Alternative carbon sources in ASD

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How to reduce costs associated with rice bran application?

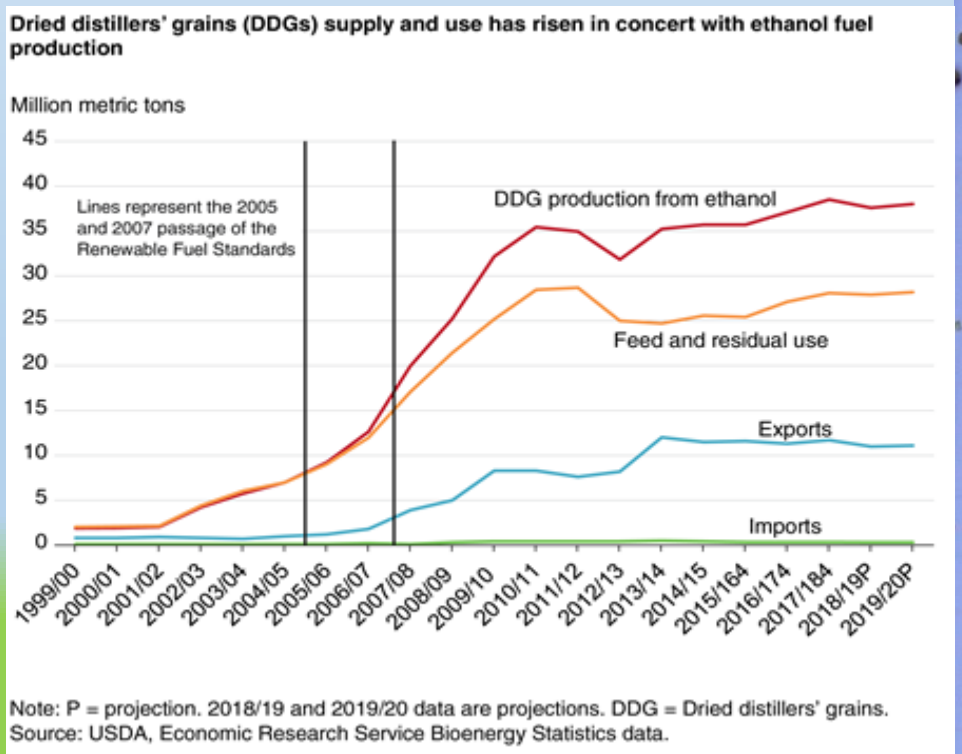
‘Midds’ = middlings, milfeed, byproduct of flour milling

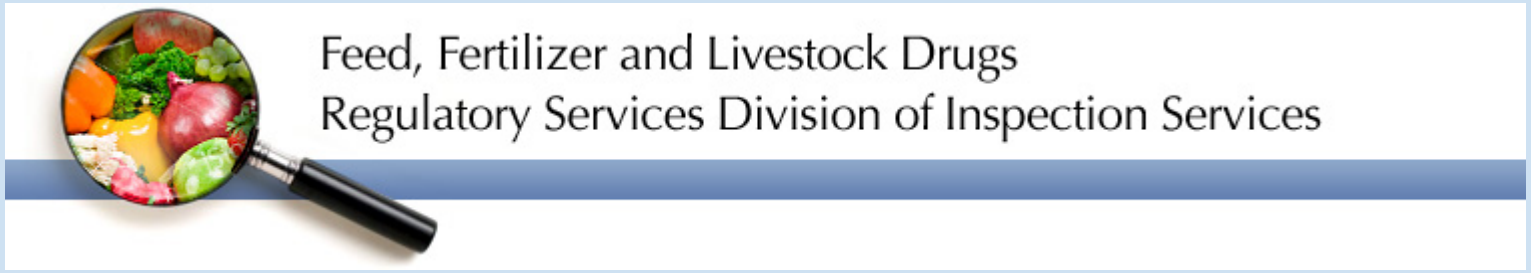
‘DDG’ = Dried Distillers Grain, byproduct of ethanol extraction shipped to CA feedlot

May 5, 2023: $280-330/t delivered to dairy (sites and delivery vary)

<u>Where to get them:</u>

Western Milling, Bakersfield, CA.
Ardent Mills, San Bernardino, CA
Penny Newman, Fresno, CA
Lacey Milling, Hanford, CA
JD Heiskell, Tulare, CA





PENNY-NEWMAN GRAIN CO INC **PENNY NEWMAN WHEAT MIDDLINGS**

Organic Input Material
Bulk Agricultural Mineral
Approved: **Yes**

Analyses, as received

	Midds	DDG
Total N	2.6 %	3.9 %
Total P_2O_5	2.0 %	2.0 %
Total K_2O	1.2 %	1.2 %
Total Cl	0.1 %	0.2 %
Carbon	30.3 %	43.7 %
C:N ratio	12.7	11.4
pH	4.4	4.5
OM	52%	75%
EC, ds/m (salinity)	4.19	25.2
Boron	4.5 ppm	2.9 ppm
Zinc	66.5 ppm	51.8 ppm
Manganese	120 ppm	12.9 ppm
Iron	96 ppm	90 ppm

2021-2022

- **Midds or DDG at 9 t/A**

- mixed in bed soil in Sept. 2021,

- tarped immediately with black TIF

- irrigated via drip 3 d later (total ~1.5”)

- left to ferment for 3 weeks

- **Untreated check:**

- fertilized soil (350 lbs/A of 21-0-0-24).

- 3 years ago was flat fumigated with 300 lb/A Pic and has been cover-cropped or fallow since.

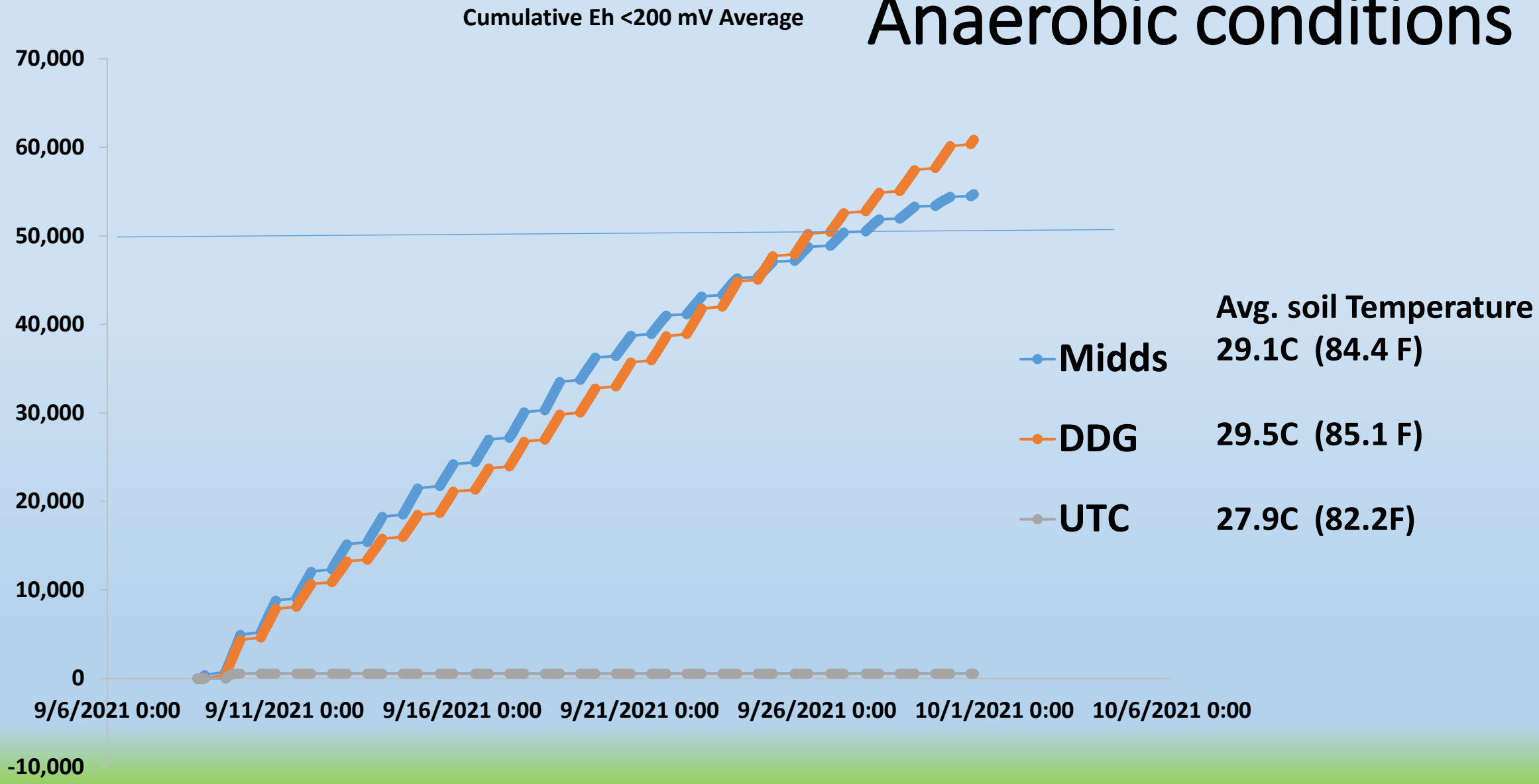
Inoculum:

nylon bags placed in all plots at 6” (15 cm) and removed for anayles afetr 2 weeks of ASD

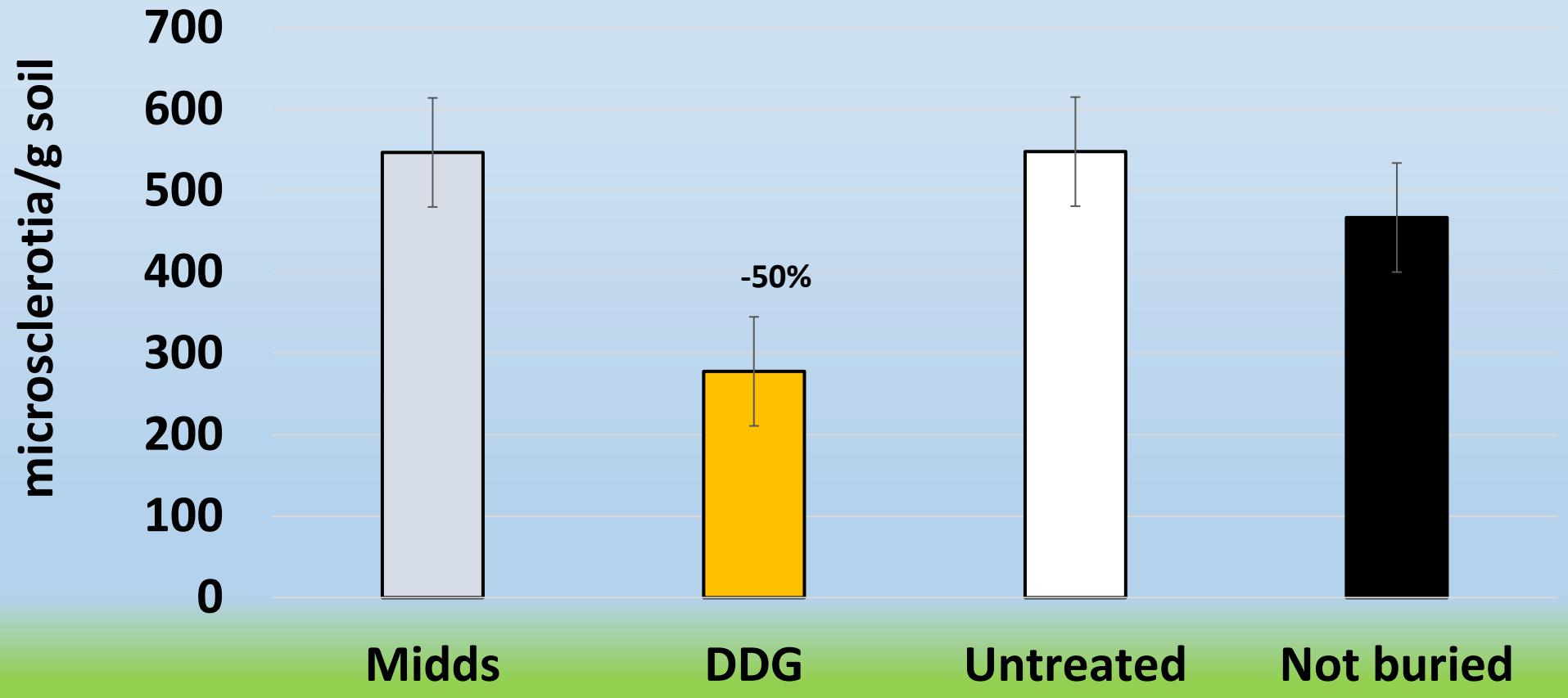
- ***Macrophomina phaseolina*** **(charcoal rot pathogen) infested soil**
- ***Cyperus esculentus*** **(Yellow nutsedge) tubers (10)**

