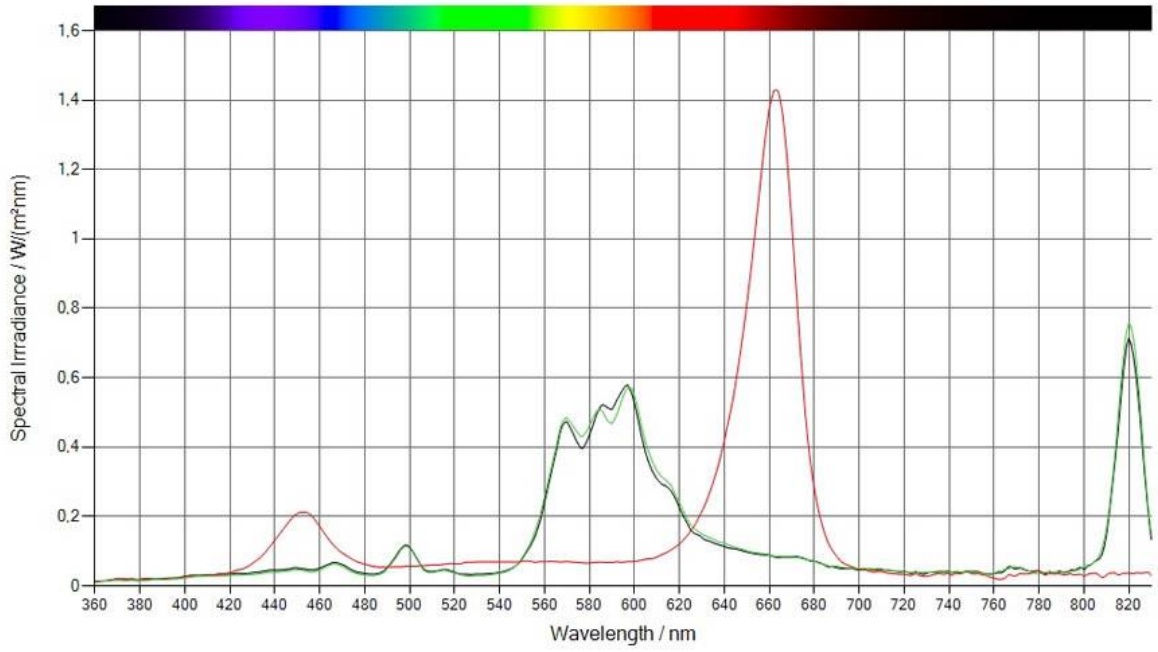


Figure S1. Characteristics of light measured at the tops of the plants in the experimental greenhouse compartments: green and black line – in the compartments with HPS toplighting (HPS and HPS + LED), red line – in the compartment with LED toplighting (LED + LED).



Figure S2. Cucumber grown in a high-wire system with application of LED supplemental lighting. Leaves sampled for analyses are marked with arrows.

Table S1. Parameters of two-factor ANOVA for the effect of supplemental lighting and leaf position on the stem on rCH/C value ($\alpha = 0.05$)

Source of variation	SS	df	MS	Femp	p-value
supplemental lighting	0.7712	2	0.3856	48.71	0.00000
leaf position	0.8043	2	0.4022	50.80	0.00000
supplemental lighting × leaf position	0.1906	4	0.0476	6.02	0.00009
Total error	5.5183	697	0.0079		

rCH/C – Pearson correlation coefficient between the occurrence of chlorophyll and carotenoid fluorescence

