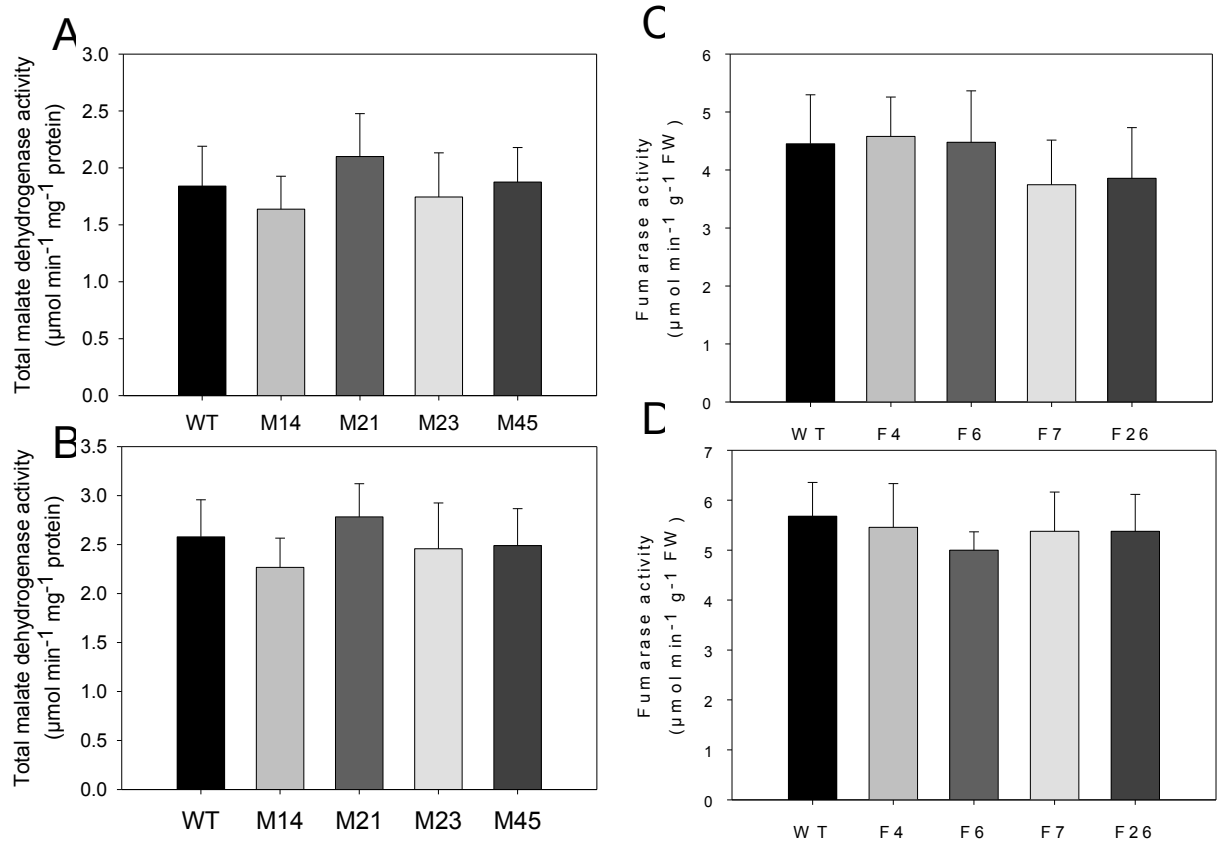
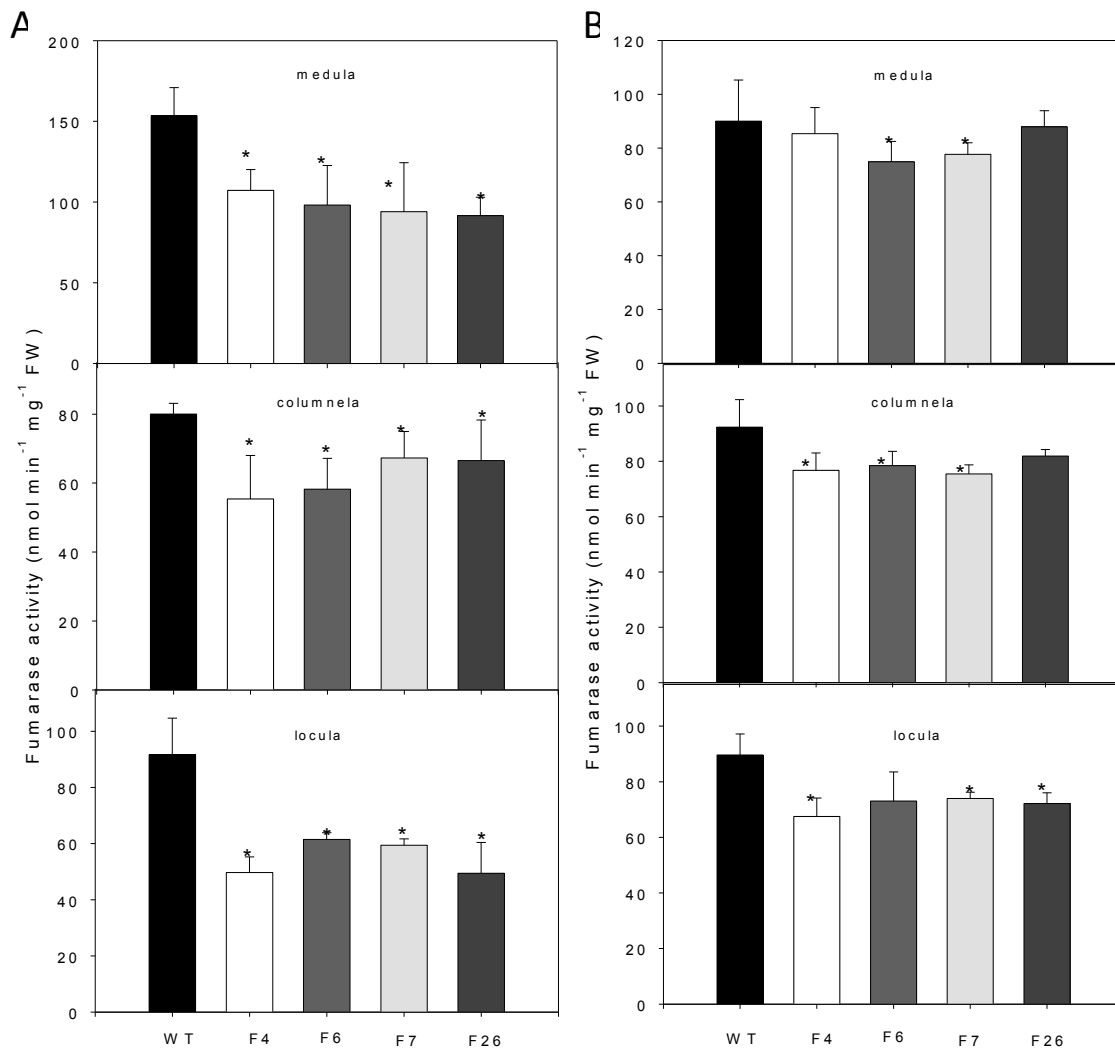


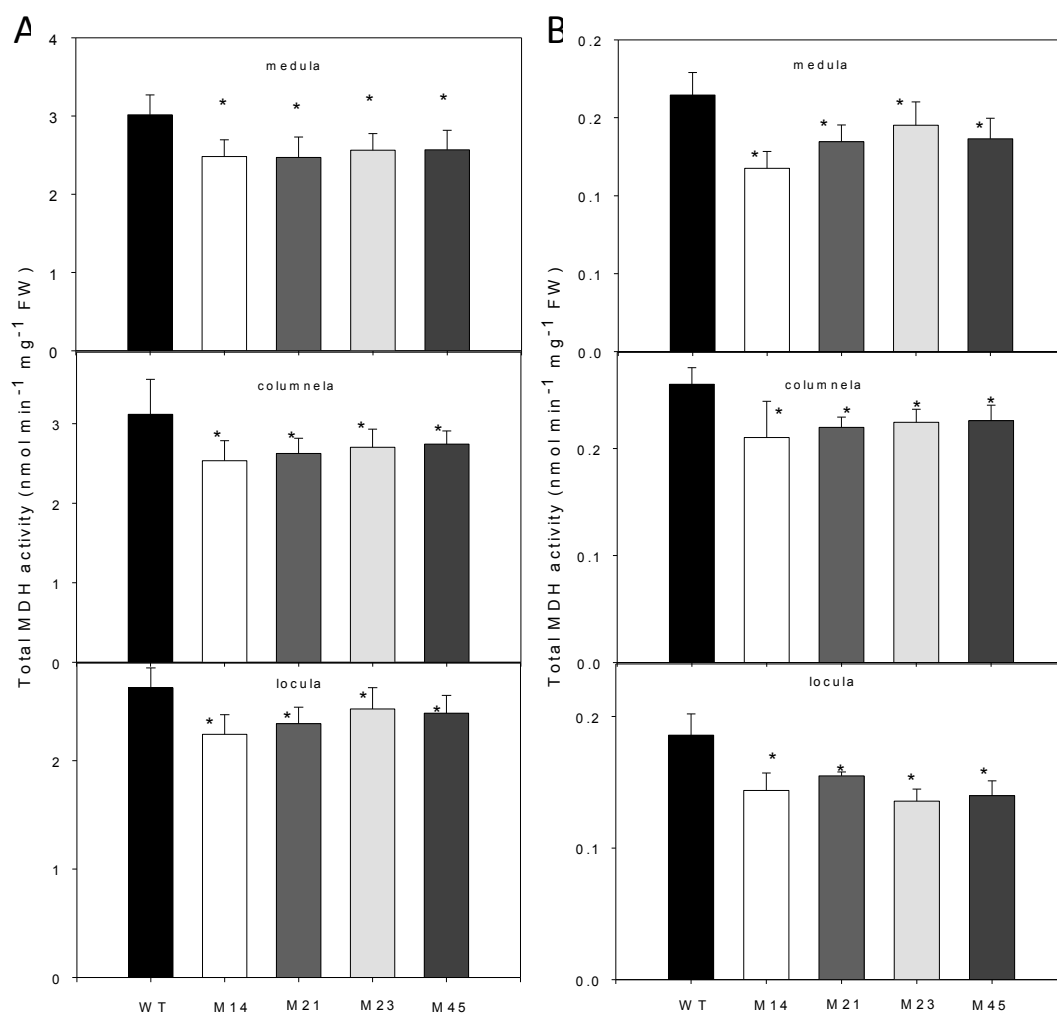
Supplemental Figure 1. Screening of total fumarase and malate dehydrogenase activity in primary fumarase (A) and malate dehydrogenase (B) transformants in extract of tissue sampled from green fruits 35 days after flowering. Black narrows indicate the selected lines for further analysis.



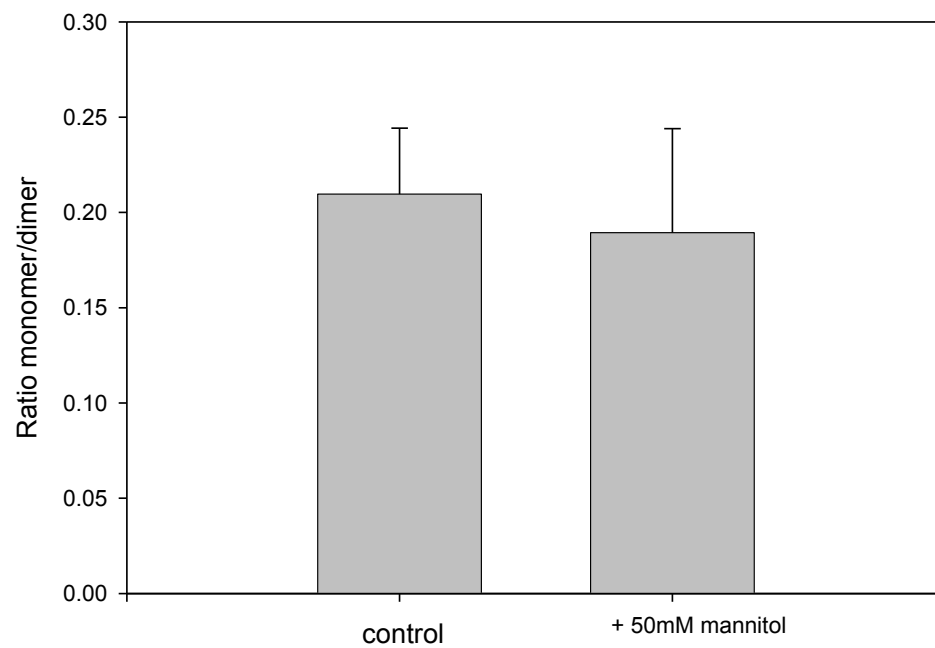
Supplemental Figure 2. Total malate dehydrogenase activity determined in 6-week-old leaves (A) in 2-week-old leaves (B) in malate dehydrogenase lines and fumarase activity in 6-week-old leaves (C) in 2-week-old leaves in fumarase lines (D). Values presented are the means \pm SE of five biological replicates. An asterisk indicates the values that were determined by the *t*-test to be significantly different ($P < 0.05$) from the wild type.



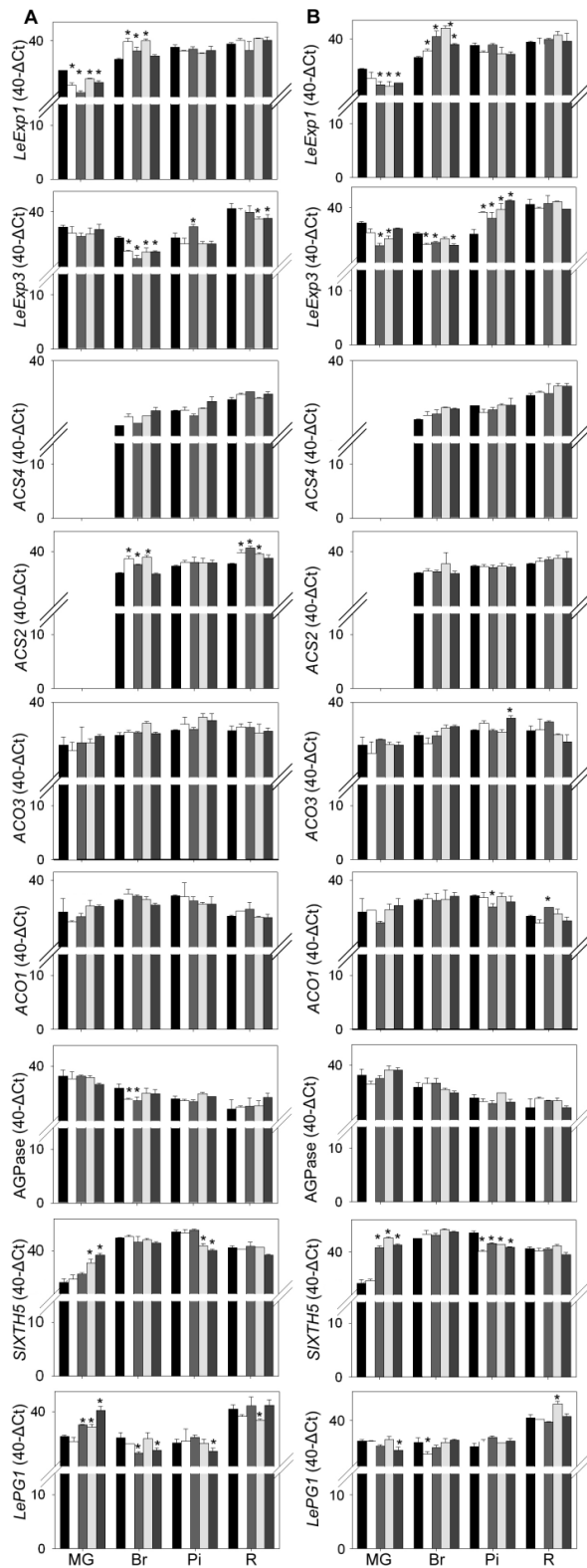
Supplemental Figure 3. Total fumarase activity in fumarase lines in different fruit tissues. The measurements were performed in green fruits with 35 days after flowering (A) and 65 days after flowering (B). The values are presented as the mean \pm SE of ten biological replicates. An asterisk indicates the values that were determined by the *t*-test to be significantly different ($P < 0.05$) from the wild type.



