

EXTENSION

Utah State UNIVERSITY

Rootstock Trials in Utah and the U.S.

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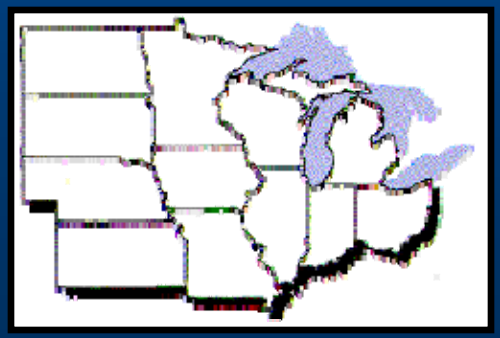
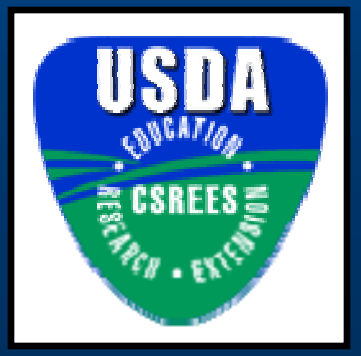
NC-140 Regional Research Project

- **Multi-state cooperative research**
- **Funded through the State Agricultural Experiment Stations**
- **Organized by the North-Central region Experiment Station Directors**







NC-140 Regional Research Project:

Current participants (30 states, 6 non U.S. entities)

U.S.

- Arkansas
- California
- Colorado
- Georgia
- Iowa
- Illinois
- Indiana
- Kansas
- Kentucky
- Massachusetts
- Maryland
- Maine
- Minnesota
- Missouri
- North Carolina
- Nebraska
- New Jersey
- New York
- Ohio
- Oregon
- Pennsylvania
- South Carolina
- South Dakota
- Tennessee
- Utah
- Vermont
- Virginia
- Washington
- Wisconsin
- West Virginia

Outside U.S.

- Canada
  - British Columbia
  - Ontario
  - New Brunswick
  - Nova Scotia
  - Quebec
- Mexico



NC-140 Regional Research Project: Objectives

1. To evaluate the field performance of pome and stone-fruit rootstocks in various environments and under different management systems.
2. To improve propagation techniques.
3. To develop improved rootstocks through breeding and genetics, and to acquire new rootstocks from worldwide sources.
4. To understand the developmental and stress physiology of rootstock/scion interactions.



Crops of interest to NC-140

- **Pome fruits**
  - **Apple**
  - **Pear**
- **Stone fruits**
  - **Peach**
  - **Sweet Cherry**
  - **Tart Cherry**
  - **Apricot**
  - **Plum**

How it works

- Crop coordinator oversees experiments for each crop
  - Terrence Robinson coordinates apple trials
  - Scott Johnson and Greg Reighard coordinates peach trials
- Coordinator proposes new experiments for that crop and develops specific guidelines for running the experiment
- Representatives from each state decide whether or not their state will participate
  - Utah's representative was Dr. L. Anderson and then T. Lindstrom
- Participating states then carry out a standardized multi-site experiment

Crops of interest: Utah

Utah's current participation

- **Apple (5)**
- **Peach (2)**
- **Sweet cherry (1)**
- **Tart cherry (1)**

Evaluation criteria

- Plant survival and vigor – under different conditions in multiple environments
- Productivity – yield and fruit size
- Precocity – how soon will it begin to produce
- Potential incompatibility –
  - Graft union failure
  - Root suckering
- Yield efficiency – Fruit per wood
  - Determines potential for high density planting
  - Units = yield per trunk area

Apple Study



Apple Study

- **Planted in 1999**
- **Scion variety**
  - **Fuji (7) – Kentucky, Missouri, North Carolina, Pennsylvania (2), South Carolina, Utah**
  - **McIntosh (10) – Massachusetts, Michigan, Minnesota, New York (2), Nova Scotia, Ontario, Pennsylvania, Vermont, Wisconsin**

Apple Study

Two sets of rootstocks

- **Dwarf**
  - **Trained to supported Vertical Axis**
  - **Spacing ~ 10’ x 16’ (270 trees per acre)**
  - **12 rootstocks**
- **Semi-dwarf**
  - **Trained to unsupported Central Leader**
  - **Spacing ~ 13’ x 20’ (170 trees per acre)**
  - **3 to 9 rootstocks (Utah has 5)**

Apple Study

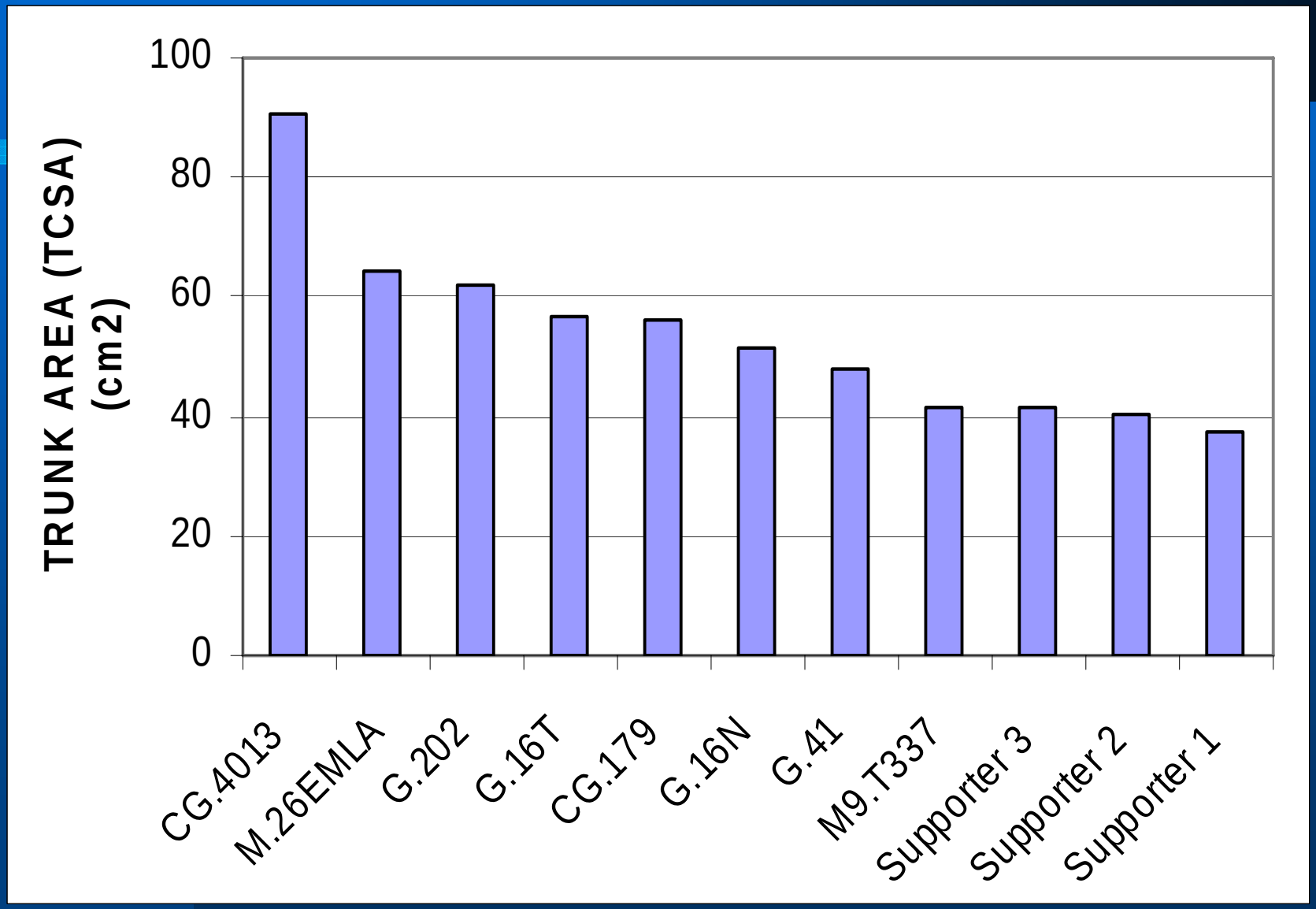
- **Dwarf stocks**
  - **M.9 T337**
  - **M.26 EMLA**
  - **Supporter 1, 2, and 3**
  - **CG.4013, CG.5179, G.202, G.41, G.935, G16N, G16T**
- **Semi-dwarf**
  - **M.7 EMLA**
  - **M.26 EMLA**
  - **G.30N**
  - **CG.4814, CG.7707**

Apple Study: Survival

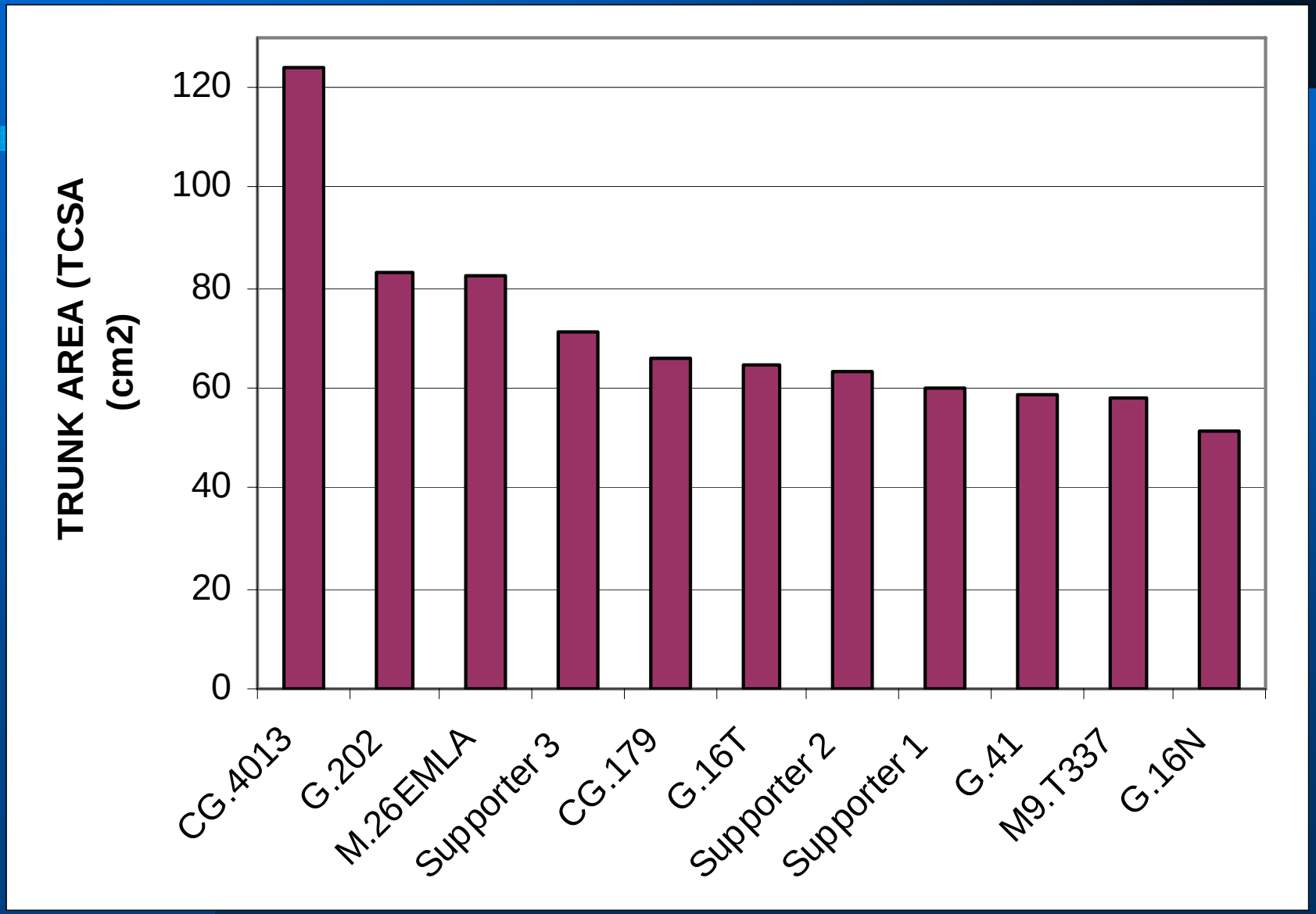
Started with six trees of each

- **Dwarf Rootstock Study**
  - **M.26 EMLA – 1 tree to fireblight**
  - **M.9 T337 – 3 trees to fireblight**
  - **G.16T – 2 weak trees, died during establishment**
  - **CG.3041 – 1 tree, possible *Phytophthora***
- **Semi-dwarf Rootstock Study**
  - **M.26 EMLA – 3 trees to fireblight**

