Effectiveness of Dispersants as Crude Oil Spill Countermeasures for Sensitive Coastal Habitat Protection

Qianxin Lin and Irving A. Mendelssohn

Wetland Biogeochemistry Institute
School of the Coast and Environment
Louisiana State University
Baton Rouge, LA 70803, USA

Objectives

- Compare the effectiveness of “recently marketed” dispersants for relieving the oil impacts to coastal 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 crude for coastal habitat protection

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

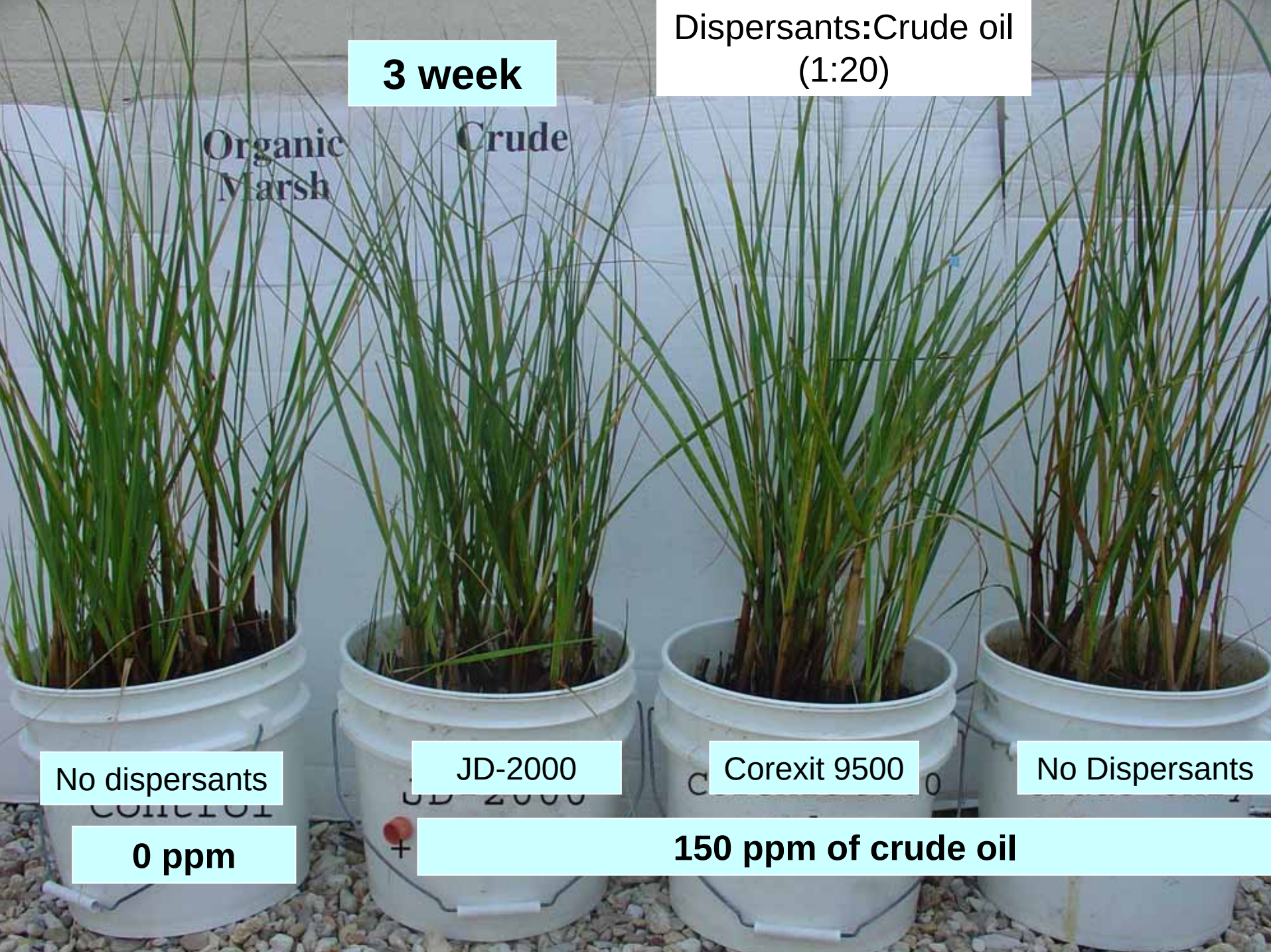
NCP Product Schedule-Listed Dispersants:

