Weed and pathogen management in vegetable crops and berries

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Production costs

- Weed propagules and pathogen structures in soil (and migrating to site) are not uniform and distribution uneven

UC COOPERATIVE EXTENSION
AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS
TABLE 1. COSTS PER ACRE TO PRODUCE AND HARVEST ORGANIC STRAWBERRIES
CENTRAL COAST REGION – 2022

Operation	Equipment Time (Hrs/A)	Labor Cost	Fuel	Cash and Labor Costs per Acre: Lube & Repairs	Material Cost	Custom/ Rent	Total Cost
Cultural:							
Cover Crop (1 per 2 crops)	0.00	0	0	0	0	75	75
Soil Samples (2 per 27 acres)	0.00	0	0	0	0	11	11
Subsoil 5X	2.08	74	57	22	0	0	153
Disk 4X	0.93	33	26	9	0	0	68
Level (Triplane)	1.00	36	27	10	0	0	73
Chisel 2X	0.58	21	13	6	0	0	40
Sprinklers: Setup and Removal	3.33	206	56	19	0	0	280
Irrigate: Sprinkler	0.00	61	0	0	105	0	166
Compost + Spread	0.00	0	0	0	440	80	520
Beds Listed	1.00	36	27	8	0	0	71
Pre-plant Fertilizer & Gypsum	0.00	0	0	0	2,462	30	2,492
Beds Shaped	1.00	36	27	8	0	0	71
Install Drip System, Tape, Laterals	3.00	132	50	22	1,525	0	1,729
Plant: Lay Mulch	1.50	53	25	9	363	0	450
Plant: Punch Planting Holes	0.75	27	13	5	0	0	44
Plant: Strawberries (7% replants)	0.00	1,204	0	0	4,661	0	5,865
Weed: Hand	0.00	5,047	0	0	0	0	5,047
Runner Removal	0.00	2,868	0	0	0	0	2,868
Insect: Mites (predatory)	0.00	115	0	0	650	0	765
Insect: Mites (Vestis)	0.20	7	4	2	11	0	24
Weed: Cultivate	0.75	27	17	7	0	0	51
Fertilize: Foliar (Biomin)	0.78	28	18	6	152	0	204
Fertilize: Foliar (Maxi)	0.78	28	18	6	226	0	278
Vertebrate Trapping	0.00	92	0	0	0	0	92
Pest Control Adviser (PCA)	0.00	0	0	0	0	150	150
Irrigate: Drip	0.00	275	0	0	720	0	995
Fertigate: Fish + 4-2-2	0.00	92	0	0	1,098	0	1,189
Insect: Vacuum Lygus 8X/month	23.73	843	398	400	0	0	1,642
Disease: Powdery Mildew (Sulfur)	0.88	31	20	7	91	0	149
Worms: (Dipel)	0.20	7	4	2	84	0	97
Post-Harvest Cleanup	3.00	668	28	12	18	0	727
Pickup: Business Use	1.71	61	22	7	0	0	90
ATV	0.59	21	2	1	0	0	24
TOTAL CULTURAL COSTS	47.79	12,124	856	568	12,605	346	26,499
Harvest:							
Harvest: Regular & Peak	0.00	36,268	0	0	11,760	0	48,028
Harvest: Load & Haul	50.00	2,157	325	142	0	0	2,624
Harvest: Cooler	0.00	0	0	0	0	5,950	5,950
Assessment	0.00	0	0	0	315	0	315
Sales	0.00	0	0	0	8,400	0	8,400
TOTAL HARVEST COSTS	50.00	38,425	325	142	20,475	5,950	65,317
Interest on Operating Capital at 5.75%							1,514
TOTAL OPERATING COSTS/ACRE	98	50,549	1,181	710	33,080	6,296	93,330

Production Costs for organic strawberry

Soil disinfestation ~$0

Weeds $5k/A

Pest management: 3 Es

Effective, Economical and Environmentally acceptable

- Avoidance, sanitation
- Production when soils are cool = slow nutsedge germination, pathogen ability to cause diseases