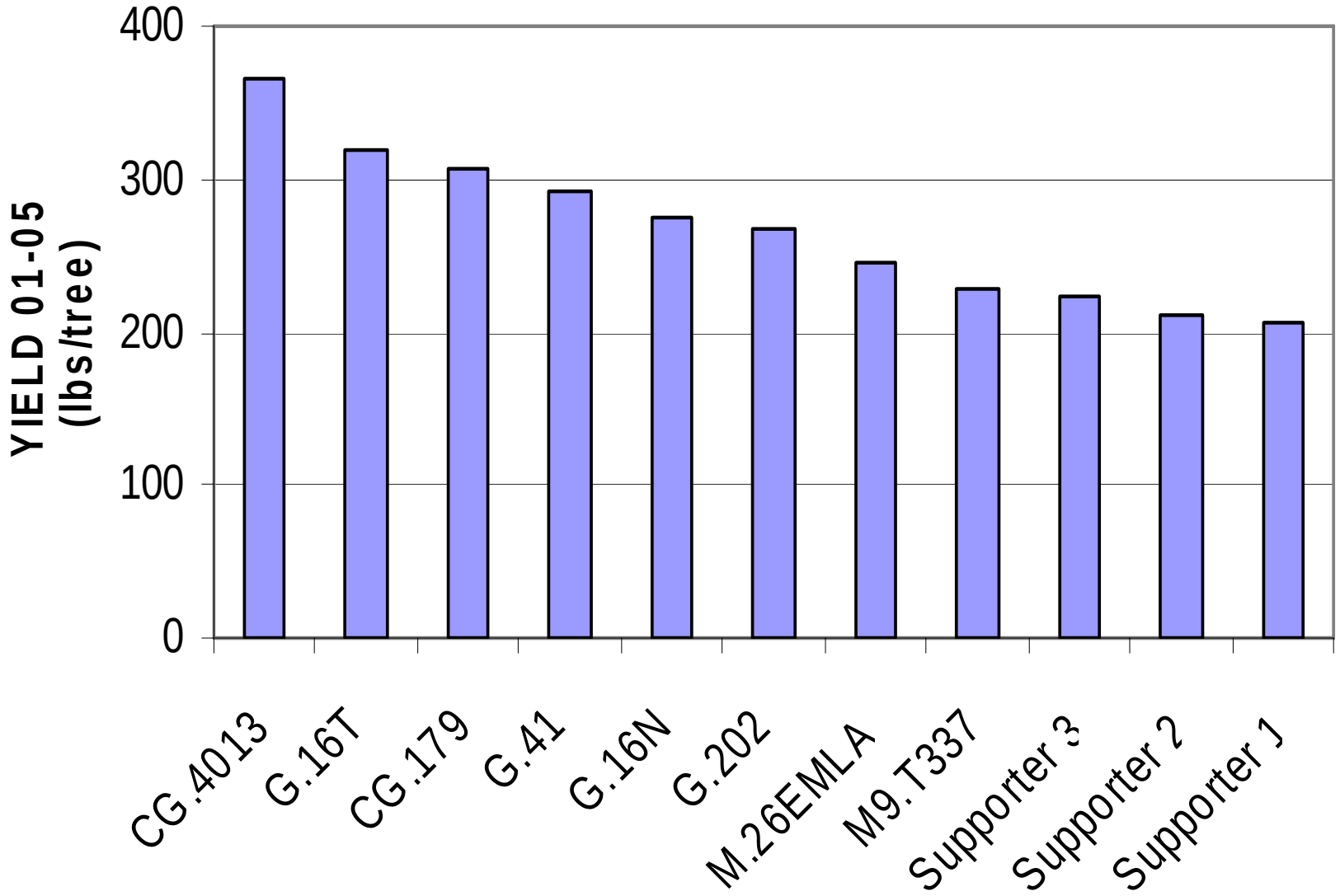
Dwarf Apple: Tree size – all sites



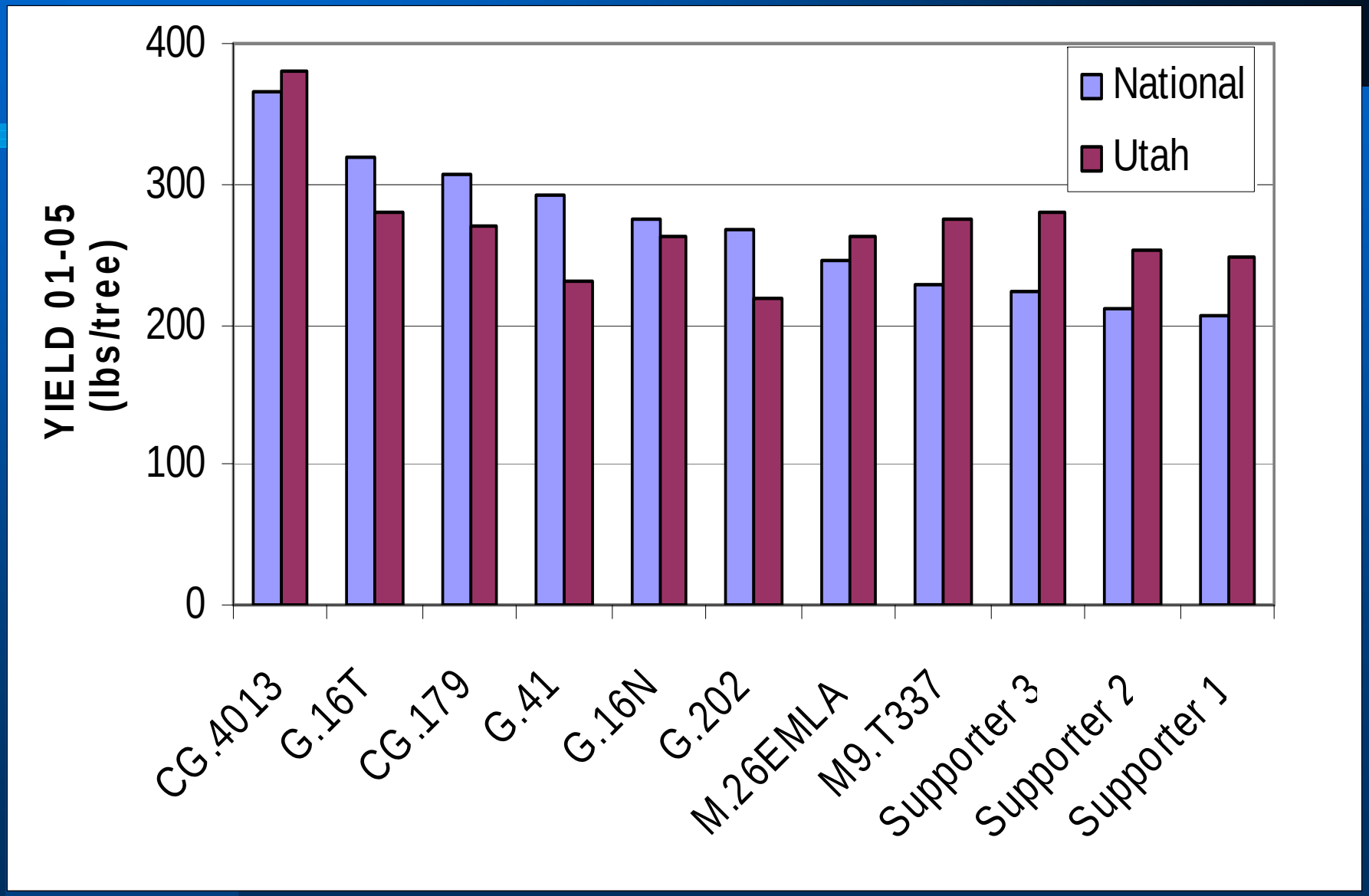
Dwarf Apple: Tree size - Utah



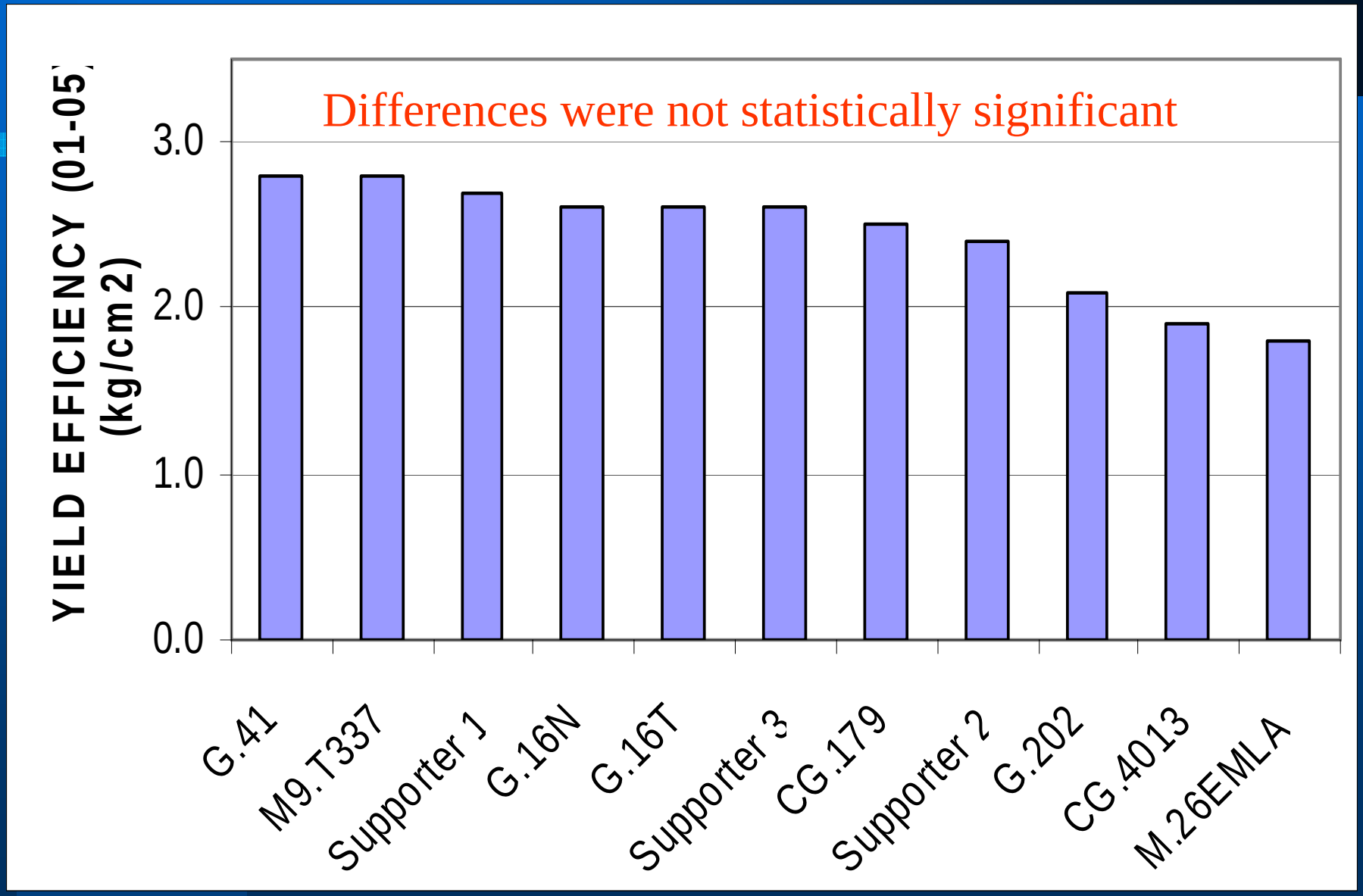
