

Cellulosimicrobium cellulans Culture to Degrade Oil Pollution

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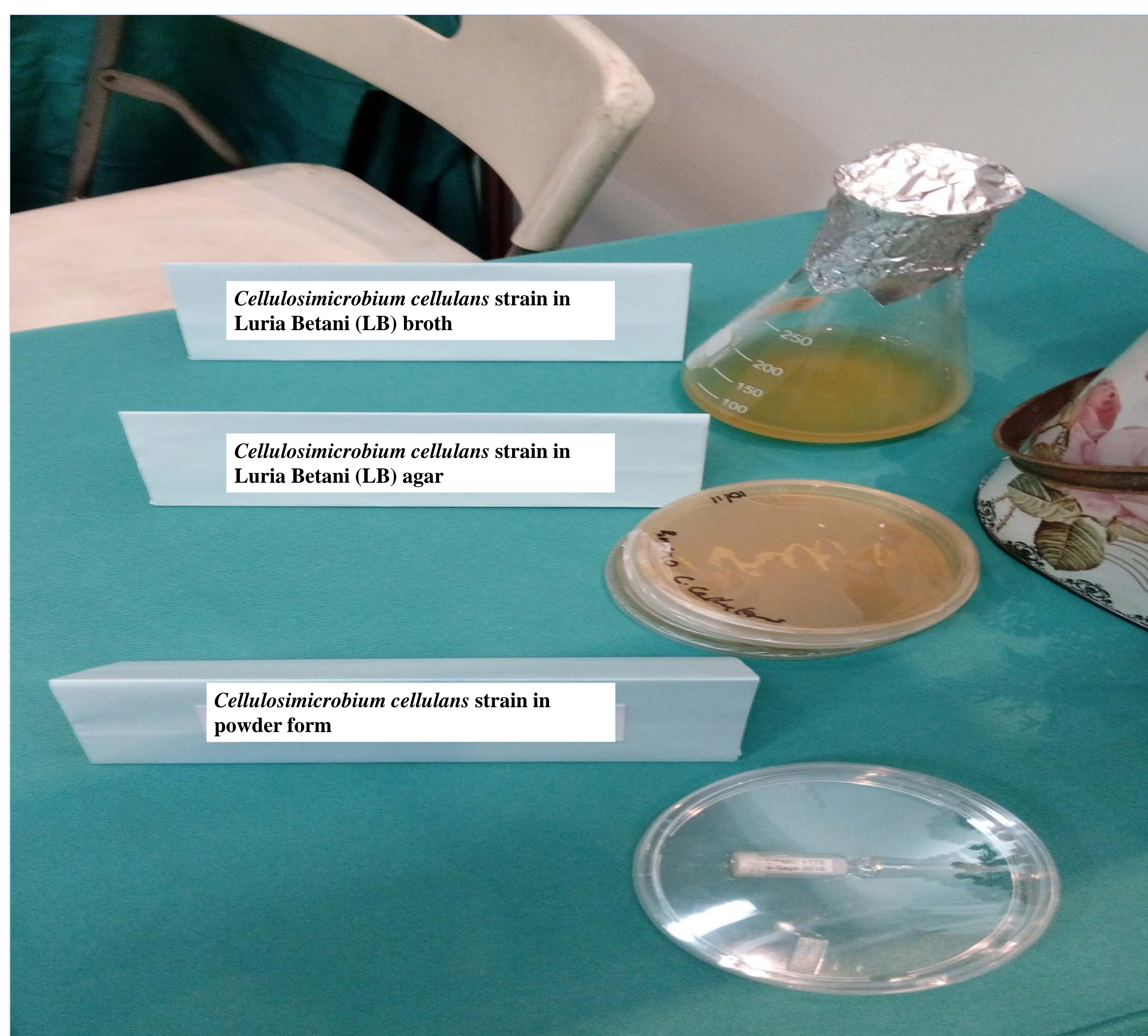


Fig 1: Tarball sample



Fig 2: Tarball sampling location at Kerteh beach Terengganu



Fig 3: Single strain of Isolated bacteria from tarball identified as *Cellulosimicrobium cellulans*

