Assessment of the Use of RGB Vegetation Indices to Determine Chlorophyll Content in Sugar Beet Leaves in the Final Cultivation Stage

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SUPPORTING INFORMATION

Table S1. Summary of descriptive statistics for all the RGB vegetation indices studied in this work using mean values from all shoots

Vegetation index	Max	Min	Mean	Std. Error	CV (%)
R	230.00	92.00	153.92	1.92	20.88
G	202.47	105.00	157.46	1.33	14.15
B	107.00	47.93	76.26	0.64	14.09
R/(R+G+B)	0.45	0.35	0.39	0.00	6.68
G/(R+G+B)	0.44	0.37	0.41	0.00	3.02
B/(R+G+B)	0.27	0.14	0.20	0.00	13.18
R-G	33.00	-19.00	-3.53	0.76	-358.01
R-B	138.00	22.00	77.66	1.73	37.14
G-B	118.00	34.00	81.20	1.14	23.37
(R-G)/(R+G)	0.09	-0.07	-0.02	0.00	-230.59
(R-B)/(R+B)	0.51	0.13	0.33	0.01	26.06
(G-B)/(G+B)	0.49	0.18	0.35	0.00	17.99
(R-G)/(R+G+B)	0.07	-0.06	-0.01	0.00	-242.53
(R-B)/(R+G+B)	0.31	0.08	0.20	0.00	26.18
(G-B)/(R+G+B)	0.28	0.11	0.21	0.00	15.07
RGRI	1.19	0.87	0.97	0.00	8.14
GLI	0.21	0.08	0.16	0.00	15.88
VARI	0.10	-0.11	0.02	0.00	213.62
I_{PCA}	268.47	65.51	165.90	2.79	28.10
ExR	0.25	0.09	0.14	0.00	28.76
ExB	-0.01	-0.22	-0.13	0.00	-32.08
ExG	0.31	0.11	0.22	0.00	16.67
ExGR	0.19	-0.12	0.08	0.00	88.98
GREY	0.39	0.36	0.38	0.00	1.73
CIVE	18.74	18.67	18.70	0.00	0.08
PCA1	0.85	-0.01	0.44	0.01	42.98
PCA2	263.87	63.89	162.63	2.75	28.28
I_1	248.00	56.00	158.86	2.82	29.69
SRL1	62.97	-6.88	24.94	0.88	58.70
SRL2	58.00	-8.34	19.97	0.83	69.11
SRL3	59.08	-6.82	22.38	0.84	62.92
SRL4	62.36	-8.97	22.86	0.85	61.79
SRL5	57.18	-7.36	22.67	0.82	60.44
I_2	0.51	0.01	0.21	0.01	58.62

Table S2. Factor analysis results for *PCA1* vegetation index

Descriptive Statistics

	Mean	Std. Deviation	Analysis N	Missing N
B/(R+G+B)	.199627956731097	.027028231802961	139	0
(R-G)/(R+G)	-.019443921070417	.038754594797646	139	0
(R-B)/(R+B)	.326277485061056	.087558626795844	139	0
(G-B)/(G+B)	.344705529957940	.064710443168605	139	0

Correlation Matrix

		B/(R+G+B)	(R-G)/(R+G)	(R-B)/(R+B)	(G-B)/(G+B)
Correlation	B/(R+G+B)	1.000	-.652	-.989	-.980
	(R-G)/(R+G)	-.652	1.000	.757	.494
	(R-B)/(R+B)	-.989	.757	1.000	.942
	(G-B)/(G+B)	-.980	.494	.942	1.000
Sig. (1-tailed)	B/(R+G+B)		.000	.000	.000
	(R-G)/(R+G)	.000		.000	.000
	(R-B)/(R+B)	.000	.000		.000
	(G-B)/(G+B)	.000	.000	.000	

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.544
Bartlett's Test of Sphericity	Approx. Chi-Square	2152.984
	df	6
	Sig.	.000

Component Matrix[a]

	Component 1
(R-B)/(R+B)	.995
B/(R+G+B)	-.977
(G-B)/(G+B)	.916
(R-G)/(R+G)	.771

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Communalities

	Extraction
B/(R+G+B)	.974
(R-G)/(R+G)	.584
(R-B)/(R+B)	1.000
(G-B)/(G+B)	.880

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %
1	3.438	85.952	85.952

Extraction Method: Principal Component Analysis.

