SUPPLEMENTARY TABLES

Supplementary Table 1. Amino acid content (nmol/g FW) in leaves of Col wild type and mutants[a]

Amino acid	**Col WT**	***5-fcl***	***arc12***	***ats1-1***	***npq1-2***	***sex1-1***	***sex4-5***	***tha1-1***	***tt7-3***
Ala	**814 ± 27**	1,089 ± 132	780 ± 47	736 ± 84	759 ± 74	1,413 ± 123***	1,031 ± 79	1,014 ± 213	999 ± 36
Arg	**18 ± 1**	15 ± 1	12 ± 1	12 ± 2	16 ± 2	47 ± 8***	11 ± 3	12 ± 1	22 ± 4
Asn	**48 ± 1**	64 ± 7	60 ± 5	47 ± 2	44 ± 3	328 ± 76***	85 ± 16	63 ± 6	40 ± 2
Asp	**903 ± 24**	1,420 ± 80***	1,057 ± 78	1,258 ± 87**	870 ± 90	2,562 ± 247***	1,589 ± 135***	1,401 ± 78***	681 ± 63
Cys	**2.8 ± 0.1**	4.0 ± 0.5	3.1 ± 0.5	3.0 ± 0.4	2.5 ± 0.2	8.0 ± 0.7***	6.1 ± 1.0***	4.0 ± 0.7	2.5 ± 0.4
Gln	**551 ± 18**	773 ± 77*	578 ± 38	493 ± 30	554 ± 54	1,176 ± 146***	717 ± 148	593 ± 28	520 ± 38
Glu	**2,759 ± 59**	3,339 ± 154	3,243 ± 170	3,527 ± 40**	2,614 ± 208	5,323 ± 420***	4,673 ± 486***	3,563 ± 133*	2,229 ± 172
Gly	**126 ± 4**	1,293 ± 479***	149 ± 13	148 ± 10	122 ± 14	412 ± 42	256 ± 50	166 ± 13	121 ± 10
His	**37 ± 2**	33 ± 7	39 ± 3	35 ± 3	35 ± 4	75 ± 15***	33 ± 4	40 ± 2	28 ± 2
Ile	**16 ± 1**	23 ± 4	17 ± 1	21 ± 2	15 ± 4	51 ± 19***	26 ± 4	18 ± 1	10 ± 2
Leu	**32 ± 4**	37 ± 11	25 ± 2	36 ± 7	31 ± 9	54 ± 20	30 ± 7	28 ± 2	27 ± 4
Lys	**42 ± 1**	49 ± 6	39 ± 3	50 ± 9	41 ± 6	80 ± 19***	47 ± 8	45 ± 3	37 ± 3
Met	**21 ± 1**	19 ± 2	21 ± 2	19 ± 2	22 ± 2	20 ± 2	20 ± 4	22 ± 2	20 ± 2
Phe	**62 ± 3**	83 ± 12	58 ± 5	65 ± 2	65 ± 7	128 ± 21***	90 ± 11	48 ± 3	71 ± 3
Pro	**168 ± 16**	201 ± 16	156 ± 10	164 ± 17	151 ± 10	294 ± 57	287 ± 125	164 ± 8	156 ± 12
Ser	**348 ± 15**	921 ± 120***	410 ± 42	380 ± 52	346 ± 77	1,213 ± 275***	1,009 ± 448***	527 ± 29	288 ± 20
Thr	**579 ± 19**	851 ± 70*	712 ± 59	621 ± 45	512 ± 55	1,377 ± 162***	1,373 ± 221***	815 ± 121	520 ± 52
Trp	**7.4 ± 0.7**	11 ± 3	6.5 ± 0.4	10 ± 1	7.5 ± 2.3	24 ± 8***	12 ± 2	8.4 ± 0.9	4.9 ± 0.9
Tyr	**12 ± 0.5**	17 ± 4	12 ± 1	15 ± 2	12 ± 2	22 ± 5***	15 ± 3	14 ± 1	11 ± 1
Val	**89 ± 5**	112 ± 18	90 ± 6	87 ± 9	87 ± 11	184 ± 52***	120 ± 17	96 ± 8	97 ± 7
Total	***6,653 ± 126***	*10,354 ± 1,039***	*7,466 ± 416*	*7,727 ± 175*	*6,306 ± 467*	*14,793 ± 1,105***	*11430 ± 1,515***	*8643 ± 369**	*5,886 ± 344*

[a]Data are presented as mean ± SE (n = 3 – 6 for mutants, n = 71 for Col WT).

*The asterisk indicates a significant difference of amino acid content between the mutant and Col wild type (Dunnett's test, *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$).

Supplementary Table 2. Amino acid content (nmol/g FW) in leaves of Ws wild type and mutants[a]

Amino acid	**Ws WT**	***arc10***	***dpe2-1***	***fatb-ko***	***lkr-sdh***	***pig1-1***
Ala	**719 ± 26**	785 ± 85	876 ± 45	823 ± 69	834 ± 54	728 ± 111
Arg	**36 ± 2**	20 ± 3	21 ± 4	15 ± 2**	32 ± 12	27 ± 4
Asn	**43 ± 2**	44 ± 6	73 ± 5***	80 ± 8***	58 ± 10	47 ± 4
Asp	**526 ± 18**	631 ± 117	501 ± 62	1,714 ± 178***	621 ± 103	719 ± 41
Cys	**1.5 ± 0.1**	2.0 ± 0.6	2.4 ± 0.4	4.5 ± 0.4***	2.1 ± 0.7	2.2 ± 0.3
Gln	**392 ± 20**	401 ± 42	674 ± 38***	987 ± 107***	488 ± 130	461 ± 60
Glu	**1,575 ± 60**	1,994 ± 360	1,741 ± 90	3,985 ± 198***	1,856 ± 305	2,127 ± 109*
Gly	**94 ± 7**	105 ± 22	356 ± 42***	203 ± 15***	127 ± 39	115 ± 19
His	**23 ± 1**	19 ± 1	32 ± 2	45 ± 5***	26 ± 3	42 ± 11**
Ile	**7.0 ± 1.0**	7.7 ± 2.5	8.2 ± 2.3	20 ± 2***	8.4 ± 3.1	13 ± 5
Leu	**23 ± 2**	21 ± 2	21 ± 2	30 ± 4	17 ± 1	51 ± 30
Lys	**35 ± 1**	32 ± 1	30 ± 2	51 ± 7*	33 ± 1	49 ± 12*
Met	**19 ± 1**	18 ± 1	18 ± 1	27 ± 3***	19 ± 3	19 ± 2
Phe	**52 ± 2**	55 ± 6	108 ± 8***	74 ± 6*	54 ± 6	79 ± 19**
Pro	**132 ± 11**	124 ± 20	135 ± 9	212 ± 18*	174 ± 18	175 ± 17
Ser	**278 ± 15**	335 ± 77	295 ± 29	705 ± 48***	374 ± 90	243 ± 42
Thr	**290 ± 17**	415 ± 101	442 ± 47	755 ± 95***	438 ± 132	464 ± 55*
Trp	**3.3 ± 0.3**	4.4 ± 1.0	9.3 ± 1.3**	8.4 ± 0.6*	4.5 ± 1.5	9.3 ± 4.7**
Tyr	**11 ± 0.5**	10 ± 1	14 ± 1	14 ± 2	10 ± 1	16 ± 6
Val	**94 ± 4**	89 ± 5	108 ± 5	97 ± 9	101 ± 9	113 ± 37
Total	***4,355 ± 135***	*5,114 ± 812*	*5,464 ± 264*	*9,849 ± 482****	*5,278 ± 786*	*5,498 ± 430*

[a]Data are presented as mean ± SE (n = 3 – 6 for mutants, n = 42 for Ws WT).
*The asterisk indicates a significant difference of amino acid content(s) between the mutant and Ws wild type (Dunnett's test, *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$).

