

## Appendix S1

### Sequence annotations of wheat (A and B genomes) and barley FD-like genes used in phylogenetic analysis

All translation start sites, splicing donor and acceptor sites and stop codons are in red. Exon sequences are also highlighted with colors.

#### TaFDL2

```
>TaFDL-A2, IWGSC_CSS_1AL_scaff_3943384
ACGGACTCCAGATCAGCCCTCCCAGAGGTTTTAGGGCTTGGCGGGCGGCTCCGTTATTGTAACCGTGTGAATCCTTCTCCTTTATTTTCTCCCCG
AAAGCAAATATATAGAGTTGGAGTTGAGGTCAGAGGAGCTCCAGGGGGCCACGAGGTAGGGGGCGCGCTAGGGGGCAGGCACGCCCCACCCCTC
GTGGCTAGGGTGTGGGCCCTTGGTCTTCATTTTTTGAAGGACTTTTTATTATTTCCAAAAAGACGTTCTATGAAGTTTCAGGTCATTCGGAGAAC
TTTTGTTTTATGCACATAAATAACACCCATGGCAATTCTGCTGAAAAACGCGTCAAGTCCGGGTTAGTTCCATTCAAATCATGCAAGTTAGAGTCCAAAA
CAAGGGCAAACGTTTGGAAAAGTAGATACGACGGAGCCGTATCAGAACCAGTCCAGAGTTTGGCGGCTGACTCTTCGGGTTGCTGGACTATATG
ACTAAGGTCATTGGTGTTCAGAGGCCAGACATAGGTACCTTGAAGGCTGTCTCTAAAGGCATCCTCCAGATCTTCCAGCTACCAATGGAGTTCTCT
AGGAGGCTGTTTAAACAGTGTCTGCTGGTCTTTCAGCTTTAAGGGGAGGTATTTGATGGCATGGAGATCATCATCGCGAGCCATGTGAATATGGA
GAAGAAAGTCCCAATCCATACCCGCGGATCGGTCTGTTTATCATATATGCTTCAATGTTTACAGATTTAAACCCTTCTGGGAAGTGGTGTGCATTAC
CTCATTGGTAAAGCATAAGGGGTGTGCGGGCCCTCTGTATCGGGCAACGTCGTGACGGAGTTCGGATGACATCCATATTCGGTTTTCCGGCCGGGAG
AGGTTATGCTTGTGCGGCTAGGCTTGATGACCGTCATCTCGTGTGGGGCACGCCCTCGATCCATAGATTGATTTGCCTGACCGACTCTATTGT
CCAGGTCCTAGCGTAAGTCGTAGGTATAGCCCGAGCTGTACCTCTTTGCCCTCGACGGCGAGGTGGTAGGGTGGTGTTCGGCACAAGCAACCCG
TTTATCTCGCCACGTCGTGGTCTGGTTCATCAGTGTGGTCATATCTTGACGGTATTGGCTCAAGGGCCCTCGTCTCAAATTTAGGTAGTAAAC
CGACACTTTGGATAACTCTTTGTTGGGTGCTCGAGGCCGATTTCTTTGCCAGCTAGGACTTGGGTCCATCTGCCATTGAGGGTATCATGTTACAGTT
TAGAGCTGTTGTTGCTTCTTCTTTAGGCTTTGCGCAGTTGCGATTAGCTGACGCTTAAAGCGCTCTTCTCGAGGGGTTCTCTGGCACGATGAAGT
CTTCGTTGCCGAGGCTGACGTCATCTCGGAGATCGGTAGATAGTTACTATCTTCCGAGTCCCTCATCTCTGACTGGCTCGTGGGGTTGACTTGTCTC
CTCCTCCCATTCATCTCTCGACCCTAGTCTGGTGGGTGAGTTCATCGGATTTTGGCATCGCCGGGGTGTATTTTTCTCCGCTGCCGGTGTGCTT
TCCTTTTTGCGACCGGATTTGAGCGGGCCCTTAACGTCGACGCTTTGGTGGTACCTCAGCGGGCTTGTCTTGGTGGATCTTTCTACCTTCTT
CGTCGCTCTCTTTGGGTGTATCCACCATATAAACATCATATGTGTAGGTAGTCTCCATGCCTAGTGAATGGCGGGTCTTGGCTTTGTTGTCTCC
GACATCTTCGTCACCCGTCGATGTCTTCAGAGGCGTAGTCTAGCATGTCTAGTCAATCTCGACAATGGCTATTAAGTGGTGGTGGTGGGATGA
TAAATTCCTGCTCAGCCCTAGTCTGGTGGGTGAGTTCGGAGGCGATATCCGTAATGGGTGAGGGATCGCATTAAAGTCCAAAGGCTCGT
TTAAGAGCGAAGGCCGGACGGGAACCGAGGACCTGTAGGGCTAGGCACGACAGATTTGCCAGGCTGTGCTCACTAGATTACAGACTTGATAGTTT
GGAGTTTGCATCTGAGCGGGTTCGGTCCCGATGACAGGGAGGGTCTTGTGTTGATTCAGGCTCGCCGAAGACATAGTTGCCTCCGGTCTCTG
GAGAAAAGTTCATAGTAGGAGAGAGTCCGGTGGGTTTCAGATAACCATCTTCGGATGAAGTGTCTACCCTGGATATAAGGCTAGGGCAGGGATGA
TAGTTGGTCTTGAAGTGGTGCATGGTGCAGGGTCCGATAGGTTTCTCTTTGGAGCAGAGGAACAATGTGCGAGGCCGTTGAACCTTGAAGATCAG
GTCTCTCGGATGTGCGCAACGTAATTCAGGCTCCCGAATCTGATCTGATGACCAGGGGCGTAGTTGTGCGATCTGTTTGGAGTGACCAATCGAATTA
GCACGCAGAGCGAAGCCGCCAAACACAAAAGCTGACCGGGAAGGAAGGTTTCCCGAAGAACAGCATCGTTGTTGACGATTGAACGAGCCATCGAAC
CTTCTGCCGATGACATAGTGAAGTCTCAATGAAAGCACAATGTCCGTTGTAACAAACCGCCGATCTCGAGTAGGGGGTCCCGGACTGTGTGTCTAA
GGATCAAAGGTAACAGGAGACAAAGGGGACCTGAAGTTTACCAGGTTTGGGCCCTCTTAATGGAGGTAAGACCTACTCTCTGTTGATGACTTT
GATGAGTATATGGACTATAAGTGTGATCTACCTCGAGATCGTAATGGCTAAACCCTAGTGTCTAGCCTATATGAATCCGATAGCCTCTACGGAC
TAAACCCTATAGTTTATATAGATACCGAGGGGCTAGGGTGTACAGAGTCCGTTTACAGAGGAAGGAAACTATACCCAGACGCCAATCTTGCCA
TCCACTCAAAGGAGAGTCCATCCGGACATGGGGGAAGGCCTTCTACCTTATATCTTACCACCCATCAGTCTACCCATATCACACAGCCACCCG
AGGACCCATAAATCCAGGACTCCCTCAATGGCAAAGCCACCTTTCATCATTTTTATACATGTTGCGGATGGGACTCTCCTTTGAGTGTGAAAGGCG
TGCATGACTTAGGAATGGAGATGTGCTAGAACCCTGGGTTCTTCTTATATAAATTAATGGTATTTTCACTTAATACTCTATCTGAGAGTTCTCAAT
ATTTAGCAAAGTTGTTCTATCAACAGATAAAAACCTTGATCAAAATGACAAAGGCATTTGTTTGTGGAGAAAGAGGTGGCTTTTCCAAATGAAACAT
