

Adjusting Plant Date to Manage Verticillium

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Verticillium Wilt

- Infection levels related to pathogen population in the soil
- Yield losses up to 50%
- Soil fumigation - \$\$\$
- Integration of cultural practices
 - Fertility management
 - Water management
- Cultivar resistance



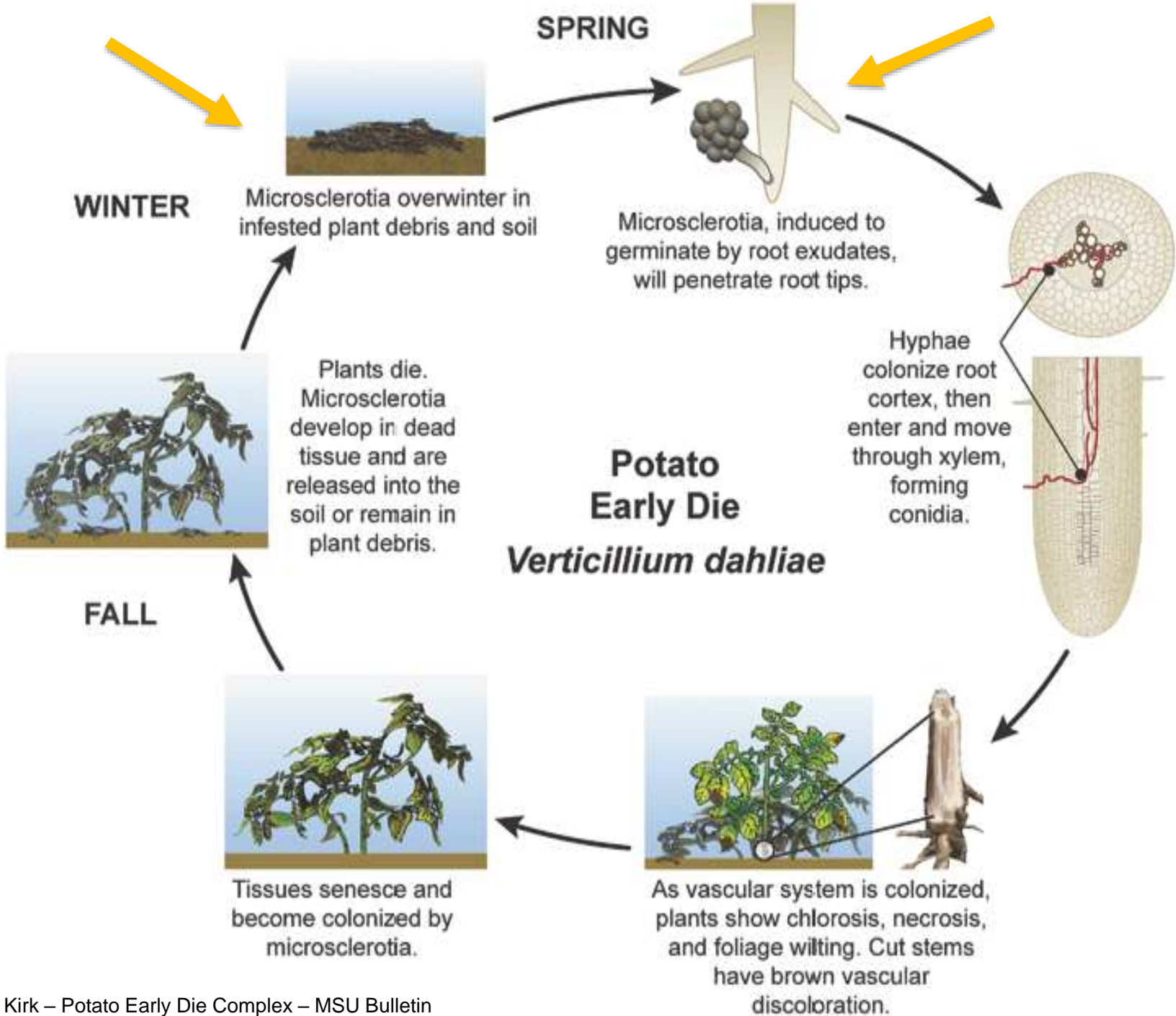
Verticillium Wilt

Russet Burbank
Moderately Susceptible



Ranger Russet
Moderately Resistant





Verticillium Planting Date

- Objective: Evaluate the effect of planting date on Verticillium wilt development
 - Monitored soil temperatures
 - Emergence
 - Verticillium wilt severity
 - Total and marketable yield
 - Tuber grade and processor returns (\$)
 - Pathogen abundance in stems at harvest

Cultivar (3)	Planting Date (3)	Treatment (2)
Russet Burbank (MS)	Early	Fumigated
Umatilla Russet (MR)	Mid	Non-fumigated
Alturas Russet (R)	Late	All combinations = 18 total treatments

Verticillium Planting Date

- Fumigation with metam sodium the fall prior to potatoes
- Soil samples fall prior to potato harvest
- Sent to Pest Pros for analysis
 - *Verticillium* propagules per gram (Vppg) of soil

2021

Rep	Fumigation	Vppg	Difference (%)
1	no	214	89.7
1	yes	22	
2	no	164	91.5
2	yes	14	
3	no	50	48.0
3	yes	26	
4	no	30	40.0
4	yes	18	
	Ave no	114.5	82.5
	Ave yes	20	