! Soil in inoculum bags was not amended with DDG or Midds

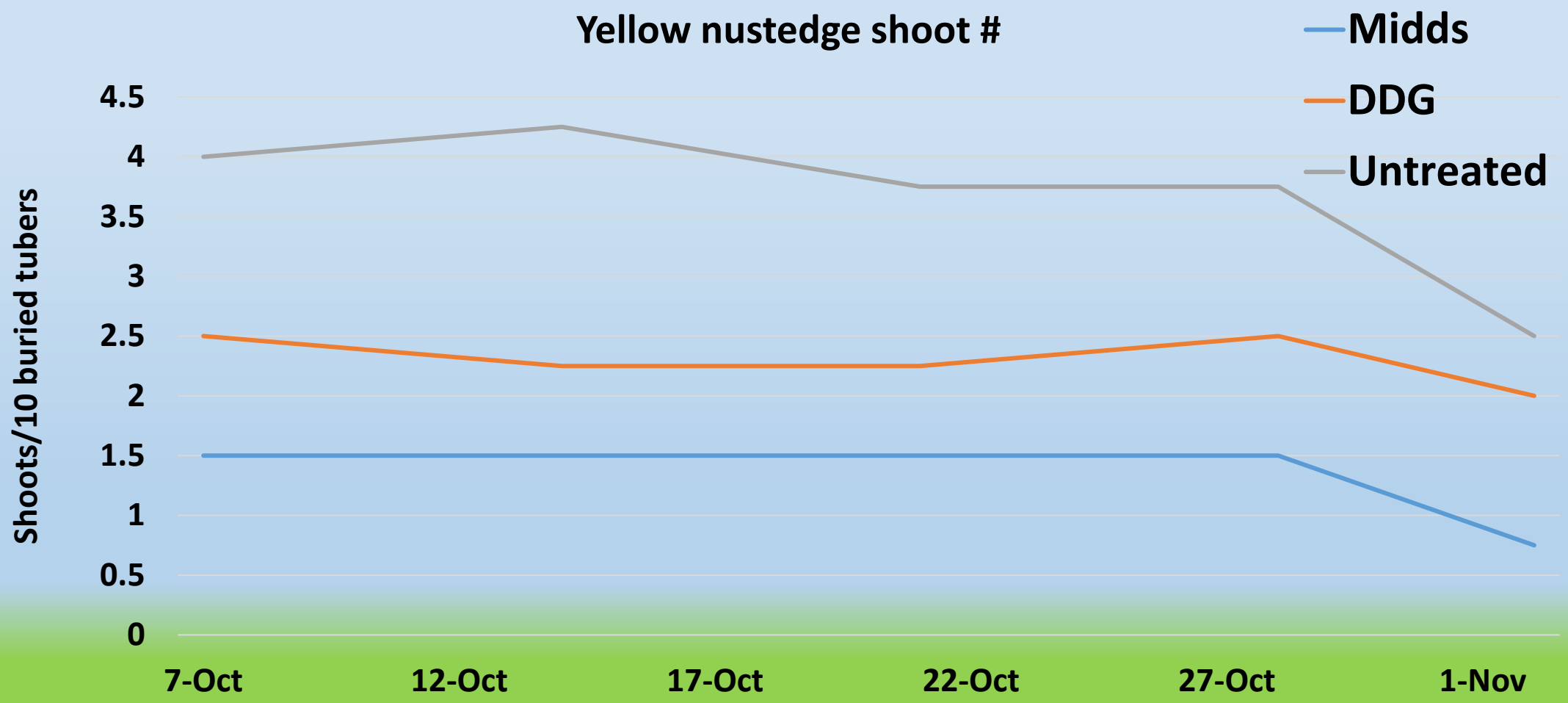
Anaerobic conditions



Macrophomina viability after ASD

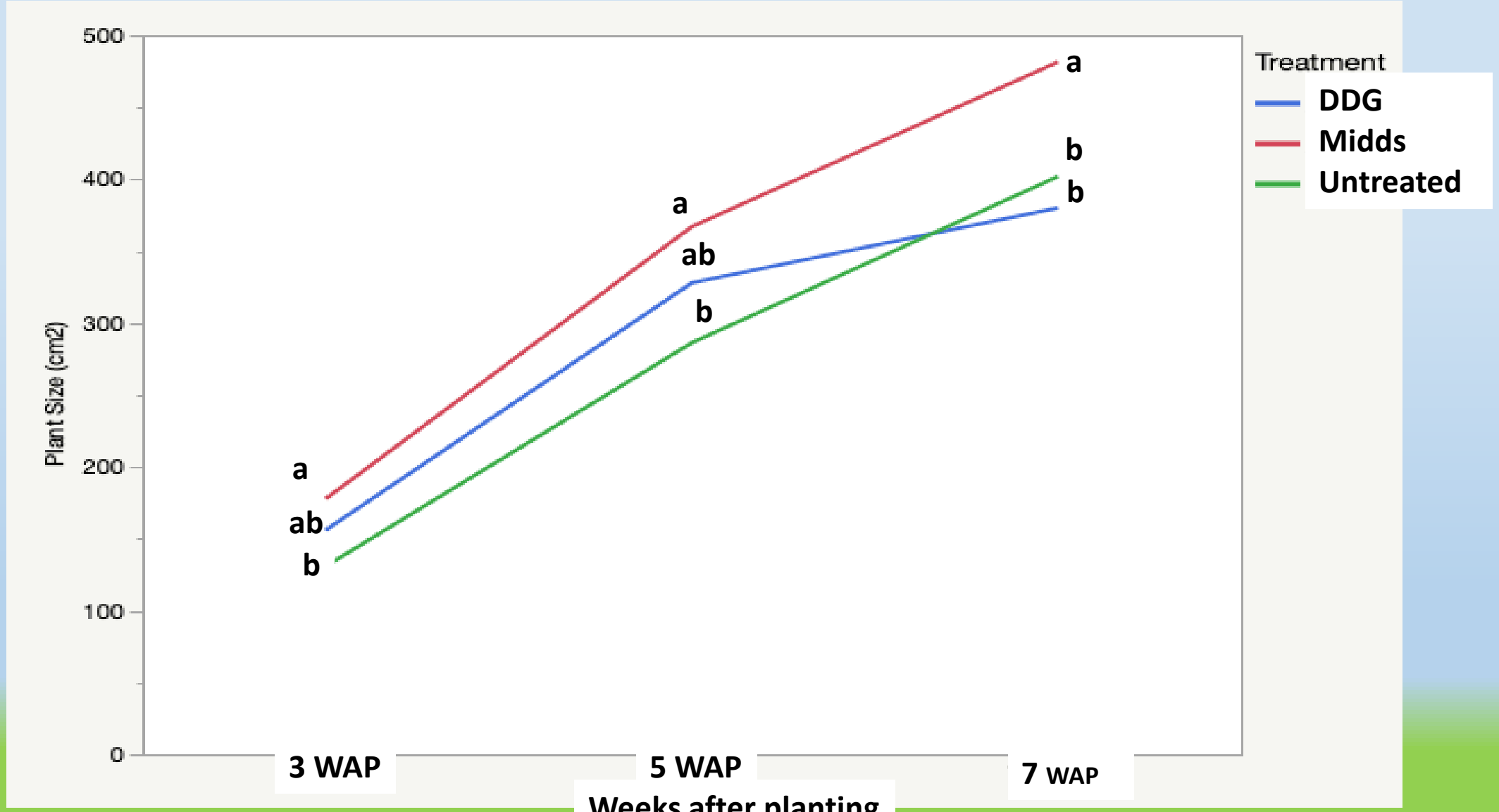


Yellow nutsedge germination after ASD



Strawberry performance

Early growth of ‘Victor’



