Supplementary information

A marine fungus efficiently degrades polyethylene

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Supplementary Figures

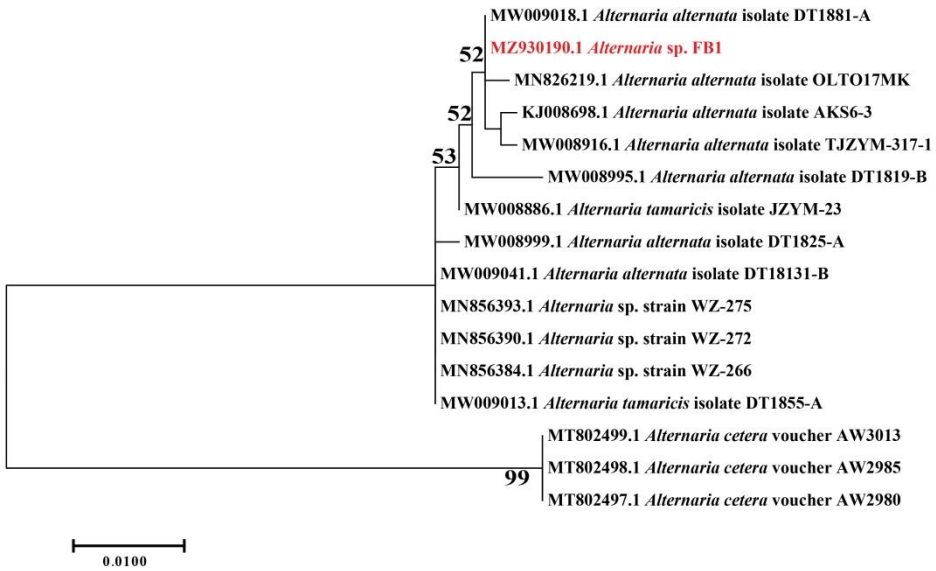

Figure S1. ITS-based phylogenetic tree of *Alternaria* sp. FB1 with other related fungal strains obtained from the GenBank. The accession number of each ITS is indicated after the species names. The phylogenetic tree was constructed by the neighbor-joining method and numbers above the branches are bootstrap values based on 1000 replicates. Bar, 0.01 substitutions per nucleotide position.

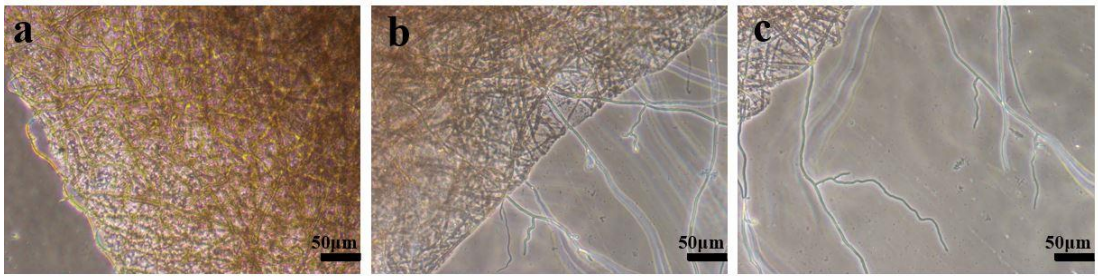

Figure S2. The light microscopy observation of the mycelium morphology of strain FB1 in the seawater supplemented with or without the PE film for 120 days. a, The mycelium morphology of strain FB1 incubated in the seawater for 120 days. **b, c,** The mycelium morphology of strain FB1 incubated in the seawater supplemented with the PE film for 120 days.

