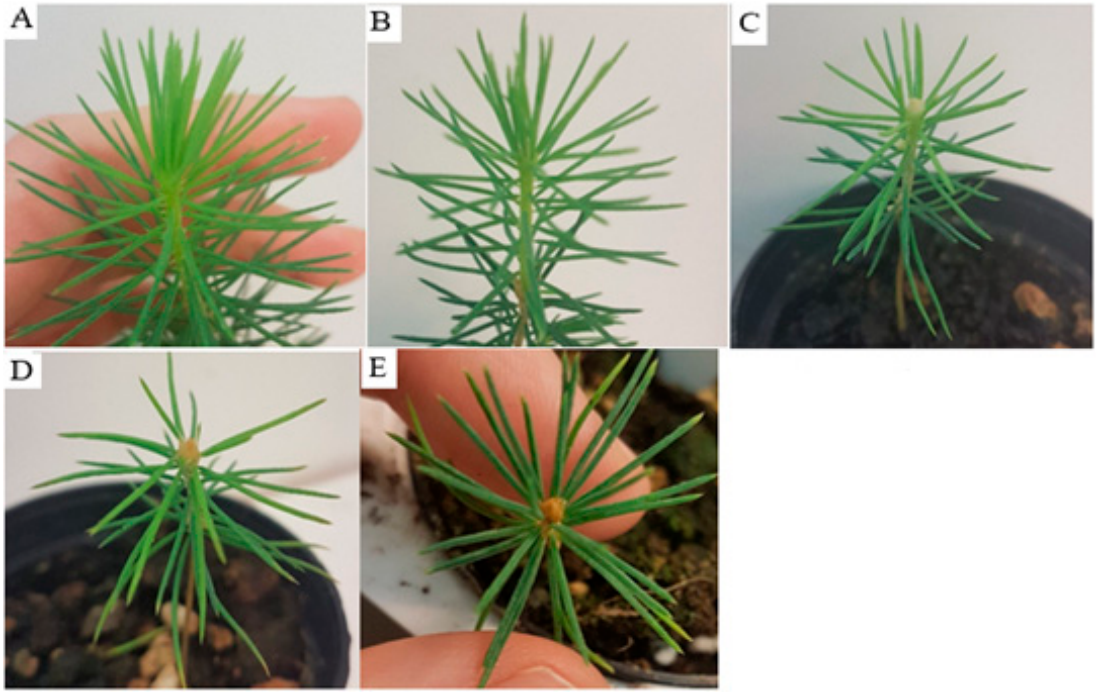

Figure S1. Examples of bud set stages in Norway spruce seedlings in growth chambers. 0; growing plants without terminal bud (**A**), 1; light green bud (**B–C**), 2; brown buds (**D–E**).

