

Effects of potato psyllid vector density and time of infection on zebra chip disease development after harvest and during storage



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Zebra chip (ZC) disease

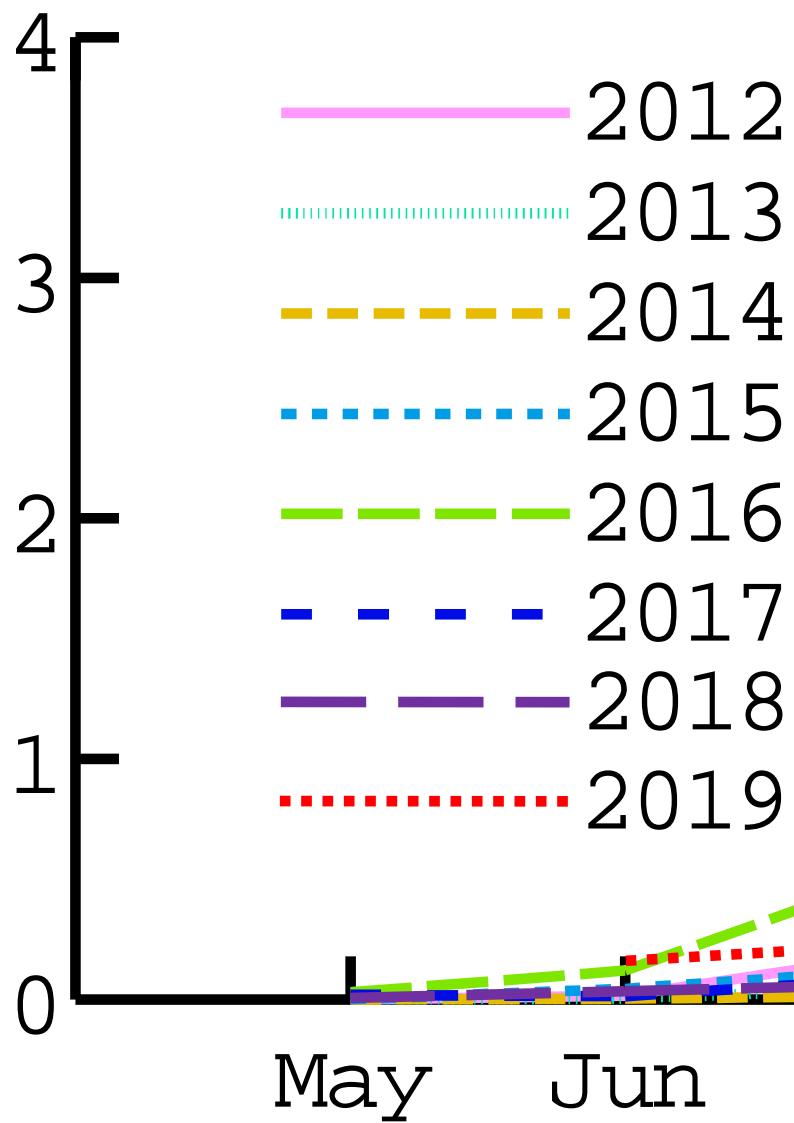
- Disease associated with bacterium
(“*Candidatus Liberibacter solanacearum*” [Lso])



- Bacterium vectored by the potato psyllid
(*Bactericera cockerelli*)

Mean psyllids

per trap



- Potato psyllid abundance low during most of season, peaking only late season
- Texas studies (Rush and Rashed) suggest ZC develops from late infections
 - “Green harvest”
 - fresh/chip varieties

Field plots

- Individually caged potato plants
- cv. Russet Burbank
- Inoculations w/ psyllids from Lso-positive colony
- RCB design
- 8-10 replicates $\begin{cases} \rightarrow \frac{1}{2} \text{ rated at harvest} \\ \rightarrow \frac{1}{2} \text{ rated after storage} \end{cases}$



Half of reps rated at harvest

- Held for no more than 2 weeks at 12.8°C, 95% RH

Half of reps rated after storage

- Cured for 2 weeks at 12.8°C, 95% RH
- Decreased 0.3°C per day until = 7.2°C
- Held for total of ca. 90 days

ZC ratings

- Each tuber cut into fry planks
- Raw planks rated, fried, fry color with Photovolt Reflection Meter