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

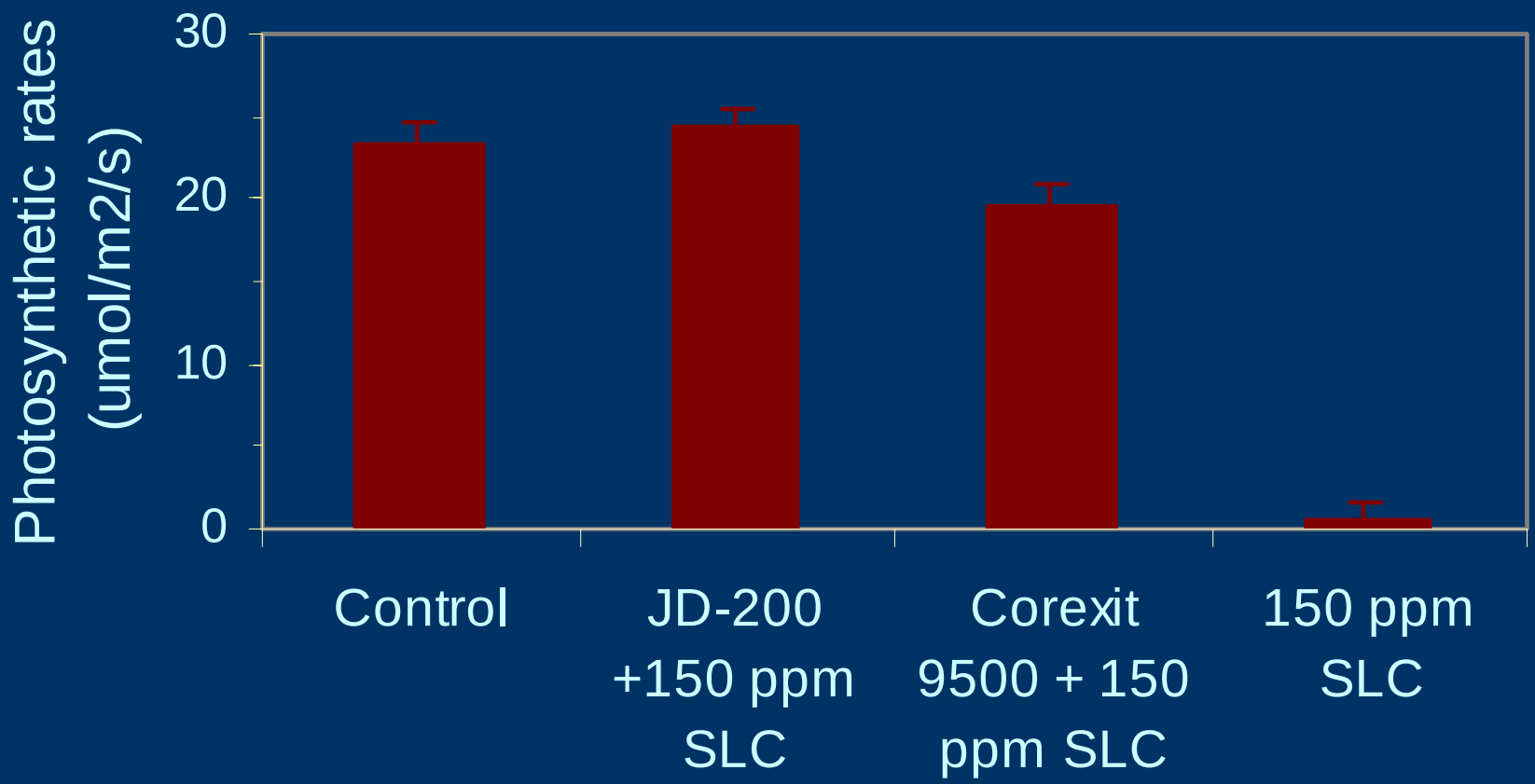
- **JD-2000 (Vopak):**
  Effectiveness: 84.1% for SLC (swirling flask test)
  $LC_{50\text{-}48hr}$: 90.5 ppm for *Mysidopsis bahia*