TTGATTTGTGTAACAGGAGAAAGATTTCCCACTCCTTAGCCATAAAGATATGTGGCCATGAAAAGGGAGGGGATTCAGTGGAAACAGGATGGCTGG
GCGGTAGAGTCTGGAAACACTTGTGATTCCATTTTTGGACCCCTAGCTCCATGGAACAATAATGCTACTGCGGAAACATGGAAGAATGCAATCTTA
GATCAAAACACTATGTGTGTAAGCTTGATAAGGGTCAAGTTACTTGTACATTTGATTAGTATGAACCTATACTCATGTGTCTCGAGAACGCTTTGC
TTACTACTCTGTATAAGAGAAGTTTCAGGCTTGTCTTTGCTATAAAAAGGATGAAGTACCTTGCTGCCCTTGTACTACTGTTACTTGTACTT
GTTACGAATTATCTGTACAAAACCTATCTGTTACCGTACTTTTTCAGTACTTGCAGAGAATACCTTGTAGAAAACCGTTGTTATTTCTTATGTCT
CTCGTTGGGTTCAATACTCTTATTTATCGAAAAGACTACAATCTATACCTTGGTGGTCAATATTAATCTTTTTTGTATCGCTCGGTCATTTAATCA
TTATATGAACTCTAAATCTACTGTATTTTTACTGCGGTGGTCTATCTTTTTCAGGGTCACTGATTCTGTGAGCCCTTGTGTAACGTAGAAAAATCA
AGTCATAGCCGAGGGTCTGCCATAAAGACACAGACGACACGCGTGTAGATGGCTCGCACGATGCCTATTCAATTGTTGCTCCTGTGTTGACCCCC
ATTAACGGCATTATATTTCCACCTTCGTTTTGGCAAATAAACAGACACTGACATACAGGCCCTGAGGTGTCTACATGTCTATATATTTCACTATTA
CATGTGAGTCTCGGAGTCCCTATGCTCAGTATATGCGCCAGTAAACGACACCTACATTTGACCCGAGGAAATCACTCGTCTTGGATATTTTTGAG
TGTGGGACGAGTGTGAGAGAGCAGAAGTGAAGGACACTAGCTGAATGGGGCAAAATTAAGGAATACTAAGTAAGTGAAGGACCAAAAAATAGAAATCC
CCAATTTTATATGAAATCTAATCACGAATTTTCACTCAATTTGTTGAAAAAAGTTTGAATGTATGCGGTTATATGTTGAAATGACGGTTTTCCGC
ATCCGTGTCTGCGGACTGATCACCTTCTACTCGCGGACGTAAGTGGAAAGGAAATTAAGAAGTTGCGGCTGGAGATGCTTTAGCCCATCGACATCGT
ACTGACGCTCCATTTGATCGACAAAAAACCTCACTTTGCATCGTTAATGTTTTCTTTGTTGGAAGCTCAAACCTGGCACCCGACAGCTCCGGA
TCCGGCACTTTTTATCCGATAGCCGGGGTGGCTAAACACCCAGGCCAATTTCCGTCCTGTGTTGGGCCAATTTGCCCCCTCGCCACGGTTTCGC
ATCAGGGCCCTCCCGTCAAGTTTCTTCTTCTCTCACTTCCACTCCACCGTGGCTGCCCTCCGCGTCCCTCCTCCTCCCTCCCAATGGCAGG
CGCCAGCTCAGCCTCAGCCAGCTGTGACCGCCGCGCGGGGCTTGTATCCGGCCAGGCGGGCGGGAATCGCGGGGTGCCCGTTCAATTGGCG
CGGACTCCAGTCCGGAGTCCGGAGTCCGGTCCGACAGTTCGCTCCAACTCCGCTGGTCCGCTCGCTCCTCGCTCCGGAAGCAAGTCGAGGTT
GGGTTAACGCTTCTGCGCTCGTCCCGTGTGCTCGTGTTTTTCTTCCATCCACTCTGTCTTCAATGACGGTCTGTCTCAAGACGGTCTGCGATCTGTGACAA
ACATGCTACTGTCTCATAGGAGGTCGTTCCGGCGCGCTGCTGCCGAGTGCCTGCTCGTGGATCTGCGGTTCCGGGACTTGTGACCGGGTCTT
TGCCGGTGGAAAGGGGGTGTCTTTGGGCACCGTTGTTCCCGAGGTGTTTGTCCCATAGGGGGACAGTCCAAAGAGACCGCGGTTCTATCTCAG
```

GCAATGGCGTTCGACAGTTCGACAGGAGGAGGCGGTGGCGGCGCGGCTATGCCGGCCAGGGCAGCGCGGGCAGGCGCAGGCGCTGGGGAGGCAAG  
GTTCCCTGTACAGCCTTACCCTCGATGAGGTGCAGAGCCAGCTGCACAGGCGCTTGTCTTAGTATGAACCTCGACGAGCTGCTCAAGAGCGTGTTC  
TGACGGCGTGGATCCTGTGCGGCGGCTGCGCGGCGGCTGAGCGGCGCCGCTGCTGCCAGGGGAGCATCACCATGCGCTCCGGACCTGAGG  
AAGAAGACCGTGGACGAGGTGTGGAAGGGCATCCAGGATTGCGCCGAAGAGAAGTGGCCAGGAGGGGTAGTCGGCGGAGCGGGAGAGGCGCCGACCT  
TTGGGGAGATGACACTTGAGGATTTCCCTGGTGAAGCTGGAGTTGTCGCTGAAGGGCATTGAAGGATCCGATTGACTTGCCAGCTAACATGGGTGC  
GGTTGGGAGCAGTGAATTTGAGGCTGCTGCGCCAGTTTGAACCCCGAGCGCATTGGTTACAGCAGTACCTGGAGCCCGAGCATCCACGCTGGCA  
GGTCCCTTTCATGGCAAGTATTTGGTCCCTCAGCCATTTGCTGTTGCTACAGCATATCATGGAACCAATTTACCCGATGGCCAGATTACGTCAC  
CAATGCTCGATGCGCTTTCTGCTCCTCAGACACTAGCGCGCAAGCTGGTGCCTCAGATGGTGAACCTGATAAAAGCTAGAAAAGAGGCGAGAAG  
AATGATAAAAAACAGGGAATCAGCTGCACGGTCCAGAGCGAGGAAGCAGGCTACAGCTATTGTCCTGCTATTCCTGTTTTCTTACGCATTGTTA  
TGCCCTGTATAATGTTATGATTGCAGCATCAAACCTTTGTGAAAAGTTATTGTTGAATGTATCGATTAAAGTATTTGTATTACATTTTGTAGTCTC  
AAATTGCAAGAGTATCATTAGGTACTCCCTCCGTTTTCTTACTTCGCATATAAGATTGTTTGAAGTCAAACCTTCATAAAGTTTGAGCAAAATTA  
TATAAAAAATATCAACATCTACAATACTAAAGTTATACAGTATGAAAATTAATTTCCATGATGCATCTAATGATATTGATTTTGTATTGCGAATGTTG  
ATATTTGTTTCCATAAAAGTTGGTCAAATTTACAAGTTTGACTTCAGACTAACTTATATGCAGAGTAAAAAGAAATCGACTATGCCACTGGAGTA  
GCCTATTGAGTTATTCTCATTCCATGTCACCTACTATATTAATAAAAAATATAGCAATAACCTATTGCATTCTACTTGGCAGCTTATACTAATGAG  
CTTGAAAACAAGTGTCTCGTCTAGAAGAGGAGAACGAGAGGTTGAAGAAGCAGAAGCTACTTTGCTTCTGTTACTGTAACACTGTTACTTTTCCG  
CCCTTCTTTTGGTGGAGGATATTTAACTACAGCATTTCCAACTGTTGTTGTTAGTGTAGTGAACCAAGTTTATGTAACAATTTTATTGCGAATGAA  
