



Supplementary materials

Table S1. The results of Linear Mixed Effects Models including impact of moss species identity, total phenols content (TP), total phenolic acids content (TPA) and total flavonoids content (TF) on antioxidant properties. The significant p-values were bolded.

Variable	Estimate	SE	Adj SE	z	P-value	Variable	Chisq	Df	P-value
ABTS full average coefficients									
Intercept	257.6591	44.93292	48.23132	5.342	<0.0001	TP	0.1701	1	0.68
SM	25.48165	9.87407	10.49916	2.427	0.015223	TPA	1.7386	1	0.1873
SP	53.98851	8.23326	8.84245	6.106	<0.0001	TF	21.2814	1	<0.0001
SS	-46.0785	11.51261	12.3309	3.737	0.000186	moss	86.0089	3	<0.0001
TF	-19.7933	4.18129	4.47695	4.421	<0.0001				
TPA	0.22942	0.65228	0.67553	0.34	0.73415				
TP	0.03451	0.44238	0.47488	0.073	0.942065				
conditional average coefficients									
Intercept	257.6591	44.9329	48.2313	5.342	<0.0001				
SM	25.4944	9.8601	10.4863	2.431	0.015048				
SP	54.0155	8.1462	8.7618	6.165	<0.0001				
SS	-46.1016	11.4693	12.2908	3.751	0.000176				
TF	-19.8331	4.0901	4.3924	4.515	<0.0001				
TPA	1.2896	1.0121	1.0945	1.178	0.238703				
TP	0.3782	1.4194	1.5302	0.247	0.804771				
DPPH full average coefficients									
Intercept	53.24122	30.81867	31.60734	1.684	0.0921	TP	0.001	1	0.9748
SM	34.81441	6.60436	6.8218	5.103	<0.0001	TPA	0.3204	1	0.57135
SP	12.16988	5.64893	5.84136	2.083	0.0372	TF	3.2557	1	0.07118
SS	-11.6317	7.77383	7.97946	1.458	0.1449	moss	178.712	3	<0.0001
TF	-2.23689	2.81602	2.88403	0.776	0.438				
TP	-0.09069	0.37627	0.39264	0.231	0.8173				
TPA	0.00216	0.21485	0.22872	0.009	0.9925				
conditional average coefficients									
Intercept	53.24122	30.81867	31.60734	1.684	0.0921				
SM	34.83942	6.54044	6.76009	5.154	<0.0001				
SP	12.17863	5.64152	5.83434	2.087	0.0369				
SS	-11.6401	7.77036	7.97623	1.459	0.1445				
TF	-4.70045	2.25469	2.42864	1.935	0.0529				
TP	-0.60861	0.79681	0.84817	0.718	0.473				
TPA	0.01934	0.64262	0.68413	0.028	0.9775				
FRAP full average coefficients									
Intercept	44.83117	24.89747	25.60028	1.751	0.079912	TP	8.5871	1	0.00339
SM	49.63696	13.08715	13.29593	3.733	0.000189	TPA	0.9252	1	0.33612
SP	15.98666	4.22915	4.44404	3.597	0.000322	TF	8.1576	1	0.00429
SS	-5.47168	9.56442	9.73321	0.562	0.574003	moss	323.998	3	<0.0001
TF	2.11798	3.02768	3.08309	0.687	0.492104				
TP	-0.69851	0.92941	0.94622	0.738	0.460384				
TPA	-0.01696	0.19017	0.20217	0.084	0.933162				
conditional average coefficients									
Intercept	44.8312	24.8975	25.6003	1.751	0.079912				
SM	49.6487	13.0663	13.2755	3.74	0.000184				
SP	15.9905	4.2225	4.4377	3.603	0.000314				