Supplementary Table 3. Amino acid content (nmol/g FW) in seeds of Col wild type and mutants[a]

Amino acid	**Col WT**	***5-fcl***	***arc12***	***ats1-1***	***npq1-2***	***sex1-1***	***sex4-5***	***tha1-1***	***tt7*-3**
Ala	**395 ± 12**	752 ± 243***	443 ± 42	396 ± 47	468 ± 59	697 ± 92***	524 ± 40	599 ± 52*	1,043 ± 30***
Arg	**137 ± 17**	1,208 ± 300***	135 ± 12	143 ± 32	212 ± 72	227 ± 32	130 ± 8	286 ± 40	349 ± 62*
Asn	**478 ± 17**	549 ± 75	543 ± 44	509 ± 47	517 ± 56	647 ± 73	450 ± 50	652 ± 80	869 ± 96***
Asp	**752 ± 25**	222 ± 39***	731 ± 83	666 ± 91	748 ± 78	1,065 ± 205*	733 ± 69	640 ± 64	802 ± 87
Cys	**3.6 ± 0.1**	13 ± 4***	3.5 ± 0.5	3.9 ± 0.8	4.1 ± 0.8	5.8 ± 0.8	4.7 ± 0.6	40 ± 2***	4.2 ± 0.6
Gln	**252 ± 16**	887 ± 122***	250 ± 46	337 ± 112	408 ± 157	366 ± 59	286 ± 36	545 ± 97**	398 ± 71
Glu	**2,715 ± 69**	1,811 ± 151	2,883 ± 213	2,741 ± 140	2,715 ± 69	3,636 ± 479**	3,083 ± 261	2,527 ± 311	2,872 ± 140
Gly	**369 ± 14**	18,483 ± 4,596***	380 ± 55	330 ± 62	446 ± 120	570 ± 62	383 ± 38	477 ± 50	654 ± 106
His	**143 ± 10**	335 ± 93**	163 ± 30	172 ± 69	198 ± 64	269 ± 40*	151 ± 16	271 ± 28*	210 ± 30
Ile	**175 ± 9**	250 ± 65	178 ± 25	193 ± 52	259 ± 95	282 ± 32	207 ± 25	240 ± 41	402 ± 57***
Leu	**223 ± 12**	290 ± 76	243 ± 39	242 ± 69	223 ± 12	366 ± 153	385 ± 45	275 ± 28	450 ± 55***
Lys	**120 ± 7**	536 ± 171***	133 ± 20	130 ± 34	185 ± 51	229 ± 29*	144 ± 16	192 ± 12	206 ± 24
Met	**43 ± 1**	61 ± 15*	55 ± 4	47 ± 3	46 ± 5	68 ± 7***	58 ± 5*	52 ± 7	71 ± 4***
Phe	**223 ± 10**	321 ± 67	235 ± 27	238 ± 54	321 ± 102	353 ± 42*	261 ± 21	304 ± 30	329 ± 42
Pro	**1,117 ± 94**	836 ± 224	930 ± 324	1,057 ± 563	1,777 ± 842	2,079 ± 411	1,346 ± 438	1,384 ± 499	1,844 ± 438
Ser	**373 ± 12**	15,241 ± 2,809***	438 ± 36	361 ± 57	373 ± 12	650 ± 67	503 ± 46	458 ± 33	684 ± 50
Thr	**324 ± 13**	1,101 ± 269***	377 ± 60	335 ± 101	442 ± 125	549 ± 66	387 ± 41	8,838 ± 612***	540 ± 94
Trp	**218 ± 9**	146 ± 31	248 ± 34	207 ± 43	257 ± 37	369 ± 47***	343 ± 32**	216 ± 11	390 ± 24***
Tyr	**62 ± 2**	86 ± 18	72 ± 7	67 ± 10	62 ± 2	103 ± 12***	76 ± 8	84 ± 6	101 ± 6***
Val	**280 ± 14**	480 ± 96	278 ± 32	305 ± 68	441 ± 169	525 ± 52**	318 ± 36	355 ± 69	657 ± 69***
Total	***8,401 ± 294***	*43,608 ± 9,330***	*8,719 ± 904*	*8,480 ± 1,581*	*10,240 ± 2,209*	*13,074 ± 1,451**	*9,662 ± 780*	*18,479 ± 992****	*12,875 ± 1,357**

[a]Data are presented as mean ± SE (n = 3 – 6 for mutants, n = 67 for Col WT).
*The asterisk indicates a significant difference of amino acid content between the mutant and Col wild type (Dunnett's test, *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$).

Supplementary Table 4. Amino acid contents (nmol/g FW) in seeds of Ws wild type and mutants[a]

Amino acid	Ws WT	*arc10*	*dpe2-1*	*fatb-ko*	*lkr-sdh*	*pig1-1*
Ala	**393 ± 20**	297 ± 35	385 ± 39	746 ± 36***	561 ± 74	430 ± 63
Arg	**111 ± 7**	94 ± 21	93 ± 15	322 ± 42***	149 ± 18	145 ± 22
Asn	**297 ± 13**	231 ± 30	194 ± 16	830 ± 26***	411 ± 42	642 ± 61***
Asp	**634 ± 34**	456 ± 79	444 ± 65	955 ± 121**	614 ± 84	792 ± 54
Cys	**3.5 ± 0.2**	3.2 ± 0.6	2.4 ± 0.04	7.2 ± 0.7***	4.1 ± 0.8	5.5 ± 0.6*
Gln	**204 ± 17**	160 ± 42	267 ± 62	363 ± 40	227 ± 53	1,286 ± 298***
Glu	**2,425 ± 106**	1,898 ± 273	1,728 ± 139	4,380 ± 179***	2,289 ± 278	2,749 ± 264
Gly	**282 ± 18**	214 ± 23	211 ± 35	605 ± 34***	399 ± 93	538 ± 120***
His	**85 ± 5**	68 ± 14	72 ± 9	261 ± 45***	120 ± 17	369 ± 77***
Ile	**168 ± 9**	142 ± 19	128 ± 9	338 ± 44**	227 ± 44	746 ± 138***
Leu	**198 ± 12**	162 ± 24	185 ± 18	424 ± 65***	293 ± 61	591 ± 101***
Lys	**102 ± 7**	78 ± 15	93 ± 11	258 ± 40***	292 ± 42***	167 ± 28
Met	**41 ± 2**	36 ± 6	32 ± 4	98 ± 8***	47 ± 2	46 ± 7
Phe	**198 ± 10**	159 ± 25	169 ± 18	469 ± 42***	243 ± 30	290 ± 37*
Pro	**426 ± 87**	262 ± 74	223 ± 2	1,667 ± 549***	647 ± 211	980 ± 208
Ser	**344 ± 15**	264 ± 27	265 ± 29	805 ± 32***	460 ± 73	432 ± 46
Thr	**230 ± 12**	167 ± 20	207 ± 20	496 ± 67***	315 ± 49	665 ± 133***
Trp	**428 ± 24**	488 ± 79	438 ± 65	796 ± 126***	517 ± 61	169 ± 27*
Tyr	**66 ± 3**	54 ± 8	58 ± 6	115 ± 12***	74 ± 10	124 ± 20***
Val	**238 ± 11**	185 ± 22	193 ± 6	448 ± 42***	296 ± 59	827 ± 161***
Total	***6,875 ± 323***	*5,421 ± 756*	*5,387 ± 370*	*14,384 ± 1,306***	*8,184 ± 1,248*	*11,994 ± 1,688****

[a]Data are presented as mean ± SE (n = 3 – 6 for mutants, n = 33 for Ws WT).
*The asterisk indicates a significant difference of amino acid content(s) between the mutant and Ws wild type (Dunnett's test, *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$).

