P-22 Rootstock Performance and Upcoming Release

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USDA-ARS, Byron, GA

P-22 *(2022 release)*

- Peach seedling rootstock (~full size)
- Resistant to PTSL
- Tolerant of Armillaria (< MP-29)
- Resistant to most root-knot nematodes
- Good productivity and fruit size

Clanton, AL Trial

- Peach Seedlings: Guardian and P-22
- Clonal MxP Types: MP-23 and MP-29
- Est. 2012 w/ uniform in row spacing (12 ft) for all rootstock treatments on a severe Armillaria infested site
- 8 reps of 5 tree plots (7 reps of MP-23)
- Collaborators: Jim Pitts and Matthew Price

Table 1. Rootstock influence on cumulative mortality due to Armillaria (ARR), peach tree short life (PTSL) and other causes on a severe Armillaria infested site near Clanton, AL[z] (2012-2020).

		Cause of Death		
Rootstock	Alive (%)	ARR (%)	PTSL (%)	Other (%)
MP-29	88 a	2 c[y]	7 ab	3 b
P-22	55 b	40 b	2 b	3 b
Guardian[x]	20 c	80 a	0 b	0 b
MP-23	20 c	46 b	17 a	17 a
MSD	28	29	14	13

[z] Est. Spring, 2012 with 8 reps (7 of MP-23) of 5 tree plots in a RCB design, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Mean separation within columns via Waller-Duncan, k-ratio=100.

[x] Guardian selection SC3-17-7, now main component of the commercial seedlot.

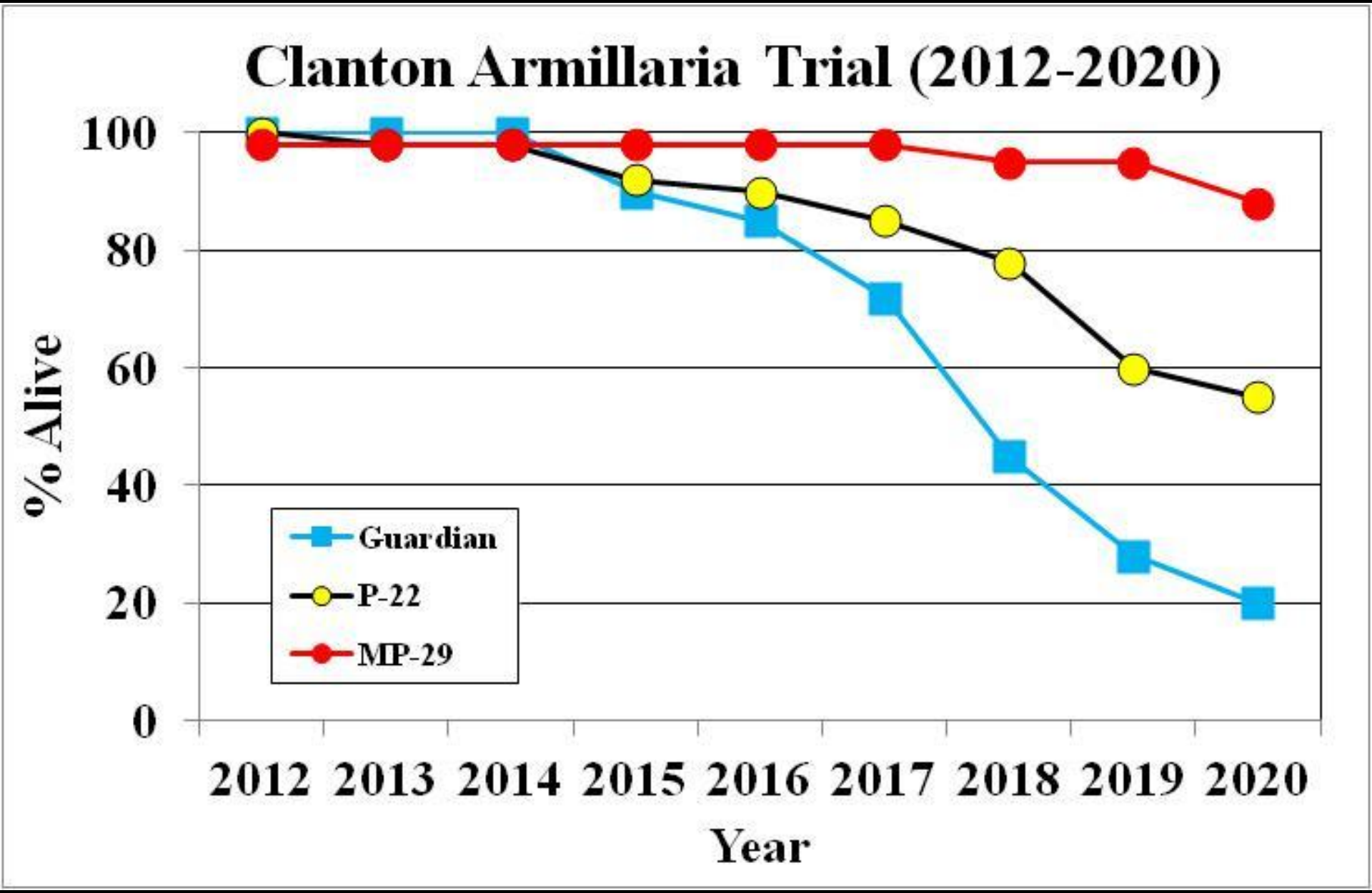

Clanton Armillaria Trial (2012-2020)
100
80
60
40
20
0
% Alive
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

Table 2. Horticultural performance of 'Julyprince' peach propagated on recently released rootstocks and advanced selections on a severe Armillaria (ARR) infested site near Clanton, AL[z] (2012-2018).

Rootstock	TCSA[y] (cm^2)	Size (% Std)	Yield[x] (kg/tree)	CYE[w] (kg/tree)	Fruit[v] (gm)	Suckers[u] (#/tree)
MP-29	149 b[t]	49	154 b	1.05 a	214 a	0 b
P-22	271 a	88	209 a	0.82 b	193 b	6 ab
Guardian[s]	307 a	100	236 a	0.79 b	210 a	17 a

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design. Trees spaced 12 feet apart.
[y] TCSA=Trunk cross-sectional area (Fall, 2018)
[x] Cumulative yield from 2014 through 2018 seasons (no crop in 2017 due to inadequate chilling).
[w] CYE=Cumulative yield efficiency from 2014 through 2018 season.
[v] Mean fruit size of 2014 through 2018 seasons.
[u] Cumulative number through Fall, 2018.
[t] Mean separation within columns via Waller-Duncan, k-ratio=100.
[s] Guardian selection SC3-17-7, now main component of the commercial seedlot.

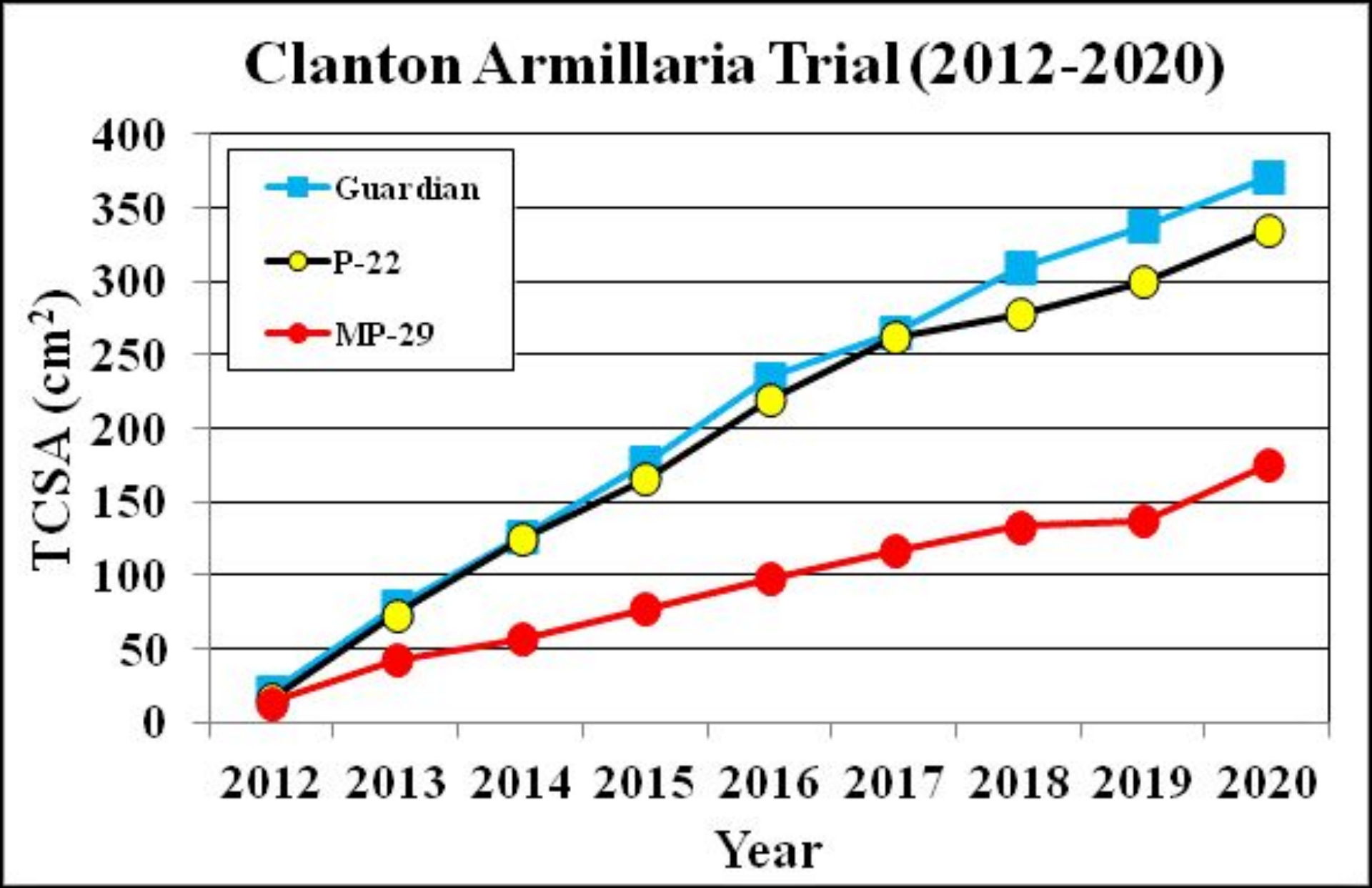

Clanton Armillaria Trial (2012-2020)
TCSA (cm²)
400
350
300
250
200
150
100
50
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

Table A. Rootstock influence in 2014 on yield, yield efficiency and mean fruit size on a severe Armillaria infested site near Clanton, AL[z] (Est. 2012).

Rootstock	Yield (kg/tree)	Yield Efficiency (Kg/cm^2)	Mean Fruit Size (gm/fruit)
Guardian[y]	48	0.39 ab	196 a
P-22	41	0.35 b	180 b
MP-29	40	0.62 a	191 ab
MSD	14	0.25	15

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

Table B. Rootstock influence in 2015 on yield, yield efficiency and mean fruit size on a severe Armillaria infested site near Clanton, AL[z] (Est. 2012).

Rootstock	Yield (kg/tree)	Yield Efficiency (Kg/cm^2)	Mean Fruit Size (gm/fruit)
Guardian[y]	61 a	0.38	213 b
P-22	57 a	0.42	195 c
MP-29	31 b	0.37	246 a
MSD	7	0.25	16

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

Table C. Rootstock influence in 2016 on yield, yield efficiency and mean fruit size on a severe Armillaria infested site near Clanton, AL[z] (Est. 2012).

Rootstock	Yield (kg/tree)	Yield Efficiency (Kg/cm^2)	Mean Fruit Size (gm/fruit)
Guardian[y]	42	0.22 b	240 a
P-22	39	0.28 b	210 b
MP-29	33	0.44 a	233 ab
MSD	13	0.11	16

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

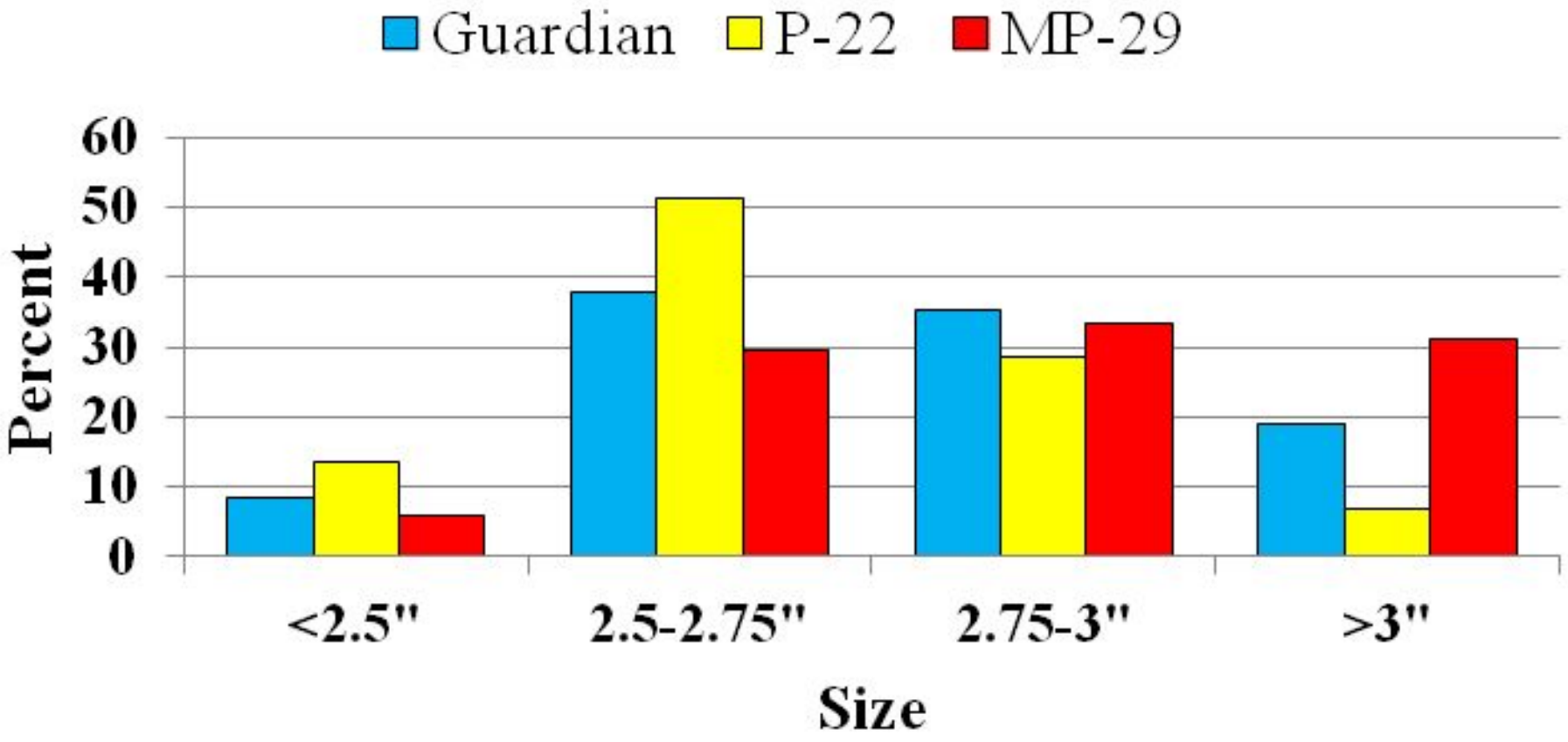
Table D. Rootstock influence in 2018 on yield, yield efficiency and mean fruit size on a severe Armillaria infested site near Clanton, AL[z] (Est. 2012).