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

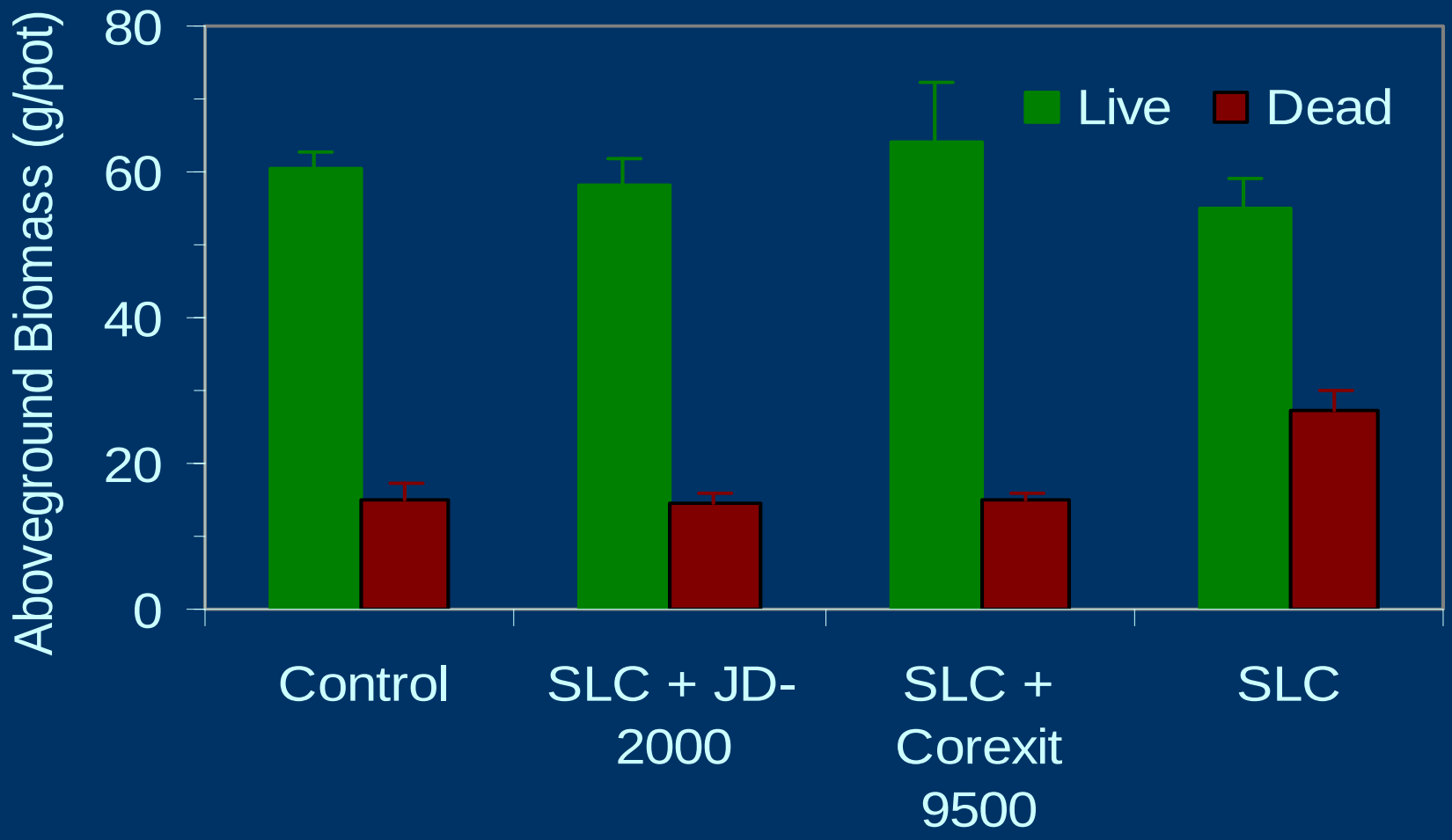

3
M2
FkM1
M1


3 week
Dispersants:Crude oil
(1:20)
Organic
Marsh
Crude
No dispersants
JD-2000
Corexit 9500
No Dispersants
0 ppm
150 ppm of crude oil

