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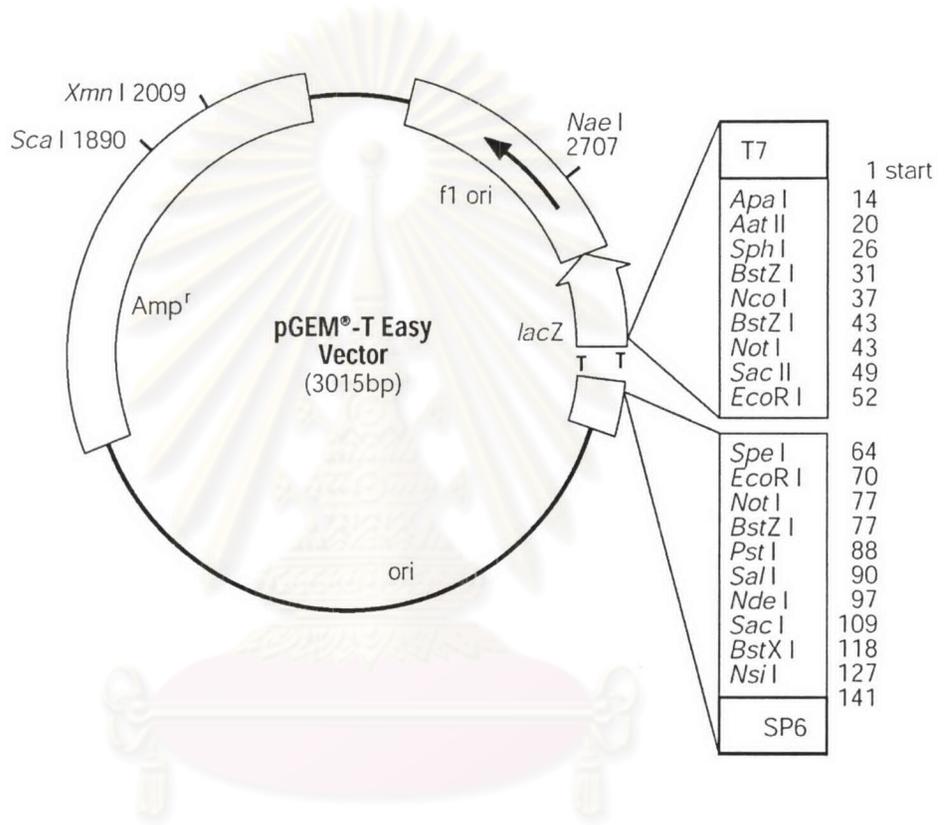


APPENDICES

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

APPENDIX A

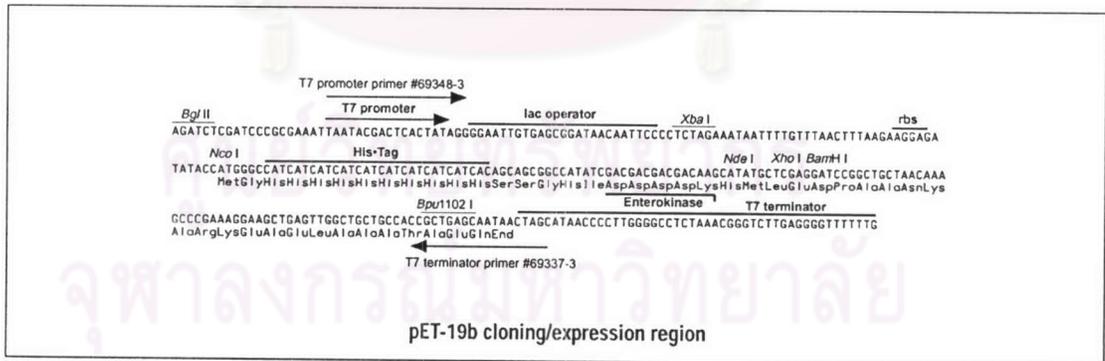
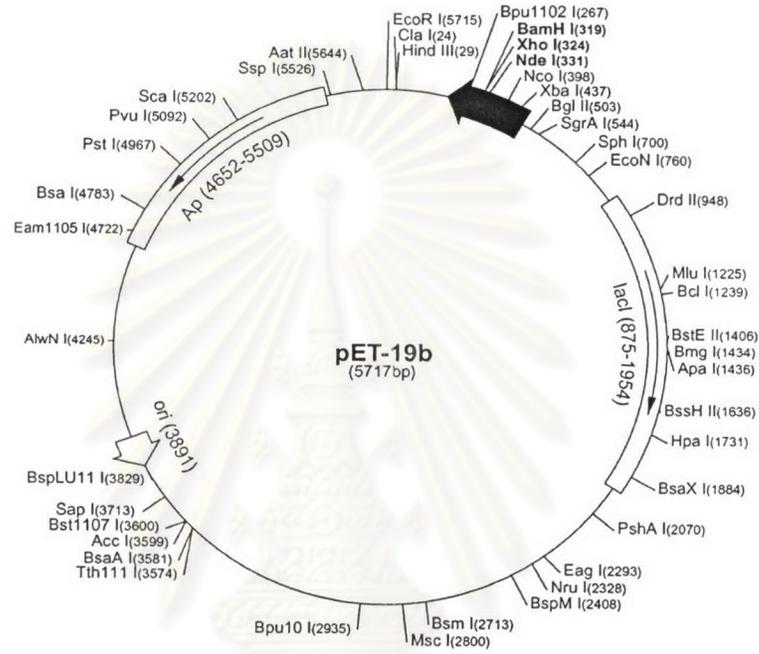
Restriction map of pGem[®]-T Easy vector



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

APPENDIX B

Restriction map of pET19b



APPENDIX C

Alignment of the nucleotide sequence of AcMRJP4 cDNA tranformant Number 1 (MRJP401), 5 (MRJP405) and 7 combined with EST of AcMRJP4 published sequence (MRJP407_AcHG126)

