

# There's a Plasmodiophorid in My Potatoes!

## Managing Powdery Scab and PMTV



Jeff Miller  
Trent Taysom  
Terry Miller



University  
of Idaho

Nora Olsen  
James Woodhall

*Spongospora subterranea* subsp. *subterranea* (Protozoa)



Photo from Ueli Merz

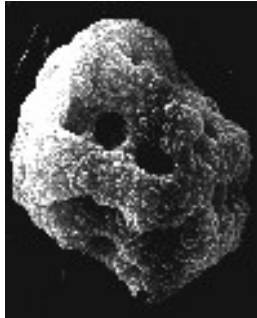


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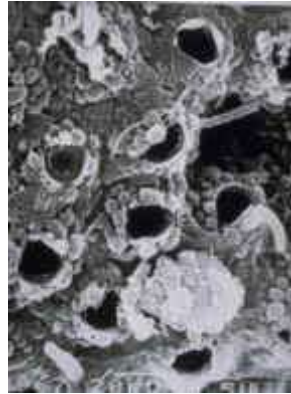


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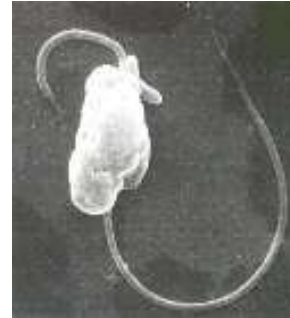


