forests

MDPI

Article –Supplementary material

Table S1. Result of two-way ANOVA (*p*-value) for all roots parameters.

Treatment [1]	Root Parameters							
	NoT [2]	FRL [3]	MRL [4]	FRL/MRL	TRL [5]	FRSA [6]	FRT [7]	Dry Mass
1	-	-	-	-	-	-	-	-
2	0.007	0.026	0.076	0.607	0.025	0.002	0.007	0.034
3	0.488	0.440	0.156	0.693	0.396	0.446	0.488	0.104
4	0.461	0.333	0.483	0.350	0.389	0.163	0.461	0.647
5	0.133	0.080	0.107	0.101	0.076	0.168	0.133	0.736
6	0.087	0.041	0.415	0.054	0.046	0.056	0.087	0.323
7	0.920	0.659	0,830	0.954	0.671	0.569	0.920	0.292
8	0.383	0.575	0.133	0.053	0.655	0.888	0.382	0.410

[1] Treatments: (1) - control; (2) - *Armillaria gallica*; (3) - *Phytophthora cactorum*; (4) - defoliation 50%; (5) - *Armillaria gallica* + defoliation 50%; (6) - *Phytophthora cactorum* + defoliation 50%; (7) - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; (8) - *Armillaria gallica* + *Phytophthora cactorum*; [2] number of tips; [3] fine root length; [4] mother root length; [5] total root length (mm); [6] fine root surface area; [7] fine root tips

Table S2. Measurement values for selected parameters of chlorophyll fluorescence.

Treatment [1]	PSII parameters				
	F_0	Fm	F_0/Fm	DI_0/CS_0	PI total
1	399ab[2]	1091a	0.366 a	0.968 a	1.512 ab
2	503 a	873 b	0.576 b	1.384 b	0.892 c
3	455 c	1156 ab	0.393 b	1.191 ab	1.663 a
4	433ab	1135b	0.381 ab	1.074 ab	1.270 a
5	475ab	927ac	0.512 bc	1.229 b	0.967 ac
6	447 a	1145 ab	0.390 ab	1.055 ab	1.272 ab
7	467 a	1004 ab	0.465 b	1.181 b	1.089 bc
8	475 a	884 ab	0.537 b	1.198 bc	0.861c

[1] Treatments: (1) - control; (2) - *Armillaria gallica*; (3) - *Phytophthora cactorum*; (4) - defoliation 50%; (5) - *Armillaria gallica* + defoliation 50%; (6) - *Phytophthora cactorum* + defoliation 50%; (7) - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; (8) - *Armillaria gallica* + *Phytophthora cactorum*.
[2] means are based on eight replicate observations. Values marked with the same letter do not differ significantly ($p < 0.05$) based on Tukey's post-hoc test.

Table S3. Statistical significance by two-way ANOVA of the chemical composition of VOCs emitted by birch seedlings leaves in the treatments, 1 - control; 2 - *Armillaria gallica*; 3 - *Phytophthora cactorum*; 4 - defoliation 50%; 5 - *Armillaria gallica* + defoliation 50%; 6 - *Phytophthora cactorum* + defoliation 50%; 7 - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; 8 - *Armillaria gallica* + *Phytophthora cactorum*. More details are given in Table S5.

	Group of Compounds											
Treatment	**Monoterpenes**	**Sesquiterpenes**	**Aromatic Esters**	**Aromatic Carbonyls**	**Aromatic Alcohols**	**Aliphatic Esters**	**Aliphatic Acids**	**Aliphatic Carbonyls**	**Aliphatic Alcohols**	**Alkanes & Alkenes**	**Other Compounds**	**Unidentified Compounds**
1	-	-	-	-	-	-	-	-	-	-	-	-
2	0.505	0.296	0.555	0.536	0.985	0.375	0.578	0.887	0.626	0.345	0.052	0.997
3	0.116	0.846	0.560	0.229	0.608	0.085	0.452	0.794	0.626	0.516	0.141	0.125
4	0.491	0.620	0.981	0.726	0.870	0.196	0.814	0.826	0.308	0.897	0.838	0.912
5	0.854	0.927	0.732	0.570	0,680	0.498	0.389	0.927	0.556	0.557	0.213	0.245
6	0.984	0.163	0.939	0.993	0,974	0.338	0.184	0.852	0.647	0.606	0.282	0.946
7	0.448	0.811	0.895	0.667	0,916	0.401	0.159	0.854	0.612	0.931	0.807	0.240
8	0.518	0.808	0.757	0.731	0,574	0.141	0.574	0.903	0.925	0.110	0.202	0.977

Table S4. Statistical significance by two-way ANOVA of the chemical composition of VOCs emitted by birch roots during treatments, 1 - control; 2 - *Armillaria gallica*; 3 - *Phytophthora cactorum*; 4 - defoliation 50%; 5 - *Armillaria gallica* + defoliation 50%; 6 - *Phytophthora cactorum* + defoliation 50%; 7 - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; 8 - *Armillaria gallica* + *Phytophthora cactorum*. More details are given in Table S6.

