Effectiveness of dispersants on relief of oil spill impact for coastal salt marshes

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Studies on the effects of dispersants have primarily been focused on marine organisms. Most were acute toxicity tests. Information on their long-term effects are lacking, especially for plants. This limits the application of dispersants.

Objectives

- Compare and evaluate the effectiveness and toxicity of “recently marketed” dispersants to salt marsh plants
- Evaluate the potential of using dispersants in nearshore oil spills to protect coastal salt marsh habitats.

1. Effect and efficacy of simulated nearshore application of dispersants to **low** concentrations of fuel oil for coastal habitat protection

2. Effect and efficacy of simulated nearshore application of dispersants to **high** concentrations of fuel oil for coastal habitat protection

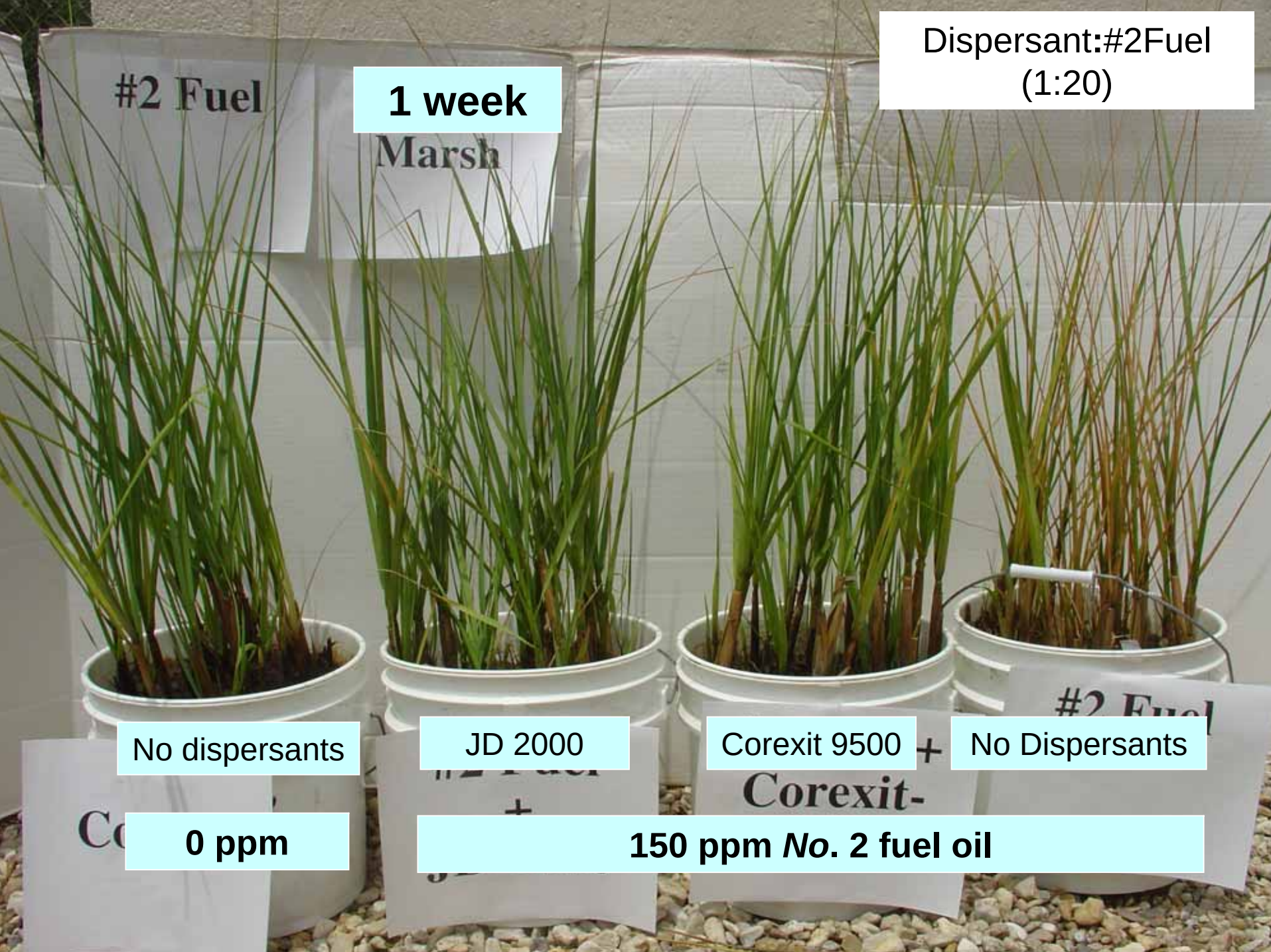
NCP Product Schedule-Listed Dispersants:

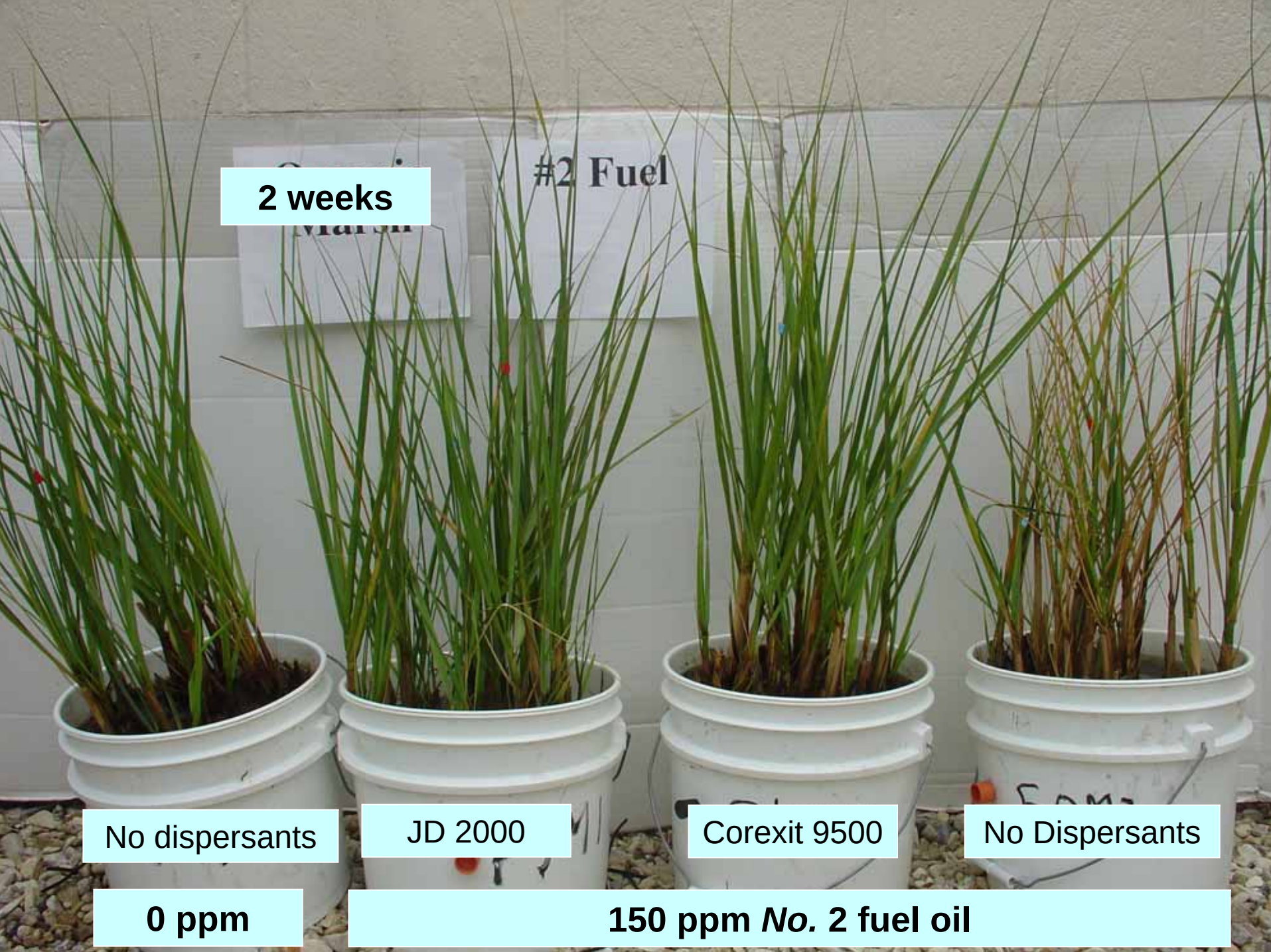
- **Corexit 9500 (Exxon):**
  Effectiveness: 45.5% for SLC (swirling flask test)
  $LC_{50\text{-}48hr}$: 32.2 ppm for *Mysidopsis bahia*

