**Article:**
Karpinska, B, Zhang, K, Rasool, B et al. (6 more authors) (2018) The redox state of the apoplast influences the acclimation of photosynthesis and leaf metabolism to changing irradiance. Plant, Cell and Environment, 41 (5). pp. 1083-1097. ISSN 0140-7791

https://doi.org/10.1111/pce.12960

TAO
WT
PAO
-3
-2
-1
0
1
2
3
PS
major CHO metabolism
fermentation
mitochondrial electron transport / ATP synthesis
cell wall
metal handling
secondary metabolism
hormone metabolism
tetrapyrrole synthesis
stress
misc
DNA
protein
signalling
development
transport
not assigned
PS
PS.lightreaction
PS.lightreaction.photosystem II
PS.lightreaction.photosystem II.PSII polypeptide subunits
PS.calvin cycle
major CHO metabolism
major CHO metabolism.degradation
major CHO metabolism.degradation.sucrose.invertases
major CHO metabolism.degradation.sucrose.invertases.neutral
major CHO metabolism.degradation.starch
major CHO metabolism.degradation.starch.starch cleavage
major CHO metabolism.degradation.starch.starch cleavage.alpha
minor CHO metabolism.raffinose family
minor CHO metabolism.raffinose family.galactinol synthases
minor CHO metabolism.myo-inositol
minor CHO metabolism.myo-inositol.InsP Synthases
minor CHO metabolism.others
fermentation
fermentation.ADH
mitochondrial electron transport / ATP synthesis
cell wall
cell wall.precursor synthesis
cell wall.precursor synthesis.MUR4
cell wall.cellulose synthesis
cell wall.cellulose synthesis.COBRA
cell wall.degradation
cell wall.degradation.mannan-xylose-arabinose-fucose
cell wall.modification
lipid metabolism.FA synthesis and FA elongation.beta hydroxyacy
lipid metabolism.FA synthesis and FA elongation.beta ketoacyl Co
lipid metabolism.FA desaturation
lipid metabolism.FA desaturation.desaturase
lipid metabolism.FA desaturation.omega 3 desaturase
lipid metabolism.FA desaturation.omega 6 desaturase
lipid metabolism.Phospholipid synthesis.(S)-coclaurine-N-methyltr
lipid metabolism.lipid degradation
lipid metabolism.lipid degradation.lysophospholipases
lipid metabolism.lipid degradation.lysophospholipases.carboxyles
lipid metabolism.lipid degradation.lysophospholipases.glycerophc
lipid metabolism.lipid degradation.beta-oxidation
lipid metabolism.lipid degradation.beta-oxidation.multifunctional
amino acid metabolism.synthesis
amino acid metabolism.synthesis.central amino acid metabolism
amino acid metabolism.synthesis.central amino acid metabolism.
amino acid metabolism.synthesis.central amino acid metabolism.
amino acid metabolism.synthesis.branched chain group
amino acid metabolism.synthesis.branched chain group.common
amino acid metabolism.synthesis.serine-glycine-cysteine group
amino acid metabolism.synthesis.serine-glycine-cysteine group.cy
amino acid metabolism.synthesis.serine-glycine-cysteine group.cy
amino acid metabolism.synthesis.aromatic aa
amino acid metabolism.synthesis.aromatic aa.chorismate
amino acid metabolism.synthesis.aromatic aa.chorismate.5-enolp
amino acid metabolism.synthesis.aromatic aa.tryptophan
amino acid metabolism.synthesis.aromatic aa.tryptophan.tryptoph
amino acid metabolism.degradation
amino acid metabolism.degradation.glutamate family
amino acid metabolism.degradation.glutamate family.proline
amino acid metabolism.degradation.branched chain group
amino acid metabolism.degradation.branched-chain group.share
metal handling
metal handling.binding, chelation and storage
secondary metabolism
secondary metabolism.isoprenoids.tocopherol biosynthesis
secondary metabolism.isoprenoids.tocopherol biosynthesis.MPBQ
secondary metabolism.phenylpropanoids
secondary metabolism.phenylpropanoids.lignin biosynthesis
secondary metabolism.phenylpropanoids.lignin biosynthesis.CCoA
secondary metabolism.phenylpropanoids.lignin biosynthesis.COM
secondary metabolism.flavonoids
secondary metabolism.flavonoids.anthocyanins
secondary metabolism.flavonoids.anthocyanins.anthocyanin 5-aro
hormone metabolism
hormone metabolism.auxin
hormone metabolism.auxin.induced-regulated-responsive-activate
hormone metabolism.ethylene
hormone metabolism.ethylene.signal transduction
hormone metabolism.ethylene.induced-regulated-responsive-activ
hormone metabolism.jasmonate
hormone metabolism.jasmonate.synthesis-degradation
hormone metabolism.jasmonate.synthesis-degradation.lipoxygena
tetrapyrrole synthesis
tetrapyrrole synthesis.uroporphyrinogen decarboxylase
tetrapyrrole synthesis.coproporphyrinogen III oxidase
tetrapyrrole synthesis.unspecified
stress
stress.biotic
stress.biotic.signalling
stress.biotic.PR-proteins
stress.biotic.PR-proteins.proteinase inhibitors
stress.biotic.PR-proteins.proteinase inhibitors.trypsin inhibitor
stress.abiotic.touch/wounding
redox.thioredoxin
redox.peroxiredoxin
redox.peroxiredoxin.BAS1
nucleotide metabolism.synthesis
nucleotide metabolism.synthesis.purine
nucleotide metabolism.synthesis.purine.GMP synthetase
misc
misc.gluco-, galacto- and mannosidases
misc.nitrilases, *nitrile lyases, berberine bridge enzymes, reticuline
misc.glutathione S transferases
misc.peroxidases
misc.protease inhibitor/seed storage/lipid transfer protein (LTP) fa
misc.short chain dehydrogenase/reductase (SDR)
misc.GDSL-motif lipase
RNA.processing
RNA.processing.RNA helicase
RNA.regulation of transcription
RNA.regulation of transcription.AP2/EREBP, APETALA2/Ethylene
RNA.regulation of transcription.C2C2(Zn) GATA transcription facto
RNA.regulation of transcription.C2H2 zinc finger family
RNA.regulation of transcription.WRKY domain transcription factor
RNA.regulation of transcription.Psudo ARR transcription factor fam
RNA.regulation of transcription.putative transcription regulator
RNA.regulation of transcription.plant TF (pbf2)
RNA.RNA binding
DNA
DNA.synthesis/chromatin structure
DNA.synthesis/chromatin structure.histone
protein
protein.synthesis
protein.synthesis.ribosomal protein
protein.synthesis.ribosomal protein.prokaryotic
protein.synthesis.ribosomal protein.prokaryotic.chloroplast
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.30S sub
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.30S sub
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.30S sub
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.30S sub
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.50S sub
protein.synthesis.ribosomal protein.prokaryotic.chloroplast.50S sub
protein.synthesis.ribosomal protein.prokaryotic.unknown organellar
protein.synthesis.ribosomal protein.prokaryotic.unknown organellar
protein.synthesis.ribosomal protein.eukaryotic
protein.synthesis.ribosomal protein.eukaryotic.40S subunit
protein.synthesis.ribosomal protein.eukaryotic.40S subunit.S2
protein.synthesis.ribosomal protein.eukaryotic.40S subunit.S3
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protein.synthesis.ribosomal protein.eukaryotic.40S subunit.S15A
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protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L3
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L5
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protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L11
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protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L26
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L30
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protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L7A
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.P1
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.P2
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L13A
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protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L23A
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L37A
protein.synthesis.ribosomal protein.unknown.large subunit
protein.synthesis.elongation
protein.targeting
protein.targeting.chloroplast
protein.targeting.peroxisomes
protein.postranslational modification
protein.postranslational modification.kinase
protein.postranslational modification.kinase.receptor like cytoplas
protein.postranslational modification.kinase.receptor like cytoplas
protein.degradation
protein.degradation.cysteine protease
protein.degradation.aspartate protease
protein.degradation.AAA type
protein.degradation.ubiquitin
protein.degradation.ubiquitin.E2
protein.degradation.ubiquitin.E3
protein.degradation.ubiquitin.E3.RING
protein.folding
signalling
signalling.in sugar and nutrient physiology
signalling.in sugar and nutrient physiology
signalling.receptor kinases
signalling.receptor kinases.leucine rich repeat VII
signalling.receptor kinases.Catharanthus roseus-like RLK1
signalling.calcium
signalling.G-proteins
signalling.MAP kinases
cell.cycle
cell.cycle.peptidylprolyl isomerase
cell.vesicle transport
development
development.late embryogenesis abundant
transport
transport.p- and v-ATPases
transport.calcium
transport.cyclic nucleotide or calcium regulated channels
transport.misc
not assigned
not assigned.unknown

