

# **Journal of Fungi**

## **Supplementary material**

### **Genome mining of fungal unique trichodiene synthase-like sesquiterpene synthases**

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## Supplementary Text

### Sequence of pUARA4

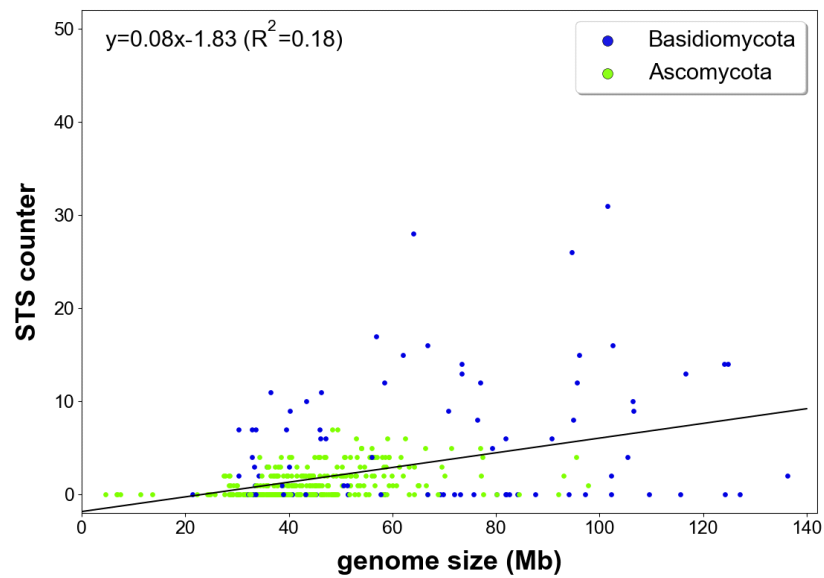
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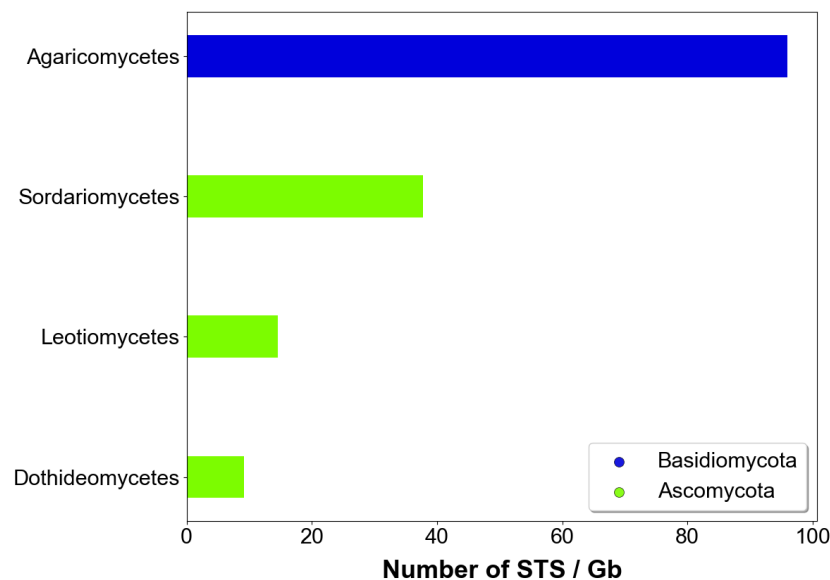
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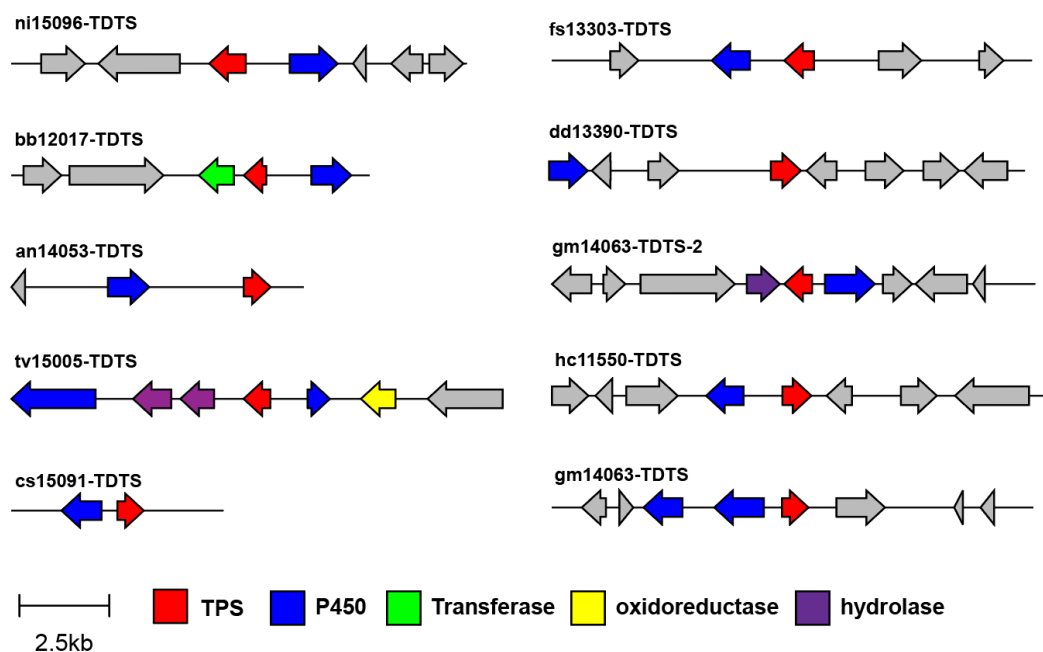
## Supplementary Figures



