**Table S1:** Fold change of differentially expressed metabolites between the hypocotyl-cotyledon of DDS and the hypocotyl-cotyledon of DDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | D-Aspartic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 14.655 |  |
| 2 | L-Aspartate | Organic acids and derivatives | Amino acids, peptides, and analogues | 9.733 |  |
| 3 | Gly-Arg | Dipeptide |  | 7.338 |  |
| 4 | Triethanolamine | Organic nitrogen compounds | Amines | 3.249 |  |
| 5 | Dopamine | Benzenoids | Benzenediols | 3.025 |  |
| 6 | 1-Palmitoylglycerol | Lipids and lipid-like molecules |  | 2.776 |  |
| 7 | Glutaraldehyde | Therapeutic category of drugs in Japan |  | 2.706 |  |
| 8 | Arg-Glu | Dipeptide |  | 2.632 |  |
| 9 | L-Isoleucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.595 |  |
| 10 | Ser-Arg | Dipeptide |  | 2.567 |  |
| 11 | Zidovudine | Anatomical Therapeutic Chemical (ATC) classification |  | 2.385 |  |
| 12 | (-)-Epicatechin | Phenylpropanoids and polyketides |  | 2.384 |  |
| 13 | 2-Hydroxy-5-methoxybenzoic acid | Phenylpropanoids and polyketides |  | 2.336 |  |
| 14 | Ser-Lys | Dipeptide |  | 2.303 |  |
| 15 | Homogentisic acid | Benzenoids | Phenylacetic acids | 2.292 |  |
| 16 | L-Pyroglutamic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.272 |  |
| 17 | L-Glutamine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.262 |  |
| 18 | L-Sorbose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.196 |  |
| 19 | Thymine | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 2.177 |  |
| 20 | L-Asparagine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.161 |  |
| 21 | Phloretin | Phenylpropanoids and polyketides | Chalcones and dihydrochalcones | 2.105 |  |
| 22 | (+)-Catechin | Phenylpropanoids and polyketides |  | 2.070 |  |
| 23 | S-Methyl-5'-thioadenosine | Nucleosides, nucleotides, and analogues | 5'-deoxy-5'-thionucleosides | 2.048 |  |
| 24 | Acetylglycine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.916 |  |
| 25 | Dioctyl phthalate | Unclassified |  | 1.867 |  |
| 26 | L-Serine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.848 |  |
| 27 | Thymidine | Nucleosides, nucleotides, and analogues | Pyrimidine 2'-deoxyribonucleosides | 1.839 |  |
| 28 | Stearidonic Acid | Lipids and lipid-like molecules |  | 1.822 |  |
| 29 | Cytidine 5'-diphosphocholine (CDP-choline) | Nucleosides, nucleotides, and analogues | Pyrimidine ribonucleotides | 1.820 |  |
| 30 | His-Glu | Dipeptide |  | 1.752 |  |
| 31 | L-Tryptophan | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.750 |  |
| 32 | L-Glutamate | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.748 |  |
| 33 | .alpha.-D-(+)-Talose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.773 |
| 34 | N2,N2-Dimethylguanosine | Nucleosides, nucleotides, and analogues |  |  | 1.828 |
| 35 | Raffinose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.832 |
| 36 | 3.alpha.-Mannobiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.927 |
| 37 | D-(+)-Melibiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.053 |
| 38 | Nicotinate | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives |  | 2.160 |
| 39 | N-Acetyl-D-phenylalanine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 2.242 |
| 40 | Phosphorylcholine | Organic nitrogen compounds | Quaternary ammonium salts |  | 2.252 |
| 41 | 1,3,5-Benzenetriol | Anatomical Therapeutic Chemical (ATC) classification |  |  | 2.257 |
| 42 | Stachyose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.625 |
| 43 | myo-Inositol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.882 |
| 44 | Galactinol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 3.049 |
| 45 | O-Phosphoethanolamine | Organic acids and derivatives | Phosphate esters |  | 3.534 |

* Note: DDS represents seeds with deeper primary physiological dormancy, while DDS2 denotes DDS incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the hypocotyl-cotyledon of DDS2 compared to DDS. Fold increase indicates a higher concentration in the hypocotyl-cotyledon of DDS2, whereas fold decrease indicates a higher concentration in the hypocotyl-cotyledon of DDS.

**Table S2:** Fold change of differentially expressed metabolites between the radicle of DDS and the radicle of DDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | L-Isoleucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 4.290 |  |
| 2 | 2'-Deoxy-D-ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 3.531 |  |
| 3 | (-)-Epicatechin | Phenylpropanoids and polyketides | Phenylpropanoids and polyketides | 3.526 |  |
| 4 | Glutathione disulfide | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.907 |  |
| 5 | L-Sorbose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.592 |  |
| 6 | L-Glutamine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.584 |  |
| 7 | L-Tryptophan | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.502 |  |
| 8 | L-Phenylalanine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.457 |  |
| 9 | L-Glutamate | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.408 |  |
| 10 | Tyramine | Benzenoids | Phenethylamines | 2.255 |  |
| 11 | D-Sorbitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.222 |  |
| 12 | Quinate | Organic oxygen compounds | Alcohols and polyols | 2.062 |  |
| 13 | L-Pyroglutamic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.947 |  |
| 14 | L-Fucose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.888 |  |
| 15 | Homocitrate | Organic acids and derivatives | Tricarboxylic acids and derivatives | 1.831 |  |
| 16 | L-Tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.772 |  |
| 17 | Citrate | Organic acids and derivatives | Tricarboxylic acids and derivatives | 1.751 |  |
| 18 | L-Histidine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.700 |  |
| 19 | Argininosuccinic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.617 |  |
| 20 | L-Malic acid | Organic acids and derivatives | Beta hydroxy acids and derivatives | 1.359 |  |
| 21 | D-Mannose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.215 |  |
| 22 | Betaine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.335 |
| 23 | L-Pipecolic acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.383 |
| 24 | 3-Methylhistidine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.479 |
| 25 | 3.alpha.-Mannobiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.508 |
| 26 | D-(+)-Melibiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.639 |
| 27 | Phosphorylcholine | Organic nitrogen compounds | Quaternary ammonium salts |  | 1.901 |
| 28 | Dihomo-gamma-Linolenic Acid | Lipids and lipid-like molecules | Lipids and lipid-like molecules |  | 1.901 |
| 29 | myo-Inositol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.905 |
| 30 | Galactinol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.938 |
| 31 | Linoleic acid | Lipids and lipid-like molecules | Lineolic acids and derivatives |  | 2.012 |
| 32 | 1-Palmitoyl-2-linoleoyl-sn-glycero-3-phosphate | Lipids and lipid-like molecules | Lipids and lipid-like molecules |  | 2.151 |
| 33 | Glycerophosphocholine | Lipids and lipid-like molecules | Glycerophosphocholines |  | 2.268 |
| 34 | Nicotinate | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives |  | 2.381 |
| 35 | alpha-ketoglutarate | Organic acids and derivatives | Gamma-keto acids and derivatives |  | 4.545 |

* Note: DDS represents seeds with deeper primary physiological dormancy, while DDS2 denotes DDS incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the radicle of DDS2 compared to DDS. Fold increase indicates a higher concentration in the radicle of DDS2, whereas fold decrease indicates a higher concentration in the radicle of DDS.

