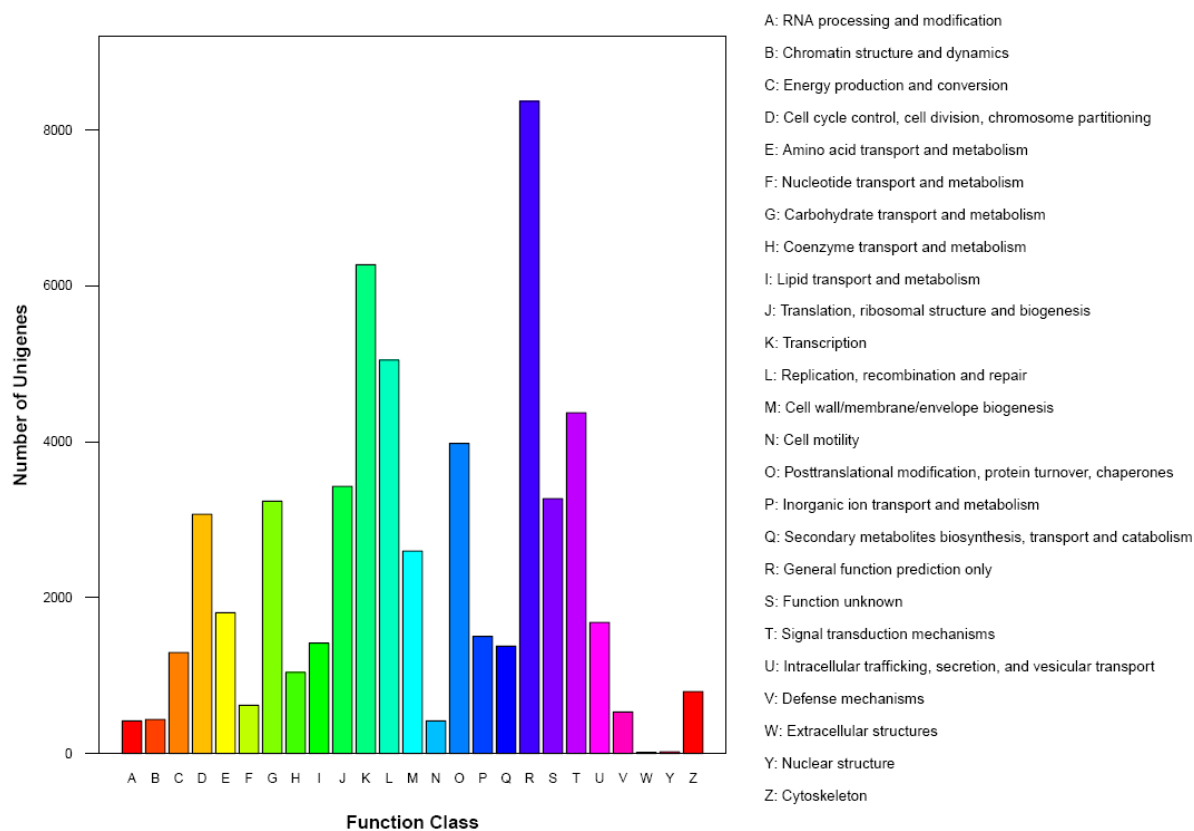


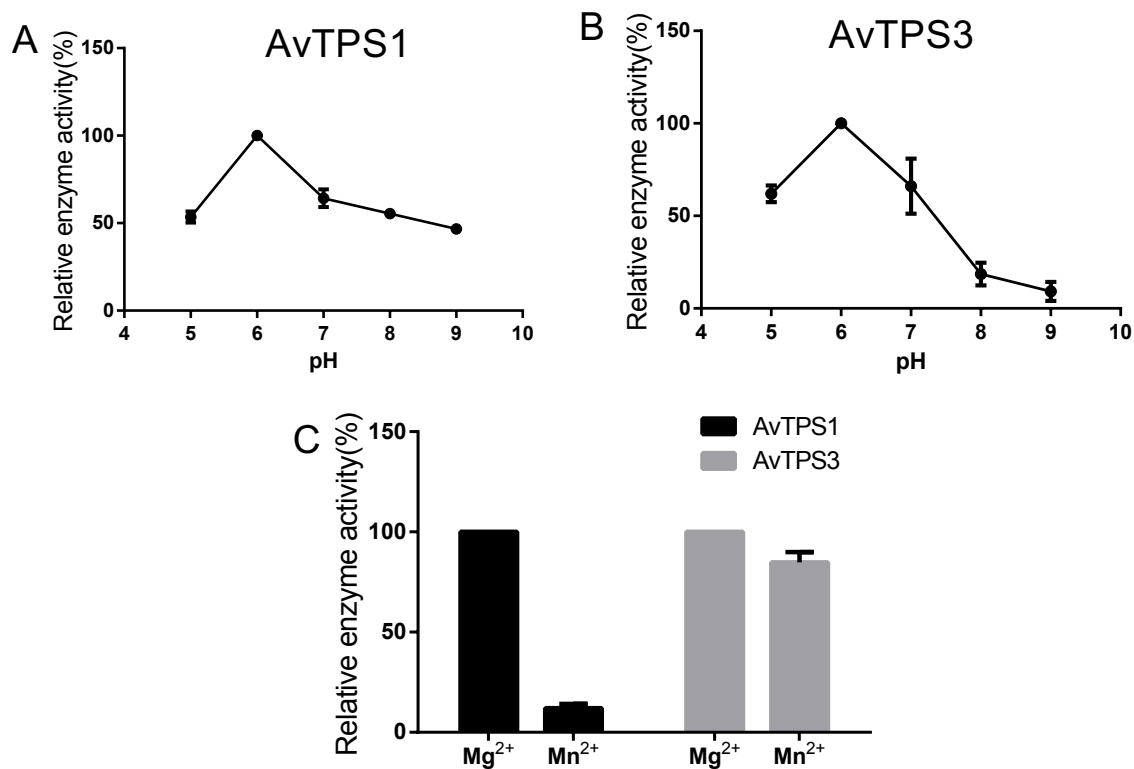
Supplementary Figure 1. Percentage of monoterpenes in different tissues of *A. villosum*. (A) Pericarp of 45-DAF fruit. (B) Seeds of 45-DAF fruit. (C) Leaf. (D) Root. (E) Creeping stem.



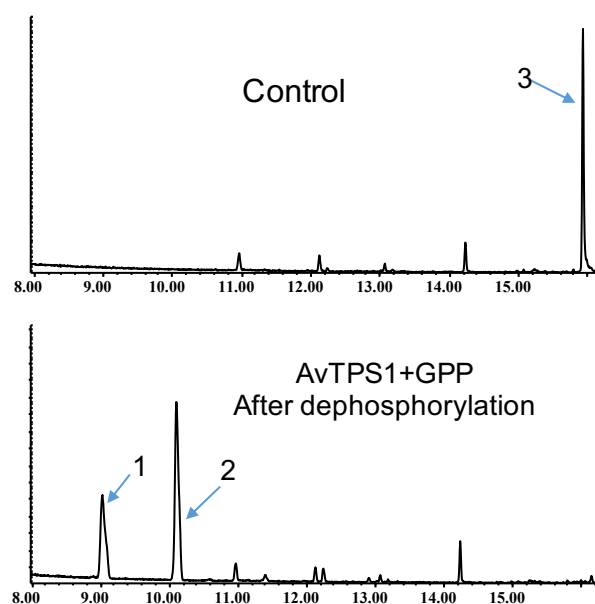
Supplementary Figure 2. COG function classification of *Amomum villosum* unigenes

	N-terminal transit peptide	RRX <sub>8</sub> W	
AvTPS3	.MAT...RQVTSIYAFPM SVLP RR...PMI VTAVEHRGRTFRRTLQVRSCIATSNVAP...LFRSGNYGPONI VTD ERVQS L T STST...EOREKRERRNNVMEQTRN		97
AvTPS1	.....NSVLSASAATFGS RAG...IGGSGSRSAAI KRRRRLPRI QCHAAEESQSLSTTSFRSGNYGPSI VTHDRI QSLT L SHA. ADEEDHAEIKL LKYQTSK		99
HcTPS7	.....NSVLSFAASATFGF RGG...LGG.FSRPAAI KQWRCLPRI QCHSAEQSQSP...LFRSGNYGPSI VTHDRI QSLT L SHT...ADEDDHGERIKL LKQTNK		93
HcTPS8	.....NSLLAPP SYFPFRG...LRRSTAAKQPCCRL VKCTADROSP EA...AFRSAHYCPNMSSDDYI QSLTVESPLKVEEKEQTKKLM LKRI AE		88
ZmM1	.....NSLFHPALAPL NAFDRR...LFVLRRCATTVKQ...RCLTLI RCAAADAGKTPA...SFRSANYCPNL VGDRI RSLTVE...EEDHTATARI KL LKVKRK		90
LaBPP5	MTAARSFNAI NSNMTDHLHKFGKKNLEFGGYS CNNASPNRL RPCCSKLSTNAESQLDST...FRSGMYKPTL VDFDRI QSLN. SVY...TEEKYSTACDIL QQVKKL		104
EILMS	MSAT...LI MHEAI PNKPI KSLSSKKSKFCFASYI PSANGLIKI EPCASIQENAQCQDSPTVD...FRSGNYEPPL VDFDFVQS L TAKY...AEERYSKRANEIK QVKKMM		103