Table S3. Factor analysis results for *PCA2* vegetation index

Descriptive Statistics

	Mean	Std. Deviation	Analysis N	Missing N
|R-B|	2109.3165	3816.02731	139	0
|G-B|	2131.0144	3743.85989	139	0
|R-G|	243.3813	501.97229	139	0

Correlation Matrix

		|R-B|	|G-B|	|R-G|
Correlation	|R-B|	1.000	.957	.745
	|G-B|	.957	1.000	.768
	|R-G|	.745	.768	1.000
Sig. (1-tailed)	|R-B|		.000	.000
	|G-B|	.000		.000
	|R-G|	.000	.000	

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.697
Bartlett's Test of Sphericity	Approx. Chi-Square	458.840
	df	3
	Sig.	.000

Component Matrix[a]

	Component 1
|G-B|	.920
|R-B|	.999
|R-G|	.886

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Communalities

	Extraction
|R-B|	.926
|G-B|	.941
|R-G|	.784

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %
1	2.651	88.351	88.351

Extraction Method: Principal Component Analysis.

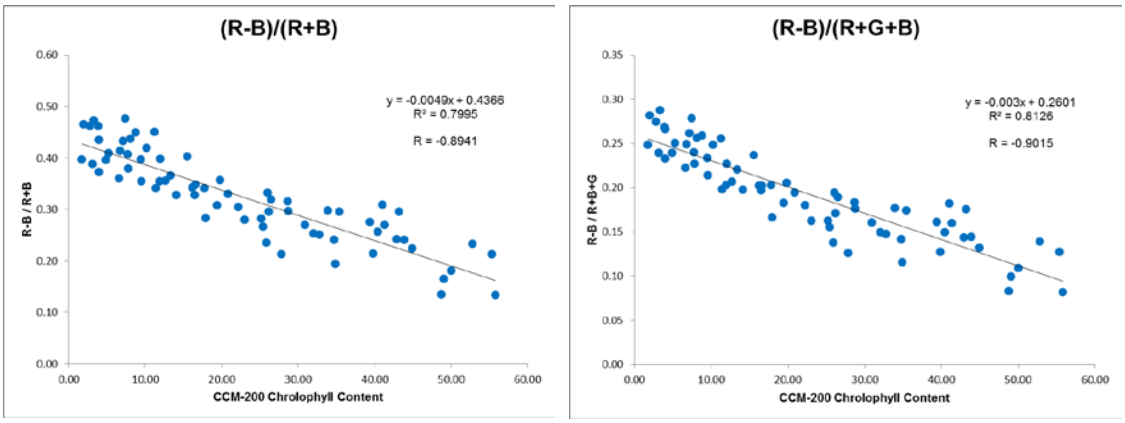

Figure S1. Relationship between (**Left**) (R-B)/(R+B) and **(Right)** (R-B)/(R+G+B) indices and the chlorophyll content measured with CCM-200 chlorophyll-meter for the dataset with information from the four days of the experiment (mean values of three shots are used for the first and last days). Regression lines, equations, R^2 and R-values are shown.