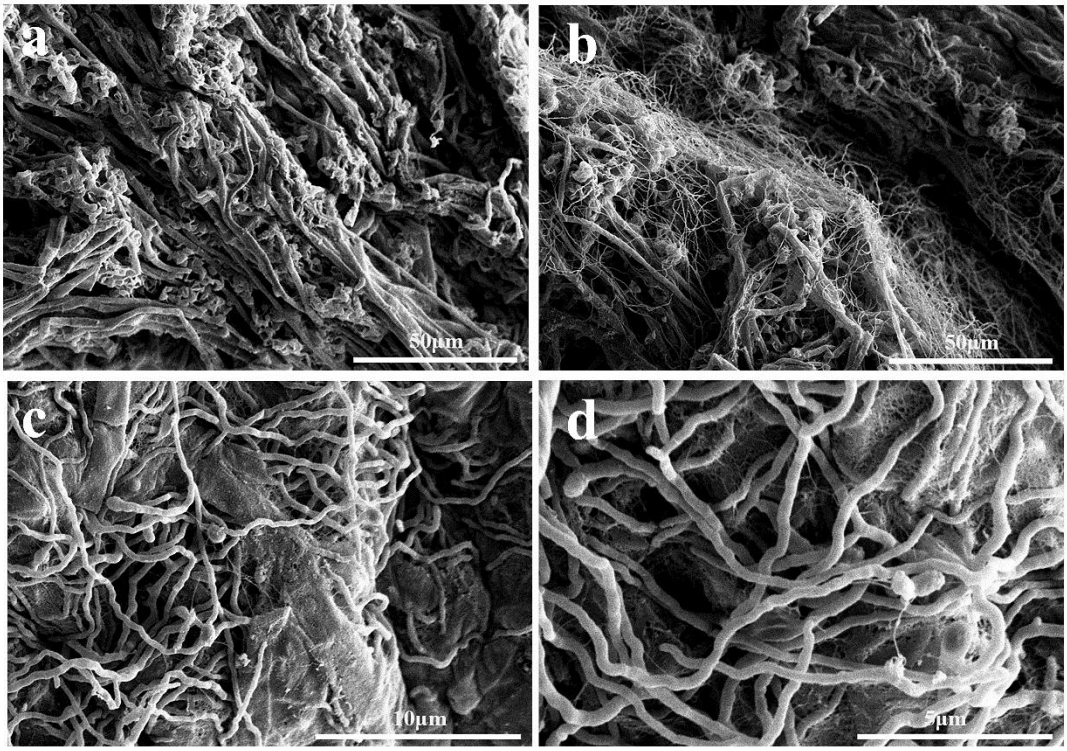

Figure S3. The SEM observation of the growth of strain FB1 in the seawater supplemented with or without the PE film for 120 days. a, The SEM observation of the mycelium morphology of strain FB1 in the seawater for 120 days. **b-d**, The SEM observation of mycelium morphology of strain FB1 in the seawater supplemented with the PE film for 120 days.

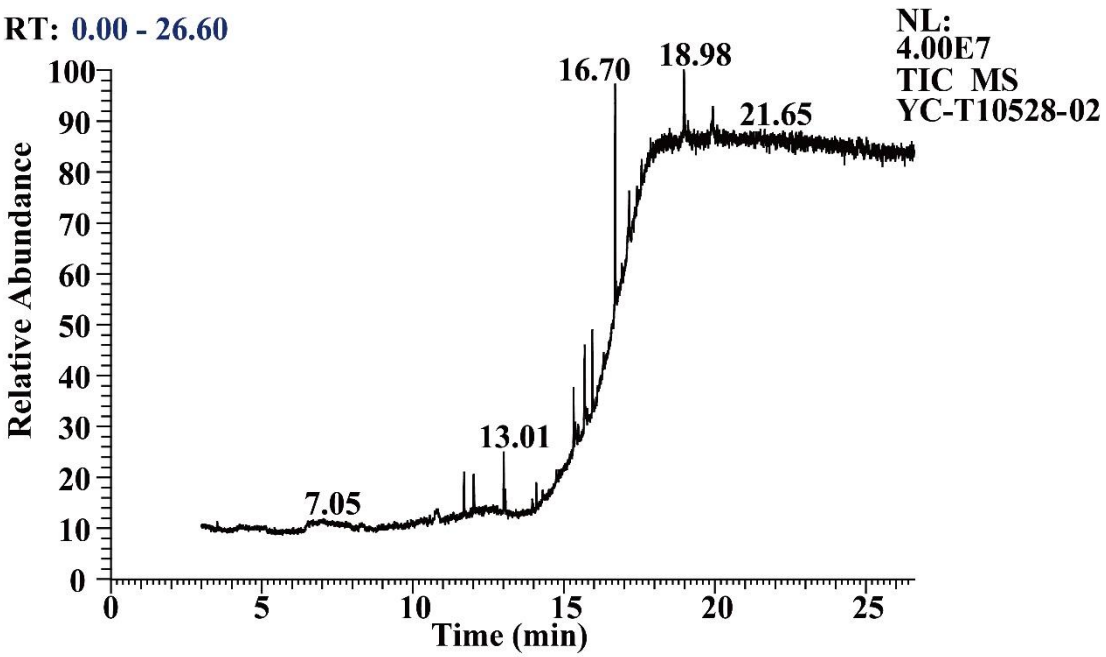

Figure S4. GC-MS chromatograms of the products extracted from PE biodegradation by *Alternaria* sp. FB1 for 60 days.