SS	-5.473	9.5652	9.734	0.562	0.573943				
TF	5.0284	2.6699	2.8165	1.785	0.074199				
TP	-1.5318	0.786	0.8288	1.848	0.06457				
TPA	-0.1576	0.5604	0.5982	0.264	0.792152				
PL full average coefficients									
Intercept	7.0948	5.26581	5.44906	1.302	0.193	TP	0.1132	1	0.7365
TF	0.56014	0.54409	0.55589	1.008	0.314	TPA	0.9634	1	0.3263
TPA	-0.26905	0.28412	0.29043	0.926	0.354	TF	0.002	1	0.9644
SM	-0.51516	1.48975	1.53211	0.336	0.737	moss	2.45	3	0.4844
SP	0.36824	1.12058	1.15807	0.318	0.75				
SS	-0.24169	0.95694	1.00128	0.241	0.809				
TP	-0.03565	0.13094	0.13623	0.262	0.794				
conditional average coefficients									
Intercept	7.0948	5.2658	5.4491	1.302	0.1929				
TF	0.815	0.4723	0.4919	1.657	0.0975				
TPA	-0.4696	0.2161	0.2303	2.039	0.0414				
SM	-2.8374	2.3737	2.5179	1.127	0.2598				
SP	2.0283	1.884	2.0049	1.012	0.3117				
SS	-1.3312	1.8956	2.0178	0.66	0.5094				
TP	-0.1473	0.2332	0.2455	0.6	0.5483				

Table S2. The results of Linear Mixed Effects Models including impact of moss species identity, total phenols content (TP), total phenolic acids content (TPA) and total flavonoids content (TF) on enzymes genes expression. The significant p-values were bolded.

Variable	Estimate	SE	Adj SE	z	P-value		Chisq	Df	Pr(>Chisq)
ELANE (full average coefficients)									
(Intercept)	3.160e-05	2.098e-05	2.165e-05	1.460	0.144	TP	0.004	1	0.94979
mossSM	4.665e-06	8.490e-06	8.640e-06	0.540	0.589	TPA	18.1259	1	0.00002068
mossSP	-2.365e-07	3.826e-06	4.000e-06	0.059	0.953	TF	2.1654	1	0.14115
mossSS	-4.393e-07	5.209e-06	5.372e-06	0.082	0.935	moss	15.6464	3	0.00134
TPA	-1.837e-06	1.408e-06	1.431e-06	1.284	0.199				
TP	2.278e-07	5.573e-07	5.721e-07	0.398	0.690				
TF	5.389e-07	2.072e-06	2.122e-06	0.254	0.800				
(conditional average coefficients)									
(Intercept)	3.160e-05	2.098e-05	2.165e-05	1.460	0.1444				
mossSM	1.351e-05	9.447e-06	9.834e-06	1.374	0.1694				
mossSP	-6.852e-07	6.489e-06	6.785e-06	0.101	0.9196				
mossSS	-1.273e-06	8.806e-06	9.085e-06	0.140	0.8886				
TPA	-2.351e-06	1.153e-06	1.188e-06	1.979	0.0479				
TP	7.498e-07	7.941e-07	8.282e-07	0.905	0.3653				
TF	2.574e-06	3.908e-06	4.034e-06	0.638	0.5235				
HYAL1 (full average coefficients)									
(Intercept)	2.779e-05	5.433e-06	5.675e-06	4.897	0.000001	TP	0.8812	1	0.348
TPA	-8.572e-07	6.882e-07	7.040e-07	1.218	0.223	TPA	7.6769	1	0.006
TP	1.283e-07	3.447e-07	3.536e-07	0.363	0.717	TF	0.6552	1	0.418