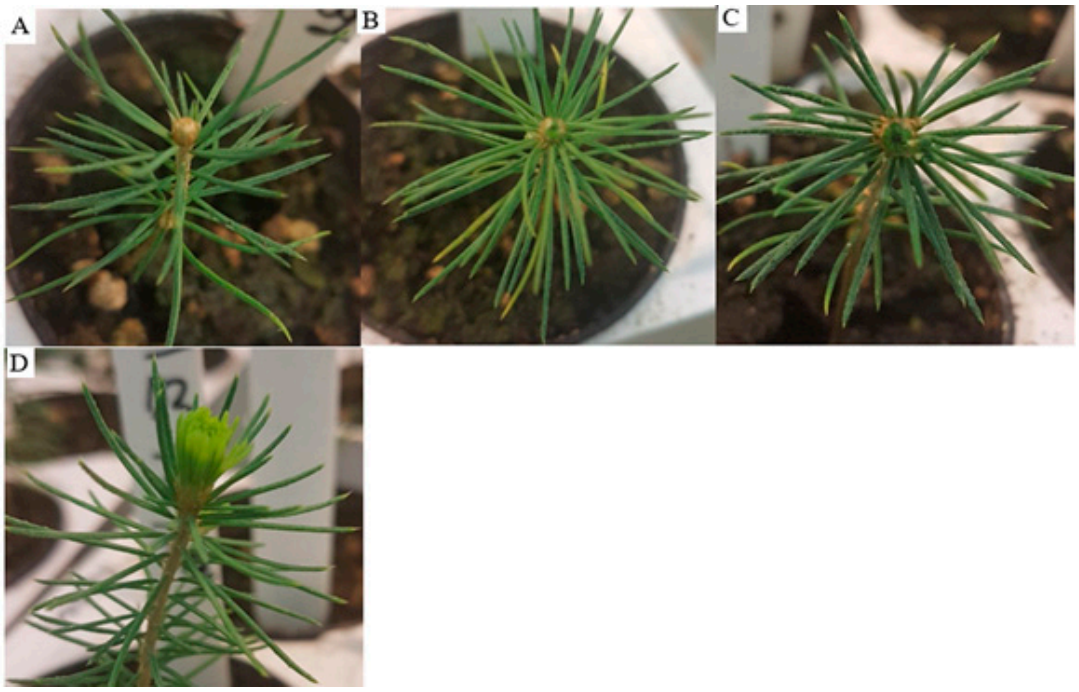

Figure S2. Examples of bud burst stages in Norway spruce seedlings. 2; brown, closed bud (**A**), 1; opening (hole) in bud making needle initials visible (**B–C**), 0; regrowth after bud burst (**D**).

Table S1. ANOVA tables for overall effect of temperature, photoperiod and provenance on shoot elongation (a), and effect of temperature and provenance on bud set stages (b) and subsequent bud burst stages (c) in Norway spruce seedlings.

a) Analysis of Deviance Table (Type III Wald chisquare tests)[1, 2]

	Chisq	Df	Pr > Chisq	
(Intercept)	277.9725	1	$< 2.2 \times 10^{-16}$	***
Photoperiod	7.1917	1	7.32×10^{-3}	**
Provenance	5.48	1	1.92×10^{-2}	*
Temperature	3.5596	2	5.92×10^{-2}	.
Photoperiod: Temperature	25.0843	2	5.49×10^{-7}	***
Provenance: Temperature	15.5266	2	8.14×10^{-5}	***

b) Analysis of Deviance Table (Type III Wald chisquare tests)[2, 3]

	Chisq	Df	Pr > Chisq	
(Intercept)	59.6909	1	1.11×10^{-14}	***
Provenance	9.5503	1	0.001999	**
Temperature	351.8417	2	2.20×10^{-16}	***
Provenance: Temperature	4.5767	2	0.03241	*

c) Analysis of Deviance Table (Type III Wald chisquare tests)[2, 3, 4]

	Chisq	Df	Pr > Chisq	
(Intercept)	407.103	1	2.20×10^{-16}	***
Provenance	13.691	1	0.0002155	***
Temperature	77.238	2	2.20×10^{-16}	***
Provenance: Temperature	14.709	2	0.0001255	***

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Chisq = Chi−Square. Df = degrees of freedom. Pr > Chisq = *p*-value of the test. Results in Figure 2; Exp. 1–2. [1]Three-way ANOVA, linear model. [2]Time and plants used as random variables. When no significant effect of a variable, the model was simplified. *n* = 20 plants per treatment per provenance. 50 long days (LD)/short days (SD) at 12, 18 or 24°C. Halden (59°N) or Rana (66°N) provenances. [3]Two-way ANOVA, generalised linear model. [4]27/26 LD at 18°C for bud burst after 50 SD.