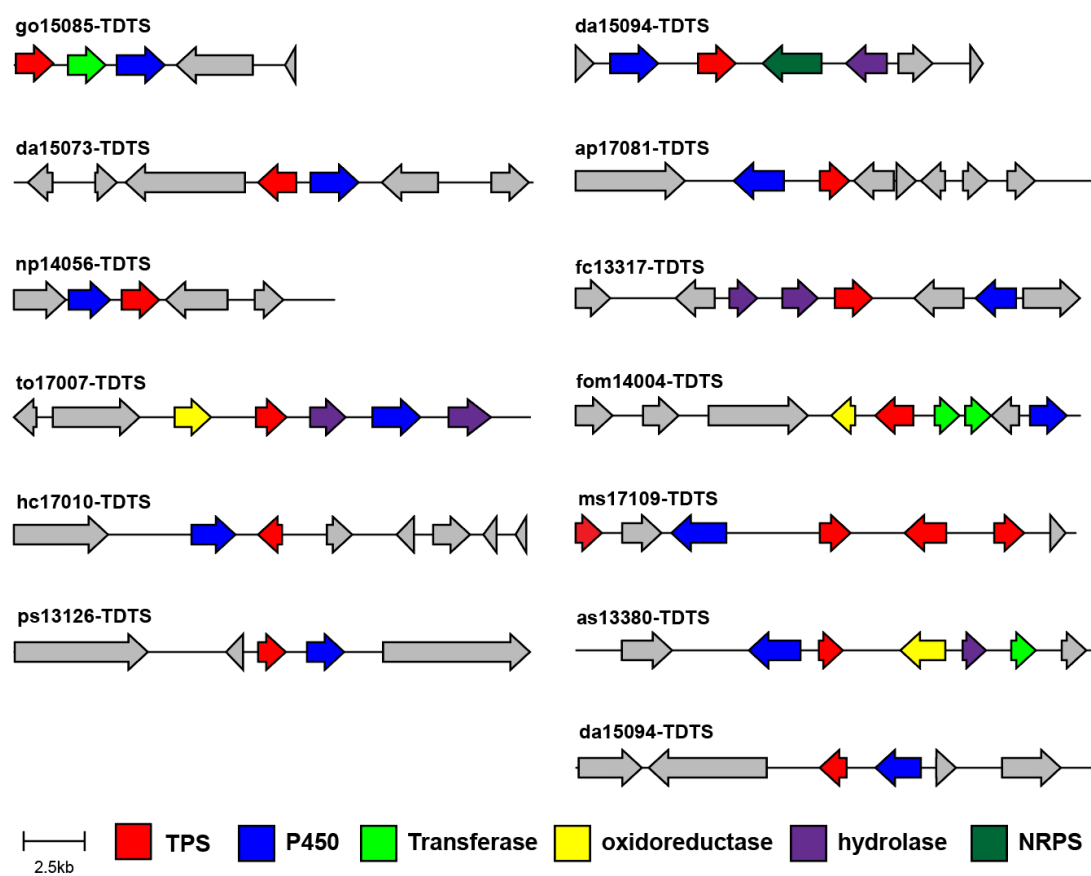
**Figure S1.** Number of TDTs by genome size. Each point represented one fungi strain. Strains from Basidiomycota were labeled as blue. Strains from Ascomycota were labeled as green.



**Figure S2.** Density of TDTs in different fungi class. Class from Basidiomycota were labeled as blue. Class from Ascomycota were labeled as green.



