

Table S1. Information for CYPs and GSTs in *S. exigua* obtained from the transcriptome data.

	ID	log₂(FC)	T/C	Annotation	NCBI Blast	GenBank Number	Coverage
	Unigene_16865	0.4538	no	<i>CYP306A1</i>	<i>CYP306A1[Spodoptera exigua]</i>	KX443455.1	1759/1793(98%)
	Unigene_16447	-2.4695	no	<i>CYP321A8</i>	<i>CYP321A8[Spodoptera exigua]</i>	KX443441.1	1472/1503(98%)
	Unigene_68447	-0.9779	no	<i>CYP324A1</i>	<i>CYP324A1[Spodoptera exigua]</i>	KX443446.1	742/1167(64%)
	Unigene_20210	1.5775	up	<i>CYP333A12</i>	<i>CYP333A12[Spodoptera exigua]</i>	KX443479.1	2047/2116(97%)
	Unigene_20462	-1.5756	down	<i>CYP333B4</i>	<i>CYP333B4[Spodoptera exigua]</i>	KX443480.1	1656/1706(97%)
	Unigene_25500	3.7734	up	<i>CYP337B5</i>	<i>CYP337B5[Spodoptera exigua]</i>	KX443448.1	1602/1668(96%)
	Unigene_21168	0.2777	no	<i>CYP339A1</i>	<i>CYP339A1[Spodoptera exigua]</i>	KX443482.1	1792/1802(99%)
	Unigene_19946	2.7846	no	<i>CYP354A14</i>	<i>CYP354A14[Spodoptera exigua]</i>	KX443450.1	2167/2218(98%)
	Unigene_21670	0.6031	no	<i>CYP4CG1</i>	<i>CYP4CG1[Manduca sexta]</i>	GU731527.1	305/459(66%)
	Unigene_21297	6.6599	up	<i>CYP4G74</i>	<i>CYP4G74[Spodoptera exigua]</i>	KX443459.1	682/902(76%)
P450s	Unigene_349	2.0090	no	<i>CYP4G75</i>	<i>CYP4G75[Spodoptera exigua]</i>	KX443460.1	1973/1985(99%)
	Unigene_21235	1.2324	no	<i>CYP4M14</i>	<i>CYP4M14[Spodoptera exigua]</i>	KX443466.1	1307/1317(99%)
	Unigene_19955	3.7537	up	<i>CYP6AB14</i>	<i>CYP6AB14[Spodoptera exigua]</i>	KX443423.1	1600/1612(99%)
	Unigene_17055	8.2566	up	<i>CYP6AB31</i>	<i>CYP6AB31[Spodoptera exigua]</i>	KX443424.1	1984/2065(96%)
	Unigene_5595	3.1979	up	<i>CYP6AB60</i>	<i>CYP6AB60[Spodoptera litura]</i>	MG697223.1	1468/1634(90%)
	Unigene_20067	-0.2771	no	<i>CYP6AE74</i>	<i>CYP6AE74[Spodoptera exigua]</i>	KX443434.1	1970/2040(97%)
	Unigene_4160	2.2923	no	<i>CYP6AN4</i>	<i>CYP6AN4[Spodoptera exigua]</i>	KX443426.1	1785/1848(97%)
	Unigene_21924	1.1907	up	<i>CYP6AW1</i>	<i>CYP6AW1[Chilo suppressalis]</i>	KF701139.1	983/1410(70%)
	Unigene_13834	4.4932	up	<i>CYP9A186</i>	<i>CYP9A186[Spodoptera exigua]</i>	KY348418.1	663/673(99%)
	Unigene_13307	9.2197	up	<i>CYP9A27</i>	<i>CYP9A27[Spodoptera exigua]</i>	KX443439.1	945/949(99%)
	Unigene_18704	-1.3938	no	<i>CYP9AJ1</i>	<i>CYP9AJ3[Helicoverpa armigera]</i>	KM016756.1	911/1162(78%)
GSTs	Unigene_20003	-1.9013	down	<i>GSTd3</i>	<i>GSTd3[Spodoptera exigua]</i>	KF482973.1	691/707(98%)

