Figure S1

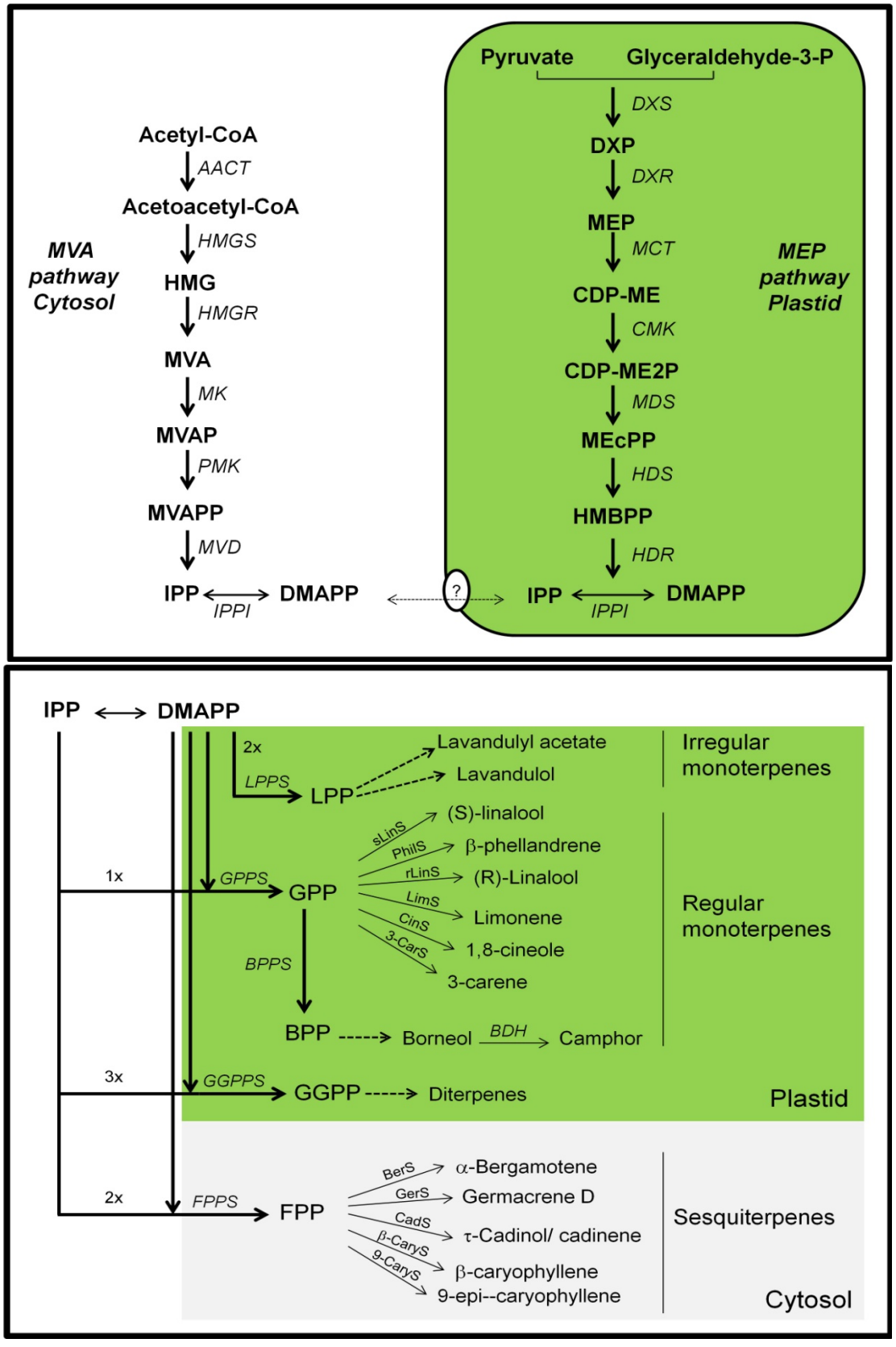
Pyruvate
Glyceraldehyde-3-P
DXS
DXP
DXR
MEP
MCT
CDP-ME
CMK
CDP-ME2P
MDS
MEcPP
HDS
HMBPP
HDR
IPP
DMAPP
IPPI
MEP pathway Plastid
Acetyl-CoA
AACT
Acetoacetyl-CoA
HMGS
HMG
HMGR
MVA
MK
MVAP
PMK
MVAPP
MVD
IPP
DMAPP
IPPI
MVA pathway Cytosol
?
IPP
DMAPP
2x
LPPS
LPP
Lavandulyl acetate
Lavandulol
Irregular monoterpenes
(S)-linalool
sLinS
PhilS
β-phellandrene
rLinS
(R)-Linalool
1x
GPPS
GPP
LimS
Limonene
CinS
1,8-cineole
3-CarS
3-carene
Regular monoterpenes
BPPS
BPP
Borneol
BDH
Camphor
3x
GGPPS
GGPP
Diterpenes
Plastid
BerS
α-Bergamotene
2x
FPPS
FPP
GerS
Germacrene D
CadS
τ-Cadinol/ cadinene
β-CaryS
β-caryophyllene
9-CaryS
9-epi--caryophyllene
Sesquiterpenes
Cytosol