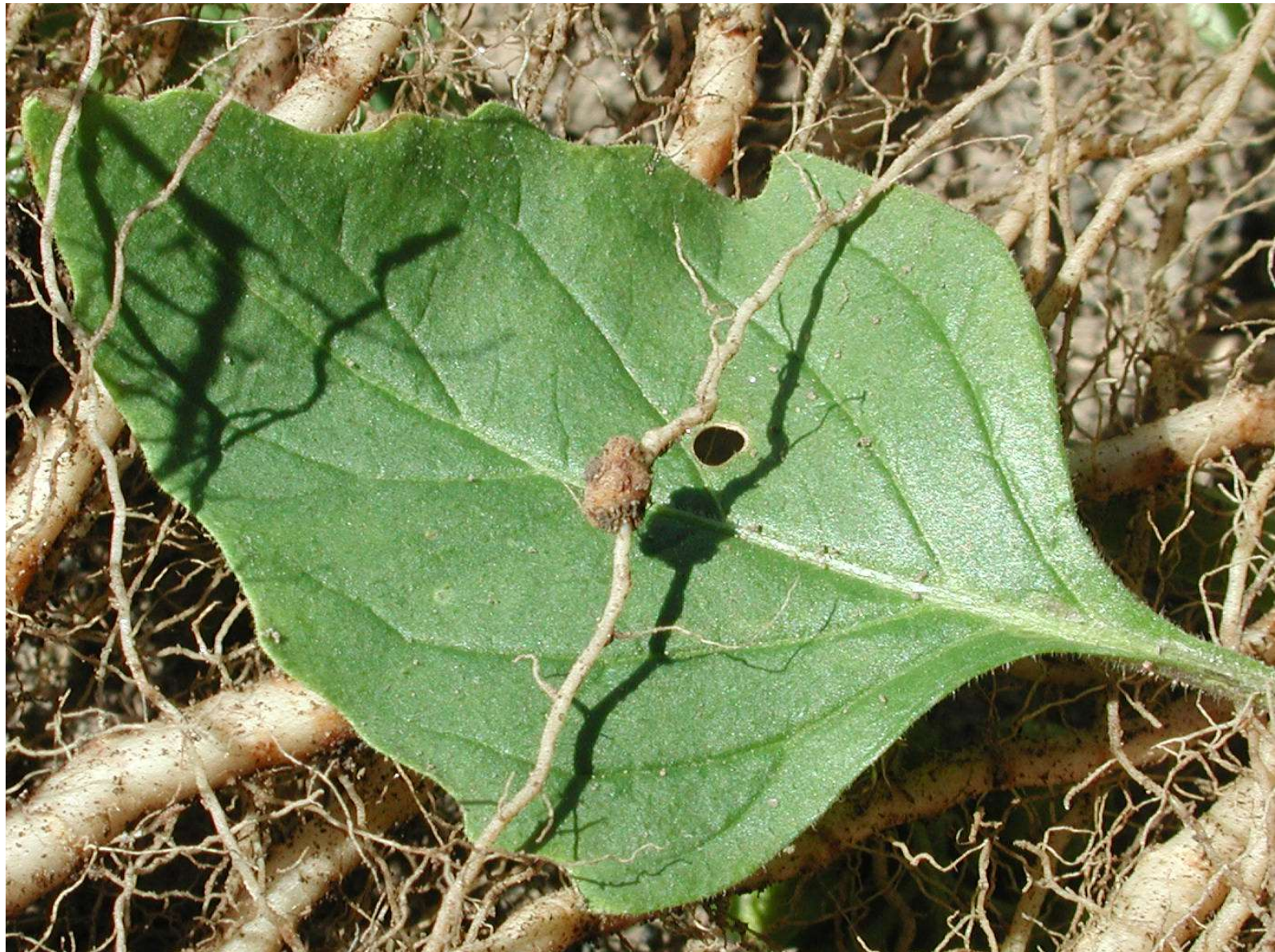
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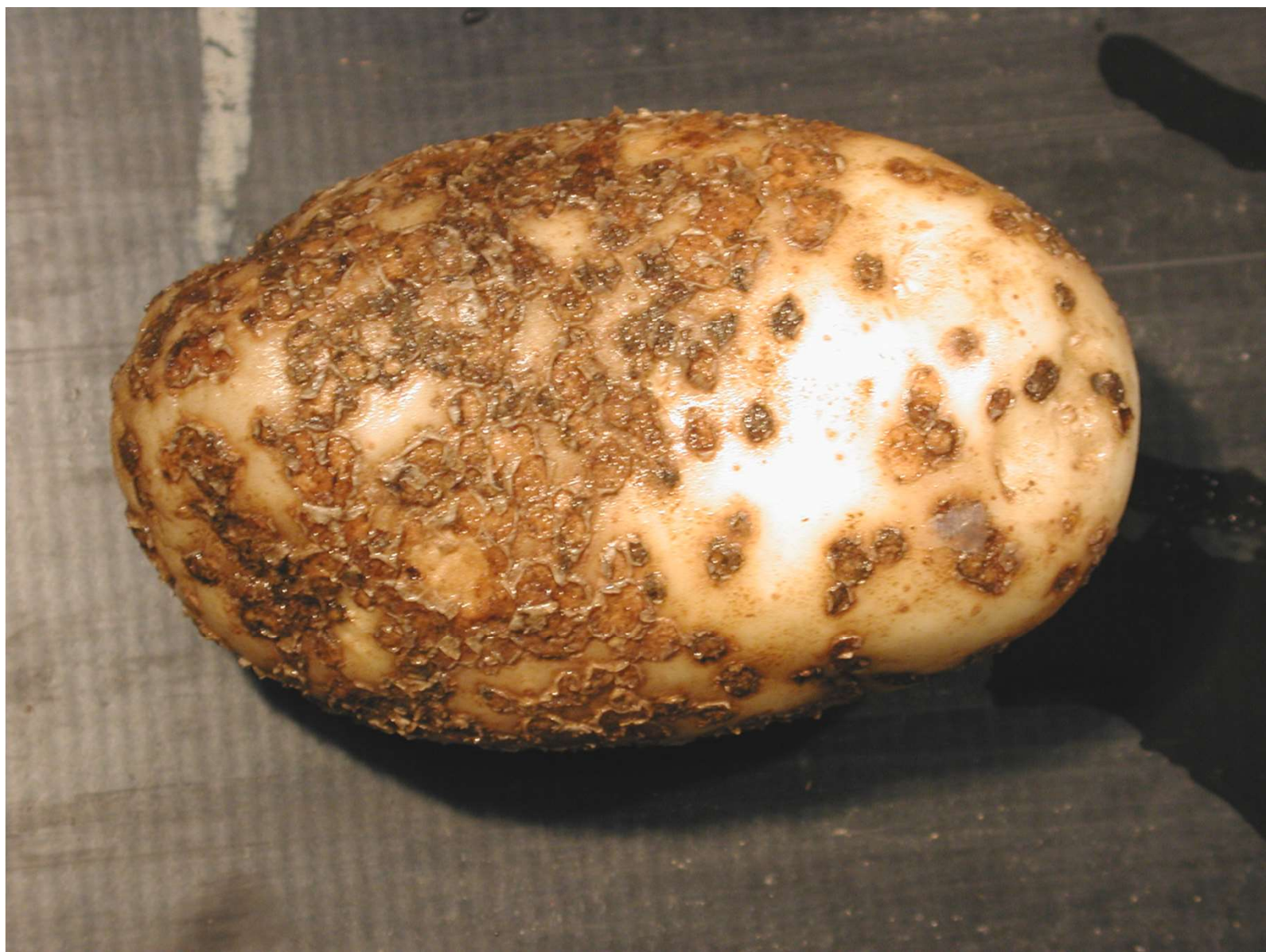
















