

A scenic view of a waterfall, likely the Horseshoe Falls in Niagara Falls, Ontario, Canada. The waterfall is the central focus, with water cascading over a rocky ledge. In the foreground, a large, leafless tree with thick, dark branches frames the top and right sides of the image. The sky is a clear, pale blue. In the distance, a large building is visible on the opposite bank of the river. The overall atmosphere is serene and natural.

Overview of the Vineland Series Apple Rootstocks

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Presentation Overview

Vineland Series Apple Rootstocks

- Description
- Attributes
- Availability

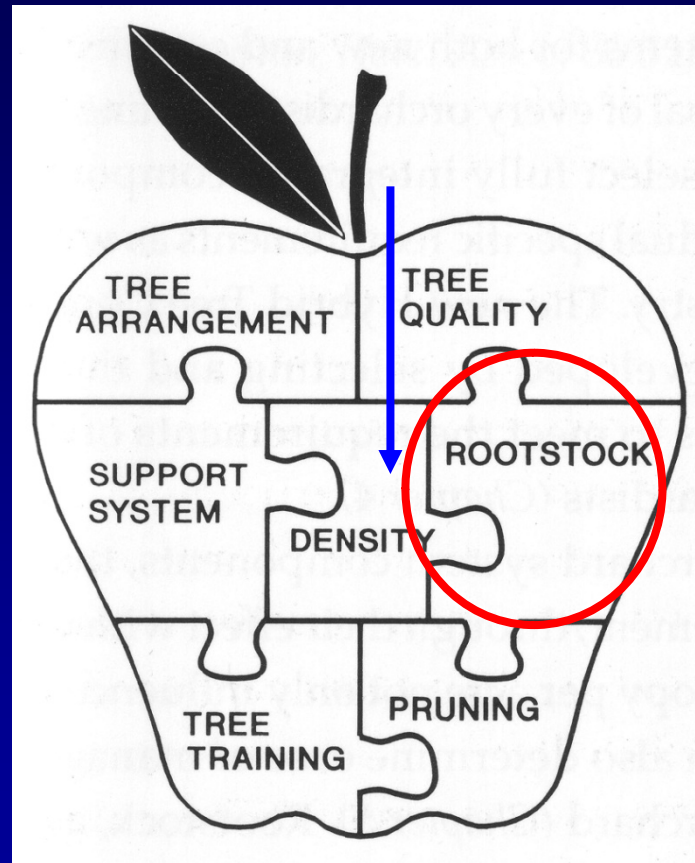
Rootstock differences can be subtle but significant



Precocity, productivity, size control, disease resistance, cold hardiness, replant tolerance

The Orchard System Puzzle

(Barritt, 1992)



FACTSHEET



ORDER NO. 00-007

MARCH 2000

AGDEX 211/36

Ontario Ministry of Agriculture,
Food and Rural Affairs

APPLE ROOTSTOCKS

K.R. Wilson

(Replaces Factsheet "Apple Rootstocks", Order No. 90-118 and portions of Publication 334, *Rootstocks for Fruit Trees*)

High land values and increases in all other farming costs make it imperative that apples be produced economically and an early return on the investment be realized. The use of appropriate apple rootstocks has greatly improved the economics of growing apples.

Apple trees are not grown on their own roots but propagated on rootstocks that control the tree. Dwarfing rootstocks control wood production in the tree, directing its energy into fruit production. By choosing the rootstocks for your needs and soil conditions, you can preselect, to a considerable extent, the size of your orchard trees at maturity. This choice, in itself, can save a great deal of labour in pruning and picking, and time waiting for your trees to start cropping.

Dwarf trees grow apples where most, if not all, of the fruit can be picked without ladders. To improve efficiency in the picking operation and to increase yield per hectare, dwarf to semi-dwarf trees are planted at close intervals in the rows. This type of high-density planting provides a continuous tree wall of bearing surface to be sprayed and picked, thus reducing waste of time and materials.

High-density relates to maximum light interception by the leaves of the trees rather than specifically to the number of trees per hectare. For maximum light interception to occur, a minimum amount of sunlight is lost on the ground between trees. It has been shown that fruit size and total fruit production increases when light interception and utilization are increased. In general, the more dwarfing the rootstocks, the better they lend themselves to high-density planting, with early economic return.

Most of the rootstocks available for apples were not bred or selected for winter hardiness in Canada. Consequently, the roots or stems suffer cold injury occasionally in certain locations across Ontario. Avoid excessive cultivation or feeding that induces late, immature growth. Sod cover with mulch under the trees provides protection for the roots against extremes of temperature.

Depending on which rootstock is used, apple trees may be broadly classified into 4 categories: dwarf, semi-dwarf, semi-vigorous or semi-standard, and vigorous or standard size. These are relative terms. Tree size at any age will vary with the cultivar, the soil, nutrition, pruning practices, amount of cropping, and climate.

The number of rootstocks available commercially for dwarfing apple trees is steadily increasing. Not all of these rootstocks are suitable for apple production in Ontario. Before selecting a rootstock be sure to research the options available. There are varying opinions on the performance of the different rootstock depending on the environment under which they have been evaluated. The rootstocks listed in this factsheet are the ones believed to have the most promise for Ontario growing conditions.

