

Practical Steps in Establishing a Modern Sweet Cherry Orchard

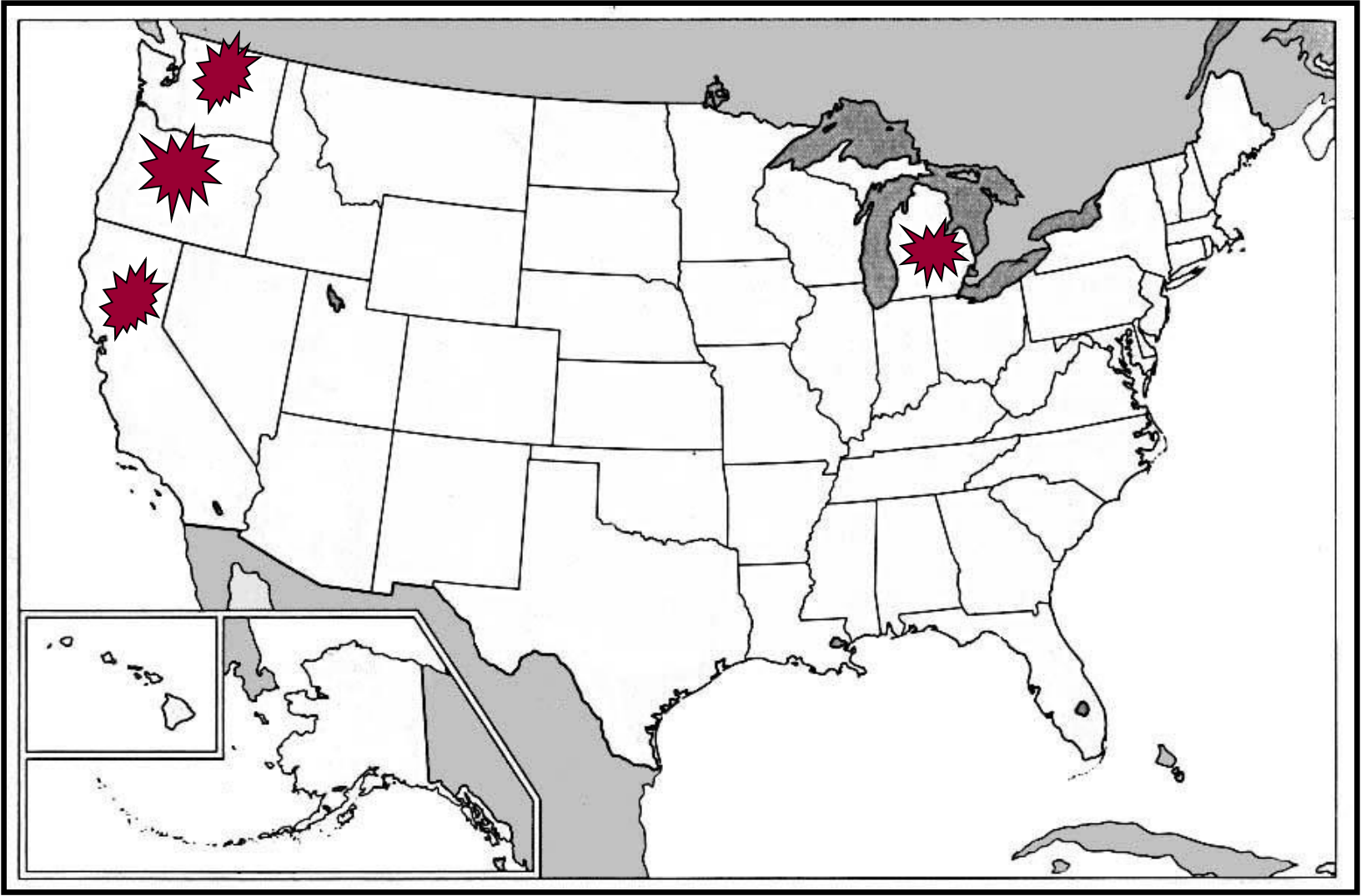
Lynn E. Long

Oregon State University

04/13/2006



Oregon State
University



China
Japan
South Korea

35,000 - 50,000 tons/year



Cultivar Trial

- Established 1996
- Evaluated 100+
- Cultivars & selections
- Potential candidates for the Pacific Northwest cherry industry

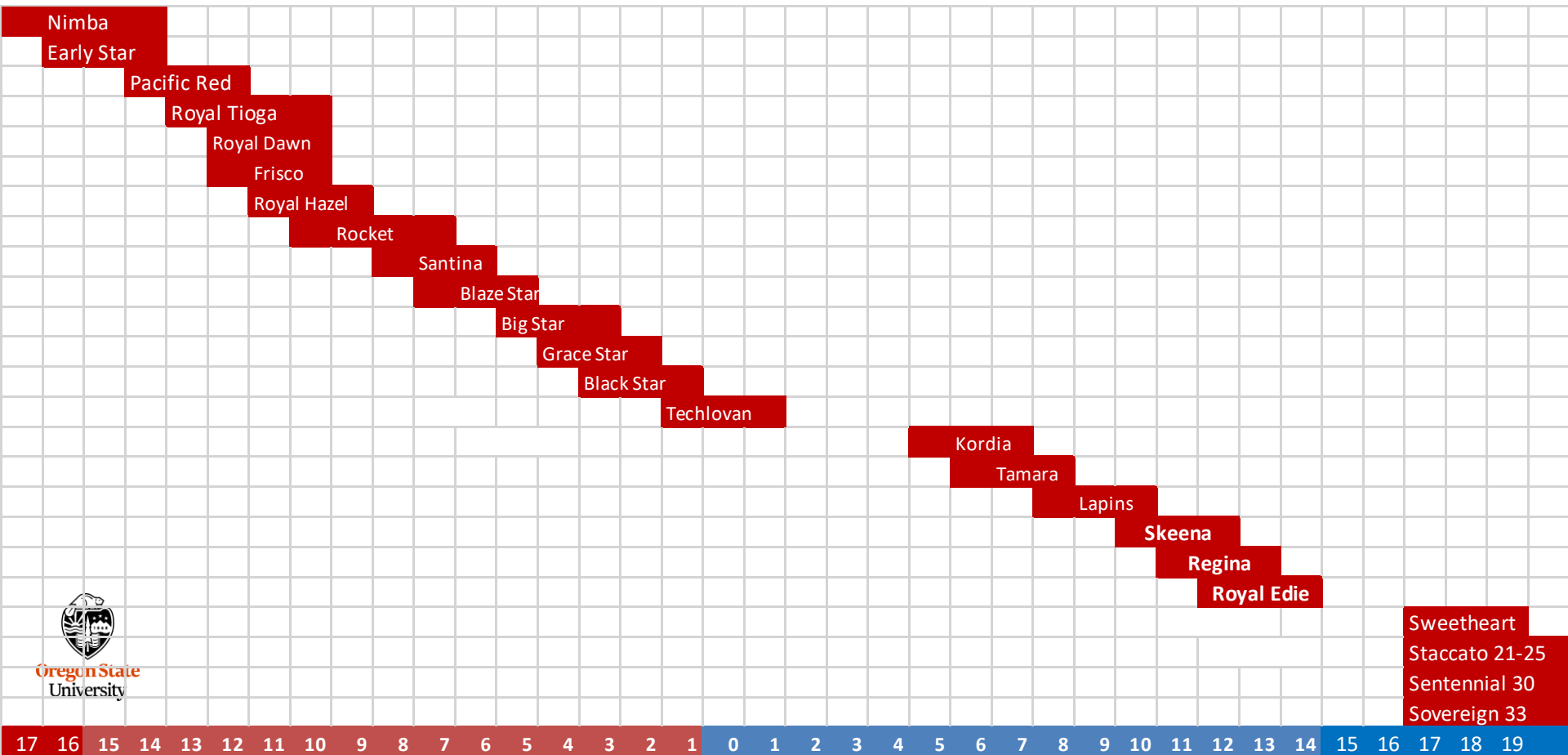
- Thanks to Mel & Mike Omeg and Orchard View Farms



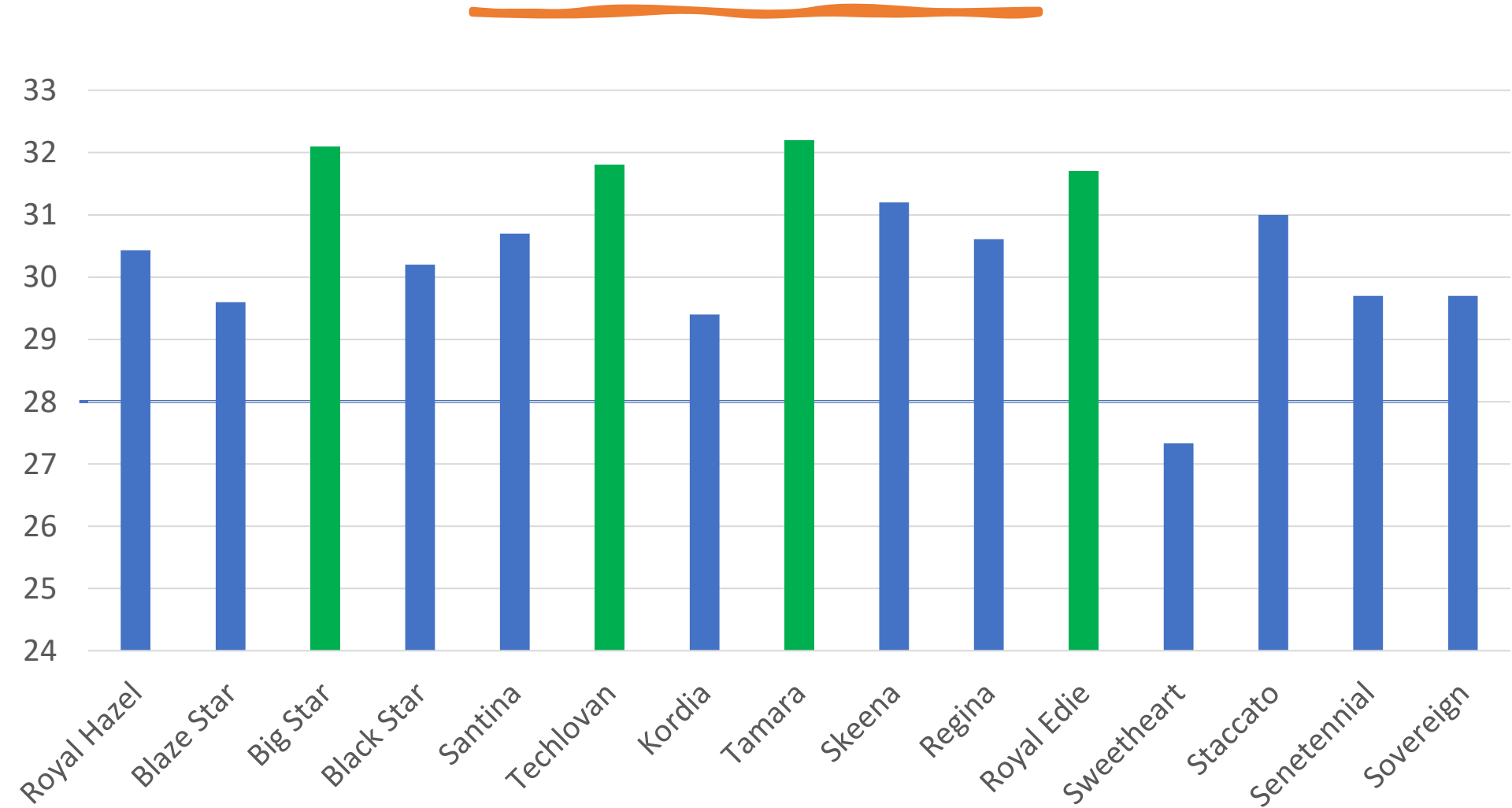
Oregon State



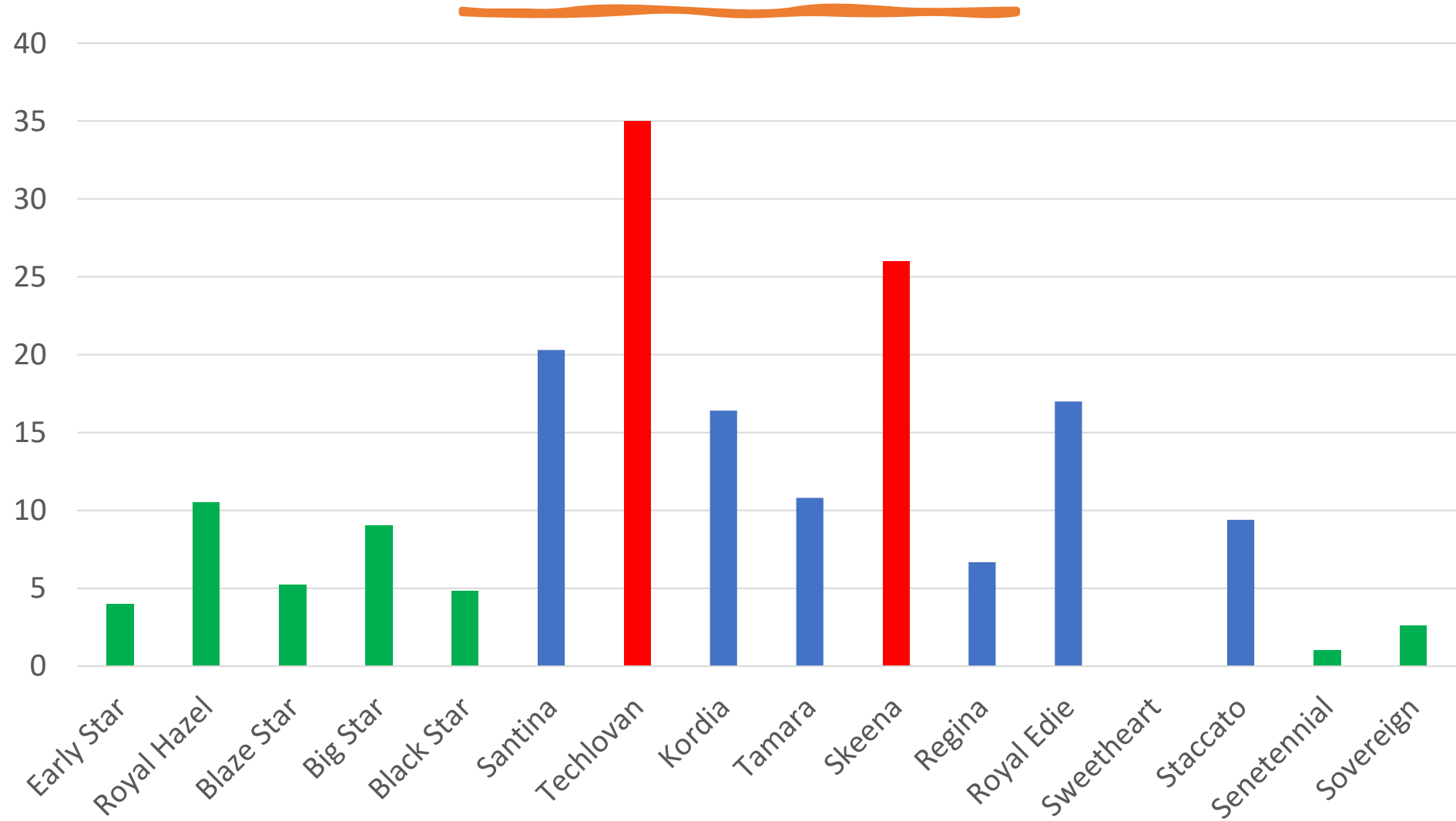
Relative Harvest Timings



Fruit Size of Selected Varieties (mm)



Fruit Cracking of Selected Varieties (% 2 hour soak)



Early Star

- University of Bologna
- Very early: 15 days < Van
- Large: 28-30 mm
- Blooms heavy but drop
- Low productivity
- Taste? Not very good with strong acid
- Self-fertile