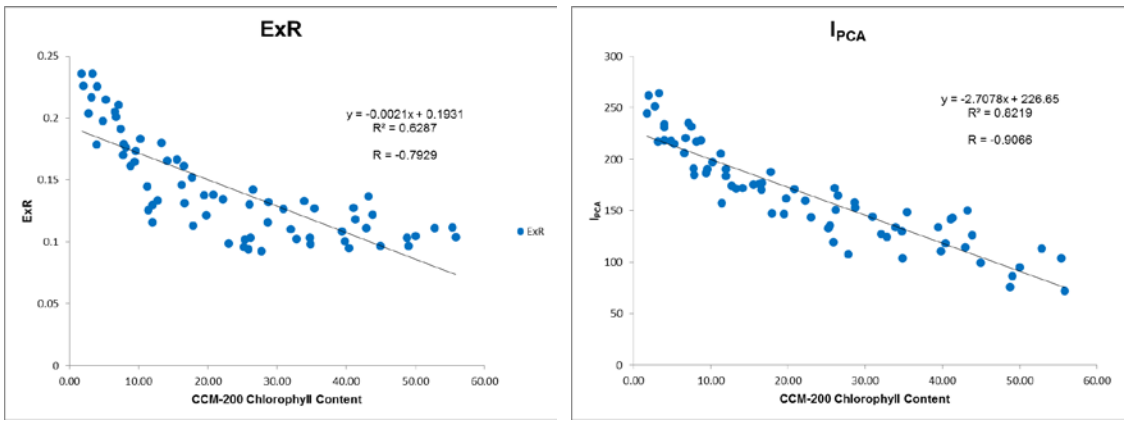

Figure S2. Relationship between (**Left**) *ExR* and **(Right)** I_{PCA} indices and the chlorophyll content measured with CCM-200 chlorophyll-meter for the dataset with information from the four days of the experiment (mean values of three shots are used for the first and last days). Regression lines, equations, R^2 and R-values are shown.

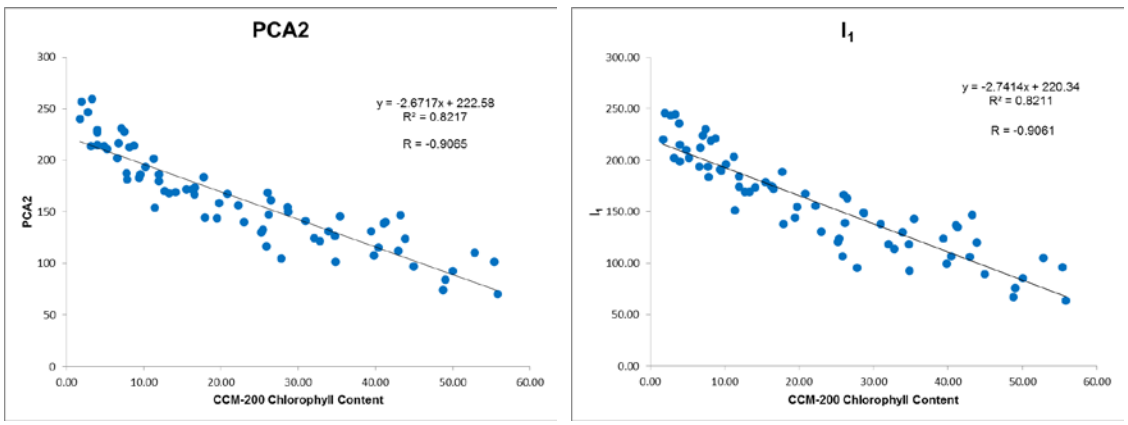

Figure S3. Relationship between (**Left**) *PCA2* and **(Right)** I_1 indices and the chlorophyll content measured with CCM-200 chlorophyll-meter for the dataset with information from the four days of the experiment (mean values of three shots are used for the first and last days). Regression lines, equations, R^2 and R-values are shown.

