

**Table S1.** sequence of primers.

Application of Primers	Primer Names	Sequence (5' - 3')	Product Size(bp)
ORF cloning	TcOct $\beta$ 2R-F1	CTCTT- GACTTTCTTCGACAAG	1326bp
	TcOct $\beta$ 2R-R1	GCAGACTAGAACTAG- TGGTCG	
	TcOct $\beta$ 2R-F2	GCGATGGACAACCTTAACAT AC	1257bp
	TcOct $\beta$ 2R-R2	CTGCTAGTTAGGTC- TACTCAGAGAC	
qRT-PCR	qTcOct $\beta$ 2R-F	GAGCG- GAATCTCAACAAAATG	279bp
	qTcOct $\beta$ 2R-R	GCGGCACAAAC- TACAAAAAAC	
qRT-PCR (reference genes)	qTcRPS3-F	CGCATTTCATGGTTGATAACG	150bp
	qTcRPS3-R	GGGCACCAAGTTAGTCTGGA	
dsRNA synthesis	dsTcOct $\beta$ 2R-F	taatacgactcactataggCGTGCAC- GATCATGATCTAC	439bp
	dsTcOct $\beta$ 2R-R	taatacgactcac- tataggGCTTCCCTGAAGTCCTT G	

The lowercase letters represent the T7 promoter sequences for efficient *in vitro* transcription in dsRNA synthesis.

**Table S2.** Overview information of the 39 sequences in phylogenetic tree.

Abbreviations	Species	GenBank Accession Number
TcOct $\beta$ 1R	<i>Tribolium castaneum</i>	NP_001280514.1
TcOct $\beta$ 2R	<i>Tribolium castaneum</i>	NP_001280501.1
TcOct $\beta$ 3R	<i>Tribolium castaneum</i>	NP_001280505.1
TcTyrR	<i>Tribolium castaneum</i>	NP_001164312.1
DmOamb	<i>Drosophila melanogaste</i>	NP_732542.1
DmOct $\alpha$ 2SR*	<i>Drosophila melanogaste</i>	NP_001262714.1
DmOct $\alpha$ 2LR*	<i>Drosophila melanogaste</i>	NP_650754.2
DmOct $\alpha$ 2LR	<i>Drosophila melanogaste</i>	NP_001262715.1
DmOct $\beta$ 1R	<i>Drosophila melanogaste</i>	NP_001262843.1
DmOct $\beta$ 2R	<i>Drosophila melanogaste</i>	NP_001303505.1
DmOct $\beta$ 3R	<i>Drosophila melanogaste</i>	NP_001034046.3
DmTyrR1	<i>Drosophila melanogaste</i>	NP_524419.2
DmTyrR2	<i>Drosophila melanogaste</i>	NP_001287382.1
DmTyrR3	<i>Drosophila melanogaste</i>	NP_650651.1
BmOct $\alpha$ 1R	<i>Bombyx mori</i>	NP_001091748.1
BmOct $\beta$ 2R	<i>Bombyx mori</i>	NP_001171666.1
BmOct $\beta$ 1R	<i>Bombyx mori</i>	XP_037876565.1
BmTyrR1	<i>Bombyx mori</i>	NP_001037504.1
BmTyrR2	<i>Bombyx mori</i>	NP_001164649.1
AmOct $\alpha$ 1R	<i>Apis mellifera</i>	NP_001011565.1
AmOct $\beta$ 1R	<i>Apis mellifera</i>	XP_397139.3
AmOct $\beta$ 2R	<i>Apis mellifera</i>	XP_006558130.1
AmOct $\beta$ 3R-1	<i>Apis mellifera</i>	XP_006557728.1
AmOct $\beta$ 3R-2	<i>Apis mellifera</i>	XP_006557730.1
AmTyrR1	<i>Apis mellifera</i>	NP_001011594.1
AmTyrR2	<i>Apis mellifera</i>	NP_001032395.1
CsOct $\alpha$ 2SR	<i>Chilo suppressalis</i>	AIC75371.1
CsOct $\alpha$ 2LR	<i>Chilo suppressalis</i>	AIC75370.1
CsOct $\beta$ 1R	<i>Chilo suppressalis</i>	AGV79326.1
CsOct $\beta$ 2R	<i>Chilo suppressalis</i>	AEO89318.1

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<i>CsTyrR1</i>	<i>Chilo suppressalis</i>	AFG26689.1
<i>CsTyrR2</i>	<i>Chilo suppressalis</i>	ADK91078.1
<i>CsOct<math>\alpha</math>1R</i>	<i>Chilo suppressalis</i>	AEQ33589.1
<i>NIOct<math>\alpha</math>R</i>	<i>Nilaparvata lugens</i>	ATY68965.1
<i>NIOct<math>\beta</math>2R</i>	<i>Nilaparvata lugens</i>	ASA47149.1
<i>NIOct<math>\beta</math>3R</i>	<i>Nilaparvata lugens</i>	QBC74627.
<i>PaOct<math>\alpha</math>1R</i>	<i>Periplaneta americana</i>	AAP93817.1
<i>PaTyrR1</i>	<i>Periplaneta americana</i>	SNT95699.1
<i>DmPDFR</i>	<i>Drosophila melanogaste</i>	NP_001284827.1

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