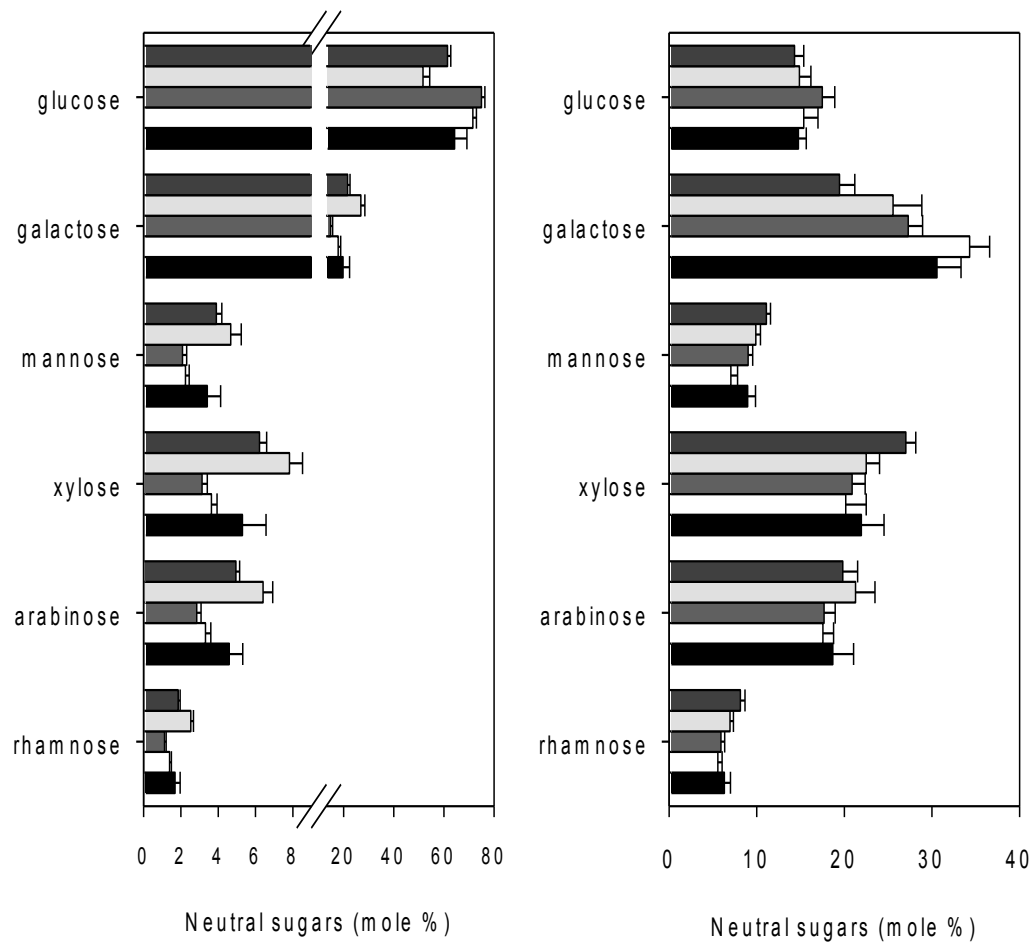
Supplemental Figure 4. Total malate dehydrogenase activity in malate dehydrogenase lines in different fruit tissues. The measurements were performed in green fruits with 35 days after flowering (A) and 65 days after flowering (B). The values are presented as the mean \pm SE of ten biological replicates. An asterisk indicates the values that were determined by the *t*-test to be significantly different ($P < 0.05$) from the wild type.



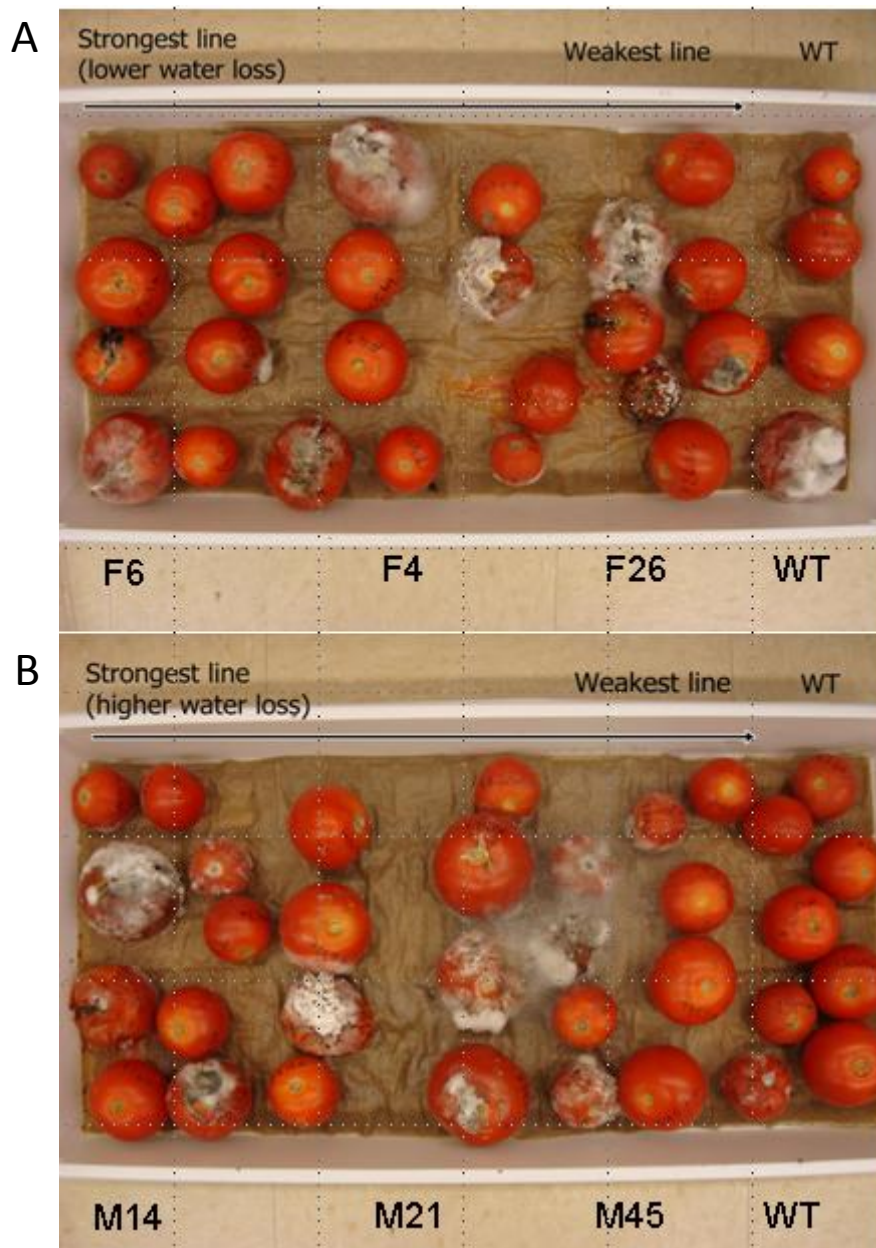
Supplemental Figure 5. Evaluation of the dimerization of AGPase following incubation of wild type pericarp discs in 50 mM mannitol. Values are presented as mean \pm SE of determinations on ten individual plants per line.



Supplemental Figure 6. Expression of ripening related genes of wild type, fumarase (A) and malate dehydrogenase (B) transgenic lines of expansins (*LeExp1*, *LeExp3*); 1-aminocyclopropane-1-carboxylate synthase (*ACS4*, *ACS2*); 1-aminocyclopropane-1-carboxylate oxidase (*ACO3*, *ACO1*); ADP-glucose pyrophosphorylase small subunit (*AGPase*); xyloglucan endotransglucosylase (*SIXTH5*); polygalacturonase (*LePG1*). The values are representative of the mean \pm SE of six individual plants; an asterisk indicates values determined by the *t*-test to be significantly different from the wild type control ($P < 0.05$). Analysis were determined in different ripening stages. MG, mature green; Br, Breaker; Pi, Pink; R, Red. Wild type, black bars; lines F4 and M14, white bars; lines F6 and M21, gray bars; lines F7 and M23, light gray bars; lines F26 and M45, very dark gray bars.



Supplemental Figure 7. Composition of cell wall neutral sugars of fruits in the antisense fumarase and malate dehydrogenase lines. The fruits were harvested at 35 (A) and 65 (B) days after flowering in the antisense fumarase and malate dehydrogenase lines. Values are presented as mean \pm SE of 12 determinations on 4 individual fruits per line. Wild type, black bars; line F4, white bars; line F6, gray bars; M14, light gray bars; M21, dark gray bars.



Supplemental Figure 8. Opportunistic microbial infection of fruits in the antisense mitochondrial fumarase and malate dehydrogenase lines. Photos of fumarase (A) and malate dehydrogenase (B) fruits of 30 days after detaching from the vine.

Supplemental Table 1. Malate and Fumarate content in different tissues of fruits with 35 DAF from wild type and Fumarase antisense plants. Values are presented as the mean \pm SE of ten biological determinations. The values that are significantly different by *t*-test from the wild type are set in bold type ($P < 0.05$).

| WT | F4 | F6 | F7 | F26 |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| malate content ($\mu\text{mol g}^{-1}$ FW) | | | | |
| <i>medula tissue</i> | | | | |
| 63.15 \pm 5.89 | 48.54 \pm 6.45 | 53.49 \pm 3.19 | 50.98 \pm 2.60 | 58.77 \pm 2.08 |
| <i>columnela tissue</i> | | | | |
| 45.11 \pm 4.07 | 38.25 \pm 5.01 | 39.48 \pm 2.18 | 41.22 \pm 2.32 | 42.72 \pm 3.63 |
| <i>locula tissue</i> | | | | |
| 38.95 \pm 3.66 | 32.81 \pm 3.25 | 33.09 \pm 2.33 | 35.07 \pm 3.36 | 34.39 \pm 2.46 |
| fumarate content ($\mu\text{mol g}^{-1}$ FW) | | | | |
| <i>medula tissue</i> | | | | |
| 6.04 \pm 0.90 | 4.71 \pm 0.77 | 4.73 \pm 0.51 | 5.38 \pm 0.78 | 5.51 \pm 0.56 |
| <i>columnela tissue</i> | | | | |
| 4.56 \pm 0.46 | 4.15 \pm 0.45 | 4.72 \pm 0.55 | 3.72 \pm 0.71 | 4.82 \pm 0.46 |
| <i>locula tissue</i> | | | | |
| 4.20 \pm 0.39 | 3.66 \pm 0.42 | 3.97 \pm 0.20 | 3.85 \pm 0.51 | 4.14 \pm 0.51 |

Supplemental Table 2. Malate and Fumarate content in different tissues of fruits with 35 DAF from wild type and malate dehydrogenase antisense plants. Values are presented as the mean \pm SE of ten biological determinations. The values that are significantly different by *t*-test from the wild type are set in bold type ($P < 0.05$).

| WT | M14 | M21 | M21 | M45 |
|---|--------------------------------|-------------------------------|--------------------------------|------------------|
| malate content ($\mu\text{mol g}^{-1}$ FW) | | | | |
| <i>medula tissue</i> | | | | |
| 63.15 \pm 5.89 | 71.94 \pm 5.91 | 65.38 \pm 2.58 | 64.15 \pm 4.54 | 61.92 \pm 5.70 |
| <i>columnela tissue</i> | | | | |
| 45.11 \pm 4.07 | 42.48 \pm 3.87 | 43.41 \pm 4.74 | 50.97 \pm 3.26 | 46.47 \pm 3.98 |
| <i>locula tissue</i> | | | | |
| 38.95 \pm 3.66 | 37.75 \pm 3.12 | 38.26 \pm 1.40 | 38.69 \pm 1.13 | 40.24 \pm 2.27 |
| fumarate content ($\mu\text{mol g}^{-1}$ FW) | | | | |
| <i>medula tissue</i> | | | | |
| 6.04 \pm 0.90 | 5.97 \pm 0.39 | 4.74 \pm 0.58 | 6.07 \pm 0.31 | 7.02 \pm 1.27 |
| <i>columnela tissue</i> | | | | |
| 4.56 \pm 0.46 | 5.00 \pm 0.26 | 4.52 \pm 0.49 | 5.50 \pm 0.82 | 5.12 \pm 0.68 |
| <i>locula tissue</i> | | | | |
| 4.20 \pm 0.39 | 4.14 \pm 0.76 | 3.99 \pm 0.26 | 4.31 \pm 0.71 | 4.20 \pm 0.59 |

Supplemental Table 3. Starch content in different tissues of fruits with 35 DAF from wild type and Fumarase antisense plants. Values are presented as the mean \pm SE of ten biological determinations. The values that are significantly different by *t*-test from the wild type are set in bold type ($P < 0.05$).

| | WT | | M14 | | M21 | | M21 | | M45 | |
|-------------------------|-------------------------------------|------------|--------------|--------------------|--------------|--------------------|-------------|-------------------|-------------|-------------------|
| | starch ($\mu\text{mol g}^{-1}$ FW) | | | | | | | | | |
| <i>medula tissue</i> | 64.5 | \pm 8.62 | 110.4 | \pm 7.17 | 105.1 | \pm 12.40 | 84.6 | \pm 6.78 | 71.5 | \pm 7.81 |
| <i>columnela tissue</i> | 58.6 | \pm 9.69 | 84.8 | \pm 11.75 | 76.2 | \pm 10.82 | 68.2 | \pm 8.84 | 67.9 | \pm 7.71 |
| <i>locula tissue</i> | 37.3 | \pm 7.71 | 34.1 | \pm 6.60 | 35.8 | \pm 8.26 | 34.1 | \pm 5.70 | 34.7 | \pm 7.83 |

Supplemental Table 4. Starch content in different tissues of fruits with 35 DAF from wild type and malate dehydrogenase antisense plants. Values are presented as the mean \pm SE of ten biological determinations. The values that are significantly different by *t*-test from the wild type are set in bold type ($P < 0.05$).

| | WT | | M14 | | M21 | | M21 | | M45 | |
|-------------------------|-------------------------------------|------------|-------------|--------------------|-------------|-------------------|------------|-------------|-------------|-------------------|
| | starch ($\mu\text{mol g}^{-1}$ FW) | | | | | | | | | |
| <i>medula tissue</i> | 64.5 | \pm 8.62 | 44.6 | \pm 10.35 | 53.3 | \pm 6.74 | 61.3 | \pm 11.37 | 56.9 | \pm 5.05 |
| <i>columnela tissue</i> | 58.6 | \pm 9.69 | 51.1 | \pm 7.13 | 62.0 | \pm 15.70 | 52.6 | \pm 6.01 | 50.9 | \pm 6.38 |
| <i>locula tissue</i> | 37.3 | \pm 7.71 | 33.4 | \pm 7.02 | 34.7 | \pm 8.19 | 32.9 | \pm 5.32 | 37.3 | \pm 6.30 |

