**Title:** Regulation of formation of volatile compounds of tea (*Camellia sinensis*) leaves by single light wavelength

**Authors:** Xiumin Fu [1, 2, +], Yiyong Chen [1, 3, +], Xin Mei [1, 2], Tsuyoshi Katsuno [4], Eiji Kobayashi [4], Fang Dong [5], Naoharu Watanabe [6], and Ziyin Yang [1, 2, 3, *]

***Affiliations*:**

[1] *Key Laboratory of South China Agricultural Plant Molecular Analysis and Genetic Improvement, South China Botanical Garden, Chinese Academy of Sciences, Xingke Road 723, Tianhe District, Guangzhou 510650, China*

[2] *Guangdong Provincial Key Laboratory of Applied Botany, South China Botanical Garden, Chinese Academy of Sciences, Xingke Road 723, Tianhe District, Guangzhou 510650, China*

[3] *University of Chinese Academy of Sciences, No.19A Yuquan Road, Beijing 100049, China*

[4] *Tea Research Center, Shizuoka Prefectural Research Institute of Agriculture and Forestry 1706-11 Kurasawa, Kikugawa 439-0002, Japan*

[5] *Guangdong Food and Drug Vocational College, Longdongbei Road 321, Tianhe District, Guangzhou 510520, China*

[6] *Graduate School of Science and Technology, Shizuoka University, 3-5-1 Johoku, Naka-ku, Hamamatsu 432-8561, Japan*

[*] Corresponding author. Ziyin Yang, Tel: +86-20-38072989, *Email address*: zyyang@scbg.ac.cn.

[+] These authors contributed equally to this work.

## Supplementary Information

**Table S1** Primers of qRT-PCR used in this study

| Gene | Accession number | Forward primer 5'-3' | Reverse primer 5'-3' |
|---|---|---|---|
| *LOX1* | EU195885 | GCTGACTGGACAACCGATGA | CAACATATGCTTCTATGAAAATGC |
| *LOX2* | FJ418174 | GTTTTGTCAAATCATTCGGT | TTCTTCAAACTCAAGTTTG |
| *LOX3* | FJ794853 | GGGACAACACTGTATGGG | CCAGAGTCATGAGCAAGGG |
| *LOX4* | HM370508 | TTCTTGGCATTTCCCTCGTA | TCATCCTCGTTCATCCTTGT |
| *PAL* | D26596 | ATTCCTTGCCAATCCTGTAA | ACTGCCTCGGCTGTCTTTCT |
| *PAAS* | FS952786 | GGGAACCTTCAATCTTAC | ACATGCCTTTCTTCTGTC |
| *PAR1* | KR873393 | TGGTTATTGGTCCTCTGTT | ATATCTTCCATTGGCTGAA |
| *PAR2* | KR873394 | ACTGGTTATCGGTCCTCTC | GCATTGGCAACATCTTTA |
| *TPS1* | KF006849 | TGAAGTTCGCTAGAGACCAACCTCTAA | TCCACAGCACCAAGTTCCCATCTA |
| *TPS2* | KR873395 | ATTCTTAAAATGGACGGGCT | TGAGGACATCTTCGAACAAG |
| *TPS3* | KR873396 | CAGCACAAACGAAATTTCCT | CATTCCATGACCCAAGAGAA |
| *β-actin* | HQ420251.1 | GCCATATTTGATTGGAATGG | GGTGCCACAACCTTGATCTT |

*LOX, 9/13-lipoxygenase*; *PAL, phenylalanine ammonialyase*; *PAAS, phenylacetaldehyde synthase*; *PAR, phenylacetaldehyde reductases*; *TPS, terpene synthase*.

**Table S2** Primers used to clone the ORF of genes

| Gene | Forward primer | Reverse primer |
|---|---|---|
| *PAL* | ACGCGTCGACAAATGGATAGTACC ACCGCC | TTAGCGGCCGCCTAACAGATAGGAAG AGG |
| *TPS1* | ACGCGTCGACAAATGCAAATCTTCCACT GTGC | TTAGCGGCCGCCTAAGGTAATTTATC ATAG |
| *TPS3* | ACGCGTCGACAAATGGCTGCCACC ACCACC | TTAGCGGCCGCTTAGAGAGAAACAGTATC AC |

**Table S3** Comparison of volatiles in 0 min and 120 min or 240 min treatments of dark, UVA, blue light, red light, and near-infrared (NIR) on postharvest tea leaves

| | 0 min | Dark | UVA | Blue | Red | NIR |
|---|---|---|---|---|---|---|
| | | | **120 min** | | | |
| Benzyl alcohol[a] | 142.87 ±2.97ab | 113.40 ±7.60c | 135.80 ±6.96b | 143.26 ±4.93ab | 154.37 ±7.02a | 156.82 ±2.92a |
| Terpineol, alpha-[b] | 0.10 ±0.02a | 0.04 ±0.00c | 0.05 ±0.01bc | 0.07 ±0.01bc | 0.08 ±0.00b | 0.06 ±0.00bc |
| Benzaldehyde[a] | 10.69 ±2.05a | 5.83 ±0.41b | 7.27 ±0.97b | 7.80 ±0.50b | 7.57 ±0.99b | 8.30 ±0.72b |
| 3-Hexen-1-ol acetate [a] | 20.50 ±1.08a | 1.98 ±0.27c | 2.06 ±1.08c | 4.50 ±0.50bc | 5.32 ±1.13b | 3.02 ±1.67bc |
| Phenylethyl alcohol[a] | 19.55 ±0.83ab | 15.37 ±0.79c | 19.27 ±1.67b | 20.47 ±1.29ab | 20.73 ±0.80ab | 22.47 ±1.12a |
| Geraniol[a] | 130.59 ±3.55a | 104.46 ±6.05c | 110.23 ±3.59bc | 124.28 ±8.54ab | 137.82 ±11.91a | 121.55 ±6.33abc |
| Nerol[b] | 0.05 ±0.00ab | 0.04 ±0.01b | 0.05 ±0.00ab | 0.05 ±0.01ab | 0.06 ±0.00a | 0.06 ±0.00a |
| Nonanal[b] | 0.08 ±0.01a | 0.06 ±0.01c | 0.06 ±0.01bc | 0.08 ±0.01abc | 0.08 ±0.00ab | 0.07 ±0.01abc |
| 1-Nonanol [b] | 0.05 ±0.01bcd | 0.04 ±0.00d | 0.05 ±0.00cd | 0.06 ±0.00ab | 0.07 ±0.00a | 0.07 ±0.01cd |
| 3-Hexen-1-ol [a] | 98.30 ±2.30bc | 67.13 ±5.01e | 79.37 ±6.15de | 108.39 ±5.61ab | 117.50 ±4.84a | 89.70 ±9.62cd |
| Methyl salicylate[a] | 52.71 ±6.48bc | 45.26 ±3.70c | 53.61 ±1.25bc | 60.90 ±2.42ab | 62.53 ±3.25a | 55.79 ±0.45ab |
| Linalool[a] | 76.16 ±2.75a | 75.26 ±6.22a | 75.23 ±2.06a | 84.97 ±6.65a | 82.78 ±2.58a | 73.71 ±3.18a |
| Linalool oxide[a] | 75.42 ±2.01a | 75.06 ±7.40a | 77.55 ±0.97a | 85.95 ±7.09a | 83.22 ±2.96a | 75.90 ±5.95a |
| 2,6-dimethyl-2,7-octad iene-1,6-diol [b] | 0.11 ±0.01a | 0.10 ±0.01a | 0.12 ±0.01a | 0.12 ±0.02a | 0.10 ±0.01a | 0.11 ±0.01a |
| Linalool pyran oxide[b] | 0.41 ±0.02bc | 0.39 ±0.02c | 0.41 ±0.01abc | 0.48 ±0.04ab | 0.46 ±0.02a | 0.45 ±0.02a |
| 2-Hexenal [b] | 0.50 ±0.03bc | 0.40 ±0.03c | 0.58 ±0.02b | 0.79 ±0.10a | 0.75 ±0.04a | 0.45 ±0.03bc |
| Nerolidol 2[a] | 6.28 ±0.20d | 11.07 ±0.92c | 12.94 ±0.61c | 17.41 ±1.22b | 21.59 ±1.17a | 14.59 ±2.26c |
| 2-Penten-1-ol [a] | 14.34 ±2.65b | 24.47 ±1.51a | 21.68 ±4.51ab | 25.33 ±3.17a | 25.73 ±0.81a | 25.70 ±1.18a |
| Benzeneacetaldehyde[b] | 0.04 ±0.01b | 0.04 ±0.01b | 0.08 ±0.01a | 0.08 ±0.01a | 0.07 ±0.01a | 0.07 ±0.01a |