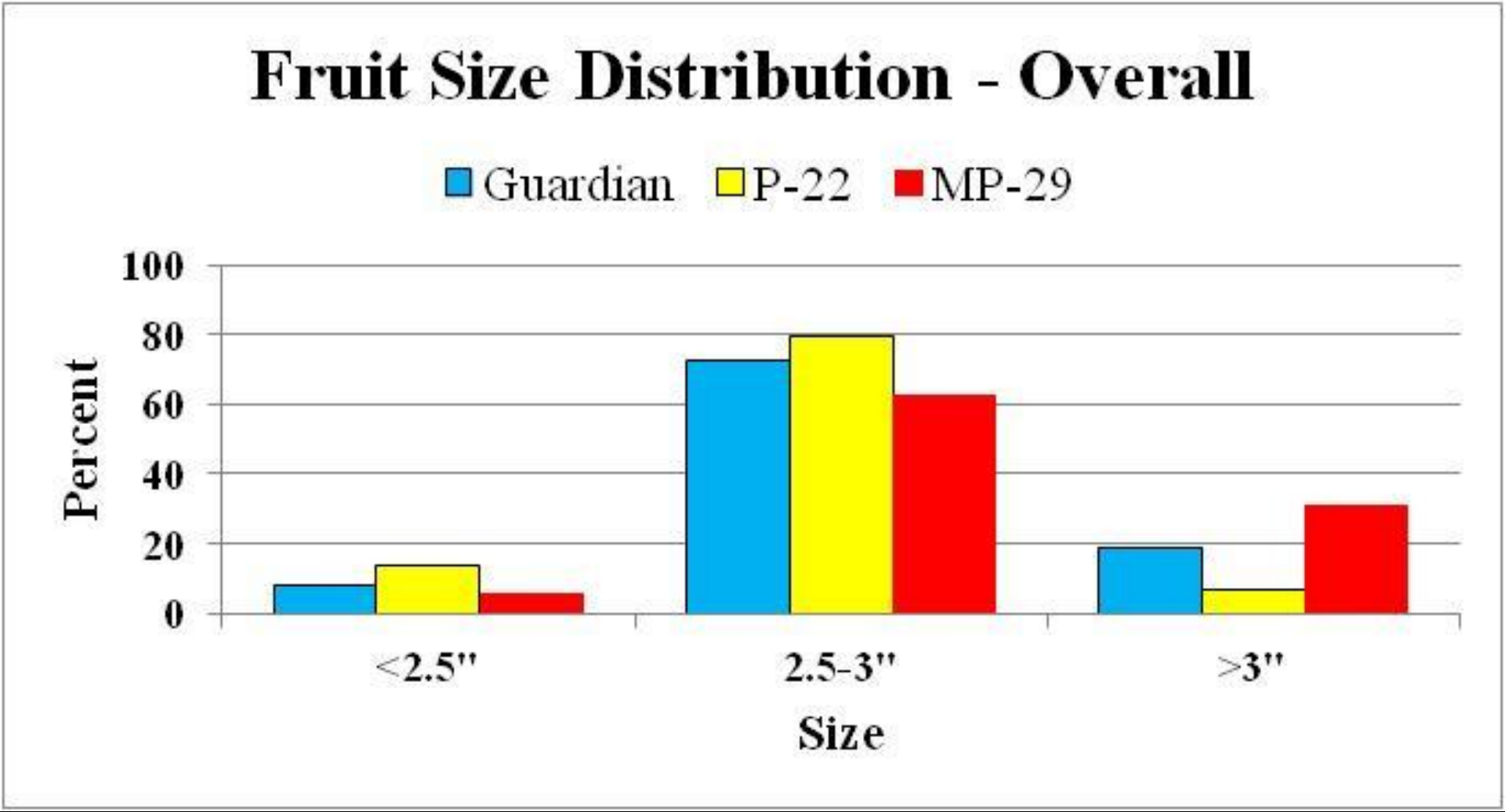
Rootstock	Yield (kg/tree)	Yield Efficiency (Kg/cm^2)	Mean Fruit Size (gm/fruit)
Guardian[y]	97 a	0.32	225 b
P-22	72 ab	0.26	203 b
MP-29	50 b	0.33	273 a
MSD	38	0.13	22

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

Fruit Size Distribution - Overall

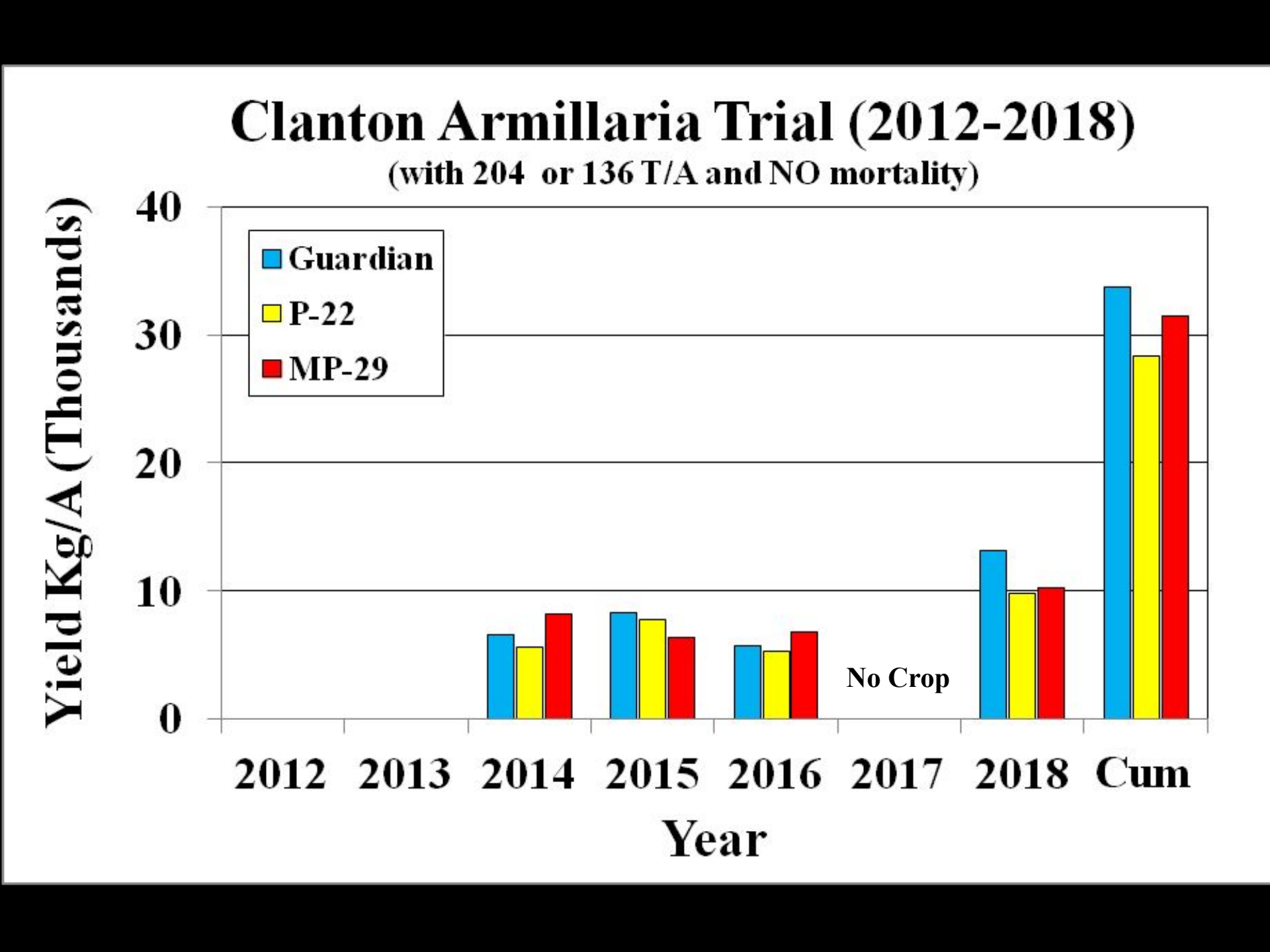


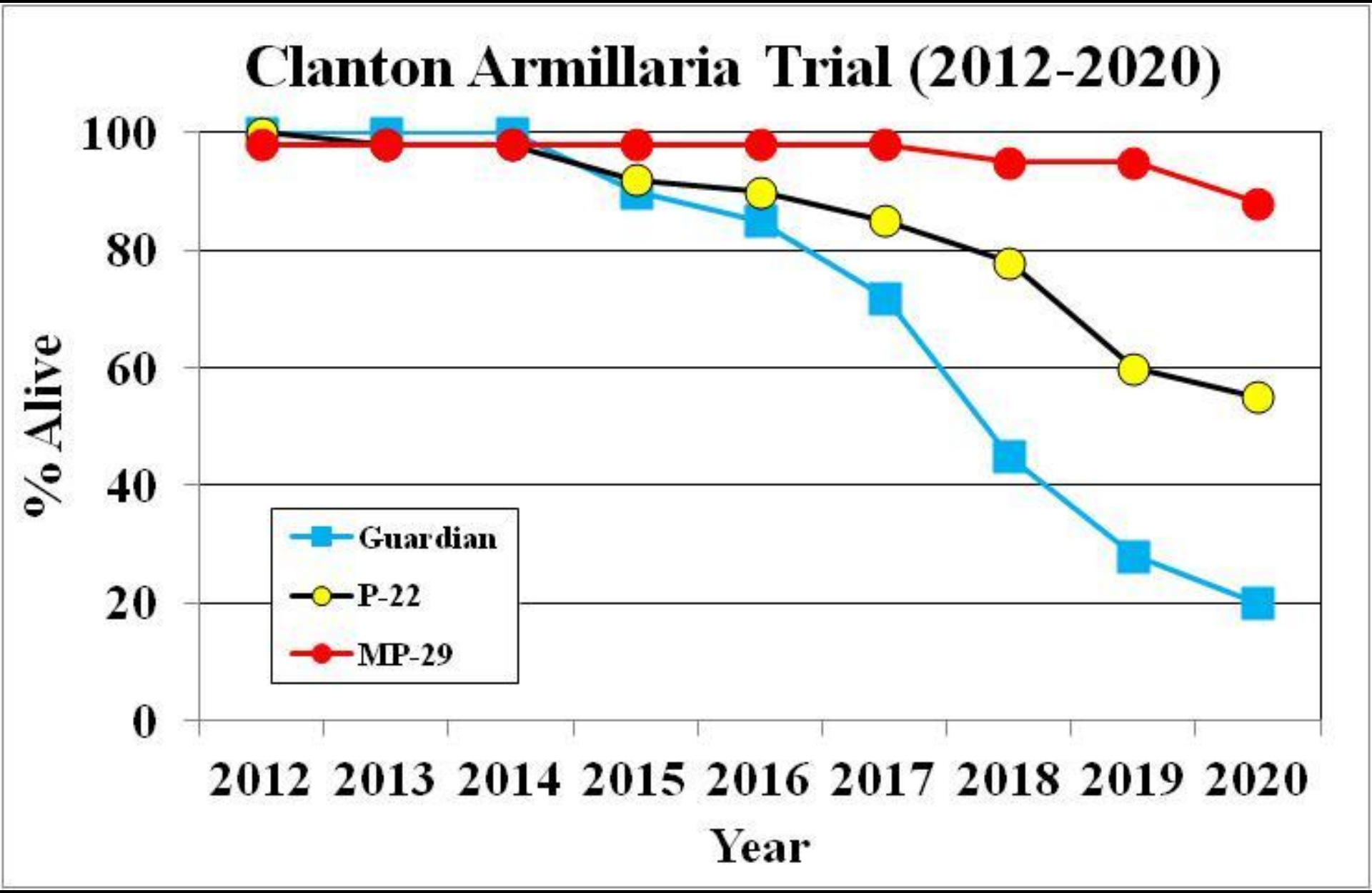

Fruit Size Distribution - Overall
Guardian
P-22
MP-29
100
80
60
40
20
0
Percent
<2.5"
2.5-3"
>3"
Size

