NC-140 Honeycrisp Rootstock Trial
10-Year Summary

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What The Right Rootstock Can Do For You

Reach full production in 5 to 6 years from planting

Higher planting costs - more trees per acre

Less pruning

Adaptation to different soils

Invigorate weak varieties such as Honeycrisp

Prevent some bitter pit in Honeycrisp

Rootstocks for Honeycrisp

Naturally low in vigor

Slow to bear

Highly biennial

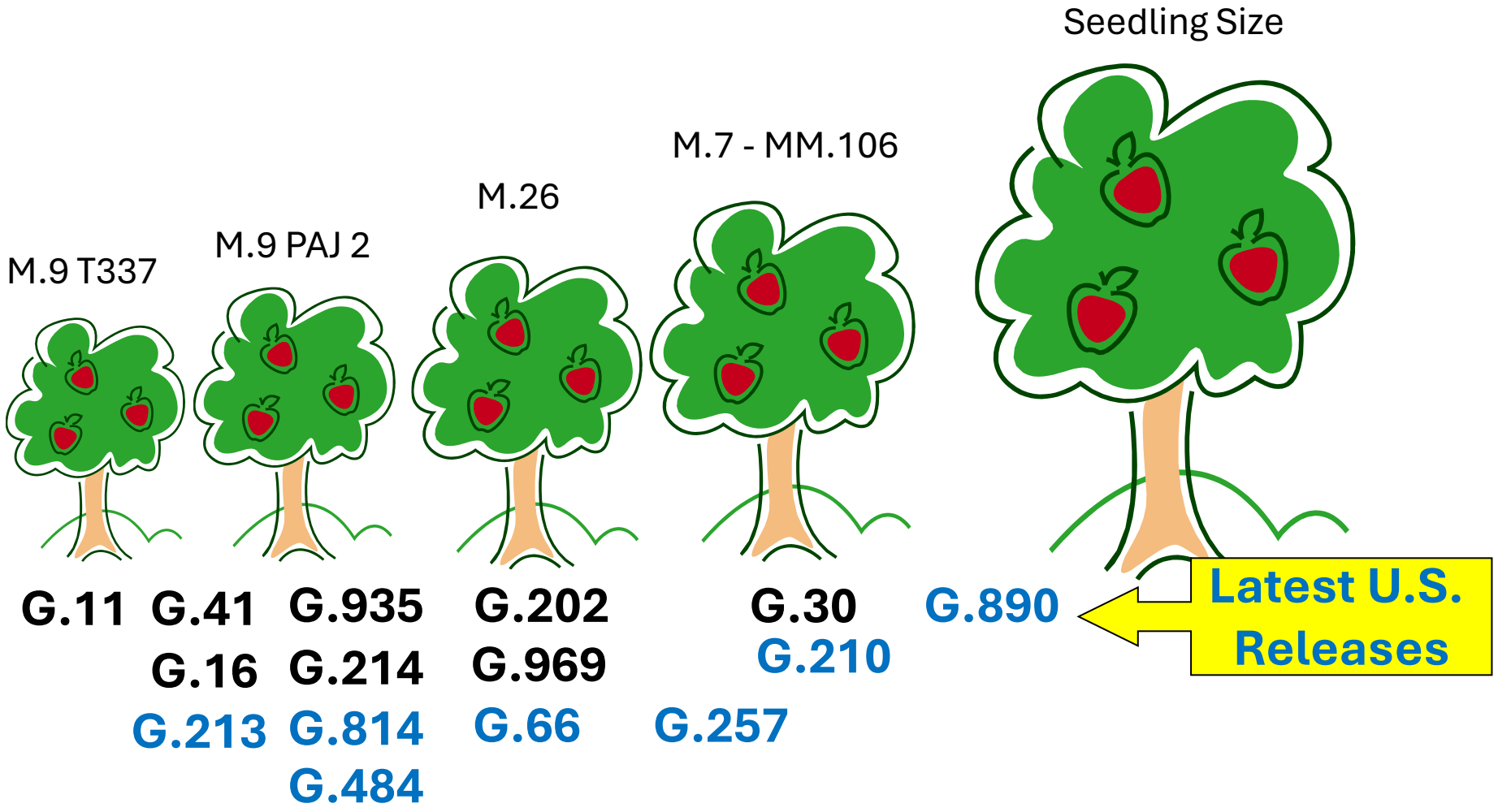
Prone to bitter pit

Apple Rootstocks

Uncommon	Common	Under Evaluation	Being Tested for Specific Sites
Seedling	MM.111 (EMLA)	G.210	V.1*
M27	MM.106	G.202*	V.2
Mark	M.7	G.222	V.3
NoVole	M.26*	G.214*	V.5*
Bud.118	M.9 (T337, Pajam, NIC29)	G.890	V.6
Ant. 313	Bud.9	G.969*	V.7*
G.16	G.30*	G.484	
P.2	G.935*	G.257	
P.22	G.41*	Bud.10*	
P.18	G.11*		

* in the trial at Highmoor Farm

Released U.S. Geneva® Apple Rootstocks Arranged by Tree Size



Courtesy of Gennaro Fazio, USDA ARS

NC140 Rootstock Experiments

Older tests

- Wide tree spacing to measure mature size
- Does the rootstock control vigor?

Newer tests

- Plant at a certain distance and see what happens