Supplementary Table 5. Fatty acids (nmol/g FW) in wild type and mutant leaves[a]

Genotype	16:0	*cis*-16:1	*trans*-16:1d3	16:2	16:3	18:0	18:1d9	18:1d11	18:2	18:2 DCA	18:3
Col WT	**2.30 ± 0.03**	**0.098 ± 0.002**	**0.64 ± 0.01**	**0.158 ± 0.003**	**2.38 ± 0.03**	**0.173 ± 0.003**	**0.66 ± 0.01**	**0.046 ± 0.001**	**2.45 ± 0.03**	**0.187 ± 0.002**	**8.8 ± 0.1**
5-fcl	2.35 ± 0.06	0.135 ± 0.043*	0.68 ± 0.02	0.152 ± 0.005	2.44 ± 0.04	0.175 ± 0.008	0.61 ± 0.03	0.064 ± 0.009***	2.47 ± 0.05	0.212 ± 0.006*	9.1 ± 0.2
arc12	2.05 ± 0.08	0.081 ± 0.005	0.63 ± 0.02	0.131 ± 0.011*	2.14 ± 0.09	0.153 ± 0.013	0.60 ± 0.05	0.037 ± 0.002	2.31 ± 0.12	0.169 ± 0.011	8.0 ± 0.3
ats1-1	1.82 ± 0.05***	0.026 ± 0.001***	0.54 ± 0.02*	0.030 ± 0.002***	0.10 ± 0.01***	0.188 ± 0.009	1.09 ± 0.03***	0.066 ± 0.007***	3.00 ± 0.07***	0.212 ± 0.005*	9.0 ± 0.1
npq1-2	2.23 ± 0.05	0.091 ± 0.004	0.67 ± 0.02	0.162 ± 0.006	2.42 ± 0.04	0.167 ± 0.004	0.63 ± 0.01	0.043 ± 0.002	2.43 ± 0.07	0.185 ± 0.008	8.8 ± 0.2
sex1-1	2.21 ± 0.20	0.095 ± 0.010	0.64 ± 0.04	0.149 ± 0.019	2.32 ± 0.14	0.196 ± 0.029	0.69 ± 0.07	0.055 ± 0.004	2.81 ± 0.25*	0.169 ± 0.014	7.8 ± 0.7
sex4-5	2.23 ± 0.12	0.086 ± 0.003	0.66 ± 0.03	0.139 ± 0.009	2.26 ± 0.09	0.165 ± 0.011	0.62 ± 0.04	0.043 ± 0.004	2.45 ± 0.15	0.192 ± 0.008	8.1 ± 0.4
tha1-1	2.50 ± 0.07	0.096 ± 0.003	0.57 ± 0.03	0.148 ± 0.006	2.21 ± 0.03	0.228 ± 0.015***	0.68 ± 0.03	0.036 ± 0.001	2.73 ± 0.06	0.215 ± 0.006*	9.2 ± 0.2
***tt7*-3**	2.39 ± 0.02	0.125 ± 0.016	0.73 ± 0.03*	0.179 ± 0.006	2.41 ± 0.04	0.156 ± 0.004	0.71 ± 0.01	0.045 ± 0.001	2.68 ± 0.05	0.206 ± 0.011	8.9 ± 0.1
***Ws* WT**	**1.86 ± 0.04**	**0.077 ± 0.003**	**0.53 ± 0.01**	**0.098 ± 0.004**	**2.18 ± 0.04**	**0.144 ± 0.005**	**0.45 ± 0.02**	**0.044 ± 0.001**	**2.07 ± 0.05**	**0.116 ± 0.007**	**7.3 ± 0.1**
arc10	1.77 ± 0.10	0.069 ± 0.006	0.50 ± 0.06	0.083 ± 0.008	2.06 ± 0.11	0.133 ± 0.013	0.41 ± 0.04	0.043 ± 0.001	1.91 ± 0.13	0.108 ± 0.019	7.0 ± 0.3
dpe2-1	2.10 ± 0.03	0.092 ± 0.004	0.75 ± 0.03***	0.130 ± 0.008*	2.20 ± 0.06	0.181 ± 0.004*	0.64 ± 0.02**	0.043 ± 0.001	2.49 ± 0.06	0.171 ± 0.014*	8.0 ± 0.2
fatb-ko	1.55 ± 0.11*	0.192 ± 0.008***	0.60 ± 0.04	0.168 ± 0.014***	2.55 ± 0.14*	0.087 ± 0.008***	1.38 ± 0.09***	0.113 ± 0.008***	3.68 ± 0.29***	0.180 ± 0.010**	8.0 ± 0.6
lkr-sdh	1.86 ± 0.09	0.072 ± 0.010	0.64 ± 0.10	0.089 ± 0.012	2.29 ± 0.08	0.146 ± 0.007	0.44 ± 0.03	0.0452 ± 0.0005	2.00 ± 0.14	0.107 ± 0.019	7.3 ± 0.3
pig1-1	2.19 ± 0.10*	0.092 ± 0.007	0.60 ± 0.03	0.114 ± 0.009	2.36 ± 0.06	0.151 ± 0.010	0.61 ± 0.04*	0.054 ± 0.001**	2.27 ± 0.11	0.182 ± 0.010**	8.2 ± 0.3

[a]Data are presented as mean ± SE (n = 3 – 6 for mutants, n = 71 for Col WT, n = 42 for Ws WT).
*The asterisk indicates a significant difference of fatty acid content between the mutant and corresponding wild type (Col or Ws) (Dunnett's test, *, $p < 0.05$; **, $p < 0.01$; ***, $p < 0.001$).