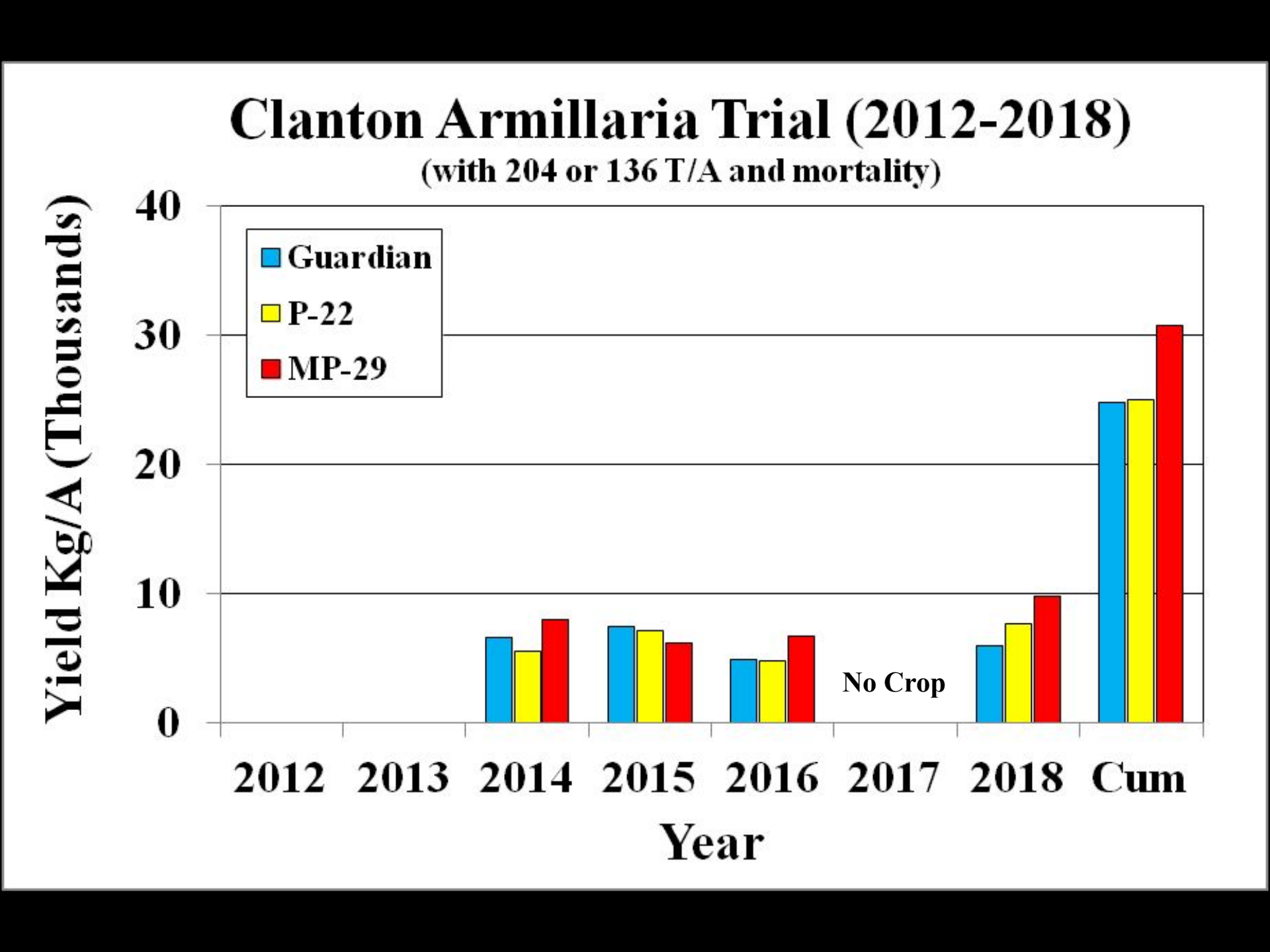
Estimating Yields per Acre

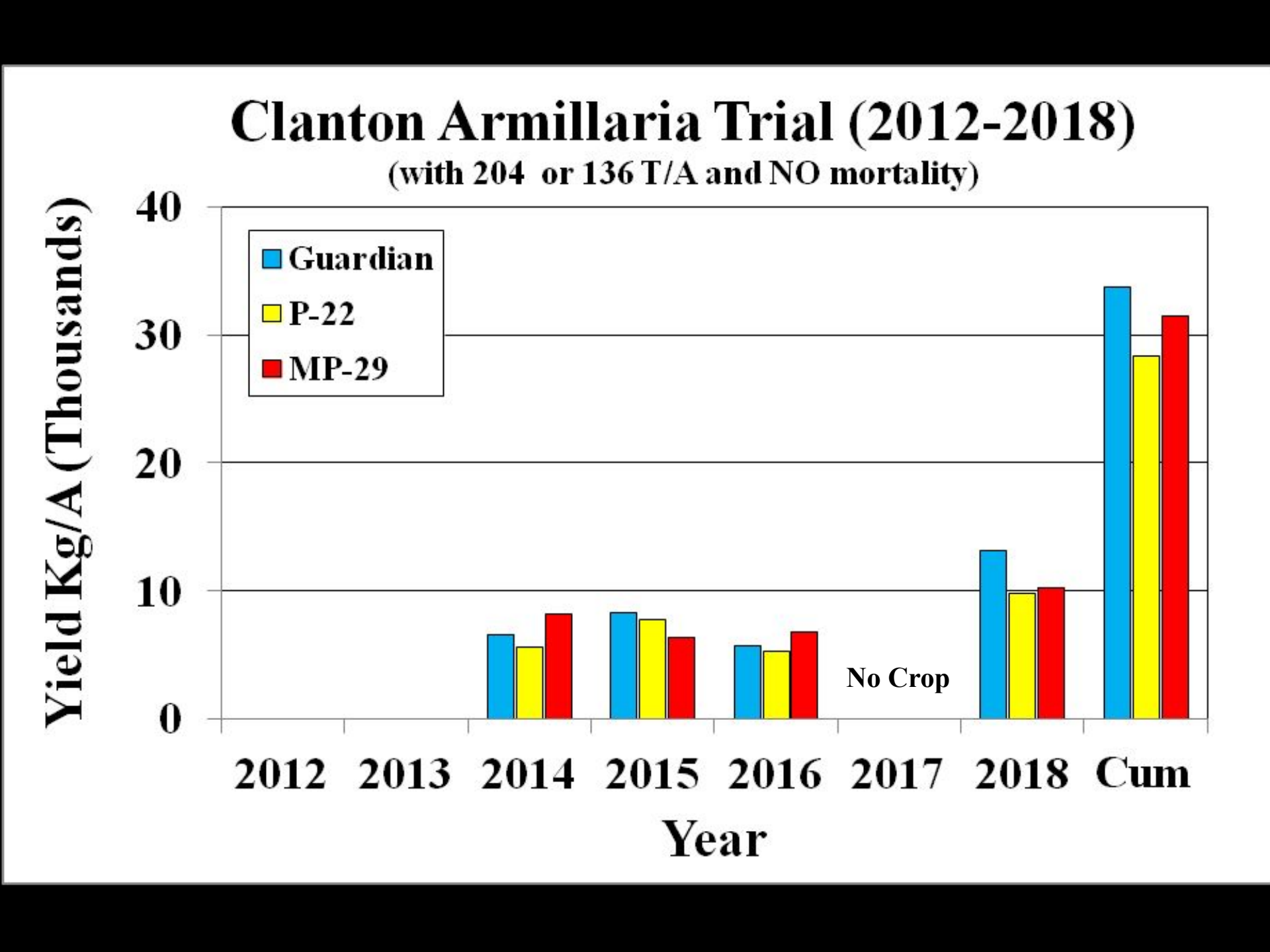
…Going where Angels fear to tread!

…What could go wrong?


Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and NO mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
No Crop
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Clanton Armillaria Trial (2012-2020)
100
80
60
40
20
0
% Alive
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year


Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
No Crop
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and NO mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
No Crop
2012
2013
2014
2015
2016
2017
2018
Cum
Year

Roberta, GA Trial

- Peach Seedlings: Guardian and P-22
- Clonal MxP Types: MP-29
- Est. 2015 on a severe Armillaria site
- Spacing: 18' between rows
  - 16' in row spacing for P-22 and Guardian
  - 10' 8" in row spacing for MP-29
- 12 reps of 4 or 6 tree plots (Guardian/P-22 vs MP-29). Uniform 64' long test plots.
- Collaborators: D. Chavez and L. Rodriguez

Table 3. Rootstock influence on cumulative mortality due to Armillaria (ARR), peach tree short life (PTSL) and other causes on a severe Armillaria infested site near Roberta, GA[z] (2015-2020).

		Cause of Death		
	Alive	ARR	PTSL	Other
Rootstock	(%)	(%)	(%)	(%)
MP-29	71 a[y]	14 b	1	14 a
P-22	33 b	60 a	4	2 b
Guardian[x]	25 b	68 a	2	5 b
MSD	19	21	7	13

[z] Est. Spring, 2015 with 12 reps of 4 or 6 tree plots (Guardian/P-22 or MP-29, respectively) in a RCB design, budded with 'Julyprince' peach. Trees spaced 18' apart between rows and either 16 ' or 10'8" apart (Guardian/P-22 or MP-29, respectively) in row.

[y] Mean separation within columns via Waller-Duncan, k-ratio=100.

[x] Guardian selection SC3-17-7, now main component of the commercial seedlot.

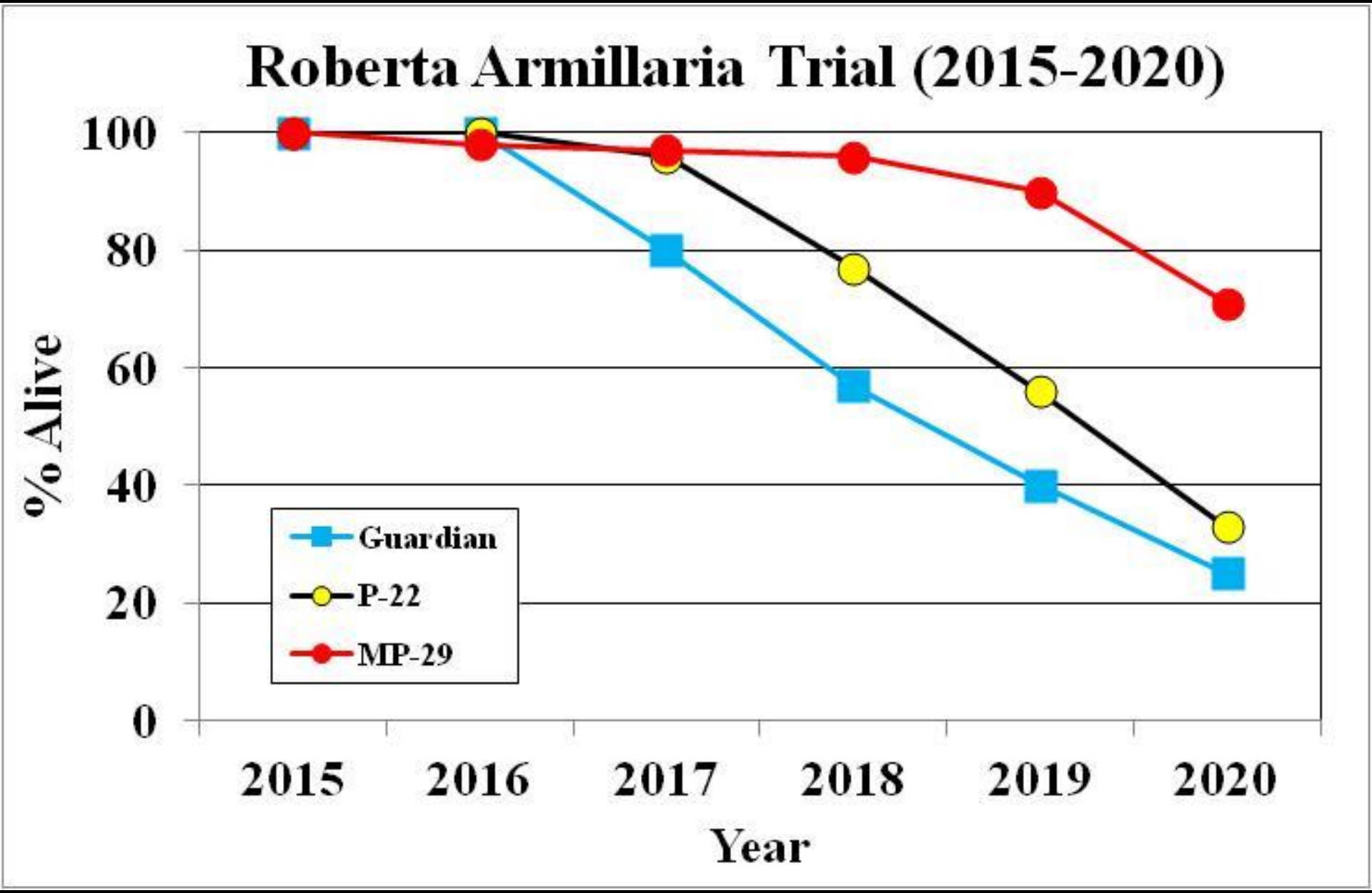

Roberta Armillaria Trial (2015-2020)
100
80
60
40
20
0
% Alive
Guardian
P-22
MP-29
2015
2016
2017
2018
2019
2020
Year

Table 4. Horticultural performance of 'Julyprince' peach propagated on commercial rootstocks and an advanced selection on a severe Armillaria (ARR) infested site near Roberta, GA[z] (2015-2020).

Rootstock	TCSA [y] (cm^2)	Size (% Std)	Suckers [x] (#/tree)
MP-29	101 b[w]	47	0 b
P-22	210 a	97	6 ab
Guardian [v]	217 a	100	17 a
MSD	40	1	

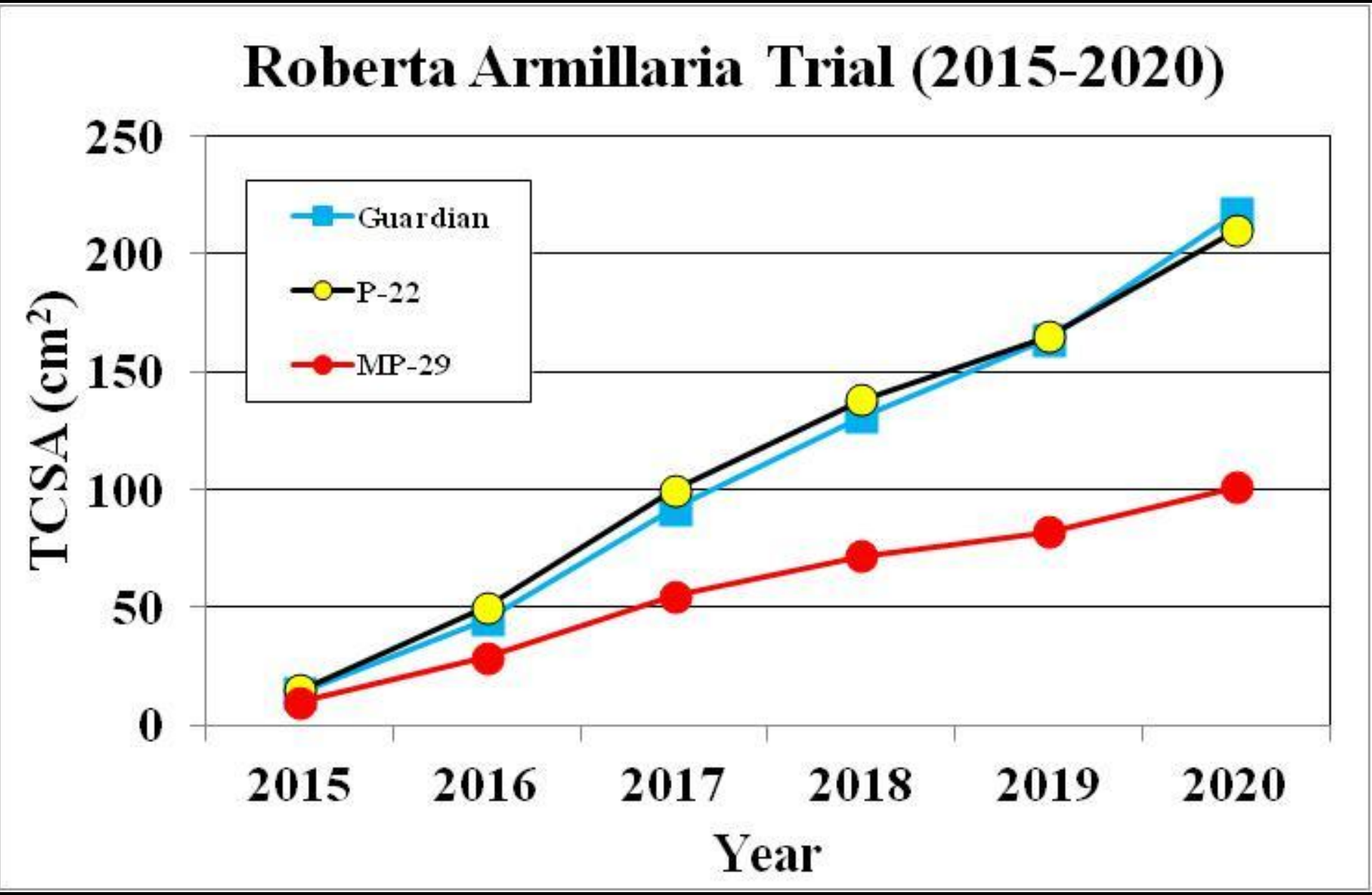
[z] Est. Spring, 2015 with 12 reps of 4 or 6 tree plots (Guardian/P-22 or MP-29, respectively) in a RCB design. Rows spaced 18' apart. Trees spaced 16' or 10' 8" apart in tree row or an equivalent tree density of 153 or 229 T/A (Guardian/P-22 or MP-29, respectively).

[y] TCSA=Trunk cross-sectional area (Fall, 2018)

[x] Cumulative number through Fall, 2020.

[w] Mean separation within columns via Waller-Duncan, k-ratio=100.

[v] Guardian selection SC3-17-7, now main component of the commercial seedlot.