| | | | | | | |
|---|---|---|---|---|---|---|
| Indole[a] | 0.00 ±0.00a | 19.73 ±1.14a | 27.37 ±0.68a | 30.06 ±1.38a | 28.88 ±1.22a | 22.04 ±2.85a |
| **240 min** | | | | | | |
| Benzyl alcohol[a] | 142.87 ±2.97a | 136.83 ±4.62ab | 126.20 ±7.78bc | 119.64 ±2.96c | 122.68 ±7.10c | 137.28 ±8.92a |
| Terpineol, alpha-[b] | 0.10 ±0.02a | 0.06 ±0.01b | 0.06 ±0.01b | 0.05 ±0.01b | 0.05 ±0.00b | 0.06 ±0.00b |
| Benzaldehyde[a] | 10.69 ±2.05a | 8.24 ±0.87ab | 8.22 ±0.79ab | 6.99 ±0.73b | 7.37 ±0.47b | 8.72 ±1.37ab |
| 3-Hexen-1-ol acetate [a] | 20.50 ±1.08a | 1.08 ±1.01c | 2.16 ±1.03bc | 2.83 ±0.23b | 3.24 ±0.81b | 0.84 ±1.19c |
| Phenylethyl alcohol[a] | 19.55 ±0.83ab | 19.86 ±1.46a | 17.90 ±0.71bc | 16.41 ±0.56c | 14.39 ±0.87d | 20.33 ±0.62a |
| Geraniol[a] | 130.59 ±3.55ab | 138.47 ±18.77a | 121.68 ±3.73abc | 108.99 ±3.87bc | 100.37 ±0.98c | 139.67 ±4.75a |
| Nerol[b] | 0.05 ±0.00ab | 0.05 ±0.01a | 0.04 ±0.00ab | 0.05 ±0.00ab | 0.04 ±0.00b | 0.05 ±0.00ab |
| Nonanal[b] | 0.08 ±0.01ab | 0.10 ±0.01ab | 0.08 ±0.01b | 0.07 ±0.00b | 0.07 ±0.01b | 0.11 ±0.03a |
| 1-Nonanol [b] | 0.05 ±0.01ab | 0.06 ±0.00ab | 0.06 ±0.01ab | 0.05 ±0.00b | 0.05 ±0.00b | 0.06 ±0.01a |
| 3-Hexen-1-ol [a] | 98.30 ±2.30b | 89.50 ±4.09b | 97.17 ±4.70b | 100.66 ±7.40ab | 99.94 ±6.00b | 110.14 ±4.66a |
| Methyl salicylate[a] | 52.71 ±6.48ab | 45.42 ±0.43b | 50.96 ±1.73ab | 51.59 ±2.62ab | 53.18 ±1.27ab | 59.02 ±2.49a |
| Linalool[a] | 76.16 ±2.75c | 87.30 ±2.25b | 106.48 ±3.28a | 108.76 ±5.76a | 119.76 ±3.52a | 112.53 ±4.93a |
| Linalool oxide[a] | 75.42 ±2.01b | 70.35 ±2.55b | 85.84 ±5.82a | 86.12 ±3.90a | 91.34 ±5.53a | 91.43 ±2.70a |
| 2,6-dimethyl-2,7-octad iene-1,6-diol [b] | 0.11 ±0.01a | 0.11 ±0.03a | 0.15 ±0.01a | 0.14 ±0.01a | 0.16 ±0.00a | 0.16 ±0.05a |
| Linalool pyran oxide[b] | 0.41 ±0.02b | 0.44 ±0.03ab | 0.46 ±0.02ab | 0.45 ±0.01ab | 0.44 ±0.01b | 0.51 ±0.03a |
| 2-Hexenal [b] | 0.50 ±0.03c | 0.59 ±0.07b | 0.56 ±0.03bc | 0.57 ±0.04bc | 0.54 ±0.02bc | 0.70 ±0.07a |
| Nerolidol 2[a] | 6.28 ±0.20c | 18.43 ±0.93ab | 18.06 ±0.83ab | 15.64 ±0.33b | 17.47 ±2.38ab | 22.49 ±3.07a |
| 2-Penten-1-ol [a] | 14.34 ±2.65d | 28.59 ±1.74c | 33.02 ±1.68bc | 33.52 ±2.48abc | 36.97 ±0.11ab | 38.86 ±4.69a |
| Benzeneacetaldehyde[b] | 0.04 ±0.01c | 0.10 ±0.01a | 0.09 ±0.01ab | 0.06 ±0.01bc | 0.11 ±0.03ab | 0.10 ±0.02a |
| Indole[a] | 0.00 ±0.00a | 107.09 ±14.77a | 108.57 ±2.41a | 92.02 ±5.16a | 96.32 ±3.14a | 96.34 ±2.38a |

[a], nmol/g; [b], peak area ratio of analyte to internal standard per g. The data are expressed as mean ± S.D. Different means with different letters in the same row are significantly different from each other ($p \leq 0.05$).

**Table S4** Comparison of metabolites (nmol/g) in 0 min and 240 min treatments of dark, UVA, blue light, red light, and near-infrared (NIR) on postharvest tea leaves

| | 0 min | Dark-240 min | UVA-240 min | Blue-240 min | Red-240 min | Near-infrared (NIR)-240 min |
|---|---|---|---|---|---|---|
| Gly | 99.90 ±5.78a | 88.20 ±1.11b | 100.26 ±4.95a | 96.83 ±2.91ab | 96.82 ±2.67ab | 96.30 ±3.01ab |
| Ornithine | 3.42 ±0.11ab | 2.32 ±0.16c | 4.18 ±0.42a | 2.85 ±0.11bc | 3.40 ±0.56ab | 2.26 ±0.22c |
| γ-Aminobutyric acid | 438.25 ±24.24b | 342.32 ±18.82c | 453.08 ±31.97b | 580.99 ±28.94a | 450.00 ±20.86b | 371.38 ±29.42c |
| Ser | 2535.56 ±87.01ab | 2365.43 ±41.72b | 2534.34 ±95.19ab | 2720.75 ±113.64a | 2551.60 ±23.51ab | 2408.53 ±42.51b |
| Ala | 1039.04 ±43.83ab | 962.29 ±49.52b | 974.35 ±25.80b | 1098.84 ±29.69a | 975.35 ±18.33b | 964.72 ±36.30b |
| Citrulline | 47.76 ±1.80b | 47.83 ±5.30b | 46.20 ±0.73b | 64.75 ±2.43a | 44.47 ±2.70b | 46.22 ±5.15b |
| Asp | 3401.65 ±140.54c | 4676.28 ±117.44a | 4350.30 ±214.52ab | 4222.21 ±145.44b | 3742.34 ±99.33c | 4529.79 ±81.95ab |
| Anthranilic acid | 0.27 ±0.33b | 1.17 ±0.17a | 0.30 ±0.37b | 0.66 ±0.41ab | 0.27 ±0.33b | 0.91 ±0.03ab |
| Tyramine | 1.80 ±1.15a | 1.84 ±0.20a | 2.00 ±0.22a | 1.81 ±0.19a | 1.37 ±0.19a | 2.07 ±0.20a |
| Gln | 12759.28 ±626.89a | 13502.28 ±1425.89a | 11259.01 ±1126.09a | 10784.94 ±1043.29a | 10978.79 ±907.32a | 12125.54 ±1273.26a |
| Arg | 4261.36 ±36.54bc | 4948.64 ±374.40b | 4953.73 ±254.62b | 5773.23 ±200.76a | 3934.72 ±147.23c | 4570.85 ±432.65bc |
| Hydroxyproline | 62.00 ±0.98c | 69.68 ±2.62c | 81.26 ±2.02ab | 94.37 ±14.37a | 83.43 ±0.50ab | 86.57 ±8.60ab |
| Glu | 5446.66 ±126.60b | 5993.67 ±137.81ab | 5927.44 ±313.79ab | 6184.45 ±209.26a | 5934.57 ±167.05ab | 5991.33 ±193.90ab |
| Met | 3.56 ±0.52b | 6.55 ±0.16a | 5.92 ±0.36a | 6.82 ±0.74a | 5.95 ±0.26a | 6.36 ±0.76a |
| His | 126.17 ±6.61c | 195.65 ±17.11ab | 192.21 ±3.02ab | 215.59 ±8.40a | 172.19 ±9.07b | 180.92 ±17.69b |
| Thr | 540.97 ±5.44b | 722.27 ±28.74a | 746.69 ±23.07a | 753.34 ±5.65a | 735.04 ±38.56a | 703.74 ±42.60a |
| S-Adenosylmethionine | 16.10 ±0.71c | 26.63 ±1.47b | 29.72 ±0.83a | 29.75 ±0.32a | 26.61 ±1.19b | 25.67 ±0.62b |
| Asn | 221.83 ±12.46c | 376.11 ±27.57b | 471.33 ±18.65a | 477.93 ±7.59a | 392.22 ±19.10b | 406.69 ±58.26ab |
| Trp | 162.91 ±6.62c | 375.32 ±13.92b | 409.94 ±17.23ab | 435.61 ±14.08a | 431.82 ±10.13a | 404.00 ±27.50ab |

