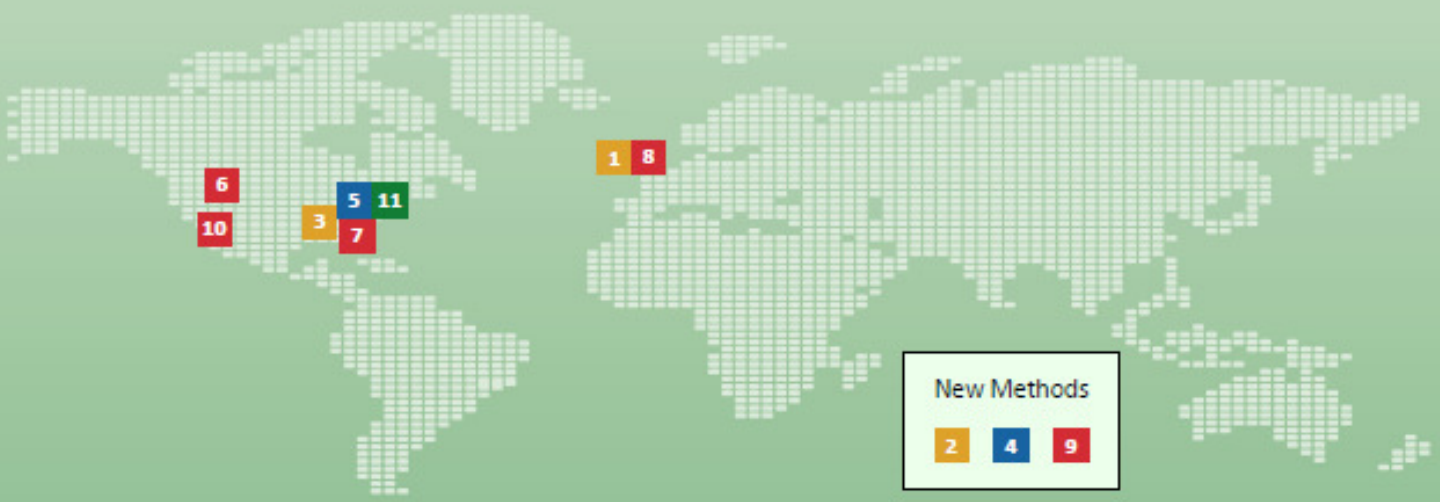

Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments
Canada

Pathology

1 First Report: Ash dieback caused by *Chalara fraxinea* in the United Kingdom

Ash dieback, caused by the fungal pathogen *Chalara fraxinea*, has increasingly been detected in European countries where it is considered a serious pest of native ash trees. This pathogen causes leaf loss and crown dieback which may lead to death of affected trees. Other symptoms include wilting of shoots and necrotic spots on the bark of stems and branches which can give rise to perennial cankers. Plants for planting and wood of European ash, *Fraxinus excelsior* can be pathways for spreading the disease over long distances. Recently, the pathogen was reported for the first time in the United Kingdom from infected *F. excelsior* nursery stock imported from the Netherlands

This pathogen is not currently present in Canada. The recent findings that the pathogen was affecting some North American species in Europe added to the concern that the pathogen might be introduced into Canada and cause significant harm to native ash species. Current import restrictions on ash products, designed to mitigate risk of Emerald Ash Borer, *Agrilus planipennis*, in North America limit the entry potential of this pathogen.

SOURCES:

United Kingdom's Forestry Commission Pest Alert, April 2012: Ash dieback disease.
http://www.forestry.gov.uk/pdf/pest-alert-ash-dieback-2012.pdf/$FILE/pest-alert-ash-dieback-2012.pdf

EPPO Reporting Service No.4 Paris 2012-04-01. 2012/080. First report of *Chalara fraxinea* in the United Kingdom.

Husson C., O. Caël, J.P. Grandjean, L. Nageleisen and B, Marçais. 2012. Occurrence of *Hymenoscyphus pseudoalbidus* on infected ash logs. Plant Pathology. DOI: 10.1111/j.1365-3059.2011.02578.x

2 New Methods: Viability of Golden nematode, *Globodera rostochiensis* and Potato wart, *Synchytrium endobioticum*, after various sanitation processes; new assay for cyst viability

Golden nematode, *Globodera rostochiensis,* and Potato wart, *Synchytrium endobioticum,* are two economically important soil-borne pathogens of potato, *Solanum tuberosum*. Both pathogens can form dormant structures that are capable of surviving more than 20 years in the soil; cysts in the case of *G. rostochiensis* and winter sporangia in the case of *S. endobioticum*.