TAO
WT
PAO
-3
-2
-1
0
1
2
3
PS
glycolysis
gluconeogenese/ glyoxylate cy
TCA / org. transformation
cell wall
lipid metabolism
amino acid metabolism
S-assimilation
secondary metabolism
hormone metabolism
Co-factor and vitamine metabo
stress
polyamine metabolism
nucleotide metabolism
RNA
DNA
protein
signalling
cell
development
transport
not assigned
PS
PS.lightreaction
PS.lightreaction.photosystem II
PS.lightreaction.photosystem II.LHC-II
PS.lightreaction.photosystem II.PSII polypeptide subunits
PS.lightreaction.photosystem I
PS.lightreaction.photosystem I.LHC-I
PS.lightreaction.photosystem I.PSI polypeptide subunits
PS.lightreaction.other electron carrier (ox/red)
PS.lightreaction.other electron carrier (ox/red).ferredoxin
PS.calvin cycle
PS.calvin cycle.GAP
PS.calvin cycle.aldolase
major CHO metabolism.degradation.sucrose
major CHO metabolism.degradation.sucrose.invertases
major CHO metabolism.degradation.sucrose.invertases.neutral
major CHO metabolism.degradation.starch
major CHO metabolism.degradation.starch.starch cleavage
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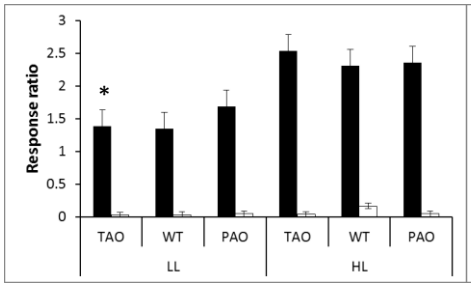
major CHO metabolism.degradation.starch.starch cleavage.beta a
major CHO metabolism.degradation.starch.glucan water dikinase
major CHO metabolism.degradation.starch.D enzyme
minor CHO metabolism.raffinose family
minor CHO metabolism.raffinose family.raffinose synthases
minor CHO metabolism.raffinose family.raffinose synthases.putativ
minor CHO metabolism.myo-inositol
minor CHO metabolism.myo-inositol.InsP Synthases
glycolysis
glycolysis.cytosolic branch
glycolysis.cytosolic branch.glyceraldehyde 3-phosphate dehydrog
glycolysis.cytosolic branch.enolase
gluconeogenese/ glyoxylate cycle
gluconeogenese/ glyoxylate cycle.isocitrate lyase
TCA / org. transformation
TCA / org. transformation.other organic acid transformations
cell wall
cell wall.cellulose synthesis
cell wall.cellulose synthesis.cellulose synthase
cell wall.cell wall proteins.AGPs
cell wall.cell wall proteins.AGPs.AGP
cell wall.degradation
cell wall.degradation.pectate lyases and polygalacturonases
lipid metabolism
lipid metabolism.FA desaturation
lipid metabolism.FA desaturation.omega 6 desaturase
lipid metabolism."exotics" (steroids, squalene etc).methylsterol mo
lipid metabolism.lipid degradation.lysophospholipases.glycerophc
lipid metabolism.lipid degradation.beta-oxidation
lipid metabolism.lipid degradation.beta-oxidation.multifunctional
N-metabolism.nitrate metabolism
N-metabolism.nitrate metabolism.NR
amino acid metabolism
amino acid metabolism.synthesis
amino acid metabolism.synthesis.central amino acid metabolism
amino acid metabolism.synthesis.central amino acid metabolism.
amino acid metabolism.synthesis.central amino acid metabolism.
amino acid metabolism.synthesis.aspartate family
amino acid metabolism.synthesis.aspartate family.methionine
amino acid metabolism.synthesis.aromatic aa
amino acid metabolism.synthesis.aromatic aa.chorismate
amino acid metabolism.synthesis.aromatic aa.chorismate.3-deoxy
amino acid metabolism.synthesis.aromatic aa.chorismate.5-enolp
amino acid metabolism.synthesis.aromatic aa.phenylalanine
amino acid metabolism.degradation
amino acid metabolism.degradation.glutamate family
amino acid metabolism.degradation.glutamate family.proline
amino acid metabolism.degradation.branched chain group
amino acid metabolism.degradation.branched-chain group.share
S-assimilation
S-assimilation.APR
metal handling.acquisition
secondary metabolism
secondary metabolism.isoprenoids.non-mevalonate pathway
secondary metabolism.isoprenoids.non-mevalonate pathway.gera
secondary metabolism.isoprenoids.mevalonate pathway
secondary metabolism.isoprenoids.mevalonate pathway.geranyl d
secondary metabolism.isoprenoids.carotenoids
secondary metabolism.isoprenoids.carotenoids.phytoene synthase
secondary metabolism.isoprenoids.terpenoids
secondary metabolism.phenylpropanoids
secondary metabolism.phenylpropanoids.lignin biosynthesis
secondary metabolism.phenylpropanoids.lignin biosynthesis.PAL
secondary metabolism.phenylpropanoids.lignin biosynthesis.4CL
secondary metabolism.phenylpropanoids.lignin biosynthesis.HCT
secondary metabolism.phenylpropanoids.lignin biosynthesis.CCoA
secondary metabolism.N misc
secondary metabolism.N misc.alkaloid-like
secondary metabolism.flavonoids.anthocyanins
secondary metabolism.flavonoids.anthocyanins.anthocyanin 5-gro
hormone metabolism
hormone metabolism.abscisic acid.synthesis-degradation
hormone metabolism.abscisic acid.synthesis-degradation.synthesi
hormone metabolism.abscisic acid.synthesis-degradation.synthesi
hormone metabolism.auxin.induced-regulated-responsive-activate
hormone metabolism.ethylene
hormone metabolism.ethylene.signal transduction
Co-factor and vitamine metabolism
Co-factor and vitamine metabolism.thiamine
tetrapyrrole synthesis.protochlorophyllide reductase
stress
stress.biotic
stress.abiotic
stress.abiotic.heat
stress.abiotic.cold
stress.abiotic.drought/salt
stress.abiotic.touch/wounding
redox.ascorbate and glutathione.ascorbate
polyamine metabolism
polyamine metabolism.synthesis
polyamine metabolism.synthesis.SAM decarboxylase
nucleotide metabolism
nucleotide metabolism.degradation
nucleotide metabolism.phosphotransfer and pyrophosphatases
nucleotide metabolism.phosphotransfer and pyrophosphatases.nuc
nucleotide metabolism.deoxynucleotide metabolism
nucleotide metabolism.deoxynucleotide metabolism.ribonucleosi
misc.UDP glucosyl and glucoronyl transferases
misc.gluco-, galacto- and mannosidases.beta-galactosidase
misc.acyl transferases
misc.glutathione S transferases
misc.acid and other phosphatases
misc.invertase/pectin methylesterase inhibitor family protein
misc.GDSL-motif lipase
RNA
RNA.processing
RNA.processing.degradation dicer
RNA.regulation of transcription
RNA.regulation of transcription.AP2/EREBP, APETALA2/Ethylene
RNA.regulation of transcription.C2C2(Zn) CO-like, Constans-like zin
RNA.regulation of transcription.CCAAT box binding factor family,
RNA.regulation of transcription.MYB domain transcription factor fa
RNA.regulation of transcription.MYB-related transcription factor fa
RNA.regulation of transcription.WRKY domain transcription factor
RNA.regulation of transcription.DNA methyltransferases
RNA.regulation of transcription.NIN-like bZIP-related family
RNA.regulation of transcription.Psudo ARR transcription factor fam
DNA
DNA.synthesis/chromatin structure
DNA.repair
protein
protein.synthesis
protein.synthesis.ribosomal protein
protein.synthesis.ribosomal protein.prokaryotic
protein.synthesis.ribosomal protein.prokaryotic.unknown organellar
protein.synthesis.ribosomal protein.prokaryotic.unknown organellar
protein.synthesis.ribosomal protein.eukaryotic
protein.synthesis.ribosomal protein.eukaryotic.40S subunit
protein.synthesis.ribosomal protein.eukaryotic.60S subunit
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L23
protein.synthesis.ribosomal protein.eukaryotic.60S subunit.L32
protein.synthesis.elongation
protein.targeting.chloroplast
protein.degradation
protein.degradation.metalloprotease
protein.degradation.AAA type
protein.degradation.ubiquitin.E3
protein.degradation.ubiquitin.E3.RING
protein.folding
signalling
signalling.receptor kinases
signalling.receptor kinases.leucine rich repeat III
signalling.calcium
signalling.MAP kinases
cell
cell.cycle
development
transport
transport.sugars
transport.nitrate
transport.sulphate
transport.unspecified cations
transport.Major Intrinsic Proteins
transport.Major Intrinsic Proteins.PIP
transport.Major Intrinsic Proteins.TIP
transport.Major Intrinsic Proteins.NIP
transport.misc
not assigned
not assigned.unknown

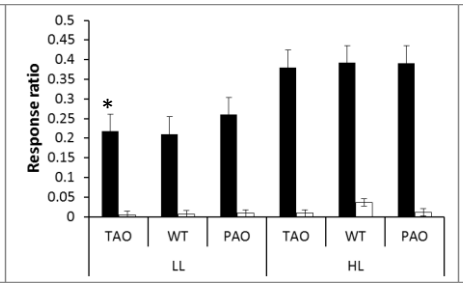
**Figure S3**. Leaf content of metabolites significantly altered by light environment