Frisco



Photo by Dalival

- SMS – California
- Very early: 10-15 days < Techlovan
- Susceptible to cracking
- Large – 28 mm
- Medium firm – 75 Durofel
- Precocious & productive
- Somewhat pendant like Kordia
- Sweet flavor – 18 brix
- Self-fertile





Rocket

- SMS – California
- Very Early – 10-15 < Van
- Very large – 30-34 mm
- Firm – 78 Durofel
- good taste 17 brix
- Some rain cracking resist
- Strong, upright tree growth
- Stores well – 4 weeks
- Self-sterile – early, mid-bloom timing:
Frisco, Santana



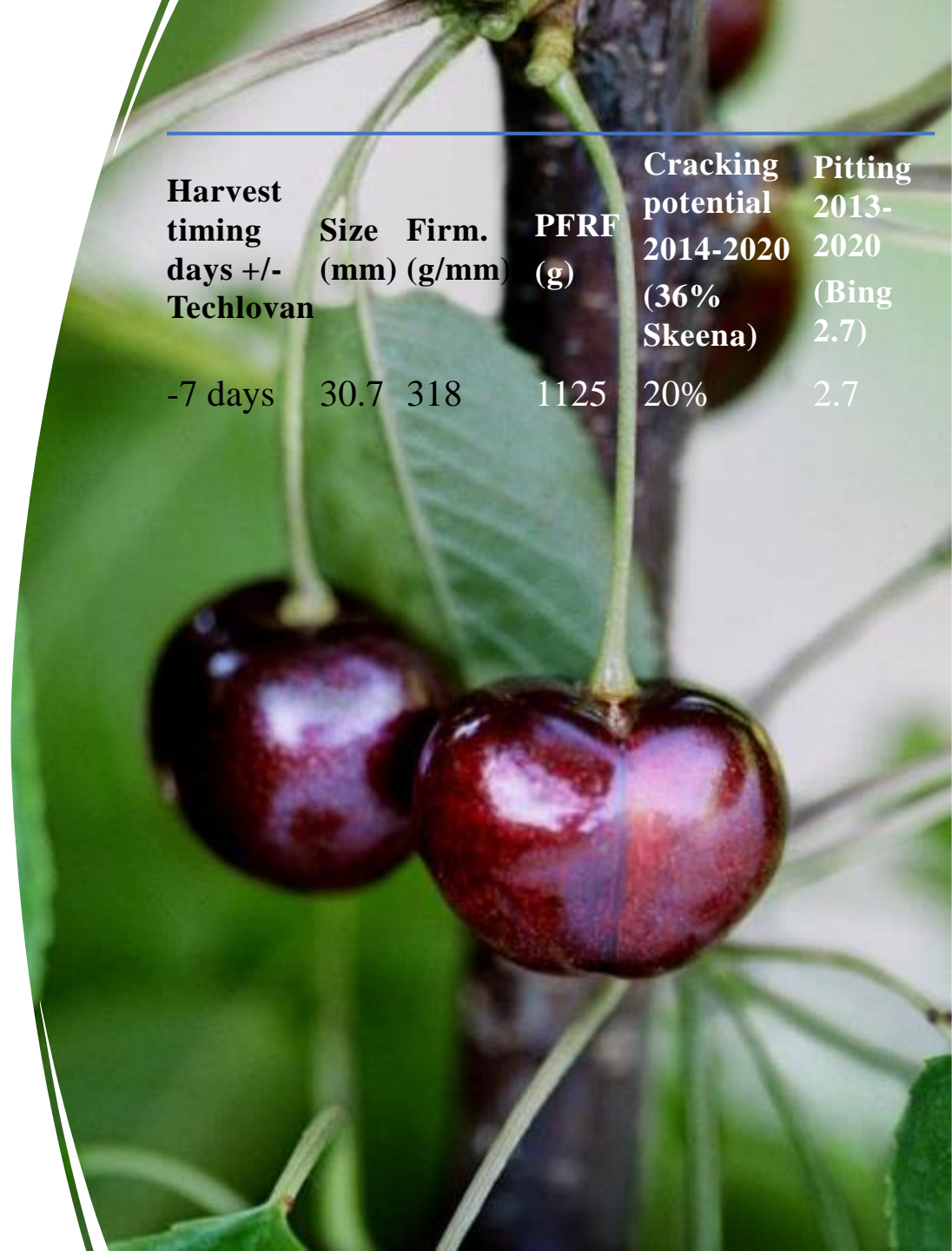
Santina

- Summerland, BC Canada
- Very large
- Mid-Early
- Flavor is fair to good
- Tart/sweet but weak
- Very popular in Chile
- Nose end crack accentuated by rain
- Gisela 6 or Gisela 5
- Self-fertile



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Harvest timing	Size	Firm.	PFRF	Cracking potential	Pitting
days +/-	(mm)	(g/mm)	(g)	2014-2020	2013-2020
Techlovan				(36% Skeena)	(Bing 2.7)
-7 days	30.7	318	1125	20%	2.7



Blaze Star

- University of Bologna
- Moderately large
- Moderately firm
- Self-fertile
- Very good flavor, strong sweet/acid
- Rain tolerant



Harvest timing days +/- Van	Bloom timing +/- Van	Size (mm)	Firm. (g/mm)	Cracking potential 2014-2016 (36% Skeena)	Pitting 2013-2016 (Bing 2.7)
-6 days	0	28.6	260	5%	2.8



Big Star

- Early to mid season (5 days < Techlovan)
- Very large (30-32 mm)
- Firmness moderate to good
- Flavor very good, strong tangy flavor
- Productivity low even on Gisela 6
- Self-fertile

Harvest timing days +/- T-van	Bloom timing +/- Van	Size (mm)	Firm. (g/mm)	Cracking potential 2014-2016 (36% Skeena)	Pitting 2013-2016 (Bing 2.7)
-4 days	1-2	32.1	285	9%	2.4



Grace Star

- Mid-season (3 days < Techlovan)
- Large fruit (28 mm +)
- Good flavor
- Firmness is marginal for long distance shipping
- Rain cracking susceptibility moderate
- Best on moderate to highly productive rootstocks
- Self-fertile





Black Star

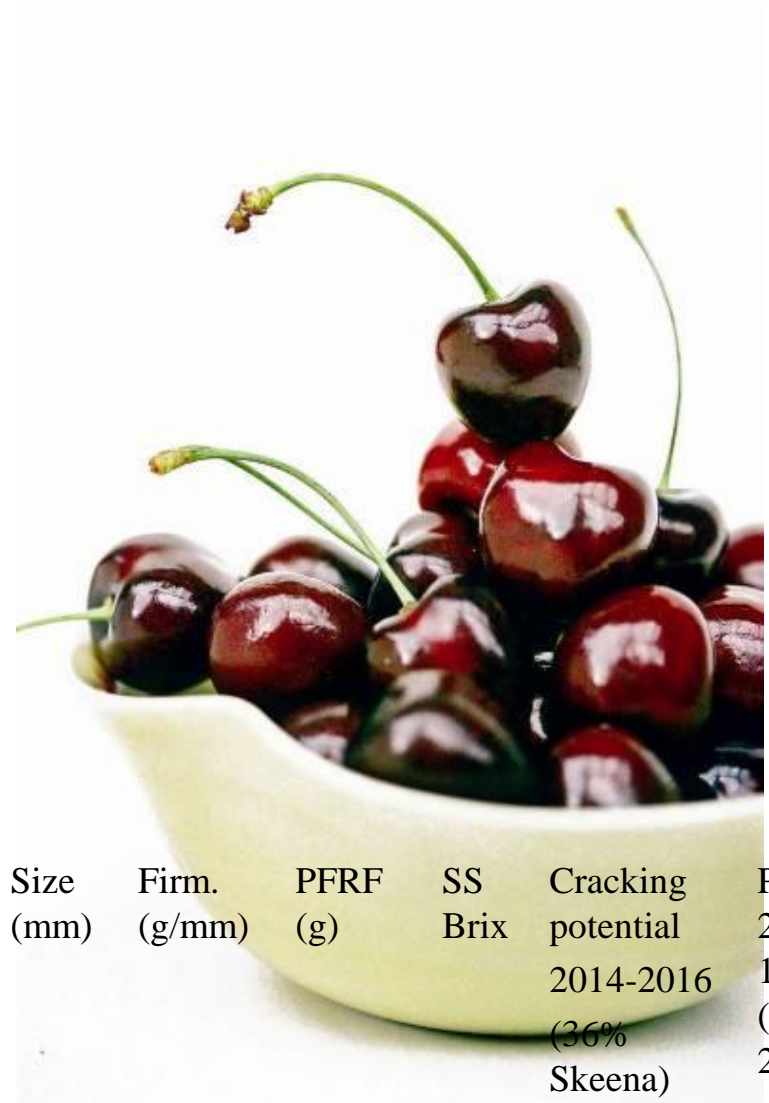
- University of Bologna
- Self-fertile
- Good flavor
- Moderately firm
- Precocious
- Productive

Harvest timing days +/-	Bloom timing +/-	Size (mm)	Firm. (g/mm)	Cracking potential 2014-2020 (36% Skeena)	Pitting 2013-2020 (Bing 2.7)
0 Techlovan	+1 T-van days	30.2	279	4.8%	2.55



Kordia

- General Impressions
 - Excellent flavor
 - Ships well
 - Rain tolerant
 - Frost sensitive
- Italy – Preferred cherry
- Chile – Highly sought by China
- Best on prod. stock
- Suggested pollinizers
 - Skeena, Regina



Harvest timing days +/- Techlovan	Size (mm)	Firm. (g/mm)	PFRF (g)	SS Brix	Cracking potential 2014-2016 (36% Skeena)	Pitting 2013- 16 (Bing 2.6)
+ 6 days	29.6	311	907	18.6	12	2.6



Tamara

- Czech Republic
- About 1 week after Techlovan
- Excellent fruit size
- Excellent firmness – 356 g/mm
- Very good flavor
- Stem pull force?
- S₁S₉ – Skeena, Kordia

Harvest timing days +/- Techlovan	Size (mm)	Firm. (g/mm)	PFRF (g)	Cracking potential 2014- 2017 (29% Skeena)	Pitting 2013- 2017 (Bing 2.6)
+ 8 days	32.2	356	532	9%	2.34



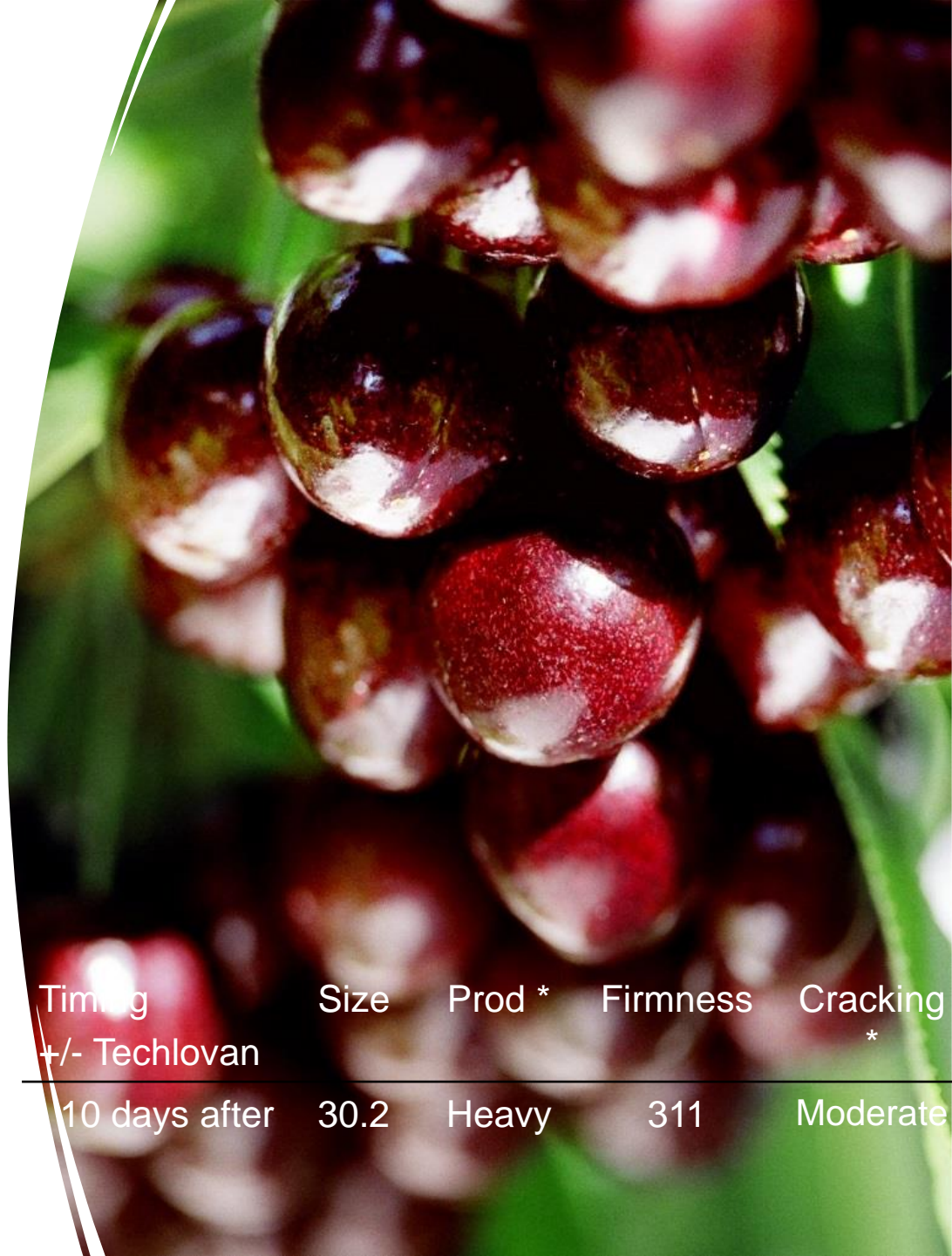
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Lapins

- Summerland, BC Canada
- 28-30 mm
- Excellent firmness
- Some rain crack resistance
- Very upright growth habit
- Very productive
- Fruit grows in clumps
- MaxMa 14
- Self-fertile



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Timing	Size	Prod *	Firmness	Cracking *
+/- Techlovan				
10 days after	30.2	Heavy	311	Moderate

Regina

Good resistance to rain

York, Germany

Good early frost resistance

Mild but good flavor

Lower productivity

Match with Gisela 6 or 5

Color when ripe

• Mahogany to dark Mahogany

Late bloom

Suggested Pollinizers

• Sam, Schneiders, Kordia

Harvest timing days +/- Techlovan	Size (mm)	Firm. (g/mm)	PFR F (g)	SS Brix	Cracking potential 2014-2016 (36% Skeena)	Pitting 2013-2020 (Bing 2.6)
+11	30.6	315	1191	19.4	5.3	2.58