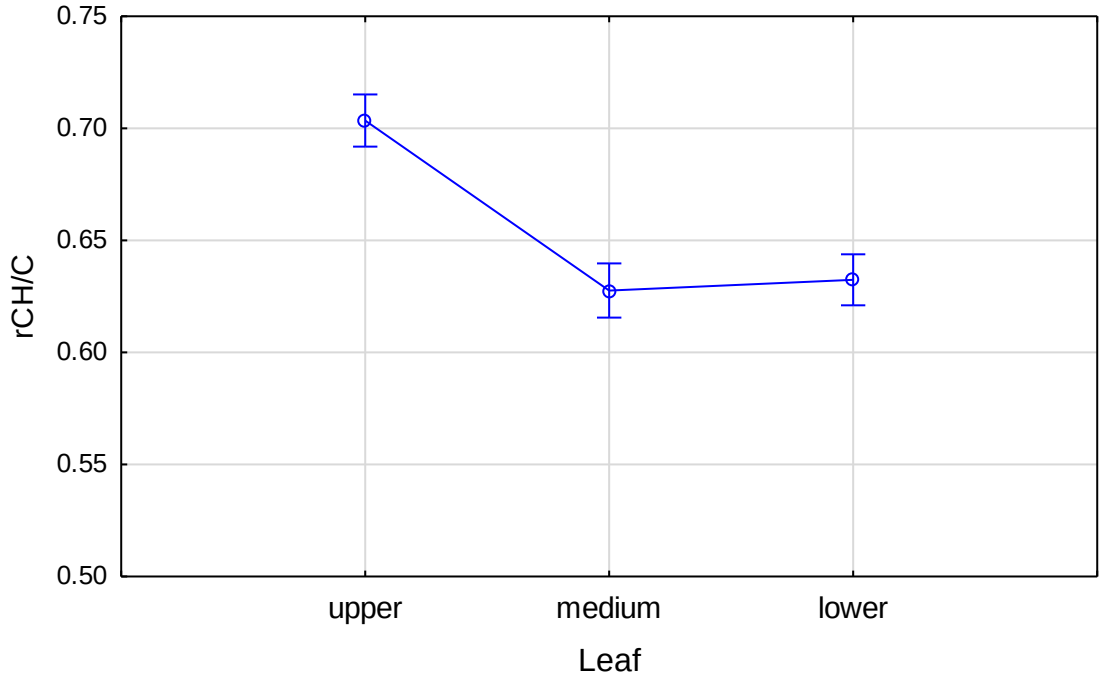


Figure S3. Mean rCH/C values for leaf position on the stem.
Vertical bars represent 0.95 confidence intervals.

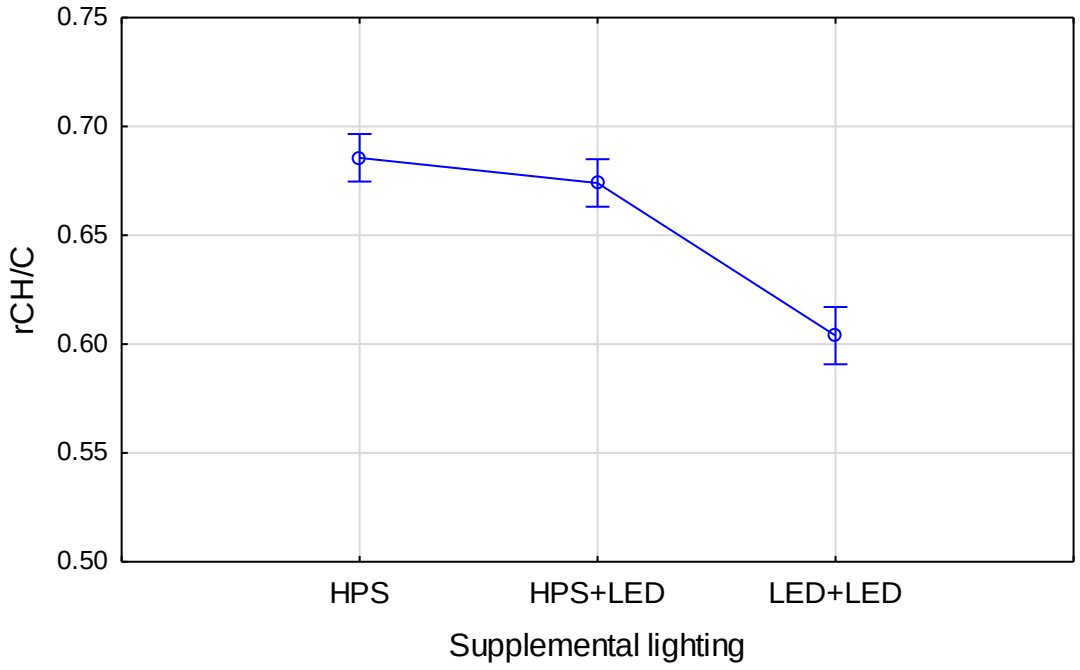


Figure S4. Mean rCH/C values for supplemental lighting type.
Vertical bars represent 0.95 confidence intervals.