**Table S3:** Fold change of differentially expressed metabolites between the hypocotyl-cotyledon of DDS2 and the radicle of DDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | Glycerophosphocholine | Lipids and lipid-like molecules | Glycerophosphocholines | 23.597 |  |
| 2 | Isopimaric acid | Lipids and lipid-like molecules |  | 16.960 |  |
| 3 | D-Aspartic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 10.645 |  |
| 4 | L-Aspartate | Organic acids and derivatives | Amino acids, peptides, and analogues | 9.565 |  |
| 5 | 1-Palmitoyl-2-linoleoyl-sn-glycero-3-phosphate | Lipids and lipid-like molecules |  | 7.101 |  |
| 6 | Linoleic acid | Lipids and lipid-like molecules | Lineolic acids and derivatives | 5.467 |  |
| 7 | Thiamine | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 2.953 |  |
| 8 | Thioetheramide-PC | Lipids and lipid-like molecules |  | 2.839 |  |
| 9 | PC(16:0/16:0) | Lipids and lipid-like molecules | Glycerophosphocholines | 2.566 |  |
| 10 | Nicotinate | Nucleosides, nucleotides, and analogues | Pyridinecarboxylic acids and derivatives | 2.321 |  |
| 11 | S-Methyl-5'-thioadenosine | Organoheterocyclic compounds | 5'-deoxy-5'-thionucleosides | 2.321 |  |
| 12 | Dihomo-gamma-Linolenic Acid | Lipids and lipid-like molecules |  | 2.269 |  |
| 13 | Linoleoyl ethanolamide | Organic nitrogen compounds | Amines | 2.209 |  |
| 14 | 1-Palmitoyl-2-hydroxy-sn-glycero-3-phosphoethanolamine | Lipids and lipid-like molecules |  | 2.045 |  |
| 15 | Betaine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.513 |  |
| 16 | MG(18:2(9Z,12Z)/0:0/0:0)[rac] | Lipids and lipid-like molecules | Glycerophosphocholines | 1.366 |  |
| 17 | L-Histidine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.218 |
| 18 | Uracil | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives |  | 1.287 |
| 19 | Dihydro-4,4-dimethyl-2,3-furandione | Unclassified |  |  | 1.316 |
| 20 | L-Malic acid | Organic acids and derivatives | Beta hydroxy acids and derivatives |  | 1.339 |
| 21 | Galactinol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.376 |
| 22 | Argininosuccinic acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.524 |
| 23 | L-Pyroglutamic acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.634 |
| 24 | L-Glutamate | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.669 |
| 25 | L-Sorbose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.736 |
| 26 | Citrate | Organic acids and derivatives | Tricarboxylic acids and derivatives |  | 1.812 |
| 27 | Quinate | Organic oxygen compounds | Alcohols and polyols |  | 5.747 |
| 28 | D-Sorbitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 6.410 |
| 29 | 5-Hydroxyhexanoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 6.897 |
| 30 | 2'-Deoxy-D-ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 7.407 |
| 31 | D-Mannitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 11.364 |
| 32 | Shikimate | Organic oxygen compounds | Alcohols and polyols |  | 12.500 |
| 33 | L-Fucose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 16.129 |
| 34 | (-)-Epicatechin | Phenylpropanoids and polyketides | Phenylpropanoids and polyketides |  | 16.949 |
| 35 | Ribitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 18.868 |
| 36 | Arg-Thr | Dipeptide |  |  | 37.037 |
| 37 | Homogentisic acid | Benzenoids | Phenylacetic acids |  | 62.500 |
| 38 | 2-Hydroxy-5-methoxybenzoic acid | Phenylpropanoids and polyketides | Carboxylic acids |  | 142.857 |

* Note: DDS2 represents seeds with deeper primary physiological dormancy incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the hypocotyl-cotyledon of DDS2 compared to those in the radicle of DDS2. Fold increase indicates a higher concentration in the hypocotyl-cotyledon, whereas fold decrease indicates a higher concentration in radicle.

