Supplementary Information for

Identification and comparative expression analysis of odorant binding protein genes in the tobacco cutworm *Spodoptera litura*

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Supplementary Figures

Supplementary Figure 1. The full-length gels for each SlitOBPs presented in Figure 8.

Supplementary Tables

Supplementary Table 1.

A percent identity matrix of the 30 full-length SlitOBPs. The calculations are based on the alignment of amino acid sequence by Vector NTI 10.2. The percentage of identity of each pair is shown.

Supplementary Table 2.

A percent identity matrix of the 78 OBPs in *S. litura*, *S. littoralis* and *S. exigua*. The calculations are based on the alignment of amino acid sequence by Vector NTI 10.2. The percentage of identity of each pair is shown.

Supplementary Table 3.

Gene specific primers used for molecular cloning of *S. litura* OBP genes.

Supplementary Table 4.

The protein names and sequences of the 78 of OBPs from *S. litura*, *S. littoralis* and *S. exigua* used in Figure 5.

Supplementary Table 5.

The protein names and sequences of the 384 OBPs and 225 CSPs used in Figure 6.

Supplementary Table 6.

Primers used in RT-PCR for determination expression level of *S. litura* OBP genes.

Supplementary Table 7.

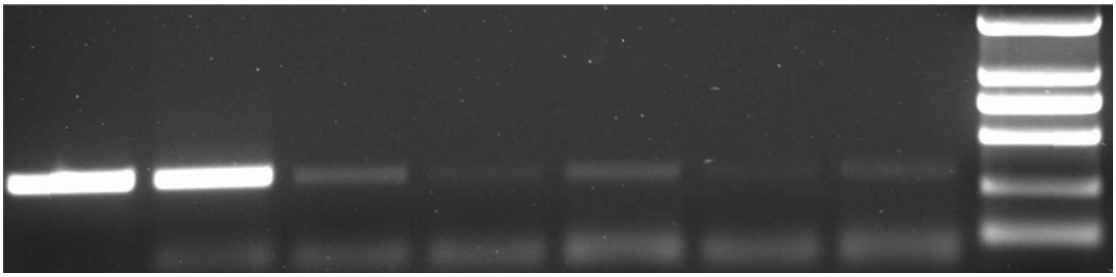
Primers used in real-time PCR for determination expression level of *S. litura* OBP genes.

Supplementary Table 8.

The protein names and sequences of the 193 Lepidoptera OBPs used in Figure 7.

Supplementary Figure 1.

SlitPBP1



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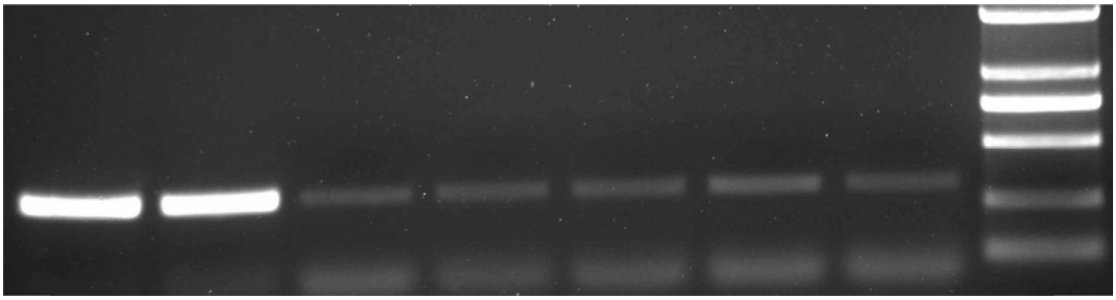

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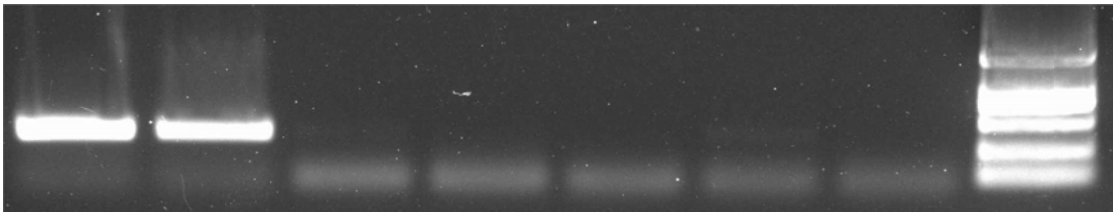

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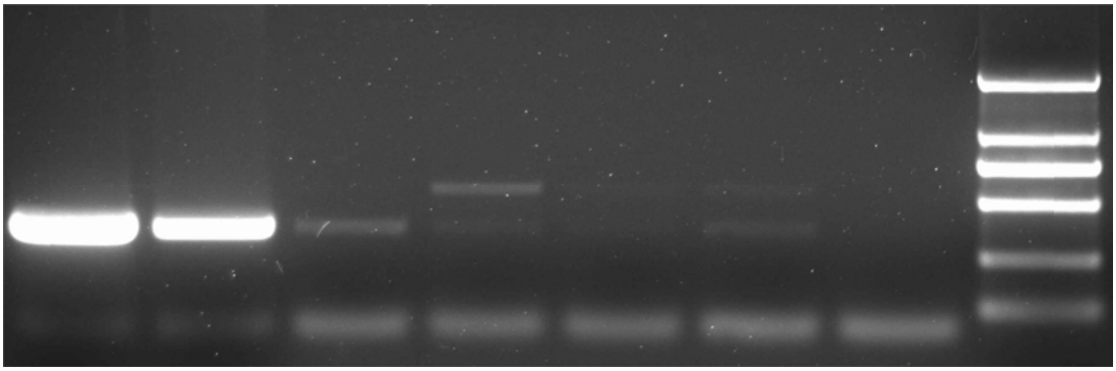

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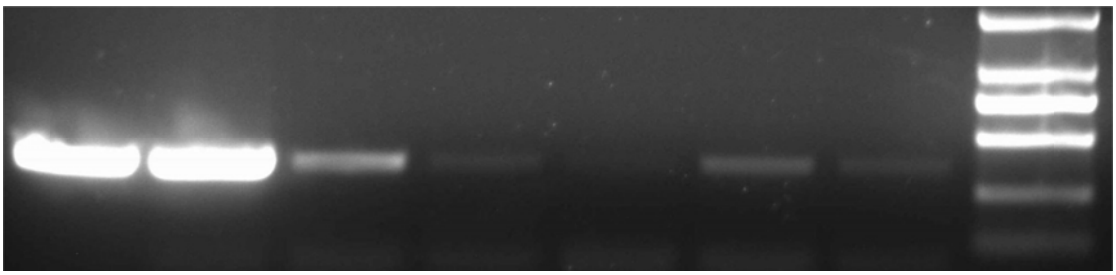

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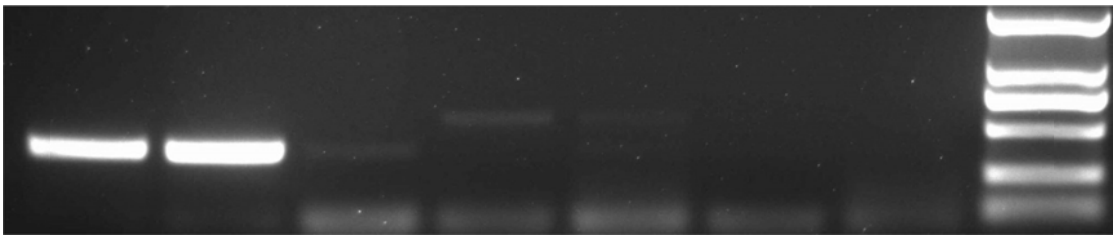