GCTATTTTGTTCACACTAGTCGATCGTTCACTTCTTTTTACTTGGGCTCAATAATATCATGTGTAATAAGTGCATACTGATGTGATCATGT  
TAGTTAATCCATAGTACGACCCACACAACCTATTAGTATGATTGCGACCTGATATATATGTCACCTGCTGAACCCCATATGATCATTTGC  
TACTTTTTTGTCCAGTATGTTGAGAAAACATAGTTAGTTACCAGGCTGCAGACAGATGCAGTGTATCTATTGTTGTTTTTATGTTCAAATA  
CTATTGGAGGCTGTATGTAATGAAAGTGGAGTCTCAAAGTATTTGCTTCTGCTTACTGTTAGTGAACCAAGTTTGGCATTGTTTTTATGTTA  
CAAGGCCAAACATACCATAATGTATATAAACCAACTGAATGGAGCTAGTTTTTGTAGCTTGAACCTAGTAATTTTGGAGATATAAGCAGCTGGTC  
ATTCGAATTTAGAGGAACTCTTATGAAGTTCTCGAGCATCTTATTTAATGAAATACCCTACTGAATGATTTGACCGATGTAGTTAGGCTAAGCA  
TGTCGATGTTTTCGACTTGAATGTGATGTGCATGGCTACAACAATTTAATGATATGGAAGCAGAAAAACTGCTATTTAATGACTGTGATGAGG  
GTTCGCTATAAATATTTTGTGAGCATGATGTAATGACTCTTGTCTTCAATTCAGCAAAACAATGCTGAAAGTAAATAAACACATATGACGAGTA  
TTTCAGCACTACATGCTATTCCATAAAGCAGTTTGTACGAAGAACTGCAGCATTAATTCATAGAACCTTATTGCCCCCTCTCTACAGTGTAGCAATT  
CAGTAAGATGCTTGGCGCCCTTACGGCATTGCTTGGTTGATCAAAACTAAGTTGCTGCTGAGAATGAAATATATAGATAGGTTATCTTGTATGAAC  
TTTTGTTTGAATCAATGAATCATGGCTCTATACTTGGCGAGTTAGCAGTGTAAATAGAAATGCTTCCCTGTAGTCTCCGTAACAATCTAAAAAGAA  
ACCCGCTTTTATGAAATGATAAATGACAAACCTGGAGTTACCAACAGATGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTGTT  
ACCACACTTAACAACAGATCAACATTTGAAATGAATACATTAGACTTTGACTCACTAAATCATAATCACACGTGAAGCAACAGAGCACCGGGTAA  
AAGAAAACCCAGAGAGTGAATCCATTTGGTCCCTGCAATGGGTGCTGCCATTATCTGTTAAGACCACATCACCTAAAGATGATGCTGGTGTAT  
ATTAATCATATCTAGCAATATTTGTAGTCTGTTCTTTTTTTGCGCAACACAAATCATATCTAGCAATATCTAGCAATATTTCAATTTGCTACTTT  
GTGCTATAAATATTTTTTGTGAGCATGATGTAATGACTCTTGTCTTCAATTCAGCAAAACAATATCCTCACACTCTTTTTGGATGCTAAGCACT  
CCCTCTCTAAACAATATCCACACTTCTTTTGGATGCCAAGTAGCTTATATATGTTATATTGATGTCATTTCTGACGCCTTCCATTTCATATTAT  
GTATATTGATGTCATGCTGACGCCTTCCATTTTCATGATAATTTCCAGAGTTGGACATGATGATAAACCCTCCGCGCTCCCCAGAACCCCAAGTATC  
AACTCCGGAGAACAGTTCTGCCCTGTTTGA

>TaFDL-A2 CDS, extracted from IWGSC\_CSS\_1AL\_scaff\_3943384  
ATCATTACAGGCAATGGCGTTCGACAGTTCGACAGGAGGAGGCGGTGGCGGCGCGGCTATGCCGGCCAGGGCAGCGCGGGCAGGCGCAGCAGGGCCTGG  
GGAGGCAAGGTTCCCTGTACAGCCTTACCCTCGATGAGGTGCAGAGCCAGCTGCACAGGCGCTTGTCTTAGTATGAACCTCGACGAGCTGCTCAAGAG  
CGTGTTTCTGACGGCGTGGATCCTGTGCGGCGGCTGCGCGGCGGCTGAGCGGCGCCGCGGCTGCTTCCGAGGGGAGCATCACATGCTCCTCCG  
GACCTGAGCAAGAAGACAGGTGGAGGAGTGTGGAAGGGCATCCAGGATTGCTGCGGAGAGAAAGTGGAGGAGGTTGCGGAGGAGGTTGCGGAGGAGG  
AGCCGACCTTTGGGGAGATGACACTTGAGGATTTCTGGTGAAGCTGGAGTTGTCGCTGAAGGGCATTGAAGGATCCGATTGACTTGCAGCTAA  
CATGGGTGCGGTTGGGAGCAGTGAATTTGAGGCTGCTGCGCCAGTTTGAACCCCGGAGCGCATTTGGTTACAGCAGTACCTGGAGCCCGAGCATCCA  
CGCATGGCAGGCTCTTACATGGCAAGTCAATTTGGGTCCTCAGCCATTTGCTGTTGCTACAGGTGCTATCATGGAACCAATTTACCCGATGGCCAGA  
TTACGTCACCAATGCTCGATGCGCTTCTGATCTCCAGACACTAGGCGCAAGCGTGGTGCCTCAGATGGTGAACCTAGTGAACCTAGATAAAAGCTGTA  
GCAGAAGAGAATGATAAAAAACAGGGAATCAGTGCACGGTCCAGAGCGAGGAAGCAGGCTTATACTAATGAGCTTGAACAAGGTTCTCGTCTA

GAAGAGGAGAACGAGAGGTTGAAGAAGCAGAAAGAGTTGGACATGATGATAAACCCTCCGCGCCTCCCCAGAACCACCAAGTATCAACTCCGGAGAACA  
GTTCTGCCCTGTTGA

>TaFDL-A2 protein, extracted from IWGSC\_CSS\_1AL\_scaff\_3943384  
MIQAMASQSQAGGGGGYAGPQGRQQAQQGLGRQGSLSYSLTLDDEVQSQLTEPLLMSMLDELKSVFDPGVDPVGGVAGQSEAPAPGLLRQGSITMPH  
DLSKKTVDEVWVKIQDSPKRSGEESRRRRERQPTFEMTLEDFLVKAGVVAEGLHKDIDLPANMGAVGSSVIEAAPSLNPGAHWLQQYLEPQHP  
RMAGPFMAHLGPOPLSVATGAIMEPIYPDGQITSPMLDASDPQTPRRKRKASDGVTDKVVERRQKRMIKNRESAARSARKQAYTNELENKVSRI  
EENERLKKQELDDMMITSAPEPKYQLRRRTSSAPV\*

>TaFDL-B2, IWGSC\_CSS\_1BL\_scaff\_3907952 RC  
GTGTGCGTAGGAAAATTTTGAAGTACTACGTTTCCCAACATCAACGAGCTAGTCAAGTAGAGGCATACTCACCATGATCCTATGTGTGCGTAGGAA  
AATTTTGAAGTACTACGTTTCCCAACATCAACGAGCTAGTCAAGTAGAGGCATACTAGTGACACTTTGTTTGTCTATGTATTACACATGTACTAA  
GTTTNNNGTTAATAACAATTTAGCATGAATAATAAACAATTTATCATGAATTAAGGAAATAAATAAATACTTTATATTTGCCACTAGGGCATAATTTCC  