CLUSTAL X (1.81) multiple sequence alignment

```

MRJP401          ATATCCTAGAAAAAAAAATGACAAAATGGTTGCTGTTGATGGCATGCCTTGGCATAGCTTG
MRJP405          ATATCCTAGAAAAAAAAATGACAAAATGGTTGCTGTTGATGGCATGCCTTGGCATAGCTTG
MRJP407_AcHG126 ATATCCTAGAAAAAAAAATGACAAAATGGTTGCTGTTGATGGCATGCCTTGGCATAGCTTG
*****

MRJP401          TCAAAATATTAGAGGTGCCGTTGTTCGAGAAAAATTCCTCAAGAAAAAATTAACAAATAC
MRJP405          TCAAAATATTAGAGGTGCCGTTGTTCGAGAAAAATTCCTCGAGAAAAAATTAACAAATAC
MRJP407_AcHG126 TCAAAATATTAGAGGTGCCGTTGTTCGAGAAAAATTCCTCGAGAAAAAATTAACAAATAC
*****

MRJP401          GTTGAACGTGATTACGAATGGAAGTATGTCGATTATGATTTCCGGTAGCGACGAAAAAAG
MRJP405          GTTGAACGTGATTACGAATGGAAGTATGTCGATTATGATTTCCGGTAGCGACGAAAAAAG
MRJP407_AcHG126 GTTGAACGTGATTACGAATGGAAGTATGTCGATTATGATTTCCGGTAGCGACGAAAAAAG
*****

MRJP401          GCAAGCTGCGATTCAATCTGGCGAATATGATCGTACGAAAAATATCCTCTTGACGTCGA
MRJP405          GCAAGCTGCGATTCAATCTGGCGAATATGATCGTACGAAAAATATCCTCTTGACGTCGA
MRJP407_AcHG126 GCAAGCTGCGATTCAATCTGGCGAATATGATCGTACGAAAAATATCCTCTTGACGTCGA
*****

MRJP401          TCAATGGCATGATAAGACTTTTGTCACTATGTTAAGATACGATGGTGTGCCTTCTCTTT
MRJP405          TCAATGGCATGATAAGACTTTTGTCACTATGTTAAGATACGATGGTGTGCCTTCTCTTT
MRJP407_AcHG126 TCAATGGCATGATAAGACTTTTGTCACTATGTTAAGATACGATGGTGTGCCTTCTCTTT
*****

MRJP401          GAACGTGGTATCTGACAAAACCTGGCGACGGTGGACCGCTTCTACAACCTTATCCCGATTG
MRJP405          GAACGTGGTATCTGACAAAACCTGGCAACGGTGGACCGCTTCTACAACCTTATCCCGATTG
MRJP407_AcHG126 GAACGTGGTATCTGACAAAACCTGGCAACGGTGGACCGCTTCTACAACCTTATCCCGATTG
*****

MRJP401          GTCATTTGCTAAGTATGAAGATTGCTCTGGAATCGTGAGCGCCAACAAAATTGCTATCGA
MRJP405          GTCATTTGCTAAGTATGAAGATTGCTCTGGAATCGTGAGCGCCAACAAAATTGCTATCGA
MRJP407_AcHG126 GTCATTTGCTAAGTATGAAGATTGCTCTGGAATCGTGAGCGCCAACAAAATTGCTATCGA
*****

MRJP401          CGAATATGAGAGATTGTGGGTTCTGGACTCGGGCCTTGTCAATAATATTCAACCTATGTG
MRJP405          CGAATATGAGAGATTGTGGGTTCTGGACTCGGGCCTTGTCAATAATATTCAACCTATGTG
MRJP407_AcHG126 CGAATATGAGAGATTGTGGGTTCTGGACTCGGGTCTTGTCAATAATATTCAACCTATGTG
*****

MRJP401          TTCTCCAAAATTGCTTGCCTTTGATTTGACTACTTCGAAATTGCTCAAGCAAGTCGAGAT
MRJP405          TTCTCCAAAATTGCTTGCCTTTGATTTGACTACTTCGAAATTGCTCAAGCAAGTCGAGAT
MRJP407_AcHG126 TTCTCCAAAATTGCTTGCCTTTGATTTGACTACTTCGAAATTGCTCAAGCAAGTCGAGAT
*****

MRJP401          ACCGCACGATGTTGCCGTAATGCCACCACAGGAAAGGGCGGATTAGCATCTTTAGCTGT
MRJP405          ACCGCACGATGTTGCCGTAATGCCACCACAGGAAAGGGCGGATTAGCATCTTTAGCTGT
MRJP407_AcHG126 ACCGCACGATGTTGCCGTAATGCCACCACAGGAAAGGGCGGATTAGCATCTTTAGCTGT
*****

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APPENDIX C (continued)

Alignment of the nucleotide sequence of AcMRJP4 cDNA transformant Number 1 (MRJP401), 5 (MRJP405) and 7 combined with EST of AcMRJP4 published sequence (MRJP407_AcHG126)

(continued)

| | |
|-----------------|---|
| MRJP401 | TCAAGCTATGGATTCTGTAAATACTGTGGTGTACATGGCAGACAACAAAGATGATGCCTT |
| MRJP405 | TCAAGCTATGGATTCTGTAAATACTATGGTGTACATGGCAGATAACAAAGATGATGCCTT |
| MRJP407_AcHG126 | TCAAGCTATGGATTCTGTAAATACTATGGTGTACATGGCAGATAACAAAGATGATGCCTT ***** |
| | |
| MRJP401 | AATTGTCTACCAAAATGCCGATGATTCTTCCATCGATTGTCTTCCCACATTTCCAATCA |
| MRJP405 | AATTGTCTACCAAAATGCCGATGATTCTTCCATCGATTGTCTTCCACATTTCCAATCA |
| MRJP407_AcHG126 | AATTGTCTACCAAAATGCCGATGATTCTTCCATCGATTGTCTTCCCACATTTCCAATCA ***** |
| | |
| MRJP401 | CAACTTTAGATCTGACAAAATGTCGCAAGAAAATCTCACCTTGAAGAAGTAGACAACAG |
| MRJP405 | CAACTTTAGATCTGACAAAATGTCGCAAGAAAATCTCACCTTGAAGAAGTAGACAACAG |
| MRJP407_AcHG126 | CAACTTTAGATCTGACAAAATGTCGCAAGAGAATCTCACCTTGAAGAAGTAGACAACAG ***** |
| | |
| MRJP401 | AGTTTTTGAATGGCACTTAGTTCGGTGACGCATAATCTTTATTATAGTCCTCTCTCTTC |
| MRJP405 | AGTTTTTGAATGGCACTTAGTTCGGTGACGCATAATCTTTATTATAGTCCTCTCTCTTC |