	Group of Compounds						
Treatment	**Phenolic Compounds**	**Triterpenes**	**Sterols**	**Fatty Acids**	**Fatty Alcohols**	**Other Compounds**	**Unidentified Compounds**
1	-	-	-	-	-	-	-
2	0.380	0.593	0.788	0.252	0.809	0.482	0.181
3	0.698	0.676	0.727	0.208	0.912	0.967	0.932
4	0.572	0.398	0.973	0.426	0.805	0.955	0.867
5	0.493	0.874	0.944	0.215	0.226	0.779	0.136
6	0.662	0.162	0.957	0.068	0.953	0.471	0.744
7	0.371	0.774	0.989	0.338	0.916	0.964	0.455
8	0.647	0.731	0.944	0.638	0.912	0.180	0.229

Table S5. Detailed chemical composition of extracts from birch seedling leaves in the following experimental treatments: 1 – control; 2 - *Armillaria gallica*; 3 - *Phytophthora cactorum*; 4 - defoliation 50%; 5 - *Armillaria gallica* + defoliation 50%; 6 - *Phytophthora cactorum* + defoliation 50%; 7 - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; 8 - *Armillaria gallica* + *Phytophthora cactorum*.

Group of Compounds	$t_{ret.}$[1]	Chemical Content (%) by Treatment							
		1	2	3	4	5	6	7	8
Monoterpenes, including:		**15.95**	**19.23**	**17.42**	**18.50**	**15.19**	**21.59**	**15.46**	**14.22**
Monoterpene $C_{10}H_{16}$ [2]	10.44	-	1.00	0.69	-	0.62	0.81	-	0.59
Limonene	11.01	0.33	0.49	0.39	trace [5]	0.46	0.44	0.28	0.48
β-Ocimene	11.59	2.51	1.07	0.58	2.36	0.84	1.39	0.26	0.37
Monoterpene $C_{10}H_{16}$ [2]	11.86	0.42	0.53	-	0.42	-	-	-	-
trans-Furanolinalool oxide	12.32	0.44	-	-	0.69	-	-	-	-
cis-Furanolinalool oxide	12.79	0.15	-	-	0.15	-	-	-	-
Terpinolene	12.80	-	-	0.16	-	0.19	0.20	-	-
p-Cymenene	12.80	-	0.18	-	-	-	-	-	-
Linalool	13.14	3.80	2.66	2.70	4.00	2.15	3.34	4.17	2.96
cis-allo-Ocimene	14.02	0.37	0.24	-	0.33	-	0.24	-	-
trans-allo-Ocimene	14.35	0.11	-	-	0.26	-	-	-	-
Lilac aldehyde B	14.38	-	-	-	-	-	0.11	-	-
Monoterpene $C_{10}H_{16}$ [2]	14.39	0.16	0.15	-	-	-	-	-	-
Citronellal	14.67	0.25	0.30	0.40	0.36	0.33	0.56	0.41	0.36
cis-Pyranolinalool oxide	15.18	0.34	-	-	-	-	-	-	0.51
trans-Pyranolinalool oxide	15.29	0.29	0.31	0.28	0.28	0.33	0.37	-	-
α-Terpineol	15.76	-	-	-	-	-	-	0.24	-
