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Data Article

A dataset representing the impact of cyanide on the fatty acid profile of *Scenedesmus obliquus*

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ABSTRACT

The data presented represents the biodetoxification of free cyanide (CN^-) by *Scenedesmus obliquus*and the subsequent fatty acid profile of the tested algal specie. This algal organism can use cyanide as a source of carbon and/or nitrogen for its growth. The organism was able to degrade 100 and 150 mg CN^-/L to 3.7 and 12.4 mg CN^-/L respectively, after 192 h. The main fatty acids which were detected were fatty acids with C_{16}—C_{18} and were observed to be 97.7% and 99.55% from cultures with 100 and 150 mg CN^-/L respectively. High CN^- concentrations proved to be favourable for the accumulation of polyunsaturated fatty acids (≥75%), thus demonstrating the biofuel production capacity of microalgal species in bioremediation of hazardous substances.

1. Data

The data presented herein shows the impact that free cyanide has on the fatty acid profile of a cyanide-degrading microalgae. Table 1 demonstrates the summarised growth and degradation data while Table 2 demonstrates the fatty acid profiles of *Scenedesmus obliquus*.

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Specification table

Subject area	Energy and Environmental Biotechnology
More specific subject area	Biofuels and Bioremediation
Type of data	Tables
How data was acquired	Direct transesterification followed by GCxGC-TOF-MS (Leco Corporation St. Joseph, MI, USA) analysis of the fatty acids
Data format	Analysed
Experimental factors	Microalgae were tested for CN^- biodegradation at different concentrations and the biomass was harvested after the experimental run for direct transesterification [1].
Experimental features	The fatty acids were analysed using GCxGC-TOF-MS using the Restek Rtx-5siLMS (30 m × 250 μm × 0.25 μm) as the first dimension column and Restek Rxi17siLMS (1 m × 250 μm × 0.25 μmd.f.) as a second dimension column.
Data source and location	Johannesburg, South Africa (26.2041° S, 28.0473° E) University of Johannesburg (26.1945° S, 28.0576° E)
Data accessibility	Data is provided in the article
Related research article	The article related to this article is still under construction.

Value of the data

- This data demonstrated the ability of *Scenedesmus obliquus* to degrade high concentrations of free cyanide at alkaline conditions.
- The fatty acid analysis revealed an accumulation of polyunsaturated fatty acids with an increase in the initial concentration of free cyanide.
- This data can be used as a motivation for the utilization of microalgal species for the treatment of environmentally hazardous compounds while recovering fatty acids for subsequent bioenergy production.

2. Experimental design, materials and methods

2.1. Microorganism and experimental conditions

Scenedesmus obliquus was obtained from the culture collection of the Department of Biotechnology, University of Johannesburg, South Africa. The culture was maintained in 3 N Bold Basal Medium (3-fold Nitrogen) at a pH of 9.5 in a bubble photobioreactor constructed of Plexiglas with 40 cm height, 10 cm external diameter and a 3 L working volume. Air enriched with 0.05% v/v CO_2 was sparged at 2 L. min^{-1} and light (8900 lx) was provided by two 18 W fluorescent bulbs (Osram). The nitrogenous compound in 3 BBM medium was replaced by the 50 mg CN^-/L and this culture was enriched for a period of 45 days prior to commencement of the experimental run. This was done to adapt the culture to CN^-. The experiment setup was the same as described previously with minor modifications; the nitrogenous compound in the 3 BBM medium was replaced with free cyanide at concentrations of 100 and 150 mg CN^-/L. After the experimental run, which was conducted over a 192 h period, the algal biomass was recovered by centrifugation (12,000 rpm for 10 min at 4 °C), followed by fatty acid analysis.

Table 1
Maximum specific growth rate (μ_{max}), minimum doubling time ($T_{d\ min}$), biomass concentration (X_{max}), CN^- degradation rate and efficiency measured over 192 h batch growth cycle.

Parameters	Control	100 mg CN^-/L	150 mg CN^-/L
μ_{max} ($days^{-1}$)	0.81 ± 0.16	0.34 ± 0.09	0.16 ± 0.07
$T_{d\ min}$ (days)	0.42	0.11	0.06
X_{max} ($g.L^{-1}$)	1.71 ± 0.23	0.85 ± 0.11	0.68 ± 0.12
Degradation rate ($mg.L^{-1}.\ day^{-1}$)	–	0.50	0.72
Degradation efficiency (%)	–	99.97	91.67

Table 2
Main fatty acids of *S. obliquus* under different CN^- concentrations.

Fatty acid	Content (%)		
	Control	100 mg CN^-/L	150 mg CN^-/L
C14:0	0.37	0.18	0.06
C15:0	0.17	n.d.	0.02
C16:0	32.4	28.30	22.17
C16:1	0.10	0.07	0.11
C16:2	3.00	2.21	3.11
C16:3	5.36	5.00	4.32
C17:0	0.31	0.10	n.d
C18:0	2.01	2.03	2.23
C18:1	0.55	0.93	1.87
C18:2	9.12	15.30	16.42
C18:3	44.52	43.76	49.32
C20:0	0.13	0.09	n.d.
C20:1	0.11	0.27	n.d.
C20:5	1.01	1.53	0.06
Saturated	35.39	30.7	24.48
Unsaturated	36.77	69.07	75.21
C_{16}–C_{18}	97.35	97.70	99.55

n.d.: undetectable.
Fatty acids are abbreviated with a number before the colon shows the number of carbon atoms number while the number after the colon signifies the number of double bonds.

2.2. Biomass quantification and fatty acid analysis

A standard curve between cell dry weight and optical density was constructed by measuring cell density at 750 nm once a day while cell dry weights were measured using the procedure developed by Ref. [1]. The fatty acid content and profile was measured using direct transesterification and gas chromatography [2]. The maximum specific growth rate, minimum doubling time and the maximum biomass concentration was calculated according to the procedure described by Ref. [2]. The degradation rate and efficiency was determined as described by Ref. [3].

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Transparency document

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