| MRJP407_AcHG126 | AGTTTTTGAATGGCACTTAGTTCGGTGACGCATAATCTTTATTATAGCCCCCTCTCTTC ***** ** * |
| | |
| MRJP401 | TCGAAATTTATATTACGTAAACACATCATCGTTAATGAA - CTCGAAAAT - CAAGGAAAT |
| MRJP405 | TCGAAATTTATATTACGTAAACACAAAATCGTTAATGAA - CTCGAAAAT - CAAGGAAAT |
| MRJP407_AcHG126 | CCGAAATTTATATTACGTAAACACAACATCGTTAATGAATCTCGAAAATGCAAGGAAAT ***** |
| | |
| MRJP401 | GACGTGCAGTATGAAAGTGTCCAAGACGTTTTTCAGCAGTCAATTATCCGCTAAAGCAGTA |
| MRJP405 | GACGTGCAGTATGAAAGTGTCCAAGACGTTTTTCAGCAGTCAATTATCCGCTAAAGCAGTA |
| MRJP407_AcHG126 | GACGTGCAGTATGAA - GTGTCCAAGACGTTTTTCAGCAGTCAATTATCCGCTAAAGCAGTT ***** |
| | |
| MRJP401 | TCGAAAATGGCGTACTCTTTTTTCGGATTACGAATAATACTCTTGGTTGCTGGAATGAG |
| MRJP405 | TCGAAAATGGCGTACTCTTTTTTCGGATTACGAATAATACTCTTGGTTGCTGGAATGAG |
| MRJP407_AcHG126 | TCGAAAATGGCGTACTCTTTTTTGGGATTCANNNNNNNNNNNNNNNNNNNNNNNNNNNNN ***** |
| | |
| MRJP401 | CATCAGTCACTTGACAGACAAAATATCGATATTGTAGCTCGAAATGAGACGCTTCAAATG |
| MRJP405 | CATCAGTCACTTGACAGACAAAATATCGATATTGTAGCTCGAAATGAGACGCTTCAAATG |
| MRJP407_AcHG126 | NN ***** |
| | |
| MRJP401 | GTCGTTGGTATGAAGATTAAGCAAAACCTTCCACAATCTGGCAAAGTTAATAACACAA |
| MRJP405 | GTCGTTGGTATGAAGATTAAGCAAAACCTTCCACAATCTGGCAAAGTTAATAACACAA |
| MRJP407_AcHG126 | NN ***** |
| | |
| MRJP401 | AGAAATGAACATTTGTTGGCTTTAACCAACAAAAGCAGGACGTGCTAAACAACGATCTT |
| MRJP405 | AGAAATGAACATTTGTTGGCTTTAACCAACAAAAGCAGGACGTGCTAAACAACGATCTT |
| MRJP407_AcHG126 | NNNNNNNNNNNNNNNNNNNNNNNNNNNNCCAAACAAAAGCAGGACGTGCTAAACAACGATCTT ***** |

APPENDIX C (continued)

Alignment of the nucleotide sequence of AcMRJP4 cDNA transformant Number 1 (MRJP401), 5 (MRJP405) and 7 combined with EST of AcMRJP4 published sequence (MRJP407_AcHG126)

(continued)

| | |
|-----------------|--|
| MRJP401 | AATCTCGAACGTGTGAACCTCCAAATTTTGGATGCTAATGTAAACGACTTGATACGGAAT |
| MRJP405 | AATCTCGAACATGTGAACCTCCAAATTTTGGATGCTAATGTAAACGACTTGATACGGAAT |
| MRJP407_AcHG126 | AATCTCGAACATGTGAACCTCCAAATTTTGGATGCTAATGTAAACGACTTGATACGGAAT ***** |
| MRJP401 | AGTCGTTGCGCAAATTCGACAATCAGGATAATAATCAACATAATTATAATCATAATCAA |
| MRJP405 | AGTCGTTGCGCAAATTCGACAATCAGGATAATAATCAACATAATTATAATCATAATCAA |
| MRJP407_AcHG126 | AGTCGTTGCGCAAATTCGACAATCAGGATAATAATCAACATAATTATAATCATAATCAA ***** |
| MRJP401 | GTCGTCATTCTTCAAATCTGACAATCAGAATAACAATCAACATAACAATCAAGCTTAT |
| MRJP405 | GTCGTCATTCTTCAAATCTGACAATCAGAATAACAATCAACATAACAATCAAGCTTAT |
| MRJP407_AcHG126 | GTCGTCATTCTTCAAATCTGACAATCAGAATAACAATCAACATAACAATCAAGCTTAT * ***** |
| MRJP401 | CATTCTTCAAAGTCTGACAATTGGGATAACAATAACAATCAGACTCATCATTCCCTCAAAA |
| MRJP405 | CATTCTTCAAAGTCTGACAATTGGGATAACAATAACAATCAGACTCATCATTCCCTCAAAA |
| MRJP407_AcHG126 | CATTCTTCAAAGTCTGACAATTGGGATAACAATAACAATCAGACTCATCATTCCCTCAAAA ***** |
| MRJP401 | TTTGATAATCAGAATAACAATCAATATAACAATTAGGTTTCATCATTCTTCATCAAATCAT |
| MRJP405 | TTTGATAATCAGAATAACAATCAATATAACAATTAGGTTTCATCATTCTTCATCAAATCAT |
| MRJP407_AcHG126 | TTTGATAATCAGAATAACAATCAATATAACAATTAGGTTTCATCATTCTTCATCAAATCAT ***** |
| MRJP401 | GTTAAATCTGATAATTAATCTTTTCTCGATGTAAGTCAAATATTTTAAAAAATTCATTA |
| MRJP405 | GTTAAATCTGATAATTAATCTTTTCTCGATGTAAGTCAAATATTTTAAAAAATTCATTA |
| MRJP407_AcHG126 | GTTAAATCTGATAATTAATCTTTTCTCGATGTAAGTCAAATATTTTAAAAAATTCATTA ***** |
| MRJP401 | CATTATAAAACGAATAAAATAAATATCGTTTTTTCGCATAAAAAAAAAAAAAAAAAAAAA |
| MRJP405 | CATTATAAAACGAATAAAATAAATATCGTTTTTTCGCATAAAAAAAAAAAAAAAAAAAAA |
| MRJP407_AcHG126 | CATTATAAAACGAATAAAATAAATATCGTTTTTTCGCATAAAAAAAAAAAAAAAAAAAAA ***** |
| MRJP401 | AAAAAA |
| MRJP405 | AAAAAA |
| MRJP407_AcHG126 | AAAAAA ***** |

APPENDIX D

Alignment of the nucleotide sequence of AcMRJP5 cDNA transformant number 16 (MRJP516), 19 (MRJP519) and partial sequence of transformant number 11 (MRJP511)

CLUSTAL X (1.81) multiple sequence alignment