TF	-7.577e-08	3.173e-07	3.325e-07	0.228	0.820	moss	2.6793	3	0.444
mossSM	1.182e-07	1.257e-06	1.288e-06	0.092	0.927				
mossSP	6.688e-08	7.744e-07	8.015e-07	0.083	0.934				
mossSS	3.045e-08	5.757e-07	6.082e-07	0.050	0.960				
(conditional average coefficients)									
(Intercept)	2.779e-05	5.433e-06	5.675e-06	4.897	0.000001				
TPA	-1.092e-06	5.892e-07	6.126e-07	1.782	0.0747				
TP	3.702e-07	5.032e-07	5.208e-07	0.711	0.4771				
TF	-3.668e-07	6.170e-07	6.546e-07	0.560	0.5752				
mossSM	6.334e-06	6.732e-06	7.032e-06	0.901	0.3677				
mossSP	3.583e-06	4.420e-06	4.671e-06	0.767	0.4430				
mossSS	1.631e-06	3.892e-06	4.148e-06	0.393	0.6941				
HYAL2 (full average coefficients)									
(Intercept)	2.220e-03	6.573e-04	6.751e-04	3.288	0.00101	TP	0.0429	1	0.835828
mossSM	1.910e-04	3.466e-04	3.508e-04	0.545	0.58601	TPA	9.0561	1	0.002618
mossSP	7.880e-05	1.659e-04	1.706e-04	0.462	0.64418	TF	0.0093	1	0.92297
mossSS	-3.526e-05	1.141e-04	1.201e-04	0.294	0.76906	moss	10.1493	3	0.017338
TPA	-4.254e-05	5.650e-05	5.724e-05	0.743	0.45734				
TP	1.180e-05	2.382e-05	2.432e-05	0.485	0.62747				
TF	-3.571e-06	3.342e-05	3.545e-05	0.101	0.91976				
(conditional average coefficients)									
(Intercept)	2.220e-03	6.573e-04	6.751e-04	3.288	0.00101				
mossSM	6.856e-04	3.036e-04	3.202e-04	2.141	0.03224				
mossSP	2.828e-04	2.028e-04	2.163e-04	1.308	0.19104				
mossSS	-1.265e-04	1.877e-04	2.005e-04	0.631	0.52802				
TPA	-8.456e-05	5.284e-05	5.440e-05	1.554	0.12007				
TP	3.358e-05	2.972e-05	3.085e-05	1.088	0.27647				
TF	-2.058e-05	7.803e-05	8.302e-05	0.248	0.80419				
HYAL3 (full average coefficients)									
(Intercept)	3.418e-06	1.976e-06	2.054e-06	1.664	0.0961	TP	1.7068	1	0.191
TF	2.896e-08	1.345e-07	1.405e-07	0.206	0.8367	TPA	3.9951	1	0.046
TP	1.584e-08	7.372e-08	7.622e-08	0.208	0.8354	TF	0.2783	1	0.598
TPA	-1.336e-08	1.050e-07	1.086e-07	0.123	0.9021	moss	6.3106	3	0.097
mossSM	7.298e-08	6.388e-07	6.525e-07	0.112	0.9109				
mossSP	6.821e-08	5.025e-07	5.123e-07	0.133	0.8941				
mossSS	-1.537e-08	2.959e-07	3.103e-07	0.050	0.9605				
(conditional average coefficients)									
(Intercept)	3.418e-06	1.976e-06	2.054e-06	1.664	0.0961				
TF	1.244e-07	2.566e-07	2.701e-07	0.461	0.6451				
TP	6.639e-08	1.394e-07	1.449e-07	0.458	0.6469				
TPA	-6.544e-08	2.250e-07	2.332e-07	0.281	0.7790				
mossSM	2.375e-06	2.795e-06	2.896e-06	0.820	0.4122				