AvTPS3	LI L EQQ. QVAEQLRIIDH LQQLGVAYHF KDEI SDVLSRLHASIDGVS...SLEDDHAT ALUFRLLURANGFSVS QDL FETFRDEK. GNF. EVRCEDDI RGLLSI YEAS		201
AvTPS1	LNEEKGVRVEQLQI IDH LQQLGVAYHF KDEI KDTLRGFHAS FEDVS...LQLRDNLHASALUFRLLURENGFSVSEDI FKKFKDEKAGGF. EDRLQSQAEG. LLSI YEAS		205
HcTPS7	LNEEKGVEGQLQI IDH LQQLGVAYHF KDEI KDTLRGFYAS FEDI S...LQFKDNLHASALUFRLLURENGFSVSEDI FKKFKDDQKGGF. EDRLQSQAEG. LLSI YEAS		199
HcTPS8	VI CEGK. EVEEQLRIIDH LQQLGVAYHF KDEI KASLRNI HSSLEESI STI I FKDKNLHASALUFRLLURENGFSVSEDI FEEFRDEKGGYFRS DGLKNQTDQAMLSI YEAS		197
ZmM1	VI HDDK. EVEEQLRIIDH LQQLGVAYHF KDEI KDSLSLHASLEDTS...LKLKDNLHASALUFRLLURENGFSVSEDI FYKFRDEN. GGF. RDCLGKNTQGLLSI YEAS		194
LaBPP5	LEESDMFR...QLQI IDH LQQLGVAYHF KDEI NLI NTI YFEKKFCEK...EMDLYSTS LAFRLURQGLKVSQEVDFDCRKEE. GGF. EARLGDETNG. LLECEASE		204
EILMS	LVGEIQI MEPI HQELI IDHLSIGI SYHFDEI DVI LNSVYHQI FNGNDKYHQRD YSTS LGERLLURQGFVSQGV DGGKNEK. GEF. KESLGDDTKG. LLSI YEAS		210
AvTPS3	LEKEGEI LKEAMDFATDKL KGFMEEGSGS...LGL...REQVAHALQPLI NWRMERVQHRMFI EACN...GADDAI NPLLEFAKL DYNL VODMYKSEL REISSVWSGLG		303
AvTPS1	LEKDGEEL LHEAREFTTI KHLKNLIEEGS...LKPGLI REQVAHALQPLI NWRFORHTKVFIFAVQR...D...PAMDPALEGLAKLDFNALQNI YKRELKEASRWMDLG		308
HcTPS7	LEKDGEEL LHEAREFTTI KHLKNLIEEGS...LKPGLI REQVAHALQPLI NRRFORHTKVFIFAVQR...D...PTMDPALEGLAKLDFNALQNI YKRELKEASRWMDLG		302
HcTPS8	YEKDGEMVLQEAECTIKHLENLIEEGSD...LK...LKEQAAHALQPLI NWRMERI HARVFI EACQR...EVVVI DNPALLEFAKLDFNAQSI YKRELKASRWMDLG		300
