

Supplementary material

Table S1. qRT-PCR primers in this study.

| Gene name | | Primer Sequences (5' -3') | Annealing | GC% |
|-----------|---------|----------------------------|------------------|------|
| | | | temperature (°C) | |
| DGAT1 | Forward | AAAGGTTGGGTAATACGCC | 56.6 | 47.4 |
| | Reverse | GCCAGACATACAAAGTGGG | 56.5 | 52.6 |
| DGAT2.4 | Forward | AGAACAGACTGGGCAGGAAA | 59.8 | 50 |
| | Reverse | AGGACCTTGATCTTCGGCA | 60.8 | 52.6 |
| GPAT9.1 | Forward | AAGTATCATGGACCTCGCCC | 61.2 | 55 |
| | Reverse | TGGCCACAATTTACGATC | 60.5 | 47.4 |
| GPAT9.3 | Forward | ATCGCCTACACTAACTGAAGC | 56.3 | 47.6 |
| | Reverse | AAACACAATCCACCCAGC | 56.8 | 50 |
| LPAT1.1 | Forward | TGGTTGCTAAGGTTTGGG | 57.1 | 50 |
| | Reverse | ATGCCCCGTCTTGCTAATG | 57.2 | 50 |
| LPAT2.9 | Forward | GCCTCCTGTTTCTTCTTTTCG | 59.1 | 50 |
| | Reverse | AGACCTGCCCACCAATCTAC | 59 | 55 |
| LPAT4.3 | Forward | ACGAAGACACCAGCCATTG | 59.7 | 52.6 |
| | Reverse | GCCACATAGATAGCCAAGTCC | 58.7 | 52.4 |
| UBQ-E2-10 | Forward | GGACCCAGAAGTACGCAATG | 60.5 | 55 |
| | Reverse | AATTACCAGGGATACAGCACC | 57.9 | 47.6 |

Table S2. Key differential metabolites in three germplasms (JL, JZ, and GK).

| Compounds | Class | Relative ionic strength | | |
|--------------------------|-----------|-------------------------|----------|----------|
| | | JL | JZ | GK |
| 3-amino-2-naphthoic acid | Alkaloids | 1.38E+07 | 4.30E+06 | 1.69E+06 |
| 3-Indoleacrylic acid* | Alkaloids | 1.48E+07 | 4.94E+06 | 1.82E+06 |
| Methoxyindoleacetic acid | Alkaloids | 2.08E+05 | 6.46E+04 | 2.72E+04 |
| N-Cis-Feruloyltyramine | Alkaloids | 6.57E+04 | 2.66E+05 | 8.94E+05 |