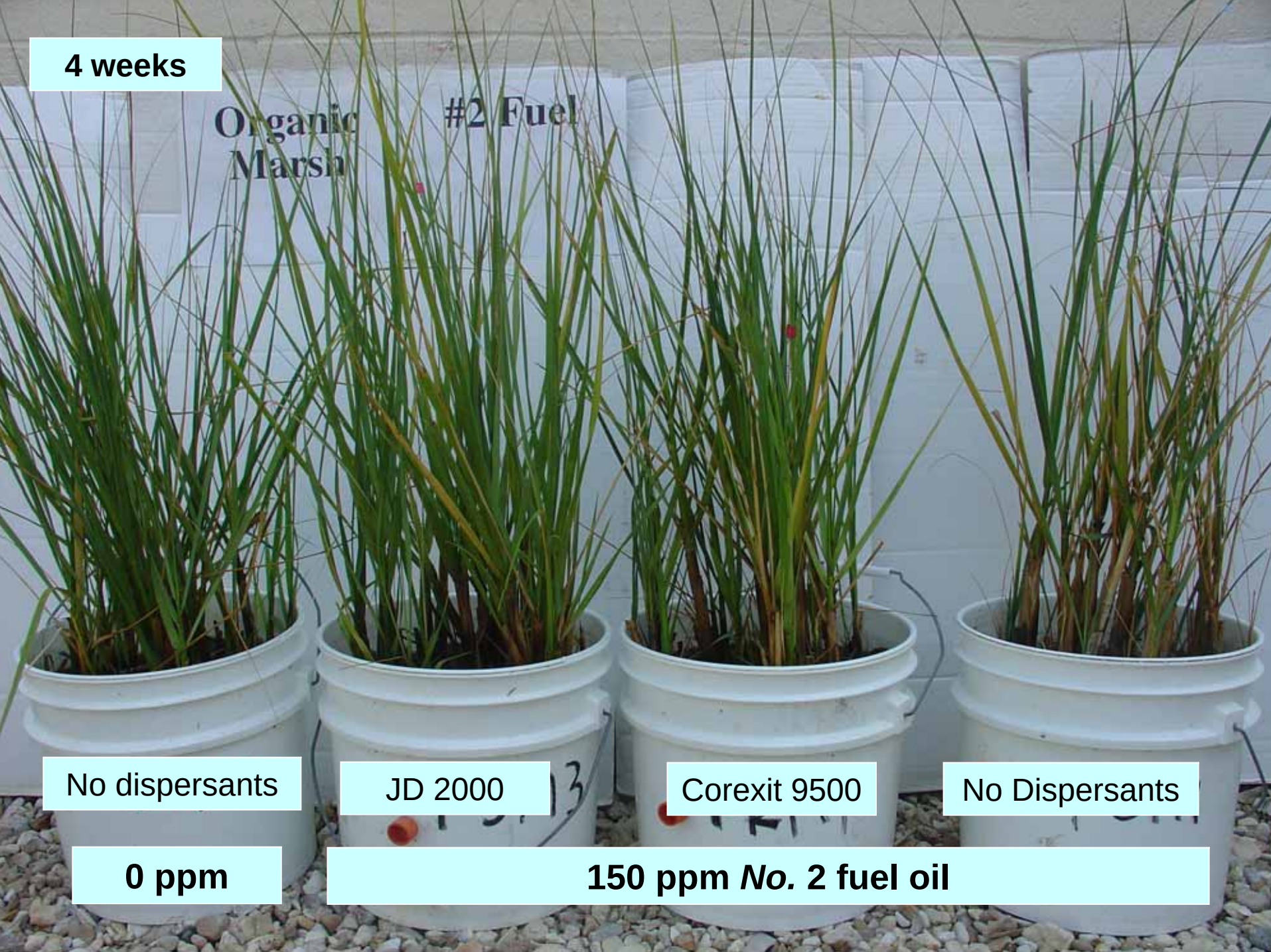
- **JD-2000 (Vopak):**
  Effectiveness: 84.1% for SLC (swirling flask)
  $LC_{50\text{-}48hr}$: 90.5 ppm for *Mysidopsis bahia*

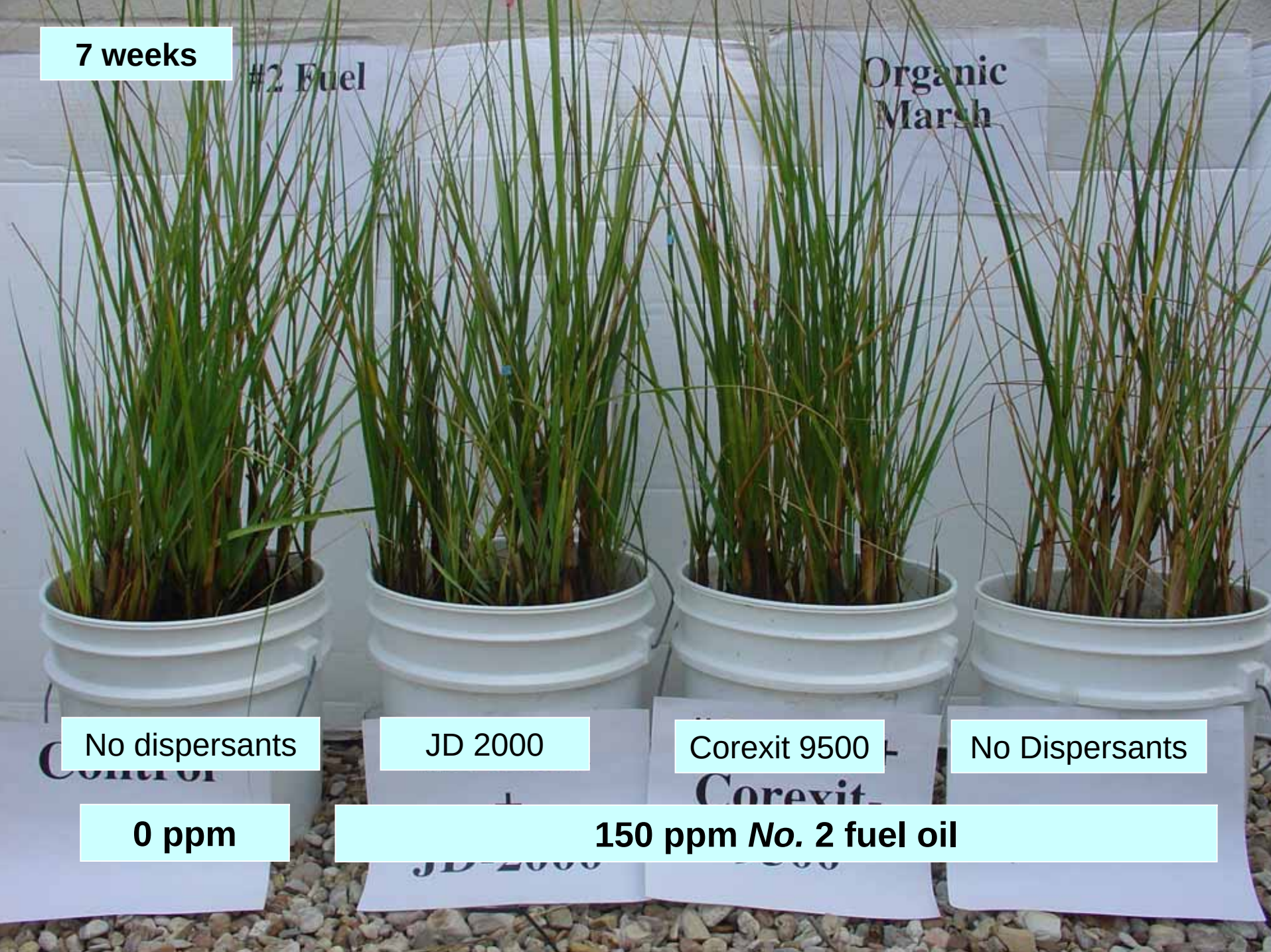

750 ppm No.2 fuel oil
750 ppm No. 2 fuel oil + JD 2000
750 ppm No. 2 fuel oil + Corexit 9500