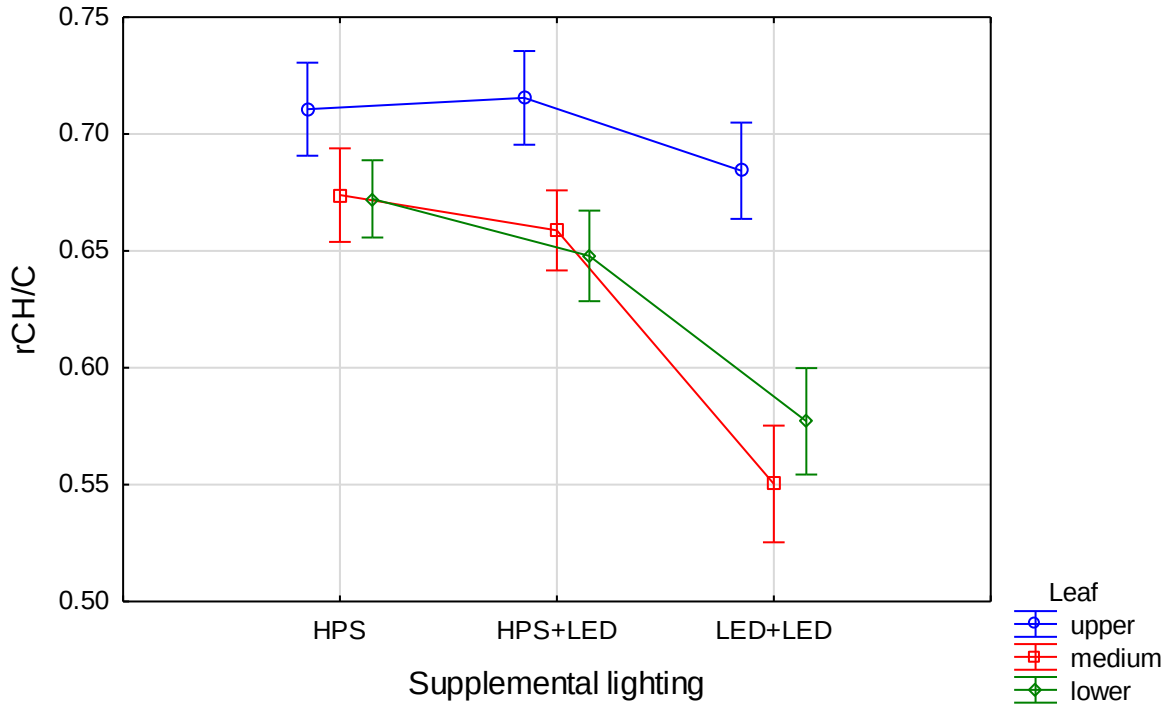


Figure S5. Mean rCH/C values for interaction "supplemental lighting × leaf position on the stem". Vertical bars represent 0.95 confidence intervals.

Table S2. Average values of the cucumber leaf parameters in dependence on leaf age (young – the 4th leaf from the top of the stem; middle – mean values of parameters for the 8th and 12th leaf from the top the of stem) and cucumber yield under different supplemental lighting conditions.

Supplemental lighting	HPS		HPS + LED		LED + LED	
Leaf age	young	middle	young	middle	young	middle
Code	HPS_y	HPS_m	HPS+LED_y	HPS+LED_m	LED+LED_y	LED+LED_m
Dry matter – DM [%]	14.46	11.01	12.97	15.59	15.68	15.29
Chlorophyll *a* – CHa [mg·g^{-1} FW]	0.163	0.161	0.124	0.216	0.150	0.309
Chlorophyll *b* – CHb [mg·g^{-1} FW]	0.044	0.045	0.036	0.061	0.043	0.048
Total carotenoids – CT [mg·100 g^{-1} FW]	13.84	12.02	11.19	15.56	11.50	20.54
Total soluble solids – TSS [%]	5.70	4.07	5.17	5.67	7.77	7.20
Total sugars – TS [%]	0.14	0.19	0.29	0.13	0.22	0.19
Nitrate reductase activity – NR [μmol NO_2·g^{-1} FW·h^{-1}]	0.78	0.41	0.92	0.71	1.83	0.82
Chlorophyll [SPAD]	49.38	44.18	42.35	48.83	47.58	53.92
FV/FM	0.818	0.829	0.822	0.830	0.815	0.827
PI	7.18	5.87	5.87	6.88	5.68	7.54
rCH/C	0.711	0.673	0.715	0.654	0.684	0.565
Total fruit yield [kg·m^{-2}]	42.82		51.16		58.87	

HPS – high-pressure sodium lamps used as toplighting; HPS + LED – HPS toplighting and LED interlighting; LED + LED – light-emitting diode lamps used as toplighting and interlighting. FV/FM – maximum quantum efficiency of PSII; PI – Performance Index; rCH/C – Pearson correlation coefficient between distribution of chlorophyll and carotenoid fluorescence.

Table S3. Correlations between the observed features (variables) and the first three principal components (PCs) in a set of 6 experimental cases (supplemental lighting × leaf age), and variation explained by these PCs

Variables	**Principal components**		
	PC1	**PC2**	**PC3**
DM	**0.665**	0.591	0.361
CHa	**0.952**	-0.123	-0.269
CHb	**0.656**	-0.357	0.351
CT	**0.951**	-0.140	-0.201
TSS	0.535	**0.841**	0.037
TS	-0.559	0.423	**-0.678**
NR	-0.067	**0.972**	0.120
SPAD	**0.947**	0.134	0.142
FV/FM	0.341	**-0.782**	-0.358
PI	**0.831**	-0.254	0.185
rCH/C	**-0.867**	0.063	0.453
Yield	0.475	**0.740**	-0.392
Eigenvalue	5.97	3.59	1.38
Explained variation (%)	49.72	29.90	11.53
Cases	**Factor coordinates of cases**		
HPS_y	-0.195	-0.425	1.699
HPS_m	-1.882	-2.356	-0.575
HPS+LED_y	-2.816	0.439	-1.062
HPS+LED_m	1.741	-1.176	0.866
LED+LED_y	-0.696	3.250	0.369
LED+LED_m	3.848	0.268	-1.298

For explanation of the codes used see Table S2.
The highest correlation coefficients are bolded.