precision application based on field distribution

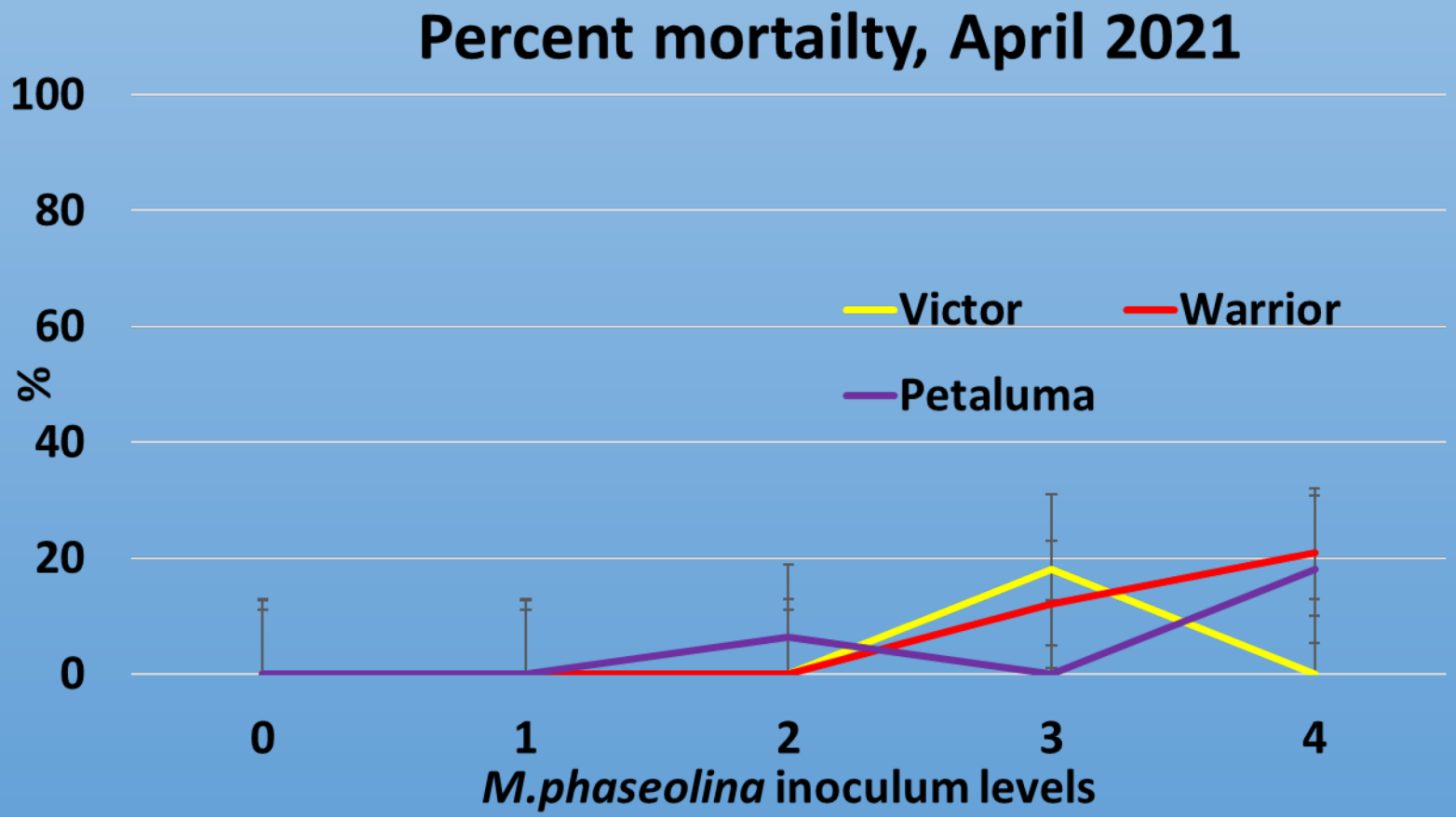
- Anaerobic soil disinfestation (ASD)
- Steam
- Resistant cultivars
- Vigorous /competitive crops
- Substrate production

Avoid heavily infested soil = rotate to a different crop

Avoid areas and times with Diamondback moth

Cilantro: killed by Fusarium

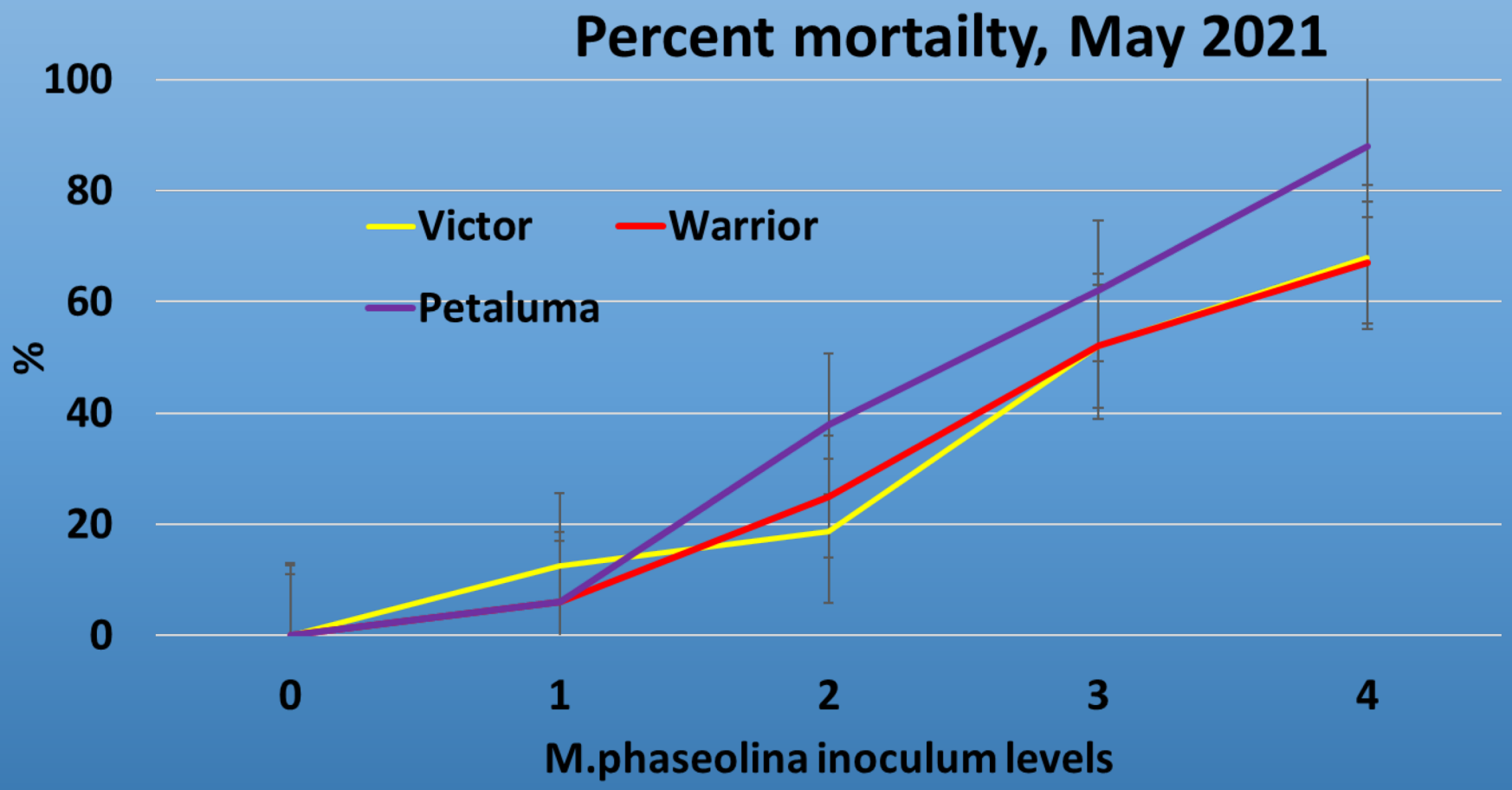
Fusarium (*F. ox. apii*) race 4 in celery: germplasm and temperature