In a recent study, Steinmöller et al. (2012) reported on the effects of various sanitation processes on the viability of these two potato pathogens. Results indicate that *S. endobioticum* winter sporangia are much more resilient compared to the cysts of *G. rostochiensis*. For example, composting at 50-55°C for 12 days was not sufficient to devitalize *S. endobioticum* sporangia, whereas cysts of *G. rostochiensis* were rendered non-viable after just 7 days of treatment. Similarly, pasteurization at 70°C for 90 minutes did not eliminate the viability of *S. endobioticum* sporangia whereas cysts of *G. rostochiensis* were rendered non-viable after just 30 minutes.

In another study, van den Elsen et al., (2012) report on a new assay to estimate the viability of cysts of the potato cyst nematodes *G. pallida* and *G. rostochiensis*. The method is relatively simple, sensitive and robust and is based upon detection of trehalose, a common and abundant disaccharide found in viable eggs contained within cysts.

In Canada the potato cyst nematodes and potato wart are regulated as quarantine pests. These pathogens are known to occur in very limited areas within Canada and are subject to strict quarantine measures to prevent their further spread. The above studies may be of interest to those involved with the detection and/or control of these quarantine species.

SOURCES:

Steinmöller, S., M. Bandte, C. Büttner and Petra Müller, 2012. Effects of sanitation processes on survival of *Synchytrium endobioticum* and *Globodera rostochiensis*. Eur J Plant Pathol 133: 753–763. DOI 10.1007/s10658-012-9955-y

van den Elsen, S., M. Ave, N. Schoenmakers, R. Landeweert, J. Bakker, and J. Helder, 2012. A rapid, sensitive, and cost-efficient assay to estimate viability of potato cyst nematodes. Phytopathology 102: 140-146

Biotechnology

3 First Report: Wheat blast, *Magnaporthe grisea* detected in North America

Wheat blast, caused by the fungus *Pyricularia grisea* (teleomorph *Magnaporthe grisea*), is a serious disease problem in some tropical and subtropical wheat growing regions of South America. Crop losses of 40 percent are common and cases of complete crop loss have been reported. Until recently this emerging disease of wheat had not been reported from outside South America. However, researchers have now reported finding wheat blast for the first time in North America, on a single head of wheat at a University of Kentucky research plot. It is speculated that the pathogen may have been present in the area for some time but had previously been mis-diagnosed as Fusarium head blight.

Genetic studies indicate that the strain of the wheat blast pathogen detected in Kentucky is not of South America origin, but rather is believed to have originated from a closely related ryegrass strain of the fungus already present in the United States where it causes a disease known as grey leaf spot. The pathogen from ryegrass appears to have "jumped" hosts, gaining the genetic ability to infect wheat.

As the fungus that causes wheat blast thrives in very warm, wet conditions, researchers in Kentucky do not believe that wheat blast represents a current economic threat to the wheat crop there. Although knowledge about this pathogen is still fairly limited, some wheat blast climate models suggest that the pathogen may not pose a very significant risk to northern hemispheric wheat-production.

SOURCES:

Pratt, K. 2012. Kentucky wheat disease discovery cause for concern across Southeast - Wheat blast could present real problems down the road . Southeast FARM PRESS, Apr. 25, 2012: http://southeastfarmpress.com/grains/kentucky-wheat-disease-discovery-cause-concern-across-southeast?page=1

Duveiller, E., D. Hodson, K. Sonder, A. von Tiedemann, 2011. An international perspective on wheat blast. Phytopathology 101 (6): S220.

4 New Method: DNA Barcoding as a tool to select for biocontrol insects

DNA Barcoding was first proposed by researchers at the University of Guelph in 2003 as a way to identify species. Barcoding uses a very short genetic sequence from a standard part of the genome present and unique in all living organisms as an identifier. This allows for a systematic comparison with the sequenced DNA of other closely related species. There is currently a global effort to utilize DNA barcoding on a wide range of animals, insects and plants in order to catalogue the diversity of life on Earth.

Recently, researchers from the United States Department of Agriculture used DNA barcodes to identify insect predators best suited to control the Colorado Potato Beetle, *Leptinotarsa decemlineata*, the most serious insect pest to potato farmers in the United States.

These researchers have studied the gut contents of four potato beetle predators: Spotted Lady Beetle - *Coleomegilla maculata*, Spined Soldier Bug - *Podisus maculiventris*, Two-spotted Stink Bug - *Perillus bioculatus* and the ground beetle - *Lebia grandis* to evaluate their ability to control this pest in the field. In the study, the researchers examined the length of time it took each predator to digest this pest by monitoring the half life of the barcode signal from *L. decemlineata* in the gut content. Since these predators digest their prey at varying rates, this approach has allowed researchers to re-evaluate the predator-prey dynamic for these biocontrol agents. The research results have demonstrated the importance of digestive rates when evaluating insect predators as biocontrol agents, and may provide guidance to producers on the most effective biocontrol strategies.