**Table S4:** Fold change of differentially expressed metabolites between the hypocotyl-cotyledon of RDS and the hypocotyl-cotyledon of RDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NO.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | 5-Amino-5-deoxy-3-dehydroshikimate | Organic oxygen compounds | Alcohols and polyols | 4.413 |  |
| 2 | S-Methyl-5'-thioadenosine | Nucleosides, nucleotides, and analogues | 5'-deoxy-5'-thionucleosides | 4.372 |  |
| 3 | Eicosapentaenoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 4.033 |  |
| 4 | APIIN | Phenylpropanoids and polyketides | Flavonoid glycosides | 3.883 |  |
| 5 | (+)-Catechin | Phenylpropanoids and polyketides |  | 3.823 |  |
| 6 | N-Acetylvaline | Organic acids and derivatives | Amino acids, peptides, and analogues | 3.701 |  |
| 7 | 1,4-Dihydroxybenzene | Unclassified |  | 3.482 |  |
| 8 | 15-keto-PGE1 | Lipids and lipid-like molecules |  | 3.335 |  |
| 9 | L-Iditol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 3.237 |  |
| 10 | Uracil | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 3.179 |  |
| 11 | Procyanidin B2 | Phenylpropanoids and polyketides | Biflavonoids and polyflavonoids | 3.054 |  |
| 12 | Threonic acid | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.964 |  |
| 13 | Hesperetin | Phenylpropanoids and polyketides |  | 2.657 |  |
| 14 | Allantoin | Organoheterocyclic compounds | Imidazoles | 2.623 |  |
| 15 | D-Proline | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.596 |  |
| 16 | N-Acetylmannosamine | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.544 |  |
| 17 | L-Isoleucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.501 |  |
| 18 | Dopamine | Benzenoids | Benzenediols | 2.417 |  |
| 19 | 1-Aminocyclopropanecarboxylic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.414 |  |
| 20 | 4-Hydroxybenzoate | Benzenoids | Benzoic acids and derivatives | 2.410 |  |
| 21 | CDP-choline | Nucleosides, nucleotides, and analogues | Pyrimidine ribonucleotides | 2.357 |  |
| 22 | 2-hydroxy-butanoic acid | Lipids and lipid-like molecules |  | 2.349 |  |
| 23 | Diethanolamine | Organic nitrogen compounds | Amines | 2.345 |  |
| 24 | Argininosuccinic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.315 |  |
| 25 | Salicylic acid | Benzenoids | Benzoic acids and derivatives | 2.290 |  |
| 26 | Tyramine | Benzenoids | Phenethylamines | 2.258 |  |
| 27 | N-Acetyl-L-tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.253 |  |
| 28 | 4-Hydroxycinnamic acid | Phenylpropanoids and polyketides | Hydroxycinnamic acids and derivatives | 2.216 |  |
| 29 | L-Leucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.128 |  |
| 30 | 4-Aminobutyric acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.058 |  |
| 31 | PC(20:5(5Z,8Z,11Z,14Z,17Z)/20:5(5Z,8Z,11Z,14Z,17Z)) | Lipids and lipid-like molecules |  | 2.020 |  |
| 32 | gamma-Glutamylmethionine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.008 |  |
| 33 | Linustatin | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.003 |  |
| 34 | L-Serine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.995 |  |
| 35 | L-Arabinono-1,4-lactone | Unclassified |  | 1.993 |  |
| 36 | D-Aspartic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.983 |  |
| 37 | Phenol | Benzenoids | 1-hydroxy-4-unsubstituted benzenoids | 1.919 |  |
| 38 | Arg-Thr | Dipeptide |  | 1.901 |  |
| 39 | L-Cystine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.888 |  |
| 40 | N,N-Dimethylarginine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.821 |  |
| 41 | trans-2-Hydroxycinnamic acid | Phenylpropanoids and polyketides |  | 1.816 |  |
| 42 | 1-Palmitoyl-2-hydroxy-sn-glycero-3-phosphoethanolamine | Lipids and lipid-like molecules |  | 1.806 |  |
| 43 | Stearidonic Acid | Lipids and lipid-like molecules |  | 1.792 |  |
| 44 | 1,3-Benzenediol | Anatomical Therapeutic Chemical (ATC) classification |  | 1.779 |  |
| 45 | 1,3,5-Benzenetriol | Anatomical Therapeutic Chemical (ATC) classification |  | 1.775 |  |
| 46 | 4-Androsten-17.beta.-ol-3-one glucosiduronate | Unclassified |  | 1.714 |  |
| 47 | hydrocortisone 21-acetate | Lipids and lipid-like molecules |  | 1.706 |  |
| 48 | L-Pyroglutamic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.674 |  |
| 49 | Adenine | Nucleosides, nucleotides, and analogues |  | 1.662 |  |
| 50 | Tetracosanoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.662 |  |
| 51 | 2-Phenylacetamide | Unclassified |  | 1.662 |  |
| 52 | Trigonelline | Alkaloids and derivatives |  | 1.655 |  |
| 53 | L-Tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.649 |  |
| 54 | alpha-ketoisovaleric acid | Organic acids and derivatives | Short-chain keto acids and derivatives | 1.647 |  |
| 55 | NAD | Nucleosides, nucleotides, and analogues |  | 1.630 |  |
| 56 | N-Methyl-D-aspartic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.592 |  |
| 57 | Glutathione disulfide | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.586 |  |
| 58 | L-Threonine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.568 |  |
| 59 | Perseitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.534 |  |
| 60 | D-Pinitol | Organic oxygen compounds | Alcohols and polyols | 1.534 |  |
| 61 | Juniperic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.527 |  |
| 62 | Glycerol 3-phosphate | Lipids and lipid-like molecules | Glycerophosphates | 1.484 |  |
| 63 | L-Arginine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.473 |  |
| 64 | 1-Acyl-sn-glycerol 3-phosphate | Lipids and lipid-like molecules |  | 1.449 |  |
| 65 | Arg-Cys | Dipeptide |  | 1.445 |  |
| 66 | Anthranilic acid | Benzenoids | Benzoic acids and derivatives | 1.444 |  |
| 67 | 2-Ethoxyethanol | Organic oxygen compounds | Ethers | 1.441 |  |
| 68 | D-Ribose 5-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.423 |  |
| 69 | 3-(2-Hydroxyethyl)indole | Organoheterocyclic compounds |  | 1.412 |  |
| 70 | Indole | Organoheterocyclic compounds | Indoles | 1.388 |  |
| 71 | UDP-D-Galactose | Nucleosides, nucleotides, and analogues | Pyrimidine nucleotide sugars | 1.385 |  |
| 72 | L-Glutamine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.379 |  |
| 73 | DL-O-tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.366 |  |
| 74 | L-Proline | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.358 |  |
| 75 | Indoleacrylic acid | Organoheterocyclic compounds | Indoles | 1.355 |  |
| 76 | MG(18:2(9Z,12Z)/0:0/0:0)[rac] | Lipids and lipid-like molecules |  | 1.354 |  |
| 77 | Tricosanoic acid | Lipids and lipid-like molecules |  | 1.347 |  |
| 78 | Indolelactic acid | Organoheterocyclic compounds |  | 1.345 |  |
| 79 | Atrolactic acid | Lipids and lipid-like molecules |  | 1.338 |  |
| 80 | Linoleic acid | Lipids and lipid-like molecules | Lineolic acids and derivatives | 1.315 |  |
| 81 | Pro-Gly | Dipeptide |  | 1.287 |  |
| 82 | L-Tryptophan | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.284 |  |
| 83 | 5-Methylcytosine | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 1.256 |  |
| 84 | 3-Methylindole | Organoheterocyclic compounds | Indoles | 1.253 |  |
| 85 | L-Citrulline | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.249 |  |
| 86 | N-Acetyl-D-glucosamine | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.208 |  |
| 87 | Glutaraldehyde | Unclassified |  | 1.196 |  |
| 88 | L-Valine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.188 |  |
| 89 | 3-Methyluridine | Nucleosides, nucleotides, and analogues |  | 1.172 |  |
| 90 | 1-Oleoyl-L-.alpha.-lysophosphatidic acid | Lipids and lipid-like molecules |  | 1.167 |  |
| 91 | Adenosine | Nucleosides, nucleotides, and analogues |  | 1.159 |  |
| 92 | FAD | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.151 |  |
| 93 | Palmitic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.122 |
| 94 | D-Phenyllactic acid | Unclassified |  |  | 1.127 |
| 95 | Zeatin | Organoheterocyclic compounds | Purines and purine derivatives |  | 1.134 |
| 96 | Myristic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.181 |
| 97 | N-Acetyl-D-Glucosamine 6-Phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.189 |
| 98 | Azelaic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.202 |
| 99 | Ergothioneine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.205 |
| 100 | Uridine | Nucleosides, nucleotides, and analogues |  |  | 1.205 |
| 101 | 2-Methyl-3-hydroxybutyric acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.217 |
| 102 | Thiamine | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives |  | 1.230 |
| 103 | Miglitol | Anatomical Therapeutic Chemical (ATC) classification |  |  | 1.232 |
| 104 | D-(+)-Melibiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.242 |
| 105 | D-Fructose | Organic oxygen compounds | Monosaccharides |  | 1.245 |
| 106 | cis-9-Palmitoleic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.256 |
| 107 | Lactate | Organic acids and derivatives | Alpha hydroxy acids and derivatives |  | 1.269 |
| 108 | Mannose 6-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.285 |
| 109 | 3,3',4'5-Tetrahydroxystilbene | Organic oxygen compounds | Alcohols and polyols |  | 1.289 |
| 110 | Ser-Pro | Dipeptide |  |  | 1.294 |
| 111 | Nicotinate | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives |  | 1.342 |
| 112 | Xylitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.344 |
| 113 | N-Acetyl-glucosamine 1-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.353 |
| 114 | D-Mannose 1-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.359 |
| 115 | DL-2,4-Diaminobutyric acid | Unclassified |  |  | 1.361 |
| 116 | Vigabatrin | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.370 |
| 117 | Prunasin | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.437 |
| 118 | D-Ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.439 |
| 119 | UDP-N-acetylglucosamine | Nucleosides, nucleotides, and analogues | Pyrimidine nucleotide sugars |  | 1.443 |
| 120 | 3,3-Dimethylacrylic acid | Unclassified |  |  | 1.445 |
| 121 | Epimelibiose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.511 |
| 122 | m-Chlorohippuric acid | Unclassified |  |  | 1.527 |
| 123 | RU-0211 | Unclassified |  |  | 1.570 |
| 124 | 2-Dehydropantoyl lactone | Unclassified |  |  | 1.647 |
| 125 | Guanosine | Nucleosides, nucleotides, and analogues |  |  | 1.686 |
| 126 | Linoleoyl ethanolamide | Organic nitrogen compounds | Amines |  | 1.692 |
| 127 | Acetylcarnitine | Lipids and lipid-like molecules | Fatty acid esters |  | 1.764 |
| 128 | D-gluconate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.786 |
| 129 | Xanthosine | Nucleosides, nucleotides, and analogues |  |  | 1.792 |
| 130 | Raffinose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.792 |
| 131 | Homoveratric acid | Benzenoids | Methoxybenzenes |  | 1.812 |
| 132 | meso-Tartaric acid | Organic acids and derivatives |  |  | 1.862 |
| 133 | L-Gulonolactone | Organoheterocyclic compounds | Gamma butyrolactones |  | 1.873 |
| 134 | D-Chinovose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.887 |
| 135 | D-Glucose 6-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.916 |
| 136 | Inosine | Nucleosides, nucleotides, and analogues |  |  | 2.020 |
| 137 | N6-methyladenosine | Nucleosides, nucleotides, and analogues |  |  | 2.024 |
| 138 | Oxypurinol | Organoheterocyclic compounds | Purines and purine derivatives/Pyrimidines and pyrimidine derivatives |  | 2.028 |
| 139 | Galactinol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.110 |
| 140 | Nicotinamide | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives |  | 2.110 |
| 141 | Alpha-Linolenoyl ethanolamide | Organic nitrogen compounds | Amines |  | 2.114 |
| 142 | myo-Inositol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.262 |
| 143 | Stachyose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.364 |
| 144 | Lactose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.375 |
| 145 | Dihomo-gamma-Linolenoyl ethanolamide | Organic nitrogen compounds | Amines |  | 2.392 |
| 146 | N-Oleoylethanolamine | Organic nitrogen compounds | Amines |  | 2.433 |
| 147 | (+)-Abscisic acid | Lipids and lipid-like molecules | Sesquiterpenoids |  | 2.519 |
| 148 | Methylmalonic acid | Organic acids and derivatives | Dicarboxylic acids and derivatives |  | 2.577 |
| 149 | Homogentisic acid | Benzenoids | Phenylacetic acids |  | 3.448 |
| 150 | L-Pipecolic acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 3.521 |
| 151 | PC(16:0/16:0) | Lipids and lipid-like molecules | Glycerophosphocholines |  | 4.167 |
| 152 | Chenodeoxycholate | Lipids and lipid-like molecules | Bile acids, alcohols and derivatives |  | 15.385 |
| 153 | Deoxycholic acid | Lipids and lipid-like molecules | Bile acids, alcohols and derivatives |  | 15.873 |