1. Effect and efficacy of simulated nearshore application of dispersants to **LOW concentration (150 ppm)** fuel oil for coastal habitat protection

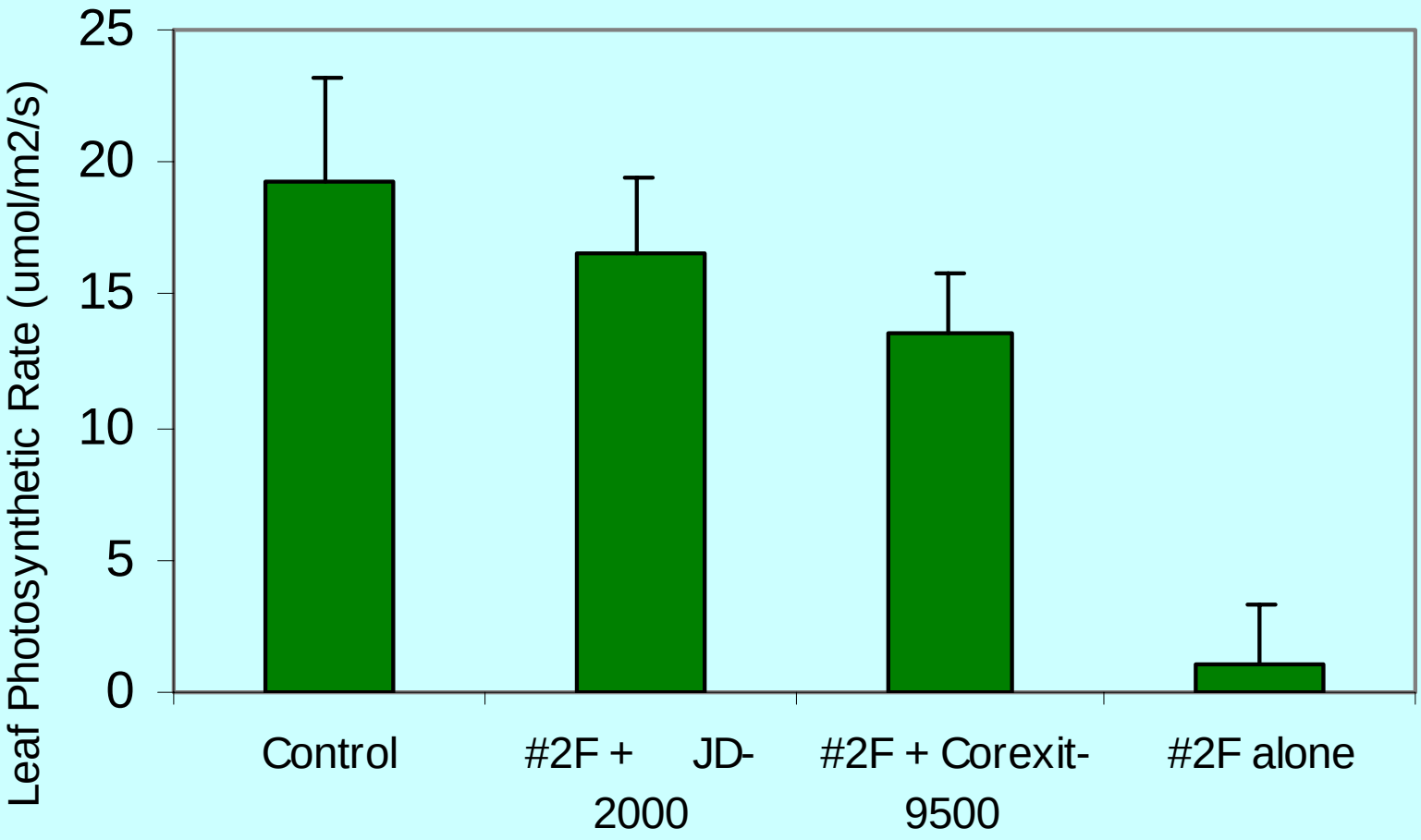

Dispersant:#2Fuel
(1:20)
#2 Fuel
1 week
Marsh
No dispersants
JD 2000
Corexit 9500
+
No Dispersants
0 ppm
150 ppm *No*. 2 fuel oil

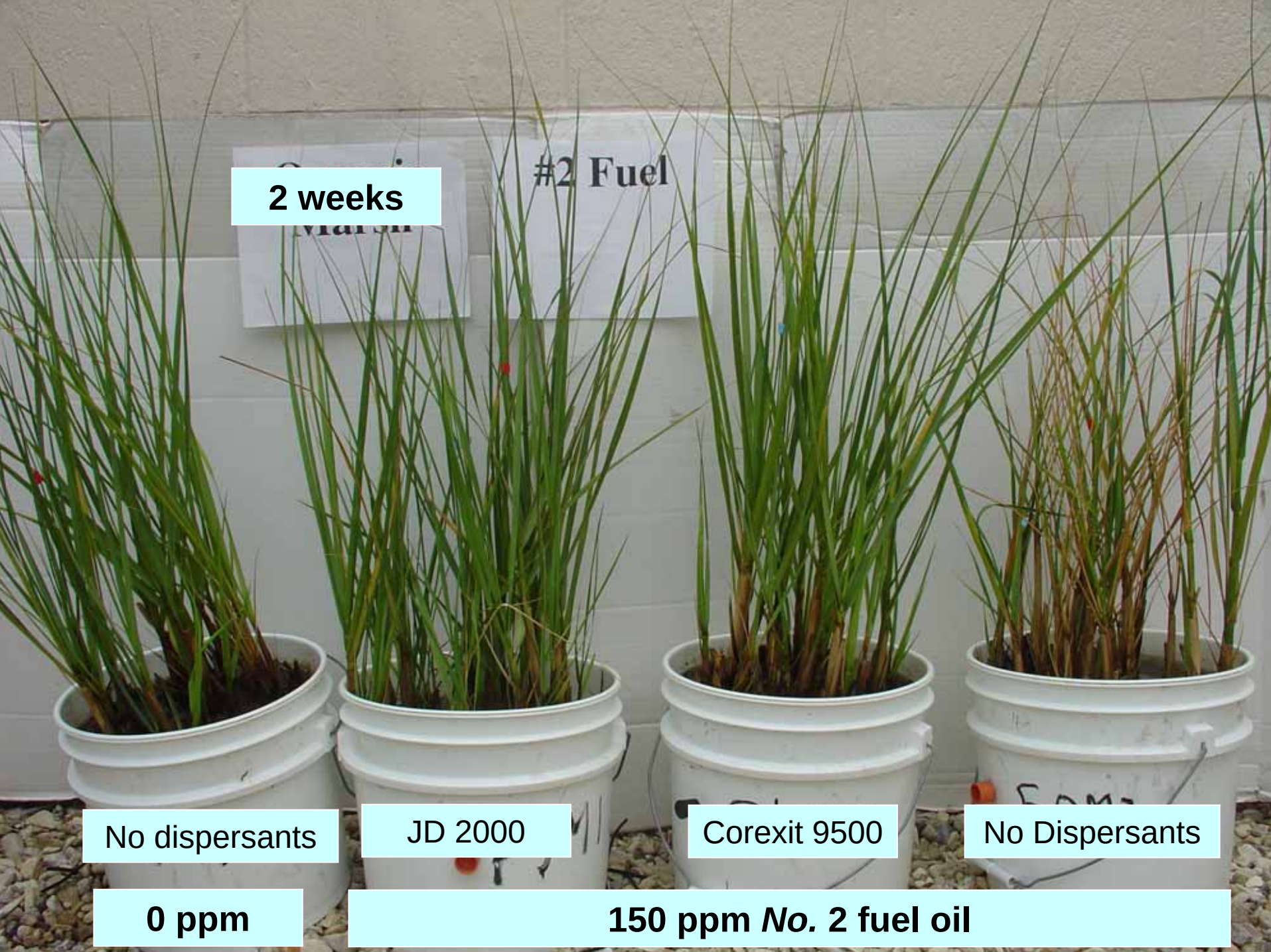

2 weeks
#2 Fuel
No dispersants
JD 2000
Corexit 9500
No Dispersants
0 ppm
150 ppm *No.* 2 fuel oil