```

MRJP516      CTGTCGTTTGCAAAATATTTGCAGCATCCAAGAACAATGACAAGTTGGTTGTTGCTGGTG
MRJP519      CTGTCGTTTGCAAAATATTTGCAGCATCCAAGAACAATGACAAGTTGGTTGTTGCTGGTG
MRJP511      CTGTCGTTTGCAAAATATTTGCAGCATCCAAGAACAATGACAAGTTGGTTGTTGCTGGTG
*****

MRJP516      GTGTGCCTTGGCATAGCTTGTCAAGGTATCACAGGCGCCACTGTTTCGAGAAAAATCTTTCG
MRJP519      GTGTGCCTTGGCATAGCTTGTCAAGGTATCACAGGCGCCACTGTTTCGAGAAAAATCTTTCG
MRJP511      GTGTGCCTTGGCATAGCTTGTCAAGGTATCACAGGCGCCACTGTTTCGAGAAAAATCTTTCG
*****

MRJP516      AGAAATTTGGCAAATTCGATGAACGTGATTCACGAATGGAAGTATCTTGATTATGACTTC
MRJP519      AGAAATTTGGCAAATTCGATGAACGTGATTCACGAATGGAAGTATCTTGATTATGACTTC
MRJP511      AGAAATTTGGCAAATTCGATGAACGTGATTCACGAATGGAAGTATCTTGATTATGACTTC
*****

MRJP516      GGTAGCGACGAAAAAAGACAAGCTGCGATTCAATCTGGCGAATATGACCATACGAAAAAT
MRJP519      GGTAGCGACGAAAAAAGACAAGCTGCGATTCAATCTGGCGAATATGACCATACGAAAAAT
MRJP511      GGTAGCGACGAAAAAAGACAAGCTGCGATTCAATCTGGCGAATATGATCATACGAAAAAT
*****

MRJP516      TATCCCTTCGATGTCGATCGATGGCATGATATGACTTTTGTACCCTACTAAGATACAAA
MRJP519      TATCCCTTCGATGTCGATCGATGGCATGATATGACTTTTGTACCCTACTAAGATATAAAA
MRJP511      TATCCCTTCGATGTCGATCGATGGCATGATATGACTTTTGTACCCTACTAAGATACAAA
*****

MRJP516      GGTGTACCTTCCTCTTTAAACGTGATAACTAAGAAAATTGGCAACGGTGGACCTCTTCTG
MRJP519      GGTGTACCTTCCTCTTTAAACGTGATATCTAAGAAAATTGGCAACGGTGGACCTCTTCTG
MRJP511      GGTGTACCTTCCTCTTTAAACGTGATATCTAAGAAAATTGGCAACGGTGGACCTCTTCTG
*****

MRJP516      CAGCCATATCCTGATTGTCGTTGGCGAACTATAAAGATTGCTCTGGAATCGTGAGCGCT
MRJP519      CAGCCATATCCTGATTGGTCGTTGGCGAACTATAAAGATTGCTCTGGAATCGTGAGCGCT
MRJP511      CAGCCATATCCTGATTGGTCGTTGGCGAACTATAAAGATTGCTCTGGAATCGTGAGCGCT
*****

MRJP516      TACAAAATTGCGATCGACAAGTTCGACAGATTGTGGGTTCTGGACTCAGGTATTATCAAT
MRJP519      TACAAAATTGCGATCGACAAGTTCGACAGATTGTGGGTTCTGGACTCAGGTATTATCAAT
MRJP511      TACAAAATTGCGATCGACAAGTTCGACAGATTGTGGGTTTGGACTCAGGTATTATCAAT
*****

MRJP516      AATACTCAACCCATGTGTTACCAAAAATGTCATGTCTTTGATCTCAATACCTCACAGCAG
MRJP519      AATACTCAACCCATGTGTTACCAAAAATGTCATGTCTTTGATCTCAATACCTCACAGCAG
MRJP511      AATACTCAACCCATGTGTTACCAAAAATGTCATGTCTTTGATCTCAATACCTCACAGCAG
*****