| | | | | | | |
|---|---|---|---|---|---|---|
| β-Ala | 44.09 ±1.20c | 146.72 ±3.67a | 146.74 ±10.54a | 145.18 ±1.16ab | 128.49 ±3.88b | 142.44 ±10.82ab |
| Lys | 96.02 ±0.67c | 270.04 ±10.14b | 331.12 ±19.14a | 336.09 ±13.84a | 276.33 ±7.34b | 266.04 ±19.39b |
| Phe | 42.03 ±1.57c | 162.61 ±2.52b | 206.90 ±9.96a | 216.80 ±22.70a | 205.88 ±5.50a | 169.69 ±11.71b |
| Pro | 115.21 ±2.68c | 253.02 ±10.09b | 329.40 ±39.25a | 357.78 ±24.52a | 300.08 ±3.95ab | 303.36 ±44.51ab |
| Val | 87.96 ±2.92c | 280.92 ±9.98b | 376.95 ±36.29a | 386.33 ±18.50a | 338.78 ±8.43ab | 324.68 ±38.09ab |
| Ile | 36.24 ±0.89c | 165.32 ±8.30b | 222.64 ±29.29a | 231.97 ±13.65a | 205.06 ±11.94ab | 197.05 ±26.25ab |
| Leu | 35.82 ±1.07c | 263.99 ±15.90b | 351.87 ±36.43a | 361.21 ±23.03a | 306.09 ±16.80ab | 303.22 ±39.53ab |
| Tyr | 38.51 ±1.12d | 382.41 ±26.63c | 496.55 ±37.44ab | 581.46 ±33.29a | 482.65 ±32.79b | 437.13 ±52.42bc |
| Uridine | 10.40 ±1.26ab | 13.81 ±0.87a | 10.89 ±0.91ab | 11.52 ±1.77ab | 12.17 ±0.90ab | 9.87 ±1.05b |
| Cytosine | 1.00 ±0.00 | 1.13 ±0.16 | 1.26 ±0.00 | 1.21 ±0.00 | 1.15 ±0.00 | 0.89 ±0.07 |
| Inosine | 2.62 ±0.37a | 2.12 ±0.22ab | 1.78 ±0.15ab | 1.94 ±0.25ab | 1.51 ±0.55b | 1.40 ±0.34b |
| Glutathione (GSH) | 3.93 ±0.13a | 3.50 ±0.17a | 3.50 ±0.18a | 3.38 ±0.19a | 2.60 ±0.28b | 3.39 ±0.32a |
| Adenosine | 5.68 ±0.45c | 5.56 ±0.12c | 7.50 ±0.75b | 7.61 ±0.26b | 9.23 ±0.31a | 6.36 ±0.22c |
| Guanosine | 11.48 ±1.08c | 17.75 ±0.15b | 19.09 ±0.96ab | 18.98 ±0.96ab | 20.35 ±0.31a | 18.99 ±0.66ab |
| Glutathione (GSSG)_divalent | 84.67 ±3.55b | 124.80 ±15.57a | 138.57 ±14.07a | 141.74 ±1.82a | 137.43 ±16.74a | 133.05 ±16.68a |
| Cytidine | 4.04 ±0.08c | 11.93 ±0.32b | 12.17 ±0.30b | 11.77 ±0.44b | 13.69 ±0.37a | 11.39 ±0.57b |
| 3-Phosphoglyceric acid | 90.01 ±1.72a | 81.05 ±3.10b | 81.87 ±3.85b | 92.55 ±3.81a | 80.67 ±2.17b | 82.54 ±0.16b |
| Malic acid | 3206.21 ±120.50a | 2195.19 ±89.19bc | 2115.48 ±42.99c | 2443.27 ±101.75c | 2791.38 ±120.72b | 2289.80 ±110.84bc |
| Fumaric acid | 138.97 ±8.80a | 136.02 ±7.23a | 129.02 ±1.59a | 134.46 ±2.99a | 120.98 ±11.38a | 137.38 ±10.55a |
| 2-Oxoisovaleric acid | 1.46 ±0.20a | 0.29 ±0.35bc | 0.98 ±0.60ab | 0.00 ±0.00c | 0.29 ±0.36bc | 0.00 ±0.00c |
| Citric acid | 2360.98 ±74.40a | 2452.78 ±62.55a | 2265.59 ±68.59a | 2345.01 ±56.02a | 2346.39 ±182.21a | 2221.47 ±88.44a |
| Isocitric acid | 133.89 ±7.57ab | 139.58 ±3.58a | 133.92 ±6.64ab | 140.55 ±8.43a | 142.03 ±7.30a | 119.04 ±5.35b |