4 weeks
Organic Marsh
#2 Fuel
No dispersants
JD 2000
Corexit 9500
No Dispersants
0 ppm
150 ppm *No.* 2 fuel oil


7 weeks
#2 Fuel
Organic Marsh
No dispersants
JD 2000
Corexit 9500
No Dispersants
0 ppm
150 ppm *No.* 2 fuel oil

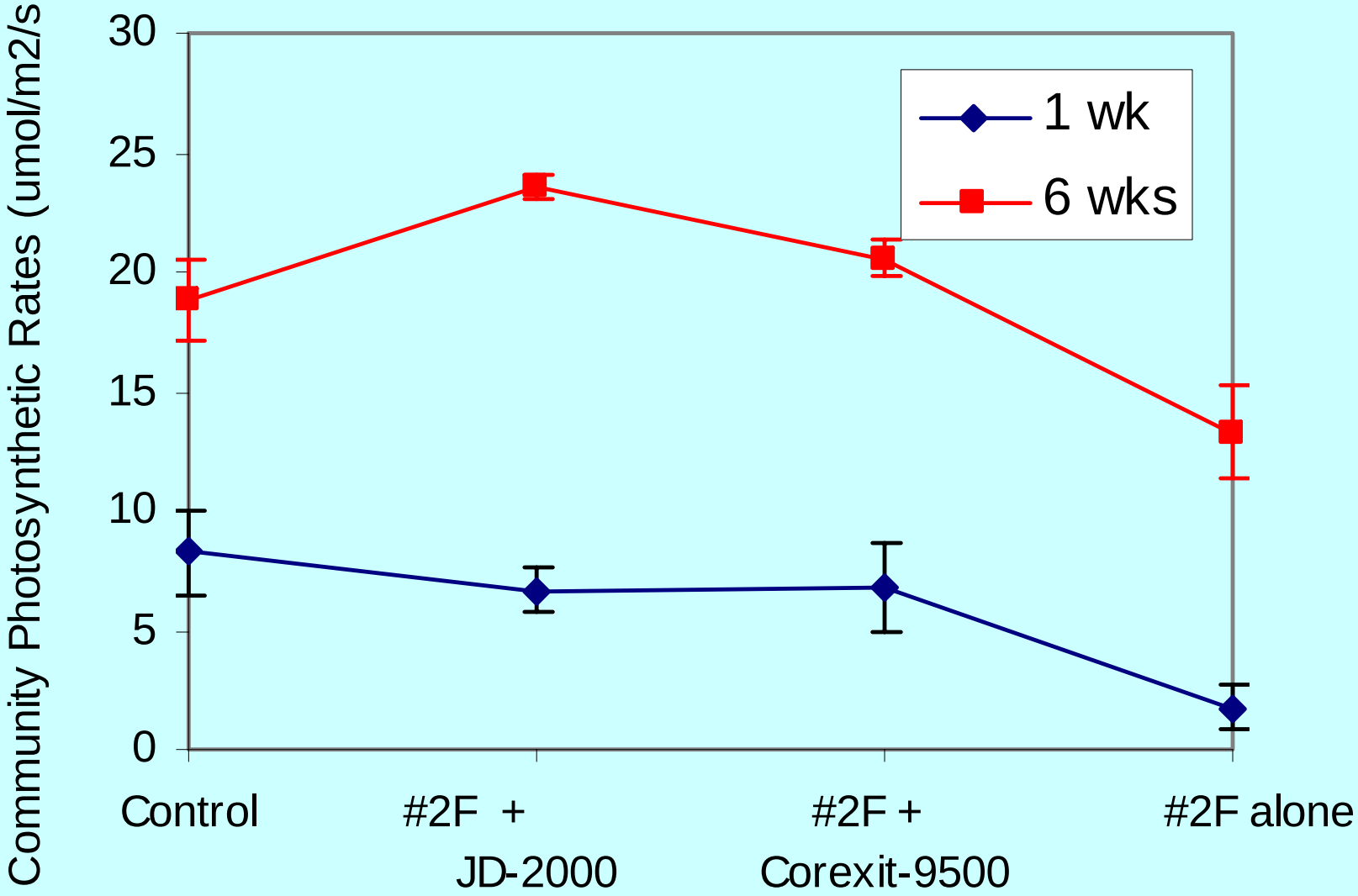
Single Leaf Photosynthetic Rate (4 days)



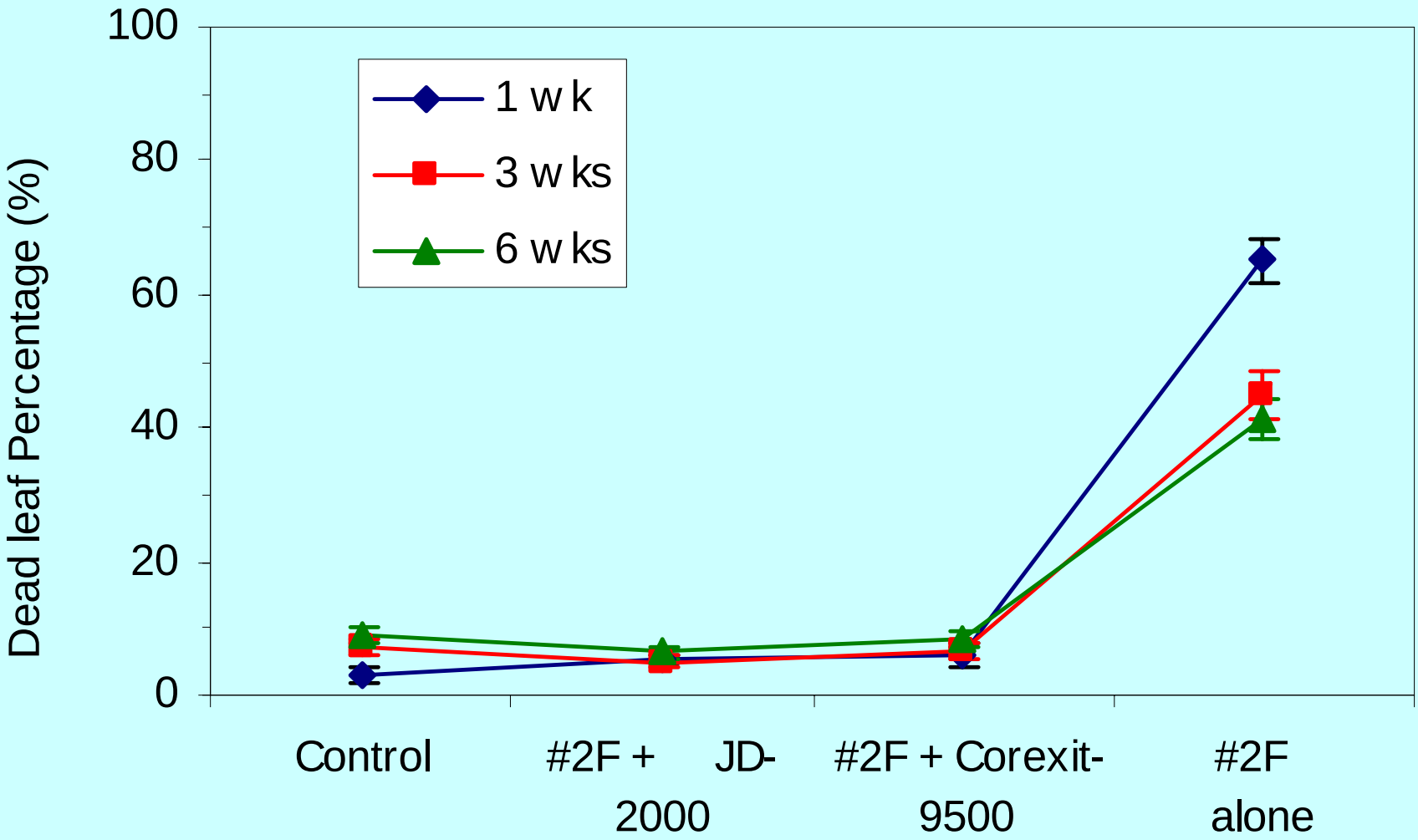

2 weeks
#2 Fuel
No dispersants
JD 2000
Corexit 9500
No Dispersants
0 ppm
150 ppm *No.* 2 fuel oil