*Carbohydrates*

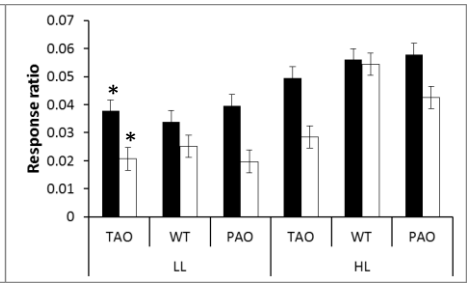
Glucose peak 1



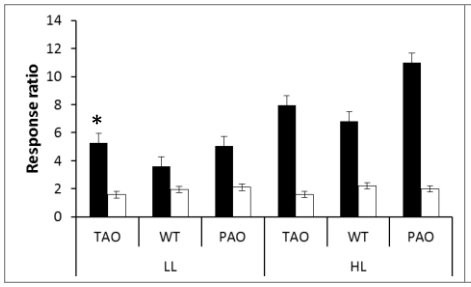

Glucose peak 2



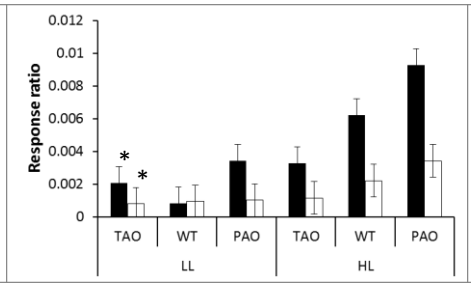

Unoximated fructose



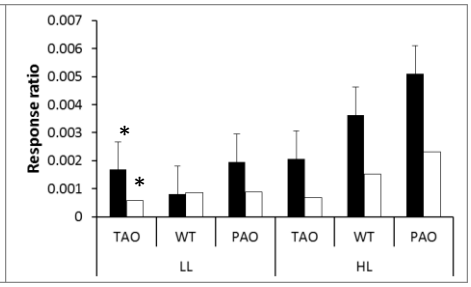

Sucrose



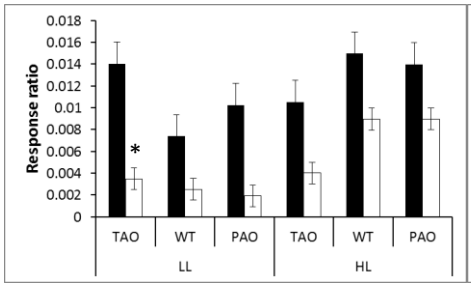

Glucose-6-P



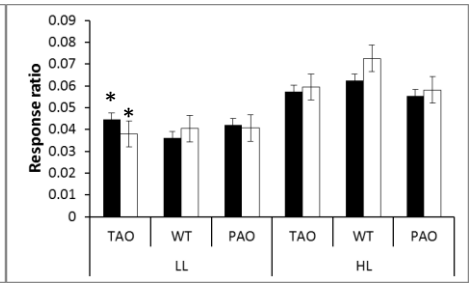

Fructose-6-P




Dihydroxydihydrofuranone

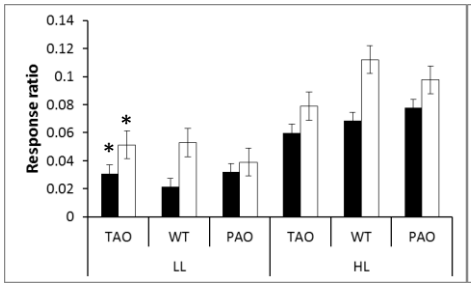



Unknown carbohydrate

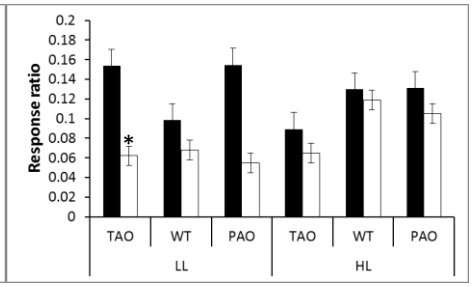



*Organic acids*

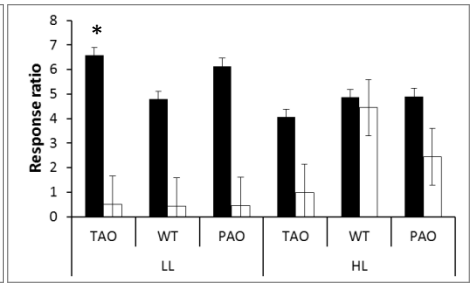
Succinate



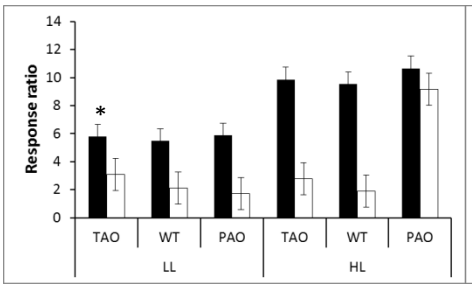

Fumarate



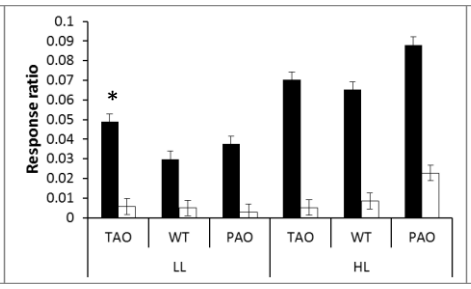

Malate



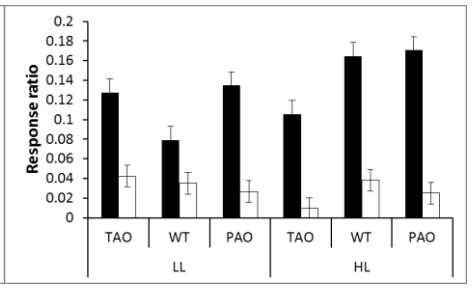
Citrate



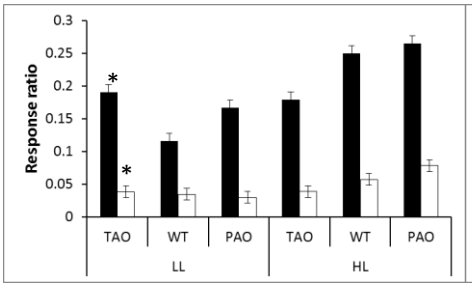

Oxalate



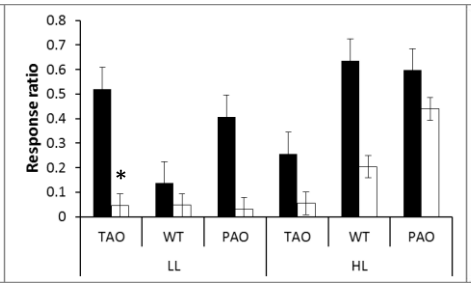

Glycerate



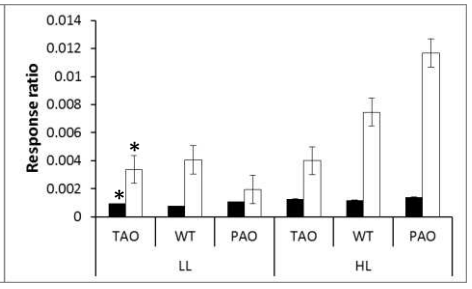

Quinate



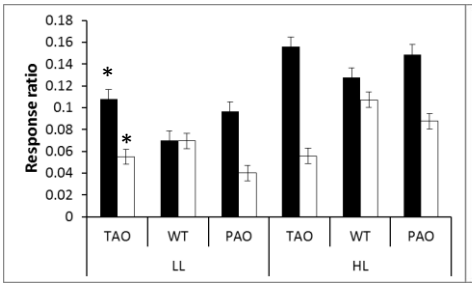

Threonate



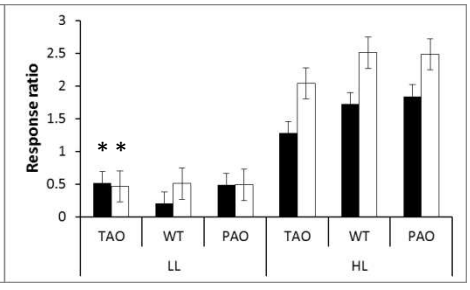

Trihydroxypentanoate




Caffeate

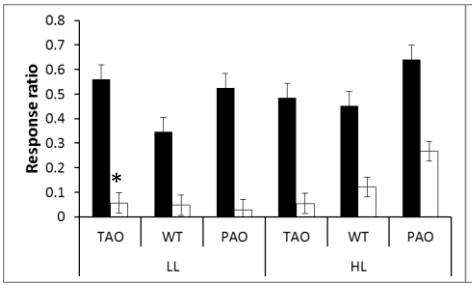



Chlorogenate

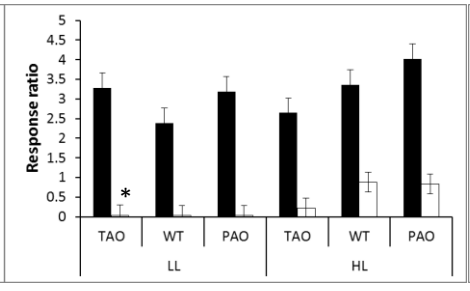



*Amino acids and amines*

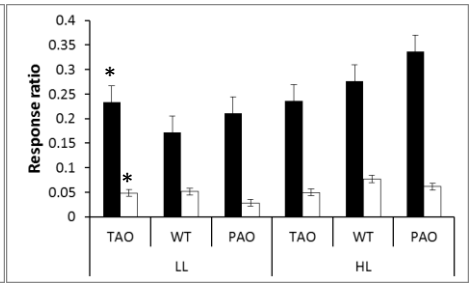
Serine



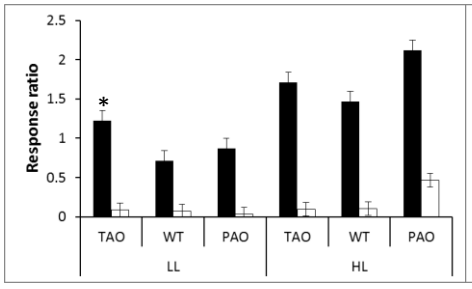

Glycine