DWARF

These rootstocks have the added advantage of being very precocious, with high yield efficiency. This allows growers to change cultivars as necessary without extended periods of lost production. The traditional concept that an orchard is a lifetime venture must be abandoned considering the economic pressures of today.

Since the fruiting canopy is so close to the ground with dwarf rootstocks, do not plant on sites where accumulation of cold air causes frequent frost conditions during the spring. Under such circumstances, loss of a crop can lead to excessive regrowth and crowding, which may prove difficult to control. Where heavy snow accumulations occur, limbs of trees on dwarf rootstocks may be damaged or pulled from the trunk as the snow melts or settles.

Dwarfing rootstocks have a limited root volume and benefit from supplemental irrigation in dry seasons and in droughty soils. Dwarfing rootstocks also benefit from total tree support for the life of the orchard.

BRINGING THE RESOURCES OF THE WORLD TO RURAL ONTARIO

Vineland Rootstocks



Orchard and Vineyard Show, Traverse City, MI – Jan 21-22, 2009

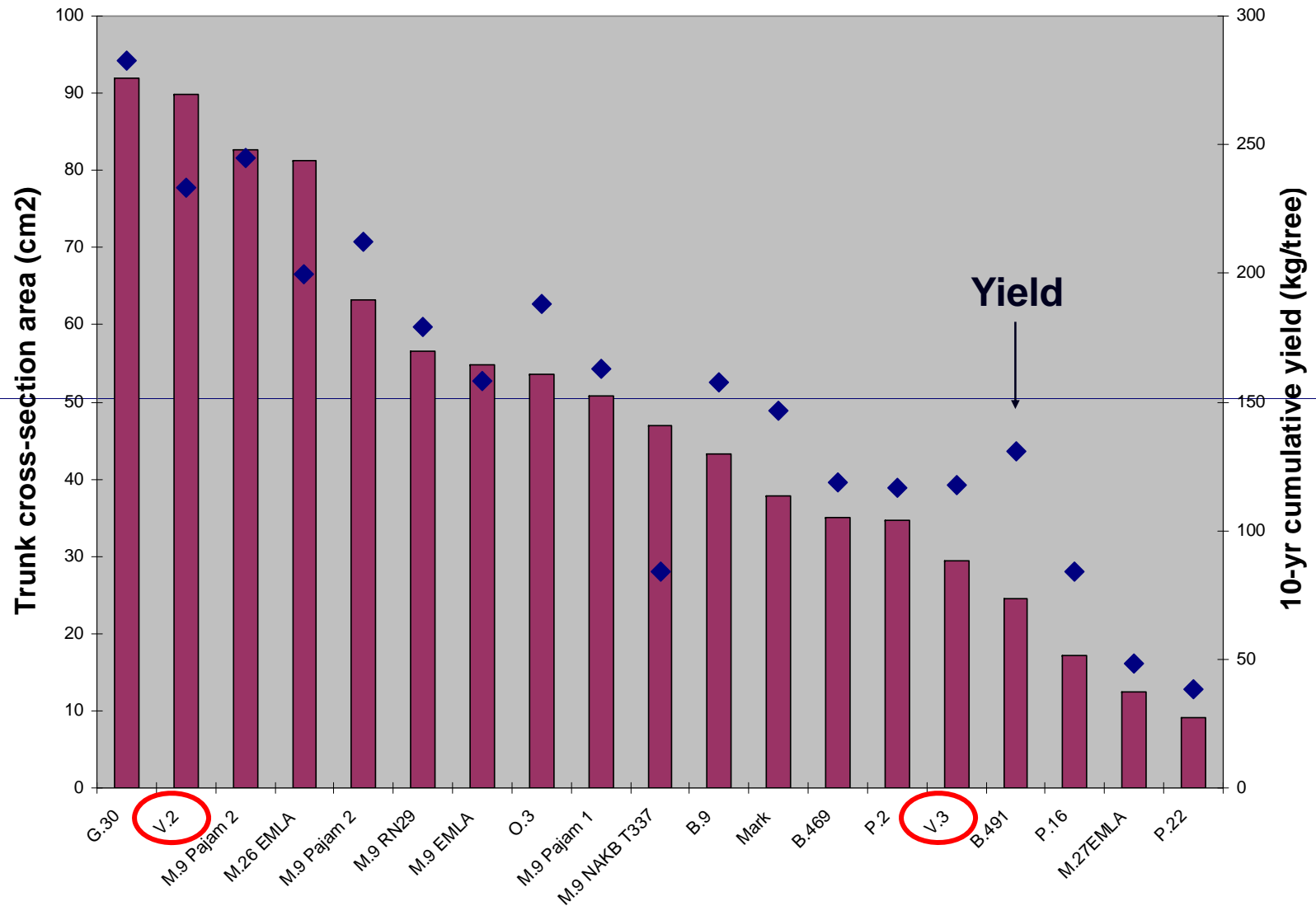


Description

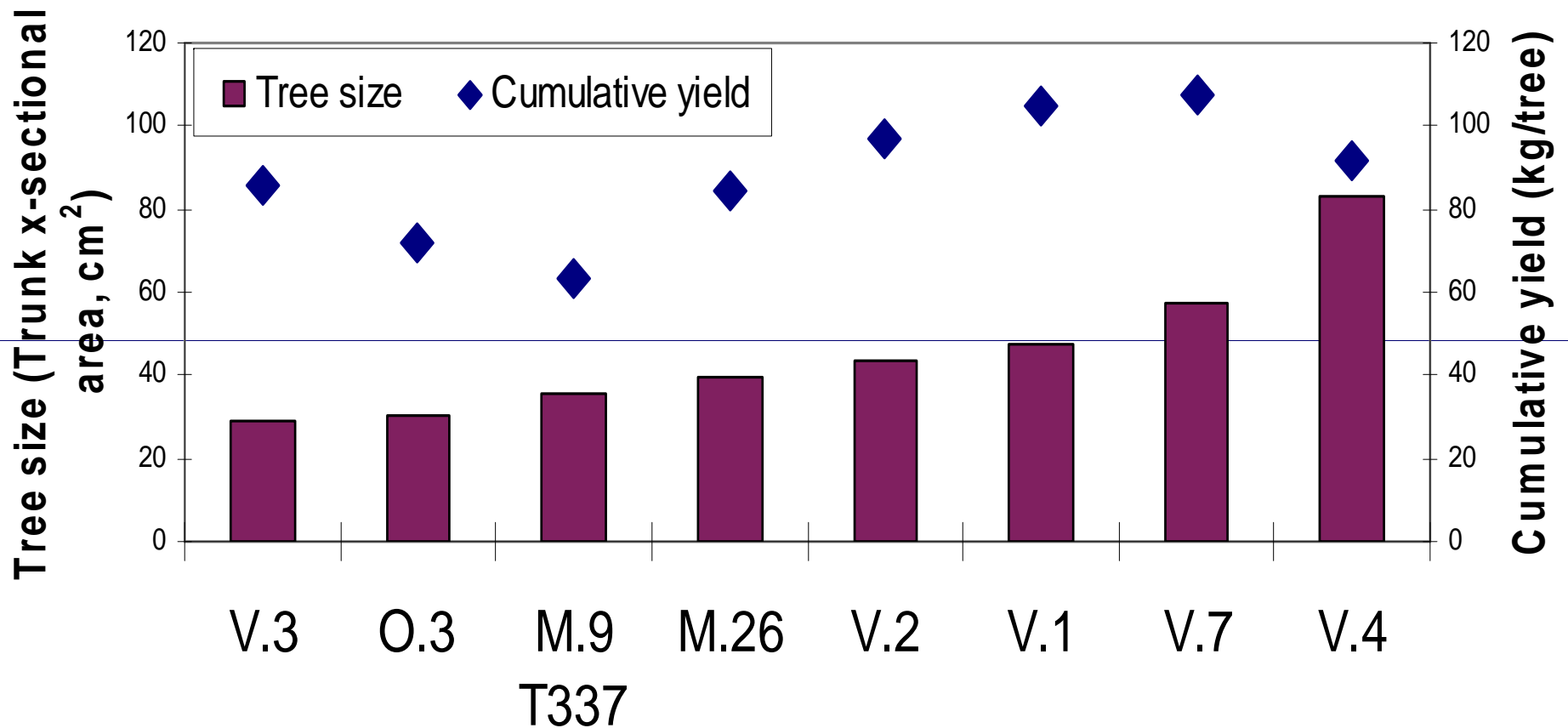
- Developed by Dr. Alec Hutchinson
- 'Kerr' applecrab x 'M.9' rootstock
- Seven rootstocks in the series ('V.1', 'V.2'-'V.7')
- Tested in 1980 (Washington, Ohio)
- Tested in 1994-2003 (NC-140)
- Tested in Simcoe 1997, 2002
- Tested in Manitoba and Edmonton (1997-)

Excluded V.5
and V.6

Tree size and cumulative yield of 10-yr-old Gala on 20 rootstocks



Mean tree size and cumulative yield for 10-Yr-old trees on various Vineland rootstocks



