BIORECLAIM

✦ SOIL BIOREMEDIATION ✦

CHALLENGES AND LIMITATIONS OF SOIL BIO-REMEDIATION

Total Petroleum Hydrocarbons – Gasoline Range (TPH-g) are relatively short hydrocarbons that easily evaporate and are flammable.

Total Petroleum Hydrocarbons – Diesel Range (TPH-d) are medium length hydrocarbons that don't evaporate as well as the smaller compounds, but do produce a lot of energy when burned. These compounds are sometimes referred to as "middle distillates."

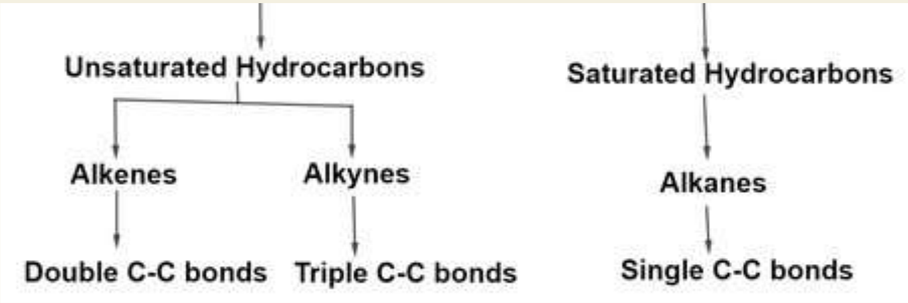
Total Petroleum Hydrocarbons – Oil Range (TPH-o) are larger hydrocarbons that don't evaporate and don't burn very well. They are commonly used to make lubricants and greases.

BTEX stands for benzene, toluene, ethylbenzene, and xylene. These are four specific compounds found in the **TPH-g category.** BTEX chemicals are used in many products.

Jet Propellant-5 (JP-5) is one type of jet fuel used by the military. It consists of many different hydrocarbons mostly in the **mid-sized (TPH-d) range.** JP-5 may also contain very small amounts of the smaller hydrocarbons in the **TPH-g category.** JP-5 does not contain lead.