MRJP516      ATTAAGCAAGTTATGATGCCGCATGATATTGCCATAAATGCCACTACAGGAAAAGGAGGA
MRJP519      ATTAAGCAAGTTATGATGCCGCATGATATTGCCATAAATGCCACTACAGGAAAAGGAGGA
MRJP511      ATTAAGCAAGTTATGATGCCGCATGATATTGNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
*****

```

APPENDIX D(continued)

Alignment of the nucleotide sequence of AcMRJP5 cDNA transformant number 16 (MRJP516), 19 (MRJP519) and partial sequence of transformant number 11 (MRJP511)

(continued)

| | |
|---------|---|
| MRJP516 | CTAGAAAATCTAGTTGTTCAAGCTATGGATCCTATGAATACTCTGGTGTATATGGCAGAT |
| MRJP519 | CTAGAAAACCTAGTTGTTCAAGCTATGGATCCTATGAATACTCTGGTGTATATGGCAGAT |
| MRJP511 | NN |
| | |
| MRJP516 | AACAAGGGTGATGCTTTAATTGTTTATCAAAATTCGGATGATTCCTTCCATCGATTGACT |
| MRJP519 | AACAAGGGTGATGCTTTAATTGTTTATCAAAATTCGGATGATTCCTTCCATCGATTGACT |
| MRJP511 | NN |
| | |
| MRJP516 | TCCAACACTTTCGATTACGATCCCAAATATATCAAAATGATGGCCGAGGAGAAAGTTTC |
| MRJP519 | TCCAATACTTTCGATTACGATCCCAAATATATCAAAATGATGGCCGAGGAGAAAGTTTC |
| MRJP511 | NN |
| | |
| MRJP516 | ACATTGCAAGATGGAATTTTGGAAATGGCACTCAGTCCCATGACAAACAATCTTTATTAC |
| MRJP519 | ACATTGCAAGATGGAATTTTGGAAATGGCACTCAGTCCCATGACAAACAATCTTTATTAC |
| MRJP511 | NN |
| | |
| MRJP516 | AGTCCTCTCGCTTCTCGCAGTTTGATTATGTTAATACGAAACCCTTCATGAAATCACAA |
| MRJP519 | AGTCCTCTCGCTTCTCGCAGTTTGATTATGTTAATACGAAACCCTTCATGAAATCACAA |
| MRJP511 | NN |
| | |
| MRJP516 | TATGGAACAAATAACGTACAACATGAAGGTGTCCAAGATATTTTCAATACTCAATCAATT |
| MRJP519 | TATGGAACAAATAACGTACAACATGAAGGTGTCCAAGATATTTTCAATACTCAATCAATT |
| MRJP511 | NN |
| | |
| MRJP516 | GCTAAAATAATGTCGAAAAATGGCGTTCCTTTTTTCGGTCTCATGAATAATTCAGCTATT |
| MRJP519 | GCTAAAATAATGTCGAAAAATGGCGTTCCTTTTTTCGGTCTCATGAATAATTCAGCTATT |
| MRJP511 | NN |
| | |
| MRJP516 | GGTTGTTGGAATGAGCACCAACCACCTTCAGAAACAAAATATGGATATGGTCGCTCAGAAT |
| MRJP519 | GGTTGTTGGAATGAGCACCAACCACCTTCAGAGACAAAATATGGATATGGTCGCTCAGAAT |
| MRJP511 | NN ***** |
| | |
| MRJP516 | GAAGAGACACTTCAAACGGTCGTTGCTATGAAAATGATGCATCTCCACAATCCAACAGG |
| MRJP519 | GAAGAGACACTTCAAACGGTCGTTGCTATGAAAATGATGCATCTCCACAATCCAACAGA |
| MRJP511 | GAAGAGACACTTCAAACGGTCGTTGCTATGAAAATGATGCATCTCCACAATCCAACAGG ***** |
| | |
| MRJP516 | ATGAATAGGATGCATAGGATGAATAGTATGAATAGAATGGATAGGATGGATAGAATGGAT |
| MRJP519 | ATGAATAGGATGCATAAGATGAATAGTATGAATAGAATGGATAGGATGGATAGGATGGAT |
| MRJP511 | ATGAATAGGATGCATAGGATGAATAGTATGAATAGAATGGATAGGATGGATAGAATGGAT ***** |

APPENDIX D(continued)

Alignment of the nucleotide sequence of AcMRJP5 cDNA transformant number 16 (MRJP516), 19 (MRJP519) and partial sequence of transformant number 11 (MRJP511)

(continued)

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MRJP516      AGGATGGATAGGATGGATA-----GGATGGATAGGATG
MRJP519      AGGATGGATAGGATGGATAAAATGGGTAGGATGGATAGGATGGATAGGATGGATAGAATG
MRJP511      AGGATGGATAGGATGGATA-----
*****

MRJP516      GATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGG
MRJP519      GATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATAGG
MRJP511      ---GGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATGGATAGGATAGG
*****

MRJP516      ATGGATAGGATGGATATAATGGATAGGACGAATAAAATGGATAGGATGGATAGGATGGAT
MRJP519      ATGGATAGGATGGATATAATGGATAGGACGAATAAAATGGATAGGATGGATAGGATGGAT
MRJP511      ATGGATAGGATGGATATAATGGATAGGACGAATAAAATGGATAGGATGGATAGGATGGAT
*****

MRJP516      ATAATGGATAAGACGAATAAAATGGATAGGATGGATAGTATGATTAGAATAGATAAAATG
MRJP519      ATAATGGATAAGATGAATAAAATGGATAGGATGGATAGTATGATTAGAATAGATAAAATG
MRJP511      ATAATGGATAAGATGAATAAAATGGATAGGATGGATAGTATGATTAGAATAGATAAAATG
*****

MRJP516      GATAGAATGGATAGAATGCATAGAATAGATATAATGAATAGAATGGATAGAATGGATAGA
MRJP519      GATAGAATGGATAGAATGGATAGAATAGATATAATGAATAGAATGGATAGAATGGATAGA