TTCACGATGCACTCCAAGTGTCCAAGAACTCACCTTATCTCCTGCCGCCCTCGCATAATGCAAGATGTCGTGAATCCACTAGCGGTGCCCTTGAA  
GGTGGCAACCAGAACTTTACAAACAAGGTTAGAGCTCTCTCAATAACTTAATTAAGAGGATCCCAACACCACCATGGAGCTTCAACCAATAGAATG  
TGATTCTGAGGTGACCTTCTGTCTAGGGTGCCAAACACCCAGGAGTACAAGATCCACAAGAAATGTATGAGGGAATCAAATTTCTTTGGTGG  
AAATGTAGATCTAGTCTCCTCCTCAATCCTTATCAAATCAACAAGTTGGTTGGCTAGAGAAGGACATCGGGTAAGAAAACTTACGGCATAAT  
GGAGGAGAGAGAGAGGCAAAATGGTAGGAGGTGGTCTTATATAGTGGTTCTCAGATTCAACTACCATGTGCAGAAACACACAAGGGTGATACA  
ATCGTTGGGCCACTGGTACCAACCCTTAGGCATAAATGACACTACTACAAGACCAGAGTGGTACATCCGCCGGCGTCCAGGTTGTATCGGTAAT  
AAATTAACACCAGAACAACCGTTCAACCACCGCCTAGTACCGCACCCAGACCCGAGCGAAATCACCCGACTCAGGTTAGTTGAGGTAGTACAAGT  
CTGGTCAACTACCCAGAAGCGGTCTCTGGTGGTTGCTAAGTCCCTAACGGTGCAACCGTCCGTAACCTTGGTTGTACTGGTATATAAACCATAAC  
CAAAATAACCGGGCAGCAACCGCGGTATCGCACGCCATACTCGAGGCAAACTCACCTCTCGGGCGGTGGTTGGAACGGTGCAGGGCCAGTAGCAC  
CGCTGAAACTCGAACCGTCTGGCGCAGTGCACAACCTCCACACAGCAGCAAGCAACTACTGGCACTGCAAGTGCATCAACTTGGCAGT  
TTTCTCTGCATAGGTTAGATAAGAGACTCTCCTCGAAACGGAATGCAATATGGTGGGTGCATTATGTATTTATGTGCGTGTTCATTCCACCTATCC  
CTTTTGTATGCAGACTCACTCTTAATAGTACAAATTTCTCAACTAAAGAAATAAACAACATCAGAAATCCGTCATCGCTTTTTCATCTGAAAGG  
GTGTCCAACCGTCTTGTGCCATATAAGTATACCTGAGTAGCTTAGGCACCGGTTAGTCCGTGAATGTGCATCAACACCAAAACACATAAC  
GTGGAAATGCCATACCAACCCCTTGTCTGCTGCGGTGTCATGACACACATCGAGCAATGCCTGGCGTTTCCCTCATAGAATCAACATGGCAA  
TGGGTACCCACGACCCGCAACCCGACGGGTAAAACCCCTATTAGGGTAAACGGTTTGGGCAAAACCAATACCCATGGGTTTATAAATGGGAACAAT  
TGTACCCATCGGTAAGCCGGTATGTGTACGGGGAGCAATATCCATACCCGCTACTTGCATACCCGCATACGAAATACAAACCGTACCCTCGA  
CCCAAAATCACCTCCGCTTACCATGTGCATGAGTTTAAATGTGTGATCTTGTTTTGTGAACCTCATGATTTTGTCTTTGATTTTGTGTGATCTTAT  
ATAGTCTCCTTCAATTTGATCATTTTAAAGTAGGGTCCACAGAAGTAACTCAATAAAAGAAAATATAGAAAATATGTCCCTCTGTGTTGTCTGT  
AATTTGAAAAACAAGAAAGACATATATGAATGTTTCTTAAGAAGTTCACCTTACATGCCTACTCATCCATGAATGTAATTCGACATTGTTTGGTG  
CCACCTAGTCCATGCTTAATGTATCCACTTTTGTAAATTAGTACCATTTTATTCATCGCCCAACAAATCGTTATATGTATGTGATGAAATGCTA  
AAATGGGTATATATGTGTTCAAATTTTGAAGTATATATGCTGAAATTTTGTGTATATATGCGGAAATGCTAAAAAATACATGGTGAAGTATAAGT  
TGGTAAGGTGACCGAGATGAGTATTTTACCATTGGTATTTACCCGGTGTGATTTACCCGGTGTGATTTGAAACCCAGGTGCGGTACAGTACCGGTTGG  
CGAAAACATTGAGATAGTTAAGGGTTTGGGCGACATTACCCGCACTCGAACCCGGCGGGTCCATGTTGACATAGAATTGACGCCGACTTGCTT  
GTAGGCTTGTAGCAGCCACTGTGCGCGTCTGTGTGAGCCTGTGTGGAGCAGAGGCTCACAACTCGGTGTCTTCTCCCTTGCAAGCACTGGTTGTGCG  
CCGTAGTAGTGGAGCACGACCGCTTGCATCAGCCCGAGCAAAACCGTGTGAGAAGGGCGGAGGGCTCCGGCTTGCAAAATAGCGCAACAGGCTTC  
CTGAGGGGCTGCAACCGGAGGCATGAAAGAGCAGTGAAGAGTAACTCAATGAGGATTTGATGTCCGGATGAGATCTCGATCAGTCAATGGGTTGGA  
GAAAGCAGAAGATGGGAGGAGGCTTTGTTGAGGAAGGAGGATGAAGAGAGGGGGCAAGAGTGTGTGTGCTGTGCGGTGTATACGACGAAACGTA  
TTGCTCCCAAGCCGACAGCAACGAGGACTGCGCGTGGGCTAGAGAAGTTCCGCAACCGACGCGAGCGCAATCGGTTGGCCGATTGTAATCGCTTC  
CCATATTTTTTTTCCATATTTTTTGAACACAGCACAGACGCAAGCGTTTATATATATACACTCATAACATTACCCCTTACAAGGACACATGCACA  
TTTTCCGAGAGACTGAACCGGCATATCATTTTTGAGATTTTGAAGTTTCAAAAGTTCACCGCTCATAGTCAATGAAAACGTCCTCCCTCTAAGGCCCT  
ATTTGGTCTGTTCCGGTATCCCGGAGGGATCCCGTCCAGAACCCAGGGCTGGAAGCCCATGGGGCAAGTCAAGCCGTTGGAAGGCTAGCGCATTCTTGG  
TCGCTCACAACCTCGGGAAATTTCTGGCCGATCCCTGTGCTTTTCCAGGGAGAGCAATCCACGCTCGACAGGTGCGGAGAGAAAATCCGCGCATCCA  
CTCCTCTCACGCGATGGAGGCTCCACTAGCAACCTGGGGCGTGTCTCCTTGTCCCCAAACGACCAAAATGGTATAGAAGAGATTTAGGAAATCTCC  
TGCCGTGGAAGGACTCTCATATGCCATGAAAATTCGCCGCTGGGTTGCTCCCGGCTTTGATTTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCT  
ACATCGCCGAACTCTGAAATAAATACGAGATAAATAACAAGCACCGGACTTGAACCTTGTGAAATAAATATATCATTATCCTTTTAAACCATCCG  
TTGATTTTGTCCACATTAACACATCGACATCGTACTAGCAGCTCCATTTGATCGACAAAAGACCTCACCTTGTATCGTTAATGTTTCTTTTGT  
