Supporting Information for

Biodiesel from Microalgae, Yeast, and Bacteria: Engine Performance and Exhaust Emissions

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Supplementary Table 1. Fatty acid composition of biodiesel fuels

FAME[a]	% of Total Fatty Acids			
	Soybean *G. max*	Microalgae *C. gracilis*	Yeast *C. curvatus*	Bacteria *R. opacus*
C10:0				0.2
C10:1				< 0.1
C12:0				0.1
C13:0				0.0
C14:0		10.3		1.9
C14:1				0.2
C14:0 CH_3[b]				0.2
C15:0		0.6		4.4
C15:1				0.5
C15:0 CH_3[b]				0.1
C16:0	11.0	26.8	15.3	33.9
C16:1		29.9	0.2	8.9
C16:0 CH_3[b]				5.4
C16:1 CH_3[b]				16.6
C16:2		6.9		
C16:3		8.6		
C18:0	3.9	0.5	18.0	3.0
C18:1	23.7	3.7	59.8	23.9
C18:0 OH[c]				0.1
C18:1 CH_3[b]				0.2
C18:2	53.9	2.2	5.3	
C18:3	6.8	4.1	0.3	
C19:1				0.6
C20:0	0.2		0.5	
C20:1	0.2			
C20:4		0.6		
C20:5		5.8		
C22:0	0.3		0.2	
C24:0			0.4	

[a]fatty acid methyl ester.
[b]GC/MS data is consistent with a terminally methylated fatty acid chain.
[c]GC/MS data is consistent with a C18 hydroxylated fatty acid chain.

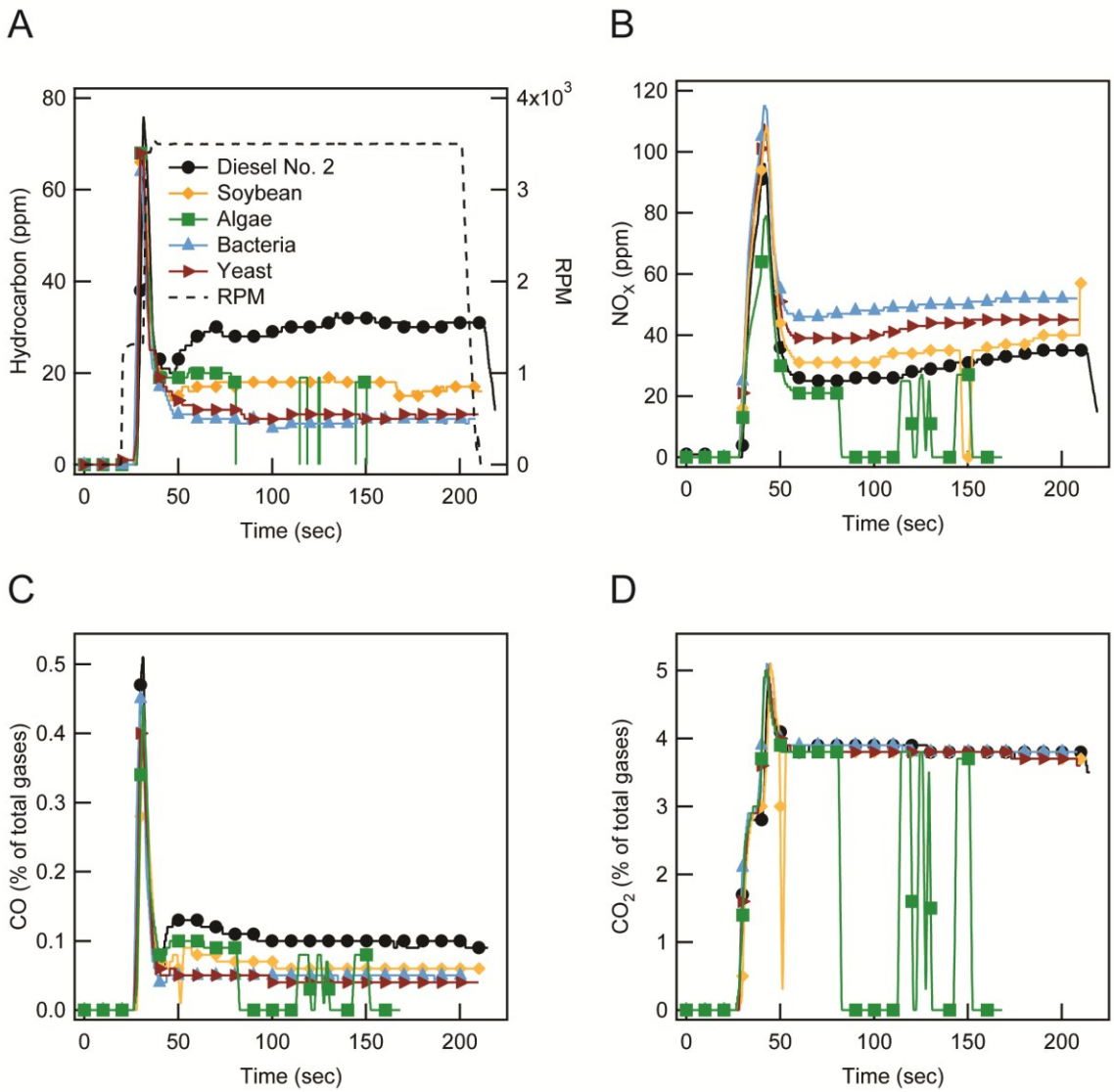

Figure S1. Emissions output at 3500 rpm and no load. Emissions analyzer was initialized prior to engine ignition resulting in the delay observed in the data collection. At about 20 s into the experiment the engine was started and ramped to 3500 rpm and held constant at this value during the course of the experiment (Panel A, dashed line). There appeared to be about a 10 s lag between when the engine was started and when gas emissions were first observed by the analyzer. The initial spike in each gas appears to correspond with engine ignition. Five gases were measured simultaneously for each fuel: Panel A, unburned hydrocarbons; Panel B, NO_X emissions; Panel C, carbon monoxide; Panel D, carbon dioxide; oxygen content of gas emissions was also measured (data not displayed). An intermittent hardware malfunction with the emissions analyzer occurred during microalgae biodiesel data acquisition, that caused no data to

be collected during each period of malfunction. A similar issue occurred, although to a lesser extent, during soybean biodiesel emissions data acquisition. Throughout the experiment 10 data points were collected every second, resulting in over 2,000 data points for each experiment. Data displayed in Table 4 was obtained by averaging data points during the same 60 s interval where emissions values appeared to reach a steady state.