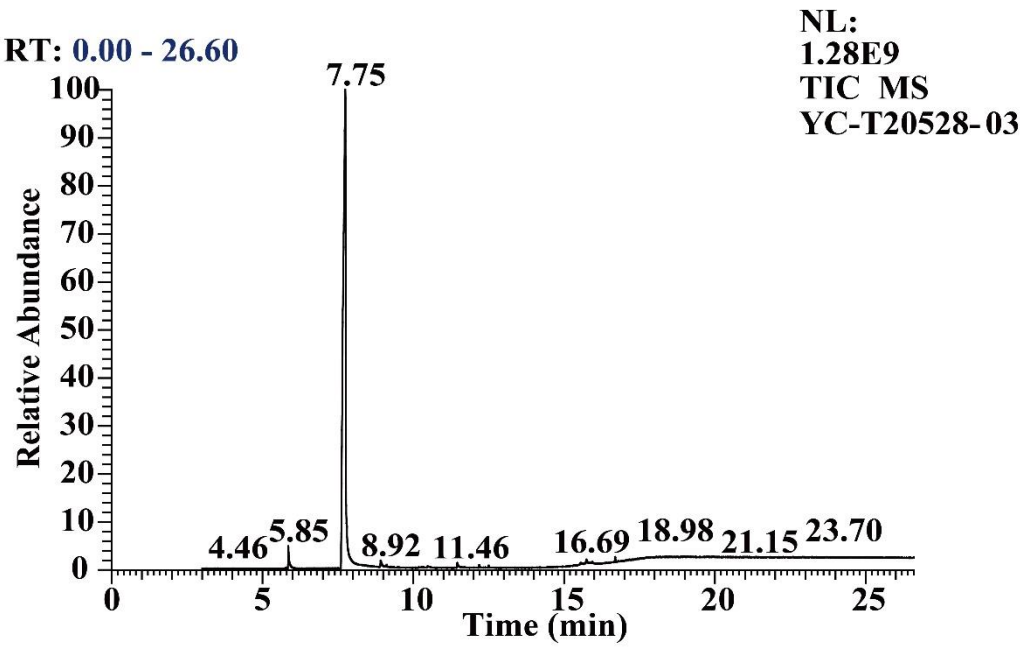

Figure S5. GC-MS chromatograms of the products extracted from PE biodegradation by *Alternaria* sp. FB1 for 120 days.

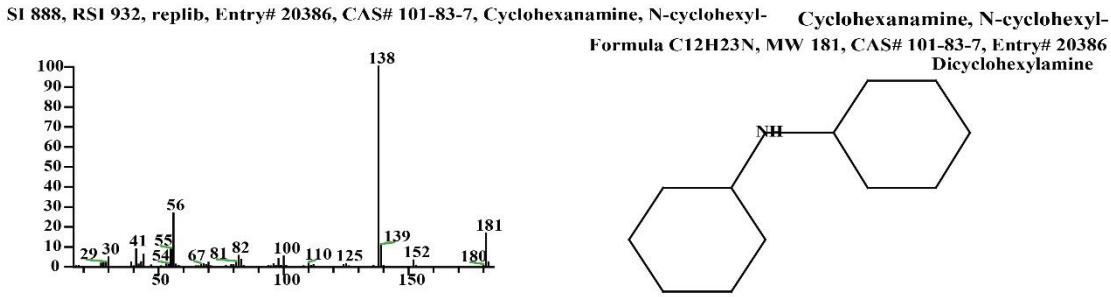

Figure S6. Mass spectrometry analysis of a component at the retention time of 11.70 min identified as Cyclohexanamine, N-cyclohexyl-.

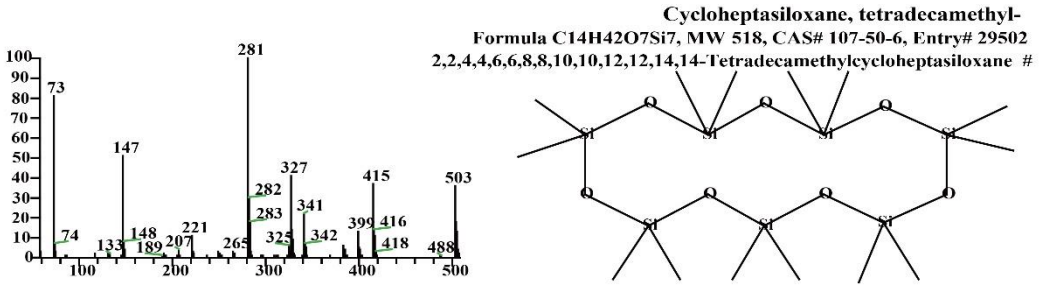

Figure S7. Mass spectrometry analysis of a component at the retention time of 12.01 min identified as Cycloheptasiloxane, tetradecamethyl-.

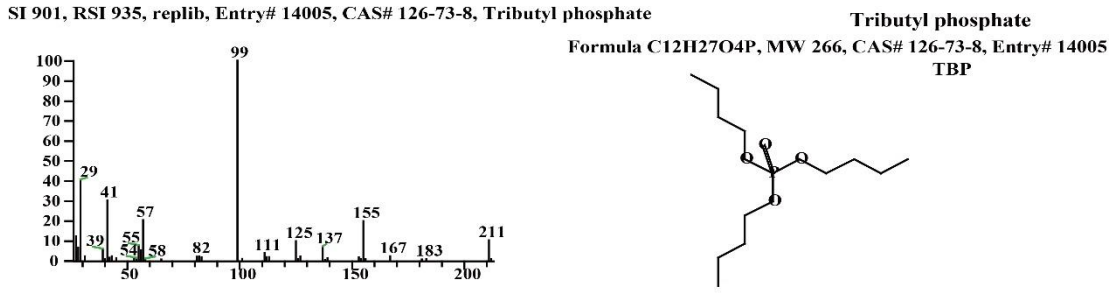

Figure S8. Mass spectrometry analysis of a component at the retention time of 13.01 min identified as Tributyl phosphate.