# PMTV

- Foliar symptoms not associated with primary infection.
- Foliar = similar to calico.
- Symptoms favored by cool weather.
- Tuber = necrotic arcs (may require alternating storage temperatures to develop).
  - Can look like TRV, PVY<sup>ntn</sup>, internal brown spot
- Symptoms increase with time in storage
- Can cause external symptoms





PMTV



TRV



Photos courtesy of Jonathan Whitworth

Which one is PMTV? TRV?





Photo courtesy of Jonathan Whitworth



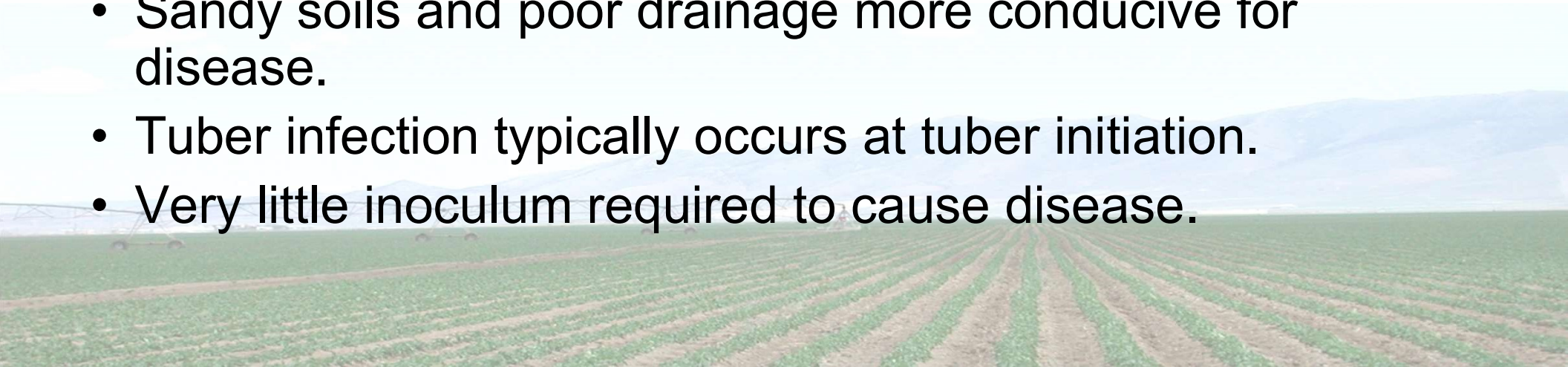
# PMTV Positive





# Powdery Scab Disease Cycle

- Environmental conditions which favor disease:
  - Cool, wet soil
  - 52-65°F
  - Alternating wet/dry conditions
  - Excessive soil moisture (especially 3-4 weeks after TI)
- Sandy soils and poor drainage more conducive for disease.
- Tuber infection typically occurs at tuber initiation.
- Very little inoculum required to cause disease.