mossSP	2.220e-06	1.855e-06	1.941e-06	1.144	0.2527					
mossSS	-5.003e-07	1.614e-06	1.700e-06	0.294	0.7686					
HYAL4 (full average coefficients)										
(Intercept)	7.222e-05	7.120e-05	7.187e-05	1.005	0.315	TP	0.2229	1	0.6368498	
mossSM	-6.592e-06	1.197e-05	1.215e-05	0.542	0.588	TPA	1.0259	1	0.3111236	
mossSP	7.750e-06	1.137e-05	1.152e-05	0.673	0.501	TF	4.0077	1	0.0452926	
mossSS	-1.324e-05	1.903e-05	1.919e-05	0.690	0.490	moss	16.44	3	0.0009211	
TF	-3.914e-06	6.248e-06	6.309e-06	0.620	0.535					
TP	-1.010e-07	4.658e-07	4.834e-07	0.209	0.835					
TPA	-1.623e-07	5.235e-07	5.411e-07	0.300	0.764					
(conditional average coefficients)										
(Intercept)	7.222e-05	7.120e-05	7.187e-05	1.005	0.3150					
mossSM	-1.689e-05	1.391e-05	1.430e-05	1.181	0.2376					
mossSP	1.985e-05	9.531e-06	9.979e-06	1.990	0.0466					
mossSS	-3.393e-05	1.504e-05	1.553e-05	2.184	0.0290					
TF	-7.508e-06	6.920e-06	7.026e-06	1.069	0.2853					
TP	-5.172e-07	9.467e-07	9.909e-07	0.522	0.6017					
TPA	-7.527e-07	9.089e-07	9.557e-07	0.788	0.4310					
MMP1 (full average coefficients)										
(Intercept)	4.877e-01	6.194e-02	6.539e-02	7.458	<2e-16	TP	0.8448	1	0.358	
TPA	1.533e-03	4.536e-03	4.704e-03	0.326	0.744	TPA	1.6817	1	0.195	
TF	6.882e-04	4.038e-03	4.272e-03	0.161	0.872	TF	0.3186	1	0.572	
TP	-9.667e-05	2.421e-03	2.535e-03	0.038	0.970	moss	1.8034	3	0.614	
mossSM	-3.291e-04	9.712e-03	1.015e-02	0.032	0.974					
mossSP	-3.285e-04	7.522e-03	7.876e-03	0.042	0.967					
mossSS	-2.293e-04	6.529e-03	6.912e-03	0.033	0.974					
(conditional average coefficients)										
(Intercept)	0.4877300	0.0619354	0.0653927	7.458	<2e-16					
TPA	0.0061255	0.0073523	0.0077623	0.789	0.430					
TF	0.0035326	0.0085806	0.0091451	0.386	0.699					
TP	-0.0004894	0.0054293	0.0056862	0.086	0.931					
mossSM	-0.0366302	0.0957600	0.1006899	0.364	0.716					
mossSP	-0.0365627	0.0705282	0.0746969	0.489	0.625					
mossSS	-0.0255234	0.0640276	0.0683612	0.373	0.709					
MMP8 (full average coefficients)										
(Intercept)	1.200e-05	6.403e-06	6.614e-06	1.814	0.0696	TP	2.5876	1	0.108	
TF	-4.435e-07	5.089e-07	5.246e-07	0.846	0.3978	TPA	0.00	1	0.991	
TP	-1.426e-07	2.448e-07	2.514e-07	0.567	0.5705	TF	0.2392	1	0.625	
TPA	-1.065e-07	2.489e-07	2.564e-07	0.415	0.6778	moss	3.7207	3	0.293	
mossSM	1.479e-07	1.831e-06	1.890e-06	0.078	0.9376					
mossSP	7.642e-09	1.180e-06	1.230e-06	0.006	0.9950					
mossSS	3.706e-07	1.411e-06	1.445e-06	0.256	0.7976					