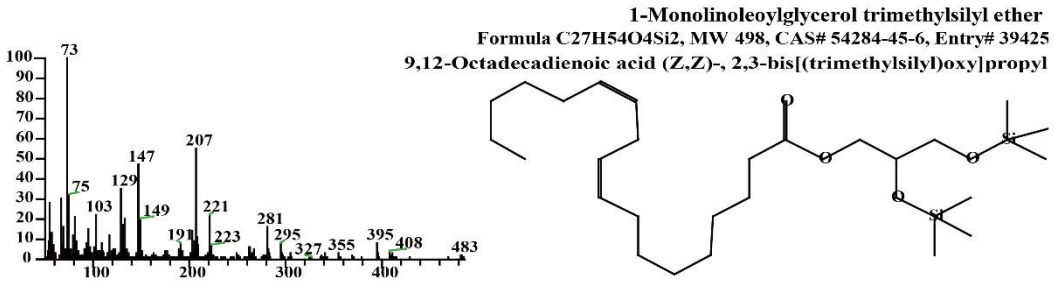

Figure S9. Mass spectrometry analysis of a component at retention times of 15.32 min, 15.69 min, 15.94 min, 17.58 min identified as 1-Monolinoleoylglycerol trimethylsilyl ether.

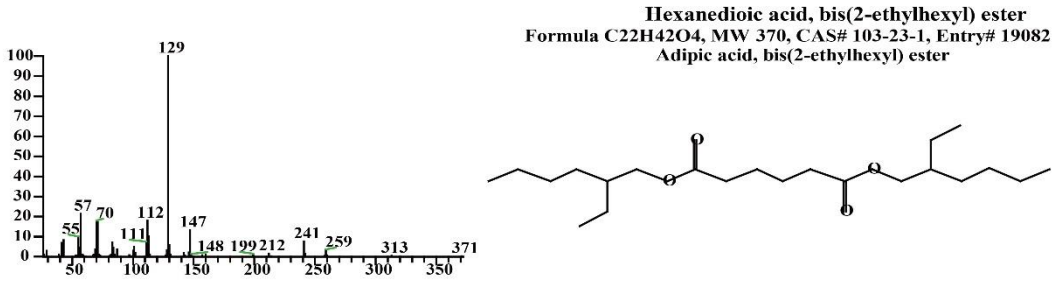

Figure S10. Mass spectrometry analysis of a component at the retention time of 16.70 min identified as Hexanedioic acid, bis(2-ethylhexyl) ester.

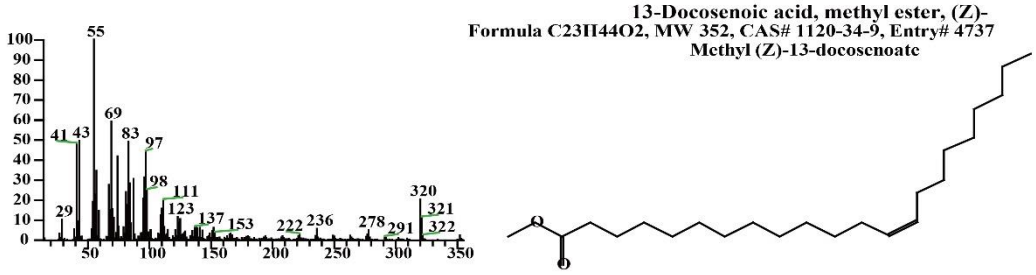

Figure S11. Mass spectrometry analysis of a component at retention time of 17.16 min identified as13-Docosenoic acid, methyl ester, (Z)-.

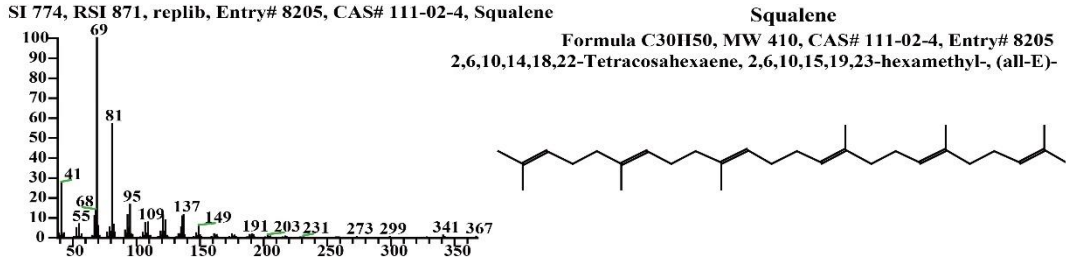

Figure S12. Mass spectrometry analysis of a component at the retention time of 18.98 min identified as Squalene.

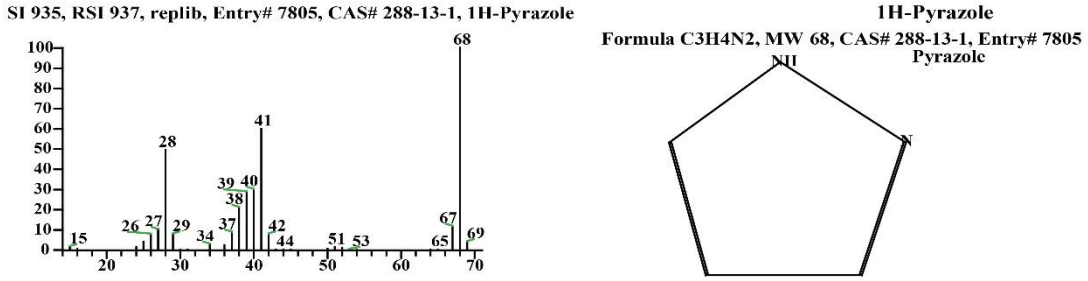

Figure S13. Mass spectrometry analysis of a component at the retention time of 5.85 min identified as 1H-Pyrazole.