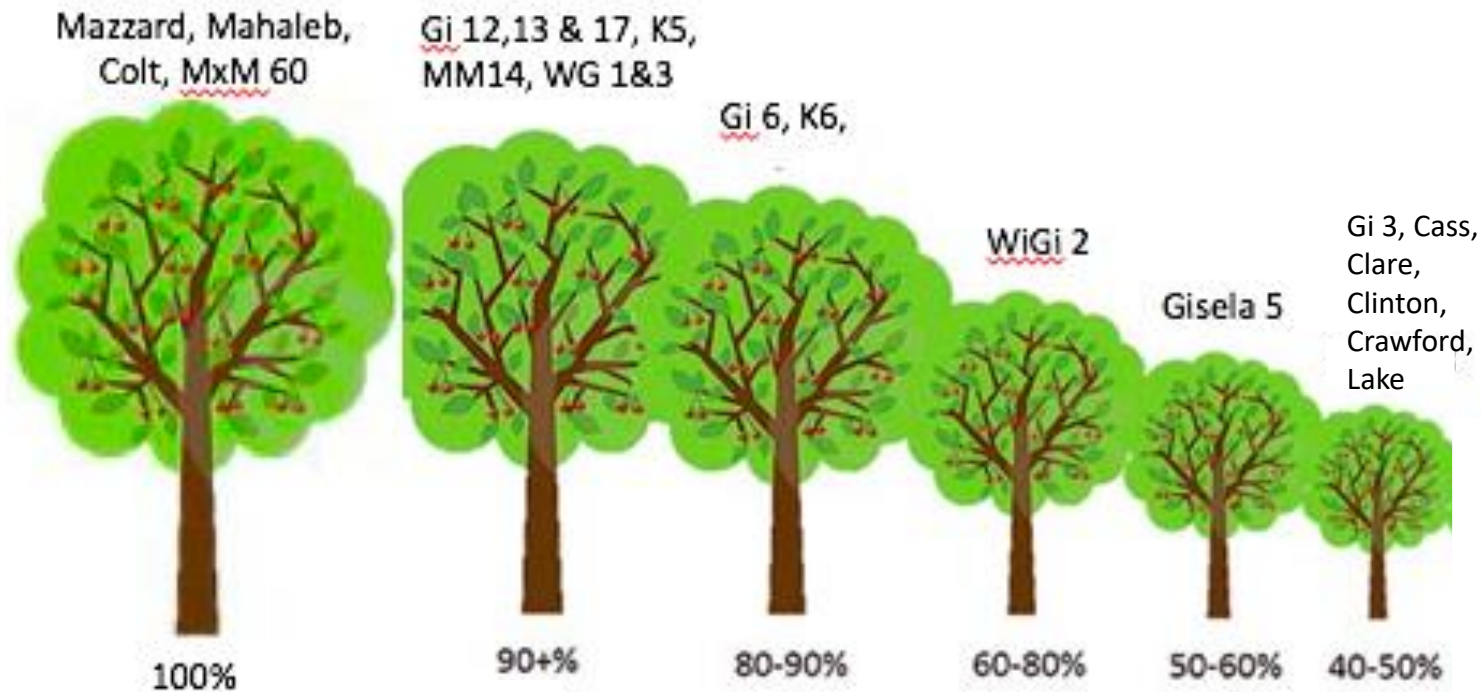
Sweetheart

- Summerland, BC Canada
- Late 18-20 days after Techlovan
- 27 mm
- Very firm
- Very productive
- MaxMa 14
- Moderate to high cracking
- Self-fertile

Timing +/- Van	Size	Firmness	Cracking *
+ .18	27.3 mm	356 g/mm	High



Relative Rootstock Size



Tree size may vary due to location, soils, climatic conditions and scion.

Used by permission. Sweet Cherries, Crop Production Science in Horticulture, CAB International



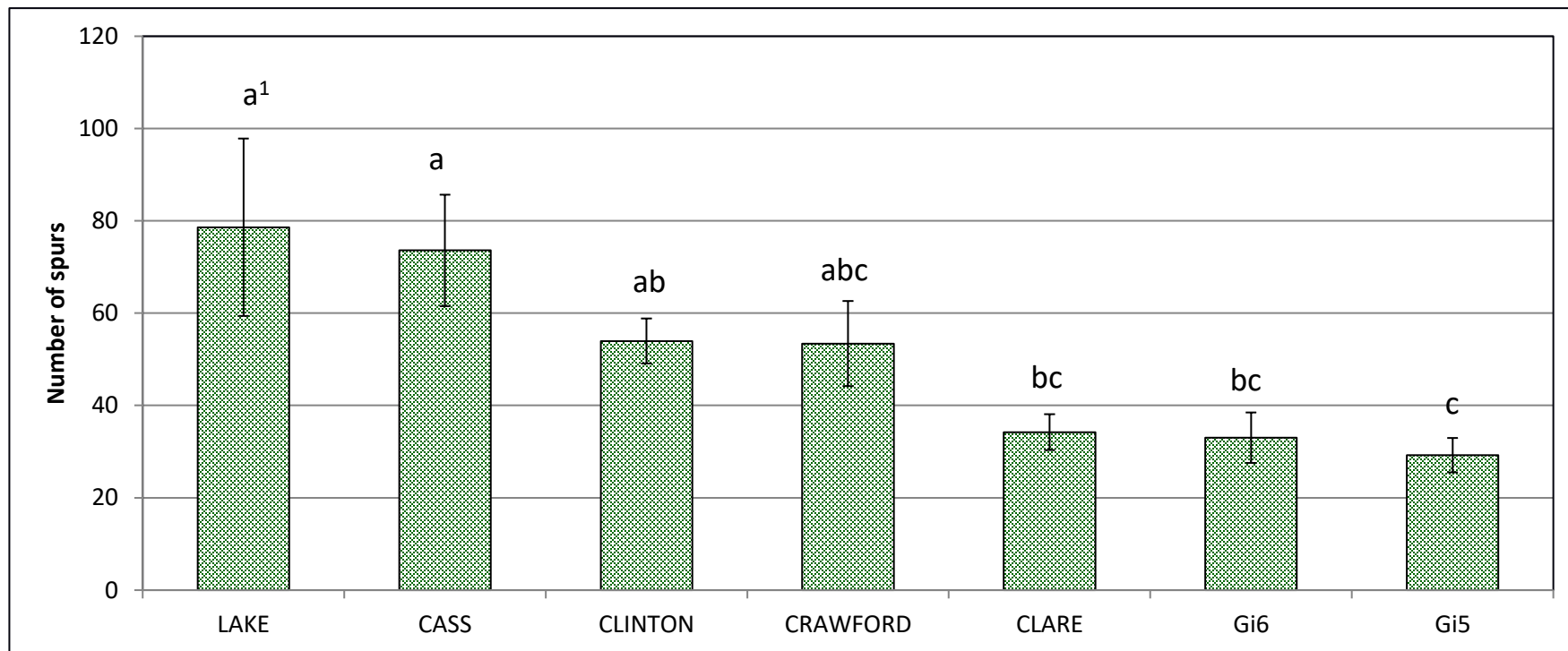
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1. Increase productivity of lower yielding varieties (Regina, Kordia, etc.)



All 5 Corette cherry rootstocks induced scion flowering greater or equal to Gi5 and Gi6 in the third leaf

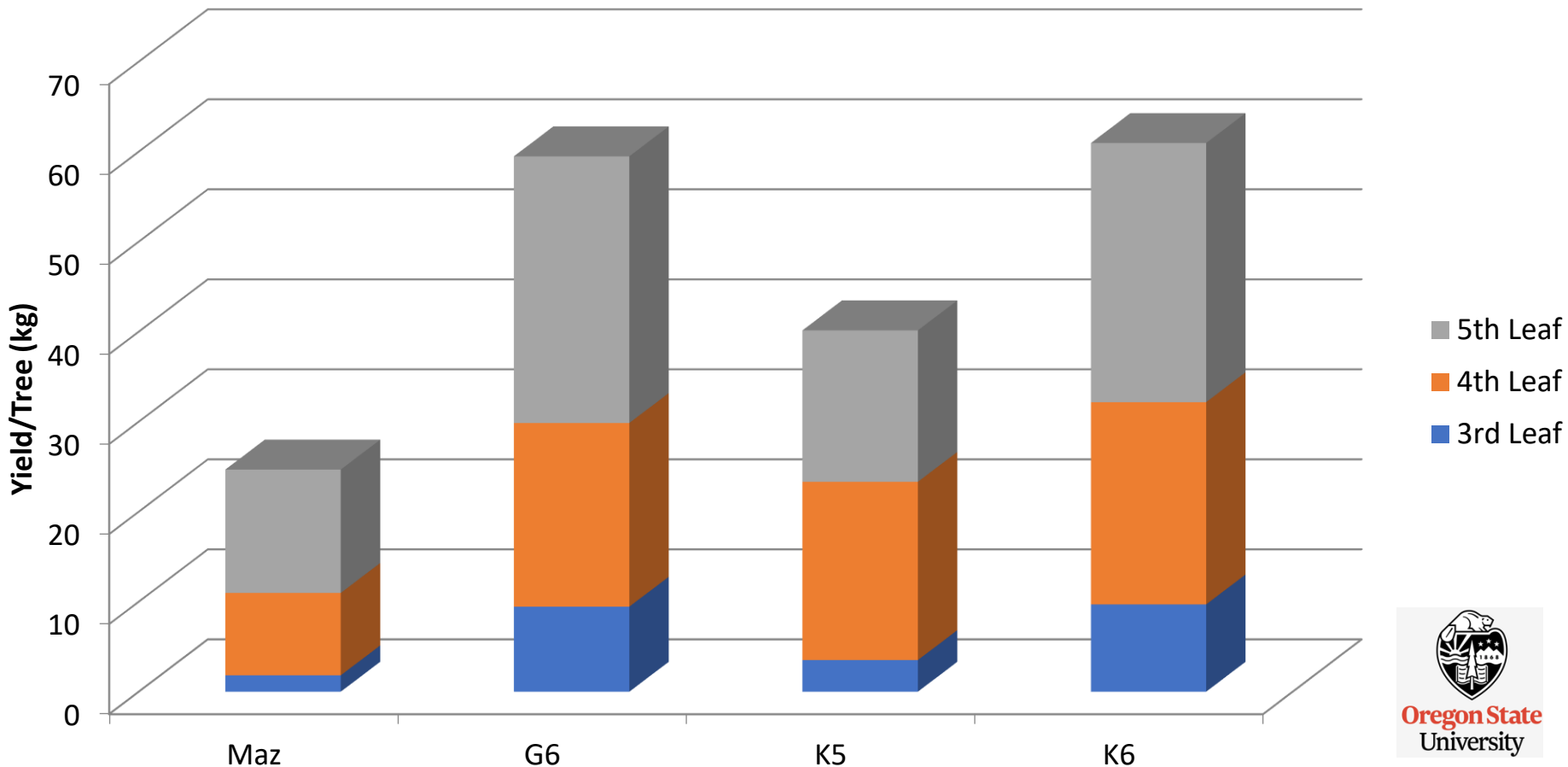
Average number of spurs on 'Bing' trees grafted on Corette rootstocks and Gi5 and Gi6 in 2011



¹Means that are significantly different ($P < 0.05$) are denoted by different letters.

2. Provide precocity while moderating oversetting potential of high yielding varieties (Royal Dawn, Sweetheart, Lapins).

Sweetheart (3rd – 5th Leaf) Yield/Tree The Dalles



3. Precocious, size controlling rootstocks that perform well in poorer soils

Gisela 13

Similar size to Gi6

Flat branch angles

No suckering

Precocious

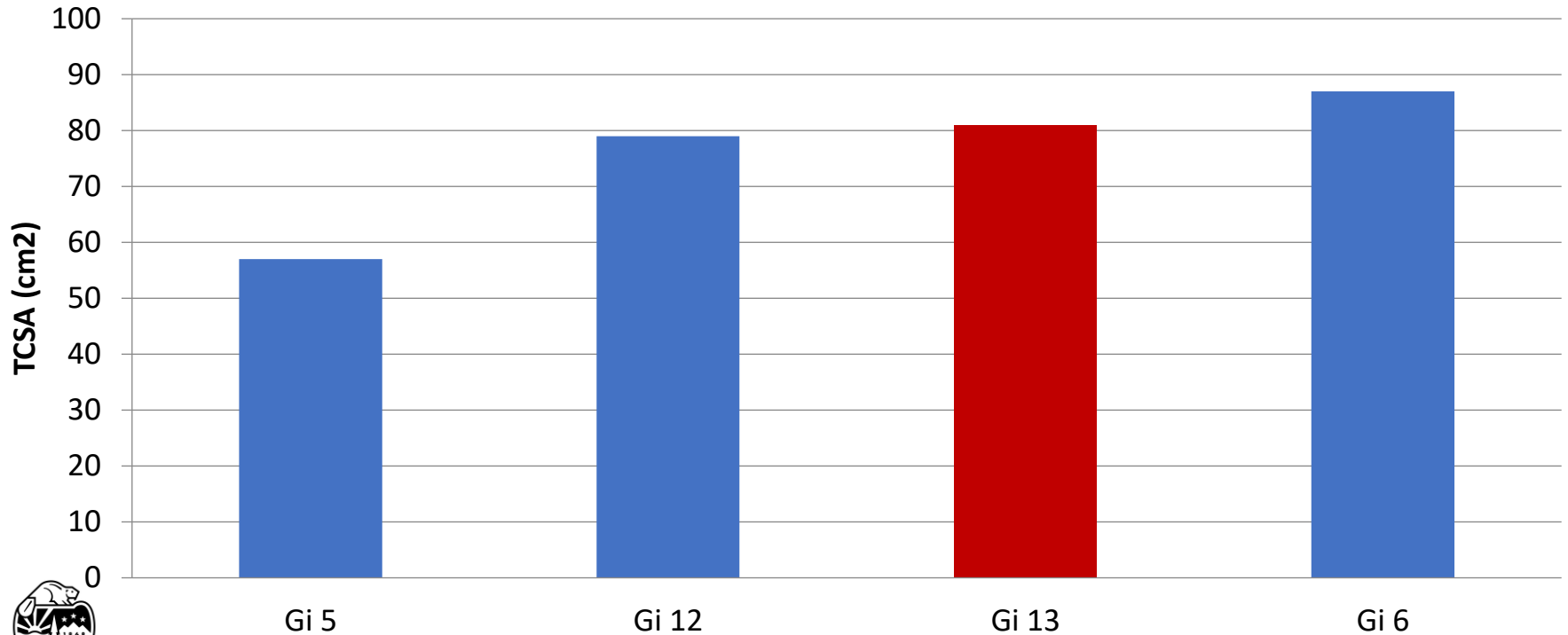
Same parentage as
Gi 5&6

In 4 trials yields
after 6-13 years
similar or > Gi5

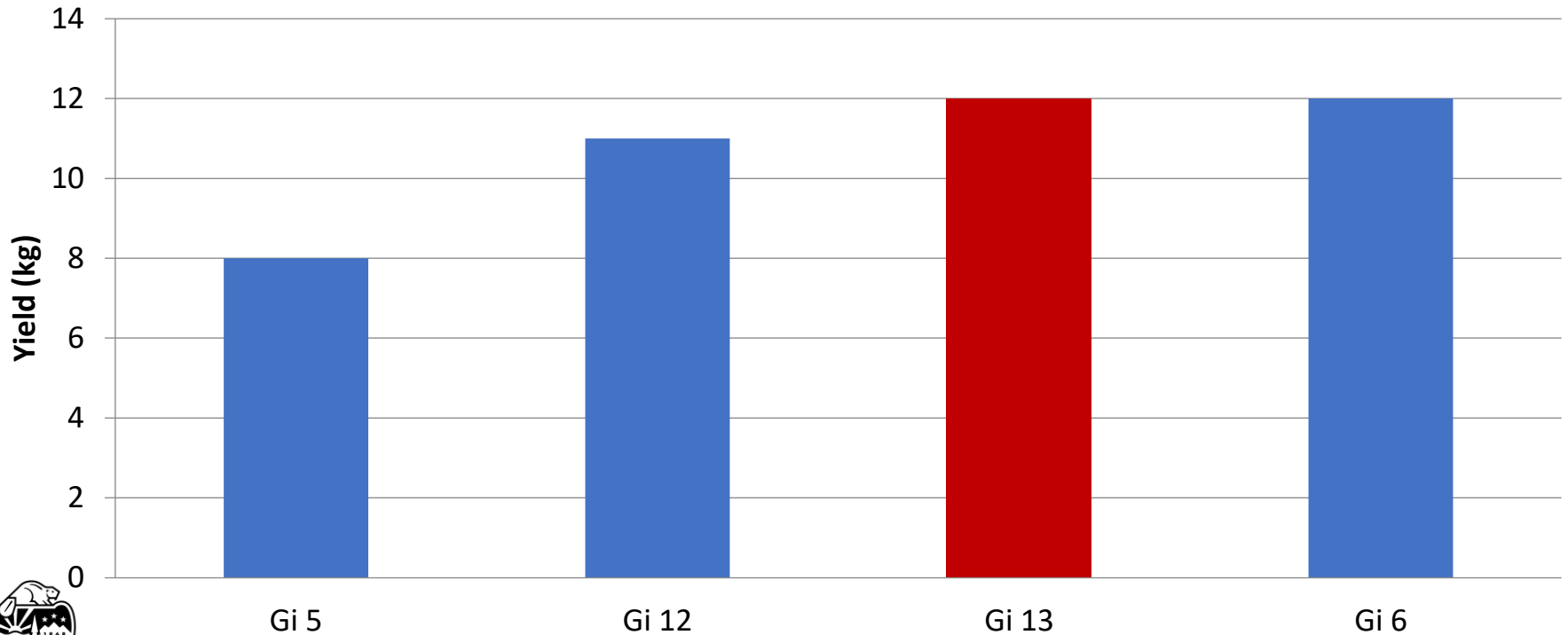
“High yields & good
quality under less
favorable
conditions”



