1 ATGGGTGTCTCTGCCGTTCTACTTCCTTTGTACCTCCTGTCCGGGGTCACCTCCGGACTG

61 GCAGTCCCCGCCTCGAGAAATCAATCCACTTGCGATACGGTCGATCAGGGGTATCAATGC

121 TTCTCGGAGACTTCGCATCTTTGGGGCCAATACGCGCCGTTCTTTTCTCTATCAAACAAA

181 TCGAATATCTCCCCTGATGTTCCCGCCGGATGCCAAGTCACTTTCGCTCAGGTTCTCTCC

241 AGACACGGTGCGAGATATCCAACCGACTCCAAGGGCAAGAAATACTCCGCTCTCATCGAG

301 GAGATCCAGCAGAACGCGACTACCTACGAGGAGAAATATGCCTTCCTGAAGACATACAAC

361 TACAGCCTGGGCGCGGATGACCTGACTCCCTTTGGAGAGCAGGAGCTGGTCAACTCCGG

421 CGTCAAGTTCTACCAGCGATACGAGTCGCTCACAAGAAACATTGTCCCGTTCATCCGATC

481 CTCAGGCTCCAGCAGAGTGATTGCCCCTGGCAATAAATTCATCGAGGGCTTCCAGAGCAC

541 TAAGCTGAAGGATCCTCGTGCTCAGCCCGGCCAATCGTCGCCCAAGATCGACGTGGTCAT

601 TTCAGAGGCCGGCACATCCAACAACACTCTCGATCCGGGCACCTGCACCGTTTTCGAAGA

661 TAGCGAATTGGCCGATGACATCGAAGCCAATTTCACCGCCACGTTCGTCCCTTCCATTCG

721 TCAACGTCTGGAGAACGACTTGTCTGGCGTGACTCTCACGGACACAGAAGTGACCTACCT

781 CATGGACATGTGCTCCTTCGACACCATCTCCACCAGCACCGTCGACACCAAGCTGTCCCC

841 CTTCTGTGACCTGTTCACCCATGAAGAATGGATCAACTACGACTACCTCCAGTCCCTGAA

901 CAAATACTACGGCCATGGCGCAGGTAACCCGCTCGGCCCGTCCAGAGGCGTCGGCTACGC

961 TAACGAGCTCATCGCCCGTCTCACCCACTCGCCTGTCCACGATGACACCAGCTCCAACCA

1 021 CACATTGGACTCCAACCCGGCTACTTTCCCGCTCAACTCCACTCTCTATGCGGACTTTTC

1 081 GCACGACAACGGCATCATCTCTATCCTCTTTGCTTTGGGTCTGTACAACGGCACCAAGCC

1 141 GCTGTCTTCCACGACCGCGGAGAATATCGCCCAGACCGATGGGTTCTCATCTGCCTGGAC

1 201 GGTTCCTTTCGCGTCGCGCATGTACGCCGAGATGATGCAATGCCAGTCTGAGCAGGAGCC

1 261 TTTGGTCCGTGTCTTGGTTAATGATCGCGTTGTTCCGCTGCATGGCTGTCCGGTTGATGC

1 321 TTTGGGGAGATGTACGCGGGATAGCTTCGTGAAGGGTTTGAGCTTTGCCAGATCGGGCGG

1 381 TGATTGGGGGGAGTCCTTCGCTTAG

下划线处表示各突变位点的位置，序列总长为 1 404 bp。

附图 1　植酸酶基因突变株 A6 序列

Attached Fig. S1　Sequences of phytase gene in mutant strain A6

ATGACAATGCCTCATCGCTATATGTTTTTGGCAGTCTTTACACTTCTGGCACTAACTAGTGTGGCCTCAGGAG
CCACAGAGGCGTGCTTACCAGCAGGCCAGAGGAAAAGTGGGATGAATATAAATTTTTACCAGTATTCATTGA
AAGATTCCTCCACATATTCGAATGCAGCATATATGGCTTATGGATATGCCTCAAAAACCAAACTAGGTTCTGT
CGGAGGACAAACTGATATCTCGATTGATTATAATATTCCCTGTGTTAGTTCATCAGGCACATTTCCTTGTCCTC
AAGAAGATTCCTATGGAAACTGGGGATGCAAAGGAATGGGTGCTTGTTCTAATAGTCAAGGAATTGCATACT
GGAGTACTGATTTATTTGGTTTCTATACTACCCCAACAAACGTAACCCTAGAAATGACAGGTTATTTTTTACC
ACCACAGACGGGTTCTTACACATTCAAGTTTGCTACAGTTGACGACTCTGCAATTCTATCAGTAGGTGGTGC