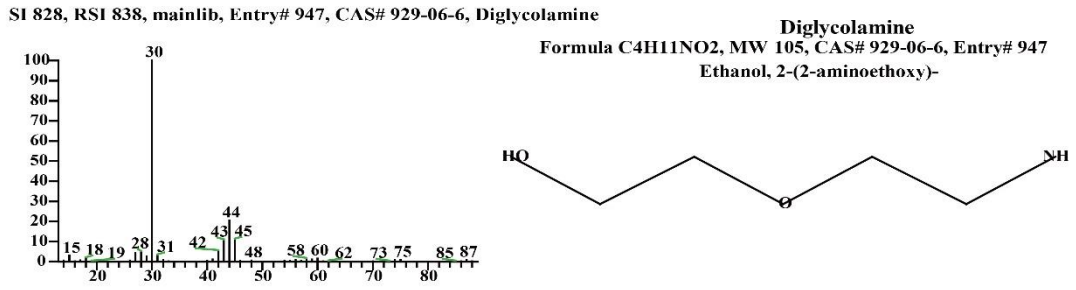

Figure S14. Mass spectrometry analysis of a component at the retention time of 7.75 min identified as Diglycolamine.

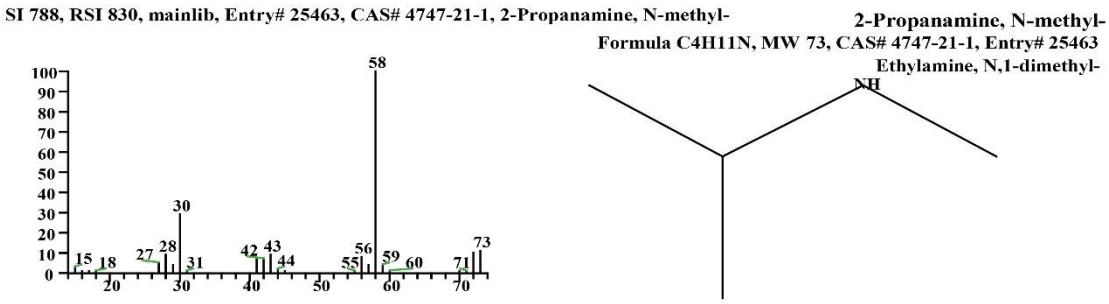

Figure S15. Mass spectrometry analysis of a component at the retention time of 8.92 min identified as 2-Propanamine, N-methyl-.

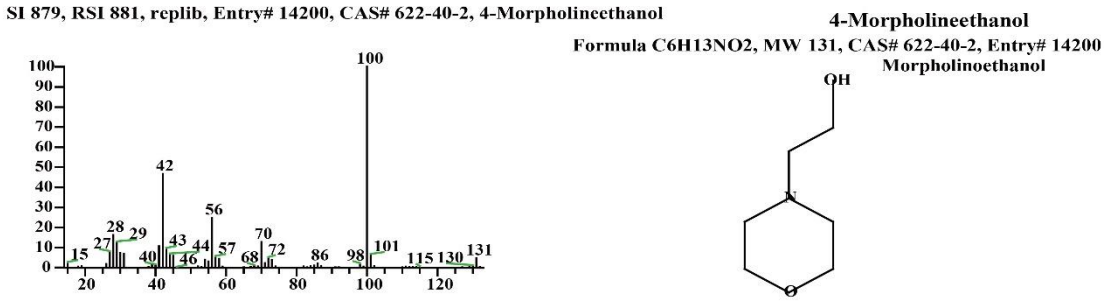

Figure S16. Mass spectrometry analysis of a component at the retention time of 9.12 min identified as 4-Morpholineethanol.

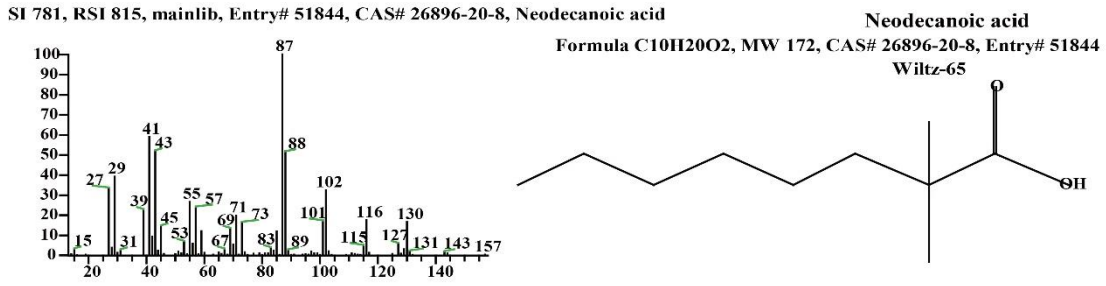

Figure S17. Mass spectrometry analysis of a component at the retention time of 10.47 min identified as Neodecanoic acid.