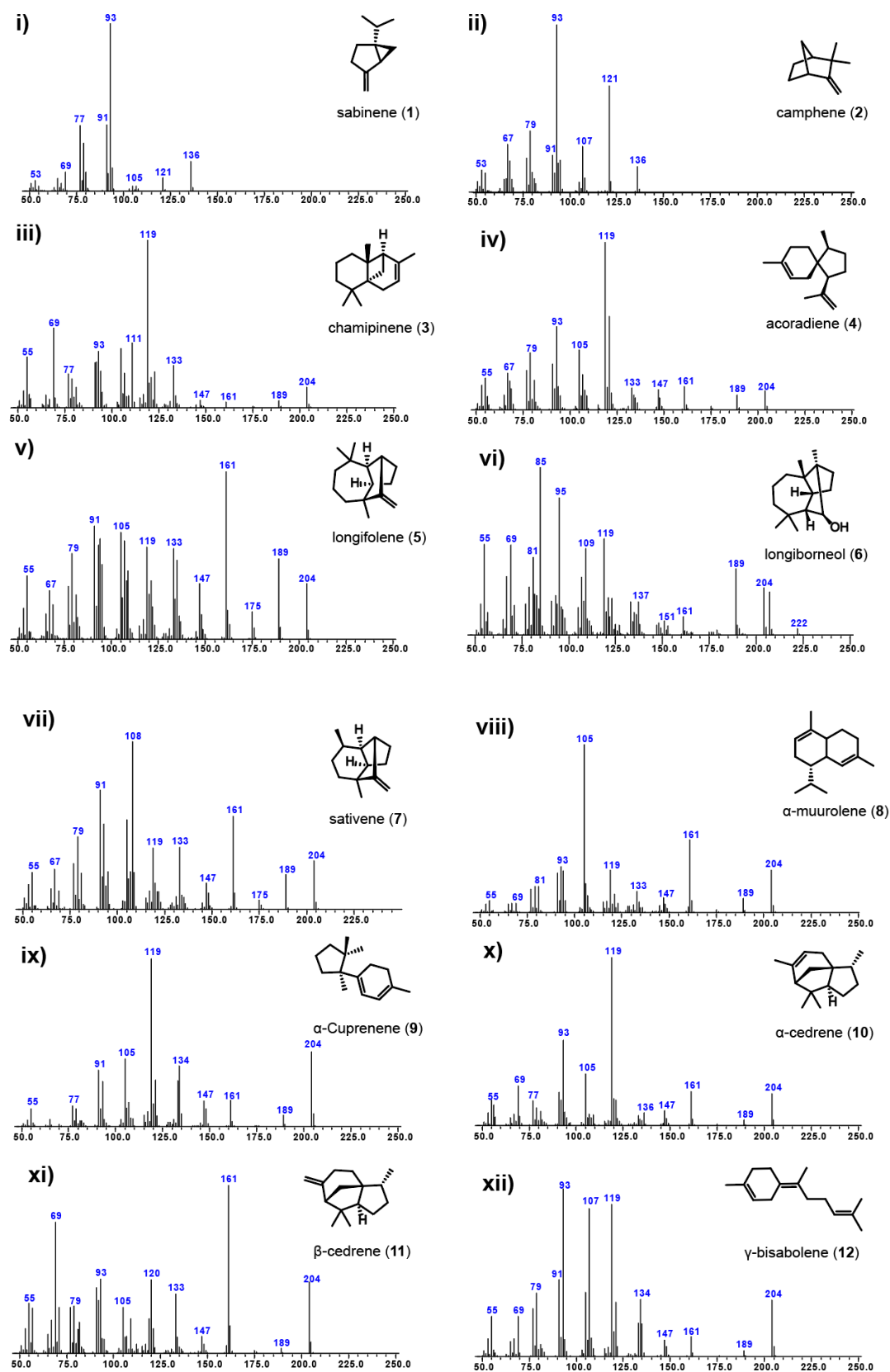
**Figure S3.** BGCs of active TDTs.



**Figure S4.** BGCs of inactive TDTs.







**Figure S6.** The mass spectra of all sesquiterpene skeletons in this study.

## Supplementary Tables

**Table S1.** Reported fungal TDTs extracted from public database and PubMed.

Accession	ID	Organism	Product	Intermediate	Ref.
PubMed	DtSTS09	<i>Desarmillaria tabescens</i>	Cis-thujosene	Bisabolene	[1]
PubMed	DtSTS10	<i>Desarmillaria tabescens</i>	$\alpha$ -Cuprenene	Bisabolene	
KAG2008248	Cop6	<i>Coprinus cinereus</i>	$\alpha$ -cuprenene	Bisabolene	[2]
JGI ID: 3258	Omp9	<i>Omphalotus olearius</i>	$\alpha$ -Barbatene	Bisabolene	[3]
JGI ID: 3981	Omp10	<i>Omphalotus olearius</i>	Dauca-4(11),8-diene	others	
PubMed	ShSTS1	<i>Stereum hirsutum</i>	$\beta$ -barbatene	Bisabolene	[4]
JGI ID: 84944	Fompi1	<i>Fomitopsis schrenkii</i>	$\alpha$ -Cuprenene	Bisabolene	[3]
PubMed	TvSTS14	<i>Trametes versicolor</i>	$\beta$ -barbatene	Bisabolene	[5]
PubMed	TvSTS16	<i>Trametes versicolor</i>	Dauca-4(11),8-diene	others	
PubMed	LnSTS20	<i>Lepista nuda</i>	$\beta$ -barbatene	Bisabolene	
PubMed	AbSTS09	<i>Agaricus bisporus</i>	(Z)- $\alpha$ -bisabolene	Bisabolene	
PubMed	AbSTS07	<i>Agaricus bisporus</i>	$\delta$ -Cadinene	germacrene	
PubMed	PoSTS16	<i>Pleurotus ostreatus</i>	$\alpha$ -Cuprenene	Bisabolene	
IIS104.1	D1M8S2	<i>Fusarium graminearum</i>	Longiborneol	Humulene	[6]
B8NHE0.1	FlvE	<i>Aspergillus flavus</i>	Acoradiene	Bisabolene	[7]
XP_001885710	LbSTS6	<i>Laccaria bicolor</i>	$\alpha$ -Cuprenene	Bisabolene	[8]
Q00909.1	Q00909	<i>Fusarium graminearum</i>	Trichodiene	Bisabolene	[9]
G0LES5.1	G0LES5	<i>Trichoderma arundinaceum</i>	Trichodiene	Bisabolene	[9]
P13513.1	P13513	<i>Trichoderma arundinaceum</i>	Trichodiene	Bisabolene	[9]
P27679.1	P27679	<i>Gibberella pulicaris</i>	Trichodiene	Bisabolene	[9]
Q00835.1	Q00835	<i>Fusarium poae</i>	Trichodiene	Bisabolene	[9]
O13489.1	O13489	<i>Paramyrothecium roridum</i>	Trichodiene	Bisabolene	[9]
A0A348B793.1	PpSTS25	<i>Postia placenta</i>	linalool	others	[10]
KGO75161.1	PitB	<i>Penicillium italicum</i>	Nerol	others	[11]
PubMed	PcSTS06	<i>Phanerodontia chrysosporium</i>	a-barbatene	Bisabolen	[12]
PubMed	PcSTS08	<i>Phanerodontia chrysosporium</i>	$\alpha$ -bisabolene	Bisabolen	[12]
PubMed	PcSTS11	<i>Phanerodontia chrysosporium</i>	santalene	Bisabolen	[12]