Year 7 TCSA Witzenhausen, Germany



Year 6 Yield Witzenhausen, Germany



3. Precocious, size controlling rootstocks that perform well in poorer soils

Gisela 17

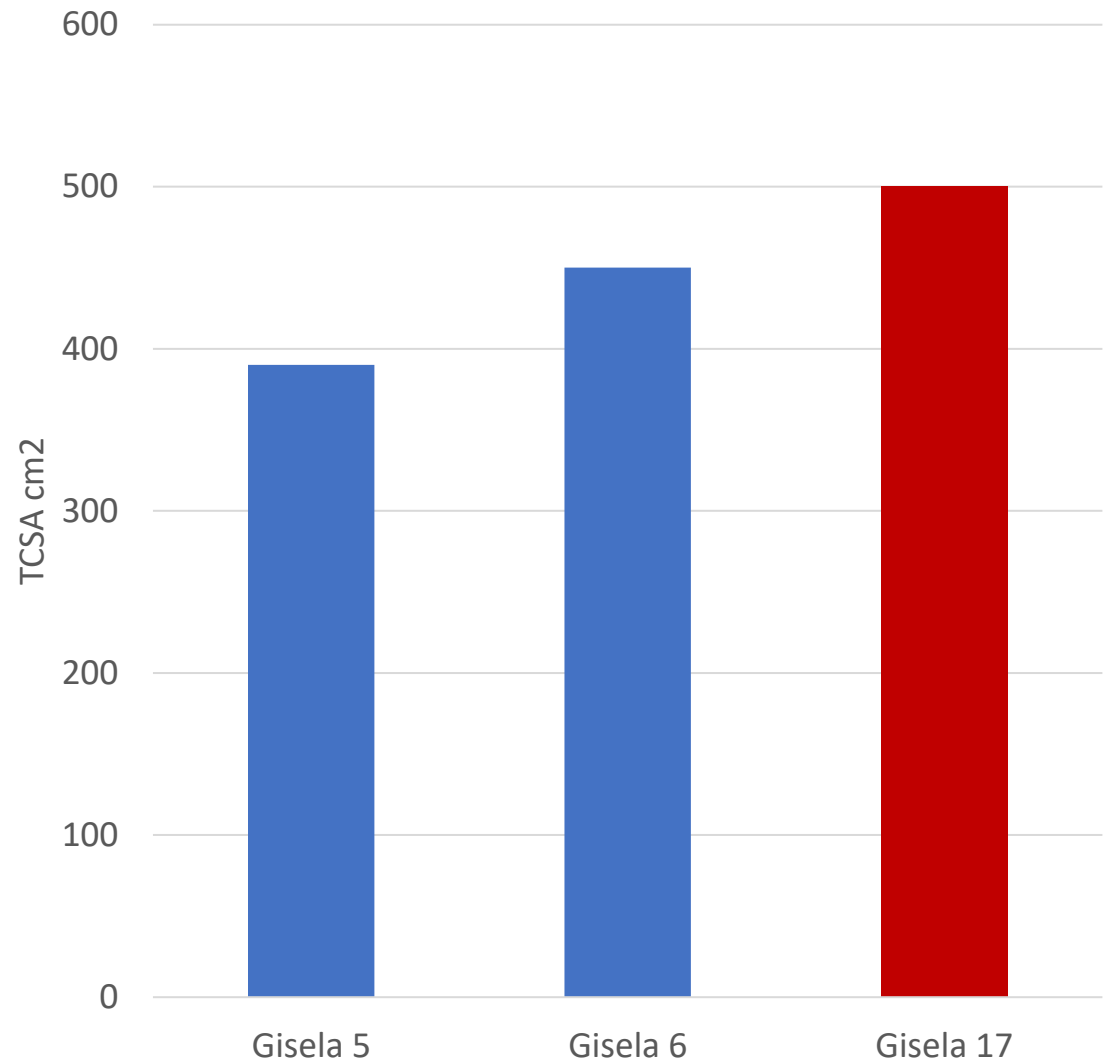
- Most vigorous of all Giselas
 - Similar size to MxM 14
 - More precocious
- *Prunus canescens* x *P. avium*
- Less potential for overcropping than Gi 5 or 6
- Combine with more productive cultivars
- “Less demanding of soil, climatic and cultural conditions than Gi5”



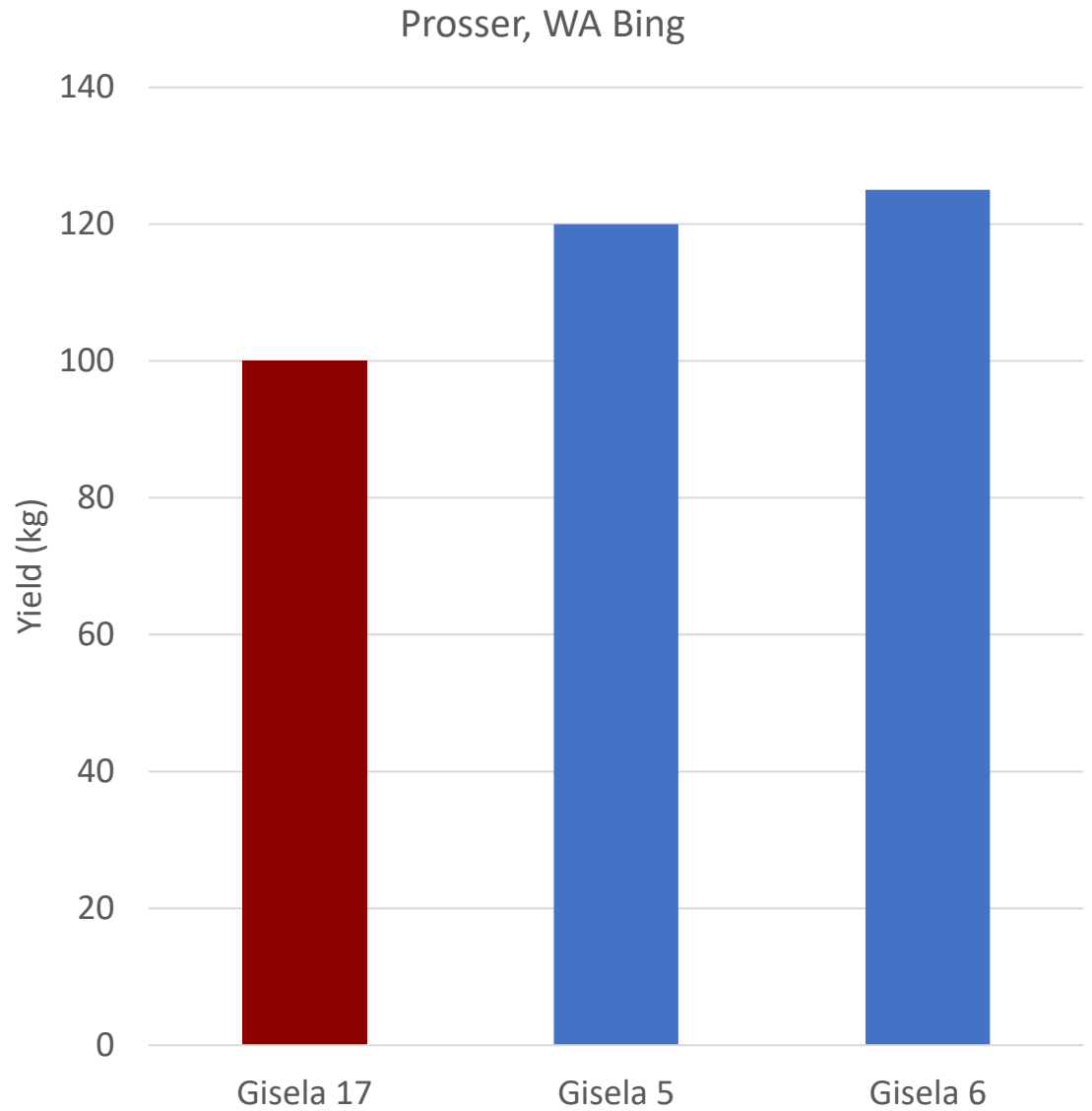
Photo by Nicola Dallabetta,
EMF

Bing - TCSA

Prosser, WA – Year 9



Bing Yield – 3-7 Leaf



New Weigi Series

Weigi 1, 2, 3

Total of 5
rootstocks

Weirout x
Gisela

Peter
Stoppel

Weigi 1, 2,
3



KGB



UFO

Science-Based Training System Options



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SSA



*Greg Lang, Michigan
State University*

Traditional Systems

- Large trees
- Full size rootstocks
- Labor intensive
- Expensive to manage
- Difficult to prune
- Low early yields
- Lower yields at maturity



Why Science-based Orchards Important

- Harvest Productivity
- We are losing our labor force
- Large Trees
 - 45 kg/hour
- Pedestrian Orchard
 - 78 kg/hour



Why UFO, KGB in Washington

Labor

Dr. Matthew Whiting Lab,
WSU

Cultivar	Training System	Mean Harvest Rate (kg/min)
Cowiche	UFO	<i>0.81</i>
Tieton	UFO	<i>0.73</i>
Sweetheart/Mazzard	KGB	<i>0.72</i>
Tieton/Gi5	Central leader	<i>0.64</i>
Bing/Mazzard	Traditional open center	<i>0.63</i>
Bing/Mazzard	4-5 leaders	<i>0.47</i>

Provided by Dr. Yiannis Ampatzidis

Why Science Based Systems are Important

- Pruning
 - Advantage of Science Based Systems
 - Every tree can be treated exactly alike
 - Teach to prune in 15 minutes
 - Each person given one task
 - Reduces complexity
 - Reduces mistakes
 - Makes pruning easier
 - Makes pruning faster

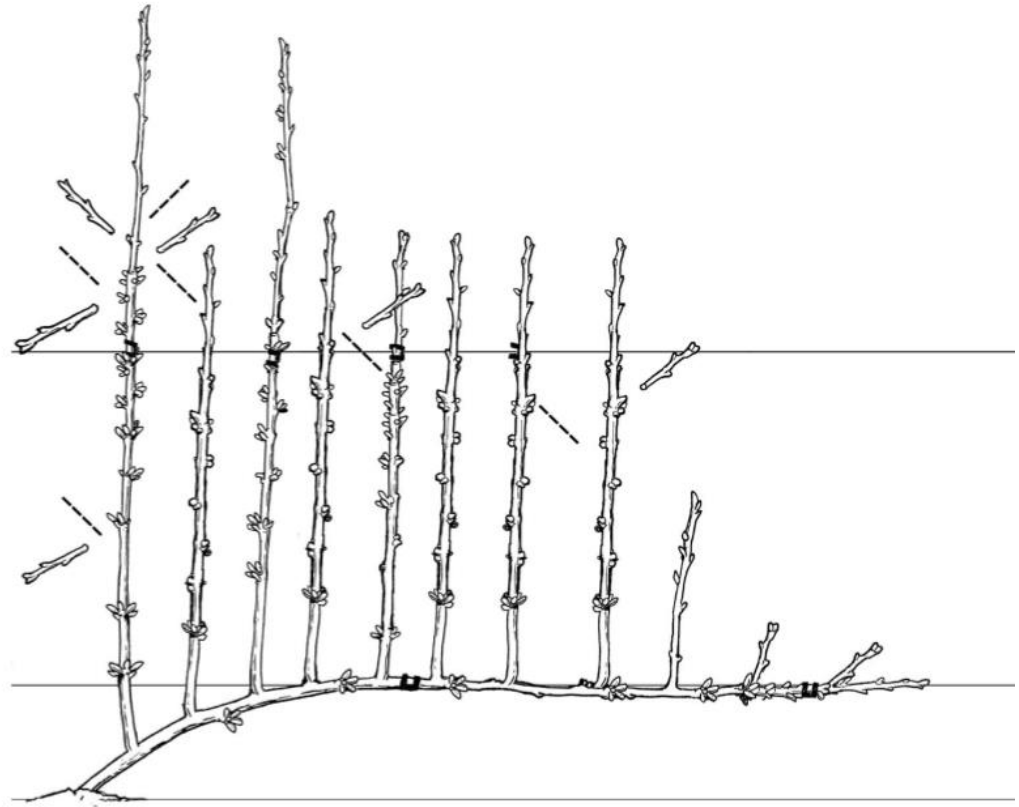
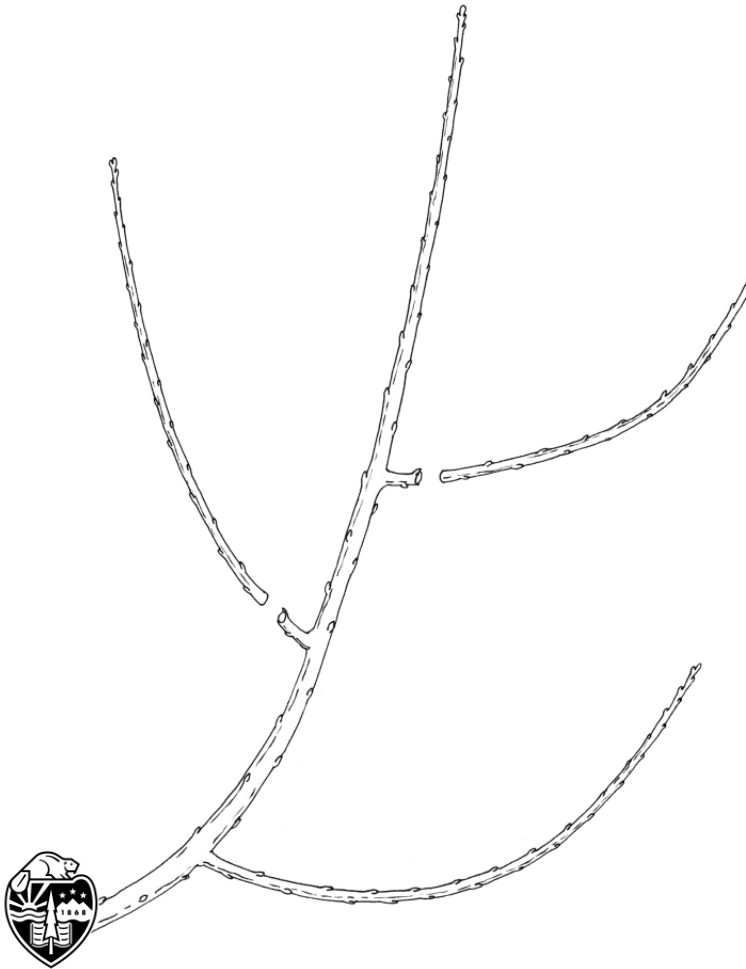


KGB



One Year Old Laterals Removed

Only 2 steps to pruning



Why Pedestrian Orchards Important

- Pruning
 - SSA
 - At maturity
 - 1 pruning step



SSA



Why Science Based Orchards Important

Oregon Grower 1

- Since planting KGB and other science based systems
- Cut labor force by $\frac{1}{2}$
 - Hire fewer workers
 - Less paperwork
 - Fewer accidents