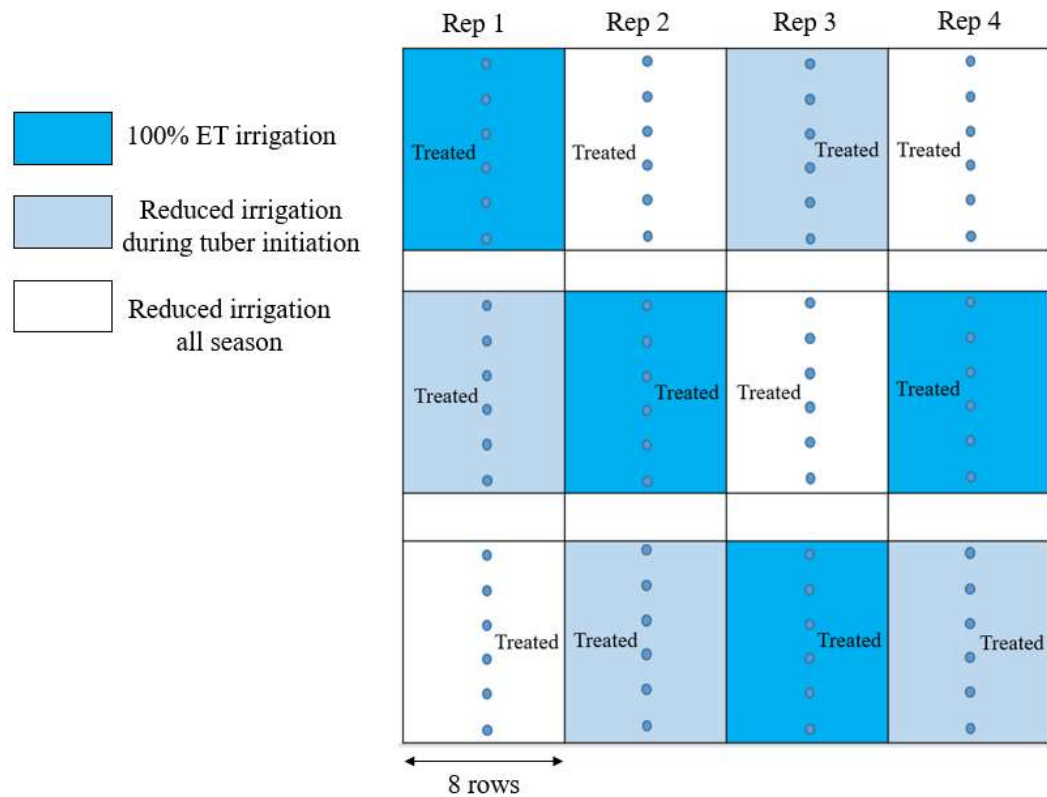
# Powdery Scab Management Recommendations

1. Plant disease-free seed
2. Avoid planting in contaminated, poorly drained soils
3. Avoid the use of manure if animals have ingested infected tubers
4. Rotate out of infested fields for >5 years (12 yr survival)
5. Plant resistant cultivars
6. Avoid tomato in crop rotation and control nightshade
7. Manage irrigation water

Compendium of Potato Diseases, 2<sup>nd</sup> Ed.  
Falloon, AJPR (2008) 85:253-260



# Experimental Design



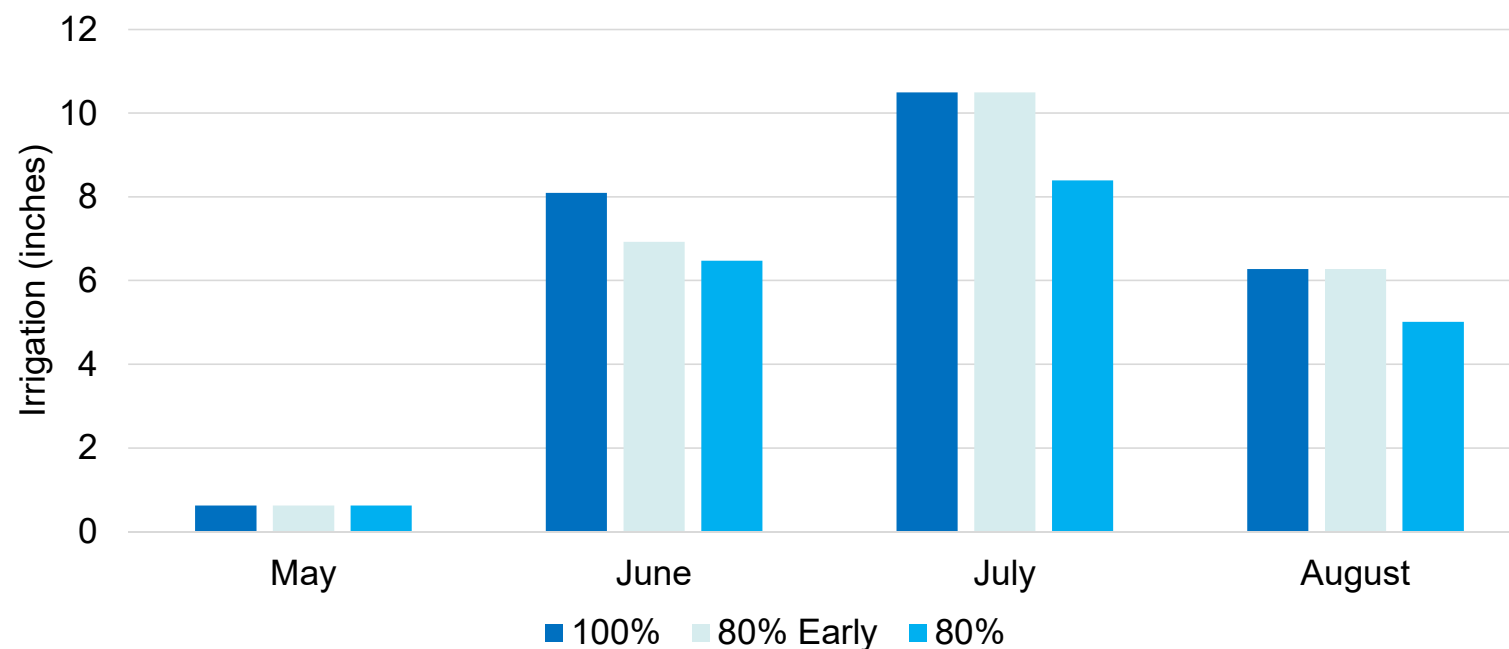
First time varying moisture tested against PS/PMTV in the field.





