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PLANT SCIENCE SCAN

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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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Canada

Pathology

1 New Host : *Paeonia* x *suffruticosa* and *Paeonia tenuifolia* new hosts for Bois Noir Phytoplasma ('*Candidatus* Phytoplasma solani')

Two *Paeonia* spp. (peony) have been identified as new hosts for '*Candidatus* Phytoplasma solani', the causal organism of bois noir, also known as stolbur phytoplasma. Two separate studies have identified *Paeonia* x *suffruticosa* (tree peony) and *Paeonia tenuifolia* L. as hosts of the phytoplasma.

In China, *Paeonia* x *suffruticosa* (tree peony) exhibited symptoms of yellowing, stunting, and flower malformation. From these diseased plants, '*Candidatus* Phytoplasma solani' was detected. This is the first report of bois noir phytoplasma infecting *Paeonia* spp. (Gao *et al*., 2013). In Serbia, several rare ornamental peony plants (*Paeonia tenuifolia* L.) showed symptoms of lower leaf reddening which, by the time the plant set seed, had slowly spread to the entire plant. Nested PCR and sequencing revealed that the diseased plants were infected with a phytoplasma with 100% genetic homology to two sequences of '*Ca*. Phytoplasma solani' from Serbia and the Czech Republic (Adamovic *et al*., 2013).

The bois noir phytoplasma is a quarantine pest for Canada. It is one of a number of phytoplasma-associated diseases of grapevine that are not known to be established in North America.

SOURCES:

Adamovic, I., Mitrovic, P., Kojic, S., Pivic, R. and D. Josic. 2013. First report of natural infection of *Paeonia tenuifolia* by '*Candidatus* Phytoplasma solani' in Serbia. Plant Disease. http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-07-13-0702-PDN?prevSearch=allfield%253A%2528adamovic%2529&searchHistoryKey=

Gao, Y., Qui, P.P., Liu, W.H., Su, W.M., Gai, S.P., Liang, Y.C. and X.P. Zhu. 2013. Identification of '*Candidatus* Phytoplasma solani' associated with tree peony yellows disease in China. Journal of Phytopathology. 161(3): 197-200. http://onlinelibrary.wiley.com/doi/10.1111/jph.12025/abstract

2 Heat treatment of *Fraxinus* spp. saplings may provide control of *Chalara fraxinea*

A recent study describes the effects of temperature on *Chalara fraxinea* Kowalski (causal agent of ash dieback in Europe) and explores the potential for hot water (HW) treatment to prevent the spread of this destructive fungus on young saplings. The study found that 5-hour HW treatments at 36°C of diseased ash saplings resulted in low fungus isolation rates post-treatment. This temperature also provided acceptable survival of ash saplings. The authors state that more studies, and testing of more isolates, are required before recommending any specific treatment for this fungus.

Chalara fraxinea Kowalski causes a serious disease of ash in many parts of Europe, and it is a potential regulated pest for Canada. It is not known to occur in the U.S. or Canada.

SOURCE:

Hauptman, T., Piskur, B., de Groot, M., Ogris, N., Ferlan, M. and D. Jurc. 2013. Temperature effect on *Chalara fraxinea*: heat treatment of saplings as a possible disease control method. Forest Pathology. 43(5): 360-370. http://onlinelibrary.wiley.com/doi/10.1111/efp.12038/abstract

3 Update: Acute Oak Decline

Acute Oak Decline (AOD) is an emerging disease that has spread over the past 5 years in parts of the UK. AOD affects native oak species (*Quercus robur* and *Quercus petraea*) in the UK, and similar conditions have been observed in Belgium, Spain, the Czech Republic, France, Germany, and Poland on one or more of *Q. pyrenacia*, *Q. ilex* and *Q. robur*. Trees affected with AOD exhibit stem bleeding or oozing from vertical cracks which may become extensive. As the disease progresses, the canopy thins and trees often die within 3-5 years. AOD primarily affects trees over 50 years old and

Agrilus biguttatus is commonly (>90%) found infesting diseased trees. The causal agent(s) of AOD are not yet known, and the disease is not known to be regulated anywhere in the world, although there is growing concern in the UK.
Two bacteria (*Brenneria goodwinii* and *Gibbsiella quercinecans*) have been consistently isolated from diseased trees, but not healthy trees. Inoculation studies indicate that both species of bacteria produce necrosis in host tissues. Further work is required before the causal agent(s) of this disease can be definitively determined. A new real-time PCR assay has been developed for the rapid identification of *Brenneria goodwinii* and this will be put into routine diagnostic use by the UK Forest Research laboratory.

Please refer to this edition's **Entomology** Plant Science Scan Article "Survey: Trap tests for European *Agrilus* species" for additional information on *Agrilus biguttatus*.