Monoterpene $C_{10}H_{16}$ [2]	15.79	-	-	0.22	-	-	0.29	-	-
β-Cyclocitral	16.64	0.10	0.13	-	0.07	0.14	-	-	-
Citronellol	16.81	0.92	1.72	1.93	1.36	1.33	2.40	1.44	1.46
Neral	17.21	0.79	1.32	1.22	1.12	1.02	1.31	-	-
(*E*)-Geraniol	17.56	2.44	4.70	3.83	3.03	3.50	4.08	3.94	4.62
α-Citral	18.00	0.94	1.91	1.65	1.51	1.66	2.30	0.90	0.95
Eugenol	20.35	1.46	2.29	3.17	2.54	2.32	3.31	3.82	1.92
(*Z*)-Geraniol	20.65	-	0.07	-	-	0.09	-	-	-
Geranyl acetate	20.99	-	-	-	-	-	0.09	-	-
(*E*)-Isoeugenol	22.69	0.13	0.16	0.23	-	0.21	0.33	-	-
Sesquiterpenes, including:		**7.57**	**6.16**	**18.34**	**19.20**	**14.95**	**11.31**	**1.49**	**1.48**
δ-Elemene	19.86	-	-	0.05	-	-	-	-	-
α-Cubebene	20.18	0.21	0.21	0.51	0.59	0.56	0.42	-	-
Sesquiterpene $C_{15}H_{24}$ [2]	20.28	-	-	-	-	0.10	-	-	-
Cyclosativene	20.68	-	-	0.13	-	-	-	-	-
α-Ylangene	20.77	0.15	0.16	1.72	0.27	0.34	0.43	-	-
α -Copaene	20.89	1.42	1.32	2.27	3.36	3.64	2.10	0.26	0.51
β-Bourbonene	21.14	0.48	0.39	1.48	1.00	1.33	0.73	0.22	trace
Sesquiterpene $C_{15}H_{24}$ [2]	21.28	-	0.15	-	-	-	-	-	-
cis-*α*-Bergamotene	21.87	0.04	0.02	0.05	-	-	-	-	-
β-Ylangene	21.88	-	-	-	0.08	0.03	0.05	-	-
β-Caryophyllene	22.03	1.09	0.91	1.05	1.38	1.01	1.13	0.49	0.42
β-Copaene	22.26	0.15	0.13	0.35	0.57	0.39	0.25	-	-
trans-*α*-Bergamotene	22.38	0.18	0.14	0.30	0.30	0.18	0.25	-	-
Guaia-6,9-diene	22.60	0.23	0.25	3.62	0.45	0.35	0.84	0.20	0.25
cis-Muurola-3,5-diene	22.70	-	-	-	0.37	-	-	-	-
Sesquiterpene $C_{15}H_{24}$ [2]	22.76	-	0.11	0.75	0.11	0.19	0.31	-	-
trans-Muurola-3,5-diene	22.80	-	-	-	0.15	-	-	-	-
α-Humulene	22.88	0.17	0.16	0.28	0.72	0.30	0.30	-	-
Sesquiterpene $C_{15}H_{24}$ [2]	22.95	-	-	0.41	-	0.09	0.12	-	-
allo-Aromadendrene	23.07	0.30	0.25	0.61	0.66	0.71	0.36	-	-
cis-Muurola-4(14),5-diene	23.12	-	-	-	0.50	-	0.22	-	-
trans-Cadina-1(6),4-diene	23.37	-	-	-	0.09	-	-	-	-
γ-Muurolene	23.43	0.29	0.30	1.37	1.17	1.28	0.67	-	-
α-Amorphene	23.53	-	-	-	-	0.13	-	-	-
Germacrene D	23.56	0.19	0.17	0.41	1.56	0.13	0.51	-	-
(*Z*,*E*)-*α*-Farnesene	23.80	0.15	0.07	0.09	-	-	-	-	-
α-Muurolene	24.00	0.16	0.16	0.40	0.66	0.50	0.29	-	-