* Note: RDS represents seeds with released primary physiological dormancy, while RDS2 denotes RDS incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the hypocotyl-cotyledon of RDS2 compared to RDS. Fold increase indicates a higher concentration in the hypocotyl-cotyledon of RDS2, whereas fold decrease indicates a higher concentration in the hypocotyl-cotyledon of RDS.

**Table S5:** Fold change of differentially expressed metabolites between the radicle of RDS and the radicle of RDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | Apigenin | Phenylpropanoids and polyketides | Flavonoid glycosides | 67.245 |  |
| 2 | Chenodeoxycholate | Lipids and lipid-like molecules | Bile acids, alcohols and derivatives | 33.736 |  |
| 3 | Arbutin | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 18.694 |  |
| 4 | (+)-Catechin | Phenylpropanoids and polyketides |  | 17.994 |  |
| 5 | 3-Dehydroshikimic acid | Organic oxygen compounds | Alcohols and polyols | 7.547 |  |
| 6 | Procyanidin B2 | Phenylpropanoids and polyketides | Biflavonoids and polyflavonoids | 6.391 |  |
| 7 | 1,4-Dihydroxybenzene | Anatomical Therapeutic Chemical (ATC) classification |  | 5.910 |  |
| 8 | Salicylic acid | Benzenoids | Benzoic acids and derivatives | 5.745 |  |
| 9 | L-Iditol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 5.608 |  |
| 10 | Bata-Carotene | Lipids and lipid-like molecules | Isoprenoids | 5.066 |  |
| 11 | Pro-Glu | Dipeptide |  | 4.728 |  |
| 12 | Arg-Thr | Dipeptide |  | 4.564 |  |
| 13 | 4-Hydroxybenzoate | Benzenoids | Benzoic acids and derivatives | 3.805 |  |
| 14 | Phenylpyruvate | Benzenoids | Phenylpyruvic acid derivatives | 3.705 |  |
| 15 | L-Alanine | Organic acids and derivatives | Amino acids, peptides, and analogues | 3.437 |  |
| 16 | 3-Hydroxycapric acid | Organic acids and derivatives | Medium-chain hydroxy acids and derivatives | 3.253 |  |
| 17 | Hesperetin | Phenylpropanoids and polyketides | Flavonoids | 3.112 |  |
| 18 | Uridine 5'-monophosphate (UMP) | Nucleosides, nucleotides, and analogues | Pyrimidine ribonucleotides | 2.825 |  |
| 19 | Allantoin | Organoheterocyclic compounds | Imidazoles | 2.707 |  |
| 20 | Shikimate | Organic oxygen compounds | Alcohols and polyols | 2.401 |  |
| 21 | Homoveratric acid | Benzenoids | Methoxybenzenes | 2.385 |  |
| 22 | N-Acetylmannosamine | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 2.265 |  |
| 23 | 3-(3-Hydroxyphenyl)propanoic acid | Phenylpropanoids and polyketides |  | 2.164 |  |
| 24 | Uracil | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 2.150 |  |
| 25 | Maleic acid | Organic acids and derivatives | Dicarboxylic acids and derivatives | 2.082 |  |
| 26 | 3,4-Dihydroxyphenylacetic acid | Phenylpropanoids and polyketides | Flavonoids | 2.077 |  |
| 27 | Resorcinol | Anatomical Therapeutic Chemical (ATC) classification |  | 2.072 |  |
| 28 | 4-Hydroxybutanoic acid lactone | Unclassified |  | 1.929 |  |
| 29 | 5-L-Glutamyl-L-alanine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.926 |  |
| 30 | Lithocholic acid | Lipids and lipid-like molecules | Bile acids, alcohols and derivatives | 1.880 |  |
| 31 | Urocanic acid | Organoheterocyclic compounds | Imidazoles | 1.796 |  |
| 32 | L-Isoleucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.722 |  |
| 33 | 2-hydroxy-butanoic acid | Lipids and lipid-like molecules | Fatty Acids and Conjugates | 1.708 |  |
| 34 | 4-Aminobutyric acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.686 |  |
| 35 | L-Threonate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.669 |  |
| 36 | Pyruvaldehyde | Organic oxygen compounds | Carbonyl compounds | 1.627 |  |
| 37 | NG,NG-dimethyl-L-arginine(ADMA) | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.607 |  |
| 38 | gamma-Glutamyl-L-methionine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.598 |  |
| 39 | 3-(2-Hydroxyethyl)indole | Organoheterocyclic compounds |  | 1.590 |  |
| 40 | D-Proline | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.587 |  |
| 41 | Dopamine | Benzenoids | Benzenediols | 1.575 |  |
| 42 | Diethanolamine | Organic nitrogen compounds | Amines | 1.570 |  |
| 43 | Anthranilic acid (Vitamin L1) | Benzenoids | Benzoic acids and derivatives | 1.514 |  |
| 44 | 4-Hydroxycinnamic acid | Phenylpropanoids and polyketides | Hydroxycinnamic acids and derivatives | 1.460 |  |
| 45 | 2-Deoxyribose 5-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.432 |  |
| 46 | Pro-Gly | Dipeptide |  | 1.432 |  |
| 47 | Tyramine | Benzenoids | Phenethylamines | 1.419 |  |
| 48 | L-Glutamine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.390 |  |
| 49 | trans-2-Hydroxycinnamic acid | Phenylpropanoids and polyketides | Monolignols | 1.375 |  |
| 50 | Phenol | Benzenoids | 1-hydroxy-4-unsubstituted benzenoids | 1.374 |  |
| 51 | 1-Oleoyl-sn-glycerol 3-phosphate | Lipids and lipid-like molecules |  | 1.368 |  |
| 52 | 2-Phenylacetamide | Unclassified |  | 1.362 |  |
| 53 | L-NG-Monomethylarginine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.361 |  |
| 54 | Glutaraldehyde | Therapeutic category of drugs in Japan |  | 1.352 |  |
| 55 | L-Ribulose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.332 |  |
| 56 | L-Pyroglutamic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.323 |  |
| 57 | L-Leucine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.310 |  |
| 58 | 4-Hexen-1-ol, (E)- | Unclassified |  | 1.258 |  |
| 59 | DL-O-tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.245 |  |
| 60 | .beta.-Homoproline | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.244 |  |
| 61 | Indoleacrylic acid | Organoheterocyclic compounds | Indoles | 1.244 |  |
| 62 | Citramalic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.243 |  |
| 63 | Maltopentaose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.238 |  |
| 64 | Indole | Organoheterocyclic compounds | Indoles | 1.228 |  |
| 65 | DL-Indole-3-lactic acid | Organoheterocyclic compounds |  | 1.217 |  |
| 66 | L-Threonine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.187 |  |
| 67 | Glu-His | Dipeptide |  |  | 1.121 |
| 68 | Dihydroxyacetone | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.139 |
| 69 | Miglitol | Anatomical Therapeutic Chemical (ATC) classification |  |  | 1.167 |
| 70 | D-Allose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.172 |
| 71 | Arg-Cys | Dipeptide |  |  | 1.217 |
| 72 | Bisindolylmaleimide I | Unclassified |  |  | 1.221 |
| 73 | D-(+)-3-Phenyllactic acid | Organic acids and derivatives |  |  | 1.224 |
| 74 | Ribitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.252 |
| 75 | 2-Methyl-3-hydroxybutyric acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.266 |
| 76 | D-Fructose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.276 |
| 77 | Uridine | Nucleosides, nucleotides, and analogues |  |  | 1.314 |
| 78 | N6-Acetyl-L-lysine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.355 |
| 79 | N6-Methyl-L-lysine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.374 |
| 80 | Ergothioneine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.383 |
| 81 | 3,3',4,5'-Tetrahydroxy-trans-stilbene | Organic oxygen compounds | Alcohols and polyols |  | 1.401 |
| 82 | Heptadecanoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.414 |
| 83 | 4-O-.beta.-Galactopyranosyl-D-mannopyranose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.439 |
| 84 | 3-Methylhistidine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.522 |
| 85 | Ethyl glucuronide | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.563 |
| 86 | D-Glucose 6-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.565 |
| 87 | D-Quinovose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.570 |
| 88 | S-Adenosyl-L-homocysteine | Nucleosides, nucleotides, and analogues | 5'-deoxy-5'-thionucleosides |  | 1.580 |
| 89 | Palmitic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.580 |
| 90 | alpha-D-Glucose 1-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.600 |
| 91 | Arg-Glu | Dipeptide |  |  | 1.608 |
| 92 | Glycerophosphocholine | Lipids and lipid-like molecules | Glycerophosphocholines |  | 1.616 |
| 93 | Raffinose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.618 |
| 94 | Vigabatrin | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.621 |
| 95 | L-Arabinono-1,4-lactone | Unclassified |  |  | 1.664 |
| 96 | D-Mannose-6-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.672 |
| 97 | 2'-Deoxy-D-ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.698 |
| 98 | D-gluconate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.802 |
| 99 | (+)-Abscisic acid | Lipids and lipid-like molecules | Sesquiterpenoids |  | 1.825 |
| 100 | cis-9-Palmitoleic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.842 |
| 101 | Xanthosine | Nucleosides, nucleotides, and analogues |  |  | 1.848 |
| 102 | Nicotinamide | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives |  | 1.927 |
| 103 | Linoleoyl ethanolamide | Organic nitrogen compounds | Amines |  | 1.946 |
| 104 | ketoisocaproic acid | Organic acids and derivatives | Short-chain keto acids and derivatives |  | 1.984 |
| 105 | Galactinol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.000 |
| 106 | Dihomo-gamma-Linolenic Acid | Lipids and lipid-like molecules |  |  | 2.033 |
| 107 | Oxypurinol | Organoheterocyclic compounds | Purines and purine derivatives/Pyrimidines and pyrimidine derivatives |  | 2.041 |
| 108 | Pyridoxal (Vitamin B6) | Organoheterocyclic compounds | Pyridine carboxaldehydes |  | 2.088 |
| 109 | N-Oleoylethanolamine | Organic nitrogen compounds | Amines |  | 2.092 |
| 110 | myo-Inositol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.155 |
| 111 | D-Lactose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.183 |
| 112 | Tyr-Ala | Dipeptide |  |  | 2.227 |
| 113 | Deoxycytidine | Nucleosides, nucleotides, and analogues | Pyrimidine 2'-deoxyribonucleosides |  | 2.237 |
| 114 | Stachyose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.299 |
| 115 | 5'-Deoxyadenosine | Nucleosides, nucleotides, and analogues |  |  | 2.315 |
| 116 | Cytidine | Nucleosides, nucleotides, and analogues |  |  | 2.577 |
| 117 | N6-methyladenosine | Nucleosides, nucleotides, and analogues |  |  | 2.755 |
| 118 | Dihomo-gamma-linolenoyl-EA | Organic nitrogen compounds | Amines |  | 2.841 |
| 119 | 1-Methyladenosine | Nucleosides, nucleotides, and analogues |  |  | 2.915 |
| 120 | .alpha.-Linolenoyl ethanolamide | Organic nitrogen compounds | Amines |  | 2.924 |
| 121 | Guanosine | Nucleosides, nucleotides, and analogues |  |  | 3.195 |
| 122 | Ribothymidine | Nucleosides, nucleotides, and analogues |  |  | 3.425 |
| 123 | 2'-O-methylguanosine | Nucleosides, nucleotides, and analogues |  |  | 3.559 |
| 124 | PGA1 | Lipids and lipid-like molecules |  |  | 3.584 |
| 125 | N6-Methyladenine | Nucleosides, nucleotides, and analogues |  |  | 3.846 |
| 126 | Dehydroabietic acid | Lipids and lipid-like molecules |  |  | 3.953 |
| 127 | 2-Methylguanosine | Nucleosides, nucleotides, and analogues |  |  | 4.098 |
| 128 | 2'-O-methyladenosine | Nucleosides, nucleotides, and analogues |  |  | 4.651 |
| 129 | all cis-(6,9,12)-Linolenic acid | Lipids and lipid-like molecules |  |  | 6.897 |