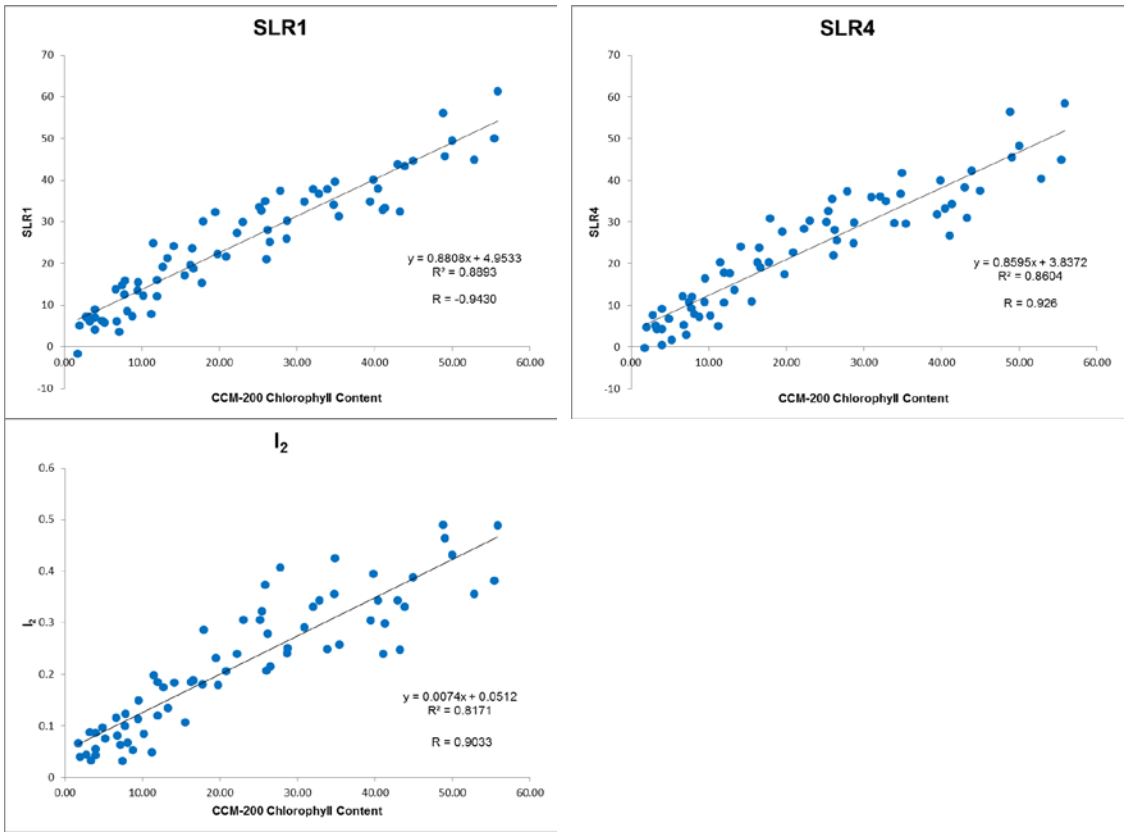

Figure S4. Relationship between (**Upper left**) *SLR1*, (**Upper right**) *SLR4* and **(Bottom left)** I_2 indices and the chlorophyll content measured with CCM-200 chlorophyll-meter for the dataset with information from the four days of the experiment (mean values of three shots are used for the first and last days). Regression lines, equations, R^2 and R-values are shown.

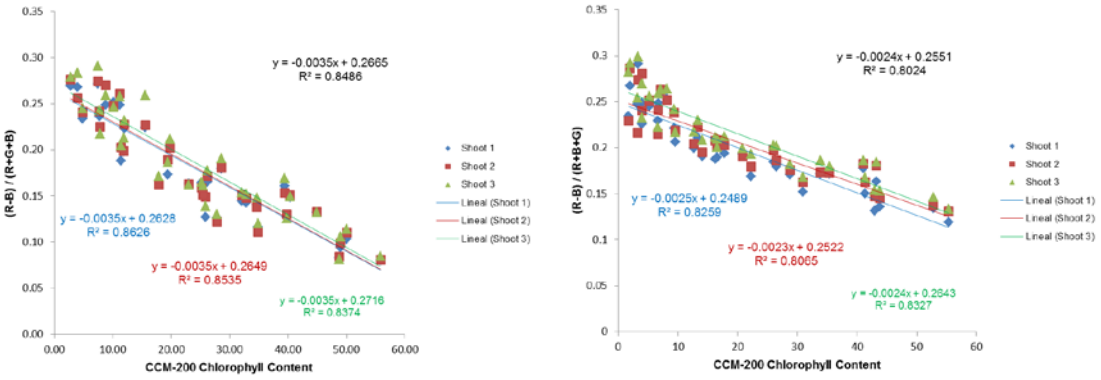

Figure S5. Relationship between (*R-B*)/(*R+G+B*) index and chlorophyll concentration measured with CCM-200 chlorophyll-meter for three shoots on (**Left**) the first day of the experiment and on (**Right**) the last day of the experiment. Regression lines, equations and coefficient of determination are shown.