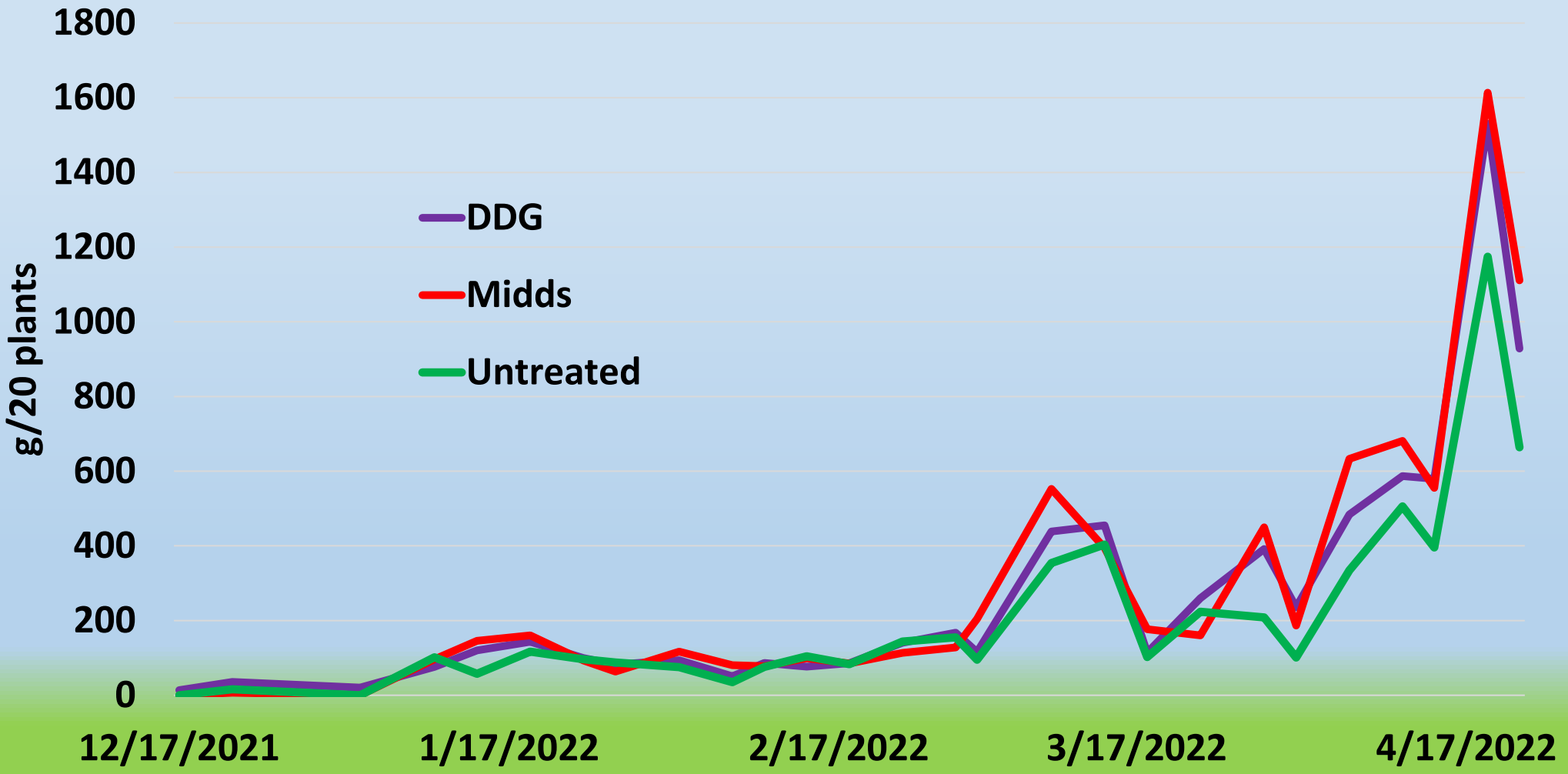
Nov 17, 2021

Untreated, no ASD

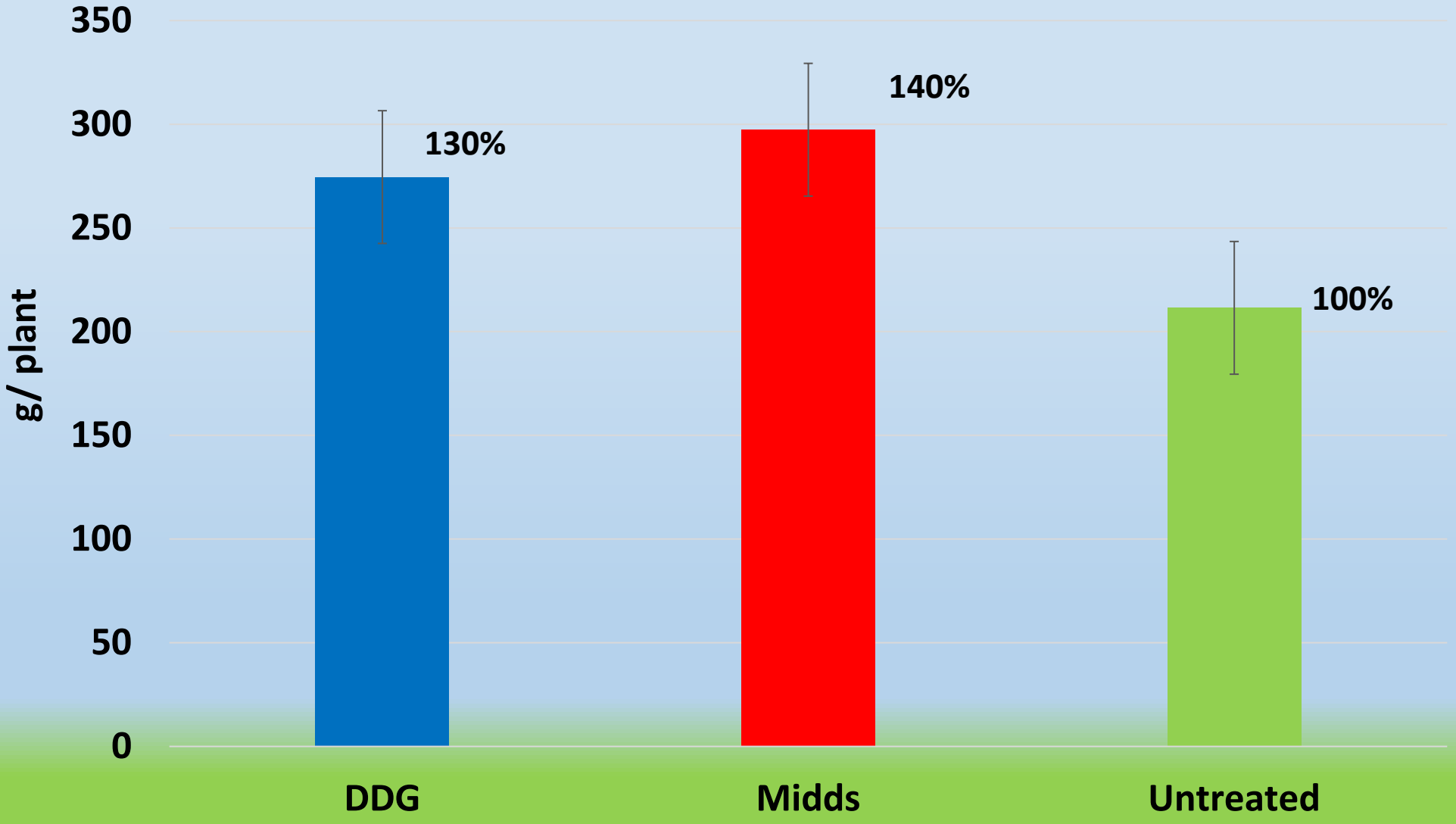
ASD - Midds

ASD - DDG

Marketable fruit yield, g/20 plants



Average Marketable fruit yields, Jan-April



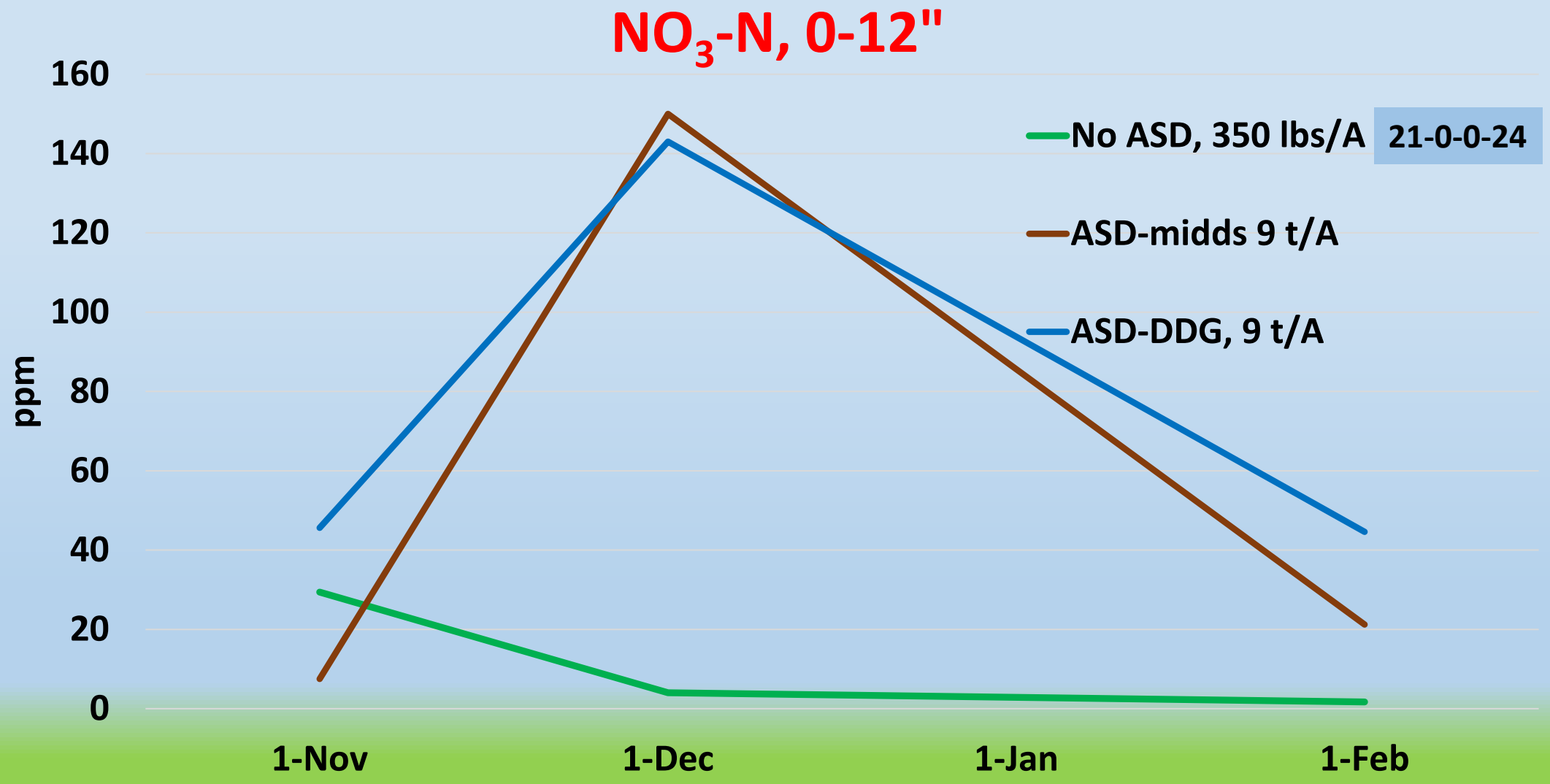