* Note: RDS2 represents seeds with released primary physiological dormancy incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the radicle of RDS2 compared to RDS. Fold increase indicates a higher concentration in the radicle of RDS2, whereas fold decrease indicates a higher concentration in the radicle of RDS.

**Table S6:** Fold change of differentially expressed metabolites between the hypocotyl-cotyledon of RDS2 and the radicle of RDS2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Metabolites** | **Superclass** | **Subclass** | **Fold Change** | |
|  |  |  |  | **Fold Increase** | **Fold Decrease** |
| 1 | Eicosapentaenoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 16.741 |  |
| 2 | PC(20:5(5Z,8Z,11Z,14Z,17Z) /20:5(5Z,8Z,11Z,14Z,17Z)) | Lipids and lipid-like molecules |  | 12.754 |  |
| 3 | Dehydroabietic acid | Lipids and lipid-like molecules | Isoprenoids | 11.640 |  |
| 4 | 15-keto-PGE1 | Lipids and lipid-like molecules |  | 9.532 |  |
| 5 | PGA1 | Lipids and lipid-like molecules |  | 5.844 |  |
| 6 | Glycerophosphocholine | Lipids and lipid-like molecules | Glycerophosphocholines | 4.539 |  |
| 7 | Glyceric acid | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 4.082 |  |
| 8 | 2'-O-methyladenosine | Nucleosides, nucleotides, and analogues |  | 3.356 |  |
| 9 | D-Arabinono-1,4-lactone | Unclassified |  | 3.349 |  |
| 10 | N6-Methyladenine | Nucleosides, nucleotides, and analogues |  | 3.256 |  |
| 11 | .alpha.-Linolenoyl ethanolamide | Organic nitrogen compounds | Amines | 3.154 |  |
| 12 | 1-Palmitoyl-2-linoleoyl-sn-glycero-3-phosphate | Lipids and lipid-like molecules |  | 2.978 |  |
| 13 | Oleanolic acid | Lipids and lipid-like molecules | Triterpenoids | 2.886 |  |
| 14 | Cytidine | Nucleosides, nucleotides, and analogues |  | 2.857 |  |
| 15 | Thiamine | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 2.730 |  |
| 16 | Acetyl-DL-Valine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.691 |  |
| 17 | 1-Methyladenosine | Nucleosides, nucleotides, and analogues |  | 2.472 |  |
| 18 | Linoleoyl ethanolamide | Organic nitrogen compounds | Amines | 2.309 |  |
| 19 | Thioetheramide-PC | Lipids and lipid-like molecules |  | 2.156 |  |
| 20 | Glycerol 3-phosphate | Lipids and lipid-like molecules | Glycerophosphates | 2.154 |  |
| 21 | L-Aspartate | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.135 |  |
| 22 | L-Asparagine | Organic acids and derivatives | Amino acids, peptides, and analogues | 2.069 |  |
| 23 | Palmitic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 2.004 |  |
| 24 | 2'-Deoxy-D-ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.897 |  |
| 25 | 2-Methylguanosine | Nucleosides, nucleotides, and analogues |  | 1.853 |  |
| 26 | 3-(2-Hydroxyethyl)indole | Organoheterocyclic compounds |  | 1.808 |  |
| 27 | Uracil | Organoheterocyclic compounds | Pyrimidines and pyrimidine derivatives | 1.797 |  |
| 28 | N-Oleoylethanolamine | Organic nitrogen compounds | Amines | 1.776 |  |
| 29 | Deoxycytidine | Nucleosides, nucleotides, and analogues | Pyrimidine 2'-deoxyribonucleosides | 1.770 |  |
| 30 | Arg-Glu |  |  | 1.756 |  |
| 31 | 1-Aminocyclopropanecarboxylic acid | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.736 |  |
| 32 | 1-Palmitoyl Lysophosphatidic Acid | Lipids and lipid-like molecules |  | 1.707 |  |
| 33 | Adenine | Nucleosides, nucleotides, and analogues |  | 1.697 |  |
| 34 | Indole-3-pyruvic acid | Organoheterocyclic compounds | Indolyl carboxylic acids and derivatives | 1.618 |  |
| 35 | 2-Phenylacetamide | Unclassified |  | 1.611 |  |
| 36 | MG(18:2(9Z,12Z)/0:0/0:0)[rac] | Lipids and lipid-like molecules |  | 1.598 |  |
| 37 | L-Cystine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.552 |  |
| 38 | 1-Stearoyl-sn-glycerol 3-phosphocholine | Lipids and lipid-like molecules |  | 1.520 |  |
| 39 | alpha-D-Glucose 1-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.496 |  |
| 40 | UDP-N-acetylglucosamine | Nucleosides, nucleotides, and analogues | Pyrimidine nucleotide sugars | 1.493 |  |
| 41 | Linustatin | Organic acids and derivatives | Amino acid related compounds | 1.481 |  |
| 42 | Heptadecanoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.480 |  |
| 43 | 11(Z),14(Z),17(Z)-Eicosatrienoic Acid | Lipids and lipid-like molecules |  | 1.476 |  |
| 44 | D-Allose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.406 |  |
| 45 | Dihomo-gamma-linolenoyl-EA | Organic nitrogen compounds | Amines | 1.405 |  |
| 46 | D-Ribose 5-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.402 |  |
| 47 | 3'-O-methyladenosine | Nucleosides, nucleotides, and analogues |  | 1.377 |  |
| 48 | 3-Methylindole | Organoheterocyclic compounds | Indoles | 1.375 |  |
| 49 | 2'-O-methylguanosine | Nucleosides, nucleotides, and analogues |  | 1.369 |  |
| 50 | Dihomo-gamma-Linolenic Acid | Lipids and lipid-like molecules |  | 1.323 |  |
| 51 | D-Mannose-6-phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.314 |  |
| 52 | Indole | Organoheterocyclic compounds | Indoles | 1.307 |  |
| 53 | DL-Indole-3-lactic acid | Organoheterocyclic compounds |  | 1.303 |  |
| 54 | Tyramine | Benzenoids | Phenethylamines | 1.301 |  |
| 55 | DL-O-tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.300 |  |
| 56 | D-gluconate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.300 |  |
| 57 | trans-Vaccenic acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.291 |  |
| 58 | L-Arabinono-1,4-lactone | Unclassified |  | 1.284 |  |
| 59 | Cyanuric acid | Unclassified |  | 1.276 |  |
| 60 | N-Acetyl-D-Glucosamine 6-Phosphate | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.269 |  |
| 61 | Indoleacrylic acid | Organoheterocyclic compounds | Indoles | 1.263 |  |
| 62 | Arg-Cys | Dipeptide |  | 1.259 |  |
| 63 | 2-Methyl-3-hydroxybutyric acid | Lipids and lipid-like molecules | Fatty acids and conjugates | 1.224 |  |
| 64 | Nicotinate | Organoheterocyclic compounds | Pyridinecarboxylic acids and derivatives | 1.209 |  |
| 65 | L-Tryptophan | Organic acids and derivatives | Amino acid related compounds | 1.205 |  |
| 66 | Diethanolamine | Organic nitrogen compounds | Amines | 1.200 |  |
| 67 | L-Arginine | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.199 |  |
| 68 | Flavin adenine dinucleotide (FAD) | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates | 1.183 |  |
| 69 | L-Citrulline | Organic acids and derivatives | Amino acids, peptides, and analogues | 1.178 |  |
| 70 | hydrocortisone 21-acetate | Lipids and lipid-like molecules |  | 1.178 |  |
| 71 | D-Fructose | Organic oxygen compounds | Monosaccharides | 1.177 |  |
| 72 | N-Acetyl-D-glucosamine | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.163 |