Supplemental Table 5. Comparison of metabolic levels from pericarp tissue of fruits with 35 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine, beta | 1.00 | \pm 0.09 | 0.58 | \pm 0.03 | 0.55 | \pm 0.05 | 0.25 | \pm 0.02 | 0.69 | \pm 0.07 |
| Asparagine | 1.00 | \pm 0.13 | 0.71 | \pm 0.06 | 0.42 | \pm 0.05 | 0.23 | \pm 0.02 | 0.45 | \pm 0.02 |
| Aspartate | 1.00 | \pm 0.06 | 0.37 | \pm 0.02 | 0.52 | \pm 0.04 | 0.34 | \pm 0.03 | 0.36 | \pm 0.03 |
| GABA | 1.00 | \pm 0.10 | 0.88 | \pm 0.06 | 0.90 | \pm 0.15 | 1.16 | \pm 0.07 | 1.33 | \pm 0.10 |
| Glutamate | 1.00 | \pm 0.15 | 0.79 | \pm 0.03 | 0.62 | \pm 0.09 | 0.24 | \pm 0.03 | 0.51 | \pm 0.09 |
| Glutamine | 1.00 | \pm 0.10 | 0.68 | \pm 0.06 | 0.59 | \pm 0.05 | 0.78 | \pm 0.08 | 0.77 | \pm 0.03 |
| Isoleucine | 1.00 | \pm 0.08 | 0.80 | \pm 0.08 | 0.92 | \pm 0.10 | 0.47 | \pm 0.06 | 0.51 | \pm 0.08 |
| Lysine | 1.00 | \pm 0.10 | 1.11 | \pm 0.11 | 1.19 | \pm 0.05 | 0.73 | \pm 0.06 | 0.69 | \pm 0.02 |
| Methionine | 1.00 | \pm 0.08 | 0.50 | \pm 0.05 | 0.94 | \pm 0.10 | 0.35 | \pm 0.02 | 0.45 | \pm 0.03 |
| Ornithine | 1.00 | \pm 0.10 | 1.78 | \pm 0.16 | 1.09 | \pm 0.07 | 1.17 | \pm 0.10 | 0.65 | \pm 0.07 |
| Phenylalanine | 1.00 | \pm 0.13 | 0.78 | \pm 0.07 | 1.62 | \pm 0.05 | 0.35 | \pm 0.04 | 0.63 | \pm 0.03 |
| Proline | 1.00 | \pm 0.16 | 0.73 | \pm 0.04 | 0.79 | \pm 0.07 | 0.58 | \pm 0.05 | 0.60 | \pm 0.06 |
| Serine | 1.00 | \pm 0.12 | 1.31 | \pm 0.11 | 1.05 | \pm 0.10 | 0.90 | \pm 0.07 | 0.73 | \pm 0.09 |
| Threonine | 1.00 | \pm 0.08 | 0.92 | \pm 0.09 | 0.96 | \pm 0.07 | 0.94 | \pm 0.10 | 0.51 | \pm 0.06 |
| Tryptophan | 1.00 | \pm 0.08 | 0.68 | \pm 0.07 | 0.88 | \pm 0.06 | 0.47 | \pm 0.05 | 0.48 | \pm 0.04 |
| Tyrosine | 1.00 | \pm 0.09 | 0.96 | \pm 0.07 | 1.45 | \pm 0.06 | 0.93 | \pm 0.14 | 0.73 | \pm 0.03 |
| Valine | 1.00 | \pm 0.09 | 0.79 | \pm 0.05 | 0.95 | \pm 0.08 | 0.55 | \pm 0.08 | 0.92 | \pm 0.09 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.07 | 0.64 | \pm 0.08 | 0.90 | \pm 0.05 | 0.84 | \pm 0.03 | 1.02 | \pm 0.06 |
| Fumaric acid | 1.00 | \pm 0.04 | 0.78 | \pm 0.02 | 0.78 | \pm 0.03 | 1.46 | \pm 0.08 | 1.37 | \pm 0.03 |
| Malic acid | 1.00 | \pm 0.03 | 0.71 | \pm 0.04 | 0.76 | \pm 0.02 | 1.29 | \pm 0.01 | 1.33 | \pm 0.06 |
| Pyroglutamic acid | 1.00 | \pm 0.06 | 0.92 | \pm 0.11 | 0.82 | \pm 0.09 | 1.21 | \pm 0.04 | 1.08 | \pm 0.09 |
| Saccharic acid | 1.00 | \pm 0.02 | 0.45 | \pm 0.01 | 0.54 | \pm 0.04 | 0.60 | \pm 0.06 | 0.33 | \pm 0.06 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.04 | 0.64 | \pm 0.03 | 0.54 | \pm 0.06 | 0.61 | \pm 0.03 | 0.55 | \pm 0.07 |
| Fructose-6P | 1.00 | \pm 0.10 | 0.96 | \pm 0.13 | 0.96 | \pm 0.10 | 0.94 | \pm 0.14 | 1.39 | \pm 0.17 |
| Fucose | 1.00 | \pm 0.06 | 1.00 | \pm 0.04 | 1.02 | \pm 0.03 | 1.03 | \pm 0.06 | 1.12 | \pm 0.04 |
| Galactinol | 1.00 | \pm 0.15 | 0.52 | \pm 0.07 | 0.60 | \pm 0.11 | 2.24 | \pm 0.27 | 0.56 | \pm 0.08 |
| Glucose | 1.00 | \pm 0.04 | 0.77 | \pm 0.03 | 0.69 | \pm 0.08 | 0.79 | \pm 0.05 | 0.67 | \pm 0.04 |
| Glucose-6P | 1.00 | \pm 0.14 | 0.92 | \pm 0.19 | 0.96 | \pm 0.13 | 0.94 | \pm 0.13 | 1.53 | \pm 0.23 |
| Maltose | 1.00 | \pm 0.11 | 1.04 | \pm 0.11 | 0.64 | \pm 0.05 | 0.92 | \pm 0.05 | 0.91 | \pm 0.13 |
| Raffinose | 1.00 | \pm 0.10 | 1.24 | \pm 0.21 | 1.38 | \pm 0.09 | 0.61 | \pm 0.10 | 2.00 | \pm 0.13 |
| Rhamnose | 1.00 | \pm 0.05 | 1.02 | \pm 0.02 | 0.96 | \pm 0.04 | 1.06 | \pm 0.06 | 1.10 | \pm 0.07 |
| Sucrose | 1.00 | \pm 0.05 | 0.99 | \pm 0.06 | 1.10 | \pm 0.04 | 0.79 | \pm 0.05 | 1.02 | \pm 0.04 |
| Xylose | 1.00 | \pm 0.05 | 0.61 | \pm 0.09 | 0.66 | \pm 0.06 | 1.22 | \pm 0.04 | 1.06 | \pm 0.04 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.10 | 0.85 | \pm 0.14 | 1.09 | \pm 0.10 | 0.93 | \pm 0.11 | 1.08 | \pm 0.05 |
| Phosphoric acid | 1.00 | \pm 0.10 | 1.04 | \pm 0.12 | 1.69 | \pm 0.03 | 1.83 | \pm 0.07 | 1.87 | \pm 0.08 |
| Putrescine | 1.00 | \pm 0.18 | 2.41 | \pm 0.17 | 2.47 | \pm 0.25 | 0.79 | \pm 0.09 | 1.22 | \pm 0.06 |

Supplemental Table 6. Comparison of metabolic levels from columnela tissue of fruits with 35 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine, beta | 1.00 | \pm 0.12 | 0.74 | \pm 0.07 | 0.61 | \pm 0.07 | 0.15 | \pm 0.03 | 1.05 | \pm 0.07 |
| Asparagine | 1.00 | \pm 0.08 | 0.66 | \pm 0.07 | 0.69 | \pm 0.1 | 0.58 | \pm 0.07 | 1.05 | \pm 0.05 |
| Aspartate | 1.00 | \pm 0.14 | 0.67 | \pm 0.03 | 0.93 | \pm 0.06 | 0.52 | \pm 0.04 | 1.28 | \pm 0.09 |
| GABA | 1.00 | \pm 0.04 | 0.74 | \pm 0.06 | 1.05 | \pm 0.06 | 0.33 | \pm 0.01 | 0.73 | \pm 0.04 |
| Glutamate | 1.00 | \pm 0.03 | 0.67 | \pm 0.07 | 0.85 | \pm 0.06 | 0.89 | \pm 0.08 | 0.91 | \pm 0.11 |
| Glutamine | 1.00 | \pm 0.09 | 0.86 | \pm 0.07 | 0.84 | \pm 0.05 | 0.82 | \pm 0.09 | 0.94 | \pm 0.07 |
| Isoleucine | 1.00 | \pm 0.22 | 1.07 | \pm 0.15 | 4.41 | \pm 0.16 | 0.65 | \pm 0.13 | 2.91 | \pm 0.48 |
| Lysine | 1.00 | \pm 0.07 | 1.00 | \pm 0.09 | 1.46 | \pm 0.11 | 0.67 | \pm 0.06 | 0.65 | \pm 0.02 |
| Methionine | 1.00 | \pm 0.2 | 1.50 | \pm 0.07 | 3.18 | \pm 0.20 | 0.83 | \pm 0.14 | 3.31 | \pm 0.17 |
| Ornithine | 1.00 | \pm 0.06 | 0.40 | \pm 0.03 | 0.25 | \pm 0.02 | 0.39 | \pm 0.04 | 1.23 | \pm 0.05 |
| Phenylalanine | 1.00 | \pm 0.13 | 1.13 | \pm 0.07 | 4.58 | \pm 0.28 | 0.51 | \pm 0.05 | 1.77 | \pm 0.01 |
| Proline | 1.00 | \pm 0.07 | 0.81 | \pm 0.07 | 0.87 | \pm 0.11 | 0.66 | \pm 0.07 | 1.27 | \pm 0.11 |
| Serine | 1.00 | \pm 0.11 | 0.91 | \pm 0.09 | 0.99 | \pm 0.10 | 0.97 | \pm 0.11 | 1.24 | \pm 0.08 |
| Threonine | 1.00 | \pm 0.14 | 0.88 | \pm 0.06 | 2.39 | \pm 0.21 | 0.52 | \pm 0.04 | 1.51 | \pm 0.14 |
| Tryptophan | 1.00 | \pm 0.11 | 3.46 | \pm 0.30 | 6.75 | \pm 0.19 | 1.88 | \pm 0.18 | 6.98 | \pm 0.47 |
| Tyrosine | 1.00 | \pm 0.11 | 1.50 | \pm 0.04 | 5.04 | \pm 0.3 | 0.91 | \pm 0.12 | 2.45 | \pm 0.26 |
| Valine | 1.00 | \pm 0.18 | 0.92 | \pm 0.10 | 3.64 | \pm 0.18 | 0.61 | \pm 0.07 | 1.43 | \pm 0.17 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.05 | 0.88 | \pm 0.1 | 0.94 | \pm 0.04 | 0.95 | \pm 0.12 | 1.31 | \pm 0.05 |
| Fumaric acid | 1.00 | \pm 0.06 | 0.71 | \pm 0.07 | 0.90 | \pm 0.03 | 1.13 | \pm 0.03 | 1.30 | \pm 0.05 |
| Malic acid | 1.00 | \pm 0.06 | 0.70 | \pm 0.05 | 0.58 | \pm 0.04 | 0.92 | \pm 0.04 | 1.05 | \pm 0.06 |
| Pyroglutamic acid | 1.00 | \pm 0.11 | 0.64 | \pm 0.07 | 1.09 | \pm 0.10 | 0.52 | \pm 0.04 | 0.78 | \pm 0.1 |
| Saccharic acid | 1.00 | \pm 0.04 | 0.42 | \pm 0.03 | 0.36 | \pm 0.03 | 0.97 | \pm 0.11 | 0.25 | \pm 0.05 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.03 | 1.14 | \pm 0.04 | 0.96 | \pm 0.05 | 0.87 | \pm 0.09 | 1.14 | \pm 0.07 |
| Fructose-6P | 1.00 | \pm 0.08 | 1.24 | \pm 0.06 | 1.09 | \pm 0.05 | 1.01 | \pm 0.06 | 1.26 | \pm 0.06 |
| Fucose | 1.00 | \pm 0.05 | 0.90 | \pm 0.07 | 1.01 | \pm 0.05 | 1.00 | \pm 0.08 | 0.94 | \pm 0.05 |
| Galactinol | 1.00 | \pm 0.07 | 0.46 | \pm 0.06 | 0.61 | \pm 0.06 | 1.52 | \pm 0.16 | 1.09 | \pm 0.06 |
| Glucose | 1.00 | \pm 0.08 | 0.96 | \pm 0.04 | 1.11 | \pm 0.04 | 0.72 | \pm 0.05 | 1.19 | \pm 0.03 |
| Glucose-6P | 1.00 | \pm 0.11 | 1.24 | \pm 0.10 | 1.03 | \pm 0.06 | 0.95 | \pm 0.06 | 1.2 | \pm 0.04 |
| Maltose | 1.00 | \pm 0.07 | 0.86 | \pm 0.08 | 0.74 | \pm 0.06 | 1.03 | \pm 0.09 | 1.08 | \pm 0.12 |
| Raffinose | 1.00 | \pm 0.05 | 1.03 | \pm 0.13 | 0.71 | \pm 0.04 | 0.81 | \pm 0.06 | 1.61 | \pm 0.14 |
| Rhamnose | 1.00 | \pm 0.08 | 1.03 | \pm 0.15 | 0.99 | \pm 0.13 | 1.04 | \pm 0.08 | 0.83 | \pm 0.07 |
| Sucrose | 1.00 | \pm 0.07 | 0.94 | \pm 0.04 | 0.96 | \pm 0.04 | 0.94 | \pm 0.06 | 1.15 | \pm 0.02 |
| Xylose | 1.00 | \pm 0.11 | 1.2 | \pm 0.03 | 1.12 | \pm 0.18 | 1.29 | \pm 0.09 | 1.11 | \pm 0.17 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.07 | 0.48 | \pm 0.06 | 0.67 | \pm 0.06 | 0.62 | \pm 0.08 | 1.68 | \pm 0.07 |
| Phosphoric acid | 1.00 | \pm 0.10 | 0.96 | \pm 0.11 | 1.35 | \pm 0.10 | 0.91 | \pm 0.08 | 0.97 | \pm 0.03 |
| Putrescine | 1.00 | \pm 0.16 | 1.85 | \pm 0.15 | 0.82 | \pm 0.05 | 0.77 | \pm 0.06 | 1.03 | \pm 0.05 |

