sustainability

MDPI

Slow-pyrolysis of *Ulva lactuca* (Chlorophyta) for sustainable production of bio-oil and bio-char

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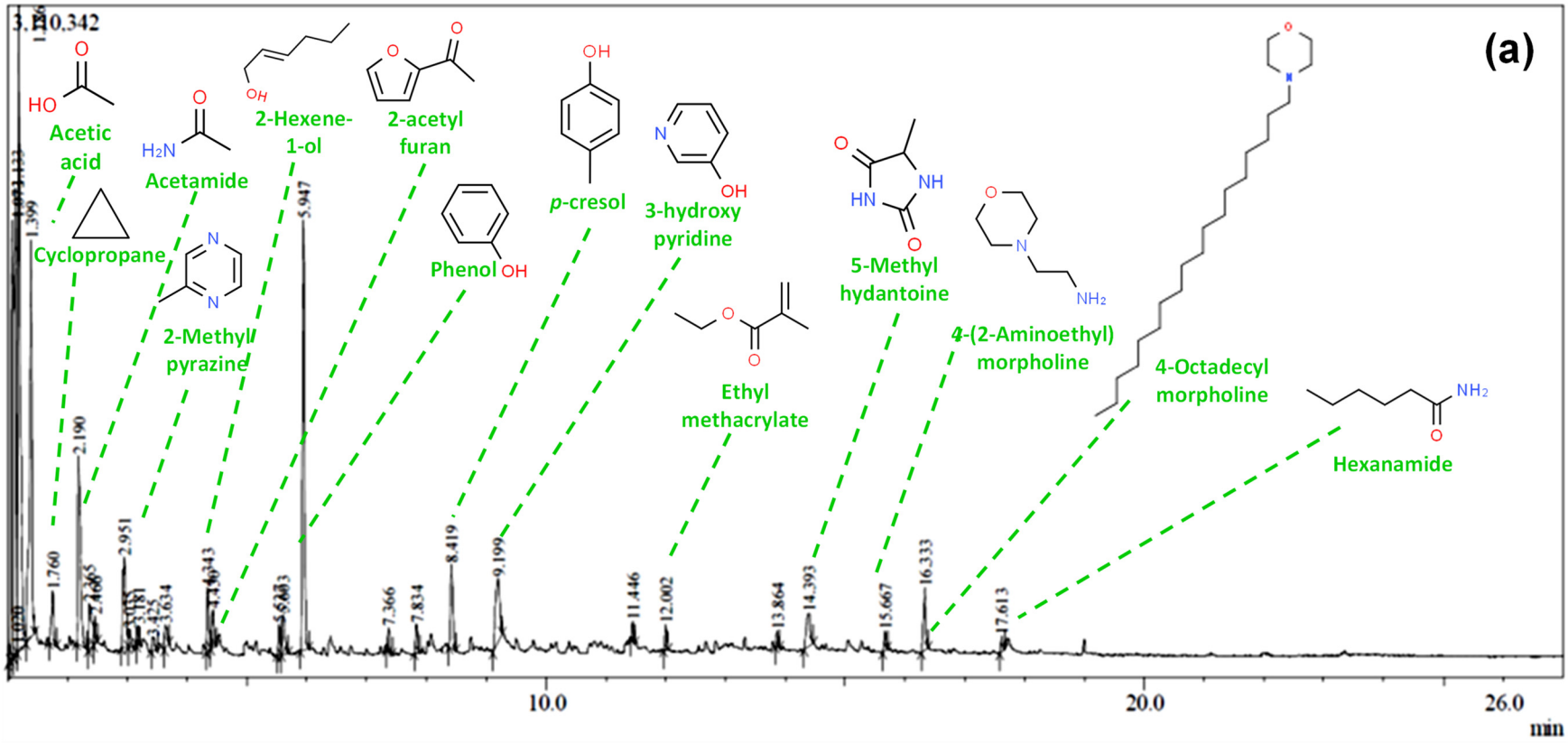
Table S1. Proximate and ultimate analysis of *Ulva lactuca*.