(conditional average coefficients)									
(Intercept)	1.200e-05	6.403e-06	6.614e-06	1.814	0.0696				
TF	-7.533e-07	4.544e-07	4.838e-07	1.557	0.1194				
TP	-3.328e-07	2.766e-07	2.902e-07	1.147	0.2514				
TPA	-3.524e-07	3.439e-07	3.618e-07	0.974	0.3301				
mossSM	1.421e-06	5.512e-06	5.701e-06	0.249	0.8032				
mossSP	7.338e-08	3.656e-06	3.810e-06	0.019	0.9846				
mossSS	3.559e-06	2.785e-06	2.951e-06	1.206	0.2278				
MMP13 (full average coefficients)									
(Intercept)	1.259e-04	9.276e-05	9.520e-05	1.322	0.186	TP	1.013	1	0.314
mossSM	3.293e-06	1.889e-05	1.996e-05	0.165	0.869	TPA	0.043	1	0.836
mossSP	-4.398e-06	1.509e-05	1.596e-05	0.276	0.783	TF	0.775	1	0.379
mossSS	2.051e-05	3.015e-05	3.061e-05	0.670	0.503	moss	7.4231	3	0.06
TF	-4.498e-06	7.603e-06	7.805e-06	0.576	0.564				
TPA	-4.789e-07	1.842e-06	1.925e-06	0.249	0.803				
TP	-4.661e-07	1.759e-06	1.848e-06	0.252	0.801				
(conditional average coefficients)									
(Intercept)	1.259e-04	9.276e-05	9.520e-05	1.322	0.1861				
mossSM	8.794e-06	3.007e-05	3.187e-05	0.276	0.7826				
mossSP	-1.174e-05	2.284e-05	2.437e-05	0.482	0.6299				
mossSS	5.475e-05	2.349e-05	2.502e-05	2.188	0.0287				
TF	-9.294e-06	8.653e-06	9.016e-06	1.031	0.3026				
TPA	-2.325e-06	3.489e-06	3.700e-06	0.628	0.5298				
TP	-2.249e-06	3.305e-06	3.530e-06	0.637	0.5241				
TYR (full average coefficients)									
(Intercept)	1.669e-04	1.140e-04	1.167e-04	1.430	0.153	TP	0.1538	1	0.695
TF	-8.447e-06	9.257e-06	9.485e-06	0.891	0.373	TPA	0.0857	1	0.77
TPA	-1.215e-06	3.029e-06	3.141e-06	0.387	0.699	TF	0.5431	1	0.461
TP	-5.936e-07	2.020e-06	2.121e-06	0.280	0.780	moss	3.5654	3	0.312
mossSM	-2.481e-07	1.640e-05	1.757e-05	0.014	0.989				
mossSP	-5.556e-06	1.837e-05	1.911e-05	0.291	0.771				
mossSS	1.041e-05	2.714e-05	2.767e-05	0.376	0.707				
(conditional average coefficients)									
(Intercept)	1.669e-04	1.140e-04	1.167e-04	1.430	0.153				
TF	-1.293e-05	8.556e-06	8.931e-06	1.448	0.148				
TPA	-4.423e-06	4.385e-06	4.662e-06	0.949	0.343				
TP	-2.372e-06	3.476e-06	3.709e-06	0.639	0.523				
mossSM	-1.428e-06	3.932e-05	4.214e-05	0.034	0.973				
mossSP	-3.198e-05	3.313e-05	3.545e-05	0.902	0.367				
mossSS	5.991e-05	3.569e-05	3.799e-05	1.577	0.115				
HAS1 (full average coefficients)									
(Intercept)	1.909e-05	7.271e-06	7.534e-06	2.534	0.0113	TP	0.0637	1	0.801