AACCGCGTTCAACTGTTGTGCTCAACAGCAACCGCCGATCACATCAACGAACTTTACCATTGACGGTATCAA
GCCATGGGGTGGAAGTTTGCCACCTAATATCGAAGGAACCGTCTATATGTACGCTGGCTACTATTATCCAATG
AAGGTTGTTTACTCGAACGCTGTTTCTTGGGGTACACTTCCAATTAGTGTGACACTTCCAGATGGTACCACT
GTAAGTGATGACTTCGAAGGGTACGTCTATTCCTTTGACGATGACCTAAGTCAATCTAACTGTACTGTCCCTG
ACCCTTCAAATTATGCTGTCAGTACCACTACAACTACAACGGAACCATGGACCGGTACTTTCACTTCTACATC
TACTGAAATGACCACCGTCACCGGTACCAACGGCGTTCCAACTGACGAAACCGTCATTGTCATCAGAACTC
CAACAACTGCTAGCACCATCATAACTACAACTGAGCCATGGAACAGCACTTTTACCTCTACTTCTACCGAAT
TGACCACAGTCACTGGCACCAATGGTGTACGAACTGACGAAACCATCATTGTAATCAGAACACCAACAACA
GCCACTACTGCCATAACTACAACTGAGCCATGGAACAGCACTTTTACCTCTACTTCTACCGAATTGACCACA
GTCACCGGTACCAATGGTTTGCCAACTGATGAGACCATCATTGTCATCAGAACACCAACAACAGCCACTACT
GCCATGACTACAACTCAGCCATGGAACGACACTTTTACCTCTACTTCTACCGAATTGACCACAGTCACCGGT
ACCAATGGTTTGCCAACTGATGAGACCATCATTGTCATCAGAACACCAACAACAGCCACTACTGCCATGACT
ACAACTCAGCCATGGAACGACACTTTTACCTCTACTTCTACCGAATTGACCACAGTCACCGGTACCAATGGT
TTGCCAACTGATGAGACCATCATTGTCATCAGAACACCAACAACAGCCACTACTGCCATGACTACAACTCAG
CCATGGAACGACACTTTTACCTCTACATCCACTGAAATCACCACCGTCACCGGTACCAATGGTTTGCCAACT
GATGAGACCATCATTGTCATCAGAACACCAACAACAGCCACTACTGCCATGACTACACCTCAGCCATGGAA
CGACACTTTTACCTCTACATCCACTGAAATGACCACCGTCACCGGTACCAACGGTTTGCCAACTGATGAAAC
CATCATTGTCATCAGAACACCAACAACAGCCACTACTGCCATAACTACAACTGAGCCATGGAACAGCACTTT
TACCTCTACATCCACTGAAATGACCACCGTCACCGGTACCAACGGTTTGCCAACTGATGAAACCATCATTGT
CATCAGAACACCAACAACAGCCACTACTGCCATAACTACAACTCAGCCATGGAACGACACTTTTACCTCTAC
ATCCACTGAAATGACCACCGTCACCGGTACCAACGGTTTGCCAACTGATGAAACCATCATTGTCATCAGAAC
ACCAACAACAGCCACTACTGCCATGACTACAACTCAGCCATGGAACGACACTTTTACCTCTACATCCACTGA
AATCACCACCGTCACCGGTACCACCGGTTTGCCAACTGATGAGACCATCATTGTCATCAGAACACCAACAA
CAGCCACTACTGCCATGACTACAACTCAGCCATGGAACGACACTTTTACCTCTACATCCACTGAAATGACCA
CCGTCACCGGTACCAACGGCGTTCCAACTGACGAAACCGTCATTGTCATCAGAACTCCAACTAGTGAAGGT
CTAATCAGCACCACCACTGAACCATGGACTGGTACTTTCACCTCTACATCCACTGAGATGACCACCGTCACC
GGTACTAACGGTCAACCAACTGACGAAACCGTGATTGTTATCAGAACTCCAACCAGTGAAGGTTTGGTTAC
AACCACCACTGAACCATGGACTGGTACTTTTACTTCTACATCTACTGAAATGACCACCATTACTGGAACCAA
CGGCGTTCCAACTGACGAAACCGTCATTGTCATCAGAACTCCAACCAGTGAAGGTCTAATCAGCACCACCA
CTGAACCATGGACTGGTACTTTTACTTCTACATCTACTGAAATGACCACCATTACTGGAACCAATGGTCAACC