| | | | | | | |
|---|---|---|---|---|---|---|
| Salicylic acid | 66.71 ±4.58abc | 65.28 ±2.18bc | 61.54 ±1.10c | 68.56 ±1.93ab | 72.86 ±1.91a | 71.29 ±0.37ab |
| Phenylpyruvic acid | 3.51 ±0.48a | 3.47 ±0.10a | 3.29 ±0.16a | 3.36 ±0.12a | 3.92 ±0.08a | 3.87 ±0.49a |
| Glycolic acid | 37.94 ±46.47b | 0.00 ±0.00b | 56.11 ±68.73b | 240.05 ±18.79a | 0.00 ±0.00b | 0.00 ±0.00b |
| Lactic acid | 170.39 ±10.59a | 96.91 ±10.54a | 213.61 ±88.37a | 127.54 ±10.62a | 342.86 ±241.21a | 112.70 ±6.32a |
| Phosphoenolpyruvic acid | 8.04 ±0.53b | 8.27 ±0.08b | 9.62 ±2.39ab | 12.71 ±1.16a | 11.88 ±0.60a | 11.11 ±0.62ab |
| cis-Aconitic acid | 49.40 ±4.22c | 47.93 ±0.59c | 52.77 ±2.38c | 68.26 ±3.70a | 64.83 ±6.36ab | 56.87 ±2.23bc |
| Benzoic acid | 3.27 ±0.32b | 3.54 ±0.07b | 3.48 ±0.20b | 3.69 ±0.07ab | 4.09 ±0.23a | 3.53 ±0.11b |
| Quinic acid | 15317.35 ±868.21a | 15998.29 ±1534.98a | 15624.38 ±1454.36a | 16164.08 ±1781.93a | 18436.31 ±652.13a | 15815.53 ±2605.23a |
| Succinic acid | 688.88 ±24.81b | 714.88 ±8.16ab | 698.89 ±35.34b | 748.31 ±26.92ab | 795.80 ±55.88a | 684.12 ±18.83b |
| Gluconic acid | 317.51 ±12.21c | 359.69 ±16.38b | 355.53 ±13.01b | 409.21 ±5.02a | 406.16 ±18.93a | 361.79 ±17.85b |
| Shikimic acid | 461.14 ±18.90c | 533.91 ±9.54ab | 517.98 ±2.11ab | 497.18 ±12.01bc | 536.13 ±21.69ab | 546.10 ±26.77a |
| Chorismic acid | 6.59 ±4.07a | 10.23 ±0.50a | 10.78 ±0.65a | 7.40 ±4.57a | 8.25 ±5.06a | 12.51 ±0.42a |
| 3-Phosphoglyceric acid | 90.01 ±1.72a | 81.05 ±3.10b | 81.87 ±3.85b | 92.55 ±3.81a | 80.67 ±2.17b | 82.54 ±0.16b |
| Fructose 6-phosphate | 68.96 ±1.42a | 54.52 ±2.87bc | 47.95 ±1.89c | 52.13 ±1.94c | 61.64 ±6.10ab | 54.95 ±2.52bc |
| Fructose 1,6-diphosphate | 21.85 ±0.68a | 15.55 ±0.82b | 15.26 ±1.32b | 16.58 ±0.53b | 16.72 ±0.14b | 15.59 ±0.55b |
| 6-Phosphogluconic acid | 9.95 ±0.62a | 5.66 ±0.42c | 7.72 ±1.00b | 8.08 ±0.20b | 8.35 ±0.42ab | 7.82 ±0.21b |
| Pyruvic acid | 26.02 ±3.32a | 18.23 ±0.31b | 20.60 ±0.97b | 17.68 ±0.10b | 21.58 ±2.81ab | 21.75 ±0.84ab |
| Glucose 6-phosphate | 402.83 ±13.00b | 418.33 ±5.27ab | 390.19 ±8.16b | 419.30 ±34.11ab | 451.33 ±14.20a | 378.83 ±10.38b |
| Glucose 1-phosphate | 27.64 ±1.47ab | 25.48 ±1.39b | 25.39 ±0.14b | 25.91 ±0.95b | 30.18 ±1.96a | 24.30 ±0.62b |
| Dihydroxyacetone phosphate | 12.28 ±0.09ab | 9.84 ±0.35c | 10.57 ±1.02bc | 13.84 ±1.40a | 13.69 ±0.58a | 12.02 ±0.91abc |
| Ribose 5-phosphate | 2.40 ±0.17b | 1.84 ±0.15c | 2.59 ±0.20ab | 2.82 ±0.11ab | 2.97 ±0.10a | 2.60 ±0.31ab |
| Ribulose 5-phosphate | 11.48 ±1.25ab | 9.71 ±0.41b | 11.26 ±1.44ab | 13.67 ±0.63a | 13.09 ±1.54a | 12.75 ±0.83a |

| | | | | | | |
|---|---|---|---|---|---|---|
| Glycerol-3-phosphate | 64.08 ±5.24b | 80.59 ±4.23ab | 88.16 ±11.12a | 95.82 ±6.60a | 88.97 ±1.76a | 87.44 ±11.56a |
| Sedoheptulose 7-phosphate | 22.28 ±1.10d | 28.59 ±3.17c | 39.38 ±3.00ab | 37.88 ±2.67ab | 42.03 ±1.16a | 33.92 ±2.29bc |
| Gluconic acid | 317.51 ±12.21c | 359.69 ±16.38b | 355.53 ±13.01b | 409.21 ±5.02a | 406.16 ±18.93a | 361.79 ±17.85b |
| Phosphoenolpyruvic acid | 8.04 ±0.53b | 8.27 ±0.08b | 9.62 ±2.39ab | 12.71 ±1.16a | 11.88 ±0.60a | 11.11 ±0.62ab |

The data are expressed as mean ± S.D. Different means with different letters in the same row are significantly different from each other ($p \leq 0.05$).

**Table S5** Full name of the metabolites in tea leaves.

| Abbreviation | Full name |
|---|---|
| Gly | Glycine |
| Ser | Serine |
| Ala | Alanine |
| Asp | Aspartic acid |
| Arg | Arginine |
| Glu | Glutamic acid |
| His | Histidine |
| Thr | Threonine |
| Asn | Asparagine |
| Trp | Tryptophan |
| β-Ala | β-Tryptophan |
| Lys | Lysine |
| Phe | Phenylalanine |
| Pro | Proline |
| Val | Valine |
| Ile | Isoleucine |
| Leu | leucine |
| Tyr | Tyrosine |

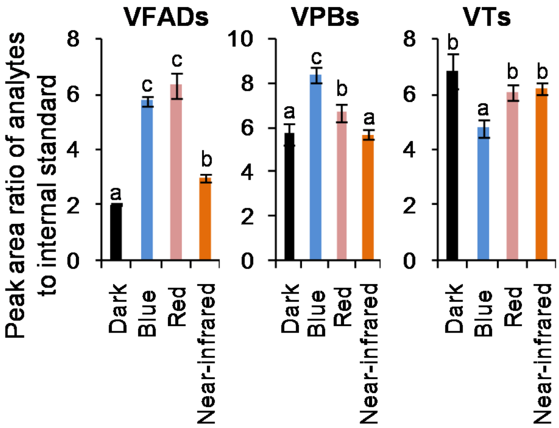


**Figure S1** Effects of LED and dark on volatiles of preharvest tea leaves after treatment from the 1st leaf stage to the 4th leaf stage

VFADs, volatile fatty acid derivatives; VPBs, volatile phenylpropanoids/ benzenoids; VTs, volatile terpenes. Different means with different letters are significantly different from each other ($p \leq 0.05$).

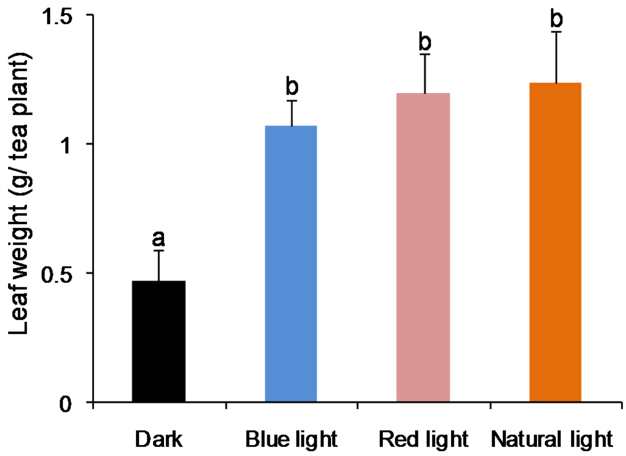


**Figure S2** Effects of LED, dark, and natural light on biomass of preharvest tea leaves after treatment from the 1st leaf stage to the 4th leaf stage

Tea seedlings at the 1st leaf stage were treated with blue light, red light, and dark, respectively. After 14 days-treatments, the tea plants developed from the 1st leaf stage to 4th leaf stage, and the weights of growing four leaves from each treatment were analyzed. In contrast to natural light treatment as a control, blue and red lights treatments had no significant effects on the biomass of tea leaves, whereas dark treatment significantly reduced the biomass of tea leaves. Different means with different letters are significantly different from each other ($p \leq 0.05$).