Cumulative Yields

Honeycrisp

- No statistical difference among roostocks

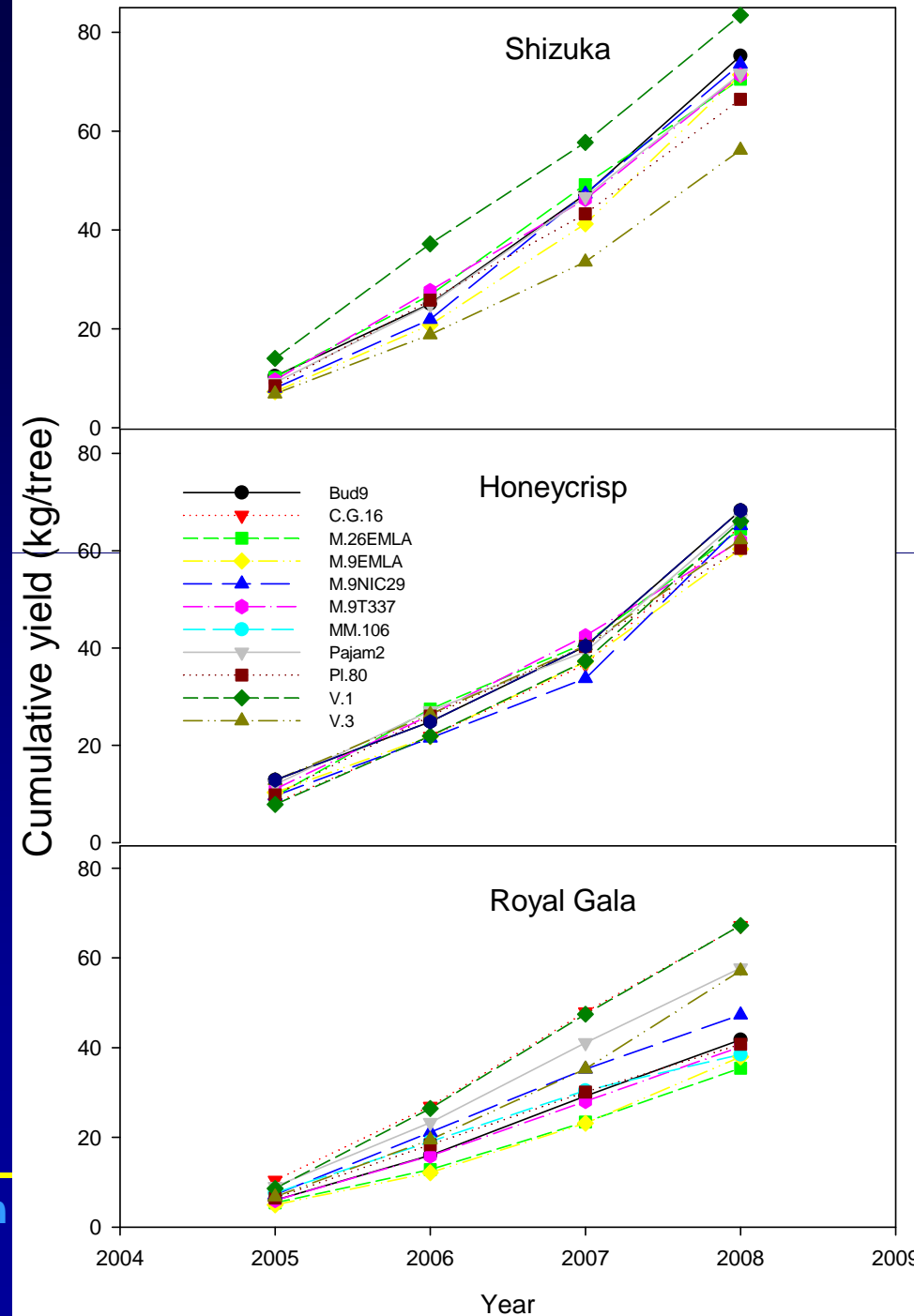
Royal Gala

- V.1 – 190% of M.26
- V.3 – 161% of M.26
- Bud.9 - 118% of M.26
- M.9E – 107% of M.26
- C.G.16 – 190% of M.26

Shizuka (No statistical difference)

- V.1 – 118% of M.26
- V.3 – 78% of M.26
- Bud.9 - 107% of M.26
- M.9E – 101% of M.26

