Elimination of Viruses from the USDA *Pyrus* Germplasm Collection

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Abstract

The national genebank for *Pyrus* in the U.S.A. is maintained by the United States Department of Agriculture, Agricultural Research Service at the National Clonal Germplasm Repository in Corvallis, Oregon. This collection represents world diversity for pears and includes over 1700 accessions representing the 26 major taxa of *Pyrus* and their hybrids. Clonal genotypes are stored as orchard trees with approximately 10% of the collection backed up as in vitro cultures. Wild species are represented as orchard trees and as seed collections. Clonal accessions are screened for latent viruses by graft inoculation to a range of woody indicator plants. Since 1983 more than 650 virus-infected pear clones have been detected in the collection. Infected clones are subjected to alternating temperature heat-therapy followed by apical meristem culture to generate virus-free replacement plants. More than 400 virus-infected clones have been replaced with heat-treated meristem derived trees. Presently, 77% of the clonal *Pyrus* accessions and more than 86% of the pear cultivars at the U.S. pear genebank are available as virus tested trees.

INTRODUCTION

The United States Department of Agriculture, Agricultural Research Service maintains a world collection of *Pyrus* germplasm at the National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon. This collection represents the 26 major taxa of *Pyrus* and their hybrids. Wild species from around the world are represented by seed collections and by specimen orchard trees. Clonal genotypes, including varieties cultivated for eating and for use as rootstocks, are stored as orchard trees with approximately 10% of the collection duplicated as in vitro cultures (Hummer, 1993). Nearly 1700 accessions are preserved clonally and 267 accessions are seedlots. The clonal collection consists of nearly 1500 unique genotypes including 92 Asian and 623 European cultivars. This paper summarizes efforts since 1983 to detect and eliminate viruses and virus-like pathogens from the clonal pear germplasm stored at NCGR Corvallis.

MATERIALS AND METHODS

Clonal accessions are screened for latent viruses by inoculation to a range of woody indicator plants as recommended by the ISHS working group on fruit tree viruses (1998). Indicators such as *P. communis* 'Nouveau Poiteau', *Pyronia veitchii* and *Malus micromalus* are inoculated in the glasshouse where infected trees produce symptoms in 4-10 weeks. The cultivar Beurré Bosc is used as an indicator for stony pit virus, but requires several years in the field to show fruit symptoms following inoculation.

Viruses are eliminated from infected trees by a combination of heat therapy and micro-propagation. Infected trees are grown at temperatures alternating every 4 hours between 30 and 38 °C. After about 3 weeks, new shoot tips are removed and apical meristems (<.5 mm) are dissected and grown in vitro (Postman, 1994). When in vitro shoots are about 1 cm in length they are removed from tissue culture, grafted onto young pear seedling rootstocks, and covered by a bottle to maintain high humidity for several weeks while a graft union forms. Following at least 1 dormant season the new trees are retested for viruses.

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RESULTS AND DISCUSSION

Since 1983 more than 650 virus-infected pear clones have been detected in the NCGR collection. Approximately 65% of European cultivars and 57% of Asian cultivars received at the repository were found to be infected with one or more viruses (Table 1). More than 400 virus infected clones have been replaced with heat-treated, meristem derived trees. Presently 77% of the clonal *Pyrus* accessions and more than 86% of the pear cultivars at the U.S. pear genebank are available as virus tested trees. Catalogs of all NCGR *Pyrus* accessions with links to additional information about the germplasm collection are available from the Repository web site at http://www.ars-grin.gov/cor.

Literature Cited

Hummer, K. 1993. Genetic resources of Pyrus and related genera at the Corvallis Repository. Acta Hort. 367:64-71.

ISHS International Working Group on Fruit Tree Viruses, 1998. Detection of virus and virus-like diseases of fruit trees. Acta Hort. 472:761-780.

Postman, J. D. 1994. Elimination of viruses from clonal pear germplasm. Acta Hort. 367:72-75.

Table

Table 1. USDA/ARS National Clonal Germplasm Repository *Pyrus* Collection, September 2000.

Total Seed Accessions 267
Total Clonal Accessions 1669

	Unique Clonal Accessions	Percent Available as Virus Tested Trees
Asian Cultivars	92	77%
European Cultivars	623	89%
Hybrid Cultivars	59	71%
Rootstock Clones	128	85%
Species Clones	463	92%