Dwarf Apple: Yield



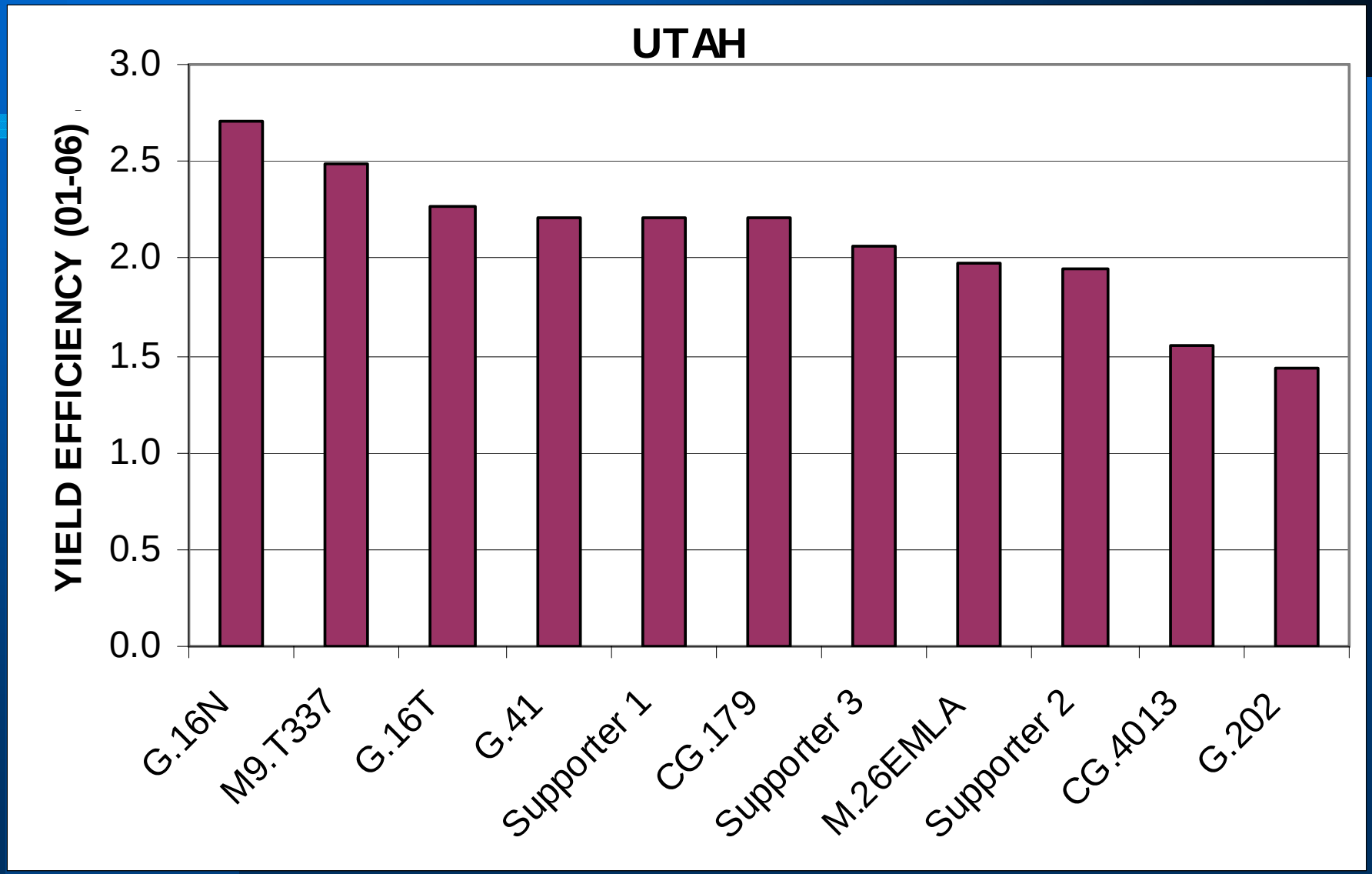
Dwarf Apple: Yield



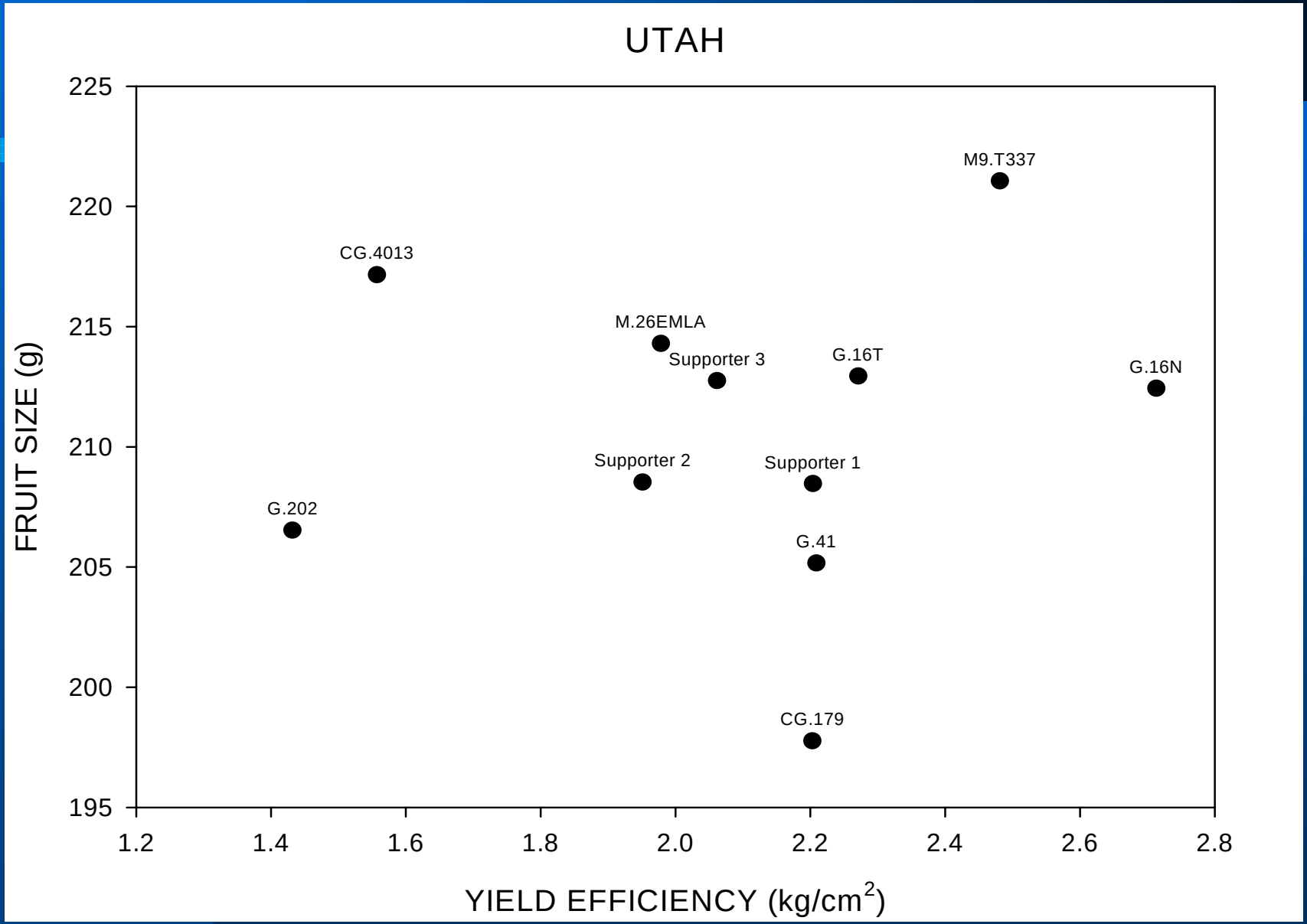
Dwarf Apple: Yield efficiency.