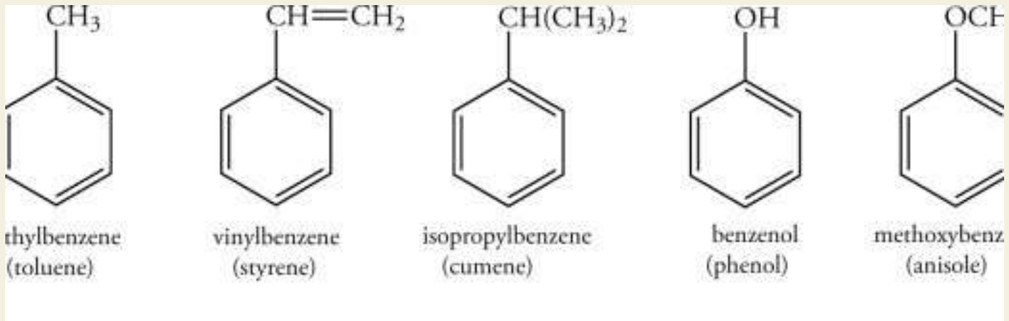
COMPLEX CONTAMINANTS

ALIPHATIC HYDROCARBONS



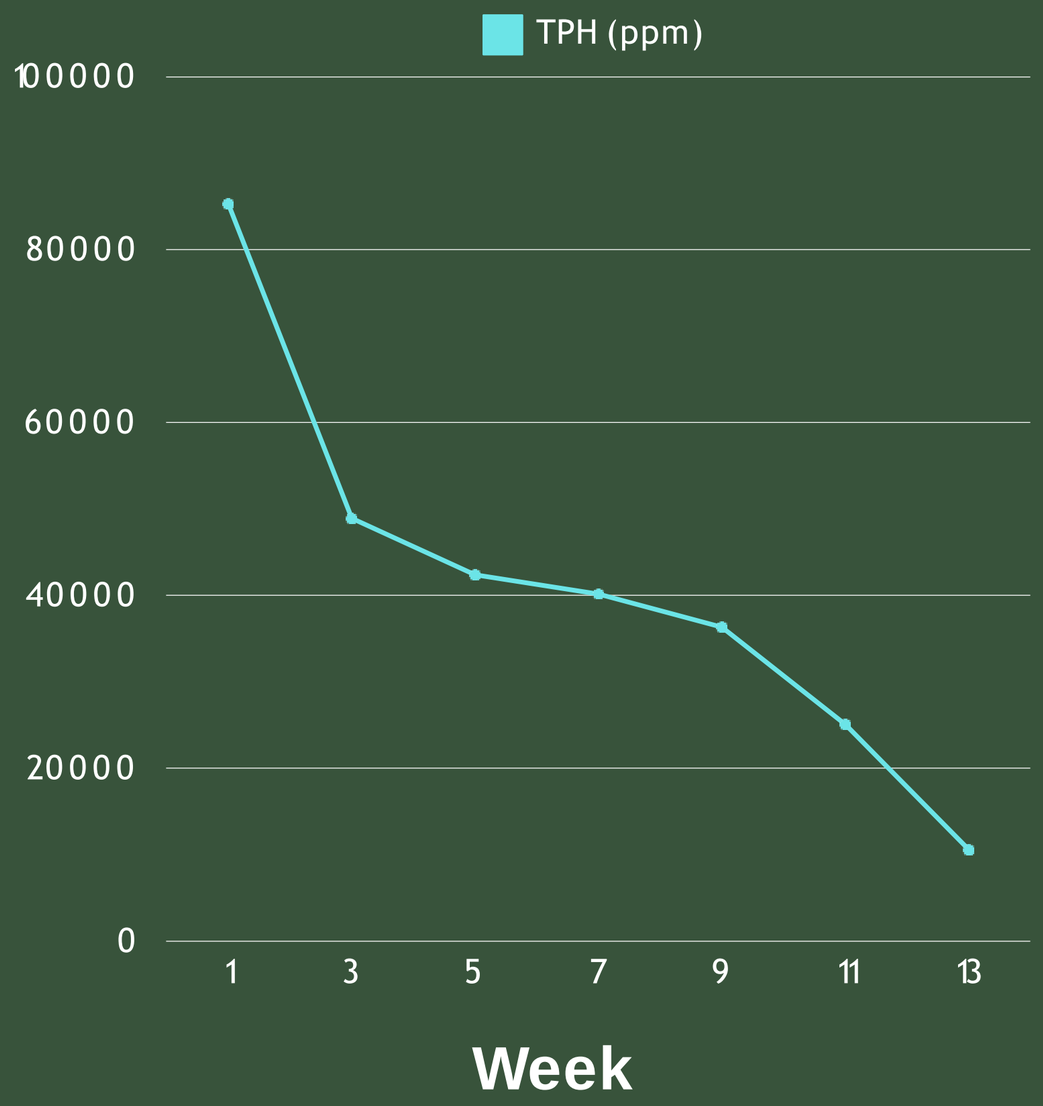
- More stable forms can be challenging to degrade.
- Due to the structure, they are more hydrophilic than aromatic hydrocarbons. Branched chain hydrocarbons may persist for longer durations.
- Are the first to be broken down and metabolized by microbes.