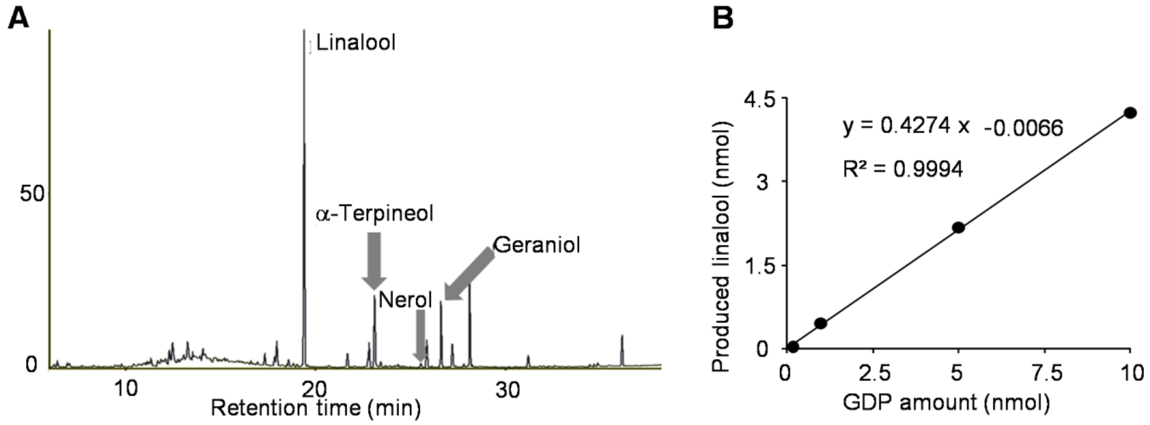


**Figure S3** GC-MS chromatogram of products from acidic hydrolysis of GDP (A) and linear relationships between GDP amount and its acidic hydrolyzed product linalool content (B). GDP, geranyl diphosphate. (A) Fifty nmol of GDP was used for acidic hydrolysis reaction.

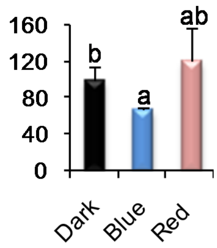


**Figure S4** Effects of blue light and red light on the content of linoleic acid in preharvest tea leaves. All treatments on preharvest tea leaves were carried out for 3 days. The y-axis unit is relative content (%) of metabolites, which was calculated based on the dark treatment (100%) as a control. Different means with different letters are significantly different from each other ($p \leq 0.05$).

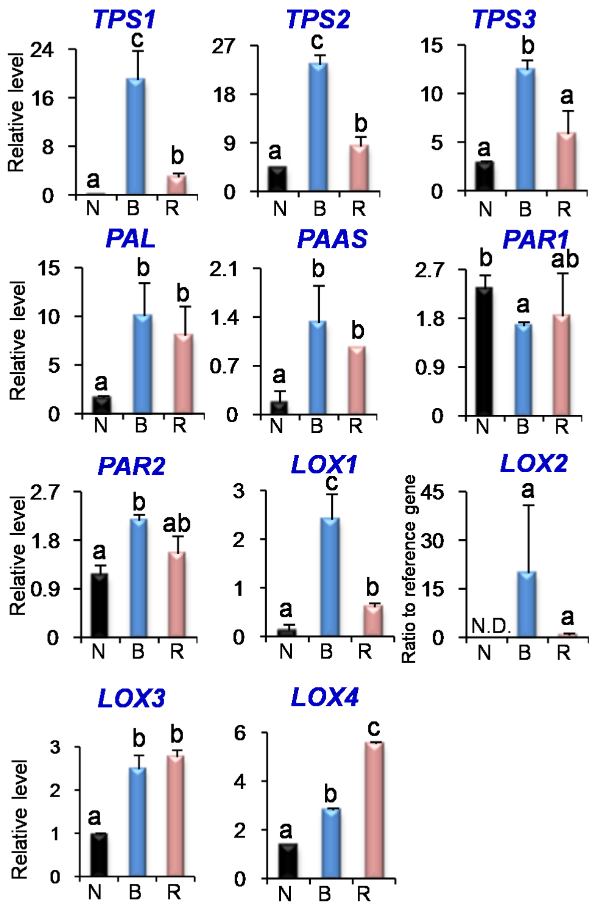


**Figure S5** Effects of blue light and red light on the expression levels of key genes involved in formation of volatiles in preharvest tea leaves

N, natural light treatment. B, blue light treatment. R, red light treatment. N.D., not detected. *TPS, terpene synthase*. *PAL, phenylalanine ammonialyase*. *PAAS, phenylacetaldehyde synthase*. *PAR, phenylacetaldehyde reductases*. *LOX, 9/13-lipoxygenase*. All treatments on preharvest tea leaves were carried out for 3 days. The relative expression levels of genes were calculated based on the dark treatment (1) as a control. Different means with different letters are significantly different from each other ($p \leq 0.05$).

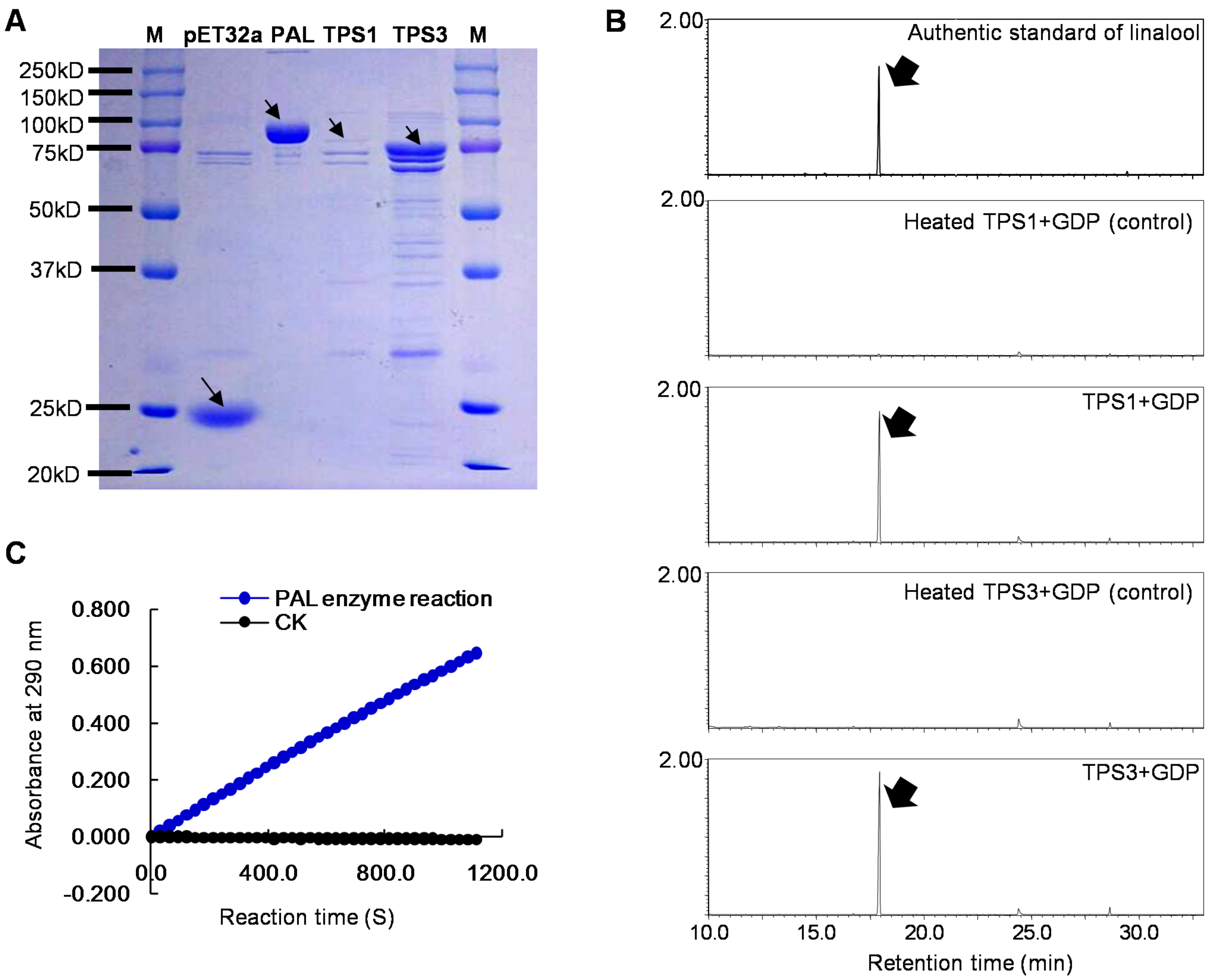


**Figure S6** SDS-page identification (A) and functional identifications (B and C) of TPS1, TPS3, and PAL recombinant proteins produced in *Escherichia coli.*

TPS, terpene synthase; PAL, phenylalanine ammonialyase; GDP, geranyl diphosphate. (A) Denatured 6×His-PAL, TPS1, and TPS3 recombinant proteins were separated on a 10% acrylamide SDS-PAGE gel. The marker lane shows the denatured protein molecular weight markers with the size label on the left. The proteins were indicated by the arrows. (B) The GC-MS chromatograms indicate that *TPS1* and *TPS3* recombinant protein produced in *E.coli* exhibited the activity of transformation from GDP to linalool. (C) The reaction product *trans*-cinnamic acid (CA) was determined at 290 nm. The PAL was assayed from the increase in absorbance at 290 nm, suggesting that the PAL recombinant protein produced in *E. coli* exhibited the activity of transformation from L-Phe to CA.