# 2021 Irrigation Treatments

Source	May	June	July	August	Total	% of Total
1. 100% ET	0.63	8.10	10.50	6.28	25.51	100
2. 80% ET early	0.63	6.93	10.50	6.28	24.34	95
3. 80% ET	0.63	6.48	8.40	5.02	20.53	80
Rain	1.05	0	0.06	0.15	1.26	



## Effect of Irrigation on Mop-Top Symptoms (Harvest) – 2021

	Visual Mop-Top	Total Yield	% US#1	% Culls
100% ET	11	462 a	69 a	5.0 a
80% ET early	11	390 b	62 b	6.2 a
80% ET	9	348 b	58 b	9.5 b
Untreated	9	404	64	6.8
Omega (3 pt/acre)	10	396	62	7.0

Cultivar: Alturas

No root galls observed during the season

Reducing irrigation water and applying Omega did not reduce mop-top symptoms.  
Reducing irrigation water resulted in significant yield and quality reductions.



## Effect of Irrigation on Mop-Top Symptoms (Storage) - 2021

	Visual Mop-Top	% Arcs/Rings	% Blotch	% Spots
100% ET	10	2.0	1.6	6.0
80% ET early	11	3.0	1.5	6.5
80% ET	10	2.5	1.3	6.5
Untreated	9	2.3	1.3	5.3
Omega (3 pt/acre)	11	2.7	1.7	7.1

Evaluation: February 14, 2022

Reducing irrigation water and applying Omega did not reduce mop-top symptoms after storage.