2022

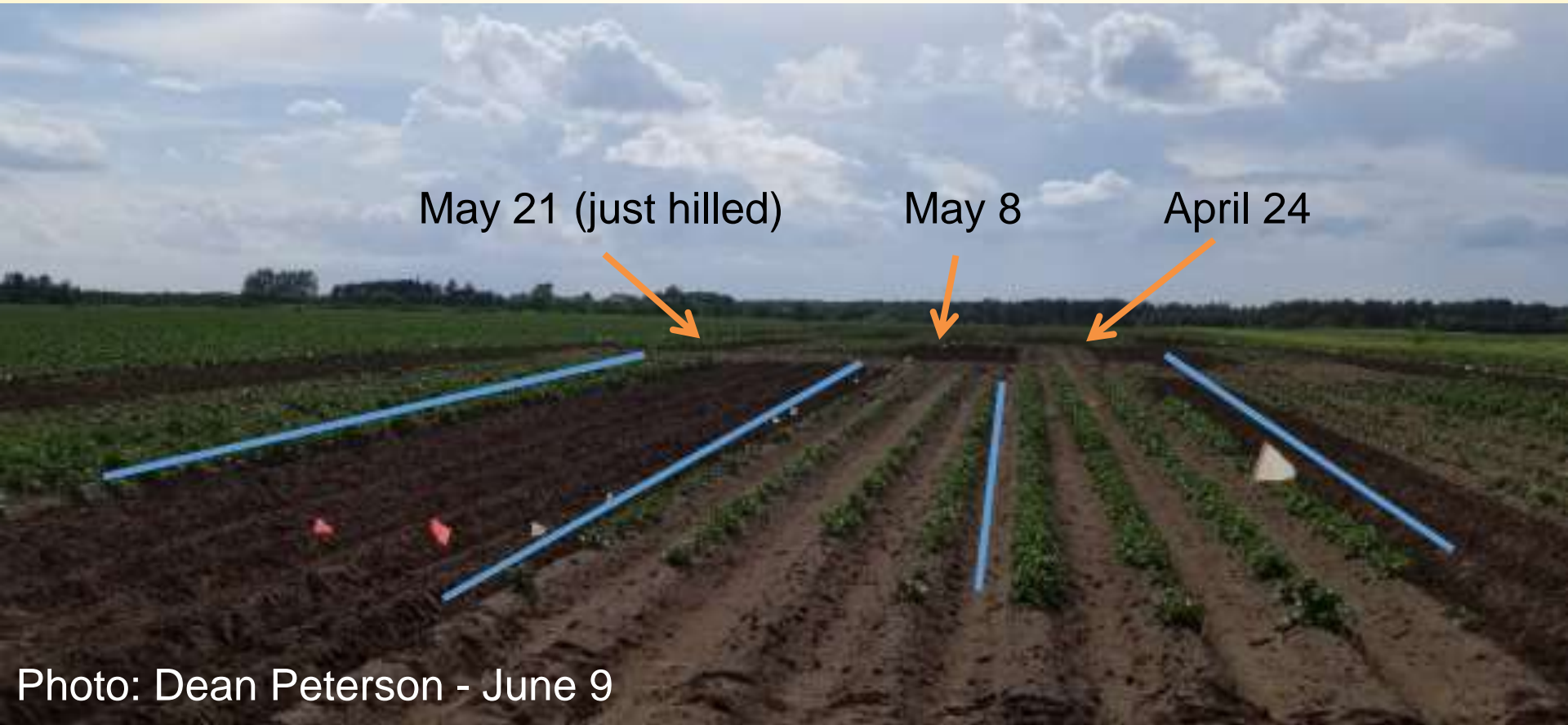
Rep	Fumigation	Vppg	Difference (%)
1	no	26	53.8
1	yes	14	
2	no	22	36.4
2	yes	8	
3	no	32	56.3
3	yes	18	
4	no	30	33.3
4	yes	10	
	Ave no	27.5	54.5
	Ave yes	12.5	

Verticillium Planting Date

Planting Date	Emergence Date	Days to 90% Emergence
2021		
April 24	June 4	41
→ May 8	June 9	32
May 21	June 18	28
2022		
→ May 7	June 7	31
May 17	June 14	28
May 27	June 20	24

Values represent the means across all three cultivars, fumigated and non-fumigated

Verticillium Planting Date – 2021



Verticillium Planting Date – 2021

- Bacterial vine rot and extreme heat damage on September 1

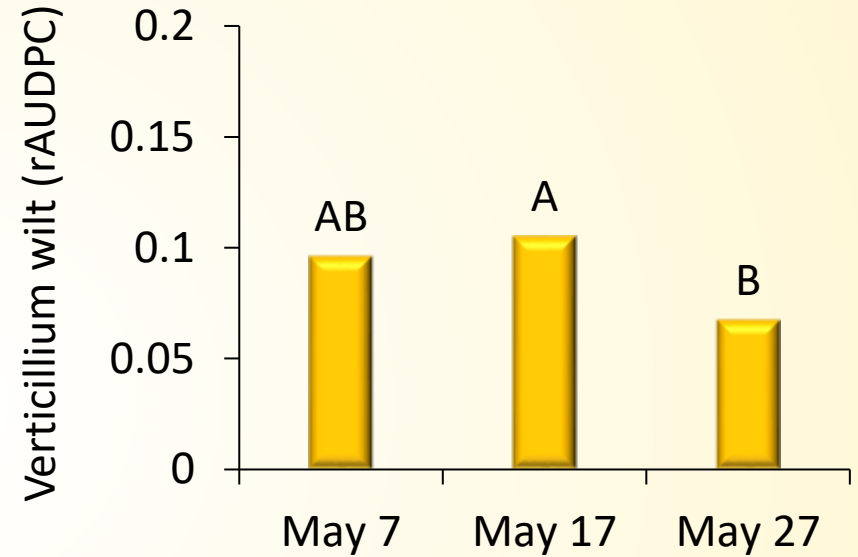
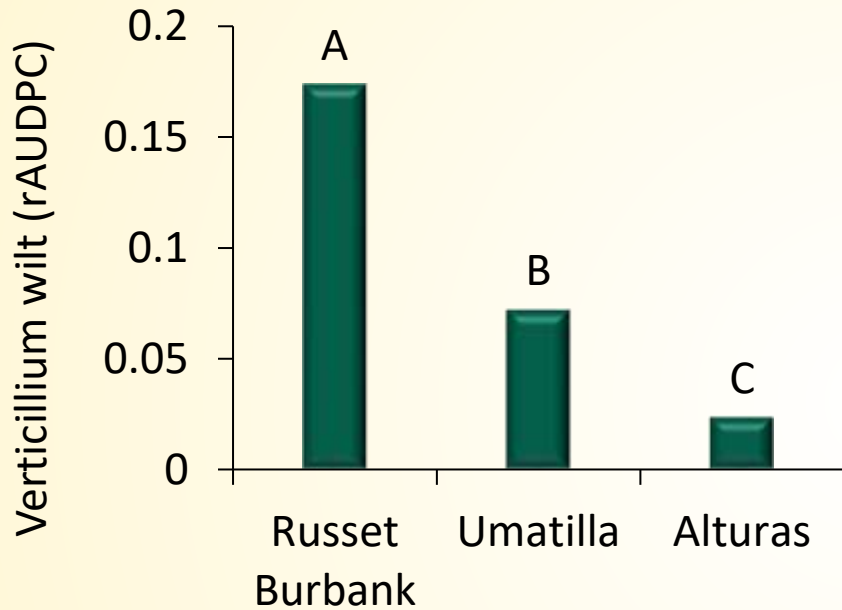