- Does the rootstock fit the training system?

2014 Honeycrisp Rootstock Trial

Tall spindle supported by a 4-wire trellis

777 trees per acre (4’ X 14’)

Planted in the old tree row

10th leaf in 2023

12 rootstocks

East Malling, England

- M.26

Russia

- Bud. 10

Geneva, NY

- G.11 (fully dwarfing)
- G.202
- G.214
- G.41
- G.935
- G.969
- G.30 (M.7 size)

Vineland, ONT

- V.1
- V.5
- V.7

The Orchard Map

G969	V5	B10	X	V1	X	X	G11	G30	V7	G11	V5	X	X	G11	V1	G41	G935	G30	G202	G969	G4214	V7	V5	G969	G202	G202	G11	G935	V1	G41	G11	B10	G30	B10	G202
B10	G30	V1	G935	G11	B10	G935	V1	G969	G935	M26	X	G969	B10	X	G30	V1	G202	V5	G11	V7	G4214	G11	G30	G935	G4214	M26	G30	M26	G969	G202	G41	G4214	X	X	V1
B10	V5	G4214	G935	M26	V7	M26	G4214	G41	M26	G41	G202	G4214	G969	B10	V1	B10	G202	X	X	X	X	X	X	G4214	V7	M26	G11	G41	G11	V1	M26	G202	G41	G30	G202
G30	G4214	V1	G935	V7	G202																														

X indicates dead or very weak trees

Causes:

union breakage in strong wind

poor soil and prolonged drought

Tree Care

- Irrigation in the first 6 years
- Dry in years 8 and 9
- Fruiting in second year
- Hand thinning fruit if needed