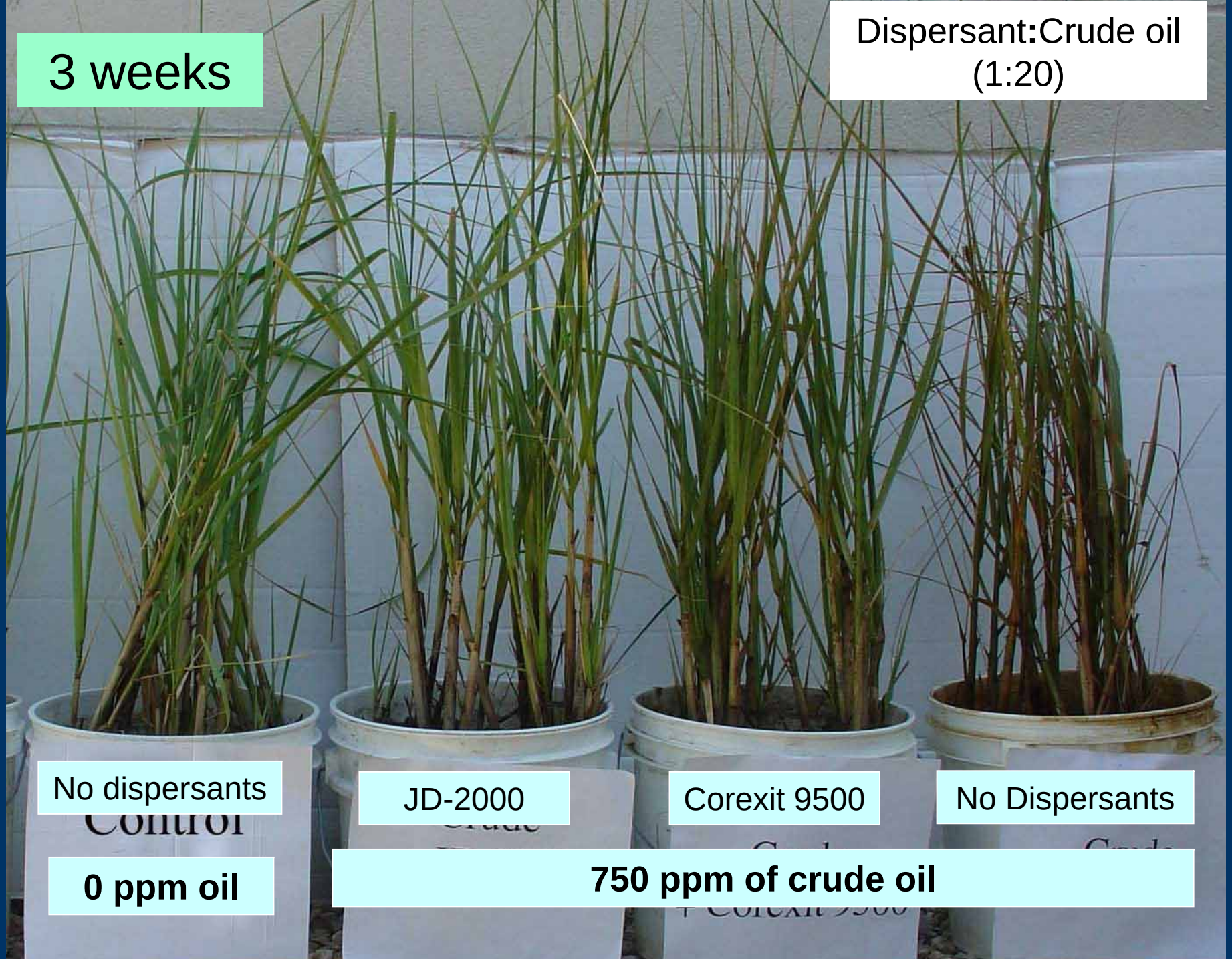
Effect of dispersants and 150 ppm of SLC on single leaf photosynthetic rate (1 week)