Supplemental Table 7. Comparison of metabolic levels from medula tissue of fruits with 35 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|----------------------------------|-----------------|----|-----------------------------------|----|-----------------------------------|----|-----------------------------------|----|-----------------------------------|----|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine, beta | 1.00 \pm 0.12 | | 1.20 \pm 0.14 | | 1.62 \pm 0.16 | | 0.42 \pm 0.09 | | 0.94 \pm 0.16 | |
| Asparagine | 1.00 \pm 0.13 | | 0.92 \pm 0.06 | | 1.03 \pm 0.06 | | 0.95 \pm 0.07 | | 1.10 \pm 0.07 | |
| Aspartate | 1.00 \pm 0.05 | | 0.79 \pm 0.08 | | 0.71 \pm 0.04 | | 0.67 \pm 0.07 | | 1.01 \pm 0.08 | |
| GABA | 1.00 \pm 0.06 | | 0.86 \pm 0.03 | | 1.10 \pm 0.03 | | 0.46 \pm 0.03 | | 0.68 \pm 0.02 | |
| Glutamate | 1.00 \pm 0.11 | | 0.98 \pm 0.06 | | 0.96 \pm 0.08 | | 0.64 \pm 0.10 | | 1.21 \pm 0.12 | |
| Glutamine | 1.00 \pm 0.10 | | 1.96 \pm 0.06 | | 1.58 \pm 0.10 | | 2.33 \pm 0.18 | | 2.82 \pm 0.23 | |
| Isoleucine | 1.00 \pm 0.22 | | 1.35 \pm 0.13 | | 4.35 \pm 0.30 | | 1.05 \pm 0.26 | | 2.66 \pm 0.44 | |
| Lysine | 1.00 \pm 0.07 | | 1.54 \pm 0.14 | | 2.58 \pm 0.17 | | 1.06 \pm 0.08 | | 2.25 \pm 0.31 | |
| Methionine | 1.00 \pm 0.11 | | 1.08 \pm 0.15 | | 1.56 \pm 0.19 | | 0.54 \pm 0.08 | | 0.86 \pm 0.06 | |
| Ornithine | 1.00 \pm 0.10 | | 1.92 \pm 0.25 | | 2.63 \pm 0.09 | | 0.86 \pm 0.09 | | 1.60 \pm 0.10 | |
| Phenylalanine | 1.00 \pm 0.14 | | 1.53 \pm 0.12 | | 4.25 \pm 0.36 | | 0.95 \pm 0.07 | | 2.55 \pm 0.20 | |
| Proline | 1.00 \pm 0.09 | | 0.93 \pm 0.05 | | 1.08 \pm 0.15 | | 0.60 \pm 0.07 | | 0.89 \pm 0.09 | |
| Serine | 1.00 \pm 0.06 | | 1.12 \pm 0.05 | | 0.93 \pm 0.12 | | 1.23 \pm 0.05 | | 1.20 \pm 0.10 | |
| Threonine | 1.00 \pm 0.08 | | 1.23 \pm 0.14 | | 2.38 \pm 0.19 | | 0.82 \pm 0.08 | | 1.84 \pm 0.15 | |
| Tryptophan | 1.00 \pm 0.14 | | 1.05 \pm 0.03 | | 2.37 \pm 0.17 | | 1.04 \pm 0.15 | | 4.69 \pm 0.11 | |
| Tyrosine | 1.00 \pm 0.18 | | 1.25 \pm 0.10 | | 1.45 \pm 0.14 | | 1.09 \pm 0.14 | | 2.36 \pm 0.13 | |
| Valine | 1.00 \pm 0.07 | | 1.77 \pm 0.16 | | 2.43 \pm 0.12 | | 0.99 \pm 0.08 | | 1.55 \pm 0.03 | |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 \pm 0.08 | | 0.71 \pm 0.08 | | 0.49 \pm 0.05 | | 0.69 \pm 0.05 | | 0.69 \pm 0.05 | |
| Fumaric acid | 1.00 \pm 0.05 | | 0.71 \pm 0.04 | | 0.73 \pm 0.04 | | 1.32 \pm 0.04 | | 1.41 \pm 0.05 | |
| Malic acid | 1.00 \pm 0.05 | | 0.75 \pm 0.05 | | 0.51 \pm 0.04 | | 1.03 \pm 0.03 | | 1.06 \pm 0.02 | |
| Pyroglutamic acid | 1.00 \pm 0.13 | | 1.53 \pm 0.15 | | 1.21 \pm 0.09 | | 0.93 \pm 0.05 | | 1.22 \pm 0.09 | |
| Saccharic acid | 1.00 \pm 0.08 | | 0.34 \pm 0.03 | | 0.35 \pm 0.05 | | 0.46 \pm 0.04 | | 0.16 \pm 0.02 | |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 \pm 0.06 | | 0.71 \pm 0.03 | | 0.66 \pm 0.07 | | 0.66 \pm 0.03 | | 0.72 \pm 0.05 | |
| Fructose-6P | 1.00 \pm 0.02 | | 0.87 \pm 0.08 | | 1.04 \pm 0.06 | | 0.82 \pm 0.07 | | 1.49 \pm 0.06 | |
| Fucose | 1.00 \pm 0.05 | | 0.9 \pm 0.07 | | 1.03 \pm 0.05 | | 1.02 \pm 0.07 | | 0.98 \pm 0.11 | |
| Galactinol | 1.00 \pm 0.08 | | 0.92 \pm 0.07 | | 0.64 \pm 0.06 | | 1.10 \pm 0.13 | | 1.00 \pm 0.04 | |
| Glucose | 1.00 \pm 0.05 | | 0.72 \pm 0.06 | | 0.81 \pm 0.09 | | 0.78 \pm 0.01 | | 0.77 \pm 0.08 | |
| Glucose-6P | 1.00 \pm 0.06 | | 1.07 \pm 0.17 | | 1.18 \pm 0.09 | | 0.79 \pm 0.06 | | 1.39 \pm 0.14 | |
| Maltose | 1.00 \pm 0.04 | | 0.57 \pm 0.03 | | 0.54 \pm 0.02 | | 1.08 \pm 0.11 | | 0.64 \pm 0.08 | |
| Raffinose | 1.00 \pm 0.28 | | 1.78 \pm 0.23 | | 2.06 \pm 0.17 | | 1.15 \pm 0.13 | | 2.48 \pm 0.09 | |
| Rhamnose | 1.00 \pm 0.06 | | 1.01 \pm 0.12 | | 1.18 \pm 0.13 | | 1.15 \pm 0.12 | | 1.08 \pm 0.22 | |
| Sucrose | 1.00 \pm 0.07 | | 1.06 \pm 0.07 | | 1.28 \pm 0.08 | | 0.97 \pm 0.09 | | 1.12 \pm 0.06 | |
| Xylose | 1.00 \pm 0.19 | | 1.11 \pm 0.13 | | 1.19 \pm 0.12 | | 1.35 \pm 0.2 | | 1.24 \pm 0.13 | |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 \pm 0.08 | | 0.89 \pm 0.07 | | 0.9 \pm 0.07 | | 0.87 \pm 0.07 | | 1.81 \pm 0.18 | |
| Phosphoric acid | 1.00 \pm 0.06 | | 0.88 \pm 0.06 | | 0.68 \pm 0.02 | | 0.67 \pm 0.03 | | 0.68 \pm 0.04 | |
| Putrescine | 1.00 \pm 0.09 | | 1.14 \pm 0.13 | | 0.98 \pm 0.06 | | 0.89 \pm 0.05 | | 0.76 \pm 0.03 | |

Supplemental Table 8. Comparison of metabolic levels from locula tissue of fruits with 35 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine, beta | 1.00 | \pm 0.12 | 0.54 | \pm 0.04 | 0.88 | \pm 0.10 | 1.00 | \pm 0.05 | 0.93 | \pm 0.06 |
| Asparagine | 1.00 | \pm 0.11 | 1.38 | \pm 0.12 | 1.07 | \pm 0.09 | 1.90 | \pm 0.10 | 1.93 | \pm 0.07 |
| Aspartate | 1.00 | \pm 0.07 | 0.24 | \pm 0.01 | 0.35 | \pm 0.02 | 0.26 | \pm 0.01 | 0.50 | \pm 0.02 |
| GABA | 1.00 | \pm 0.06 | 0.73 | \pm 0.04 | 0.91 | \pm 0.04 | 0.39 | \pm 0.02 | 0.55 | \pm 0.05 |
| Glutamate | 1.00 | \pm 0.10 | 1.27 | \pm 0.09 | 1.39 | \pm 0.10 | 0.92 | \pm 0.07 | 1.36 | \pm 0.14 |
| Glutamine | 1.00 | \pm 0.10 | 0.89 | \pm 0.07 | 0.66 | \pm 0.07 | 0.6 | \pm 0.03 | 1.01 | \pm 0.04 |
| Isoleucine | 1.00 | \pm 0.08 | 0.32 | \pm 0.05 | 0.89 | \pm 0.10 | 0.25 | \pm 0.04 | 1.09 | \pm 0.09 |
| Lysine | 1.00 | \pm 0.03 | 1.18 | \pm 0.04 | 0.78 | \pm 0.10 | 0.53 | \pm 0.19 | 0.43 | \pm 0.01 |
| Methionine | 1.00 | \pm 0.08 | 0.43 | \pm 0.05 | 0.65 | \pm 0.06 | 0.49 | \pm 0.05 | 0.68 | \pm 0.04 |
| Ornithine | 1.00 | \pm 0.11 | 1.29 | \pm 0.09 | 0.73 | \pm 0.08 | 0.70 | \pm 0.07 | 1.07 | \pm 0.13 |
| Phenylalanine | 1.00 | \pm 0.14 | 0.39 | \pm 0.05 | 0.8 | \pm 0.09 | 0.25 | \pm 0.03 | 1.38 | \pm 0.15 |
| Proline | 1.00 | \pm 0.12 | 0.41 | \pm 0.04 | 0.58 | \pm 0.04 | 0.4 | \pm 0.05 | 0.62 | \pm 0.03 |
| Serine | 1.00 | \pm 0.11 | 1.02 | \pm 0.09 | 1.06 | \pm 0.09 | 0.99 | \pm 0.04 | 0.83 | \pm 0.06 |
| Threonine | 1.00 | \pm 0.14 | 0.41 | \pm 0.03 | 0.70 | \pm 0.03 | 0.39 | \pm 0.02 | 0.40 | \pm 0.03 |
| Tryptophan | 1.00 | \pm 0.08 | 0.46 | \pm 0.05 | 0.86 | \pm 0.03 | 0.74 | \pm 0.04 | 0.50 | \pm 0.07 |
| Tyrosine | 1.00 | \pm 0.09 | 0.32 | \pm 0.04 | 0.79 | \pm 0.07 | 0.30 | \pm 0.04 | 0.56 | \pm 0.07 |
| Valine | 1.00 | \pm 0.09 | 0.78 | \pm 0.09 | 0.84 | \pm 0.08 | 0.29 | \pm 0.02 | 1.34 | \pm 0.13 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.09 | 0.93 | \pm 0.19 | 0.50 | \pm 0.01 | 0.71 | \pm 0.14 | 1.28 | \pm 0.04 |
| Fumaric acid | 1.00 | \pm 0.04 | 0.65 | \pm 0.03 | 0.91 | \pm 0.05 | 0.93 | \pm 0.10 | 0.98 | \pm 0.07 |
| Malic acid | 1.00 | \pm 0.08 | 0.45 | \pm 0.07 | 0.37 | \pm 0.10 | 0.78 | \pm 0.12 | 0.85 | \pm 0.05 |
| Pyroglutamic acid | 1.00 | \pm 0.04 | 1.89 | \pm 0.18 | 1.72 | \pm 0.19 | 1.47 | \pm 0.11 | 1.68 | \pm 0.05 |
| Saccharic acid | 1.00 | \pm 0.09 | 0.58 | \pm 0.09 | 0.63 | \pm 0.11 | 0.84 | \pm 0.06 | 0.34 | \pm 0.03 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.04 | 0.99 | \pm 0 | 0.77 | \pm 0.05 | 0.62 | \pm 0.03 | 0.71 | \pm 0.05 |
| Fructose-6P | 1.00 | \pm 0.11 | 1.05 | \pm 0.13 | 1.35 | \pm 0.17 | 0.78 | \pm 0.12 | 1.02 | \pm 0.06 |
| Fucose | 1.00 | \pm 0.08 | 1.06 | \pm 0.04 | 1.20 | \pm 0.13 | 1.11 | \pm 0.02 | 1.10 | \pm 0.03 |
| Galactinol | 1.00 | \pm 0.22 | 0.99 | \pm 0.13 | 1.10 | \pm 0.11 | 3.03 | \pm 0.13 | 3.58 | \pm 0.21 |
| Glucose | 1.00 | \pm 0.04 | 1.16 | \pm 0.03 | 1.28 | \pm 0.03 | 1.32 | \pm 0.17 | 1.56 | \pm 0.07 |
| Glucose-6P | 1.00 | \pm 0.09 | 0.93 | \pm 0.18 | 1.32 | \pm 0.26 | 0.8 | \pm 0.18 | 1.13 | \pm 0.12 |
| Maltose | 1.00 | \pm 0.09 | 1.21 | \pm 0.11 | 0.96 | \pm 0.09 | 1.35 | \pm 0.13 | 1.04 | \pm 0.09 |
| Raffinose | 1.00 | \pm 0.21 | 1.16 | \pm 0.17 | 2.68 | \pm 0.26 | 1.28 | \pm 0.17 | 2.11 | \pm 0.14 |
| Rhamnose | 1.00 | \pm 0.06 | 1.19 | \pm 0.10 | 1.12 | \pm 0.05 | 1.24 | \pm 0.10 | 1.10 | \pm 0.06 |
| Sucrose | 1.00 | \pm 0.11 | 1.10 | \pm 0.12 | 1.37 | \pm 0.11 | 1.27 | \pm 0.16 | 1.37 | \pm 0.15 |
| Xylose | 1.00 | \pm 0.13 | 1.24 | \pm 0.12 | 0.98 | \pm 0.07 | 1.62 | \pm 0.05 | 1.45 | \pm 0.14 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.11 | 0.74 | \pm 0.03 | 0.70 | \pm 0.08 | 0.65 | \pm 0.04 | 1.08 | \pm 0.09 |
| Phosphoric acid | 1.00 | \pm 0.10 | 0.87 | \pm 0.07 | 0.99 | \pm 0.07 | 0.55 | \pm 0.08 | 0.97 | \pm 0.03 |
| Putrescine | 1.00 | \pm 0.13 | 1.19 | \pm 0.05 | 0.66 | \pm 0.03 | 0.27 | \pm 0.04 | 0.30 | \pm 0.03 |

Supplemental Table 9. Comparison of metabolic levels from pericarp tissue of fruits with 65 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|-----------------------------------|-----------------|----|-----------------------------------|----|-----------------------------------|----|-----------------------------------|----|-----------------------------------|----|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 \pm 0.08 | | 0.60 \pm 0.04 | | 0.77 \pm 0.06 | | 0.23 \pm 0.03 | | 1.00 \pm 0.07 | |
| Alanine, beta | 1.00 \pm 0.26 | | 0.97 \pm 0.11 | | 0.95 \pm 0.08 | | 0.71 \pm 0.09 | | 1.01 \pm 0.13 | |
| Asparagine | 1.00 \pm 0.09 | | 1.48 \pm 0.05 | | 1.27 \pm 0.09 | | 0.86 \pm 0.09 | | 1.01 \pm 0.18 | |
| Aspartate | 1.00 \pm 0.07 | | 0.87 \pm 0.08 | | 0.82 \pm 0.06 | | 1.10 \pm 0.11 | | 0.76 \pm 0.10 | |
| GABA | 1.00 \pm 0.14 | | 0.81 \pm 0.09 | | 0.72 \pm 0.10 | | 0.63 \pm 0.07 | | 0.72 \pm 0.07 | |
| Glutamate | 1.00 \pm 0.09 | | 0.58 \pm 0.04 | | 1.00 \pm 0.05 | | 0.58 \pm 0.11 | | 0.66 \pm 0.09 | |
| Glutamine | 1.00 \pm 0.06 | | 2.66 \pm 0.11 | | 2.18 \pm 0.32 | | 1.33 \pm 0.15 | | 1.25 \pm 0.07 | |
| Glycine | 1.00 \pm 0.08 | | 1.40 \pm 0.05 | | 1.60 \pm 0.25 | | 0.54 \pm 0.04 | | 1.85 \pm 0.2 | |
| Histidine | 1.00 \pm 0.07 | | 0.90 \pm 0.11 | | 1.10 \pm 0.09 | | 0.47 \pm 0.07 | | 0.71 \pm 0.12 | |
| Isoleucine | 1.00 \pm 0.1 | | 1.65 \pm 0.07 | | 1.60 \pm 0.11 | | 1.27 \pm 0.13 | | 1.55 \pm 0.13 | |
| Lysine | 1.00 \pm 0.07 | | 1.10 \pm 0.13 | | 1.60 \pm 0.08 | | 0.79 \pm 0.09 | | 1.28 \pm 0.14 | |
| Methionine | 1.00 \pm 0.14 | | 0.69 \pm 0.07 | | 1.03 \pm 0.12 | | 0.61 \pm 0.13 | | 0.67 \pm 0.13 | |
| Phenylalanine | 1.00 \pm 0.11 | | 0.8 \pm 0.06 | | 1.53 \pm 0.19 | | 0.97 \pm 0.15 | | 1.07 \pm 0.19 | |
| Proline | 1.00 \pm 0.17 | | 1.52 \pm 0.06 | | 1.57 \pm 0.23 | | 0.96 \pm 0.10 | | 0.99 \pm 0.09 | |
| Serine | 1.00 \pm 0.08 | | 1.54 \pm 0.17 | | 1.37 \pm 0.14 | | 1.01 \pm 0.04 | | 0.95 \pm 0.18 | |
| Threonine | 1.00 \pm 0.1 | | 1.25 \pm 0.12 | | 1.2 \pm 0.09 | | 0.55 \pm 0.03 | | 0.8 \pm 0.11 | |
| Tryptophan | 1.00 \pm 0.2 | | 0.71 \pm 0.15 | | 1.85 \pm 0.25 | | 0.92 \pm 0.12 | | 1.34 \pm 0.17 | |
| Tyramine | 1.00 \pm 0.12 | | 0.57 \pm 0.10 | | 0.93 \pm 0.07 | | 0.72 \pm 0.13 | | 1.00 \pm 0.09 | |
| Valine | 1.00 \pm 0.08 | | 1.17 \pm 0.25 | | 1.32 \pm 0.23 | | 0.87 \pm 0.12 | | 1.28 \pm 0.12 | |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 \pm 0.09 | | 0.8 \pm 0.09 | | 0.89 \pm 0.12 | | 0.83 \pm 0.07 | | 1.96 \pm 0.28 | |
| Dehydroascorbic acid | 1.00 \pm 0.11 | | 1.39 \pm 0.18 | | 2.08 \pm 0.07 | | 1.59 \pm 0.10 | | 1.52 \pm 0.2 | |
| Fumaric acid | 1.00 \pm 0.08 | | 0.58 \pm 0.06 | | 0.54 \pm 0.06 | | 1.36 \pm 0.06 | | 1.40 \pm 0.09 | |
| Galacturonic acid/Glucuronic acid | 1.00 \pm 0.13 | | 0.98 \pm 0.09 | | 0.49 \pm 0.07 | | 0.61 \pm 0.1 | | 1.45 \pm 0.08 | |
| Malic acid | 1.00 \pm 0.05 | | 0.49 \pm 0.06 | | 0.67 \pm 0.10 | | 1.39 \pm 0.07 | | 1.38 \pm 0.07 | |
| Pyroglutamic acid | 1.00 \pm 0.08 | | 0.78 \pm 0.09 | | 0.74 \pm 0.07 | | 0.38 \pm 0.05 | | 0.39 \pm 0.03 | |
| Saccharic acid | 1.00 \pm 0.19 | | 1.32 \pm 0.24 | | 1.05 \pm 0.09 | | 1.81 \pm 0.27 | | 1.32 \pm 0.15 | |
| Succinic acid | 1.00 \pm 0.16 | | 0.62 \pm 0.14 | | 0.66 \pm 0.12 | | 0.96 \pm 0.04 | | 0.82 \pm 0.1 | |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 \pm 0.07 | | 0.69 \pm 0.01 | | 0.52 \pm 0.06 | | 0.57 \pm 0.01 | | 0.70 \pm 0.07 | |
| Fucose | 1.00 \pm 0.1 | | 1.03 \pm 0.04 | | 1.14 \pm 0.13 | | 0.99 \pm 0.10 | | 1.11 \pm 0.03 | |
| Galactinol | 1.00 \pm 0.18 | | 0.93 \pm 0.23 | | 0.88 \pm 0.13 | | 1.12 \pm 0.14 | | 1.03 \pm 0.14 | |
| Glucose | 1.00 \pm 0.05 | | 0.66 \pm 0.02 | | 0.60 \pm 0.08 | | 0.69 \pm 0.06 | | 0.78 \pm 0.03 | |
| Maltose | 1.00 \pm 0.14 | | 1.23 \pm 0.38 | | 2.25 \pm 0.55 | | 1.54 \pm 0.35 | | 1.80 \pm 0.33 | |
| Rhamnose | 1.00 \pm 0.09 | | 1.01 \pm 0.14 | | 1.14 \pm 0.22 | | 0.96 \pm 0.15 | | 1.06 \pm 0.15 | |
| Sucrose | 1.00 \pm 0.11 | | 1.12 \pm 0.17 | | 1.99 \pm 0.20 | | 0.96 \pm 0.11 | | 1.07 \pm 0.11 | |
| Xylose | 1.00 \pm 0.1 | | 1.20 \pm 0.09 | | 1.29 \pm 0.2 | | 1.12 \pm 0.05 | | 1.32 \pm 0.16 | |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 \pm 0.08 | | 0.95 \pm 0.08 | | 1.08 \pm 0.12 | | 0.84 \pm 0.08 | | 0.9 \pm 0.08 | |
| Phosphoric acid | 1.00 \pm 0.02 | | 0.97 \pm 0.07 | | 1.09 \pm 0.08 | | 0.72 \pm 0.08 | | 1.05 \pm 0.11 | |
| Putrescine | 1.00 \pm 0.13 | | 1.86 \pm 0.24 | | 2.36 \pm 0.18 | | 0.45 \pm 0.02 | | 0.59 \pm 0.14 | |

