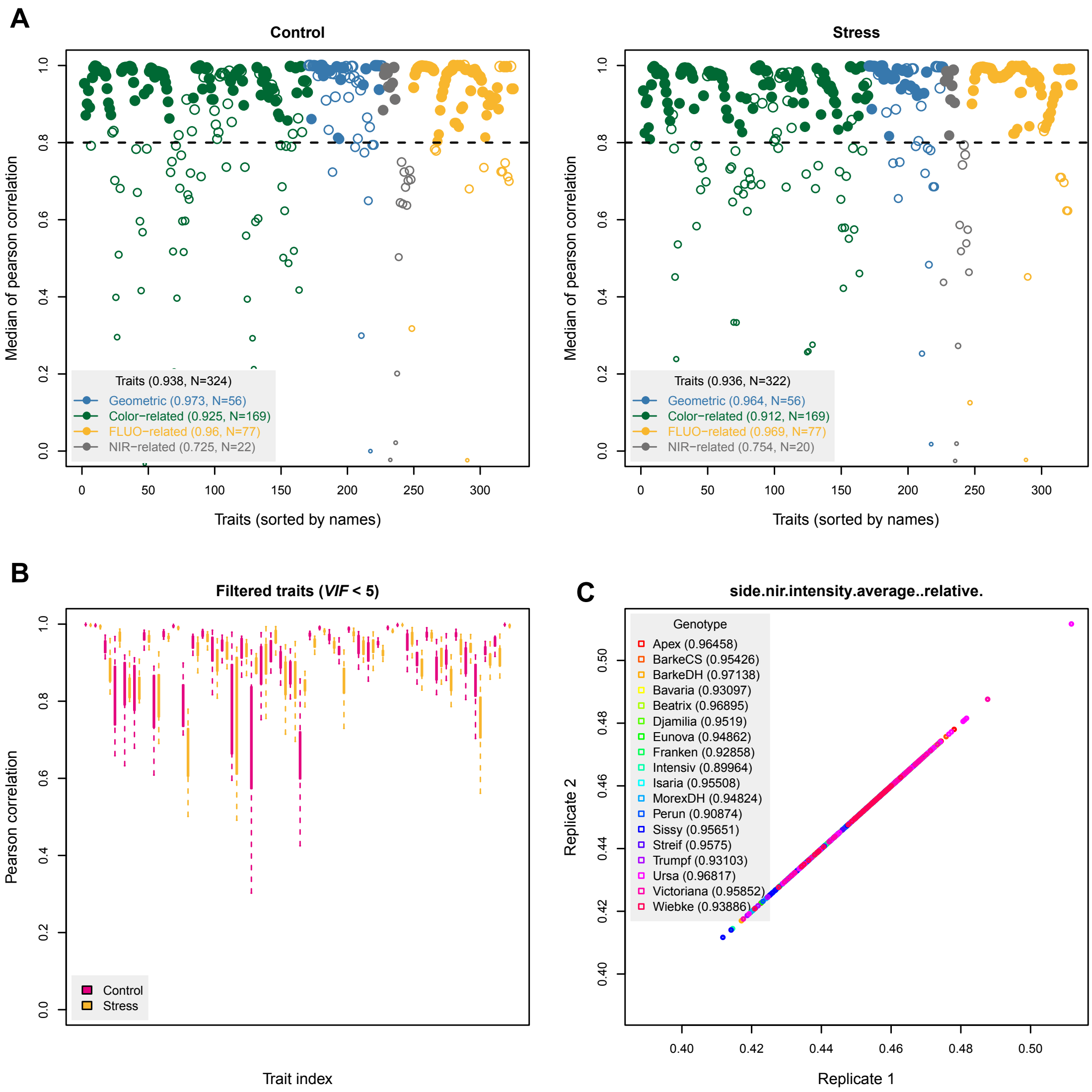
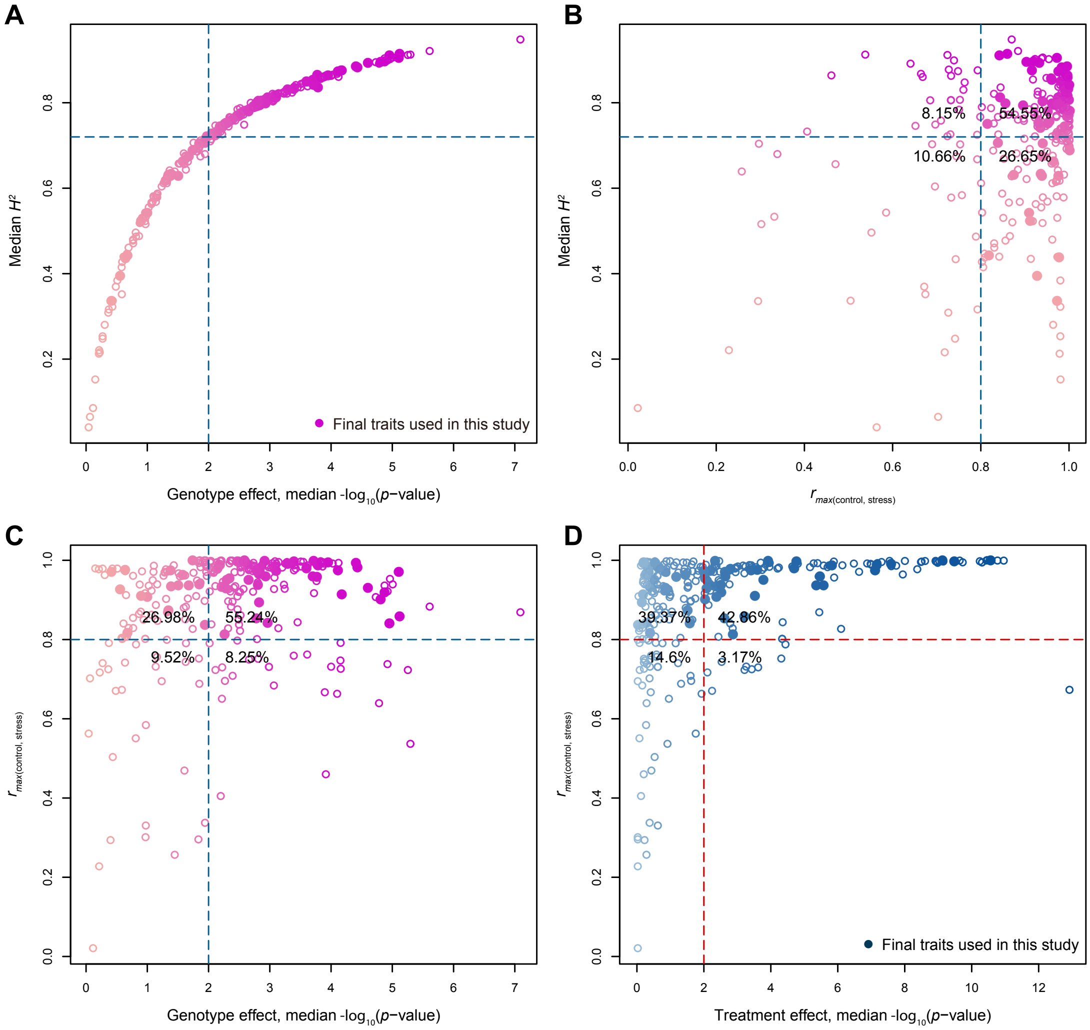


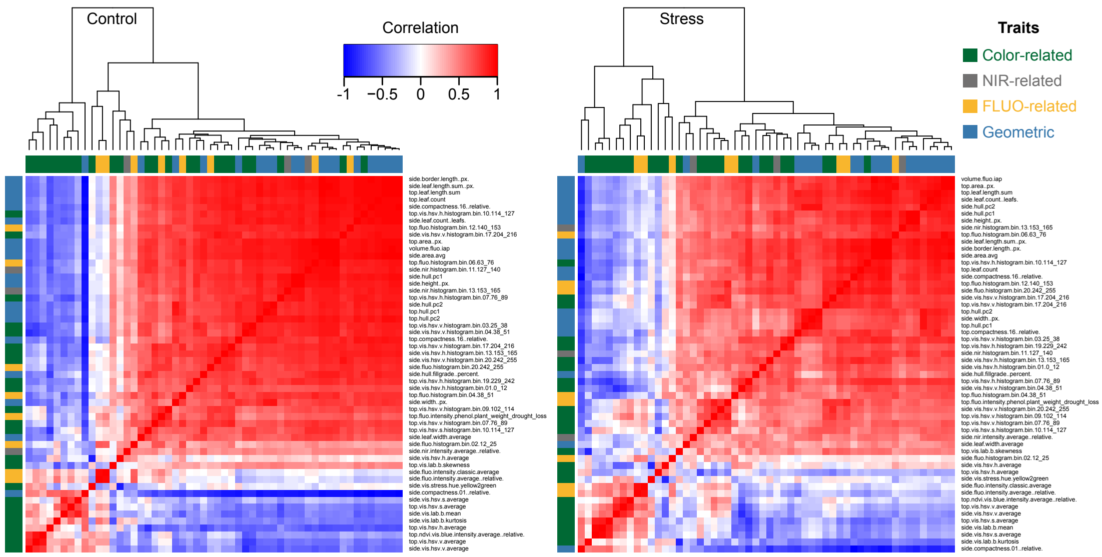
Supplemental Figure 1. Reproducibility of phenotypic traits.

