

Supplementary Materials

The Antioxidant Profile of Some Species of Microgreens Cultivated on Hemp and Coconut Substrate Under the Action of a Biostimulator Based on Humic Acids

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Table S1. Raw data for the determinations made on spinach (a, b, c, d), radish (e, f, g, h) and mustard (i, j, k, l) for the two substrate types tested under the influence biostimulant Biohumusol.

(a)

Hemp substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g DW	DPPH μmol TE/g DW
5.098665643	0.201283718	4.191377111	1967.053171	0.91840073	1.737032487	1.577416293	2.54061327
5.080413153	0.191192067	4.179073422	1974.604736	0.91964246	1.681438706	1.563626216	2.97515861
5.092782963	0.199093404	4.189469242	1968.47111	0.90163601	1.670601917	1.566820384	2.64299993
5.089213173	0.203495097	4.198608981	1982.197786	0.9031495	1.682023485	1.589858362	3.59476532
5.091613057	0.215252317	4.187890302	1969.885265	0.90413446	1.71329887	1.560909009	2.40075841

(b)

Hemp substrate/Biohumusol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μmol TE/g DW
9.955427719	0.548645717	9.499485317	1484.673293	0.917924503	1.701196972	2.918015785	13.49485026
10.01576385	0.540131801	9.507621043	1510.414359	0.904370588	1.688562723	2.926397142	13.46598962
10.00517672	0.550600608	9.49945162	1459.666228	0.895995199	1.78018271	2.919252362	13.31339555
10.04454622	0.511650428	9.501807894	1472.71232	0.88851149	1.784253662	2.951289316	13.4037521
10.00210396	0.569432082	9.493745769	1499.105663	0.895086625	1.835673037	2.910760822	13.41316847

(c)

Coconut substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
4.889246885	0.196660397	4.089882956	1952.640664	0.88066599	1.61298055	1.449828349	2.478423206
4.88925914	0.198507126	4.086028836	1962.075651	0.88911417	1.706753882	1.434275716	2.024591272
4.893884705	0.173927997	4.0958494	1949.611767	0.87630891	1.624018435	1.421629329	3.107039617
4.90635689	0.157692278	4.063424823	1952.720865	0.88579644	1.64743712	1.420371293	2.283580792
4.901074955	0.171982213	4.087276776	1957.883838	0.89181158	1.645274752	1.43297216	2.934837479

(d)

Coconut substrate/Biohumussol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
9.625182832	0.508321027	9.464922867	1476.842025	0.8824458	1.586398699	3.261150743	12.9089
9.623805993	0.528898481	9.470987924	1463.877855	0.85349726	1.652441492	3.228655369	13.17782
9.610237924	0.508863473	9.455776238	1471.355699	0.83266754	1.622117121	3.257152753	12.92059
9.605880671	0.518480038	9.470274493	1469.278907	0.80788349	1.704826944	3.164126679	13.208
9.569742854	0.512535683	9.453501092	1499.180585	0.90106211	1.661340262	3.156295702	13.20657

(e)

Radish

Hemp substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
4.55848684	0.498156758	4.042722223	1567.842443	3.35680652	6.332261521	2.896570053	35.2975751
4.542151257	0.474718215	4.050625778	1550.394994	3.23481681	6.310186772	2.818635225	35.3951037
4.557194777	0.497806466	4.03600174	1551.994463	3.34130609	6.331269308	2.917662554	35.1096795
4.573704812	0.479571256	4.037062324	1560.370778	3.23594845	6.339055794	2.915154714	35.4133394
4.543237649	0.493292507	4.051627006	1545.233896	3.2867619	6.412452334	2.866991148	35.4988751

(f)

Hemp substrate/Biohumussol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
4.55848684	0.485637825	4.062768191	1143.84678	3.750332442	7.317104541	2.889894408	24.8806481
4.542151257	0.500780423	4.061114707	1185.080223	3.772222183	7.343140756	2.859721547	24.70948949
4.557194777	0.502593819	4.051353942	1298.56297	3.784769424	7.381452408	2.887419687	24.70193774
4.573704812	0.476164903	4.038940453	1123.173672	3.790458484	7.300354491	2.896918494	24.30353883
4.543237649	0.493903062	4.056222626	1230.041167	3.789938128	7.2332	2.896077425	24.40128697

(g)