Verticillium Planting Date – 2022

Verticillium Wilt September 16

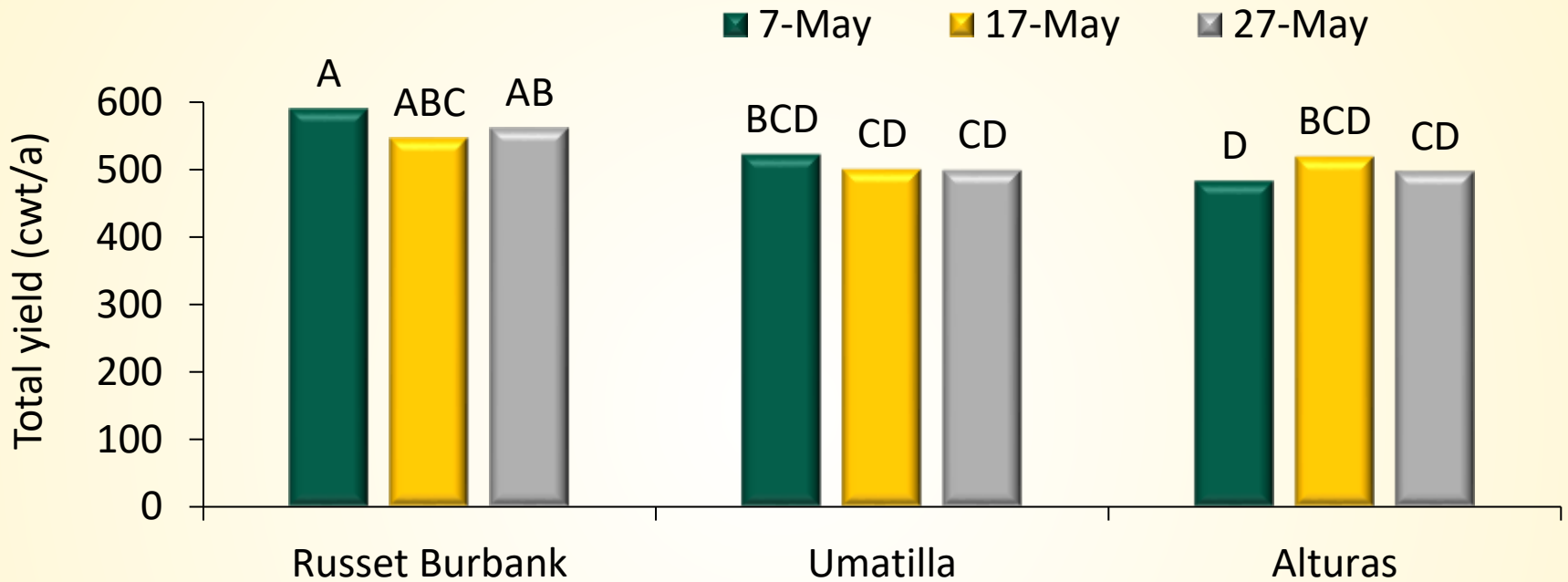


Verticillium Wilt - 2022



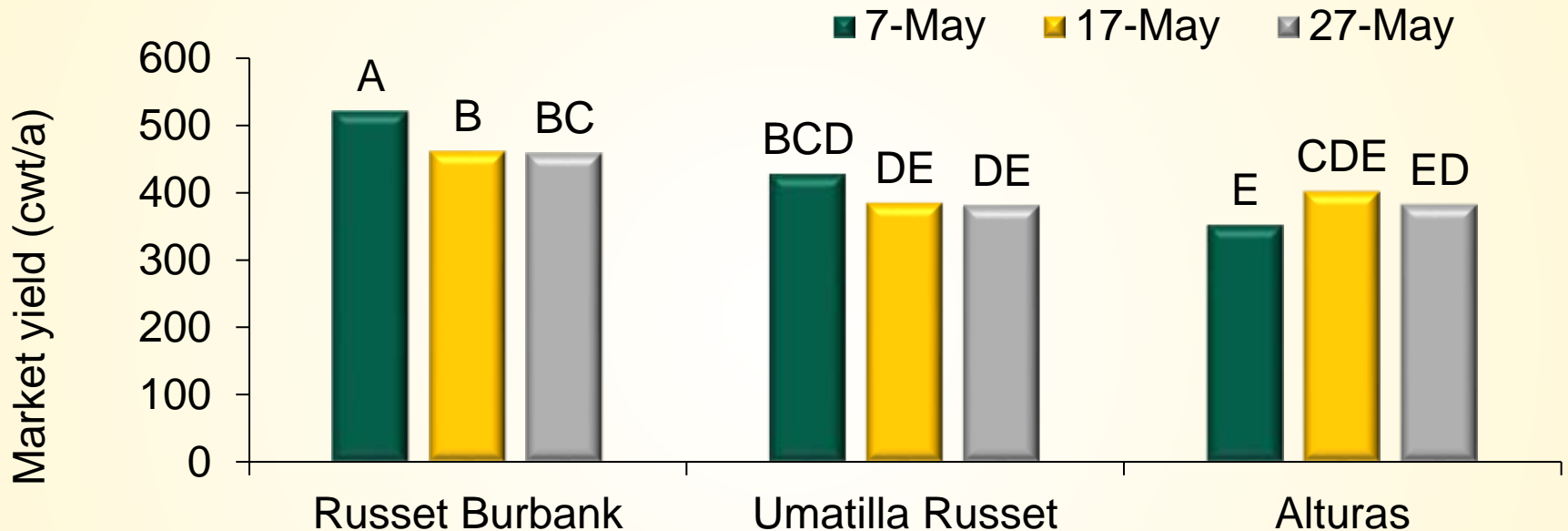
Significant interaction between planting date, fumigation, and cultivar

Total Yield – 2022



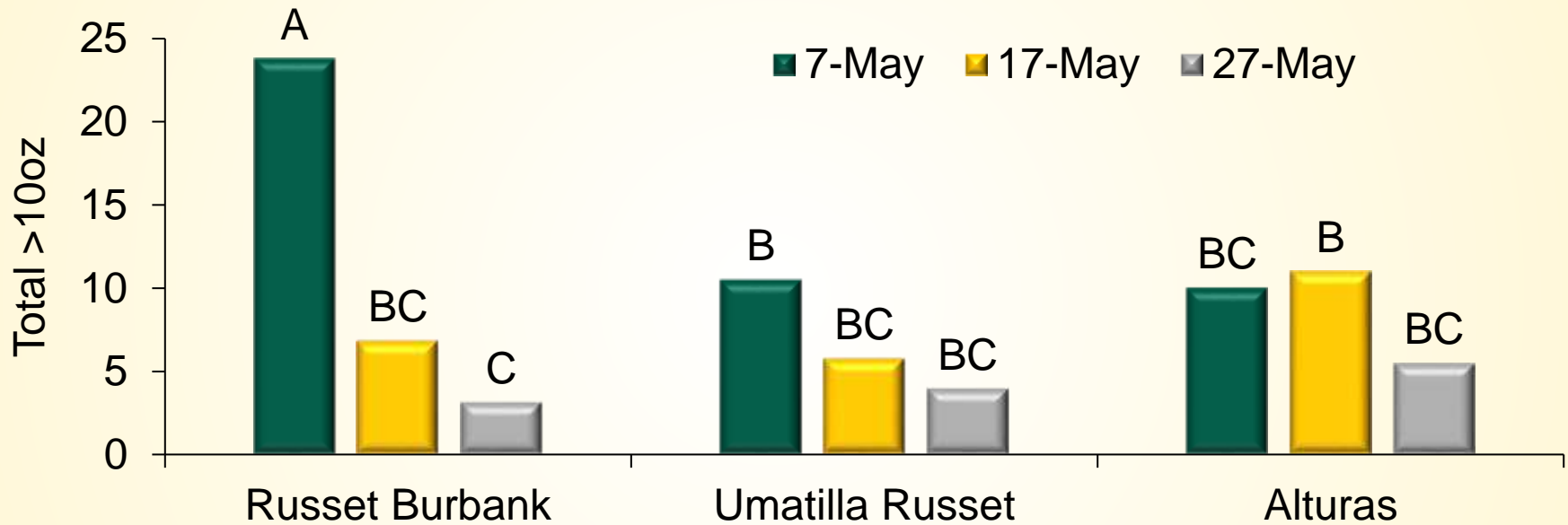
Significant interaction between planting date and cultivar