Colorado Potato Beetle, which is a quarantine pest in Canada, is a serious pest of potato crops in all the major potato regions of the world. While this pest occurs throughout Canadian potato growing regions, it is not present in the province of Newfoundland and Labrador.

Non-biological control methods, such as trap planting, crop rotation or chemical insecticides are other methods of managing this pest and are effective when used in accordance with an integrated pest management strategy.

SOURCE:

Greenstone M.H., Z. Szendrei, M.E. Payton, D.L. Rowley, T.C. Coudron and D.C. Weber 2010. Choosing natural enemies for conservation biological control: use of the prey detectability half-life to rank key predators of Colorado potato beetle. Entomologia Experimentalis et Applicata. 136: 97-107

Agriculture and Agri-Food Canada - Pest Management Center's Crop Profile for Potato in Canada, 2005. http://publications.gc.ca/site/eng/351018/publication.html

5 Update: Delaying corn rootworm, *Diabrotica* spp. resistance to Bt corn

The continued success of transgenic corn varieties expressing *Bacillus thuringiensis* (Bt) toxins is dependent on the prevention of resistance evolution by the pests they have been designed to target. Currently, three Bt toxins (Cry3Bb1, Cry34/35Ab1 and mCry3A) active against corn rootworm species (*Diabrotica* spp.) are produced either alone or in pairs by Bt corn registered in Canada and the United States. Recognizing the risk of resistance development, the Canadian Food Inspection Agency (CFIA) and the United States Environmental Protection Agency (U.S. EPA) have mandated registrants of Bt crops to develop and implement insect resistance management (IRM) plans. The goal of these plans relies primarily on a non-Bt crop refuge strategy. These refuges allow insects that have not been exposed to the toxin to emerge and mate with those that may have been exposed to the toxin. Thus, the susceptibility genotype is conserved in the ensuing populations thereby ensuring pest populations remain controlled over time. Generally speaking, the CFIA and U.S. EPA require minimum refuges where 20% of the corn planted does not express the Bt toxin for corn varieties expressing one corn rootworm-targeting toxin and 5% for corn varieties producing two toxins active against corn rootworms.

Recently, researchers in the U.S. have published a new recommendation with respect to the management of Bt corn, stating that the minimum refuge for Bt corn targeting corn rootworms should be raised to 50% for plants producing one toxin and 20% for plants producing two toxins. The primary reason for their recommendation is two-fold: (i) Bt corn expressing Cry proteins active against corn rootworms do not produce sufficiently high doses of the toxin to minimize the possibility of survival of insects with some degree of resistance and (ii) field-evolved resistance to Cry3Bb1 by western corn rootworm has recently been reported in the U.S. The authors state that their recommendation applies to corn plants producing Cry3Bb1, Cry34/35Ab1 and/or mCry3A.

This new research from the U.S. does not mention whether other regulatory agencies should consider increasing refuge size for Bt corn targeting corn rootworms. The situation in Canada is not directly comparable, given that there is no evidence of Cry3Bb1-resistant rootworm populations in Canada, and pest pressure is significantly lower than in the U.S. Nevertheless, the CFIA will continue to mandate the use of an IRM plan and promote an integrated approach to pest management to help prevent resistance development in the future.

SOURCES:

Gassmann, A.J., J.L. Petzold-Maxwell, R.S. Keweshan and M.W. Dunbar. 2011. Field-evolved resistance to Bt maize by western corn rootworm. PLoS ONE 6(7): e22629. DOI:10.1371/journal.pone.0022629. http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0022629

Tabasknik, B.E. and F. Gould. 2012. Delaying corn rootworm resistance to Bt corn. Journal of Economic Entomology 105(3): 767-776. http://www.bioone.org/doi/pdf/10.1603/EC12080

Entomology

6 Update: *Bactericera cockerelli*, vector for Zebra Chip disease, found overwintering in Idaho

The tomato/potato psyllid, *Bactericera cockerelli* is the vector for '*Candidatus* Liberibacter solanacearum' the bacterium which causes the Zebra Chip (ZC) frying

defect in processing potatoes. The first edition of the Plant Science Scan included an update on the spread of ZC in North America as well as the first report of the disease from the Pacific North-West. It was believed that the psyllid was unable to overwinter outside of southern Texas but, this past winter, researchers found psyllids overwintering in Idaho. Some of these psyllids were later found to carry the Zebra Chip bacterium. This raises the possibility that Zebra Chip disease may eventually become a significant problem in North-Western and North-Central US potato production areas.