**Table S2.** Reported fungal TPTSs extracted from public database and PubMed.

Accession	ID	Organism	Major product	Intermediate	Ref.
<b>Basidiomycota</b>					
QDF59313.1	Hfas94a	<i>Hypholoma fasciculare</i>	humulene	humulene	[13]
QDF59314.1	Hfas94b	<i>Hypholoma fasciculare</i>	caryophyllene	humulene	
QDF59315.1	Hfas344	<i>Hypholoma fasciculare</i>	humulene	humulene	
PubMed	STC9	<i>Termitomyces sp. J132</i>	(-)-gamma-cadinene	germacrene	[14]
PubMed	STC15	<i>Termitomyces sp. J132</i>	Germacrene-D-4-ol	germacrene	
PubMed	STC4	<i>Termitomyces sp. J132</i>	Intermedeol	germacrene	
BBD74522.1	PpSTS08	<i>Postia placenta</i>	delta-6-protoilludene	humulene	[15]
JGI ID: 99496	PpSTS03	<i>Postia placenta</i>	alpha-Cadinene	germacrene	
BBD74520.1	PpSTS06	<i>Postia placenta</i>	alpha-Gurjunene	germacrene	
JGI ID: 98072	PpSTS10	<i>Postia placenta</i>	delta-Cadinene	germacrene	
BBD74517.1	PpSTS01	<i>Postia placenta</i>	alpha-Muurolene	germacrene	
JGI ID: 101549	PpSTS14	<i>Postia placenta</i>	pentalenene	humulene	
XP_007765978	Copu3	<i>Coniophora puteana</i>	Cubebol	germacrene	[16]
XP_007771895	Copu2	<i>Coniophora puteana</i>	beta-Copaene	germacrene	
KX281943.1	GME6364	<i>Lignosus rhinocerotis</i>	(+)-torreyol	germacrene	
KX281944.1	GME6368	<i>Lignosus rhinocerotis</i>	alpha-cadinol	germacrene	[17]
JGI ID: 1311	Omp1	<i>Omphalotus olearius</i>	alpha-Muurolene	germacrene	
JGI ID: 1447	Omp4	<i>Omphalotus olearius</i>	delta-cadinene	germacrene	
JGI ID: 2271	Omp7	<i>Omphalotus olearius</i>	delta-6-protoilludene	humulene	
JGI ID: 2392	Omp5a	<i>Omphalotus olearius</i>	gamma-cadinene	germacrene	
JGI ID: 2393	Omp5b	<i>Omphalotus olearius</i>	gamma-cadinene	germacrene	
JGI ID: 4636	Omp3	<i>Omphalotus olearius</i>	alpha-Muurolene	germacrene	
JGI ID: 4774	Omp6	<i>Omphalotus olearius</i>	delta-6-protoilludene	humulene	
A8NE23	Cop6	<i>Coprinopsis cinerea</i>	alpha-muurolene	germacrene	
EAU85264	Cop2	<i>Coprinopsis cinerea</i>	Germacrene A	germacrene	[18]
EAU85540	Cop4	<i>Coprinopsis cinerea</i>	delta-Cadinene	germacrene	
EAU88892	Cop3	<i>Coprinopsis cinerea</i>	alpha-Muurolene	germacrene	
EAU89322	Cop1	<i>Coprinopsis cinerea</i>	Germacrene A	germacrene	
PubMed	ShSTS12	<i>Stereum hirsutum</i>	alpha-cubebene	germacrene	
PubMed	ShSTS10	<i>Stereum hirsutum</i>	delta-cadinene	germacrene	
PubMed	ShSTS7	<i>Stereum hirsutum</i>	delta-cadinene	germacrene	[4]
PubMed	CPSTS18	<i>Clitopilus pseudopinsitus</i>	gamma-cadinene	germacrene	
PubMed	ShSTS5	<i>Stereum hirsutum</i>	gamma-cadinene	germacrene	
PubMed	CPSTS2	<i>Clitopilus pseudopinsitus</i>	delta-cadinene	germacrene	
PubMed	ShSTS8	<i>Stereum hirsutum</i>	alpha-cubebene	germacrene	
PubMed	ShSTS11	<i>Stereum hirsutum</i>	alpha-cubebene	germacrene	