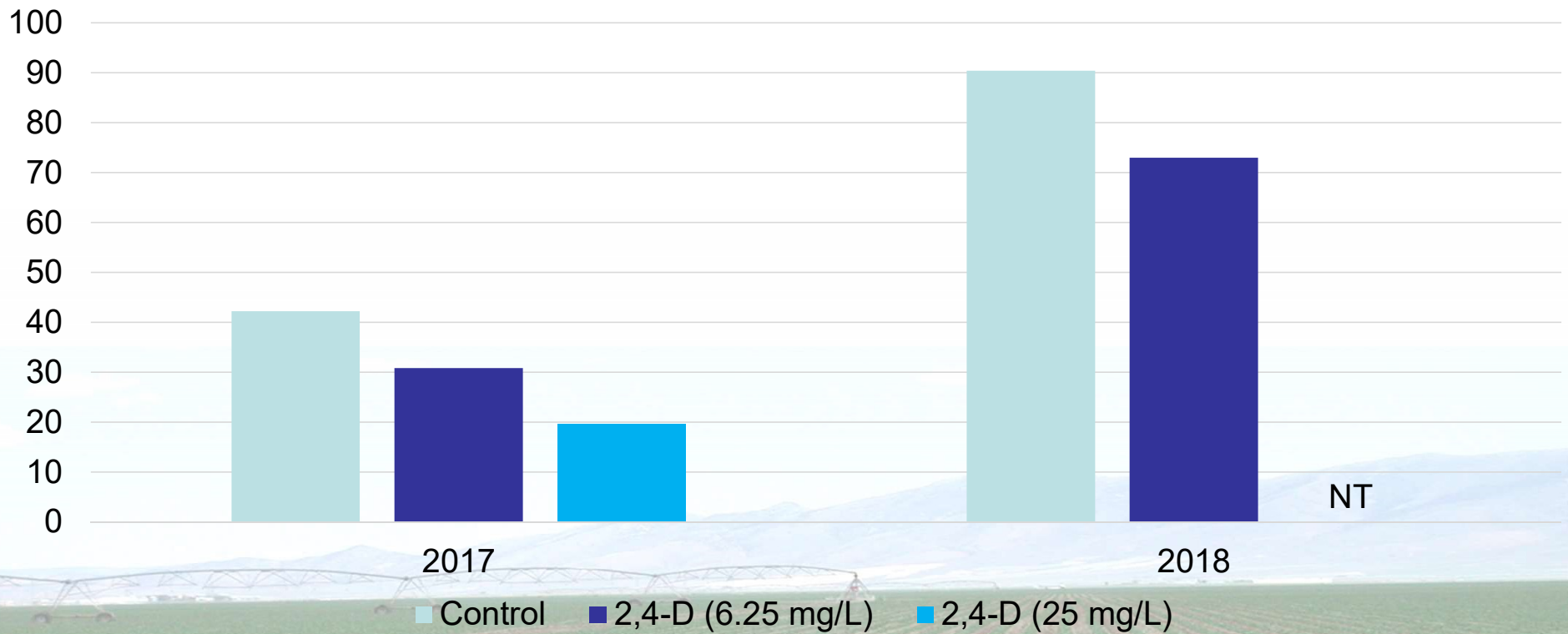
# Take Home from Year 1

- Reducing irrigation did not reduce PMTV symptoms.
- Fluazinam (Omega) did not reduce PMTV symptoms.





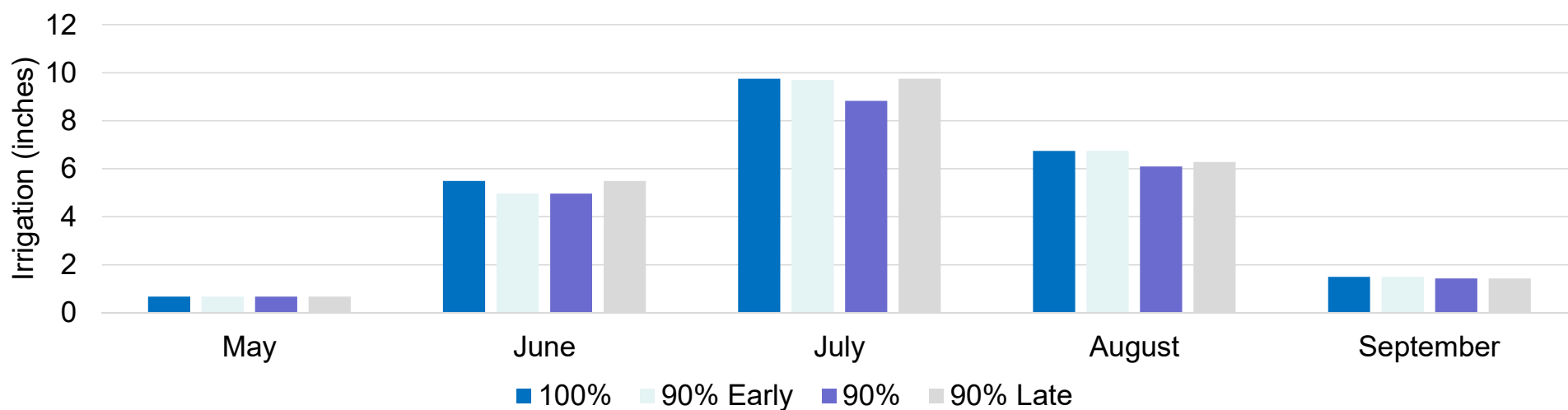
# Incidence of Tuber Powdery Scab Lesions