| | | | | |
|--|-----------------------------|----------|----------|----------|
| p-Coumaroyltyramine* | Alkaloids | 1.59E+04 | 1.61E+05 | 7.64E+05 |
| Tataramide A | Alkaloids | 5.95E+03 | 1.96E+04 | 8.87E+04 |
| N-trans-p-Coumaroyloctopamine* | Alkaloids | 1.06E+04 | 4.50E+04 | 3.76E+05 |
| N-Trans-Feruloylphenacylamine | Alkaloids | 3.50E+04 | 1.48E+05 | 3.95E+05 |
| N-trans-p-Coumaroylphenacylamine | Alkaloids | 1.27E+04 | 7.18E+04 | 6.00E+05 |
| N-Trans-Feruloyloctopamine* | Alkaloids | 6.03E+04 | 1.75E+05 | 5.08E+05 |
| N-Feruloyloctopamine | Alkaloids | 1.06E+04 | 2.81E+04 | 1.09E+05 |
| N-Feruloyl-3-methoxytyramine* | Alkaloids | 4.94E+02 | 1.01E+04 | 1.19E+05 |
| N-Trans-Feruloyl-3'-O-methyldopamine* | Alkaloids | 1.60E+03 | 8.75E+03 | 1.11E+05 |
| N-Cis-Feruloyl-3'-O-methyldopamine* | Alkaloids | 2.48E+03 | 9.02E+03 | 1.04E+05 |
| (2E)-3-(4-Hydroxyphenyl)-N-[2-(4-hydroxyphenyl)ethyl]-2-propenamide* | Alkaloids | 1.38E+04 | 1.50E+05 | 8.12E+05 |
| (2Z)-N-[2-(3,4-Dihydroxyphenyl)-2-hydroxyethyl]-3-(4-methoxyphenyl)-2-propenamide* | Alkaloids | 6.48E+04 | 1.78E+05 | 5.25E+05 |
| Luteolin-7-O-glucoside (Cynaroside)* | Flavonoids | 2.07E+05 | 1.59E+04 | 3.87E+04 |
| 6-C-Methylquercetin-3-O-glucoside* | Flavonoids | 4.40E+05 | 4.74E+04 | 1.93E+04 |
| 3'-O-Methyltricetin-7-O-glucoside* | Flavonoids | 4.07E+05 | 3.49E+04 | 1.64E+04 |
| Gossypetin-3-O-glucoside | Flavonoids | 1.18E+05 | 1.89E+04 | 9.00E+00 |
| 2,6-Dimethoxybenzaldehyde | Phenolic acids | 3.62E+04 | 1.30E+04 | 4.71E+03 |
| P-Hydroxycinnamic acid p-hydroxyphenethylamine* | Phenolic acids | 2.41E+04 | 1.63E+05 | 8.39E+05 |
| Salicylic acid-2-O-glucoside* | Phenolic acids | 1.22E+05 | 9.04E+05 | 3.89E+05 |
| 6-O-Acetylارbutin | Phenolic acids | 1.02E+04 | 9.00E+00 | 4.34E+03 |
| Methoxysalicylic acid glucoside* | Phenolic acids | 2.16E+05 | 1.96E+06 | 6.78E+05 |
| 5-Glucosyloxy-2-Hydroxybenzoic acid methyl ester* | Phenolic acids | 1.43E+05 | 2.99E+05 | 2.54E+04 |
| 3,4,5-Trimethoxyphenyl-1-O-Glucoside | Phenolic acids | 4.54E+05 | 4.04E+06 | 1.37E+06 |
| Benzyl β-primeveroside* | Phenolic acids | 1.23E+05 | 2.66E+05 | 5.13E+04 |
| DL-Tryptophan | Amino acids and derivatives | 2.94E+07 | 1.32E+07 | 5.38E+06 |
| Seryl threonine | Amino acids and derivatives | 1.41E+05 | 4.50E+04 | 1.86E+04 |
| Threonylleucine | Amino acids and derivatives | 1.72E+07 | 4.15E+06 | 1.24E+06 |
| L-Valyl-L-Phenylalanine | Amino acids and derivatives | 6.24E+03 | 2.57E+04 | 5.26E+04 |
| (10E,12Z)-9-Oxo-octadeca-10,12-dienoic acid | Lipids | 1.13E+03 | 2.56E+03 | 1.22E+04 |
| E,E,Z-1,3,12-Nonadecatriene-5,14-diol | Lipids | 4.99E+02 | 1.22E+03 | 2.04E+04 |
| Eicosadienoic acid | Lipids | 1.79E+04 | 4.35E+04 | 3.64E+05 |
| 2-α-Linolenoyl-glycerol | Lipids | 1.44E+04 | 6.47E+03 | 9.31E+05 |
| MG 18:3 | Lipids | 1.36E+04 | 6.17E+03 | 9.42E+05 |
| naphthisoxazol A* | Others | 1.34E+07 | 4.38E+06 | 1.66E+06 |
| Tridecadienoyl sulfate | Others | 1.34E+04 | 2.96E+04 | 2.77E+03 |
| Ruscogenin-1-O-carboxyglucosyl(1,2)ramnoside | Steroids | 2.69E+05 | 9.46E+04 | 1.87E+04 |
| Muconic acid | Organic acids | 3.82E+05 | 1.55E+05 | 5.21E+04 |

Note: JL: pointed-leaved green stem, JZ: pointed-leaved purple stem, GK: broad-leaved green stem. "*" indicates an isomer, and the same below.