AROMATIC HYDROCARBONS



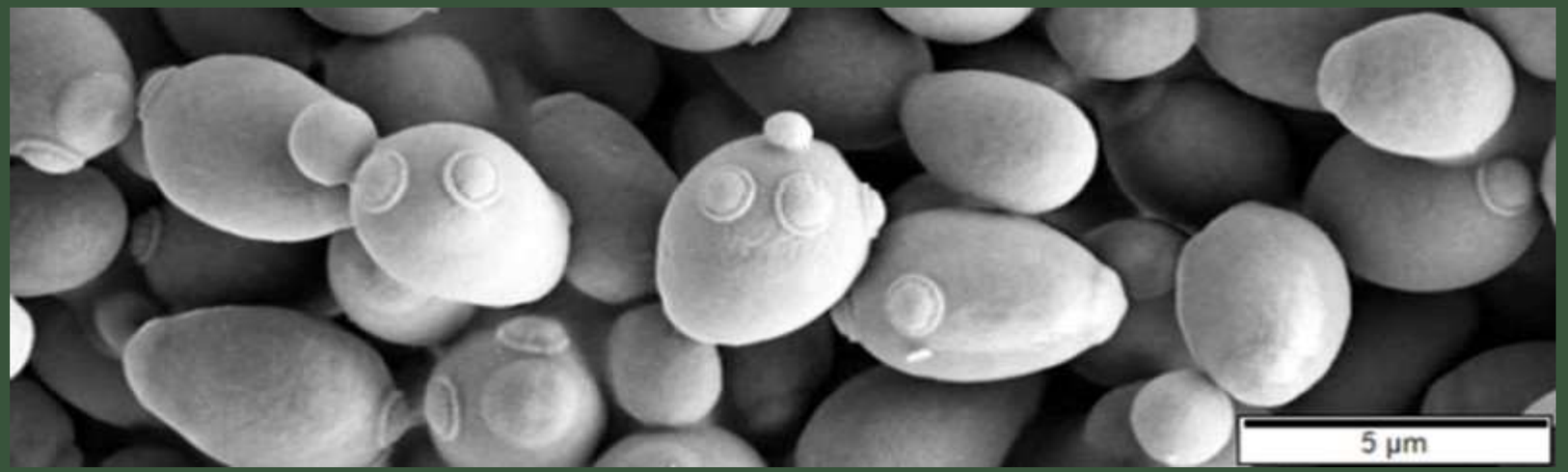
- Can be highly difficult to degrade due to greater inherent toxicity.
- High-molecular-weight PAHs are a major recalcitrant
- Fungi are more effective at breakdown of aromatic hydrocarbons

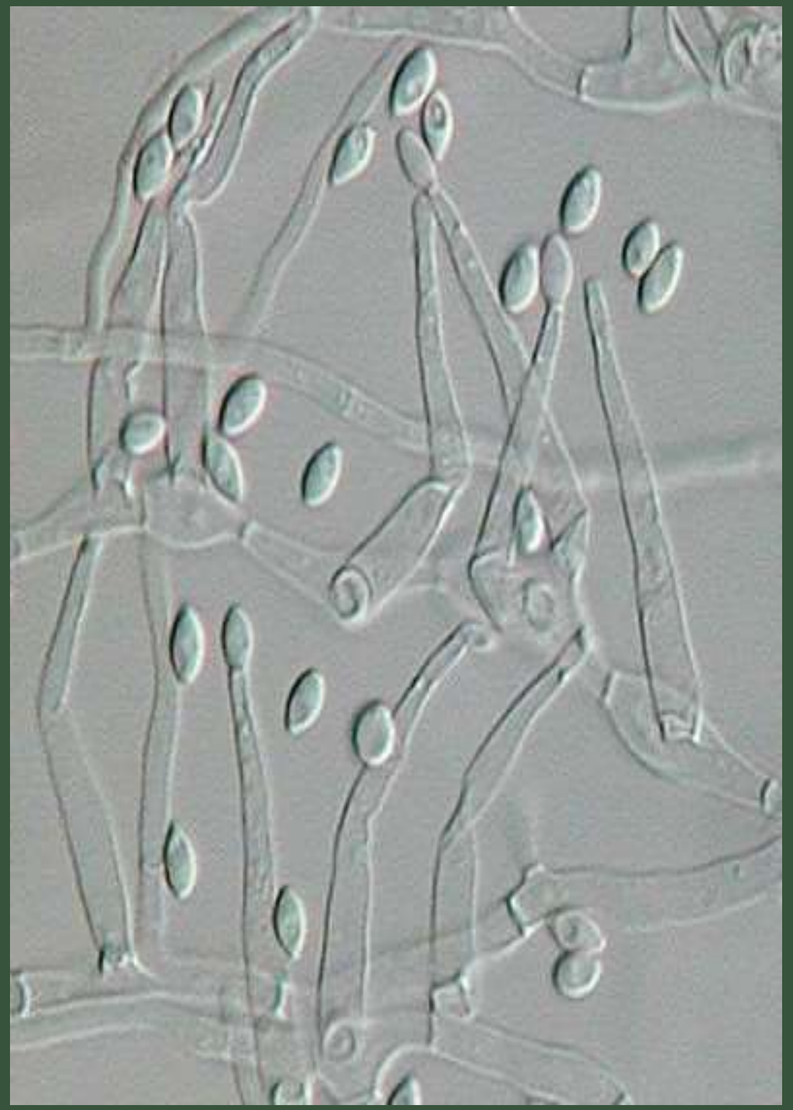
TPH-o reductions (Trial)