Measurement for Community Photosynthetic Rates

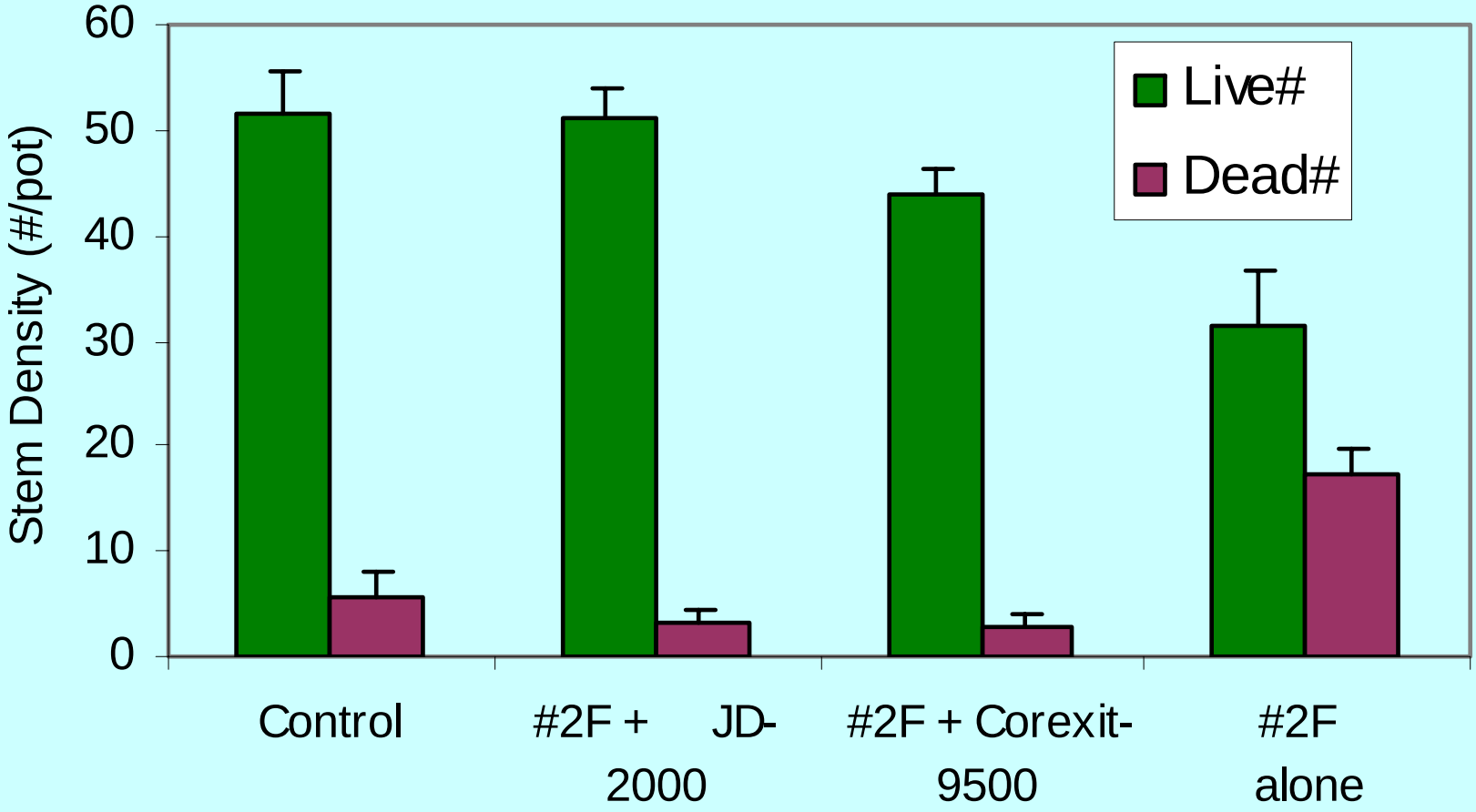
Community Photosynthetic Rates



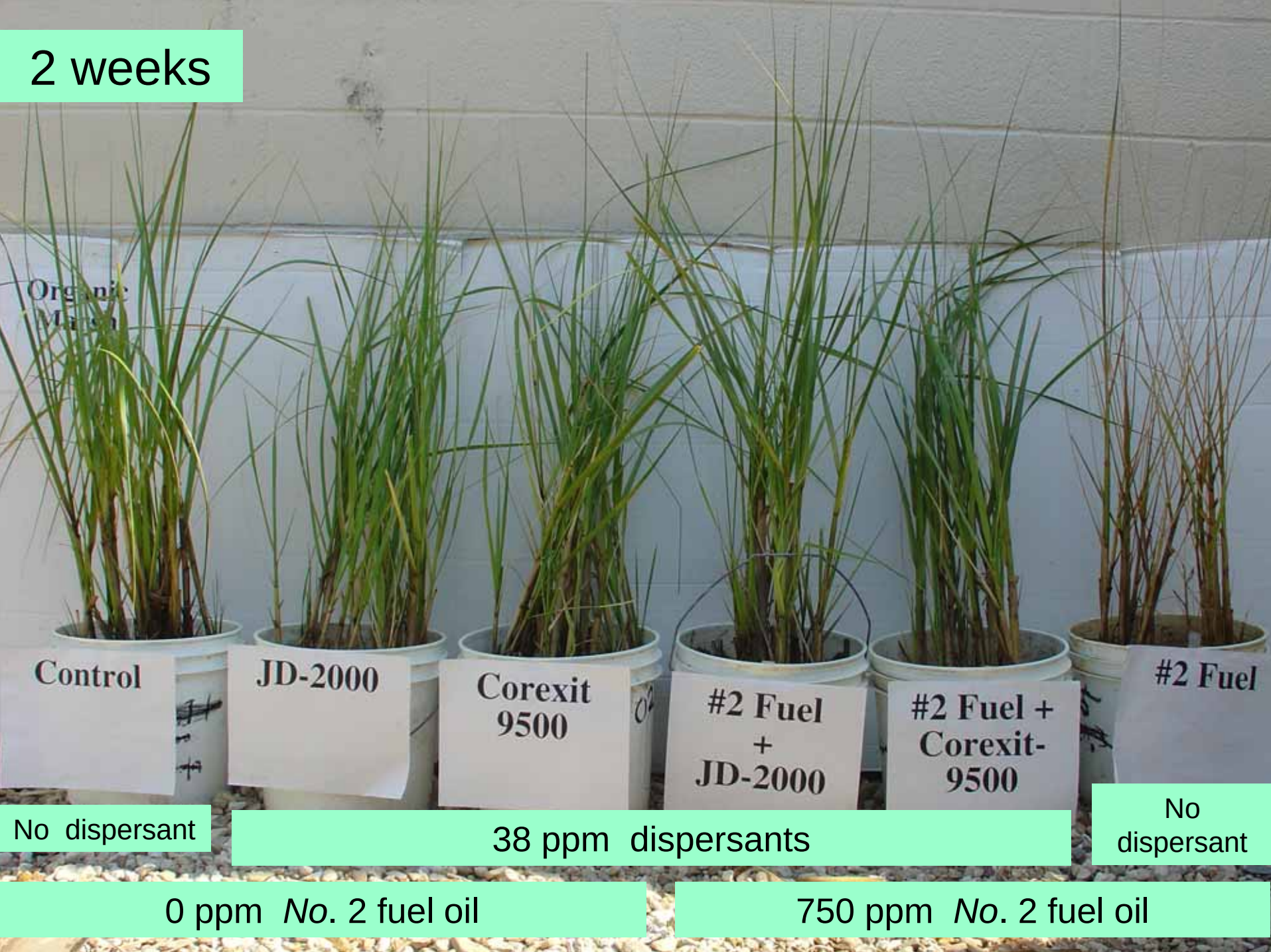
Mortality Rates

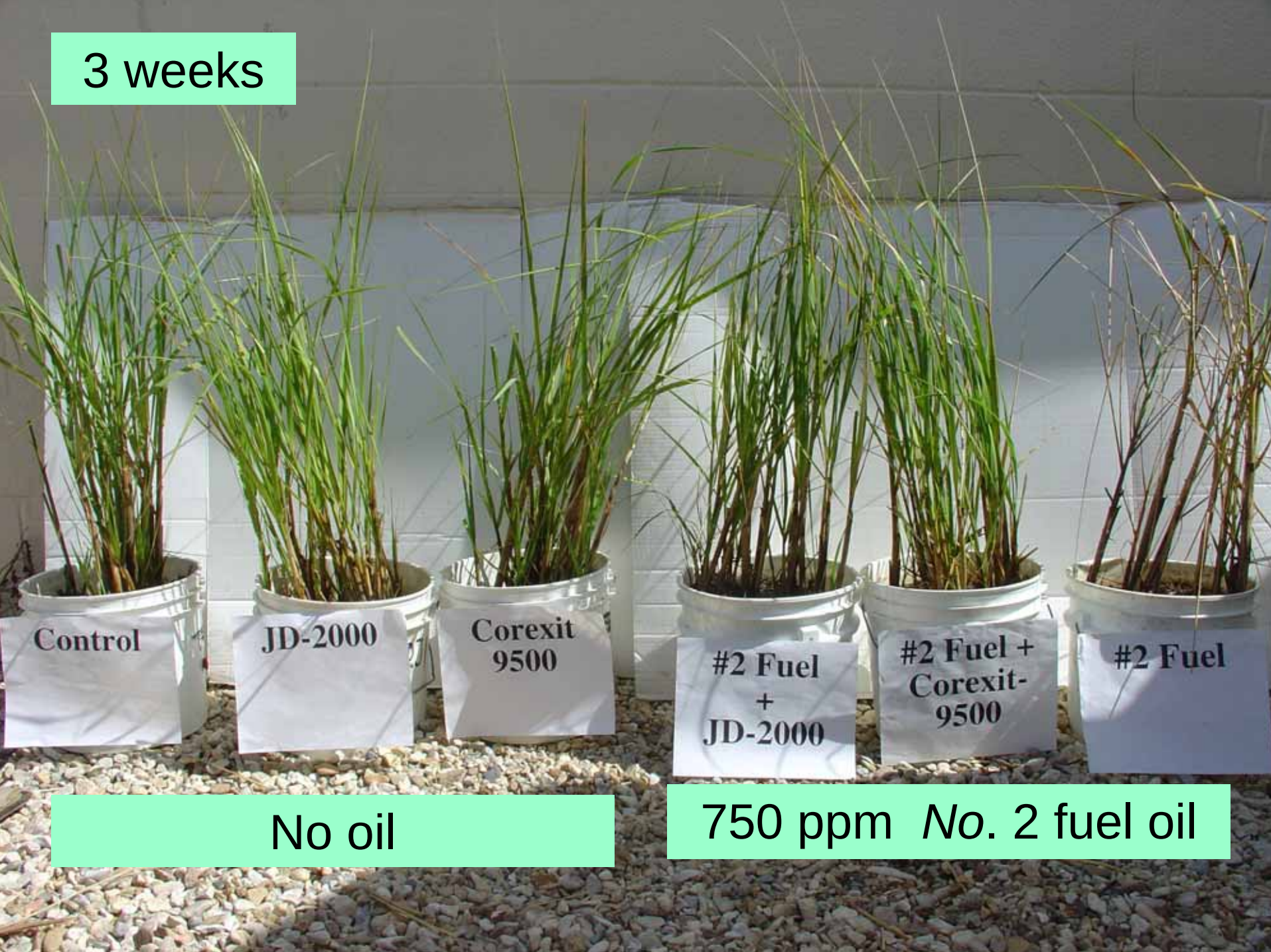


