**Table S1. The amino acid makeup of proteins of rice coleoptiles grown in normoxic (aerated), hypoxic (3% $O_2$) and anoxic ($N_2$) solution.** *O. sativa* (cv. Amaroo) seeds were de-hulled and surface sterilised. Seeds were grown in 2 L of solution with 3% $O_2$, $N_2$ or atmosphere (aerated) gas bubbled though the solution at 0.2 L $h^{-1}$. Coleoptiles were collected at 3 d after imbibition, freeze dried and powdered. Amino acid make-up of total protein was determined by the Australian Proteome Analysis Facility.

| | ***anoxic*** | | ***hypoxic*** | | ***normoxic*** | |
|---|---|---|---|---|---|---|
| **Amino acid** | *Amino acid content (mg $g^{-1}$)* | *% by weight* | *Amino acid content (mg $g^{-1}$)* | *% by weight* | *Amino acid content (mg $g^{-1}$)* | *% by weight* |
| Histidine | 3.7 | 1.9 | 5.8 | 1.9 | 3.7 | 2.0 |
| Serine | 7.6 | 6.1 | 11.7 | 6.0 | 7.8 | 6.7 |
| Arginine | 10.3 | 4.6 | 16.5 | 4.8 | 10.0 | 4.8 |
| Glycine | 8.7 | 10.6 | 13.1 | 10.4 | 7.3 | 9.6 |
| Aspartic acid | 14.2 | 8.6 | 21.7 | 8.5 | 18.4 | 12.0 |
| Glutamic acid | 18.6 | 10.1 | 28.9 | 10.1 | 20.6 | 12.0 |
| Threonine | 6.6 | 4.6 | 10.1 | 4.5 | 7.0 | 5.2 |
| Alanine | 18.0 | 17.8 | 30.1 | 19.1 | 9.4 | 10.0 |
| Proline | 7.6 | 5.5 | 11.1 | 5.2 | 7.1 | 5.5 |
| Lysine | 10.1 | 5.5 | 15.0 | 5.3 | 10.3 | 6.1 |
| Tyrosine | 5.1 | 2.2 | 7.5 | 2.1 | 4.4 | 2.0 |
| Methionine | 2.8 | 1.5 | 4.5 | 1.5 | 2.9 | 1.7 |
| Valine | 9.1 | 6.4 | 13.9 | 6.3 | 8.9 | 6.8 |
| Isoleucine | 6.2 | 3.8 | 9.5 | 3.8 | 6.4 | 4.3 |
| Leucine | 11.9 | 7.3 | 18.0 | 7.2 | 11.9 | 7.9 |
| Phenylalanine | 7.3 | 3.5 | 11.2 | 3.4 | 7.0 | 3.6 |
| **TOTAL** | 147.9 | 100.0 | 228.5 | 100.0 | 143.2 | 100.0 |

**Table S2. Free amino acid content of rice coleoptiles grown in normoxic (aerated), hypoxic (3% $O_2$) and anoxic ($N_2$) solution.** *O. sativa* (cv. Amaroo) seeds were de-hulled and surface sterilised. Seeds were grown in 2 L of solution with 3% $O_2$, $N_2$ or atmosphere (aerated) gas bubbled though the solution at 0.2 L $h^{-1}$. Coleoptiles were collected at 3 d after imbibition, freeze dried and powdered. Free amino acid make-up of each sample was determined by the Australian Proteome Analysis Facility.