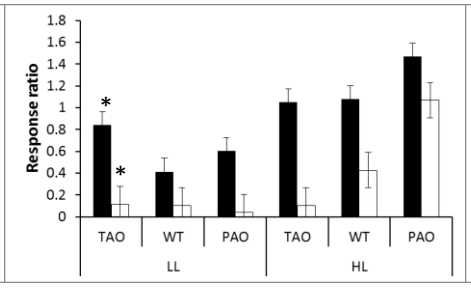

Phenylalanine



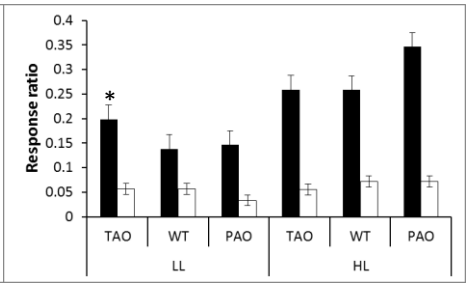

Alanine



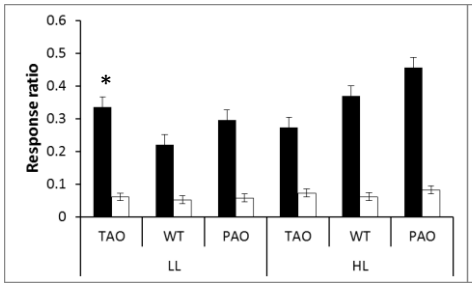

Glutamate



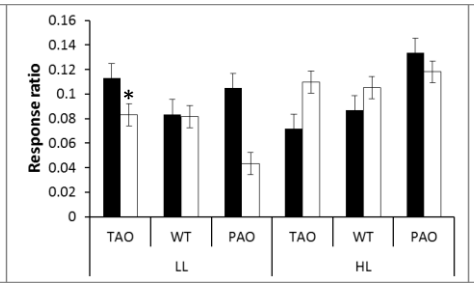

Proline



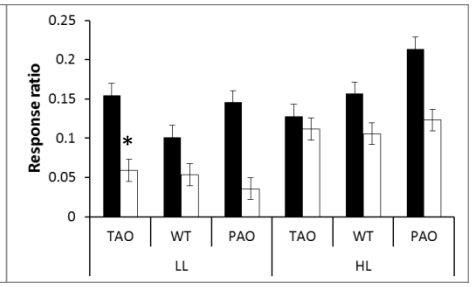
Hydroxy/Oxoproline



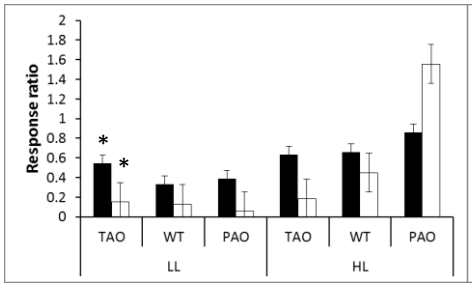

Leucine



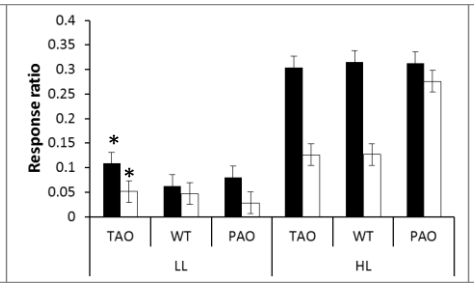

Valine



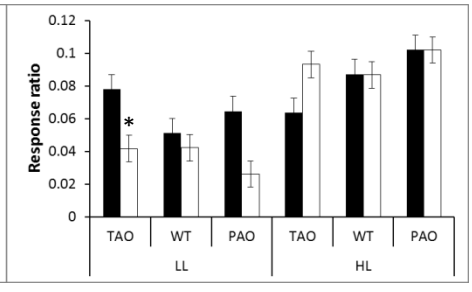

Aspartate



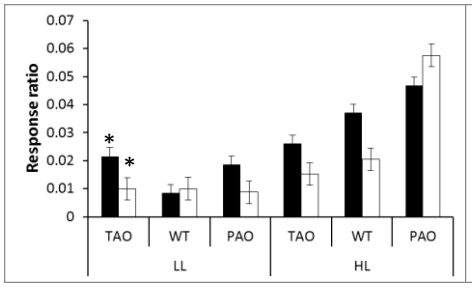

Threonine



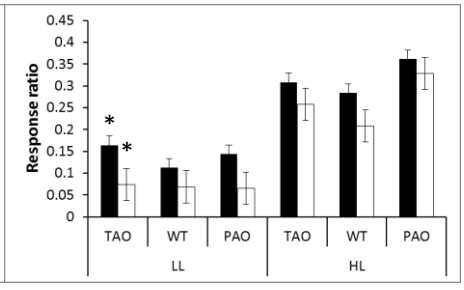

Isoleucine




β-Alanine

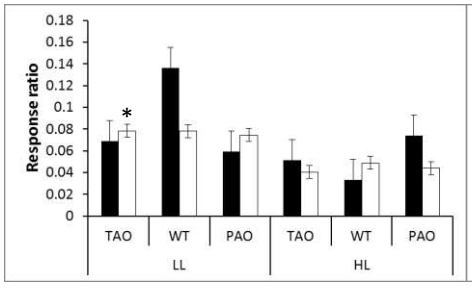



Putrescine

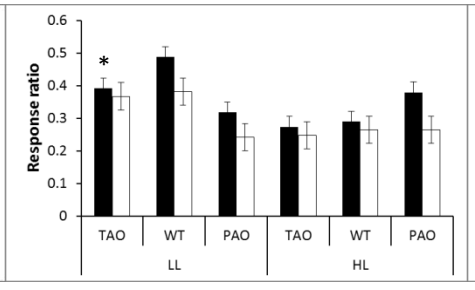



*Fatty acids*

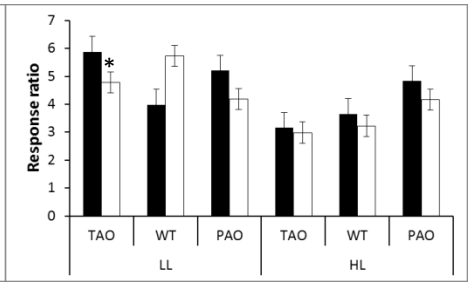
Pentadecylate (C15:0)



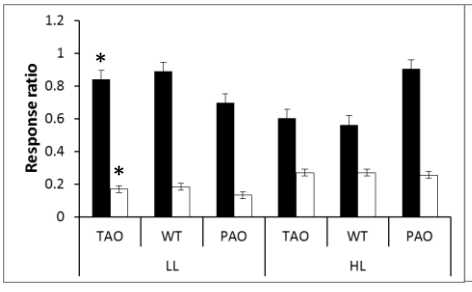

Methyl pentadecylate



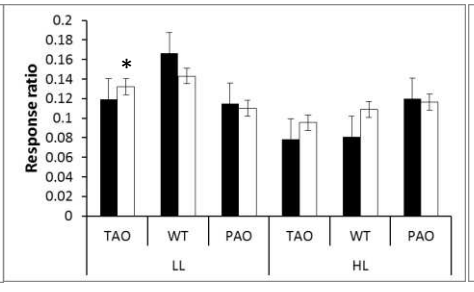

Methyl palmitate



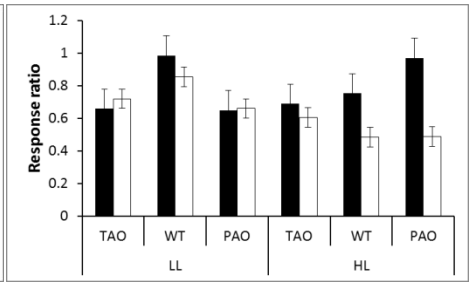

Palmitoleate (C16:1)



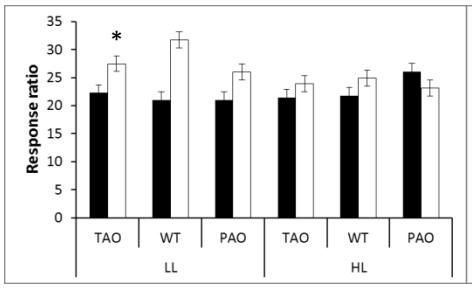

Margarate (C17:0)



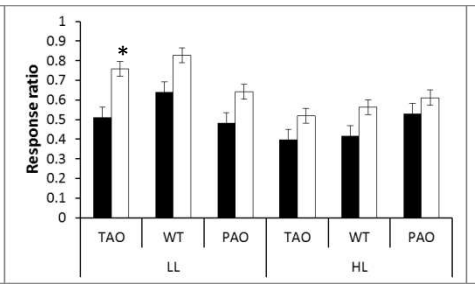

Oleate (C18:1)



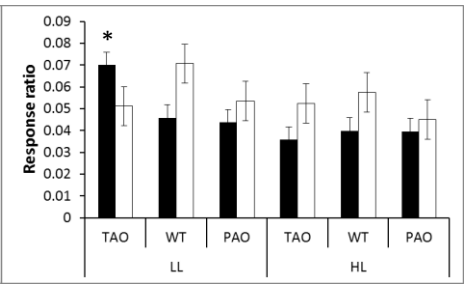
Linolenate (C18:3)



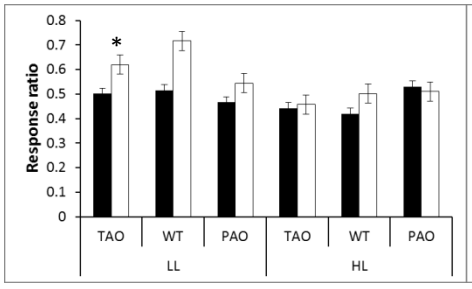

Arachidate (C20:0)



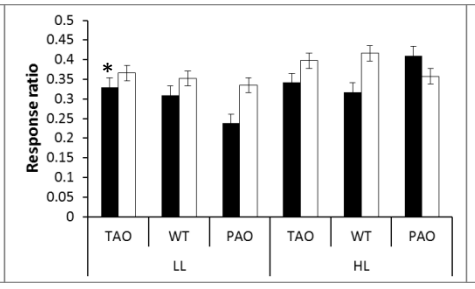

Heneicosylate (C21:0)



