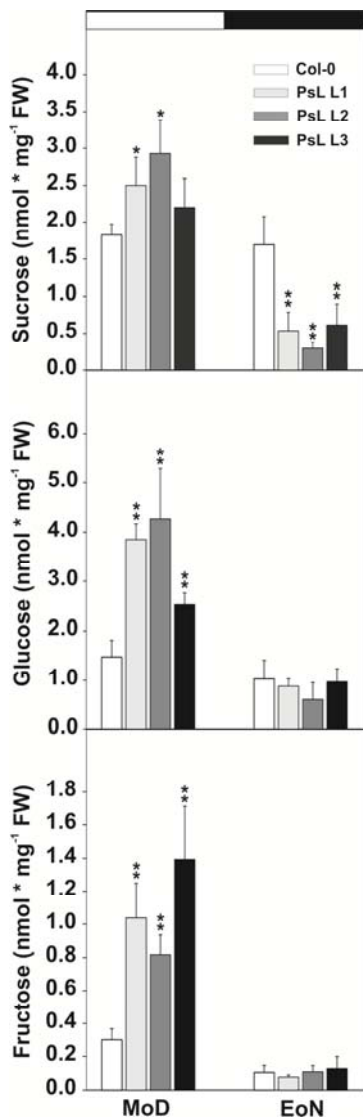


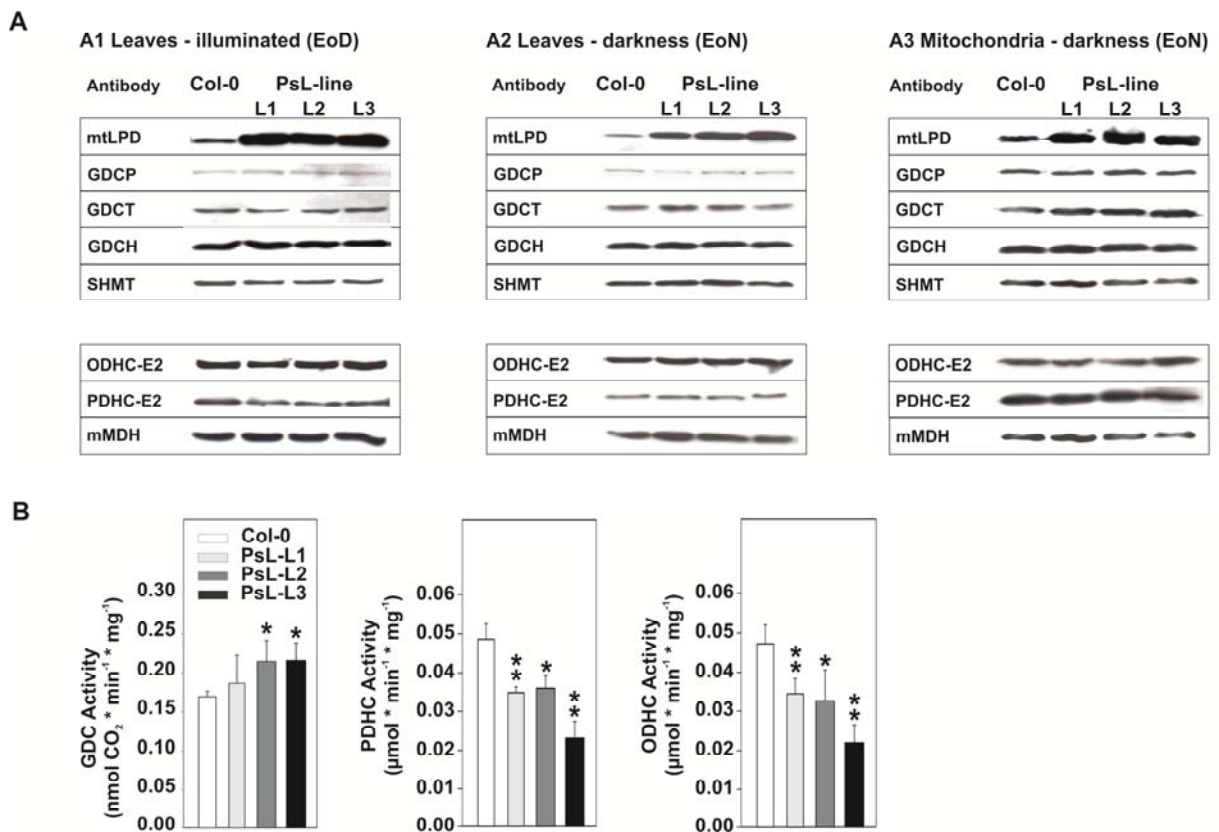
**Supplemental Figure 1.** Visual phenotype and biomass accumulation of *mtLPD* overexpressors.