Table S3. Key differential metabolites in three age sections (AT, BT, and CT).

| Compounds | Class | Relative ionic strength | | |
|--|-----------------------------|-------------------------|----------|----------|
| | | AT | BT | CT |
| LysoPC 20:2* | Lipids | 2.42E+05 | 1.17E+05 | 5.14E+04 |
| 4-Methoxybutyl Acetate | Lipids | 7.92E+04 | 3.81E+04 | 1.69E+04 |
| LysoPC 20:2(2n isomer)* | Lipids | 9.93E+04 | 4.89E+04 | 1.88E+04 |
| N-Feruloyltryptamine | Alkaloids | 3.19E+04 | 1.01E+04 | 9.00E+00 |
| N-(4-hydroxyphenethyl)-glucosamine | Alkaloids | 3.17E+05 | 6.98E+05 | 2.71E+06 |
| Sibiricose A6 | Phenolic acids | 7.39E+03 | 9.00E+00 | 3.68E+04 |
| 3-Hydroxy-5-Methylphenol-1-O-Glucoside | Phenolic acids | 1.71E+06 | 5.33E+05 | 1.75E+05 |
| Furanofructosyl- α -D-(3-mustard acyl)glucoside | Phenolic acids | 4.69E+03 | 1.57E+04 | 5.79E+04 |
| L-Serine | Amino acids and derivatives | 1.28E+06 | 3.41E+06 | 6.88E+06 |
| L-Alanyl-L-Alanine | Amino acids and derivatives | 5.66E+04 | 1.25E+04 | 2.74E+04 |
| 3-Aminoisobutyric acid* | Organic acids | 2.95E+04 | 1.34E+04 | 3.92E+03 |
| 1-Pyrroline-4-hydroxy-2-carboxylic acid | Organic acids | 1.79E+05 | 9.00E+00 | 4.13E+05 |
| Phloretin | Flavonoids | 4.65E+04 | 3.06E+05 | 9.65E+05 |
| Diosgenin | Steroids | 1.13E+05 | 1.03E+04 | 9.00E+00 |
| Trehalose 6-phosphate | Saccharides and Alcohols | 3.94E+05 | 2.59E+06 | 1.05E+06 |
| Tridecadienoyl sulfate | Others | 3.25E+05 | 1.32E+06 | 3.09E+06 |

Note: AT: one-year age sections, BT: two-year age sections, CT: three-year age sections.

Table S4. Relative expression of *GPAT*, *LPAT*, and *DGAT* genes in the transcriptome of different tissue sites of *P. cyrtonema*.

| Index | Gene name | Class | F | L | R | S | T |
|----------------------|-----------|-------|-------|-------|-------|-------|-------|
| Cluster-11683.26510 | PcGPAT1.2 | GPAT | 0.00 | 0.00 | 0.00 | 0.00 | 1.06 |
| Cluster-11683.201308 | PcGPAT1.3 | | 1.29 | 0.13 | 28.28 | 0.00 | 0.45 |
| Cluster-11683.106825 | PcGPAT9.2 | | 4.54 | 8.03 | 6.21 | 6.02 | 3.56 |
| Cluster-11683.56323 | PcGPAT6.1 | | 0.99 | 0.00 | 2.35 | 0.04 | 0.53 |
| Cluster-29692.0 | PcGPAT1.5 | | 1.04 | 0.00 | 1.15 | 0.00 | 1.33 |
| Cluster-11683.178507 | PcGPAT9.5 | | 1.20 | 1.93 | 0.91 | 0.97 | 1.77 |
| Cluster-11683.137258 | PcGPAT4 | | 83.60 | 3.58 | 27.64 | 2.96 | 7.26 |
| Cluster-11683.117604 | PcGPAT9.3 | | 17.84 | 11.21 | 20.53 | 15.70 | 12.04 |
| Cluster-11683.145205 | PcGPAT3.2 | | 0.20 | 0.09 | 1.00 | 0.00 | 0.00 |
| Cluster-11683.226019 | PcGPAT1.4 | | 0.00 | 0.00 | 1.39 | 0.00 | 0.02 |
| Cluster-11683.131185 | PcGPAT9.4 | | 3.82 | 4.21 | 3.26 | 6.01 | 1.67 |
| Cluster-11683.76883 | PcGPAT6.3 | | 2.04 | 4.21 | 0.98 | 0.82 | 1.03 |
| Cluster-11683.61945 | PcGPAT6.2 | | 0.22 | 2.57 | 1.46 | 1.45 | 2.14 |