This psyllid occasionally is carried on wind currents north into Canada, arriving late in the potato growing season. Existing evidence suggest that the inability of the psyllid to overwinter in Canada, coupled with inefficient transmission via tubers, will limit the spread and impact of the disease in Canada.

SOURCES:

Capital Press: Ellis S. May 2012. Growers learn to spot disease carrier
http://www.capitalpress.com/newsletter/SE-psyllids-052512

University of Idaho, Kimberly Research and Extension Centre, Potato Storage and Research Facility - Psyllid and Zebra Chip Management extension resource
http://www.kimberly.uidaho.edu/potatoes/INFO.htm

Canadian Food Inspection Agency, April 2012. Plant Science Scan Edition 1

7 New Pest: Kudzu Bug, *Megacopta cribraria*, a potential invasive pest of leguminous crops

Native to Asia, kudzu bug, *Megacopta cribraria*, was the first member of the family Plataspidae discovered in the Western Hemisphere. It was found for the first time in the U.S. state of Georgia in 2009. As of July 2012, populations have been reported from Alabama, Florida, Georgia, North Carolina, Mississippi, South Carolina, Tennessee, and Virginia. Leguminous plants are susceptible to this pest. The kudzu plant, *Puereria montana*, is an invasive leguminous weed that has become well established in some areas in North America, particularly in the southern United States and is also the primary host of this pest. Of special note, this bug has also been reported to be a pest of soybean, *Glycine max*, in Georgia and South Carolina, where yield reduction of up to 47% in untreated plots has been reported.

The kudzu bug has not been reported in Canada, and is not considered a quarantine pest. Adult bugs are easily dispersed on active weather fronts and are also adept hitchhikers on means of transportation such as cars, trucks, recreational vehicles, etc. Due to the remarkably fast spread of this pest in the U.S., there are concerns that this bug may eventually arrive in Canada. However, the observed dependence on *P. montana* as a primary host in its current expanded range may limit the spread of the Kudzu Bug to those areas where *P. montana* grows.

SOURCES:

Department of Entomology, University of Georgia. Gardner, W. A. March 2012. *Megacopta cribraria*: A New Invasive Insect Pest Threatening U.S. Agricultural Production and Export Markets.
http://www.cotton.org/tech/flow/upload/Megacopta-cribraria-Export-Report.pdf

North Carolina State University Extension Entomology. Reisig, D. and J. Bacheler April 2012. Kudzu bug (*Megacopta cribraria*), a new potentially devastating pest of soybeans.
http://ipm.ncsu.edu/cotton/insectcorner/PDF/Kudzu%20Bug%20Handout_Field%20Crops.Final.pdf

8 Update: Asian Longhorned Beetle, *Anoplophora glabripennis* found in the United Kingdom

The first edition of the Plant Science Scan provided an update on the spread of the Asian Longhorned Beetle (ALHB), *Anoplophora glabripennis* in Europe. This destructive wood-boring pest has been cryptically spreading throughout various parts of the world, hidden in infested wood and wood products imported from China. Recently, at least 20 infested trees, including maple (*Acer*), birch (*Betula*) and willow (*Salix*), were detected in the town of Paddock Wood, Kent, in the United Kingdom (UK). The detection was the result of a survey conducted after the finding of a single adult beetle back in 2009. The UK's Food and Environmental Agency and the Forest Commission are taking urgent steps in order to eradicate the outbreak and prevent any further spread to surrounding areas.

The CFIA regulates this beetle as a quarantine pest. In Canada, an important proportion of broadleaf trees are at risk from *A. glabripennis*, including all maple (*Acer* spp.) species. Paired with the beetle's ability to survive our winters, this insect poses a serious threat to Canadian forests. The ALHB is under eradication in Toronto/Vaughan, Ontario.

SOURCES:

Department for Environment Food and Rural Affairs, Food and Environment Research Agency Press Release March 2012: Exotic beetle pest of trees found in Kent.
http://www.fera.defra.gov.uk/showNews.cfm?id=529

EPPO Reporting Service No 4. 2012-04-01. 2012/069
http://archives.eppo.int/EPPOReporting/2012/Rse-1204.pdf

Canadian Food Inspection Agency, April 2012. Plant Science Scan Edition 1

9 New Method: Updated trapping guidelines for the Walnut Twig Beetle, *Pityophthorus juglandis*

The Walnut Twig Beetle, *Pityophthorus juglandis* is native to the South-Western United States and Mexico. It vectors the fungal pathogen *Geosmithia morbida* and together these pests are responsible for the fatal Thousand canker disease of walnut, *Juglans* spp. Eastern black walnut, *J. nigra,* is a particularly susceptible host. The fungus enters the tree as the beetle bores into the wood leading to the formation of cankers, branch decline and eventually tree mortality.