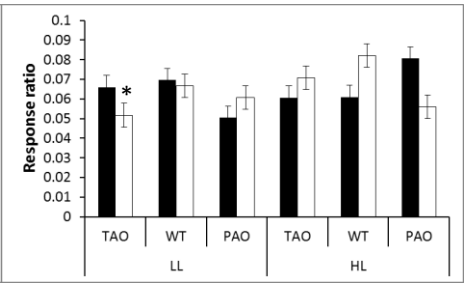

Behenate (C22:0)




Lignocerotate (C24:0)

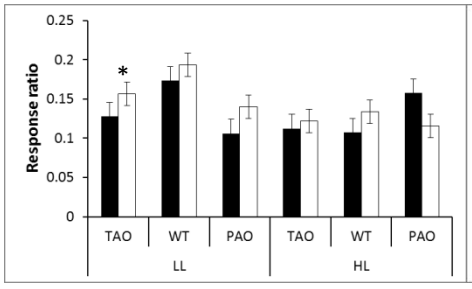



Cerotate (C26:0)

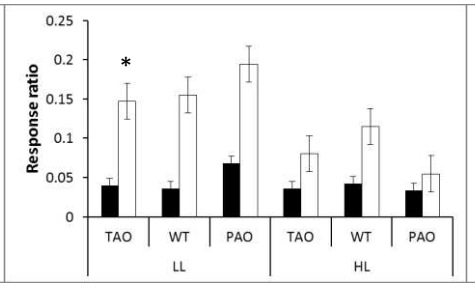



*Fatty alcohols and phytosterols*

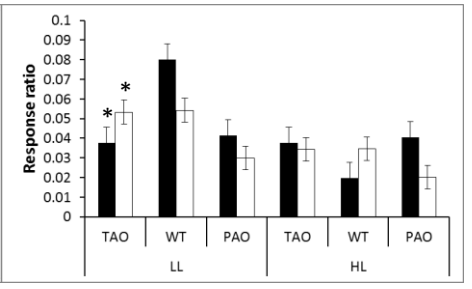
Behenyl alcohol (C22)



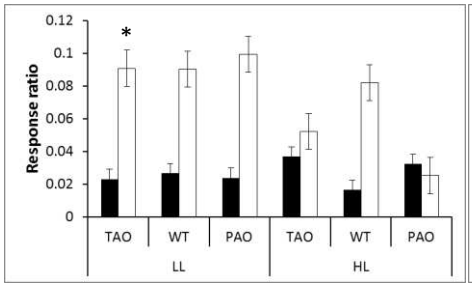

Tricosanol (C23)



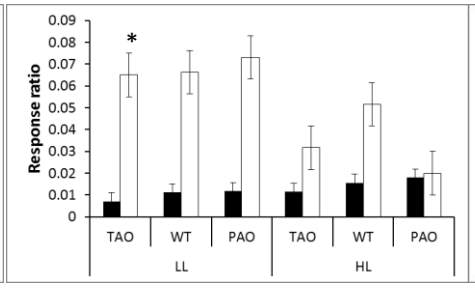

Lignoceryl alcohol (C24)



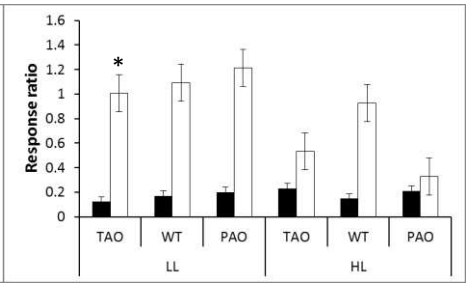

Ceryl alcohol (C26)



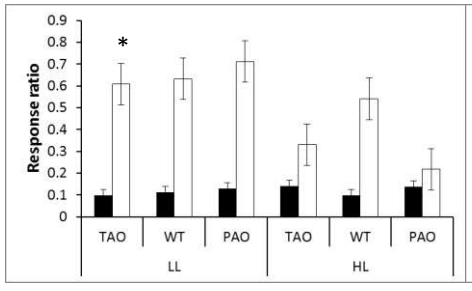

Heptacosanol (C27)



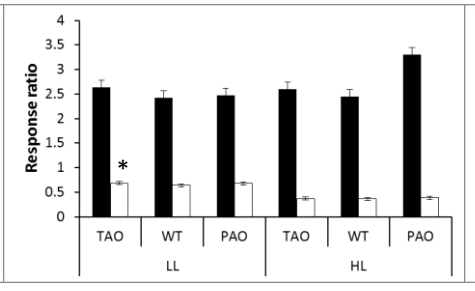

Montanyl alcohol (C28)



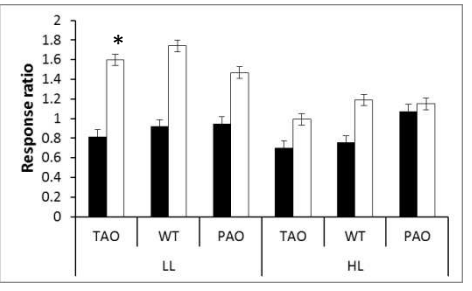

Myricyl alcohol (C30)



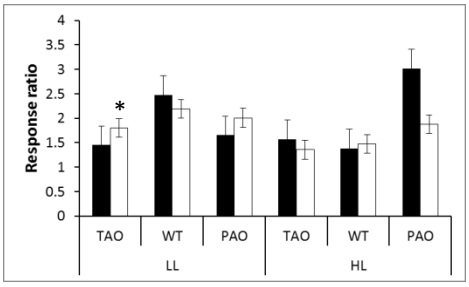

Phytol A




Stigmasterol



β-Sitosterol




## *Miscellaneous and unknowns*

Non-polar 8.12 min

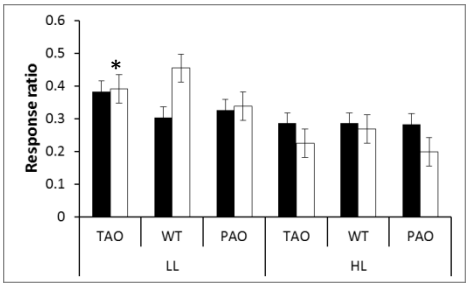
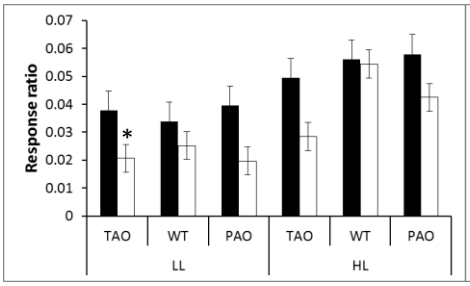


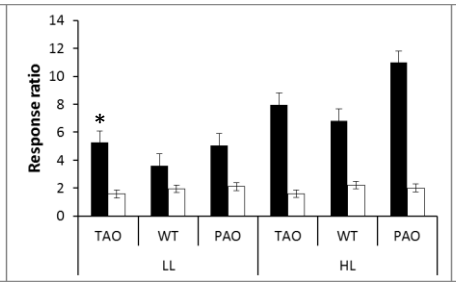
**Figure S4**. Leaf content of metabolites significantly altered by plant genotype