Supplementary Table 6. Spearman's correlation of traits in wild-type plants with $|\rho| > 0.5$[a]

Variable	by Variable	ρ	Prob > $\|\rho\|$
14:0	Leaf Arg	0.5226	< 0.0001[b]
14:0	Leaf Hyp	-0.5237	< 0.0001
16:2	14:0	-0.6752	< 0.0001
16:2	Leaf Ala	-0.5303	< 0.0001[b]
16:2	Leaf Arg	-0.6583	< 0.0001[b]
16:2	Leaf Asn	-0.5564	< 0.0001[b]
16:2	Leaf Glu	0.5930	< 0.0001[b]
16:2	Leaf Hyp	0.5790	< 0.0001[b]
16:2	Leaf Lys	-0.6272	< 0.0001
16:2	Leaf Tyr	-0.5339	< 0.0001[b]
16:2	Leaf Val	-0.5928	< 0.0001[b]
16:3	14:0	0.5737	< 0.0001[b]
16:3	16:0	-0.7299	< 0.0001
16:3	16:2	-0.6564	< 0.0001[b]
16:3	Leaf Arg	0.5326	< 0.0001[b]
16:3	Leaf Asn	0.5587	< 0.0001[b]
16:3	Leaf Hyp	-0.5672	< 0.0001[b]
16:3	Leaf Thr	-0.5570	< 0.0001[b]
16:3	Leaf Val	0.5738	< 0.0001[b]
18:0	16:0	0.5230	< 0.0001
18:2	18:0	0.5641	< 0.0001
18:3	18:0	-0.6706	< 0.0001
18:3	18:2	-0.5313	< 0.0001
(16:3+ *trans*-16:1d3))/(18:0+18:2)	16:0	-0.7100	< 0.0001
(16:3+ *trans*-16:1d3)/(18:0+18:2)	16:2	-0.5100	< 0.0001
(16:3+ *trans*-16:1d3)/(18:0+18:2)	16:3	0.8496	< 0.0001[c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:0	-0.5737	< 0.0001[c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:2	-0.6948	< 0.0001[c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:1d9	-0.7383	< 0.0001
16:0/(18:1d9+18:1d11)	14:0	0.5616	< 0.0001[b]
16:0/(18:1d9+18:1d11)	16:2	-0.7915	< 0.0001
16:0/(18:1d9+18:1d11)	16:3	0.7108	< 0.0001
16:0/(18:1d9+18:1d11)	(16:3+*trans*-16:1d3)/(18:0+18:2)	0.6018	< 0.0001
16:0/(18:1d9+18:1d11)	16:3/18:2	0.6295	< 0.0001
16:0/(18:1d9+18:1d11)	18:1d11	0.5550	< 0.0001
16:0/(18:1d9+18:1d11)	18:1d9	-0.8959	< 0.0001[c]
16:0/(18:1d9+18:1d11)	18:2 DCA	-0.5717	< 0.0001[b]
16:0/(18:1d9+18:1d11)	*cis*-16:1	-0.6163	< 0.0001
16:0/(18:1d9+18:1d11)	Leaf Arg	0.5902	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Asn	0.5670	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Glu	-0.5468	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Hyp	-0.5744	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Lys	0.5376	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Ser	0.5028	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Tyr	0.5194	< 0.0001[b]
16:0/(18:1d9+18:1d11)	Leaf Val	0.5958	< 0.0001[b]
16:3/18:2	14:0	0.5470	< 0.0001

16:3/18:2	16:0	-0.6839	< 0.0001
16:3/18:2	16:2	-0.5861	< 0.0001
16:3/18:2	16:3	0.9218	< 0.0001[c]
16:3/18:2	18:2	-0.6823	< 0.0001[c]
16:3/18:2	(16:3+ *trans*-16:1d3)/(18:0+18:2)	0.9380	< 0.0001[c]
16:3/18:2	18:1d9	-0.7638	< 0.0001
18:1d11	14:0	0.5597	< 0.0001
18:1d11	16:2	-0.7270	< 0.0001
18:1d9	14:0	-0.5168	< 0.0001[b]
18:1d9	16:0	0.6967	< 0.0001
18:1d9	16:2	0.7174	< 0.0001[b]
18:1d9	16:3	-0.8541	< 0.0001
18:1d9	*cis*-16:1	0.5258	< 0.0001
18:1d9	Leaf Arg	-0.5570	< 0.0001[b]
18:1d9	Leaf Asn	-0.6544	< 0.0001
18:1d9	Leaf Glu	0.5009	< 0.0001[b]
18:1d9	Leaf Hyp	0.5452	< 0.0001[b]
18:1d9	Leaf Lys	-0.5294	< 0.0001[b]
18:1d9	Leaf Thr	0.5218	< 0.0001[b]
18:1d9	Leaf Val	-0.5455	< 0.0001[b]
18:2 DCA	16:2	0.5992	< 0.0001[b]
18:2 DCA	Leaf Ala	-0.6462	< 0.0001
18:2 DCA	Leaf Arg	-0.6280	< 0.0001[b]
18:2 DCA	Leaf Asn	-0.5023	< 0.0001[b]
18:2 DCA	Leaf Hyp	0.6388	< 0.0001[b]
18:2 DCA	Leaf Lys	-0.5696	< 0.0001[b]
18:2 DCA	Leaf Met	-0.5527	< 0.0001[b]
18:2 DCA	Leaf Phe	-0.5417	< 0.0001[b]
18:2 DCA	Leaf Thr	0.5386	< 0.0001[b]
18:2 DCA	Leaf Tyr	-0.5679	< 0.0001[b]
18:2 DCA	Leaf Val	-0.6445	< 0.0001[b]
Inflorescence[d]	14:0	0.5551	< 0.0001[b]
Inflorescence[d]	16:2	-0.716	< 0.0001[b]
Inflorescence[d]	16:3	0.6910	< 0.0001[b]
Inflorescence[d]	16:0/(18:1d9+18:1d11)	0.7102	< 0.0001[b]
Inflorescence[d]	16:3/18:2	0.5160	< 0.0001[b]
Inflorescence[d]	18:1d9	-0.7085	< 0.0001[b]
Inflorescence[d]	18:2 DCA	-0.7585	< 0.0001[b]
Inflorescence[d]	Leaf Ala	0.6477	< 0.0001[b]
Inflorescence[d]	Leaf Arg	0.7227	< 0.0001[b]
Inflorescence[d]	Leaf Asn	0.6802	< 0.0001[b]
Inflorescence[d]	Leaf color[d]	-0.9424	< 0.0001[b]
Inflorescence[d]	Leaf Cys	-0.5189	< 0.0001[b]
Inflorescence[d]	Leaf Glu	-0.6210	< 0.0001[b]
Inflorescence[d]	Leaf Hyp	-0.7294	< 0.0001[b]
Inflorescence[d]	Leaf Lys	0.6648	< 0.0001[b]
Inflorescence[d]	Leaf Met	0.6126	< 0.0001[b]
Inflorescence[d]	Leaf Phe	0.5289	< 0.0001[b]
Inflorescence[d]	Leaf Thr	-0.6306	< 0.0001[b]
Inflorescence[d]	Leaf Tyr	0.6535	< 0.0001[b]