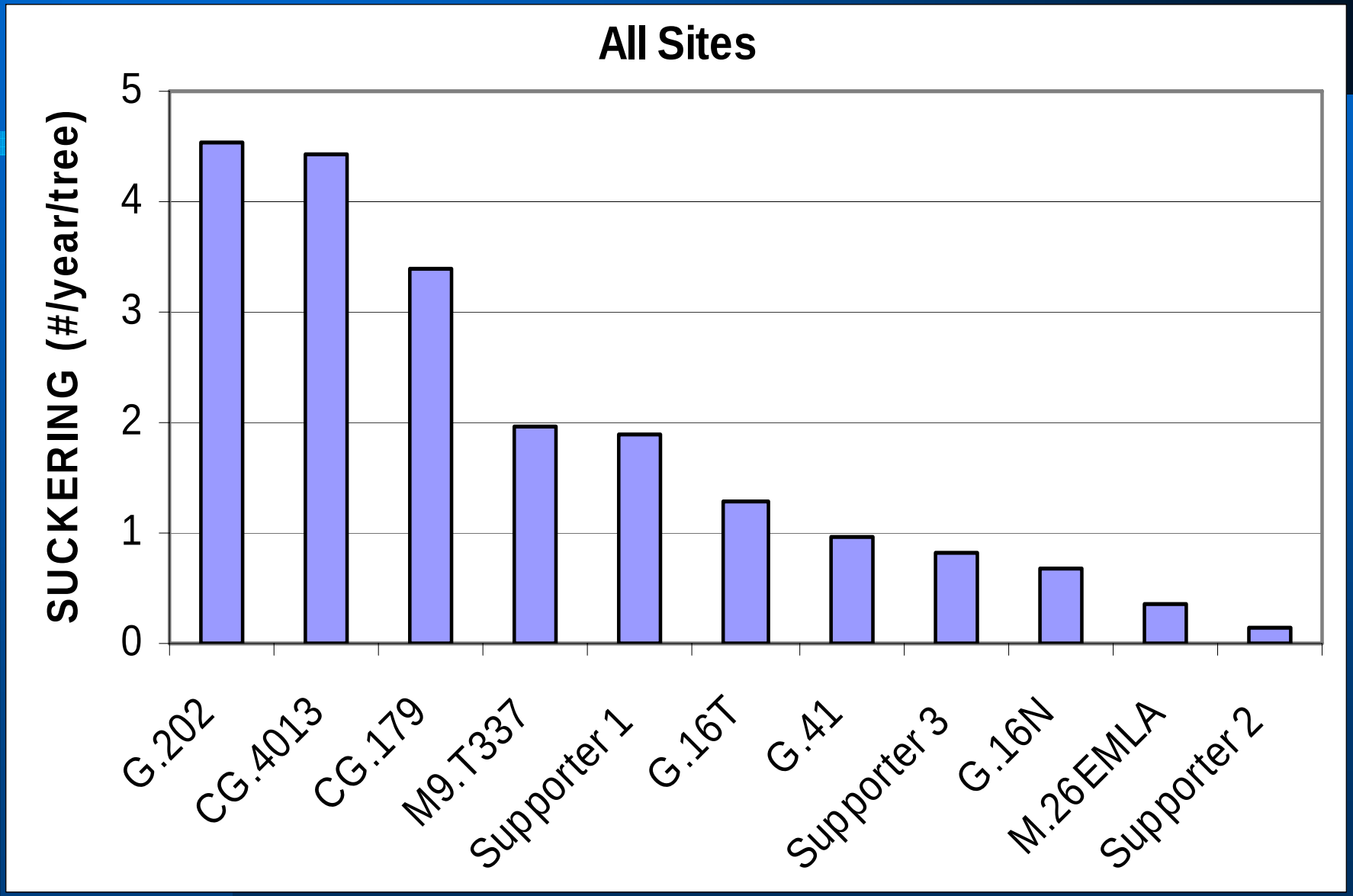
Dwarf Apple: Yield efficiency



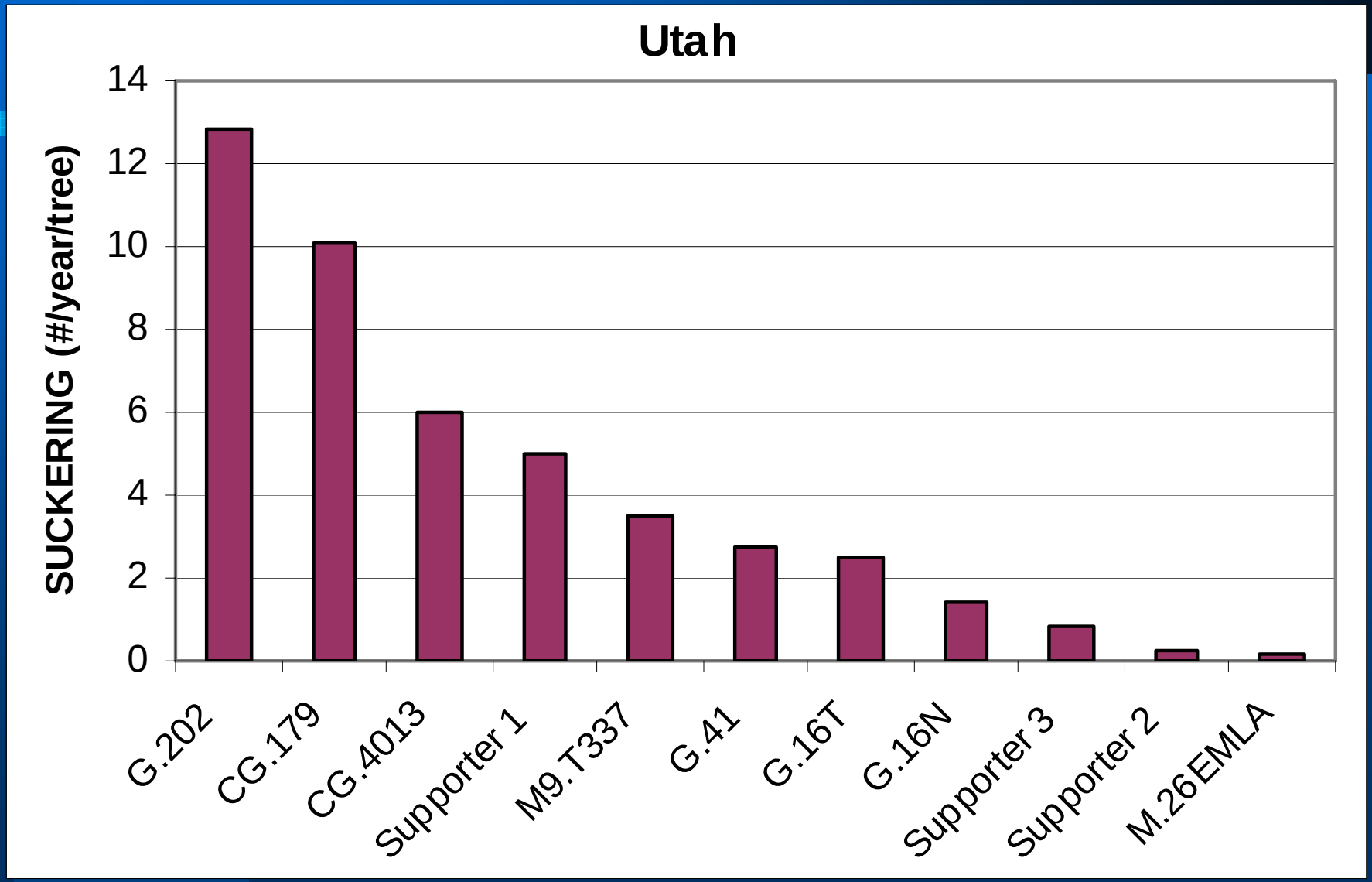
Dwarf Apple: Fruit size



Dwarf Apple: Suckering



Dwarf Apple: Suckering



Dwarf Apple: Summary

- **For Utah, G.16, M.9 T337 and G.41 were the smallest trees, followed by the Supporter series.**
- **M.9 T337 and G.16 had the highest yield efficiency.**
- **M.9 T337 had the largest fruit size.**

- **Why consider others?**

Tolerance of G.11, G.16 and G.41to Fire Blight Inoculation and Natural Infection.

(Norelli, et al. 2002)

Rootstock	% Tree Death due to Fire Blight	
	Inoculation	Natural Infection
M.9	91	95
M.26EMLA	100	93
MM.111EMLA	8	15
M.7EMLA	--	31
G.16	0	0
G.41	0	0
G.11	25	25

2001 Peach study



2001 Peach study

- **Scion variety:**
  - **Redhaven, Cresthaven, or Redtop depending on location**
- **Locations:**
  - **Redhaven: Indiana, Missouri, New Jersey, Ontario, Utah**
  - **Cresthaven: Colorado, Texas, Washington**
  - **Redtop: California, Georgia, Maryland, South Carolina**

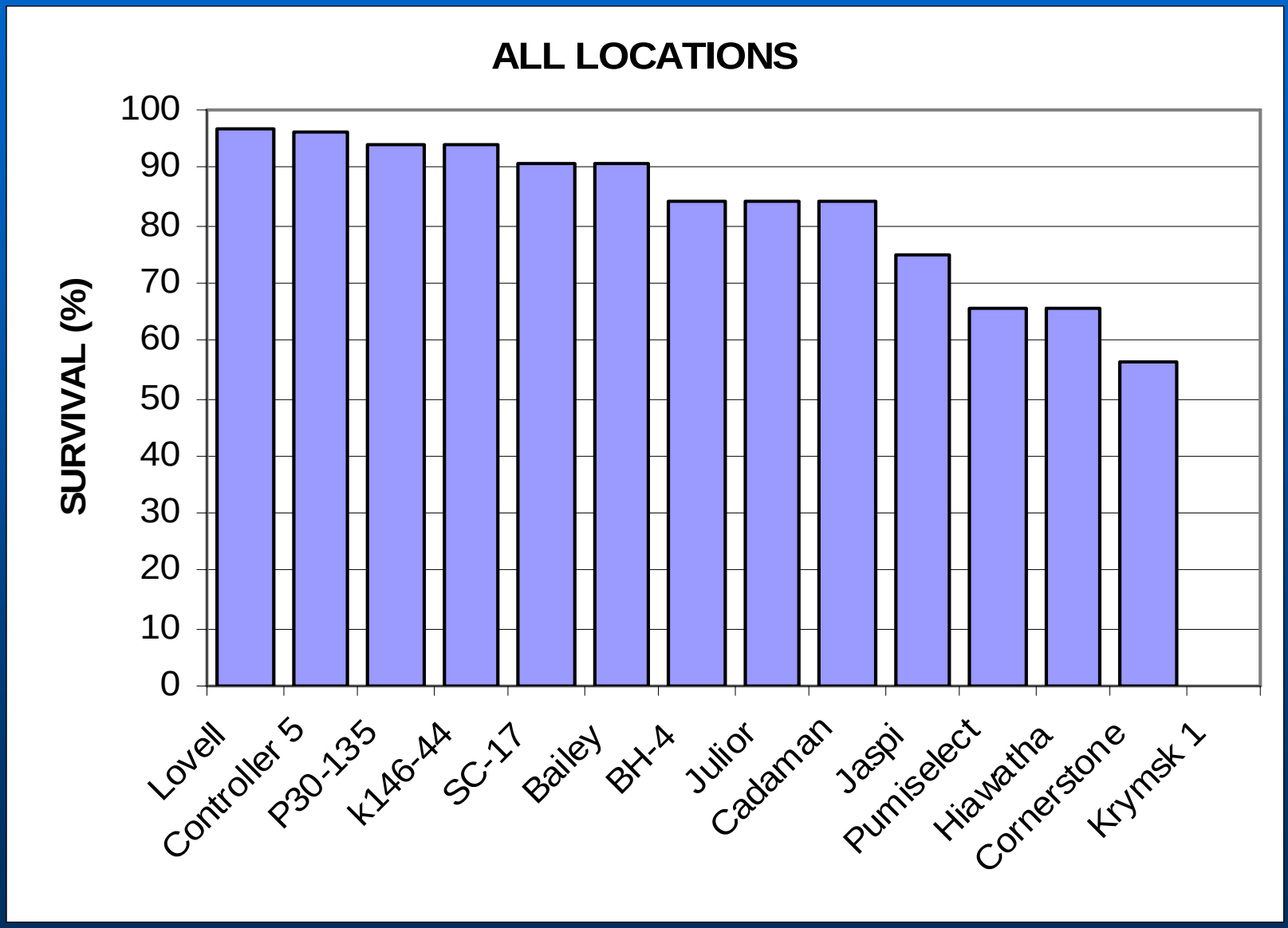
2001 Peach study: 14 Rootstocks

- **Peach seedling:**
  - **Bailey**
  - **Lovell**
  - **Guardian® BY520-9 (Selection SC-17)**
- **Clonal:**
  - **BH-4**
  - **Cadaman**
  - **Cornerstone (SLAP)**
  - **Controller 5 (K146-43)**
  - **Controller 9 (P30-135)**
  - **Hiawatha**
  - **Jaspi**
  - **Julior**
  - **K146-44**
  - **Krymsk®1 (VVA-1)**
  - **Pumiselect®**

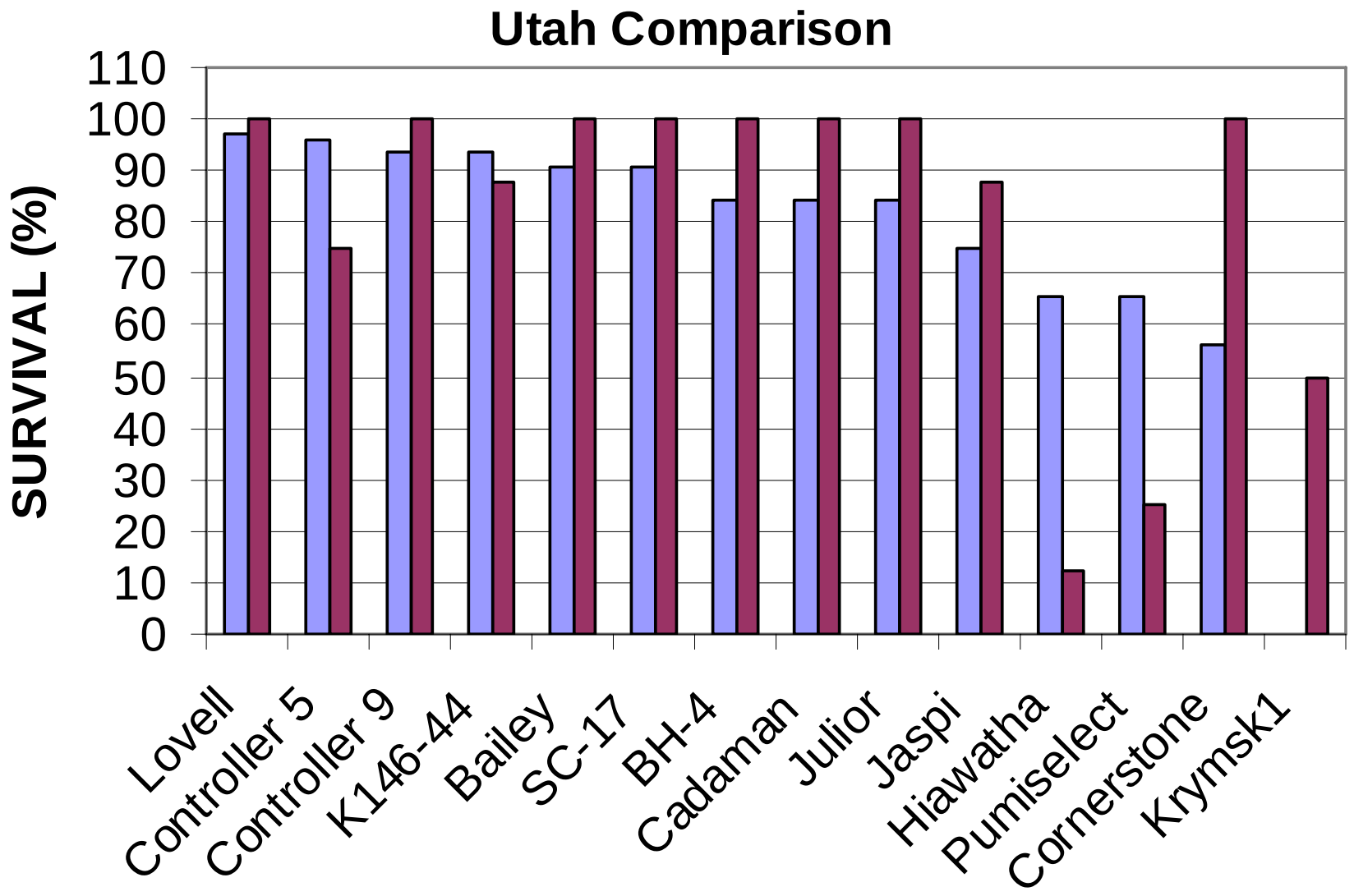
2001 Peach study: layout

- **Plant spacing**
  - **16’ x 20’ (135 trees per acre)**
- **Training**
  - **Open vase**
  - **Water sprouts removed during both summer and winter pruning**
  - **50% of fruiting wood removed each year**
- **Thinning**
  - **Through 2005: 4 to 6” fruit spacing**
  - **2006: 1 to 2 fruits per branch**