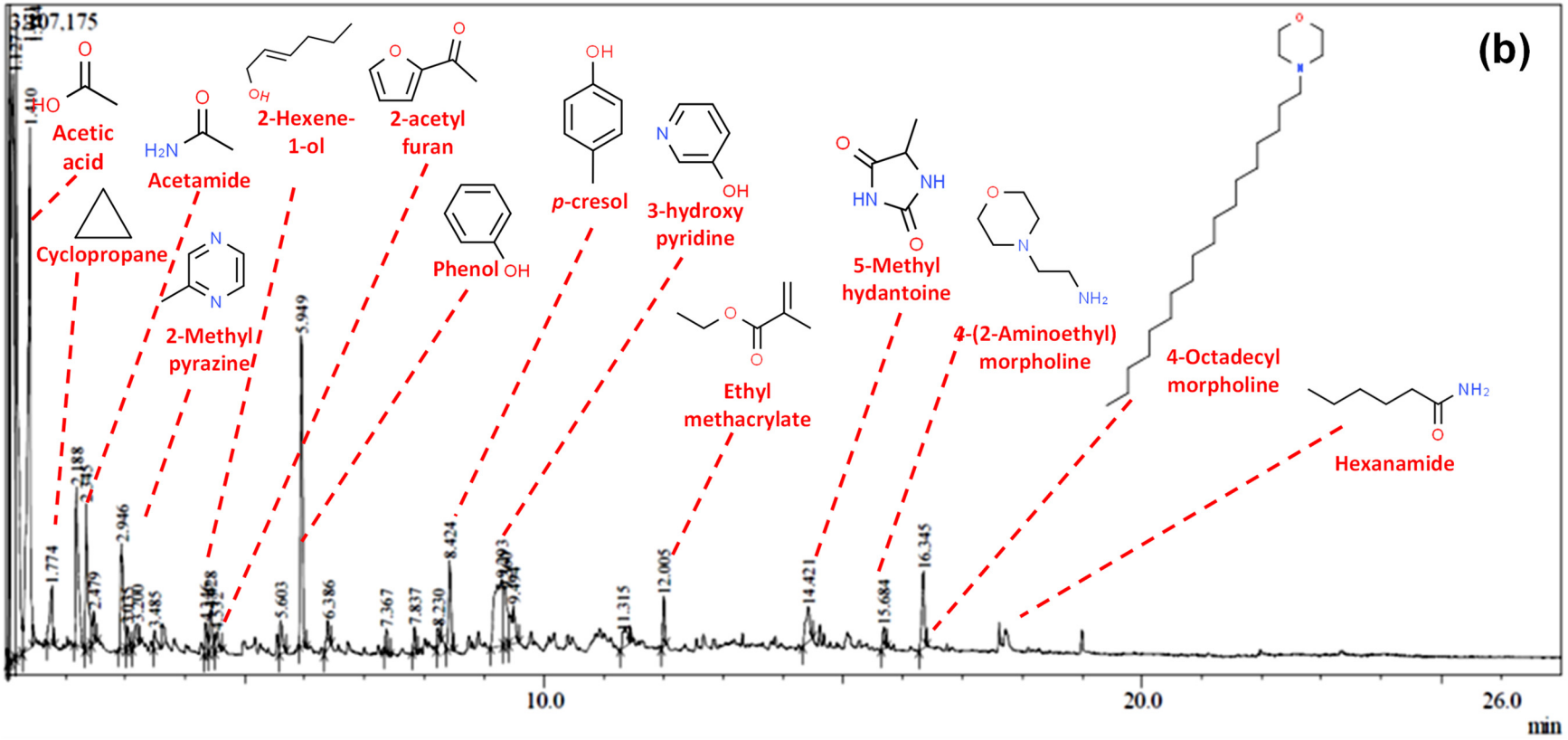
Proximate analysis (wt%)[a]				Ultimate analysis (wt%)[b]					HHV (MJ/kg)
Moisture	Ash Content	Fixed Carbon	Volatile Matter	% C	% H	% N	% S	% O[c]	
7.18 ± 0.03	42.06 ± 0.19	1.01 ± 0.01	49.75 ± 0.15	39.10 ± 0.05	6.20 ± 0.05	4.46 ± 0.02	7.28 ± 0.03	42.96 ± 0.05	12.04 ± 0.03

[a] dry base.
[a] dry ash-free.
[c] calculated by difference, i.e.,O = 100% – C – H – N – S.