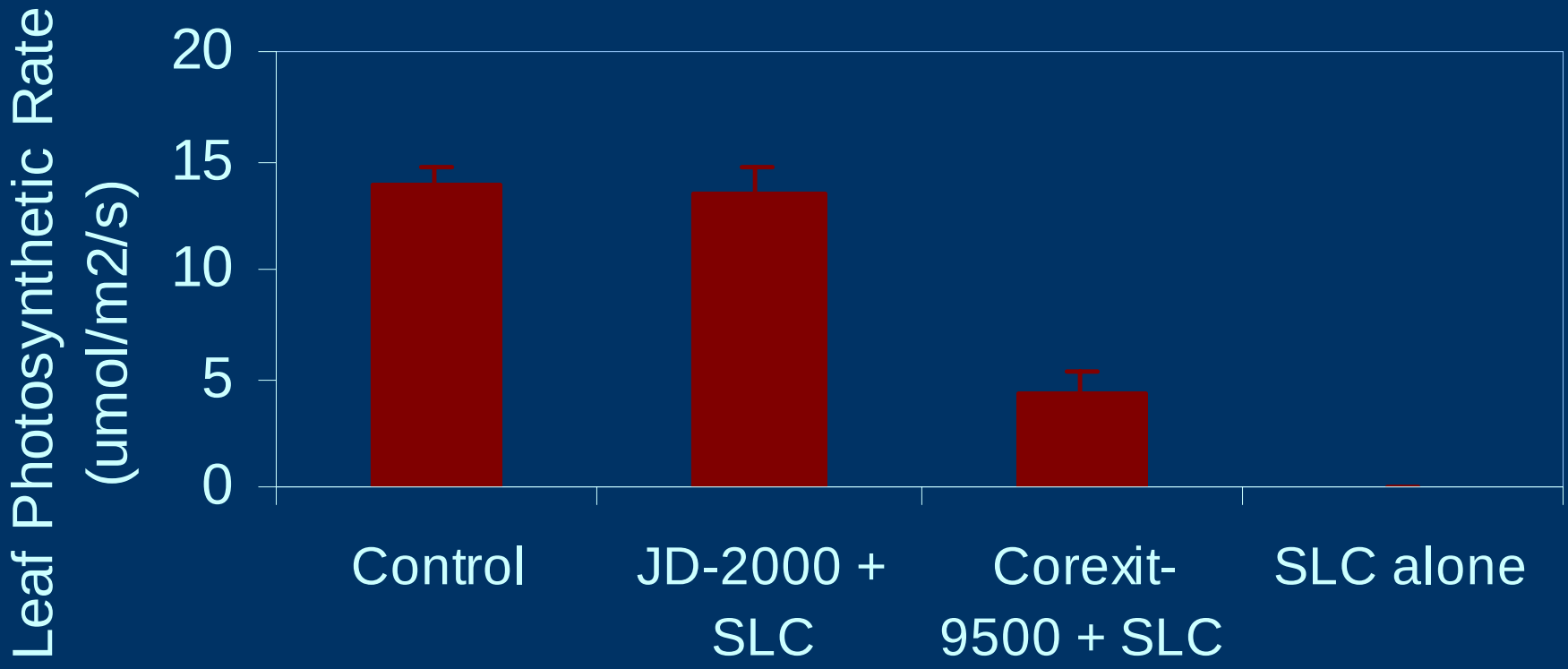
Effect of dispersants and 150 ppm of SLC on aboveground biomass (2 months)