Percent mortailty, April 2021
100
80
60
40
20
0
%
Victor
Warrior
Petaluma
0
1
2
3
4
M.phaseolina inoculum levels

March

Victor - 1

Warrior – 72g fruit


Percent mortailty, May 2021
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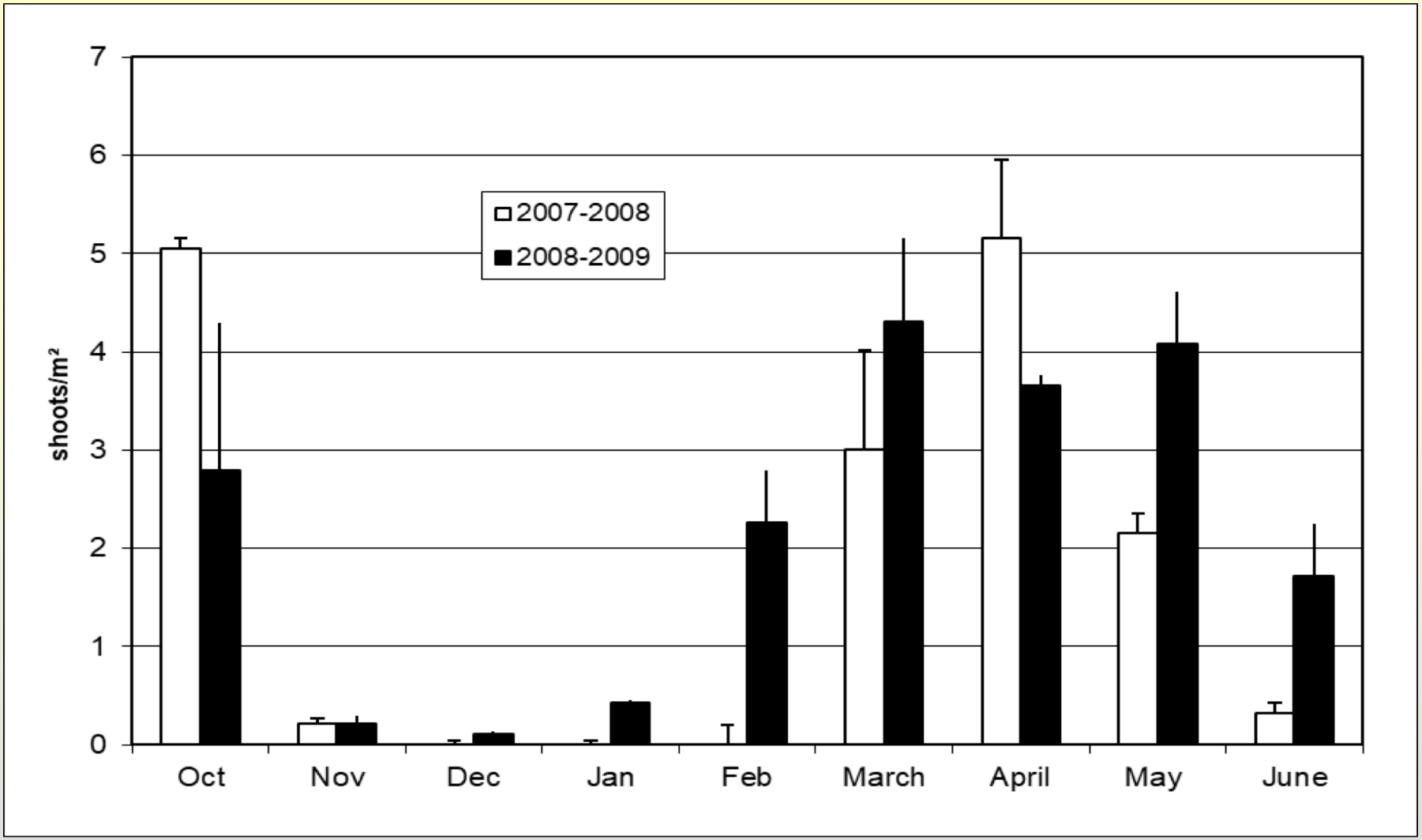
80
60
40
20
0
%
Victor
Warrior
Petaluma
0
1
2
3
4
M.phaseolina inoculum levels

May

Petaluma - 2 | Victor - 2 | Warrior - 2 | Petaluma -4 | Warrior - 4 | Victor - 4

Nutsedge shoot germination at Oxnard, CA



Yellow nutsedge

- Nutsedge is primarily propagated by tubers rather than seed.
- Tubers viable in soil ~3 years
- 3-4 leaf stage = start new tubers
- Most tubers form <6 inches deep
- Can emerge from 12 inches deep
- One plant can form 1,900 daughter plants and 7,000 tubers in 12 months.
- Grew after 3 yrs at 30 ft depth in Salton sea