Apr 20, 2022

Untreated, no ASD

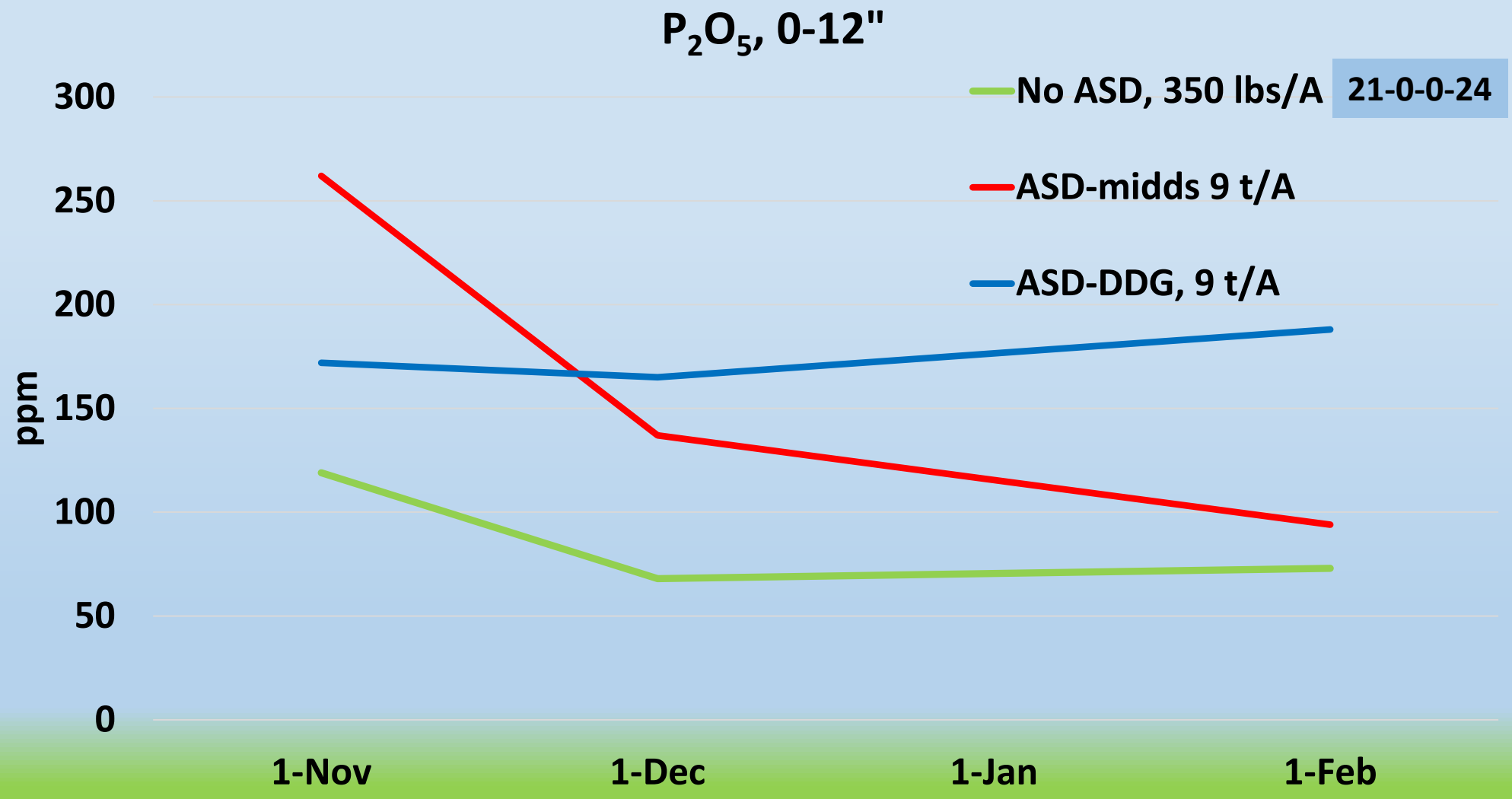
ASD - Midds

ASD - DDG

No fertilizers applied in-season



No fertilizers applied in-season



2022-2023

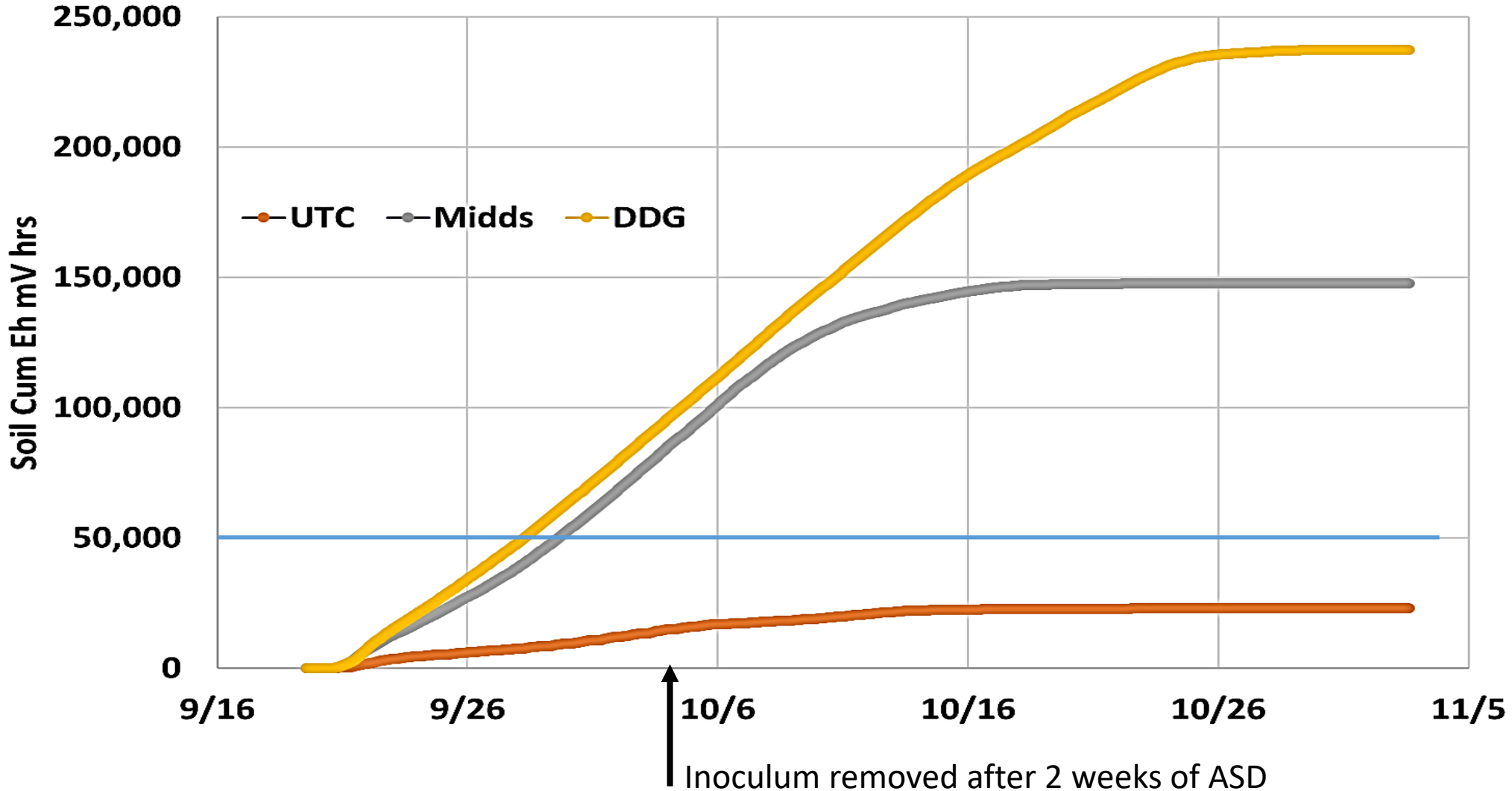
Same as in 2021-22 except:

- **Midds or DDG at 7 t/A**
- **Inoculum bag soil amended with Midds or DDG**
- **‘Fronteras’ instead of ‘Victor’**

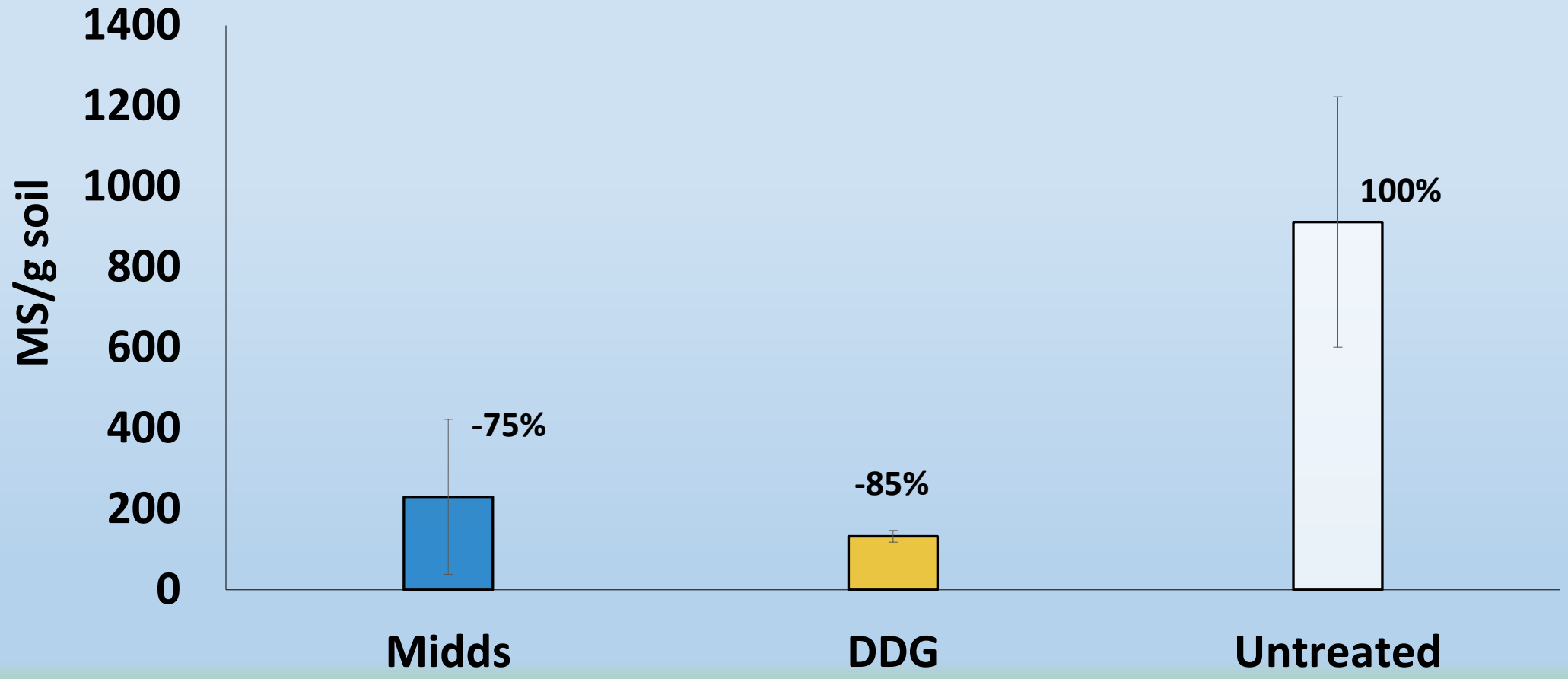
Anaerobic conditions

Soil temperatures at 15 cm:

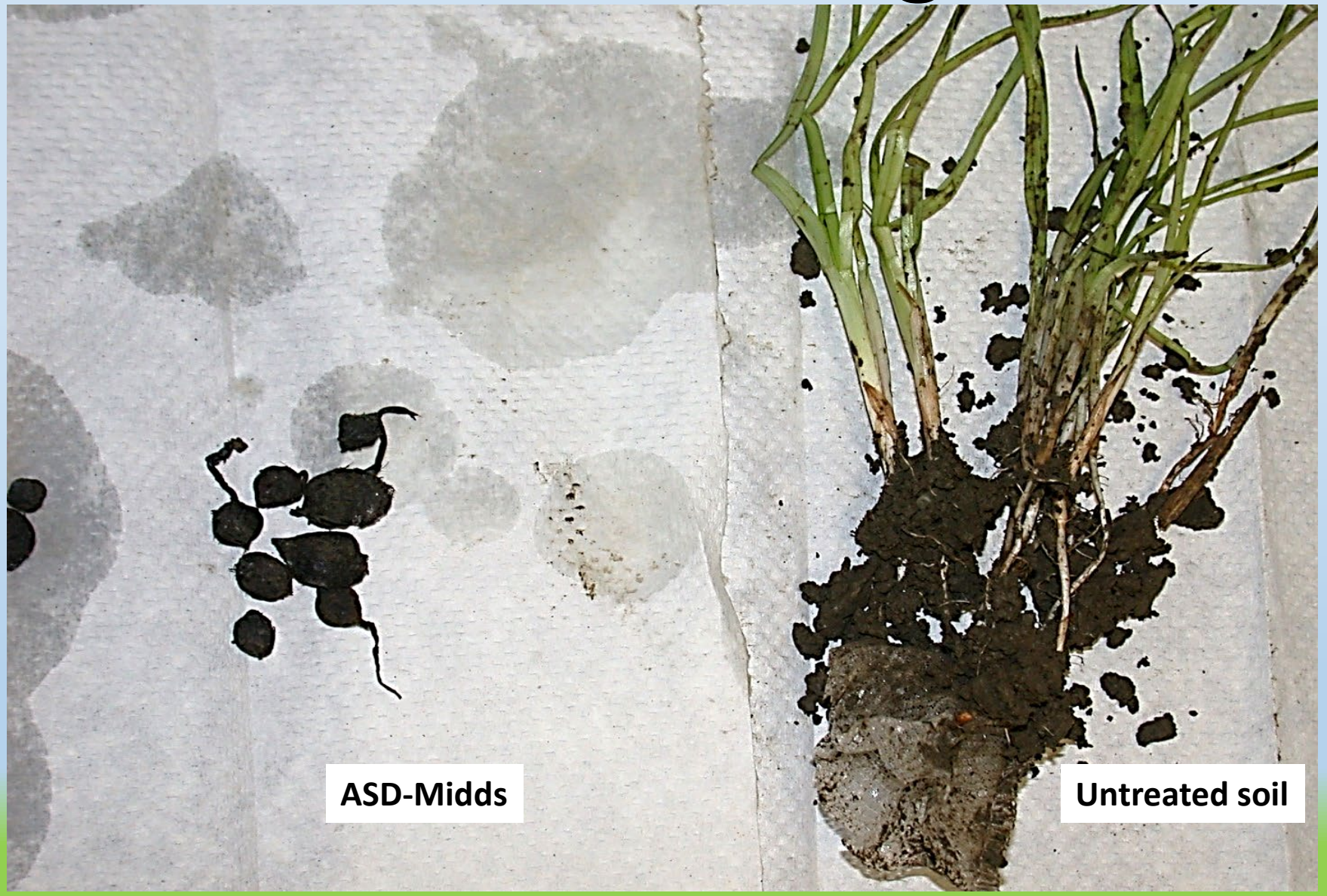
- **84.4F in ASD-Midds,**
- **85.1F in ASD-DDG**
- **82.2 F in untreated soil**