Supplemental Table 10. Comparison of metabolic levels from columbina tissue of fruits with 65 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.08 | 1.08 | \pm 0.21 | 0.76 | \pm 0.09 | 0.72 | \pm 0.08 | 0.88 | \pm 0.01 |
| Alanine, beta | 1.00 | \pm 0.09 | 0.92 | \pm 0.05 | 0.45 | \pm 0.05 | 0.71 | \pm 0.09 | 0.56 | \pm 0.04 |
| Asparagine | 1.00 | \pm 0.24 | 1.72 | \pm 0.13 | 0.65 | \pm 0.07 | 1.85 | \pm 0.4 | 1.00 | \pm 0.03 |
| Aspartate | 1.00 | \pm 0.06 | 0.98 | \pm 0.07 | 0.51 | \pm 0.07 | 0.67 | \pm 0.05 | 1.09 | \pm 0.05 |
| GABA | 1.00 | \pm 0.04 | 1.77 | \pm 0.15 | 1.90 | \pm 0.32 | 1.20 | \pm 0.11 | 2.12 | \pm 0.19 |
| Glutamate | 1.00 | \pm 0.14 | 0.98 | \pm 0.09 | 0.22 | \pm 0.05 | 1.05 | \pm 0.11 | 0.85 | \pm 0.12 |
| Glutamine | 1.00 | \pm 0.10 | 2.92 | \pm 0.47 | 0.64 | \pm 0.08 | 1.09 | \pm 0.05 | 1.39 | \pm 0.14 |
| Glycine | 1.00 | \pm 0.09 | 1.37 | \pm 0.05 | 0.95 | \pm 0.07 | 1.03 | \pm 0.08 | 1.02 | \pm 0.13 |
| Histidine | 1.00 | \pm 0.14 | 1.39 | \pm 0.11 | 0.52 | \pm 0.05 | 1.70 | \pm 0.04 | 1.06 | \pm 0.03 |
| Isoleucine | 1.00 | \pm 0.21 | 1.18 | \pm 0.15 | 0.67 | \pm 0.14 | 1.26 | \pm 0.11 | 0.81 | \pm 0.01 |
| Lysine | 1.00 | \pm 0.16 | 1.37 | \pm 0.16 | 0.55 | \pm 0.07 | 1.50 | \pm 0.11 | 1.5 | \pm 0.23 |
| Methionine | 1.00 | \pm 0.2 | 1.11 | \pm 0.2 | 0.51 | \pm 0.10 | 0.70 | \pm 0.15 | 1.27 | \pm 0.29 |
| Phenylalanine | 1.00 | \pm 0.15 | 0.94 | \pm 0.06 | 0.49 | \pm 0.05 | 1.27 | \pm 0.24 | 0.76 | \pm 0.10 |
| Proline | 1.00 | \pm 0.12 | 0.75 | \pm 0.05 | 0.65 | \pm 0.09 | 0.94 | \pm 0.09 | 0.98 | \pm 0.08 |
| Serine | 1.00 | \pm 0.11 | 0.88 | \pm 0.04 | 0.45 | \pm 0.08 | 1.08 | \pm 0.14 | 0.99 | \pm 0.08 |
| Threonine | 1.00 | \pm 0.11 | 1.22 | \pm 0.23 | 0.80 | \pm 0.14 | 0.87 | \pm 0.14 | 1.05 | \pm 0.01 |
| Tryptophan | 1.00 | \pm 0.17 | 1.2 | \pm 0.10 | 0.75 | \pm 0.11 | 0.96 | \pm 0.08 | 2.12 | \pm 0.27 |
| Tyramine | 1.00 | \pm 0.22 | 0.96 | \pm 0.11 | 1.41 | \pm 0.2 | 1.55 | \pm 0.19 | 1.34 | \pm 0.13 |
| Valine | 1.00 | \pm 0.07 | 0.71 | \pm 0.04 | 0.57 | \pm 0.06 | 0.97 | \pm 0.12 | 0.77 | \pm 0.07 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.09 | 0.97 | \pm 0.09 | 0.35 | \pm 0.04 | 0.38 | \pm 0.02 | 0.37 | \pm 0.04 |
| Dehydroascorbic acid | 1.00 | \pm 0.08 | 0.58 | \pm 0.08 | 0.75 | \pm 0.05 | 0.78 | \pm 0.05 | 0.88 | \pm 0.15 |
| Fumaric acid | 1.00 | \pm 0.13 | 0.52 | \pm 0.01 | 0.63 | \pm 0.07 | 1.41 | \pm 0.10 | 1.33 | \pm 0.12 |
| Galacturonic acid/Glucuroni | 1.00 | \pm 0.12 | 0.97 | \pm 0.09 | 0.99 | \pm 0.08 | 0.99 | \pm 0.13 | 1.33 | \pm 0.14 |
| Malic acid | 1.00 | \pm 0.07 | 0.52 | \pm 0.04 | 0.51 | \pm 0.03 | 0.81 | \pm 0.09 | 0.80 | \pm 0.03 |
| Pyroglutamic acid | 1.00 | \pm 0.09 | 1.91 | \pm 0.14 | 0.93 | \pm 0.36 | 1.79 | \pm 0.15 | 2.08 | \pm 0.3 |
| Saccharic acid | 1.00 | \pm 0.09 | 0.99 | \pm 0.14 | 0.63 | \pm 0.10 | 1.87 | \pm 0.22 | 1.30 | \pm 0.16 |
| Succinic acid | 1.00 | \pm 0.14 | 1.09 | \pm 0.27 | 1.01 | \pm 0.09 | 1.22 | \pm 0.18 | 1.19 | \pm 0.14 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.04 | 0.73 | \pm 0.07 | 0.72 | \pm 0.06 | 0.75 | \pm 0.06 | 0.73 | \pm 0.02 |
| Fucose | 1.00 | \pm 0.15 | 1.07 | \pm 0.05 | 0.97 | \pm 0.07 | 1.18 | \pm 0.10 | 0.86 | \pm 0.04 |
| Galactinol | 1.00 | \pm 0.21 | 1.03 | \pm 0.18 | 0.66 | \pm 0.08 | 1.3 | \pm 0.19 | 0.91 | \pm 0.11 |
| Glucose | 1.00 | \pm 0.07 | 0.69 | \pm 0.09 | 0.69 | \pm 0.05 | 0.70 | \pm 0.05 | 0.78 | \pm 0.02 |
| Maltose | 1.00 | \pm 0.12 | 3.75 | \pm 1.01 | 2.95 | \pm 0.64 | 0.99 | \pm 0.21 | 2.79 | \pm 0.44 |
| Rhamnose | 1.00 | \pm 0.12 | 1.11 | \pm 0.06 | 1.12 | \pm 0.2 | 1.08 | \pm 0.13 | 0.85 | \pm 0.03 |
| Sucrose | 1.00 | \pm 0.11 | 0.97 | \pm 0.08 | 1.13 | \pm 0.04 | 1.52 | \pm 0.26 | 1.22 | \pm 0.07 |
| Xylose | 1.00 | \pm 0.14 | 1.15 | \pm 0.03 | 1.14 | \pm 0.18 | 1.2 | \pm 0.14 | 0.99 | \pm 0.13 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.12 | 0.63 | \pm 0.13 | 0.68 | \pm 0.08 | 0.81 | \pm 0.12 | 1.41 | \pm 0.12 |
| Phosphoric acid | 1.00 | \pm 0.14 | 0.78 | \pm 0.11 | 1.53 | \pm 0.16 | 1.38 | \pm 0.25 | 2.91 | \pm 0.39 |
| Putrescine | 1.00 | \pm 0.14 | 1.25 | \pm 0.17 | 1.12 | \pm 0.14 | 0.93 | \pm 0.23 | 1.03 | \pm 0.07 |

Supplemental Table 11. Comparison of metabolic levels from medula tissue of fruits with 65 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|-----------------------------------|-----------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|----|------|----|------|----|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 \pm 0.16 | 1.23 \pm 0.21 | 0.88 \pm 0.18 | 1.08 \pm 0.03 | 1.08 \pm 0.21 | | | | | |
| Alanine, beta | 1.00 \pm 0.22 | 0.92 \pm 0.22 | 0.97 \pm 0.04 | 0.76 \pm 0.14 | 1.49 \pm 0.18 | | | | | |
| Asparagine | 1.00 \pm 0.17 | 0.58 \pm 0.12 | 0.42 \pm 0.06 | 0.52 \pm 0.02 | 0.50 \pm 0.03 | | | | | |
| Aspartate | 1.00 \pm 0.09 | 0.47 \pm 0.03 | 0.29 \pm 0.03 | 0.51 \pm 0.04 | 1.07 \pm 0.06 | | | | | |
| GABA | 1.00 \pm 0.04 | 2.08 \pm 0.07 | 1.99 \pm 0.04 | 1.77 \pm 0.20 | 1.81 \pm 0.13 | | | | | |
| Glutamate | 1.00 \pm 0.16 | 0.69 \pm 0.06 | 0.59 \pm 0.04 | 0.78 \pm 0.17 | 0.68 \pm 0.1 | | | | | |
| Glutamine | 1.00 \pm 0.12 | 1.20 \pm 0.15 | 1.03 \pm 0.12 | 1.35 \pm 0.18 | 0.9 \pm 0.21 | | | | | |
| Glycine | 1.00 \pm 0.16 | 1.28 \pm 0.21 | 1.15 \pm 0.1 | 0.99 \pm 0.06 | 1.23 \pm 0.13 | | | | | |
| Histidine | 1.00 \pm 0.05 | 0.58 \pm 0.08 | 0.53 \pm 0.01 | 0.49 \pm 0.02 | 1.20 \pm 0.13 | | | | | |
| Isoleucine | 1.00 \pm 0.09 | 1.08 \pm 0.06 | 1.02 \pm 0.13 | 0.51 \pm 0.06 | 1.34 \pm 0.05 | | | | | |
| Lysine | 1.00 \pm 0.09 | 1.2 \pm 0.09 | 0.79 \pm 0.04 | 0.62 \pm 0.10 | 1.01 \pm 0.15 | | | | | |
| Methionine | 1.00 \pm 0.17 | 0.57 \pm 0.09 | 0.60 \pm 0.07 | 0.60 \pm 0.09 | 1.02 \pm 0.1 | | | | | |
| Phenylalanine | 1.00 \pm 0.04 | 0.99 \pm 0.10 | 1.68 \pm 0.12 | 0.50 \pm 0.06 | 0.64 \pm 0.03 | | | | | |
| Proline | 1.00 \pm 0.12 | 1.13 \pm 0.17 | 0.73 \pm 0.06 | 0.73 \pm 0.09 | 0.94 \pm 0.11 | | | | | |
| Serine | 1.00 \pm 0.12 | 1.02 \pm 0.24 | 0.83 \pm 0.11 | 1.06 \pm 0.02 | 0.93 \pm 0.1 | | | | | |
| Threonine | 1.00 \pm 0.14 | 1.25 \pm 0.30 | 1.09 \pm 0.11 | 0.87 \pm 0.05 | 1.31 \pm 0.05 | | | | | |
| Tryptophan | 1.00 \pm 0.18 | 0.62 \pm 0.06 | 0.89 \pm 0.16 | 1.38 \pm 0.17 | 0.93 \pm 0.17 | | | | | |
| Tyramine | 1.00 \pm 0.09 | 0.8 \pm 0.13 | 0.92 \pm 0.18 | 0.99 \pm 0.15 | 0.97 \pm 0.12 | | | | | |
| Valine | 1.00 \pm 0.11 | 1.24 \pm 0.20 | 0.97 \pm 0.09 | 1.19 \pm 0.14 | 0.98 \pm 0.16 | | | | | |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 \pm 0.11 | 1.07 \pm 0.12 | 0.76 \pm 0.08 | 0.53 \pm 0.09 | 0.99 \pm 0.15 | | | | | |
| Dehydroascorbic acid | 1.00 \pm 0.12 | 0.88 \pm 0.08 | 1.13 \pm 0.27 | 1.23 \pm 0.22 | 1.06 \pm 0.19 | | | | | |
| Fumaric acid | 1.00 \pm 0.09 | 1.21 \pm 0.23 | 0.98 \pm 0.1 | 1.57 \pm 0.28 | 1.16 \pm 0.16 | | | | | |
| Galacturonic acid/Glucuronic acid | 1.00 \pm 0.05 | 0.84 \pm 0.02 | 0.53 \pm 0.09 | 0.63 \pm 0.09 | 1.20 \pm 0.05 | | | | | |
| Malic acid | 1.00 \pm 0.11 | 0.46 \pm 0.05 | 0.53 \pm 0.06 | 0.93 \pm 0.03 | 1.12 \pm 0.08 | | | | | |
| Pyroglutamic acid | 1.00 \pm 0.06 | 0.62 \pm 0.07 | 0.48 \pm 0.05 | 0.52 \pm 0.05 | 0.37 \pm 0.06 | | | | | |
| Saccharic acid | 1.00 \pm 0.12 | 0.39 \pm 0.04 | 0.40 \pm 0.05 | 0.92 \pm 0.1 | 0.44 \pm 0.03 | | | | | |
| Succinic acid | 1.00 \pm 0.03 | 0.89 \pm 0.09 | 0.88 \pm 0.05 | 0.91 \pm 0.09 | 0.99 \pm 0.07 | | | | | |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 \pm 0.09 | 0.63 \pm 0.05 | 0.77 \pm 0.06 | 0.82 \pm 0.04 | 0.87 \pm 0.03 | | | | | |
| Fucose | 1.00 \pm 0.11 | 1.1 \pm 0.06 | 1.03 \pm 0.1 | 1.17 \pm 0.13 | 0.97 \pm 0.07 | | | | | |
| Galactinol | 1.00 \pm 0.16 | 0.94 \pm 0.14 | 0.7 \pm 0.11 | 1.11 \pm 0.2 | 1.50 \pm 0.18 | | | | | |
| Glucose | 1.00 \pm 0.10 | 0.71 \pm 0.08 | 0.68 \pm 0.01 | 0.71 \pm 0.04 | 0.81 \pm 0.02 | | | | | |
| Maltose | 1.00 \pm 0.31 | 3.18 \pm 2.24 | 6.10 \pm 0.32 | 1.8 \pm 0.24 | 0.77 \pm 0.06 | | | | | |
| Rhamnose | 1.00 \pm 0.16 | 1.07 \pm 0.06 | 1.13 \pm 0.22 | 1.23 \pm 0.14 | 0.87 \pm 0.08 | | | | | |
| Sucrose | 1.00 \pm 0.11 | 1.19 \pm 0.09 | 1.2 \pm 0.06 | 1.05 \pm 0.12 | 1.11 \pm 0.11 | | | | | |
| Xylose | 1.00 \pm 0.1 | 1.11 \pm 0.06 | 1.1 \pm 0.1 | 1.21 \pm 0.07 | 1.06 \pm 0.14 | | | | | |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 \pm 0.08 | 1.01 \pm 0.15 | 0.76 \pm 0.05 | 1.09 \pm 0.16 | 1.31 \pm 0.14 | | | | | |
| Phosphoric acid | 1.00 \pm 0.15 | 0.66 \pm 0.02 | 0.62 \pm 0.03 | 0.42 \pm 0.03 | 1.75 \pm 0.13 | | | | | |
| Putrescine | 1.00 \pm 0.12 | 1.76 \pm 0.14 | 1.97 \pm 0.40 | 0.77 \pm 0.27 | 1.04 \pm 0.12 | | | | | |