TGAAGCTCAAACCTGGAACCCGACAGCTCCGGATCCGGCACTTTTATCCGTAGGCGGAGGTGGGCCATTTCCGCTCCCTCGGTGGGCCATTTGCC  
CCGCTCGGCCACGGTTTCGATCAGGGCCATCCGTCAGTTTCTCCTTCCATCCACTCCACCGTGGCTGCCTCGCCGTCGCTCCTCCTCCTCCTC  
CTCCTTCCCCAATGGTAGGCGCAGACTGAGCCAGCTCTGACCCGCGCGGGGCTTGTATCCGGCCAGGCGGTGCGGAATCGCGCGGTGCCC  
CGTTCAATTCGACGCGGACTCCAGCTGGGAGGTGCGAGCGGGAGATCCGGTCCGGGACTTGCCTCCAATCCGCTGGTCCGGCTGTTCCGGAA  
GAAAAATCGAGGTTGGTTAAACATTCCTTGGCGGTTCTGCTCCGATATGTCTCGTGTTTTCTTCCCGAGTCACTCTGTTCATGAGCGAGTGTGCGAT  
TCTGTCTGATGAAAATATCAACATGTTTCTAGGAGGTTGTTCCGCCGCGTGTGCTGCGCGGTTCTGTTGATGTTGCTGCTGCTGCTGCTGCTGCTGCT  
CGGCTTTTGGCGGTGGAAGGGGCTGCTTTGGGCACTGTTTGTCCGAGGTGTTTGTCCCATAGGGGCGACAGTTCAAGAGAGCGCGGTTTC  
TCATTAGGCAATGGCGTCCCAATCGCAGGCGAGGCGCGGTGGCGCGGCTATGCTGGCCGGGGCAGCGCGGGCAGGCGCAGGGCTGGCGAG  
GCAAGGTTCCCTGTACAGCCTTACCCTCGATGAGGTGCAGAGCCAGCTGCACAGAGCCTTTGCTTAGTATGAACCTCGACGAGCTGCTCAAGAGCGTG  
TTTCCGGACGGCGTGCATCCTGTGGTGGCTGCTGCGCAGTCTGAGCCGGCCCGGGCTGCATCGCCAGGGGAGCATACAATGCTCCTCGTGGC  
TGAGCAAGAAGACCGGTGACGAGGTGTGGAAGGGCATCCAAGATTCGCGGAAGAGAAGTGGTGAAGGGGATTTCCGGCGAGGGGAGGAGGCGC  
GACCTTTGGGAGATGACACTTGAGGATTTCTGGTGAAGCTGGAGTGTGCTGCTGAAGGGCATTGAAGGATCCAATGACTTGCCAGCTAACATG  
GGTGGGTTGGGAGCAGTGAACGGCCGCTGCGCCAGTTTGAACCCGAGGCGCATTTGGTTACAGCAGTACCTGGAGCCCAAGCATCCAAGCATGG  
CAGGCCCTTTCATGGCAAGTCAATTTGGTCCCTCAGCCATGTCTGTGCTACAGGTGCTATCATGGAACCAATTTACCCGGATGGCCAGATTTACGTC  
ACCAATGCTCGATGACTTTCTGATCCTCAGACACTAGGCGCAAGCGTGGTGCATCAGATGGTGAAGTAAAGTTGATGATGATGATGATGATGATGATGATG  
AGAATGATAAAAAACAGGAATCAGCTGCACGCTCCAGAGCGAGGAAGCAGGTTACAGCTATTGCTCTGCTATCCTGTTTTCTACGATTGGCT  
ATGTCCTGTTATATGTTATGATCGCAGCATCAAAGCTTTGTGAAAAGTATTGTTGAAATGATGATGATGATGATGATGATGATGATGATGATGATGAT  
CAAATAGTCAAATGCAAGAATATCATTAGGTAACCTTACGTTTCTTACTTCCGATATAAGATTTGTTTGAAGTCAAACATCATAAACTTTGAG  
CAAATTTATATTAACAATCAACATCAACAATAAAGTATAACAATAAAGTAAATTTATGATGATGATGATGATGATGATGATGATGATGATGATGATG  
GAATGTTGATTTTTTTTCTATAAAGTTGGTCAAACCTTTATAAAGTTTACTTCCAGCAAACTTATATGCAGAGTAAAAGAAATGACTGTGCCAC  
TGGAGTAGCCTATTGACTTATCTCATTCATGCTACTCTATTAATAAAGAAATAGCAATAAACCCTAGTGCATCTACTTGGCAGCTTACAC



AGPFMASHLGPQPLSVATGAIMPEIYPDQIITSPMLDALSDPQTPRRKRKRGASDGVTKVVERRQKRMKRNRESAARSARKQAYTNELENKVSRLRE  
ENERLKKQKELDDMITSAPPPEPKYQLRRTSSAPV\*

>HvFDL-H2 morex\_contig\_137689 chr=1H cm=72.52RC

GCACCTATTCACCCCTCTAGGGGAGATCCACATCCCTTCAATCGTGCCCGGGAATTTCAAGCAGAGAAAACAGGAGCTCCTCCCTGGTCTGT  
CGACCATCGAGACCCCCAGCATCTCTGCTGCTCTCGCAGTCGGACGAGTCACTCGCCTGATGAAGGGAAAAGGCTCAGATGGGCTCGTCAGAATCG  
AGCATGGACACTTGCCTTGATGTGGCTTGATGAGCCACCGCATGCATCAACCGTCCAGCCGTGTGCGCTGAAGGCTTCCGACGACCCGCA  
CGGGACGCAAGGGTGGCGAGTGATACAACACTGACGGTGCCTGGACCGATCTCCGTGTGACACCACGCTAAAAGTGAAGACACCTCGAGCGGGTAG  
AGCGTCGATGTCCAACAGCGCTCTGACGCCACGCCAATCGTCTGCGGTGAAGCTGAGAGAGCCGAAGAGGATCTCACCGTGTGATGTCATCATG  
ATGACGAAAAGGATGAAAACCTCAATTCGCTAGAATTCGCTAGATGCGCAGCCCCACGGTGGGCGCAACTATCGAGGGAATGAACCTGACAATAG  
TACGAGGGGTACGAATGAGGGCGGAGTCTAGTACGGTGCCTGTTACACTCAGATGTACGAGTTCACGCCCACTCAGGAGTGGTAAAGACCT  
ACATCTCGAGCCCGAGGCTTGTCTTTGCTTATGGGGGTGTGAATACACGGGTGTTAACCTTGTTCAGGAGCTCAGGTGCGGCTTATATAGAG  
GGCGCCATACCAACCGAGCGTCATAACTAGGGCATTAATGAGAGTAACTCCGGGCTTACTTGAACTGCTGCCTTAACTAGAGTGTATCCGGT  
AACGCTAGGCTTTAAACACTTCAAGTGAAGGTAAGTCTCGCAGCGTTCGACACCTTCGCTCGTCCATGCCTTGCTCGTCCGAGTGCCTGGTGT  
CGCTTAAATGCGAGGAAGTCACTCCGAGTGCCTTCGTTTCCGAGCGAAGCATCAATGGCCCTGGACTTTAATGACTATGTGGGGCCCTTGGAGG  
CGCTGAAATGCATGTCCATGGCCCTTCTTAAATGGACAACCCATCAGACACCTGACCCGAAACCTAGCCAAGGTAAGGTCAGCAGCGGAGCG  
TGGGAGGCTCTATCGACGGATTGGACAGATGGGAGGAAGGAGCGGGGCGAGGGGAAGTCTGTTGGTGTGCCACCCGCGCCGGGACTCGTCGAAAT  
CGGCTGGCGTAGTGGTGTGTCGCGACGACGGCAGGGGGTTCGCGGGGAGAGAGAGCTCGCAGAGAGTAAAGGAGGGGATGCTTGGCGCGCA  