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PhPAAS          CAGATCATTGAAGTTGTGGCTTGTGTTAAAAAGTTATGGTGTAGCTAACCTCAGAAATTT
CsPAAS          -----------------------------------------GGGGGAACCTTCAATCTTA
RhPAAS          TCGGGCATTGAAGCTGTGGCTTGTGCTAAGAAGCTATGGTGTGGCTAACCTTAGAAACTT
                                                           *  *****   *   *

PhPAAS          CATAAGAAGCCATATAGAAATGGCTAAGCATTTTGAAGAACTTGTAGCCATGGATGAGAG
CsPAAS          CATAAGAAACCATATTGAATTGGCTAAACACTTTGAAGAGCTTGTTTCTCAAGACCCGAG
RhPAAS          TATTCGTATCCATGTCAAAATGGCCAAGACTTTTGAAGGGCTTGTGAGAATGGACAAGAG
                 **  * * **** *  ** **** **    *******  *****       **   ***

PhPAAS          GTTCGAAATTATGGCCCCAAGAAATTTCTCTCTGGTGTGCTTTAGGGTTTCACTATTGGC
CsPAAS          ATTTCAGGTTGTTGCTCCTCGGAAGTTTTCATTGGTTTGTTTTTGCCTTCT---------
RhPAAS          GTTTGAGATTCTGGTGCCTAGAAACTTCTCCTTGGTCTGCTTTAGAATTTCACCATCGGC
                 **  *  ** * *  **  * ** ** **  **** ** *** *  **

PhPAAS          ATTGGAGAAAAAGTTTAACTTTGTCGATGAAACCCAAGTGAATGAGTTCAACGCTAAGCT
CsPAAS          ------------GCCTCCCCATAACAACGAAGACTGTGCTAACAAACTAAACCATGACCT
RhPAAS          CTTGATCAGTAGTAATGAGGATGATGAGATCGGTATGGTAAACGAGGTCAATTGCAAATT
                               *     *    *          *  **  *  * **     *  *

PhPAAS          TTTAGAGTCCATTATTTCATCCGGTAATGTTTACATGACTCATACTGTGGTTGAAGGAGT
CsPAAS          ACTGGATGCTGTTAACTCAACCGGGAAATTATTCATTTCTCATACAGTTCTATCAGGTAA
RhPAAS          GCTGGAGGCCATCAATGCATCAGGTAAAGCATACATGACTCATGCTGTGGTTGGAGGGCT
                  * **  *  * *   ** * ** **    * ***  ***** * **  *   ***

PhPAAS          TTACATGATACGTTTTGCTGTTGGTGCACCTCTCACTGACTATCCCCATATTGATATGGC
CsPAAS          GTACACATTACGCTTTGCAGTAGGAGCTCCATTGACAGAAGAAAGGCATGTAAATGCAGA
RhPAAS          GTACGTGCTTCGTTGCGCGGTTGGTGCAACTCTGACCGAGGAAAAGCACATAGTCGAGGC
                 ***    * ** *  ** ** ** **  *  * ** **  *    **  *       *
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**Figure S7** Alignment of *Camellia sinensis PAAS* (*CsPAAS*) with *Petunia x hybrida PAAS* (*PhPAAS*, DQ243784) and rose hybrid *PAAS* (*RhPAAS*, DQ192639).

cDNA sequences were aligned using Clustal X. Method: tea plant shoot stems cDNA library from NCBI was chosen to blast, one PAAS (phenylacetaldehyde synthase) unigenes (*CsPAAS,* FS952786) was obtained by blasting with the homologous sequences from *PhPAAS* and *RhPAAS*. *Petunia x hybrida PAAS* and rose hybrid *PAAS* from paper: *Kaminaga, Y., et al., Plant phenylacetaldehyde synthase is a bifunctional homotetrameric enzyme that catalyzes phenylalanine decarboxylation and oxidation*. *Journal of Biological Chemistry, 2006, 281, 23357-23366.*

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CsPAR1      AAAAGAGTGGTTTTGACATCGTCTGTAGCTGCAGTTGCATACAATGGTAGGCCTCGAACT
CsPAR2      AAAAGAGTAGTGTTGACATCTTCTGTAGCTGCCGTTGCTTTCAATGGTAGGCCTCGAGCT
RdPAR       AAACGGGTGGTCTTAACATCTTCTATAGCCGCAGTTGCATATAATGGAAAGCCTCGAACT
SlPAR1      AAACGAGTTGTTTTAACGTCTTCCATAGCTGCAGTTGCTTACAGTGGTCAGCCTCGGACA
SlPAR2      AGAAGAGTGGTCTTGACATCATCTGTTGCAGCAGTTGCTTTCAATGGCAAGCCAAGAACC
            * * * ** ** ** ** ** **  * ** ** ***** *  * ***   ***  *  *

CsPAR1      TCTGATGTGATAATTGATGAGACTTGGTTTTCTGATCCGGTGTCATGCAAGGAAAATAAG
CsPAR2      CCTGACGTCGTAGTTGATGAGAGTTGGTTTTCTGATCCAGAGTTCTGCAAGCAAAATAAG
RdPAR       CCTGATGTAGTGGTTGATGAGACTTGGTTTACTGATCCAGATGTCTGTAAGGAATCGAAG
SlPAR1      CCTGAGGTTGTGGTTGATGAGAGCTGGTGGACCAGTCCAGACTACTGCAAAGAAAAACAG
SlPAR2      CCTGAAGTGGTGGTTGATGAAACATGGTGGTCAGATCCTGACTTTTGCAGAGAATCACAG
             **** **  *  ******* *  ****   *   *** *     ** *   **    **

CsPAR1      CTTTGGTATCAGCTGTCCAAGACTCTAGCAGAGGATGCTGCCTGGAAGTTTGCAAAAGAG
CsPAR2      CTTTGGTATGTGCTGTCAAAGACTTTAGCAGAGGATGCTGCCTGGAAGTTTACAAAAGGA
RdPAR       CTATGGTATGTGCTTTCAAAGACTTTGGCGGAGGATGCTGCCTGGAAATTTGTAAAGGAG
SlPAR1      CTCTGGTATGTCCTCTCAAAGACATTGGCTGAGGATGCTGCGTGGAAGTTTGTGAAGGAG
SlPAR2      CTCTGGTATGTGCTTTCGAAGACATTAGCTGAGGATGCTGCGTGGAAGTTTGTGAAAGAG
            ** ******   ** ** *****  * ** *********** ***** ***   ** *

CsPAR1      AACGGTATTGACATGGTTGCAATAAACCCAGCAATGGTTATTGGTCCTCTGTTACAACCA
CsPAR2      AAGGGTATTGACATGGTTACAATTAACCCAGCAATGGTTGTCGGTCCTCTCTTGCAGCCA
RdPAR       AAGGGAATTGACATGGTTACAATTAATCCTGCAATGGTGATCGGTCCTCTGTTACAGCCA
SlPAR1      AAAGGCATTGATATGGTTGTAGTAAACCCTGCTATGGTTATTGGTCCTCTGTTACAGCCT
SlPAR2      AAAGCTTTCGATATGGTTACAATAAACCCAGCAATGGTTATAGGCGGTTTGTTGCAACCA
            ** *   * ** ******  * * ** ** ** *****  * **   * * ** ** **