ZC ratings

- Visual ZC ratings, confirmed by PCR

no symptoms



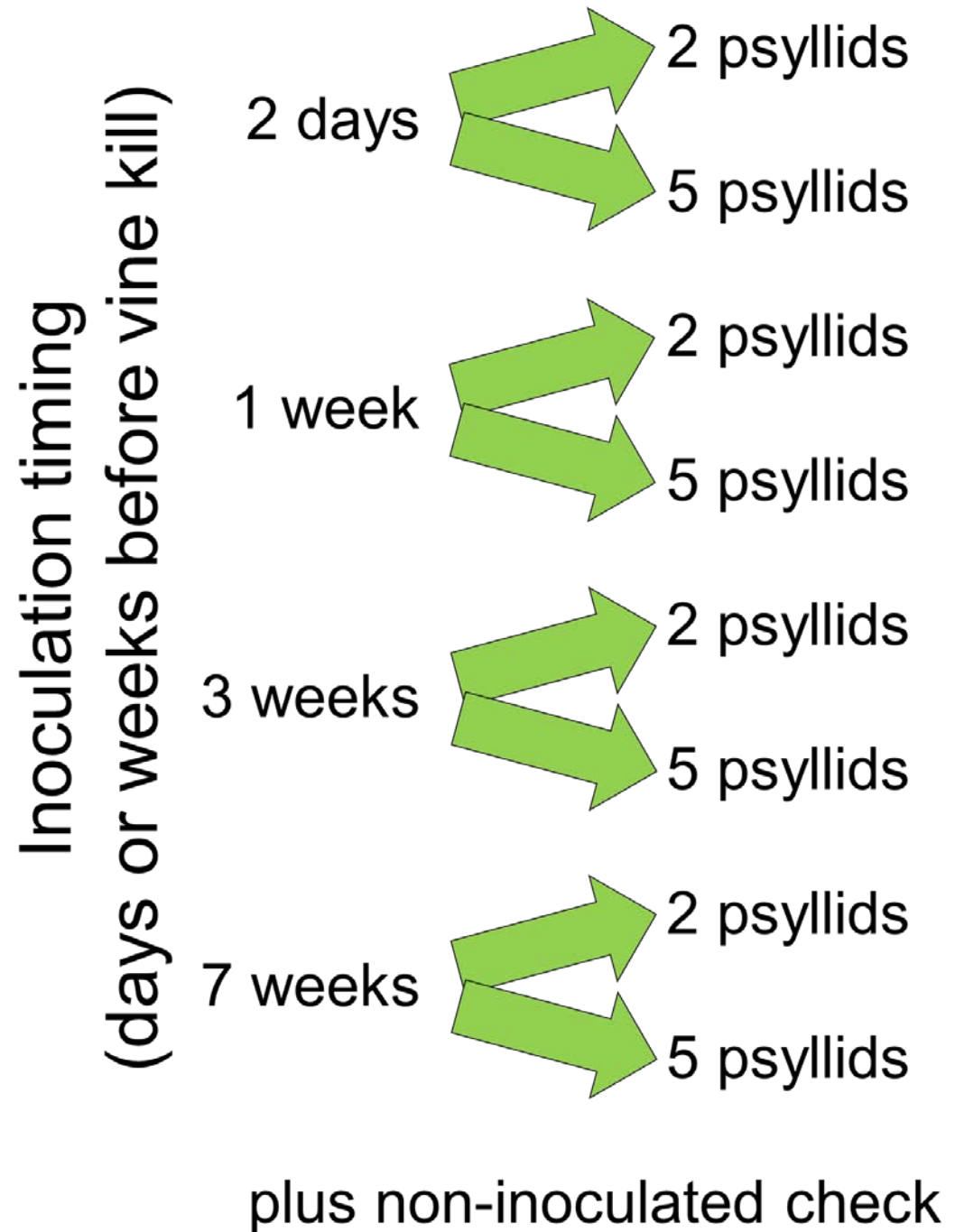
some
discoloration
near stem end



obvious ZC
symptoms
through tuber



Inoculation treatments (2014-2015 experiment)



Percentage of raw tubers with severe ZC symptoms				
	at harvest		after storage	
No. psyllids	2014	2015	2014	2015
0 (check)	0.0	0.0	0.0	0.0
2	2.6	15.3	17.8	25.3
5	23.5	24.4	30.8	27.1

	Percentage of raw tubers with severe ZC symptoms at harvest		after storage	
	2014	2015	2014	2015
Check	0.0 b	0.0 b	0.0 b	0.0 c
2 days	0.0 b	0.0 b	0.0 b	0.0 c
1 week	0.0 b	0.0 b	0.0 b	0.0 c
3 weeks	1.4 b	1.3 b	36.9 a	24.3 b
7 weeks	50.8 a	78.2 a	60.3 a	80.4 a

Inoculation treatments (2016-2017 experiments)

- 5 weeks before vine kill
- 4 weeks
- 3 weeks
- 2 weeks
- 1 week
- non-inoculated check

4 psyllids
per plant

2016	Percentage of raw tubers with severe ZC symptoms	
Inoculation timing	at harvest	after storage
—	0.0 b	0.0 b
1 week	0.0 b	0.0 b
2 weeks	0.0 b	2.1 b
3 weeks	7.3 ab	14.0 b
4 weeks	25.2 a	48.9 a

<div>2017</div> <div>Inoculation timing</div>	Percentage of raw tubers with severe ZC symptoms	
	at harvest	after storage
—	0.0 b	0.0 b
1 week	0.0 b	0.0 b
2 weeks	0.0 b	11.4 b
3 weeks	4.5 ab	25.7 b
4 weeks	8.3 ab	30.6 b
5 weeks	38.5 a	94.1 a

<div> <div>USDA1</div> <div>USDA2</div> <div>USDA3</div> <div>USDA4</div> </div>	Mean fry color reflectance			
	at harvest		after storage	
	2016	2017	2016	2017
Check	45.3 a	43.5 a	38.4	40.6 a
1 week	44.7 a	38.8 ab	38.1	40.7 a
2 weeks	47.5 a	37.5 ab	37.5	37.8 ab
3 weeks	44.5 a	33.1 bc	33.1	32.9 b
4 weeks	36.6 b	29.8 c	33.7	32.9 b
5 weeks	—	—	24.5	19.1 c

time before vine kill	ZC risk at harvest	ZC risk after storage
1 week	low	low
2 weeks	low	low to moderate
3 weeks	low to moderate	high
4+ weeks	high	high

Conclusions

- Vector density less important than timing of infection
- ZC incidence at harvest may underestimate risk after storage
- Plants should be protected until at least 2 weeks before vine kill

Acknowledgements

- NW Potato Research Consortium
- Lucy Standley, Lynn Woodell, Anastasia Stanzak, Wyatt Shewmaker, and Brandon Thompson