Market Yield – 2022



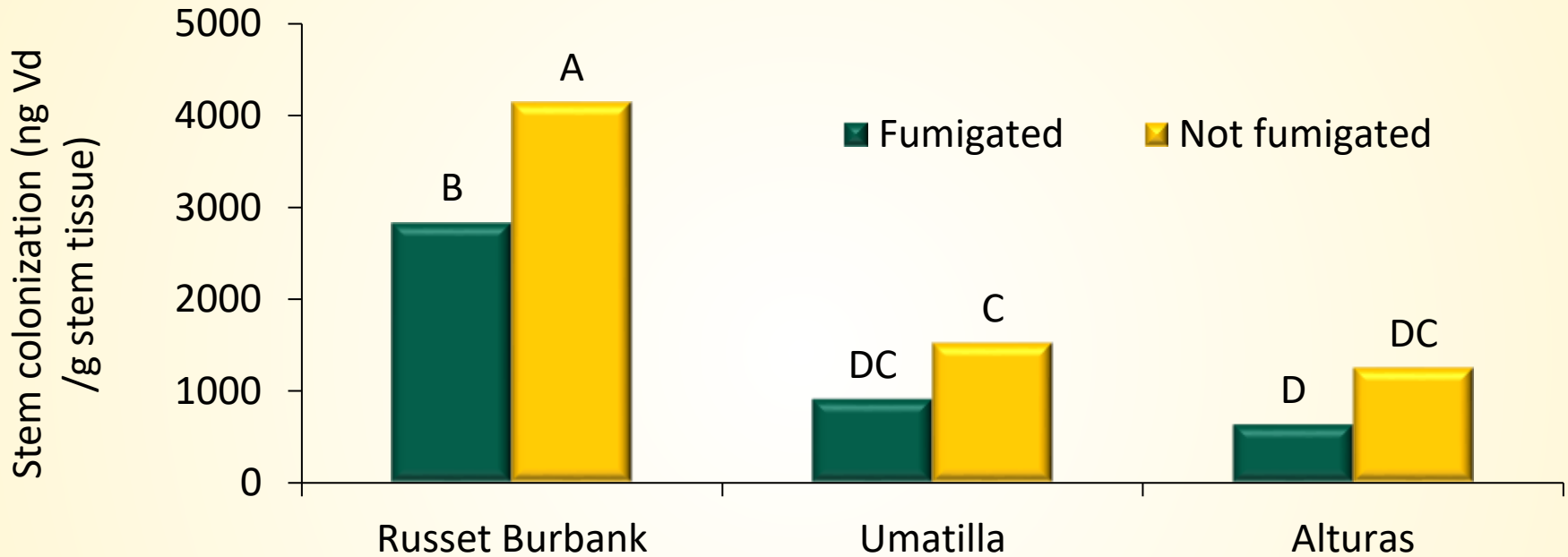
Significant interaction between planting date and cultivar

Tubers >10 oz. – 2022



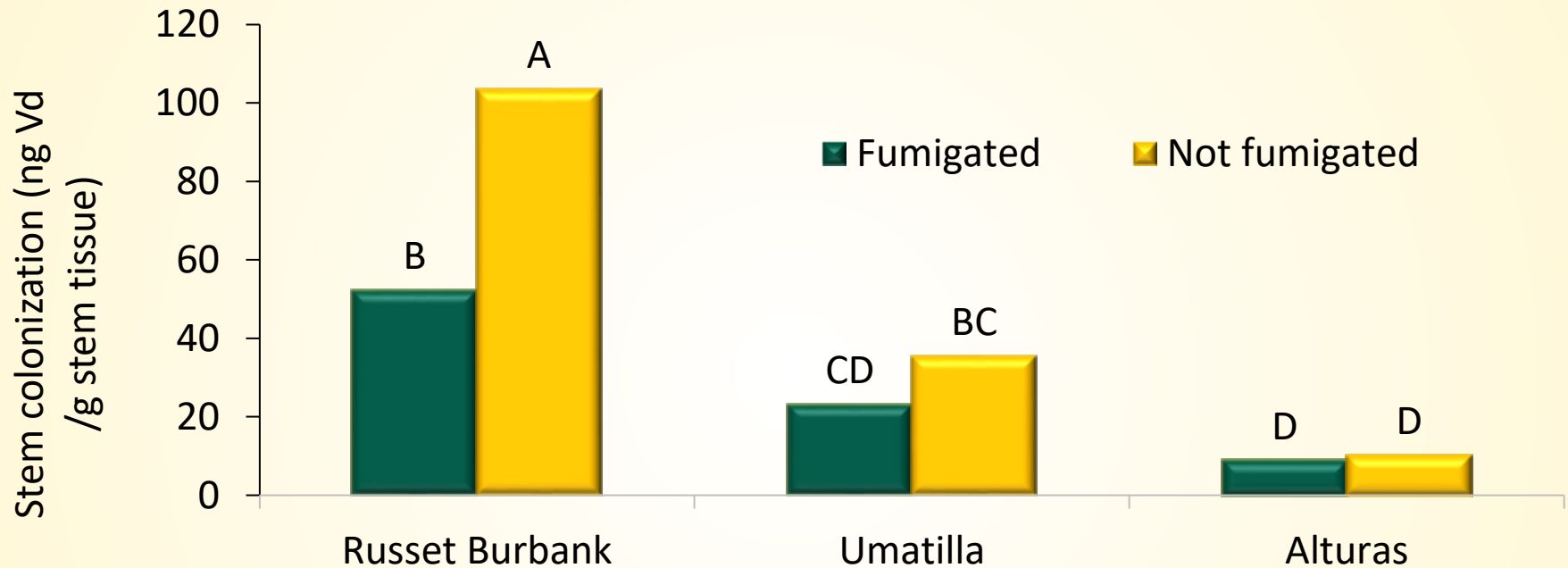
Significant interaction between cultivar and planting date

Stem colonization by *Verticillium dahliae* – 2021



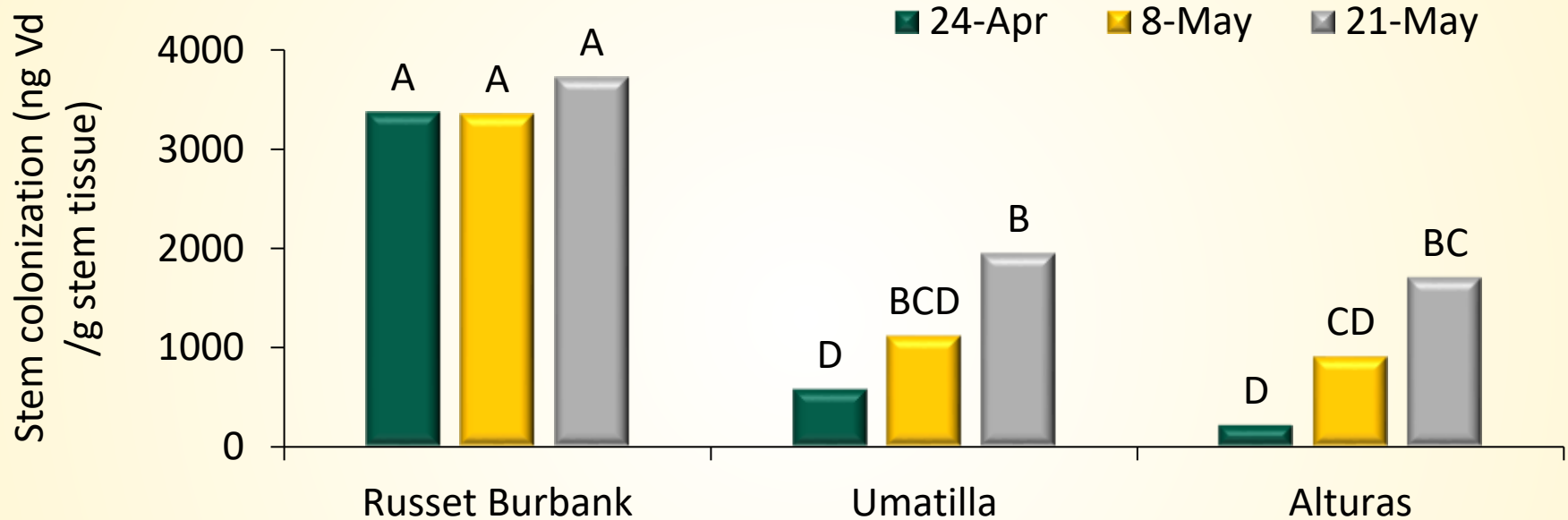
Significant interaction between cultivar and fumigation ($P = 0.08$)