(*E*,*E*)-*α*-Farnesene	24.13	1.49	0.55	0.23	1.26	0.71	0.57	0.32	0.30
Sesquiterpene $C_{15}H_{24}$ [2]	24.19	-	-	0.16	-	-	-	-	-
γ-Cadinene	24.35	0.28	0.26	0.72	1.19	1.06	0.52	-	-
δ-Cadinene	24.56	0.41	0.37	0.85	1.96	1.05	0.83	-	-
trans-Cadina-1,4-diene	24.79	-	-	0.04	0.09	0.04	0.04	-	-
α-Cadinene	24.90	0.03	0.03	0.10	0.18	0.09	0.07	-	-
α-Calacorene	25.05	0.03	0.03	0.14	0.15	0.08	0.08	-	-
Salviadienol	25.30	-	-	0.03	-	0.03	-	-	-
(*E*)-Nerolidol	25.45	-	-	-	-	-	0.08	-	-
β-Calacorene	25.53	-	-	0.03	0.03	0.42	-	-	-
Humulene epoxide II	26.63	-	-	-	0.05	0.04	-	-	-
Sesquiterpene $C_{15}H_{24}$ [2]	26.78	0.14	-	-	0.13	0.07	-	-	-
α-Corocalene	26.89	-	-	0.03	0.04	-	0.03	-	-
τ-Muurolol	27.31	-	-	0.05	0.05	0.05	-	-	-
Cadalene	28.07	-	-	0.04	0.04	0.06	0.04	-	-
Guaiazulene	30.27	-	-	0.08	-	-	0.06	-	-
Aromatic Esters, including:		**5.52**	**5.91**	**8.05**	**3.96**	**7.12**	**6.68**	**4.98**	**4.66**
Benzyl acetate	14.99	0.14	0.17	0.21	-	-	0.25	-	-
Methyl salicylate	15.90	4.97	5.27	7.46	3.26	6.87	5.91	4.67	4.40
(*Z*)-3-Hexenyl benzoate	25.64	0.36	0.30	0.23	0.42	0.14	0.33	0.32	0.26
Hexanyl benzoate	25.78	-	0.12	0.10	0.19	0.05	0.12	-	-
(*E*)-2-Hexenyl benzoate	25.95	0.05	0.04	0.05	0.09	0.06	0.06	-	-
Aromatic Carbonyls, including:		**1.32**	**3.87**	**4.03**	**2.47**	**4.37**	**7.12**	**5.46**	**6.98**
Benzaldehyde	8.98	0.68	3.03	3.20	2.03	3.66	6.28	4.49	5.44
Benzene acetaldehyde	11.43	0.64	0.84	0.83	0.44	0.71	0.84	0.97	1.54
Aromatic alcohols, including:		**5.64**	**8.35**	**8.82**	**7.60**	**7.02**	**10.62**	**11.75**	**12.47**
Benzyl alcohol	11.16	4.14	5.92	5.96	5.55	4.76	7.60	7.26	8.76
p-Cresol	12.35	-	0.63	0.77	-	0.42	0.90	0.41	0.48
2-Phenylethyl alcohol	13.51	1.50	1.80	2.09	2.04	1.85	2.12	4.08	3.23