TPA	-3.286e-07	5.008e-07	5.147e-07	0.638	0.5232	TPA	4.076	1	0.044
TP	-2.582e-08	2.260e-07	2.354e-07	0.110	0.9126	TF	3.0066	1	0.083
TF	-9.740e-08	5.438e-07	5.612e-07	0.174	0.8622	moss	4.8787	3	0.181
mossSM	2.736e-09	1.146e-06	1.192e-06	0.002	0.9982				
mossSP	-1.125e-07	1.141e-06	1.172e-06	0.096	0.9235				
mossSS	4.841e-08	1.124e-06	1.161e-06	0.042	0.9668				
(conditional average coefficients)									
(Intercept)	1.909e-05	7.271e-06	7.534e-06	2.534	0.0113				
TPA	-7.465e-07	5.077e-07	5.383e-07	1.387	0.1656				
TP	-1.033e-07	4.430e-07	4.622e-07	0.223	0.8232				
TF	-4.103e-07	1.057e-06	1.095e-06	0.375	0.7078				
mossSM	1.387e-07	8.160e-06	8.486e-06	0.016	0.9870				
mossSP	-5.702e-06	5.847e-06	6.143e-06	0.928	0.3533				
mossSS	2.454e-06	7.623e-06	7.905e-06	0.311	0.7562				
HAS2 (full average coefficients)									
(Intercept)	2.559e-02	5.973e-03	6.327e-03	4.044	5.25e-05	TP	0.6224	1	0.43
mossSM	-4.857e-03	3.523e-03	3.592e-03	1.352	0.176	TPA	0.4655	1	0.495
mossSP	-4.539e-03	3.120e-03	3.170e-03	1.432	0.152	TF	0.1416	1	0.707
mossSS	-3.068e-03	2.376e-03	2.442e-03	1.256	0.209	moss	16.1623	3	0.001
TP	-4.396e-05	2.389e-04	2.453e-04	0.179	0.858				
TPA	-6.799e-05	2.042e-04	2.113e-04	0.322	0.748				
TF	-3.773e-05	4.538e-04	4.848e-04	0.078	0.938				
(conditional average coefficients)									
(Intercept)	0.0255878	0.0059726	0.0063272	4.044	5.25e-05				
mossSM	-0.0066195	0.0022914	0.0024320	2.722	0.006492				
mossSP	-0.0061856	0.0017539	0.0018731	3.302	0.000959				
mossSS	-0.0041809	0.0017429	0.0018636	2.243	0.024868				
TP	-0.0001934	0.0004714	0.0004858	0.398	0.690462				
TPA	-0.0003497	0.0003405	0.0003620	0.966	0.334018				
TF	-0.0002871	0.0012229	0.0013101	0.219	0.826553				
HAS3 (full average coefficients)									
(Intercept)	6.605e-04	1.357e-04	1.415e-04	4.669	0.000003	TP	0.0063	1	0.937
TPA	-1.026e-05	1.038e-05	1.062e-05	0.966	0.334	TPA	2.7902	1	0.095
TP	-1.984e-06	4.884e-06	5.033e-06	0.394	0.693	TF	0.0313	1	0.86
TF	-3.357e-06	9.956e-06	1.036e-05	0.324	0.746	moss	5.2756	3	0.153
mossSM	-2.945e-06	3.134e-05	3.268e-05	0.090	0.928				
mossSP	-6.831e-06	3.138e-05	3.224e-05	0.212	0.832				
mossSS	-4.483e-06	2.668e-05	2.772e-05	0.162	0.872				
(conditional average coefficients)									
(Intercept)	6.605e-04	1.357e-04	1.415e-04	4.669	0.000003				
TPA	-1.699e-05	8.002e-06	8.515e-06	1.995	0.046				
TP	-6.330e-06	6.970e-06	7.301e-06	0.867	0.386				

TF	-1.240e-05	1.594e-05	1.687e-05	0.735	0.462
mossSM	-3.570e-05	1.036e-04	1.085e-04	0.329	0.742
mossSP	-8.282e-05	7.511e-05	7.943e-05	1.043	0.297
mossSS	-5.435e-05	7.692e-05	8.128e-05	0.669	0.504