Table S2. Typical band assignment of bio-char from slow-pyrolysis of *U. lactuca.*

Main peak (cm^{-1})			Typical band assignment
400 °C	500 °C	600 °C	
3239	n/a	n/a	O–H stretching
1435	1399	1423	aliphatic C–H bending
1087	1084	1088	C–O bending
871	871	872	aromatic C–H stretching


(a)
Acetic acid
Acetamide
2-Hexene-1-ol
2-acetyl furan
Cyclopropane
2-Methyl pyrazine
Phenol
p-cresol
3-hydroxy pyridine
Ethyl methacrylate
5-Methyl hydantoine
4-(2-Aminoethyl) morpholine
4-Octadecyl morpholine
Hexanamide
10.0
20.0
26.0
min


(b)
Acetic acid
Acetamide
2-Hexene-1-ol
2-acetyl furan
Cyclopropane
2-Methyl pyrazine
Phenol
p-cresol
3-hydroxy pyridine
Ethyl methacrylate
5-Methyl hydantoine
4-(2-Aminoethyl) morpholine
4-Octadecyl morpholine
Hexanamide
10.0
20.0
26.0
min

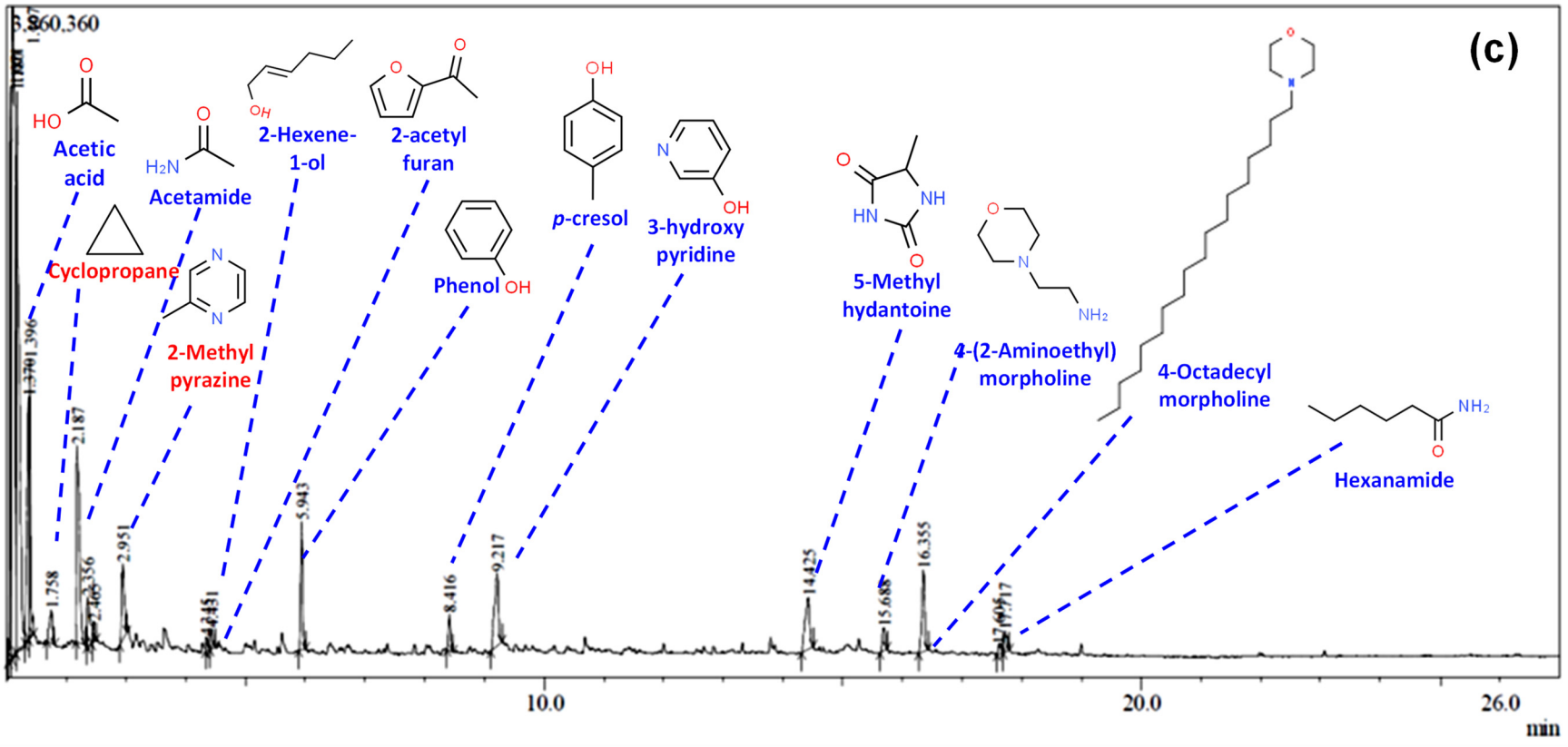


Figure S1. GC/MS chromatogram from pyrolysis of *U. lactuca* at (a) 400 °C, (b) 500 °C, and (c) 600 °C.