(**A**) Highly reproducible analysis of phenotypic traits based on control (left) and stressed plants (right). Replicate plants with the same genotype and treatment were used to assess the reproducibility of traits based on Pearson's correlation ($r > 0.8$). Besides, the correlation in replicate plants is considered to be significant higher than by chance ($P < 0.001$; see **Methods**). Filled dots represent the filtered traits with high reproducibility ($r > 0.8$ and $P < 0.001$). The median values of Pearson's correlation for each trait categories are indicated. The number of traits with non-empty values is provided as well. The trait reproducibility is consistence between control and stressed plants. (**B**) The reproducibility of the 54 filtered traits. (**C**) An example of highly reproducible traits: the NIR-intensity trait.



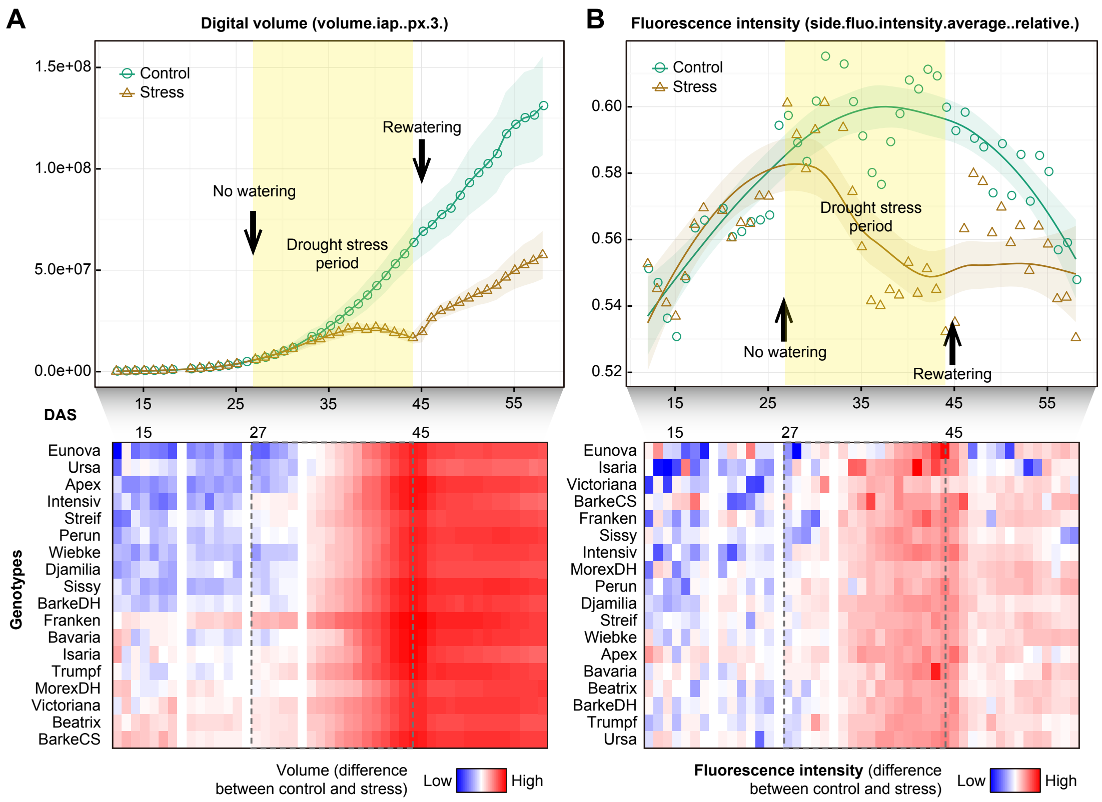
Supplemental Figure 2. Assessment of trait reproducibility analysis.

For all the plots, each point represents one trait. Filled circles indicate the final 54 traits used in this study. The dash lines indicate the corresponding cut-offs. (**A**) Scatter plot showing genotype effect (median negative log-transformed p-values) versus heritability (H^2). (**B**) Scatter plot of trait reproducibility (the maximum correlation value in either control or stress treatments) and H^2. (**C**) Scatter plot of genotype effect and trait reproducibility. (**D**) Scatter plot of treatment effect and trait reproducibility.



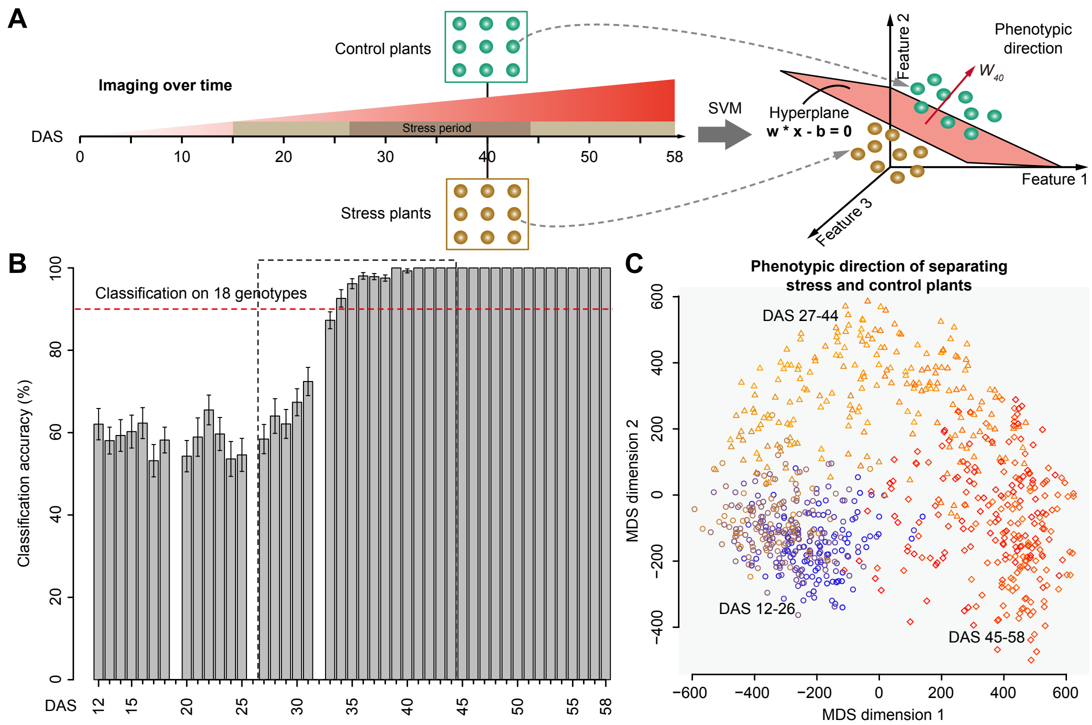
Supplemental Figure 3. Trait similarity.

Canonical correlation analysis of phenotypic traits based on control (left) and stressed plants (right). Heatmap plot is organized by hierarchical clustering with the tree (top). Traits are listed on the right.



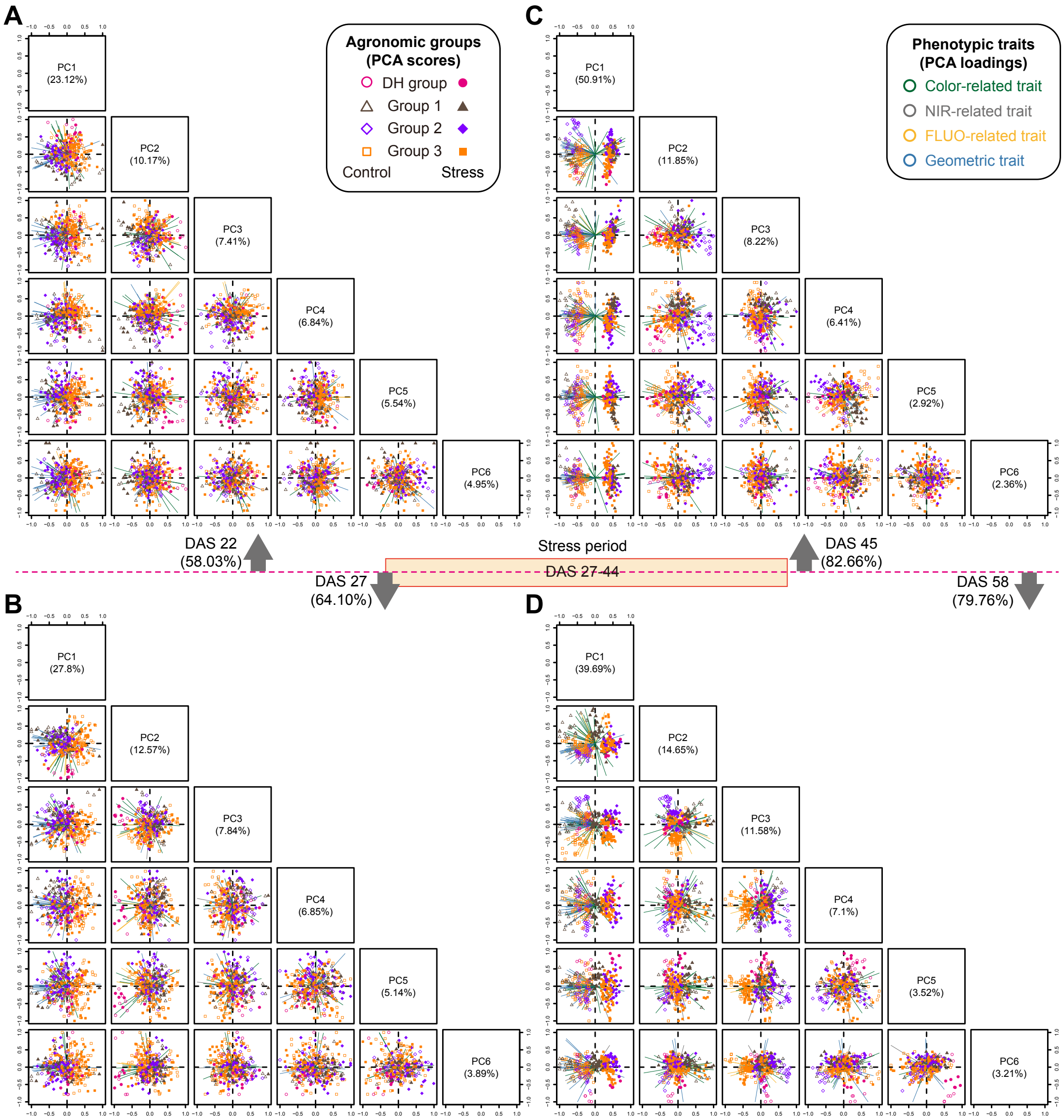
Supplemental Figure 4. Phenotypic traits revealing the stress symptom; related to Figure 1D.