| | | | | | | | |
|----------------------|-----------|------|--------|--------|--------|--------|--------|
| Cluster-11683.17927 | PcGPAT1.1 | | 0.17 | 0.02 | 4.67 | 0.00 | 0.00 |
| Cluster-11683.60675 | PcGPAT5 | | 6.20 | 0.17 | 3.55 | 0.00 | 0.80 |
| Cluster-11683.49377 | PcGPAT3.1 | | 1.39 | 0.07 | 3.37 | 0.37 | 0.01 |
| Cluster-11683.89039 | PcGPAT9.1 | | 18.68 | 31.84 | 26.60 | 32.77 | 22.48 |
| Cluster-11683.125365 | PcATS1.1 | | 27.30 | 60.12 | 6.92 | 50.41 | 10.00 |
| Cluster-11683.168120 | PcATS1.2 | | 0.24 | 0.77 | 0.39 | 0.65 | 0.95 |
| Cluster-11683.164452 | PcLPAT2.7 | | 2.04 | 2.42 | 2.24 | 2.16 | 1.82 |
| Cluster-11683.140043 | PcLPAT2.4 | | 23.98 | 17.90 | 16.66 | 17.50 | 17.38 |
| Cluster-11683.122314 | PcLPAT2.3 | | 14.78 | 13.09 | 12.89 | 16.48 | 16.93 |
| Cluster-11683.86126 | PcLPAT2.1 | | 0.61 | 1.09 | 0.81 | 1.02 | 0.44 |
| Cluster-11683.105098 | PcLPAT2.2 | | 39.50 | 17.02 | 13.34 | 20.85 | 23.36 |
| Cluster-11683.145946 | PcLPAT1.2 | | 67.18 | 77.56 | 2.65 | 33.24 | 4.43 |
| Cluster-11683.143957 | PcLPAT2.5 | LPAT | 1.02 | 0.55 | 0.07 | 1.13 | 0.46 |
| Cluster-11683.187439 | PcLPAT2.9 | | 15.24 | 14.57 | 14.63 | 12.41 | 24.34 |
| Cluster-11683.63640 | PcLPAT4.1 | | 8.72 | 22.37 | 14.10 | 26.12 | 11.41 |
| Cluster-11683.116975 | PcLPAT1.1 | | 6.14 | 9.96 | 7.41 | 9.10 | 12.05 |
| Cluster-11683.144893 | PcLPAT4.3 | | 12.81 | 7.21 | 11.27 | 9.63 | 13.23 |
| Cluster-11683.169863 | PcLPAT2.8 | | 2.13 | 2.33 | 1.16 | 2.12 | 0.30 |
| Cluster-11683.95330 | PcLPAT4.2 | | 0.20 | 0.73 | 0.00 | 0.20 | 0.10 |
| Cluster-11683.158348 | PcLPAT2.6 | | | | | | |
| Cluster-11683.114805 | PcDGAT1 | | 11.30 | 13.73 | 16.87 | 17.36 | 14.61 |
| Cluster-11683.125465 | PcDGAT2.2 | | 8.36 | 11.50 | 6.17 | 9.70 | 6.47 |
| Cluster-11683.128175 | PcDGAT2.3 | | 19.39 | 12.13 | 0.00 | 58.36 | 0.05 |
| Cluster-11683.137374 | PcDGAT2.4 | | 242.85 | 295.00 | 112.25 | 352.44 | 160.04 |
| Cluster-11683.139297 | PcDGAT2.5 | | 0.21 | 0.47 | 0.64 | 0.29 | 0.03 |
| Cluster-11683.144767 | PcDGAT2.6 | | 1.24 | 0.81 | 0.16 | 0.97 | 0.57 |
| Cluster-11683.150005 | PcWSD1.3 | DGAT | 23.53 | 91.68 | 32.73 | 38.69 | 10.95 |
| Cluster-11683.160378 | PcWSD1.4 | | 0.89 | 3.21 | 0.40 | 2.93 | 0.29 |
| Cluster-11683.202350 | PcWSD1.5 | | 1.90 | 0.06 | 0.35 | 0.02 | 0.33 |
| Cluster-11683.61124 | PcWSD1.1 | | 1.95 | 0.62 | 0.57 | 0.12 | 5.80 |
| Cluster-11683.64305 | PcWSD1.2 | | 1.60 | 0.09 | 0.20 | 0.00 | 0.84 |
| Cluster-11683.123837 | PcDGAT2.1 | | | | | | |
| Cluster-11683.175971 | PcDGAT2.7 | | | | | | |

Note: F: fruit, L: leaf, R: root, S: stem, T: rhizome.