Orchard and Vineyard Show, Traverse City, MI – Jan



TCSA – 7 Years

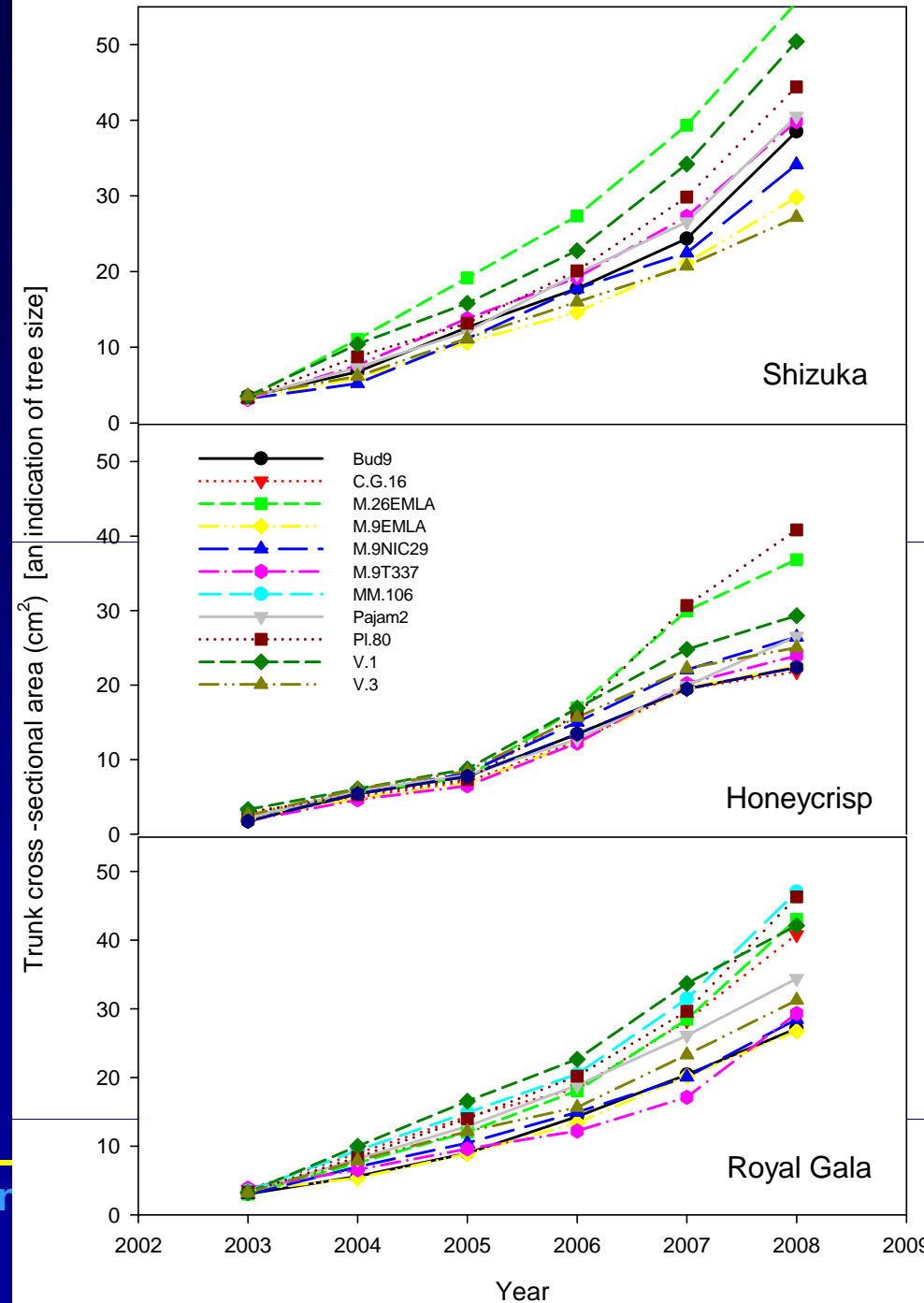
Tree Growth

- Honeycrisp < Royal Gala < Shizuka

For Honeycrisp

- V.1 – 81% of M.26
- V.3 – 70% of M.26
- Bud.9 - 62% of M.26
- M.9E – 66% of M.26