From Clarke, et al., 2020, Crop Protection 136:105208

# 2022 Irrigation Treatments

Source	May	June	July	August	September	Total	% of Total
1. 100% ET	0.68	5.50	9.75	6.75	1.50	24.18	100
2. 90% ET early	0.68	4.97	9.70	6.75	1.50	23.60	97.6
3. 90% ET	0.68	4.97	8.83	6.10	1.43	22.01	91.0
4. 90% ET late	0.68	5.50	9.75	6.29	1.43	23.65	97.8
Rain	1.42	0.41	0.03	0.55	0.24	2.65	





## Effect of Irrigation on Powdery Scab - 2022

	Root Gall Incidence	Root Gall Severity	Tuber Scab Incidence	Tuber Scab Severity
100% ET	22	4	33	1.0
90% ET early	15	1	27	0.6
90% ET	25	5	30	0.8
90% ET late	35	1	30	1.0
Untreated	40 a	4	32	0.9
2,4-D (0.75 fl oz/a)	12 b	1	28	0.8

Cultivar: Shepody

Reducing irrigation water did not reduce powdery scab symptoms.  
2,4-D application did reduce root gall incidence but did not affect tuber scab.

## Effect of Irrigation on Mop-Top Symptoms (Harvest) - 2022

	Visual Mop-Top	Total Yield	Marketable	Avg. Tuber Wt
100% ET	6.3	503 a	395 a	7.5
90% ET early	6.1	480 ab	365 a	7.9
90% ET	8.7	446 c	322 b	7.3
90% ET late	5.4	467 bc	386 a	7.4
Untreated	7.6 a	490 a	398 a	7.8 a
2,4-D (0.75 fl oz/a)	5.7 b	459 b	336 b	7.2 b

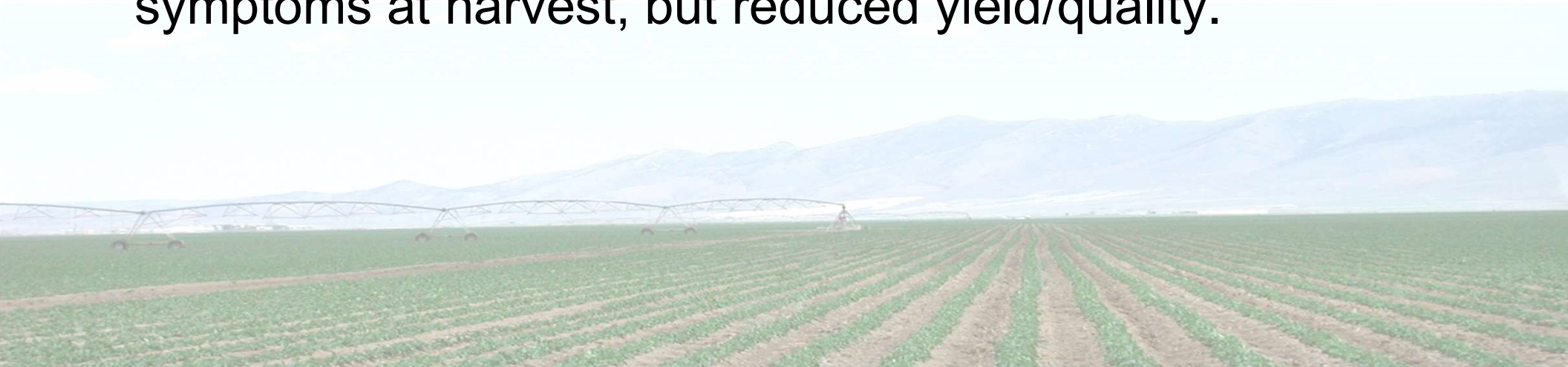
Cultivar: Shepody

Reducing irrigation water did not reduce mop-top symptoms, but reduced yield and quality. 2,4-D slightly reduced visual mop-top symptoms, but also reduced yield.



## Take Home from Year 2

- Reducing irrigation did not reduce powdery scab or PMTV symptoms.
- 2,4-D (10.121 g ai/acre) reduced root galling and PMTV symptoms at harvest, but reduced yield/quality.



## Susceptibility to powdery scab- tuber lesions and root galls (NDSU)

**Table 1.** Potato powdery scab and root gall formation susceptibility ranking of commonly used potato cultivars evaluated under field conditions in Minnesota and North Dakota (Bittara et al., 2016).