Roberta Armillaria Trial (2015-2020)
250
200
150
100
50
0
TCSA (cm²)
Guardian
P-22
MP-29
2015
2016
2017
2018
2019
2020
Year

P-22 *(2022 release)*

- Peach seedling rootstock (~full size)
- Resistant to PTSL
- Tolerant of Armillaria (< MP-29)
- Resistant to most root-knot nematodes
- Good productivity and fruit size

P-22 *(2022 release)*

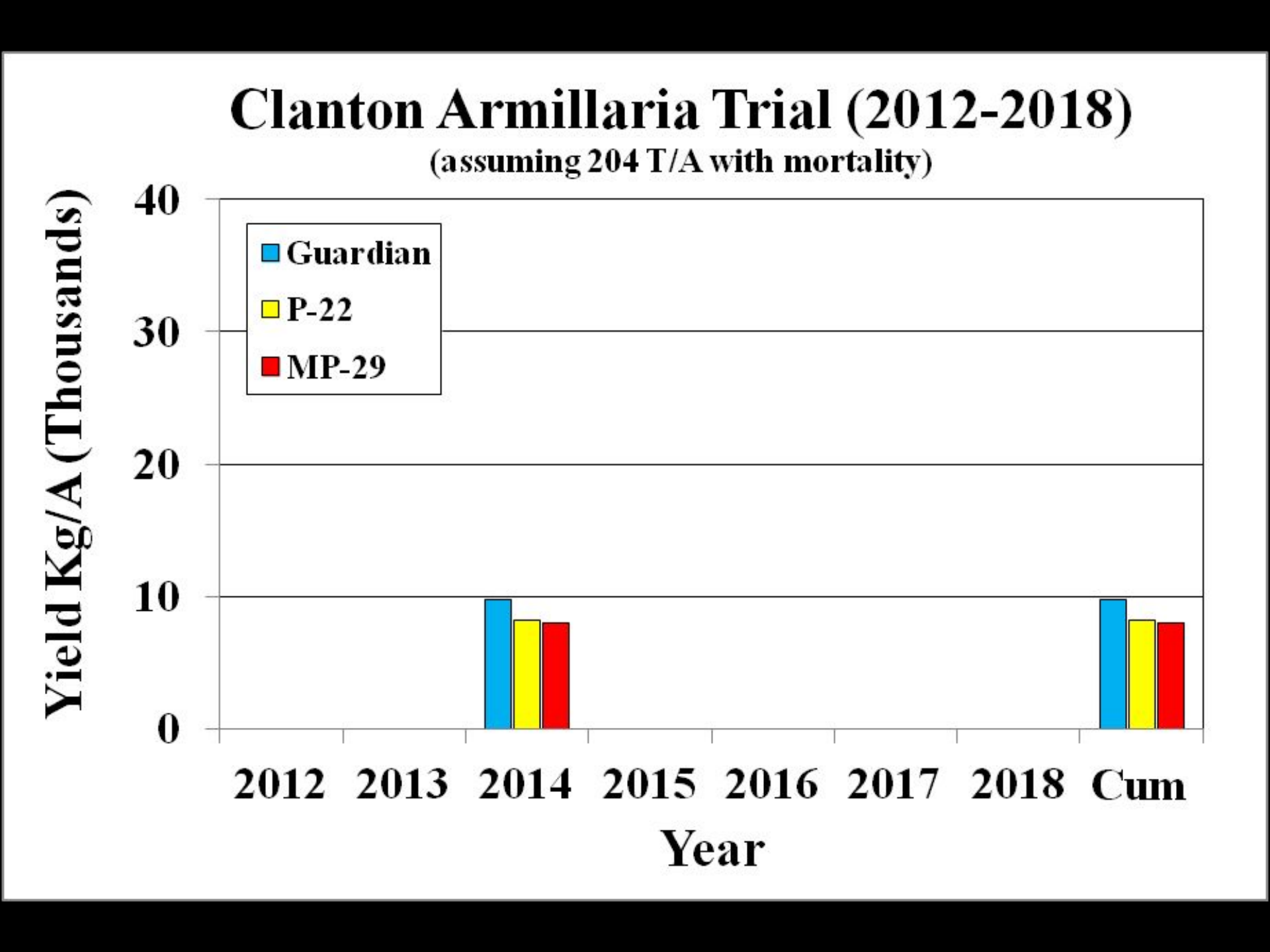
- Test lots distributed to TN nurseries F'21
- 80K seed are in storage from 2021 harvest
- Patent application to be filed this month
- 2022 seed crop?
- Cooperative release (USDA, UGA and UF) expected this coming Fall
- Cost?


USDA
SOUTHEASTERN
FRUIT AND TREE NUT
RESEARCH STATION
AGRICULTURAL RESEARCH
SERVICE

"Care and Handling" of MP-29

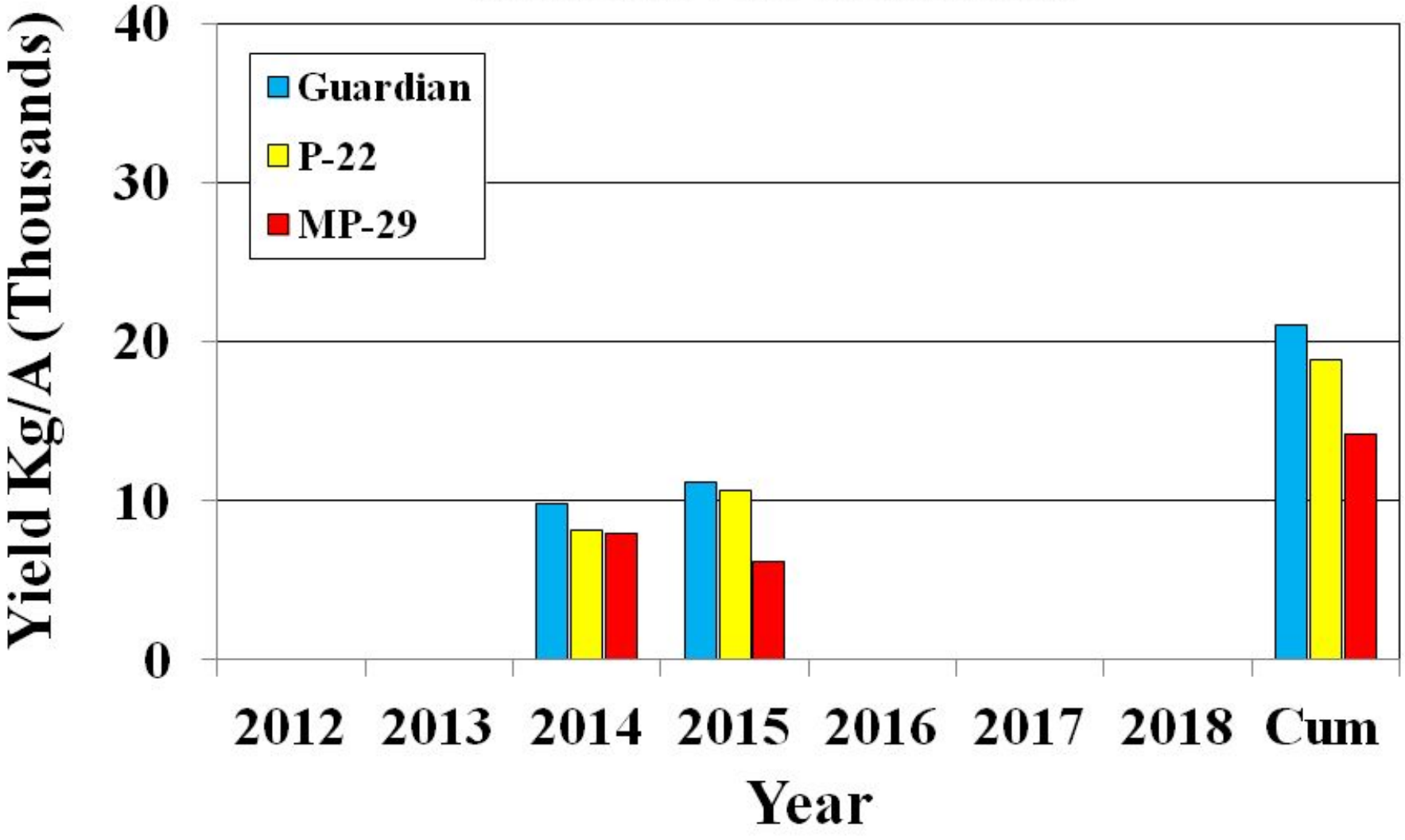
- Bud only with virus indexed cultivars
- Handle carefully when planting
- Set with graft union above soil line

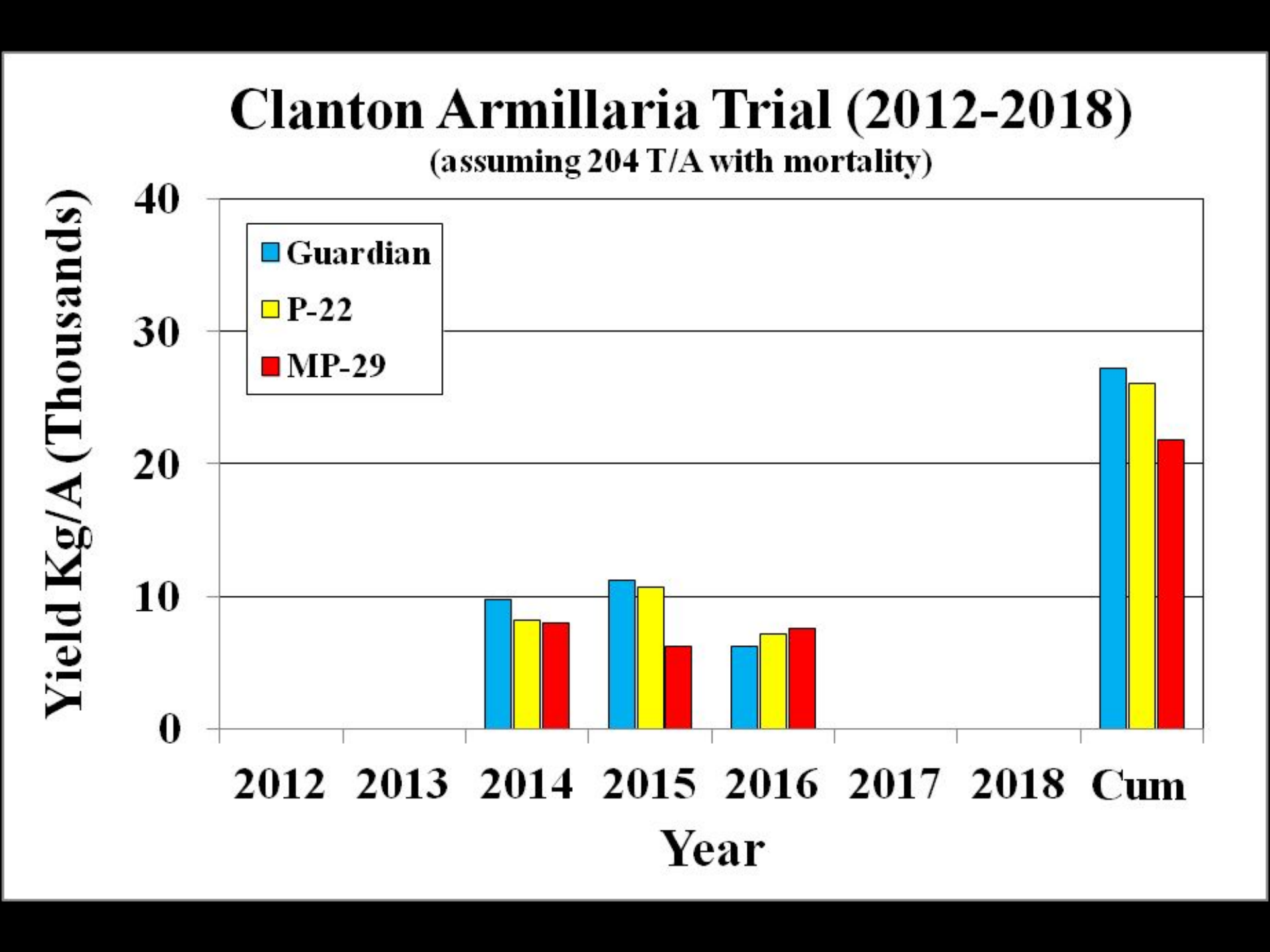
- Irrigate from the start
- Chemical mowing of orchard floor is a potential issue

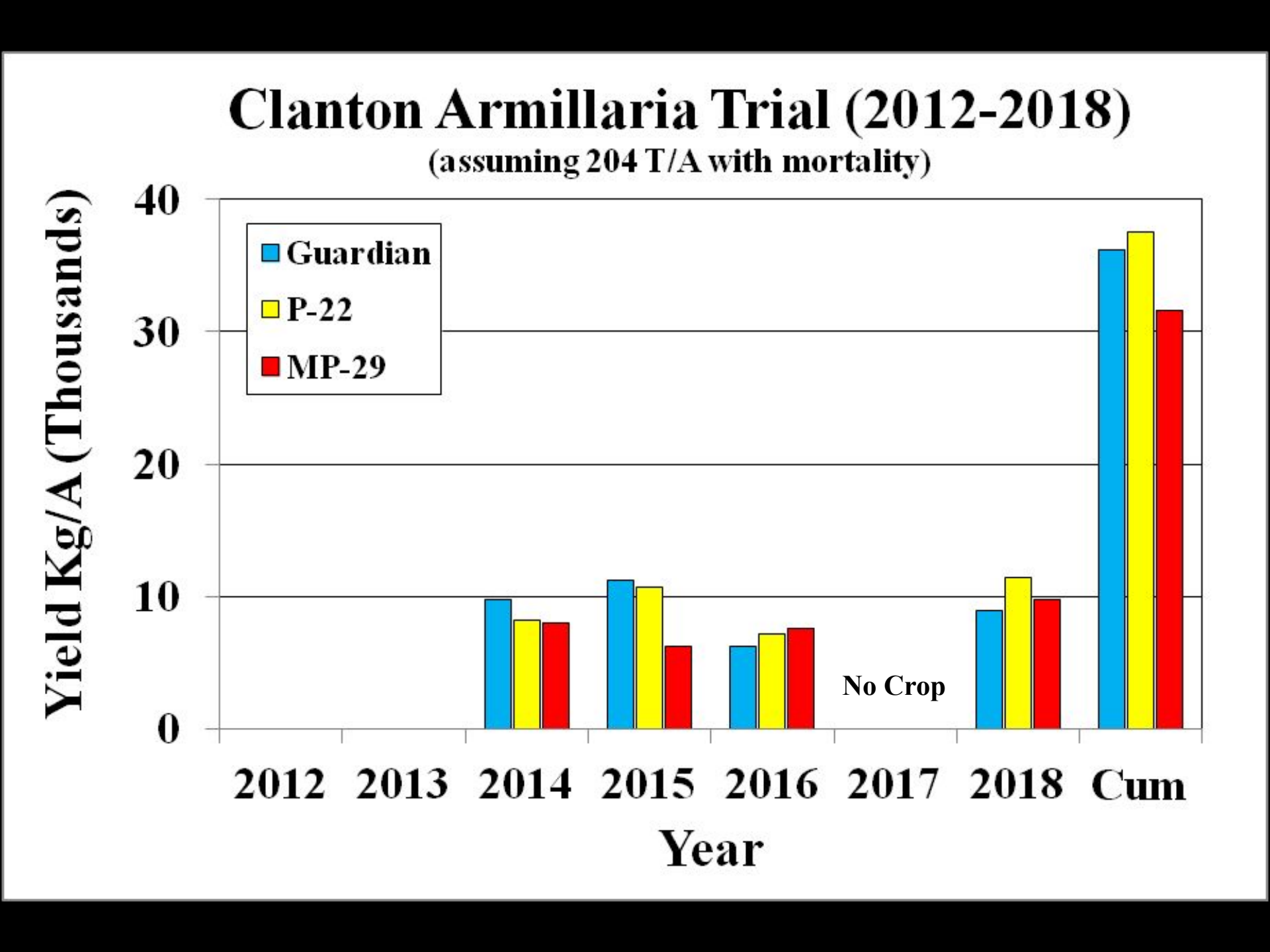

Clanton Armillaria Trial (2012-2018)
(assuming 204 T/A with mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year

Clanton Armillaria Trial (2012-2018)

(assuming 204 T/A with mortality)




Clanton Armillaria Trial (2012-2018)
(assuming 204 T/A with mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Clanton Armillaria Trial (2012-2018)
(assuming 204 T/A with mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
No Crop
2012
2013
2014
2015
2016
2017
2018
Cum
Year