Table S2. Two-way ANOVA tables for overall effect of temperature and day-extension with blue, red or far-red light compared to short days on shoot elongation (**a**, **b**), bud set stages (**c**, **d**) and bud burst stages (**e**) in Norway spruce seedlings.

a) Analysis of Deviance Table (Type III tests)[1, 2, 3]

	Chisq	Df	Pr > Chisq	
(Intercept)	1.0115	1	0.314539	
Temperature	8.1888	1	0.004215	**
Light treatment	224.8591	3	$< 2.2 \times 10^{-16}$	***

b) Analysis of Deviance Table (Type III Wald chisquare tests)[1, 2, 4]

	Chisq	Df	Pr > Chisq	
(Intercept)	6.53	1	0.011	*

Temperature	0.24	1	0.624	
Light Treatment	18.53	3	0.000	***
Temperature: Light Treatment	10.87	3	0.012	*

c) Analysis of Deviance Table (Type III tests)[2, 3, 5]

	Chisq	Df	Pr > Chisq	
(Intercept)	5.5628	1	0.01835	*
Temperature	3.5318	1	0.0602	.
Light treatment	58.5782	3	1.18×10^{-12}	***
Temperature: Light treatment	25.3288	3	1.32×10^{-5}	***

d) Analysis of Deviance Table (Type III Wald chisquare tests)[2, 4, 5]

	Chisq	Df	Pr > Chisq	
(Intercept)	77.29	1	2.20×10^{-16}	***
Temperature	36.95	1	1.21×10^{-9}	***
Light Treatment	97.08	3	2.20×10^{-16}	***
Temperature: Light Treatment	67.40	3	1.54×10^{-14}	***

e) Analysis of Deviance Table (Type III Wald chisquare tests)[2, 4, 5, 6]

	Chisq	Df	Pr > Chisq	
(Intercept)	72.1983	1	2.20×10^{-16}	***
Temperature	1.2956	1	0.255	
Light Treatment	101.0584	3	2.20×10^{-16}	***
Temperature: Light Treatment	37.2525	3	4.07×10^{-8}	***

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Chisq = Chi-Square. Df = degrees of freedom. Pr > Chisq = *p*-value of the test. Results in Figure 3 (**a**, **b**) and 4 (**c**, **d, e**); Exp. 3 (**a**, **c**) and 4 (**b**, **d**, **e**). [1]Linear model. [2]Time and plant used as random variables. When no significant effect of a variable, the model was simplified. [3]18°C or 22°C. [4]18°C or 24°C. [5]Generalised linear model. [6]51 long days at 18°C for bud burst after 50 days of treatments.

Table S3. Two-way ANOVA tables for overall effect of temperature and day-extension with either R or FR light or R:FR ratio 0.5. 1 or 2 (**a**, **c**) or R or FR light or R:FR ratio 0.1, 0.2 or 0.5 (**b**, **d**) compared to short days on shoot elongation (**a**, **b**) and bud set stages (**c**, **d**) in Norway spruce seedlings.

a) Analysis of Deviance Table (Type III Wald chisquare tests) for shoot elongation[1, 2]

	Chisq	Df	Pr > Chisq	
(Intercept)	75.13	1	2.20×10^{-16}	***
Temperature	95.45	1	2.20×10^{-16}	***
Light Treatment	36.98	5	6.05×10^{-7}	***
Temperature: Light Treatment	34.09	5	2.29×10^{-6}	***

b) Analysis of Deviance Table (Type III tests) for shoot elongation[1, 2]

	Chisq	Df	Pr > Chisq	
(Intercept)	9.4415	1	0.002121	**
Temperature	45.2414	1	1.74×10^{-11}	***
Light treatment	114.9177	5	$< 2.2 \times 10^{-16}$	***

c) Analysis of Deviance Table (Type III Wald chisquare tests) for bud set stages[2, 3]

	Chisq	Df	Pr > Chisq	
(Intercept)	22.389	1	2.23×10^{-6}	***
Light Treatment	128.597	5	2.20×10^{-16}	***

d) Analysis of Deviance Table (Type III tests) for bud set stages[2, 3]

	Chisq	Df	Pr > Chisq	
(Intercept)	0.0873	1	0.767575	
Temperature	3.4994	1	0.061391	.
Light treatment	0.5864	5	0.988616	
Temperature: Light treatment	17.084	5	0.004343	**