- Bioclean FOG dosed at 25 ppm
- Bioclean FOG+dosed at 5 ppm
- Duration: 13 weeks
- **Final reduction: 87.62 % reduction**

Our technology: Bioaugmentation





BIORECLAIM

EXPLORING THE ROLE OF MICROBES IN SOIL BIO-REMEDIATION THROUGH BIOCLEAN FOG

HIGHLY CONCENTRATED

Microbial formulation consisting of mainly **environmentally hardened 'bacteria'** which are effective at the breakdown of short-chain & long-chain branched and unbranched aliphatic hydrocarbons

TOXIN RESISTANT

Our formulation utilizes microbes that are tolerant to a multitude of soil toxins and by-products

ECONOMICAL

High-concentration, tough and built to withstand high toxicity with low application

BIORECLAIM

EXPLORING THE ROLE OF MICROBES IN SOIL BIO-REMEDIATION THROUGH BIOCLEAN FOG

AROMATIC HYDROCARBON DEGRADORS

Microbial formulation consisting of mainly bacteria, fungi which are effective at the breakdown of aromatic hydrocarbons.

ENHANCED WITH ENZYMES

Enriched with special enzyme systems for deeper scale treatment of soil.

IMPROVES SOIL QUALITY

Improves soil microbiome for agricultural purposes.