M. phaseolina



Yellow nutsedge



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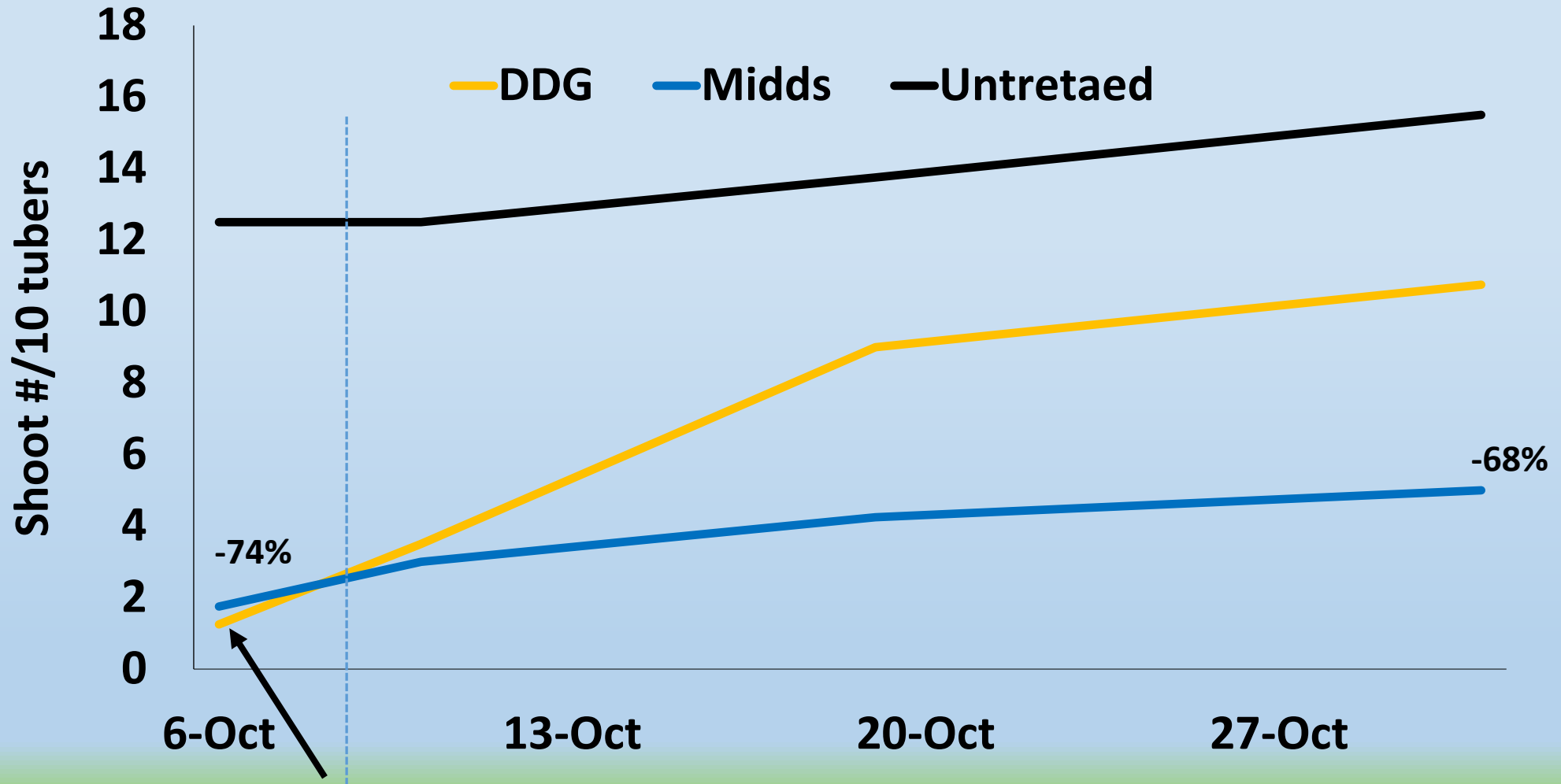