CGGATGAAAAGCAGGGATCAATGGCCATCATGTTAAGTTTTTTCTGTTGGCTCAGTAGAATCGAGTGGCATAGGCGAGAAGACGCTCTTACC  
CGTAACCTTATGTAGGGTGTCTTTGTACCCGGGGGCTGTGAATACAGAAATTTACGGATTGTCCCTAGTATTTTCAATTAACCCATACCCGG  
TTGTAACACCTTTTCTTATATTTGCAATAAAAGCTACGCTGCAAGCATTGAGTCATTTTAATGAACCCATGAACATCGTACTAGCAGCTCCATTT  
TGTAATTTTGTATCGATCAAAACCGCACACAGTGTGTGCTGGAAGCTCAAACCTGGAACACGACACGCCCCGCCGAATGCGGCACCTTTTATCCGA  
ATCACCCAGGCCAATTTCCGTCGCCGTTGGGCCACGCCCTGTCCGCCACGGTTTTCTTCTCCTCCACTTCCACTCCCACCATGGTGCCTCC  
ACCGTGCCTCCTCCTCCCTTCCCAATGGTAGGCGTAGCTCAGCCAGTCCGACCCGACGCGGGCTTGTATTCGGCGGACGCGGGGGGA  
ACCGCGCGGGAGCCCGTTGAGTTCGCGGGGAGTCCAGCTCGAAAGTCCGAGCAGCGGAGATCCGGTCCGCGGAGTACCCTCGAATCCGCTGCTCG  
ACGTCGTATCCAGGGAAATTCGAGGTTGGATTGGATTCCTTGGCGCTCCCTCTTGTTCGCGCTTGTGTTTTTCTTCCCAAGTCACTTGTCCGGGA  
CGATTGTGCGATTCTGTCTGATGCAACGTCACATGTCATATAGGAGTTCGTCGTTGGTGCCTGCTCCTGTGACTGCTGGCGCTTGTGGAT  
CTGGGATCGGGCATGCTGGCGGGACTTCGCGGCTGCGGGGAGGAGCTGTTGGGCATCGTGTCTTCTGAGTCTTTGTTCCCATATAGGGCG  
ACCTGTTCAAGAGAGCATCGGTTCTCATTAGGCAATGGCGTCCGAGTCCGAGGAGGCGGGCCAGCCGGCTGCTATGCAGGCCCGGGGACG  
GCGAGCAGCCGACGGGCTGGCGCGGCAAGGCTCCCTGTACAGCCTCACCTTGTATGAGGTGCAGAGCCAGCTGACAGAGCCTTGTCTAGTATGAA  
CCTCGATGAGCTGCTCAAGACGCTGTTTCTGAAGGCATGGATCCTGTGCGTGGCGTCCGCGCCAGTCTGAGCCGACCTGGGCTGCATCGCCAG  
GGGACATCACGATGCCCTCCGGAGCTGAGCAAGAAGACCTGAGCAGAGTGTGAAGGCGCATCCAAGATTCCGCCAAGAGAGTGGCGAGGAGGTA  
GTCGGCGCAGGCGGGAGGCGAGCCGACGTTTGGGAGATGACACTCGAGGATTTCTGGTGAAGCTGGGGTGTGCTGCTGAAGGCAATTTGAAGGA  
TTCCATGACTTCCAGCTAAACATGGGTGCAATTTGGGAGCAGTGAATTTGCGCTGCTGCGCCAGTTTGAAACCCGAGCGCATTGTTTACAGCAG  
TACCAGCAGCAAACTTTGGAGCCCGACATCCAGCATGGCAGGTCCTTTCATGGCAGGTCATTTGGGTCTCGGCCATGGTGTGTTGCTACAGGTG  
CTATCATGGAATCGATTACCCTGAGGCTGAGGCTGAGGCTTACTTCCCAATGCTCGATGACATCTGATCCCTCAGACACCTGGGCGCAAGCGTGTGCCTC  
AGATGGTATACCTGATAAGGTCGTAGAAAGAAGGCAAAAAAGAATGATAAAAAACAGGGAATCAGCTGCAAGGTCAGAGCGAGGAAGCAGGTTTAA  
TTCTATTTTCTGCTACTTCTGTTTTCTATGATCGAGTTAGTCTCTTCACTGACGAGCTAGGCAAGAAGTCTTGGGGGGGCTAAACCTAGA  
ATAGGGATGTTTGGGGGCCAAAAGCATATGCTTTTCTAATCTGACCTCCCTCAAAAAGTTCCTTCAAGTATTTAATCTAGGCTGGGGGCCATG  
TCCTGACAGAACTCCGCTGCTGGTCTGTTATAATCTGATGAGTGAATCAACCTGAGTAAAGTAAAGTGAAGTATGTTGAGTGTGCTTAAATGAT  
TTCTGCTCATAGTTAAAAAAGTGCTAGGCGTTAATGTGTGATTTGCCACCCGCTTGTCTTTGCTGACCAAAAGCGCACGCTCATGCACAAGTAT  
GTGCAATATGTCGAGATTAAGCGCTAGGCATTTGCTATGGCTAGGCAAAAATGTGGCCTTTTTTAAACATGTTTTCTGTCACATTTTAGTCTAA  
AATTCAGGCATATCGTTAGTACTATTTACTCTATAAAAAACTAAAGTACTGTATTTCTGGCAGCTTACACTAATGAGCTCGAAAAACA  
GGTGTCTCGTCTAGAAGGAGGACGAGGTTGAAGAAGCAGAGGTAATTTGTCCTCTGTTTCTGTAACACTGTACATTTCTCCCTCTTTT  
GGTGGAGGATATCTAATACAGCATTTCCACTATTCATTGTAGTGAACCCGCTGCTTATTCAAATTTAGAGGAACTCTTATGAAGTATTTGAGCATGC  
TATTCAAATGAATATATCCACTGCATTAATGACCAAGTTTACTTAGGCTAAGCATGTCAATGTTTTGCATGGTGGACTGTATATGTCATATACT  
CCTATTTATTTTGAAGCAGATATGTTATACTCAATGTTTGGTGTCTTACTTCCCTCCGTTCTAAATATAAGTCTTTTTAGAGGTTTCCAGT  
ACGGACTACATCCGATGATNNNACATATTTAGAGTGATGATTCATTTGCTCCGATGATGTCATATAAAAATCAATGAGTTCATGAAAGGACTTA  
TATTTAAGAACCGAGGGAGTATTTGTTAACCATGTGAGTGAATTCAGCTGTGCATATATTTCTAACAGGCGGTTAGAATGCACCGTTGATTCTATA  
GAACTTTATTGGCTTCTGTGAGCGTAGCTATTCATTAAGATGCCTTGCGCCGCTGATTTTATTTGCTTTGCTGGCCAAAGGCTGAGTTGAGCGCTG  
AGAATTTAATACATACATGGGTTATCTTGTATGAACATTTGTTTGAATCATGCCCTATACTTGGCAAGTTACCGTGTATAGAATGCTTCCCGCG  
TTGCAATACAGATTTAAAAAATGAAAGCCAGTCTTTCATACAAATGCAATCCCTGGAGTTATCCATCAATACAGATTTGAGTTCATGAA  
GTAACATAAACACATGCCATGAACATTTGACAGGAACACACTTAAACAAACAGATCACCATAGAAATGAATACATGAGGTTGTACTCACTAAATC  
ATAATCACATGCGAAGCAACAAAGGACCGGTATAAGAAAACACAGAGACATATGCTTGTGTTTTCTGTATTTTGTAGTGAATTTCCATTTGAG  
CCTTGCATATGGGCGCTGCCATTTATCAGTTTAAACACACATCACCTAGATATGATGCTGGTCTATAAATCATATCTATCAATAGTTGTAATAA  