ZmM1	YEKDGEMVLHEAMEFATEHLKNVIEEGMAS...MDLT...REKVAHALQPLI NWRMERI HTRVFI ESCQR...EATNVNQALIEFAKLDFNATQSVHKRELREVSRWMDLG		298
LaBPP5	LATEGEETLELRLFTTNI LQKKDDERNELL MDYLRTL RHSLDPLIYWRVORPSARMFIEAYAT...RS...DMNPI MLEFAKLDFNI VQATHOEL KQVSRWVKESR		310
EILMS	LNTGEGTKLELREYSLSLHKLDERI DD...NDDDVVLVM RRALEPLVHMRI ORPNARMI EEYSNERRSI MKNPI LLEFAKLDFNI VQATHOEL KHVSWWEQTG		318
	RXR	DDXXD	
AvTPS3	LLEKLPFFRDRLI AENYLVAAGFAVETDSWRCRM OTKI I CLVTIM DDIDYVYGTIL DELELFTI DVVDRMDLTAMDKLPEYMKLSFFALENMVHEEGYRVMKEKGLDI VPDL		413
AvTPS1	LPQKLPFFRDRLI TENYLVTGWAFEPDSWAFREL OTKI NCFITIM DDIDYVYGTIL DELELFTI DIRMVDNSI DKLPEYMKI CFUAVENTVNDAGYEVIRDKGVDPYI		418
HcTPS7	LPQKLPFFRDRLI TENYLVAWVFARFEDSWAFREMDTKNCFITIM DDIDYVYGTIL DELELFTI DIRMVDNAI DKLPEYMKI CFUAVENTVNDAGYEVIRDKGVDPYI		412
HcTPS8	VVEKLPFFARDRLI TENYLVTGWAFEPHISFRDACTKGNCFVTIM DDIDYVYGTIL DELELFTI HVVDVDRMDNADQLDPEYMKI LEFALENTVNDAGYEVIRDKGVDPYI		410
ZmM1	LAELKLPFFRDRLI TENYLVTGWAFEPHMRREVOITKVI CFVTIM DDIDYVYGTIL DELELFTI DIRMDLAANDKLPEYMKLOFFAI INLVHEEGYRVMKEKGLDI VPDL		408
LaBPP5	LAELKLPFFARDRVENYLWNRGVLFPQYGYPI MNAKLFVLTIVDDIDYVYGTILEETOLFTNLI TRMDVEALGOLPEYMKI CYMAIDNNINELAYEVLKQGLLI QDL		420
EILMS	LAKTIPFARDRLI VECYLVTIGGLEEGQYGYSPIMSKVNAFIVTIDIDYVYGTILEELLFNDVI QRMDEAVIDKLPHYWQNCFLALNNVDELAAYNLKQGLFI PHL		428
	NSE/DTE		