Stem Density (2 months)

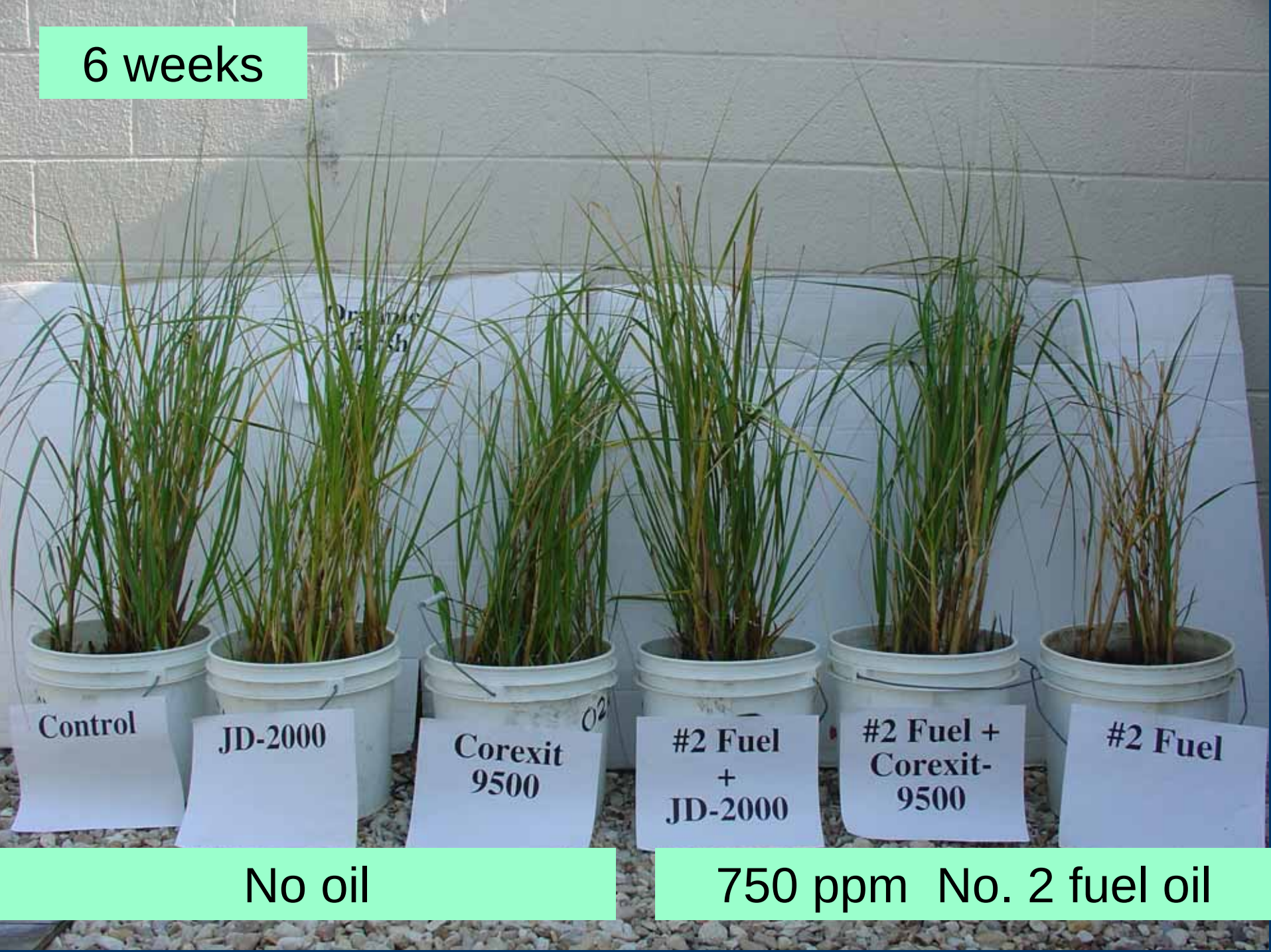


2. Effect and efficacy of simulated nearshore application of dispersants to **HIGH concentration (750 ppm)** fuel oil for coastal habitat protection

