Supplementary Materials

Oxygenase Ppo-Regulated Moldy Volatiles Affect Growth, Pathogenicity and Patulin Biosynthesis of *Penicillium expansum* Through G Protein Signaling

Table S1. All primers used for gene knockout and complementation.

Gene	Primer Sequences (5' - 3')	Length (bp)
ppoA-up	F: AGCTCGGTACCCGGGGATCCTCTAGAGGCGTTCCTCTTACCCAG R: TTGCATGCCTGCAGGTCGACTCTAGACAGATCCATCAGCCTTCC	1000
ppoA-down	F: TTGCCTAACTCGGCGCGCCGAAGCTTTCATGGAAGGAGCGAGAC R: GTAAAACGACGGCCAGTGCCAAGCTTAGAAAGGACGAGCAACGT	1100
ppoC-up	F: ACAGCTATGACCATGATTACGAATTCGTTCGTGCAAGTTAAAGCG R: GATCCCCGGGTACCGAGCTCGAATTCTGGTCTTAGGCTCGGTGT	1104
ppoC-down	F: TTGCCTAACTCGGCGCGCCGAAGCTTATGGTCCATTTGAGCAGA R: GTAAAACGACGGCCAGTGCCAAGCTTAGCGGGTAGAACGAGTGA	1101
ppoA-C	F: TTGCCTAACTCGGCGCGCCGAAGCTT GGTGCATTCA GCCGTACGTA R: GTAAAACGACGGCCAGTGCCAAGCTT GGGTGGTTGA TAGAAGAGAA	2439
ppoC-C	F: TTGCCTAACTCGGCGCGCCGAAGCTT GTGGGTCTGC GACGATCAAC R: GTAAAACGACGGCCAGTGCCAAGCTT TAGCCATACT GCCTATCGCA	3484

Table S2. Primers used for Real-time PCR of genes.

Gene	Primer Sequences (5' - 3')	Gene ID	Target function
ppoA	F: GGCCAACTTTTCTCCCAATG R: GACAAGCGCTGGATCTCAACT	PEX2_008260	Psi-producing oxygenase A
ppoC	F: ACCAGTGATGGCGCCTACTT R: ATATCGCGGAATCCCAAAGA	PEX2_077570	Psi-producing oxygenase C
AC	F: CTTGCACAAGGCATCCGATA R: CAGCGCTCAGGTGGTTGAAT	PEX2_061920	Adenylate cyclase
PkaC	F: GCAAATCGAGCACACAAATGA R: AAGTTCCCCACAACGTAACGA	PEX2_021600	cAMP-dependent protein
PkaR	F: CCGGCTTAAGAGTGCCGTTA R: GAGCGTTGAGGACGGTCAA	PEX2_028480	cAMP/cGMP-dependent protein kinase
pkc1	F: TGTGAAGTGCTTCGCAGACAT R: ACCAGTAGCCCGACCATTCTC	PEX2_068640	PKc protein Kinases,
pkc2	F: CAAGTCCGAGAAGCGTGTTTT R: TTTGGAAACAAGCGTGCAAGT	PEX2_087150	Protein Kinase C
plc	F: GGCTGTCGGTGATGGAAATC R: GTTGTGCAGAGACGACGTCAA	PEX2_061150	Phosphoinositide phospholipase C
abaA	F: ATCATTTCGACGGCCTCTTG R: ATGCATGCTGGGACCATTG	PEX2_109770	Conidiophore development regulator abaA
brlA	F: ACTTCGGCGACTCCATTGC R: TTACCGCAGGGCATGTTCAT	PEX2_076900	Conidiophore development regulator brlA
wetA	F: ATCACCGCAACCCTGGAGTA R: CGGTGTCATGGAAAGCAAAA	PEX2_105580	Developmental regulatory protein wetA
vosA	F: TCCAGATCATTTGCGGATCA R: GGTCGTGTCGTTCGTTTCAA	PEX2_008170	Velvet factor
patA	F: AAAGGCCGGTGCATTGATC R: TTGGAGGCTTTGGTGAGCAT	PEX2_082810	Acetate transporter
patB	F: GCCAGGCTATGCGATTGAGT R: GCTGGAACCCTGTCCATTGT	PEX2_082800	Carboxylesterase
patC	F: TCCACCTGCGAATATCCCTTA R: CATCGCCAGTGCCATTTTC	PEX2_082790	MFS transporter
patD	F: ATGAGATTCGTCTGCGCAAAG R: CTACCCAAGCGGGATGAGATT	PEX2_082780	Alcohol dehydrogenase
patE	F: CATTCTCATCGGGCCTGAGT	PEX2_082770	GMC oxidoreductase