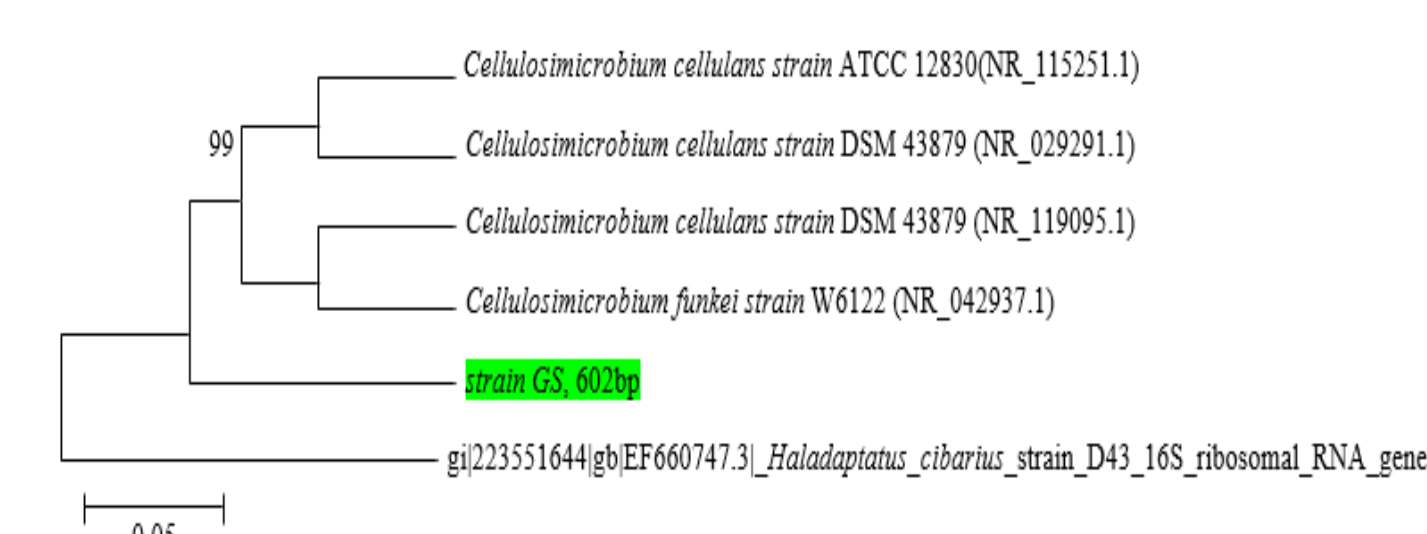
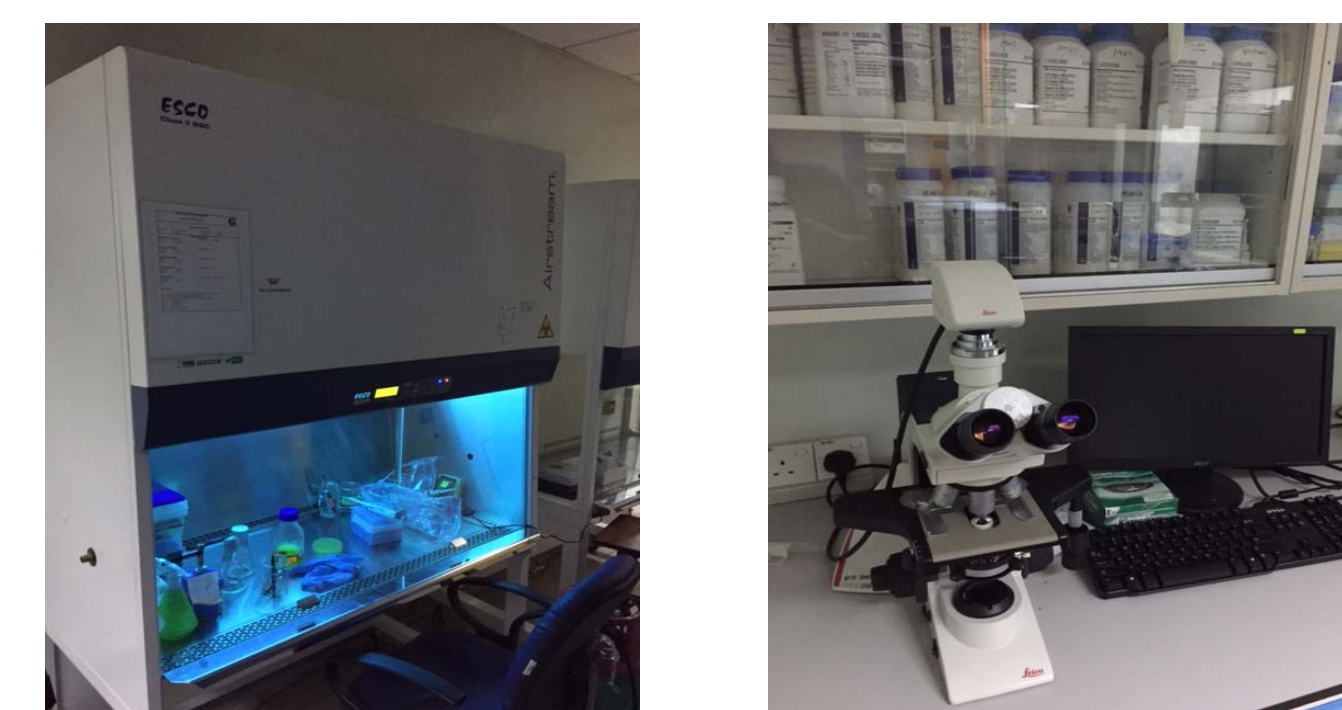


Fig 4: Phylogram showed the phylogenetic relationships of strain GS (*Cellulosimicrobium cellulans*) on 16S rRNA sequences.