Orchard and Vineyard Show, Traverse City, MI – Jan



TCSA – 7 Years

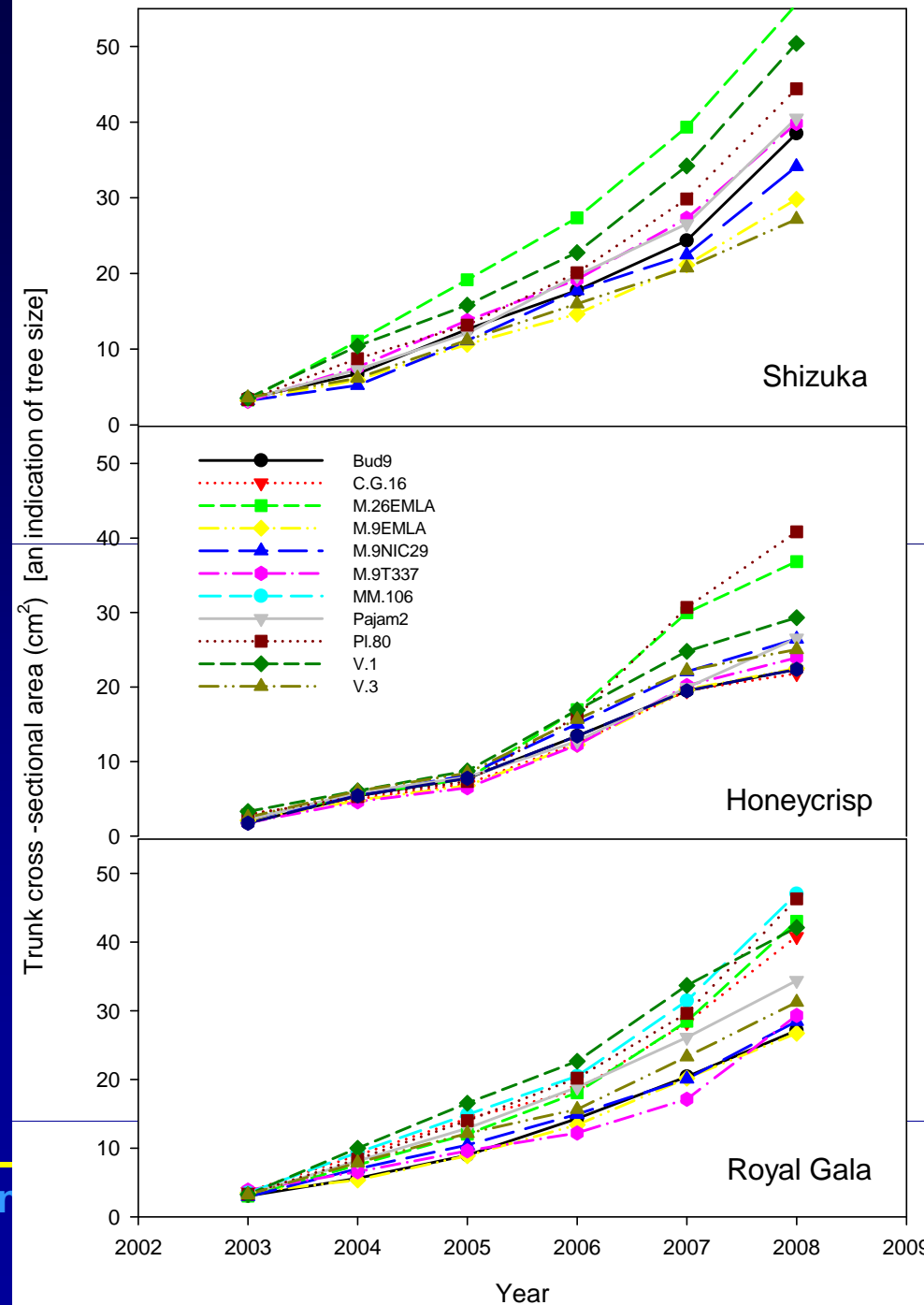
For Royal Gala

- V.1 – 98% of M.26
- V.3 – 78% of M.26
- M.9 – 66% of M.26
- Bud.9 – 64% of M.26

For Shizuka

- V.1 – 92% of M.26
- V.3 – 60% of M.26
- M.9 E – 60% of M.26
- Bud.9 - 67% of M.26