PubMed	CPSTS5	<i>Clitopilus pseudopinsitus</i>	gamma-muurolene	germacrene	[19]
PubMed	CPSTS3	<i>Clitopilus pseudopinsitus</i>	alpha-muurolene	germacrene	
PubMed	CPSTS14	<i>Clitopilus pseudopinsitus</i>	beta-elemene	germacrene	
PubMed	CPSTS9	<i>Clitopilus pseudopinsitus</i>	ledene	germacrene	
PubMed	CPSTS13	<i>Clitopilus pseudopinsitus</i>	ledene	germacrene	
PubMed	CPSTS12	<i>Clitopilus pseudopinsitus</i>	beta-elemene	germacrene	
PubMed	CPSTS16	<i>Clitopilus pseudopinsitus</i>	aristolene	germacrene	
PubMed	CPSTS8	<i>Clitopilus pseudopinsitus</i>	alloaromadendrene	germacrene	
PubMed	CPSTS11	<i>Clitopilus pseudopinsitus</i>	alloaromadendrene	germacrene	
PubMed	CPSTS1	<i>Clitopilus pseudopinsitus</i>	sterprene	humulene	
PubMed	CPSTS6	<i>Clitopilus pseudopinsitus</i>	pentalenene	humulene	
PubMed	ShSTS4	<i>Stereum hirsutum</i>	hirsutene	humulene	
PubMed	ShSTS16	<i>Stereum hirsutum</i>	delta-6-protoilludene	humulene	
PubMed	ShSTS17	<i>Stereum hirsutum</i>	delta-6-protoilludene	humulene	
PubMed	ShSTS18	<i>Stereum hirsutum</i>	delta-6-protoilludene	humulene	
PubMed	CPSTS17	<i>Clitopilus pseudopinsitus</i>	beta-caryophyllene	humulene	
PubMed	ShSTS13	<i>Stereum hirsutum</i>	beta-caryophyllene	humulene	
PubMed	CPSTS4	<i>Clitopilus pseudopinsitus</i>	6-protoilludene	humulene	
PubMed	CPSTS7	<i>Clitopilus pseudopinsitus</i>	alpha-farnesene	acyclic	
PubMed	ShSTS3	<i>Stereum hirsutum</i>	beta-farnesene	acyclic	
PubMed	ShSTS15	<i>Stereum hirsutum</i>	delta-6-protoilludene	humulene	
JGI ID: 825684	Pilcr_825684	<i>Piloderma croceum</i>	gamma-cadinene	germacrene	
JGI ID: 47084	Sphst_47084	<i>Stereum hirsutum</i>	Viridiflorol	germacrene	
JGI ID: 659367	Denbi1_659367	<i>Dendrothele bispora</i>	delta-6-protoilludene	humulene	
JGI ID: 816208	Denbi1_816208	<i>Dendrothele bispora</i>	Viridiflorol	germacrene	
JGI ID: 104215	Galma_104215	<i>Galerina marginata</i>	beta-Gurjunene	germacrene	
JGI ID: 454193	Hetan2_454193	<i>Heterobasidion annosum</i>	delta-6-protoilludene	humulene	
JGI ID: 138665	Hypsu1_138665	<i>Hypholoma sublateritium</i>	delta-6-protoilludene	humulene	
MN146024	Agr1	<i>Agrocybe aegerita</i>	delta-cadinene	germacrene	
MN146025	Agr2	<i>Agrocybe aegerita</i>	viridiflorene	germacrene	
MN146026	Agr3	<i>Agrocybe aegerita</i>	alpha-Muurolene	germacrene	
MN146027	Agr4	<i>Agrocybe aegerita</i>	delta-cadinene	germacrene	
MN146028	Agr5	<i>Agrocybe aegerita</i>	Viridiflorol	germacrene	
MN146029	Agr6	<i>Agrocybe aegerita</i>	delta-6-protoilludene	humulene	
MN146030	Agr7	<i>Agrocybe aegerita</i>	delta-6-	humulene	