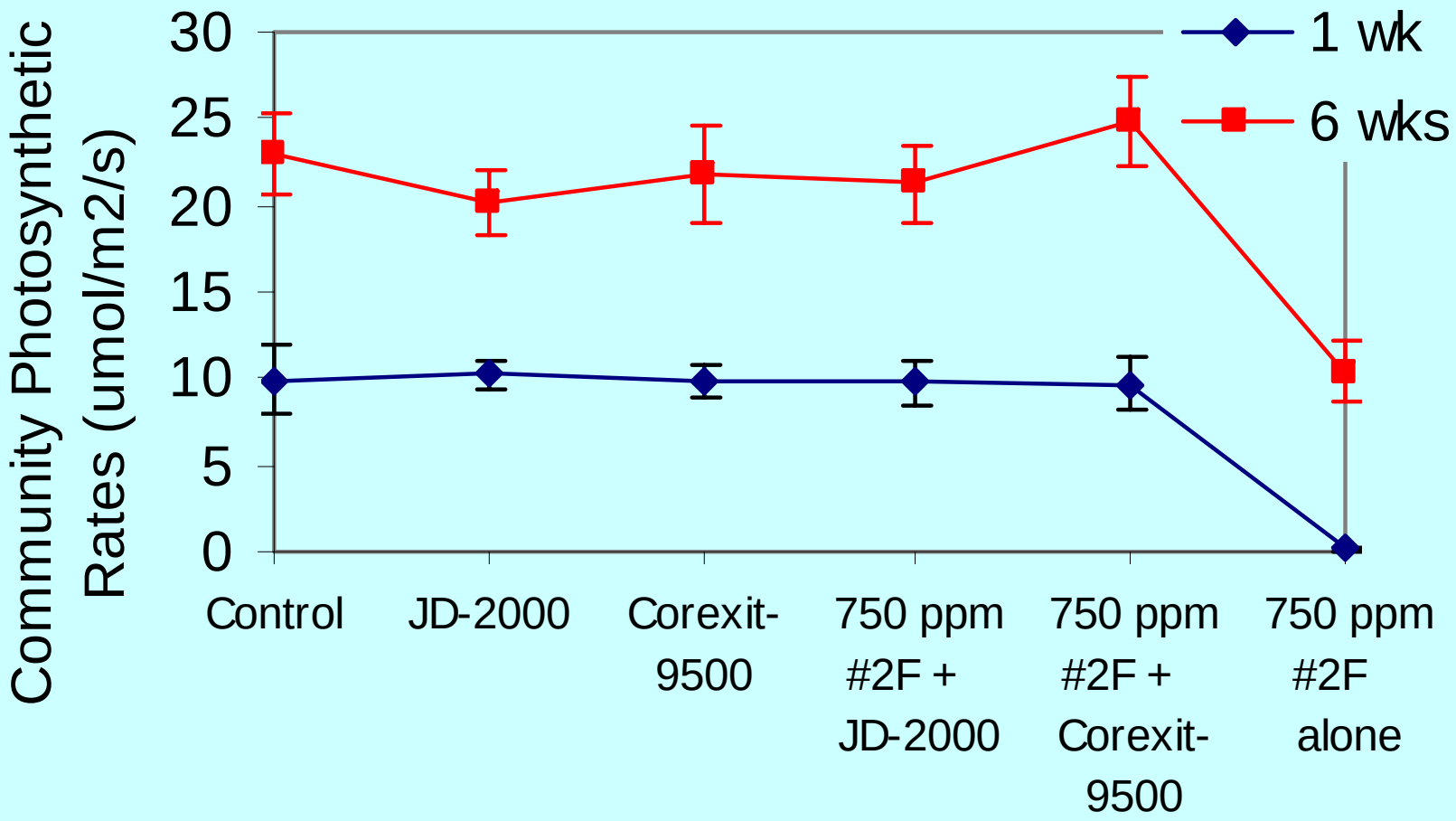

2 weeks
Control
JD-2000
Corexit 9500
#2 Fuel + JD-2000
#2 Fuel + Corexit-9500
#2 Fuel
No dispersant
38 ppm dispersants
No dispersant
0 ppm *No*. 2 fuel oil
750 ppm *No*. 2 fuel oil


3 weeks
Control
JD-2000
Corexit 9500
#2 Fuel + JD-2000
#2 Fuel + Corexit-9500
#2 Fuel
No oil
750 ppm *No*. 2 fuel oil

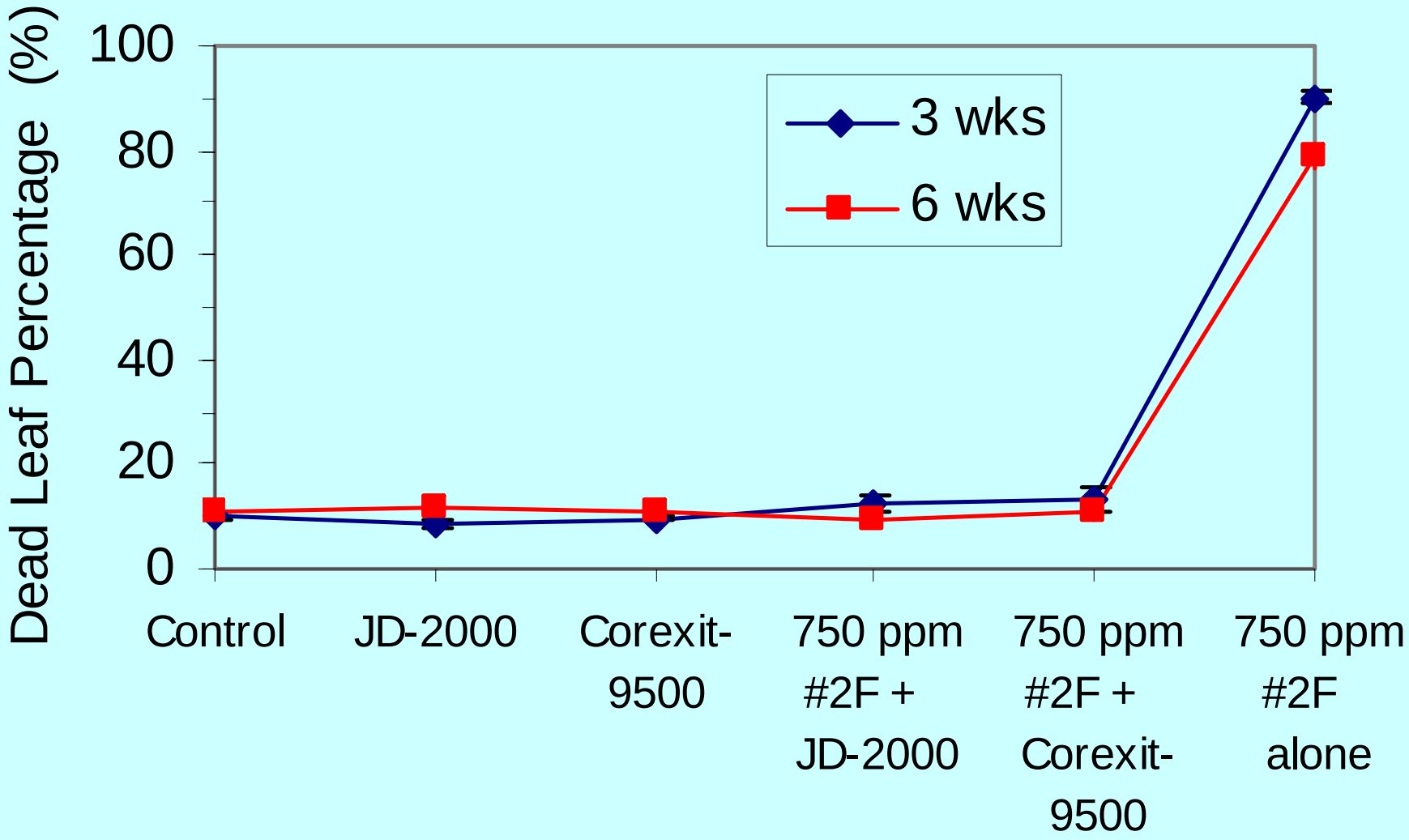

Control
JD-2000
Corexit 9500
JD-2000 + 750 ppm
Corexit 9500 + 750 ppm
750 ppm No. 2