Why UFO in Washington State

Mark Hanrahan

Labor

Picking

Picking productivity
3x more efficient

- 1500 boxes UFO in same time
- 500 boxes steep leader

Pruning

Pruning efficiency

- About same as steep leader
- Could increase UFO efficiency with platform



UFO



5th leaf fruit quality – Matthew Whiting, WSU

Variety	Yield/tree (kg)	Yield (m.tons/ha)	28mm+ (m.tons/ha)	25.4mm+ (m. tons/ha)
'Skeena'/Gi12	18.1	23.9	23.3	23.8
'Bing'/Gi12	28.7	38.1	15.9	34.7
'Tieton'/Gi5	12.6	16.3	15.2	16.3
'Skeena'/Gi5	10.5	13.8	13.2	13.8
'Chelan'/Gi12	10.5	13.8	6.5	12.5

Super Slender Axe (SSA) Yields

50-100 cm

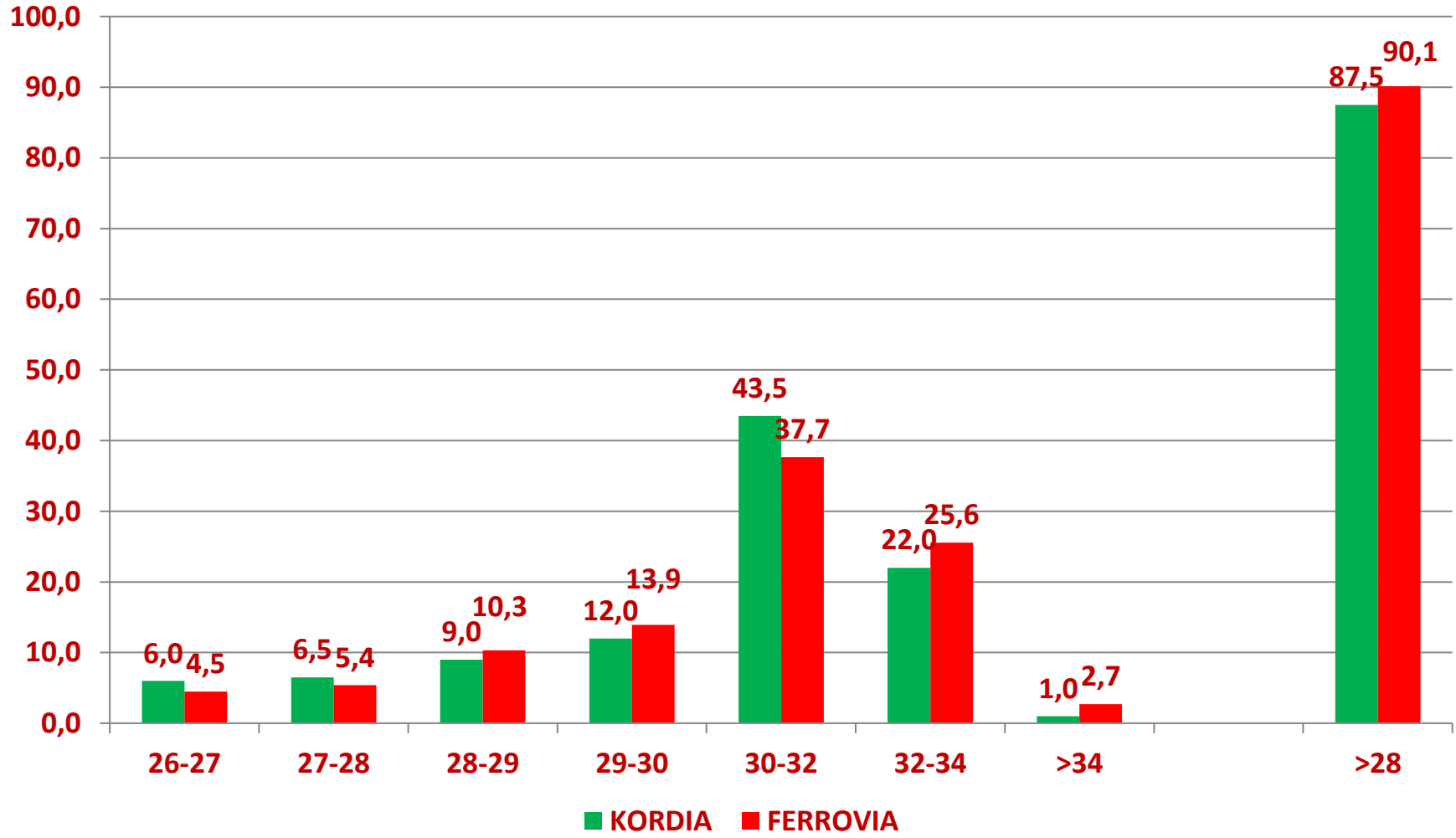


SSA Cropping on basal buds of year-old shoots



**Second trial (Beltrami farm)- Vertical axis. Planting distance 4.0 x 0.5 m –
Planting density 5,000 alb./ha. Year of plantation 2004**

Fruit size distribution 2008



Slide courtesy of Stefano Musacchi

Four Simple Steps to Pruning Cherry Trees on Gisela and Other Productive Rootstocks

L.E. Long

Pruning and training trees on productive rootstocks, such as Gisela® 6 or 12, requires techniques that are completely counter to pruning trees on Mazzard rootstock. When producing cherries on Mazzard rootstock, orchardists must constantly think about how to encourage precocity and productivity in the tree, whereas when producing cherries on productive rootstocks, they must focus on reducing crop load and increasing vigor.



Corinne Duman

Tree vigor is important because more leaves mean more carbohydrate production and larger cherries. The production of high-quality cherries requires a gross canopy leaf area-to-fruit (LA:F) ratio of at least 200 cm² of leaf area per fruit, which roughly translates to five leaves per fruit (Whiting and Lang, 2004). Trees with a lower LA:F ratio are unable to manufacture enough carbohydrates to produce premium cherries.

Pruning strategies for trees on productive rootstocks should focus on the following:

- Thinning cuts to remove pendant (downward-hanging) and weak wood and to improve light penetration into the tree
- Stub cuts to reduce crop load and renew spurs
- Heading cuts to encourage branching (leaf production) and reduce crop load

Thinning cuts

Each year, begin by removing any pendant or small-diameter wood at the point of its origin. Typically, these branches overset and produce small cherries. Removing these branches in the dormant season can eliminate a significant amount of small cherries before they develop.

Also reduce branches in the top of the tree and on the perimeter to a single shoot.

These thinning cuts will allow light to reach the inner and lower portions of the tree. Only leaves in full sunlight can photosynthesize at maximum capacity.

Stub cuts

The current season's crop can be reduced by heading with stub cuts. Stub cuts also replace branches and renew old spurs.

The highest quality cherries grow at the base of last year's growth and on young spurs. Therefore, no spur should be older than 5 years old. To keep spurs within this age range, stub back and renew 20 percent of all fruiting branches each year.

Adequate light must reach the area around the cut in order for a new branch to form. For this reason, cut branches located near the tree base to a longer stub than those near the tree top. Stubs can range from 3 inches to 2 feet in length, depending on the position of the branch in the tree.

Lynn E. Long, Extension faculty (horticulture), Wasco County, Oregon State University.

A Pacific Northwest Extension publication
Oregon State University • University of Idaho • Washington State University

- Lynn Long pruning Gisela trees



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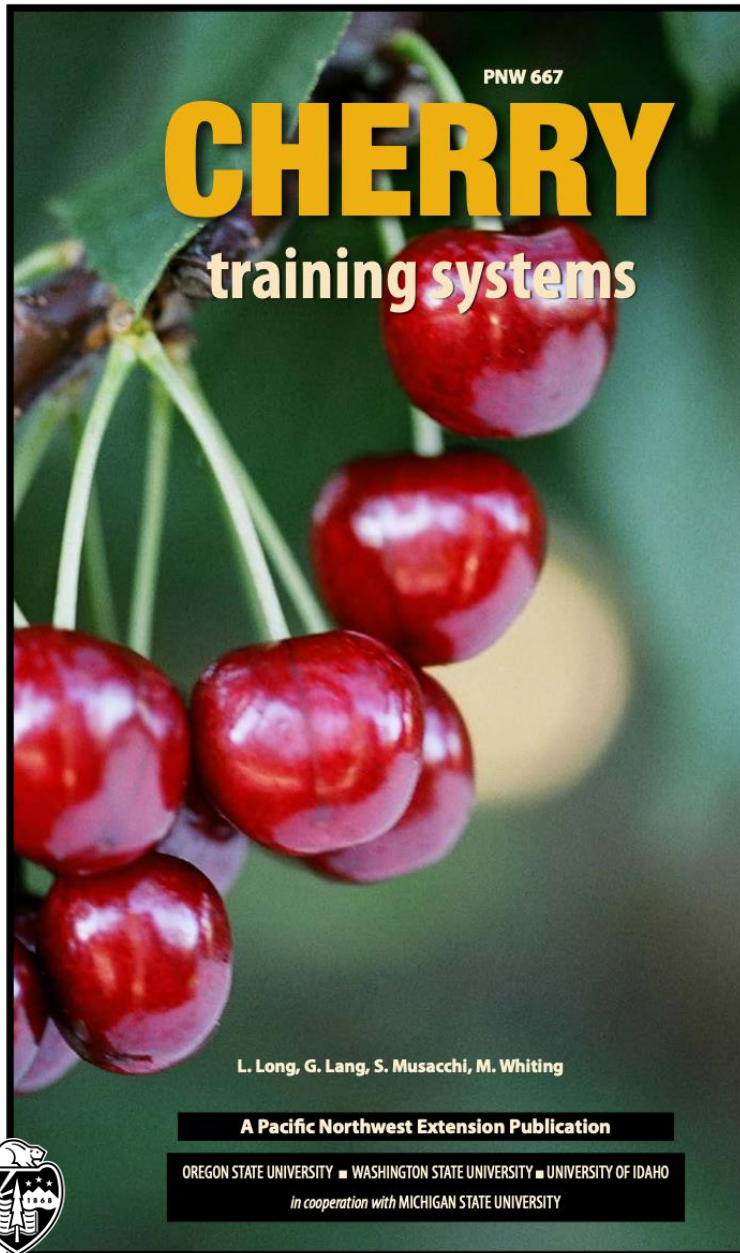
Lynn Long



Greg Lang

Lynn Long Cherry Training Systems

App Store: Cherry Pruning



TRAINING SYSTEM: **SUPER SLENDER AXE**

STAGE: *First dormant season*

GOALS

- Impose bud-activation techniques to stimulate additional extensive lateral shoot formation on leader.
- Begin “short-pruning” of existing lateral shoots to simultaneously balance leaf area with second-year crop load and renew or initiate new fruiting laterals.



Figure 46a



Figure 46b

SYSTEM DEVELOPMENT

- SSA “short-pruning” is done by removing the majority of the length of each 1-year-old (previous season) shoot, retaining only the basal flower buds plus at least two vegetative buds for new shoot formation (Figure 46a). Lower branches can be left slightly longer than upper branches.
- Short-pruning may be accomplished best during bud swell, when it is easier to differentiate between the rounded flower buds and the more pointed vegetative buds (Figure 46b).
- When leader extension has been moderate, bud activation steps can be taken (as described above) to induce another 10 or more lateral branches on this leader growth, repeating as needed until the full tree height is achieved.

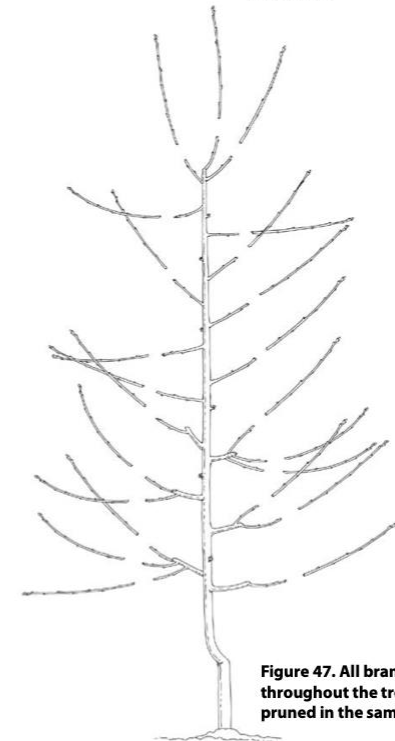


Figure 47. All branches throughout the tree are short pruned in the same manner.



SWEET CHERRIES

Lynn E. Long, Gregory A. Lang and Clive Kaiser

CROP PRODUCTION SCIENCE IN HORTICULTURE



www.cabi.org/bookshop/book/9781786398284/



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Why UFO in Washington State

Grower Fruit Quality Experience

- Yield & Fruit Quality
 - Hand thinning may be necessary on some varieties
 - Especially in 4th to 5th leaf
 - Other systems prune to reduce crops
 - Costing \$2500/ha

Mark Hanrahan





Nimba

- SMS Genetics – California
- Very early
- Good size ~ 30 mm
- Moderate firmness
- Flavor sweet/weak
- S₂S₃ Pollinizer: Pacific Red, Royal Hazel
- Moderate cracking
- Productivity good



Pacific Red

- SMS – California
- Very early
- Good size – 28-30 mm
- Excellent firmness
- Moderately strong but pleasant flavor
- S₄S₉ Pollinizer – Nimba, Royal Hazel
- Productive



Royal Tioga

- Zaiger Genetics – California
- Early
- 28-30 mm
- Good firmness
- Sweet/good flavor
- Blooms early
- Self-fertile





Royal Hazel

Zaiger Genetics

500 Chilling hours

First bloom 7 days before Bing

Fruit set - 2013-2016 Heavy

Excellent, strong sweet/acid flavor

Very early bloom S_4S_6 - Royal Lynn or Royal Tioga as pollinizers



Harvest timing days +/- Techlovan	Size (mm)	Firm. (g/mm)	PFRF (g)	Cracking potential 2014-2020 (36% Skeena)	Pitting 2013-2020 (Bing 2.6)
-10 days	30.24	335	1294	10.5%	2.75



Royal Dawn

- Very Early: 10 to 15 days before Techlovan
- Popular in Chile & Spain
- Best at 18-20 brix
- Large 28 mm
- Tree is precocious & productive
- Storage > 30 days problematic
- Fruit cracking high
- Self-sterile: Black Star, Samba, Bellise, Earlise



Royal Bailey

- Zaiger Genetics- California
- Early ripening
- 30-32 mm
- Moderate firmness
- Susceptible to cracking
- Early bloom
- S₁S₃ Pollinizer - Frisco



Royal Edie

- Zaiger Genetics - California
- Very large
- Very firm
- Regina timing
- Somewhat mild flavor
- Very meaty
- Crunchy
- Moderate susceptibility to rain
- Self-fertile

Harvest timing days +/- Techlovan	Bloom timing +/- Bing	Size (mm)	Firm. (g/mm)	Cracking potential 2013-2016 (36% Skeena)	Pitting 2013-2016 (Bing 2.6)
+ 13 days	+2	31.5	371	15%	2.71



Skeena

- Summerland, BC Canada
- Mid-Late Ripening
- Easier to grow than Lapins
- Ships very well
- Productive
- Self-fertile
- Gisela 6, MM14
- Sensitive to heat
- Sensitive to rain

Harvest
Timing
+/-
Techlovan

Size

Firmness

Cracking
potential
2014-2016
(36%
Skeena)

Pitting
2013-2016
(Bing 2.6)