MRJP511      GATAGAATGGATAGAATGCATAGAATAGATATAATGAATAGAATGGATAGAATGGATAGA
*****

MRJP516      ATGGACACAAGAATAGATACAAGAATGGACAGAATGGATAGAATGGATAAAATGGATAAG
MRJP519      ATGGACACAAGAATAGATACAAGAATGGACAGAATGGATAGAATGGATAAAATGGATAAG
MRJP511      ATGGACACAAGAATAGATACAAGAATGGACAGAATGGATAGAATGGATAAAATGGATAAG
*****

MRJP516      ATAAATAAGATGCATAGGATGGGTAGGATGGATAGGATGGATAGGATGGATAGAATGAATAGAATGAAT
MRJP519      ATAAATAAGATGCATAGGATGGGTAGGATGGATAGGATGGATAGGATGGATAGAATGAATAGAATGAAT
MRJP511      ATAAATAAGATGCATAGGATGGGTAGGATGGATAGGATGGATAGGATGGATAGAATGAATAGAATGAAT
*****

MRJP516      AGACAAATGAATGAATATATGATGGCTTTAAGTATGAAATTACAGAAATTTATAACAAT
MRJP519      AGACAAATGAATGAATATATGATGGCTTTAAGTATGAAATTACAGAAATTTATAACAAT
MRJP511      AGACAAATGAATGAATATATGATGGCTTTAAGTATGAAATTACAGAAATTTATAAAC ---
*****

MRJP516      GATTATAATTTCAACGAAGTAAATTTCCGAATTTTGGCTGCAAATGTAAACGATTTAATA
MRJP519      GATTATAATTTCAACGAAGTAAATTTCCGAATTTTGGCTGCAAATGTAAACGATTTAATA
MRJP511      -----

MRJP516      ATGAACACTCGTTGTGCAAATTTCTAACAATCAGAATGATAATCAAATAAGCATAATAAT
MRJP519      ATGAACACTCGTTGTGCAAATTTCTAACAATCAGAATGATAATCAAATAAGCATAATAAT
MRJP511      -----

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APPENDIX D(continued)

Alignment of the nucleotide sequence of AcMRJP5 cDNA transformant number 16 (MRJP516), 19 (MRJP519) and partial sequence of transformant number 11 (MRJP511)

(continued)

| | |
|---------|--|
| MRJP516 | TAAGGTAGTCGTTCTTTATATTAAAATCTGTTAATTAGTCTTTTCTCGACTATAAACCAA |
| MRJP519 | TAAGGTAGTCGTTCTTTATATTAAAATCTGTTAATTAGTCTTTTCTCGACTATAAACCAA |
| MRJP511 | ----- |
| MRJP516 | ATATTGTTTCAAATTTCTTTATATTATAAATGAATAAAATAAATATCGTTTTTGCTTAAA |
| MRJP519 | ATATTGTTTCAAATTTCTTTATATTATAAATGAATAAAATAAATATCGTTTTTGCTTAAA |
| MRJP511 | ----- |
| MRJP516 | AAAAAAAAAAAAAAAAAAAAAAAA----- |
| MRJP519 | AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA |
| MRJP511 | ----- |

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APPENDIX E

**Alignment of the nucleotide sequence of AcMRJP6 cDNA transformant number 3
(MRJP603), 8 (MRJP608) and 24 (MRJP624)**

CLUSTAL X (1.81) multiple sequence alignment

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MRJP603      ATATCCTAGAAAAAAAAATGACAAAATGGTTGCTGCTGATAGTGTGTCTTAGCATAGCTTG
MRJP624      ATATCCTAGAAAAAAAAATGACAAAATGGTTGCTGCTGATAGTGTGTCTTAGCATAGCTTG
MRJP608      ATATCCTAGAAAAAAAAATGACAAAATGGTTGCCGCTGATAGTGTGTCTTAGCATAGCTTG
*****

MRJP603      TCAAGATGTCACAAGCGCGATTTCATCGAAGAAAATCTTCAAAAAATTTGGAACATTCCGAT
MRJP624      TCAAGATGTCACAAGCGCGATTTCATCGAAGAAAATCTTCAAAAAATTTGGAACATTCCGAT
MRJP608      TCAAGATGTCACAAGCGCGATTTCATCGAAGAAAATCTTCAAAAAATTTGGAACATTCCGAT
*****

MRJP603      GAACGTGATTACGAATGGAATATCTTGATTATGATTTTCGATACCAATGAAAAAACA
MRJP624      GAACGTGATTACGAATGGAATATCTTGATTATGATTTTCGATACCAATGAAAAAACA
MRJP608      GAACGTGATTACGAATGGAATATCTTGATTATGATTTTCGATACCAATGAAAAAACA
*****

MRJP603      AGCTGCGATTCAATTTGGTGAATACGACTATACGAAAAATATCCCTTTGACGTCGATCA
MRJP624      AGCTGCGATTCAATTTGGTGAATACGACTATACGAAAAATATCCCTTTGACGTCGATCA
MRJP608      AGCTGCGATTCAATTTGGTGAATACGACTATACGAAAAATATCCCTTTGACGTCGATCA
*****

MRJP603      ATGGCATGATAAGACTTTTGTGCTGTGAATAAGATACGATGGTGTACCTTCCTCTTTGAA
MRJP624      ATGGCATGATAAGACTTTTGTGCTGTGAATAAGATACGATGGTGTACCTTCCTCTTTGAA
MRJP608      ATGGCATGATAAGACTTTTGTGCTGTGAATAAGATACGATGGTGTACCTTCCTCTTTGAA
*****

MRJP603      CGTGATATCTGACAAAACGGCAACGGTGGACGCCTTCTCCAACCGTATCCTGATTGGTC
MRJP624      CGTGATATCTGACAAAACGGCAACGGTGGACGCCTTCTCCAACCGTATCCTGATTGGTC
MRJP608      CGTGATATCTGACAAAACGGCAACGGTGGACGCCTTCTCCAACCGTATCCTGATTGGTC
*****

MRJP603      GTGGACGAAGTATAAAGATTGTTCTGGAATCGTGAGCGTTTACAAAATTGCGATTGACAA