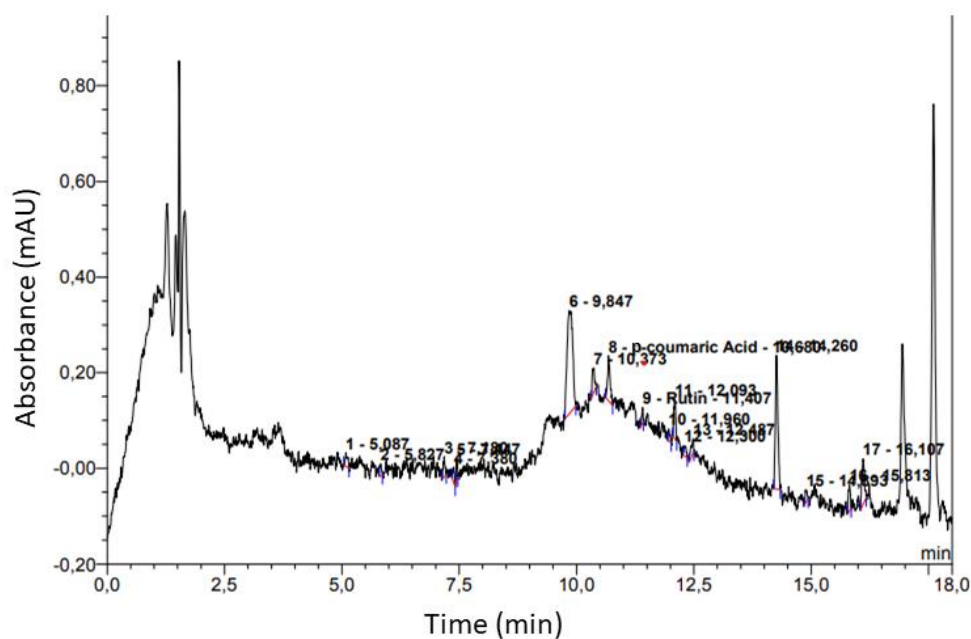


Figure S1. Chromatogram of *Sphagnum girgensohnii* Russow. (0.141 mg/g *p*-coumaric acid, 0.064 mg/g rutin).

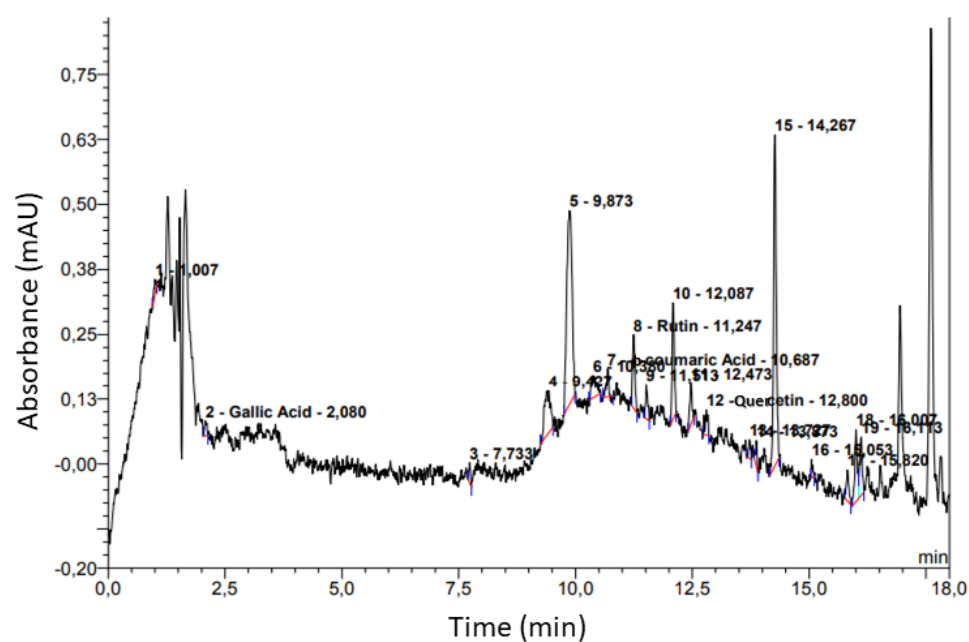


Figure S2. Chromatogram of *Sphagnum magellanicum* Brid. (0.069 mg/g *p*-coumaric acid, 0.510 mg/g rutin, 0.142 mg/g quercetin).

