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

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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$_{50-48hr}$: 32.2 ppm for *Mysidopsis bahia*

- **JD-2000 (Vopak):**
  - Effectiveness: 84.1% for SLC (swirling flask test)
  - LC$_{50-48hr}$: 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 week

No dispersants
0 ppm

Organic Marsh

Crude

Dispersants: Crude oil (1:20)

JD-2000

Corexit 9500

No Dispersants

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

Photosynthetic rates (umol/m²/s)

Control
JD-200 +150 ppm SLC
Corexit 9500 + 150 ppm SLC
150 ppm SLC
Effect of dispersants and 150 ppm of SLC on aboveground biomass (2 months)

Aboveground Biomass (g/pot)

- Control
- SLC + JD-2000
- SLC + Corexit 9500
- SLC

Live - Dead
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

0 ppm oil

JD-2000

750 ppm of crude oil

Corexit 9500

No Dispersants
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)

Dead leaf Tissue Percentage (%)

- Control
- SLC + JD-2000
- SLC + Corexit 9500
- SLC
Effect of dispersants and 750 ppm of SLC oil coating to plant shoots

Oil coating on shoots (mg/g dry tissue)

- Control
- JD 2000 + 750 ppm SLC
- Corexit 9500 + 750 ppm SLC
- 750 ppm SLC
Effect of dispersants and 750 ppm of SLC on Aboveground Biomass (2 months)
### Dispersion Effectiveness - 750 ppm

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>3 Hrs</th>
<th>24 Hrs</th>
<th>Swirled at 24 Hrs</th>
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</thead>
<tbody>
<tr>
<td>No dispersant</td>
<td>JD-2000</td>
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<tr>
<td></td>
<td></td>
<td>81%</td>
<td>42%</td>
<td>90%</td>
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<tr>
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<td></td>
<td>28%</td>
<td>6%</td>
<td>13%</td>
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</tbody>
</table>

Initial: 750 ppm dispersion effectiveness comparison across different conditions.
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.
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.
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

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