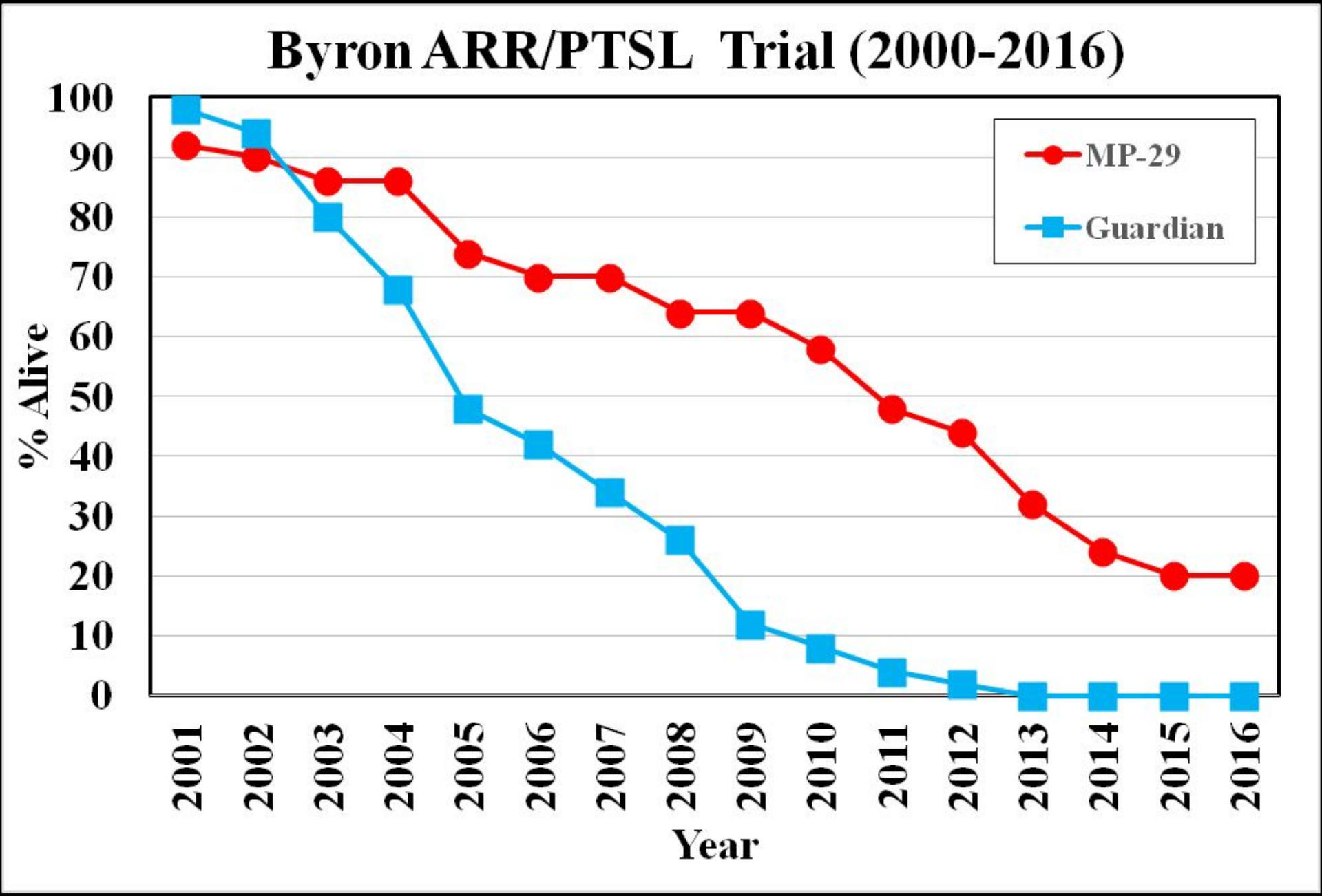

Byron ARR/PTSL Trial (2000-2016)
100
90
80
70
60
50
40
30
20
10
0
% Alive
MP-29
Guardian
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

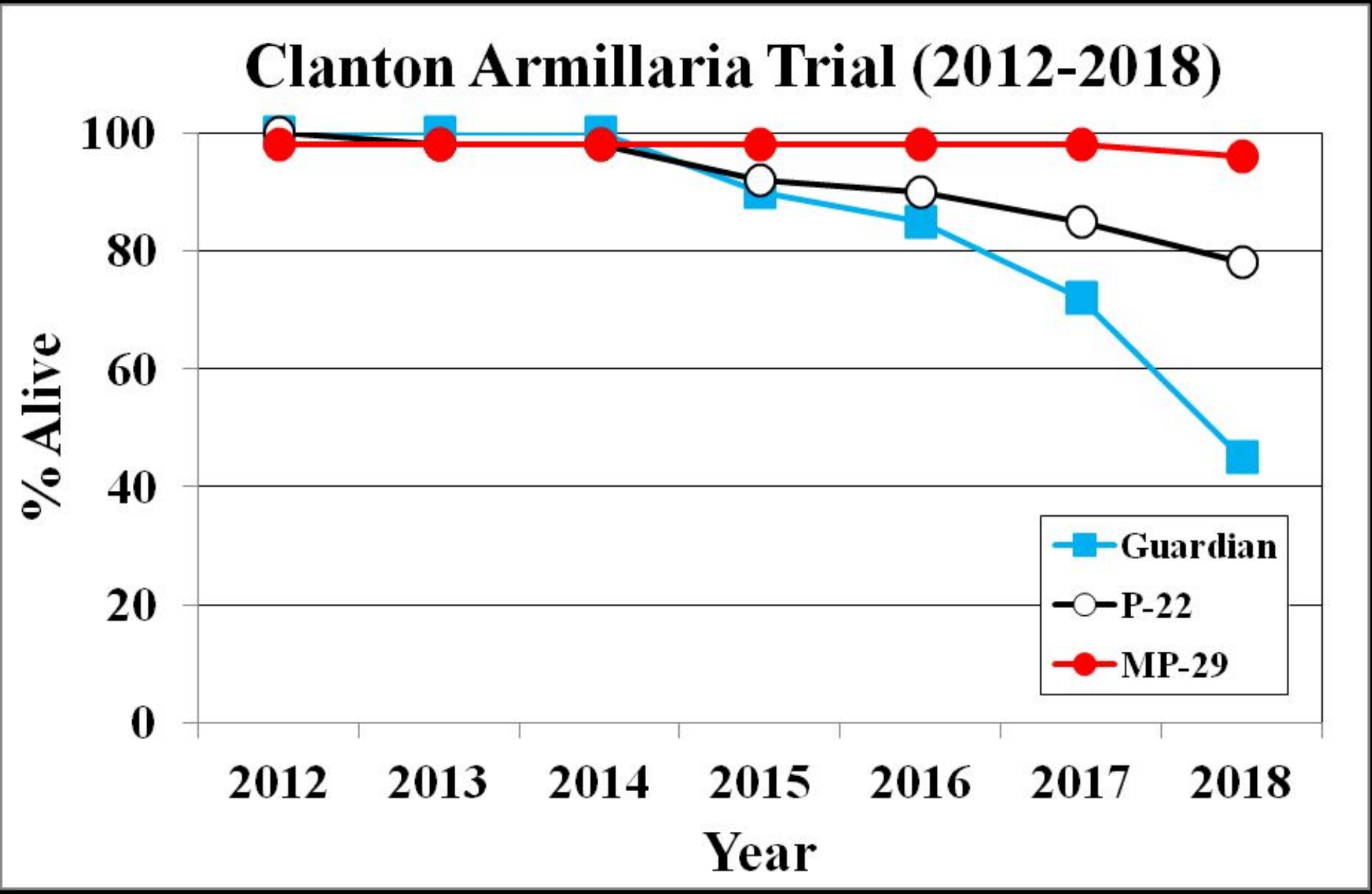
Table 1. Rootstock influence on cumulative mortality due to Armillaria (ARR), peach tree short life (PTSL) and other causes on a severe Armillaria infested site[z] (Clanton, AL 2012-2018).

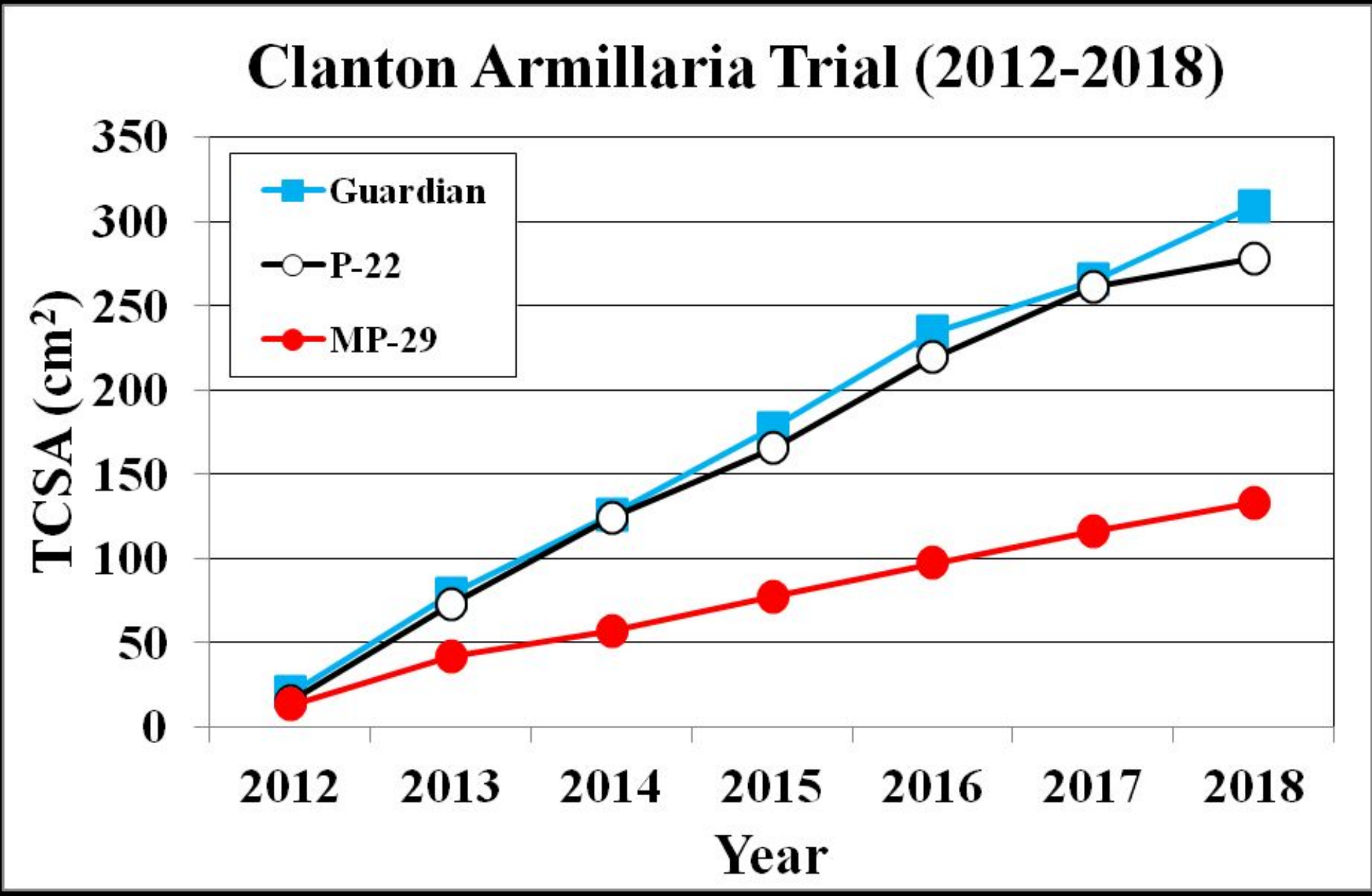
		Cause of Death					
	Alive	ARR		PTSL	Other		
Rootstock	(%)	(%)		(%)	(%)		
MP-29	96	a	2	bc[y]	0	2	
MP-23	97	a	0	c	3	0	
P-22	78	ab	22	b	0	0	
Guardian[x]	45	b	55	a	0	0	

[z] Est. Spring, 2012 with 8 reps (7 of MP-23) of 5 tree plots in a RCB design, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Mean separation within columns via Waller-Duncan, k-ratio=100.

[x] Guardian selection SC3-17-7, now main component of the commercial seedlot.


Clanton Armillaria Trial (2012-2018)
100
80
60
40
20
0
% Alive
2012
2013
2014
2015
2016
2017
2018
Year
Guardian
P-22
MP-29


Clanton Armillaria Trial (2012-2018)
350
300
250
200
150
100
50
0
TCSA (cm²)
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Year

MP-29

- Clonal semi-dwarf plum-peach hybrid
- Resistant to PTSL
- Resistant to Armillaria
- Resistant to most Root-knot nematodes
- Excellent productivity and fruit size
- Tolerant of waterlogging

MP-29

- Clonal semi-dwarf plum-peach hybrid
- Resistant to PTSL
- Resistant to Armillaria
- Resistant to most Root-knot nematodes
- Excellent productivity and fruit size
- Tolerant of waterlogging

P-22 *(2022 release)*

- Peach seedling rootstock
- Resistant to PTSL
- Resistant to most RK Nematodes
- Tolerant of Armillaria (< MP-29)
- Susceptible to Waterlogging

Table 3. Rootstock influence on cumulative yield, yield efficiency and mean fruit size on a severe Armillaria infested site Clanton, Al[z] (2014-2018).

	Cumulative		
Rootstock	Yield (Kg/tree)	Yield Efficiency (Kg/cm^2)	Mean Fruit Size (gm/fruit)
Guardian[y]	236 a	0.77 b	214 a
P-22	209 a	0.82 b	193 b
MP-29	154 b	1.09 a	209 a
MSD	47	0.23	8

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

Table 3. Rootstock influence on annual and cumulative yield on a severe Armillaria infested site in NC Alabama[z] (Clanton, 2012-2018).

Rootstock	Yield (kg/tree)				
	2014	2015	2016	2018	Cum.
Guardian[y]	48	61 a	42	97 a	236 a
P-22	41	57 a	39	72 ab	209 a
MP-29	40	31 b	33	50 b	154 b
MSD	14	7	13	38	47

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

Table 4. Rootstock influence on annual and overall mean fruit size on a severe Armillaria infested site in NC Alabama[z] (Clanton, 2012-2018).

Rootstock	Mean Fruit Size (gm/fruit)				
	2014	2015	2016	2018	Overall
Guardian[y]	196 a	213 b	240 a	225 b	214 a
P-22	180 b	195 c	210 b	203 b	193 b
MP-29	191 ab	246 a	233 ab	273 a	209 a
MSD	15	16	16	22	8

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

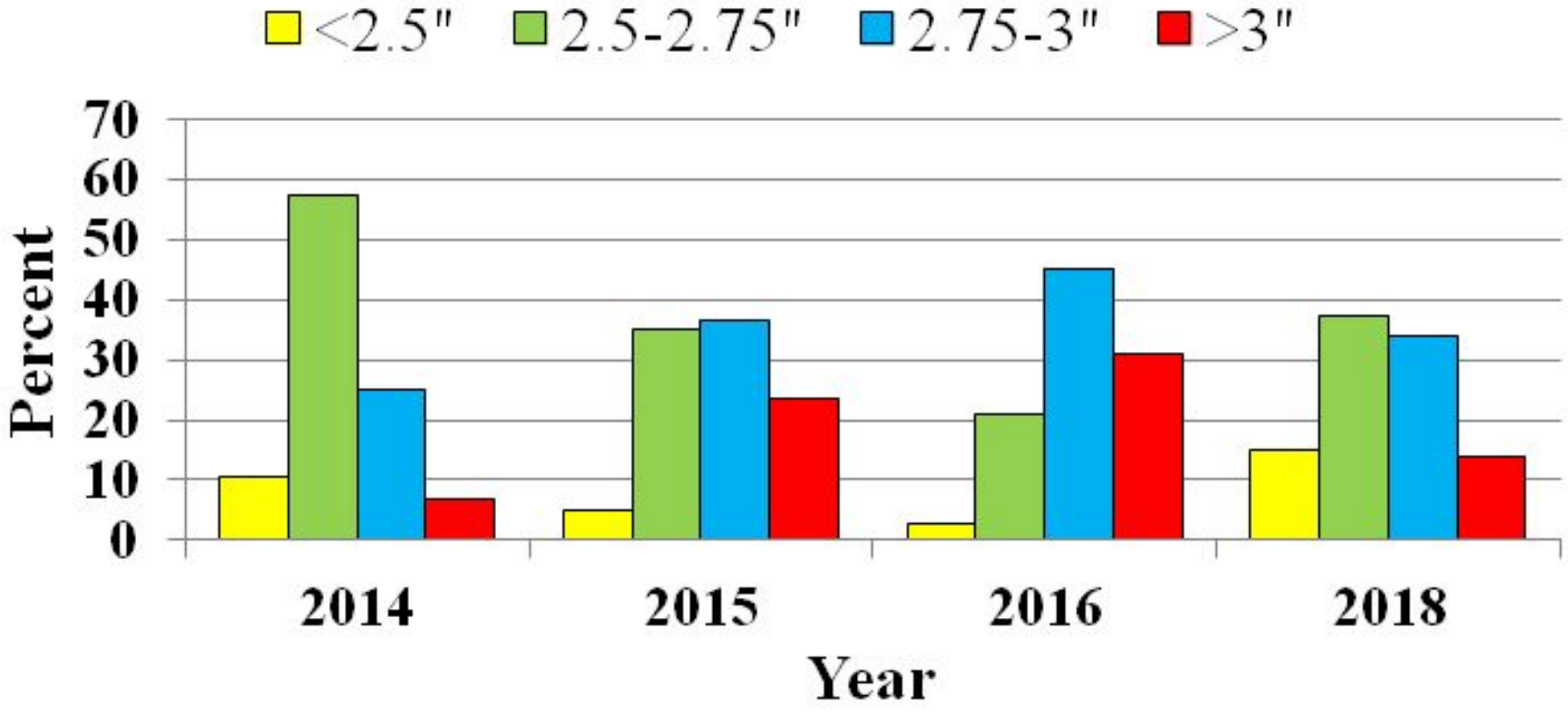
Table 5. Rootstock influence on annual and cumulative yield efficiency (kg/cm^2) on a severe Armillaria infested site in NC Alabama[z] (Clanton, 2012-2016).