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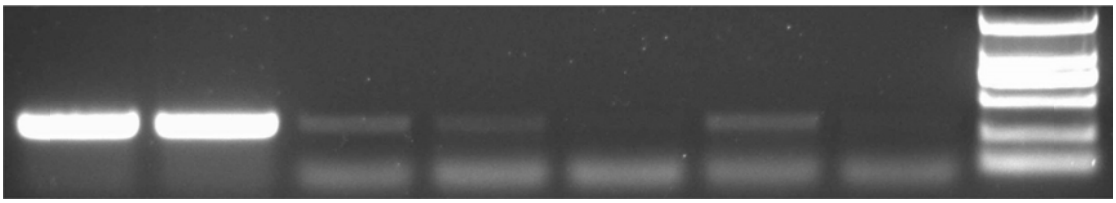

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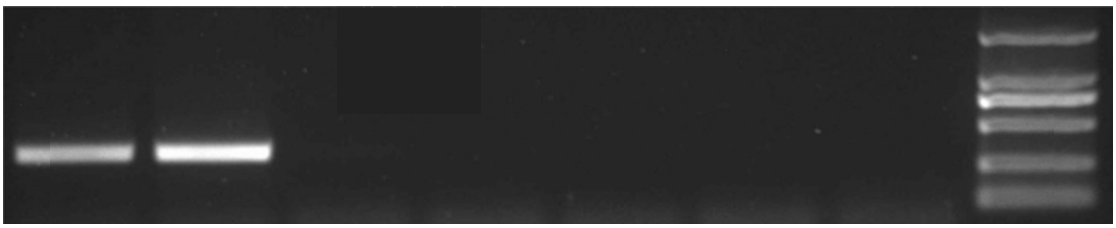

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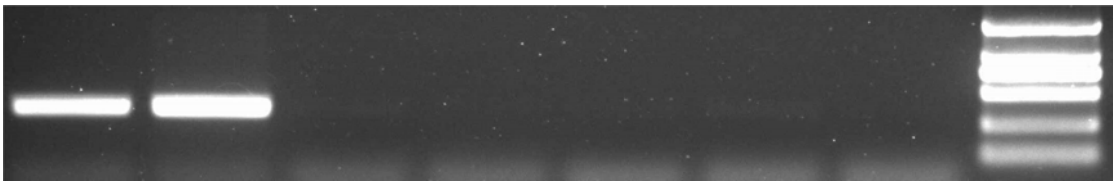

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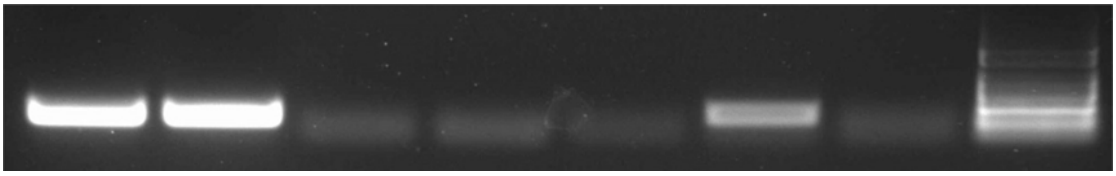

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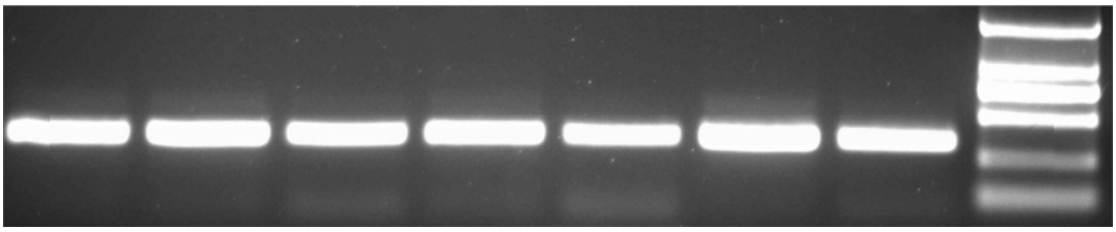

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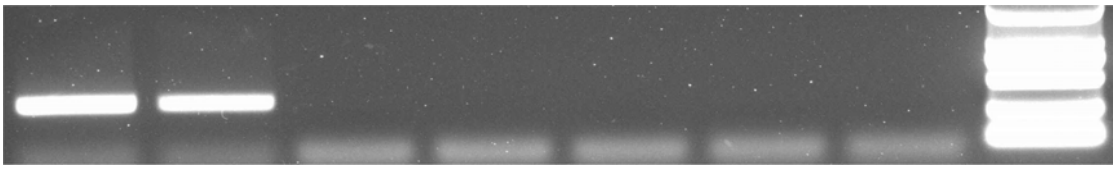

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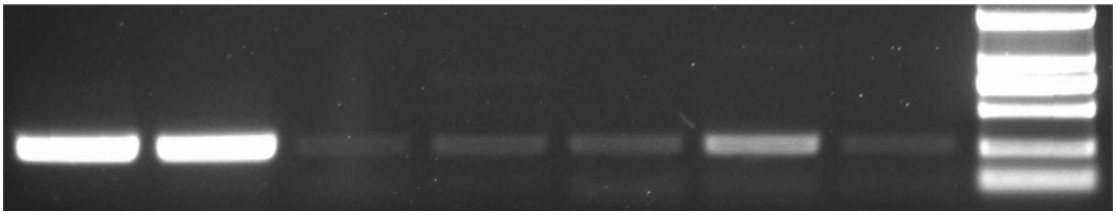

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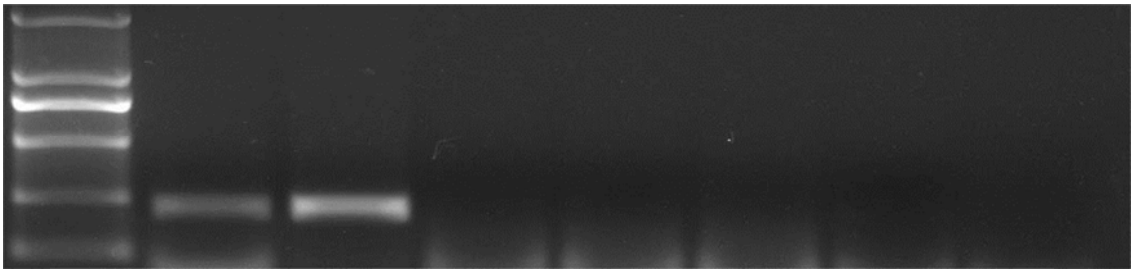

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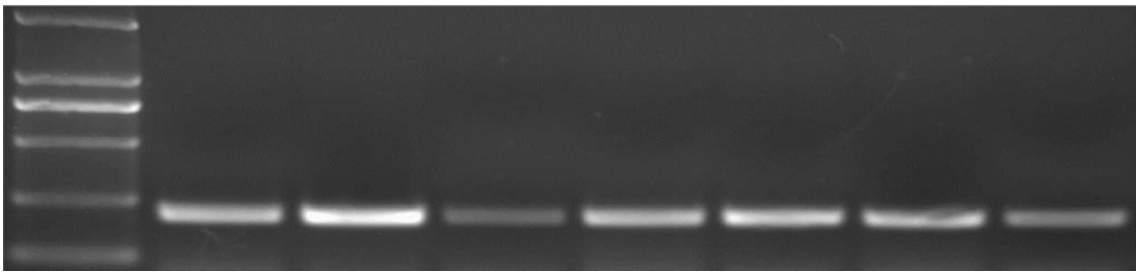