Yellow nutsedge management in what looks like strawberry

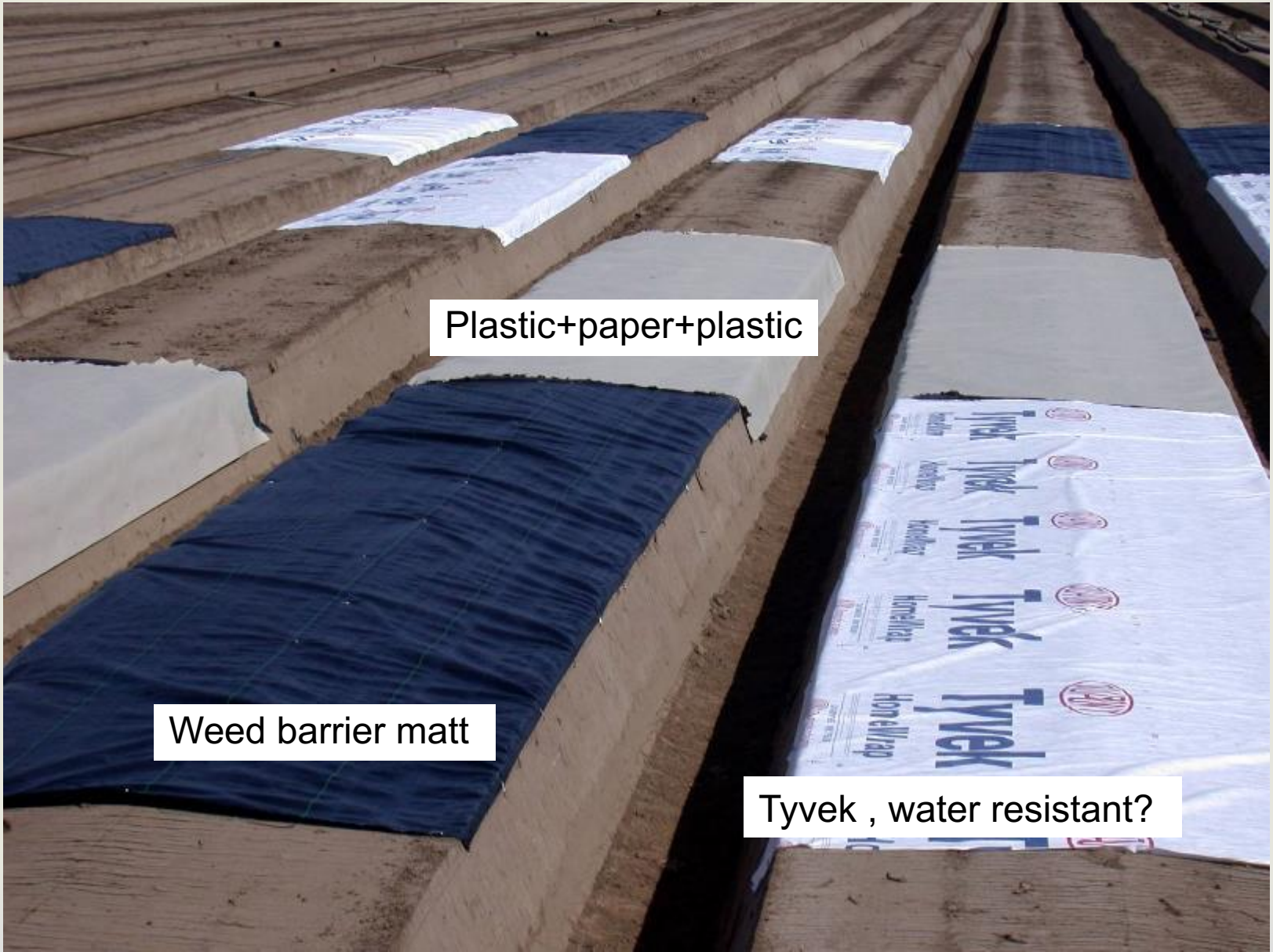
End-season tuber production: 0-12”

1 ft of bed =
400 tubers

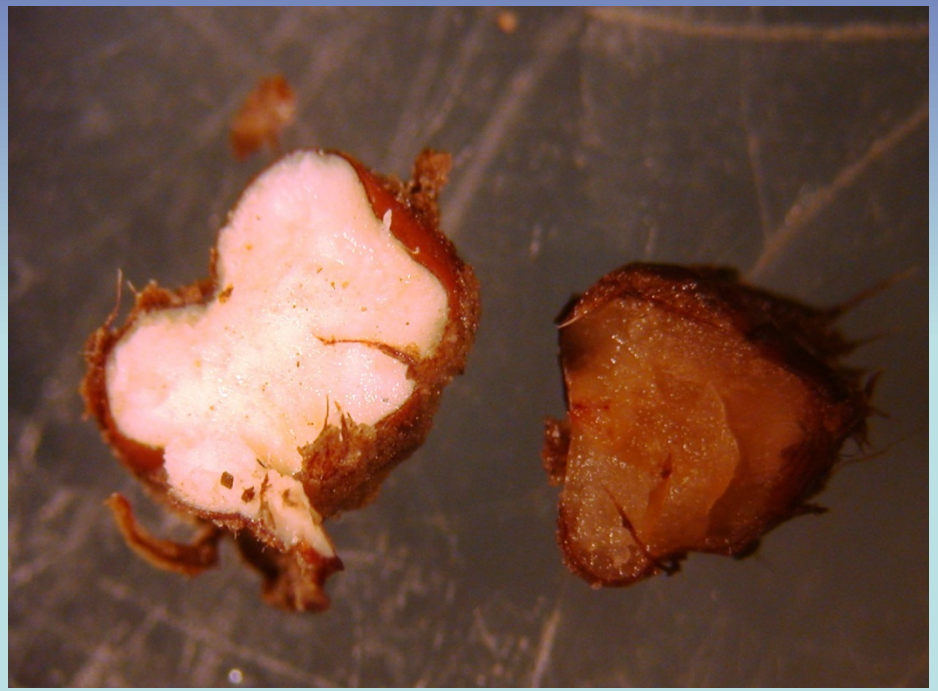
Total nutsedge shoots/season

Treatment	Number
Control	192 a
Duraskrim	0 b
Midas	2 b
Plastic-paper-plastic	1 b
Steam	31 b
Tyvek	1 b
Weed barrier	8 b
P-value	<0.0001