SOURCE:
UK Forestry Commission.2013. Oak decline publications. http://www.forestry.gov.uk/fr/INFD-8RNAXF

4 New Report: Identification of a virus (variant or putative new) associated with Apple Green Crinkle Disease

A recent study concluded that the virus identified in affected apple trees may be either a variant/strain of Apple stem pitting virus with unique biological properties, or a distinct putative foveavirus. The virus, identified as "Apple green crinkle associated virus" (AGCaV), is the subject of ongoing studies to obtain further evidence that might confirm or exclude this virus as the causal agent of Apple green crinkle disease.
Apple green crinkle agent is regulated by Canada. The agent was previously known to be graft-transmissible, and the varying degrees of severity of the disease were thought to be associated with different strains of the causal agent (CABI, 2013). Apple green crinkle disease has been recorded in most apple-growing countries of the world. The disease is characterized by the appearance of depressed areas on the fruit. Affected trees generally remain symptomless, but fruit of susceptible cultivars can become severely malformed (CABI, 2013). There are old reports of the disease in NS and BC.

SOURCE:
CABI, 2013. Crop Protection Compendium (online edition), CAB International, Wallingford, UK. http://www.cabi.org/

James, D. Varga, A. Jesperson, G. D. Navratil, M. Safarova, D. Constable, F. Horner, M. Eastwell, K. Jelkmann, W. 2013. Identification and complete genome analysis of a virus variant or putative new foveavirus associated with apple green crinkle disease. Archives of Virology. 158(9):1877-1887. http://link.springer.com/article/10.1007%2Fs00705-013-1678-7#page-1

5 New Report: *Phytophthora acerina* - a new species causing bleeding cankers and dieback of *Acer pseudoplatanus*

Severe dieback of *Acer pseudoplatanus* (Sycamore maple) trees was noticed in planted forest stands in northern Italy. Affected trees showed collar rot and aerial bleeding cankers along the stems, leading to crown dieback and eventually death. An unknown *Phytophthora* species was consistently isolated from necrotic bark and xylem tissue and from rhizosphere soil. Based on its unique combination of morphological and physiological characters and phylogenetic analysis, this new taxon was described as *Phytophthora acerina* sp. *nov*. Laboratory tests indicate that *P. acerina* can also infect *Fagus sylvatica* (European beech).

There is little information on the biology and ecology of this pathogen and it is also not known if native/introduced maple species in Canada are susceptible to the pathogen.

SOURCE:
B. Ginetti, S. Moricca, J. N. Squires, D. E. L. Cooke, A. Ragazzi, T. Jung. 2013. *Phytophthora acerina* sp. *nov*., a new species causing bleeding cankers and dieback of *Acer pseudoplatanus* trees in planted forests in northern Italy. Plant Pathology. http://onlinelibrary.wiley.com/doi/10.1111/ppa.12153/pdf.

Botany

6 New Pest: Stinkwort

Stinkwort, *Dittrichia graveolens* (L.) Greuter, is a member of the Asteraceae (a.k.a. Compositae) (USDA-ARS 2013) that is native to Europe. It is a relatively recent introduction to North America, having been first reported in Connecticut in the 1930's as an ephemeral weed. Since then it has become established in New York, New Jersey and, most recently, in California (FNA 1993+) where it was first found in 1994 (Ortiz 2013). Recent newspaper reports suggest that the species is expanding rapidly there along roadways and, more alarmingly, in vineyards. It is now found in 36 of 58 counties in California. The main concern in vineyards seems to that the strong odor might affect grapes used for wine, rather than its threat as a competitive weed. However, weed scientists in California are comparing stinkwort with yellow star thistle, California's most troublesome and pervasive weed (Ortiz 2013). The only known population of this species in Canada is in Nova Scotia between Amherst and Halifax along the Trans-Canada Highway (McAlpine and Smith 2010).

The current range of stinkwort suggests that it can grow to about NAPPFAST Plant Hardiness Zone 6. This would include most of the wine growing areas in Canada. If the species is found to have an economic impact on vineyards, then it could potentially be a problem, particularly with the increasing interest in wine production in this country.

SOURCES:

FNA. 1993+. Flora of North America North of Mexico. eFloras.org. http://www.fna.org/FNA/

McAlpine, D. F. and Smith, I. M., (eds.) 2010. Assessment of Species Diversity in the Atlantic Maritime Ecozone. NRC Research Press. 785 pp.

Ortiz, E. 2013. Stinkwort's fast growth could threaten California's wine growers. Sacramento Bee, Sacramento, CA.

USDA-ARS. 2013. Germplasm Resources Information Network - (GRIN) [Online Database]. http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl

Entomology

7 Survey: Trap tests for European *Agrilus* species

This study examined the efficacy of a range of traps designs and semiochemical lure choices on catching European forest buprestids. The study evaluated branch and leaf traps, visual attraction, odor baiting, and high canopy green sticky taps; two species of economic concern, *Agrilus biguttatus* and *Agrilus sulcicollis*, were attracted to both visual decoys and green plastic branch- traps. Overall, green plastic branch traps were identified as a potentially useful tool for the detection of a range of species.