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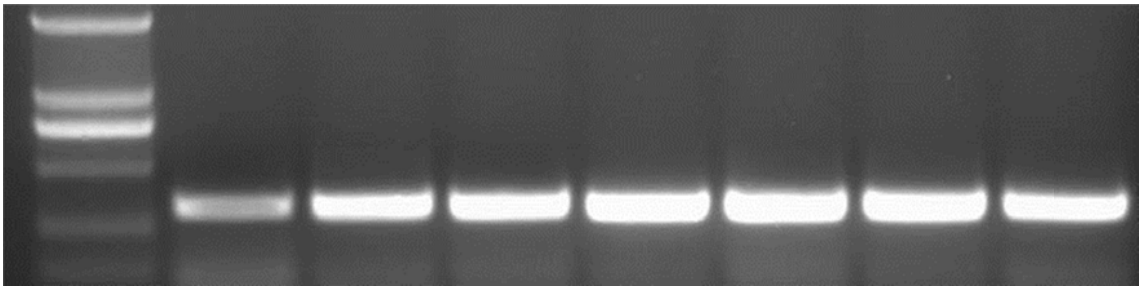

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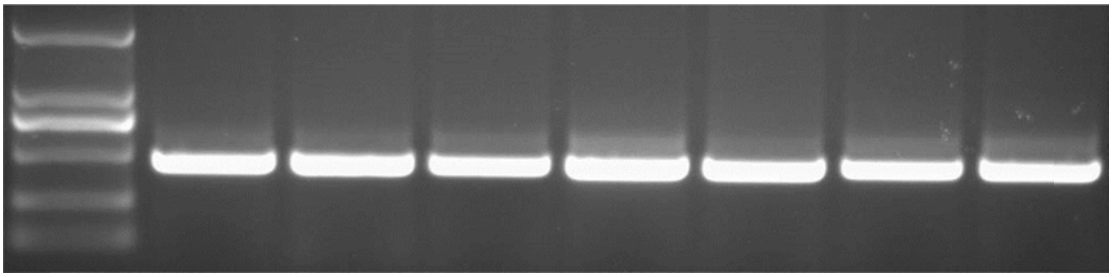

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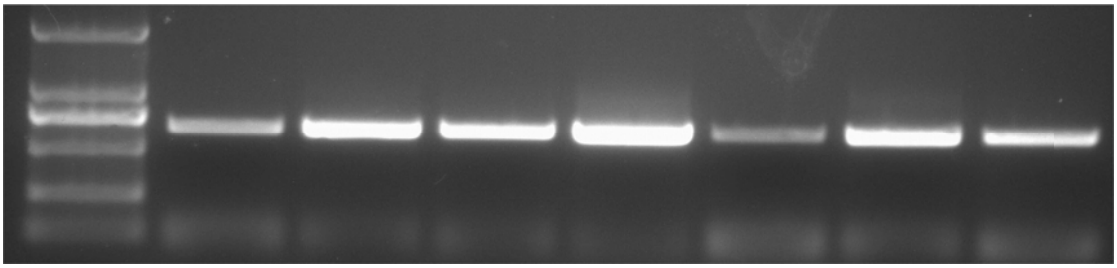

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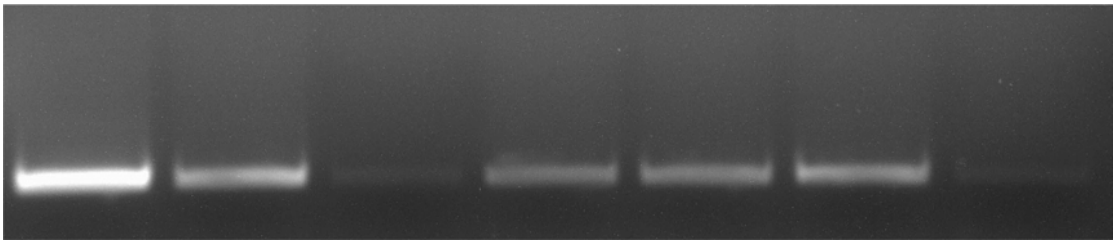

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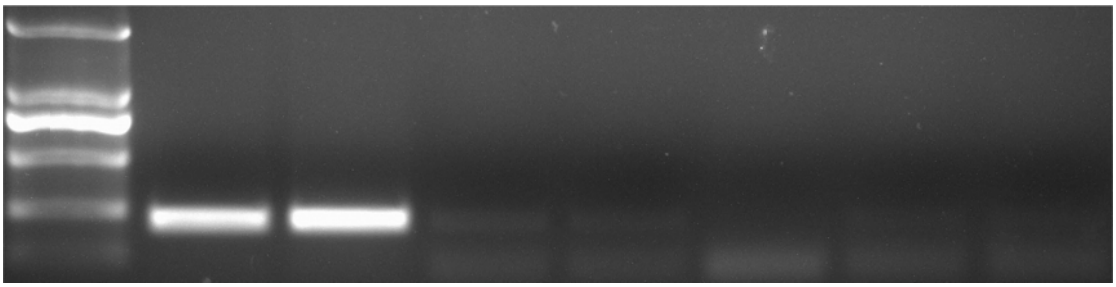

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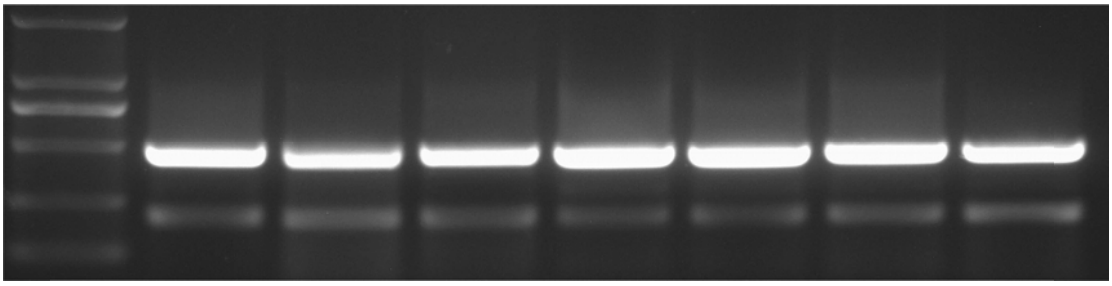

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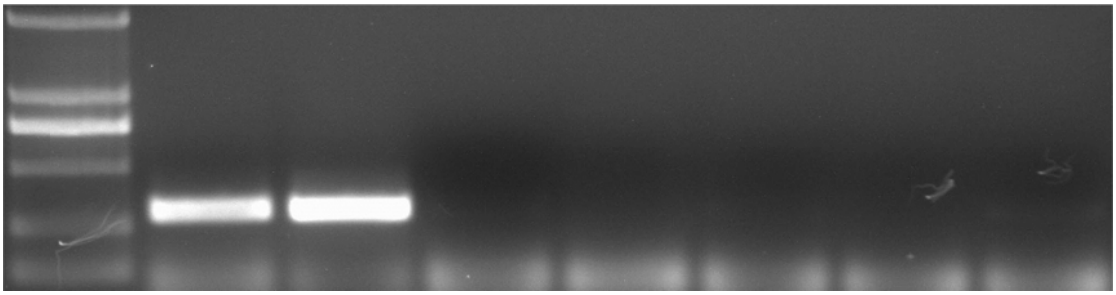