Top: Examples show the trait of (**A**) "digital volume" and (**B**) "fluorescence intensity" over time. Bottom: heatmap shows the difference in traits, measured by the ratio values, between control and stressed plants. Blue indicates low difference, whereas red indicates high difference. Note: plants from different genotypes show different patterns.



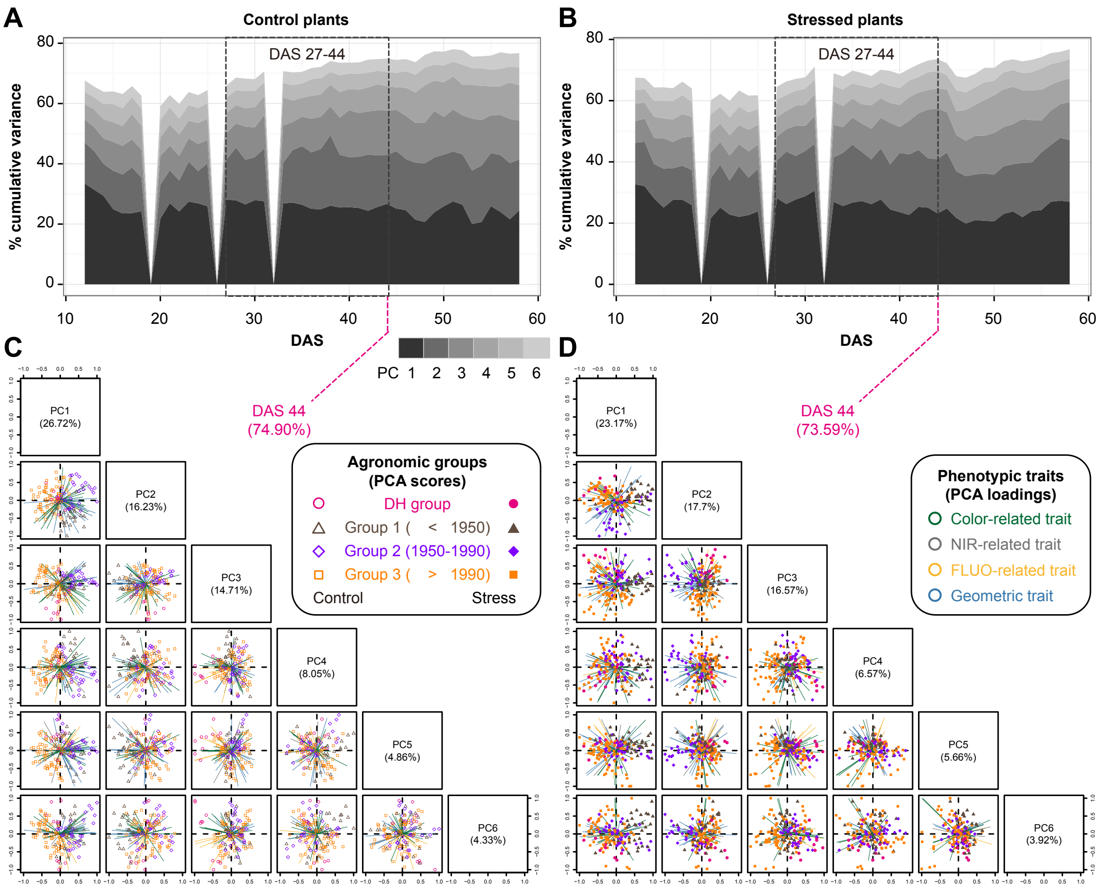
Supplemental Figure 5. Classification of plants based on the SVM methodology.

(**A**) An SVM-based methodology used for classification of plants with different treatments. Measurements of multidimensional traits (the highly reproducible traits) were used to represent plants in a high-dimensional feature space. An SVM-based classifier was used to determine the optimum hyperplane which separated plants into control and stress groups for each genotype from every daily imaging data (for example, in 40 days after sowing, DAS 40). Hyperplane orientation represented its weight vector (W_{40} for DAS 40), indicating the "phenotypic direction" of greatest separation between the two plant groups. (**B**) Classification accuracy to evaluate the performance of classification. Dashed line indicates classification accuracy of 90%. Stress period is indicated. Error bars, s.e.m. (n=18). (**C**) Multidimensional scaling (MDS) plot showing the patterns of phenotypic direction over time. Each point represents the phenotypic direction for a specific genotype from a specific time point. Three distinct patters were observed, corresponding to three different phases to the experiment.



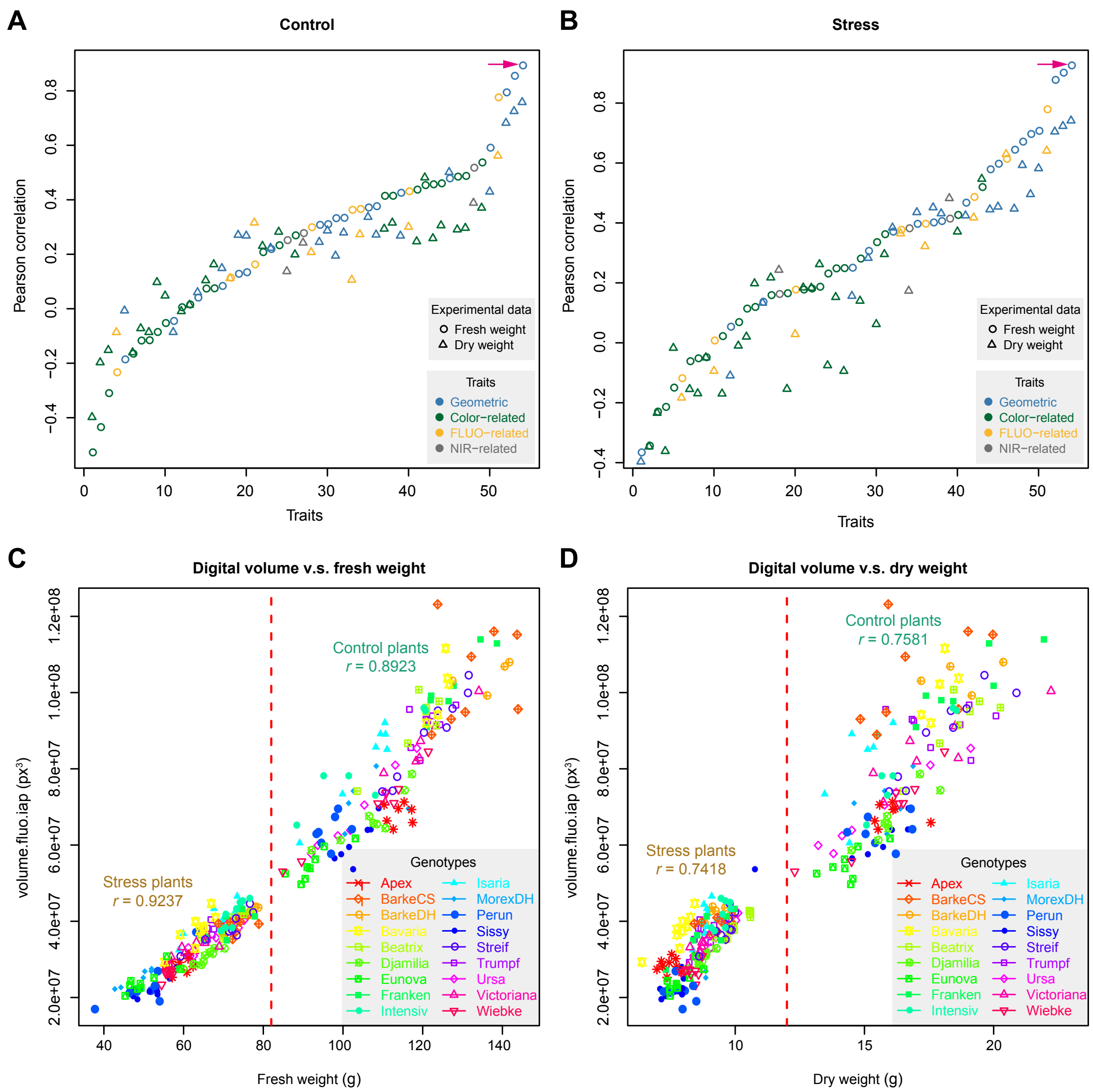
Supplemental Figure 6. PCA performed over time; related to Figure 4B.