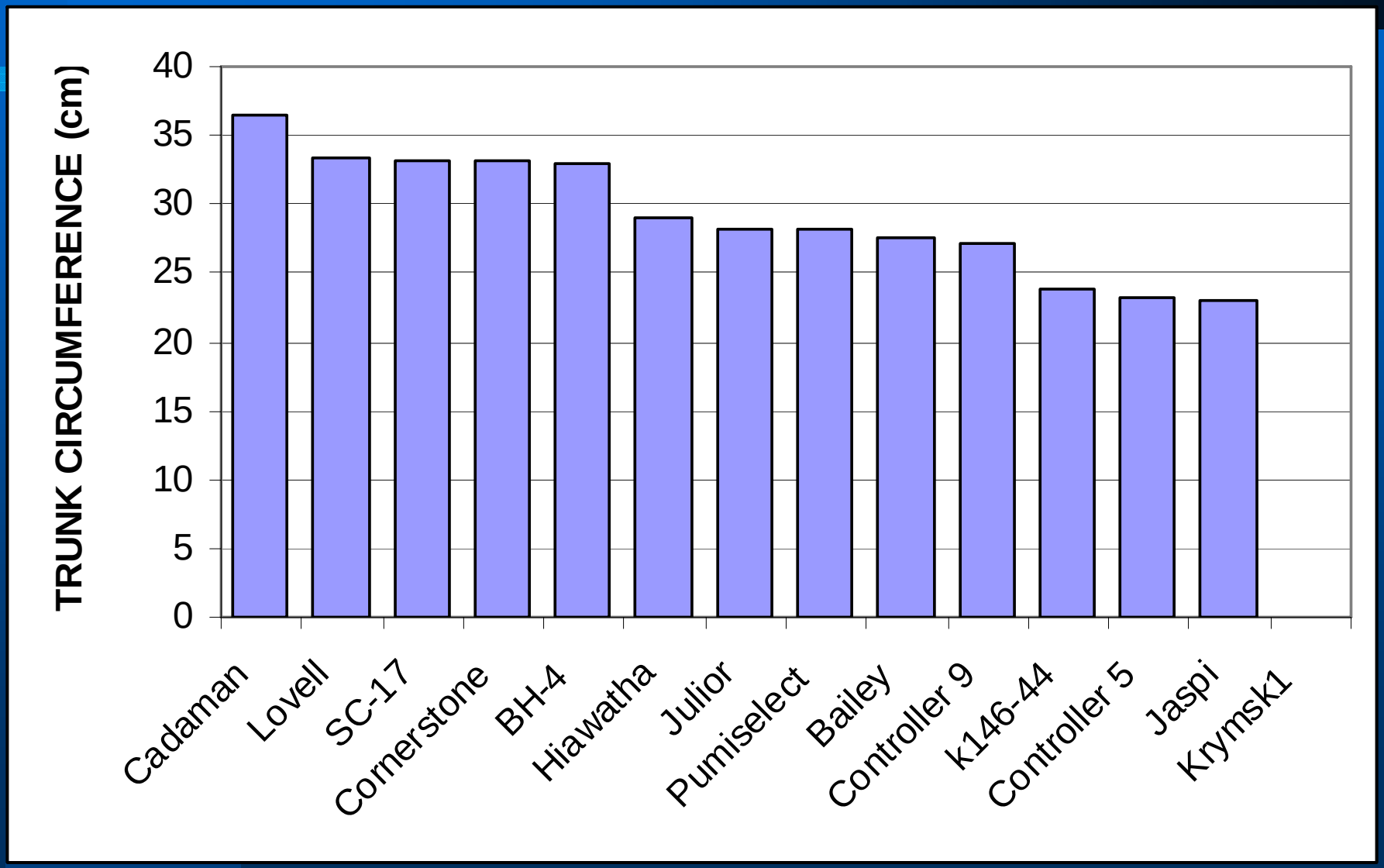
2001 Peach study: Survival



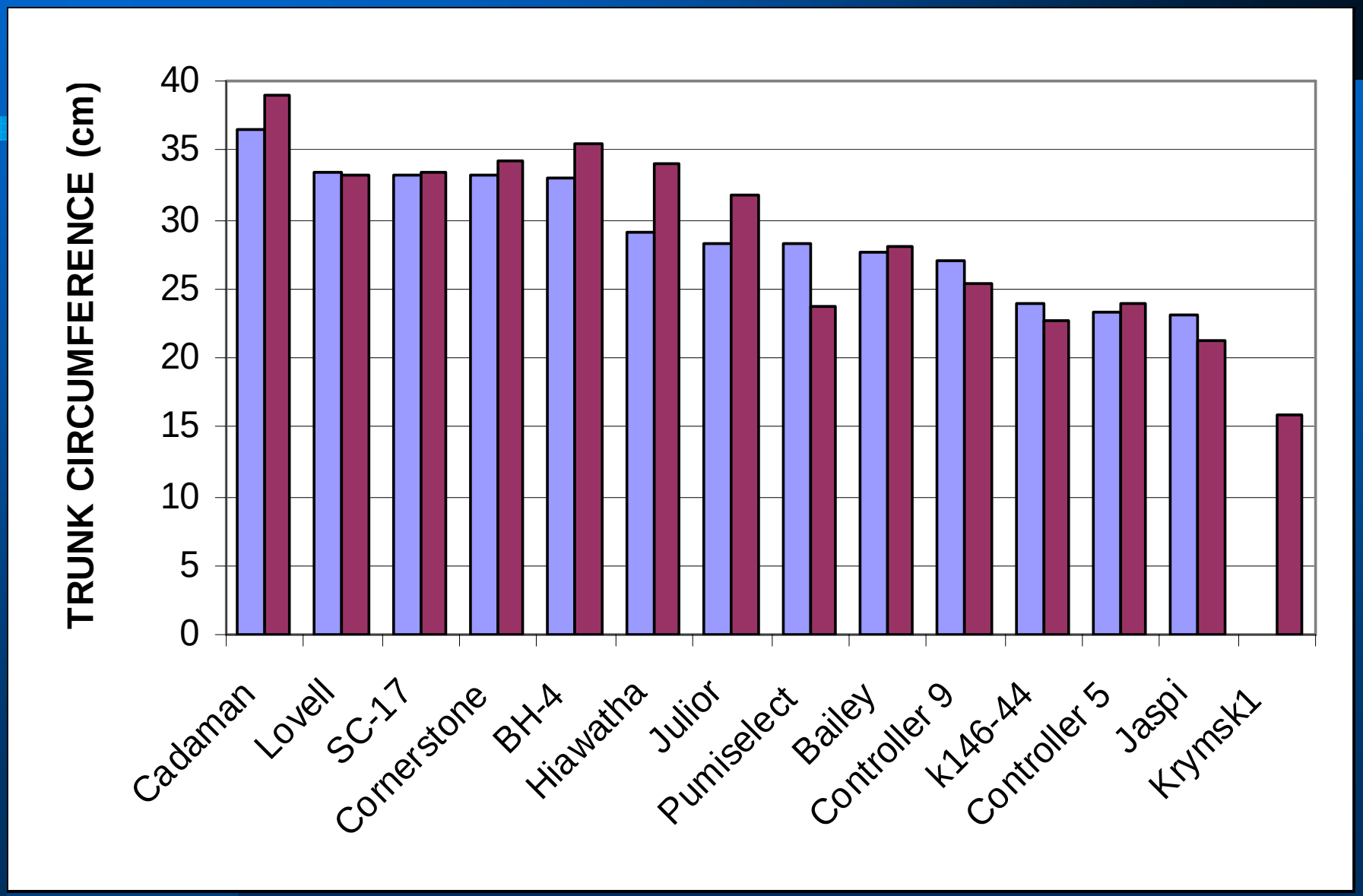
2001 Peach study: Survival



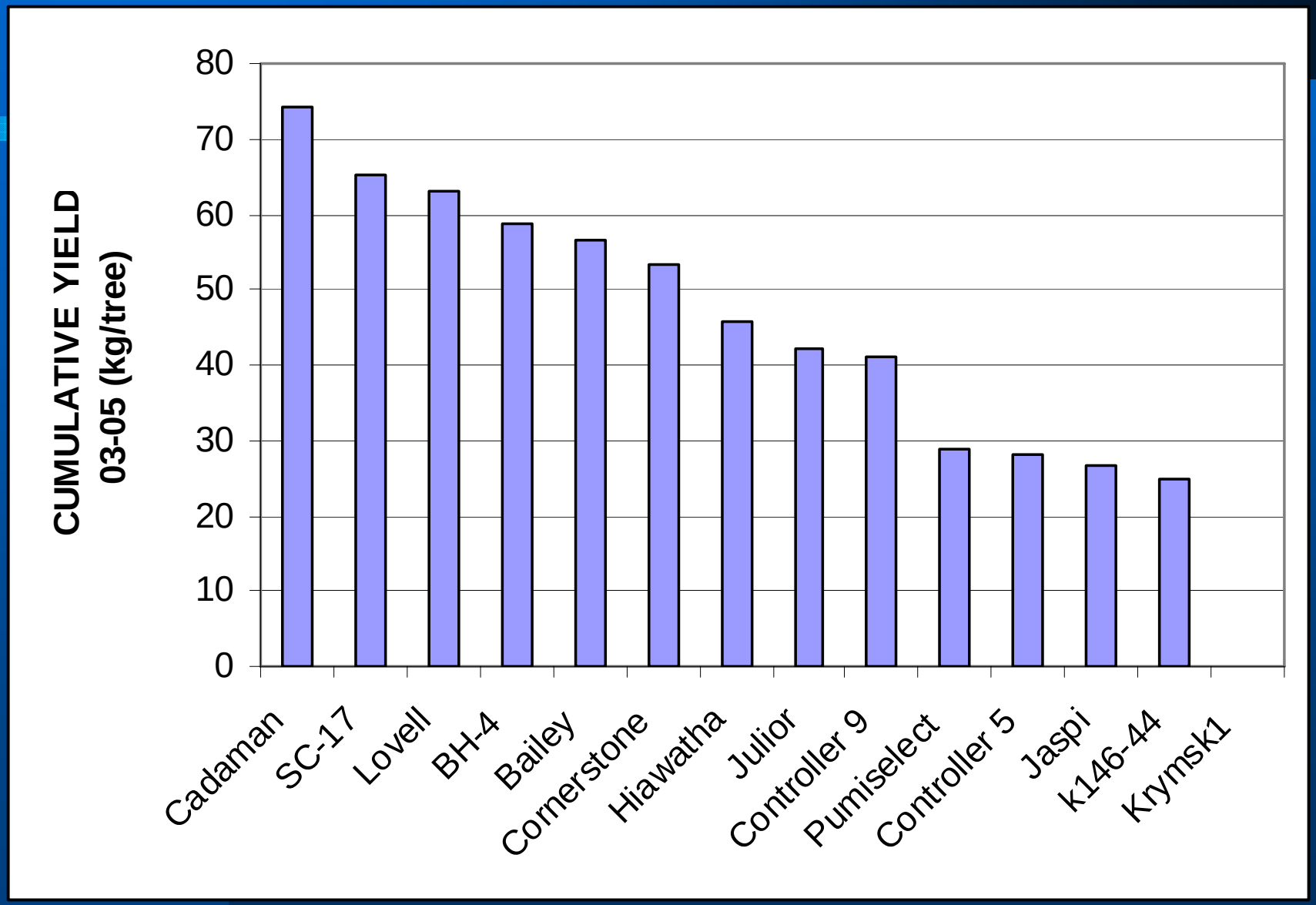
2001 Peach study: Tree size



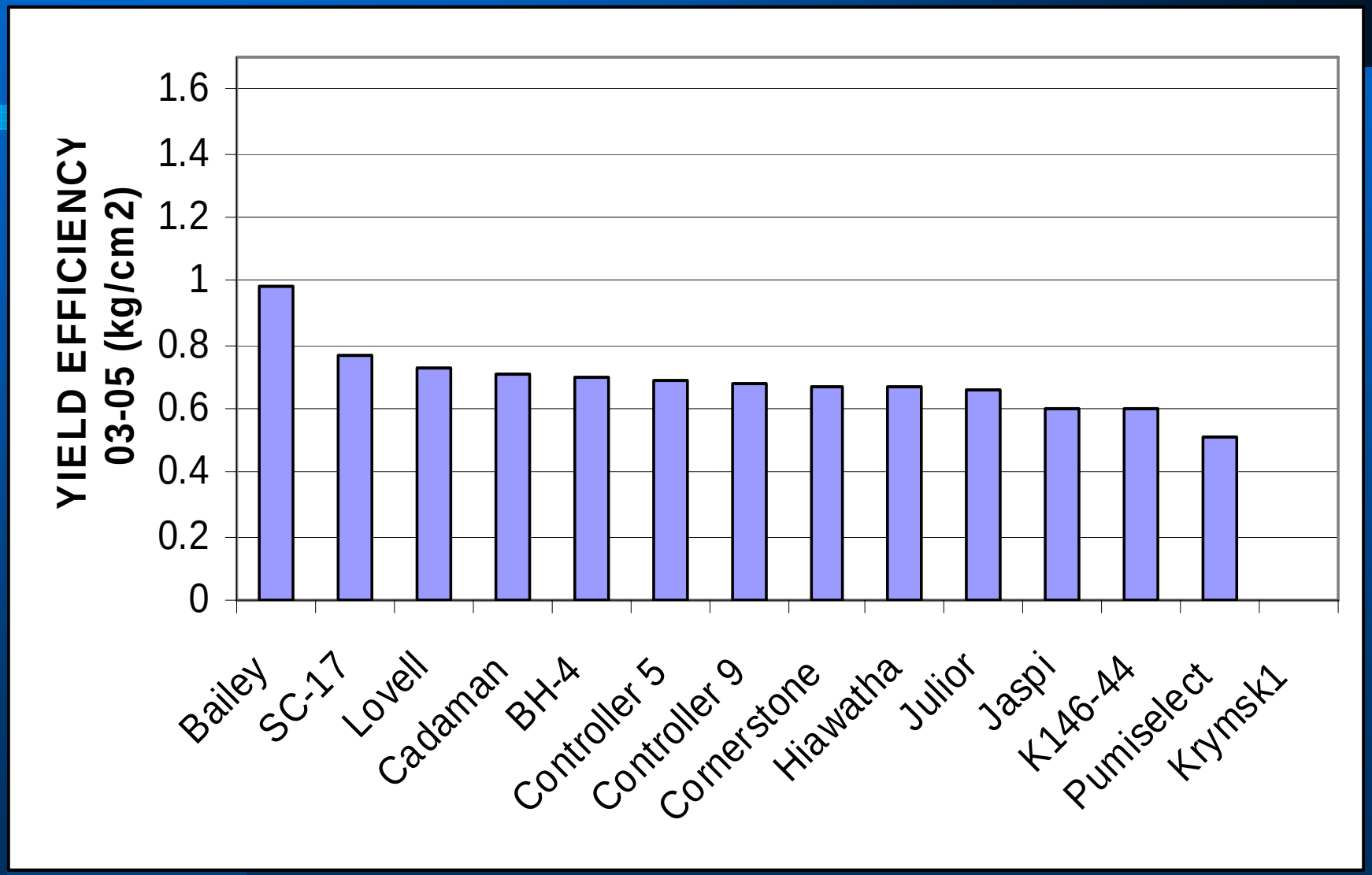
2001 Peach study: Tree size



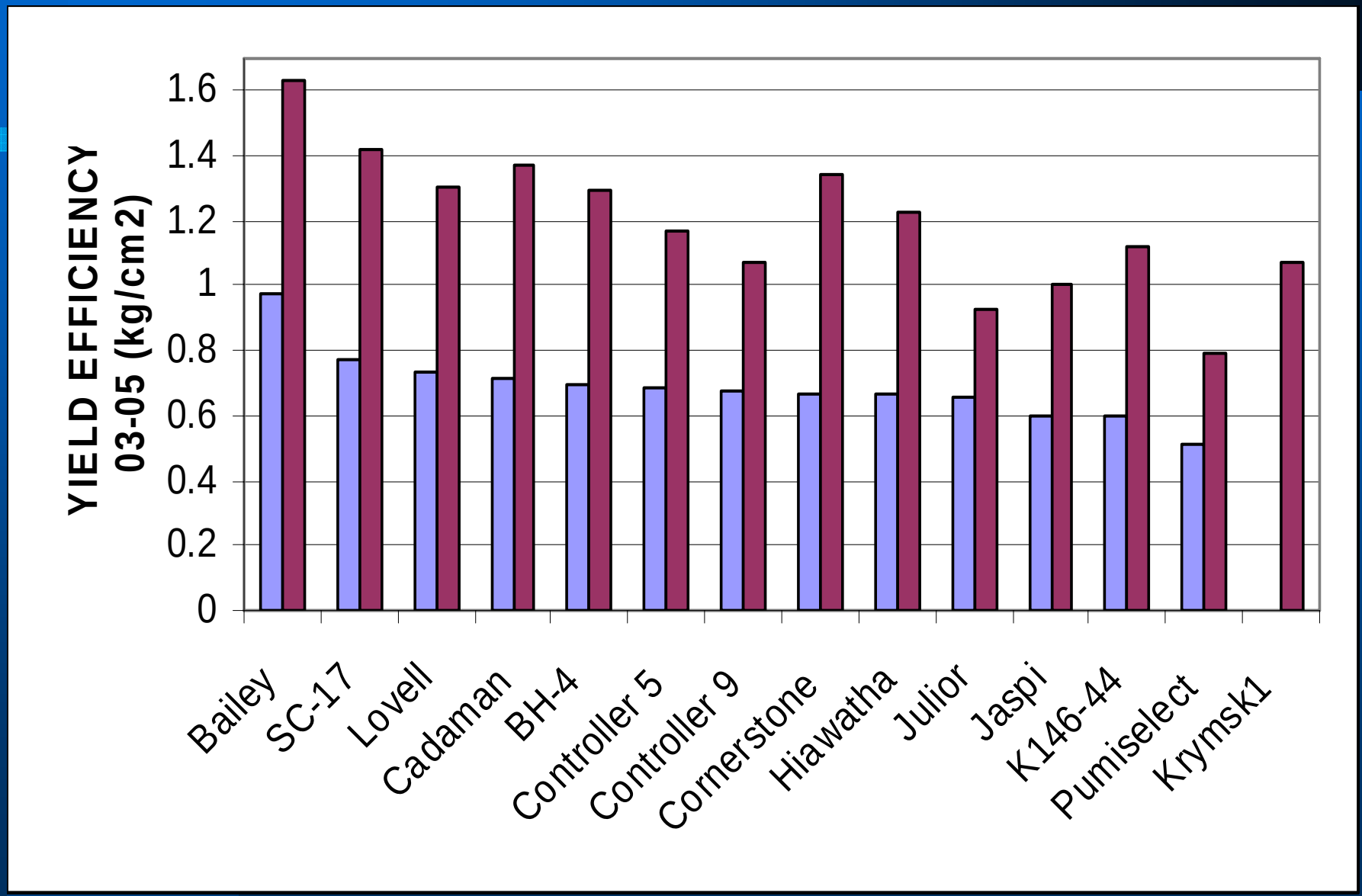
2001 Peach study: Yield



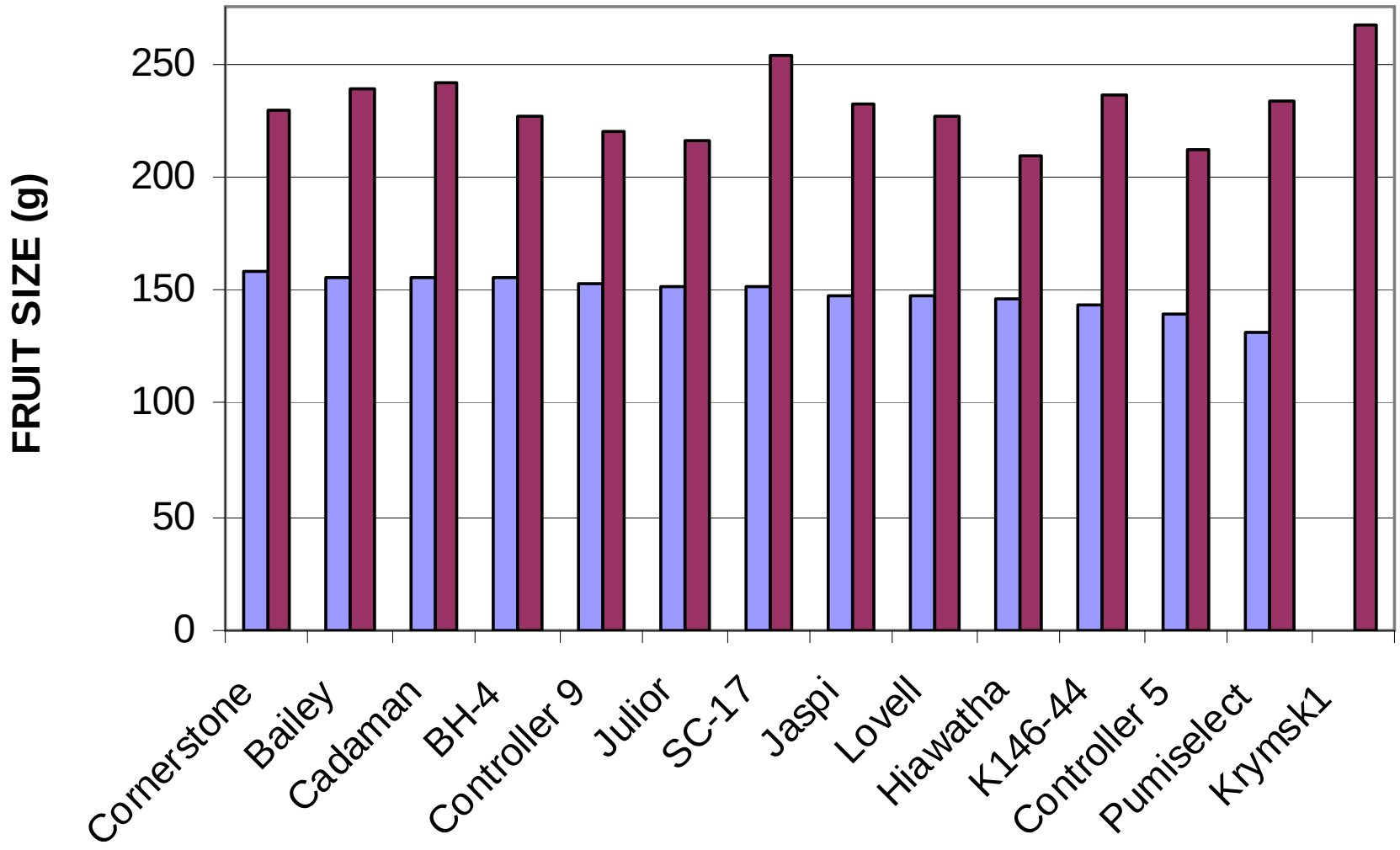
2001 Peach study: Yield efficiency



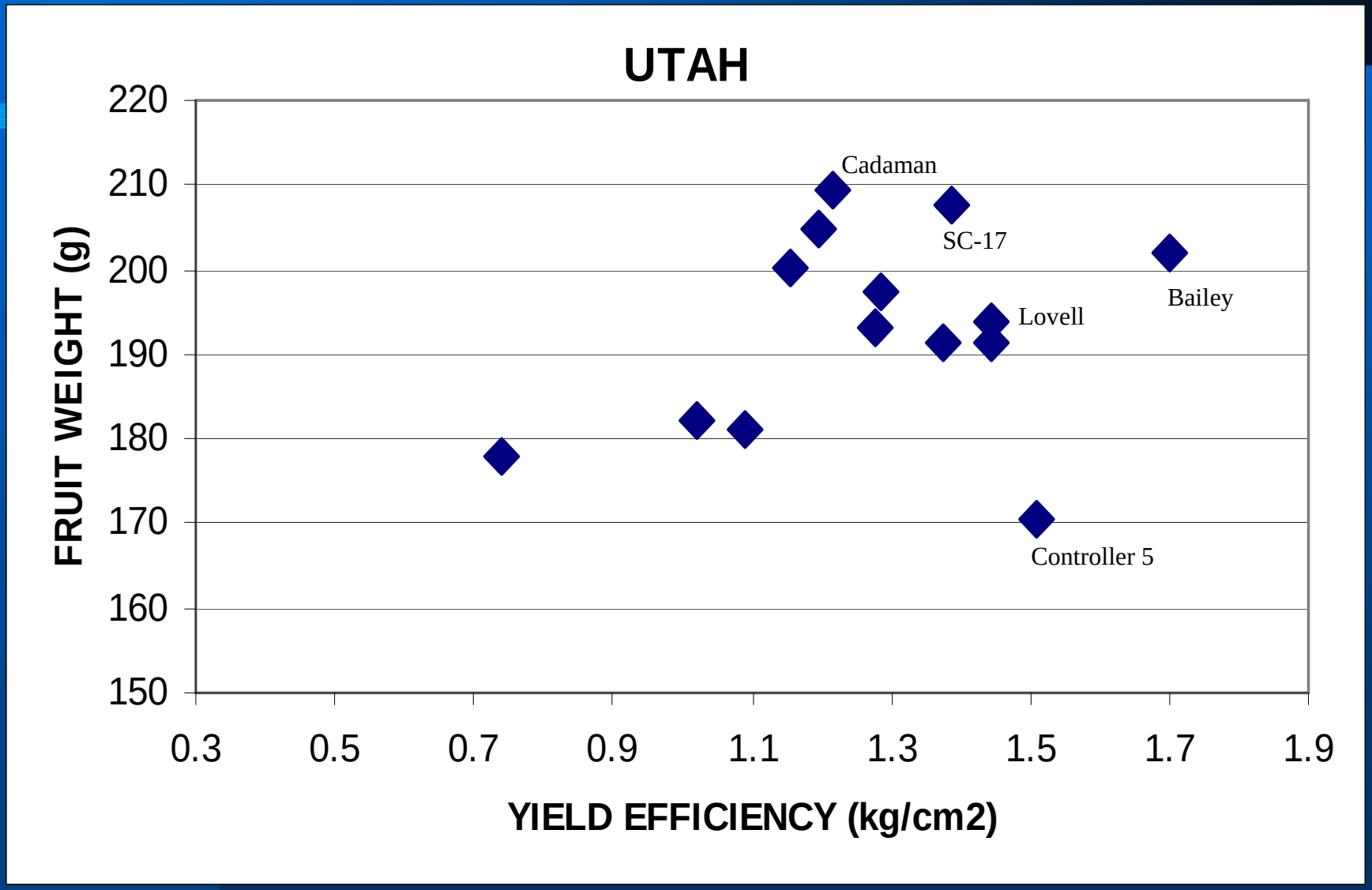
2001 Peach study: Yield efficiency



2001 Peach study: Fruit Size



2001 Peach study: Fruit Size



Peach study - Summary

- **Highest yield efficiency found in Bailey, followed by SC-17, Lovell, Cadaman and Cornerstone**