| 73 | gamma-Glutamyl-L-methionine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.241 |
| 74 | Ser-Pro | Dipeptide |  |  | 1.261 |
| 75 | Citramalic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.267 |
| 76 | 16-Hydroxypalmitic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.276 |
| 77 | Azelaic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.321 |
| 78 | D(-)-beta-hydroxy butyric acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.353 |
| 79 | L-Ribulose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.385 |
| 80 | 3,3',4,5'-Tetrahydroxy-trans-stilbene | Organic oxygen compounds | Alcohols and polyols |  | 1.391 |
| 81 | L-Ascorbic acid | Vitamins and cofactors |  |  | 1.433 |
| 82 | Glutaric acid | Organic acids and derivatives | Dicarboxylic acids and derivatives |  | 1.435 |
| 83 | .beta.-Homoproline | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.445 |
| 84 | Vigabatrin | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.468 |
| 85 | Maltopentaose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.495 |
| 86 | Homocitrate | Organic acids and derivatives | Tricarboxylic acids and derivatives |  | 1.495 |
| 87 | meso-Tartaric acid | Organic acids and derivatives |  |  | 1.502 |
| 88 | L-Threonine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.522 |
| 89 | alpha-ketoisovaleric acid | Organic acids and derivatives | Short-chain keto acids and derivatives |  | 1.531 |
| 90 | Heneicosanoic acid | Lipids and lipid-like molecules |  |  | 1.534 |
| 91 | m-Chlorohippuric acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.565 |
| 92 | D-(+)-3-Phenyllactic acid | Organic acids and derivatives |  |  | 1.570 |
| 93 | Pyruvaldehyde | Organic oxygen compounds | Carbonyl compounds |  | 1.585 |
| 94 | L-Galactono-1,4-lactone | Unclassified |  |  | 1.597 |
| 95 | Dihydro-4,4-dimethyl-2,3-furandione | Unclassified |  |  | 1.603 |
| 96 | Gentisic acid | Benzenoids | Benzoic acids and derivatives |  | 1.608 |
| 97 | L-Histidine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.634 |
| 98 | 4-Androsten-17.beta.-ol-3-one glucosiduronate | Unclassified |  |  | 1.645 |
| 99 | Maltotriose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.664 |
| 100 | Glu-His | Dipeptide |  |  | 1.672 |
| 101 | Astragalin | Phenylpropanoids and polyketides | Flavonoid glycosides |  | 1.709 |
| 102 | (R)-3-Hydroxybutyric acid | Organic acids and derivatives | Beta hydroxy acids and derivatives |  | 1.721 |
| 103 | Succinate | Organic acids and derivatives | Dicarboxylic acids and derivatives |  | 1.757 |
| 104 | N6-Methyl-L-lysine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.808 |
| 105 | Behenic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 1.825 |
| 106 | L-Alanine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 1.848 |
| 107 | His-Glu | Dipeptide |  |  | 1.862 |
| 108 | Glutaraldehyde | Therapeutic category of drugs in Japan |  |  | 1.873 |
| 109 | Quinate | Organic oxygen compounds | Alcohols and polyols |  | 1.887 |
| 110 | D-Ribose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.969 |
| 111 | Maltotetraose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 1.992 |
| 112 | cis-9-Palmitoleic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 2.110 |
| 113 | 4-Hydroxybenzoate | Benzenoids | Benzoic acids and derivatives |  | 2.160 |
| 114 | Urocanic acid | Organoheterocyclic compounds | Imidazoles |  | 2.174 |
| 115 | Pro-Ser | Dipeptide |  |  | 2.217 |
| 116 | Resorcinol | Anatomical Therapeutic Chemical (ATC) classification |  |  | 2.283 |
| 117 | L-Gulonic gamma-lactone | Organoheterocyclic compounds | Gamma butyrolactones |  | 2.299 |
| 118 | 3,4-Dihydroxyphenylacetic acid | Phenylpropanoids and polyketides | Flavonoids |  | 2.353 |
| 119 | L-Pipecolic acid | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 2.463 |
| 120 | Tricosanoic acid | Lipids and lipid-like molecules |  |  | 2.532 |
| 121 | Shikimate | Organic oxygen compounds | Alcohols and polyols |  | 2.571 |
| 122 | Tetracosanoic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 2.577 |
| 123 | L-Iditol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 2.695 |
| 124 | 3-(3-Hydroxyphenyl)propanoic acid | Phenylpropanoids and polyketides |  |  | 2.717 |
| 125 | Methylmalonic acid | Organic acids and derivatives | Dicarboxylic acids and derivatives |  | 2.801 |
| 126 | 5(S),14(R)-Lipoxin B4 | Unclassified |  |  | 3.058 |
| 127 | Maltitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 3.185 |
| 128 | Amygdalin | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 3.247 |
| 129 | D-Sorbitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 3.279 |
| 130 | Mevalonic acid | Lipids and lipid-like molecules | Fatty acids and conjugates |  | 3.333 |
| 131 | Salicylic acid | Benzenoids | Benzoic acids and derivatives |  | 3.425 |
| 132 | Homogentisic acid | Benzenoids | Phenylacetic acids |  | 3.448 |
| 133 | Xylitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 3.571 |
| 134 | 3-Hydroxycapric acid | Organic acids and derivatives | Medium-chain hydroxy acids and derivatives |  | 3.717 |
| 135 | 2'-Deoxyinosine | Nucleosides, nucleotides, and analogues |  |  | 4.049 |
| 136 | RU-0211 | Unclassified |  |  | 4.255 |
| 137 | Ribitol | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 4.274 |
| 138 | L-Sorbose | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 4.292 |
| 139 | Enterodiol | Lignans, neolignans and related compounds | Dibenzylbutanediol lignans |  | 4.695 |
| 140 | N-Acetyl-L-tyrosine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 4.762 |
| 141 | Homoveratric acid | Benzenoids | Methoxybenzenes |  | 5.000 |
| 142 | Inosine | Nucleosides, nucleotides, and analogues |  |  | 5.000 |
| 143 | Phenethyl Caffeiate | Unclassified |  |  | 5.025 |
| 144 | 2-hydroxy-butanoic acid | Lipids and lipid-like molecules | Fatty Acids and Conjugates |  | 5.236 |
| 145 | Pro-Glu | Dipeptide |  |  | 5.348 |
| 146 | Bisindolylmaleimide I | Unclassified |  |  | 5.348 |
| 147 | Procyanidin B2 | Phenylpropanoids and polyketides | Biflavonoids and polyflavonoids |  | 5.952 |
| 148 | Arg-Thr | Dipeptide |  |  | 6.135 |
| 149 | Phenylpyruvate | Benzenoids | Phenylpyruvic acid derivatives |  | 6.579 |
| 150 | L-Saccharopine | Organic acids and derivatives | Amino acids, peptides, and analogues |  | 8.065 |
| 151 | Bata-Carotene | Lipids and lipid-like molecules | Isoprenoids |  | 9.524 |
| 152 | (+)-Catechin | Phenylpropanoids and polyketides |  |  | 10.204 |
| 153 | Arbutin | Organic oxygen compounds | Carbohydrates and carbohydrate conjugates |  | 18.519 |
| 154 | APIIN | Phenylpropanoids and polyketides | Flavonoid glycosides |  | 41.667 |