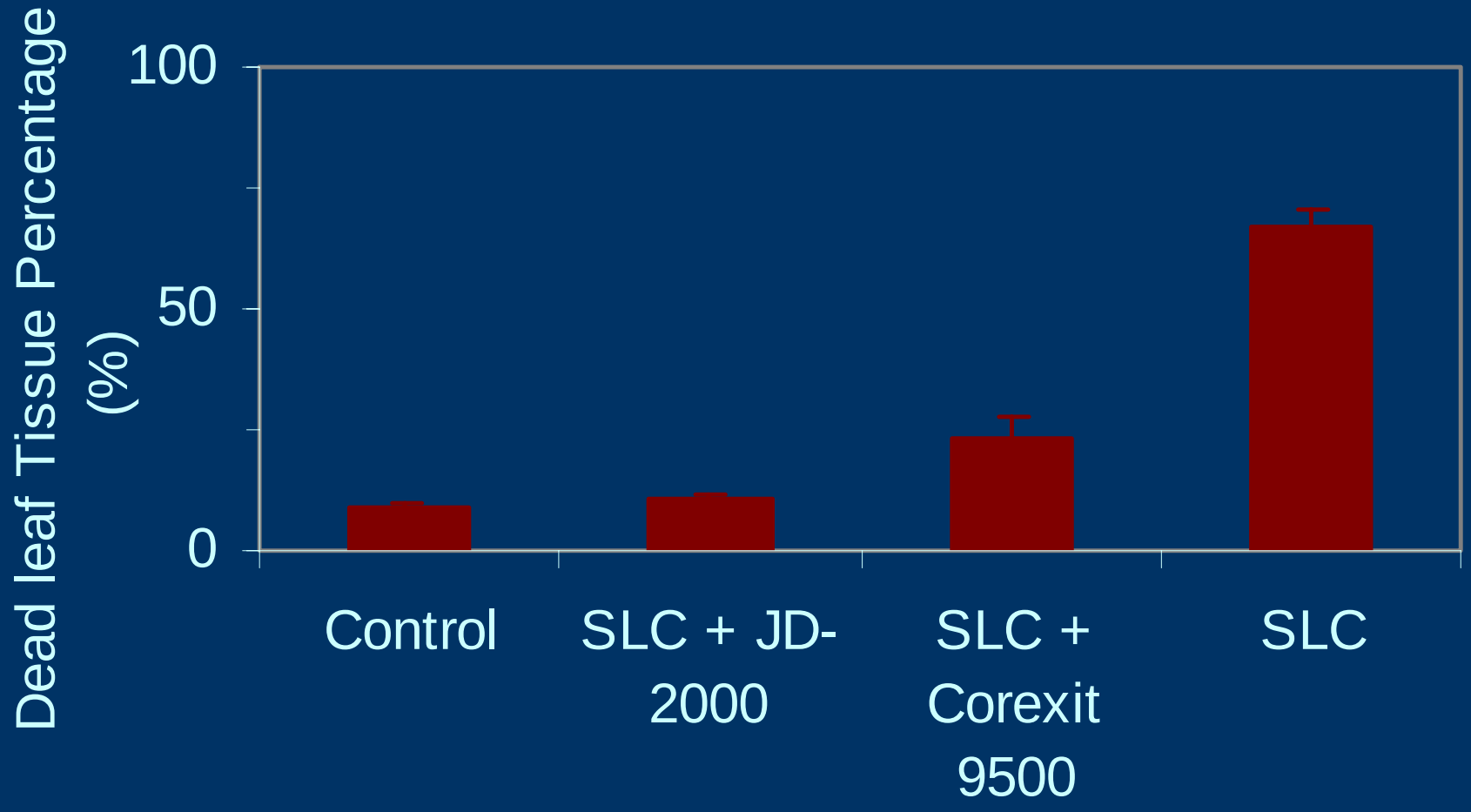
2. Effect and efficacy of simulated nearshore application of dispersants to **HIGH concentration (750 ppm)** SLC oil for coastal habitat protection


3 weeks
Dispersant:Crude oil (1:20)
No dispersants
JD-2000
Corexit 9500
No Dispersants
0 ppm oil
750 ppm of crude oil