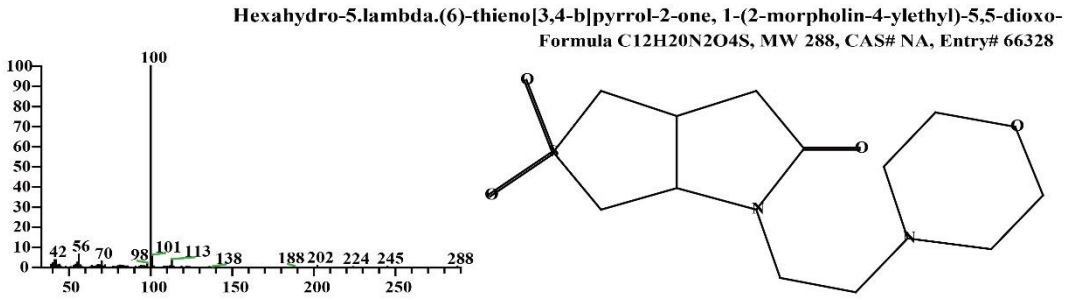

Figure S18. Mass spectrometry analysis of a component at the retention time of 11.46 min identified as Hexahydro-5.lambda.(6)-thieno[3,4-b]pyrrol-2-one, 1-(2-morpholin-4-ylethyl)-5,5-dioxo-.

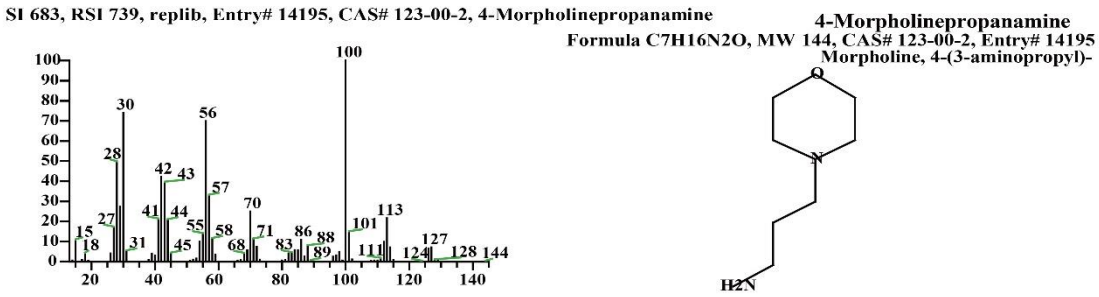

Figure S19. Mass spectrometry analysis of a component at the retention time of 12.18 min identified as 4-Morpholinepropanamine.

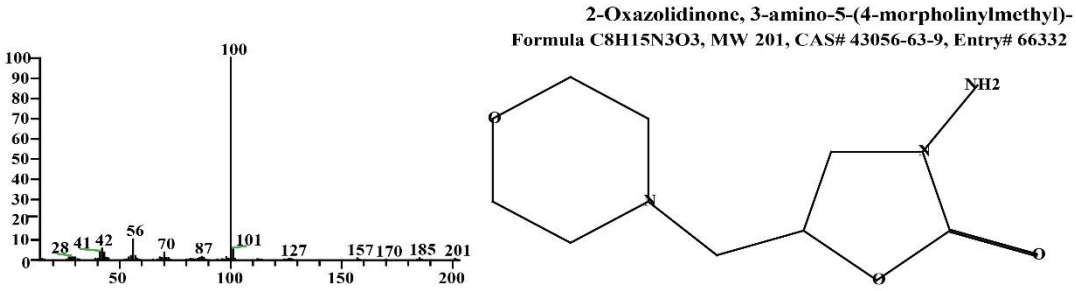

Figure S20. Mass spectrometry analysis of a component at the retention time of 12.50 min identified as 2-Oxazolidinone, 3-amino-5-(4-morpholinylmethyl)-.

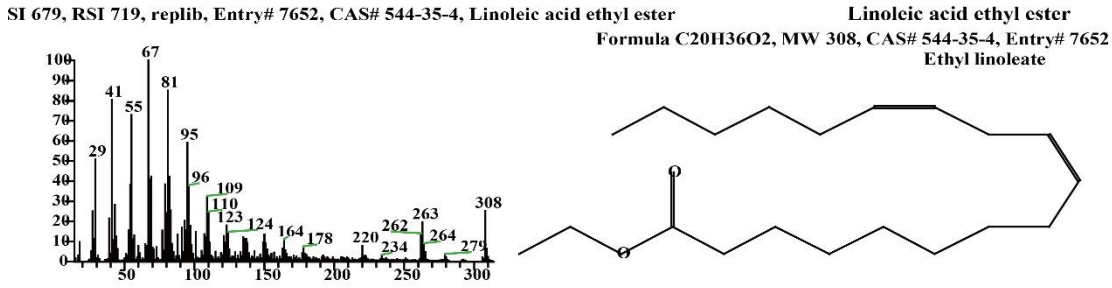

Figure S21. Mass spectrometry analysis of a component at the retention time of 15.56 min identified as Linoleic acid ethyl ester.