Inflorescence[d]	Leaf Val	0.7419	< 0.0001[b]
Inflorescence[d]	Seed %C	0.5826	< 0.0001[b]
Inflorescence[d]	Seed Ala	0.6151	< 0.0001[b]
Inflorescence[d]	Seed Asn	-0.6447	< 0.0001[b]
Inflorescence[d]	Seed C/N ratio	0.6239	< 0.0001[b]
Inflorescence[d]	Seed His	-0.6443	< 0.0001[b]
Inflorescence[d]	Seed Ile	0.5985	< 0.0001[b]
Inflorescence[d]	Seed Pro	-0.5851	< 0.0001[b]
Inflorescence[d]	Seed Ser	0.5731	< 0.0001[b]
Inflorescence[d]	Seed Trp	0.7393	< 0.0001[b]
Inflorescence[d]	Seed Tyr	0.7393	< 0.0001[b]
Leaf Arg	Leaf Ala	0.7671	< 0.0001
Leaf Asp	Leaf Ala	-0.6763	< 0.0001
Leaf Asp	Leaf Arg	-0.5806	< 0.0001
Leaf color[d]	14:0	-0.5609	< 0.0001[b]
Leaf color[d]	16:0	0.5107	< 0.0001[b]
Leaf color[d]	16:2	0.7375	< 0.0001[b]
Leaf color[d]	16:3	-0.7023	< 0.0001[b]
Leaf color[d]	16:0/(18:1d9+18:1d11)	-0.7311	< 0.0001[b]
Leaf color[d]	18:1d9	0.7284	< 0.0001[b]
Leaf color[d]	18:2 DCA	0.7425	< 0.0001[b]
Leaf color[d]	Leaf Ala	-0.599	< 0.0001[b]
Leaf color[d]	Leaf Arg	-0.6805	< 0.0001[b]
Leaf color[d]	Leaf Asn	-0.6963	< 0.0001[b]
Leaf color[d]	Leaf Cys	0.5569	< 0.0001[b]
Leaf color[d]	Leaf Glu	0.6372	< 0.0001[b]
Leaf color[d]	Leaf Hyp	0.6842	< 0.0001[b]
Leaf color[d]	Leaf Lys	-0.6147	< 0.0001[b]
Leaf color[d]	Leaf Met	-0.5804	< 0.0001[b]
Leaf color[d]	Leaf Phe	-0.5061	< 0.0001[b]
Leaf color[d]	Leaf Ser	-0.5208	< 0.0001[b]
Leaf color[d]	Leaf Thr	0.6857	< 0.0001[b]
Leaf color[d]	Leaf Tyr	-0.6153	< 0.0001[b]
Leaf color[d]	Leaf Val	-0.7228	< 0.0001[b]
Leaf color[d]	Seed %C	-0.5833	< 0.0001[b]
Leaf color[d]	Seed Ala	-0.6511	< 0.0001[b]
Leaf color[d]	Seed Asn	0.6650	< 0.0001[b]
Leaf color[d]	Seed C/N ratio	-0.6547	< 0.0001[b]
Leaf color[d]	Seed His	0.6861	< 0.0001[b]
Leaf color[d]	Seed HoSer	0.524	< 0.0001[b]
Leaf color[d]	Seed Ile	-0.6066	< 0.0001[b]
Leaf color[d]	Seed Met	-0.5059	< 0.0001[b]
Leaf color[d]	Seed Phe	-0.5232	< 0.0001[b]
Leaf color[d]	Seed Pro	0.6304	< 0.0001[b]
Leaf color[d]	Seed Ser	-0.5672	< 0.0001[b]
Leaf color[d]	Seed Trp	-0.7782	< 0.0001[b]
Leaf color[d]	Seed Tyr	-0.7872	< 0.0001[b]
Leaf Gln	Leaf Asn	0.5708	< 0.0001
Leaf Glu	Leaf Ala	-0.7065	< 0.0001
Leaf Glu	Leaf Arg	-0.7331	< 0.0001

Leaf Glu	Leaf Asp	0.6267	< 0.0001
Leaf HoSer	Leaf Ala	-0.5101	< 0.0001
Leaf HoSer	Leaf Ser	-0.5055	< 0.0001
Leaf Hyp	Leaf Ala	-0.7964	< 0.0001
Leaf Hyp	Leaf Arg	-0.7665	< 0.0001
Leaf Hyp	Leaf Asp	0.5173	< 0.0001
Leaf Hyp	Leaf Glu	0.5981	< 0.0001
Leaf Hyp	Leaf Lys	-0.6586	< 0.0001
Leaf Hyp	Leaf Met	-0.5414	< 0.0001[b]
Leaf Hyp	Leaf Phe	-0.5749	< 0.0001
Leaf Hyp	Leaf Thr	0.5474	< 0.0001[b]
Leaf Hyp	Leaf Trp	0.5515	< 0.0001
Leaf Hyp	Leaf Tyr	-0.5493	< 0.0001[b]
Leaf Hyp	Leaf Val	-0.7785	< 0.0001
Leaf Leu	Leaf Ala	0.5306	< 0.0001
Leaf Leu	Leaf Asp	-0.5975	< 0.0001
Leaf Leu	Leaf Glu	-0.7171	< 0.0001
Leaf Lys	Leaf Ala	0.5409	< 0.0001
Leaf Lys	Leaf Arg	0.8230	< 0.0001
Leaf Lys	Leaf Asp	-0.5143	< 0.0001
Leaf Lys	Leaf Glu	-0.6399	< 0.0001
Leaf Lys	Leaf Leu	0.6325	< 0.0001
Leaf Met	Leaf Arg	0.5584	< 0.0001[b]
Leaf Met	Leaf Asn	0.5610	< 0.0001
Leaf Met	Leaf Ile	-0.6190	< 0.0001
Leaf Met	Leaf Lys	0.6223	< 0.0001[b]
Leaf number[d]	Leaf shape[d]	-0.7033	< 0.0001
Leaf Phe	Leaf Ala	0.6032	< 0.0001
Leaf Phe	Leaf Arg	0.6070	< 0.0001
Leaf Phe	Leaf Asp	-0.6948	< 0.0001
Leaf Phe	Leaf Glu	-0.6773	< 0.0001
Leaf Phe	Leaf Leu	0.7113	< 0.0001
Leaf Phe	Leaf Lys	0.6616	< 0.0001
Leaf Phe	Leaf Met	0.5033	< 0.0001[b]
Leaf Pro	Leaf Asn	0.5949	< 0.0001
Leaf Pro	Leaf Gln	0.5995	< 0.0001
Leaf Pro	Leaf Met	0.7058	< 0.0001
Leaf Ser	Leaf Glu	-0.6887	< 0.0001
Leaf Ser	Leaf Leu	0.5386	< 0.0001
Leaf Thr	Leaf Cys	0.6631	< 0.0001
Leaf Thr	Leaf Met	-0.6047	< 0.0001
Leaf Trp	Leaf Ala	-0.6170	< 0.0001
Leaf Trp	Leaf Arg	-0.5105	< 0.0001
Leaf Trp	Leaf Thr	0.5041	< 0.0001
Leaf Tyr	Leaf Arg	0.5776	< 0.0001[b]
Leaf Tyr	Leaf Asn	0.5133	< 0.0001[b]
Leaf Tyr	Leaf Asp	-0.5717	< 0.0001
Leaf Tyr	Leaf Glu	-0.6708	< 0.0001
Leaf Tyr	Leaf Leu	0.7063	< 0.0001
Leaf Tyr	Leaf Lys	0.6330	< 0.0001