GTTGTTCCAGCCAGAAACACGACTAGTCTGACTAGTCTGACTGCTCGAGTCCGCTCGACTCATCCCAAGAGTCAAGTGCAGAGGTTGAGTCCG  
ACCTGGAAAGTGTGACTACGACTAGTCCGGGCTTCAAAAACAGAGGTTGTAATCATATTTCTTTTTTAGCTTAAACAAATGCTACCGGATTTAC  
AGTAGTCATTACTTTGTGGCTATGAATAGTTTTAGGTCAGCATGATGTAATGACTCTGTTTCAATTCAGCAACACTTCTTTTGGATGCTAAGATC  
GGAGGAGTAGCTTATATTTATGTTTATGTTTATGTCATGCTGATGCTTCCGTTTTCATGATAATTTCAAGGTTGGAGATGATGATAACCTCTGCGC  
CTCCCCAGAACCAAGTATCACTCCGGAGAACAAAGTTCTGCACCCGTTTGAAGTTCGATAGTAAATTTGTAGATACACTGCTCGTATGTTTTCC  
GTGGTTATGATAGAAACAGTTGAGCTGAGGTTGTAGCTTATCCAGCCCGGTTGAGGTTGTAGATGATAGCAGCCCTAGGCGACCC  
CTAGCATGCTCCAGATGATCTGTCTGTTCCGAGGCTTTGTCAGTGTGTGTAATCTGCTAGGTACATGTTTTAATTTTATCAGAGCTCCTCTTTGT  
ATATGATAAGTTATGACTGCTTTATCTCATATATGTCATATGTCGCGCATGCCCAGAGAAAGTGTCTTTTCAATGCTGTTTCTGTGACAGATG  
CGGTTGGTGTGACCTGGCGAACACTCTGTTTTGCTCCCTCCGTTTCTAAATTAATAAATCTTAAAAAATAAAGTCTTTTTAAAGATTTTTATTA  
AAAGACTACATAAAGCAAAAATAAAGTAACTATACTTTAAAAATGATTTTAAATATATCCGAATGTAGTCTTTTACTAGTAACTTAAAAAATAA  
TTATAATTTAAACCGAGGGTGAAGCGACGATCATCAAAGAGTCAATGATTTCTCTCTCTTAACTCTCCAGTAAACGGGAAATGGAGCCGAC  
AGTTTGGCCCTCCATTTGTTGTGAGATAGTGGCTCCCTGTATCCATATTTCAATGCTTCAACCGGGAGGTTGACGCTTCGATTTCTACCGTAGTGAG  
GGTGCAGTCCACATAATAATAAGTTGCTCTCAAATATTAACGACAGCAATTCATGTCATATTTTTCTTCTAGGAGAAACCAATTAAT  
AATGAATAATTTAAGTACTTATAAACCAGTGGCCATAACACCAACTCACCTGAGTTAACTTTACCTGTTTCTGTACTTGTGACATGTG  
CGAAACGAATCTCTGAAATCTCGCTCGTACTTTGTTGTAGTCTTTTTGCGCCCTAATTTGGTCTACTTCCGCTGCATTTAGTTCATGACTGAG  
GACTTTTCTCACTTGAATTTTCTCAGTGTAGAAATTAATAAATCGCCTATTCACCTCCCTTTAGTCGATAACACACTTCCTTGTCTTCTCT



TCGAGGATTTCTTGGTCCAAGCAGGGGTTGTTTCCAGGGATTCTCAAGGACACGAGCGATGTTGGCAATTTGGGTCTGATGGGAGAGGTGCCAC  
AGCAGCTGGAGCCACCGATTGCATCTGGGGCACAGTGGTTAGGCCAGTACCAGCAGCAGATTGCAGCTTACGCCATCAACACTCATCAGCATGTG  
CAACAAAATTTGGCCAGCTGCTTATATGCCAATTCAGTTAGTCCTCAGCCACTGCAATTTGTTGGCCCTGGTCCACTCTGGGGTCTGTTACTCTG  
ATGGACAGAGTACATCACCAATGATCAGTCCAATCTCTGATTCTCAGACACCTGGGAGAAAAGCGTGGTGTATCAGGAGATGTCCCAATAAGTTTGT  
GGAGAGAAGGCAGAAGAGGATGATCAAGAATAGGGAGTCCGGCTGCCCGTTCAAGGGCTAGGAAGCAGGTATATTTACCTCTCTGTTTTTTCCCTC  
TAATTTCTTTTATAGCAATGGAACATAGATAAAGATTTCATGAAGGGTTATCAACGGTACTTGTGTAATTTGGCTTTTCTGTGATCTGTGATC  
TGAAAAATGTTACAATAGGCTTACTTTACTTTCCATAATTTGCTTAGGGTCAGATCACTTACATTGTATTTGCAACAGGCTACACTAATGAAC  
CGAAAAACAAGGTATCCCGTTTGGAAAGAGGAGAATGAGAGGCTAAAGAAGCAAAAGGTATTTTCTTTTCAATACAAGTTTACTGAAATGCCACACTT  
TCAGTGGAAAGTTGGACTACCTGATAAGTAGCAGGGAATAAATGTGATTGCTCGTATTGGCAGGTGGTGTGAGTTTCATAGTTTGCAGTGTAAAGCAC  
TTAAGCTACCCCTTTTGGTGTACGGGTATGAGAGTATCATACTATAATCCTATGTATCTGCTTCCACTACTGGGGCCAGCCATTACTGGGTGGGA  
TAGGAACAATCTGGGTACAATGGACAATTCGACCTGTGGTTTATTAATTAATAGTGTAAATGTAACAATGAACACTACGAGGCTACCATTCTTTCTATT  
GGATATTGGAGTTTACTTCATTTACCTCAATTTACATGACAAATAAGGCTCAAGACCGTGTACTAATGAATTACATGTTAGAAAAGAAAACCTAGAA  
GACAATAGGGGCTCATTTGATTTTCATGAGAGAAGTGTATTAAGTCTTGTGGATATTCTAATGAACACTTCTGATTTGCTCCCTGCATTAGAATT  
TTAGCACAAATAAGTCTGCGGTCTAGCTCTAAAGGTAGAGTCTACTTCAAGTTATAGGTTGCAATAGAGAGGTAGGAACAGGAACTGTCTGCTGTAGA  
TTTTCCGGATGACATAGACCTGATAATGTATAAGAGTGAATAAGGGAATAACATATTACAAGAGTTTATACTCTGATTTGCCCTGAAAAAGATA  
TACATCTGATTTAGGGAATGCATATAAATCAGCAGGTTATGCATTTAGTATGTAGATACTCTGATTAGGAATGTCTACACGGGAGGCTTTGTTGTTT  
TTTTAGAGAGAGAGGGAGGATTTGTACCATGGATATGTGAGTTACGGTCAGCAGGATATTATGTACCTGGTGTCTCAGTTATTCTGTGGGATTAGT  
TACCATATTTCTGGAAAGATAGGGGAGTCAAGAGAGAAAACCTGGGCGTCCGGAATAAGGAGGGAGCGAAACGACAGCGCGCAGGGAGGAGTTT  
GACTAATCCAGGAACAGCGGTTGACGGGACAGGAGGGGCCATACCGCGACCTTCACTGACATATGAGGTCAACTCCAAGAATTAACACACAGGAG  
CTCTCCAGAGCTTACTTCATAGGAGCATAGAGCCTTTAGGACACTTCAAGACCGTGTACTGAAATAAATATCAGGCTAACATGGTATGTGTA  
TGTTAGAAATAGTGGTGTGCAAGGGAAAACGAGGTTTTATCCAGTCTCTGCATCATCAGTTTATCTAAAAGATTATATGACCACCATCGTTTAGGG  