CsPAR1      ACACTTAATACAAGTTCTGCTGCTATCTTGAACTTAATAAATGGTTCACAAACATATCCA
CsPAR2      ACTCTCAATACAAGTGCTGCTGCAATTTTGAACGTAATAAATGGTTCACAAACATTTCCA
RdPAR       ACGCTAAATACAAGTGCTGCTGCAATTCTGAATATTATTAAGGGAGCTCGAACATATCCA
SlPAR1      ACACTTAATACCAGTTCTGCTGCAGTCTTGAGCTTGGTAAATGGTGCTGAGACATACCCA
SlPAR2      ACGCTTAATACAAGTGCTGCTGCTATCTTACAACTGCTAAATGGTTCTGAAACATACCCA
            ** ** ***** *** *******  *  *     *  * ** **  *    ****  ***

CsPAR1      AATGCTTCATTTGGATGGATTAATGTTAAAGATGTTGCAAATGCGCACATTCAAGCATAT
CsPAR2      AATTCTACATTTGGATGGGTTAATGTTAAAGATGTTGCCAATGCACATATTCAAGCATTT
RdPAR       AATGCAAGTTTTGGATGGATTAATGTCAAAGATGTTGCCAACGCACATGTTCAAGCATTT
SlPAR1      AATTCCTCTTTTGGGTGGGTTAACGTGAAAGATGTTGCAAATGCACATATTCTTGCATTT
SlPAR2      AATTCTACATTTGGTTGGGTTAACGTGAAAGATGTCGCCCTTGCACATATTCTGGCATTT
            *** *    ***** *** **** ** ******** **    ** **  ***  **** *

CsPAR1      GAGATTCCTTCAGCCAATGGAAGATATTGTTTGGTTGAGAGAGTCGCACACTACTCTGAA
CsPAR2      GAGATTCCTTCAGCTAATGGAAGATATTGTTTGGTTGAGAGCGTTGCACACTACTCTGAA
RdPAR       GAGATTCCTTCAGCTAGTGGAAGATATTGTTTAGTCGAGAGAGTTGCACACTTCACTGAA
SlPAR1      GAGAACCCTTCAGCTAATGGGAGATACTTAATGGTTGAGAGGGTTGCACACTATTCTGAT
SlPAR2      GAAAACCCTTCAGCTAATGGTAGATATTTAATGGTGGAGTCAGTTGCACACTACTCTGAG
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                    ** *  ******** * *** ***** *   * ** ***   ** *******   ****

CsPAR1              GTTGTGAACATACTACACAAGCTTTATCCTTCTTTTCAACTTCCAGAAAAGTCTGCGGAT
CsPAR2              GTTGTGAAGATACTACAAGAGCTGTTTCCTGCTTTTCAACTTCCAGAAAAGTGTGCTGAT
RdPAR               GTTCTGCAAATTATACATGAGCTGTACCCTGATTTGCAACTTCCAGAGAAATGTTCGGAT
SlPAR1              ATATTGAAGATATTGCGTGACCTTTATCCTACTATGCAACTTCCAGAAAAGTGTGCTGAT
SlPAR2              ATAGTTAAGATATTACGCGAGCTTTACCCTACACTGAAGCTTCCAGAAAAGTGTGCTGAT
                     *  *  * **  * *   * ** *  ***    *  * ******** ** * * * ***

CsPAR1              GACAAACCATTTATGCCAACATACCAGGTATCCAGGGAAAAAGCAAAAACTTTAGGAATT
CsPAR2              GACAAGCCATTTACGCCGACTTACCAGGTGTCTAAGGAAAGAACAAAAAGCTTAGGTATT
RdPAR               GATAAACCTTTTGTGCCAACATATCAGGTGTCCAAAGAAAAGGCAAAGAGCTTGGGAATT
SlPAR1              GACAACCCATTGATGCAAAATTATCAAGTATCAAAGGAGAAGGCAAAAAGCTTGGGTATT
SlPAR2              GATAAGCCATTTACGCCAACGTACCAGGTTAACGTAGAAAGAGCCAAAAAATTGGGTATT
                    ** ** ** **   **  *  ** ** **       ** *   * ** *  ** ** ***

CsPAR1              GACTTCATTTCCCTCGAGGAGGGCCTCAAGGAAACTGTTGAAAGCTTGACAGAGAAGAAA
CsPAR2              GAGTTCATTCCCCTCAAGCAGAGCATCAAGGAAACAGTTGAAAGCTTGATGGAGAAGAAA
RdPAR               GAGTTTATTCCATTAGACATTAGCCTCAAGGAAACAATTGAAAGCTTGAAGGAAAAGAGT
SlPAR1              GAGTTTACTACCCTTGAAGAAAGCATCAAAGAAACTGTTGAAAGTTTGAAGGAAAAGAAG
SlPAR2              GAATTCATTCCTTTGGCGGAAAGCGTCAAGGAAACAGCTGAAAGCTTGAAAGAGAAGAAG
                    ** ** * * *  *        ** **** *****   ****** ****  ** ****

CsPAR1              TTTTTTGGTATGTG-------------
CsPAR2              CTTTTCACTCGGTGA------------
RdPAR               ATCGTCAGCTTCTGA------------
SlPAR1              TTTTTTGGAGGTTCATCTTCTATGTAA
SlPAR2              TTTTACTGA------------------
                     *
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**Figure S8** Alignment of *Camellia sinensis PARs* (*CsPAR1* and *CsPAR2*) with tomato *PARs* (*SlPAR1*, NM_001247894; *SlPAR2*, NM_001247901) and *Rosa damascene PAR* (*RdPAR*, AB426519). cDNA sequences were aligned using Clustal X. Method: Tea library of GAAC01.1 was downloaded from NCBI, two *PAR* (*Phenylacetaldehyde reductase*) unigenes (*CsPAR1* and *CsPAR2*) were obtained by blasting with the homologous sequences from *SlPAR1*, *SlPAR2*, and *RdPAR*.

*Rosa damascene PAR* from paper: *Chen, X.M., et al., Functional characterization of rose phenylacetaldehyde reductase (PAR), an enzyme involved in the biosynthesis of the scent compound 2-phenylethanol. Journal of Plant Physiology, 2011, 168, 88-95.*

Tomato *PARs* from paper: *Tieman, D.M., et al., Tomato phenylacetaldehyde reductases catalyze the last step in the synthesis of the aroma volatile 2-phenylethanol. Phytochemistry, 2007, 68,2660-2669.*