MRJP624      GTGGACGAAGTATAAAGATTGTTCTGGAATCGTGAGCGTTTACAAAATTGCGATTGACAA
MRJP608      GTGGACGAAGTATAAAGATTGTTCTGGAATCGTGAGCGTTTACAAAATTGCGATTGACAA
*****

MRJP603      ATTCGACAGATTGTGGGTTCTGGACTCAGGTCTTATTAATAATATCAACTTATGTGTTT
MRJP624      ATTCGACAGATTGTGGGTTCTGGACTCAGGTCTTATTAATAATATCAACTTATGTGTTT
MRJP608      ATTCGACAGATTGTGGGTTCTGGACTCAGGTCTTATTAATAATATCAACTTATGTGTTT
*****

MRJP603      TCCAAAATTGCTTGCCTTTGATCTGACAACTTCGAAATTGCTCAAGCAAGTCGAGATACC
MRJP624      TCCAAAATTGCTTGCCTTTGATCTGACAACTTCGAAATTGCTCAAGCAAGTCGAGATACC
MRJP608      TCCAAAATTGCTTGCCTTTGATCTGACAACTTCGAAATTGCTCAAGCAAGTCGAGATACC
*****

MRJP603      GTACGATATTGCTGTAATGCCAGCACAGGAATGGGAGGACTCGTCTCATTAGTTGTTCA
MRJP624      GTACGATATTGCTGTAATGCCAGCACAGGAATGGGAGGACTCGTCTCATTAGTTGTTCA
MRJP608      GTACGATATTGCTGTAATGCCAGCACAGGAATGGGAGGACTCGTCTCATTAGTTGTTCA
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APPENDIX E (continued)

Alignment of the nucleotide sequence of AcMRJP6 cDNA transformant number 3 (MRJP603), 8 (MRJP608) and 24 (MRJP624)

(continued)

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MRJP603      AGCTATGGATCCTATGAATACTATGGTATATATAGCAGATGACAGAGGTGACGCTTTAAT
MRJP624      AGCTATGGATCCTATGAATACTATGGTATATATAGCAGATGACAGAGGTGACGCTTTAAT
MRJP608      AGCTATGGATCCTATGAATACTATGGTATATATAGCAGATGACAGAGGTGATGCTTTAAT
*****

MRJP603      CATCTATCAAAATTCGGATGATTCTTTCCATCGATTGAGTTCCAATACTTTTGATAACGA
MRJP624      CATCTATCAAAATTCGGATGATTCTTTCCATCGATTGAGTTCCAATACTTTTGATAACGA
MRJP608      CGTCTATCAAAATTCGGATGATTCTTTCCATCGATTGAGTTCCAATACTTTTGATAACGA
* *****

MRJP603      TCCAGATATTCTGAATTGACGGTCGCGGGAGAAAGTTTCACAGTGCATGATGGAATTTT
MRJP624      TCCAGATATTCTGAATTGACGGTCGCGGGAGAAAGTTTCACAGTGCATGATGGAATTTT
MRJP608      TCCAGATATTCTGAATTGACGGTCGCGGGAGAAAGTTTCACAGTGCATGATGGAATTTT
*****

MRJP603      TGGAAATGGCACTTAGTCCTGTGACGAACAATCTTTATTATAGCCCTCTCACTTCTCACAG
MRJP624      TGGAAATGGCACTTAGTCCTGTGACGAACAATCTTTATTATAGCCCTCTCACTTCTCACAG
MRJP608      TGGAAATGGCACTTAGTCCTGTGACGAACAATCTTTATTACAGCCCTCTCACTTCTCACAG
*****

MRJP603      TTTGTATTACGTTAACACGGAACCATTTATGAAATCACAATATGGAGAAAATAATATACA
MRJP624      TTTGTATTACGTTAACACGGAACCATTTATGAAATCACAATATGGAGAAAATAATATACA
MRJP608      TTTGTATTACGTTAACACGGAACCATTTATGAAATCACAATATGGAGAAAATAATATACA
*****

MRJP603      ATATGAAGGAATTCAAGATATTTTCAACACTCAATCATCCGCTAAAGTAATGTCGAAAAA
MRJP624      ATATGAAGGAATTCAAGATATTTTCAACACTCAATCATCCGCTAAAGTAATGTCGAAAAA
MRJP608      ATATGAAGGAATTCAAGATATTTTCAACACTCAATCATCCGCTAAAGTAATGTCGAAAAA
*****

MRJP603      TGGCGTCCTTTTCTTCGGACTTGTGAATAATTCAGCTATTGGTTGTTGGAACGAGCATCA
MRJP624      TGGCGTCCTTTTCTTCGGACTTGTGAATGATTTCAGCTATTGGTTGTTGGAACGAGCATCA
MRJP608      TGGCGTCCTTTTCTTCGGACTTGTGAATAATTCAGCTATTGGTTGTTGGAACGAGCATCA
*****

MRJP603      ACCACTTCAGAAACAAAATATGGATATGGTCGCTCAGAATGAAGAGACACTTCAAATAAT
MRJP624      ACCACTTCAGAAACAAAATATGGATATGGTCGCTCAGAATGAAGAGACACTTCAAATAAT
MRJP608      ACCACTTCAGAAACAAAATATGGATATGGTCGCTCAGAATGAAGAGACACTTCAAATAAT
*****

MRJP603      CACTAGTGTGAAAATTATACAAAATCTTCCATATCCGGAAGATGAATAGAATTCACAA
MRJP624      CACTAGTGTGAAAATTATACAAAATCTTCCATATCCGGAAGATGAATAGAATTCACAA
MRJP608      CACTAGTGTGAAAATTATACAAAATCTTCCATATCCGGAAGATGAATAGAATTCACAA
*****

MRJP603      GAATGAATATATGTTGGCTTTAAGTAACAGAATGCAGAAAATAGTAAACAATGATTTTAA
MRJP624      GAATGAATATATGTTGGCTTTAAGTAACAGAATGCAGAAAATAGTAAACAATGATTTTAA
MRJP608      GAATGAATATATGTTGGCTTTAAGTAACAGAATGCAGAAAATAGTAAACAATGATTTTAA
*****

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APPENDIX E (continued)

Alignment of the nucleotide sequence of AcMRJP6 cDNA transformant number 3 (MRJP603), 8 (MRJP608) and 24 (MRJP624)

(continued)