Aliphatic Esters, including:		**14.41**	**6.27**	**3.75**	**6.97**	**5.11**	**3.86**	**2.85**	**3.31**
(*Z*)-3-Hexenyl acetate	10.37	3.42	1.17	0.80	1.53	0.87	1.07	trace	0.77
Hexyl acetate	10.55	1.62	0.30	0.59	0.78	0.36	0.36	0.24	0.26
(*E*)-3-Hexenyl acetate	10.64	4.23	0.77	0.56	0.77	-	0.43	-	0.69
(*Z*)-2-Hexenyl acetate	10.64	-	-	-	-	0.56	-	-	-
(*Z*)-3-Hexenyl butanoate	15.64	1.42	0.89	0.36	0.65	0.65	0.41	0.55	0.33
Hexyl butanoate	15.79	0.57	0.33	-	0.42	0.29	-	-	-
(*Z*)-3-Hexenyl 2-methylbutanoate	16.94	0.79	0.79	0.37	0.47	0.84	0.32	0.57	0.45
(*Z*)-3-Hexenyl (*E*)-2-butenoate	17.03	0.84	0.64	0.36	0.67	0.41	0.50	0.44	0.36
(*Z*)-2-Hexenyl isovalerate	17.10	0.41	0.35	0.13	0.30	0.31	0.12	-	-
(*Z*)-3-Hexenyl pentanoate	18.35	0.04	-	-	-	-	-	-	-
Ethyl nonanoate	18.69	-	-	-	-	-	0.04	-	-
(*E*)-3-Hexenyl tiglate	19.16	0.03	-	-	0.02	-	-	-	-
(*Z*)-3-Hexenyl tiglate	19.45	0.48	0.45	0.28	0.59	0.27	0.33	0.51	0.45
Hexyl tiglate	19.60	0.14	0.11	-	0.19	0.12	-	-	-
(*E*)-2-Hexenyl tiglate	19.80	0.28	0.23	0.14	0.40	0.21	0.15	-	-
(*Z*)-3-Hexenyl hexanoate	20.93	-	-	-	-	-	-	0.31	-
(*Z*)-3-Hexenyl (*Z*)-3-hexenoate	21.06	0.15	0.23	0.15	0.18	0.21	0.13	0.23	trace
Aliphatic Acids, including:		**1.12**	**-**	**-**	**0.38**	**-**	**0.17**	**11.85**	**9.68**
Acetic acid	2.13	-	-	-	-	-	-	4.06	4.25
Hexanoic acid	9.60	0.57	-	-	-	-	-	2.05	1.60
3-Hexenoic acid [3]	10.20	-	-	-	-	-	-	2.13	2.76
3-Hexenoic acid [3]	10.32	-	-	-	-	-	-	2.57	-
2-Hexenoic acid [3]	10.76	-	-	-	-	-	-	1.03	1.07
2-Hexenoic acid [3]	12.57	0.11	-	-	-	-	0.13	-	-
Heptanoic acid	13.84	0.43	-	-	0.38	-	-	-	-
Dodecanoic acid	25.33	-	-	-	-	-	0.04	-	-
Aliphatic Carbonyls, including:		**21.58**	**22.47**	**17.12**	**17.21**	**20.79**	**18.32**	**20.66**	**18.30**
Acetone	1.73	-	-	-	-	-	-	0.81	1.70