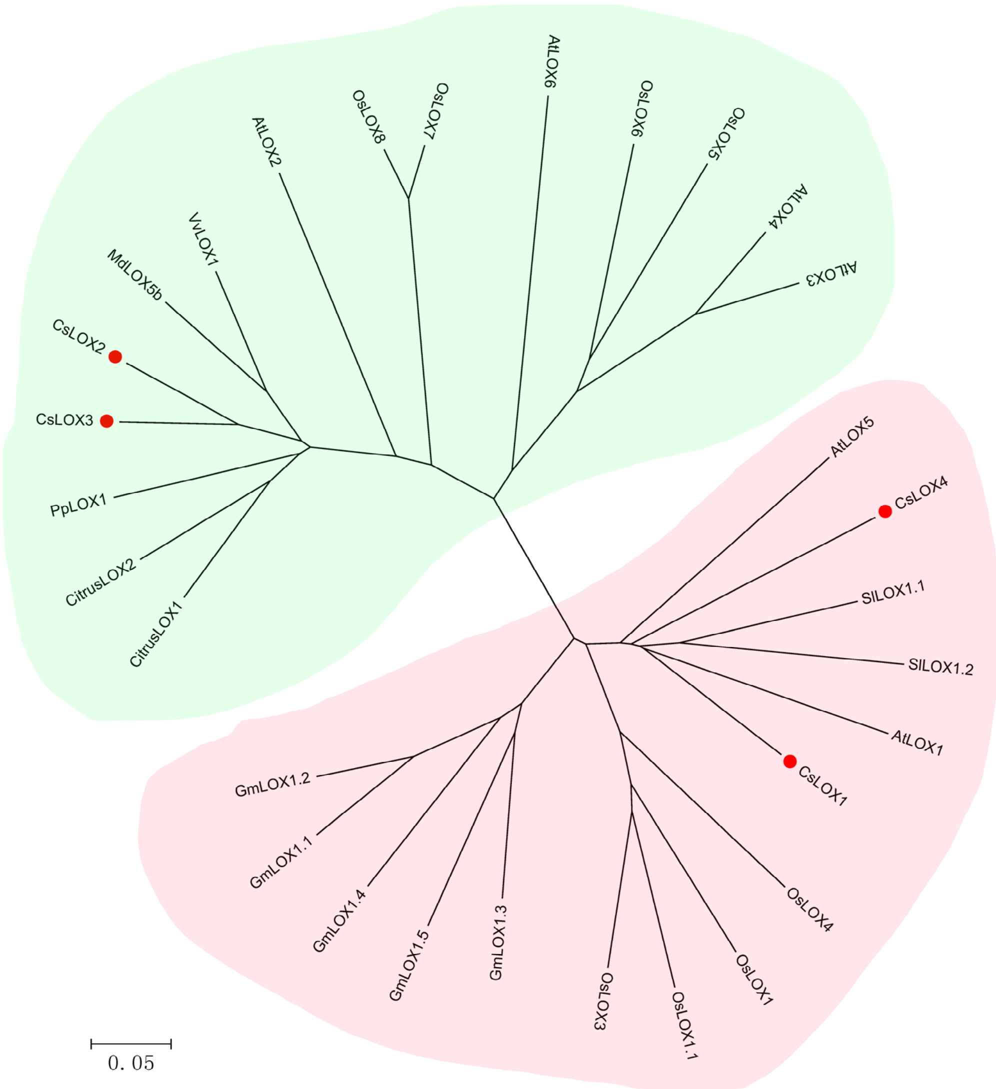


**Figure S9** Phylogenetic analysis of *Camellia sinensis* (CsLOX1 , CsLOX2, CsLOX3 and CsLOX4,) and other plant Lipoxygenase genes. AtLOX1, Q06327; AtLOX2, P38418; AtLOX3, Q9LNR3; AtLOX4, Q9FNX8; AtLOX5, Q9LUW0; AtLOX6, Q9CAG3; CitrusLOX1, V4U565; CitrusLOX2, V4TFS9; GmLOX1.1, P08170; GmLOX1.2, P09439; GmLOX1.3, P09186; GmLOX1.4, P24095; GmLOX1.5, P38417; MdLOX5b, S4UL41; OsLOX1, Q76I22; OsLOX1.1, P29250; OsLOX3, Q7G794; OsLOX4, Q53RB0; OsLOX5, Q7XV13; OsLOX6, Q8H016; OsLOX7, P38419; OsLOX8, Q84YK8;PpLOX1, M5W1M2; SlLOX1.2, P38416; SlLOX1.2, P38415; VvLOX1, F6HB91. Method: The phylogenetic tree constructed using MEGA (version 5.0), and the sequence alignment was used for a Neighbor–Joining (NJ) tree using default parameters in MEGA. Bootstrap analysis of the NJ tree was performed using 1000 replicates.

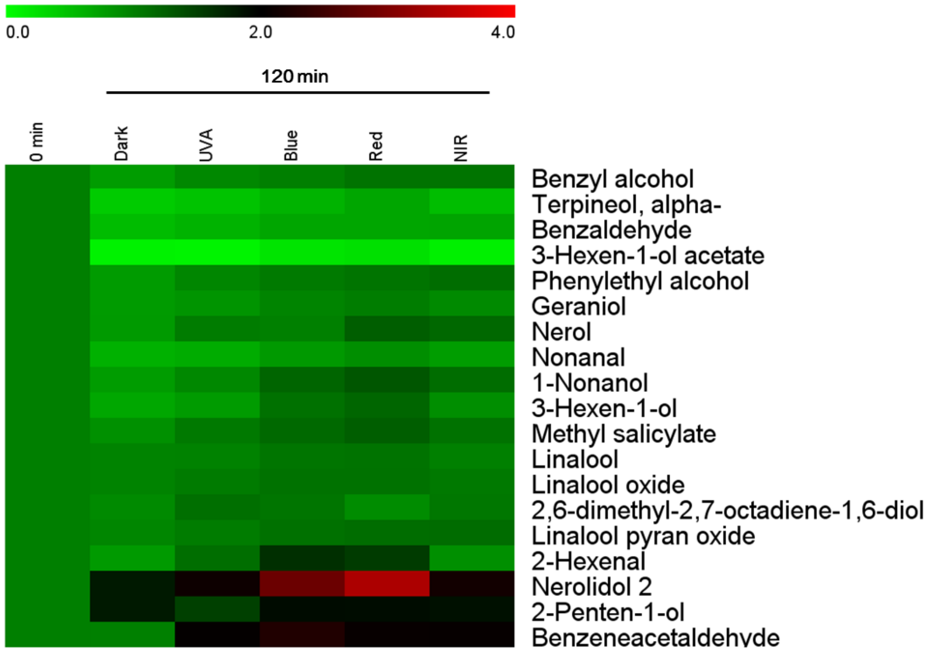


**Figure S10** Comparison of volatiles in 0 min and 120 min treatments of dark, UVA, blue light, red light, and near-infrared (NIR) on postharvest tea leaves

The 0 min treatment was normalized as 1. The data were calculated based on mean values (n=3). The original data for making this figure is shown in Table S3 (Supplementary information).

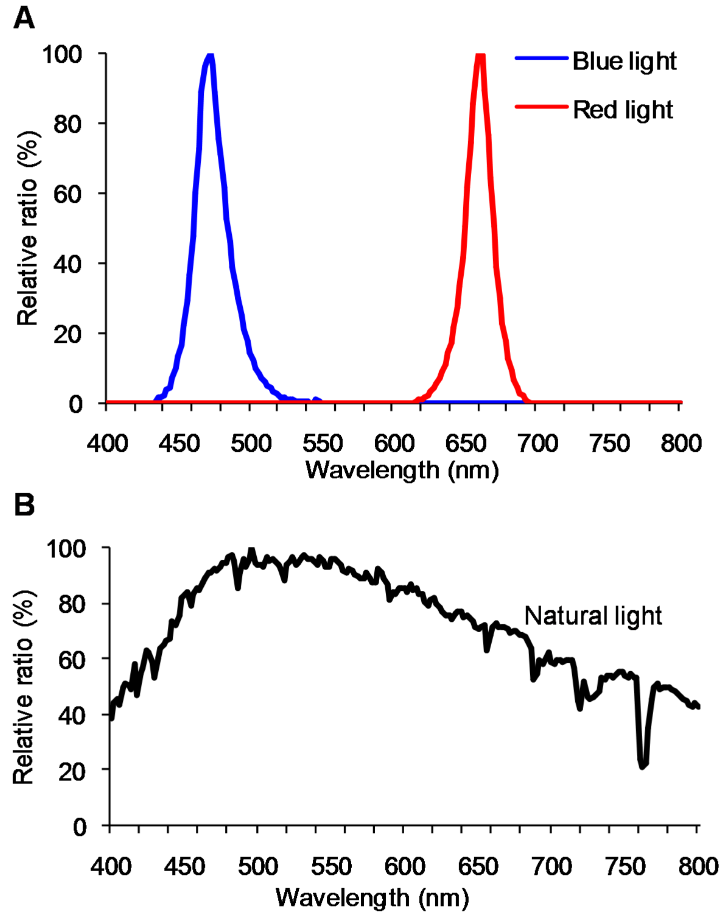


**Figure S11** Light conditions under blue light and red light (A), and natural light (B)

The highest light intensity was defined as 100%.