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| **Table S1 The treatment of light quality in the experiment** | | | | |
| **Group** | **Treatments** | **Percentage (%)** | | |
|  |  | R | B | W |
| Control | White (Control) | 0 | 0 | 100 |
| T1 | 3R-1B-6W (T1) | 30 | 10 | 60 |
| T2 | 4R-1B-5W (T2) | 40 | 10 | 50 |
| T3 | 5R-1B-4W (T3) | 50 | 10 | 40 |
| T4 | 7R-1B-2W (T4) | 70 | 10 | 20 |

R: red light; B: blue light; W: white. The number before these capitals represents the percentage of light qualities

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| **Table S2 Seed germination in fruit with different color under LED light qualities** | | | | | |
|  | Control | T1 | T2 | T3 | T4 |
|  | Percentage of germinated seeds (%) | | | | |
| Red | 82.7 | 56.2 | 84.1 | 64.4 | 54.2 |
| Orange-red | 40.1 | 37.2 | 45.8 | 37.6 | 18.5 |
| Orange | 12.3 | 34.4 | 36.4 | 34.5 | 18.3 |
| Yellow | / | 10.1 | 6.1 | 34.1 | / |
| White | / | / | / | / | / |
| Purple | / | / | / | / | / |

“/” represented “no data”

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| **Table S3 Primers used in this study** | | |
| Name | Forward primer (5’——3’) | Reverse primer (5’——3’) |
| ERF021 | TTCTTGCCCTGAGGACATAC | CGGTTATTGGTGCTACATCG |
| FAD2 | AGTGGGACTGGTTAAGAGGA | GTGGATGGAGCATAGTGAAA |
| ERF1B | GACTAATAAGAAGAAGGAGCAA | TCCAAGTAATCAGCACCTAA |
| ERF026 | CGGTTGTTGGTAAGCAGTAG | GACTTAGCATCATTGCCTCA |
| TMN7 | AAGTGACGACGTGCAACCCG | ATCCCAACGAGAAGCCCACC |
| ERF091 | CCCACTTGAAACAGTTGCTC | TTCCAATCCCTTGATACCCT |
| EIL1 | CTGAAGAAAGCCTGGAAAGT | AATAGCAAGCCAAGTAGCAC |
| ERF05 | GGAAGATGGGCTATGTTGGC | GGAGAATGGGAGTGGCTGTC |
| CTR1 | TATGAGGCTTGAAATACCAC | CTCAACATATCCATAATAGCG |
| CHS | GTGGAACCGTTATCCGACTAGCAA | GTATCACTTGGGCCACGGAAAGTA |
| DFR | AATCGCTCCAGCTGGTCTCATCAT | CTAACACAGGGAAGAGGCTGGTTT |
| F3H | GGCATGTGTGGATATGGACC | CCTCCGGTGCTGGATTCTG |
| UFGT | GGATGGTGTCAAACAAGGC | GTTCAGTACAACACCATCTGC |
| ANS | CAAATGCCCACAACCAGAACTAGC | CGCACTTTGCAGTTACCCACTTTC |
| MYB | AGATTGCCGGGAAGAACAGCAAAC | TTGCACTTGATGAGAAGGTCCGAG |
