

CRRC Progress Report for the period 7/1/04 through 12/31/04

Project Title:

Dispersants as an Oil Spill Countermeasure for Remediation and Restoration in Sensitive Coastal Habitats

Principal Investigator(s):

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I. Accomplishments

A. Scheduled Tasks

- (1) Effects and efficacy of dispersant application in nearshore environments on *No. 2* fuel oil impact to salt marsh plants, microbes and oil remediation in different marsh types during a plant active growing season (early summer)
- (2) Effect of different dispersants on *No. 2* fuel oil adsorption to different marsh soil types

B. Progress on Tasks

During this reporting period, intact soil sods of salt marsh dominated by *Spartina alterniflora* in both clay and sandy substrates were extracted from coastal marshes. Using intact, un-disturbed marsh sods as experimental units would ensure results more similar to the field situation. The experiment was to simulate the application of dispersants on oil spilled in the near-shore, shallow water or estuarine environments before the oil contacts coastal marsh habitats. The following treatments were randomly applied: (1) Dispersant application - no dispersant, dispersant Corexit 9500 and dispersant JD-2000, and (2) Marsh types - clay and sand soil substrates. Weathered *No. 2* fuel oil (20% v/v) was applied to all the above treatments. In addition, treatments receiving neither oil nor dispersants were served as the overall control. Thus, the experimental design was a completely randomized design with a 4x2 factorial treatment arrangement (4 dispersant and oil combination treatments and 2 marsh types). One hundred fifty ppm weathered *No. 2* fuel oil dispersed in the water column (1:20 ratio of dispersant to oil) was used.

We simulated nearshore dispersed oil moving in and out of coastal marshes by generating a tide with either 150 ppm *No. 2* fuel or 150 ppm dispersed *No. 2* fuel in seawater so that the plant shoots was covered for a 30-minute period. Then, the water receded to 10 cm above the soil surface for the rest of 12-hr high tide period. For the 12-hr low tide, the water table will be at 10 cm below the soil surface. The effects of dispersants and dispersed *No. 2* fuel oil on responses of plants, soil microbes, and oil remediation were determined.

C. Difficulties Encountered

No major problems encountered except delaying a signed contract until March 2004.

D. Anticipated Success in Meeting Project Objectives in Scheduled Project Period

We have met the Scheduled Project Period.

E. Preliminary data (incorporate in text)

Dispersant application simulation in nearshore environment greatly reduced the detrimental effect of oil on salt marsh plants. The stems and leaves of the plants were exposed to No. 2 fuel oil at the concentration of 150 ppm with or without the dispersant JD-2000 or Corexit 9500 during the simulated high tide. No. 2 fuel without the dispersants substantially impacted the salt marsh plant *Spartina alterniflora* (Fig. 1).

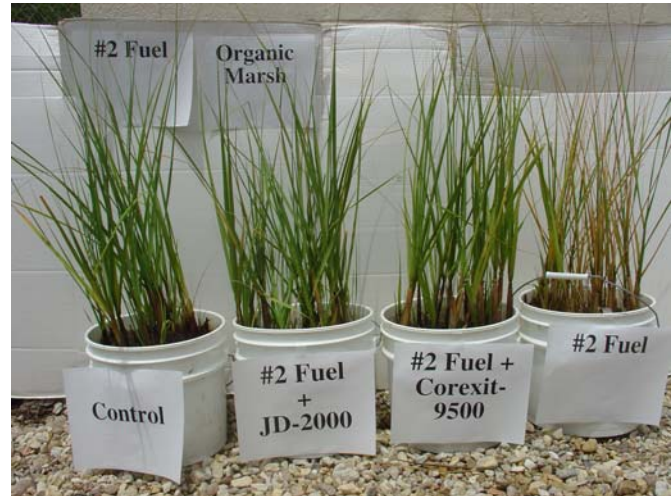


Fig. 1. Effects of dispersants JD-2000 and Corexit 9500 on 150 ppm of No. 2 fuel oil impact to the salt marsh grass, *Spartina alterniflora*, one week after the treatment.