Thousand canker disease has spread widely in the western United States and has recently been detected in some eastern states. Eradication and/or effective management of the disease relies upon timely detection of *P. juglandis*. The United States Department of Agriculture (USDA) Forest Service and the USDA Plant Protection and Quarantine as well as the University of California's Statewide Integrated Pest Management Program have recently published updated trapping guidelines for this vector. The new guidelines include how to properly use the insect lure for trapping as well as provide further details on how to effectively survey for the vector and the disease.

Thousand canker disease has not been reported from Canada. Native walnut species such as *J. nigra,* as well as butternut, *J. cinerea*, are both considered susceptible to the disease.

SOURCES:

Seybold, S. J., P. L.. Dallara, S. M. Hishinuma and M. L. Flint. 2012. Detecting and identifying the walnut twig beetle: Monitoring guidelines for the invasive vector of thousand cankers disease of walnut. UC IPM Program, University of California Agriculture and Natural Resources.
http://ipm.ucdavis.edu/PDF/PESTNOTES/WTB_trapping.pdf

United States Department of Agriculture's Forest Service (FS) and Plant Protection and Quarantine (PPQ), April 2012**.** Thousand Cankers Disease Survey Guidelines for 2012.
http://www.aphis.usda.gov/plant_health/plant_pest_info/tcd/downloads/TCDSurveyGuidelines2012.pdf

10 Update: Assessment of European Grapevine moth, *Lobesia botrana* establishment and harm in the United States

The European grapevine moth, *Lobesia botrana*, is polyphagous and is considered a serious economic pest of grape vines, *Vitis* spp. The developing larvae feed on the flowers and fruit, and fruit damage is not readily noticeable until later stages of development. This moth is native to Europe but has spread to California, Argentina and Chile.

A model incorporating dynamic factors between host grapevine and pest including effects of temperature and climate was recently developed and reported in an effort to determine the potential distribution of this pest throughout California and the continental United States. Results suggest that the hotter regions of southern California as well as southern Texas and much of the South-Eastern United States present favourable locations for this pest.

Extrapolating the results from this study to Canada suggests that the potential for *Lobesia botrana* to cause significant harm needs investigation, but it would likely be able to survive at least in low numbers in parts of British Columbia and southern Ontario and Quebec. *Lobesia botrana* is a regulated pest in Canada.

SOURCE :

A. P. Gutierrez, Ponti L.., Cooper M.L.., Gilioli G., Baumgärtner J. and Duso C. 2012. Prospective analysis of the invasive potential of the European grapevine moth *Lobesia botrana* (Den. & Schiff.) in California. Agricultural and Forest Entomology 14(3): 1461-9563.

Botany

11 First Report: Hairy St. John's-wort in North America

Hairy St. John's-wort, *Hypericum hirsutum*, was discovered in North America for the first time in 2008 in Pickering, Ontario, Canada. Two patches of the species were discovered during biological inventories conducted by the Toronto and Region Conservation Authority. In 2011, a larger population was found in Scarborough, Ontario. Voucher specimens have been collected and preserved in major herbaria. This species is readily distinguishable from other Ontario species of *Hypericum* in having hairy stems and leaves, as well as in having stalked, black glands on the sepals and petals.

At the Ontario sites, Hairy St. John's-wort was growing in disturbed habitats in a hedgerow, an old-field meadow and along the edge of a young forest. It is native to northern Europe. In the native range in the U.K., the species grows in woods and damp grassland, mostly on basic soils. This suggests that Hairy St. John's-wort can grow in disturbed areas within more or less natural habitats, such as woodlands, as well as more disturbed areas such as fallow land and meadows. The plants in Ontario have produced viable seed and the Scarborough population, at least, is described as well-established and spreading locally. This is a species that might be of concern to Canada as a potential invasive weed in disturbed and semi-natural areas.

SOURCES:

P.A. Heydon, Miller, G. C. and Oldham, M. J. 2012. Hairy St. John's-wort (*Hypericum hirsutum* L.) in the Toronto area, new to North America. Canadian Field-Naturalist 125 (3): 248-251.

A.R. Clapham, Tutin, T. G. and Warburg, E. F. 1962. Flora of the British Isles. Cambridge: Cambridge University Press. 1269 pp.

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