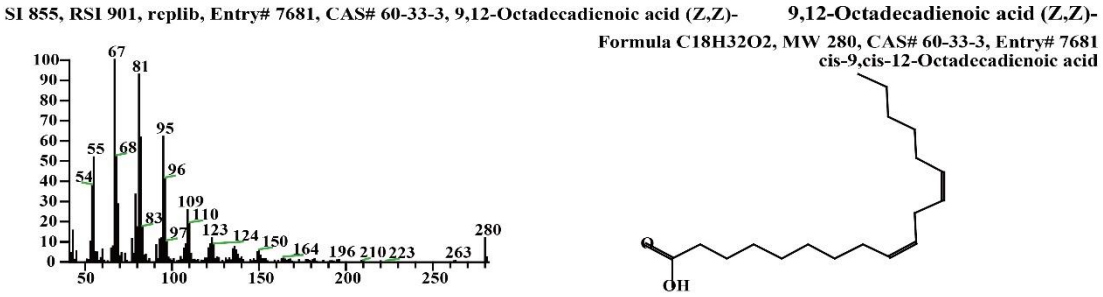

Figure S22. Mass spectrometry analysis of a component at the retention time of 15.74 min identified as 9,12-Octadecadienoic acid (Z,Z)-.

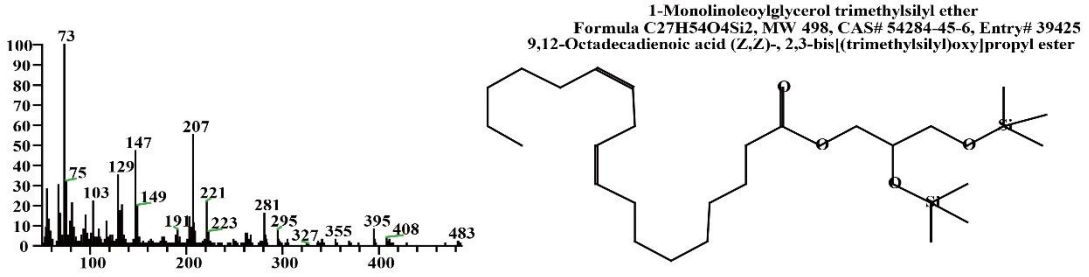

Figure S23. Mass spectrometry analysis of a component at the retention time of 15.86 min identified as 1-Monolinoleoylglycerol trimethylsilyl ether.

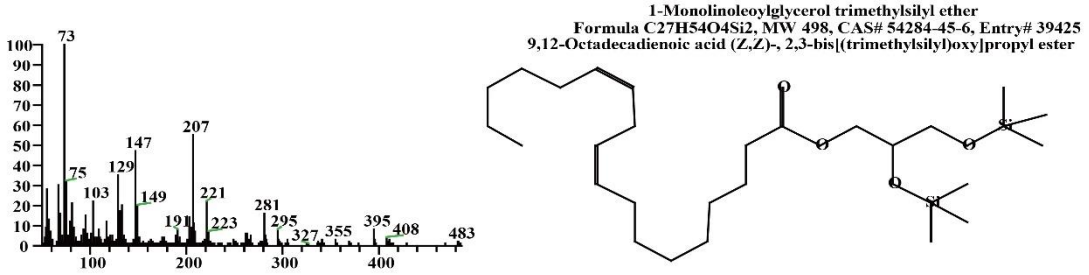

Figure S24. Mass spectrometry analysis of a component at the retention time of 15.94 min identified as 1,8-Dioxa-5-thiaoctane, 8-(9-borabicyclo[3.3.1]non-9-yl)-3-(9-borabicyclo[3.3.1]non-9-yloxy)-1-phenyl-.

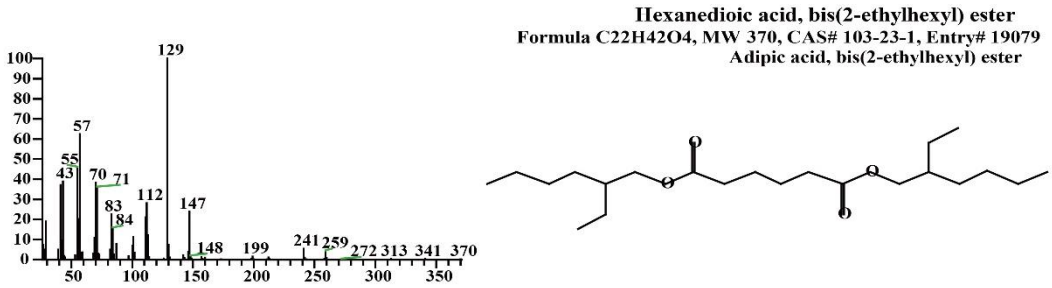

Figure S25. Mass spectrometry analysis of a component at the retention time of 16.69 min identified as Hexanedioic acid, bis(2-ethylhexyl) ester.