			protoilludene		
MN146031	Agr8	<i>Agrocybe aegerita</i>	gamma-Muurolene	germacrene	
MN146032	Agr9	<i>Armillaria gallica</i>	delta-6- protoilludene	humulene	
JGI:77541	SiTPS	<i>Serendipita indica</i>	viridiflorene	germacrene	[20]
<b>Ascomycota</b>					
A0A516F405	peniA	<i>Penicillium patulum</i>	silphiene	humulene	[21]
A0A284RNH4	PRO1	<i>Armillaria ostoyae</i>	delta-6- protoilludene	humulene	[22]
PubMed	FgJ09920	<i>Fusarium graminearum</i>	koraiol	humulene	[23]
AKE33935.1	CaTPS	<i>Colletotrichum acutatum</i>	beta-caryophyllene	humulene	[24]
JGI ID:17536	EC12-PGS	<i>Daldinia eschscholzii</i>	alpha-guaiene	germacrene	[25]
JGI ID:24646	EC12-SS	<i>Daldinia eschscholzii</i> <i>EC12</i>	alpha-selinene	germacrene	
JGI ID:372695	EC38-CS	<i>Hypoxylon sp. EC38</i>	caryophyllene	humulene	
JGI ID:397991	CO27-CS	<i>Hypoxylon sp. CO27</i>	alpha-caryophyllene	humulene	
JGI ID:6706	CI4A-CS	<i>Hypoxylon sp. CI4A</i>	alpha-caryophyllene	humulene	
JGI ID:70183	EC12-ILS	<i>Daldinia eschscholzii</i> <i>EC12</i>	(-)-isolekene	germacrene	
B6H063	prx2	<i>Penicillium chrysogenum</i>	(+)-aristolochene	germacrene	[26]
CCT65043	FfSTC3	<i>Fusarium fujikuroi</i>	(+)-eremophilene	germacrene	[27]
CCT75704	FfSTC5	<i>Fusarium fujikuroi</i>	Guaiadiene	germacrene	
AHY23920	Hyp1	<i>Hypoxylon sp. E7406B</i>	nerolidol	acyclic	[28]
AHY23921	Hyp2	<i>Hypoxylon sp. E7406B</i>	delta-cadinene	germacrene	
PubMed	Dial	<i>Diaporthe sp.</i>	delta-6- protoilludene	humulene	[29]
PubMed	Tvi09626	<i>Trichoderma viride</i>	trichobrasileno	humulene	[30]
CCP20071	Ffsc6	<i>Fusarium fujikuroi</i>	koraiol	humulene	[31]
AAQ16575	BcBOT2	<i>Botrytis cinerea</i>	presilphiperfolan-8beta-ol	humulene	[32]
Q9UR08	AtAS	<i>Aspergillus terreus</i>	(+)-aristolochene	germacrene	[33]
Q03471	Ari1	<i>Penicillium roqueforti</i>	(+)-aristolochene	germacrene	[34]
BBK61014.1	TaTC6	<i>Trichoderma atroviride</i>	trichobrasileno	humulene	[35]

**Table S3.** TDTs selected for heterologous expression.

Gene name	Organism	Division	Identity <sup>#</sup>	Family in SSN
<i>ni15096-TDTs*</i>	<i>Nigrospora sp.</i>	Ascomycota	D1M8S2 (36.46%)	Others
<i>bb12017-TDTs*</i>	<i>Beauveria sp.</i>	Ascomycota	TvSTS_14 (28.6%)	Others
<i>an14053-TDTs*</i>	<i>Arthrimum nigrum</i>	Ascomycota	FlvE (42.9%)	2
<i>tv15005-TDTs*</i>	<i>Trichoderma voglmayrii</i>	Ascomycota	ShSTS1 (25.94%)	Others
<i>cs15091-TDTs*</i>	<i>Cochliobolus sativus</i>	Ascomycota	D1M8S2 (33.5%)	1
<i>fs13303-TDTs*</i>	<i>Fusarium sporotrichioides</i>	Ascomycota	D1M8S2 (58.5%)	1
<i>dd13390-TDTs*</i>	<i>Dicarpella dryina</i>	Ascomycota	D1M8S2 (31.3%)	1
<i>gm14063-TDTs-1*</i>	<i>Glomerella magna</i>	Ascomycota	LbSTS6 (50.5%)	6
<i>gm14063-TDTs-2*</i>	<i>Glomerella magna</i>	Ascomycota	D1M8S2 (32.5%)	1
<i>hc11550-TDTs*=</i>	<i>Hapsidospora sp.</i>	Basidiomycota	PitB (25.90%)	Others
<i>go15085-TDTs</i>	<i>Ganoderma oregonense</i>	Basidiomycota	TvSTS_16 (41.2%)	3
<i>to17007-TDTs</i>	<i>Trichoderma ovalisporum</i>	Ascomycota	ShSTS1 (26.3%)	Others
<i>ap17081-TDTs</i>	<i>Arthrimum phaeospermum</i>	Ascomycota	D1M8S2 (34.1%)	1
<i>hc17010-TDTs</i>	<i>Hypomyces chrysospermus</i>	Ascomycota	D1M8S2 (29.9%)	4
<i>fom14004-TDTs</i>	<i>Fusarium oxysporum</i>	Ascomycota	D1M8S2 (36.8%)	1
<i>np14056-TDTs=</i>	<i>Neofusicoccum parvum</i>	Ascomycota	LbSTS6 (40.6%)	6
<i>da15094-TDTs=</i>	<i>Trametes gibbosa</i>	Basidiomycota	PpSTS29 (35.5%)	9
<i>fc13317-TDTs</i>	<i>Fusarium culmorum</i>	Ascomycota	D1M8S2 (38.5%)	7
<i>cc13107-TDTs=</i>	<i>Clitocybe clavipes</i>	Basidiomycota	AbSTS_07 (30.0%)	2
<i>as13380-TDTs=</i>	<i>Armillaria sinapina</i>	Basidiomycota	ShSTS1 (44.7%)	5
<i>da15073-TDTs=</i>	<i>Diaporthaceae sp.</i>	Ascomycota	PitB (29.4%)	Others
<i>ms17109-TDTs=</i>	<i>Mycena sanguinolenta</i>	Basidiomycota	Q00835 (48.17%)	8
<i>ps13126-TDTs=</i>	<i>Phaeolus schweinitzii</i>	Basidiomycota	FlvE (29.3%)	Others

\* Active TDTs.

