Early field trials in pear and apple orchards have demonstrated that the phage-carrier system can reduce the incidence of diseased blossom clusters by 50 per cent. Research is continuing to identify isolates with high field efficacy, determine the mechanisms of development of phage resistance in host bacterium, develop large scale processing of phage/carrier, and to follow the environmental fate of the phages in the orchard ecosystem. The goal of this research is to develop a biocontrol system that is effective in disease control and environmentally sound.

Research Team: Dr. Antonet Svircev, Kathy Whybourne, Ed Barszcz (retired) and Karin Schneider (2003-2010), AAFC - Vineland; Dr. Peter Sholberg (retired), Dan O'Gorman and Joulie Boulé, AAFC - Summerland

Collaborators: Dr. Alan Castle, Jason Gill, Susan Lehman, Dwayne Roach, David Sjaarda, Abdelbaset Yagubi, Brock University

Controlling Moth Pests of Fruit Crops

The control of moth pests of fruit crops is becoming increasingly difficult because of insecticide resistance and changes in insecticide registrations at governmental levels. The use of synthetic sex pheromones to disrupt sexual orientation, a process commonly referred to as "mating disruption," has been successfully used to control some moth pests. Disruption is achieved by permeating the cropping environment with a synthetic pheromone that is dispensed from hollow plastic fibers, plastic tubes, or microcapsules, or by combining pheromones and insecticides to attract and kill male moths. Pheromones have low toxicity, are easy to apply and are compatible with horticultural practices and natural control agents.

Research at AAFC Vineland Research Station has supported registrations of mating disruption products for the grape berry moth, oriental fruit moth, codling moth and oblique banded leafroller. A highly effective program that integrates the use of insecticide and mating disruption for sustainable control of the oriental fruit moth has also been developed at the Vineland facility. Current research is directed towards developing basic knowledge about how pheromones work in mating disruption systems and developing technologies that can be used to support the implementation and use of this novel pest control technology.

Research Team: Dr. Mitch Trimble and Don Marshall (retired)

Minor Use Pesticides Program at Vineland

In 2003, AAFC, Health Canada's Pest Management Regulatory Agency together with industry and the provinces established the Minor Use Pesticides Program (MUPP). Vineland Station was certified by the Standards Council of Canada to conduct Good Laboratory Practices (GLP) field research trials and was established as one of nine MUPP test sites across Canada. Vineland generates data on residue and efficacy of pest control products to support registration submissions for tree fruits, grapes, berries and vegetables. MUPP research projects involve insecticides, herbicides and fungicides on peaches, cherries, plums, grapes, apples and pears, berries, vegetables and post-harvest storage treatments. In a typical year, 20 residue trials and 20 efficacy trials are completed at AAFC Vineland Station to support MUPP submissions. From 2003-2010, 23 uses of insecticides, fungicides and herbicides were registered for cherries, peaches, plums, cabbage, grapes, blueberries, apples and field peppers.

Research Team: Dr. Deena Errampalli, Mitch Pogoda (2003-2010), Robert Wismer (2011) and Lori Bittner

Collaborators: Researchers at MUPP test sites across Canada and the Pest Management Centre, Ottawa

N° AAFC 11607E

Aussi offert en français sous le titre :
Station de recherche de Vineland
Recherches d'Agriculture et Agroalimentaire Caanada

Karl Volkmar, Ph.D.
Research Manager
Southern Crop Protection and Food Research Centre (SCPFRC)
Telephone: (519) 457-1470 (206)
karl.volkmar@agr.gc.ca

Canada

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Vineland Research Station

Agriculture and Agri-Food Canada Research

Since 1911, federal scientists have played a key role in studying crop protection issues in the Niagara peninsula. The Dominion Entomological Laboratory was created in 1911 at Vineland Station to study the biology and control of insect pests of fruit. In 1912, the Dominion Laboratory of Plant Pathology at St. Catharines officially opened and began conducting research on plant disease organisms. The two facilities merged in 1960, and the present facility at the Vineland site was completed in 1968.

Today, research at Vineland Station concentrates on developing alternative and environmentally-acceptable pest management options for protecting tree fruits with the aim of replacing or reducing current pesticide use.

2011 marks the 100th anniversary (1911-2011) of the Vineland Research Station, which coincides with the 125th anniversary of the creation of the first five Agriculture and Agri-Food Canada (AAFC) research stations across Canada.

Since 2007, the Vineland Research Station has been part of a new and exciting government and industry led initiative -- the Vineland Research and Innovation Centre -- which aims to be a world-class hub of horticultural research and innovation excellence. Collaborations between Vineland (AAFC) and the Vineland Research and Innovation Centre hold a promising future for the horticulture industry.

Management of Diseases of Tree Fruits and Grapes

Early detection is an essential first step to understanding tree fruit diseases so that farmers can apply management practices in a timely fashion to preserve their crops. Vineland is currently investigating the development of molecular detection methods for fungi, in particular pathogens causing grape powdery mildew and apple scab; it is also assessing novel detection methods for the fungicide-resistant *Penicillium* species. Through an international collaborative research initiative between Canada and Israel, AAFC Vineland is studying factors involved in the resistance in grapevines against the Botrytis pathogen, which causes particularly invasive fungal disease.