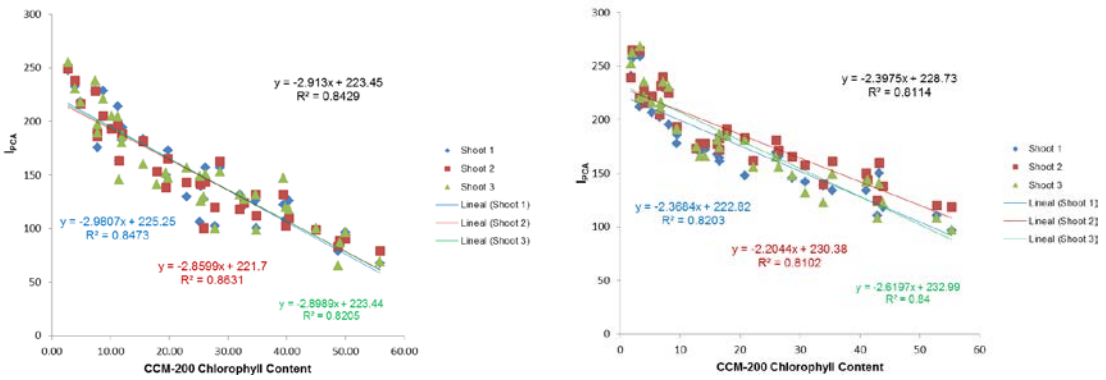

Figure S6. Relationship between I_{PCA} index and chlorophyll concentration measured with CCM-200 chlorophyll-meter for three shoots on (**Left**) the first day of the experiment and on (**Right**) the last day of the experiment. Regression lines, equations and coefficient of determination are shown.

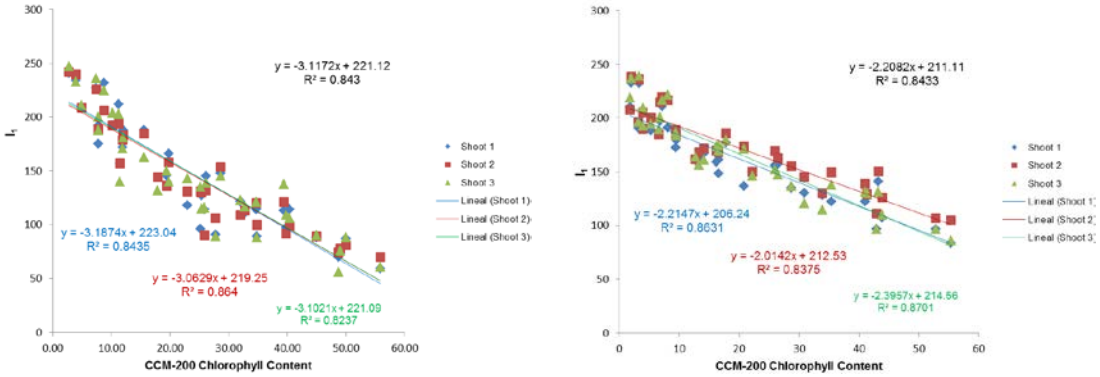

Figure S7. Relationship between I_1 index and chlorophyll concentration measured with CCM-200 chlorophyll-meter for three shoots on (**Left**) the first day of the experiment and on (**Right**) the last day of the experiment. Regression lines, equations and coefficient of determination are shown.

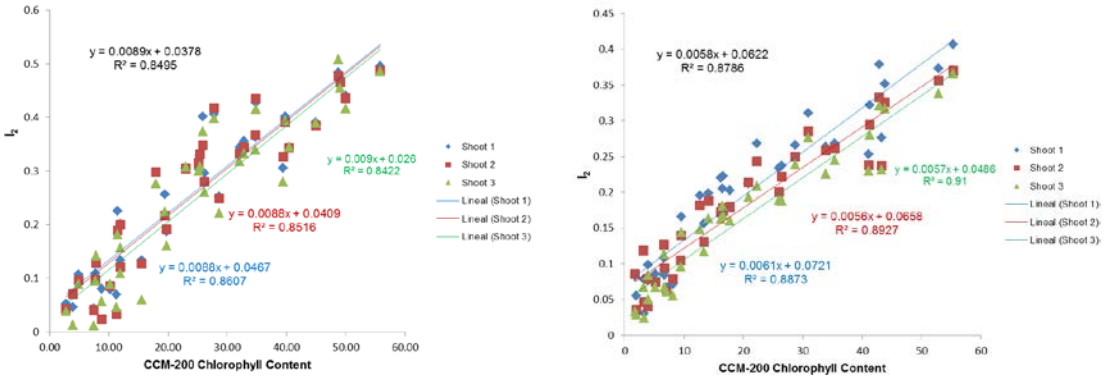

Figure S8. Relationship between I_2 index and chlorophyll concentration measured with CCM-200 chlorophyll-meter for three shoots on (**Left**) the first day of the experiment and on (**Right**) the last day of the experiment. Regression lines, equations and coefficient of determination are shown.