+ 11

27-32
mm

322 g/mm

36%

2.65



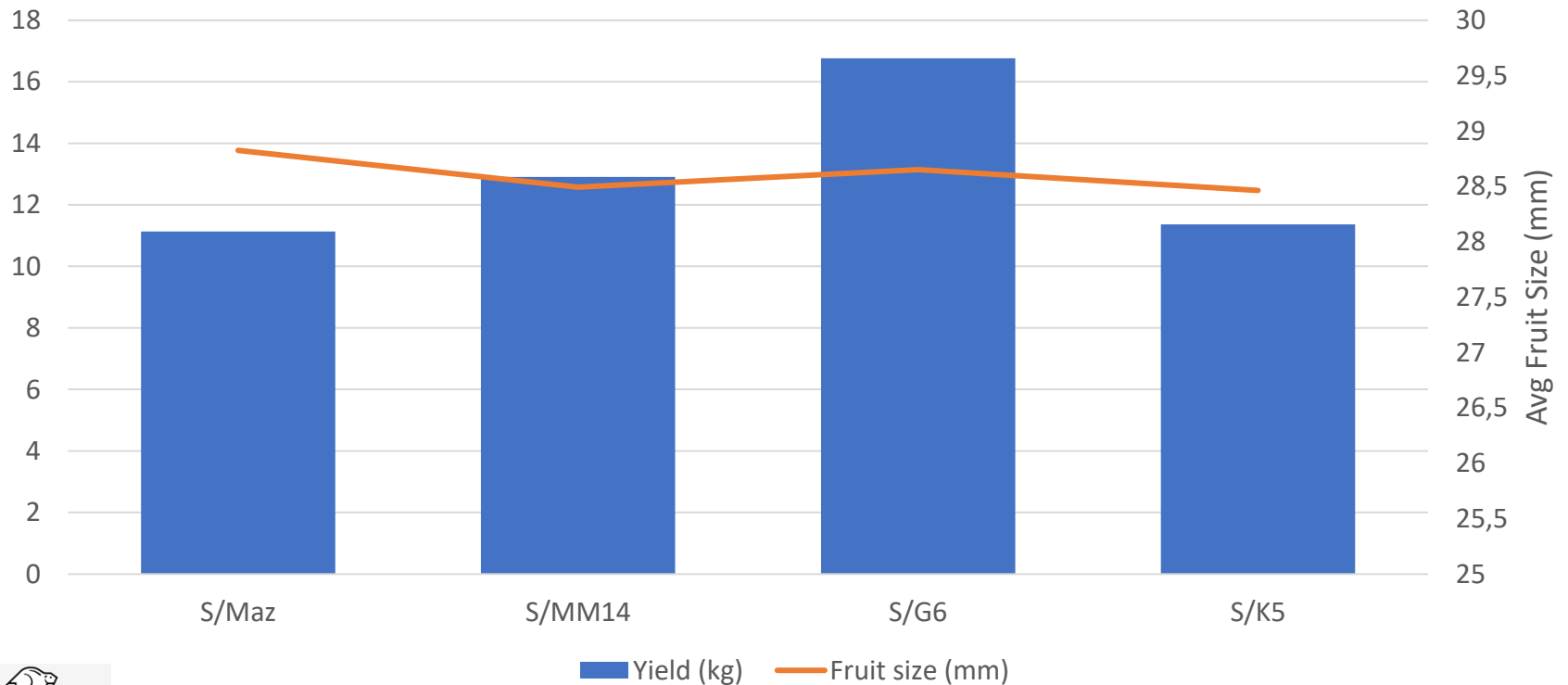
Sovereign

- Summerland, BC Canada
- Very late – 33 days > Van
- 31 mm
- Excellent Firmness
- Good flavor - medium strong
- Resistant to cracking
- Productive
- Gisela 6, MxM 14
- Self-fertile

Harvest timing days +/- Bing	Size (mm)	Firm. (g/mm)	PFRF (g)	Cracking potential 2014- 2016 (36% Skeena)	Pitting 2013- 2016 (Bing 2.7)
+27 days	31.3	364	984	9.2	2.64

Sweetheart average per tree yield and fruit size – The Dalles

Sweetheart Average Yield/Tree (kg) (2-7 leaf) and Average Fruit Size (4-7 leaf)



Sentennial

- Summerland, BC Canada
- Very late – 28-30 days > Van
- Somewhat mild flavor, but good
- Excellent firmness
- 29-30 mm
- Moderate cracking
- Heavy producer on Gisela 6
- Self-fertile

Harvest timing days +/- Bing	Size (mm)	Firm. (g/mm)	PFRF (g)	Cracking potential (36% Skeena)	Pitting 2013-2016 (Bing 2.7)
+28 days	29.8	404	666	19.0	2.56

Planning and Developing a Modern Sweet Cherry Orchard

Lynn E. Long

Oregon State University

04/13/2006



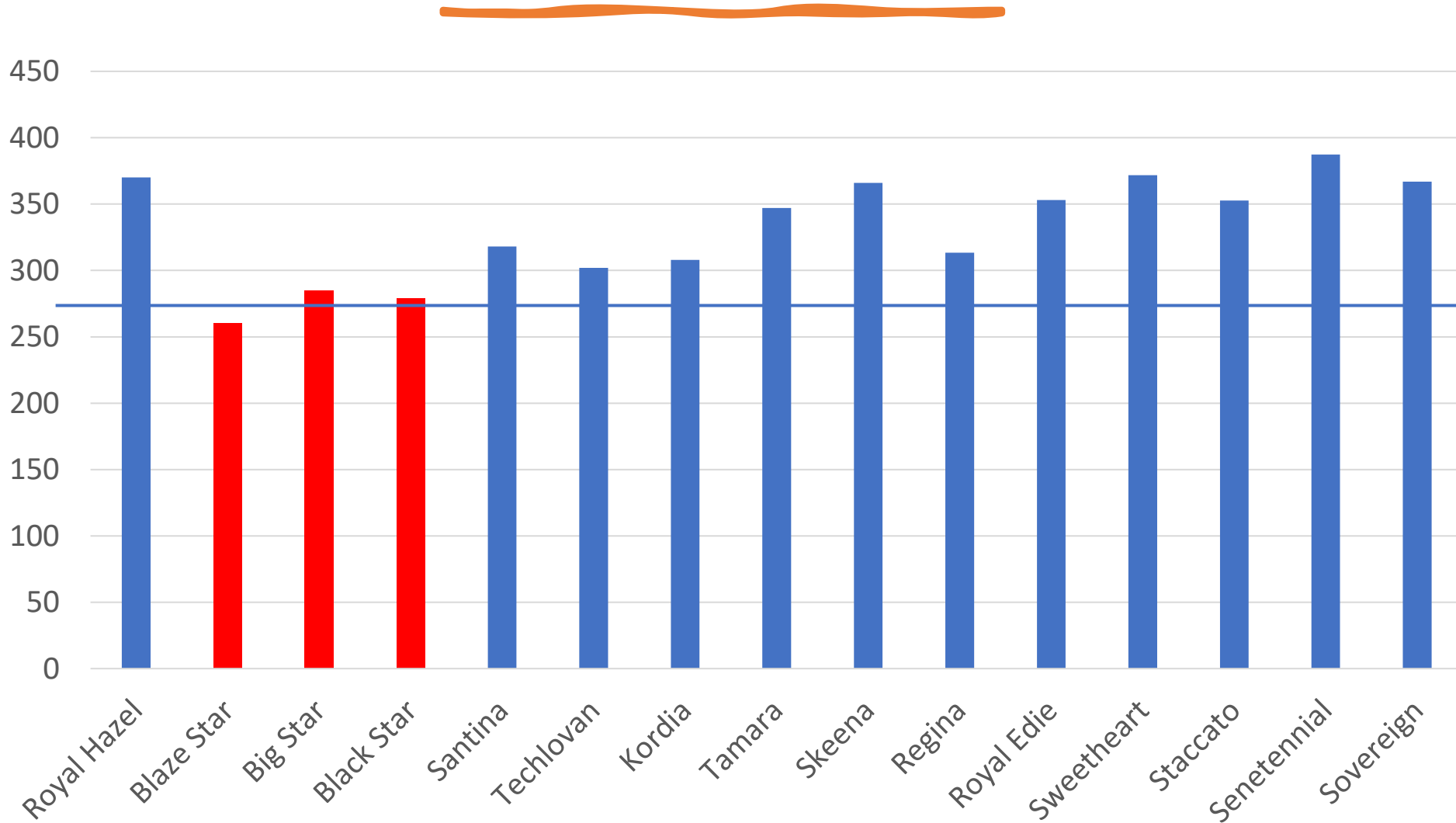
Sweet Cherry Varieties, Rootstocks and Training Systems for the Modern Sweet Cherry Orchard

Lynn E. Long
Oregon State University

04/13/2006



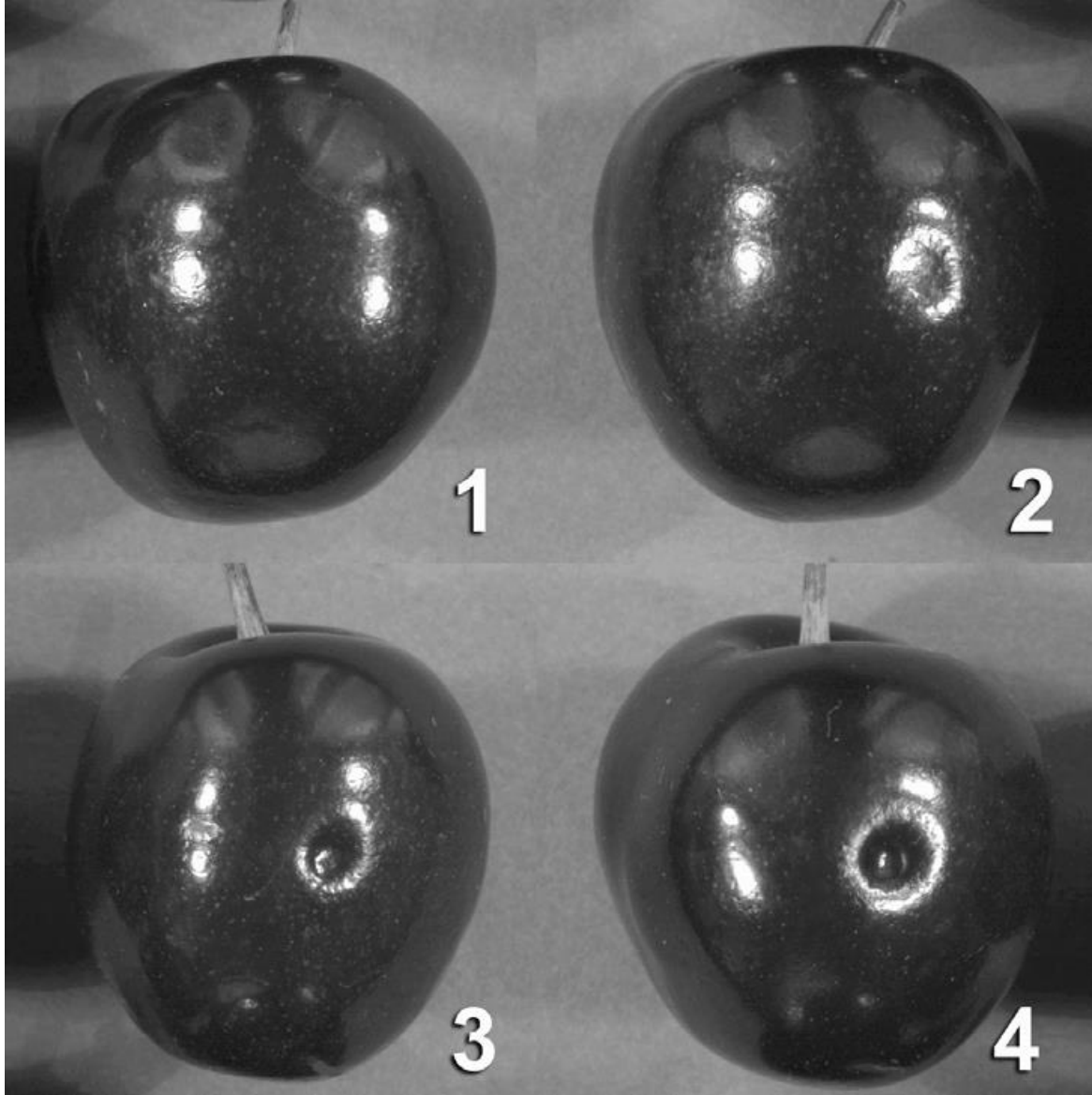
Fruit Firmness of Selected Varieties (g/mm)



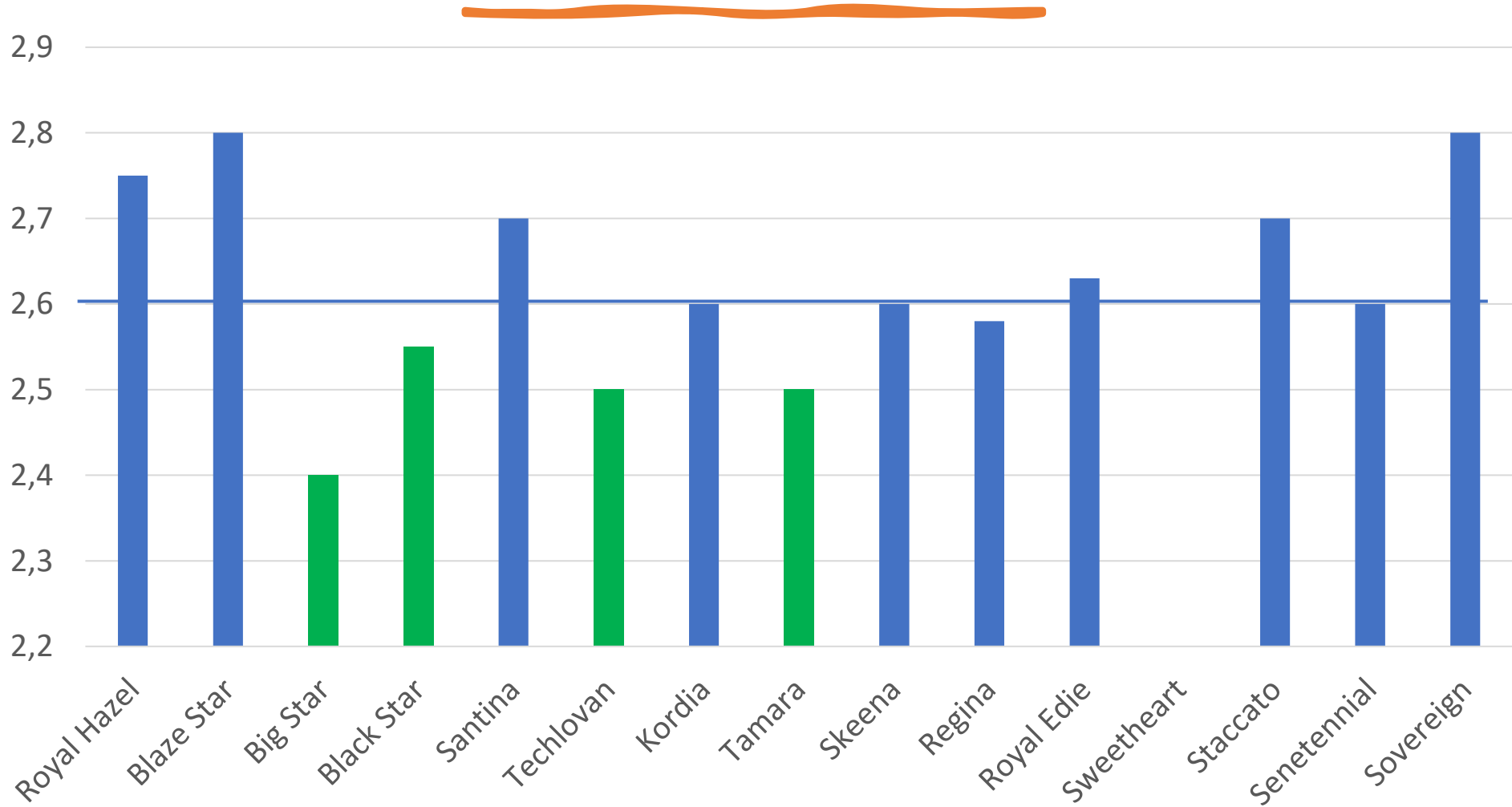
What should growers look for?