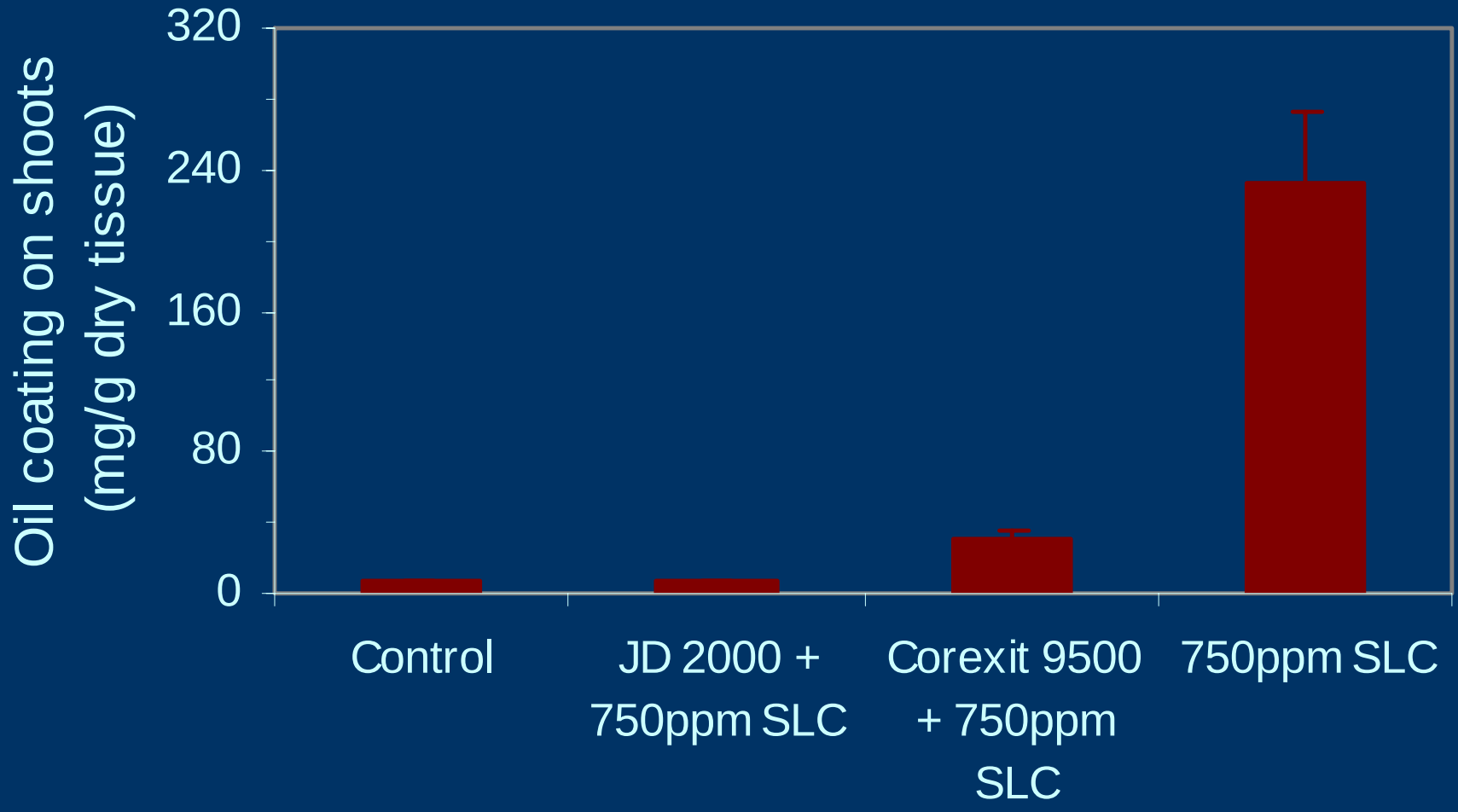
Effect of dispersants and 750 ppm of SLC on leaf photosynthetic rate (1 weeks)