Tree training

Minimal pruning until year 6

4-wire trellis

Tying down strong limbs

Attaching limbs to wires

Renewal pruning

Pruning Practices

Renewal pruning starting in year 6

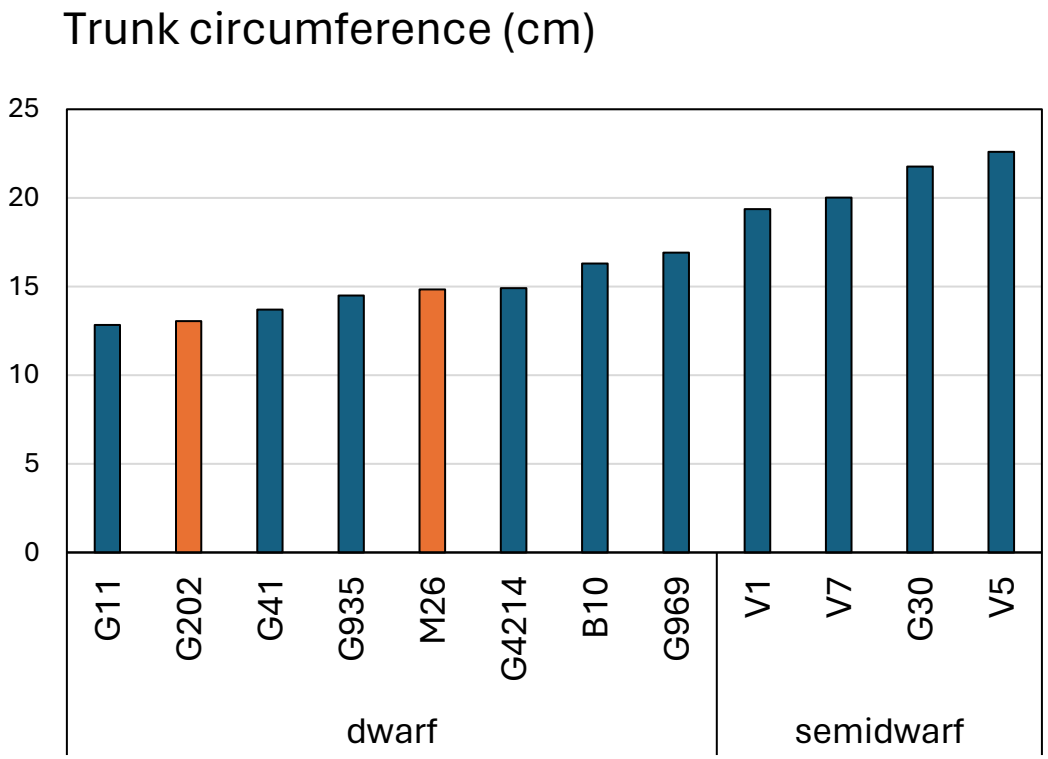