NEED

Petroleum hydrocarbons polluted sea water by enter the marine environment as oil spills through pollution from ports including shipping accidents and terrestrial discharge such as sewage treatment systems and natural oil seepages. The oil disintegrates into slicks losing its volatile hydrocarbon fractions to form tar balls by aggregates with debris. The oil hydrocarbons need to clean-up from polluted to aquatic ecosystem in marine environment.

APPROACH

- The present invention of isolated *Cellulosimicrobium cellulans* strain from tar ball can be degraded individual diesel oil alkanes between 10 to 95.4%.
- This shows the bacteria strain was able to degrade diesel-oil alkanes in Minimal Salt Media (MSM) after 10 days at an initial pH of 7.5 and temperature of 32 °C.

BENEFIT

Degradation of oil by bacteria offers environmental friendly and cost-effective to cleaning-up hydrocarbons at marine environment. The strain utilize mixtures of petroleum hydrocarbon as their carbon and energy sources to produce CO₂ and H₂O of nontoxic products.

Characteristics	Cellulosimicrobium cellulans (GS)
Size	Punctiform
Shape	Circular
Pigmentation	Pale yellow
Texture	Smooth/moist
Elevation	Raised
Margin	Entire
Growth at 37°C	+
Gram Stain	+
Cell Morphology	Rod-shaped
Motility	+
Pigmentation	Pale-yellow
Catalase	+
Oxidase	+
Starch Hydrolysis	+
Gelatin hydrolysis	+
Carbohydrate Fermentation:	
Glucose	+
Mannitol	-
Sucrose	+
Mannose	+
Lactose	+
Maltose	+
H ₂ S on TSI	-
Urea production	+
Nitrate reduction	+

Table 1: Physiological and biochemical characterization of isolated strain *Cellulosimicrobium cellulans*.

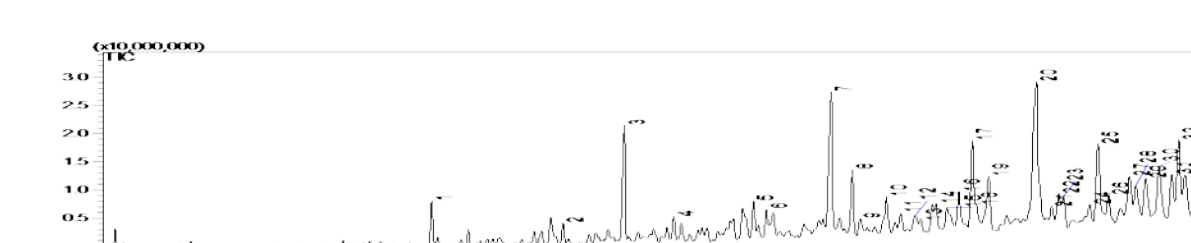


Fig 5: Total ion currents (TIC) of gas chromatography-mass spectrometer (GC-MS)

Diesel Alkanes	Carbon number	GS R _f (%)
Decane	C ₁₀	30
Undecane	C ₁₁	90
Dodecane	C ₁₂	91.4
Tridecane	C ₁₃	90.4
Tetradecane	C ₁₄	24.6
Pentadecane	C ₁₅	82.5
Hexadecane	C ₁₆	20.3
Heptadecane	C ₁₇	72
Octadecane	C ₁₈	93.3
Nonadecane	C ₁₉	93
Eicosane	C ₂₀	17.9
Docosane	C ₂₂	95.4
Tricosane	C ₂₃	94.5
Tetracosane	C ₂₄	11.8
Pentacosane	C ₂₅	37.2
Hexacosane	C ₂₆	41.3
Heptacosane	C ₂₇	46.7
Octacosane	C ₂₈	53.4
Nonacosane	C ₂₉	71.8

Table 2: Degradation of diesel-oil alkanes by *Cellulosimicrobium cellulans*, in the MSM after 10 days at 32°C and 120 rpm.

COMPETITOR/MARKET POTENTIAL

- The potential consumer of the product are a Department of Environment and non-governmental organization (NGO) to cleanup oil pollutions at marine polluted areas.
- Cellulosimicrobium cellulans* strain can be formed in powder (freeze dry) or liquid culture, then spray on the polluted environment.
- Bioremediation offers environmental friendly and cost-effective to cleaning-up hydrocarbons at marine environment compare to chemical and physical techniques.



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