Supplemental Table 12. Comparison of metabolic levels from locula tissue of fruits with 65 DAF from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | M14 | | M21 | |
|-----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.08 | 1.25 | \pm 0.12 | 1.36 | \pm 0.13 | 1.10 | \pm 0.05 | 1.60 | \pm 0.10 |
| Alanine, beta | 1.00 | \pm 0.14 | 1.41 | \pm 0.25 | 1.10 | \pm 0.12 | 0.75 | \pm 0.18 | 0.70 | \pm 0.05 |
| Asparagine | 1.00 | \pm 0.04 | 0.64 | \pm 0.11 | 0.67 | \pm 0.06 | 0.84 | \pm 0.10 | 0.44 | \pm 0.06 |
| Aspartate | 1.00 | \pm 0.11 | 0.43 | \pm 0.02 | 0.72 | \pm 0.13 | 0.89 | \pm 0.02 | 0.51 | \pm 0.08 |
| GABA | 1.00 | \pm 0.13 | 1.59 | \pm 0.13 | 1.17 | \pm 0.13 | 0.86 | \pm 0.06 | 0.57 | \pm 0.06 |
| Glutamate | 1.00 | \pm 0.04 | 0.36 | \pm 0.03 | 0.41 | \pm 0.03 | 1.02 | \pm 0.11 | 0.74 | \pm 0.11 |
| Glutamine | 1.00 | \pm 0.07 | 1.00 | \pm 0.17 | 0.85 | \pm 0.07 | 0.89 | \pm 0.13 | 0.33 | \pm 0.04 |
| Glycine | 1.00 | \pm 0.10 | 0.95 | \pm 0.2 | 1.13 | \pm 0.1 | 0.76 | \pm 0.02 | 0.88 | \pm 0.13 |
| Histidine | 1.00 | \pm 0.12 | 0.72 | \pm 0.09 | 1.07 | \pm 0.07 | 0.7 | \pm 0.06 | 0.58 | \pm 0.04 |
| Isoleucine | 1.00 | \pm 0.10 | 1.06 | \pm 0.08 | 1.11 | \pm 0.12 | 0.67 | \pm 0.02 | 0.53 | \pm 0.04 |
| Lysine | 1.00 | \pm 0.14 | 0.77 | \pm 0.13 | 0.8 | \pm 0.08 | 0.64 | \pm 0.11 | 0.73 | \pm 0.13 |
| Methionine | 1.00 | \pm 0.07 | 0.57 | \pm 0.05 | 0.85 | \pm 0.03 | 0.54 | \pm 0.05 | 0.53 | \pm 0.07 |
| Phenylalanine | 1.00 | \pm 0.10 | 0.91 | \pm 0.07 | 1.03 | \pm 0.17 | 0.75 | \pm 0.05 | 0.43 | \pm 0.05 |
| Proline | 1.00 | \pm 0.15 | 0.83 | \pm 0.12 | 1.19 | \pm 0.05 | 0.61 | \pm 0.06 | 1.15 | \pm 0.13 |
| Serine | 1.00 | \pm 0.16 | 0.39 | \pm 0.04 | 0.92 | \pm 0.07 | 0.59 | \pm 0.01 | 0.31 | \pm 0.04 |
| Threonine | 1.00 | \pm 0.14 | 0.63 | \pm 0.14 | 1.11 | \pm 0.08 | 0.75 | \pm 0.07 | 0.43 | \pm 0.05 |
| Tryptophan | 1.00 | \pm 0.12 | 0.90 | \pm 0.22 | 1.19 | \pm 0.18 | 0.61 | \pm 0.04 | 0.80 | \pm 0.08 |
| Tyramine | 1.00 | \pm 0.31 | 1.08 | \pm 0.12 | 1.02 | \pm 0.15 | 0.72 | \pm 0.09 | 0.68 | \pm 0.15 |
| Valine | 1.00 | \pm 0.10 | 0.65 | \pm 0.05 | 1.14 | \pm 0.13 | 1.33 | \pm 0.18 | 1.25 | \pm 0.14 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.11 | 1.01 | \pm 0.13 | 0.85 | \pm 0.07 | 0.62 | \pm 0.03 | 1.00 | \pm 0.05 |
| Dehydroascorbic acid | 1.00 | \pm 0.06 | 0.88 | \pm 0.08 | 0.85 | \pm 0.12 | 1.02 | \pm 0.02 | 1.01 | \pm 0.09 |
| Fumaric acid | 1.00 | \pm 0.16 | 1.23 | \pm 0.16 | 1.00 | \pm 0.05 | 0.93 | \pm 0.07 | 1.21 | \pm 0.17 |
| Galacturonic acid/Glucuronic acid | 1.00 | \pm 0.19 | 0.93 | \pm 0.12 | 0.63 | \pm 0.08 | 0.92 | \pm 0.07 | 1.54 | \pm 0.12 |
| Malic acid | 1.00 | \pm 0.06 | 0.85 | \pm 0.03 | 0.65 | \pm 0.07 | 1.12 | \pm 0.07 | 1.23 | \pm 0.03 |
| Pyroglutamic acid | 1.00 | \pm 0.15 | 0.53 | \pm 0.06 | 0.50 | \pm 0.02 | 0.74 | \pm 0.04 | 0.29 | \pm 0.04 |
| Saccharic acid | 1.00 | \pm 0.19 | 1.53 | \pm 0.44 | 1.16 | \pm 0.08 | 3.01 | \pm 0.37 | 1.55 | \pm 0.15 |
| Succinic acid | 1.00 | \pm 0.12 | 1.06 | \pm 0.02 | 0.97 | \pm 0.1 | 0.87 | \pm 0.14 | 1.24 | \pm 0.18 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.10 | 1.08 | \pm 0.07 | 1.02 | \pm 0.1 | 1.03 | \pm 0.04 | 1.12 | \pm 0.05 |
| Fucose | 1.00 | \pm 0.06 | 1.09 | \pm 0.09 | 1.01 | \pm 0.07 | 1.01 | \pm 0.05 | 1.03 | \pm 0.12 |
| Galactinol | 1.00 | \pm 0.13 | 1.04 | \pm 0.12 | 0.62 | \pm 0.06 | 1.02 | \pm 0.08 | 1.15 | \pm 0.04 |
| Glucose | 1.00 | \pm 0.03 | 0.83 | \pm 0.05 | 1.14 | \pm 0.05 | 1.28 | \pm 0.07 | 1.31 | \pm 0.08 |
| Maltose | 1.00 | \pm 0.14 | 1.65 | \pm 0.33 | 3.49 | \pm 0.11 | 0.67 | \pm 0.07 | 0.89 | \pm 0.17 |
| Rhamnose | 1.00 | \pm 0.05 | 1.12 | \pm 0.20 | 1.07 | \pm 0.13 | 1.09 | \pm 0.09 | 1.00 | \pm 0.13 |
| Sucrose | 1.00 | \pm 0.07 | 1.07 | \pm 0.11 | 1.64 | \pm 0.12 | 1.27 | \pm 0.15 | 1.50 | \pm 0.13 |
| Xylose | 1.00 | \pm 0.04 | 1.12 | \pm 0.07 | 1.07 | \pm 0.10 | 1.11 | \pm 0.05 | 1.17 | \pm 0.11 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.12 | 0.88 | \pm 0.06 | 0.73 | \pm 0.08 | 0.64 | \pm 0.01 | 0.77 | \pm 0.04 |
| Phosphoric acid | 1.00 | \pm 0.07 | 0.63 | \pm 0.07 | 0.68 | \pm 0.10 | 0.66 | \pm 0.03 | 1.03 | \pm 0.03 |
| Putrescine | 1.00 | \pm 0.11 | 1.78 | \pm 0.22 | 1.75 | \pm 0.21 | 0.48 | \pm 0.10 | 0.64 | \pm 0.10 |

Supplemental Table 13. Comparison of metabolic levels of breaker-3 DAF stage fruits from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | MDH14 | | MDH21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.03 | 0.95 | \pm 0.08 | 1.46 | \pm 0.01 | 1.09 | \pm 0.08 | 1.04 | \pm 0.04 |
| Alanine, beta | 1.00 | \pm 0.04 | 1.20 | \pm 0.04 | 1.29 | \pm 0.18 | 1.92 | \pm 0.18 | 1.28 | \pm 0.25 |
| Aspartic acid | 1.00 | \pm 0.05 | 1.01 | \pm 0.10 | 1.13 | \pm 0.02 | 3.46 | \pm 0.06 | 2.02 | \pm 0.13 |
| GABA | 1.00 | \pm 0.08 | 1.43 | \pm 0.00 | 1.37 | \pm 0.03 | 0.64 | \pm 0.02 | 0.56 | \pm 0.06 |
| Glutamine | 1.00 | \pm 0.11 | 1.70 | \pm 0.03 | 1.17 | \pm 0.09 | 1.98 | \pm 0.02 | 1.50 | \pm 0.05 |
| Glycine | 1.00 | \pm 0.03 | 0.89 | \pm 0.06 | 0.57 | \pm 0.01 | 1.43 | \pm 0.05 | 0.92 | \pm 0.01 |
| Isoleucine | 1.00 | \pm 0.15 | 2.22 | \pm 0.11 | 2.11 | \pm 0.23 | 3.97 | \pm 0.29 | 3.11 | \pm 2.01 |
| Methionine | 1.00 | \pm 0.01 | 1.15 | \pm 0.01 | 1.94 | \pm 0.18 | 1.49 | \pm 0.03 | 1.58 | \pm 0.15 |
| Phenylalanine | 1.00 | \pm 0.09 | 0.91 | \pm 0.01 | 1.01 | \pm 0.01 | 1.01 | \pm 0.00 | 0.21 | \pm 0.00 |
| Serine | 1.00 | \pm 0.03 | 0.57 | \pm 0.04 | 1.05 | \pm 0.10 | 0.90 | \pm 0.02 | 0.74 | \pm 0.07 |
| Threonine | 1.00 | \pm 0.18 | 1.44 | \pm 0.03 | 2.24 | \pm 0.10 | 6.01 | \pm 0.88 | 6.89 | \pm 0.04 |
| Tryptophan | 1.00 | \pm 0.05 | 1.32 | \pm 0.10 | 1.54 | \pm 0.12 | 1.80 | \pm 0.35 | 1.24 | \pm 0.25 |
| Valine | 1.00 | \pm 0.06 | 1.02 | \pm 0.03 | 1.13 | \pm 0.02 | 2.23 | \pm 0.20 | 0.80 | \pm 0.05 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.05 | 1.01 | \pm 0.01 | 1.08 | \pm 0.02 | 1.09 | \pm 0.05 | 1.22 | \pm 0.06 |
| Fumaric acid | 1.00 | \pm 0.13 | 0.50 | \pm 0.04 | 0.61 | \pm 0.04 | 2.01 | \pm 0.05 | 2.72 | \pm 0.17 |
| Glyceric acid | 1.00 | \pm 0.07 | 0.78 | \pm 0.00 | 1.31 | \pm 0.36 | 1.13 | \pm 0.25 | 1.03 | \pm 0.02 |
| Malic acid | 1.00 | \pm 0.02 | 0.75 | \pm 0.00 | 0.73 | \pm 0.04 | 2.18 | \pm 0.04 | 2.08 | \pm 0.01 |
| Threonic acid | 1.00 | \pm 0.11 | 1.22 | \pm 0.04 | 1.02 | \pm 0.04 | 1.17 | \pm 0.06 | 1.55 | \pm 0.23 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.12 | 1.07 | \pm 0.00 | 1.08 | \pm 0.01 | 0.92 | \pm 0.10 | 0.93 | \pm 0.01 |
| Glucose | 1.00 | \pm 0.06 | 0.77 | \pm 0.02 | 0.84 | \pm 0.05 | 0.86 | \pm 0.09 | 0.83 | \pm 0.03 |
| Raffinose | 1.00 | \pm 0.05 | 7.33 | \pm 1.35 | 3.81 | \pm 0.36 | 0.71 | \pm 0.07 | 1.40 | \pm 0.13 |
| Sucrose | 1.00 | \pm 0.06 | 0.97 | \pm 0.00 | 0.80 | \pm 0.11 | 0.79 | \pm 0.00 | 0.94 | \pm 0.01 |
| Xylose | 1.00 | \pm 0.05 | 0.92 | \pm 0.02 | 0.87 | \pm 0.02 | 0.88 | \pm 0.08 | 1.10 | \pm 0.01 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.13 | 1.22 | \pm 0.02 | 1.48 | \pm 0.09 | 1.11 | \pm 0.10 | 1.51 | \pm 0.00 |
| Inositol-1P | 1.00 | \pm 0.07 | 1.06 | \pm 0.00 | 1.18 | \pm 0.04 | 1.19 | \pm 0.05 | 1.26 | \pm 0.02 |
| Phosphoric acid | 1.00 | \pm 0.01 | 0.95 | \pm 0.06 | 1.25 | \pm 0.14 | 1.32 | \pm 0.17 | 1.18 | \pm 0.16 |