Unigene_13134	1.3895	up	<i>GSTd2</i>	<i>GSTd2 [Spodoptera litura]</i>	KY411925.1	1052/1176(89%)
Unigene_18617	5.8515	up	<i>GSTe1</i>	<i>GSTe10 [Spodoptera littoralis]</i>	MH177589.1	498/635(78%)
Unigene_19307	2.6091	no	<i>GSTe10</i>	<i>GSTe13 [Spodoptera littoralis]</i>	MH177592.1	581/654(89%)
Unigene_17641	0.5337	no	<i>GSTe12</i>	<i>GSTe14 [Spodoptera littoralis]</i>	MH177593.1	574/652(88%)
Unigene_18512	0.0866	no	<i>GSTe13</i>	<i>GSTe1 [Spodoptera littoralis]</i>	MH177581.1	567/653(87%)
Unigene_11347	7.5124	up	<i>GSTe14</i>	<i>GSTe7 [Spodoptera littoralis]</i>	MH177586.1	562/647(87%)
Unigene_19965	0.4264	no	<i>GSTe16</i>	<i>GSTe16 [Spodoptera exigua]</i>	MH177595.1	562/647(87%)
Unigene_15859	2.5988	up	<i>GSTe4</i>	<i>GSTe12 [Spodoptera litura]</i>	KF482963.1	605/722(84%)
Unigene_21040	2.9056	up	<i>GSTe5</i>	<i>GSTe4 [Spodoptera litura]</i>	KF482955.1	601/701(86%)
Unigene_20140	0.3207	no	<i>GSTe7</i>	<i>GSTe5 [Spodoptera litura]</i>	KF482956.1	683/776(88%)
Unigene_18505	1.0718	no	<i>GSTe9</i>	<i>GSTe9 [Spodoptera exigua]</i>	KY411934.1	624/654(95%)
Unigene_21397	0.9671	no	<i>GSTs1</i>	<i>GSTs1 [Spodoptera litura]</i>	HQ667936.1	386/448(86%)
Unigene_21445	8.0015	up	<i>GSTs2</i>	<i>GSTs2 [Spodoptera litura]</i>	HQ667937.1	562/647(87%)
Unigene_21707	0.6507	no	<i>GSTs3</i>	<i>GSTs3 [Spodoptera litura]</i>	HQ667938.1	606/759(80%)
Unigene_18114	-1.2213	no	<i>GSTt1</i>	<i>GSTt1 [Spodoptera litura]</i>	KF482976.1	668/771(87%)
Unigene_20937	2.1011	up	<i>GSTu1</i>	<i>GSTu1 [Spodoptera litura]</i>	HQ667940.1	838/1002(84%)

Table S2. The corresponding protein sequences from different species for the phylogenetic analysis.

Genes	Sympos	<i>Bombyx mori</i>	<i>Spodoptera littoralis</i>	<i>Spodoptera litura</i>	<i>Spodoptera frugiperda</i>
CYPs	CYP306A1	BAD34476.1	ACM45975.1	XP_022819701.1	QGA73312.1
	CYP321A8	/	CAH1647199.1	ATP16105.1	AGO62006.1
	CYP324A1	XP_037874442.1	AFP20597.1	XP_022834509.1	XP_050562828.1
	CYP333A12	XP_004932126.1	AFP20609.1	XP_022837760.1	QGA73305.1
	CYP333B4	BAM73887.1	AFP20610.1	XP_022829034.1	ULR85578.1
	CYP337B5	BAM73901.1	CAH1643127.1	XP_022835182.1	AID55432.1
	CYP339A1	NP_001121192.1	CAB3507276.1	XP_022827170.1	XP_035438156.1
	CYP354A14	NP_001266295.1	CAB3508644.1	XP_022835312.1	ULR85498.1
	CYP4CG1	/	CAH1646808.1	/	KAG8117804.1
	CYP4G74	BAM73805.1	CAB3505815.1	XP_022828928.1	ULR85500.1
	CYP4G75	BAM73802.1	AFP20598.1	XP_022829115.1	XP_035431180.1
	CYP4M14	NP_001103833.1	CAB3510194.1	ABC72321.2	XP_050554524.1
	CYP6AB14	BAM73813.1	AFP20592.1	XP_022824615.1	ULR85438.1
	CYP6AB31	BAM73814.1	AFP20591.1	XP_022817035.1	ULR85484.1
	CYP6AB60	ABN71370.1	CAB3507599.1	XP_022824581.1	XP_035447497.2
	CYP6AE74	NP_001104004.1	CAB3507967.1	XP_022824880.1	QGA73299.1
	CYP6AN4	NP_001266427.1	AFP20585.1	XP_022816422.1	AGO62003.1
	CYP6AW1	NP_001296520.1	CAB3516145.1	XP_022820166.1	XP_035436192.2
	CYP9A186	/	CAB3515416.1	AAP80766.1	QGA73302.1
	CYP9A27	/	CAB3515414.1	XP_022819612.1	QGA73301.1
	CYP9AJ1	XP_012546250.1	CAB3515443.1	XP_022830826.1	XP_035433316.2
GSTs	GSTd2	NP_001036974.1	AYM01151.1	XP_022825796.1	XP_050562946.1
	GSTd3	NP_001037546.1	AYM01149.1	XP_022825795.1	QGA73316.1