Coconut substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μmol TE/g DW
4.735933256	0.481532013	4.369041972	1126.565571	2.46106825	4.815654938	2.219799184	22.29933204
4.713920642	0.473397583	4.354350642	1113.101477	2.48937228	4.746439753	2.197857465	22.29320391
4.728875782	0.487407394	4.454311354	1112.584598	2.47474419	4.724294558	2.20856523	22.19003825
4.709763023	0.473656062	4.408279525	1077.555406	2.45636489	4.661570346	2.219379168	22.25997362
4.709612002	0.484568907	4.369938214	1149.558032	2.44717364	4.751127198	2.232842122	22.25931018

(h)

Coconut substrate/Biohumussol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μmol TE/g DW
4.368253126	0.334334424	4.110093329	1432.537745	2.60362737	5.000289949	1.906657582	23.49284
4.367854949	0.339739369	4.100487519	1515.811811	2.62081182	4.965100417	1.888383657	23.61174
4.37952056	0.331176579	4.119104148	1429.512899	2.52798685	4.79587765	1.590372598	23.9942
4.385189747	0.338723691	4.122198169	1378.783181	2.61542203	5.057879517	1.882267544	23.07449
4.38002027	0.322139487	4.128129041	1393.068403	2.56030625	4.918286587	1.733390151	23.52212

(i)

Mustard

Hemp substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μmol TE/g DW
14.93060576	1.253460431	11.24137711	2576.016715	2.93727262	5.290761091	5.280254288	16.3934787
14.92372002	1.244745743	11.22907342	2574.716556	2.90947128	5.572125011	5.297489916	16.4180084
14.96753102	1.231205596	11.23946924	2591.323932	2.96377112	5.396379348	5.302307282	16.2473749
14.96567101	1.22557978	11.24860898	2587.893224	3.05618884	5.581867349	5.295485027	16.2040696
14.93847437	1.226106923	11.2378903	2610.273435	3.07400129	4.993108306	5.303258417	16.0464227

(j)

Hemp substrate/Biohumussol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β-caroten mg/100 g DW	ABTS μmol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μmol TE/g DW
9.151181903	0.564328042	8.289485317	1602.870061	3.762976398	7.127946912	2.028323726	21.5045409
9.161260582	0.581059573	8.297621043	1573.517466	3.831783946	7.182029155	2.035776717	21.4080052
9.172044893	0.588661186	8.28945162	1581.691975	3.752843535	7.152311104	2.047990321	21.90743004
9.171385509	0.589122368	8.291807894	1571.37564	3.766888407	7.325563126	1.981810576	21.80989986
9.16458964	0.554702223	8.283745769	1564.708439	3.761756629	7.115948358	2.011447847	21.26090839

(k)

Coconut substrate/untreated							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
10.75576658	0.938270716	8.732170706	2304.947026	2.60960331	4.891788168	3.349668399	10.59504857
10.77043521	0.965573497	8.732165499	2184.658757	2.59526167	5.045630411	3.222945547	10.39958705
10.76469348	0.969978157	8.748525058	2164.548644	2.54035516	4.951850502	3.380161256	10.39466818
10.78538571	0.948431205	8.736622569	2330.759799	2.59272177	4.8891262	3.331280974	10.48962665
10.75169186	0.967671247	8.757242746	2231.094768	2.65489755	4.96464009	3.30495241	10.3999

(l)

Coconut substrate/Biohumussol							
Total carotenoids mg/100 g DW	Licopen mg/100 g DW	β -caroten mg/100 g DW	ABTS μ mol Trolox/g DW	Total flavonoids mg EC/g DW	Total polyphenols mg GAE/g DW	Total chlorophyll mg/100g FW	DPPH μ mol TE/g DW
6.458279122	0.568321027	5.373757865	1447.910853	2.21467435	4.222191972	3.326494459	11.88979
6.440477241	0.588898481	5.373447136	1447.922452	2.21739956	4.083994116	3.296548527	11.65754
6.458229418	0.568863473	5.375026985	1458.209398	2.33839361	4.309076251	3.259762011	11.67003
6.446554712	0.578480038	5.393396357	1439.849467	2.20063166	4.657740299	3.379259701	11.4505
6.465400102	0.572535683	5.389911673	1461.537713	2.33646948	4.040303036	3.269227443	11.76395

Table S2. Results of T-tests performed for making heatmaps for spinach (a), radish (b) and mustard (c).