* Note: RDS2 represents seeds with released primary physiological dormancy incubated for 2 weeks. Fold changes were calculated as ratios of metabolite relative levels in the hypocotyl-cotyledon of RDS2 compared to those in the radicle of RDS2. Fold increase indicates a higher concentration in the hypocotyl-cotyledon, whereas fold decrease indicates a higher concentration in radicle.

**Table S7:** The metabolites enriched in significantly altered metabolic pathways (excluding carbohydrate metabolism pathways and genetic information processing) among the following three pairs of different types of samples: DDS-HC versus DDS2-HC, DDS-R versus DDS2-R, and DDS2-R versus DDS2-HC.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group** | **Metabolic Pathways** | | **Metabolites** | **Fold Change** |
| DDS-HC vs. DDS2-HC | Amino acid metabolism | Alanine, aspartate and glutamate metabolism | L-aspartate  L-asparagine  L-glutamine  L-glutamate | Fold increase  Fold increase  Fold increase  Fold increase |
| Glycine, serine and threonine metabolism | L-tryptophan  L-serine  L-aspartate | Fold increase  Fold increase  Fold increase |
| Tyrosine metabolism | Dopamine  Homogentisate | Fold increase  Fold increase |
| Tryptophan metabolism | L-tryptophan | Fold increase |
| Metabolism of cofactors and vitamins | Ubiquinone and other terpenoid-quinone biosynthesis | Homogentisate | Fold increase |
| Biosynthesis of other secondary metabolites | Isoquinoline alkaloid biosynthesis | Dopamine | Fold increase |
| DDS-R vs. DDS2-R | Lipid metabolism | Linoleic acid metabolism | Linoleate | Fold decrease |
| Glycerophospholipid metabolism | sn-glycero-3-phosphocholine  Phosphatide  Choline phosphate | Fold decrease  Fold decrease  Fold decrease |
| Amino acid metabolism | Alanine, aspartate and glutamate metabolism | N-(L-arginino) succinate  2-oxoglutarate  L-glutamine  L-glutamate | Fold increase  Fold decrease  Fold increase  Fold increase |
| Phenylalanine metabolism | L-phenylalanine | Fold increase |
| Tyrosine metabolism | L-tyrosine  Tyramine | Fold increase  Fold increase |
| Arginine biosynthesis | 2-oxoglutarate  L-glutamine  L-glutamate  N-(L-arginino) succinate | Fold decrease  Fold increase  Fold increase  Fold increase |
| Tryptophan metabolism | L-tryptophan | Fold increase |
| Metabolism of other amino acids | Glutathione metabolism | Glutathione disulfide  L-glutamate  5-oxoproline | Fold increase  Fold increase  Fold increase |
| Biosynthesis of other secondary metabolites | Isoquinoline alkaloid biosynthesis | L-tyrosine  Tyramine | Fold increase  Fold increase |
| DDS2-R vs. DDS2-HC | Lipid metabolism | Linoleic acid metabolism | Phosphatidylcholine  Linoleate | Fold increase  Fold increase |
| [Glycerophospholipid metabolism](javascript:void(0);) | Phosphatidylcholine  sn-glycero-3-phosphocholine  Phosphatidate | Fold increase  Fold increase  Fold increase |
| Amino acid metabolism | [Alanine, aspartate and glutamate metabolism](javascript:void(0);) | L-aspartate  N-(L-arginino) succinate  L-glutamate | Fold increase  Fold decrease  Fold decrease |
| Arginine biosynthesis | L-glutamate  L-aspartate  N-(L-arginino) succinate | Fold decrease  Fold increase  Fold decrease |
| Tyrosine metabolism | Homogentisate | Fold decrease |
| Metabolism of cofactors and vitamins | [Ubiquinone and other terpenoid-quinone biosynthesis](javascript:void(0);) | Homogentisate | Fold decrease |

* Note: DDS refers to seeds with deeper primary physiological dormancy, DDS2 represents DDS incubated for 2 weeks, DDS-HC denotes the hypocotyl-cotyledon of DDS, DDS2-HC indicates the hypocotyl-cotyledon of DDS2, DDS-R signifies the radicle of DDS, and DDS2-R signifies the radicle of DDS2.