Leaf Tyr	Leaf Phe	0.6426	< 0.0001
Leaf Val	Leaf Ala	0.7670	< 0.0001
Leaf Val	Leaf Arg	0.7336	< 0.0001
Leaf Val	Leaf Asp	-0.6936	< 0.0001
Leaf Val	Leaf Glu	-0.8347	< 0.0001
Leaf Val	Leaf Leu	0.7382	< 0.0001
Leaf Val	Leaf Lys	0.6580	< 0.0001
Leaf Val	Leaf Phe	0.7749	< 0.0001
Leaf Val	Leaf Ser	0.6346	< 0.0001
Leaf Val	Leaf Thr	-0.5080	< 0.0001[b]
Leaf Val	Leaf Tyr	0.7334	< 0.0001
Mature leaf size[d]	14:0	0.5109	< 0.0001[b]
Mature leaf size[d]	16:2	-0.7075	< 0.0001[b]
Mature leaf size[d]	16:3	0.6406	< 0.0001[b]
Mature leaf size[d]	16:0/(18:1d9+18:1d11)	0.6855	< 0.0001[b]
Mature leaf size[d]	18:1d9	-0.6655	< 0.0001[b]
Mature leaf size[d]	18:2 DCA	-0.7826	< 0.0001[b]
Mature leaf size[d]	Inflorescence[d]	0.9168	< 0.0001[b]
Mature leaf size[d]	Leaf Ala	0.6141	< 0.0001[b]
Mature leaf size[d]	Leaf Arg	0.7240	< 0.0001[b]
Mature leaf size[d]	Leaf Asn	0.6275	< 0.0001[b]
Mature leaf size[d]	Leaf Asp	-0.5467	< 0.0001[b]
Mature leaf size[d]	Leaf color[d]	-0.8771	< 0.0001[b]
Mature leaf size[d]	Leaf Cys	-0.5068	< 0.0001[b]
Mature leaf size[d]	Leaf Glu	-0.5549	< 0.0001[b]
Mature leaf size[d]	Leaf Hyp	-0.7301	< 0.0001[b]
Mature leaf size[d]	Leaf Lys	0.6820	< 0.0001[b]
Mature leaf size[d]	Leaf Met	0.6293	< 0.0001[b]
Mature leaf size[d]	Leaf Phe	0.5622	< 0.0001[b]
Mature leaf size[d]	Leaf Thr	-0.5956	< 0.0001[b]
Mature leaf size[d]	Leaf Tyr	0.6762	< 0.0001[b]
Mature leaf size[d]	Leaf Val	0.7191	< 0.0001[b]
Mature leaf size[d]	Seed %C	0.5756	< 0.0001[b]
Mature leaf size[d]	Seed Ala	0.5751	< 0.0001[b]
Mature leaf size[d]	Seed Asn	-0.6179	< 0.0001[b]
Mature leaf size[d]	Seed C/N ratio	0.5862	< 0.0001[b]
Mature leaf size[d]	Seed His	-0.6229	< 0.0001[b]
Mature leaf size[d]	Seed Ile	0.5307	< 0.0001[b]
Mature leaf size[d]	Seed Phe	0.5063	< 0.0001[b]
Mature leaf size[d]	Seed Pro	-0.5884	< 0.0001[b]
Mature leaf size[d]	Seed Ser	0.5416	< 0.0001[b]
Mature leaf size[d]	Seed Trp	0.7402	< 0.0001[b]
Mature leaf size[d]	Seed Tyr	0.7542	< 0.0001[b]
Petiole chloroplast number[d]	Leaf number[d]	0.7033	< 0.0001
Petiole chloroplast number[d]	Leaf shape[d]	-1	0
Petiole chloroplast size[d]	Leaf number[d]	-0.7033	< 0.0001
Petiole chloroplast size[d]	Leaf shape[d]	1	0
Petiole chloroplast size[d]	Petiole chloroplast number[d]	-1	0
Seed %C	Seed Ala	0.5497	< 0.0001[b]
Seed %C	Seed His	-0.5270	< 0.0001[b]

Seed %C	Seed Met	0.5128	< 0.0001
Seed %C	Seed Pro	-0.5762	< 0.0001[b]
Seed %C	Seed Trp	0.5697	< 0.0001[b]
Seed Ala	16:0/(18:1d9+18:1d11)	0.5265	< 0.0001[b]
Seed Ala	18:1d9	-0.5086	< 0.0001[b]
Seed Ala	Leaf Lys	0.5004	< 0.0001[b]
Seed Asn	16:2	0.5810	< 0.0001[b]
Seed Asn	16:0/(18:1d9+18:1)	-0.5582	< 0.0001[b]
Seed Asn	18:2 DCA	0.5995	< 0.0001[b]
Seed Asn	Leaf Asn	-0.5117	< 0.0001[b]
Seed Asn	Leaf Tyr	-0.5095	< 0.0001[b]
Seed Asn	Leaf Val	-0.5411	< 0.0001[b]
Seed C/N ratio	Leaf Asn	0.5203	< 0.0001[b]
Seed C/N ratio	Seed %C	0.5280	< 0.0001[b]
Seed C/N ratio	Seed %N	-0.6897	< 0.0001
Seed C/N ratio	Seed Ala	0.5453	< 0.0001
Seed C/N ratio	Seed His	-0.5852	< 0.0001
Seed C/N ratio	Seed Met	0.5958	< 0.0001
Seed C/N ratio	Seed Pro	-0.5735	< 0.0001[b]
Seed C/N ratio	Seed Trp	0.6904	< 0.0001
Seed C/N ratio	Seed Tyr	0.6257	< 0.0001[b]
Seed GABA	Seed Arg	-0.5246	< 0.0001
Seed GABA	Seed Asp	-0.6090	< 0.0001
Seed GABA	Seed Gln	0.5101	< 0.0001
Seed GABA	Seed Glu	-0.7483	< 0.0001
Seed GABA	Seed Met	-0.6808	< 0.0001
Seed GABA	Seed Pro	0.6376	< 0.0001
Seed GABA	Seed Thr	0.6462	< 0.0001
Seed Glu	Seed Ala	0.5141	< 0.0001
Seed Glu	Seed Asp	0.7679	< 0.0001
Seed Glu	Seed Gln	-0.5389	< 0.0001
Seed His	16:2	0.5762	< 0.0001[b]
Seed His	Leaf Arg	-0.5689	< 0.0001[b]
Seed His	Leaf Glu	0.5757	< 0.0001[b]
Seed His	Leaf Lys	-0.5432	< 0.0001[b]
Seed His	Leaf Phe	-0.5371	< 0.0001
Seed His	Leaf Tyr	-0.6094	< 0.0001
Seed His	Leaf Val	-0.5635	< 0.0001[b]
Seed His	Seed Ala	-0.5526	< 0.0001[b]
Seed His	Seed Glu	-0.5819	< 0.0001
Seed HoSer	Seed Ala	-0.5558	< 0.0001
Seed HoSer	Seed Met	-0.5226	< 0.0001
Seed HoSer	Seed Pro	0.6357	< 0.0001
Seed HoSer	Seed Trp	-0.5572	< 0.0001
Seed HoSer	Seed Tyr	-0.5222	< 0.0001
Seed Hyp	Seed Glu	-0.5541	< 0.0001
Seed Hyp	Seed Leu	0.5178	< 0.0001
Seed Ile	16:2	-0.5275	< 0.0001[b]
Seed Ile	16:0/(18:1d9+18:1d11)	0.5670	< 0.0001[b]
Seed Ile	18:1d9	-0.5407	< 0.0001[b]