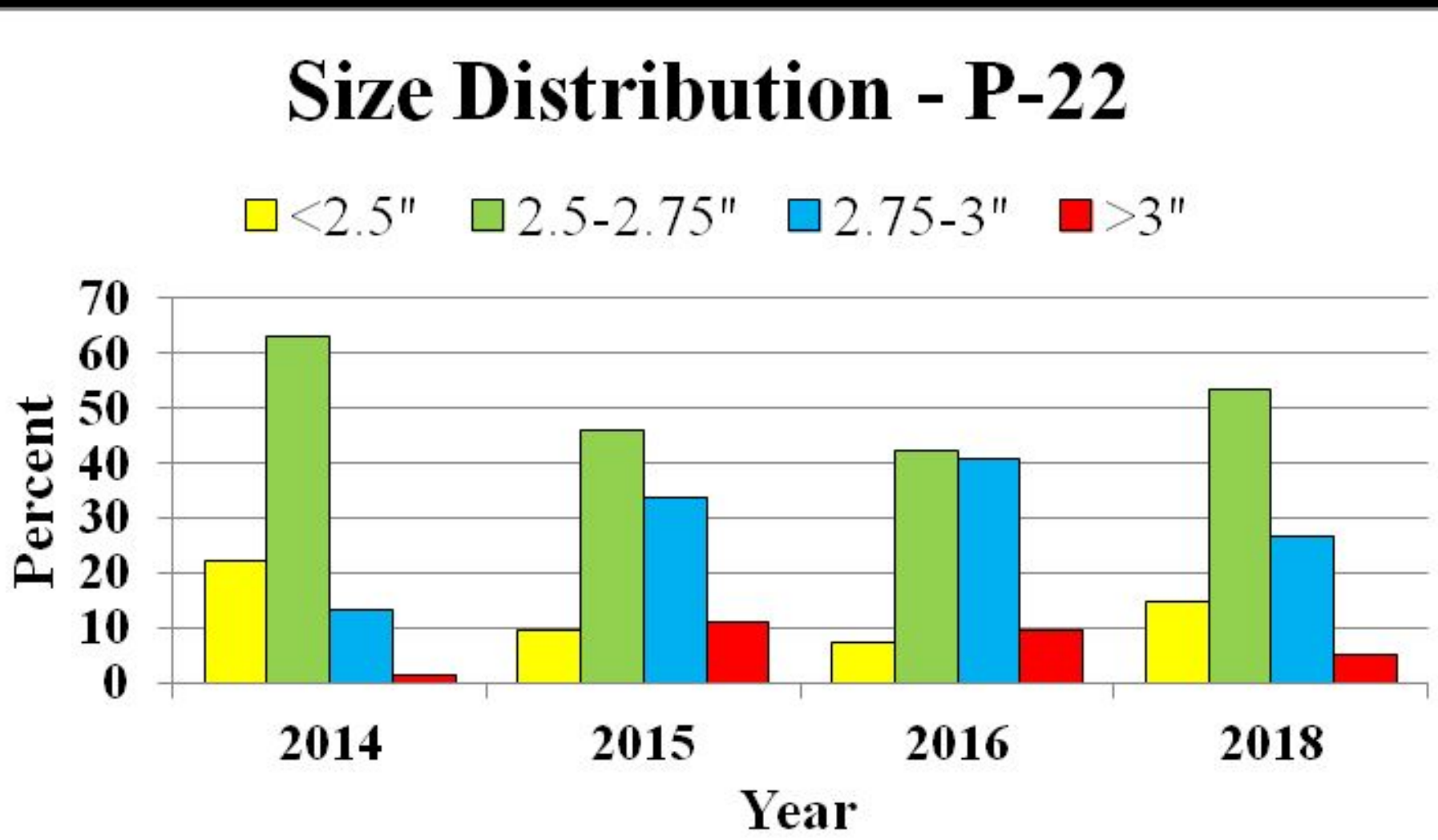
	Yield Efficiency (Kg/cm^2)				
Rootstock	2014	2015	2016	2018	Cum.
Guardian[y]	0.39 ab	0.38	0.22 b	0.32	0.77 b
P-22	0.35 b	0.42	0.28 b	0.26	0.82 b
MP-29	0.62 a	0.37	0.44 a	0.33	1.09 a
MSD	0.25	0.25	0.11	0.13	0.23

[z] Est. Spring, 2012 with 8 reps of 5 tree plots in a RCB design w/ 8 reps, budded with 'Julyprince' peach. Trees spaced 12 feet apart in row.

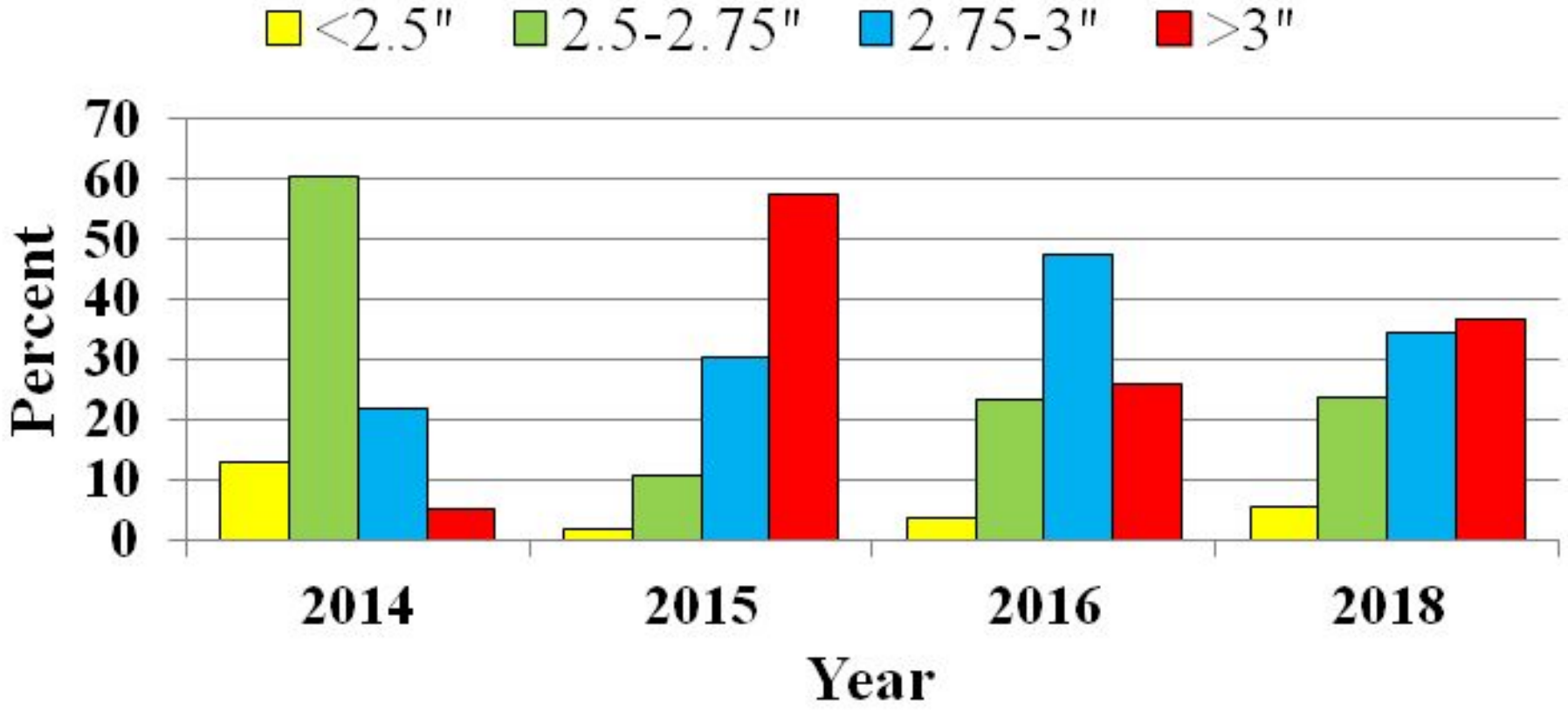
[y] Guardian peach seedling rootstock was collected from a single seed line, SC3-17-7, now the dominant component of the bulk seed mix sold commercially.

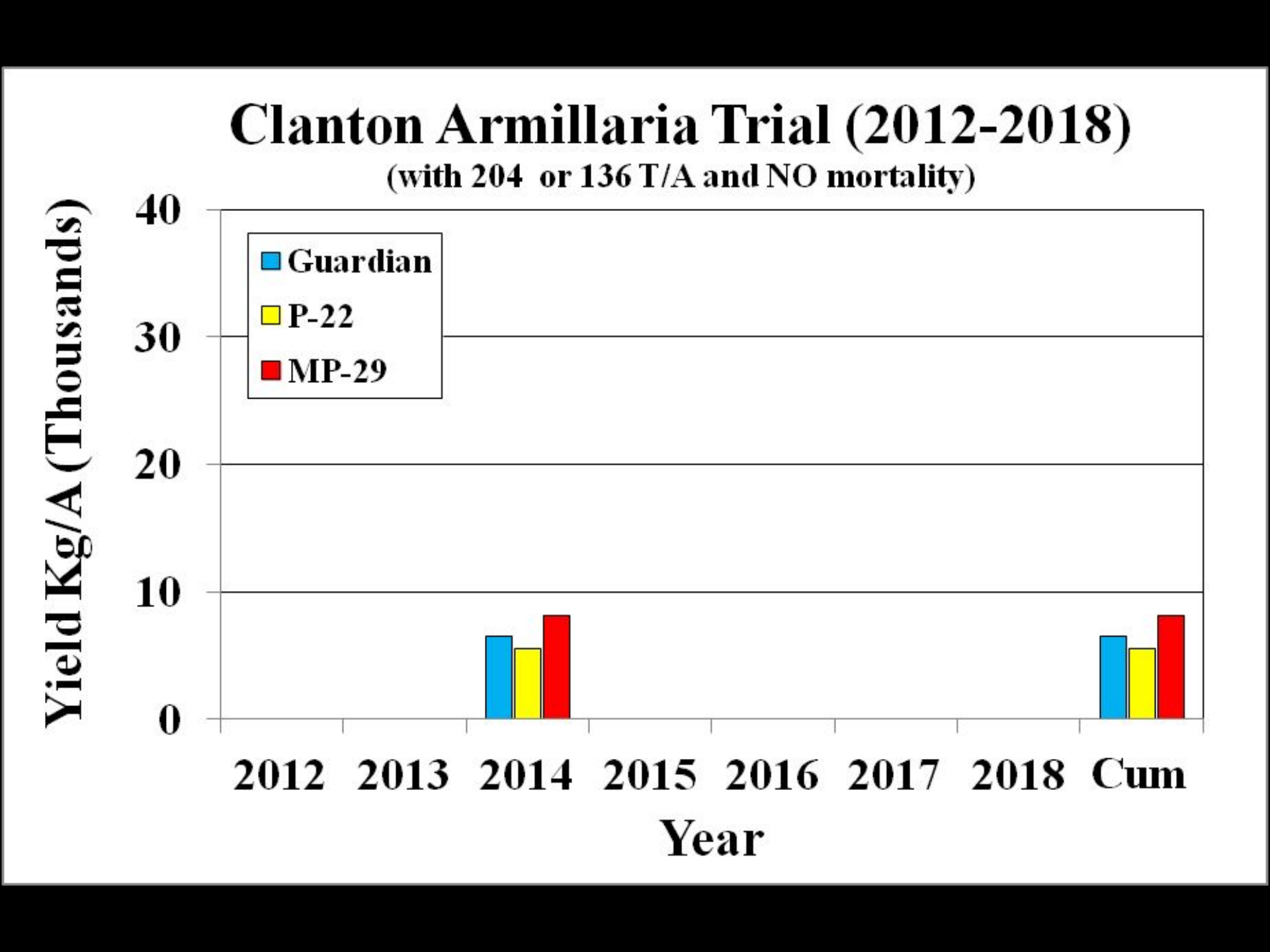
Size Distribution - Guardian

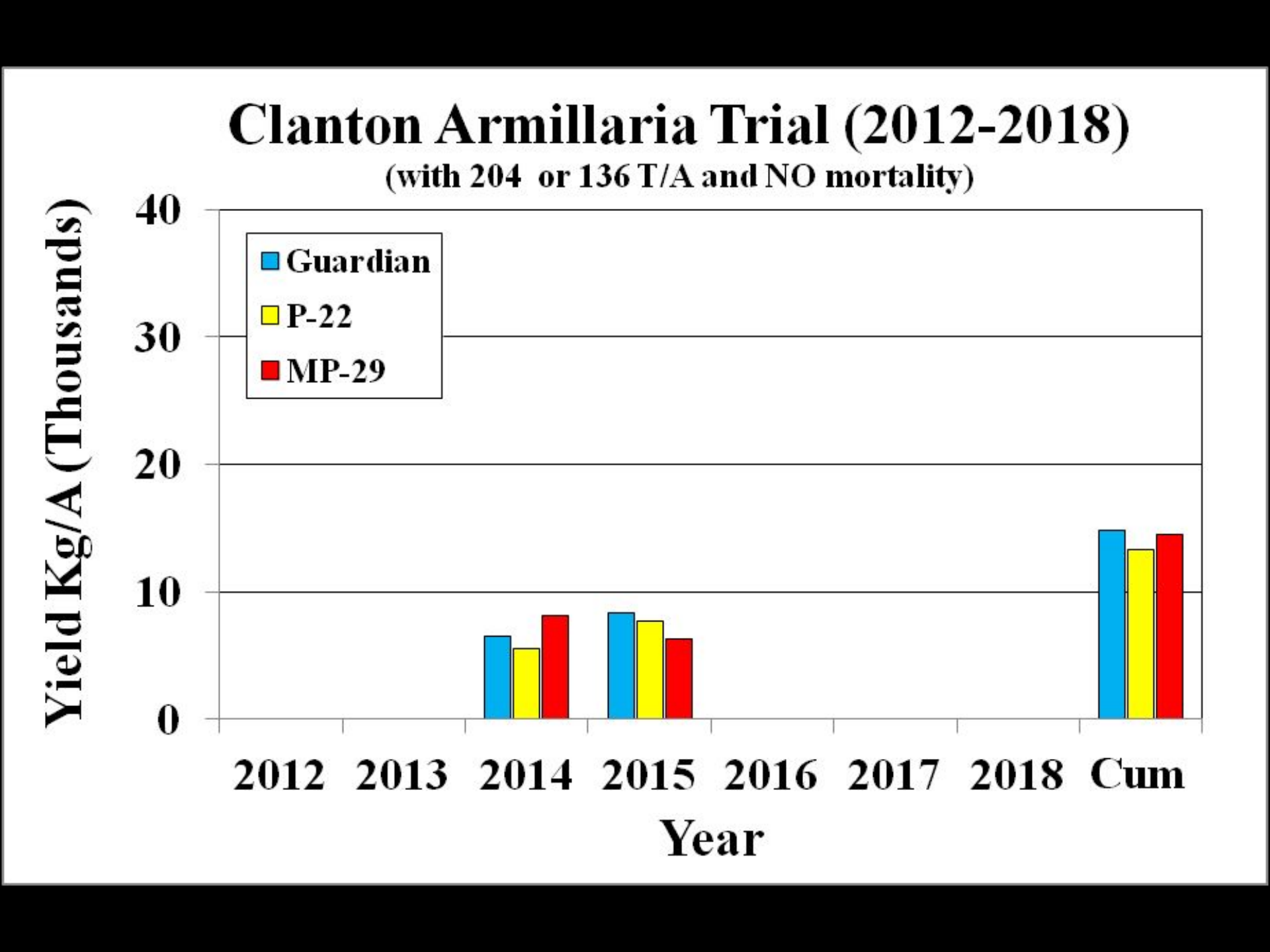



Size Distribution - P-22
<2.5"
2.5-2.75"
2.75-3"
>3"
Percent
70
60
50
40
30
20
10
0
2014
2015
2016
2018
Year