Scatter plots show the top six PCs on (**A**) DAS 22, (**B**) 27, (**C**) 45 and (**D**) 58. The proportion of variance explained by the PCs is shown in parentheses. The component scores (dots) are coloured and shaped according to agronomic groups of plants. The loadings (lines) of each variable (traits) are coloured according to their categories.



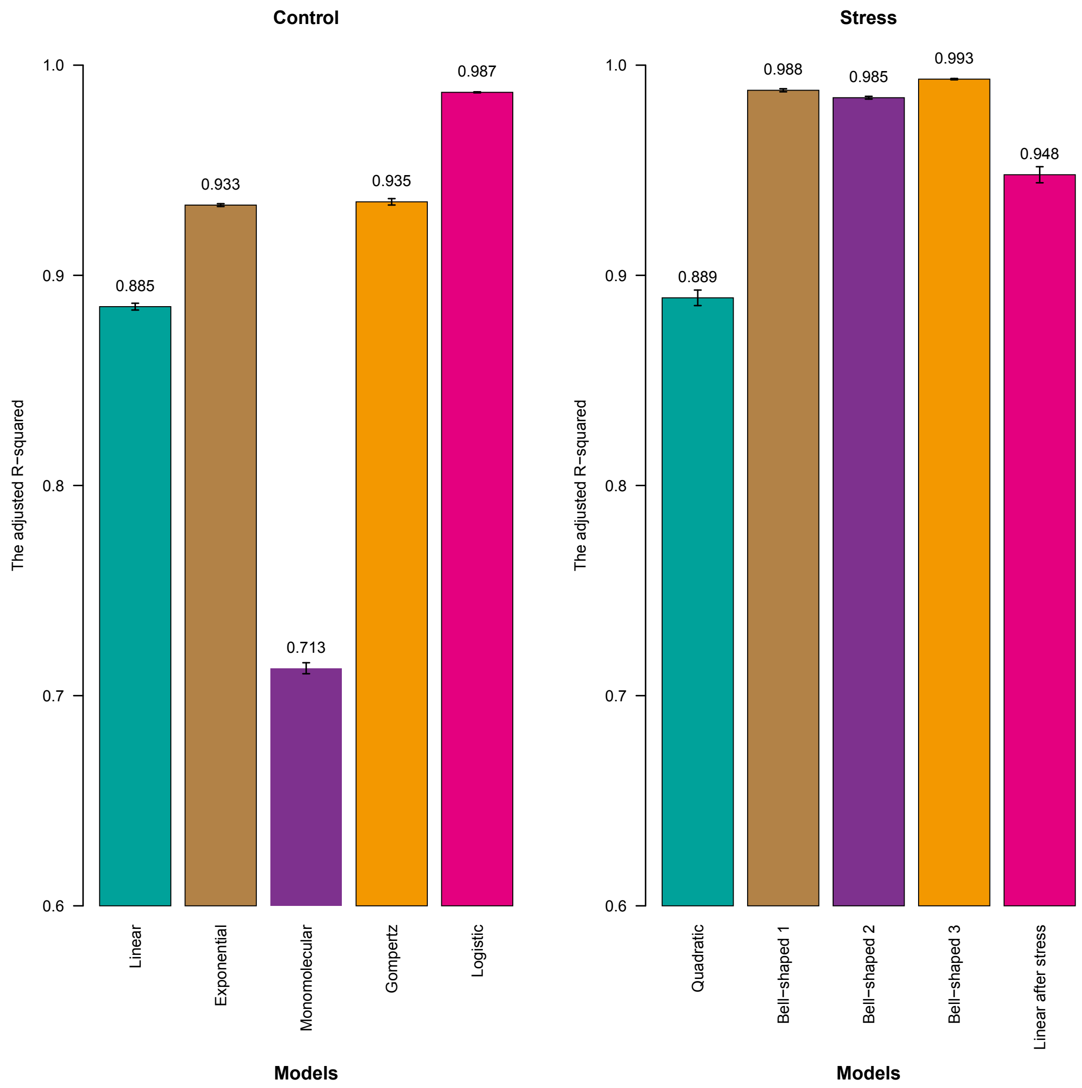
Supplemental Figure 7. PCA performed on control and stressed plants, respectively; related to Figure 4.

Principal component analysis (PCA) of phenotypic variance over time for control (**A**) and stressed plants (**B**). The percentage of total variance explained by the top six principal components is shown. The stress period is indicated by the dashed box. (**C**) and (**D**) Scatter plots showing the PCA results on DAS 44 (to compare the results of Figure 3). The first six PCs display 74.9% and 73.6% of the total phenotypic variance for control (**C**) and stressed plants (**D**), respectively. The component scores (shown in points) are coloured and shaped according to the agronomic groups (as legend listed in the box). The component loading vectors (represented in lines) of each variable (traits as coloured according to their categories) were superimposed proportionally to their contribution.



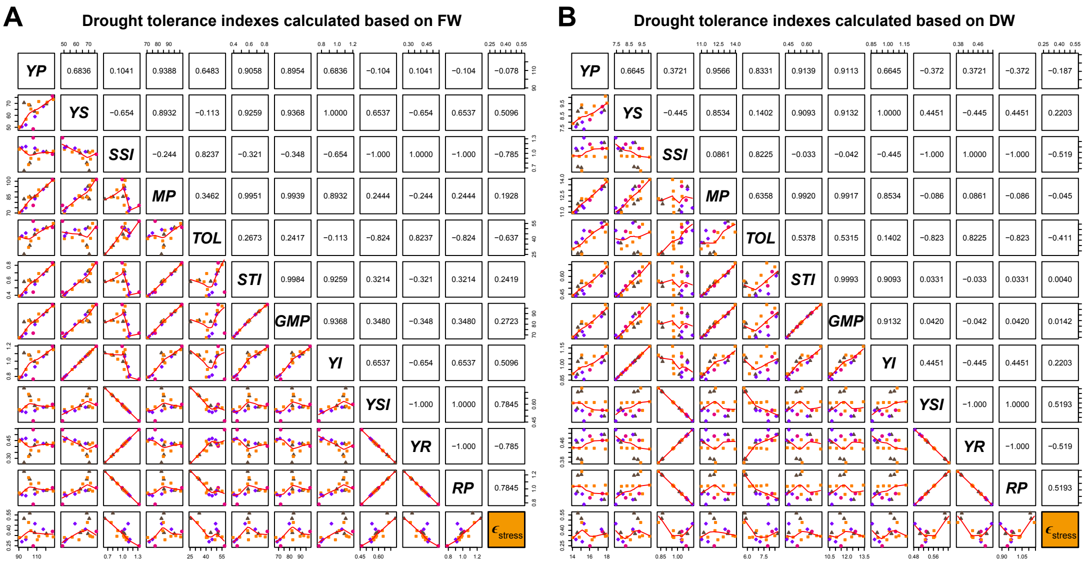
Supplemental Figure 8. Correlation analysis of manual measurements with phenotypic traits.

Correlation of all phenotypic traits with fresh weight and dry weight for control plants (**A**) and stressed plants (**B**). The digital volume has the best correlation with manually measured biomass. For **A** and **B**, traits are coloured according their classification. Correlation analysis of digital volume with biomass for control plants (**C**) and stressed plants (**D**). For **C** and **D**, data points are coloured according to the genotype origin of plants. The correlation coefficients are indicated for stress and control plant, respectively.



Supplemental Figure 9. Evaluation of the performance of growth curves.

Left: control plants; right: stressed plants. The quality of fit (the adjusted R^2) for each model is indicated. The average value of the adjusted R^2 is indicated. For control plants, Logistic model presents the best-fitted model. Bell-shape 3 is the best-fitted model to describe plant growth before recovery for stressed plants; while stressed plants follow a linear growth model after recovery. Error bars: s.e.m..



Supplemental Figure 10. Comparison of stress elasticity and several drought tolerance indexes.

Scatter plot showing pairwise comparison of stress elasticity (ϵ_{stress}) and eleven drought tolerance indexes. The drought tolerance indexes were calculated based on fresh weight (**A**) and dry weight (**B**). Pearson's correlation coefficients of these indexes are indicated in top-right quadrants. YP: biomass under control condition; YS: biomass under stress condition; SSI: stress susceptibility index (Fischer and Maurer, 1978); MP: mean productivity (Rosielle and Hamblin, 1981; Hossain et al., 1990); TOL: stress tolerance (Rosielle and Hamblin, 1981; Hossain et al., 1990); STI: stress tolerance index (Fernandez, 1992); GMP: geometric mean productivity (Fernandez, 1992); YI: yield index (Lin et al., 1986; Gavuzzi et al., 1997); YSI: yield stability index (Bouslama and Schapaugh, 1984; Fereres et al., 1986); YR: yield reduction ratio (Araghi and Assad, 1998); RP: relative performance (Abo-Elwafa and Bakheit, 1999).

Supplemental Tables

Supplemental Table 1. The 54 investigated phenotypic traits in this study.