Stem colonization by *Verticillium dahliae* – 2022



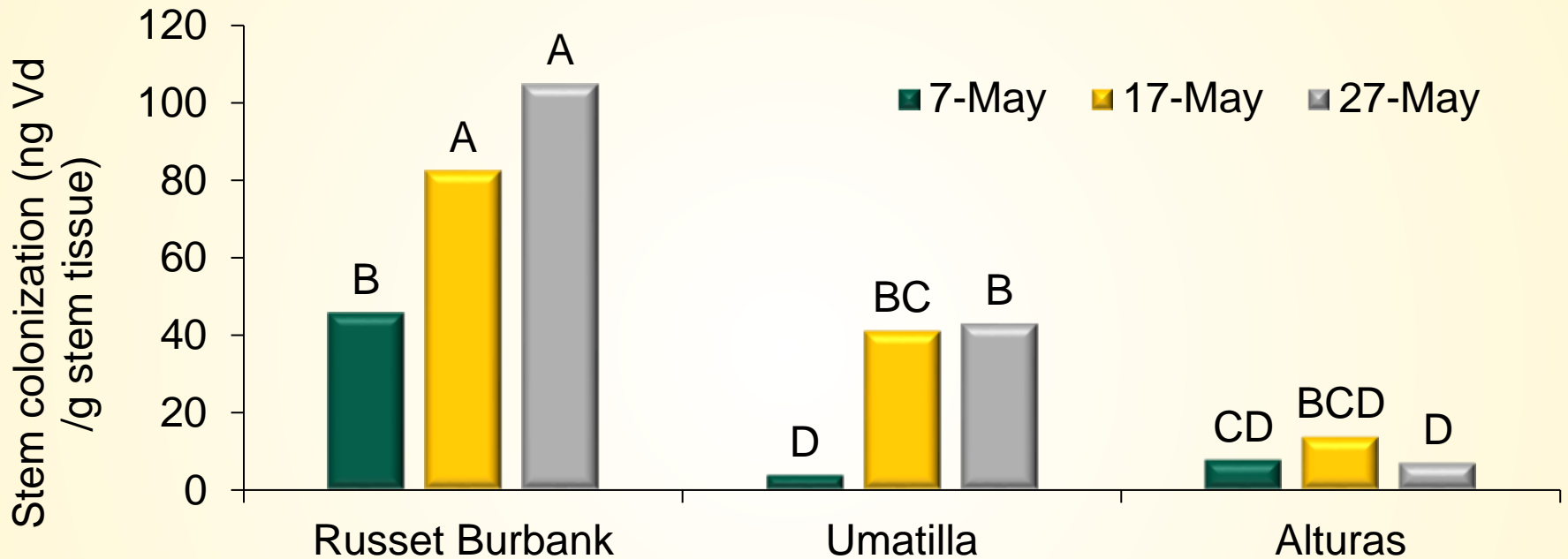
Significant interaction between cultivar and fumigation

Stem colonization by *Verticillium dahliae* – 2021



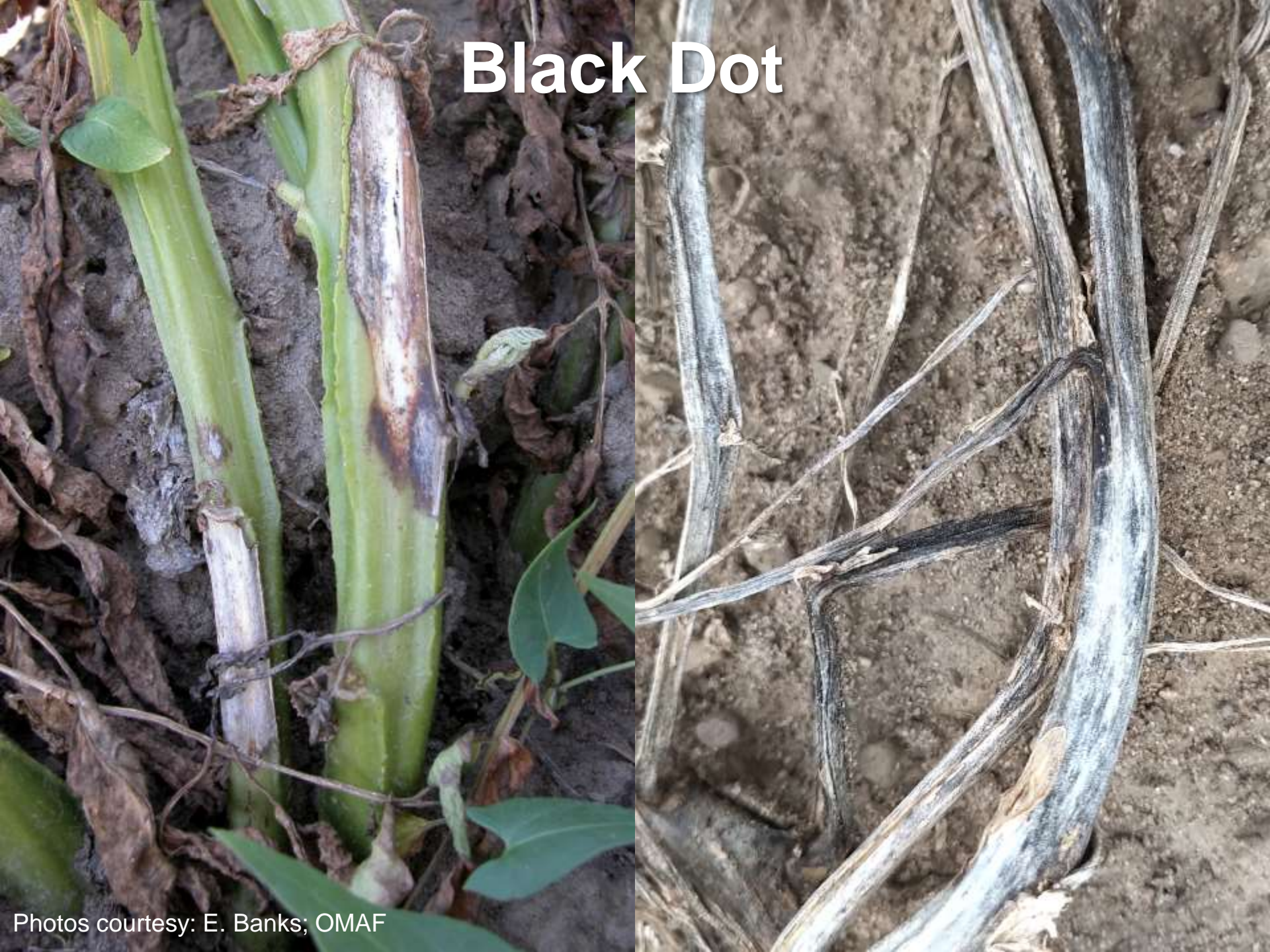
Significant interaction between cultivar and fumigation ($P = 0.08$)