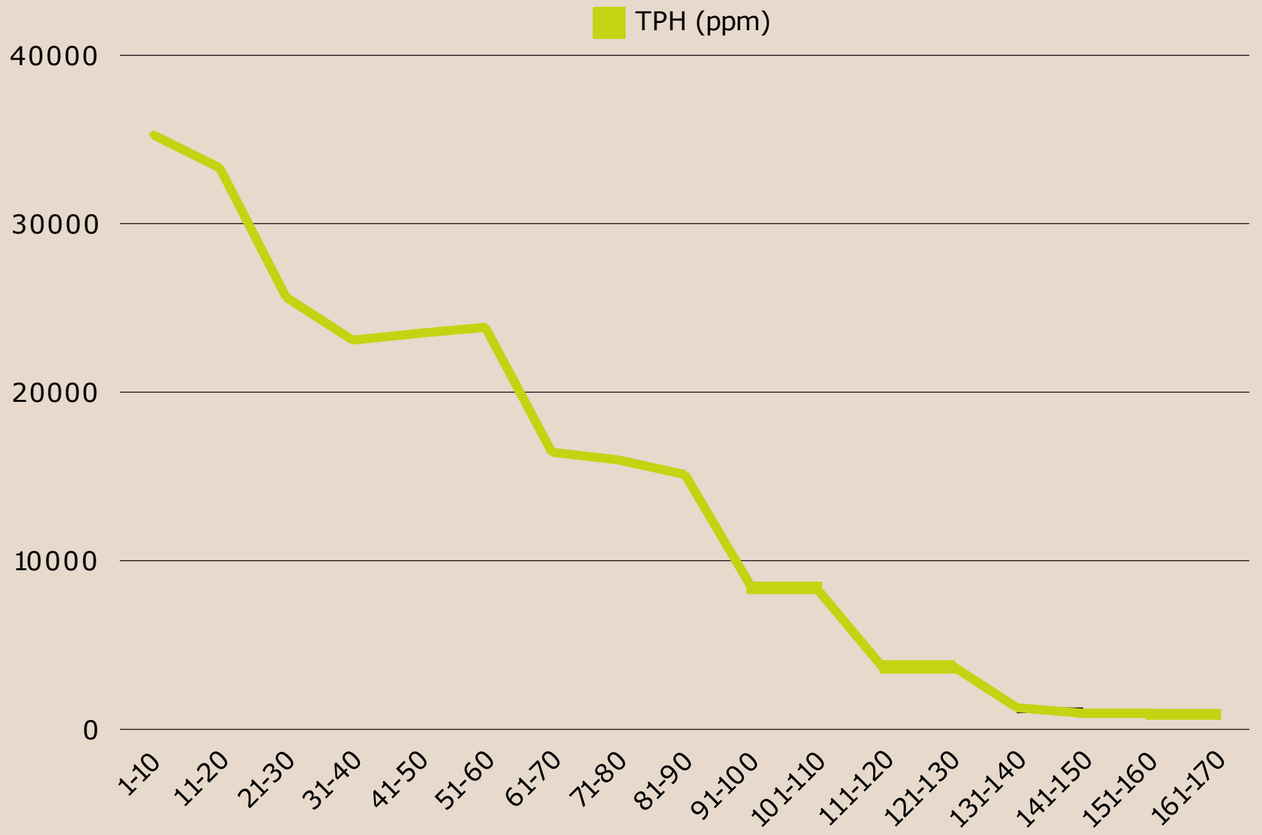
CASE STUDY 1

DILEX, NIGERIA

OVER 97% REDUCTION IN TPH LEVELS

BTEX SAMPLING SHOWED PRESENCE OF VOLATILE AROMATIC HYDROCARBONS.

ADEQUATE N AND P NUTRIENTS SUPPLIED.