(a)

Spinach	CT	Li	BC	ATBS	TF	TpP	CIT	DPPH
Variants compared	Significance	Significance	Significance	Significance	Significance	Significance	Significance	Significance
I-III	****	*	****	****	****	*	****	NS
I-II	****	****	****	****	NS	*	****	****
III-IV	****	****	****	****	NS	NS	****	****
I-IV	****	****	****	****	*	*	****	****
II-III	****	****	****	****	*	***	****	****
II-IV	*	*	****	NS	*	***	****	***

(b)

Radish	TC	Li	BC	ATBS	TF	TpP	CIT	DPPH
Variants compared	Significance	Significance	Significance	Significance	Significance	Significance	Significance	Significance
I-III	****	NS	****	****	****	****	****	****
I-II	*	NS	*	****	****	****	NS	****
III-IV	****	****	****	****	****	****	****	****
I-IV	****	****	****	***	****	****	***	****
II-III	****	*	****	*	****	****	****	****
II-IV	****	****	****	****	****	****	****	****

(c)

Mustard	TC	Li	BC	ATBS	TF	TpP	CIT	DPPH
Variants compared	Significance	Significance	Significance	Significance	Significance	Significance	Significance	Significance
I-III	****	****	****	****	****	****	****	****
I-II	****	****	****	****	****	****	****	****
III-IV	****	****	****	****	****	****	NS	****
I-IV	****	****	****	****	****	****	****	****
II-III	****	****	****	****	****	****	****	****
II-IV	****	NS	****	****	****	****	****	****

Table S3. Height (cm) of mustard radish and spinach microgreens grown on hemp and coconut substrate under the action of Biohumussol biostimulator.

	Hemp substrate		Coconut substrate	
	Untreated	Biohumussol	Untreated	Biohumussol
Spinach	4.7; 4.8; 4.6; 4.75; 4.7; 4.8; 4.7; 4.65; 4.9; 4.5	5.0; 5.5; 5.2; 5.1; 5.4; 5.3; 5.0; 5.6; 5.1; 5.8	3.5; 3.2; 3.0; 3.5; 3.4; 3.1; 3.0; 3.7; 3.0; 3.4	3.80; 3.75; 3.70; 3.85; 3.90; 3.60; 3.80; 3.60; 3.85; 3.70
Radish	10.5; 11.2; 11.1; 11.0; 11.3; 10.9; 11.0; 11.4; 10.7; 11.3	12.0; 12.5; 10.8; 11.6; 11.7; 11.3; 12.2; 11.5; 10.9; 11.3	9.5; 9.8; 10.2; 9.7; 10.1; 10.0; 9.6; 10.3; 9.9; 9.9	10.5; 11.2; 10.3; 10.9; 10.6; 10.8; 10.2; 11.0; 10.4; 10.5
Mustard	12.0; 12.5; 12.2; 12.3; 12.4; 12.0; 12.7; 12.1; 12.8; 12.3	14.5; 13.2; 13.9; 14.1; 12.8; 13.4; 13.5; 13.7; 14.0; 13.1	10.0; 10.2; 10.4; 10.6; 10.8; 10.9; 9.8; 10.5; 11.1; 10.3	11.6; 11.9; 11.5; 12.2; 11.7; 12.0; 11.8; 11.4; 12.1; 11.8

Table S4. Weight (g) of mustard radish and spinach microgreens grown on hemp and coconut substrate under the action of Biohumussol biostimulator.

	Hemp substrate		Coconut substrate	
	Untreated	Biohumussol	Untreated	Biohumussol
Spinach	92.5; 94.1; 96.3; 97.2; 93.7; 94.8; 95.5; 96.9; 93.0; 94.0	98.3; 97.1; 99.4; 96.8; 98.2; 97.5; 97.9; 96.6; 98.0; 97.5;	85.5; 87.3; 89.1; 88.6; 90.2; 88.4; 87.8; 89.4; 88.7; 89.5	91.8; 91.6; 91.7; 91.7; 91.8; 91.6; 91.7; 91.7; 91.7; 91.7
Radish	140; 142; 143; 145; 144; 141; 146; 139; 147; 143	150; 155; 160; 165; 170; 155; 160; 165; 150; 155	120.5; 125.3; 126.8; 128.2; 123.6; 127.5; 124.4; 130.1; 126.2; 123.8	136.5; 137.2; 138.0; 136.8; 137.1; 137.3; 136.9; 137.6; 137.4; 137.6
Mustard	140; 145; 150; 155; 160; 135; 155; 160; 145; 135	176; 178; 177; 177; 179; 176; 178; 177; 175; 178	130.5; 132.0; 133.2; 134.5; 133.0; 132.3; 134.0; 135.5; 130.0; 133.0	145.0; 146.5; 147.0; 144.5; 146.0; 147.5; 144.0; 146.5; 145.5; 146.0