# The identity between TDTs in this work and reported previously.

= Synthesized genes.

**Table S4.** Primers used in this study.

Gene	Restriction Site	Primer sequence 5'-3'	Vector/Size
<i>ap17081-TDTS</i>	<i>KpnI</i>	gcaagctccgAATTCGAGCTCATGGGGGACTG GCAAAC (primer-F) acgagctactacaGATCCCCGCTATTTACGCGTC GAAACCTT (primer-R)	pUARA4 1138 bp
<i>gm14063-TDTS-2</i>	<i>KpnI</i>	agctccgAATTCGAGCTCGATGCACATTCAG ATGAATGATATT (primer-F) gagctactacaGATCCCCGGTCAAGCCGGACAT TCCATAG (primer-R)	pUARA4 1198 bp
<i>gm14063-TDTS-1</i>	<i>KpnI</i>	agctccgAATTCGAGCTCGATGCCCATCGAA GCTTCTC (primer-F) gagctactacaGATCCCCGGCTAGACATGCAAG TCAAGTTCT	pUARA4 1325 bp
<i>go15085-TDTS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCGatgtattcattctcttccc ag (primer-F) cgagctactacaGATCCCCGGctaaggtgcggtacagtc (primer-R)	pUARA4 1253 bp
<i>ms13281-TDTS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCATGGTTTCCACAA GTGAAATTTCCA (primer-F) CCGAAGTTTGCGGACGACTAGCGGGGAT Ctgtagtagctc (primer-R)	pUARA4 1064 bp
<i>tv15005-TDTS</i>	<i>KpnI</i>	caagctccgAATTCGAGCTCatggcgagtactttccacag (primer-F) cgagctactacaGATCCCCGttactcagtggtaccatactc t (primer-R)	pUARA4 1153 bp
<i>da15094-TDTS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCGatggccgaactcgattcta g (primer-F) gagctactacaGATCCCCGtcacatttgcgcaggeg	pUARA4 1076 bp
<i>dd13390-TDTS</i>	<i>KpnI</i>	caagctccgAATTCGAGCTCATGGGTTGCCAC GAAAATGA (primer-F) cgagctactacaGATCCCCGTTAGTTGCTGAAA ACCCGTT (primer-R)	pUARA4 1300 bp
<i>fs13303-TDTS</i>	<i>KpnI</i>	agctccgAATTCGAGCTCGATGATCGCTGCA CCGAG (primer-F) gagctactacaGATCCCCGGTTAGTTCCTCTGG ACAATTCCTTT	pUARA4 1278 bp
<i>fom14004-TDTS</i>	<i>KpnI</i>	caagctccgAATTCGAGCTCatgtttatggtcggaagcca (primer-F) cgagctactacaGATCCCCGetaaggccccagegc (primer-R)	pUARA4 1152 bp
<i>au11219-TDTS</i>	<i>KpnI</i>	cgAATTCGAGCTCGGTACCATGCTTCAACC CAGTTCAGTT (primer-F) GACGGTGATCTCGTTTGCTAACGGGGATC ttagtagctc (primer-R)	pUARA4 1321 bp
<i>pm17515-TDTS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCATGGACCGTATTA CTCCCAA (primer-F) gagctactacaGATCCCCGCTATGATCCAAACG ACCACAC (primer-R)	pUARA4 1252 bp
<i>di11573-TDTS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCATGTTGCGCAATT ATGTGCGT (primer-F) gagctactacaGATCCCCGTCAGACAACAAAA GCTGCCTG (primer-R)	pUARA4 1352 bp
<i>bb12017-</i>	<i>KpnI</i>	agctccgAATTCGAGCTCGATGACTCCAGGC	pUARA4