Size Distribution MP-29

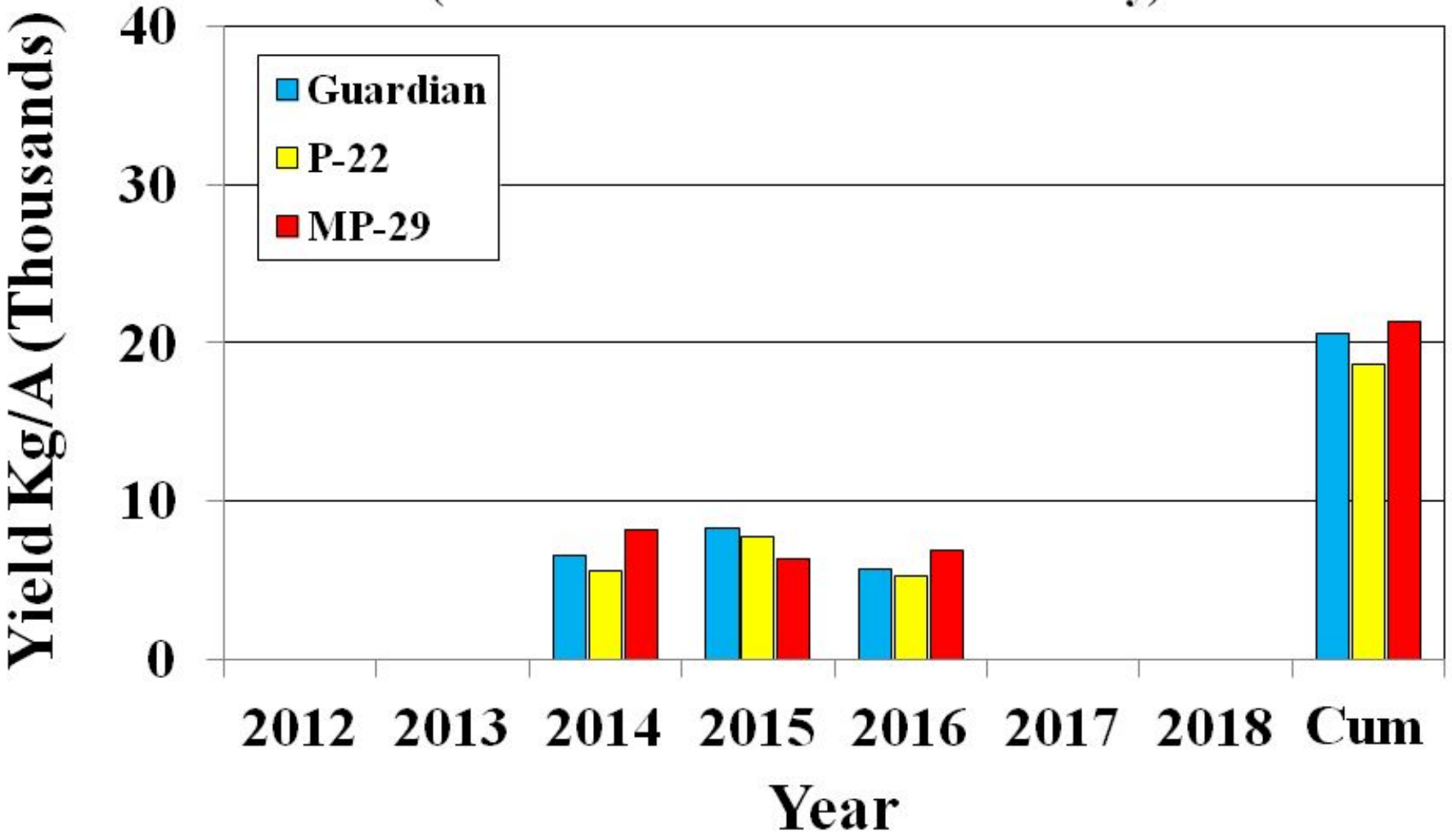


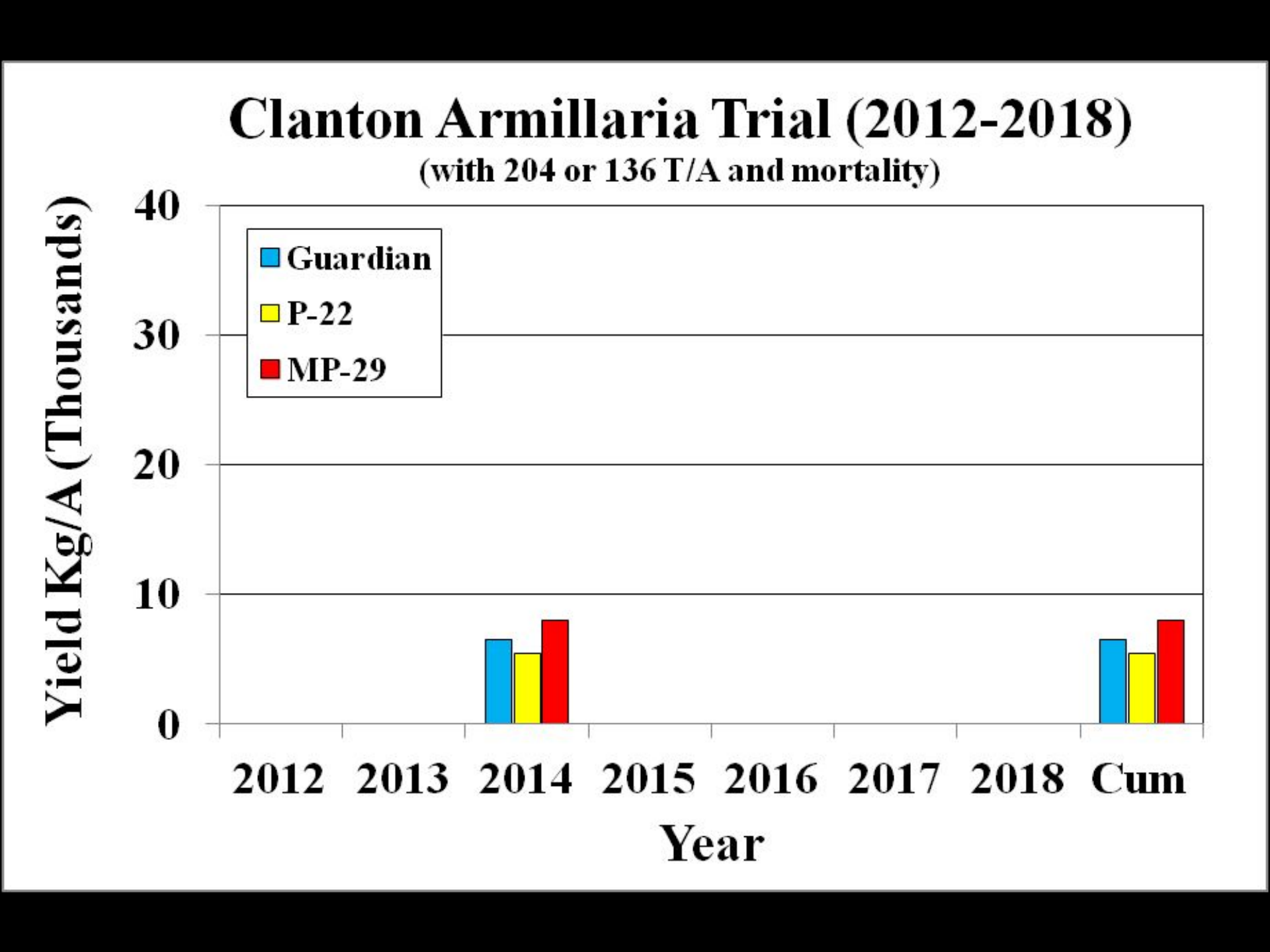

Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and NO mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year

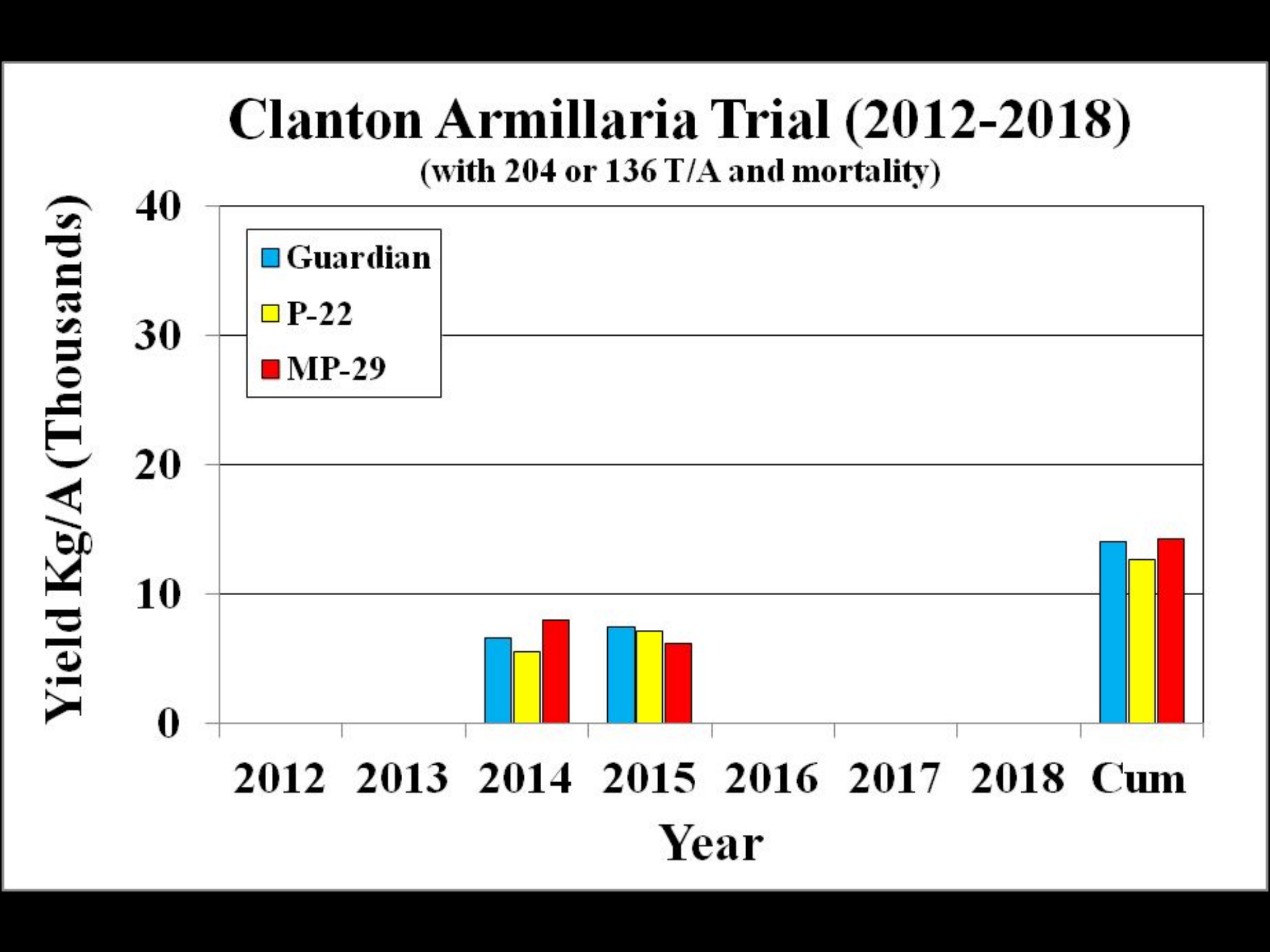

Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and NO mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year

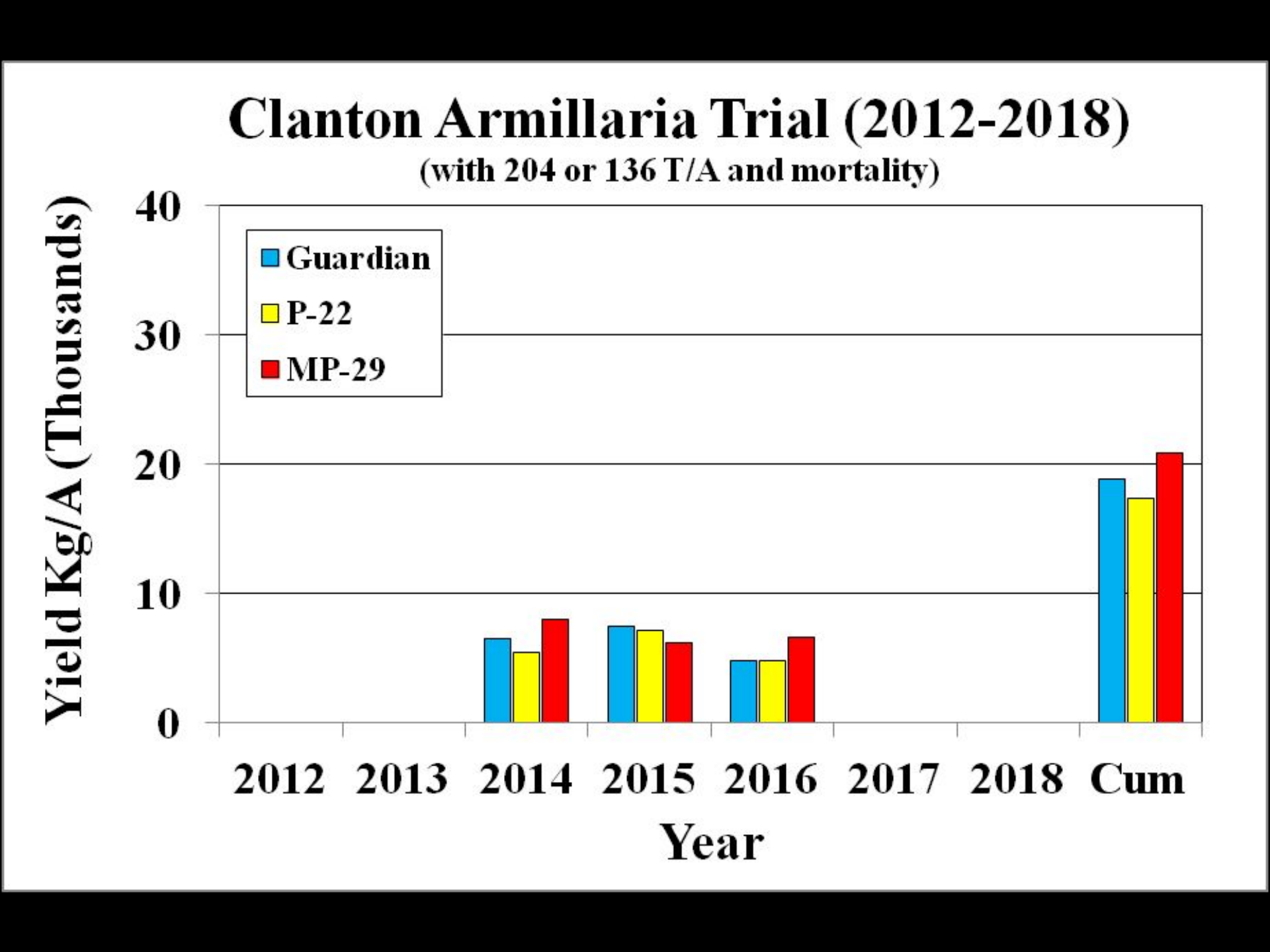
Clanton Armillaria Trial (2012-2018)