Trait	Description	Category§	View*	Camera¶
side.area	Projected area from side (filled pixels)	Geometric	Side	VIS
side.border.length	Plant area border length	Geometric	Side	VIS
side.compactness.01.relative	Geometric measure of plant compactness 4 * π / (whole border length from side ^{2} / projected side area)	Geometric	Side	VIS
side.compactness.16.relative	Geometric measure of plant compactness whole border length from side ^{2} / projected side area	Geometric	Side	VIS
side.fluo.histogram.bin.02.12_25	Number of pixels in intensity bin 2 / 20 (low)	FLUO	Side	FLUO
side.fluo.histogram.bin.20.242_255	Number of pixels in intensity bin 20/20 (high)	FLUO	Side	FLUO
side.fluo.intensity.average..relative	Average intensity of the fluorescence reflection based on the color (pure red highest intensity, yellow lowest intensity)	FLUO	Side	FLUO
side.fluo.intensity.classic.average	Average intensity of the fluorescence reflection based on the color and brightness (pure red highest intensity, yellow lowest intensity, value is scaled by the brightness)	FLUO	Side	FLUO
side.height	Plant height (px or mm)	Geometric	Side	VIS
side.hull.fillgrade..percent.	Projected area / area of convex hull	Geometric	Side	VIS
side.hull.pc1	Largest distance between any plant pixels from side view (these pixels are the base for the 'maximum distance line')	Geometric	Side	VIS
side.hull.pc2	Sum of the maximum distance of pixels left and right to the 'maximum distance line'	Geometric	Side	VIS
side.leaf.count..leaves	Estimated leaf count, based on the number of end points of the plant skeleton	Geometric	Side	VIS
side.leaf.length.sum	Length of the plant skeleton	Geometric	Side	VIS
side.leaf.width.average	Average distance of plant pixels to the nearest skeleton pixel	Geometric	Side	VIS
side.nir.histogram.bin.11.127_140	Number of pixels with NIR intensity in the rage of 127-140 (0 no intensity, 255 highest intensity)	NIR	Side	NIR
side.nir.histogram.bin.13.153_165	Number of pixels with NIR intensity in the rage of 153-165 (0 no intensity, 255 highest intensity)	NIR	Side	NIR
side.nir.intensity.average..relative.	Average near-infrared intensity of plant pixels (0..255, 0 no intensity, 255 highest intensity)	NIR	Side	NIR
side.vis.hsv.h.average	Average hue of plant pixels	Color	Side	VIS
side.vis.hsv.h.histogram.bin.01.0_12	Number of plant pixels within specific hue range	Color	Side	VIS
side.vis.hsv.h.histogram.bin.13.153_165	Number of plant pixels within specific hue range	Color	Side	VIS
side.vis.hsv.s.average	Average plant pixels color saturation	Color	Side	VIS
side.vis.hsv.v.average	Average brightness	Color	Side	VIS
side.vis.hsv.v.histogram.bin.04.38_51	Number of plant pixels with brightness in specific range	Color	Side	VIS
side.vis.hsv.v.histogram.bin.17.204_216	Number of plant pixels with brightness in specific range	Color	Side	VIS
side.vis.hsv.v.histogram.bin.20.242_255	Number of plant pixels with brightness in specific range	Color	Side	VIS
side.vis.lab.b.kurtosis	„Peakedness" of the b* (blue to yellow) values of the plant color histogram, calculated in the L*a*b*-color space	Color	Side	VIS
side.vis.lab.b.mean	Average color in the b* range of the L*a*b* color space (blue to yellow)	Color	Side	VIS

side.vis.stress.hue.yellow2green	Yellow to green ratio of plant pixels (based on according HSV hue classes)	Color	Side	VIS
side.width	Horizontal extend of the plant	Geometric	Side	VIS
top.area	Projected area from top view (filled pixels)	Geometric	Top	VIS
top.compactness.16..relative.	Geometric measure of plant compactness (whole border length from side) ^{2} / projected side area	Geometric	Top	VIS
top.fluo.histogram.bin.04.38_51	Number of pixels in intensity bin 4/20 (rel. low)	FLUO	Top	FLUO
top.fluo.histogram.bin.06.63_76	Number of pixels in intensity bin 6/20 (rel. middle)	FLUO	Top	FLUO
top.fluo.histogram.bin.12.140_153	Number of pixels in intensity bin 4/20 (rel. high)	FLUO	Top	FLUO
top.fluo.intensity.phenol.plant_weight_drought_loss	Top plant area reduced by a penalty term for yellowish plant parts (drought stressed leaf areas appear yellowish)	FLUO	Top	FLUO
top.hull.pc1	Largest distance between any plant pixels from top view (these pixels are the base for the 'maximum distance line')	Geometric	Top	VIS
top.hull.pc2	Sum of the maximum distance of pixels left and right to the 'maximum distance line'	Geometric	Top	VIS
top.leaf.count	Estimated number of leafs (skeleton based)	Geometric	Top	VIS
top.leaf.length.sum	Length of plant pixel skeleton	Geometric	Top	VIS
top.ndvi.vis.blue.intensity.average..relative.	Average blue intensity in the RGB color space	Color	Top	VIS
top.vis.hsv.h.average	Average hue in the HSV color space	Color	Top	VIS
top.vis.hsv.h.histogram.bin.07.76_89	Number of pixels in bin 7/20 of the hue histogram (yellow to green)	Color	Top	VIS
top.vis.hsv.h.histogram.bin.10.114_127	Number of pixels in bin 10/20 of the hue histogram (green to blue)	Color	Top	VIS
top.vis.hsv.h.histogram.bin.19.229_242	Number of pixels in bin 19/20 of the hue histogram (red)	Color	Top	VIS
top.vis.hsv.s.average	Average plant pixel color saturation	Color	Top	VIS
top.vis.hsv.s.histogram.bin.10.114_127	Number of pixels in bin 10/20 of the saturation histogram (middle)	Color	Top	VIS
top.vis.hsv.v.average	Average brightness	Color	Top	VIS
top.vis.hsv.v.histogram.bin.03.25_38	Number of pixels with brightness in a specific range (bin 3/20, low)	Color	Top	VIS
top.vis.hsv.v.histogram.bin.07.76_89	Number of pixels with brightness in a specific range (bin 7/20, middle)	Color	Top	VIS
top.vis.hsv.v.histogram.bin.09.102_114	Number of pixels with brightness in a specific range (bin 9/20, middle)	Color	Top	VIS
top.vis.hsv.v.histogram.bin.17.204_216	Number of pixels with brightness in a specific range (bin 17/20, high)	Color	Top	VIS
top.vis.lab.b.skewness	Asymmetry of the b* (blue to yellow) values of the plant color histogram, calculated within the L*a*b*-color space	Color	Top	VIS
volume.fluo.iap	Estimated digital volume (px^3 or mm^3)	Geometric	Both	FLUO

Note: VIS, visible-light; FLUO, fluorescence; NIR, near-infrared; [§]the category of a defined phenotypic trait belonged to; [*]a trait is defined based on images from side view, top view or both; [¶]the type of image data used to define the trait.

Supplemental Table 2. Mechanistic models used for modeling biomass accumulation in this study. Differential equations, their analytical solutions and linearized forms are presented.

Model	Differential equation	Analytical solution	Linearized form
Control plants (DAS 22-58)			
Linear	$\frac{dy}{dt} = r$	$y = y_0 + rt$	$y = y_0 + rt$
Exponential	$\frac{dy}{dt} = ry(t)$	$y = y_0 e^{rt}$	$ln\,(y) = ln\,(y_0) + rt$
Monomolecular	$\frac{dy}{dt} = r(K - y(t))$	$y = y_0 - (K - y_0)e^{-rt}$	$ln\frac{1}{K - y} = ln\frac{1}{K - y_0} + rt$
Logistic	$\frac{dy}{dt} = ry(t)\left(1 - \frac{y(t)}{K}\right)$	$y = \frac{Ky_0}{y_0 + (K - y_0)e^{-rt}}$	$ln\frac{y}{K - y} = ln\frac{y_0}{K - y_0} + rt$
Gompertz	$\frac{dy}{dt} = ry(t)ln\frac{K}{y(t)}$	$y = Ke^{ln\frac{y_0}{K}e^{-rt}}$	$-ln[-\,ln\frac{y}{K}] = -\,ln[-\,ln\frac{y_0}{K}] + rt$
Stressed plants			
Quadratic (DAS 22-44)	$\frac{dy}{dt} = b - 2at$	$y = c + bt - at^2$	$y = c + bt - at^2$
Bell–shaped 1 (DAS 22-44)	$\frac{dy}{dt} = 2Aa(t - t_{max})e^{a(t - t_{max})^2}$	$y = Ae^{a(t - t_{max})^2}$	$\ln(y) = \ln(A) + a(t - t_{max})^2$
Bell–shaped 2 (DAS 22-44)	$\frac{dy}{dt} = A(b - a)t^b e^{-at}$	$y = At^b e^{-at}$	$\ln(y) = \ln(A) + bln(t) - at$
Bell–shaped 3 (DAS 22-44)	$\frac{dy}{dt} = A(b - 2at)e^{bt - at^2}$	$y = Ae^{bt - at^2}$	$\ln(y) = \ln(A) + bt - at^2$
Linear after stress (DAS 45-58)	$\frac{dy}{dt} = r$	$y = y_0 + rt$	$y = y_0 + rt$

Note: *y* is the digital volume; *t* is the time point; *r* is intrinsic growth rate for control plants or re-growth rate for stressed plant in the recovery phase; *K* is saturation level of biomass or final biomass for control plants, *A* the maximum biomass under stress at time point $t_{\max} = \frac{b}{2a}$. Other parameters are constants.

Supplemental Table 3. Growth modeling of control plants.