Stem colonization by *Verticillium dahliae* – 2022



Significant interaction between cultivar and planting date

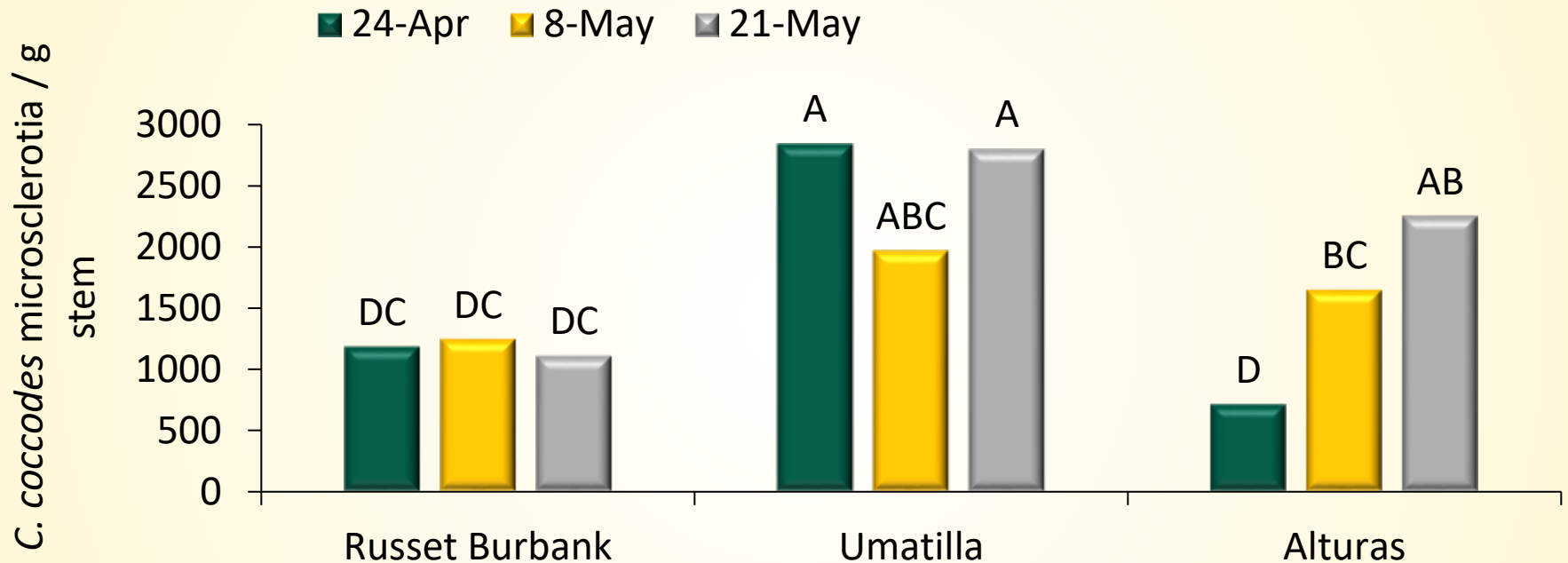
Black Dot



Black Dot

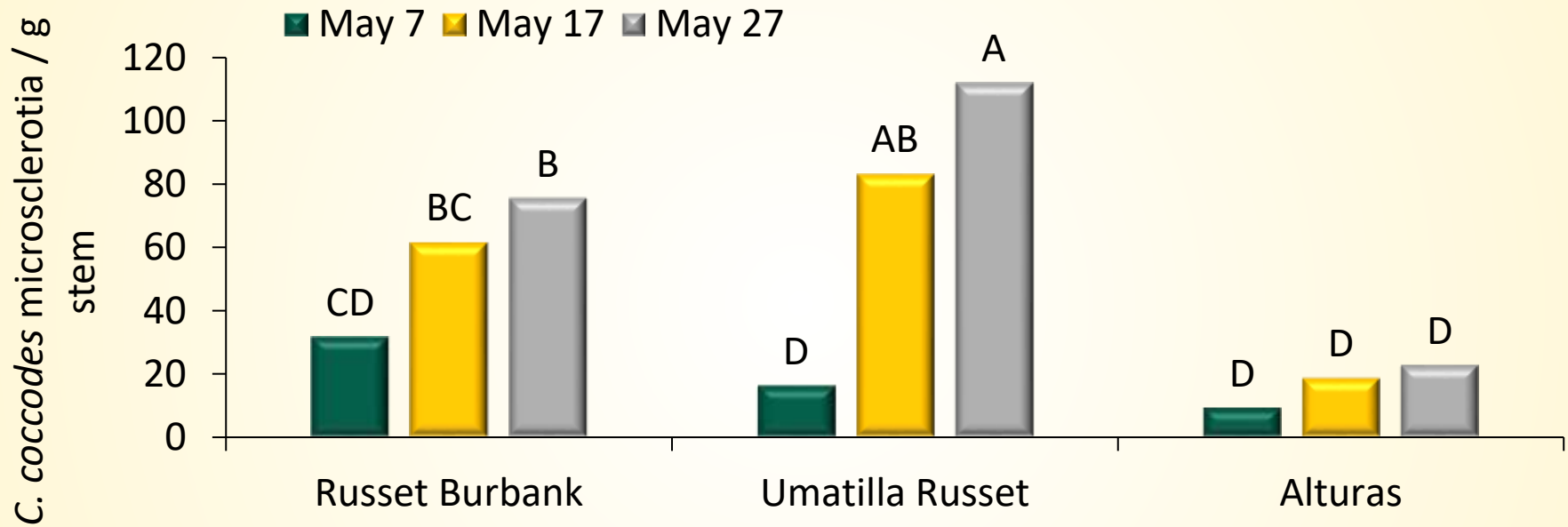
- Caused by *Colletotrichum coccodes*
- Infections occur above and below ground
- Important as a tuber 'blemish' disease and as component in the 'early dying' complex
 - Symptoms similar to those of early blight and Verticillium wilt may develop
 - Interaction with other pathogens exacerbates yield losses
- Disease importance often overlooked
 - Symptom development occurs late in the growing season
 - Losses due to the disease can occur without obvious symptom development