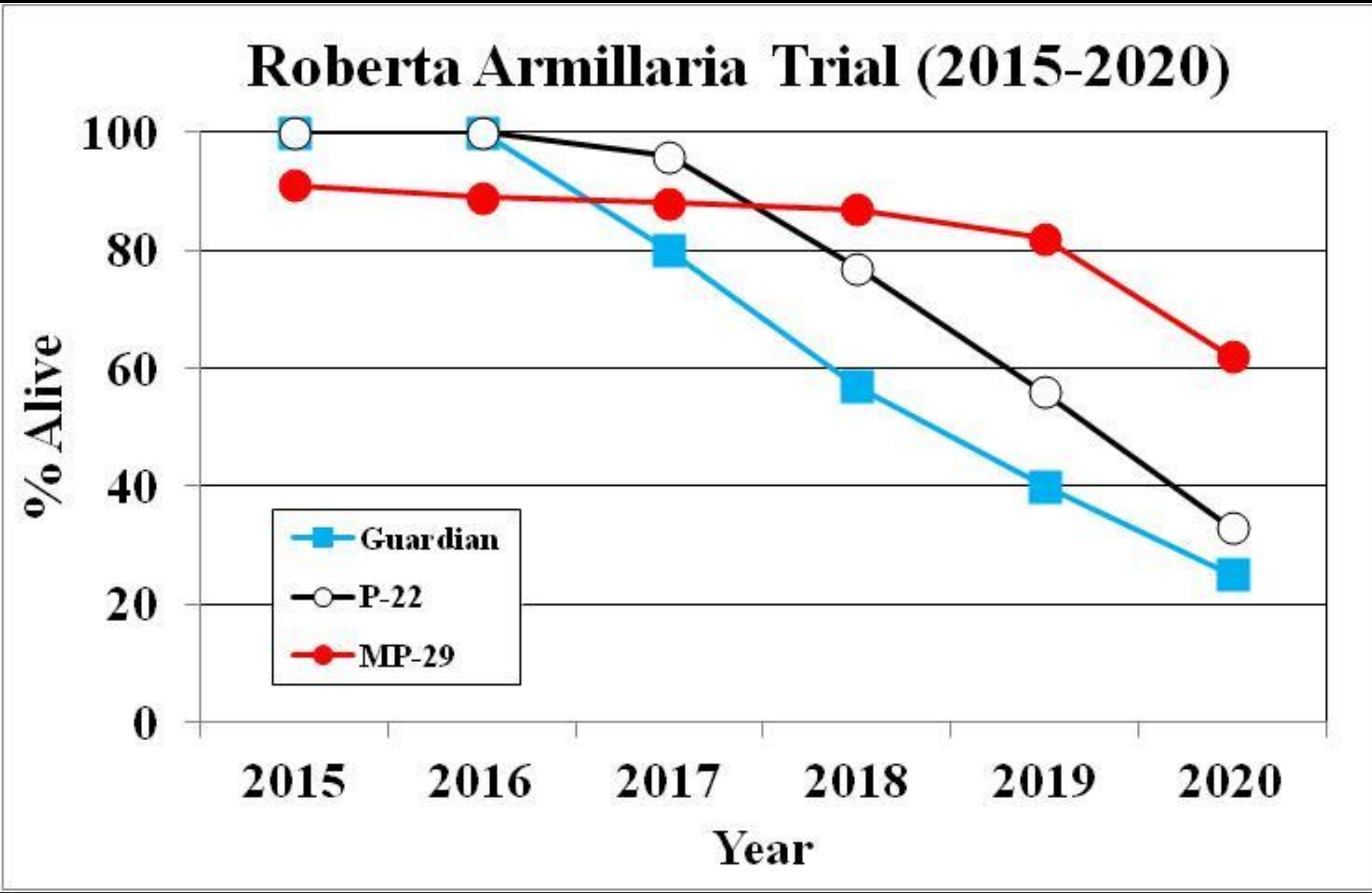
(with 204 or 136 T/A and NO mortality)




Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Clanton Armillaria Trial (2012-2018)
(with 204 or 136 T/A and mortality)
Yield Kg/A (Thousands)
40
30
20
10
0
Guardian
P-22
MP-29
2012
2013
2014
2015
2016
2017
2018
Cum
Year


Roberta Armillaria Trial (2015-2020)
100
80
60
40
20
0
% Alive
Guardian
P-22
MP-29
2015
2016
2017
2018
2019
2020
Year

Chesnee, SC Trial

- Peach Seedlings: Guardian and P-22
- Clonal MxP Types: MP-29
- Est. 2015 on a suspected Armillaria site
- Spacing: 18' between rows
  - 18' in row spacing for P-22 and Guardian
  - 12' in row spacing for MP-29
- 12 reps of 4 or 6 tree plots (Guardian/P-22 vs MP-29). Uniform 72' long test plots.
- Collaborator: A. Rollins

Table 5. Rootstock influence on cumulative mortality due to Armillaria (ARR), peach tree short life (PTSL) and other causes on a severe Armillaria infested site [z] in Chesnee, SC (2015-2020).

			Cause of Death		
	Alive		ARR	PTSL	Other
Rootstock	(%)		(%)	(%)	(%)
MP-29	99	a [y]	0	0	1
Guardian [x]	87	a	4	7	2
P-22	75	b	8	7	10
MSD	14		9	10	10

[z] Est. Spring, 2015 with 12 reps of 4 or 6 tree plots (Guardian/P-22 or MP-29, respectively) in a RCB design, budded with 'Monroe' peach. Trees spaced 18' apart between rows and either 18' or 12' apart (Guardian/P-22 or MP-29, respectively). Uniform 72' plots.

[y] Mean separation within columns via Waller-Duncan, k-ratio=100.

[x] Guardian selection SC3-17-7, now main component of the commercial seedlot.

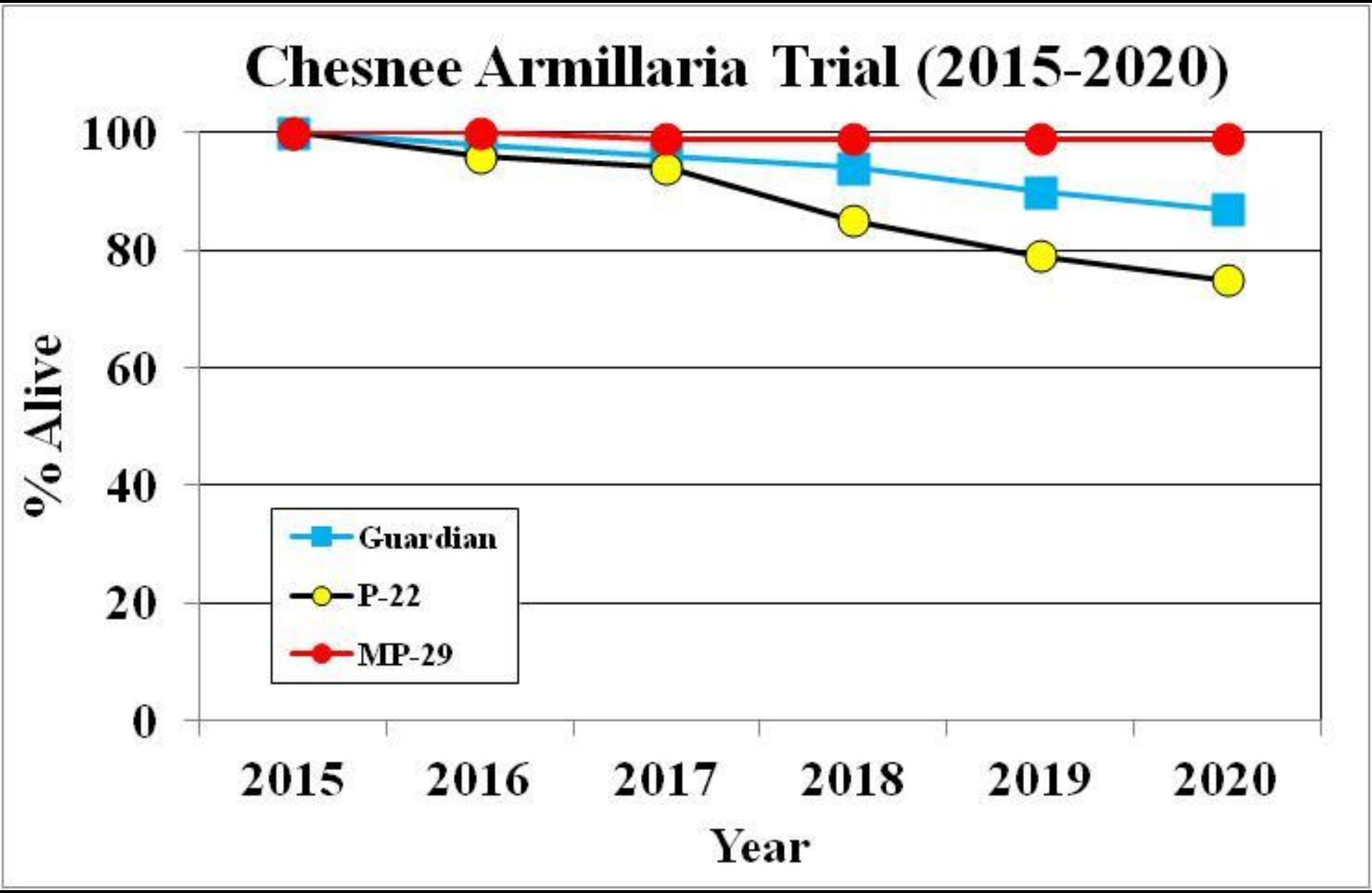

Chesnee Armillaria Trial (2015-2020)
100
80
60
40
20
0
% Alive
Guardian
P-22
MP-29
2015
2016
2017
2018
2019
2020
Year

Table 6. Horticultural performance of 'Monroe' peach propagated on commercial rootstocks and an advanced selection on a severe Armillaria (ARR) infested site[z] in Chesnee, SC (2015-2020).

Rootstock	TCSA [y] (cm^2)	Size (% Std)	Suckers [x] (#/tree)
MP-29	101 c[w]	47	1 b
P-22	213 a	121	11 a
Guardian [v]	176 b	100	13 a
MSD	40	3	

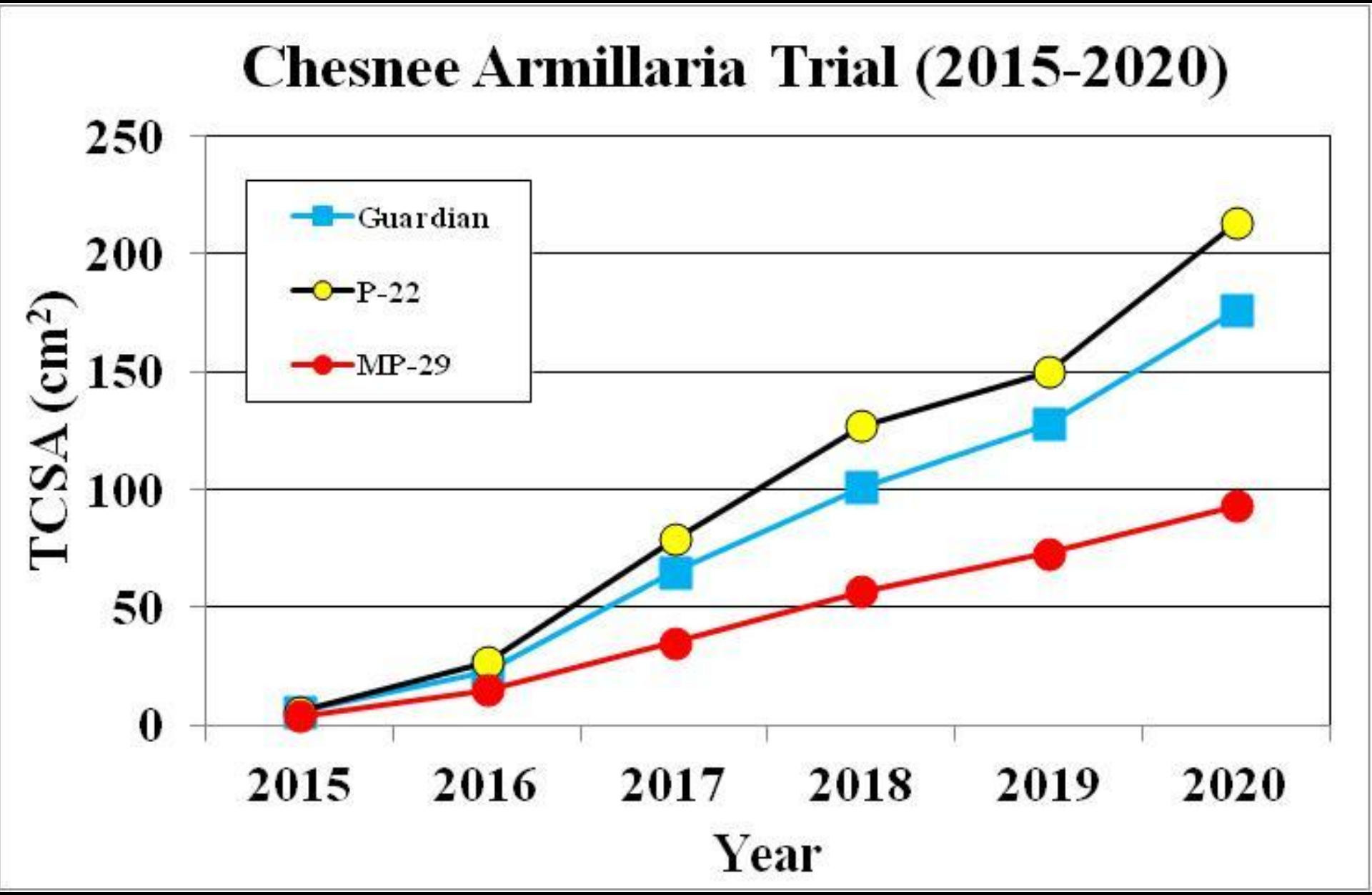
[z] Est. Spring, 2015 with 12 reps of 4 or 6 tree plots (Guardian/P-22 or MP-29, respectively) in a RCB design. Rows spaced 18' apart. Trees spaced 18' or 12' apart in tree row or an equivalent tree density of 153 or 229 T/A (Guardian/P-22 or MP-29, respectively) . Uniform 72' plots.

[y] TCSA=Trunk cross-sectional area (Fall, 2020)

[x] Cumulative number through Fall, 2020.

[w] Mean separation within columns via Waller-Duncan, k-ratio=100.

[v] Guardian selection SC3-17-7, now main component of the commercial seedlot.


Chesnee Armillaria Trial (2015-2020)
250
200
150
100
50
0
TCSA (cm²)
Guardian
P-22
MP-29
2015
2016
2017
2018
2019
2020
Year