*Carbohydrates*

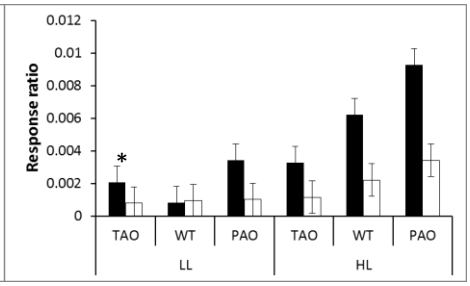
Unoximated fructose




Sucrose

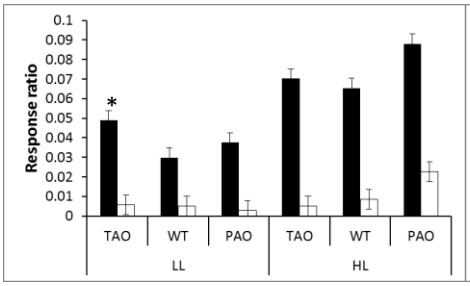



Glucose-6-P

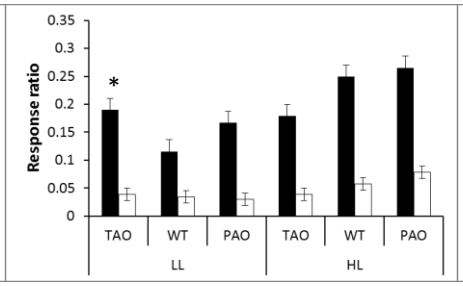



*Organic acids*

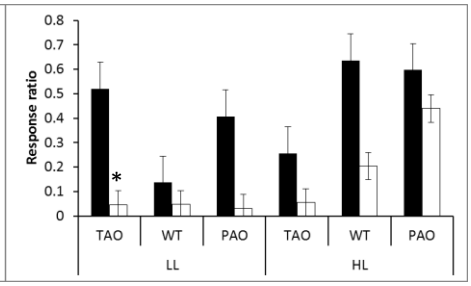
Oxalate



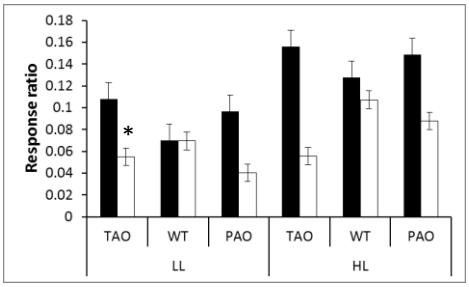

Quinate




Threonate

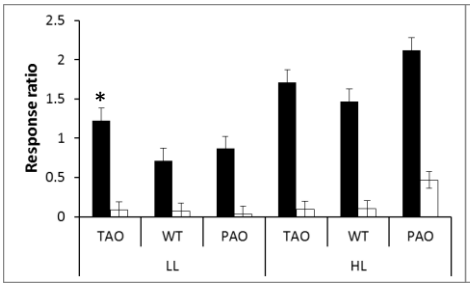



Caffeate

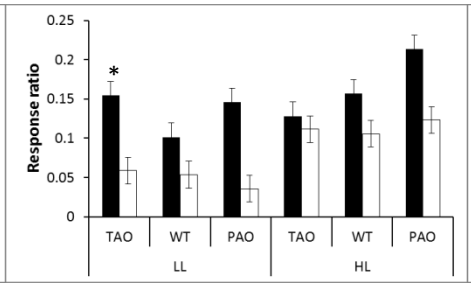



*Amino acids and amines*

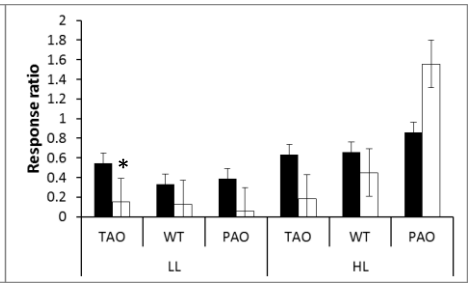
Alanine



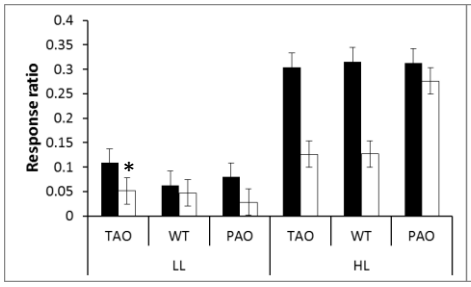

Valine



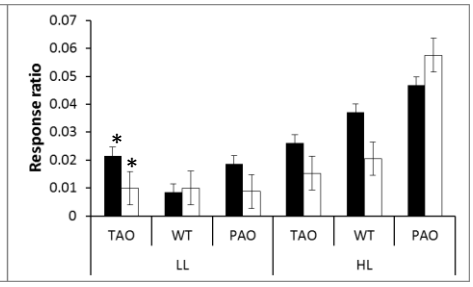

Aspartate



Threonine

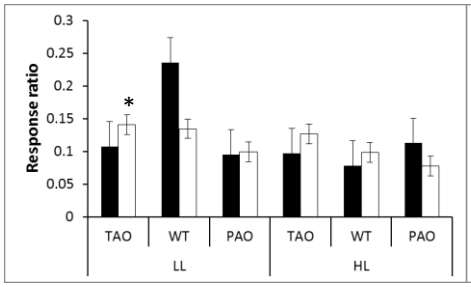



β-Alanine

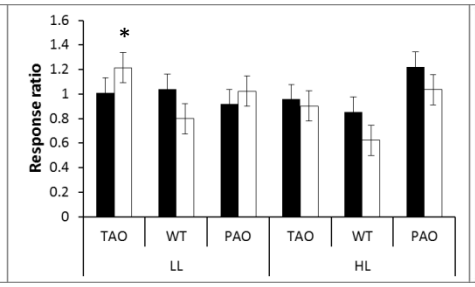



*Fatty acids*

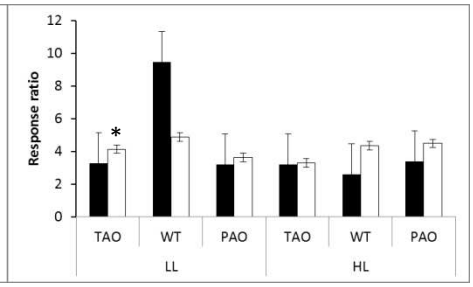
Myristate (C14:0)



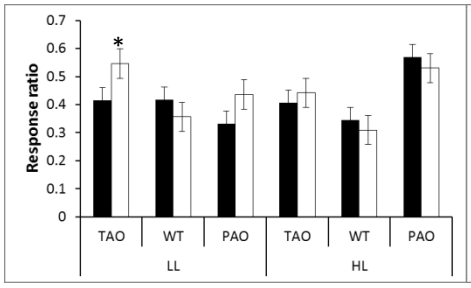

Hydroxypalmitate (C16:0)



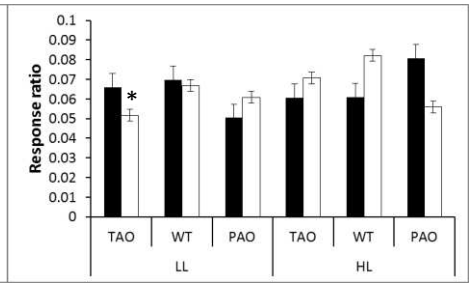

Stearate (C18:0)




Hydroxylignocerate (C24:0)

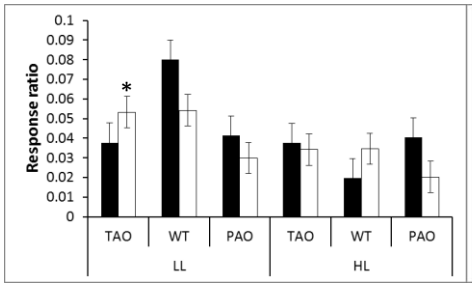



Cerotate (C26:0)




*Fatty alcohols and phytosterols*

Lignoceryl alcohol (C24)




Sitosterol

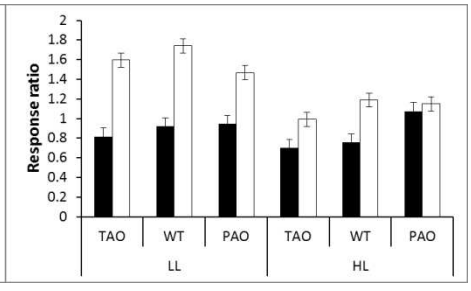
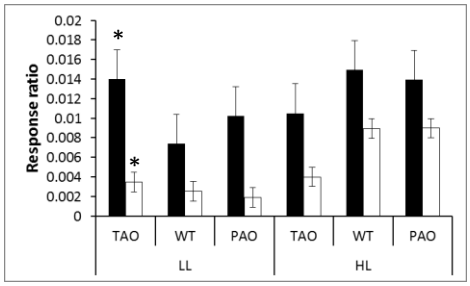