Orchard and Vineyard Show, Traverse City, MI – Jan



Royal Gala/M.26



, MI – Jan 21-22, 2009



Royal Gala/V.3

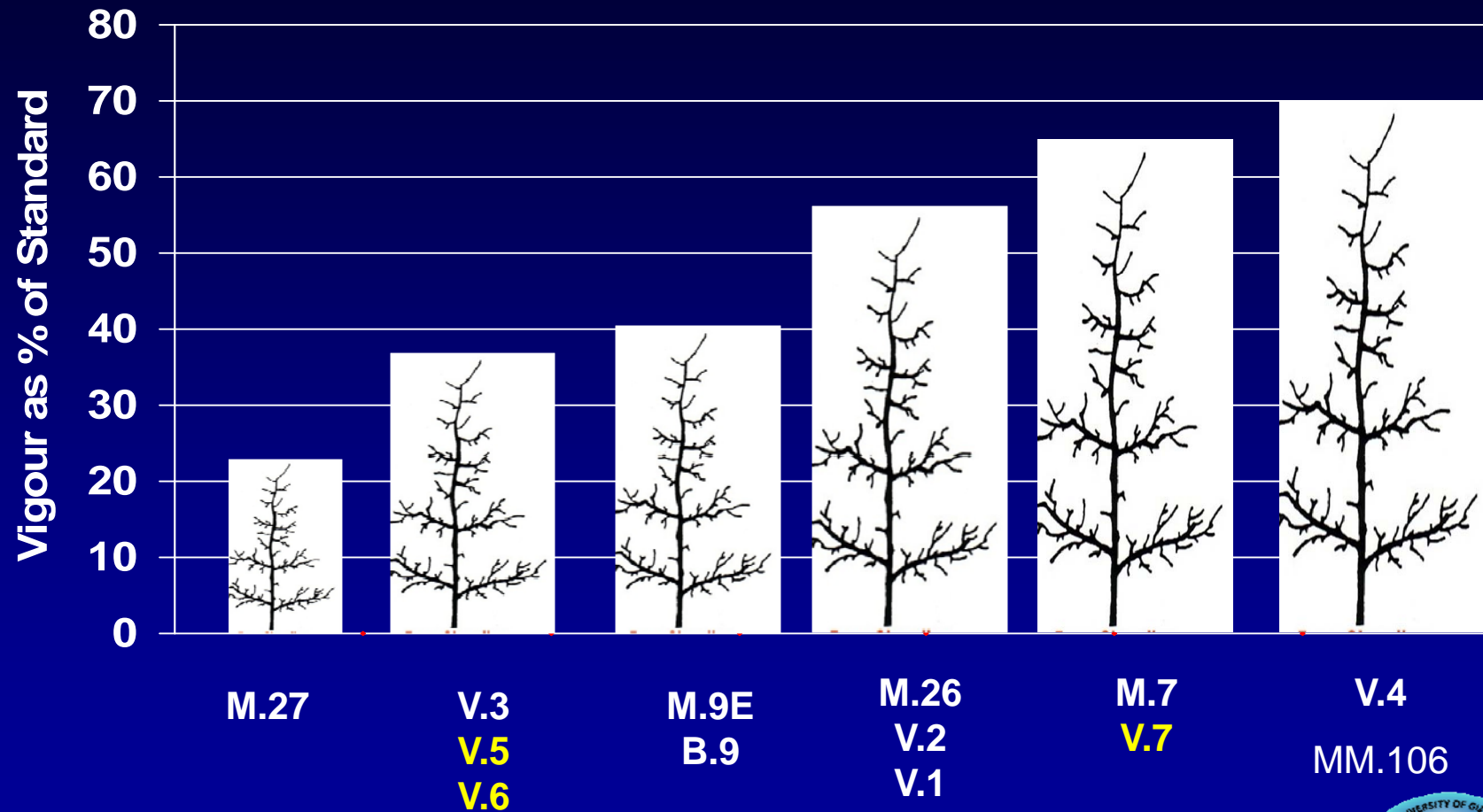


Royal Gala/V.1



y, MI – Jan 2

Dwarfing Characteristics of the Vineland Series Apple Rootstocks



Other Attributes

- Cold hardiness
 - Demonstrated in Edmonton planting
- Fireblight resistance
 - Orchard (OHIO) and lab evidence



FOR IMMEDIATE RELEASE

SEPTEMBER 24, 2004

Contact: Linda McCandless, 607-254-5137, email llm3@cornell.edu

Cornell-developed apple rootstocks survive extreme winter

By Aaron Goldweber

GENEVA, NY: Last winter a "perfect freeze" in New York's Champlain Valley destroyed nearly 25,000 apple trees, resulting in losses projected to be as high as \$2.5 million. Out of this devastation comes the encouraging report that two new Cornell-developed rootstocks show strong resistance to unusually harsh conditions.

"The new rootstocks in our trial tolerated this cold snap and survived extremely well compared to those in growers' orchards on standard rootstocks," said Terence Robinson, associate professor in the department of horticultural sciences at the New York State Agricultural Experiment Station (NYSAES) in Geneva, NY. Among five rootstocks showing the most hardiness were Geneva 30 and Geneva 16, which exhibited 96 and 92 percent survivability, respectively.

In commercial orchards, apple varieties are grafted onto rootstocks that help growers control tree size and productivity, and manage pests, diseases, and environmental stress. During a 20-year period from the mid-1970s through the mid-1990s, two Cornell researchers working at the NYSAES, James Cummins and Herb Aldwinckle, developed the apple rootstocks for tolerance to fire blight, a devastating bacterial disease.

"Their survival this past winter demonstrates another important characteristic-extreme cold-hardiness," said Robinson, who specializes in tree fruit systems. He and Kevin Jungerman, extension associate with Cornell Cooperative Extension's Northeast New York Commercial Fruit Program, have a five-acre, 3,200-tree rootstock trial comparing 16 rootstocks at Chazy Orchards in the Champlain Region.

Planted in 2001, trees in the trial were in a unique location to show the effects of the 2003-04 winter, which was one of the harshest of the last 50 years. The stress of bearing the large apple crop of 2003 coupled with mild temperatures in the fall and early winter made the apple trees extremely vulnerable to conditions that followed. A late-December and early-January thaw was followed by rains that saturated the ground and eliminated the snow cover that usually insulates tree roots. In the space of 24 hours, the mercury plunged to extreme sub-zero temperatures and stayed there. The freeze penetrated the soil and damaged root systems, especially those of trees that were three to five years old.

According to a survey taken in June by Jungerman, 24,632 trees were lost coming out of the 2003-04 dormant season. This number is on the rise now that the consequences of summer stress and cropload are showing at harvest. Trees that initially appeared to survive are now seen as lost. The survey showed the freeze killed trees of all ages, but hit younger and more productive trees hardest.

The 25,000 trees lost represent only about five percent of the county's apple trees, but they were predominantly young orchards representing the recent investments by growers and the future production of the area. Growers will have to make considerable new investments to replant the lost orchards.

The economic impact of the loss will not be clear for some time, but Robinson has some numbers that can be used as a starting point. "Each tree that is three- to five-years-old and is killed represents a \$50 loss if it was McIntosh and a \$100 loss if it was Honeycrisp," he said. "Even working with the assumption that all of the lost trees were McIntosh, the current losses represent \$1.23 million. And that doesn't include the cost of replanting." This monetary loss includes the original tree cost and the lost production time while waiting for replacement trees to begin bearing fruit.

To avoid the same level of damage in the future, growers are advised to choose wisely among commercially

Pictures are linked to hi-res scans



SUGGESTED CAPTION: Roger (center) and Mason Forrence (right) of Forrence Orchards in Peru, NY, show Susan A. Henry, dean of Cornell University's College of Agriculture and Life Sciences, a dead McIntosh apple tree whose rootstock was killed during last winter's freeze. Damages from the loss of 25,000 apple trees in New York's Champlain Valley could approach \$2.5 million. CREDIT: L. McCandless/Cornell

available rootstocks when replanting.