Plant	Genotype	t_{IP} (DAS)	Growth rate / t_{IP} [*]	Final[§,1]	Predicted / t_H [§,2]	Observed / t_H [§,3]	FW (g)	DW (g)
1121KN001	Apex	45.08	3.67	6.84	6.51	6.59	117.46	17.57
1121KN002	Apex	45.53	3.46	6.85	6.43	6.41	112.61	15.53
1121KN003	Apex	45.73	3.69	7.30	6.83	6.93	117.23	16.11
1121KN004	Apex	45.37	3.60	7.00	6.60	6.63	111.02	15.4
1121KN006	Apex	45.08	3.74	7.42	7.00	7.06	110.31	15.59
1121KN007	Apex	44.54	3.65	7.33	6.94	6.96	113.88	16.18
1121KN008	Apex	45.13	3.81	7.50	7.08	7.13	115.33	16.08
1121KN019	Isaria	46.23	4.48	9.06	8.39	8.57	108.23	15.35
1121KN021	Isaria	44.26	5.04	9.58	9.17	9.21	110.51	16.11
1121KN022	Isaria	45.28	5.04	9.29	8.84	8.92	109.42	14.51
1121KN023	Isaria	45.84	3.92	7.83	7.31	7.34	99.88	13.46
1121KN024	Isaria	45.26	4.75	8.88	8.43	8.51	111.06	15.12
1121KN025	Isaria	45.40	4.98	9.28	8.80	8.91	110.66	15.49

1121KN026	Isaria	43.35	3.48	6.66	6.41	6.05	89.13	14.42
1121KN037	Perun	44.31	3.15	6.24	5.93	5.76	96.79	16.18
1121KN038	Perun	44.06	3.48	6.65	6.37	6.41	102.02	16.82
1121KN041	Perun	44.73	3.18	6.29	5.96	6.05	94.34	15.38
1121KN042	Perun	43.97	3.63	7.19	6.86	6.94	98.55	16.76
1121KN043	Perun	44.97	3.76	7.10	6.75	6.73	97.79	15.1
1121KN044	Perun	44.99	3.40	6.57	6.23	6.33	93.66	14.3
1121KN045	Perun	45.60	3.34	6.65	6.23	6.28	93.13	15.01
1121KN055	Sissy	44.53	3.16	6.28	5.96	5.36	102.4	10.74
1121KN056	Sissy	44.58	3.22	6.49	6.14	5.65	97.74	14.5
1121KN057	Sissy	44.01	4.20	8.22	7.86	6.96	108.8	16.68
1121KN058	Sissy	43.30	3.33	6.51	6.26	5.75	99.4	15.11
1121KN061	Sissy	43.13	3.68	6.98	6.74	6.39	106.02	16.04
1121KN062	Sissy	43.76	3.67	7.34	7.01	6.40	106.83	16.66
1121KN063	Sissy	43.37	3.40	6.44	6.21	5.94	101.38	15.7
1121KN073	Trumpf	45.45	5.04	9.91	9.32	9.30	120.81	16.84
1121KN074	Trumpf	45.11	5.21	9.97	9.45	9.26	121.24	16.91
1121KN075	Trumpf	46.04	5.44	10.35	9.71	9.56	116.67	15.82
1121KN076	Trumpf	44.25	5.02	9.24	8.88	8.56	117.02	17.56
1121KN078	Trumpf	44.51	5.34	10.11	9.66	9.39	122.39	20.09
1121KN079	Trumpf	44.44	4.47	8.62	8.22	8.22	119.36	19.12
1121KN080	Trumpf	44.64	5.06	9.65	9.20	9.16	124.32	18.7
1121KN081	Trumpf	44.81	5.46	10.32	9.83	9.67	128.34	19.05
1121KN091	Franken	46.73	6.21	10.41	9.88	9.92	122.15	17.37
1121KN092	Franken	45.25	5.69	10.94	10.35	10.18	127.7	20
1121KN093	Franken	45.66	5.27	9.59	9.11	9.10	121.05	17
1121KN094	Franken	44.33	6.39	12.11	11.59	11.40	134.46	21.94
1121KN095	Franken	44.84	5.69	10.76	10.24	9.77	126.45	18.44
1121KN096	Franken	44.22	6.40	12.03	11.53	11.28	138.62	19.82
1121KN097	Franken	44.80	5.38	10.41	9.89	9.80	122.04	17.97
1121KN109	Intensiv	43.29	3.47	6.76	6.50	6.51	88.2	15.05
1121KN110	Intensiv	46.25	3.75	7.67	7.08	7.30	107.93	15.86
1121KN112	Intensiv	43.61	4.49	8.06	7.81	7.81	94.97	15.64
1121KN113	Intensiv	44.81	4.20	8.05	7.65	7.80	101.26	16.07
1121KN116	Intensiv	45.97	5.25	10.08	9.45	9.58	120.08	18.4
1121KN117	Intensiv	45.78	5.06	10.01	9.36	9.52	120.5	18.53
1121KN127	Bavaria	47.14	4.89	9.91	9.04	9.42	123.77	17.2
1121KN128	Bavaria	46.79	5.40	10.71	9.87	10.22	126.59	17.91
1121KN129	Bavaria	45.71	5.89	10.74	10.19	10.37	126.2	18.64
1121KN131	Bavaria	46.31	5.09	9.69	9.06	9.20	120.93	17.57
1121KN132	Bavaria	46.38	6.07	11.65	10.87	11.16	125.78	18.11
1121KN145	BarkeCS	46.03	6.40	12.01	11.30	11.52	143.7	19.97
1121KN146	BarkeCS	47.09	6.03	11.56	10.67	10.94	132.18	16.58
1121KN147	BarkeCS	47.12	5.09	9.80	9.03	9.30	127.15	14.84

1121KN148	BarkeCS	46.33	6.27	12.10	11.28	11.60	137.88	19.01
1121KN149	BarkeCS	47.40	5.18	9.98	9.16	9.49	130.68	15.84
1121KN150	BarkeCS	47.52	6.77	13.05	11.95	12.32	123.76	15.92
1121KN151	BarkeCS	47.09	5.31	10.06	9.31	9.56	143.93	18.64
1121KN153	BarkeCS	47.53	5.06	9.39	8.66	8.89	122.22	15.48
1121KN163	Beatrix	45.98	3.86	7.78	7.24	7.41	103.56	16.49
1121KN164	Beatrix	46.59	5.60	10.57	9.86	10.08	119.03	18.45
1121KN165	Beatrix	46.19	4.94	9.63	8.98	9.14	123.44	18.64
1121KN166	Beatrix	45.93	4.70	9.04	8.48	8.67	116.26	17.91
1121KN167	Beatrix	46.26	5.33	10.00	9.38	9.51	120.82	19.08
1121KN169	Beatrix	45.06	5.17	9.98	9.45	9.61	120.91	20.26
1121KN171	Beatrix	46.66	5.53	10.26	9.59	9.77	124.1	19.45
1121KN181	Djamilia	45.18	4.05	7.80	7.38	7.43	115.31	17.91
1121KN182	Djamilia	46.43	4.00	7.00	6.62	6.75	106.38	15.85
1121KN183	Djamilia	46.65	3.68	6.80	6.36	6.43	110.46	15.9
1121KN184	Djamilia	45.41	3.49	6.79	6.40	6.54	108.28	15.87
1121KN185	Djamilia	45.63	4.34	8.22	7.76	7.86	117.15	17.12
1121KN186	Djamilia	44.36	3.28	6.37	6.07	6.12	99.21	15.51
1121KN188	Djamilia	43.56	3.34	5.98	5.80	5.86	91.95	14.47
1121KN189	Djamilia	45.26	3.53	6.81	6.44	6.57	107.43	15.75
1121KN199	Eunova	43.23	2.77	5.24	5.06	5.12	90.5	14.55
1121KN200	Eunova	43.81	2.94	5.51	5.30	5.39	91.71	14.24
1121KN201	Eunova	42.99	3.14	5.55	5.40	5.42	91	13.78
1121KN203	Eunova	43.48	3.10	5.75	5.55	5.63	93.02	14.23
1121KN204	Eunova	43.18	3.34	6.09	5.90	5.96	95.29	14.75
1121KN205	Eunova	44.90	2.81	5.50	5.21	5.25	85.51	13.15
1121KN206	Eunova	43.59	2.67	5.09	4.90	4.97	89.49	14.47
1121KN207	Eunova	44.33	3.67	6.30	6.10	6.18	103.1	15.99
1121KN217	Streif	46.24	5.02	10.07	9.33	9.57	127.28	18.92
1121KN218	Streif	45.86	4.22	8.15	7.65	7.78	113.38	16.26
1121KN219	Streif	45.82	3.91	7.76	7.25	7.39	109.63	15.92
1121KN220	Streif	46.16	4.93	9.44	8.84	9.07	125.79	18.4
1121KN221	Streif	45.80	5.25	10.48	9.78	9.98	131.14	20.85
1121KN222	Streif	45.76	3.89	7.78	7.27	7.41	112.23	16.57
1121KN223	Streif	46.52	5.42	10.94	10.09	10.45	131.33	19.61
1121KN224	Streif	46.10	4.80	9.31	8.70	8.94	120.1	17.35
1121KN225	Streif	46.93	5.07	10.01	9.21	9.52	123.58	18.31
1121KN235	Ursa	45.50	4.53	9.03	8.47	8.54	118.53	19.11
1121KN236	Ursa	45.57	3.89	7.76	7.26	7.39	110.56	16.23
1121KN237	Ursa	46.07	3.53	6.90	6.44	6.39	101.84	14.51
1121KN239	Ursa	45.52	3.30	6.61	6.19	6.24	98.7	14.13
1121KN240	Ursa	45.35	3.85	7.59	7.14	7.05	105.36	15.78
1121KN241	Ursa	46.07	3.21	6.48	6.02	5.99	93.67	13.21
1121KN242	Ursa	45.26	4.39	8.59	8.10	8.10	113.12	17.55