**Figure S5**. Leaf content of metabolites significantly altered by light in a plant genotype dependent manner

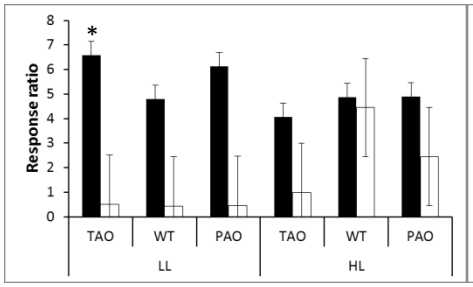
*Carbohydrates*

Dihydroxydihydrofuranone

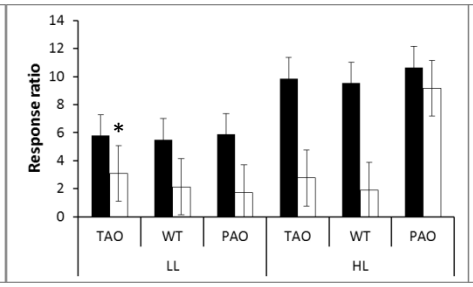



*Organic acids*

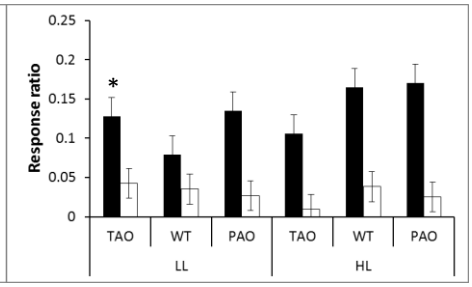
Malate



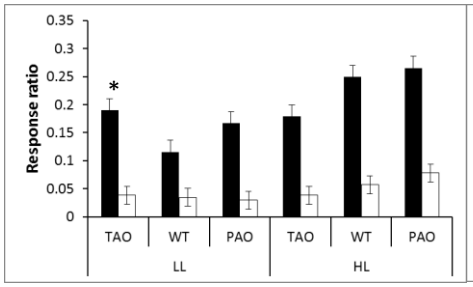

Citrate



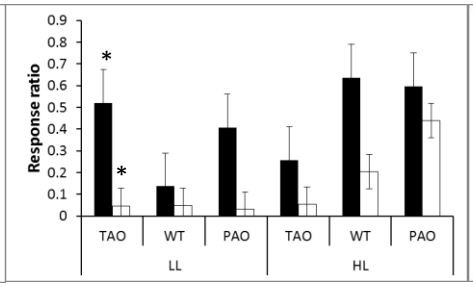

Glycerate



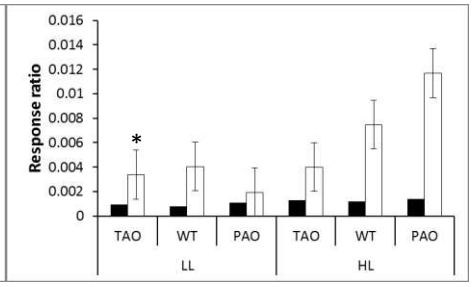

Quinate



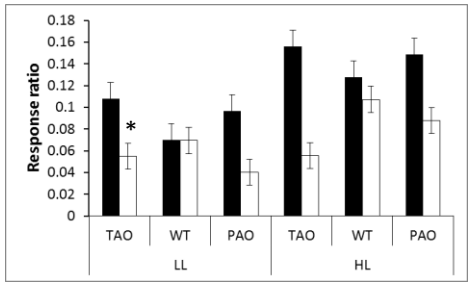

Threonate




Trihydroxypentanoate

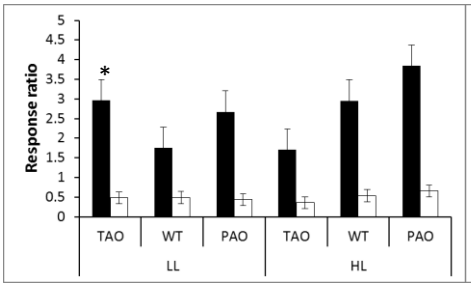



Caffeate

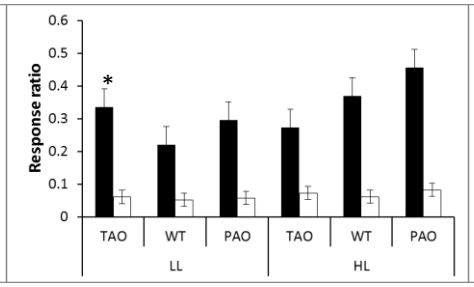


*Amino acids and amines*

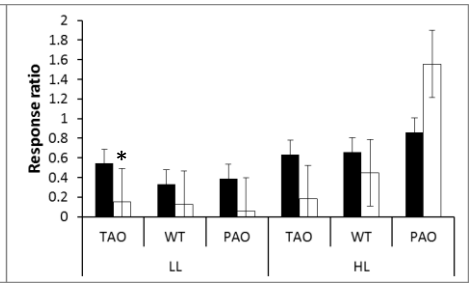
Oxoproline



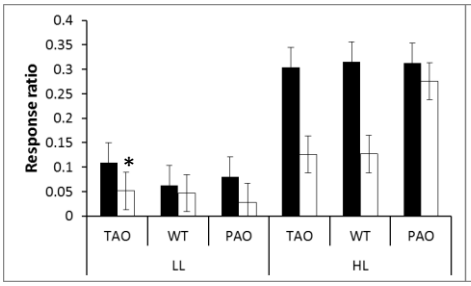

Hydroxy/Oxoproline



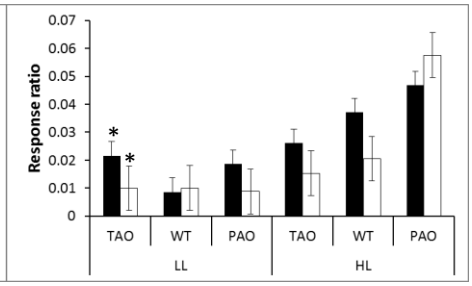

Aspartate




Threonine

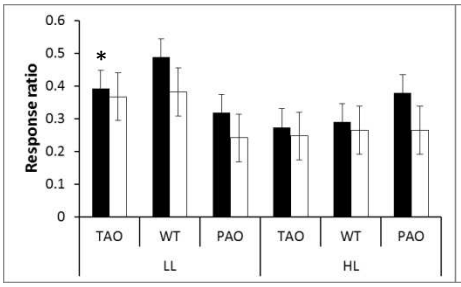



β-Alanine

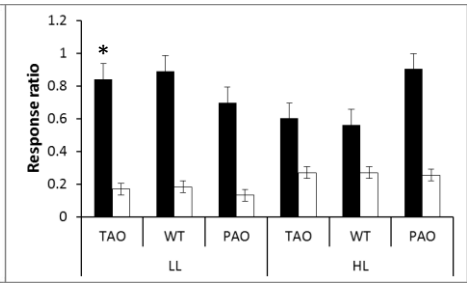



*Fatty acids*

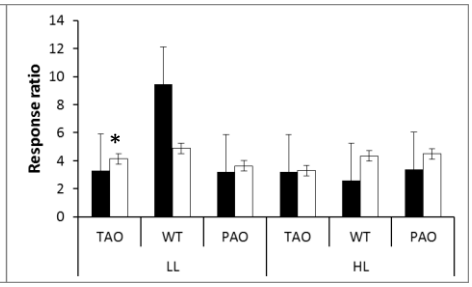
Methyl pentadecylate



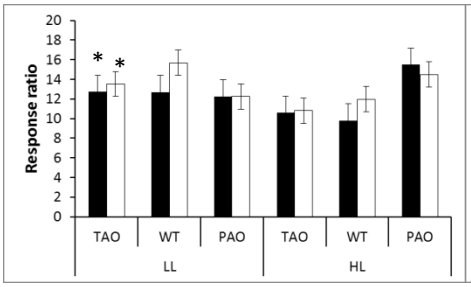

Palmitoleate (C16:1)



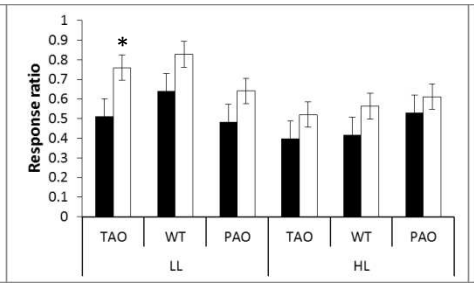

Sterate (C18:0)



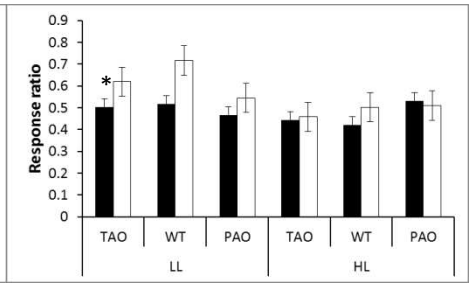

Linoleate (C18:2)



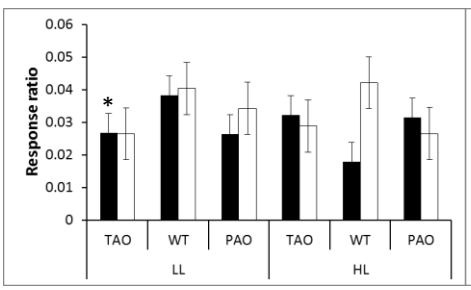

Arachidate (C20:0)



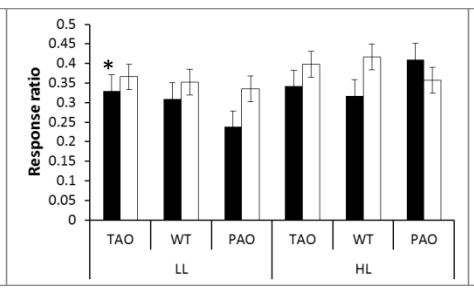

Behenate (C22:0)



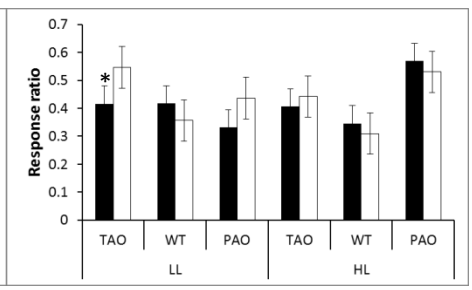

Tricosylate (C23:0)



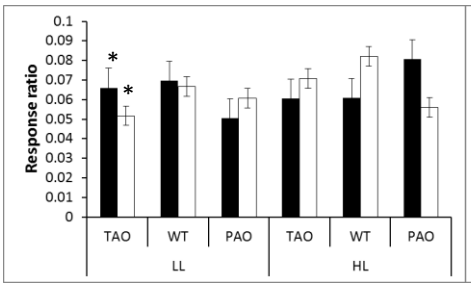

Lignocerate (C24:0)



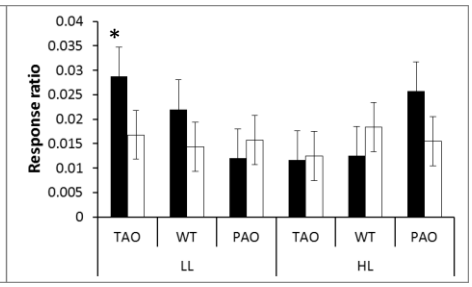

Hydroxylignocerate (C24:0)



Cerotate (C26:0)

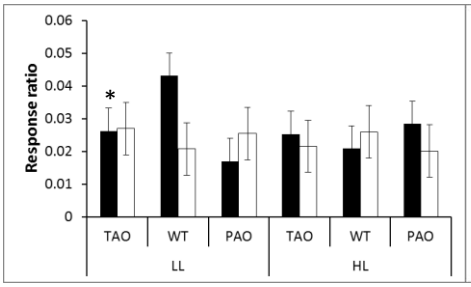



Montanate (C28:0)

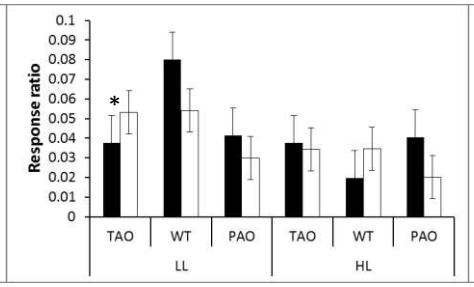



## *Fatty alcohols and phytosterols*

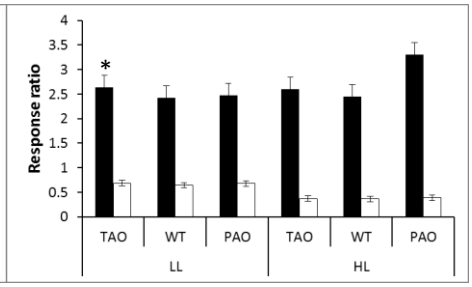
Heneicosanol (C21)