Plants were grown under environmental controlled conditions with a photoperiod of 10/14 h and 20/18°C day/night, 75% relative humidity and a light intensity of ~120  $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ . **(A)** Representative photographs of normal air grown plants (400 ppm CO<sub>2</sub>, 8 weeks upper panel and 10 weeks lower panel). **(B)** Biomass accumulation after 10 weeks of cultivation in normal air (values are expressed as means  $\pm$  SD; N = 8, \*\*p < 0.01). **(C)** Representative photographs of plants grown under elevated CO<sub>2</sub> concentrations (2000 ppm, 10 weeks).



**Supplemental Figure 2.** Absolute sugar contents in *mtLPD* overexpressors.

Leaf material was harvested at two different time points (mid of day [MoD], in correlation with the harvesting time point of the <sup>13</sup>C labelling approach and at the end of night [EoN]) during a normal day/night-cycle from plants at growth stage 5.1 according to Boyes et al., (2001) and absolute steady-state contents of soluble sugars analysed by GC. Values are mean ± SD of five independent biological replicates. Values marked with asterisks were significantly different from the wild-type control based Student's *t*-test (\**p* < 0.05; \*\**p* < 0.01).



**Supplemental Figure 3.** Enzyme abundances and activities in *mtLPD* overexpressors at different times of the day/night-cycle.

Plants were grown under environmental controlled conditions with a photoperiod of 10/14 h and 20/18°C day/night, 75% relative humidity and a light intensity of ~120 μmol photons m<sup>-2</sup> s<sup>-1</sup>. **(A)** Immunoblotting analysis of GDC, PDHC and ODHC components from leaf samples at the end of the day (EoD), end of the night (EoN) and from isolated mitochondria. **(B)** Enzyme activities of GDC, PDHC and ODHC in isolated mitochondria. Values are means ± SD (N>3) from four technical replicates. Asterisks indicate values that were significantly different from the wild-type control based on Student's *t*-test (\* *p* < 0.05).

**Supplemental Table 1.** Absolute amino acid and selected organic acid contents in *mtLPD* overexpressors

Leaf material was harvested at the end of the light period from plants at growth stage 5.1 according to Boyes et al., (2001) and absolute steady-state contents of amino acids analysed by HPLC. Values are mean  $\pm$  SD of five independent biological replicates. Values in bold were significantly different from the wild-type control based on Student's *t*-test (\**p* < 0.05). Values for metabolites shown with a grey background were used in Figure 2.