		Root phase (Root gall formation)			
		Very Resistant	Moderately Resistant	Moderately Susceptible	Very Susceptible
Tuber phase (Powdery scab)	Very Resistant	Alturas Atlantic Bannock Russet Dakota Jewel Dakota Russet Dakota Trailblazer Dark Red Norland Karu Ranger Russet Russet Norkotah Yukon Gold	Alpine Russet	Russet Burbank Umatilla Russet Yagana	Snowden
	Moderately Resistant	Colorado Rose	Dakota Crisp Red Norland		Lamoka Nicolet
	Moderately Susceptible		Dakota Ruby Viking		Red Pontiac
	Very Susceptible			Dakota Pearl Red LaSoda	Ivory Crisp Kennebec Shepody

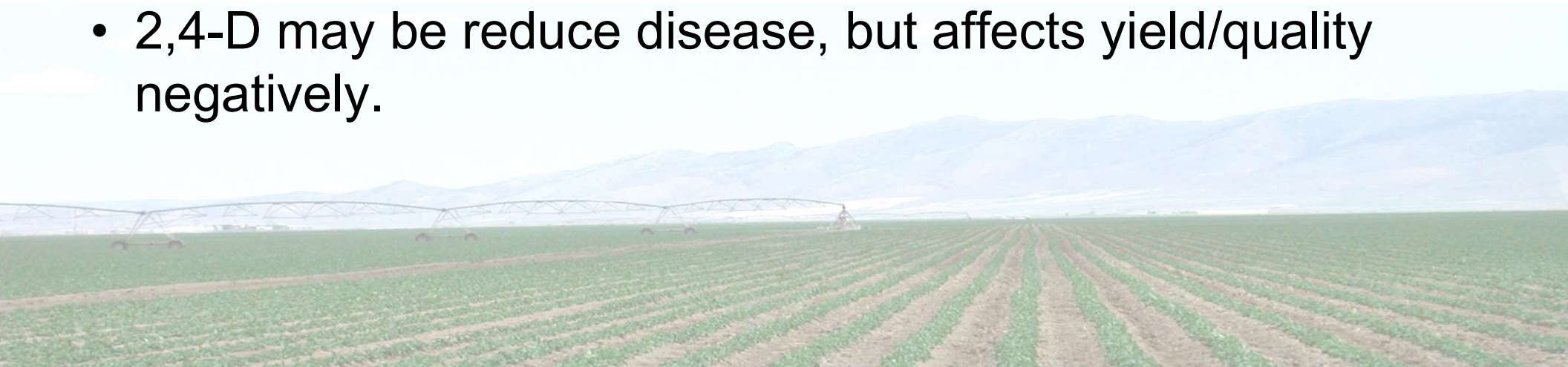


## Cultivar susceptibility to PMTV symptoms (NDSU)

Sensitive (>15%)	Moderately Sensitive (10-15%)	Moderately Insensitive (5 -10%)	Insensitive (<5%)
Dark Red Norland	Red Norland	Alpine Russet	Red Gold
Modoc	Chieftain	Ciklamen	Red Tumb
Viking	Snowden	Dakota Ruby	Colorado Rose
	Dakota Crisp	Red La Soda	Bintje
		Yukon Gold	LaMoka
			Alturas
			Most russets

# Trial Summary

- Irrigation management was not effective.
- Omega was not cost-effective.
- 2,4-D may be reduce disease, but affects yield/quality negatively.



## Utah Poison Control Center reminds everyone not to take poison

"Children Act Fast, So Do Poisons" is the theme for National Poison Prevention Week, March 20 - 26. The Utah Poison Control Center (UPCC) would like to take the opportunity to remind parents and caregivers that poisonings can be prevented. In 2004, the Utah Poison Control Center responded to over 50,000 calls, the majority of which were about actual potential poisonings.

Over 60 percent of the potential poisoning exposures involved children under age 6. The top five substances that children in this

giving or taking medicine. Check the dosage each use.

- \* Avoid taking medicine in front of children.

- \* Never refer to medicine as candy.

- \* Clean your medicine cabinet periodically, safely disposing of unneeded and outdated medicines.

The UPCC, part of the College of Pharmacy, has an active community outreach program. In 2004, representatives of the Utah Poison Control Center provided 126 community presentations and distributed more than 40,000 poison prevention education materi-

From 25 Funniest Newspaper Headlines of All Time, BestLife

<https://bestlifeonline.com/funniest-newspaper-headlines-of-all-time/>