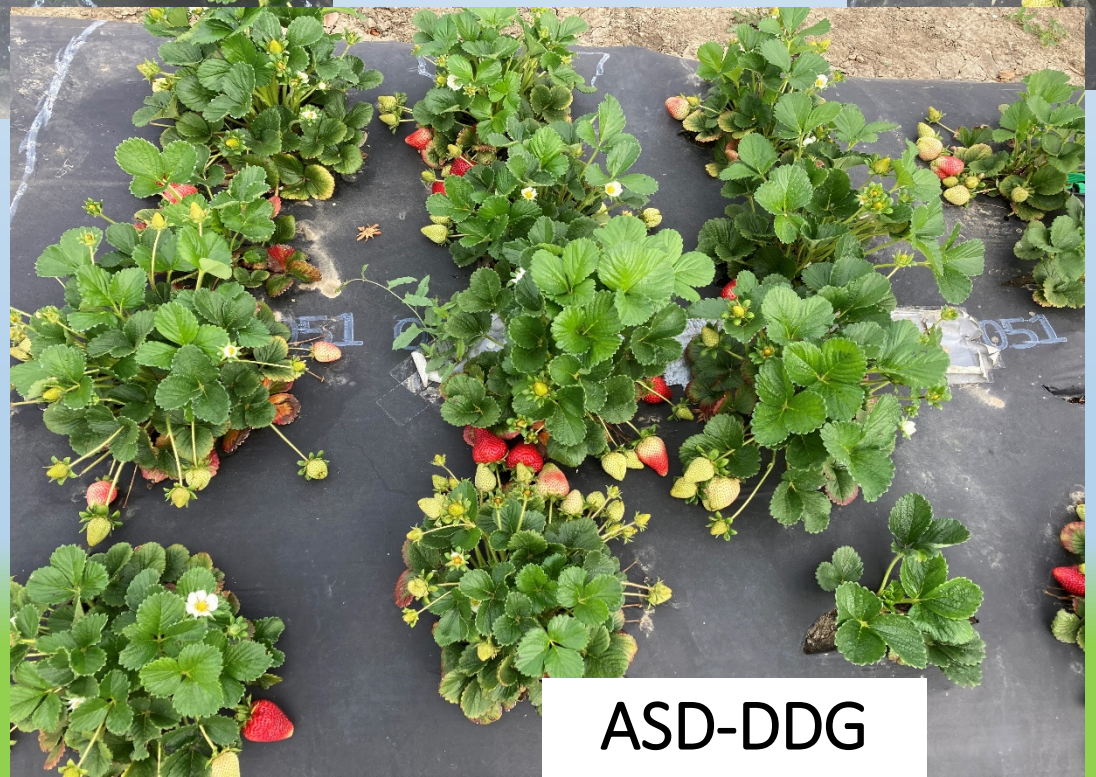
At removal after 2 weeks of ASD

Germination in lab after removal

Strawberry performance

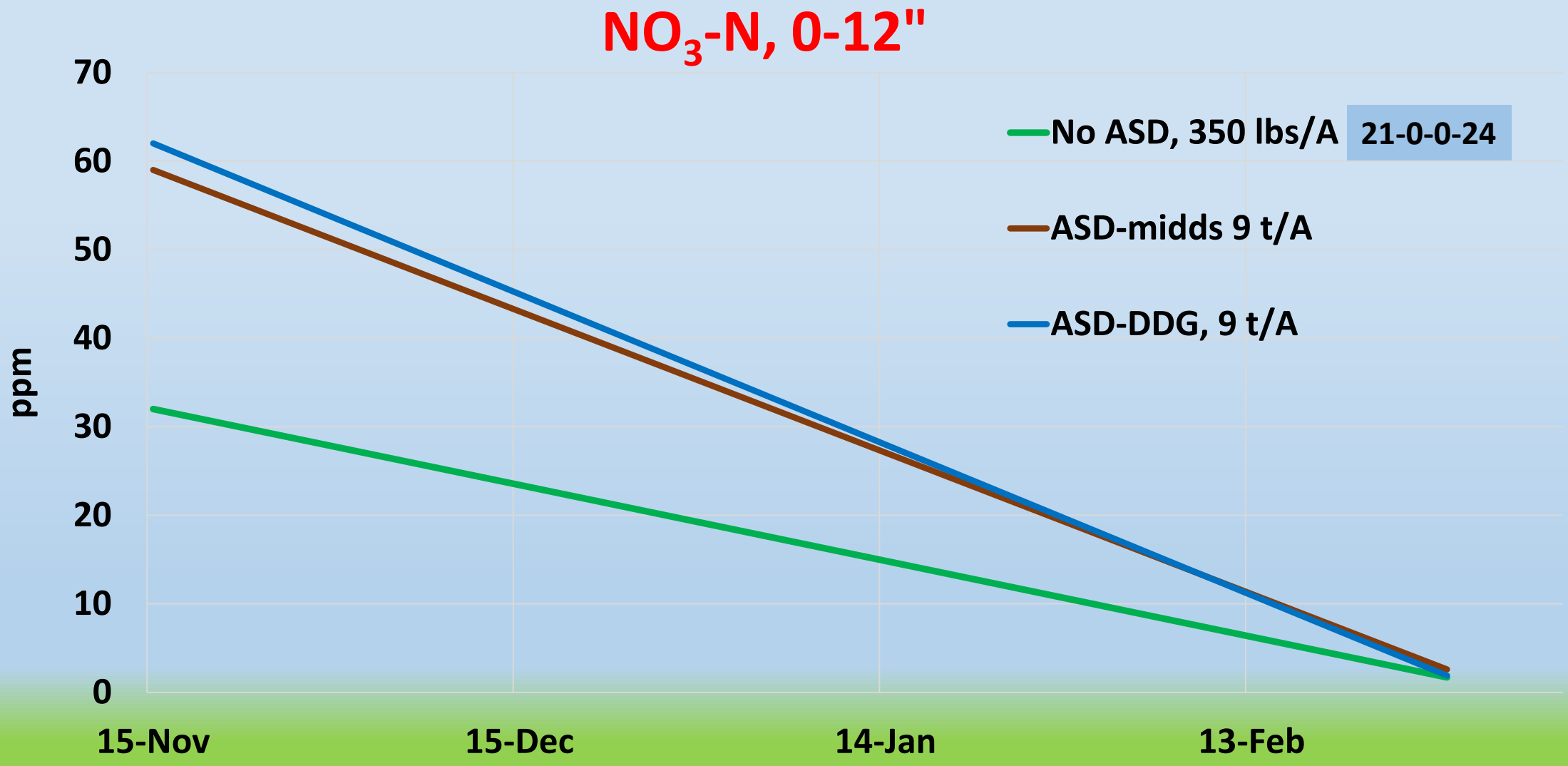
Untreated

ASD-Midds

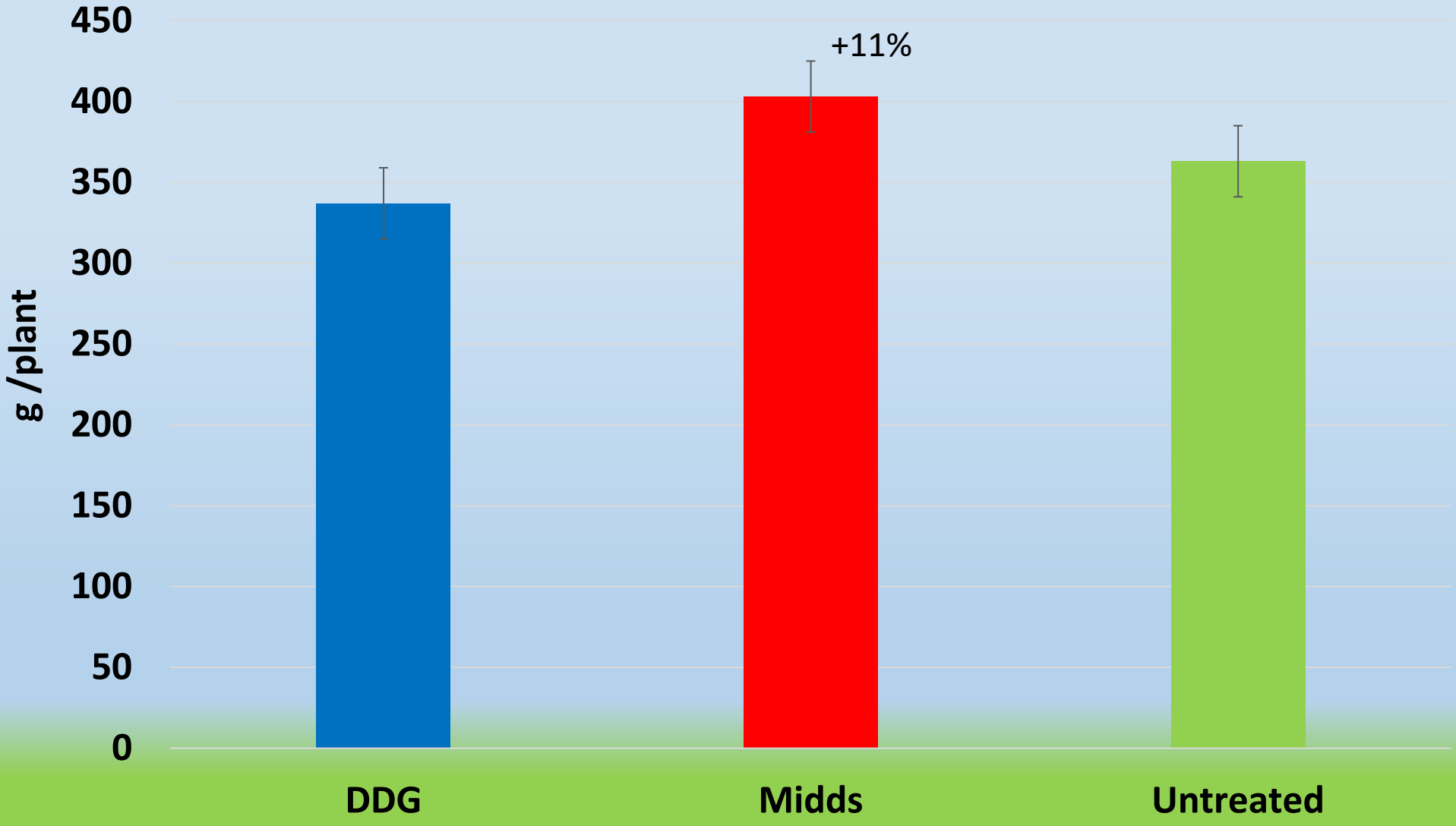


ASD-DDG

2022-2023; No fertilizers applied in-season



Average marketable fruit yields, Jan-April 2023



Summary:
ASD with Midds (millfeed) and DDG (dried distillers grain)

- **More affordable than rice bran**
- **Similar pre-plant fertility contribution as rice bran**
- **Reduction in Macrophomina viability**
- **Reduction in nutsedge germination**
- **Improved or similar (to fertilized soil) fruit production**

Acknowledgements

- Hansen REC
- NIFA USDA funding
- Ardent Mills and Western Milling