AACTGACGAAACCGTTATTGTTATCAGAACTCCAACTAGTGAAGGTCTAATCAGCACTACAACGGAACCATG
GACCGGTACTTTCACTTCTACATCTACTGAAATGACGCACGTCACCGGTACCAACGGCGTTCCAACTGACGA
AACCGTCATTGTCATCAGAACTCCAACCAGTGAAGGTCTAATCAGCACCACCACTGAACCATGGACTGGCA
CTTTCACTTCGACTTCCACTGAGGTTACCACCATCACTGGAACCAACGGTCAACCAACTGACGAAACTGTG
ATTGTTATCAGAACTCCAACCAGTGAAGGTCTAATCAGCACCACCACTGAACCATGGACTGGTACTTTCACT
TCTACATCTACTGAAATGACCACCGTCACCGGTACTAACGGTCAACCAACTGACGAAACCGTGATTGTTATC
AGAACTCCAACCAGTGAAGGTTTGGTTACAACCACCACTGAACCATGGACTGGTACTTTTACTTCGACTTCC
ACTGAAATGTCTACTGTCACTGGAACCAATGGCTTGCCAACTGATGAAACTGTCATTGTTGTCAAAACTCCA
ACTACTGCCATCTCATCCAGTTTGTCATCATCATCTTCAGGACAAATCACCAGCTCTGATTACAAGGATGATG
ACGATAAGCTGGCAGTCCCCGCCTCGAGAAATCAATCCACTTGCGATACGGTCGATCAGGGGTATCAATGCT
TCTCGGAGACTTCGCATCTTTGGGGCCAATACGCGCCGTTCTTTTCTCTATCAAACAAATCGGCCATCTCCCC
TGATGTTCCCGCCGGATGCCAAGTCACTTTCGCTCAGGTTCTCTCCTGCCATGGAGCGCGGTATCCGACCGA
CTCCAAGGGCAAGAAATACTCCGCTCTCATCGAGGAGATCCAGCAGAACGCGACTACCTACGAGGAGAAAT
ATGCCTTCCTGAAGACATACAACTACAGCCTGGGCGCGGATGACCTGACTCCCTTTGGAGAGCAGGAGCTG
GTCAACTCCGGCGTCAAGTTCTACCAGCGATACGAGTCGCTCACAAGAAACATTGTCCCGTTCATCCGATCC
TCAGGCTCCAGCCGCGTGATTGCCTCTGGCAATAAATTCATCGAGGGCTTCCAGAGCACTAAGCTGAAGGAT
CCTCGTGCTCAGCCCGGCCAATCGTCGCCCAAGATCGACGTGGTCATTTCAGAGGCCGGCACATCCAACAA
CACTCTCGATCCGGGCACCTGCACCGTTTTCGAAGATAGCGAATTGGCCGATGACATCGAAGCCAATTTCAC
CGCCACGTTCGTCCCTTCCATTCGTCAACGTCTGGAGAACGACTTGTCTGGCGTGACTCTCACGGACACAG
AAGTGACCTACCTCATGGACATGTGCTCCTTCGACACCATCTCCACCAGCACCGTCGACACCAAGCTGTCCC
CCTTCTGTGACCTGTTCACCCATGAAGAATGGATCAACTACGACTACCTCCAGTCCCTGAACAAATACTACG
GCCATGGCGCAGGTAACCCGCTCGGCCCGACCCAGGGCGTCGGCTACGCTAACGAGCTCATCGCCCGTCTC
ACCCACTCGCCTGTCCACGATGACACCAGCTCCAACCACACATTGGACTCCAACCCGGCTACTTTCCCGCTC
AACTCCACTCTCTATGCGGACTTTTCGCATGATAACGGCATCATCTCTATCCTCTTTGCTTTGGGTCTGTACAA
CGGCACCAAGCCGCTGTCTTCCACGACCGCGGAGAATATCGCCCAGACCGATGGGTTCTCATCTGCCTGGA
CGGTTCCTTTCGCGTCGCGCATGTACGCCGAGATGATGCAATGCCAGTCTGAGCAGGAGCCTTTGGTCCGTG
TCTTGGTTAATGATCGCGTTGTTCCGCTGCATGGCTGTCCGGTTGATGCTTTGGGGAGATGTACGCGGGATAG
CTTCGTGAAGGGTTTGAGCTTTGCCAGATCGGGCGGTGATTGGGGGGAGTGTTTCGCTTAG

下划线处为 *fs* 的碱基序列，其余为 *phyA1* 的碱基序列，插入片段总长为 4 668 bp。

附图 2　*fs/phyA1* 序列

Attached Fig. S2　Sequences of *fs/phyA1*