GSTe1	XP_004930497.3	AYM01153.1	XP_022819498.1	XP_050559253.1
GSTe4	/	CAB3515985.1	XP_022819495.1	UNG44354.1
GSTe5	NP_001108465.1	AYM01156.1	AIH07580.1	XP_035447327.2
GSTe7	NP_001037420.1	AYM01158.1	AIH07582.1	UNG44357.1
GSTe9	NP_001108466.1	AYM01160.1	AIH07584.1	XP_035428870.1
GSTe10	/	AYM01165.1	AIH07589.1	XP_050557481.1
GSTe12	NP_001037197.1	CAB3506633.1	AIH07587.1	KAG8109949.1
GSTe13	NP_001108460.1	AYM01164.1	AIH07588.1	UNG44348.1
GSTe14	/	AYM01165.1	AIH07589.1	XP_050557548.1
GSTe16	XP_037873490.1	AYM01167.1	XP_022837684.1	QGA73324.1
GSTs1	NP_001037077.1	AYM01175.1	AEG75842.1	QGA73328.1
GSTs2	NP_001036994.1	AYM01176.1	AEG75843.1	XP_050549798.1
GSTs3	NP_001037077.1	AYM01177.1	AEG75844.1	QGA73329.1
GSTt1	NP_001108463.1	AYM01181.1	AIH07600.1	XP_035440418.1
GSTu1	NP_001108462.1	AYM01182.1	XP_022825963.1	XP_035441082.1

Table S3. Information for primers used in RT-qPCR analysis.

ID	Annotation	Primer Sequences [5'→3']	Amplification Efficiency
Unigene_16865	<i>CYP306A1</i>	For 5' GTGACGAACTCTCGCGGATG 3' Rev 5' GTAACGCCGACGGTTCCTTG 3'	91.115%
Unigene_16447	<i>CYP321A8</i>	For 5' ACACGACTTCGCGGACATTG 3' Rev 5' TGCAGAGAGTATACCGGTCGT 3'	93.669%
Unigene_68447	<i>CYP324A1</i>	For 5' TCGCTAAGCTGCCGTACTTG 3' Rev 5' TGCATTCCAATGGCGTTGAC 3'	92.907%
Unigene_20210	<i>CYP333A12</i>	For 5' TCGCGCCATTTCTCACCTTG 3' Rev 5' ACGACCAGGGTTTCAGACTC 3'	92.813%
Unigene_20462	<i>CYP333B4</i>	For 5' TTGGTACGGTAGCTCTCGGC 3' Rev 5' AACAGGTCGTGGACGCATTG 3'	99.400%
Unigene_25500	<i>CYP337B5</i>	For 5' ACGACACCAACGCTGATCCT 3' Rev 5' CGTGGGGTCCAAACTTAATGCC 3'	103.881%
Unigene_21168	<i>CYP339A1</i>	For 5' TACGGCCCTGTGGTACGATT 3' Rev 5' CCATTCCTCGCCGTAAGCAG 3'	95.321%
Unigene_19946	<i>CYP354A14</i>	For 5' GATGACGCGACCGTAGATGC 3' Rev 5' TCGCAAGGAGGTCGTAGTCT 3'	92.239%
Unigene_21670	<i>CYP4CG1</i>	For 5' GCAATTCCTTGGTCCTGCAC 3' Rev 5' AACGTGTTTCGATCTCCACCG 3'	94.957%
Unigene_21297	<i>CYP4G74</i>	For 5' ATAGCAACGTACGGCATCCA 3' Rev 5' GTCCAGCACTGAAGGGTATGT 3'	107.289%
Unigene_21235	<i>CYP4M14</i>	For 5' CAGCGAGCGGTTCTAGAAAG 3' Rev 5' GGCAGCACTGTTATCGTCACT 3'	91.391%