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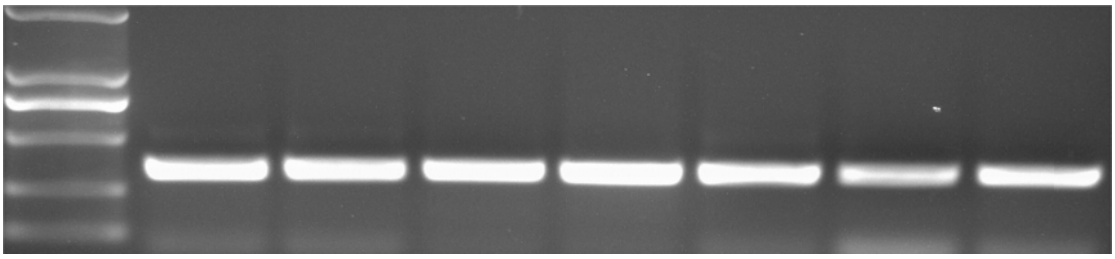

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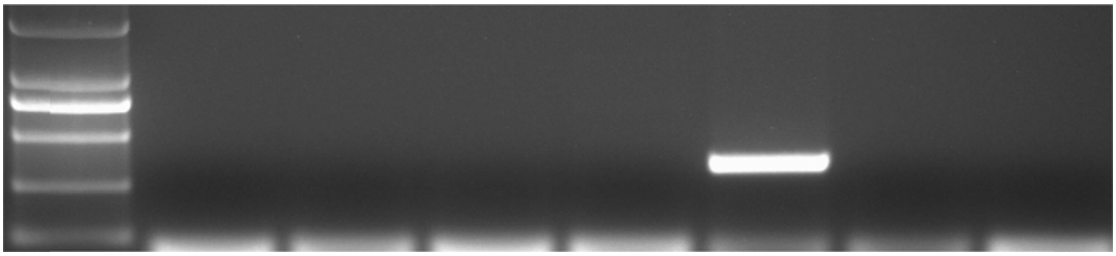

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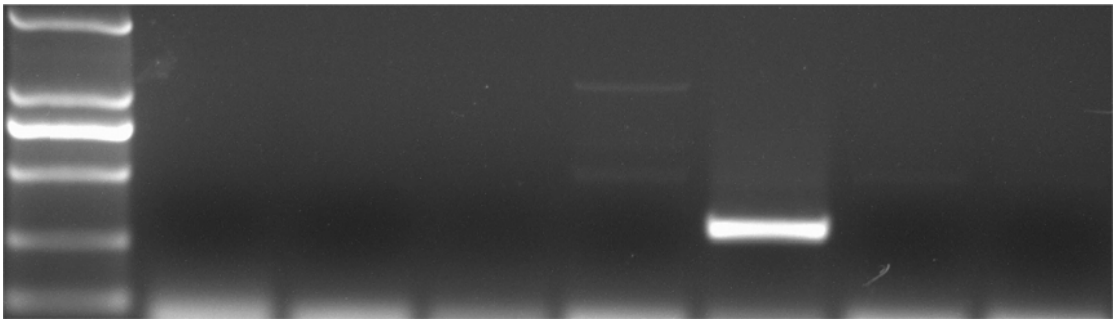

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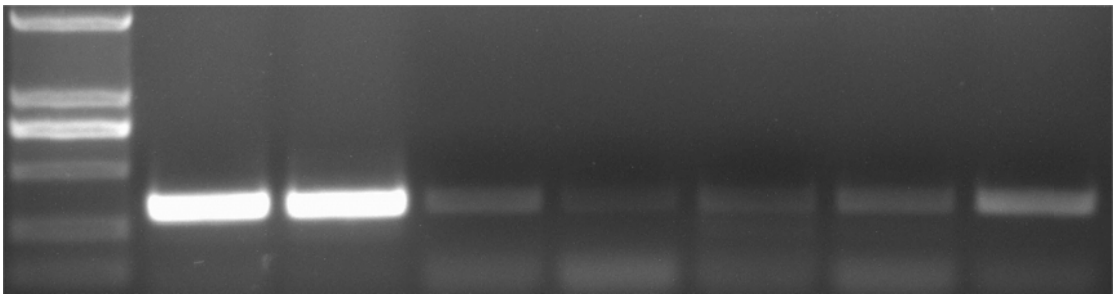

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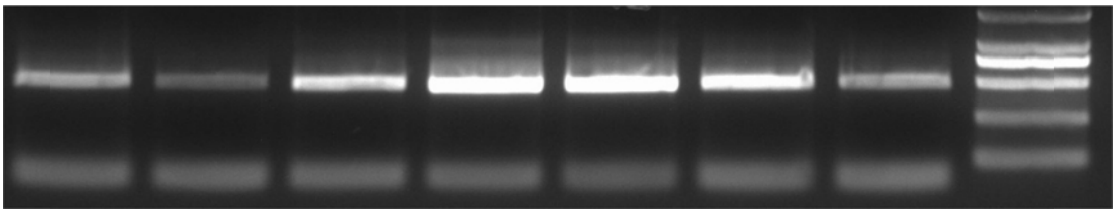

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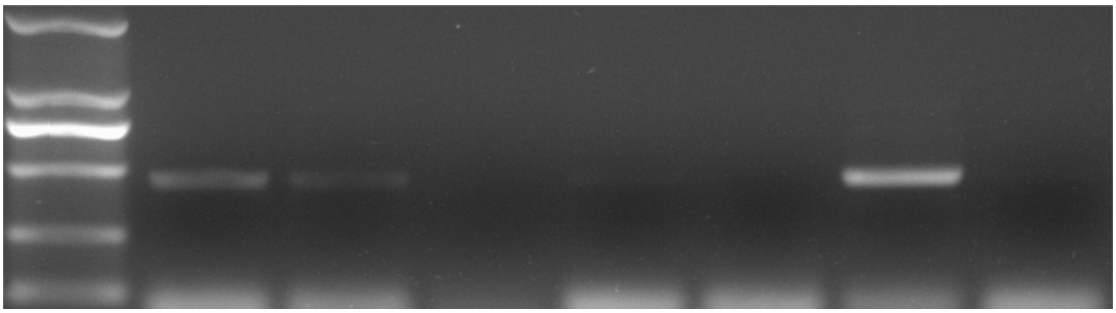

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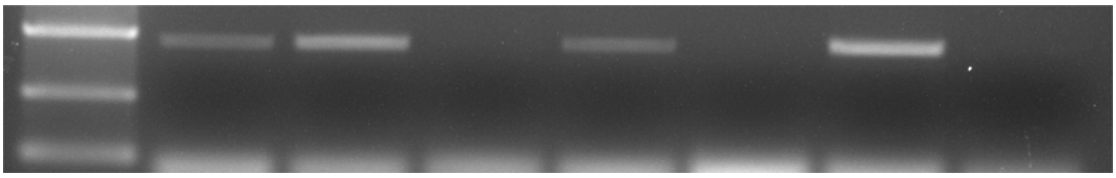

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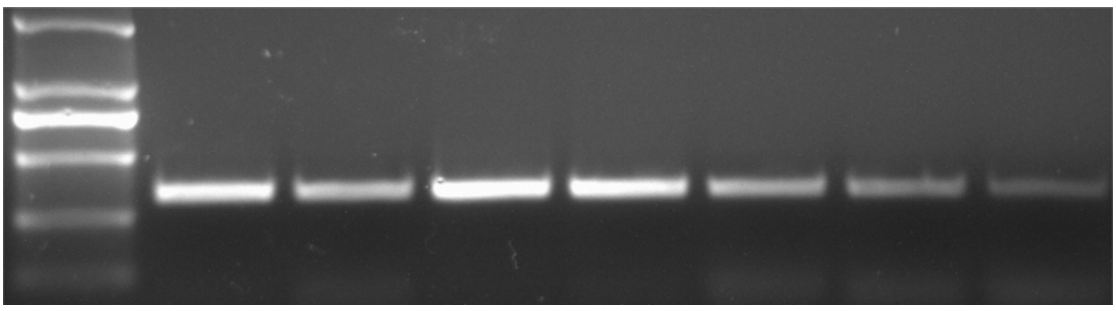