The station specializes in integrated management of plant diseases, using cultural, biological and chemical control methods to reduce the use of chemical fungicides while controlling field and postharvest losses. A range of control methods for managing storage diseases in apples, pears, plums and peaches are being evaluated. One success was the discovery that two fungicides with reduced risk to humans and the environment are effective against blue and gray mold of apple and pears, and gray mold and brown rot of peaches and plums. Vineland has also shown that biological control agents such as *Pseudomonas syringae* can protect against blue and gray mold. Integrating biological control and fungicide

Canada

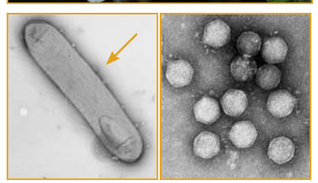
control along with new and emerging postharvest technologies are being investigated. The goal of this project is to develop fungicide-resistance storage-management strategies for tree fruit diseases.

Research Team: Dr. Deena Errampalli and Karin Schneider

Collaborators: Drs. Paul Goodwin, University of Guelph; Amir Sharon, University of Tel Aviv; Louise Nelson, University of British Columbia at Okanagan; Dr. Jennifer DeEll, OMAFRA, Simcoe; and Dr. Jay Subramanian, University of Guelph.

Pest Control Products for Potential Roles in IPM Systems for Tree Fruits and Grapes

Since 1997, AAFC researchers at Vineland have been assessing the suitability of biopesticides and newer low risk pesticides in Integrated Pest Management (IPM) and pesticide resistance management programs for tree fruits and grapes. The new products are being screened for the control of the complex of insects and mites associated with tender fruit, apples, pears and grapes. Also their effect on beneficial insects in the orchards and vineyards is being tested. Replicated field trials are conducted at the AAFC experimental farm at Jordan Station and on commercial farm locations across southern Ontario. This project benefits growers and industry by advancing the development and registration of new products. This project complements the Minor Use Pesticides Program by providing lead or advance efficacy studies to identify pesticides which are effective for needs identified by commodity groups. This is a collaborative project between AAFC,



three grower groups (Ontario Tender Fruit Producers Marketing Board, Grape Growers of Ontario, and the Ontario Apple Growers) and Crop Life members.

Research Team: Dr. Deena Errampalli and Leo VanDriel

Collaborators: Mitch Pogoda and Robert Wismer

Fruit Breeding

Pears, and more recently apples, have been the focus of Vineland's fruit breeding activities. Pears from Canada's breeding program are grown and enjoyed around the world. Cultivars such as "Harrow Sweet" and "AC Harrow Delicious" have enjoyed tremendous success in Europe. The pear breeding program at Vineland Station (formerly located at Harrow) used primarily traditional breeding methods (such as controlled hybridizations between selected parents) to develop new cultivars. The seedling orchards established here identify promising selections based on tree and fruit characteristics. Evaluations take at least 10 years followed by further testing of new cultivars prior to their commercial introduction. The end result of the pear breeding program was the introduction of new cultivars for table consumption, with improved fruit quality, regional adaptation, an extended harvest and marketing season, and increased resistance to stresses. Six cultivars were introduced to the market from the program, with three more cultivars in process. The program was successful in introducing several cultivars with resistance to fire blight, and now an apple breeding program is being developed in collaboration with the Vineland Research and Innovation Centre. This program will focus on product quality, consumer preference, market drivers and developing new technologies to enhance efficiency in apple breeding.

Research Team: Dr. David Hunter and Cheryl Collucci

Collaborators: Charlie Embree, AAFC - Kentville: Dan Thompson, CFIA - Sidney; Mina Kaviani, University of Guelph; Dr. Daryl Somers, Vineland Research and Innovation Centre

Strategies for the Eradication of Plum Pox Virus in Canada

In Canada, the plum pox virus (PPV) has had a severe impact on peach producers in the Niagara region. Research at Vineland has focused on better understanding the disease epidemiology and host range, and developing more targeted sampling and improved virus detection assays. Further studies showed that the Canadian isolate of this virus was more readily transmitted by aphids than European isolates, and oil sprays were shown to effectively reduce levels of natural spread by aphids. Natural resistance to this virus has not been found. The generation of germplasm resistant to PPV through the use of biotechnology is particularly important for providing an effective and practical long-term strategy to eradicate it from Niagara orchards and protect the tender fruit, ornamental and nursery industries. The objective of the AAFC-based research program is to identify a plant source of PPV disease resistance for developing peach, plum and ornamental *Prunus* plants resistant to PPV. This will help eradicate PPV from commercially

grown Prunus species on a national and global scale. A core research team from six AAFC laboratories is working on the generation of PPV resistant germplasm with established gene silencing technology, the development of biosafety approaches that can be used to produce transgene-free fruits with PPV resistance, and the development of highly efficient and reliable technology for gene transfer in *Prunus* species.

Research Team: Dr. Lorne Stobbs and Dr. Antonet Svircev, AAFC - Vineland; Dr. Dan Brown, Dr. Lining Tian and Dr. Aiming Wang, AAFC - London; Dr. Brian Miki, AAFC - Ottawa; Dr. Helene Sanfaçon and Dr. Tom Lowery, AAFC - Summerland

Collaborators: Dr. Jay Subramanian, University of Guelph and Dr. Islam El-Sharkawy

Biopesticides for Control of Fire Blight in the Orchard

Researchers at AAFC and Brock University have developed a novel approach to control fire blight in the orchard. The system relies on using microorganisms commonly found in the orchard ecosystem to control the fire blight pathogen. Bacteriophages (or simply "phages") are bacterial viruses that infect specific host bacteria, replicate inside it, and then kill the host cell to release the new phages. *P. agglomerans* has a dual role in this system, acting as a biological control agent and as a carrier for the phages. The carrier permits the continuous production of fresh, infective phages on the flower surface, while competing with the pathogen for the ecological niche provided by the blossom.