AvTPS3	KRI VGNCKSVLKEAKVYHHGQI PTLLEEVLENGYVSVTTPML LHALCAGDD. LTGEAL KSFSSYYAI TRSTGWLFRLYDDNGTSTDEIERGDVAKI QCVNHEKGVTEE		522
AvTPS1	KRAMAELCKMYNRBAARYHAGVTPTLDEYLDGAWISISGALI LSTAYCMGND. LTKDDL DKFSTYPAPVWHPSCMLRLHDDFGTSTDEIARGDVQKAVQCCMHERKVPEA		527
HcTPS7	KRAMAELCKMYNRBAARYHTGYTPTLDEYLDGAWISISGALI LSTAYCMGKD. LTKEDL DKFSTYPSI VQPSCLRLHDDFGTSTDEIARGDVQKAVQCCMHERKVPEA		521
HcTPS8	KRSWADLCKAYLVBAKYHRYKPTINBYLDNTWISISGPAI FTNAYCMANN. LTKDGLERFSEYPAL AKHSSMLGRILYDGLATSTAEIERGDVPKSI QCCMHERGVSEG		519
ZmM1	KKSVGDCKSVYFEAKVYHHGQI PKLKEVYENGLVSI AGRI LSHAYCVAND. LTGEAL KI FPSYHEI TRSSS LERLYDDNGTSTDEIERGDVPKIVQCVNHEKGVSEE		517
LaBPP5	RKFVADLCVAYGKBAEYVYTYGKPTLEEVLEVAWSISAHLI LGYMFLTSNPI EKEASQSLSNYHNI IRNSANVLRALADDLGTSPYEMORGDVPKAVGYNNENGASTE		530
EILMS	RKSWANLCKAYLVQBAKYVSKGYTPTLEEVINNAWISISARVMSHEYFLVANPI DNEAVQSI YEYHNI VRCSANVLRSLNDLGTSPDEIMKRGDVPKSVQCVNHEKGVTEE		538
AvTPS3	AARKEMTELNRKYVRELNGFLSV. DSPVEEYLNVAI NIPRTAQFFVYFGDG/GWVVDRET KSI I SLELEPI QI...		596
AvTPS1	VAREHI IQVNEAKVRLNNGNRVA. TSSFEYFLNVAI NIPRSAQFFYGGDG/GSGDGS. ETKKQVI SLLI EPVQF...		600
HcTPS7	VAREHI KQVNEAKVRLNNGNRVA. ASSFEYFQNVAI NLPRAAQFFYGGDG/GANADG. ETQKQVNSLLI EPVQF...		593
HcTPS8	VAREQVKELI RGNVRCNNGDRAA. ASSFEEMKTVAVDI ARASQFFYHNGDKYKAGDG. ETMTQVMSLLI NPI I...		591
ZmM1	VARETRELNRKCVRELNASLSV. DSPLEEYI NNI QVNI PRTAQFFYQDG/GKAYG. ETRSKI I LLELEPI QI...		590
LaBPP5	EAREYVKHLIREVWKTETNGERFK. ESPFTPSNRI CADLGRMAQFMYQHDG/GI RNL. QVEDRI QSLI FEPI V...		602