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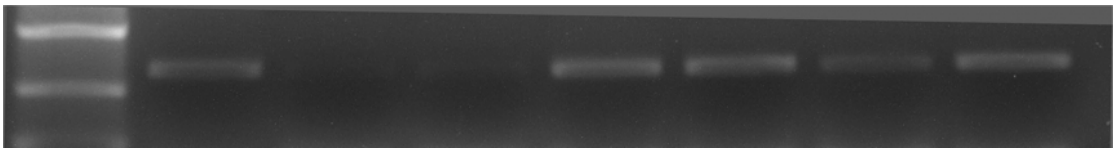

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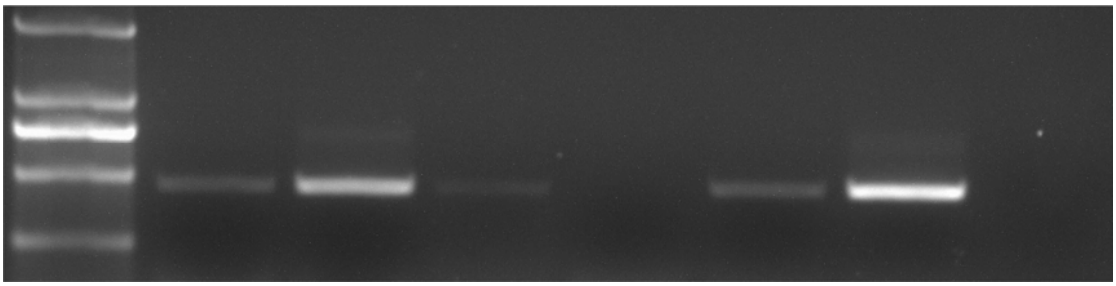

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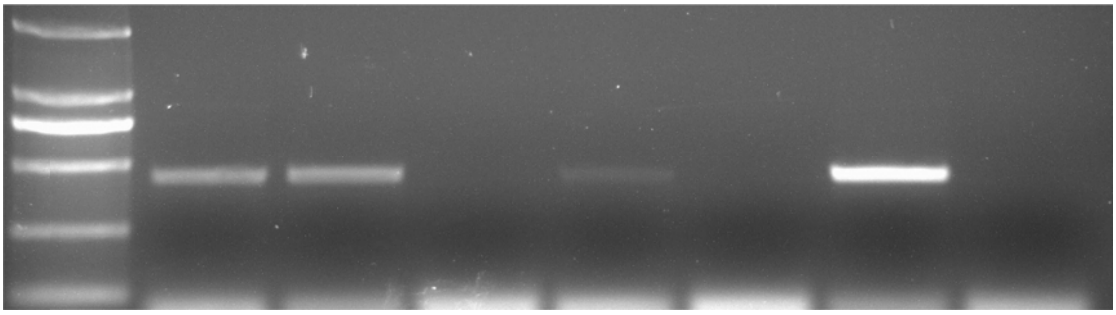

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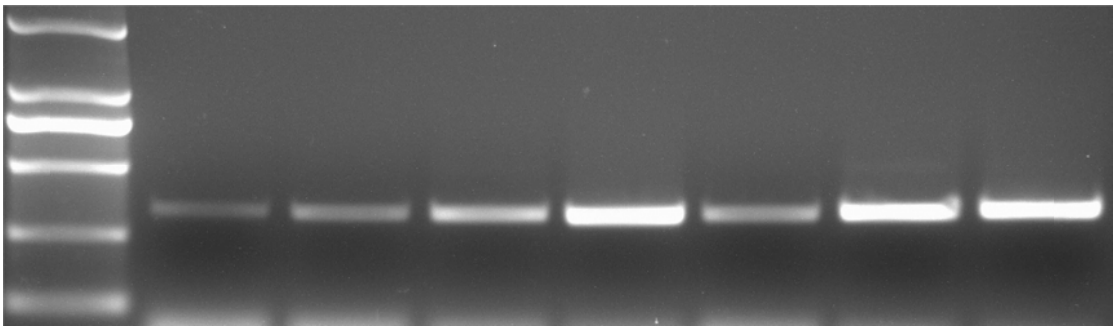

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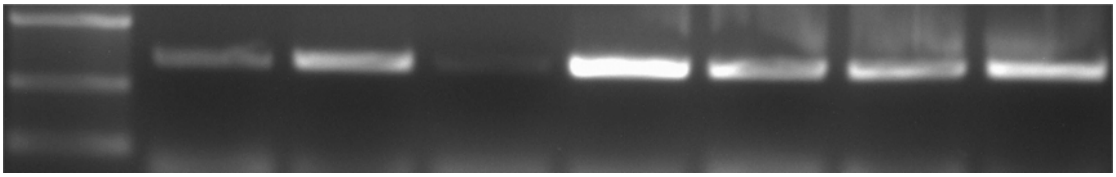

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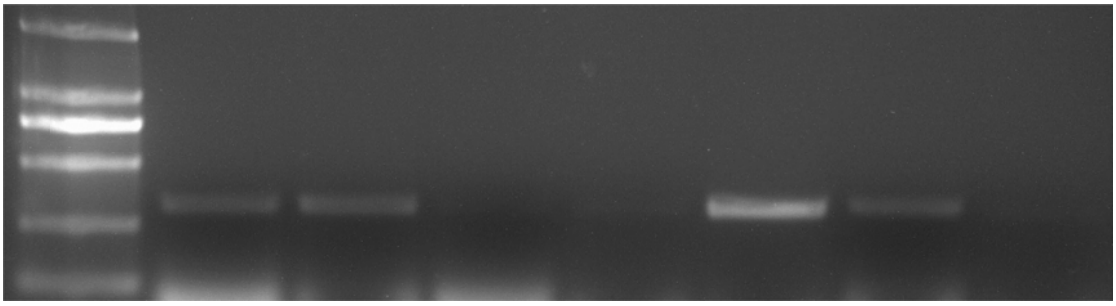

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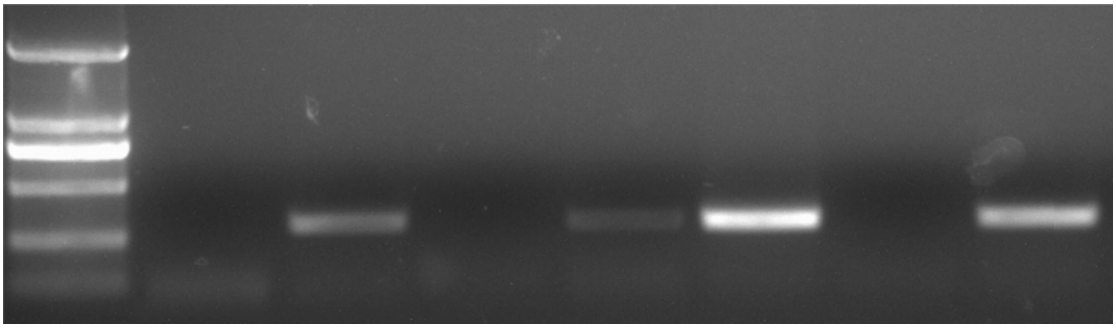