Supplemental Table 14. Comparison of metabolic levels of breaker-1 DAF fruits from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | MDH14 | | MDH21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.05 | 0.82 | \pm 0.04 | 1.04 | \pm 0.08 | 1.04 | \pm 0.05 | 1.02 | \pm 0.02 |
| Alanine, beta | 1.00 | \pm 0.01 | 1.28 | \pm 0.18 | 1.27 | \pm 0.16 | 1.32 | \pm 0.20 | 1.13 | \pm 0.12 |
| Aspartic acid | 1.00 | \pm 0.04 | 0.93 | \pm 0.03 | 0.92 | \pm 0.07 | 2.25 | \pm 0.17 | 1.48 | \pm 0.06 |
| GABA | 1.00 | \pm 0.09 | 1.45 | \pm 0.13 | 1.19 | \pm 0.14 | 0.47 | \pm 0.04 | 0.53 | \pm 0.01 |
| Glutamine | 1.00 | \pm 0.02 | 1.21 | \pm 0.15 | 3.76 | \pm 0.22 | 1.15 | \pm 0.13 | 1.24 | \pm 0.11 |
| Glycine | 1.00 | \pm 0.04 | 1.00 | \pm 0.11 | 1.23 | \pm 0.16 | 1.47 | \pm 0.11 | 1.20 | \pm 0.12 |
| Isoleucine | 1.00 | \pm 0.10 | 1.78 | \pm 0.34 | 1.60 | \pm 0.23 | 3.30 | \pm 0.48 | 2.25 | \pm 0.24 |
| Methionine | 1.00 | \pm 0.07 | 0.71 | \pm 0.13 | 1.51 | \pm 0.11 | 0.69 | \pm 0.08 | 0.69 | \pm 0.05 |
| Phenylalanine | 1.00 | \pm 0.08 | 1.04 | \pm 0.04 | 1.30 | \pm 0.15 | 2.69 | \pm 0.11 | 1.79 | \pm 0.08 |
| Serine | 1.00 | \pm 0.12 | 1.08 | \pm 0.13 | 0.99 | \pm 0.10 | 1.47 | \pm 0.38 | 1.57 | \pm 0.14 |
| Threonine | 1.00 | \pm 0.08 | 1.22 | \pm 0.13 | 1.13 | \pm 0.20 | 2.28 | \pm 0.23 | 2.06 | \pm 0.15 |
| Tryptophan | 1.00 | \pm 0.11 | 1.16 | \pm 0.15 | 1.22 | \pm 0.07 | 1.01 | \pm 0.04 | 1.03 | \pm 0.10 |
| Valine | 1.00 | \pm 0.02 | 1.03 | \pm 0.02 | 0.86 | \pm 0.04 | 1.42 | \pm 0.06 | 1.26 | \pm 0.07 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.04 | 1.04 | \pm 0.05 | 1.03 | \pm 0.06 | 1.04 | \pm 0.05 | 1.09 | \pm 0.01 |
| Fumaric acid | 1.00 | \pm 0.07 | 0.49 | \pm 0.02 | 0.47 | \pm 0.03 | 1.28 | \pm 0.02 | 1.56 | \pm 0.07 |
| Glyceric acid | 1.00 | \pm 0.10 | 0.81 | \pm 0.03 | 1.10 | \pm 0.16 | 1.54 | \pm 0.35 | 1.27 | \pm 0.16 |
| Malic acid | 1.00 | \pm 0.02 | 0.57 | \pm 0.04 | 0.50 | \pm 0.06 | 1.43 | \pm 0.04 | 1.95 | \pm 0.06 |
| Threonic acid | 1.00 | \pm 0.08 | 1.14 | \pm 0.11 | 1.63 | \pm 0.15 | 1.71 | \pm 0.01 | 1.77 | \pm 0.02 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.03 | 0.65 | \pm 0.06 | 0.74 | \pm 0.03 | 1.03 | \pm 0.05 | 0.92 | \pm 0.01 |
| Glucose | 1.00 | \pm 0.06 | 0.69 | \pm 0.07 | 0.74 | \pm 0.06 | 0.85 | \pm 0.02 | 0.94 | \pm 0.04 |
| Raffinose | 1.00 | \pm 0.03 | 2.55 | \pm 0.23 | 1.10 | \pm 0.10 | 0.83 | \pm 0.07 | 0.73 | \pm 0.05 |
| Sucrose | 1.00 | \pm 0.07 | 1.31 | \pm 0.07 | 1.68 | \pm 0.11 | 0.89 | \pm 0.06 | 1.76 | \pm 0.12 |
| Xylose | 1.00 | \pm 0.11 | 1.03 | \pm 0.05 | 1.08 | \pm 0.08 | 1.23 | \pm 0.10 | 1.42 | \pm 0.16 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.02 | 0.97 | \pm 0.04 | 0.92 | \pm 0.04 | 0.76 | \pm 0.05 | 1.15 | \pm 0.02 |
| Inositol-1P | 1.00 | \pm 0.01 | 1.09 | \pm 0.03 | 1.05 | \pm 0.06 | 1.06 | \pm 0.01 | 1.08 | \pm 0.01 |
| Phosphoric acid | 1.00 | \pm 0.06 | 1.12 | \pm 0.07 | 1.07 | \pm 0.12 | 1.26 | \pm 0.16 | 1.06 | \pm 0.03 |

Supplemental Table 15. Comparison of metabolic levels of breaker stage fruits from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | MDH14 | | MDH21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.11 | 0.81 | \pm 0.15 | 0.81 | \pm 0.05 | 0.47 | \pm 0.06 | 0.63 | \pm 0.08 |
| Alanine, beta | 1.00 | \pm 0.19 | 1.17 | \pm 0.18 | 1.07 | \pm 0.16 | 1.13 | \pm 0.13 | 1.19 | \pm 0.16 |
| Aspartic acid | 1.00 | \pm 0.07 | 0.73 | \pm 0.07 | 0.92 | \pm 0.04 | 1.08 | \pm 0.60 | 0.81 | \pm 0.06 |
| GABA | 1.00 | \pm 0.09 | 0.59 | \pm 0.05 | 5.47 | \pm 0.81 | 0.77 | \pm 0.04 | 1.34 | \pm 0.07 |
| Glutamine | 1.00 | \pm 0.03 | 1.49 | \pm 0.25 | 0.77 | \pm 0.03 | 0.85 | \pm 0.08 | 1.40 | \pm 0.04 |
| Glycine | 1.00 | \pm 0.17 | 1.00 | \pm 0.15 | 1.17 | \pm 0.19 | 0.96 | \pm 0.19 | 0.98 | \pm 0.21 |
| Isoleucine | 1.00 | \pm 0.15 | 0.83 | \pm 0.08 | 1.62 | \pm 0.18 | 0.94 | \pm 0.10 | 0.83 | \pm 0.08 |
| Methionine | 1.00 | \pm 0.08 | 1.46 | \pm 0.13 | 1.13 | \pm 0.14 | 0.58 | \pm 0.07 | 0.59 | \pm 0.02 |
| Phenylalanine | 1.00 | \pm 0.11 | 0.95 | \pm 0.07 | 4.66 | \pm 0.56 | 1.73 | \pm 0.30 | 2.02 | \pm 0.28 |
| Serine | 1.00 | \pm 0.07 | 0.69 | \pm 0.05 | 1.00 | \pm 0.08 | 0.84 | \pm 0.13 | 1.28 | \pm 0.07 |
| Threonine | 1.00 | \pm 0.16 | 1.02 | \pm 0.13 | 1.59 | \pm 0.09 | 1.05 | \pm 0.26 | 1.29 | \pm 0.20 |
| Tryptophan | 1.00 | \pm 0.21 | 1.38 | \pm 0.23 | 1.53 | \pm 0.19 | 1.32 | \pm 0.16 | 0.94 | \pm 0.12 |
| Valine | 1.00 | \pm 0.08 | 1.16 | \pm 0.06 | 1.78 | \pm 0.08 | 0.87 | \pm 0.06 | 1.69 | \pm 0.10 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.05 | 1.01 | \pm 0.04 | 1.05 | \pm 0.06 | 1.08 | \pm 0.07 | 1.04 | \pm 0.02 |
| Fumaric acid | 1.00 | \pm 0.15 | 0.46 | \pm 0.03 | 0.47 | \pm 0.02 | 1.98 | \pm 0.09 | 1.89 | \pm 0.00 |
| Glyceric acid | 1.00 | \pm 0.21 | 0.79 | \pm 0.05 | 0.82 | \pm 0.07 | 0.86 | \pm 0.12 | 0.69 | \pm 0.11 |
| Malic acid | 1.00 | \pm 0.05 | 0.78 | \pm 0.06 | 0.76 | \pm 0.06 | 0.74 | \pm 0.09 | 1.78 | \pm 0.03 |
| Threonic acid | 1.00 | \pm 0.14 | 0.91 | \pm 0.10 | 0.91 | \pm 0.10 | 1.20 | \pm 0.12 | 1.14 | \pm 0.05 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.09 | 0.90 | \pm 0.06 | 1.02 | \pm 0.12 | 1.23 | \pm 0.10 | 1.21 | \pm 0.06 |
| Glucose | 1.00 | \pm 0.04 | 0.74 | \pm 0.05 | 0.80 | \pm 0.03 | 0.98 | \pm 0.06 | 0.85 | \pm 0.03 |
| Raffinose | 1.00 | \pm 0.05 | 2.81 | \pm 0.36 | 2.08 | \pm 0.09 | 1.29 | \pm 0.05 | 1.29 | \pm 0.07 |
| Sucrose | 1.00 | \pm 0.07 | 0.64 | \pm 0.08 | 0.91 | \pm 0.06 | 0.97 | \pm 0.04 | 1.06 | \pm 0.04 |
| Xylose | 1.00 | \pm 0.05 | 0.99 | \pm 0.06 | 0.89 | \pm 0.07 | 1.01 | \pm 0.11 | 1.29 | \pm 0.22 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.08 | 1.15 | \pm 0.05 | 0.90 | \pm 0.05 | 0.75 | \pm 0.06 | 0.94 | \pm 0.07 |
| Inositol-1P | 1.00 | \pm 0.03 | 1.03 | \pm 0.06 | 1.06 | \pm 0.04 | 1.07 | \pm 0.05 | 1.03 | \pm 0.00 |
| Phosphoric acid | 1.00 | \pm 0.16 | 1.33 | \pm 0.09 | 1.12 | \pm 0.09 | 1.08 | \pm 0.08 | 1.26 | \pm 0.17 |

Supplemental Table 16. Comparison of metabolic levels of breaker+1 DAF fruits from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | MDH14 | | MDH21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.06 | 1.14 | \pm 0.19 | 1.52 | \pm 0.10 | 0.81 | \pm 0.04 | 0.82 | \pm 0.08 |
| Alanine, beta | 1.00 | \pm 0.09 | 1.09 | \pm 0.10 | 3.14 | \pm 0.22 | 0.51 | \pm 0.07 | 1.01 | \pm 0.11 |
| Asparagine | 1.00 | \pm 0.10 | 0.89 | \pm 0.14 | 6.91 | \pm 0.24 | 0.46 | \pm 0.01 | 1.21 | \pm 0.08 |
| Aspartic acid | 1.00 | \pm 0.13 | 0.88 | \pm 0.15 | 4.26 | \pm 0.14 | 0.71 | \pm 0.31 | 1.59 | \pm 0.16 |
| GABA | 1.00 | \pm 0.11 | 1.00 | \pm 0.19 | 8.80 | \pm 0.79 | 1.26 | \pm 0.08 | 4.03 | \pm 0.39 |
| Glutamine | 1.00 | \pm 0.10 | 0.84 | \pm 0.12 | 0.82 | \pm 0.11 | 0.70 | \pm 0.01 | 0.61 | \pm 0.04 |
| Glycine | 1.00 | \pm 0.06 | 1.59 | \pm 0.23 | 2.65 | \pm 0.22 | 0.62 | \pm 0.04 | 0.69 | \pm 0.09 |
| Isoleucine | 1.00 | \pm 0.09 | 1.03 | \pm 0.17 | 2.50 | \pm 0.11 | 0.40 | \pm 0.05 | 0.52 | \pm 0.04 |
| Methionine | 1.00 | \pm 0.13 | 0.58 | \pm 0.08 | 1.99 | \pm 0.30 | 0.61 | \pm 0.07 | 1.14 | \pm 0.06 |
| Phenylalanine | 1.00 | \pm 0.08 | 1.03 | \pm 0.05 | 9.60 | \pm 0.29 | 1.05 | \pm 0.03 | 1.45 | \pm 0.09 |
| Serine | 1.00 | \pm 0.06 | 0.93 | \pm 0.13 | 2.53 | \pm 0.04 | 0.76 | \pm 0.05 | 0.71 | \pm 0.04 |
| Threonine | 1.00 | \pm 0.16 | 1.84 | \pm 0.31 | 5.10 | \pm 0.20 | 0.68 | \pm 0.12 | 0.91 | \pm 0.12 |
| Tryptophan | 1.00 | \pm 0.13 | 0.96 | \pm 0.14 | 5.89 | \pm 0.48 | 1.00 | \pm 0.19 | 1.25 | \pm 0.18 |
| Valine | 1.00 | \pm 0.14 | 0.29 | \pm 0.01 | 1.92 | \pm 0.07 | 0.33 | \pm 0.01 | 0.40 | \pm 0.05 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.13 | 0.93 | \pm 0.16 | 0.82 | \pm 0.14 | 0.90 | \pm 0.05 | 1.45 | \pm 0.20 |
| Fumaric acid | 1.00 | \pm 0.12 | 0.52 | \pm 0.12 | 0.25 | \pm 0.01 | 1.53 | \pm 0.02 | 1.50 | \pm 0.06 |
| Glyceric acid | 1.00 | \pm 0.14 | 1.09 | \pm 0.26 | 0.85 | \pm 0.09 | 0.94 | \pm 0.11 | 0.97 | \pm 0.02 |
| Malic acid | 1.00 | \pm 0.16 | 0.69 | \pm 0.12 | 0.34 | \pm 0.04 | 1.30 | \pm 0.04 | 1.23 | \pm 0.06 |
| Threonic acid | 1.00 | \pm 0.12 | 0.43 | \pm 0.02 | 0.70 | \pm 0.08 | 1.40 | \pm 0.01 | 1.10 | \pm 0.05 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.14 | 0.97 | \pm 0.16 | 0.49 | \pm 0.04 | 1.21 | \pm 0.04 | 1.26 | \pm 0.13 |
| Glucose | 1.00 | \pm 0.11 | 0.83 | \pm 0.14 | 0.56 | \pm 0.05 | 0.91 | \pm 0.06 | 0.85 | \pm 0.08 |
| Raffinose | 1.00 | \pm 0.12 | 1.89 | \pm 0.14 | 1.06 | \pm 0.09 | 0.70 | \pm 0.05 | 0.76 | \pm 0.01 |
| Sucrose | 1.00 | \pm 0.08 | 1.14 | \pm 0.16 | 1.01 | \pm 0.05 | 1.91 | \pm 0.10 | 1.95 | \pm 0.10 |
| Xylose | 1.00 | \pm 0.09 | 1.15 | \pm 0.11 | 0.97 | \pm 0.08 | 1.22 | \pm 0.09 | 1.20 | \pm 0.21 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.09 | 0.90 | \pm 0.12 | 0.91 | \pm 0.03 | 0.95 | \pm 0.06 | 0.87 | \pm 0.08 |
| Inositol-1P | 1.00 | \pm 0.09 | 1.07 | \pm 0.12 | 0.90 | \pm 0.04 | 0.96 | \pm 0.01 | 0.93 | \pm 0.04 |
| Phosphoric acid | 1.00 | \pm 0.15 | 0.77 | \pm 0.12 | 1.19 | \pm 0.07 | 0.24 | \pm 0.02 | 0.62 | \pm 0.05 |