- **Bailey tree size is 20% smaller than Lovell, had good survival rate, large fruit size.**
- **SC-17 and Cornerstone tree size is the same as Lovell.**
  - **SC-17 had good survival rates at all locations and large fruit size.**
  - **Survival rates of Cornerstone were good at Kaysville, but below average elsewhere.**

Peach study - Summary

- **Cadaman tree size is 10% larger than Lovell, with good survival rates.**
- **Controller 5, Jaspi, K146-44 and Krymsk1 were 30 to 50% smaller than Lovell.**
  - **Of these, Controller 5 had the highest yield efficiency, but the smallest fruit size. Survival at Kaysville was below average (75%)**
  - **Krymsk1 had the lowest survival rate.**
- **Cadaman may be more tolerant of alkaline soils. Trial at Goshen site to be planted in ’07.**

Cherry Study: Montmorency



Cherry Study: Montmorency

- **Locations**
  - **Michigan, Traverse City**
  - **New York, Geneva**
  - **Ontario, Vineland**
  - **Pennsylvania, Biglerville**
  - **Wisconsin, Sturgeon Bay**
  - **Utah, Kaysville**

Montmorency Cherry Study

- **11 rootstocks at all sites (13 in Utah)**
  - **Mahaleb**
  - **Gisela: Gisela 5, Gisela 6, Gisela 7**
  - **Edabriz**
  - **Gl.195.20, Gl. 209.1**
  - **Weiroot: W.10, W.13, W.53, W.72, W.158**
  - **P.50**
- **8 replicate trees of each rootstock**
- **10’ x 15’ (290 trees/acre)**

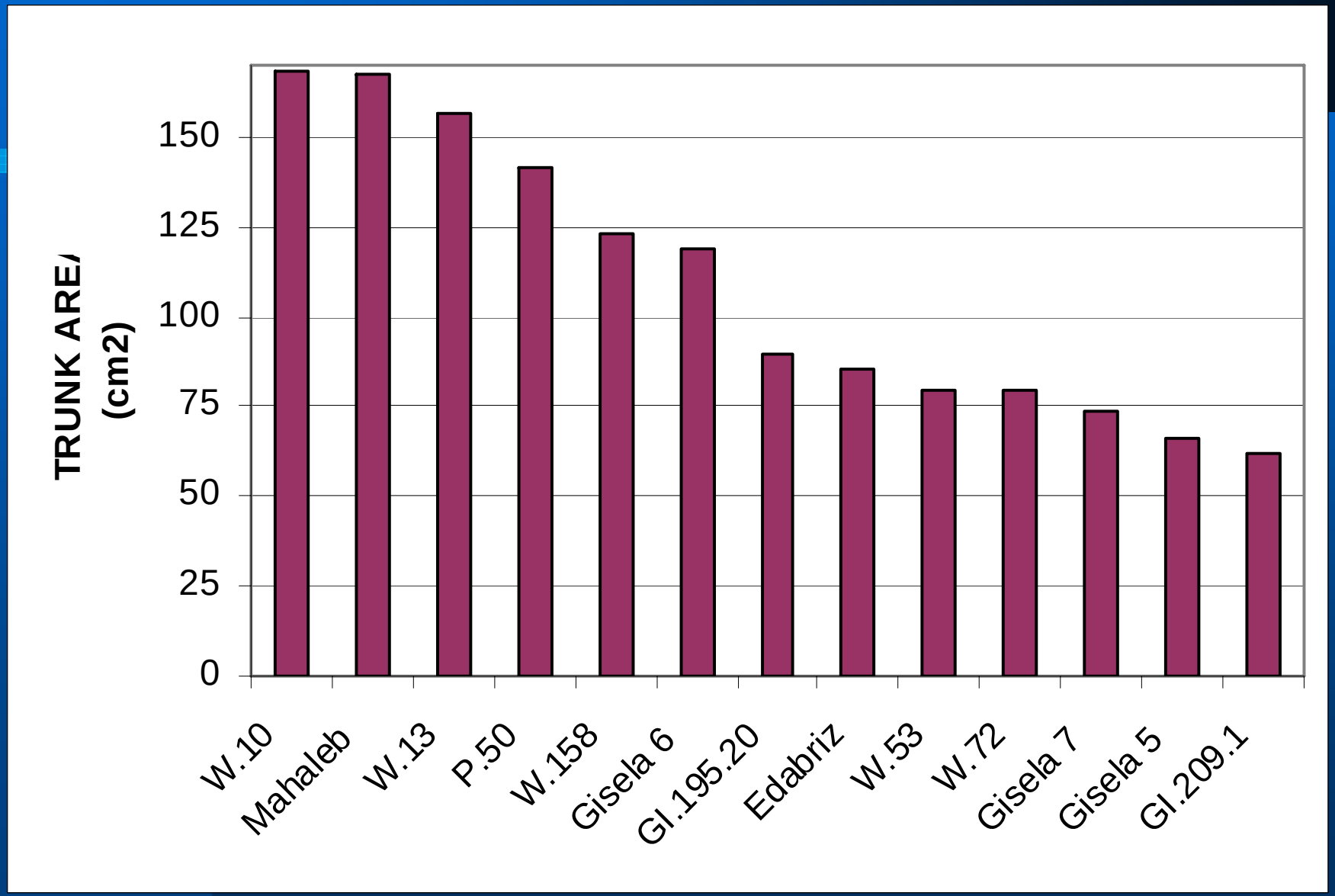
Cherry study

- **Survival**
- **Tree size**
- **Yield**
- **Yield efficiency**
- **Fruit size**
- **Suckers**