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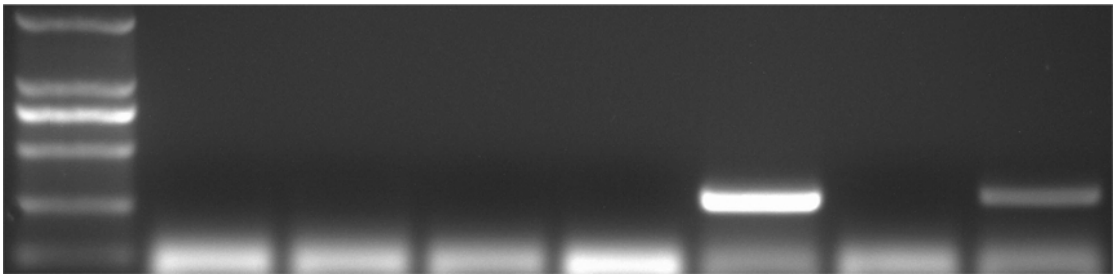
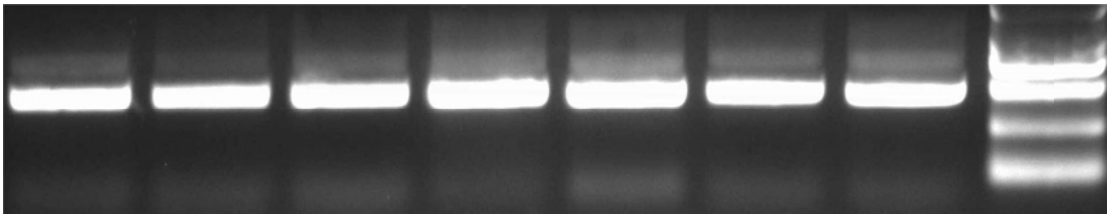


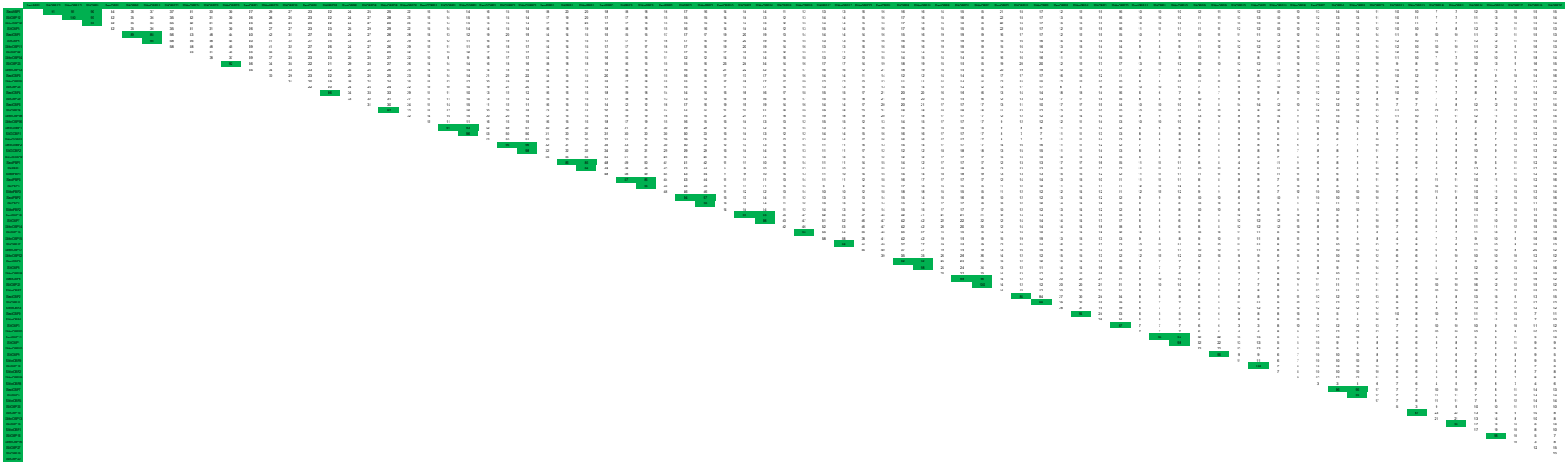
β-actin



Supplementary Table 1.

	SlitGOBP1	SlitGOBP2	SlitPBP1	SlitPBP3	SlitPBP2	SlitOBP10	SlitOBP22	SlitOBP6	SlitOBP23	SlitOBP25	SlitOBP5	SlitOBP28	SlitOBP29	SlitOBP11	SlitOBP12	SlitOBP33	SlitOBP15	SlitOBP17	SlitOBP7	SlitOBP8	SlitOBP21	SlitOBP3	SlitOBP13	SlitOBP18	SlitOBP27	SlitOBP16	SlitOBP9	SlitOBP19	SlitOBP20	SlitOBP4
SlitGOBP1		50	30	30	30	12	12	11	14	10	12	18	11	8	15	11	13	14	15	18	15	18	9	9	10	10	11	12	13	11
SlitGOBP2			32	30	29	12	19	15	18	19	16	18	10	13	14	11	12	13	13	16	15	14	12	8	8	11	11	13	12	12
SlitPBP1				48	43	14	17	16	21	15	18	16	11	14	16	14	13	10	11	11	15	15	12	8	5	10	11	14	13	10
SlitPBP3					46	14	18	16	16	16	17	17	12	19	14	12	13	11	10	12	14	11	13	6	8	11	12	15	16	12
SlitPBP2						10	18	18	18	15	14	16	13	16	17	16	13	15	13	12	15	11	10	6	10	11	15	13	17	14
SlitOBP10							20	16	16	15	17	12	14	15	11	12	13	15	12	14	12	11	12	13	8	8	14	12	10	13
SlitOBP22								59	51	32	35	28	25	19	17	14	12	10	13	15	14	17	11	7	9	15	16	14	15	14
SlitOBP6									47	33	35	26	26	23	18	14	13	12	16	14	14	15	14	11	10	18	21	16	15	14
SlitOBP23										34	31	26	21	24	13	18	15	15	16	13	12	18	10	9	10	15	18	18	16	13
SlitOBP25											28	23	19	20	12	14	12	11	12	10	11	10	12	12	10	14	13	14	11	17
SlitOBP5												28	23	18	19	14	11	11	10	14	15	13	11	11	12	12	19	15	14	14
SlitOBP28													31	20	20	15	15	16	21	17	17	13	12	6	16	12	18	15	14	16
SlitOBP29														17	19	12	15	14	18	15	17	12	8	8	13	13	15	12	13	13
SlitOBP11															32	21	20	15	16	13	16	20	11	14	12	20	14	16	16	16
SlitOBP12																28	16	17	13	15	23	22	12	14	15	14	13	14	13	11
SlitOBP33																	12	13	14	17	20	15	10	13	17	13	11	16	14	14
SlitOBP15																		53	42	38	20	12	9	6	11	14	17	14	16	12
SlitOBP17																			54	36	18	11	10	10	12	12	18	14	12	9
SlitOBP7																				42	24	17	9	9	14	7	16	11	12	12
SlitOBP8																					22	17	12	5	13	11	13	14	15	11
SlitOBP21																						24	10	8	15	15	15	12	12	14
SlitOBP3																							10	9	11	11	9	12	16	20
SlitOBP13																								17	15	14	8	7	12	9
SlitOBP18																									16	12	9	7	8	12
SlitOBP27																										18	10	10	16	10
SlitOBP16																											20	11	10	10
SlitOBP9																												13	9	12
SlitOBP19																													21	14
SlitOBP20																														15
SlitOBP4																														

Supplementary Table 2.



Supplementary Table 3.