1121KN243	Ursa	45.87	3.05	6.15	5.72	5.78	92	13.8
1121KN253	Victoriana	45.69	4.61	8.78	8.27	8.20	118.33	17.02
1121KN254	Victoriana	46.20	4.81	9.39	8.76	8.73	119.47	16.76
1121KN255	Victoriana	45.42	4.00	7.72	7.28	7.12	110.58	15.73
1121KN256	Victoriana	46.76	4.41	8.50	7.88	7.89	110.22	15.34
1121KN259	Victoriana	45.54	5.09	9.61	9.09	9.12	123.25	18.51
1121KN260	Victoriana	44.84	5.66	10.41	9.95	10.04	134.1	22.22
1121KN261	Victoriana	46.19	4.48	8.65	8.08	8.28	119.15	18.63
1121KN271	Wiebke	46.09	3.83	7.46	6.97	7.09	108.76	16.34
1121KN273	Wiebke	46.31	4.33	8.94	8.24	8.45	121.41	18.1
1121KN274	Wiebke	45.75	3.80	7.47	7.00	7.10	112.77	16.5
1121KN275	Wiebke	46.59	3.98	7.87	7.28	7.37	110.85	16.21
1121KN276	Wiebke	44.70	2.84	5.81	5.48	5.57	89.61	14.5
1121KN278	Wiebke	45.73	4.01	7.84	7.35	7.47	113.94	16.95
1121KN279	Wiebke	46.77	2.75	5.67	5.19	5.30	84.88	12.3
1121KN289	MorexPE	43.87	3.35	6.54	6.26	6.29	100.46	15.87
1121KN290	MorexPE	44.48	4.01	7.66	7.32	7.42	102.61	15.78
1121KN291	MorexPE	44.94	4.02	7.52	7.17	7.10	101.42	14.6
1121KN292	MorexPE	43.57	3.69	7.31	7.00	6.96	116.4	16.39
1121KN293	MorexPE	45.30	4.27	8.56	8.04	8.07	108.34	16.88
1121KN301	BarkePE	46.79	5.52	10.53	9.77	9.92	135.97	19.12
1121KN302	BarkePE	47.71	5.96	11.04	10.15	10.30	127.25	17.16
1121KN304	BarkePE	46.97	6.01	11.29	10.48	10.68	140.35	18.29
1121KN306	BarkePE	46.49	5.90	11.53	10.70	10.79	141.54	20.34
1121KN001	Apex	45.08	3.67	6.84	6.51	6.59	117.46	17.57
1121KN002	Apex	45.53	3.46	6.85	6.43	6.41	112.61	15.53

Note: t_{IP}, time of inflection points (plants with maximum growth rate); t_H, the time point for plant harvesting; FW, fresh weight; DW, dry weight; §digital volumes of plants ($\times 10^7$ px^3); *the maximum growth rate ($\times 10^6$ px^3/day); [1]the final biomass estimated from the logistic model; [2]the predicted biomass from the logistic model at time t_H; [3]the predicted biomass from image data at time t_H.

Supplemental Table 4. Growth modeling of stressed plants.

Plant	Genotype	t_{max} (DAS)	Observed/ t_{max} §,1	Predicted/ t_{max} §,2	Growth rate/LM[3]	Predicted/ t_H §,4	FW (g)	DW (g)
1121KN010	Apex	38.75	1.10	1.09	1.78	3.27	56.98	7.14
1121KN011	Apex	36.46	1.17	1.04	1.89	3.11	55.35	7.18
1121KN012	Apex	44.20	0.89	1.05	1.20	2.68	60.82	7.93
1121KN013	Apex	37.19	1.10	1.02	1.79	3.07	59.01	7.44
1121KN014	Apex	39.17	0.88	0.86	1.49	2.73	57.15	7.36
1121KN015	Apex	38.17	1.09	1.04	1.77	3.25	62.39	7.73

1121KN016	Apex	37.74	1.09	1.00	1.88	3.24	61.11	7.7
1121KN017	Apex	37.57	0.99	0.91	1.75	2.96	56.37	6.97
1121KN018	Apex	39.71	1.07	1.04	1.78	3.29	61.25	7.54
1121KN028	Isaria	38.20	1.18	1.08	2.63	4.57	69.81	9.3
1121KN029	Isaria	37.73	1.21	1.09	3.08	5.10	73.44	9.09
1121KN030	Isaria	39.81	1.11	1.04	2.37	4.21	70.77	8.89
1121KN031	Isaria	38.88	1.17	1.12	2.37	4.39	59.92	8.83
1121KN032	Isaria	39.05	1.13	1.08	2.56	4.53	67.61	8.9
1121KN033	Isaria	38.94	1.18	1.11	2.98	5.09	74.42	8.79
1121KN034	Isaria	37.56	1.21	1.06	2.42	4.24	69.17	8.77
1121KN035	Isaria	37.36	1.38	1.13	2.77	4.75	72.65	8.92
1121KN036	Isaria	38.65	1.10	1.04	1.93	3.66	58.85	8.36
1121KN046	Perun	39.23	1.18	1.19	1.34	2.92	53.33	7.66
1121KN047	Perun	39.12	1.14	1.08	0.68	2.00	46.23	7.48
1121KN048	Perun	38.87	1.05	1.05	0.86	2.22	48.73	7.71
1121KN049	Perun	40.28	1.11	1.07	0.41	1.76	37.54	7.93
1121KN050	Perun	39.73	1.45	1.29	1.79	3.72	62.94	9.24
1121KN051	Perun	38.97	0.99	0.96	0.82	2.04	48.09	7.19
1121KN052	Perun	39.17	1.06	0.98	0.96	2.23	52.56	8.34
1121KN053	Perun	39.92	1.03	0.97	1.05	2.40	53.78	8.46
1121KN054	Perun	39.07	1.14	1.09	1.01	2.42	51.63	8.02
1121KN064	Sissy	37.93	1.13	1.06	1.05	2.38	51.31	7.63
1121KN065	Sissy	37.74	1.14	1.05	1.14	2.54	53.06	7.94
1121KN066	Sissy	39.60	1.05	1.05	0.98	2.36	53.31	7.92
1121KN067	Sissy	37.40	1.28	1.18	1.05	2.39	53.24	7.77
1121KN068	Sissy	38.95	1.10	1.04	1.34	2.80	56.35	7.98
1121KN069	Sissy	37.88	1.06	1.02	0.91	2.09	48.27	7.12
1121KN070	Sissy	38.42	1.14	1.08	0.93	2.25	47.22	7.29
1121KN071	Sissy	37.65	1.22	1.14	1.47	3.04	58.14	7.91
1121KN072	Sissy	38.59	1.10	1.07	1.01	2.44	47.18	7.07
1121KN082	Trumpf	38.75	1.21	1.19	1.98	3.88	65.97	8.42
1121KN083	Trumpf	38.55	1.31	1.22	2.05	3.99	65.94	8.57
1121KN084	Trumpf	40.83	1.18	1.19	2.41	4.46	67.62	8.67
1121KN085	Trumpf	40.78	1.12	1.14	1.55	3.30	62.33	8.22
1121KN086	Trumpf	38.94	1.22	1.21	2.46	4.48	75.39	9.47
1121KN087	Trumpf	42.31	1.16	1.19	1.79	3.71	65.63	9.05
1121KN088	Trumpf	38.55	1.38	1.25	2.10	3.94	67.17	8.82
1121KN089	Trumpf	40.02	1.24	1.18	2.28	4.25	69.96	9.18
1121KN090	Trumpf	38.12	1.34	1.26	2.33	4.32	66.84	8.63
1121KN100	Franken	38.52	1.14	1.02	1.56	3.04	57.96	7.32
1121KN101	Franken	38.62	1.05	0.95	1.98	3.60	65.15	8.38
1121KN102	Franken	38.61	1.11	0.99	2.46	4.18	69.46	8.72
1121KN103	Franken	37.37	1.21	1.13	2.42	4.13	65.64	8.52
1121KN104	Franken	40.67	1.03	0.99	2.36	4.17	73.45	9.6