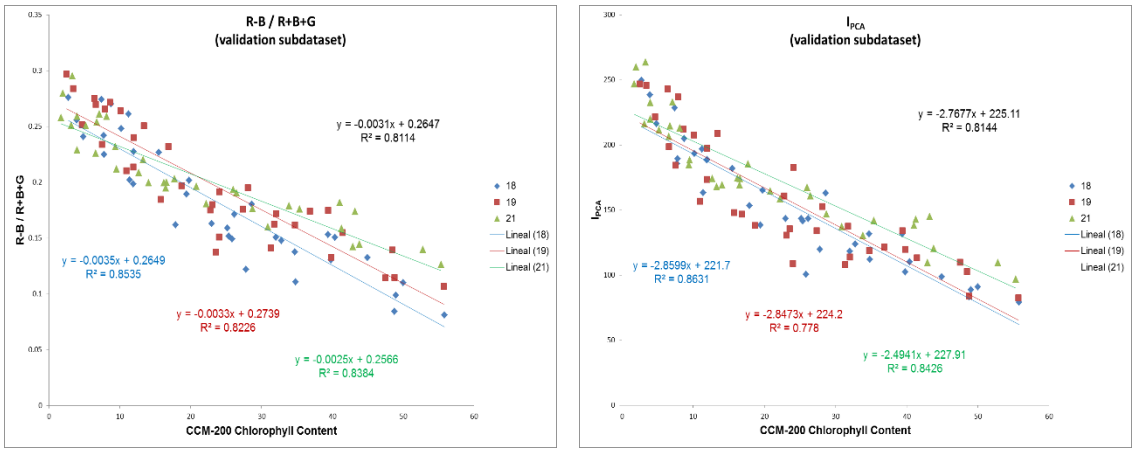

Figure S9. Relationship between (**Left**) (R-B)/(R+G+B) and (**Right**) I_{PCA} indices and the chlorophyll content for the validation subdataset. Regression lines, equations, daily and global R^2 values are shown.

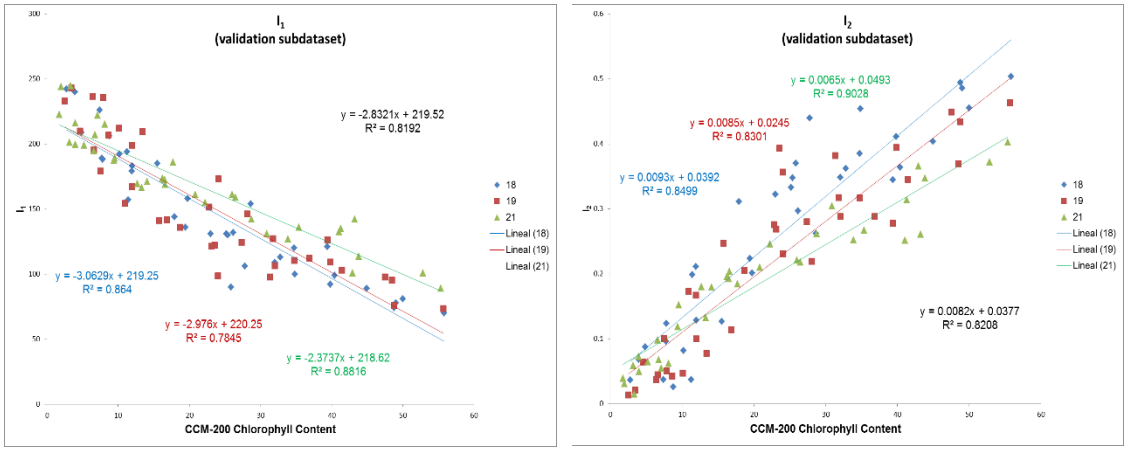

Figure S10. Relationship between (**Left**) I_1 and (**Right**) I_2 indices and the chlorophyll content for the validation subdataset. Regression lines, equations, daily and global R^2 values are shown.