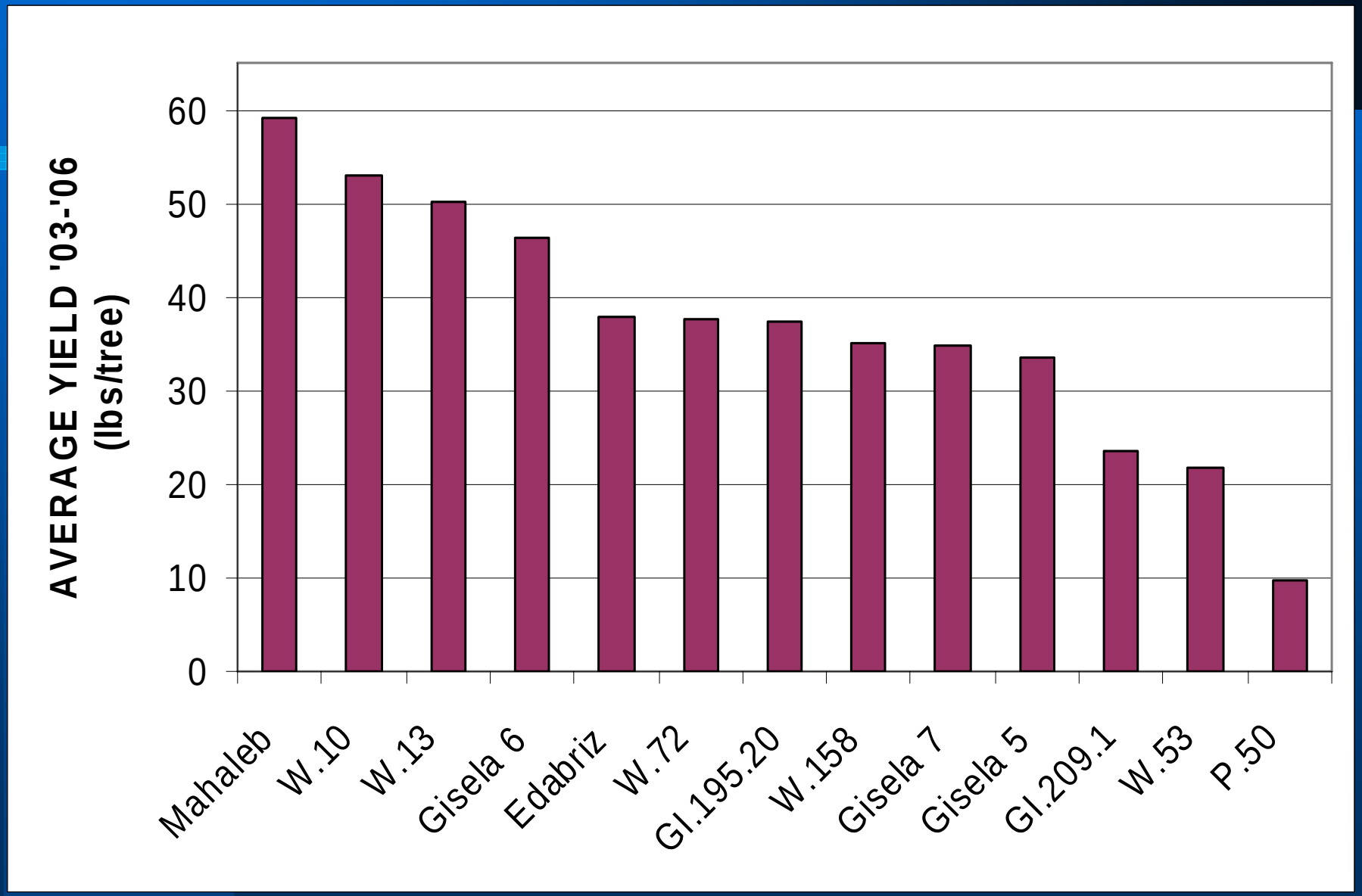
Cherry Study: Survival



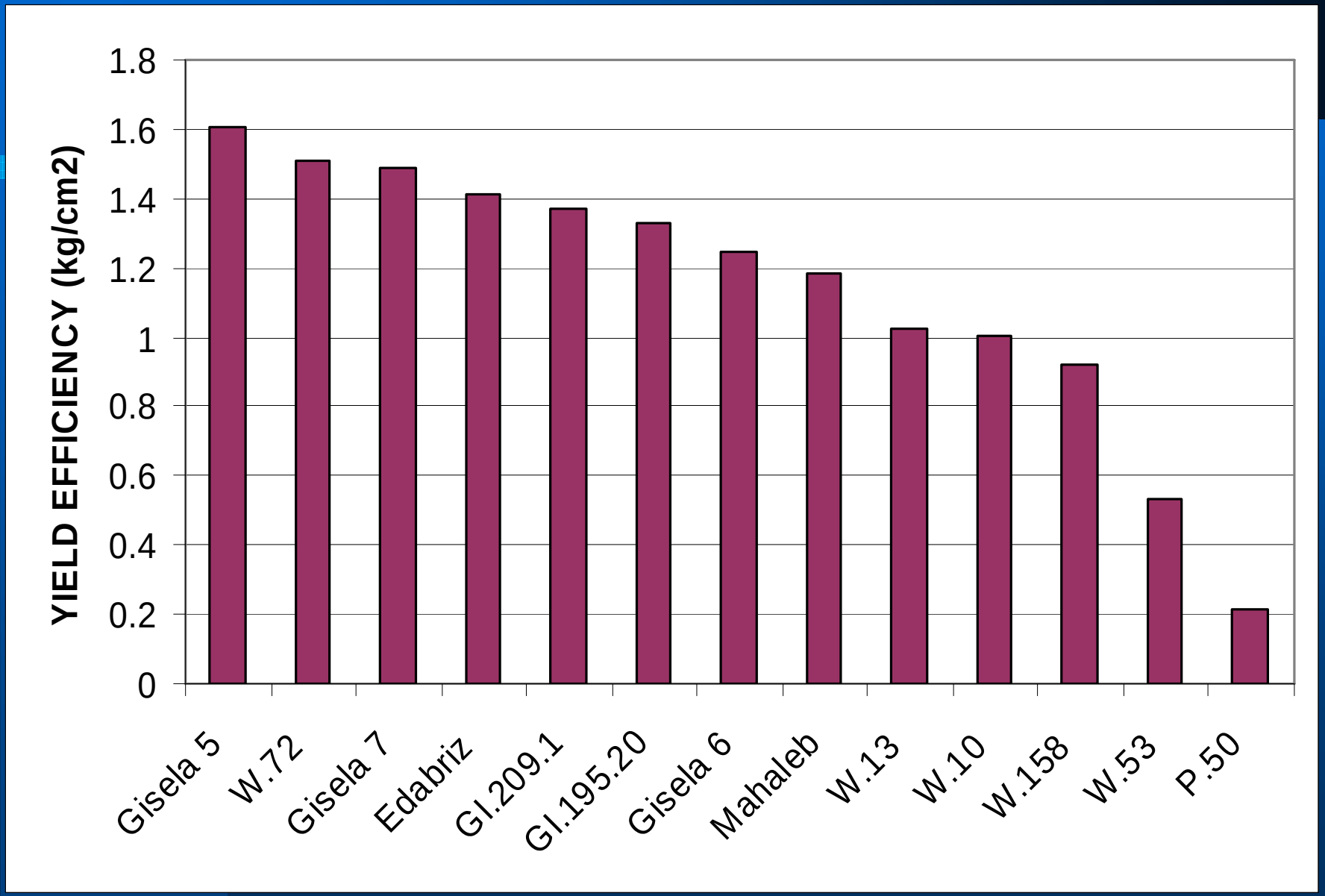
Cherry Study: Tree size



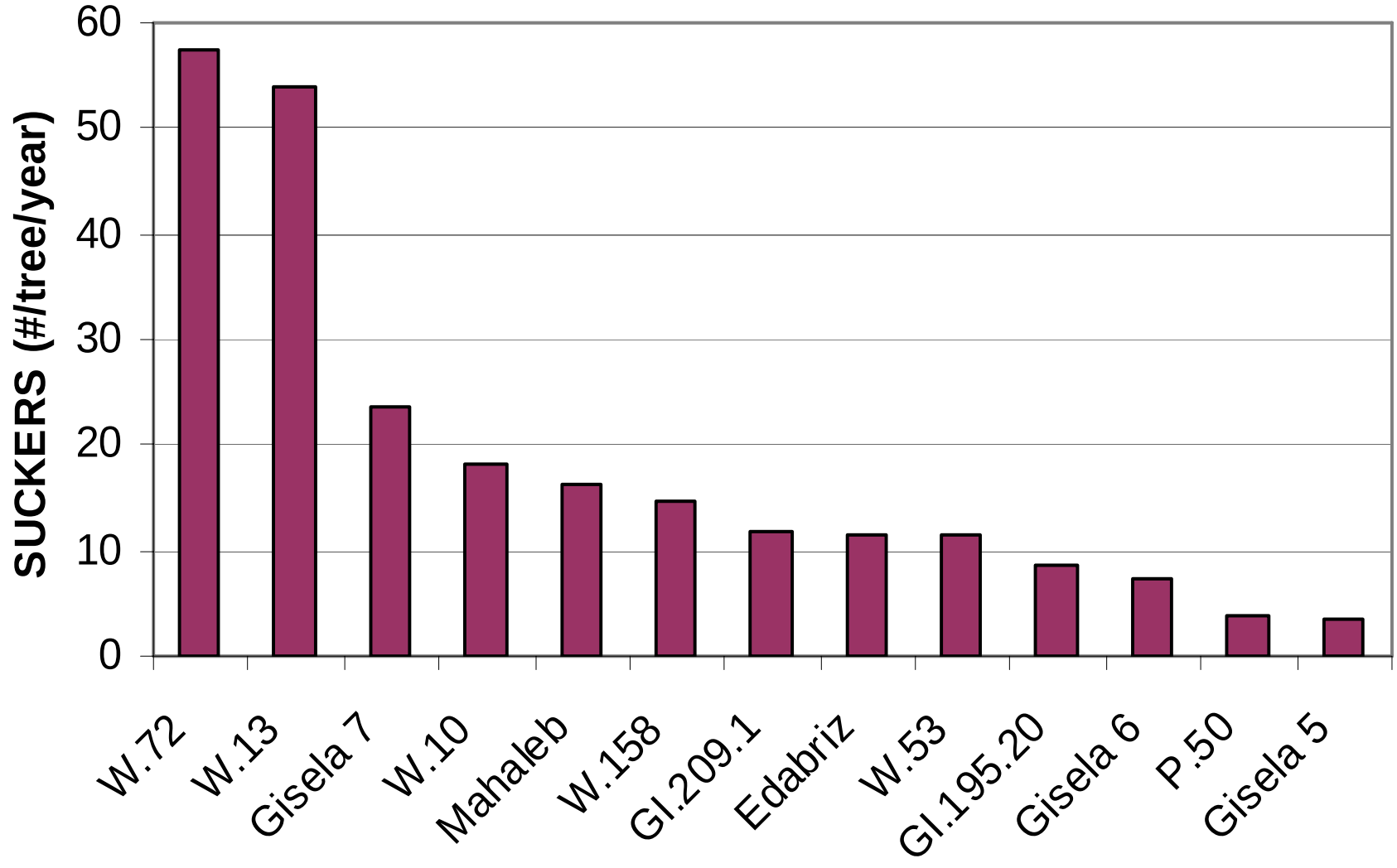
Cherry Study: Yield



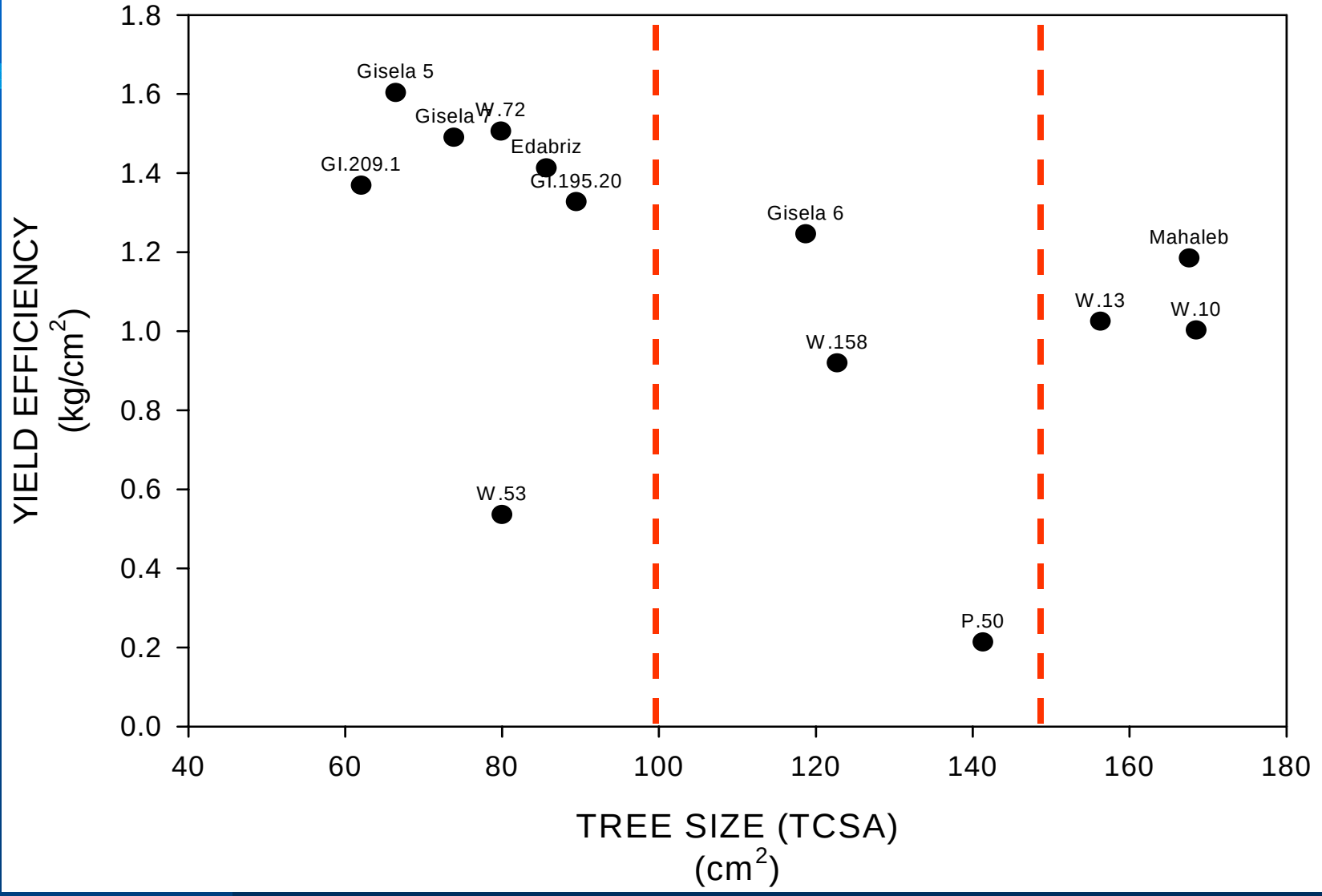
Cherry Study: Yield Efficiency



Cherry Study: Suckers



Montmorency Cherry Study



Cherry study - Summary

- **Mahaleb has the largest tree size and the highest yields.**
- **Only the most dwarfing stocks had significantly higher yield efficiency than Mahaleb.**
- **How do you harvest high density tarts?**



Where do we go next?

- **Rootstock trials represent a long-term research investment**
- **Is Kaysville representative of Utah orchards?**
- **If not Kaysville then where?**
  - **Apple rootstocks in Santaquin**
  - **Peach rootstocks in Goshen**
  - **2009 Apple rootstock planting**

Announcements

- **Utah Berry Growers Meeting**
  - **February 6**
  - **Bridgerland Applied Technology Center – Brigham City Campus**
  - **1:00 pm to 5:00 pm**
- **http:www.utahhort.org is the Association website, where many of the talks will be posted within a few weeks.**