1121KN105	Franken	37.57	1.15	1.07	1.86	3.59	70.88	9.45
1121KN106	Franken	42.38	1.23	1.11	2.16	4.21	74.58	9.98
1121KN107	Franken	42.51	1.07	0.97	2.30	4.18	77.82	9.66
1121KN108	Franken	37.96	1.25	1.19	2.27	4.19	70.67	8.9
1121KN118	Intensiv	37.52	1.38	1.31	2.50	4.60	74.68	9.59
1121KN119	Intensiv	39.55	1.10	1.12	2.06	4.00	73.06	9.8
1121KN121	Intensiv	37.86	1.22	1.17	2.41	4.27	70.4	9.48
1121KN122	Intensiv	40.58	1.06	1.00	2.08	3.89	69.15	9.16
1121KN123	Intensiv	40.77	1.17	1.07	1.88	3.83	70.34	9.59
1121KN124	Intensiv	40.35	1.08	1.03	2.35	4.36	73.95	9.77
1121KN125	Intensiv	38.40	1.18	1.17	2.50	4.42	76.42	9.42
1121KN126	Intensiv	38.91	1.12	1.10	2.20	4.04	72.05	9.05
1121KN136	Bavaria	39.32	1.12	1.02	2.09	3.91	65.07	7.74
1121KN137	Bavaria	47.31	1.17	0.94	1.42	2.78	55.19	6.39
1121KN138	Bavaria	39.29	1.06	0.98	1.61	3.40	62.9	7.85
1121KN139	Bavaria	38.82	1.06	1.01	2.01	3.88	64.06	7.95
1121KN140	Bavaria	41.07	1.20	1.10	1.86	3.81	59.14	7.74
1121KN141	Bavaria	37.15	1.36	1.22	2.75	4.74	66.95	8.43
1121KN142	Bavaria	40.51	1.09	1.01	2.01	3.89	65.11	8.14
1121KN143	Bavaria	38.66	1.10	1.05	2.45	4.43	68	8.27
1121KN144	Bavaria	37.82	1.34	1.21	2.36	4.27	63.01	7.96
1121KN154	BarkeCS	40.53	1.16	1.07	1.97	3.93	68.76	8.42
1121KN155	BarkeCS	40.72	1.22	1.11	1.92	3.84	71.7	8.7
1121KN156	BarkeCS	39.20	1.13	1.08	2.00	3.74	73.13	9.31
1121KN157	BarkeCS	39.45	1.15	1.07	1.79	3.38	72.31	9.63
1121KN158	BarkeCS	40.19	1.23	1.17	1.93	3.76	78.88	9.91
1121KN159	BarkeCS	40.55	1.13	1.12	2.16	4.15	76.11	9.88
1121KN160	BarkeCS	42.16	1.09	1.09	1.91	3.71	74.25	9.47
1121KN161	BarkeCS	41.74	1.11	1.07	1.69	3.46	70.18	9.11
1121KN162	BarkeCS	41.36	1.09	1.08	2.10	4.02	73.94	9.3
1121KN172	Beatrix	46.73	1.54	1.20	1.50	3.34	64.43	9.24
1121KN173	Beatrix	40.67	1.26	1.25	1.73	3.92	71.99	10.59
1121KN174	Beatrix	41.02	1.23	1.22	1.86	4.04	75.13	10.56
1121KN175	Beatrix	41.15	1.19	1.16	1.71	3.80	71.28	9.93
1121KN176	Beatrix	40.63	1.18	1.19	1.68	3.66	69.57	9.75
1121KN177	Beatrix	47.03	1.72	1.42	1.38	3.38	69.87	9.68
1121KN178	Beatrix	40.15	1.32	1.31	2.07	4.31	77.03	10.59
1121KN179	Beatrix	40.90	1.32	1.31	1.97	4.26	74.69	10.54
1121KN180	Beatrix	41.96	1.21	1.20	1.57	3.61	70.1	9.96
1121KN190	Djamilia	40.00	0.96	1.00	1.54	3.30	67.13	8.84
1121KN191	Djamilia	44.14	0.99	1.02	1.48	3.20	66.37	8.85
1121KN192	Djamilia	39.18	1.05	1.01	1.51	3.08	64.79	8.69
1121KN193	Djamilia	40.30	1.07	1.07	1.64	3.39	70.1	9.25
1121KN194	Djamilia	39.27	1.00	0.99	1.41	3.04	62.31	8.55

1121KN195	Djamilia	39.24	0.95	0.92	1.55	3.22	65.15	8.84
1121KN196	Djamilia	38.65	1.08	1.02	1.54	3.16	64.29	8.57
1121KN197	Djamilia	46.20	1.41	1.23	1.44	3.37	67.55	9.24
1121KN198	Djamilia	43.35	1.00	0.98	1.16	2.85	59.67	8.14
1121KN208	Eunova	41.56	0.84	0.84	1.18	2.59	52.58	8.23
1121KN209	Eunova	37.48	1.15	1.09	1.29	2.87	59.16	8.78
1121KN210	Eunova	38.23	1.10	1.08	1.41	3.10	55.77	8.45
1121KN211	Eunova	37.91	1.05	0.97	0.99	2.41	49.3	7.76
1121KN212	Eunova	42.39	0.91	0.89	0.82	2.12	48.47	7.46
1121KN213	Eunova	39.34	0.97	0.95	0.68	2.02	45.32	7.48
1121KN214	Eunova	41.63	1.05	1.05	0.77	2.35	46.51	7.73
1121KN215	Eunova	39.50	0.97	0.97	0.93	2.46	49.15	7.72
1121KN216	Eunova	38.28	1.00	1.01	1.01	2.47	46.77	7.37
1121KN226	Streif	44.00	1.14	1.16	1.19	2.91	59.01	8.57
1121KN227	Streif	41.06	1.23	1.25	1.33	3.33	65.21	9.59
1121KN228	Streif	39.71	1.24	1.22	1.79	3.59	71.17	9.23
1121KN229	Streif	43.46	1.46	1.42	1.58	3.79	72.91	9.72
1121KN230	Streif	46.60	1.85	1.47	1.97	4.24	76.42	9.75
1121KN231	Streif	39.57	1.46	1.43	1.85	4.22	77.24	9.96
1121KN232	Streif	39.66	1.39	1.34	1.56	3.64	71.89	9.76
1121KN233	Streif	39.79	1.28	1.24	1.69	3.71	73.13	9.42
1121KN234	Streif	39.10	1.19	1.18	1.83	3.68	71.98	9.83
1121KN244	Ursa	39.22	1.28	1.23	2.08	4.46	75.23	10.11
1121KN245	Ursa	38.25	1.23	1.18	2.04	4.23	75.16	10.03
1121KN246	Ursa	40.19	0.99	0.97	1.46	3.37	61.19	9.05
1121KN247	Ursa	38.16	1.10	1.08	1.82	3.95	73.79	9.93
1121KN248	Ursa	39.06	1.11	1.10	1.87	3.91	70.89	9.58
1121KN249	Ursa	39.91	1.08	1.03	1.67	3.58	68.15	9.25
1121KN250	Ursa	38.33	1.21	1.21	2.08	4.21	72.68	9.62
1121KN251	Ursa	41.48	1.04	0.96	1.48	3.29	61.66	8.58
1121KN252	Ursa	41.45	1.06	1.00	1.45	3.25	62.55	8.39
1121KN262	Victoriana	43.32	1.14	1.17	1.31	3.19	60.31	8.64
1121KN263	Victoriana	41.47	1.20	1.20	1.50	3.37	65.29	8.78
1121KN264	Victoriana	41.50	1.15	1.12	1.23	2.91	56.62	8.18
1121KN265	Victoriana	42.61	1.17	1.19	1.46	3.30	62.76	8.64
1121KN266	Victoriana	43.22	1.08	1.09	1.26	3.00	56.93	8.4
1121KN267	Victoriana	43.29	0.98	1.04	1.40	3.03	59.57	8.25
1121KN268	Victoriana	42.49	1.22	1.23	1.55	3.43	63.21	8.71
1121KN269	Victoriana	40.97	1.28	1.28	1.73	3.61	68.97	8.7
1121KN270	Victoriana	41.73	1.37	1.37	1.68	3.77	65.88	8.99
1121KN280	Wiebke	38.87	1.06	1.00	1.19	2.67	55.56	7.9
1121KN281	Wiebke	39.78	1.13	1.08	1.28	2.86	56.66	8.23
1121KN282	Wiebke	40.40	1.07	1.02	1.19	2.69	56.66	8.28
1121KN283	Wiebke	43.46	0.98	1.04	1.02	2.57	56.97	8.46

1121KN284	Wiebke	40.53	0.97	0.97	1.17	2.71	55.75	8.1
1121KN285	Wiebke	38.71	1.14	1.06	1.25	2.72	57.25	8.58
1121KN286	Wiebke	37.54	1.37	1.23	1.57	3.07	61.23	8.72
1121KN287	Wiebke	40.58	0.99	0.97	1.10	2.53	54.48	8.47
1121KN288	Wiebke	40.84	1.03	1.01	1.18	2.74	55.56	8.15
1121KN295	MorexPE	42.98	1.24	1.26	1.05	2.85	50.26	8.11
1121KN296	MorexPE	41.45	1.50	1.50	0.88	2.85	49.89	8.86
1121KN297	MorexPE	42.24	1.53	1.49	1.16	3.19	51.89	8.86
1121KN298	MorexPE	39.18	1.62	1.50	0.71	2.48	44.28	7.38
1121KN299	MorexPE	40.06	1.30	1.25	0.84	2.47	42.75	7.69
1121KN300	MorexPE	41.51	1.37	1.35	1.10	2.98	51.97	8.25
1121KN307	BarkePE	39.28	1.30	1.21	2.30	4.23	73.99	9.02
1121KN308	BarkePE	41.37	1.12	1.11	1.98	3.86	72.86	8.79
1121KN309	BarkePE	41.83	1.15	1.13	2.13	4.10	76.58	9.21
1121KN310	BarkePE	39.07	1.26	1.19	2.56	4.58	77.87	9.09
1121KN311	BarkePE	39.17	1.26	1.15	2.49	4.49	78.55	9.58
1121KN312	BarkePE	39.59	1.20	1.12	2.15	3.99	76.18	9.79

Note: $t_{\max} = \frac{b}{2a}$, the time point that plants reach maximum biomass, estimated from the bell-shaped model; t_H, the time point for plant harvesting; FW, fresh weight; DW, dry weight; [§]digital volumes of plants ($\times 10^7$ px^3); [1]the predicted biomass from image data at time $t_{\max}$; [2]the predicted biomass from image data at time $t_{\max}$; [3]growth rate (slope; $\times 10^6$ px^3/day) detected from the linear model (LM); [4]the predicted biomass from image data at time t_H.

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