Plant photosynthetic rates were measured to determine if treatments impacted plants. Photosynthetic rates of *Spartina alterniflora* were significantly lower in the treatment receiving No. 2 fuel oil without dispersants than the treatments receiving the JD-2000 or Corexit 9500 dispersed No. 2 fuel (Fig. 2). However, photosynthetic rates of *Spartina alterniflora* in the treatments receiving JD 2000 or Corexit 9500 dispersed No. 2 fuel were not significantly different from the control, suggesting that dispersants JD 2000 and Corexit 9500 greatly relieved the impact of fuel oil on the plant aboveground components.

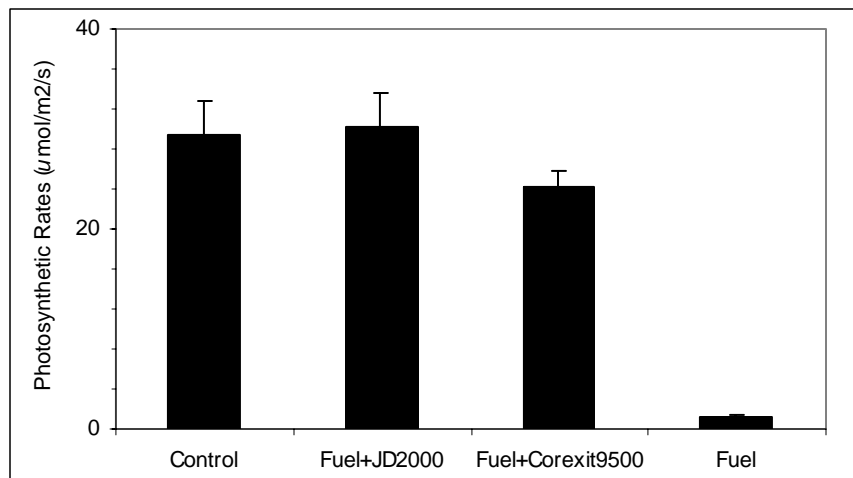


Fig. 2. Effects of dispersants on No. 2 fuel oil impact on photosynthetic rates of *Spartina alterniflora* one month after the treatments.

F. Manuscripts, Reports, Presentations

A manuscript has been submitted and accepted for *Proceedings of the 2005 International Oil Spill Conference*. An oral presentation has been scheduled in the International Oil Spill Conference in May 2005. In addition, a presentation has been scheduled for the NOAA Workshop in March 2005 in Baltimore, MD.

II. Tasks and activities for next reporting period

A. Tasks for the next reporting period

For the next reporting period, the effects and efficacy of application of different dispersants in nearshore environments on *No. 2* fuel oil impact to salt marsh plants, microbes and oil remediation in different marsh types during a plant inactive growing season (late fall) will be investigated.

B. Work plan to accomplish tasks

During the next reporting period, intact soil sods of salt marsh dominated by *Spartina alterniflora* in both clay and sand substrates will be collected from coastal marshes to study the effects of dispersants on coastal marshes during a plant inactive growing season (late fall). The following treatments will be randomly applied: (1) Dispersant application - no dispersant, dispersant Corexit 9500 and dispersant JD-2000, and (2) Marsh types - organic and sand soil substrates. Weathered *No. 2* fuel oil (20% v/v) will be applied to all the above treatments. The experimental design is a completely randomized design with a 4x2 factorial treatment arrangement (4 dispersant and oil treatments and 2 marsh types). One hundred fifty ppm weathered *No. 2* fuel oil dispersed in the water column (1:20 ratio of dispersant to oil) will be used to compare with undispersed *No. 2* fuel oil. The short-term and long-term effects of dispersants and dispersed fuel oil on the responses of plants, soil microbes, and oil remediation will be determined.

B. Concerns or difficulties

No major difficulties occur.

III. Expenditures

(Note: Each institution's grants office responsible for submitting financial reports, so all you need to do in this section is to state whether or not expenditures were in the range anticipated for the work accomplished to date)

Yes, expenditures were in the range anticipated for the work accomplished to date.