Fig S1. Biosynthesis of terpenes in plants.

a) Biosynthesis of IPP and DMAPP through the plastidial-localized MEP pathway (right) and the MVA pathway (left) in cytosol. In MEP pathway, seven step-wise enzymes are involved in to form IPP/DMAPP, starting from synthesis of DXP from pyruvate and glyceraldehyde-3-P by DXS and ending with reduction of HMBPP to IPP/DMAPP by HDR in plastids. IPP/DMAPP pools are also synthesized *via* cytosolic MVA pathway using six step-wise enzymes. Initially, acetoacetyl-CoA (AAC) is formed from Acetyl CoA by AAC thiolase and is subsequently converted to mevalonate-5-diphosphate (MVAPP), which is the last step to give IPP by MVA decarboxylase (MVD). IPP is then isomerized to DMAPP by IPPI. Overall, MEP and MVA are independent pathways, but interactive, exchanging IPP/DMAPP pool between the two compartments although the trafficking mechanisms are yet unknown. The intermediate products and enzymes in the MEP pathway: DXP - 1-deoxyxylulose-5-phosphate; DXS - DXP synthase; DXR - DXP reductoisomerase; MEP - 2-C-methylerythritol-4-phosphate; CDP-ME - 4-diphosphocytidyl-2-C-methylerythritol; MCT - CDP-ME synthase; CDP-ME2P - 4-diphosphocytidyl-2-C-methyl-D-erythritol 2-phosphate; CMK - 4-diphosphocytidyl-2-C-methyl-D-erythritol kinase; MEcPP - 2-C-methyl-D-erythritol 2,4-cyclodiphosphate; MDS - MEcPP synthase; HMBPP - 4-hydroxy-3-methylbut-2-enyl diphosphate; HDS - HMBPP synthase; HDR - HMBPP reductase; IPP - Isopentenyl diphosphate; IPPI - IPP isomerase; DMAPP - Dimethylallyl diphosphate. The MVA pathway products and enzymes are: HMG - 3-hydroxy-3-methylglutaryl-CoA; HMGS - HMG synthase; HMG - 3-hydroxy-3-methylglutaryl-CoA; HMGR- HMG reductase; MVA - mevalonate; MK - MVA kinase; MVAP - phosphomevalonate; PMK - MVAP kinase.

b) Biosynthesis of *Lavandula* terpenes catalyzed by terpene synthases. IPP and its allylic isomer, DAMPP are the common precursor of all terpenes. In plastids, DMAPP fuses either with one DMAPP unit to give LPP or with one IPP unit to form GPP. While LPP in the *cis*-configration has been believed to be the natural precursor of irregular monoterpenes, the *trans*-pernyl diphosphate (GPP) serves as a primary substrate for different regular monoterpenes. Regular monoterpene synthases catalyze GPP not only to several regular monoterpenes but also to another pernyl diphosphate (e.g. BPP), which is then converted to other monoterpenes. Further, the condensation of DMAPP and three IPP units forms GGPP, which is subsequently converted to diterpenes by diterpene synthases in plastids. In cytosol, one unit of DMAPP and two IPP units are condensed in a head-to-tail configuration to give FPP that serves as a substrate for sesquiterpenes. Sesquiterpene synthases convert FPP to specific sesquiterpenes. Some of the major regular monoterpene synthases and sesquiterpene synthases have been reported in *Lavandula* (Adal et al., 2017; Demissie et al., 2011, 2012; Despinasse et al., 2017; Guitton et al., 2010; Jullien et al., 2014; Landmann et al., 2007; Sarker et al., 2013). However, there are still unknown terpene synthases that are indicated by dashed arrows. The pernyl diphosphates and enzymes include: LPP - lavandulyl diphosphate; LPPS - LPP synthase; GPP - geranyl diphosphate; GPPS - GPP synthase; GGPP - geranylgeranyl diphosphate; GGPPS - GGPP synthase; FPP - farnesyl diphosphate; FPPS - FPP synthase; BPP - bornyl diphosphate; sLinS - (S)-linalool synthase; PhilS - β-phellanderene synthase; rLinS - (R)-linalool synthase; LimS - limonene synthase; CinS - 1,8-cineole synthase; 3-CarS - 3-carene synthase and BDH - borneol dehydrogenase; BerS - α-bergamotene synthase; GerS - germacrene D synthase; CadS - cadinol synthase; β-CaryS - β-caryophyllene synthase and s9-CaryS - 9-epi-caryophyllene synthase