Supplemental Table 17. Comparison of metabolic levels of breaker+3 DAF fruits from wild type, fumarase and malate dehydrogenase antisense plants. Data are normalized to the mean response calculated for the wild type of each measure batch. Values are presented as the mean \pm SE of 6 biological determinations. The values that are significantly different by t test from the wild type are set in bold type ($P < 0.05$). Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | | F4 | | F6 | | MDH14 | | MDH21 | |
|----------------------------------|------|------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|
| | Fold | SE | Fold | SE | Fold | SE | Fold | SE | Fold | SE |
| Amino acids | | | | | | | | | | |
| Alanine | 1.00 | \pm 0.09 | 0.93 | \pm 0.08 | 1.85 | \pm 0.01 | 0.84 | \pm 0.10 | 0.68 | \pm 0.07 |
| Alanine, beta | 1.00 | \pm 0.19 | 0.83 | \pm 0.12 | 6.42 | \pm 0.06 | 1.42 | \pm 0.11 | 1.31 | \pm 0.10 |
| Asparagine | 1.00 | \pm 0.09 | 0.53 | \pm 0.06 | 3.18 | \pm 0.31 | 0.28 | \pm 0.03 | 0.38 | \pm 0.03 |
| Aspartic acid | 1.00 | \pm 0.05 | 0.87 | \pm 0.01 | 2.23 | \pm 0.05 | 0.69 | \pm 0.23 | 0.89 | \pm 0.05 |
| GABA | 1.00 | \pm 0.06 | 0.40 | \pm 0.03 | 4.96 | \pm 0.60 | 0.17 | \pm 0.01 | 0.56 | \pm 0.03 |
| Glutamine | 1.00 | \pm 0.01 | 1.13 | \pm 0.16 | 1.97 | \pm 0.17 | 1.89 | \pm 0.18 | 1.47 | \pm 0.13 |
| Glycine | 1.00 | \pm 0.14 | 1.76 | \pm 0.15 | 7.07 | \pm 0.53 | 3.01 | \pm 0.23 | 1.26 | \pm 0.22 |
| Isoleucine | 1.00 | \pm 0.09 | 1.59 | \pm 0.04 | 5.37 | \pm 0.40 | 0.59 | \pm 0.07 | 0.85 | \pm 0.15 |
| Methionine | 1.00 | \pm 0.09 | 0.65 | \pm 0.11 | 2.70 | \pm 0.10 | 0.61 | \pm 0.06 | 0.90 | \pm 0.10 |
| Phenylalanine | 1.00 | \pm 0.08 | 0.95 | \pm 0.05 | 3.50 | \pm 0.13 | 0.34 | \pm 0.03 | 0.56 | \pm 0.10 |
| Serine | 1.00 | \pm 0.06 | 1.74 | \pm 0.05 | 5.41 | \pm 0.17 | 0.42 | \pm 0.04 | 0.83 | \pm 0.03 |
| Threonine | 1.00 | \pm 0.07 | 1.67 | \pm 0.16 | 7.28 | \pm 0.60 | 0.68 | \pm 0.05 | 0.77 | \pm 0.12 |
| Tryptophan | 1.00 | \pm 0.08 | 1.04 | \pm 0.09 | 6.20 | \pm 0.78 | 0.90 | \pm 0.12 | 1.79 | \pm 0.18 |
| Valine | 1.00 | \pm 0.11 | 1.43 | \pm 0.19 | 6.15 | \pm 0.20 | 0.70 | \pm 0.09 | 0.50 | \pm 0.07 |
| Organic acids | | | | | | | | | | |
| Citric acid | 1.00 | \pm 0.06 | 0.85 | \pm 0.07 | 1.03 | \pm 0.04 | 1.34 | \pm 0.08 | 0.96 | \pm 0.03 |
| Fumaric acid | 1.00 | \pm 0.08 | 0.52 | \pm 0.00 | 0.54 | \pm 0.01 | 2.23 | \pm 0.07 | 2.23 | \pm 0.08 |
| Glyceric acid | 1.00 | \pm 0.10 | 0.93 | \pm 0.06 | 1.22 | \pm 0.03 | 1.12 | \pm 0.14 | 1.03 | \pm 0.15 |
| Malic acid | 1.00 | \pm 0.07 | 0.58 | \pm 0.01 | 0.62 | \pm 0.01 | 1.66 | \pm 0.07 | 1.51 | \pm 0.04 |
| Threonic acid | 1.00 | \pm 0.14 | 0.71 | \pm 0.06 | 0.89 | \pm 0.06 | 1.19 | \pm 0.13 | 0.90 | \pm 0.13 |
| Sugars and Sugars alcohol | | | | | | | | | | |
| Fructose | 1.00 | \pm 0.05 | 0.76 | \pm 0.02 | 1.24 | \pm 0.03 | 1.29 | \pm 0.05 | 1.70 | \pm 0.11 |
| Glucose | 1.00 | \pm 0.04 | 0.76 | \pm 0.04 | 0.86 | \pm 0.07 | 1.08 | \pm 0.08 | 1.23 | \pm 0.08 |
| Raffinose | 1.00 | \pm 0.09 | 1.33 | \pm 0.10 | 1.59 | \pm 0.03 | 0.85 | \pm 0.08 | 0.90 | \pm 0.14 |
| Sucrose | 1.00 | \pm 0.02 | 0.69 | \pm 0.04 | 0.72 | \pm 0.03 | 0.65 | \pm 0.03 | 1.16 | \pm 0.08 |
| Xylose | 1.00 | \pm 0.03 | 1.09 | \pm 0.05 | 1.18 | \pm 0.07 | 1.25 | \pm 0.08 | 1.13 | \pm 0.11 |
| Miscellaneous | | | | | | | | | | |
| Inositol, myo | 1.00 | \pm 0.07 | 1.16 | \pm 0.10 | 1.18 | \pm 0.16 | 1.32 | \pm 0.10 | 0.94 | \pm 0.07 |
| Inositol-1P | 1.00 | \pm 0.02 | 0.95 | \pm 0.01 | 0.97 | \pm 0.01 | 1.00 | \pm 0.03 | 1.01 | \pm 0.04 |
| Phosphoric acid | 1.00 | \pm 0.07 | 1.98 | \pm 0.08 | 1.25 | \pm 0.15 | 0.34 | \pm 0.05 | 0.87 | \pm 0.05 |

Supplemental Table 18. Pigment content during fruit development in the mitochondrial fumarase lines. Values are presented as the mean \pm SE of 3 biological determinations. The values that are significantly different by *t* test from the wild type are set in bold type ($P < 0.05$). nd means not determined. Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | F7 | F4 | F6 |
|-------------------|-----------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 20 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 1.50 \pm 0.10 | 1.29 | 1.43 \pm 0.00 | 2.12 \pm 0.00 |
| Violaxanthin | 1.68 \pm 0.16 | 1.41 | 1.40 \pm 0.00 | 1.91 \pm 0.00 |
| Antheraxanthin | 1.31 \pm 0.17 | 1.41 \pm 0.18 | 1.33 \pm 0.08 | 1.31 \pm 0.06 |
| Lutein | 5.51 \pm 0.57 | 5.89 \pm 1.04 | 5.54 \pm 0.50 | 5.89 \pm 0.53 |
| Chlorophyll b | 14.97 \pm 1.37 | 15.13 \pm 2.45 | 13.45 \pm 1.80 | 14.10 \pm 1.40 |
| Chlorophyll a | 39.99 \pm 3.19 | 37.64 \pm 4.91 | 37.16 \pm 4.55 | 38.76 \pm 2.17 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 7.44 \pm 0.56 | 7.52 \pm 0.43 | 7.13 \pm 0.27 | 9.72 \pm 1.49 |
| 35 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 0.76 \pm 0.13 | 0.60 \pm 0.04 | 0.82 \pm 0.14 | 0.79 \pm 0.10 |
| Violaxanthin | 1.01 \pm 0.05 | 0.81 \pm 0.15 | 1.01 \pm 0.01 | 1.04 \pm 0.04 |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 2.09 \pm 0.28 | 2.01 \pm 0.04 | 2.52 \pm 0.41 | 2.57 \pm 0.21 |
| Chlorophyll b | 5.70 \pm 1.26 | 5.15 \pm 0.24 | 6.51 \pm 1.21 | 7.32 \pm 0.82 |
| Chlorophyll a | 14.28 \pm 1.68 | 14.53 \pm 0.42 | 18.29 \pm 2.91 | 19.34 \pm 2.16 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 2.59 \pm 0.46 | 3.09 \pm 0.39 | 4.22 \pm 1.36 | 3.72 \pm 0.76 |
| 48 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 0.73 \pm 0.17 | 0.71 \pm 0.18 | 0.51 \pm 0.00 | 0.59 \pm 0.13 |
| Violaxanthin | 0.95 \pm 0.18 | 0.75 \pm 0.00 | 1.22 \pm 0.02 | 0.66 \pm 0.05 |
| Antheraxanthin | 1.21 \pm 0.03 | 1.36 \pm 0.08 | 0.94 \pm 0.01 | 1.44 \pm 0.01 |
| Lutein | 2.27 \pm 0.78 | 2.43 \pm 0.99 | 1.83 \pm 0.18 | 2.14 \pm 0.19 |
| Chlorophyll b | 6.83 \pm 0.52 | 4.22 \pm 0.42 | 3.44 \pm 0.60 | 4.68 \pm 0.56 |
| Chlorophyll a | 16.32 \pm 2.69 | 16.22 \pm 4.69 | 7.50 \pm 0.84 | 12.99 \pm 2.11 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 3.89 \pm 0.75 | 2.99 \pm 1.10 | 6.85 \pm 0.84 | 2.53 \pm 0.02 |
| 56 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | nd | nd | nd | nd |
| Violaxanthin | 0.38 \pm 0.01 | 0.42 \pm 0.00 | 0.29 \pm 0.03 | 0.53 \pm 0.10 |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 1.49 \pm 0.09 | 1.61 \pm 0.40 | 1.67 \pm 0.04 | 1.28 \pm 0.13 |
| Chlorophyll b | nd | nd | nd | nd |
| Chlorophyll a | 0.68 \pm 0.08 | 0.76 \pm 0.00 | 0.65 \pm 0.00 | 0.48 \pm 0.02 |
| Lycopene | 8.64 \pm 1.30 | 11.67 \pm 1.33 | 10.66 \pm 2.63 | 6.39 \pm 0.65 |
| β -carotene | 9.09 \pm 0.90 | 8.55 \pm 0.82 | 8.43 \pm 0.53 | 7.13 \pm 0.21 |
| 65 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | nd | nd | nd | nd |
| Violaxanthin | nd | nd | nd | nd |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 1.35 \pm 0.29 | 1.40 \pm 0.16 | 0.90 \pm 0.10 | 0.97 \pm 0.04 |
| Chlorophyll b | nd | nd | nd | nd |
| Chlorophyll a | 0.66 \pm 0.06 | 1.28 \pm 0.36 | 0.57 \pm 0.07 | 1.40 \pm 0.58 |
| Lycopene | 12.82 \pm 1.26 | 12.93 \pm 1.37 | 9.39 \pm 1.74 | 8.32 \pm 0.79 |
| β -carotene | 8.88 \pm 1.18 | 6.41 \pm 0.11 | 6.86 \pm 1.26 | 6.24 \pm 0.63 |

Supplemental Table 19. Pigment content during fruit development in the mitochondrial malate dehydrogenase lines. Values are presented as the mean \pm SE of 3 biological determinations. The values that are significantly different by *t* test from the wild type are set in bold type ($P < 0.05$). nd means not determined. Red and blue indicate values that are significantly increased or decreased, respectively.

| | WT | M23 | M21 | M14 |
|-------------------|-----------------------|------------------------------------|-----------------------------------|------------------------------------|
| 20 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 1.38 \pm 0.16 | 0.97 \pm 0.13 | 1.20 \pm 0.02 | 1.47 \pm 0.24 |
| Violaxanthin | 1.63 \pm 0.14 | 1.36 \pm 0.19 | 1.32 \pm 0.21 | 1.51 \pm 0.15 |
| Antheraxanthin | 1.07 \pm 0.05 | 0.98 \pm 0.04 | 1.09 \pm 0.05 | 1.03 \pm 0.05 |
| Lutein | 4.85 \pm 0.65 | 3.74 \pm 0.42 | 4.66 \pm 0.15 | 6.02 \pm 0.90 |
| Chlorophyll b | 15.10 \pm 2.22 | 9.52 \pm 1.26 | 12.01 \pm 0.31 | 15.61 \pm 2.53 |
| Chlorophyll a | 39.96 \pm 5.40 | 27.21 \pm 3.67 | 33.21 \pm 0.83 | 42.63 \pm 5.49 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 6.63 \pm 0.92 | 5.19 \pm 0.70 | 6.23 \pm 0.16 | 8.25 \pm 0.96 |
| 35 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 0.66 \pm 0.07 | 0.55 \pm 0.06 | 0.66 \pm 0.06 | 0.42 \pm 0.01 |
| Violaxanthin | 0.93 \pm 0.12 | 1.04 \pm 0.15 | 0.70 \pm 0.03 | 0.52 \pm 0.02 |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 2.23 \pm 0.08 | 2.12 \pm 0.12 | 2.15 \pm 0.24 | 1.48 \pm 0.06 |
| Chlorophyll b | 6.75 \pm 0.09 | 5.01 \pm 0.57 | 6.69 \pm 0.93 | 3.97 \pm 0.21 |
| Chlorophyll a | 17.66 \pm 0.02 | 12.95 \pm 1.54 | 17.17 \pm 2.34 | 11.06 \pm 0.52 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 2.83 \pm 0.07 | 3.40 \pm 0.49 | 2.92 \pm 0.50 | 1.99 \pm 0.12 |
| 48 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | 0.64 \pm 0.04 | 0.42 \pm 0.04 | 0.45 \pm 0.01 | 0.47 \pm 0.07 |
| Violaxanthin | 1.18 \pm 0.06 | 0.84 \pm 0.09 | 0.93 \pm 0.07 | 1.01 \pm 0.20 |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 2.11 \pm 0.02 | 1.57 \pm 0.00 | 1.75 \pm 0.05 | 1.73 \pm 0.31 |
| Chlorophyll b | 5.30 \pm 0.41 | 3.43 \pm 0.32 | 3.20 \pm 0.39 | 3.19 \pm 0.88 |
| Chlorophyll a | 14.64 \pm 0.66 | 9.11 \pm 1.05 | 8.91 \pm 1.01 | 9.07 \pm 2.14 |
| Lycopene | nd | nd | nd | nd |
| β -carotene | 2.59 \pm 0.04 | 2.31 \pm 0.32 | 3.63 \pm 1.08 | 4.40 \pm 1.49 |
| 56 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | nd | nd | nd | nd |
| Violaxanthin | 0.25 \pm 0.01 | 0.43 \pm 0.01 | 0.36 \pm 0.03 | nd |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 1.13 \pm 0.03 | 1.55 \pm 0.14 | 1.33 \pm 0.25 | 1.01 \pm 0.08 |
| Chlorophyll b | nd | nd | nd | nd |
| Chlorophyll a | 0.50 \pm 0.06 | 1.92 \pm 0.26 | 0.90 \pm 0.44 | nd |
| Lycopene | 4.97 \pm 0.91 | 4.20 \pm 0.40 | 8.62 \pm 3.40 | 10.08 \pm 0.95 |
| β -carotene | 6.04 \pm 0.40 | 6.66 \pm 0.33 | 6.83 \pm 0.27 | 5.98 \pm 0.14 |
| 65 DAF | | | | |
| | mg g ⁻¹ FW | | | |
| Neoxanthin | nd | nd | nd | nd |
| Violaxanthin | nd | nd | nd | nd |
| Antheraxanthin | nd | nd | nd | nd |
| Lutein | 1.32 \pm 0.22 | 1.32 \pm 0.11 | 1.06 \pm 0.12 | 1.10 \pm 0.10 |
| Chlorophyll b | nd | nd | nd | nd |
| Chlorophyll a | 0.56 \pm 0.06 | 0.50 \pm 0.00 | 0.51 \pm 0.00 | 0.51 \pm 0.00 |
| Lycopene | 5.80 \pm 0.45 | 7.62 \pm 0.48 | 7.93 \pm 0.36 | 8.24 \pm 0.42 |
| β -carotene | 9.61 \pm 1.32 | 8.66 \pm 0.36 | 7.09 \pm 0.50 | 7.17 \pm 0.24 |