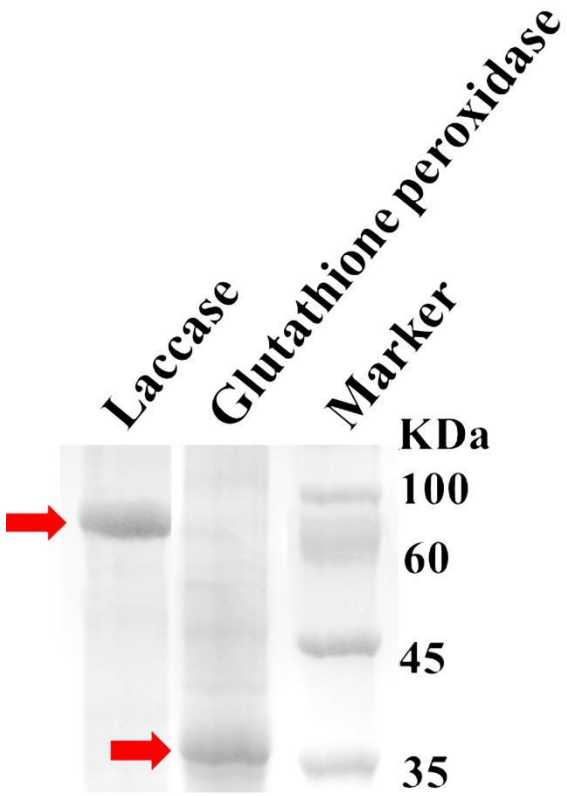

Figure S26. Coomassie blue-stained SDS gel of purified His-tagged Glutathione peroxidase and Laccase.

Supplementary Table S1. Mass spectrometric identification of compositions released from the PE film treated by *Alternaria* sp. FB1 for 60 days.

Retention time	Peak Area	Area %	chemical formula	Compound Name	Cas #
11.70	3803383.72	2.33	$C_{12}H_{23}N$	Cyclohexanamine, N-cyclohexyl-	101-83-7
12.01	5640482.26	3.45	$C_{14}H_{42}O_7Si_7$	Cycloheptasiloxane, tetradecamethyl-	107-50-6
13.01	7789352.35	4.77	$C_{12}H_{27}$	Tributyl phosphate	126-73-8
15.32	8879994.65	5.44	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
15.69	14727808.96	9.02	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
15.94	7910509.73	4.84	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
16.70	26809165.70	16.42	$C_{22}H_{42}O_4$	Hexanedioic acid, bis(2-ethylhexyl) ester	103-23-1
17.16	12894410.05	7.90	$C_{23}H_{44}O_2$	13-Docosenoic acid, methyl ester, (Z)-	1120-34-9
17.58	52152219.34	31.94	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
18.98	22675990.39	13.89	$C_{30}H_{50}$	Squalene	111-02-4

Supplementary Table S2. Mass spectrometric identification of compositions released from the PE film treated by *Alternaria* sp. FB1 for 120 days.

Retention time	Peak Area	Area %	chemical formula	Compound Name	Cas #
5.85	160827301.91	1.98	$C_3H_4N_2$	1H-Pyrazole	288-13-1
7.75	7586192268.64	93.28	$C_4H_{11}NO_2$	Diglycolamine	929-06-6
8.92	53491610.03	0.66	$C_4H_{11}N$	2-Propanamine, N-methyl-	4747-21-1
9.12	8303541.90	0.10	$C_6H_{13}NO_2$	4-Morpholineethanol	622-40-2
10.47	17177624.61	0.21	$C_{10}H_{20}O_2$	Neodecanoic acid	26896-20-8
11.46	40745877.94	0.50	$C_{12}H_{20}N_2O_4S$	Hexahydro-5.lambda.(6)-thieno[3,4-b]pyrrol-2-one, 1-(2-morpholin-4-ylethyl)-5,5-dioxo-	NA
12.18	10690688.81	0.13	$C_7H_{16}N_2O$	4-Morpholinepropanamine	123-00-2
12.50	6114688.36	0.08	$C_8H_{15}N_3O_3$	2-Oxazolidinone, 3-amino-5-(4-morpholinylmethyl)-	43056-63-9
15.56	23251808.47	0.29	$C_{20}H_{36}O_2$	Linoleic acid ethyl ester	544-35-4
15.74	54484769.63	0.67	$C_{18}H_{32}O_2$	9,12-Octadecadienoic acid (Z,Z)-	60-33-3
15.86	9971750.86	0.12	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
15.94	16603906.65	0.20	$C_{27}H_{54}O_4Si_2$	1-Monolinoleoylglycerol trimethylsilyl ether	54284-45-6
16.69	15787407.31	0.19	$C_{22}H_{42}O_4$	Hexanedioic acid, bis(2-ethylhexyl) ester	103-23-1

Supplementary Table S3. Primers used for construction of vectors for expression of potential PE-degrading enzymes.

Primer	Sequence
Glutathione peroxidase F	GGATCCATGATTCGATTGGGAGGGG
Glutathione peroxidase R	CTCGAGTTTGCCGCCCAGCTCCTTC
Laccase F	GGATCCATGAGCGAGCACACTGATTCGC
Laccase R	CTCGAGGATTGTGTCCGTGTCTAGAATTCTT