Gene	Forward primers (5'-3')	Reverse primers (5'-3')
PBP1	ATGGCGAACGCAAGATGG	TTACACGGCGGTCATGACCT
PBP2	ATGGCGTTCTGTCCATCGG	TTACACTTCAGCAAGCACCTCTC
PBP3	ATGGGATCGCGTAACGTCTTT	CTATATTTCCGTGAGGACCTCACTC
GOBP1	ATGTTGCTGTTGTTGCGCG	TCAGCGCGCCTCAGCCT
GOBP2	ATGACGTCGAAGTGTTGTTTGCT	TCAGTACTTCTCCATAACAGCTTCAAT
OBP1	ATGAAAGAAGGGAACCGATACAG	CTATCCTGTCTGTTCCGTAGAAGATT
OBP2	ATGACTCGAGCACAAGTTAAAAAGA	CTTTTCATACAAACATTTCGATGC
OBP3	ATGTGGATGCAGGCGCTAGT	CTATATGAGGAAGTAGTCCGCCTTG
OBP4	ATGACTAAAGTACTGTTTGCCATCG	TTAAGATTTCTCATATCTTTCAATTTCC
OBP5	ATGTCCGTTGTGCGGTGTTC	TCACTCCATCTTCTTCTTAGTCTCAG
OBP6	ATGTCCAAGTTCACTTGTTTGGTTT	TTAAGCGGAGATCTCGCTCTTGT
OBP7	ATGGATCAAAAAAGAATATGTTTATTTG	TTATGCGAAAATAAAATCTTCTGGC
OBP8	ATGCTTCTGACAAAAATTGTGAAGTT	TCAAGGAAAGTAAAATATACCAGGATT
OBP9	ATGTGCCTCGTCAAGTACCATG	CTAGAACGTCAGGTCATCCTTCC
OBP10	ATGGTTCGTAAAATCAGTGGACTC	TTAGAGGCCGGAGGTTCCAC
OBP11	ATGAAATCGTTTGTTGTATTCTGTATC	TTACGAAGCGAACATAATGTGTGAT
OBP12	ATGAAGACTCTGTTTGTTTTCGCT	TTACAAAAAAATCGCATGCTTG
OBP13	ATGATAACATCATGTTTATTAGTACTAAGTGC	TTAACGAACTTCAAAATCTTTTATTGTT
OBP14	ATGGTTAAAGTTACTTACATAGCCTTGT	GGGGCAAGTAAACTCGCATC
OBP15	ATGTATTCCATTAACTGTTTTATTTTTTC	GGGAACATGAAATTAGCTGGGT
OBP16	ATGTACCGCTTTGTGATCCTCA	TTATATGACTTTCGCACATTTTCC
OBP17	ATGAAAACCTTTCGACTACTCTGTTG	TCAAGGAAATACAAAATTTTGCG
OBP18	ATGTTTAAGCTCTGTGTGTTCCTTG	TTATACTGTACGTGGTTGTGTGTAGC
OBP19	ATGTTTCGCCGAACGCTG	TTAATAGTTAACCATTATTTTGTGTTTATTA
OBP20	ATGGAAAAAATCCTAATTTTTACTTTTATAA	TTACATTAGTAGAATTCTGTATAAATGTGTG
OBP21	ATGGCGCGGAGGCAGC	TCAGAATAAGAAGTATAAGTCTGGATCCT
OBP22	ATGTCGAAGTTTACCTGCATTATCC	TTAGAACGGCATCTCAACTTTGTG
OBP23	ATGGCCAAGTTCTCTTGTCTTGTT	TTAGATGATGATACTAGTCTTATGCTCCAA
OBP24	TGTGTTTATAAAAAGACAGAATTTTTG	TTTATGATCCAAAAAGCATTGGGTT
OBP25	ATGGCTAAAGTTACGTGCATAGTCC	TTAATAATCAACACCAAACATATTTGG
OBP26	TGCTTCTTGGCCTGCATGAT	TTAGATGTCGAACCCAAACTTAGAAG
OBP27	ATGTATAAATTTGTTATTTTGTGCTCTA	CTAGCACTTCCACGCTGTGTC
OBP28	ATGATCGTTCGGTTTTTATTATGTTT	TTATGGTAATTTTATTCCCAGCTGAG
OBP29	ATGTGGAATTTATTGGTTGTGTTTT	TTATAACTTGAATCCAAACTTGGGT
OBP30	GCTTTATCGATGGACGATCTAAAG	CCCTGGTCGTTCATCATTCC
OBP31	CGAAACGAACACCGCGAG	AGCTCTATTAGCTTCTAATAAATGTTC
OBP32	CGAATTGATAGGAATGATATACCTTGTA	CTATTTCCATTCATCGGGATCTCT
OBP33	ATGACTTGCTCCCAGGCGC	TTAGGAGTTGTTGTCAGTCTCGCT

Supplementary Table 4.

>SlitPBP1
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>SlitPBP2
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CFKLKVHELNWAPSVELIVGEVLAEV
>SlitPBP3
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NWQPNVEVIVSEVLTEI
>SlitGOBP1
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GIAPSMEIMITEFIMEAEAR
>SlitGOBP2
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>SlitOBP1
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EVITEKGEYDADKALEKLKKFVSNEDDYAKFANIGKKCASVNEKSVSDGEAGCERAALLTSCFLEHKSEISA
>SlitOBP7
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>SlitOBP8
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SQVVKNNKLSYEAVIKQVDVMFPAEMRDAVKAAATHCKETTKKYKDLCESSYWTAKCMYDYDAQNFVFP
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SVWSTATDCAYPKAYAADCPVCPSDCYSPQIPFGSCNACYTQPRTV
>SlitOBP19
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KIEVLDAKGLYDAETGLGKLRKFVKDDDEFAKFEDIAKKCLKVNDESVSDGEAGCDRAKLVLGCFIEHKVEMPF
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>SlittoGOBP2
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>SlittoOBP5

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>SlittoOBP7

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LVDDDDTVDYDMLVSLIPDEYYERTTKMIFACKHLDTPDKDRCQRAFEVHKCSYEKDPDLYFLF

>SlittoOBP8

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>SlittoOBP9

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>SlittoOBP10

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>SlittoOBP11

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Supplementary Table 5.

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>SnonCSP7
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>SnonCSP8
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>SnonCSP9
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>SnonCSP11
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TEKQKVLVAKFIKAIKEKFPEEYGALVKKSDPEGTHGGDLQKFIDKYGS

>SnonCSP12

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>SnonCSP14

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ECSKCTAKQKTGSDKVIRHLVNKRPELWRELSTKYDPDHIYQDKYKTQIESVKQ

>SnonCSP15

MINLNKCSFRGSLILTYLFLVTVLAQDKFYDRRYDYYEIDTLIQNRRLLRKYLECFLWKGPCTPIGRVFRQILPEAVS
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>SnonCSP17

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>SnonCSP18

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QRQNVRKTVKALSEKKPEEFTQFRAKYDPKGEHEKSFSAFVMGTD

>SnonCSP19

MKTILALCLLVVAVCAKPEATYDSRYDNFDVESLVGNTRLLKSYGHCFLGTGHCTAEGSAFKKQIPDALRTGCSKC
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>MsexCSP1

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>MsexCSP4

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>MsexCSP13

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QKVNIRKVIKAIQQKYPKQWEELVKKNDPSGKHRANFDKFIQGS

Supplementary Table 6.

