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## Bioremediation Mechanism for Oil Spills

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### Why in News

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The **National Institute of Ocean Technology (NIOT)**, Chennai has developed an **eco-friendly crude oil bioremediation mechanism technology** using consortia (group of two or more species) of marine microbes **wheat bran (WB)** immobilized (**microbes controlled degradation**) on agro-residue bacterial cells.

**Wheat bran** is the hard outer layer of the **wheat** kernel. It's stripped away during the milling process.

### Key Points

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## Eco-friendly Crude Oil Bioremediation Mechanism Technology

- **Bioremediation:** It can be defined as any process that uses microorganisms or their enzymes to remove and or **neutralize contaminants within the environment to their original condition.**
- In the marine ecosystem, deep sea **hydrocarbonoclastic** (ability to degrade hydrocarbon) microbial consortium plays an important role in breaking down **oil in the event of a spill.**
  - The microbial community serves as **energetic primary degraders** of a complex mixture of petroleum hydrocarbons into various aldehydes, ketones and acidic metabolites.
  - These hydrocarbon degrading bacteria don't depend on hydrocarbons for survival, but have a metabolic mechanism where they use petroleum products as **carbon and energy source** and thus, help cleaning up oil spills.
  - The **complete breakdown and degradation** of crude oil is achievable using **wheat bran marine bacterial consortia** (which are **low-cost non-toxic** agro-residues) in an environmentally sustainable manner.
- **Advantages of Immobilized State:**
  - They are more **effective in their immobilised state** than the free bacteria cells in degrading the oil spills.

They could remove 84% of the oils within 10 days. The free bacterial cells degraded a maximum of 60% of the crude oil at optimised conditions.
  - They are more **versatile and resistant** to adverse conditions.
  - They have **efficacy in treating accidental bulk discharge of oil** in marine environments through non-toxic clean-up technology.

## Oil Spill

- It is an **accidental/uncontrolled release** of crude oil, gasoline, fuels, or other oil by-products into the environment. Oil spills can pollute land, air, or water, though it is mostly used for oceanic oil spills.

The recent **MV Wakashio spill off Mauritius** — about 1,000 tonnes of oil spilled into a sanctuary for rare wildlife after the Japanese ship struck a coral reef in 2020.
- **Cause:** They have become a major environmental problem, chiefly as a result of **intensified petroleum exploration and production** on continental shelves and the transport of large amounts of oils in vessels.

- **Measure: Cleaning up of the oil spillage from the oceans without damaging the marine ecosystem** is becoming an increasingly challenging task.
  - **Containment Booms:** Floating barriers, called booms are used to restrict the spread of oil and to allow for its recovery, removal, or dispersal.
  - **Skimmers:** They are devices used for physically separating spilled oil from the water's surface.
  - **Sorbents:** Various sorbents (e.g., straw, volcanic ash, and shavings of polyester-derived plastic) that absorb the oil from the water are used.
  - **Dispersing agents:** These are chemicals that contain surfactants, or compounds that act to break liquid substances such as oil into small droplets. They accelerate its natural dispersion into the sea.

**Source: DTE**