Seed Ile	18:2 DCA	-0.5691	< 0.0001
Seed Ile	Leaf Thr	-0.5150	< 0.0001[b]
Seed Ile	Seed Asn	-0.6500	< 0.0001
Seed Leu	Seed Asp	-0.5341	< 0.0001
Seed Leu	Seed Gln	0.5238	< 0.0001
Seed Leu	Seed Ile	0.6803	< 0.0001
Seed Lys	Seed Leu	0.5308	< 0.0001
Seed Met	Seed Ala	0.5517	< 0.0001
Seed Met	Seed Asp	0.5774	< 0.0001
Seed Met	Seed Glu	0.7266	< 0.0001
Seed Met	Seed His	-0.6132	< 0.0001
Seed Phe	18:2 DCA	-0.5257	< 0.0001
Seed Phe	Leaf Asn	0.5139	< 0.0001
Seed Phe	Seed Ile	0.5613	< 0.0001
Seed Phe	Seed Leu	0.6058	< 0.0001
Seed Pro	Seed Ala	-0.7311	< 0.0001
Seed Pro	Seed Asp	-0.6532	< 0.0001
Seed Pro	Seed Glu	-0.8038	< 0.0001
Seed Pro	Seed His	0.6752	< 0.0001
Seed Pro	Seed Met	-0.7879	< 0.0001
Seed Ser	Leaf Thr	-0.5366	< 0.0001[b]
Seed Ser	Seed Ala	0.5739	< 0.0001
Seed Ser	Seed Pro	-0.5933	< 0.0001
Seed Thr	Seed Arg	-0.5362	< 0.0001
Seed Thr	Seed Glu	-0.6119	< 0.0001
Seed Thr	Seed Met	-0.5298	< 0.0001
Seed Thr	Seed Pro	0.5989	< 0.0001
Seed Trp	16:2	-0.6334	< 0.0001[b]
Seed Trp	16:3	0.5702	< 0.0001[b]
Seed Trp	16:0/(18:1d9+18:1d11)	0.6404	< 0.0001[b]
Seed Trp	18:1d9	-0.6255	< 0.0001[b]
Seed Trp	18:2 DCA	-0.584	< 0.0001[b]
Seed Trp	Leaf Arg	0.5712	< 0.0001[b]
Seed Trp	Leaf Asn	0.6569	< 0.0001[b]
Seed Trp	Leaf Cys	-0.5059	< 0.0001[b]
Seed Trp	Leaf Hyp	-0.5073	< 0.0001[b]
Seed Trp	Leaf Lys	0.5556	< 0.0001[b]
Seed Trp	Leaf Met	0.5639	< 0.0001[b]
Seed Trp	Leaf Thr	-0.5726	< 0.0001[b]
Seed Trp	Leaf Val	0.5242	< 0.0001[b]
Seed Trp	Seed Ala	0.6263	< 0.0001
Seed Trp	Seed Asn	-0.5165	< 0.0001[b]
Seed Trp	Seed His	-0.6392	< 0.0001[b]
Seed Trp	Seed Met	0.6530	< 0.0001
Seed Trp	Seed Pro	-0.6546	< 0.0001
Seed Trp	Seed Ser	0.5282	< 0.0001[b]
Seed Tyr	16:2	-0.6379	< 0.0001[b]
Seed Tyr	16:3	0.5853	< 0.0001[b]
Seed Tyr	16:0/(18:1d9+18:1d11)	0.6304	< 0.0001[b]
Seed Tyr	18:1d9	-0.5960	< 0.0001[b]

Seed Tyr	18:2 DCA	-0.6334	< 0.0001[b]
Seed Tyr	Leaf Arg	0.5422	< 0.0001[b]
Seed Tyr	Leaf Asn	0.6325	< 0.0001[b]
Seed Tyr	Leaf Cys	-0.5319	< 0.0001[b]
Seed Tyr	Leaf Thr	-0.5472	< 0.0001[b]
Seed Tyr	Leaf Val	0.5340	< 0.0001[b]
Seed Tyr	Seed Ala	0.6942	< 0.0001
Seed Tyr	Seed His	-0.5885	< 0.0001[b]
Seed Tyr	Seed Met	0.7000	< 0.0001
Seed Tyr	Seed Phe	0.5188	< 0.0001[b]
Seed Tyr	Seed Pro	-0.6914	< 0.0001
Seed Tyr	Seed Ser	0.6520	< 0.0001
Seed Tyr	Seed Trp	0.7791	< 0.0001
Seed Val	Seed Asp	-0.5897	< 0.0001
Seed Val	Seed Glu	-0.5101	< 0.0001
Seed Val	Seed Ile	0.7679	< 0.0001
Seed Val	Seed Leu	0.6929	< 0.0001

[a]Spearman's ρ correlations were calculated from the table containing *z*-scores of mol% of amino acids and fatty acids, z-scores of, %C and %N, *z*-scores of fatty acid and C/N ratios, and from numeric codes of morphological and qualitative traits. Only data from Col and Ws wild-type plants were used.
[b]Correlations that were not significant ($p > 0.05$) when only data from Col wild-type plants were used. Presumably, many of these correlations are due to differences in ecotypes.
[c]Correlations caused by mathematical reasons are indicated.
[d]Non-quantitative variables are indicated.

Supplementary Table 7. Spearman's correlation of traits in Col wild-type plants with $|\rho| > 0.5$[a]

Variable	by Variable	ρ	Prob > $\lvert\rho\rvert$
16:3	16:0	-0.6408	<.0001[b]
18:0	16:0	0.5351	<.0001
18:0	16:3	-0.5667	<.0001[b]
18:2	16:3	-0.8020	<.0001[b]
18:2	18:0	0.5766	<.0001
18:2	18:1d9	0.5995	<.0001
18:3	16:0	-0.5028	<.0001[b]
18:3	18:0	-0.6496	<.0001[b]
18:3	18:2	-0.5401	<.0001[b]
18:3	18:1d9	-0.6578	<.0001[b]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	16:0	-0.6186	<.0001
(16:3+ *trans*-16:1d3)/(18:0+18:2)	16:3	0.8996	<.0001[b,c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:0	-0.6516	<.0001[c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:2	-0.8515	<.0001[c]
(16:3+ *trans*-16:1d3)/(18:0+18:2)	18:1d9	-0.6878	<.0001
16:0/(18:1d9+18:1d11)	18:1d9	-0.7131	<.0001[c]
16:3/18:2	16:0	-0.5967	<.0001
16:3/18:2	16:3	0.9431	<.0001[b,c]
16:3/18:2	18:0	-0.5921	<.0001
16:3/18:2	18:2	-0.8734	<.0001 [c]
16:3/18:2	(16:3+*trans*-16:1d3)/(18:0+18:2)	0.9410	<.0001[c]
16:3/18:2	18:1d9	-0.6558	< 0.0001
18:1d11	16:2	-0.7067	< 0.0001
18:1d9	16:0	0.6114	< 0.0001
18:1d9	16:3	-0.6912	< 0.0001[b]
18:1d9	18:0	0.6465	< 0.0001
Leaf Arg	Leaf Ala	0.6169	< 0.0001
Leaf Asp	Leaf Ala	-0.6707	< 0.0001
Leaf GABA	Leaf Arg	0.5664	< 0.0001
Leaf Gln	Leaf Asn	0.5260	< 0.0001
Leaf Glu	Leaf Ala	-0.6522	< 0.0001[b]
Leaf Glu	Leaf Arg	-0.5698	< 0.0001
Leaf Glu	Leaf Asp	0.6154	< 0.0001[d]
Leaf His	Leaf Arg	0.5727	< 0.0001[b]
Leaf His	Leaf Asp	-0.5274	< 0.0001[b]
Leaf His	Leaf Glu	-0.6075	< 0.0001[b]
Leaf HoSer	Leaf Glu	0.5138	< 0.0001
Leaf HoSer	Leaf Pro	0.5180	< 0.0001
Leaf HoSer	Leaf Ser	-0.5238	< 0.0001[b]
Leaf Hyp	Leaf Ala	-0.6447	< 0.0001[b]
Leaf Hyp	Leaf Arg	-0.5439	< 0.0001[d]
Leaf Hyp	Leaf Val	-0.5768	< 0.0001[b]
Leaf Leu	Leaf Asp	-0.6032	< 0.0001[b,d]
Leaf Leu	Leaf Glu	-0.7041	< 0.0001[b]
Leaf Leu	Leaf His	0.5398	< 0.0001
Leaf Lys	Leaf Arg	0.6733	< 0.0001[b]
Leaf Lys	Leaf His	0.6326	< 0.0001