<i>TDS</i>		ACGGA (primer-F) gagctactacaGATCCCCGGTTATTGGATAGCTA TTCCGATTTCTTC (primer-R)	975 bp
<i>ph10046-TDS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCATGTCCCATTCAC GCCACGAC (primer-F) GTTACTGCCGTAGAGGTTTGACGGGGATC tgtagtagctc (primer-R)	pUARA4 1274 bp
<i>hc17010-TDS</i>	<i>KpnI</i>	GcaagctccgAATTCGAGCTCATGGAGCCCAA GGTCTTC (primer-F) acgagctactacaGATCCCCGTCACCGATTTTGC CATTCATC (primer-R)	pUARA4 1164 bp
<i>hc11500-TDS</i>	<i>KpnI</i>	agctccgAATTCGAGCTCATGGTATGAACCGT TTGAAAAAGC (primer-F) cgagctactacaGATCCCCGtcagGCTCTGCAAGT CTGCA (primer-R)	pUARA4 1251 bp
<i>cs15091-TDS</i>	<i>KpnI</i>	aagctccgAATTCGAGCTCATGGGACATTCTG CCAAAGAC (primer-F) cgagctactacaGATCCCCGCTAGCCTGCAAAC ACTTCCT (primer-R)	pUARA4 1140 bp
<i>an14053-TDS</i>	<i>KpnI</i>	GcaagctccgAATTCGAGCTCATGACTGCTGC AGAGTTC (primer-F) acgagctactacaGATCCCCGTCAGCGAACCAG AACCC (primer-R)	pUARA4 1161 bp
<i>np14056-TDS</i>	<i>KpnI</i>	GcaagctccgAATTCGAGCTCATGCATCTCGC GATAGAACA (primer-F) cgagctactacaGATCCCCGCTAAAGATGACTT TGCGTCTCC (primer-R)	pUARA4 1354 bp
<i>fc13317-TDS</i>	<i>KpnI</i>	AGCTCCGAATTCGAGCTCATGGGCATTTG GCTATCA (primer-F) ACGAGCTACTACAGATCCCCGTTATGTATC GATGCTCTGAGCT (primer-R)	pUARA4 1247 bp
<i>ni15096-TDS</i>	<i>KpnI</i>	AGCTCCGAATTCGAGCTCATGGTCTGTAG CATTTTCTGTTC AACAGTA (primer-F) ACGAGCTACTACAGATCCCCGTTAGGAAG TCTTGGCCACCTCCTT (primer-R)	pUARA4 1578 bp

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**Table S5.** Plasmids and transformants constructed in this study.

<b>Plasmid</b>	<b>Gene to be expressed</b>	<b>Transformant</b>
pUARA4- <i>ap17081-TDTS</i>	<i>ap17081-TDTS</i>	AO- <i>ap17081-TDTS</i>
pUARA4- <i>gm14063-TDTS-2</i>	<i>gm14063-TDTS-2</i>	AO- <i>gm14063-TDTS-2</i>
pUARA4- <i>gm14063-TDTS-1</i>	<i>gm14063-TDTS-1</i>	AO- <i>gm14063-TDTS-1</i>
pUARA4- <i>go15085-TDTS</i>	<i>go15085-TDTS</i>	AO- <i>go15085-TDTS</i>
pUARA4- <i>ms13281-TDTS</i>	<i>ms13281-TDTS</i>	AO- <i>ms13281-TDTS</i>
pUARA4- <i>tv15005-TDTS</i>	<i>tv15005-TDTS</i>	AO- <i>tv15005-TDTS</i>
pUARA4- <i>da15094-TDTS</i>	<i>da15094-TDTS</i>	AO- <i>da15094-TDTS</i>
pUARA4- <i>dd13390-TDTS</i>	<i>dd13390-TDTS</i>	AO- <i>dd13390-TDTS</i>
pUARA4- <i>fs13303-TDTS</i>	<i>fs13303-TDTS</i>	AO- <i>fs13303-TDTS</i>
pUARA4- <i>fom14004-TDTS</i>	<i>fom14004-TDTS</i>	AO- <i>fom14004-TDTS</i>
pUARA4- <i>au11219-TDTS</i>	<i>au11219-TDTS</i>	AO- <i>au11219-TDTS</i>
pUARA4- <i>pm17515-TDTS</i>	<i>pm17515-TDTS</i>	AO- <i>pm17515-TDTS</i>
pUARA4- <i>di11573-TDTS</i>	<i>di11573-TDTS</i>	AO- <i>di11573-TDTS</i>
pUARA4- <i>bb12017-TDTS</i>	<i>bb12017-TDTS</i>	AO- <i>bb12017-TDTS</i>
pUARA4- <i>ph10046-TDTS</i>	<i>ph10046-TDTS</i>	AO- <i>ph10046-TDTS</i>
pUARA4- <i>hc17010-TDTS</i>	<i>hc17010-TDTS</i>	AO- <i>hc17010-TDTS</i>
pUARA4- <i>hc11500-TDTS</i>	<i>hc11500-TDTS</i>	AO- <i>hc11500-TDTS</i>
pUARA4- <i>cs15091-TDTS</i>	<i>cs15091-TDTS</i>	AO- <i>cs15091-TDTS</i>
pUARA4- <i>an14053-TDTS</i>	<i>an14053-TDTS</i>	AO- <i>an14053-TDTS</i>
pUARA4- <i>np14056-TDTS</i>	<i>np14056-TDTS</i>	AO- <i>np14056-TDTS</i>
pUARA4- <i>fc13317-TDTS</i>	<i>fc13317-TDTS</i>	AO- <i>fc13317-TDTS</i>
pUARA4- <i>ni15096-TDTS</i>	<i>ni15096-TDTS</i>	AO- <i>ni15096-TDTS</i>

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