	R: TCGAAGCTCTTCCGGACATG		
patF	F: GCGAGTGAATTCGGCCAAT R: GTCCGACCCAAAGGATGAAG	PEX2_082760	Hypothetical protein
patG	F: CGGCCGTCTTGAAGGAAAT R: CTTGCCGTAGCGGGTGAATA	PEX2_082750	Amidohydrolase
patH	F: CATTTATCGGCGGTGTTCTGA R: GATCAACGCTTGCACGATAGC	PEX2_082740	m-Cresol methyl hydroxylase
patI	F: GCAAACTCATTCCGCAAGGA R: TGGTTCTTGCCATCGATCAC	PEX2_082860	m-Hydroxybenzyl alcohol hydroxylase
patJ	F: CGCCAGACATACCGCCATA R: TTTGGTCGATCGGGACTGTT	PEX2_082870	Hypothetical protein
patK	F: GACGCTGGGCTACTGGATTG R: TCGTGCGTGAGGCCAGTAT	PEX2_082880	6-Methylsalicylic acid synthase
patL	F: GCAGGAGATCCGTTTCAGACA R: CCACTGACCGACGGTTACAAC	PEX2_082850	C6 transcription activator
patM	F: ACCCACAGCTGCACATGGA R: AGCGAGAAGAGGCGGAAGA	PEX2_082820	ABC transporter
patN	F: CGTTCGATGTCGCTAGCAAA R: GGCGATAATCACGTCAATTCG	PEX2_082830	Isoepoxydon dehydrogenase
patO	F: TCGCCTCCTGGTGTGTATCTT R: AAGCGTGCCCAGTCATTCAG	PEX2_082840	Isoamyl alcohol oxidase
tublin	F: CTCCAGCTCGAGCGTATGAAC R: GGCTCCAAATCGACGAGAAC	PEX2_027410	An endogenous control

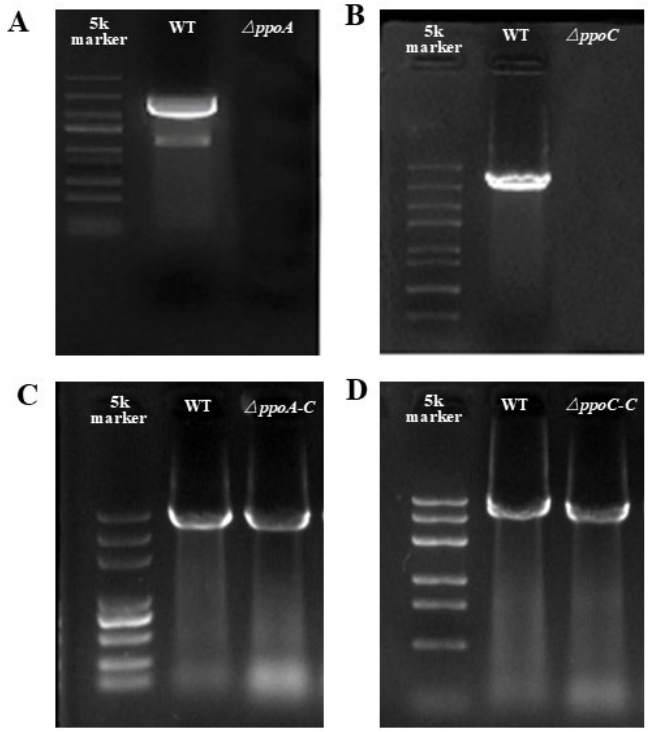


Figure S1. PCR verification of *ppoA* and *ppoC* knockout mutants and their corresponding complementary strains of *P. expansum*. A and B showed the identification of the positive transformants of knockout mutants; C and D showed the identification of the corresponding complementary strains.

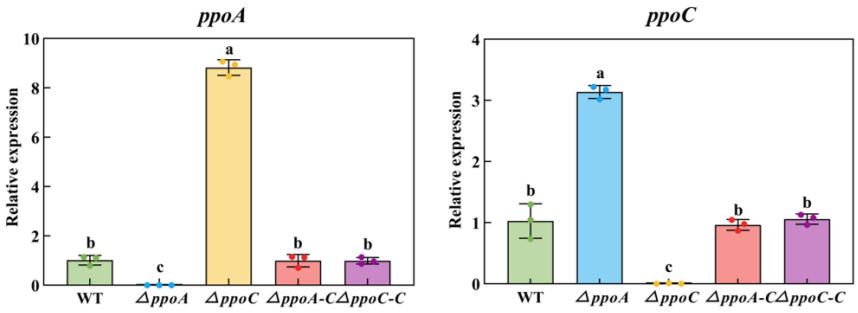


Figure S2. Expression level of *ppoA* and *ppoC* in the mutants.