2007-08 and 08-09: 100% control



Tubers produce new shoots over time



Untreated: *M. phaseolina* and weeds

Steam of holes pre-plant

ASD: anaerobic soil disinfestation

Labile carbon source + moist soil+ plastic much for 2 - 4 weeks

- anaerobic decomposition yields organic acids, volatiles)
- Biocontrol by anaerobic microorganisms
- Low pH; Lack of oxygen
- Physical changes and plant available N and P
- Combination of all * time

Standard Anaerobic Soil Disinfestation(ASD)
for California strawberries

1. Broadcast rice bran at 9 tons/acre in Sep-Oct
2. Incorporate bran
3. List beds
4. Cover w/ plastic mulch
5. Drip irrigate
6. Leave 3 wks and monitor soil Eh (redox potential)

February 12

ASD

Untreated

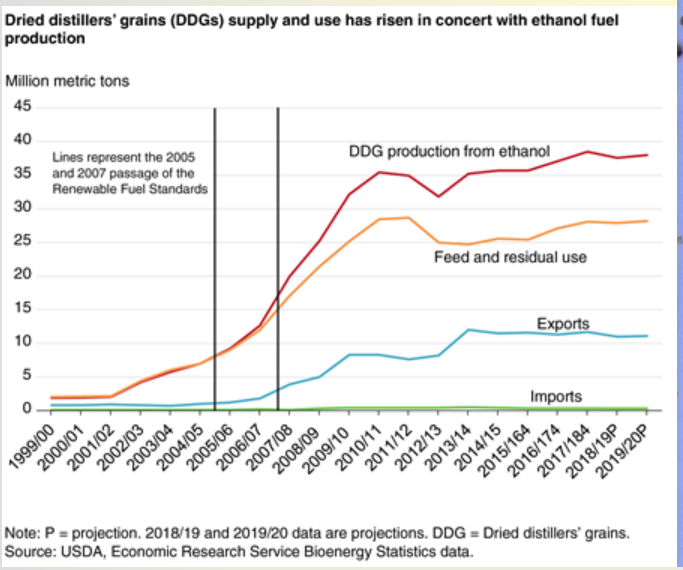
Cost of ASD with 7 t of C-source:

Rice bran @ $400/ton = $2,800/A

Midds@250/ton = $1,750

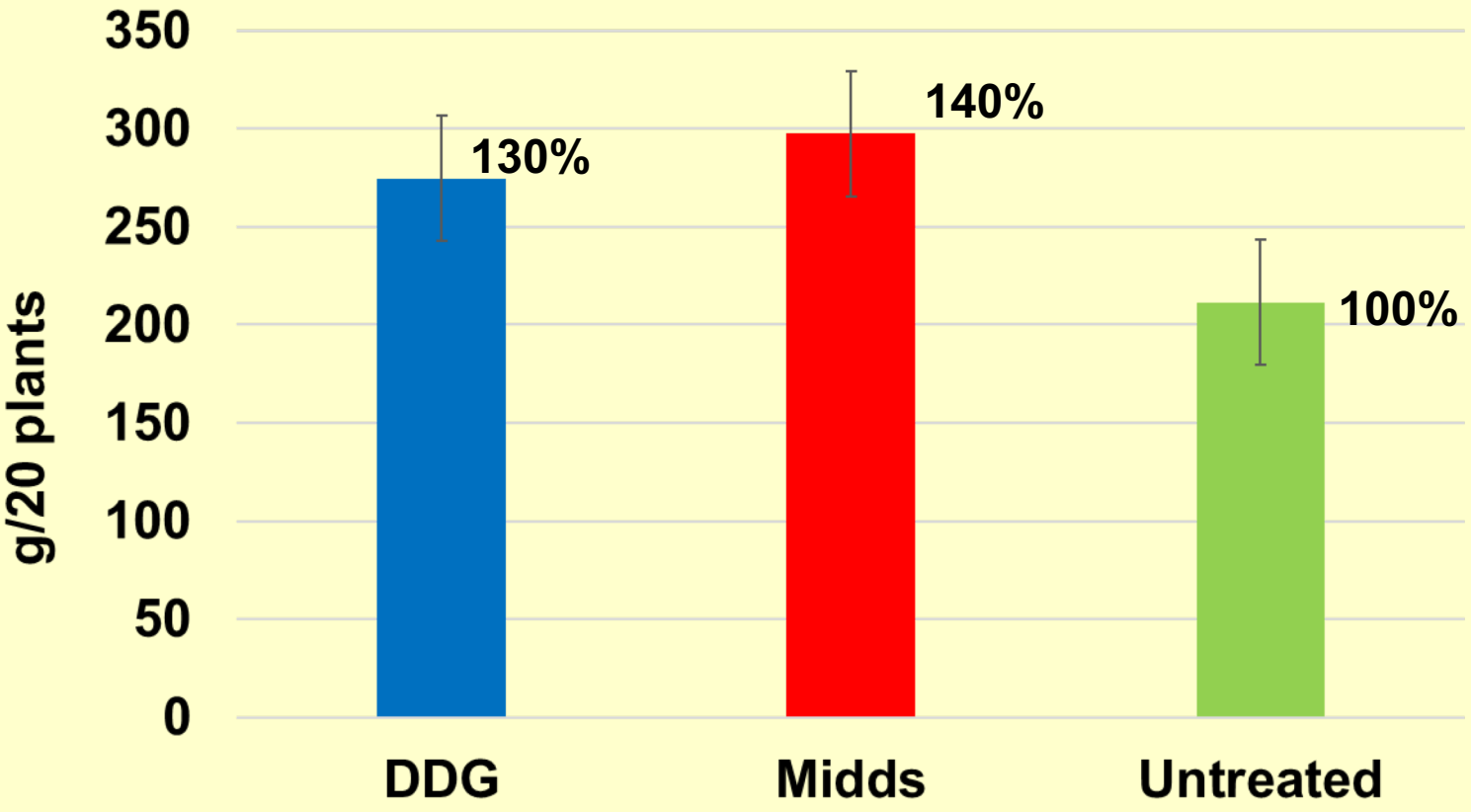
DDG@280/ton= $1,960

2021-2022



Dried Distilled Grain **Midds (middlings)**

Average Marketable fruit yields, Jan-April



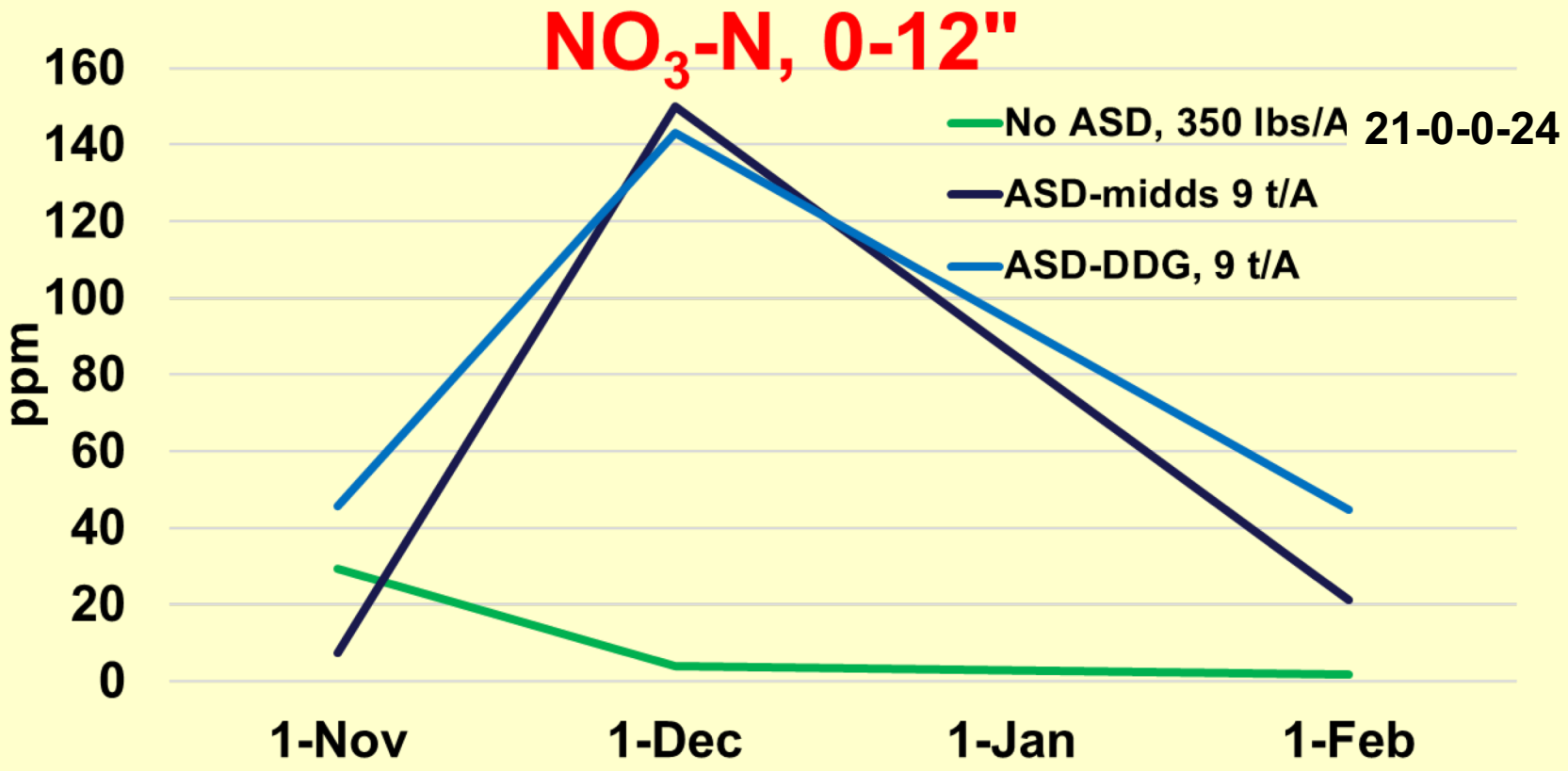