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Chisq = Chi-Square. Df = degrees of freedom. Pr > Chisq = *p*-value of the test. Results in Figure 5 (**a**, **b**) and 6 (**c**, **d**); Exp. 5 (**a**, **c**) and 6 (**b**, **d**). [1]Linear model. [2]Time and plant used as random variables. When no significant effect of a variable, the model was simplified. n = 18-20 plants per treatment. 50 days of treatments. 18°C or 24°C. Halden (59°N) provenance. [3]Generalised linear model.

Table S4. Three-way ANOVA tables for effect of temperature, photoperiod and provenance on transcript levels of *COL1*, (**a**) *COL2*, (**b**) *SOC1* (**c**) and *FTL2* (**d**) in Norway spruce seedlings after 50 short or long days.

a) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	18.6993	1	953.7056	$< 2.2 \times 10^{-16}$	***
Provenance	0.0096	1	0.4886	0.489611	
Temperature	0.1803	2	4.5984	0.017563	*
Photoperiod	3.5583	1	181.4816	9.81×10^{-15}	***
Provenance: Temperature	0.2287	2	5.8312	0.006929	**
Temperature: Photoperiod	0.2223	2	5.6688	7.81×10^{-3}	**
Residuals	0.6274	32			

b) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	39.686	1	845.8483	$< 2.2 \times 10^{-16}$	***
Provenance	0.462	1	9.8432	3.39×10^{-3}	**
Temperature	0.74	2	7.8829	0.001448	**
Photoperiod	0.553	1	11.7793	1.52×10^{-3}	**
Residuals	1.689	36			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	137.382	1	251.4217	$< 2.2 \times 10^{-16}$	***
Provenance	1.1	1	2.013	0.16533	
Temperature	19.82	2	18.1363	4.86×10^{-6}	***
Photoperiod	5.566	1	10.1872	0.0031	**
Provenance: Photoperiod	3.768	1	6.8957	0.013	*
Temperature: Photoperiod	4.74	2	4.3377	0.02126	*
Residuals	18.032	33			

d) Analysis of Deviance Table (Type III tests)[1]					
	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	1023684	1	599.762	$< 2.2 \times 10^{-16}$	***
Temperature	90154	2	26.41	1.02×10^{-7}	***
Photoperiod	983524	1	576.232	$< 2.2 \times 10^{-16}$	***
Temperature: Photoperiod	83524	2	24.468	2.25×10^{-7}	***
Residuals	59739	35			

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test. Results in Figure 7; Exp. 1–2. [1]Linear model. When no significant effect of a variable, the model was simplified. *n* = 4 samples, each consisting of shoot tips of 3 pooled plants. 12, 18 or 24°C. Halden (59°N) or Rana (66°N) provenances.

Table S5. Three-way ANOVA tables for analyses of correlation between transcript levels of *COL1* (**a**), *COL2* (**b**), *SOC1* (**c**) and *FTL2* (**d**) and bud set stages in two provenances of Norway spruce seedlings after 50 short or long days at different temperatures.

a) Analysis of Deviance Table (Type III tests)[1]					
	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	0.0182	1	0.5213	0.4755315	
Bud set	8.9032	1	254.92	$< 2.2 \times 10^{-16}$	***
Temperature	0.0873	2	1.2491	0.300357	
Provenance	0.0922	1	2.6412	0.1139338	
Bud set: Temperature	0.8189	2	11.724	0.0001514	***
Temperature: Provenance	0.4049	2	5.7965	0.0071078	**
Residuals	1.1176	32			

b) Analysis of Deviance Table (Type III tests)[1]					
	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	0.49853	1	10.0138	0.003154	**
Bud set	0.50473	1	10.1383	0.002993	**
Temperature	0.69865	2	7.0167	0.002672	**
Provenance	0.49268	1	9.8963	0.003316	**
Residuals	1.79224	36			