Leaf number[e]	Leaf color[e]	-1	0[d]
Leaf number[e]	Leaf shape[e]	-1	0
Leaf Phe	Leaf Ala	0.5062	< 0.0001
Leaf Phe	Leaf Asp	-0.6948	< 0.0001[b]
Leaf Phe	Leaf Glu	-0.6316	< 0.0001[b]
Leaf Phe	Leaf Leu	0.6762	< 0.0001
Leaf Pro	Leaf Asn	0.5201	< 0.0001
Leaf Pro	Leaf Gln	0.5508	< 0.0001
Leaf Pro	Leaf Met	0.7480	< 0.0001
Leaf Ser	Leaf Glu	-0.5993	< 0.0001[b]
Leaf Ser	Leaf Leu	0.5431	< 0.0001[d]
Leaf Ser	Leaf Met	-0.6501	< 0.0001[b]
Leaf Ser	Leaf Pro	-0.6063	< 0.0001[b]
Leaf shape[e]	Leaf color[e]	1	0[d]
Leaf Tyr	Leaf His	0.5107	< 0.0001
Leaf Tyr	Leaf Leu	0.5735	< 0.0001
Leaf Val	Leaf Ala	0.6425	< 0.0001
Leaf Val	Leaf Asp	-0.6233	< 0.0001[b]
Leaf Val	Leaf Glu	-0.7683	< 0.0001[b]
Leaf Val	Leaf His	0.5226	< 0.0001
Leaf Val	Leaf Leu	0.6979	< 0.0001
Leaf Val	Leaf Phe	0.7422	< 0.0001
Leaf Val	Leaf Ser	0.5365	< 0.0001
Petiole chloroplast number[e]	Leaf color[e]	-1	0[d]
Petiole chloroplast number[e]	Leaf number[e]	1	0
Petiole chloroplast number[e]	Leaf shape[e]	-1	0
Petiole chloroplast size[e]	Leaf color[e]	1	0[d]
Petiole chloroplast size[e]	Leaf number[e]	-1	0[d]
Petiole chloroplast size[e]	Leaf shape[e]	1	0[d]
Petiole chloroplast size[e]	Petiole chloroplast number[e]	-1	0
Seed Asn	Seed Arg	0.5771	< 0.0001
Seed Asp	Seed Asn	0.5442	< 0.0001[b]
Seed C/N ratio	Seed %N	-0.7825	< 0.0001
Seed GABA	Seed Asp	-0.5874	< 0.0001[b]
Seed GABA	Seed Gln	0.5175	< 0.0001
Seed GABA	Seed Glu	-0.6332	< 0.0001[b]
Seed GABA	Seed Leu	0.5793	< 0.0001
Seed GABA	Seed Pro	0.5419	< 0.0001
Seed GABA	Seed Thr	0.5632	< 0.0001[d]
Seed GABA	Seed Val	0.5402	< 0.0001
Seed Glu	Seed Asn	0.5632	< 0.0001
Seed Glu	Seed Asp	0.8114	< 0.0001
Seed Glu	Seed Gln	-0.5377	< 0.0001[b]
Seed His	Seed Asp	-0.5483	< 0.0001[b]
Seed His	Seed Gln	0.5398	< 0.0001
Seed His	Seed Glu	-0.5697	< 0.0001[b]
Seed HoSer	Seed Pro	0.5031	< 0.0001
Seed Hyp	Seed Glu	-0.5663	< 0.0001[b]
Seed Hyp	Seed His	0.5602	< 0.0001
Seed Hyp	Seed Ile	0.5173	< 0.0001

Seed Ile	Seed Asp	-0.6876	< 0.0001[b]
Seed Ile	Seed Glu	-0.7062	< 0.0001[b]
Seed Ile	Seed His	0.5180	< 0.0001
Seed Leu	Seed Asp	-0.5753	< 0.0001[b]
Seed Leu	Seed Glu	-0.5861	< 0.0001
Seed Leu	Seed Ile	0.7248	< 0.0001
Seed Lys	Seed Leu	0.5237	< 0.0001
Seed Met	Seed Asp	0.6370	< 0.0001
Seed Met	Seed Glu	0.6861	< 0.0001
Seed Phe	Seed Gln	0.5239	< 0.0001
Seed Phe	Seed Leu	0.7467	< 0.0001
Seed Pro	Seed Ala	-0.5523	< 0.0001[b]
Seed Pro	Seed Asn	-0.6319	< 0.0001
Seed Pro	Seed Asp	-0.8521	< 0.0001[b]
Seed Pro	Seed Glu	-0.8899	< 0.0001[b]
Seed Pro	Seed Ile	0.6247	< 0.0001
Seed Pro	Seed Met	-0.7049	< 0.0001[b]
Seed Ser	Seed Pro	-0.5195	< 0.0001[b]
Seed Thr	Seed Leu	0.5172	< 0.0001
Seed Tyr	Seed Lys	0.5177	< 0.0001
Seed Tyr	Seed Met	0.5043	< 0.0001
Seed Val	Seed Asp	-0.6989	< 0.0001[b]
Seed Val	Seed Glu	-0.7766	< 0.0001[b]
Seed Val	Seed His	0.5760	< 0.0001
Seed Val	Seed Ile	0.8065	< 0.0001
Seed Val	Seed Leu	0.6910	< 0.0001
Seed Val	Seed Met	-0.5362	< 0.0001[b,d]
Seed Val	Seed Phe	0.5358	< 0.0001
Seed Val	Seed Pro	0.6617	< 0.0001

[a]Spearman's ρ correlations were calculated from the table containing *z*-scores of mol% of amino acids and fatty acids, *z*-scores of %C and %N, *z*-scores of fatty acid and C/N ratios, and from numeric codes of morphological and qualitative traits. Only data from Col wild-type plants were used.
[b]Correlations that were either not significant ($p > 0.05$) or in the opposite direction when *z*-scores were calculated from nmol/g FW of amino acids and fatty acids.
[c]Correlations caused by mathematical reasons are indicated.
[d]During our pipeline, we screened hundreds of homozygous T-DNA insertion lines of chloroplast-targeted genes for the same traits. Spearman's ρ correlations were calculated. "d" indicates correlations that were either not significant ($p > 0.05$) or in the opposite direction in the pipeline data.
[e]Non-quantitative variables are indicated.

Supplementary Table 8. *k*-means clustering analysis of mutants and wild-type plants in this study

Cluster[a]	Genotype	Number of samples
1[b]	*pig1-1*	3
2[b]	Col WT	58
	npq1-2	5
3[b]	*tha1-1*	3
4[b]	*tt7-3*	6
5[b]	*fatb-ko*	5
6	Col WT	3
	npq1-2	1
	pig1-1	1
7[b]	*ats1-1*	4
8	*dpe2-1*	3
	Ws WT	3
9[b]	*5-fcl*	3
10[b]	Col WT	2
	Ws WT	1
11	*arc12*	4
	sex1-1	3
	sex4-5	4
	Ws WT	1
12	*arc10*	5
	lkr-sdh	3
	Ws WT	27

[a]The number of *k*-means clustered was set to 12 according to the number of hierarchical clustered obtained.
[b]*k*-means clusters that existed in hierarchical clustering as well.