Apr 20, 2022

Untreated, no ASD

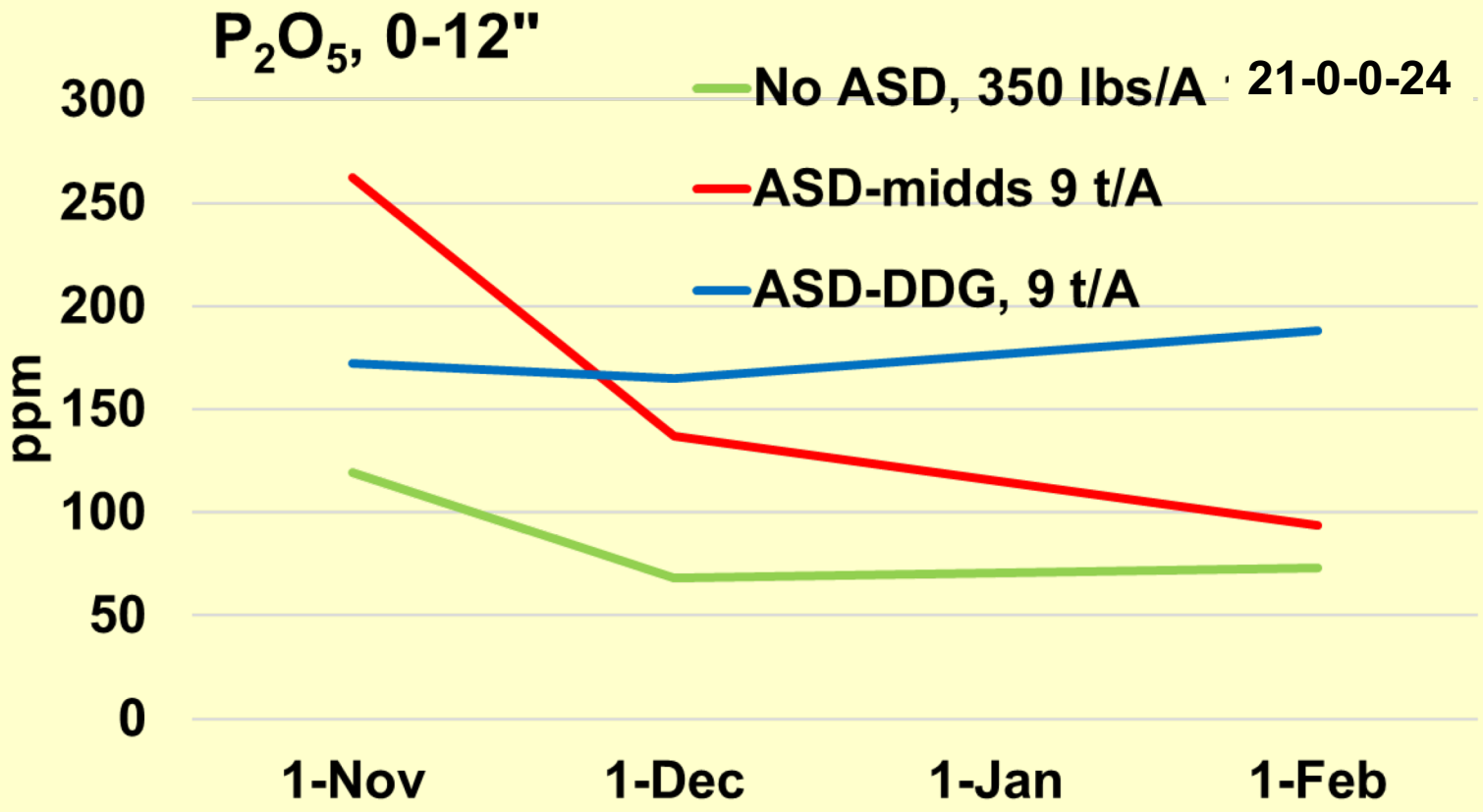
ASD - Midds

ASD - DDG

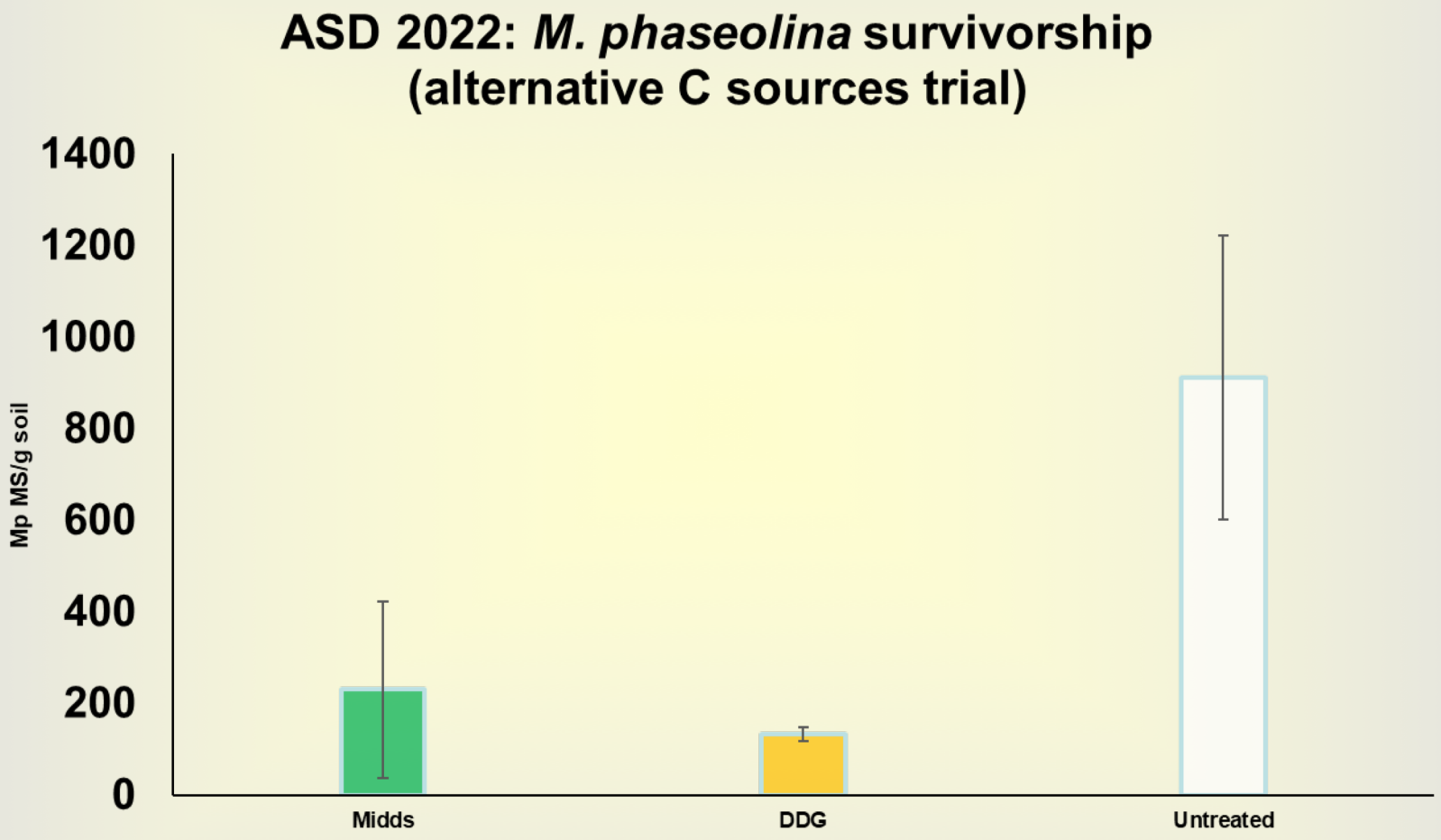
No fertilizers applied in-season

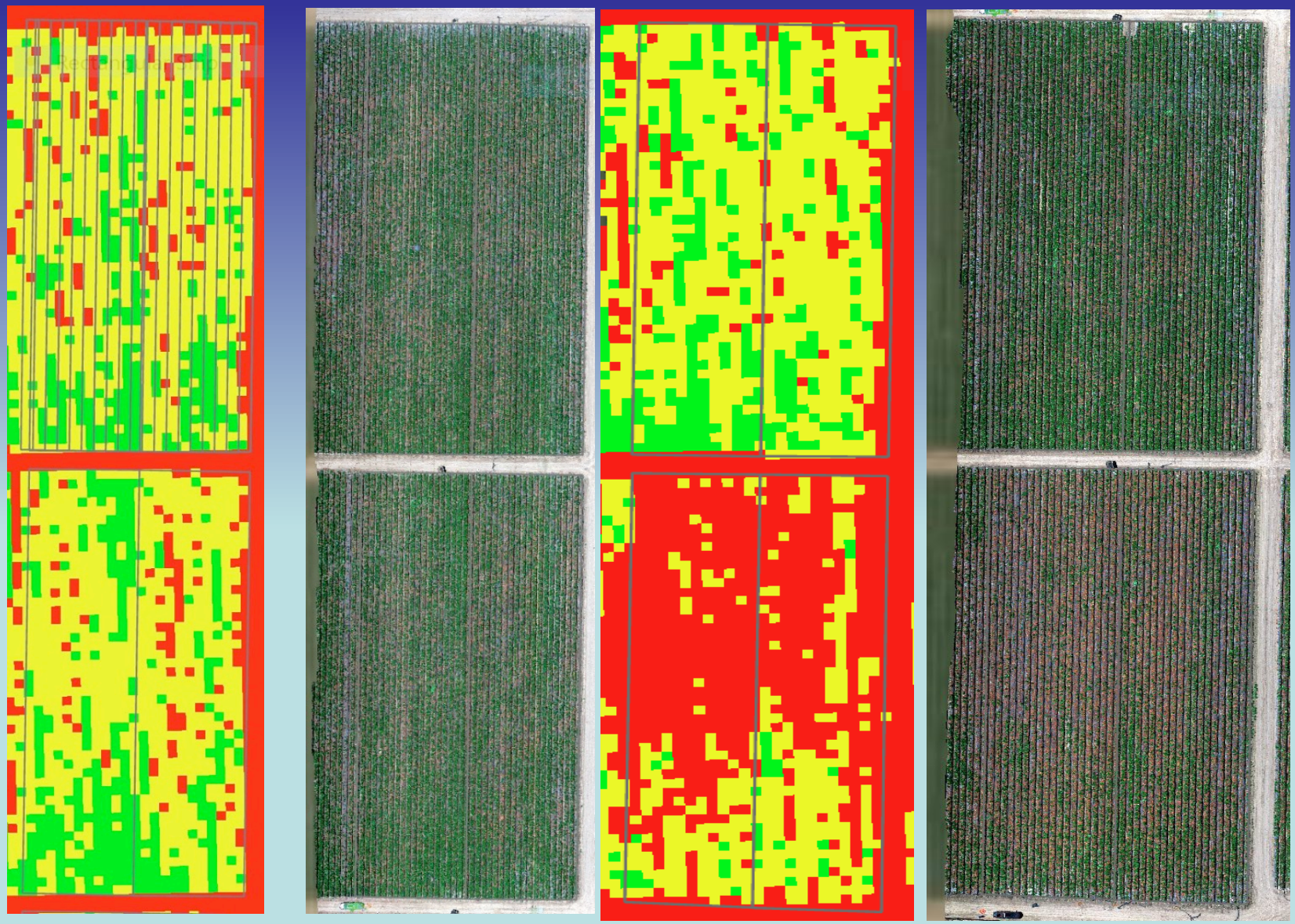


No fertilizers applied in-season



2022: ASD vs Untreated


ASD 2022: M. phaseolina survivorship
(alternative C sources trial)
Mp MS/g soil
1400
1200
1000
800
600
400
200
0
Midds
DDG
Untreated



Color	Upper value	Label
	≤ 0.45	0.042 - 0.45
	≤ 0.6	0.451 - 0.6
	≤ 0.88681	0.601 - 0.887

NORTH BLOCKS