EILMS	DAQTYI RTVI YETWKKNEERVAADSLFKDFVRSVVDLGRMAQFMYQHDG/GI HFP. EMVDRI SLELEFEFSVDM		614

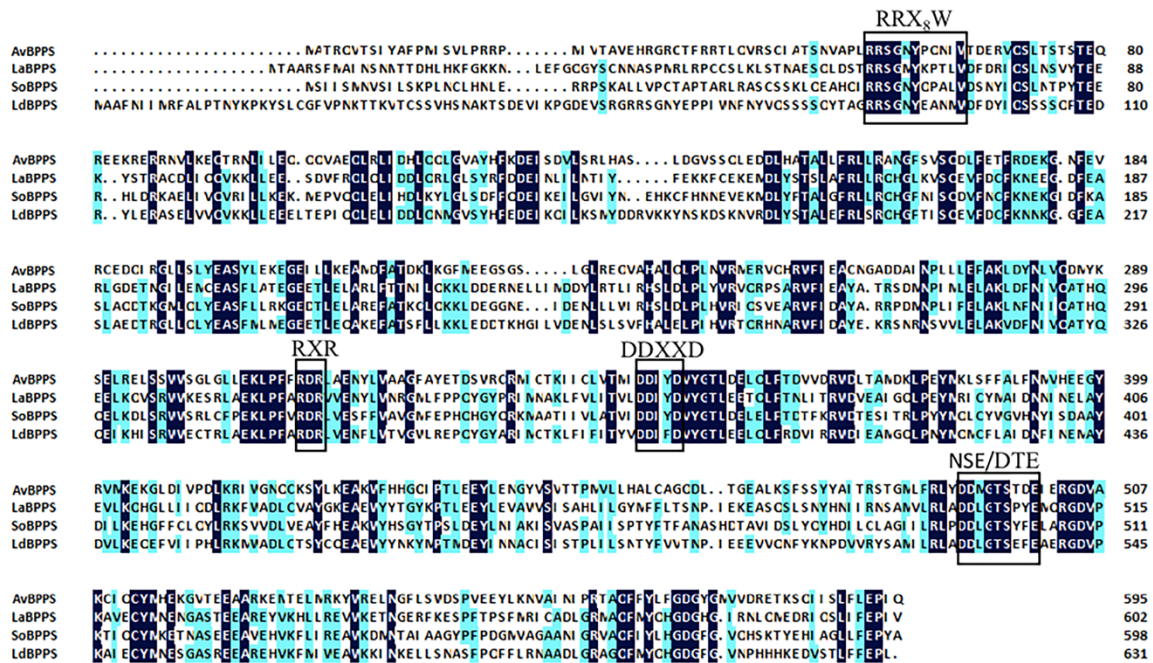
Supplementary Figure 3. Protein alignment of AvTPS1 and AvTPS3 with *Hedychium coronarium* TPS7 (AHJ57305.1), TPS8 (AGY49283.1), *Zingiber montanum* monoterpene synthase (AHI46572.1) and *Lavandula angustifolia* bornyl diphosphate synthase (AJW68082.1) and *Erythranthe lewisii* limonene/myrcene synthase (AHI50308.2). The predicted transit peptides of AvTPS1 and AvTPS3 were showed with red frame. The conserved domains RRX<sub>8</sub>W, RXR, DDXXD and NSE/DTE were showed with black frame.



Supplementary Figure 4. The analysis of optimum pH and metal ion in AvTPS1 and AvTPS3. (A) pH analysis of AvTPS1. (B) pH analysis of AvTPS3. (C) Metal ion analysis of AvTPS1 and AvTPS3.



Supplementary Figure 5. The GC-MS chromatogram of the monoterpene products generated by AvTPS1 protein after dephosphorylation. The compounds of peaks: 1,  $\alpha$ -pinene. 2,  $\beta$ -pinene. 3. geraniol.



Supplementary Figure 6. Protein alignment of AvBPPS with bornyl diphosphate synthases from *Lavandula angustifolia* (LaBPPS, AJW68082), *Salvia officinalis* (SoBPPS, AF051900) and *Lippia dulcis* (LdBPPS, ATY48638). The conserved domains RRX<sub>8</sub>W, RXR, DDXXD and NSE/DTE were showed with frame.