c) Analysis of Deviance Table (Type III tests)[1]					
	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	9.7477	1	81.1917	2.06×10^{-10}	***
Bud set	1.0354	1	8.6245	6.00×10^{-3}	**
Temperature	6.7145	2	27.9635	7.88×10^{-8}	***
Provenance	0.0117	1	0.0974	7.57×10^{-1}	
Bud set: Temperature	0.9362	2	3.899	0.030195	*
Bud set: Provenance	1.4519	1	12.0934	0.001441	**
Residuals	3.9619	33			

d) Analysis of Deviance Table (Type III tests)[1]					
	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	13.492	1	78.4618	3.08×10^{-10}	***
Bud set	224.576	1	1305.9693	$< 2.2 \times 10^{-16}$	***
Temperature	12.243	2	35.5987	5.77×10^{-9}	***

Provenance	0.636	1	3.6977	0.063154	.
Bud set: Temperature	1.752	2	5.0944	0.011799	*
Bud set: Provenance	1.311	1	7.6244	0.009332	**
Residuals	5.675	33			

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' ' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test.Results in Figure 8 (a, c, e, g); Exp. 1–2. [1]Linear model. When no significant effect of a variable, the model was simplified. *n* = 4 samples, each consisting of shoot tips of 3 pooled plants. 12, 18 or 24°C. Halden (59°N) or Rana (66°N) provenances.

Table S6. Three-way ANOVA tables for analyses of correlation between transcript levels of *COL1* (**a**), *COL2* (**b**), *SOC1* (**c**) and *FTL2* (**d**) and plant height in two provenances of Norway spruce after 50 short or long days at different temperatures.

a) Anova Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	12.2462	1	232.6364	$< 2.2 \times 10^{-16}$	***
Plant height	8.3725	1	159.0494	3.61×10^{-14}	***
Temperature	0.3355	2	3.1871	0.054263	.
Provenance	0.1232	1	2.3412	0.135527	
Plant height:Temperature	0.2879	2	2.7343	0.079657	.
Plant height: Provenance	0.6645	1	12.6225	1.17×10^{-3}	**
Residuals	1.7372	33			

b) Anova Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	0.64066	1	11.729	0.0015197	**
Plant height	0.97646	1	17.877	0.0001482	***
Temperature	1.12431	2	10.292	0.0002794	***
Residuals	2.02103	37			

c) Anova Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	0.0905	1	0.8131	0.3733598	
Plant height	3.066	1	27.5343	7.59×10^{-6}	***
Temperature	2.4115	2	10.8282	0.0002184	***
Provvenance	1.8809	1	16.8913	0.0002269	***
Plant height: Provenance	2.847	1	25.5668	1.35×10^{-5}	***
Residuals	3.8974	35			

d) Anova Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	283.944	1	338.7099	$< 2.2 \times 10^{-16}$	***
Plant height	108.63	1	129.5828	3.23×10^{-12}	***
Temperature	9.539	2	5.6895	0.0082319	**
Provenance	0.537	1	0.6404	0.4300645	
Plant height: Temperature	20.903	2	12.4676	1.24×10^{-4}	***
Plant height: Provenance	17.571	1	20.9596	8.18×10^{-5}	***
Temperature: Provenance	6.354	2	3.7898	0.0344989	*

Plant height: Temperature: Provenance	11.686	2	6.9698	0.0033754	**
Residuals	24.311	29			

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test. Results in Figure 8 (b, d, f, h); Exp. 1–2. [1]Linear model. When no significant effect of a variable, the model was simplified. *n* = 4 samples, each consisting of shoot tips of 3 pooled plants. 12, 18 or 24°C. Halden (59°N) or Rana (66°N) provenances.