Stem colonization by *Colletotrichum coccodes* – 2021



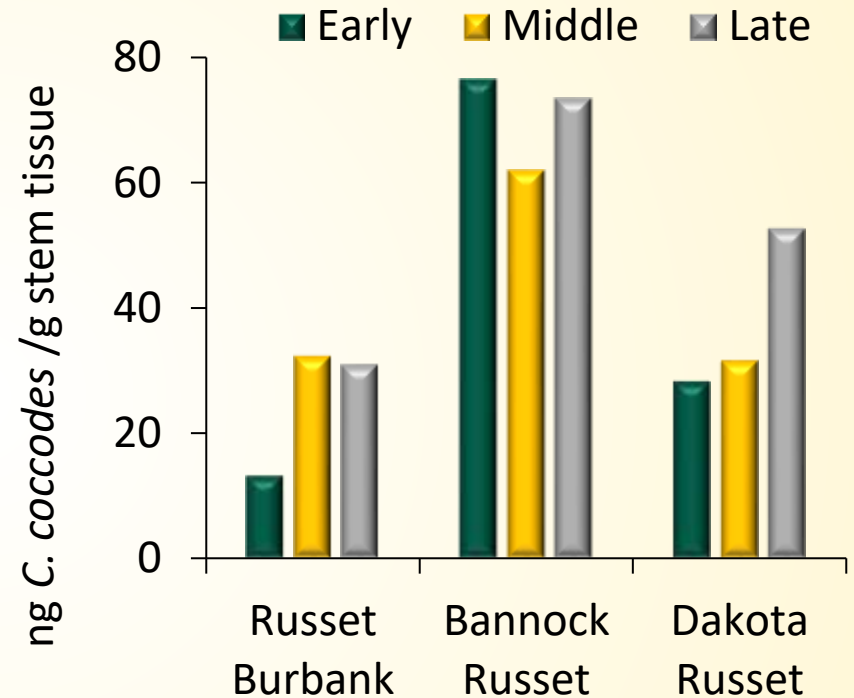
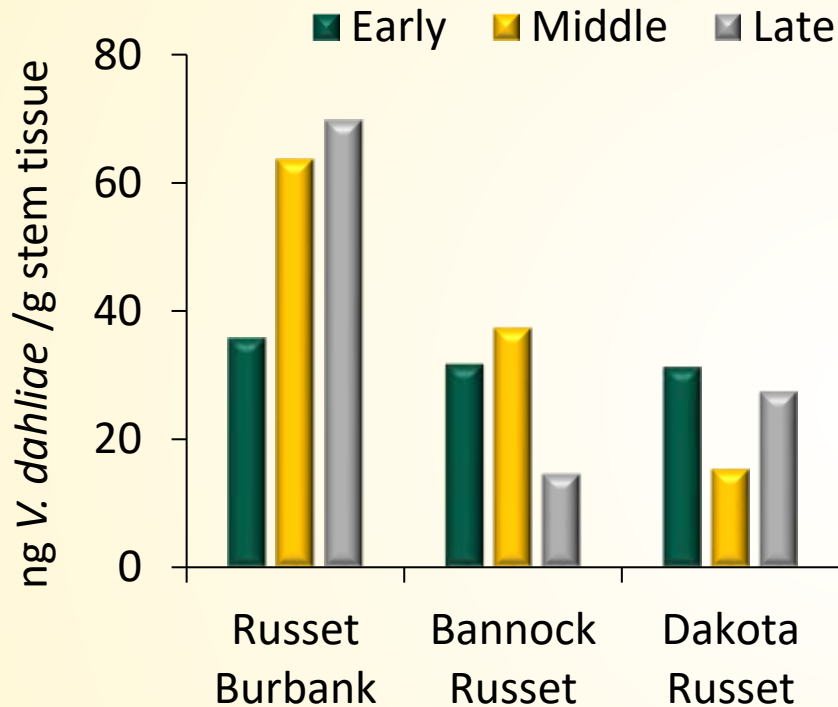
Significant interaction between cultivar and planting date

Stem colonization by *Colletotrichum coccodes* – 2022



Significant interaction between cultivar and planting date

Stem colonization – Tuber Bulking Trials 2021



No statistics applied

Verticillium Planting Date

- Preliminary results
 - Pathogen colonization increased with delayed planting in some trials
 - Results were variable
 - Pathogen populations were variable
 - Stems collected at different times across years due to vine rot challenges
 - May be due to low soil temperatures at earlier planting
 - Integration of soil temperatures underway
- Visual results can be deceiving due to general crop maturity

Verticillium Planting Date

- This management practice will likely be limited to high risk fields
 - Susceptible cultivar
 - High soil inoculum
 - Many potato crops
 - Inability to fumigate
 - Fumigation does not reduce infestation level below risk tolerances
- Validate preliminary recommendations with additional trial results

Thank You

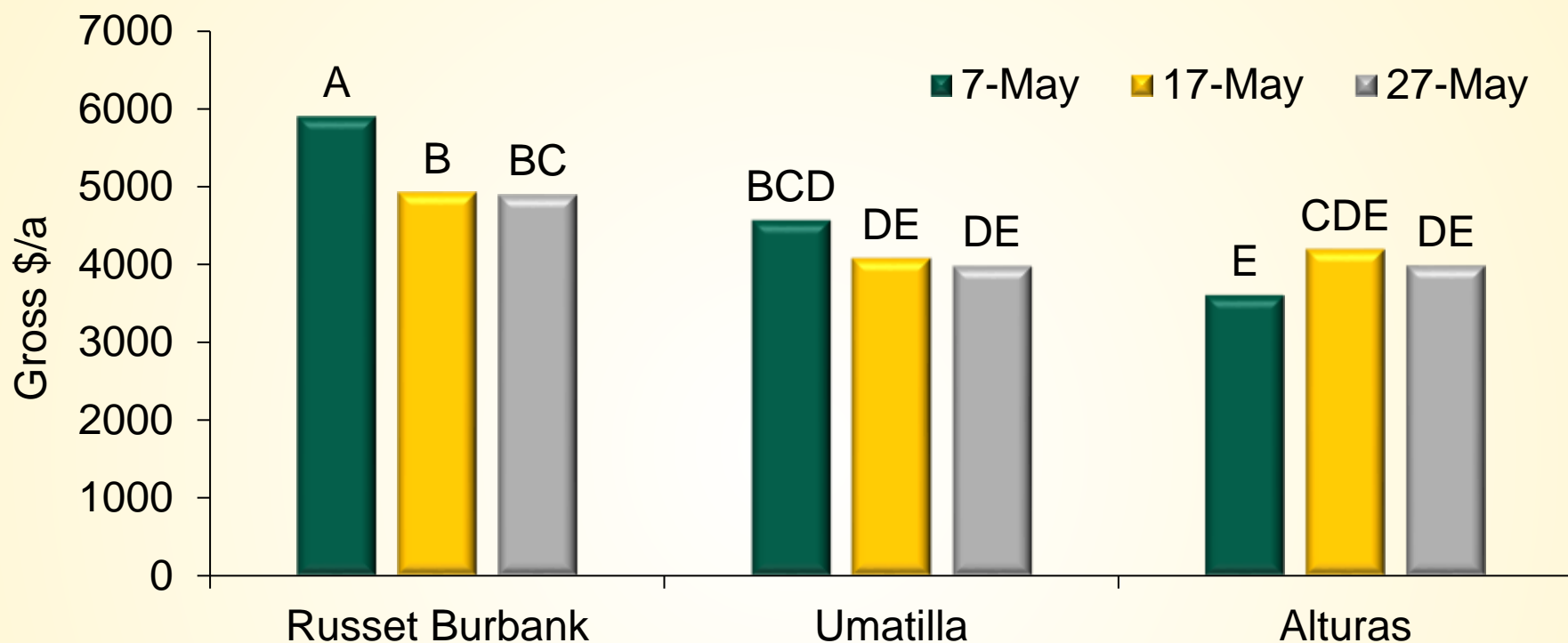


Early die symptoms across field. 25 August 2023 New York Mills, MN Credit: Danny Gill