Spur pruning when needed

Ineffective renewal cuts

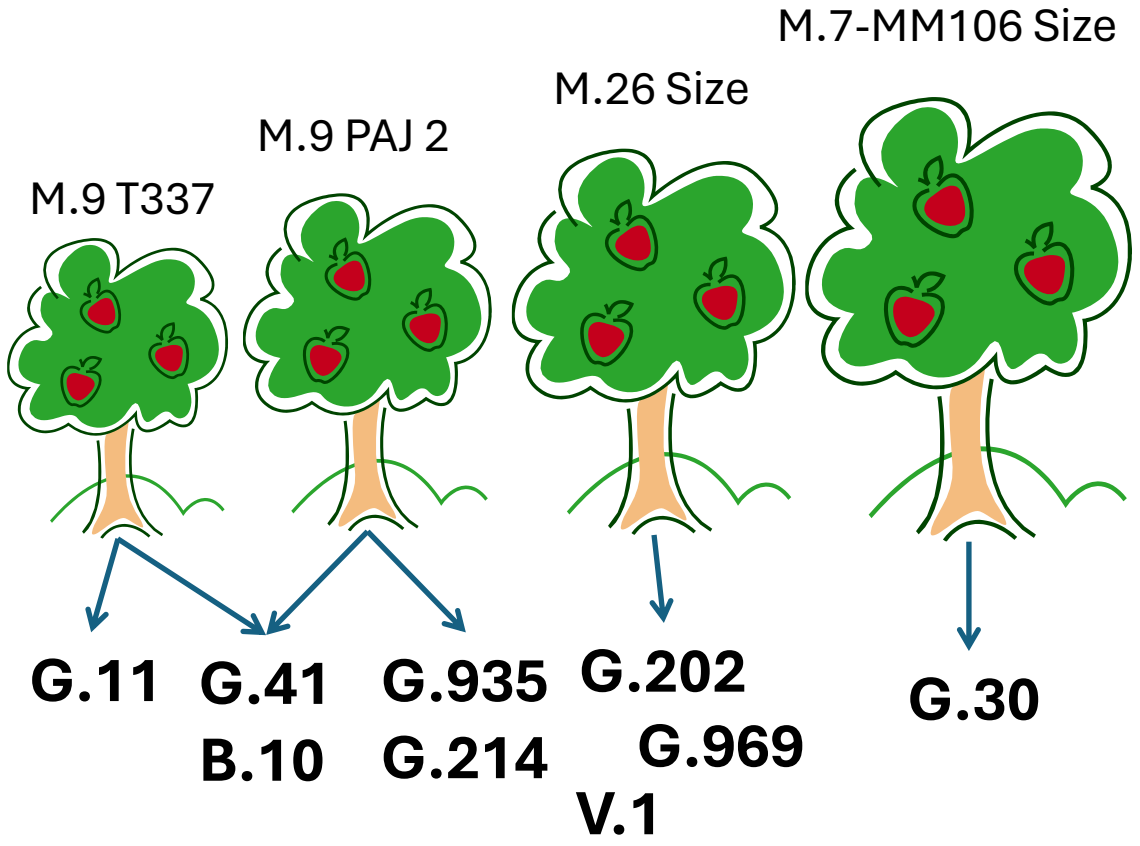
with dwarfing stocks

Effective renewal cuts with semidwarfing stocks

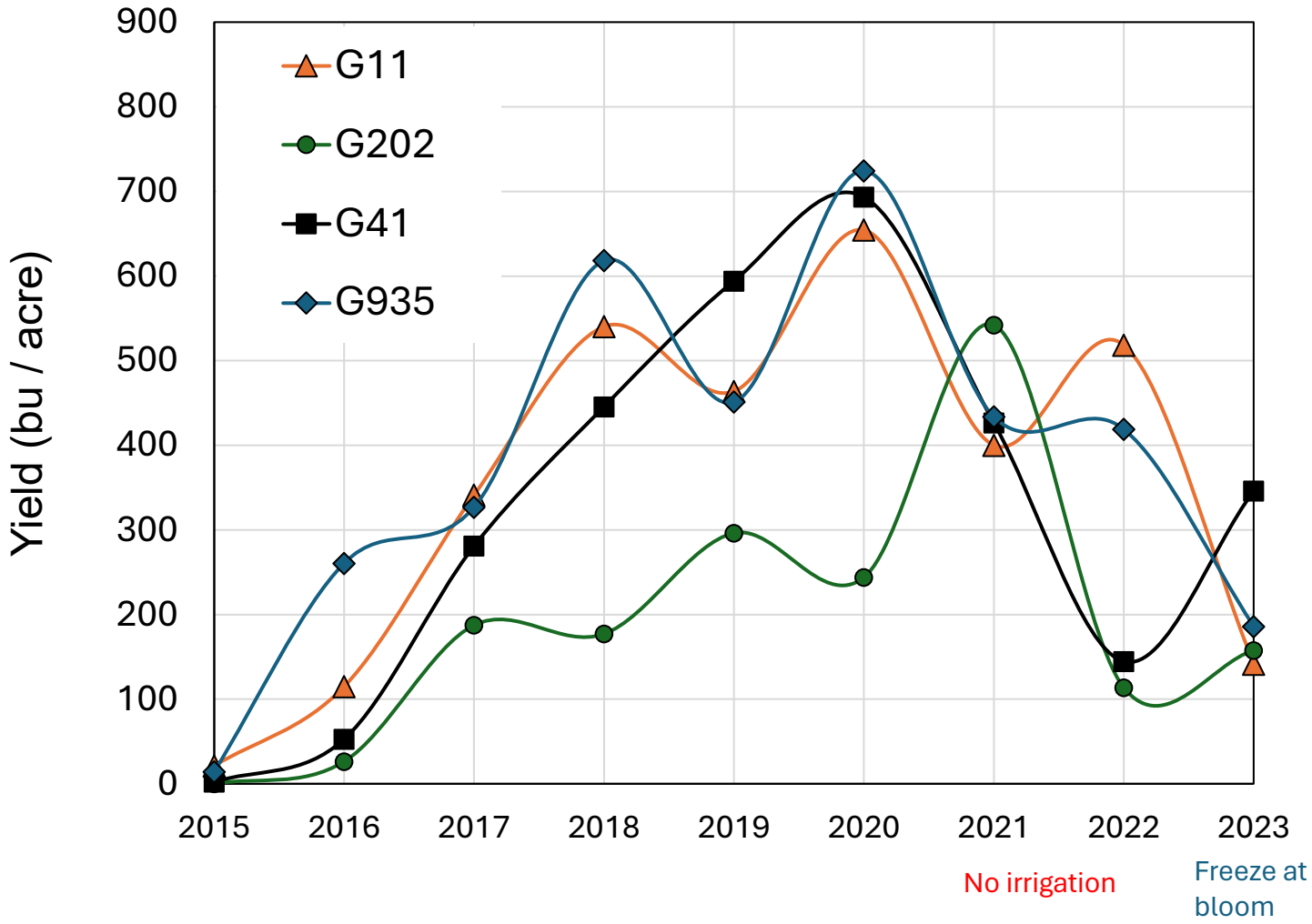