```

MRJP603      TTTCAACGACATAAATTTCCGAATATTGGGTGCGAATGTAAAGAACTTAATAAAAAACAC
MRJP624      TTTCAACGACATAAATTTCCGAATATTGGGTGCGAATGTAAAGAACTTAATAAAAAACAC
MRJP608      TTTCAACGACATAAATTTCCGAATATTGGGTGCGAATGTAAAGAACTTAATAAAAAACAC
*****

MRJP603      TCGTTGTGCAAATTCATAAAATCAGAATAACAATCAAAGAAACATAAGAATCAAGCTCA
MRJP624      TCGTTGTGCAAATTCATAAAATCAGAATAACAATCAAAGAAACATAAGAATCAAGCTCA
MRJP608      TCGTTGTGCAAATTCATAAAATCAGAATAACAATCAAAGAAACATAAGAATCAAGCTCA
*****

MRJP603      TTAGATCTTTTCCAAGATCATATTAATTTCTATAGATTAATTTTTTCTCGTGGTAAATCA
MRJP624      TTAGATCTTTTCCAAGATCATATTAATTTCTATAGATTAATTTTTTCTCGTGGTAAATCA
MRJP608      TTAGATCTTTTCCAAGATCATATTAATTTCTATAGATTAATTTTTTCTCGTGGTAAATCA
*****

MRJP603      AATATTTTTAAAAATTTATTTGCATTATAAATTAATAAAATAAATATCATTTTCGCATAA
MRJP624      AATATTTTTAAAAATTTATTTGCATTATAAATTAATAAAATAAATATCATTTTCGCATAA
MRJP608      AATATTTTTAAAAATTTATTTGCATTATAAATTAATAAAATAAATATCATTTTCGCATAA
*****

MRJP603      AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
MRJP624      AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA-----
MRJP608      AAAAAAAAAAAAAAAAAAAAAAAAAA-----
*****

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APPENDIX F

Preparation for SDS-polyacrylamide gel electrophoresis

1. Stock solutions

2 M Tris-HCl (pH 8.8)

Tris (hydroxymethyl)-aminomethane 24.2 g

Adjusted pH to 8.8 with conc. HCl and volume to 100 ml with deionized water

1 M Tris-HCl (pH 6.8)

Tris (hydroxymethyl)-aminomethane 12.1 g

Adjusted pH to 6.8 with conc. HCl and volume to 100 ml with deionized water

10 % SDS (W/V)

Sodium dodecyl sulfate (SDS) 10 g

Dissolved in deionized water to the total volume of 100 ml

50 % glycerol (V/V)

100% Glycerol 50 ml

Deionized water 50 ml

1% bromophenol blue (W/V)

Bromophenol blue 100 mg

Brought to 10 ml with deionized water and stirred until dissolved and filtered aggregated dye.

2. Working solutions

Solution A (30% (W/V) acrylamide, 0.8 % (W/V) bis-acrylamide)

Acrylamide 29.2 g

N, N'-methylene-bis-acrylamide 0.8 g

Dissolved in deionized water to the total volume of 100 ml and stirred until completely dissolved.

Solution B (4X separating gel buffer: 1.5 M Tris-HCl (pH 8.8), 0.4% SDS)

2 M Tris-HCl (pH 8.8) 75 ml

10% SDS 4 ml

Deionized water 21 ml

Solution C (4X stacking gel buffer: 0.5 M Tris-HCl (pH 6.8), 0.4% SDS)

1 M Tris-HCl (pH 6.8) 50 ml

10% SDS 4 ml

Deionized water 46 ml

10% ammonium persulfate

Ammonium persulfate 0.5 g

Dissolved in deionized water to the total volume of 5 ml

Electrophoresis buffer (25 mM Tris, 192 mM Glycine, 0.1% SDS)

Tris (hydroxymethyl)-aminomethane 3 g

Glycine 14.4 g

SDS 1 g

Dissolved in deionized water to the total volume of 1 litre

5X Sample buffer (60 mM Tris-HCl (pH 6.8), 25% glycerol, 2% SDS, 14.4 mM 2-mercaptoethanol, 0.1% bromophenol blue)

1 M Tris-HCl (pH 6.8) 0.6 ml

50 % Glycerol 5 ml

10 % SDS 2 ml

2-Mercaptoethanol 0.5 ml

1% Bromopenol blue 1 ml

Deionized water 0.9 ml

3. SDS-PAGE

10 % Separating gel

Solution A 2.5 ml

Solution B 2.5 ml

Deionized water 2.39 ml

10 % Ammonium persulfate 50 μ l

TEMED 10 μ l

4 % Stacking gel

Solution A 0.67 ml

Solution C 1.0 ml

Deionized water 3.27 ml

10 % Ammonium persulfate 50 μ l

TEMED 10 μ l



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BIOGRAPHY

Mr. Khemmanun Cenphakdee was born on December 25, 1978. He graduated with Bachelor degree of Science in Biotechnology from Mahidol University in 1999.



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