Unigene_19955	<i>CYP6AB14</i>	For 5' GCTTACCACTCGTGAACGCT 3' Rev 5' AACGTGCACAAGACAGCCAT 3'	95.347%
Unigene_17055	<i>CYP6AB31</i>	For 5' AGAAGGGAGTGATGGTCGGA 3' Rev 5' ACAAACACCTGAGCAGCGAT 3'	106.998%
Unigene_5595	<i>CYP6AB60</i>	For 5' CACCCAGTCCAGGTACGTCA 3' Rev 5' CTTCGCTGCTGGCTTTGAGA 3'	96.815%
Unigene_20067	<i>CYP6AE74</i>	For 5' CGCTGATGAGAACAGTGGAGT 3' Rev 5' ATTCAACCACTTGGAGCCTGC 3'	98.076%
Unigene_4160	<i>CYP6AN4</i>	For 5' ACTCAGAGCTGTCTCTCGCT 3' Rev 5' CTTTGCAGCTGGGTTCGAGA 3'	100.932%
Unigene_21924	<i>CYP6AW1</i>	For 5' AATATGGGAGGCGCTGAGTG 3' Rev 5' GCGCACATTTCGGCTATCAAG 3'	100.563%
Unigene_13834	<i>CYP9A186</i>	For 5' GGCGAGCTTGGCAGGAATAC 3' Rev 5' CATGCCTTTTGGTGTGTGGTCC 3'	95.779%
Unigene_13307	<i>CYP9A27</i>	For 5' CGCAGAGGTACTAGCGTCAT 3' Rev 5' CCGAAGGGGATGTAGGCATT 3'	104.765%
Unigene_18704	<i>CYP9AJ3</i>	For 5' CTTTGGCCCCGACACATCCTG 3' Rev 5' CCAGAACTTCTCGTCCCGGT 3'	101.500%
Unigene_20003	<i>GSTd3</i>	For 5' CCAACAGCGTACTTGTTCCT 3' Rev 5' TTCGACTTGGGCACGCTGTA 3'	105.468%
Unigene_13134	<i>GSTd2</i>	For 5' GTTGAGAGCCTTTGCGGTGA 3' Rev 5' ACGCGCTGTGTTTCTTGTC 3'	93.761%
Unigene_18617	<i>GSTe1</i>	For 5' TAAACCTTCAGGCCGAGAAC 3' Rev 5' ACCAAGAGTCGTCCTTTCCG 3'	93.066%
Unigene_19307	<i>GSTe10</i>	For 5' CTTGCACACCAGGCAAATTCC 3' Rev 5' GCTCGCAGGGGAGTCAATAAC 3'	96.580%

Unigene_17641	<i>GSTe12</i>	For 5' TCACCTGGCTTCCCTCGAAT 3' Rev 5' TCGTACAGAGCCTTTGCACCT 3'	104.651%
Unigene_18512	<i>GSTe13</i>	For 5' TTCAGAAGGTGCCGTGTCTT 3' Rev 5' TCGATTGGAAACAGTACGCCA 3'	97.848%
Unigene_11347	<i>GSTe14</i>	For 5' GCACGCGCTACACTAATCCT 3' Rev 5' CTCAGGGCTGAATTGTTGCC 3'	107.779%
Unigene_19965	<i>GSTe16</i>	For 5' AAGGGATGCATGGAGATGGC 3' Rev 5' AGGCAGATATCGACGAAGCG 3'	96.952%
Unigene_15859	<i>GSTe4</i>	For 5' ACTGTTCCGATGCTAGCTGAC 3' Rev 5' TCTTGCCGTATTCGTCACCA 3'	95.207%
Unigene_21040	<i>GSTe5</i>	For 5' TTTGCGTCATGTCGGTGTCT 3' Rev 5' ATCGCTGAGCATCATCACGG 3'	100.399%
Unigene_20140	<i>GSTe7</i>	For 5' GCGGATTTGAGCATAGCGTC 3' Rev 5' CCGTCGGAATGTTCTTTGCC 3'	98.715%
Unigene_18505	<i>GSTe9</i>	For 5' GTGACATGGTCACCAGCGAT 3' Rev 5' ATGCAGCTGTCGTGTTCCAA 3'	93.208%
Unigene_21397	<i>GSTs1</i>	For 5' ACTCTGAGCGTACGTCTTGC 3' Rev 5' CTGCTACTGGCTTTTCGGTGA 3'	109.673%
Unigene_21445	<i>GSTs2</i>	For 5' CGTCGACCTCATCAACGACC 3' Rev 5' TCCAACATGGCAGGGAACAC 3'	100.198%
Unigene_21707	<i>GSTs3</i>	For 5' AGCCCATCCGTCTACTGCTA 3' Rev 5' CTGAGCGTATCTCTTGCCGT 3'	102.756%
Unigene_18114	<i>GSTt1</i>	For 5' ATTCACAAGCTGCCACCAAG 3' Rev 5' CTGGGTACAAGAGCCGCAT 3'	97.489%
Unigene_20937	<i>GSTu1</i>	For 5' CCCTCAGCGGTGATACTCCA 3' Rev 5' TCCCTCTCATCAACGCCACT 3'	100.294%

GAPDH	For 5' CTGAGGAACAGGTCGTGTCATCCGA 3' Rev 5' GATCGATAACGCGGTTGGAGTAGCC 3'	95.271%
L7A	For 5' TGAGCTTGTCTCTTCCTGCCC 3' Rev 5' GCTGCACGGTCGCCAGACTC 3'	98.524%