**Table S8:** The metabolites enriched in significantly altered metabolic pathways (excluding carbohydrate metabolism pathways) among the following three pairs of different types of samples: RDS-HC versus RDS2-HC, RDS-R versus RDS2-R, and RDS2-R versus RDS2-HC.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group** | **Metabolic Pathways** |  | **Metabolites** | **Fold Change** |
| RDS-HC vs. RDS2-HC | Lipid metabolism | Linoleic acid metabolism | Phosphatidylcholine  Linoleate | Fold decrease  Fold increase |
| Glycerophospholipid metabolism | Phosphatidylcholine  sn-glycero 3-phosphate | Fold decrease  Fold increase |
| [Cutin, suberine and wax biosynthesis](javascript:void(0);) | Hexadecanoic acid  16-Hydroxypalmitate | Fold decrease  Fold increase |
| Amino acid metabolism | Alanine, aspartate and glutamate metabolism | N-(L-arginino) succinate  L-glutamine  4-aminobutanoate | Fold increase  Fold increase  Fold increase |
| Tyrosine metabolism | Dopamine  L-tyrosine  Tyramine  Homogentisate | Fold increase  Fold increase  Fold increase  Fold decrease |
| Glycine, serine and threonine metabolism | L-threonine  L-serine  L-tryptophan | Fold increase  Fold increase  Fold increase |
| Arginine biosynthesis | L-citrulline  L-glutamine  N-(L-arginino) succinate  L-arginine | Fold increase  Fold increase  Fold increase  Fold increase |
| Arginine and proline metabolism | L-arginine  L-proline  4-aminobutanoate | Fold increase  Fold increase  Fold increase |
| Tryptophan metabolism | L-tryptophan | Fold increase |
|  | [Phenylalanine, tyrosine and tryptophan biosynthesis](javascript:void(0);) | Anthranilate  Indole  L-tryptophan  L-tyrosine | Fold increase  Fold increase  Fold increase  Fold increase |
| Metabolism of other amino acids | [Cyanoamino acid metabolism](javascript:void(0);) | Prunasin  L-Serine | Fold decrease  Fold increase |
| Metabolism of cofactors and vitamins | Ubiquinone and other terpenoid-quinone biosynthesis | L-tyrosine  4-coumarate  Homogentisate | Fold increase  Fold increase  Fold decrease |
| [Nicotinate and nicotinamide metabolism](javascript:void(0);) | Nicotinate  Nicotinamide  NAD+ | Fold decrease  Fold decrease  Fold increase |
| Biosynthesis of secondary metabolites – unclassified |  | 4-coumarate | Fold increase |
| Biosynthesis of other secondary metabolites | Isoquinoline alkaloid biosynthesis | L-tyrosine  Dopamine  Tyramine | Fold increase  Fold increase  Fold increase |
| RDS-R vs. RDS2-R | Amino acid metabolism | Alanine, aspartate and glutamate metabolism | L-alanine  L-glutamine  4-aminobutanoate | Fold increase  Fold increase  Fold increase |
| Phenylalanine metabolism | Phenylpyruvate  2-phenylacetamide | Fold increase  Fold increase |
| Glycine, serine and threonine metabolism | L-threonine  Methylglyoxal | Fold increase  Fold increase |
| [Phenylalanine, tyrosine and tryptophan biosynthesis](javascript:void(0);) | Shikimate  Anthranilate  Indole  Phenylpyruvate | Fold increase  Fold increase  Fold increase  Fold increase |
| Nucleotide metabolism | Pyrimidine metabolism | Deoxycytidine  L-glutamine  Cytidine  Uridine  Uracil | Fold decrease  Fold increase  Fold decrease  Fold decrease  Fold increase |
| Biosynthesis of secondary metabolites – unclassified |  | 4-coumarate | Fold increase |
| Biosynthesis of other secondary metabolites | Isoquinoline alkaloid biosynthesis | Tyramine  Dopamine | Fold increase  Fold increase |
| Metabolism of cofactors and vitamins | [Vitamin B6 metabolism](javascript:void(0);) | Pyridoxal | Fold decrease |
| Metabolism of terpenoids and polyketides | [Carotenoid biosynthesis](javascript:void(0);) | Abscisate  beta-Carotene | Fold decrease  Fold increase |
| RDS2-R vs. RDS2-HC | Lipid metabolism | Glycerophospholipid metabolism | Phosphatidylcholine  Sn-glycero-3-phosphocholine  Sn-glycerol 3-phosphate  Phosphatidate | Fold increase  Fold increase  Fold increase  Fold increase |
| [Glycerolipid metabolism](https://www.kegg.jp/pathway/map00561) | D-glucose 1-phosphate  D-glycerate  sn-glycerol 3-phosphate  1-acyl-sn-glycerol 3-phosphate  phosphatidate | Fold increase  Fold increase  Fold increase  Fold increase  Fold increase |
| [Cutin, suberine and wax biosynthesis](javascript:void(0);) | Hexadecanoic acid  16-Hydroxypalmitate  Docosanoic acid | Fold increase  Fold decrease  Fold decrease |
| Amino acid metabolism | Lysine degradation | N6-(L-1,3-dicarboxypropyl)-L-lysine  L-pipecolate | Fold decrease  Fold decrease |
| Phenylalanine metabolism | Phenylpyruvate  2-phenylacetamide | Fold decrease  Fold increase |
| Tyrosine metabolism | Homogentisate  Tyramine | Fold decrease  Fold increase |
| Arginine biosynthesis | L-aspartate  L-arginine  L-citrulline | Fold increase  Fold increase  Fold increase |
| Glycine, serine and threonine metabolism | L-aspartate  D-glycerate  Methylglyoxal  L-threonine  L-tryptophan | Fold increase  Fold increase  Fold decrease  Fold decrease  Fold increase |
| Alanine, aspartate and glutamate metabolism | L-aspartate  L-alanine  L-asparagine  Succinate | Fold increase  Fold decrease  Fold increase  Fold decrease |
| Tryptophan metabolism | L-tryptophan | Fold increase |
| Arginine and proline metabolism | L-arginine | Fold increase |
| Metabolism of other amino acids | Phosphonate and phosphinate metabolism | CMP-2-aminoethylphosphonate | Fold increase |
| Metabolism of cofactors and vitamins | Ubiquinone and other terpenoid-quinone biosynthesis | Homogentisate | Fold decrease |
| Metabolism of terpenoids and polyketides | [Carotenoid biosynthesis](https://www.kegg.jp/pathway/map00906) | Beta-carotene | Fold decrease |

* Note: RDS refers to seeds with released primary physiological dormancy, RDS2 represents RDS incubated for 2 weeks, RDS-HC denotes the hypocotyl-cotyledon of RDS, RDS2-HC indicates the hypocotyl-cotyledon of RDS2, RDS-R signifies the radicle of RDS, and RDS2-R signifies the radicle of RDS2.