- Characteristics of desired varieties
 - Early to late harvest
 - 30-45 days +
 - Good shipping potential
 - Western Europe
 - Middle East
 - Large (28 mm +)
 - Firm
 - Rain crack resistant
 - Flavorful





Fruit Pitting Potential of Selected Varieties





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COUNTY
EXTENSION



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Varieties to Consider for Season-Long Production



Techlovan

- Czech Republic
- Very pendant
- High Quality mid-season
- Excellent flavor
- Firm
- Cracks in rain
- Pollinizers: Skeena, Santana

Harvest timing days +/- Techlovan	Size (mm)	Firm. (g/mm)	PFRF (g)	Cracking potential 2014-2020 (36% Skeena)	Pitting 2013-2020 (Bing 2.6)
0	31.8	302	952	35%	2.7



Available Cherry Rootstocks

Commonly Available

- Colt
- Mazzard
- Mahaleb
- Gisela 3, 5, 6, 12 (USA & Chile)
- MaxMa 14 & 60 (Chile)
- Cab-6P (Chile)
- Krymsk 5 & 6 (USA)

New Rootstocks

- Gisela 13, 17
- Weigi 1, 2, 3
- Corette Series
 - Cass, Clare, Clinton, Lake, Crawford

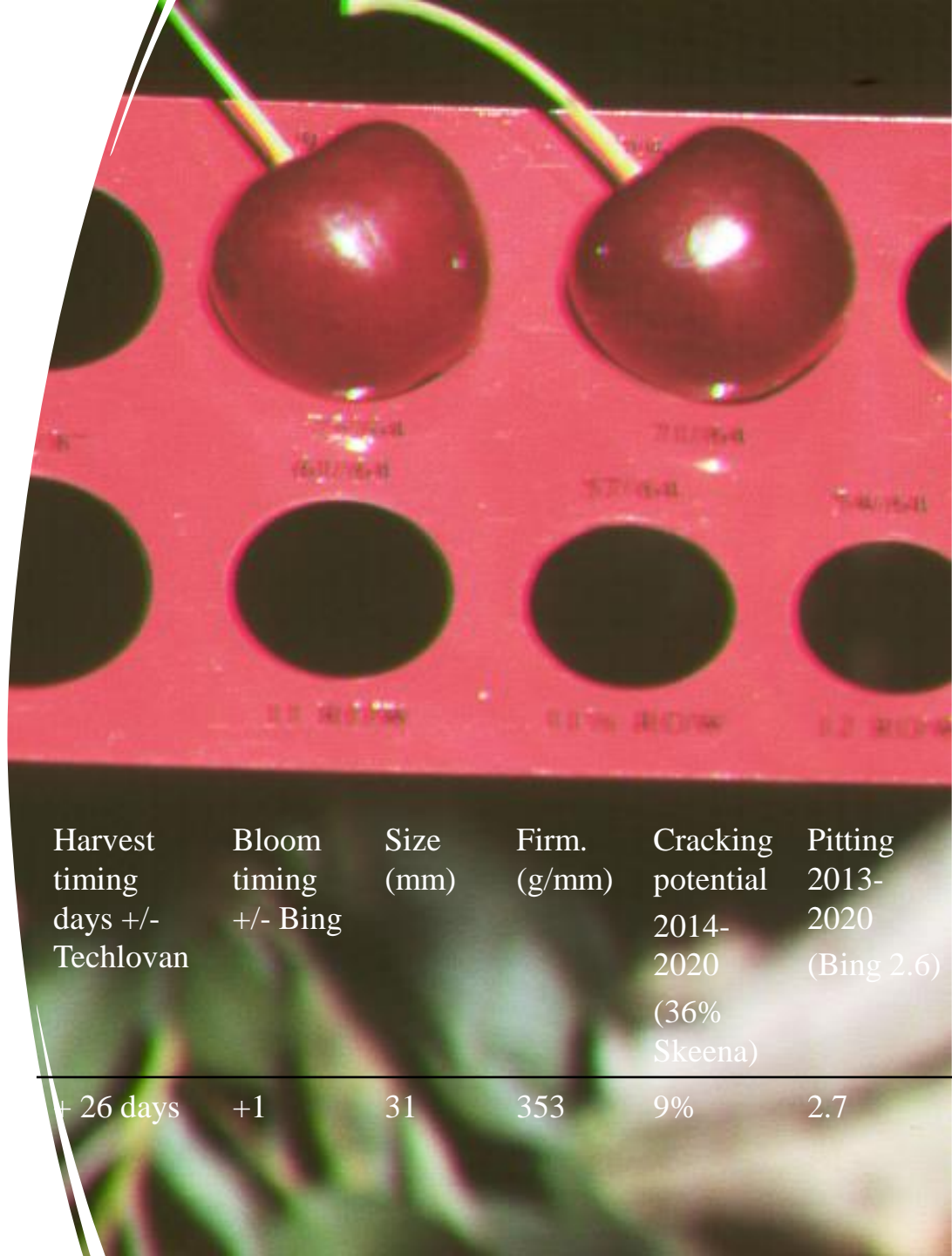
Staccato

- Summerland, BC Canada
- Very late, ~25 days > Techlovan
- Fruit size 31 mm
- Excellent firmness
- Moderate intense sweet/acid flavor
- Rain cracking resistance
- Good productivity
- Gisela 6 or MaxMa 14
- Self-fertile



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Harvest timing days +/- Techlovan	Bloom timing +/- Bing	Size (mm)	Firm. (g/mm)	Cracking potential 2013-2020 (36% Skeena)	Pitting 2013-2020 (Bing 2.6)
+ 26 days	+1	31	353	9%	2.7



Sweet Aryana

- Very early: 14 days < Black Star



What Traits are We Looking For?

1. Increase productivity of lower yielding varieties (Kordia & Regina).
2. Provide precocity while moderating oversetting potential of high yielding var. (Lapins, Sweetheart).
3. Rootstocks like apples, good precocity (similar to Gi5), but more forgiving. Consistently good fruit set, without affecting fruit size.
4. Two vigor levels: 1) Precocity with vigor 2) Precocity with size control
5. Precocious, size controlling rootstocks that perform well in poorer soils

Regina – Steep Leader The Dalles, Oregon

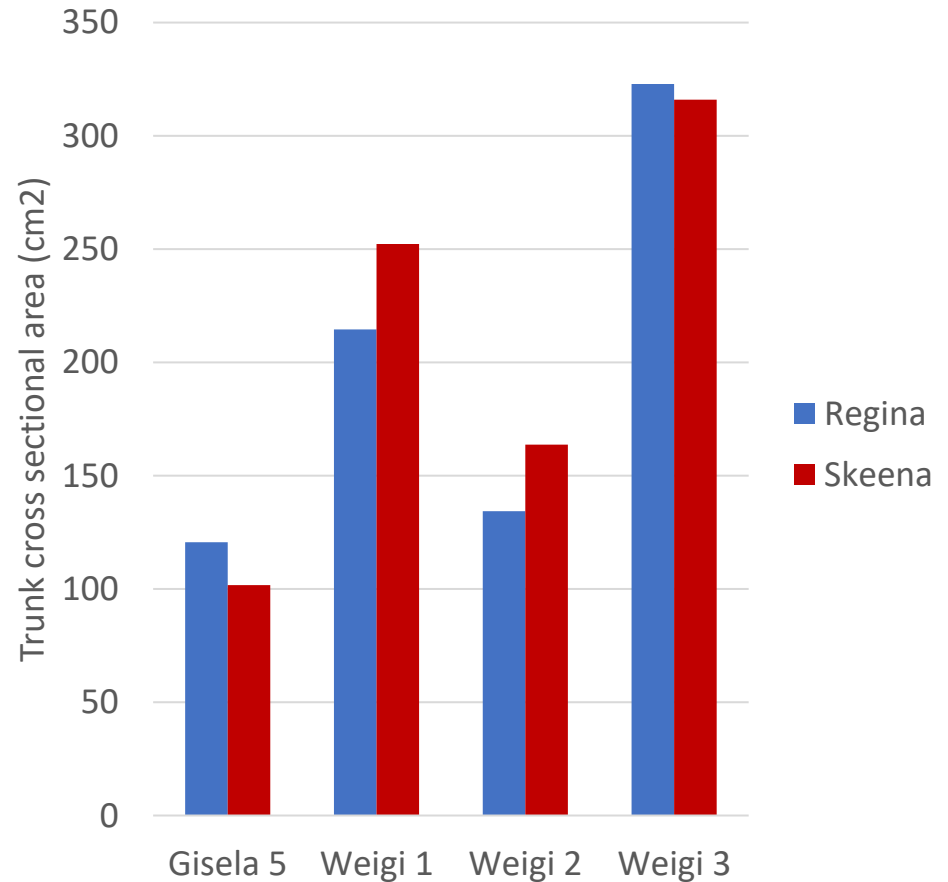
Rootstock Selection	4 th Leaf		5 th Leaf	
	Yield tonnes/ha ¹	Fruit Size mm	Yield tonnes/ha ¹	Fruit Size mm
Gi 5	18.3 a ²	27.2 ab	3.8 b	28.0 ab
Gi 6	23.2 a	26.8 ab	8.9 ab	29.2 a
K 6	17.0 a	27.5 ab	9.7 ab	27.8 ab
Cass	22.7 a	27.2 ab	24.0 ab	27.9 ab
Clare	13.0 a	28.0 a	15.2 a	29.1 a
Clinton	21.7 a	27.0 b	13.5 a	27.3 b
Lake	14.6 a	27.5 a	8.6 ab	28.4 ab

¹Yields per hectare were calculated as average yield per tree × number of trees per ha with 1,282 trees/ha (1.8 m × 4.3 m) for K5/K6 and Gi6; 1,536 trees/ha (1.5 m × 4.3 m) Gi5 and Clinton; and 1,922 trees/ha (1.2 m × 4.3 m) for Clare, Cass, and Lake.

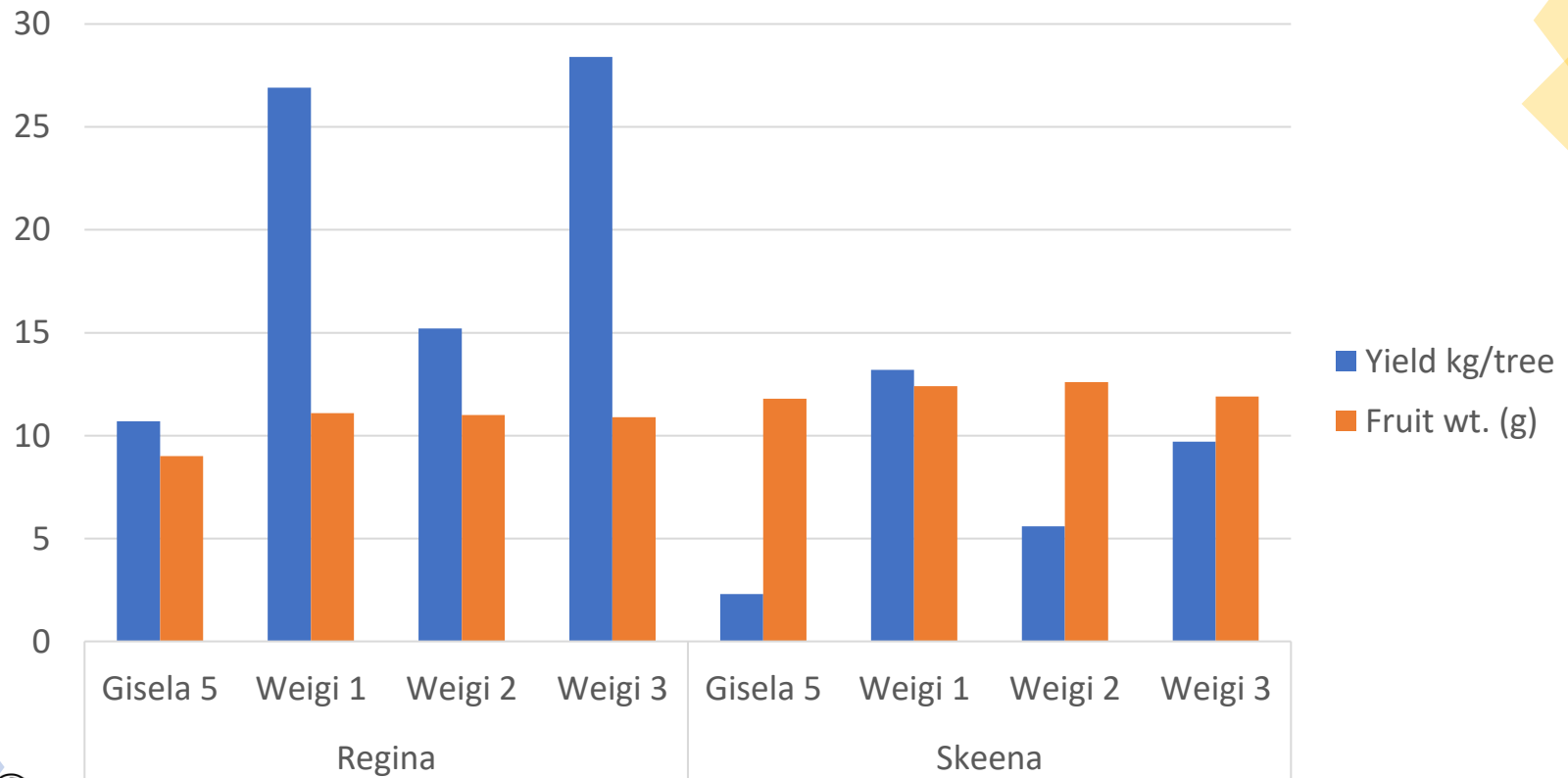
²Means that are significantly different ($P < 0.05$) are denoted by different letters.

Relative Tree Size at La Tapy France

- SARA PINCZON DU SEL
- Domaine Expérimental La Tapy



Weigi Per Tree Yield and Fruit Weight - 2012



4. Two Tree Vigor Levels

Precocity with vigor

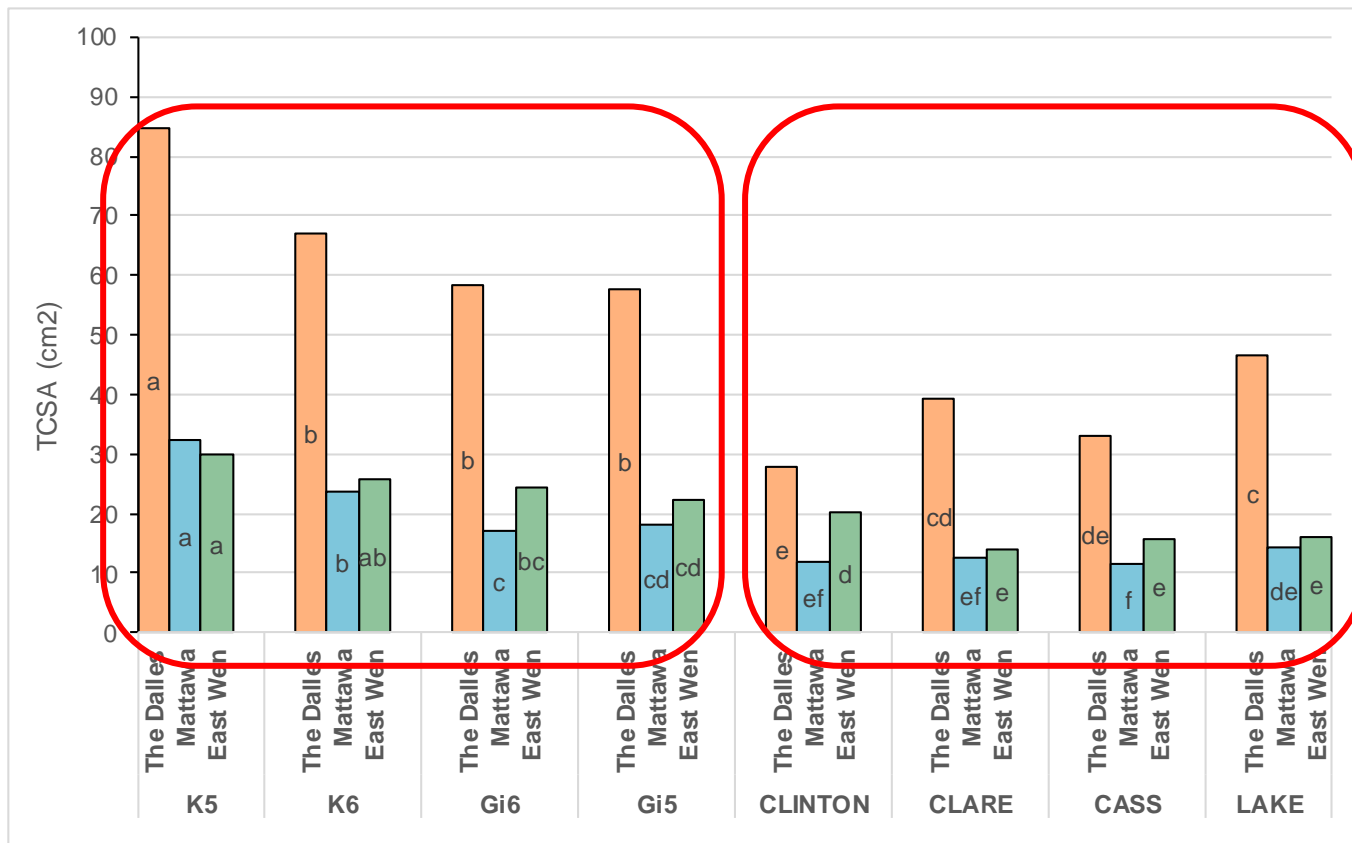
- Gisela 6 and 12
- Gisela 13 & 17
- Krymsk 5 & 6
- Weigi 1 and 3
- MaxMa 14 & 60