Gene	Forward primers (5'-3')	Reverse primers (5'-3')
PBP1	AAACTGAGCTTAACGTGGGC	TCGTGGATCTTAGTGCGGAA
PBP2	GCGTTCTGTCCATCGGTTAC	TTCATGGCAAATTCCTGGGC
PBP3	CGCCTCAGGATTCGTGAAAG	TTAGCTCGTGGATACCGGTC
GOBP1	ACTGACGGAGGAGAAGATGG	AGCCTCCATGATGAACTCGG
GOBP2	GTGCAGAGAAGAGTCAGGGT	ATCATTGCGACTTCTGGTGC
OBP1	GCTTACATCAGTACCACGCC	ACGCAGCATCAAACATCGTT
OBP2	ACAGAAGAACAAGTTGGGAGAA	TCATACAAACATTTCGATGCGT
OBP3	AGAGATGGACGAGGACATGG	TAGTCCGCCTTGTTAGCGTT
OBP4	CTGTTTGCCATCGTCCTCAC	TTTCCATTGCGTTCTCCAGC
OBP5	GTTCCTCGTTATTGGTGGCG	AACTTCATAGCCGGCTCACT
OBP6	TGGTTTTGTGTGTTGTGGCT	TTTTCGTTGACTGAAGCGCA
OBP7	TCTGGAAGTGATGCCATGTCT	CTGGCTTAAACTCGTACATGCA
OBP8	AGTTGCAACGTGTGAAGCTA	ACATGAAATGACGCATCGCA
OBP9	ATGTGCCTCGTCAAGTACCATG	CGACCTCGGTCCCAGTCATT
OBP10	GATTCCGAGTCAAGATGCCG	GGTACACACACTGCAGCAAA
OBP11	GTGTTCGTGGTTGGGGTTTG	TGTCTCCACGGCATCTTTTC
OBP12	ATGAAGACTCTGTTTGTTTTCGCT	TTACAAAAAAATCGCATGCTTG
OBP13	GATAACATCATGTTTATTAGTACTAAGTG	TAACGAACTTCAAAATCTTTTATTG
OBP14	GCCTTGTTTGTAGTAGCTGTGA	GGGGCAAGTAAACTCGCATC
OBP15	TGGGACAGAGCGTTAAAGGT	GGGAACATGAAATTAGCTGGGT
OBP16	ACCGCTTTGTGATCCTCAGT	TTCCGTCGTCACTCCATTCA
OBP17	CCTTTCGACTACTCTGTTGCA	AGCATCCCTCATCTCAGCTG
OBP18	GTGGAGCAATAGACAAGGCG	GTAGCAGGCGTTACAAGAGC
OBP19	ATGACCGAGTGCTTGAAGGA	CATGAGGTCGTTCGTGCAAT
OBP20	ATAACACTCTCCGGCTTCGCT	ATGTGTGCAGTCGTTGAAGACCT
OBP21	TGCTGTTACTCATGGCGGTA	GGCATCGGTCCTTATCTGGA
OBP22	ATGTCGAAGTTTACCTGCATTATCC	TTAGAACGGCATCTCAACTTTGTG
OBP23	ATGGCCAAGTTCTCTTGTCTTGTT	TTAGATGATGATACTAGTCTTATGCTCCA
OBP24	TGTGTTTATAAAAAGACAGAATTTTTG	CACCTCTCTCGCATCCAGCC
OBP25	TCAAGCAGATGATGGCAAGA	TTAATAATCAACACCAAACATATTTGG
OBP26	GGCCTGCATGATGAAGCAAA	GCACCATCACTGACCGATTC
OBP27	ATGTATAAATTTGTTATTTTGTGCTCTA	CTAGCACTTCCACGCTGTGTC
OBP28	ATGATCGTTCGGTTTTTATTATGTTT	TTATGGTAATTTTATTCCCAGCTGAG
OBP29	GCTCAAGATGGAGTTCACAAAGTTA	GGGTGCATTTTCAACTGTGC
OBP30	TCTAAAGCAGAAGTATGTGGACA	CTGGTCGTTCATCATTCCCG
OBP31	CGAACACCGCGAGAAAGAAA	AGCTCTATTAGCTTCTAATAAATGTTC
OBP32	CGAATTGATAGGAATGATATACCTTGTA	CTATTTCCATTCATCGGGATCTCT
OBP33	CTGGGTAAGGAGGAGAAGGC	CGCCTTCTTGTCATAGCCAC
β-actin	CGAGAAATCGTGCGTGACAT	ATCTGCTGGAAGGTCGAGAG

Supplementary Table 7.

Gene	Forward primers (5'-3')	Reverse primers (5'-3')
PBP1	AAGATGACCAAGGGATTC	CGCCAGTAGTTATACATG
PBP2	CGAAACCTTTGGATGATT	TCCAGAAGTTGTAGAAGT
PBP3	TACATCGCCTCAGGATTC	TGGAACAGGTCTGCTATG
GOBP1	GCCAGGAGAGTCAACTGA	CGGTGCTCGAACTTGAAG
GOBP2	ATGTCACCGCCCATTTCG	GGAACTCCTCTAACACCTCTG
OBP1	CAACTGATGACGACTATA	TGCTGGTATTATTCTTGT
OBP2	CTCAGTAACAGAAGAACAAGT	GCAAGCGACATAACACAT
OBP3	GCTCAAGTGCTACATCAAGT	TACAGCCTCGATGTCCAC
OBP4	AGTTCAATCCAGCGAGAG	ATGTCAGCGATGTCTTCC
OBP5	CGGTGTTCCTCGTTATTG	ATACCTGCCTCTTCATCTC
OBP6	ATGGCATCAACTCCTGTT	TATCGGCGTCGTATTCTC
OBP7	CTATGAATTGACGAATGTGATAA	CGCAGATGTCCTTGTATT
OBP8	TTGCGGATGCCCATAAAG	TACCAGGATTGTGATTGTAGATG
OBP9	CAATCCGAACAACCACAA	GTAACGCACACGACTTAT
OBP10	GATTACTCTGTGTCAGGATG	ATCGTGTGCTCTTCTTTG
OBP11	AATAGAGATGTAGCCATT	GTTGATAGCATTTGAAGA
OBP12	CGCACTGAATGTCTAACT	GCCTCATTGTCCATCTTAT
OBP13	ATTCCTACACTGTATCCA	ATTACGCAATATCCTTCTT
OBP14	GAGCCTTAGTAGTGTTCA	AATTGTTCTTCAGAGATGTC
OBP15	GATATGAAGGCACCAGTTA	TCGCTGTCCAATAAGATG
OBP16	CTTAACAACTACGGACCA	TCACTCCATTCAGAACAG
OBP17	AAGTGGTGAAGAATAACAA	ATCGTAGTCGTACATACA
OBP18	AATAGTAGTCCTGGAACC	GGCACCTGTATATGTTATC
OBP19	ACTGGTCCTATGCGAATT	GAACTTCCTTCAAGCACTC
OBP20	AATCCAGGAATCAGATGAAC	TCTAGTTGGTGAGCGATT
OBP21	GAGGAGGATATAACGAAT	AATCCACTGTATCATCAT
OBP22	AAACTGGACTTGGTAAACTAA	CGTCGCTTACAGATTCAT
OBP23	AACTGGATTGAAGAACCT	ATCACTCACTGCCTTATC
OBP24	TAGCAATGATGATGATTAC	GTTAGTAGTACACCTCTC
OBP25	TGTAGTAGGTGTGAGTCT	AGTCGTCTATGATCTGATTC
OBP26	AATTGGTGTTATGGATGAC	GATTGCCTTCAGTTCTTC
OBP27	GACTGATTCCATTTACAAA	TTCTTCAACATAGCGATA
OBP28	ACTCAATAGCAATGACACAA	CTTCGTCGTTCACTTTCT
OBP29	TGTGTATGCTCGAAGAAG	ACCTCTCCATCCTTGTTA
OBP30	GTGGACAACATATTAGAATG	TATAAACACAGGCAAACA
OBP31	TTGTACTGTTCTCATTCG	GTTCTCTGTCATCTTGTT
OBP32	CCTGTGCTCAGAACATTA	GTAGGACACTGCGTATAG
OBP33	CTGGGTAAGGAGGAGAAGGC	CGCCTTCTTGTCATAGCCAC
β-actin	CATCCGTAAGGACTTGTA	TGATCTTGATCTTCATTGTG
RL-31	AAGTTGTAACTCGTGAATAC	GTTCCCATTTGTTTCTCAG

Supplementary Table 8.

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