CASE STUDY 1

DILEX, NIGERIA

EXCAVATION AT
POLLUTED SITE

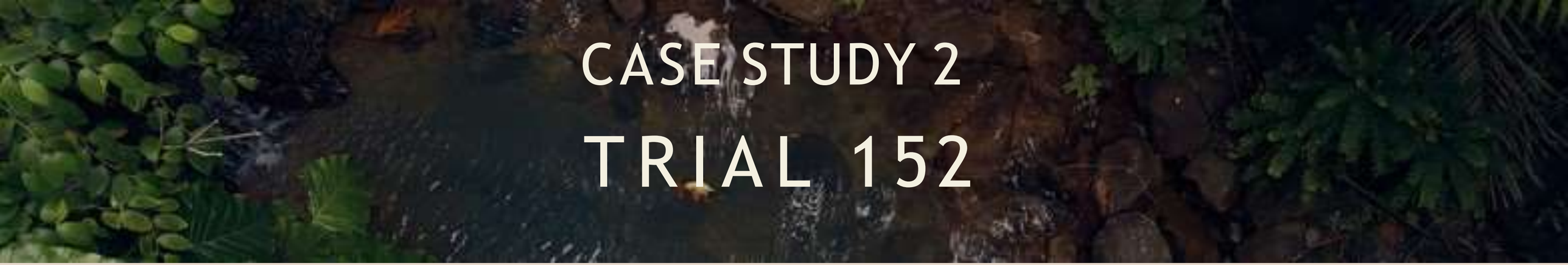
GROWTH OF PLANTS
ON TREATED LAND

CASE STUDY 1

DILEX, NIGERIA

PIT HEAVILY CONTAMINATED
WITH CRUDE OIL

OIL-CONTAMINATED PIT AFTER 10
DAYS OF TREATMENT

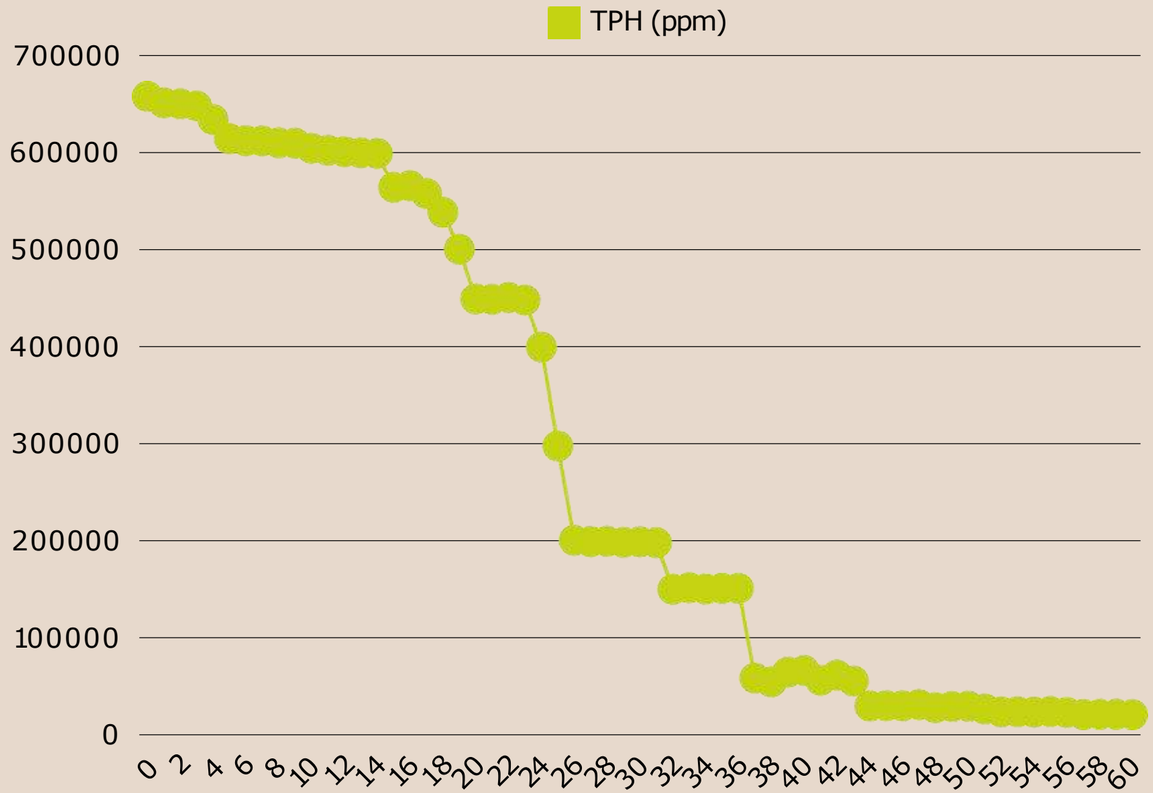


CASE STUDY 2
TRIAL 152

75% TPH REDUCTION
DURING PHASE I WHICH LASTED UNDER 40 DAYS. THIS BROKE DOWN MAJORITY OF ALIPHATIC HYDROCARBONS.EVELS

TOTAL OF **97% TPH REDUCTION BY DAY 60**

ADEQUATE N AND P NUTRIENTS SUPPLIED.



CASE STUDY 2
TRIAL 152

BEFORE TRIAL

AFTER TRIAL (GRASS SHOOTS EMERGE)

Our expertise

- 4000+ strong library of microbial types
- 100+varieties of hydrocarbon-degrading microbes
- 20+ years expertise in working with agricultural-grade fungi.
- Biosurfactant optimization: Maximizing hydrocarbon reduction efficiency

Biosurfactants

- Surfactin
- Rhamnolipids
- Peptide-lipids
- Viscosin
- Liposan

Visible Changes within 1 month

Day 0

Day 12

Day 30