6 weeks
Control
JD-2000
Corexit 9500
#2 Fuel + JD-2000
#2 Fuel + Corexit-9500
#2 Fuel
No oil
750 ppm No. 2 fuel oil

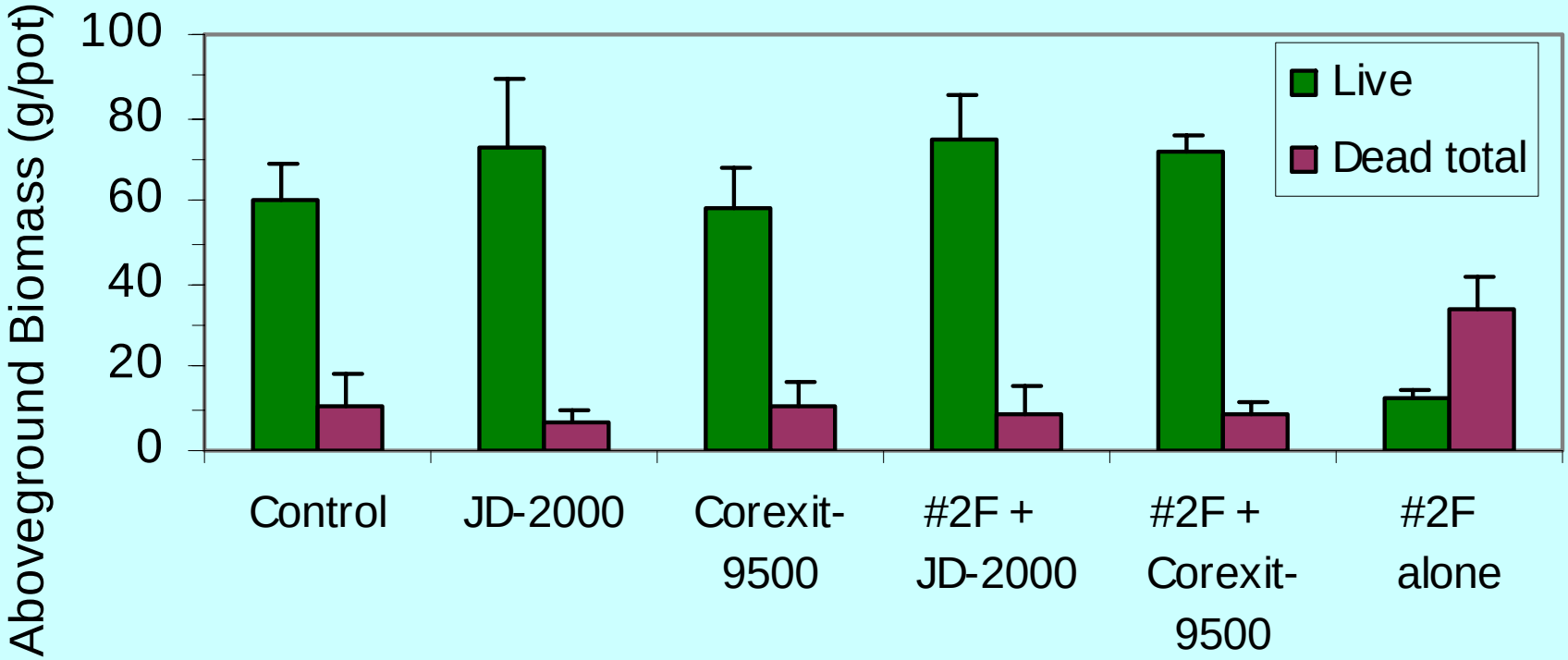
Community Photosynthetic Rates



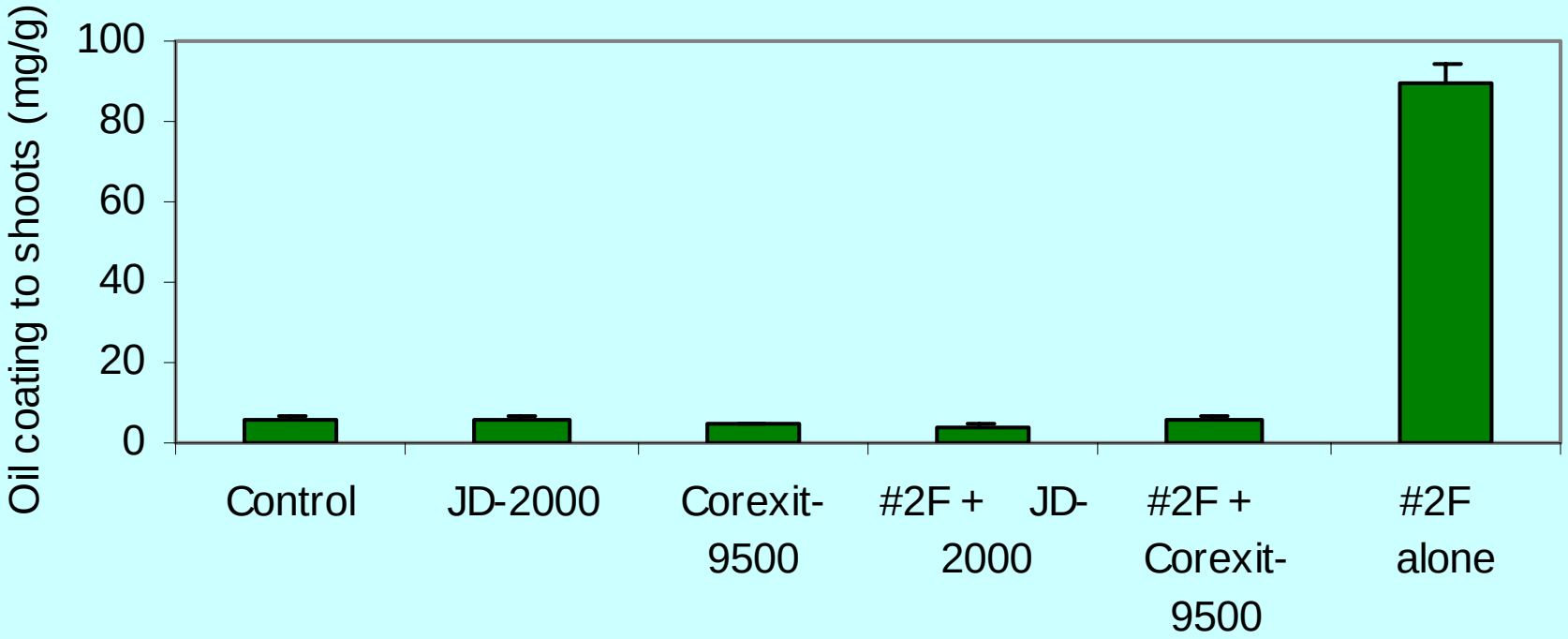
Mortality Rates



Aboveground Biomass (2 months)



No. 2 fuel oil coated to shoots at 750 ppm treatment



Summary

- Simulated nearshore dispersant application to low concentrations of *No.* 2 fuel oil indicated that both JD-2000 and Corexit-9500 greatly relieved coating impacts of the oil to salt marsh plants. However, without dispersant application, impact of *No*. 2 fuel oil on *Spartina alterniflora* was significant even at the concentration of 150 ppm.

Summary continued……

- Simulated nearshore dispersant application to high concentrations of *No.* 2 fuel oil indicates that JD-2000 and Corexit-9500 also greatly relieved impacts of the oil to salt marsh plants. Without dispersant application, impact of the oil at high concentration to the plant was much more severe than that of the low concentration.

Summary continued……

- The mechanisms of dispersants relieving oil impact to salt marsh plants appear to reduce the oil adhesion to plant leaf surfaces when dispersants are applied. Dispersing effectiveness seems to be more important for relieving oil impact to plants than the toxicity of dispersants because of the low ratio of dispersants applied to oil.

Acknowledgement

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