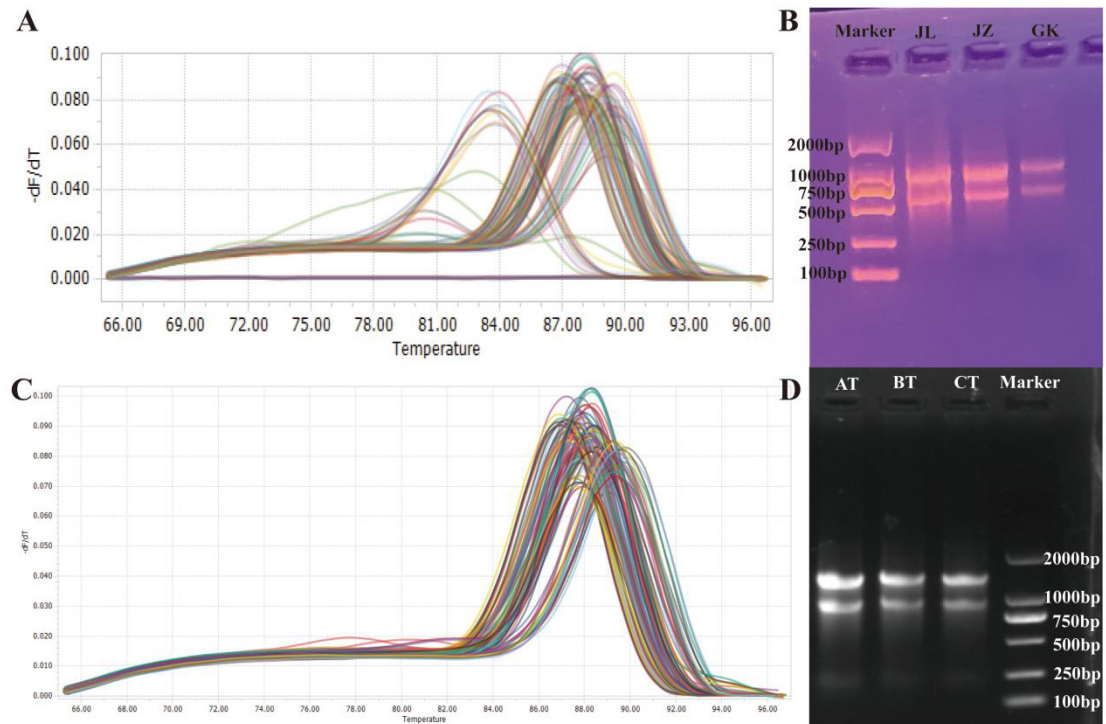


Figure S1. Melting curve (A: different germplasms, C: different age sections) of qRT-PCR and electrophoresis map (B: different germplasms, D: different age sections) of the total RNA isolated from *P. cyrtonema*.