Tree Size at Highmoor Farm



Expected Size



Annual Yield in Fully Dwarfing Rootstocks



10-year Total

G.935: 3434

G.11: 3195

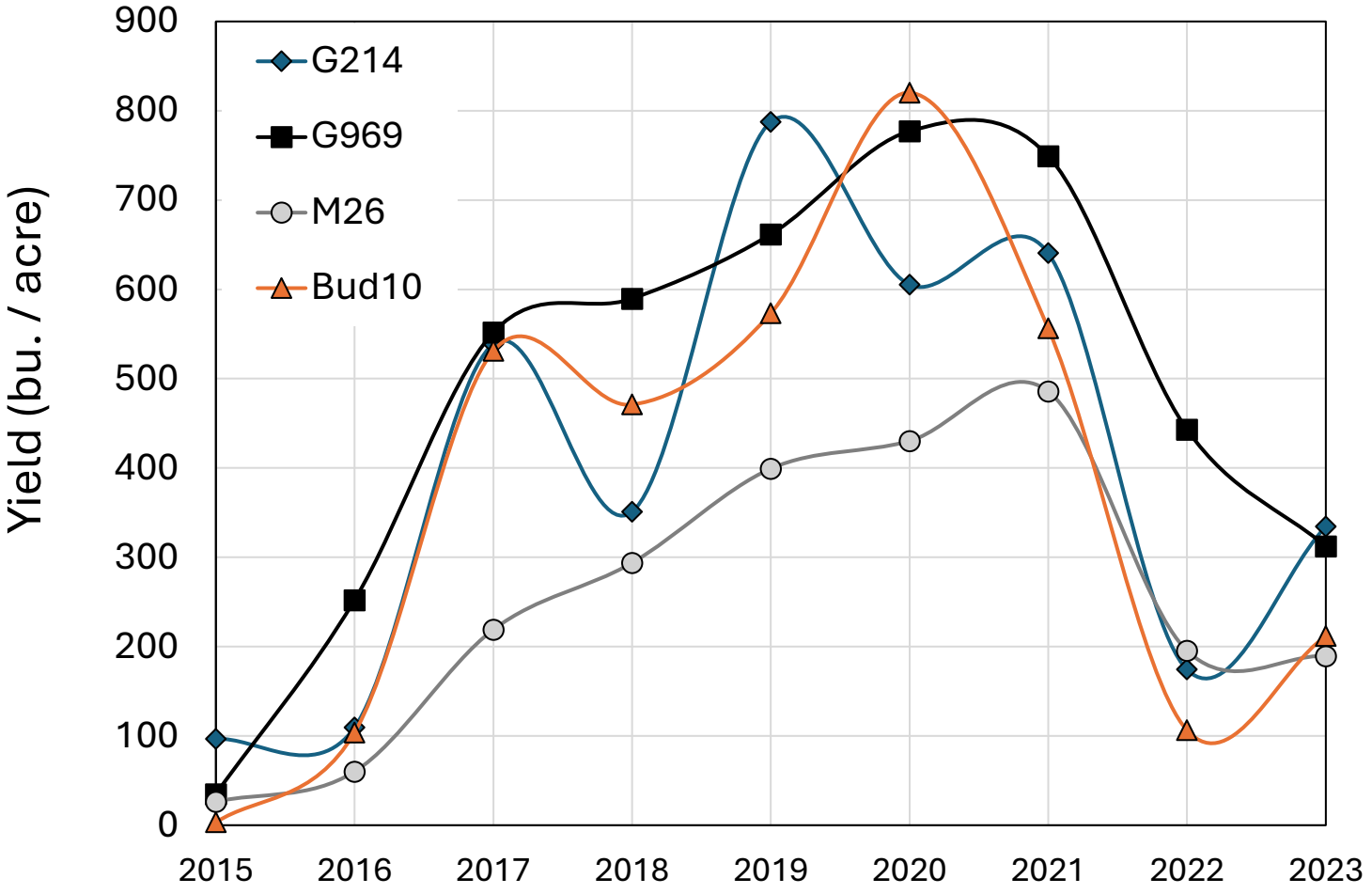
G.41: 2986 (one year behind)