Precocity with size control

- Gisela 3 & 5
- Clinton, Lake, Cass, Crawford, Clare
- Weigi 2

TCSA - E. Robin, Regina, Sweetheart

A. Iezzoni, B. Sallato & L. Long





Training Systems - Labor Savings



Training System Options

Historic

- Open Vase
- Natural (no training)



Now

- Steep Leader
- KGB
- UFO
 - Vertical
 - Y trellis
- SSA
- TSA
- Tatura trellis
- Bibaum
- Palmatte



Training System Evolution

KGB, UFO and SSA examples of science-based systems

Simplified training and pruning

Created totally replicatable system

Every tree treated identically

Good yields of high quality



Why KGB in Australia

Kym Green

Labor

- High labor cost - \$25/hr
- Labor efficiency
 - Pruning from ground
 - 1-2 minutes/tree
 - 1777 trees/ha
 - Picking from ground
 - Ease of application
 - Bird net
 - Rain covers



Why KGB in Australia

Grower Yield Experience

- 2012 Yields
 - Lapins: 26.67 tons/ha
 - Summit: 25 tons/ha
 - Regina: 24.99 tons/ha
 - Kordia: 10 tons/ha

Kym Green



Year 4 Dormant

Fruiting potential:

2m x 3m = 1667 trees/ha

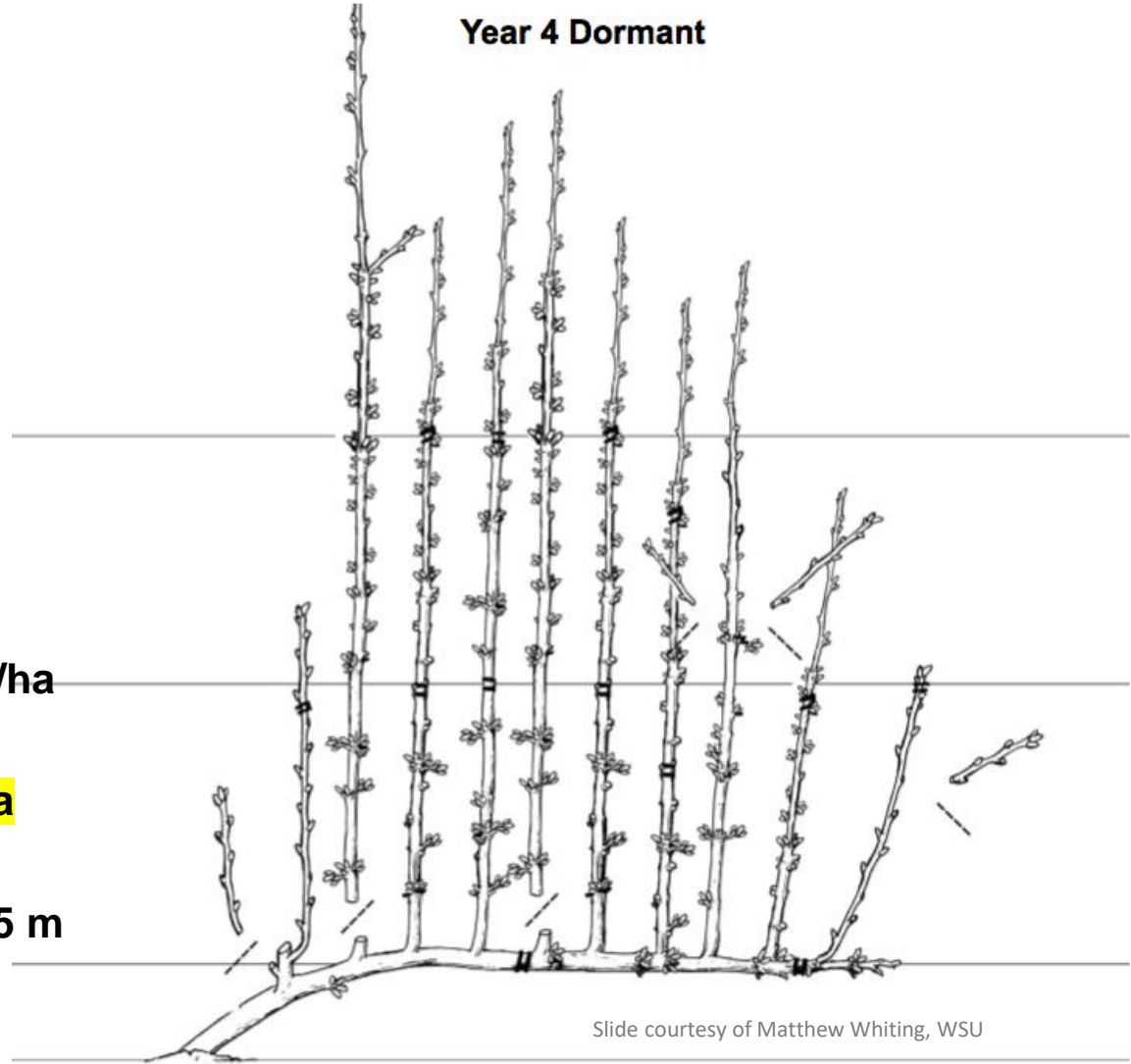
10.5 uprights/tree = 17,500/ha

8,077 fruiting uprights/ha

2.2 kg/upright for 17.77 t/ha

200 fruit/upright (11g)

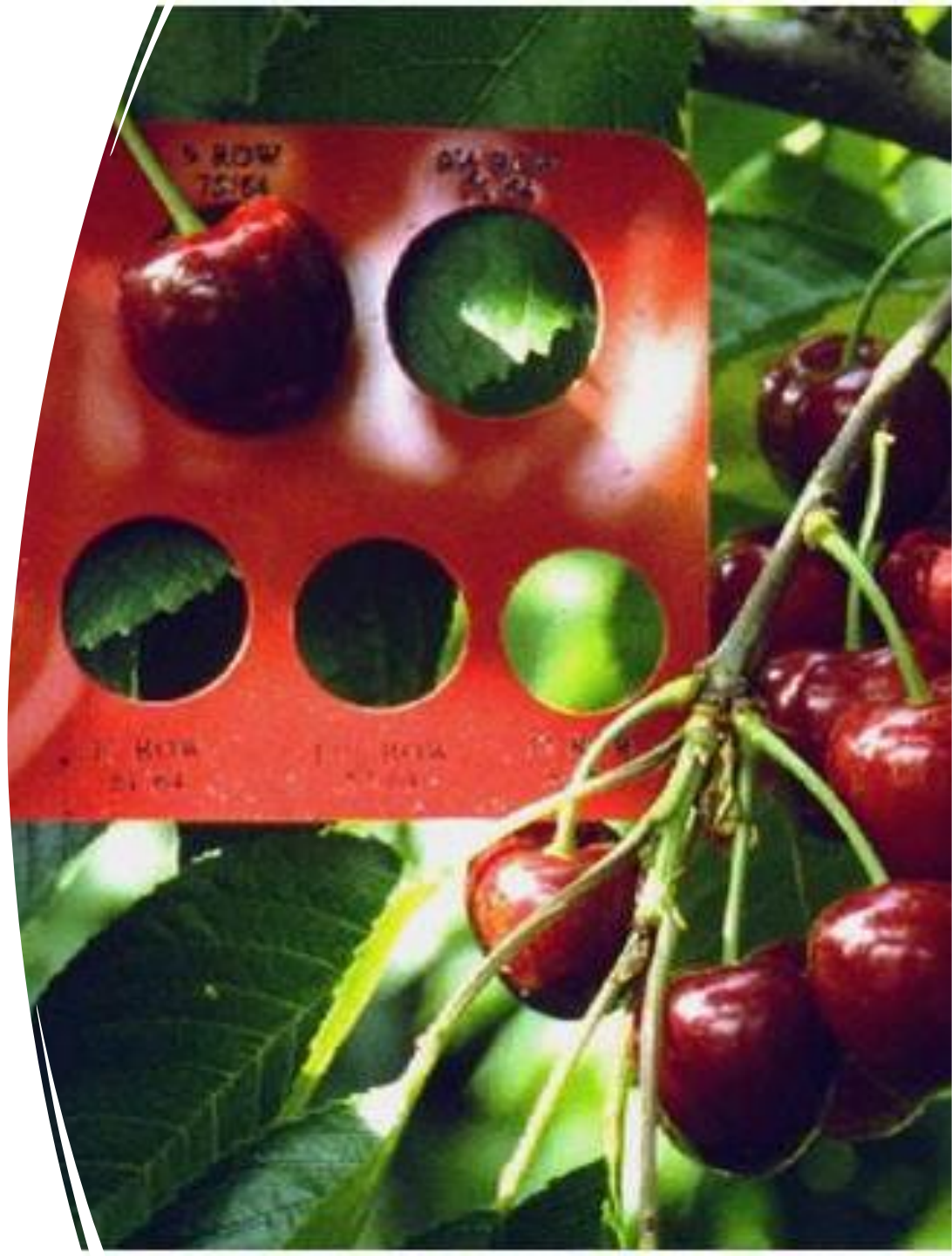
3 fruit/spur = 66 spurs = 2.5 m



Slide courtesy of Matthew Whiting, WSU

SSA Fruiting Wood

- All fruit borne at base of one year old wood
- Highest quality fruit on tree



SSA Systems Trials (4 to 7 years old)

Italy (2007):

0.5 x 3.5 m Gi5 with **Early Bigi**; **Sweet Early**; Early Star; Grace Star;
Black Star; **Summit**; **Sylvia**; **Ferrovio**; Kordia; Regina

0.7 x 3.5 m Gi6 with **Sweet Early**; Giorgia; Grace Star

Michigan (2009, 2010, 2011):

0.6 x 2.2 m **BlackPearl/Gi12**, **Kordia/Gi5**, **Selah/Gi5**

0.75 x 3.5 m **Benton/Gi3**, Benton/Gi6

0.75 x 2.5 m Gi5, Gi6 with RadiancePearl; EbonyPearl/Gi5

New York (2010):

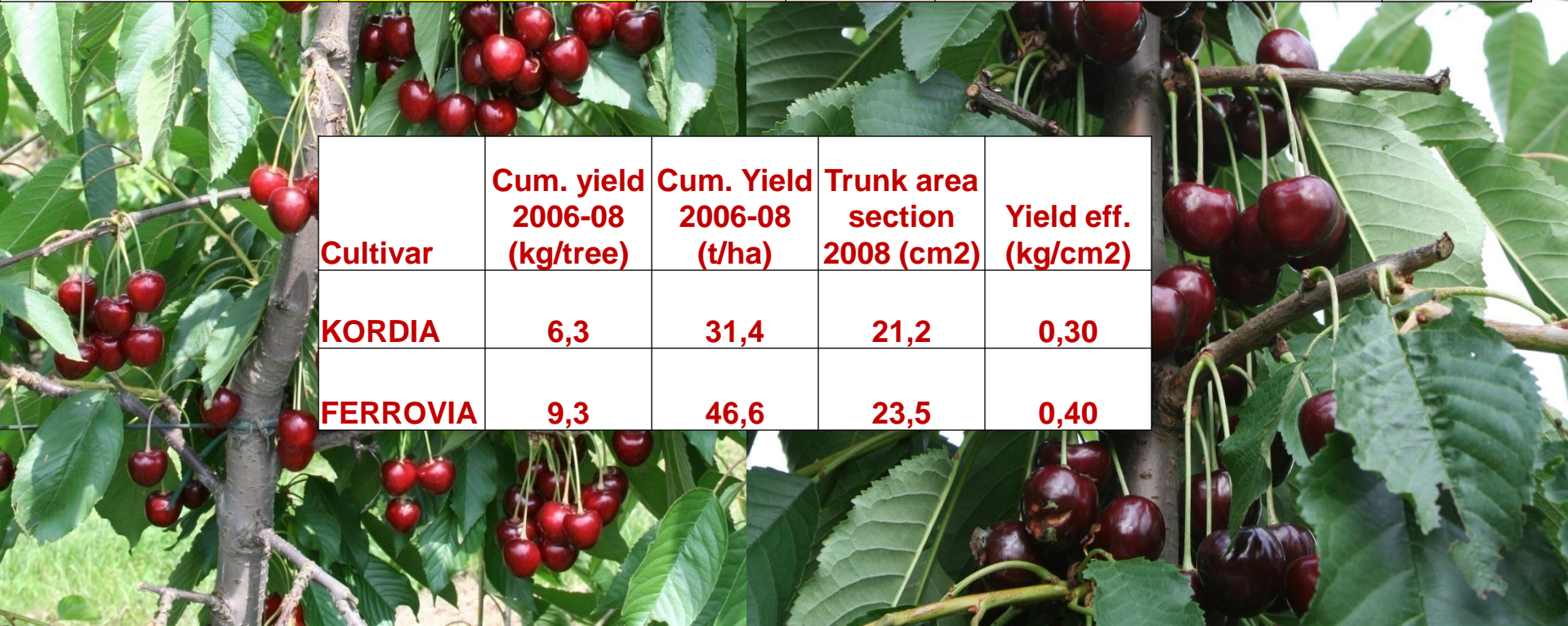
0.75 x 3.5 m Gi3, Gi5, Gi6 with Regina

Greg Lang, Michigan State University

Green = good yields, **Red** = poor yields, white = moderate yields or insufficient data

**Second trial (Beltrami farm)- Vertical axis. Planting distance 4.0 x 0.5 m –
Planting density 5,000 alb./ha. Year of plantation 2004 – Productive data 2006-
2008**
Slide courtesy of Stefano Musacchi

	2006 (year3)			2007 (year 4)			2008 (year 5)		
Cultivar	Weight/tr ee. (kg)	Fruit weight(g)	Calc. Yield (t/ha)	Weight/tr ee. (kg)	Fruit weight(g)	Calc. Yield (t/ha)	Weight/tr ee. (kg)	Fruit weight(g)	Calc. Yield (t/ha)
KORDIA	1,05	11,24	5,3	3,60	10,21	18,0	1,64	14,7	8,2
FERROVIA	1,64	11,32	8,2	4,70	9,30	23,5	2,97	13,6	14,9



Cultivar	Cum. yield 2006-08 (kg/tree)	Cum. Yield 2006-08 (t/ha)	Trunk area section 2008 (cm2)	Yield eff. (kg/cm2)
KORDIA	6,3	31,4	21,2	0,30
FERROVIA	9,3	46,6	23,5	0,40