Leaf amino acid and selected organic acid contents in <i>mtLPD</i> overexpressors compared to wild-type plants				
<i>Amino acids</i>				
Metabolite				
( $\mu\text{mol}\cdot\text{gFW}^{-1}$ )	Col-0	PsL-L1	PsL-L2	PsL-L3
Alanine	0.897 $\pm$ 0.174	0.693 $\pm$ 0.135	<b>0.559 <math>\pm</math> 0.072*</b>	<b>0.585 <math>\pm</math> 0.061*</b>
Arginine	0.047 $\pm$ 0.008	0.055 $\pm$ 0.037	0.067 $\pm$ 0.066	<b>0.028 <math>\pm</math> 0.002*</b>
Asparagine	0.444 $\pm$ 0.013	0.521 $\pm$ 0.187	0.439 $\pm$ 0.147	0.355 $\pm$ 0.067
Aspartate	0.603 $\pm$ 0.048	0.621 $\pm$ 0.078	0.555 $\pm$ 0.073	0.648 $\pm$ 0.123
Glutamate	2.388 $\pm$ 0.333	3.321 $\pm$ 0.546	2.503 $\pm$ 0.807	3.091 $\pm$ 0.607
Glutamine	2.281 $\pm$ 0.254	2.127 $\pm$ 0.226	1.924 $\pm$ 0.305	2.409 $\pm$ 0.257
Glycine	1.367 $\pm$ 0.160	<b>0.725 <math>\pm</math> 0.192*</b>	<b>0.593 <math>\pm</math> 0.112*</b>	<b>0.788 <math>\pm</math> 0.177*</b>
Histidine	0.138 $\pm$ 0.025	0.131 $\pm$ 0.028	0.100 $\pm$ 0.024	0.117 $\pm$ 0.009
Isoleucine	0.029 $\pm$ 0.005	0.030 $\pm$ 0.006	<b>0.020 <math>\pm</math> 0.002*</b>	0.027 $\pm$ 0.001
Leucine	0.083 $\pm$ 0.025	0.039 $\pm$ 0.017	<b>0.037 <math>\pm</math> 0.003*</b>	<b>0.036 <math>\pm</math> 0.003*</b>
Lysine	0.009 $\pm$ 0.005	0.020 $\pm$ 0.020	0.007 $\pm$ 0.001	0.007 $\pm$ 0.0004
Methionine	0.009 $\pm$ 0.001	<b>0.0009 <math>\pm</math> 0.0005*</b>	<b>0.001 <math>\pm</math> 0.0004*</b>	<b>0.001 <math>\pm</math> 0.0001*</b>

Phenylalanine	0.030 ± 0.001	0.037 ± 0.016	0.025 ± 0.009	0.023 ± 0.003
Serine	3.015 ± 0.398	2.478 ± 0.187	2.123 ± 0.594	2.398 ± 0.501
Threonine	0.827 ± 0.030	0.989 ± 0.212	0.754 ± 0.182	0.760 ± 0.106
Thyrosine	0.025 ± 0.007	0.012 ± 0.011	0.004 ± 0.0007	0.003 ± 0.0003
Tryptophane	0.007 ± 0.005	0.005 ± 0.02	0.006 ± 0.003	0.005 ± 0.0008
Valine	0.250 ± 0.091	0.234 ± 0.004	0.211 ± 0.053	0.230 ± 0.056
Gly/Ser ratio	0.498 ± 0.104	<b>0.338 ± 0.036*</b>	<b>0.233 ± 0.064*</b>	<b>0.337 ± 0.094</b>
Total	11.791 ± 0.434	12.525 ± 1.318	9.926 ± 1.893	11.542 ± 1.832
<i>Selected organic acids</i>				
Metabolite				
(nmol*mgFW <sup>-1</sup> )	Col-0	PsL-L1	PsL-L2	PsL-L3
Malate	0.71 ± 0.19	<b>0.35 ± 0.06*</b>	<b>0.33 ± 0.05*</b>	<b>0.20 ± 0.05*</b>
Succinate	0.35 ± 0.03	<b>0.21 ± 0.06*</b>	<b>0.13 ± 0.03*</b>	<b>0.15 ± 0.02*</b>
Oxoglutarate	0.42 ± 0.20	<b>0.010 ± 0.002*</b>	<b>0.007 ± 0.002*</b>	<b>0.011 ± 0.002*</b>

**Supplemental Table 2.**  $^{13}\text{C}$  enrichment in selected metabolites of primary metabolism

Leaf discs were generated from plants at growth stage 5.1 according to Boyes et al., (2001) after 6 h of illumination. These were further incubated in  $^{12}\text{C}$ - and  $^{13}\text{C}$ -glycine for 3 h under growth conditions and frozen until GC-MS analysis (for further details see material and methods section). Values are mean  $\pm$  SD of four independent biological and 2 technical replicates. Values in bold were significantly different from the wild-type control based on Student's *t*-test (\**p* < 0.05). Values for metabolites with a grey background were used in Figure 3.