2-Butenal	2.58	-	-	-	-	-	-	0.45	0.33
Acetoin	3.22	-	-	-	-	-	-	0.26	-
(*E*)-2-Pentenal	3.95	-	-	-	-	-	-	0.46	0.42
Hexanal	4.87	0.80	0.69	0.16	0.24	0.10	trace*	0.56	0.44
(*Z*)-2-Hexenal	5.86	-	-	-	-	-	-	0.13	-
(*E*)-2-Hexenal	6.15	16.78	15.97	12.19	13.48	15.18	12.24	11.70	9.27
Heptanal	7.29	-	-	-	-	-	-	-	0.24
(*E*,*E*)-2,4-Hexadienal	7.55	0.14	0.51	0.16	0.07	0.42	0.30	0.78	0.37
(*Z*)-2-Heptenal	8.87	-	-	0.03	-	-	-	0.19	-
2-Methyl-3-octanone	9.65	-	-	-	-	-	-	-	0.25
6-Methyl-5-hepten-2-one	9.77	1.51	1.85	1.28	1.16	1.31	1.34	0.84	0.95
(*E*,*E*)-2,4-Heptadienal	10.02	-	-	-	-	-	-	0.36	0.47
Octanal	10.23	-	0.47	-	-	0.49	0.59	-	-
(E,E)-2,4-Heptadienal	10.41	-	-	-	-	-	-	0.66	-
(*E*)-2-Octenal	11.84	-	-	-	-	-	-	0.37	-
(*Z*)-2-Octenal	11.87	-	-	0.42	-	0.48	0.49	-	0.47
Nonanal	13.25	1.18	1.38	1.35	1.16	1.30	1.59	2.28	2.86
(*E*)-2-Nonenal	14.85	0.12	0.15	0.14	0.14	0.15	0.18	0.23	trace
Decanal	16.17	0.51	0.71	0.69	0.36	0.65	0.74	0.38	0.54
(*E*)-2-Decenal	17.74	0.12	0.20	0.16	0.11	0.16	0.21	0.18	trace
Undecanal	18.98	0.13	0.15	0.14	0.11	0.14	0.16	-	-
Dodecanal	21.64	0.14	0.16	0.18	0.16	0.18	0.19	-	-
Tetradecanal	26.54	0.04	0.06	0.05	0.06	0.06	0.07	-	-
Pentadecanal	28.81	0.07	0.10	0.08	0.10	0.10	0.12	-	-
Hexadecanal	30.96	0.03	0.03	0.03	0.03	0.04	0.05	-	-
Hexahydrofarnesyl acetone	31.55	0.03	0.04	0.04	0.04	0.04	0.05	-	-
Aliphatic Alcohols, including:		**15.36**	**15.31**	**12.76**	**13.38**	**15.78**	**8.43**	**17.13**	**21.41**
(*Z*)-2-Penten-1-ol	4.22	-	-	-	-	-	-	0.73	0.70
(*Z*)-3-Hexen-1-ol	6.09	-	-	-	-	-	-	10.02	11.91
(*Z*)-2-Hexenol	6.46	12.54	10.58	7.79	9.45	11.68	2.26	1.85	2.17
1-Hexanol	6.48	-	-	-	-	-	-	1.77	2.08
Hexylene glycol	7.83	0.06	trace	0.17	0.28	0.25	0.21	0.42	1.14
6-Hepten-3-ol	7.84	-	0.40	-	-	-	-	-	-
1-Heptanol	9.25	-	-	0.77	-	-	1.24	-	0.36
6-Methyl-5-hepten-2-ol	9.93	2.53	3.54	3.15	2.76	3.01	3.55	1.53	2.51
(*E*)-2-Octen-1-ol	12.17	-	-	-	-	0.10	-	-	-
(*Z*)-2-Octen-1-ol	12.25	-	-	0.44	-	-	-	-	-
1-Octanol	12.25	0.22	0.46	trace	0.51	0.41	0.55	0.47	0.56
1-Nonanol	15.19	-	0.32	0.44	0.37	0.34	0.62	0.34	-
Alkanes and Alkenes, including:		**7.12**	**8.65**	**7.04**	**7.44**	**6.62**	**9.62**	**2.73**	**1.83**
1-Undecene	12.85	0.26	0.20	0.17	0.20	0.17	-	-	-
(*E*)-4,8-Dimethyl-1,3,7-nonatriene	13.61	1.26	1.14	0.86	0.48	1.36	1.78	0.34	0.31
n-Dodecane	16.00	1.04	1.18	-	0.73	-	1.26	0.32	-
1-Tridecene	18.55	0.36	0.44	0.38	0.33	0.36	0.40	-	-
n-Tridecane	18.78	0.67	1.34	0.52	0.65	0.57	0.72	0.42	0.77
1-Tetradecene	21.20	1.00	1.44	1.12	1.49	1.26	1.61	0.45	0.24
n-Tetradecane	21.40	0.59	0.82	0.72	0.71	0.70	0.85	0.34	0.27
1-Pentadecene	23.70	0.24	0.29	0.77	0.28	0.28	0.38	-	-
n-Pentadecane	23.89	0.51	0.66	1.01	1.05	0.82	0.93	0.33	0.25
1-Hexadecene	26.07	0.51	0.56	0.91	0.79	0.53	0.88	0.30	trace
n-Hexadecane	26.24	0.45	0.32	0.34	0.46	0.35	0.41	0.23	trace
1-Heptadecene	28.33	0.05	0.05	0.06	0.05	0.05	0.08	-	-
n-Heptadecane	28.48	0.16	0.16	0.16	0.16	0.15	0.22	-	-
1-Octadecene	30.47	-	-	-	0.02	-	0.03	-	-
n-Octadecane	30.61	0.03	0.04	0.03	0.04	0.04	0.05	-	-
n-Nonadecane	32.64	-	-	-	-	-	0.01	-	-
Other Compounds, including:		**1.78**	**1.62**	**1.27**	**1.53**	**1.56**	**1.38**	**3.88**	**4.31**
2-Ethylfuran	3.13	-	-	-	-	-	-	0.17	-
γ-Hexalactone	11.73	0.87	0.64	0.41	0.72	0.72	0.44	1.64	1.84
Naphtalene	15.54	0.06	-	-	-	-	-	-	-
1-(2-Butoxy-1-methoxy)-2-	17.19	-	-	-	-	-	-	1.17	1.34