G.202: 1744

G.30: 7312 highest yield

Trees in poor soil were excluded.

Dwarfing

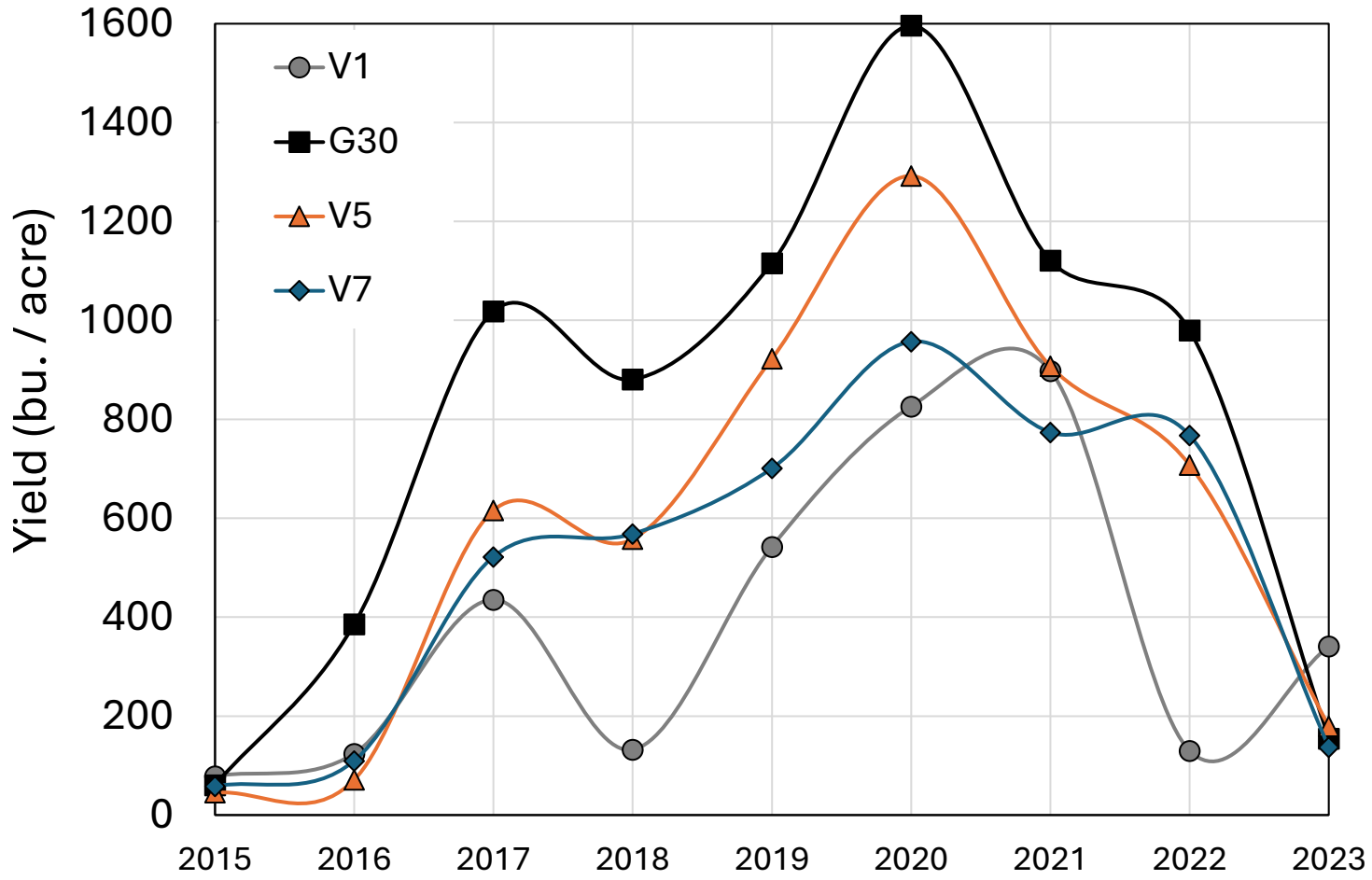


10-year Total

G.969:	4370
G.214:	3638
Bud.10:	3377
M.26:	2299
G.30:	7312

Trees in poor soil were excluded.

Semidwarfing



10-year Total

G.30:	7312
V.5:	5298
V.7:	4592
V.1:	3506

Trees in poor soil were excluded.

10-year total (bushels per acre)	
G.202	1744
M.26	2299
G.41	2986
G.11	3195
Bud.10	3377
G.935	3434
V.1	3506
G.214	3638
G.969	4370
V.7	4592
V.5	5298
G.30	7312