$^{13}\text{C}$ enrichment in selected metabolites after external glycine feeding (%)				
Metabolite				
	Col-0	PsL-L1	PsL-L2	PsL-L3
Photorespiration				
Glycolate	17.56 $\pm$ 1.25	<b>4.98 <math>\pm</math> 0.75*</b>	<b>1.54 <math>\pm</math> 0.23*</b>	<b>1.87 <math>\pm</math> 0.14*</b>
Glycine	85.98 $\pm$ 8.41	<b>57.17 <math>\pm</math> 5.89*</b>	<b>43.54 <math>\pm</math> 1.92*</b>	<b>39.36 <math>\pm</math> 2.22*</b>
Serine	342.71 $\pm$ 22.56	<b>232.25 <math>\pm</math> 23.67*</b>	<b>273.96 <math>\pm</math> 26.40*</b>	<b>212.93 <math>\pm</math> 20.04*</b>
Glycerate	15.19 $\pm$ 1.10	<b>9.58 <math>\pm</math> 1.50*</b>	<b>12.51 <math>\pm</math> 0.98*</b>	<b>13.41 <math>\pm</math> 0.48*</b>
TCA cycle				
Citrate	0.80 $\pm$ 0.11	<b>1.70 <math>\pm</math> 0.21*</b>	<b>1.69 <math>\pm</math> 0.34*</b>	<b>1.42 <math>\pm</math> 0.32*</b>
Succinate	3.77 $\pm$ 0.43	<b>1.77 <math>\pm</math> 0.25*</b>	<b>1.63 <math>\pm</math> 0.23*</b>	<b>2.06 <math>\pm</math> 0.34*</b>
Malate	23.58 $\pm$ 1.74	<b>14.59 <math>\pm</math> 1.28*</b>	<b>10.65 <math>\pm</math> 1.05*</b>	<b>15.81 <math>\pm</math> 1.22*</b>
Soluble sugars				
Glucose	2.81 $\pm$ 0.14	2.90 $\pm$ 0.21	2.24 $\pm$ 0.21	2.52 $\pm$ 0.20
Sucrose	11.64 $\pm$ 0.70	<b>15.18 <math>\pm</math> 1.43*</b>	<b>14.90 <math>\pm</math> 1.04*</b>	<b>13.89 <math>\pm</math> 1.25*</b>
Fructose	3.39 $\pm$ 1.34	<b>8.84 <math>\pm</math> 1.30*</b>	<b>13.79 <math>\pm</math> 2.38*</b>	<b>13.05 <math>\pm</math> 2.79*</b>

Maltose	0.55 ± 0.55	<b>2.96 ± 0.20*</b>	<b>2.96 ± 0.20*</b>	<b>3.08 ± 0.26*</b>
Inositol	1.41 ± 0.08	1.30 ± 0.12	1.35 ± 0.08	1.29 ± 0.07
Amino acids				
Glutamine	1.12 ± 0.07	1.42 ± 0.14	1.12 ± 0.06	1.20 ± 0.08
Glutamate	3.81 ± 0.43	3.63 ± 0.48	<b>2.71 ± 0.16*</b>	3.22 ± 0.23
Isoleucine	38.86 ± 2.85	<b>7.88 ± 0.99*</b>	<b>17.86 ± 1.80*</b>	33.23 ± 4.36
Lysine	2.33 ± 0.69	<b>0.75 ± 0.18*</b>	<b>0.57 ± 0.16*</b>	<b>0.47 ± 0.11*</b>
Threonine	2.94 ± 0.18	2.20 ± 0.40	2.22 ± 0.12	2.93 ± 0.22
Valine	1.20 ± 0.08	1.21 ± 0.07	1.10 ± 0.07	<b>1.63 ± 0.11*</b>