Danny Gill 2023

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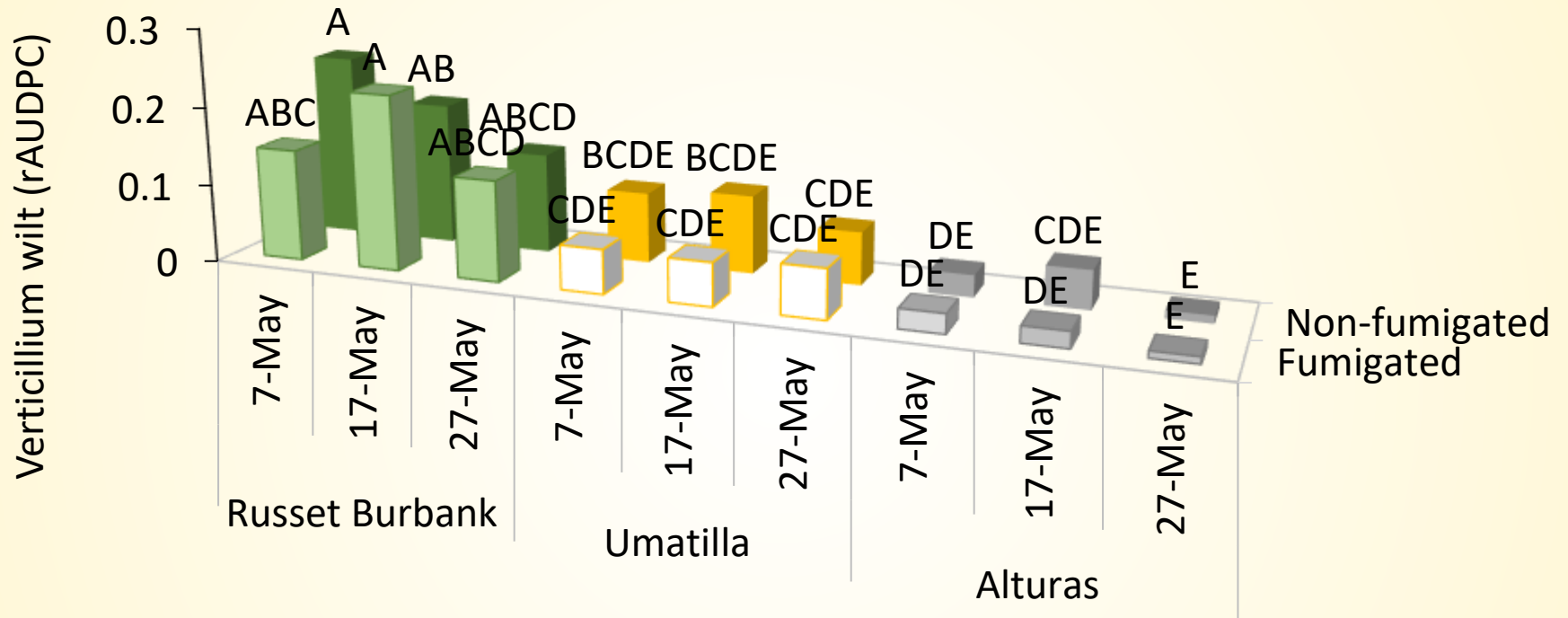
Gross Return (\$/a) – 2022



Planting date was significant for grower return (\$/a) across cultivars and fumigation treatments

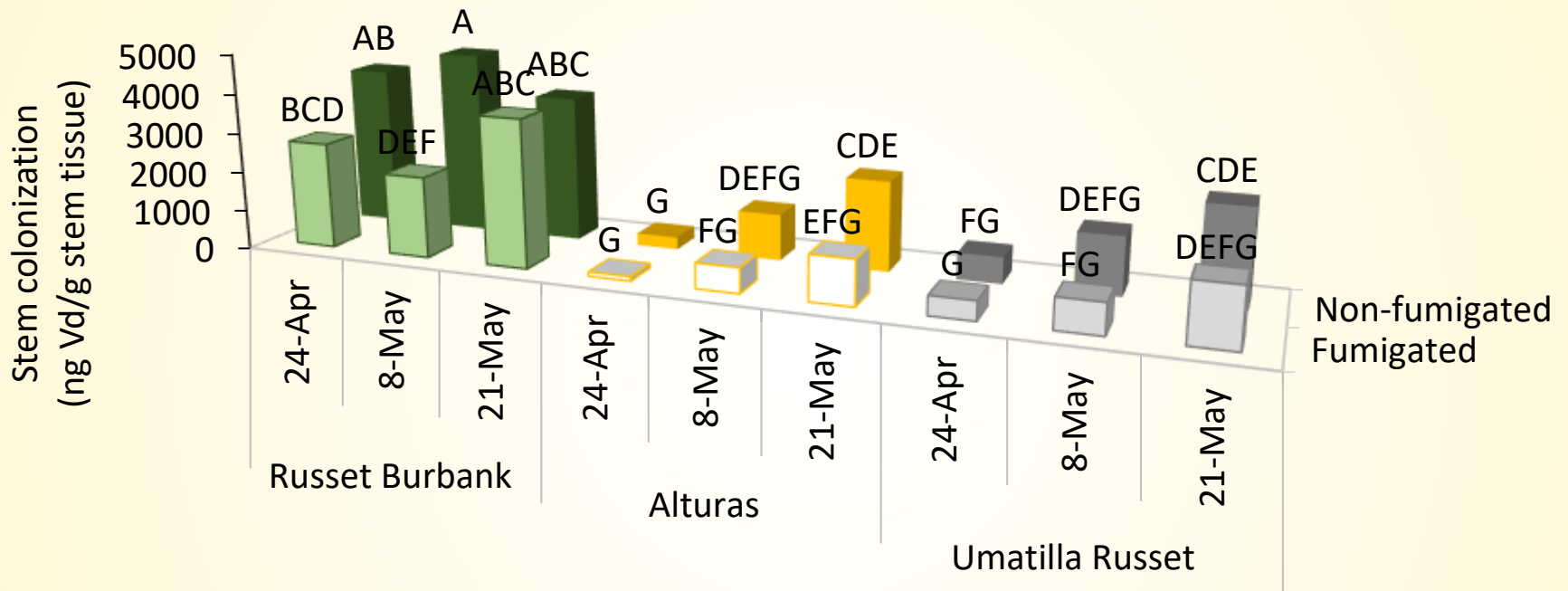
NOTE: The cost of fumigation was not included in these evaluations

Verticillium Wilt - 2022



Significant interaction between planting date, fumigation, and cultivar

Stem colonization by *Verticillium dahliae* – 2021



Significant interaction between cultivar, fumigation, and planting date