| PAL | ATTGATTTTTGCAAGAAATCAATTC | GCTCCACTTTAGCCCCAC |
| MYC | CAATGGAGCTATAAAGACTAGGAA | GGAAAAGAGAAAGAAACACACATG |
| WD40 | GTGTGAATGCTATTGCTTGG | GGAGGAGGACCACTGAAG |
| CP26 | CATGCGATACTGTACGATTC | ATTTGTCCCATAACACTTGC |
| Phot1 | TTTCGTGTTTGACATCTTG | ATCGGACTCTGTTGACCTTT |
| PSBH | AATCTGGTCCAAGACGAACT | TAGAAATACCGCAAATAAGG |
| PSAF | ACCCATTTCAACATCATCTA | AAGTGCTGCTGAGAATACCT |
| RBCS | CATGTTCGGGTGTACTGATG | TTGTAGGCGATGAAACTGATA |
| FT | CTGGTTATGGTAGACCCTGAT | CCAAAGTTTGCTCCTGTAGTT |
| CRR1 | CTGCCACTTTCAACCAACAT | CAGCTCTGCCAATTTCCTTA |
| LHY | CCAGCGTCACCATCATCAGA | CCGCTCCTTGCTCAGTATCA |
| LhcA-P4 | ATGGCAGTCTAGCTGGTGAC | CTGCACGAACCATCTCAAGT |
| COP1 | TCGTGTACCATAAGGCAATC | AGCTAACATCGTTGGGCTAT |
| PSAH2 | TTCTTTGAGACATTTGCTGCTC | TGAAGTAAGCGAGGGTGGAG |
| ChlD | CTTTAGGTGGGAAGACAGGC | ACCAAGCGGAATCTGAACAA |
| CBA6A | GCTAACAACGCCATGTCTAG | AGCCCATCTGCAATGAATAA |
| PhyA | TCTTCAAGACCTAGCCAATC | GCTCACCTCCAGCAACACTC |
| PhyB | GCTTTGTTGGGCAGGATGTT | GGGAGGGATCAGAGGATTGG |
| PSAG | CAGACACCTCCCTCTTCCTC | ATGGGTTGAGTTCAGCTTTG |
| PSBR | GCAGGAAGCCCAAGGGAAAG | GCAAGAATGCCAAGCAAGGT |
| HY5 | CAATAATCCAACGGGTGCTT | AGGAAGCAGCCTGATGGAAT |
| LhcA6 | TACCTCACAAGAAGAAACCGAAAC | CTAACATAGCGAGCCGACCA |
| PSBW | CTCATCCCTCATCTGTTGTTG | CTTTAGGCTTTCCCTCCATT |
| CP29.1 | GGAAGATGGGCTATGTTGGC | GGAGAATGGGAGTGGCTGTC |
| CAAT7 | GCGAGGAGTTTCACTGGTTA | ATCTCATTGAATCCCTTTGG |
| Table S1 (continued) | | |
| Name | Forward primer (5’——3’) | Reverse primer (5’——3’) |
| AVT6C | TATGTCAATCCCAGCAACTC | TACTGCCAAAGAACCAATCT |
| AVT1D | TCTACCCTTGTCATACTTCC | ATCAGTGCTATAACTCCACC |
| AVT3C | CAATTCCAACACTGACCCTT | GAACCATCACTACACCCAAA |
| ACCO | TTACATTATCCAGGCGAGTT | TGAACCTACCCACTGAGATG |
| Sweet10 | CCAGGGTCCATACAGTGAAA | AAATAAGGCAAATCCATCCA |
| STP8 | CGTGGCAAAGAGGAGAAGGC | AGTGGCGGAATGCTAGGAGG |
| NEC1 | CAACTACAAACTATGCCTCTG | TCTAATGCACCCTCTAACAC |
| STC | TCATCTCGGTAGGTTCACTC | TCTGCAATAAGTTCCTCCAC |
| UBI | TGTCCATCTGCTCTCTGTTG | CACCCCAAGCACAATAAGAC |