Table S7. Two-way ANOVA tables for effect of temperature and day-extension with red (R) or far-red (FR) light or R:FR ratio 1 compared to short days; SD on transcript levels of *COL1* (**a**), *COL2* (**b**), *SOC1* (**c**) and *FTL2* (**d**) in Norway spruce seedlings after 50 days.

a) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	24.492	1	5.8763	0.02361	*
Residuals	95.861	23			

b) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	71.912	1	48.5897	9.14×10^{-7}	***
Light treatment	12.151	3	2.7368	0.07055	.
Residuals	29.6	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	504.52	1	109.1948	1.50×10^{-9}	***
Light treatment	59.25	3	4.2747	0.0174	*
Residuals	92.41	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	401270	1	63.3106	5.95×10^{-7}	***
Light treatment	955981	3	50.2768	2.29×10^{-8}	***
Temperature	13031	1	2.0559	0.17087	
Light treatment: Temperature	66090	3	3.4758	0.04087	*
Residuals	101410	16			

Scheme 0. '***' 0.001 '**' 0.01 '*' 0.05 '.' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test. Results in Figure 9; Exp. 5. [1]Linear model. When there was no significant effect of a variable, the model was simplified. *n* = 3 samples, each consisting of shoot tips of 3 pooled plants. 18 or 24°C. Halden (59°N) provenance.

Table S8. Three-way ANOVA tables for analyses of correlation between transcript levels of *COL1* (**a**), *COL2* (**b**), *SOC1* (**c**) and *FTL2* (**d**) and bud set stages in Norway spruce seedlings after 50 days under different temperatures and day extension with red (R) or far-red (FR) light or R:FR ratio 1, compared to short days.

a) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	8.771	1	5.2117	0.03246	*
Bud set	7.377	1	4.3833	0.04803	*

Residuals	37.024	22			

b) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	1.3614	1	2.9485	0.101407	
Light treatment	9.7134	3	7.0121	0.002087	**
Residuals	9.2349	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	43.261	1	170.6815	2.99×10^{-11}	***
Light treatment	5.066	3	6.6625	0.002675	**
Residuals	5.069	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	23.519	1	29.251	1.97×10^{-5}	***
Bud set	93.976	1	116.882	2.87×10^{-10}	***
Residuals	17.689	22			

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test. Results in Figure 10 (a, c, e, g); Exp. 5.[1]Linear model. When there was no significant effect of a variable, the model was simplified. *n* = 3 samples, each consisting of shoot tips of 3 pooled plants. 18 or 24°C. Halden (59°N) provenance.

Table S9. Three-way ANOVA tables for analyses of correlation between transcript levels of *COL1* (**a**), *COL2* (**b**), *SOC1* (**c**) and *FTL2* (**d**) and shoot elongation in Norway spruce seedlings after 50 days under different temperatures and day extension with red (R) or far-red (FR) light or R:FR ratio 1, compared to short days.

a) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	37.487	1	19.419	0.0002043	***
Residuals	44.4	23			

b) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	43.261	1	170.6815	2.99×10^{-11}	***
Light treatment	5.066	3	6.6625	0.002675	**
Residuals	5.069	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	43.261	1	170.6815	2.99×10^{-11}	***
Light treatment	5.066	3	6.6625	0.002675	**
Residuals	5.069	20			

c) Analysis of Deviance Table (Type III tests)[1]

	Sum Sq	Df	F value	Pr (> F)	
(Intercept)	15.5962	1	20.2678	2.44×10^{-4}	***
Shoot	2.7753	1	3.6066	7.28×10^{-2}	
Light treatment	8.3413	3	3.6133	0.0322305	*
Residuals	14.6206	19			

Signif. codes: 0.0001 '***' 0.001 '**' 0.01 '*' 0.05 '.' Sum Sq = sum of squares. Df = degrees of freedom. Pr (> F) = *p*-value of the test. Results in Figure 10 (**b**, **d**, **f**, **h**); Exp. 5. [1]Linear model. When there was no significant effect of a variable, the model was simplified. *n* = 3 samples, each consisting of shoot tips of 3 pooled plants. 18 or 24°C. Halden (59°N) provenance.