"Although Geneva 16 and 30 are relatively new, they have been tested in several locations in New York and around the country, so they are ready for use now," said Robinson. "Growers who plant these stocks will have the benefits of using the most highly productive and disease-resistant rootstocks around and will have some insurance against tree death from this type of winter damage."

Growers may not be able to replant these new rootstocks immediately because the rootstocks are at the beginning of commercialization and not yet readily available. Three Canadian rootstocks in the trials also showed strong survival rates. These included Ottawa 3, Vineland 1, and Vineland 3.

"Growers may have to leave their plots open while they wait for commercial stock to become available, but that small amount of time will be a big help in the future of the farm," said Robinson. "This exact type of winter cold snap may not happen for another 50 years, but if another event like 2004 comes, growers will protect themselves from losses by planting the new stocks."

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■ *“Three Canadian rootstocks in the trials also showed strong survival rates. These included Ottawa 3, Vineland 1, and Vineland 3.”*

■ *(Cornell University Press Release, Sept 24 2004)*



Summary of the characteristic and availability of the Vineland Apple Rootstocks

	Commercially Available			Under Test			Will not be commercialized
Characteristic	V.1	V.2	V.3	V.5	V.6	V.7	V.4
Tree Vigor	M.26 size	M.26 Size	M.9E size or slightly smaller	M.9E Size or slightly smaller	M.9E Size or slightly smaller	M.7 Size	MM.106- MM.111 Size
Availability	Cameron Nurseries (cameronnursery.com)	Not commercially available	DNA Gardens, Elnora, Alberta (dnagardens.com)	Not commercially available	Not commercially available	Not commercially available	Not available
Yield Performance	Similar or better than M.26	Similar or better than M.26	Similar to M.9E	NA	NA	Excellent, better than M.26E	Similar to M.26
Yield Efficiency	Similar or better than M.26	Similar or better than M.26	Similar to M.9E	NA	NA	Better than M.26	
Features	Cold Hardy, displays fireblight resistant	Cold Hardy, displays fireblight resistant	Cold Hardy, displays fireblight resistant	NA	NA	Cold Hardy, displays fireblight resistant	Cold Hardy, displays fireblight resistant

NA = not available (rootstock has not been tested)

Availability

- Commercial development by the University of Guelph and the Ontario Ministry of Agriculture.
- 'V.1', 'V.2' and 'V.3' have been licensed
- More information is required to determine the suitability of commercializing 'V.5', 'V.6', and 'V.7'.
- 'V.2' has been commercially released but has been difficult to propagate in the nursery, therefore it may have limited availability.
- 'V.4' will not be commercialized.

Further Information

- Contact the author (John Cline, Univ of Guelph)
- Dr. Stephen Bowley, Business Development Office, University of Guelph
(www.uoguelph.ca/research/bdo/)

Tel: (519) 824-4120 Ext 58704

www.nc140.org

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NC-140 Means Better Roots

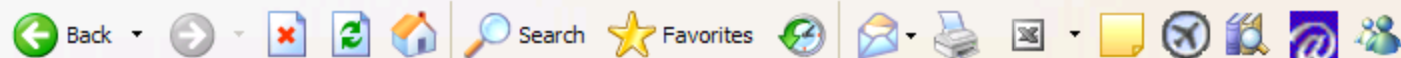


North-Central Regional Association of Agricultural Experiment Station Directors (NCRA)

- [NC-140 Regional Rootstock Research Project](#)
- [2004 Annual Meeting Information](#)
- [Contact Information by State \(Project Leaders\)](#)
- [Impacts and Research Needs Statement](#)
- [Rootstock Planting Trials](#)
- [2003 Annual Meeting Minutes / 2003 Annual Report](#)
- [Annual Meeting Minutes](#)
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Welcome to the NC-140 Regional Rootstock Research Project. The goal of these pages is to disseminate research information generated by pome fruit rootstock research projects throughout North America that are part of the NC-140 Regional Research Project. Additionally, the site offers NC-140 researcher and

start Internet 8:59 AM



- [Project Publications](#)
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Current Plantings

2002 Peach Rootstock Trial (Scott Johnson)

[2002 Apple Rootstock Trial \(Wes Autio\)](#)

[2001 Peach Rootstock Trial \(Greg Reighard\)](#)

[1999 Dwarf Apple Rootstock Trial \(Wes Autio\)](#)

[1999 Semi-dwarf Apple Rootstock Trial \(Wes Autio\)](#)

1998 Cherry Rootstock Trial

- [NC-140 Cherry Rootstock Pages](#)
- [Preliminary Performance of Hedelfingen Cherry on Ten Rootstocks in the 1998 NC-140 Cherry Rootstock Trial](#)
- [Preliminary Performance of Montmorency Cherry on Eleven Rootstocks in the 1998 NC-140 Trial](#)

1998 G.16 Apple Rootstock Trial (Terence Robinson)

[1994 Peach Rootstock Trial \(Greg Reighard\)](#)

[1994 Gala Dwarf Apple Rootstock Trial \(Rich Marini\)](#)

[1994 Gala Semi-dwarf Apple Rootstock Trial \(Rich Marini\)](#)