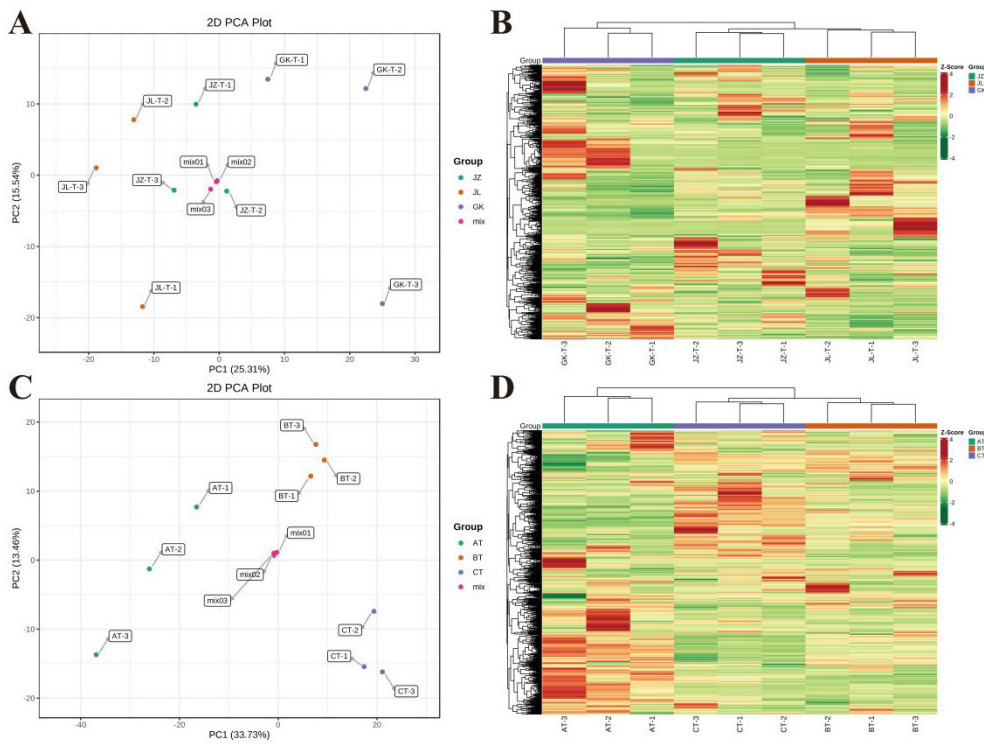


Figure S2. PCA plots (A: different germplasms, C: different age sections) and clustered heat maps (B: different germplasms, D: different age sections) of *P. cyrtonema*.

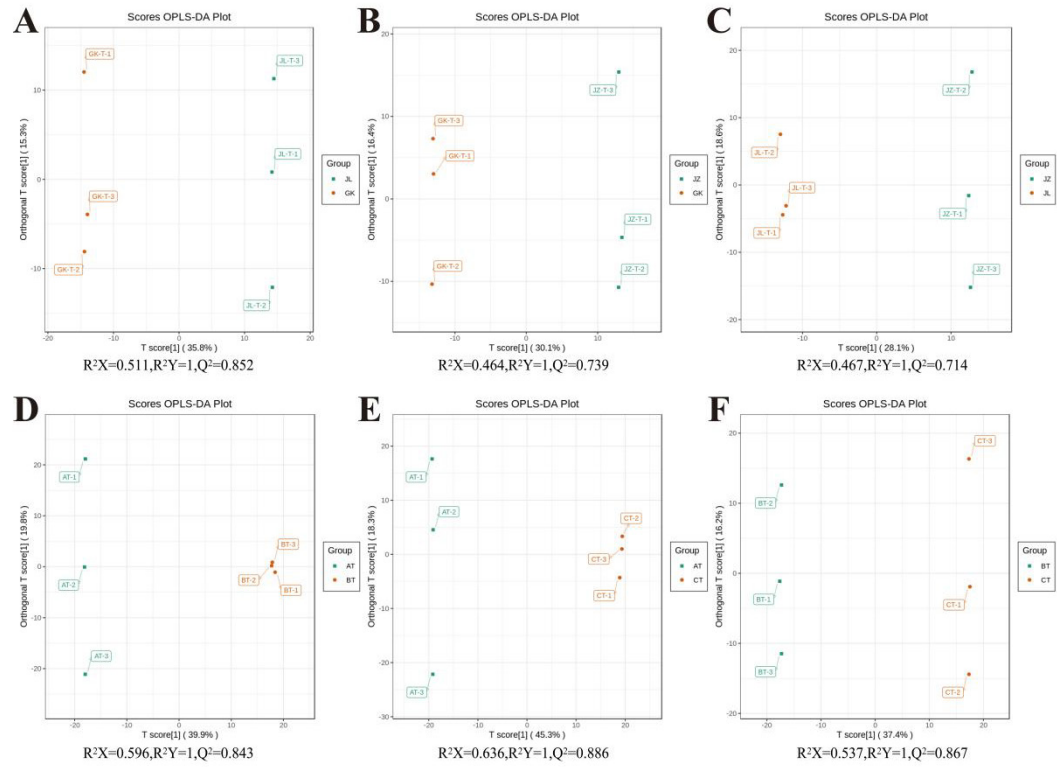


Figure S3. OPLS-DA score plot for *P. cyrtonema* (A: JL vs GK, B: JZ vs GK, C: JZ vs JL, D: AT vs BT, E: AT vs CT, F: BT vs CT).