propanol, isomer 1 [4]									
1-(2-Butoxy-1-methoxy)-2-propanol, isomer 2 [4]	17.33	0.71	0.80	0.74	0.81	0.68	0.81	0.89	1.13
(*E*)-*β*-Ionone	23.62	0.14	0.18	0.11	-	0.15	0.12	-	-
Unidentified Compounds		**2.63**	**2.17**	**1.40**	**1.38**	**1.49**	**0.89**	**1.76**	**1.35**

[1] Retention time (min); [2] based on the GC-MS analysis, the compound was identified as monoterpene/sesquiterpene with the chemical formula, but the chemical structure of compound was not specified; [3] isomer (*E*) or (*Z*); [4] *n*-butyl or *iso*-butyl; [5] below 0.01%.

Table S6. The detailed chemical composition of extracts from birch seedling roots in the following experimental treatments: 1 – Control; 2 - *Armillaria gallica*; 3 - *Phytophthora cactorum*; 4 - Defoliation 50%; 5 - *Armillaria gallica* + defoliation 50%; 6 - *Phytophthora cactorum* + defoliation 50%; 7 - *Armillaria gallica* + *Phytophthora cactorum* + defoliation 50%; 8 - *Armillaria gallica* + *Phytophthora cactorum*.

Group of Compounds	$t_{ret.}$ [1]	**Chemical Content (%) by Treatment**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Phenolic Compounds, including:		**0.87**	**15.35**	**5.02**	**11.91**	**4.83**	**4.36**	**7.85**	**13.32**
(*E*)-p-Coumaric acid	46.38	-	-	-	-	-	-	-	0.12
(*Z*)-Caffeic acid	48.12	-	9.51	-	0.42	-	-	0.18	0.48
(*E*)-Caffeic acid	52.74	-	1.92	1.89	1.95	1.75	2.08	2.46	2.59
Catechin	72.47	0.87	1.34	0.98	0.89	0.98	0.87	3.35	2.70
Cirsimaritin	76.74	-	-	-	-	-	-	-	0.16
α-Tocopherol	77.01	-	0.44	0.31	0.65	0.31	0.31	0.23	0.51
Flavonoid glucoside [2]	86.00	-	1.68	1.83	5.03	1.41	0.77	1.11	5.23
1-Eicosyl p-coumarate	88.19	-	-	-	0.24	-	-	-	-
1-Docosyl caffeate, isomer 1 [3]	90.97	-	-	-	-	-	-	-	0.11
1-Docosyl caffeate, isomer 2 [3]	94.24	-	-	-	0.88	-	-	-	0.75
1-Tetracosyl p-coumarate	95.07	-	-	-	0.26	-	-	-	-
Triterpenes, including:		**1.25**	**3.63**	**2.73**	**8.64**	**4.46**	**3.69**	**4.82**	**10.25**
Triterpene $C_{30}H_{50}$ [4]	74.28	0.72	-	-	-	-	-	-	-
Triterpenoid $C_{30}H_{48}O$ [4]	78.79	-	0.71	0.77	0.94	0.57	0.59	0.78	0.93
Triterpenoid $C_{30}H_{48}O$ [4]	78.95	-	0.36	-	0.44	-	0.33	0.38	0.42
Triterpenoid $C_{30}H_{48}O_2$ [4]	79.37	0.53	1.33	-	1.30	1.49	1.00	1.15	1.00
Triterpenoid $C_{30}H_{46}O_2$ [4]	79.52	-	0.48	1.02	0.57	1.17	0.31	0.39	0.41
Triterpenoid [2]	80.22	-	-	-	-	-	-	0.75	-
Triterpenoid $C_{30}H_{46}O_2$ [4]	80.72	-	-	-	-	-	-	0.46	-
Lupeol	81.89	-	-	-	0.81	0.35	0.54	-	0.39
Triterpenoid [2]	84.09	-	-	-	-	-	-	-	0.27
Triterpenoid $C_{30}H_{46}O_3$ [4]	84.42	-	-	-	-	-	0.27	-	-
Triterpenoid [2]	84.54	-	-	-	-	-	-	-	0.47
Triterpenoid [2]	84.93	-	-	-	0.68	-	-	-	-
Betulin	85.01	-	-	-	0.93	0.38	-	-	1.95
Oleanolic acid	85.26	-	-	-	0.49	-	-	-	-
Betulinic acid	85.56	-	-	-	0.91	-	-	-	1.39
Triterpenoid [2]	86.39	-	-	-	0.74	-	-	-	-
Triterpenoid acetate [2]	86.83	-	-	-	0.83	-	-	-	-
Methyl acetylbetulinate	86.84	-	0.75	0.93	-	0.51	0.65	0.90	3.03
Sterols, including:		**33.53**	**39.58**	**28.37**	**41.83**	**28.94**	**29.61**	**23.30**	**35.80**
Campesterol	79.18	1.00	1.61	1.13	1.88	1.31	1.18	0.95	1.50
Stigmasterol	79.81	3.51	4.87	2.53	4.81	3.02	3.28	2.72	3.41
β-Sitosterol	80.96	28.54	31.46	23.57	32.15	24.07	24.04	18.76	28.22
Stigmastanol	81.14	0.48	1.29	1.15	1.89	0.54	1.12	0.86	1.60
Avenasterol	81.27	-	-	-	-	-	-	-	0.32
Steroid $C_{29}H_{48}O$ [4]	82.73	-	0.35	-	1.09	-	-	-	0.75