| | ***anoxic*** | | ***hypoxic*** | | ***normoxic*** | |
|---|---|---|---|---|---|---|
| **Amino acid** | *Amino acid content (mg $g^{-1}$)* | *% by weight* | *Amino acid content (mg $g^{-1}$)* | *% by weight* | *Amino acid content (mg $g^{-1}$)* | *% by weight* |
| Histidine | 0.24 | 0.4 | 0.76 | 0.8 | 0.23 | 1.2 |
| Asparagine | 1.18 | 2.3 | 2.59 | 3.3 | 4.32 | 26.4 |
| Serine | 2.03 | 4.9 | 2.20 | 3.5 | 0.81 | 6.2 |
| Glutamine | 1.34 | 2.3 | 1.15 | 1.3 | 2.44 | 13.5 |
| Arginine | 0.37 | 0.5 | 1.37 | 1.3 | 0.16 | 0.7 |
| Glycine | 1.64 | 5.5 | 1.65 | 3.7 | 0.16 | 1.8 |
| Aspartic acid | 0.90 | 1.7 | 1.30 | 1.6 | 1.85 | 11.3 |
| Glutamic acid | 5.03 | 8.7 | 5.15 | 5.8 | 1.76 | 9.7 |
| Threonine | 0.31 | 0.7 | 0.82 | 1.1 | 0.45 | 3.0 |
| Alanine | 20.50 | 58.5 | 33.80 | 63.0 | 0.82 | 7.4 |
| Proline | 1.33 | 2.9 | 1.78 | 2.6 | 0.35 | 2.5 |
| Cysteine | 0.03 | 0.1 | 0.09 | 0.1 | 0.00 | 0.0 |
| Lysine | 0.29 | 0.5 | 0.59 | 0.7 | 0.26 | 1.4 |
| Tyrosine | 1.40 | 2.0 | 1.78 | 1.6 | 0.29 | 1.3 |
| Methionine | 0.24 | 0.4 | 0.43 | 0.5 | 0.09 | 0.5 |
| Valine | 1.65 | 3.6 | 2.21 | 3.1 | 0.83 | 5.7 |
| Isoleucine | 0.40 | 0.8 | 0.85 | 1.1 | 0.48 | 3.0 |
| Leucine | 1.29 | 2.5 | 2.49 | 3.2 | 0.48 | 3.0 |
| Phenylalanine | 1.00 | 1.5 | 1.70 | 1.7 | 0.26 | 1.3 |
| Tryptophan | 0.11 | 0.1 | 0.17 | 0.1 | 0.07 | 0.3 |
| Total | 41.26 | 100.0 | 62.89 | 100.0 | 16.10 | 100.0 |

**Table S3. Total DNA content and estimates of cell number of 3 d old coleoptiles grown in normoxic (aerated), hypoxic (3% $O_2$) and anoxic ($N_2$) solution.** *O. sativa* (cv. Amaroo) seeds were de-hulled and surface sterilised. Seeds were grown in 2 L of solution with 3% $O_2$, $N_2$ or atmosphere (aerated) gas bubbled though the solution at 0.2 L $h^{-1}$. Coleoptiles were collected at 3 d after imbibition, total DNA extracted by phenol-chloroform extraction and quantified spectrophotometrically. This total was used to estimate total cell number per coleoptile. Total cell number was also estimated based on the known dimensions of the coleoptile and cells within it (Wada, 1961).

| **Treatment** | *DNA Content (ng DNA per coleoptile)* | *Cell number (cells per coleoptile) by DNA content* | *Cell number (cells per coleoptile) By cell packing methods* |
|---|---|---|---|
| ***Normoxia*** | 1.2 ± 0.6 | 74000 ± 17000 | 78000 ± 12000 |
| ***Hypoxia*** | 1.1 ± 0.3 | 68000 ± 18000 | 59000 ± 13000 |
| ***Anoxia*** | 0.8 ± 0.1 | 50000 ± 6000 | 49000 ± 8000 |

**Table S4. PDC activity in the *O. sativa* PDC mutant and its parent line (*cv.* Nipponbare).** *O. sativa* seeds were de-hulled and surface sterilised. Seeds were grown in 2 L of solution with $N_2$ or gas bubbled though the solution at 0.2 L $h^{-1}$. Coleoptiles were collected at 3 d after imbibition, total protein extracted and PDC activity determined as per Gibbs *et al*. (2000).

| Line | PDC Activity (nmol NADH $g^{-1}$ (FW) $min^{-1}$) |
|---|---|
| PDC mutant | 50 ± 14 |
| Nipponbare | 245 ± 39 |