Agrilus biguttatus is an aggressive oak-killing buprestid that is exotic to Canada (Kimoto and Duthie-Holt, 2006). It seems to co-occur with Acute oak decline in the U.K. and carries bacteria that are found in association with Acute oak decline symptoms.
Please refer to this edition's **Pathology** Plant Science Scan article "Update: Acute Oak Decline" for further information regarding AOC.

SOURCE:

Domingue, M. J., Imrei, Z., Lelito, J. P., Muskovits, J., Janik, G., Csóka, G., Mastro, V. C. and Baker, T. C. 2013. Trapping of European buprestid beetles in oak forests using visual and olfactory cues. Entomologia Experimentalis et Applicata 148(2):116-129. http://onlinelibrary.wiley.com/doi/10.1111/eea.12083/abstract

Kimoto and Duthie-Holt. 2006. Exotic Forest Insect Guidebook. Canadian Food Inspection Agency.

8 Biological Control: Evaluation of interspecific competition between EAB biological control agents

A recent study examined the likelihood of interspecific competition between parasitic wasps, *Tetrastichus planipennisi* and *Spathius agrili*, both introduced in the U.S. as biological control agents for the emerald ash borer (*Agrilus planipennis*). Native to northeast China, *T. planipennisi* is an endoparasite; a single EAB larvae can produce over 100 *T. planipennisi* adults. *Spathius agrili* is an ectoparasite which parasitize up to 90% of EAB larvae in its native range. Both species attack EAB at the late-instar larva stage, which could lead to competition thereby affecting establishment and decreasing their efficacy as biological control agents. In a dual choice assay, *T. planipennisi* could discriminate *S. agrili* parasitized EAB and would not attack EAB larvae 4 days after *S. agrili* pre-parasitism. This study also showed that EAB became paralyzed 2 days after *S. agrili* exposure demonstrating slow paralysis as EAB larvae are not immediately paralyzed during *S. agrili* oviposition. Having demonstrated *T. planipennisi* can discriminate *S. agrili* parasitized EAB from non-parasitized EAB, the authors predict limited *T. planipennisi* parasitism of *S. agrili* -parasitized EAB in natural habitats and suggest only low levels of competition would occur between the two species when co-released.

The Canadian Food Inspection Agency (CFIA) has approved the release of these two species China as the first biological control agents for use in Canada in an attempt to control the spread of the emerald ash borer (EAB), which has been destroying Canada's ash trees. EAB is not native to Canada and has few natural enemies here.

SOURCES:

APHIS. Biological Control of Emerald Ash Borer (*Agrilus planipennis*) http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/downloads/eab-biocontrol.pdf

Yang, S., Duan, J.J., Lelito, J. and Van Driesche (2013) Multiparasitism by *Tetrastichus planipennisi* (Hymenoptera: Eulophidae) and *Spathius agrili* (Hymenoptera: Braconidae): Implication for biological control of the emerald ash borer (Coleoptera: Buprestidae). Biological Control 65:118-123. http://www.sciencedirect.com/science/article/pii/S104996441200196X

Biotechnology

9 Update: Critical review of the last 10 years of genetically engineered (GE) crop safety research

The production and consumption of GE crops are contentious issues in Canada and around the world. Advocates of GE crops cite the potential for increased yields, profits and nutrition value and decreased environmental impacts as benefits of the technology. Opponents of GE crops cite uncertainties regarding environmental and health impacts among the primary reasons to limit their use.

A review article was recently published in Critical Reviews in Biotechnology in which the authors conclude that the past 10 years of GE crop safety research failed to detect any significant hazards directly connected with the use of GE crops. The review took 1783 scientific records into account, including original research papers, reviews, scientific opinions and reports. All records are provided in a supplementary file, including links for many of the online articles. The papers were sub-categorized under the general headings of (i) general literature (166 papers), (ii) interaction of GE crops with the environment (847 papers) and (iii) interaction of GE crops with humans and animals (770 papers).

The authors conclude that the scientific literature shows little or no evidence that GE crops lead to increased negative impacts on biodiversity, problems associated with gene flow to wild relatives, problems associated with gene flow from

a GE to a non-GE crop, horizontal gene transfer in the field or detrimental interaction of GE crops with humans and livestock. In terms of the interaction of GE crops with humans and animals, the authors examined articles dealing with topics such as substantial equivalence, non-targeted approaches to equivalence assessment, GE food/feed consumption and traceability.

The CFIA and Health Canada (HC) are responsible for regulating the environmental release, livestock feed and human food uses of plants with novel traits (PNTs), most of which are GE crops. This review article and its associated repository of scientific papers support the conclusions of previous safety assessments conducted by the CFIA and HC, and is a resource that may prove useful for future safety assessments on GE crops.

SOURCE:

Nicolia, A., Manzo, A., Veronesi, F. and D. Rosellini. 2013. An overview of the last 10 years of genetically engineered crop safety research. Critical Reviews in Biotechnology, Early Online: 1-12. http://informahealthcare.com/doi/abs/10.3109/07388551.2013.823595

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