Fatty Acids, including:		**44.47**	**21.47**	**32.30**	**15.65**	**32.10**	**33.93**	**35.82**	**15.50**
Hexanoic acid	12.73	-	-	-	0.10	0.21	0.20	-	0.10
Dodecanoic acid	36.53	-	-	-	-	-	-	-	0.18
Tetradecanoic acid	43.39	-	0.28	0.33	0.20	0.32	0.43	0.33	0.22
Pentadecanoic acid	46.59	-	-	-	-	-	0.27	0.27	0.13
Palmitelaidic acid	49.33	-	-	0.24	-	-	0.17	-	-
Palmitic acid	49.69	16.30	0.61	12.16	4.98	11.27	11.04	11.13	4.64
Heptadecanoic acid	52.64	-	-	0.20	-	-	0.16	0.24	0.08
Linoleic acid	54.52	15.04	10.22	9.32	3.52	9.53	10.73	11.14	4.00
Oleic acid	54.69	7.76	4.95	3.76	2.31	4.49	4.75	5.14	1.92
(*E*)-9-Octadecenoic acid	54.89	0.59	0.28	0.31	-	0.29	0.37	0.35	0.14
Stearic acid	55.47	3.48	2.96	3.46	1.68	3.31	3.33	3.24	1.53
Fatty acid [2]	60.45	-	-	0.61	-	0.38	0.34	1.17	0.47
Eicosanoic acid	60.80	0.79	-	-	-	-	-	-	-
Docosanoic acid	65.79	0.51	0.76	0.67	0.77	0.79	0.59	0.57	0.41
Tricosanoic acid	68.15	-	1.07	0.92	0.81	1.14	1.20	2.00	1.18
Tetracosanoic acid	70.43	-	0.34	0.31	0.80	0.35	0.36	0.25	0.37
Hexacosanoic acid	74.78	-	-	-	0.46	-	-	-	0.13
Fatty Alcohols, including:		**4.23**	**5.45**	**6.43**	**6.29**	**9.27**	**6.15**	**7.28**	**5.67**
1-Hexadecanol	47.03	-	0.38	0.29	0.17	0.38	0.43	0.30	0.14
1-Octadecanol	53.00	-	0.36	-	0.15	0.32	0.79	-	0.19
1-Docosanol	63.61	3.09	3.09	2.68	3.65	5.38	3.30	3.99	2.32
1-Tricosanol	66.03	-	-	-	-	0.31	0.24	0.29	0.19
1-Tetracosanol	68.36	1.14	1.62	3.46	2.16	2.88	1.39	2.70	2.82
1-Hexacosanol	72.81	-	-	-	0.16	-	-	-	-
Other Compounds, including:		**8.33**	**8.17**	**12.01**	**8.31**	**8.79**	**15.00**	**9.03**	**7.83**
6-Methyl-5-hepten-2-one	9.39	0.48	-	-	0.43	-	0.33	-	-
Ethylene glycol	9.47	0.53	0.29	0.25	0.22	0.33	0.32	0.36	0.19
Boric acid	9.83	-	-	0.34	0.14	0.21	0.21	0.32	0.22
Lactic acid	12.43	0.63	0.28	0.38	0.17	0.50	0.29	0.29	0.20
Phosphotic acid	21.76	-	-	-	-	-	-	-	0.12
Glycerol	21.96	0.80	0.46	0.50	0.48	0.58	0.57	0.58	0.52
2-(2-Butoxyethoxy)ethyl acetate, isomer 1 [5]	24.18	2.20	2.42	4.25	3.16	2.93	7.38	1.23	2.81
2-(2-Butoxyethoxy)ethyl acetate, isomer 2 [5]	25.12	0.52	-	0.27	0.18	0.37	0.47	0.24	0.31
n-Tetradecane	26.46	-	-	-	0.13	-	-	-	0.17
n-Pentdecane	30.36	-	-	-	-	-	-	0.21	0.10
2-Butoxyethoxyethanol	34.92	-	-	-	-	-	-	0.42	-
n-Heptadecane	38.42	-	-	-	-	-	0.23	-	-
Methylbenzene-sulfamide	40.26	1.04	0.85	0.24	0.15	0.00	0.30	0.54	0.11
Azelaic acid	41.87	-	-	0.25	-	-	0.24	0.28	0.23
Octadecanenitrile	51.28	0.71	-	0.89	0.36	0.67	0.64	0.73	0.12
Hexadecanamide	55.32	0.34	0.44	0.55	0.40	0.40	0.38	0.43	0.21
Oleamide	59.99	-	-	0.39	-	-	-	-	0.17
Oleanitrile	59.99	-	0.33	-	-	-	0.27	-	-
Octadecanamide	60.77	0.56	1.72	1.93	1.53	1.63	1.52	1.60	0.96
1-Monopalmtin	64.94	0.53	0.84	1.21	0.37	0.75	1.11	1.26	0.42
1-Monolinolein	68.86	-	0.54	0.56	0.22	0.43	0.74	0.54	0.47
Heneicosanedioic acid	73.71	-	-	-	0.38	-	-	-	0.51
Unidentified Compounds		**7.30**	**6.35**	**13.14**	**7.39**	**11.60**	**7.26**	**11.90**	**11.64**

[1] Retention time (min).; [2] Based on the GC-MS analysis, the compound was identified as flavonoid glucoside/triterpenoid/triterpenoid acetate/fatty acid, but the chemical formula and the chemical structure of compound were not specified; [3] isomer (*E*) or (*Z*); [4] based on the GC-MS analysis, the compound was identified as triterpene/triterpenoid/steroid with the chemical formula, but the chemical structure of compound was not specified; [5] *n*-butyl or *iso*-butyl.

56