Lignoceryl alcohol (C24)

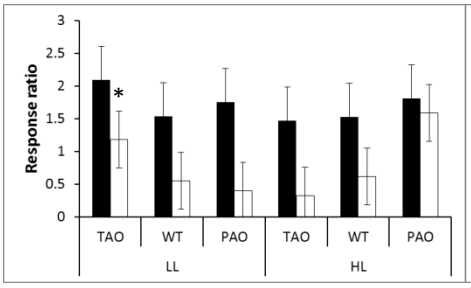



Phytol A




## *Miscellaneous and unknowns*

Phosphate




Polar 3.11 min

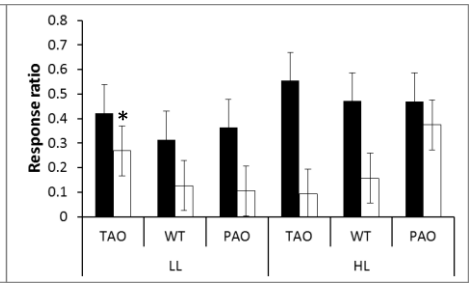


**Table S3**. Statistical significance of the factors light and genotype on tobacco leaf metabolite immediately after the end of seven days of HL treatment (stress) or following return to LL for 12 h

| Metabolite | Light | | Genotype | | Light.Genotype | |
|---|---|---|---|---|---|---|
| | Stress | Recovery | Stress | Recovery | Stress | Recovery |
| *1. Carbohydrates* | | | | | | |
| Glucose (1) | **0.003** | 0.303 | 0.819 | 0.454 | 0.735 | 0.416 |
| Glucose (2) | **0.004** | 0.191 | 0.86 | 0.382 | 0.892 | 0.375 |
| Unoximated fructose | **0.002** | **0.001** | 0.619 | **0.045** | 0.619 | 0.166 |
| Sucrose | **0.001** | 0.798 | **0.019** | 0.187 | 0.162 | 0.804 |
| Glucose-6-P | **0.001** | **0.021** | **0.006** | 0.169 | 0.062 | 0.286 |
| Fructose-6-P | **0.002** | **0.04** | 0.052 | 0.088 | 0.093 | 0.287 |
| Dihydroxydihydrofuranone | 0.121 | **0.001** | 0.828 | 0.131 | **0.039** | **0.011** |
| Unknown carbohydrate | **0.001** | **0.001** | 0.806 | 0.486 | 0.147 | 0.562 |
| *2. Organic acids* | | | | | | |
| Succinate | **0.001** | **0.001** | 0.303 | 0.32 | 0.376 | 0.335 |
| Fumarate | 0.299 | **0.003** | 0.399 | 0.074 | 0.119 | 0.105 |
| Malate | **0.003** | 0.087 | 0.251 | 0.51 | **0.024** | 0.478 |
| Citrate | **0.001** | 0.069 | 0.777 | 0.078 | 0.926 | **0.026** |
| Oxalate | **0.001** | 0.089 | **0.035** | 0.336 | 0.055 | 0.149 |
| Glycerate | **0.033** | 0.345 | 0.111 | 0.649 | **0.026** | 0.359 |
| Quinate | **0.001** | **0.024** | **0.001** | 0.412 | **0.001** | 0.143 |
| Threonate | 0.136 | **0.001** | 0.494 | **0.021** | **0.015** | **0.013** |
| Trihydroxypentanoate | **0.033** | **0.003** | 0.402 | 0.154 | 0.974 | **0.03** |
| Caffeate | **0.001** | **0.001** | 0.912 | **0.005** | 0.912 | **0.035** |
| Chlorogenate | **0.001** | **0.001** | 0.449 | 0.634 | 0.221 | 0.713 |
| *3. Amino acids and amines* | | | | | | |
| Serine | 0.432 | **0.028** | 0.073 | 0.215 | 0.37 | 0.091 |
| Glycine | 0.326 | **0.034** | 0.27 | 0.526 | 0.207 | 0.511 |
| Phenylalanine | **0.041** | **0.014** | 0.467 | 0.097 | 0.312 | 0.197 |
| Alanine | **0.001** | 0.093 | **0.049** | 0.247 | 0.09 | 0.119 |
| Glutamate | **0.001** | **0.017** | 0.186 | 0.114 | 0.127 | 0.06 |
| Proline | **0.001** | 0.145 | 0.42 | 0.681 | 0.19 | 0.371 |
| Oxoproline | 0.25 | 0.61 | 0.051 | 0.496 | **0.011** | 0.304 |
| Hydroxy/Oxoproline | **0.027** | 0.217 | 0.124 | 0.624 | **0.028** | 0.857 |
| Leucine | 0.809 | **0.001** | 0.095 | 0.321 | 0.099 | 0.056 |
| Valine | 0.053 | **0.001** | **0.045** | 0.932 | 0.051 | 0.522 |
| Aspartate | **0.005** | **0.008** | 0.448 | **0.047** | 0.222 | **0.024** |
| Threonine | **0.001** | **0.001** | 0.844 | **0.05** | 0.062 | **0.011** |
| Isoleucine | 0.062 | **0.001** | 0.44 | 0.935 | 0.079 | 0.299 |
| β-Alanine | **0.001** | **0.001** | **0.02** | **0.006** | **0.005** | **0.004** |
| Putrescine | **0.001** | **0.001** | 0.162 | 0.468 | 0.415 | 0.422 |
| *4. Fatty acids* | | | | | | |
| Myristate (C14:0) | 0.13 | 0.095 | 0.295 | **0.044** | 0.08 | 0.785 |
| Pentadecylate (C15:0) | 0.094 | **0.001** | 0.576 | 0.831 | 0.072 | 0.835 |
| Methyl pentadecylate | **0.023** | 0.114 | 0.387 | 0.39 | **0.02** | 0.317 |
| Hydroxy palmitate (C16:0) | 0.824 | 0.144 | 0.6 | **0.029** | 0.158 | 0.451 |
| Methyl palmitate | 0.059 | **0.003** | 0.24 | 0.461 | 0.168 | 0.052 |
| Palmitoleate (C16:1) | **0.048** | **0.001** | 0.442 | 0.423 | **0.04** | 0.785 |
| Margarate (C17:0) | 0.073 | **0.014** | 0.607 | 0.329 | 0.242 | 0.066 |
| Stearate (C18:0) | 0.168 | 0.42 | 0.277 | **0.015** | 0.146 | **0.016** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Oleate (C18:1) | 0.745 | **0.003** | 0.422 | 0.37 | 0.211 | 0.221 |
| Linoleate (C18:2) | 0.559 | 0.083 | 0.099 | 0.205 | **0.048** | **0.014** |
| Linolenate (C18:3) | 0.262 | **0.009** | 0.47 | 0.125 | 0.266 | 0.497 |
| Arachidate (C20:0) | 0.088 | **0.001** | 0.513 | 0.325 | 0.145 | **0.05** |
| Heneicosylate (C21:0) | **0.041** | 0.453 | 0.328 | 0.363 | 0.143 | 0.792 |
| Behenate (C22:0) | 0.203 | **0.004** | 0.508 | 0.217 | **0.03** | 0.196 |
| Tricosylate (C23:0) | 0.374 | 0.798 | 0.946 | 0.075 | **0.017** | 0.613 |
| Lignocerate (C24:0) | **0.018** | 0.063 | 0.742 | 0.247 | **0.022** | 0.652 |
| Hydroxylignocerate | 0.179 | 0.661 | 0.336 | **0.016** | **0.011** | 0.19 |
| Cerotate (C26:0) | 0.371 | **0.003** | 0.944 | **0.001** | **0.031** | **0.006** |
| Montanate (C28:0) | 0.255 | 0.955 | 0.803 | 0.897 | **0.011** | 0.543 |
| 5. Fatty alcohols and phytosterols | | | | | | |
| Heneicosanol (C21) | 0.352 | 0.691 | 0.208 | 0.966 | **0.017** | 0.561 |
| Behenyl alcohol (C22) | 0.583 | **0.023** | 0.659 | 0.195 | 0.057 | 0.64 |
| Tricosanol (C23) | 0.27 | **0.004** | 0.451 | 0.76 | 0.199 | 0.233 |
| Lignoceryl alcohol (C24) | **0.026** | **0.024** | 0.464 | **0.043** | **0.014** | 0.77 |
| Ceryl alcohol (C26) | 0.513 | **0.003** | 0.5 | 0.234 | 0.265 | 0.083 |
| Heptacosanol (C27) | 0.19 | **0.007** | 0.441 | 0.585 | 0.971 | 0.35 |
| Montanyl alcohol (C28) | 0.443 | **0.006** | 0.627 | 0.36 | 0.39 | 0.195 |
| Myricyl alcohol (C30) | 0.67 | **0.01** | 0.688 | 0.51 | 0.7 | 0.26 |
| Phytol A | 0.081 | **0.001** | 0.068 | 0.724 | **0.05** | 0.901 |
| Stigmasterol | 0.488 | **0.001** | **0.037** | 0.06 | 0.237 | 0.145 |
| β-Sitosterol | 0.745 | **0.046** | 0.264 | 0.326 | 0.071 | 0.486 |
| *6. Miscellaneous and unknowns* | | | | | | |
| Phosphate | 0.528 | 0.6 | 0.729 | 0.997 | 0.605 | **0.02** |
| Polar compound 3.11 min | 0.074 | 0.498 | 0.5 | 0.421 | 0.954 | **0.03** |
| Non-polar 8.12 min | 0.126 | **0.002** | 0.592 | 0.242 | 0.596 | 0.903 |