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| **Table S4 Percentage of fruit color under different LED light qualities** | | | | | | |
| Treatments | Purple | White | Yellow | Orange | Orang-red | Full red |
|  | Percentage of fruit color (%) | | | | | |
| Control | 46.15 | 19.23 | 19.23 | 3.85 | 7.69 | 3.85 |
| T1 | 29.34 | 29.94 | 12.58 | 6.59 | 7.78 | 13.77 |
| T2 | 25.52 | 23.45 | 20.69 | 6.2 | 9.66 | 14.48 |
| T3 | 40.75 | 16.29 | 17.04 | 11.1 | 8.89 | 5.93 |
| T4 | 42.86 | 35.72 | 14.28 | 0 | 2.38 | 4.76 |

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| **Table S5 The correlation index between vitexin and metabolites** | | |
|  | **Vitexin** | **Correlation index** |
| Free amino acid | L-Prolinamide | -0.94 |
| 2,6-Dimethylaniline | -0.95 |
| 2-Aminobenzoic acid | -0.91 |
| Diaminopimelic acid | -0.95 |
| 5-Aminopentanoic acid | 0.90 |
| L-2,4-diaminobutyric acid | -0.92 |
| 2-Aminobenzoic acid | -0.97 |
| Flavonoid | Apiole | 0.89 |
| Qing Hau Sau | -0.92 |
| Hesperetin | 0.95 |
| Taxifolin | 0.92 |
| Carbohydrate | Methyl beta-D-galactosid...Methyl beta-D-galactoside | -0.94 |
| Glucose 6-phosphate | -0.94 |
| 2-O-(alpha-D-Mannosyl)-D...a-D-Mannosyl)-D-glycerate | -0.91 |
| Organic acid | Deoxycholic acid | -0.95 |
| Dodecanedioic acid | 0.91 |
| trans-Ferulic acid | 0.91 |
| Azelaic acid | 0.90 |
| Citric acid | -0.95 |
| Nicotinamide ribotide | -0.92 |
| Taurine | 0.94 |
| Isonicotinic acid | 0.95 |
| 3-Methylthiopropionic ac...-Methylthiopropionic acid | 0.91 |
| (9Z,12Z)-(8R)-Hydroxyoct...ctadeca-9,12-dienoic acid | 0.95 |
| 1-Methylhistidine | 0.97 |
| Protocatechuic acid | 0.97 |
| Undecanoic acid | 0.93 |
| Linoleic acid | 0.96 |
| Stearidonic acid | 0.95 |
| Pantothenic acid | 0.91 |
| Heptanoic acid | -0.96 |

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| Table S6 Estimation of RNA-sequencing data | | | | | |
| **Sample** | **Clean data (bp)** | **Q30 (bp)** | **N (%)** | **Q20 (%)** | **Q30 (%)** |
| Control | 6370764695 | 6461194012 | 0 | 98.42 | 95.12 |
| T1 | 6527451858 | 6634379165 | 0 | 98.54 | 95.43 |
| T3 | 6678468871 | 6765309719 | 0 | 98.5 | 95.3 |
| Clean Data (bp) : base number of high quality sequence; Q20(%) and Q30 (%): the percentage of bases with base recognition accuracy above 99% and 99.9%, respectively; N(%): Percentage of fuzzy bases. | | | | | |

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| **Table S7 Statistics of expression difference analysis results** | | | | |
| **Groups** | | **Up-regulated** | **Down-regulated** | **Total** |
| Control | T2 | 2006 | 1037 | 3043 |
| Control | T4 | 2925 | 1174 | 4099 |
| T2 | T4 | 2793 | 2239 | 5032 |
| Control: Control sample; Treat: an experimental sample;Up-regulated Genes: up-regulated genes treated compared with Control;Down-regulated Genes: Treat genes that are regulated compared to Control; Total DEGs: Treat versus Control differentially expressed genes. | | | | |

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| **Table S8 Screening of key DEGs under different LED light qualities** | | |
| **id** | **foldChange(>2)** | **Description** |
|  | | **Conrol vs T2** |
| CA08g04180 | 8.25 | Delta(12)-fatty-acid desaturase FAD2 |
| CA03g13530 | 7.38 | ERF05 Ethylene-responsive transcription factor 5 |
| CA01g01340 | 11.27 | Transcription termination factor MTEF1, chloroplastic |
| CA05g01840 | 9.72 | Ethylene-responsive transcription factor 1B |
| CA05g11070 | 18.40 | ERF92\_ARATH Ethylene-responsive transcription factor 1B |
| CA04g09130 | 67.63 | ERF21\_ARATH Ethylene-responsive transcription factor ERF021 |
| CA06g14570 | 27.83 | ERF03\_ARATH Ethylene-responsive transcription factor ERF003 |
| CA03g34980 | 22.99 | ERF34\_ARATH Ethylene-responsive transcription factor ERF034 |
| CA06g11200 | 4.20 | ERF17 Ethylene-responsive transcription factor ERF017 |
|  | | **Control vs T4** |
| CA08g04180 | 2.86 | FAD2\_VERFO Delta(12)-fatty-acid desaturase FAD2 |
| CA12g10490 | 2.35 | TMN7\_ARATH Transmembrane 9 superfamily member 7 |
| CA04g07350 | 2.29 | ERF12\_ARATH Ethylene-responsive transcription factor ERF012 |
| CA08g01120 | 2.10 | TMN2\_ARATH Transmembrane 9 superfamily member 2 |
| CA02g11070 | 2.90 | EF110\_ARATH Ethylene-responsive transcription factor ERF110 |
| CA01g03410 | 2.01 | ERF26\_ARATH Ethylene-responsive transcription factor ERF026 |
| CA02g04370 | 2.22 | ERF91\_ARATH Ethylene-responsive transcription factor ERF091 |
| CA04g09130 | 2.88 | ERF21\_ARATH Ethylene-responsive transcription factor ERF021 |
| CA08g01120 | 2.10 | TMN2\_ARATH Transmembrane 9 superfamily member 2 |