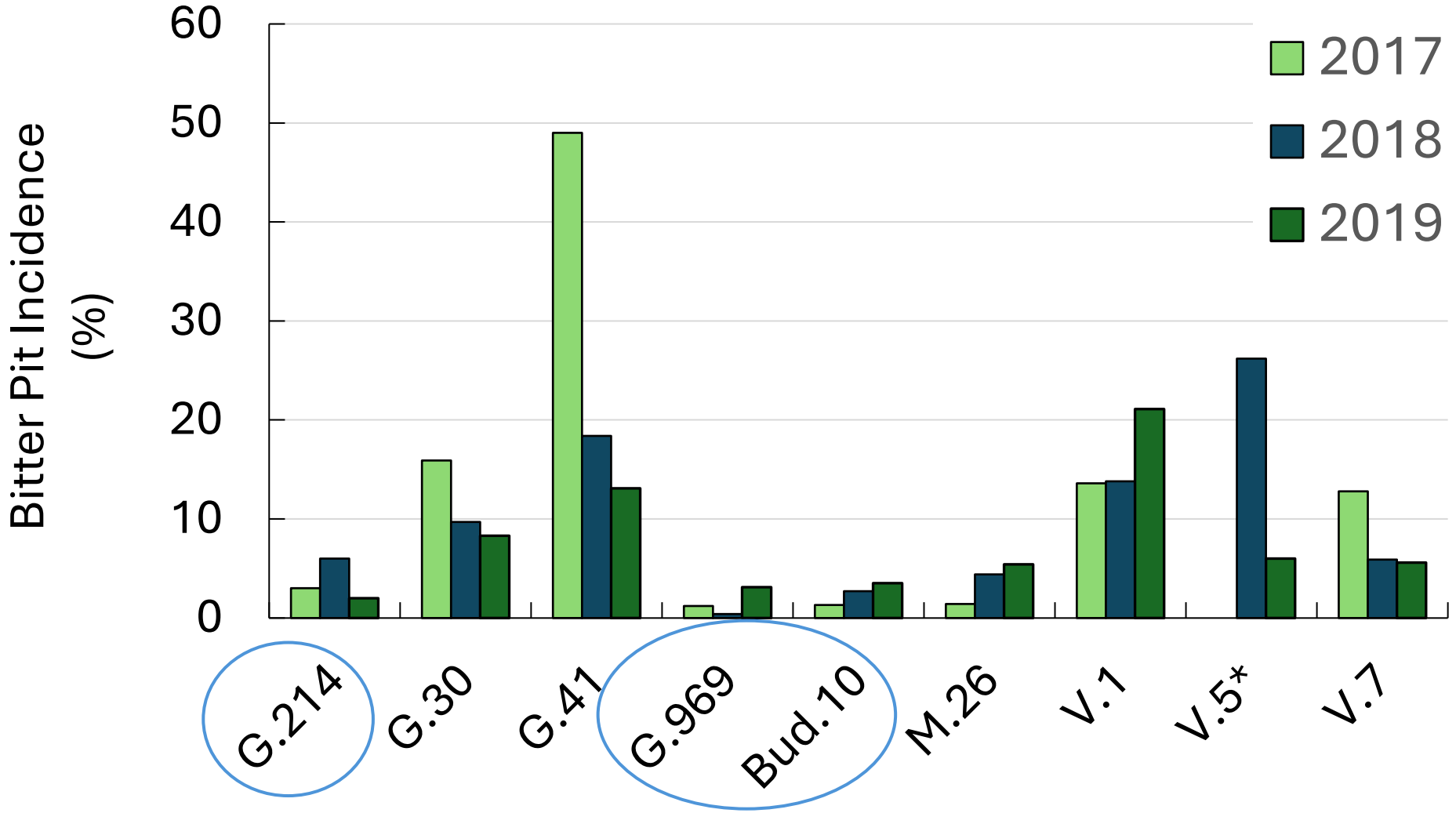
Semidwarf

Quickly reaches the top wire
Greater yield with taller trees
Could outgrow its space in the next five years

Dwarf

Shorter trees means less yield

Bitter Pit by Rootstock



Too Dwarfing for Honeycrisp

G.202

- Inconsistent tree size and poor yield
- Did not perform well in this site
- Resistant to fire blight and crown rot
- Tolerant to apple replant disease

G.11

- Large fruit size
- Partial tolerance to Replant Disease
- Some resistant to Fire Blight
- Resistant to Crown Rot

G.41

- Does poorly in wet soils
- Productive and precocious
- Resistant to Replant Disease, Fire Blight and Crown Rot
- Very cold hardy
- Bitter pit is a problem
- A good choice for vigorous varieties

G.935

- Vigor intermediate between M.9 Pajam 2 and M.26
- Very cold hardy
- Resistant to Replant Disease, Fire Blight and Crown Rot

- Some susceptibility to latent viruses

For rich soils with consistent irrigation

G.214

- Vigor similar to M.9 Pajam2
- Precocious
- Biennial
- Resistant to Fire Blight, Crown Rot and Replant tolerant
- Strong Graft Union
- Less bitter pit

Bud.10

- Precocious
- Less bitter pit
- Not as biennial as G.214

G.969*

- Vigor between M.26 and M.7
- Productive
- Very cold tolerant
- Resistant to Fire Blight and Phytopthora
- Good Anchorage
- Less bitter pit
- Less biennial bearing
- Good rootstock for weak scions

At Highmoor

Somewhere else

Another rootstock not tested at Highmoor

G.890

- Vigor between M.7 and MM.106
- Replacement for G.30
- Free standing (Honeycrisp?)
- Precocious, productive
- Resistant to fire blight, and crown rot
- Tolerance to apple replant disease
- Mostly for processing industry

G.30

Greatest yield due to height
Good rootstock for weak varieties in poor soil

Too vigorous for rich soil

G.969

Good rootstock for Honeycrisp

G.11

G.202

Insufficient vigor for Honeycrisp

G.41

Bitter pit

G.214

Biennial

Bud.10

Suffered in the drought

M.26

Slow to bear

V.1, V.5, V.7

Not widely available

Managing Problems Before They Become Problems

Order the right rootstock for your site

Give the nursery time to make your trees – 2 years

Greater vigor needed in poor soil – G.969, G.30

Give them water when they need it

Avoid over cropping in years 2 and 3