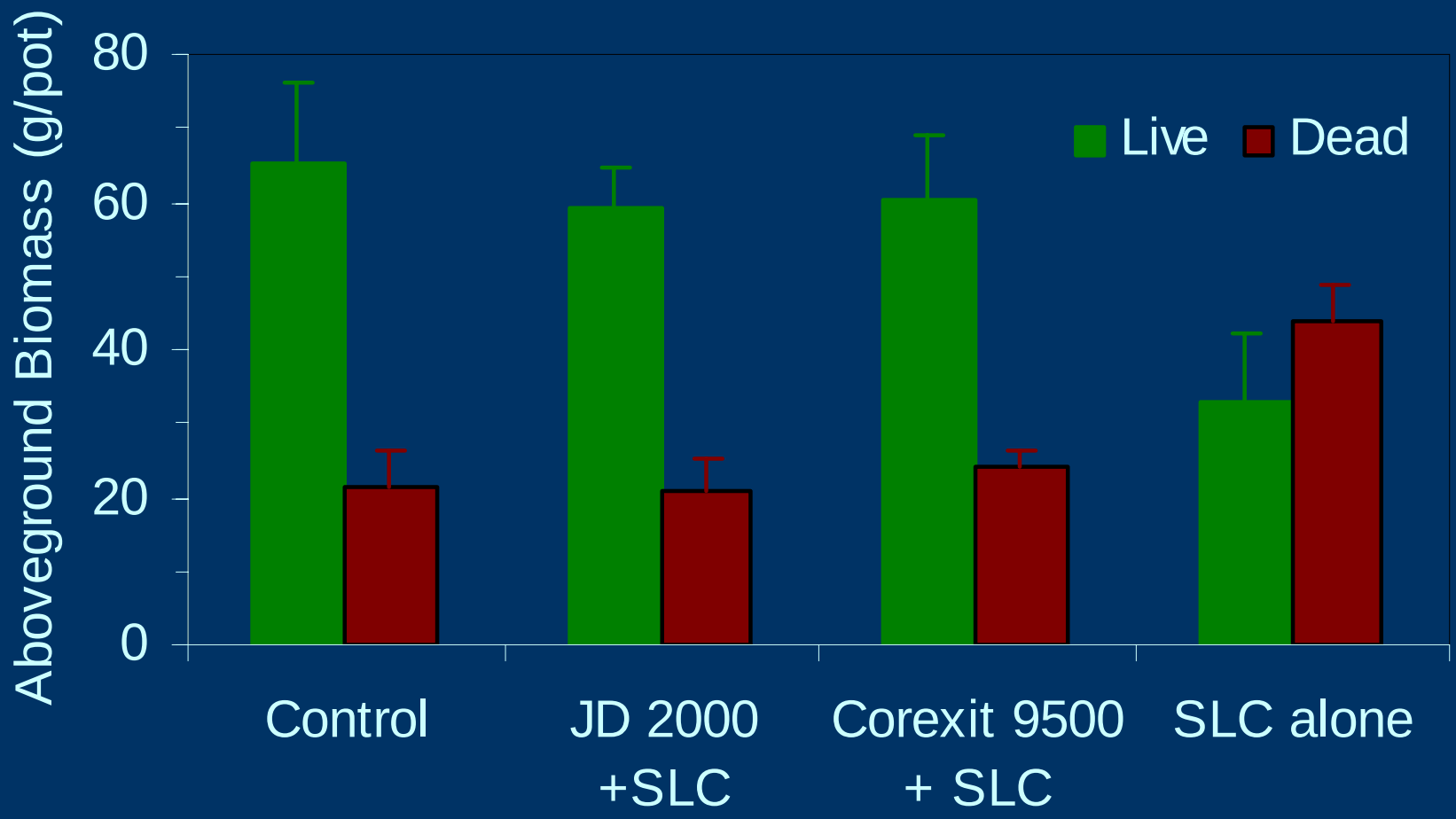
Effect of dispersants and 750 ppm of SLC on leaf mortality rates (3 weeks)



Effect of dispersants and 750 ppm of SLC oil coating to plant shoots



Effect of dispersants and 750 ppm of SLC on Aboveground Biomass (2 months)



Dispersion Effectiveness - 750 ppm

No dispersant | JD-2000 | Corexit 9500

Initial

3 Hrs

24 Hrs

Swirled at 24Hrs

Summary

- Simulated nearshore dispersant application to low concentrations of SLC oil indicates that both JD-2000 and Corexit-9500 greatly relieved coating impacts of the oil to salt marsh plants. JD-2000 appeared to have a greater protection for marsh plants than Corexit 9500 in terms of photosynthetic rates. However, without dispersant application, impacts of SLC to plants were significant.

Summary continued……

- Simulated nearshore dispersant application to high concentration of SLC oil indicated that JD-2000 and Corexit-9500 also relieved impacts of the SLC oil to salt marsh plants. However, relief of impacts of crude oil by Corexit 9500 was not as great as JD-2000. Without dispersant application, impacts of the high concentration of SLC oil to plants were severe, and were much greater than those of the low concentration.

Summary continued……

- Dispersants relieving oil impact to salt marsh plants are most likely to reduce the oil adhesion to plant leaf surface and soil. JD-2000 appears to be better than the Corexit-9500 in terms of relieving the impacts of oil to plants and dispersion effectiveness.

Acknowledgement

Funding for this project was provided by the Coastal Response Research Center (www.crrc.unh.edu)

We also thank Bob Potts of Ondeo Nalco Energy Services and Joannie Docter of GlobaMark Resources for providing the Corexit-9500 and JD-2000 samples.