CTTCTATGATTCGCATGATTTCCAAAATTCGGGAATAGGAAAACGTAACGAATAGAGGTGGCATGTCACTTCAATACTACAGGATTTGAGGATGTT  
TGATTTGTCACAGGAAAACCGAGGATTTCTTCAAAGAAATTTGGAGTAGATGCAAAAATTTCCCATGAAACCTAGTGCAACTGATCCTAAGGAAAAT  
TCCTATGTTTGGGAATGCATATAAATCAACACCCACATAGGAAAATTTCTAAAGATTAGAATTTCCAAAATTTCTCGAAAATCTTGAATCA  
AAGAAGCCCAATCTTGTGAGTGAGAGATATCCGGATATGTATCATGTATTGACTCTGTCTGCTTCTATGGAAGTGTAGATTTGATTACTGCACCATT  
TTGTGGTTCAGTTTTATGTTGTAGAGATGCATTAGCTATACTATGATTGTAAGTGGTAATTGAGTGGAAATGATTTATTTTAGGTGCTTAAAGATTA  
GGAGGGATCTGTGAGTGAACATGTTTATAGAACTCACATTTCTTTCTGTACTGCATAAATTTGAGTACATTAATTTCTCTTTTGTGGCGAAA  
ATAGTACGAATCTCCTTCCATTAATTTGCTTTCTAGTATTTCAAGATTTCACAAAGTGTACTACATACGAGGACAAAATGAGTGAATCTACACTTA  
AAATATGCTATATACATCCGTATGTGGTACTCATTTGAAATCTCTAAAAGACAATAATTTAGGAACGGAGGGAGTACATGGTAGTCTTTATCAC  
TGATACAAAGGTTGTGGCACCAGGGGTTAATTAACAATCTGTCAACAAATTTCTTGTGCTTATTTCTGTCTAATCTGCTTTCAGCCAAATGTTTA  
TCCACTGTAGCTATTAGCGAATCTTCCATGCATAACATTTGACATGCTGACCTTTTTCTGCCCTATCTTCAAGAGTTGAACATGATGCTTTGCTCG  
GTCCCTCTACCAGAACCCAAAGTACCAACTCAGGAGAACATGCTCCGGCTTTCTGACTGTCTGTCAGAATACTTTGCCTTGTAGATTTTAAAGTGGC  
GGCGCTCGTAAGGTTTGCCTCTTCCGTTTAGAATCGTTTGCAGGCTGGGAGTTCTTTTTGGCTTTATCCTTGCAGGATGATTTCCGGTGTGTAGA  
TCAGCGGAGCCTAGCATGTGCTGTGTTAGCACTTGGCACTTTTATTTACCTGTGTGGGAGGCCCTGCCACAGCCTAGTATGTAATCTGTGGA  
CTCATTTTAAAGTTTATCGGAGCTTCTTTCGACATGGGCTGTCTTTTCATGTAATGTCAGAGCGGTATGCAATTTGCTGTCTTTTCTTCCGAGAG  
TCAAGTTTACATTTACTTCTGACTCAGGTGAACGACGCAATTCAGGATTAACAAGCAATTTGGAATGTGAGAAATTCACATGAAACCTCAATG  
CGATTCGGTTTCTTGATATTGCTTCCGCTCTTGCATCCGTTTCAAAGCCATGTAGGCTTTCAATGACCAACTTGGCCAAAATACGTTTGGGCCAA  
ACAAAATTCGAAAATAAGTAAATCAGATCTTATGATATGGTGCATTTCCATGCAATCATTTGCTATGCTGGTCAAGAACTGTCTTATCCTGG  
ATGTTGTACACTATGCTGGTCACTGGAATTTGCTTATCTGGACGCGCTGCATCAATAACATGCAATGCAAGAGATGCTGTGTTATCTGCTCTGCTGT  
GGTTGTAAAACCTCTCTCTCCTAGTTAATGACAGGCAAAATTTTGCCTCAGTTTCAAAAACAAAACAACTAGTATGCTTAAAGTCAAGCAAC  
CTTCTCAATGCCGTATAAGTTGGATCCAACGGGGGCTTTTGGCTTTGCTGCTGCACTGCTTCTTGTGCGCCAGAATAATGGTGTCTCACC  
TGCCACTCGCTAGTTTTCAGGGCTGTGGTGCCTTTCAAACCTTCACTCCTCATGGAATGTGCTTTGAGTCTTTTGAACCCCTGGCTGGTTATGAG  
ACACGACGGTCTAAAGGTGACGATACACAGAGTGCGAATATACGTGGATGTCCCTTCACTCCAATCAGATGCACTCTTGGGAGAAGTGGAGAGCGTT  
GCTGGACGATGATGCCATTTACCGCCGTTTGGTGGCTGCGGTTTACACCACCACTGTCAGTACGTTATCTGCTTGTGATCTGCTATCCTCCCGCC  
GCCCGCGCGAGGTGAGGCACTTGAAGCTCCCTGCAAGTGGCACCCTAAGTGAAGCAGCAATACAGATGGTTGCGCATCCGAGGAGAGAAACA  
ACGTCGCGCATCAAAATGTCGCCATACACAAGGATCGTGTGCGAGTCACTGTCGCCGACAGAAATCATGACCCAAAACCTGCTTTTTTTTTCTA  
AAATAAAAACAAAAGCATGACCCAAAACCTGTAATCAAAGAAATCTTGGCAGCTGCAACGAGGTTCAATTTGGGCGACAGGGCGCACACCTCTT  
CTGGAGGGTAGATACCCGATTTCCGGCTAGAGGAATTTCCCAACAGTCTTACACGAGATGCCCAGAGAAATCAAGTGCACACACAGCATC  
CTTGGAGCTTTATCAGATGAAACTTGGGAAGGATGTGGTGGCGTCAATCGAAGCCGAAAACATTGACGCAATTTCTGGATGTGTGGCTATGGTGG  
CGGTGGCGGGTTAGGATGCAACAGCGGGGCAAGTTAAGTGGTCTGGGAGAAAATGGCCTCTTCTTCCGAAGTCTGCTACGCGGCAAGCT  
TGAAGCTTCGGAGGATCTCCACCGCAACAGCTTTCACTTGGGAAACGGGAGCGCAATTTGTTGCTGGCTCTCCGATGGTTTCGGCTCACCAA  
CAAATGTTGACGTTTCGATAGATTTGGCTGAAGAGGGTCCACACCAATCCGTTCTGCGATCAACAAGAGAGTGTGGGGAACGTAG  
TAAATTTCAAATTTTCTTACGCACAGCAAGATCATGTTGATGTATAGCAACGAGAGAGGAGTGTGCAACGTACCTCGTAGACCAGAAAGCGTA  
AACGTTATGACAACGCGTTGATGCACTGCTTACAGTCCGACCGATCTTAGCACCAAGCTACGGCACTCCGCGATCAGCACACGTTCA  
TCTCGGGGACGTCCTCTACTCTTGTATCCAGTTGAGGCCGAGGAGGTTTCGTTCAACAGCAGCGGCTGGTACGCTGATGGTGAAGTTACCGGCA  
CAGGCTTCCCTAACGACTACGACGATATGACCGAGGTGTGTAACCTGTGGAGGGGACCGCACATGGCTAAACAATGTCAACTTGTGTGTTCTG  
GGTCCCTCCCTGACCGTATAAAGGAGCAAGGGGGAGGCGCCCTGGGGCGCCAAAGGAGGGAGGAGTCTCCTCTCTAGTAG  
TAGTAGGACTCCTCTTCTAGTCCAACCTAGGAGGGAAGGGGAAGGAAGGAGAGGGAGAGGGAAAGAGGGGCCCGCCCTCCCT  
AGTCCAATTCGGACTCCCTTTGAGGGGGCACTCTTGGGCTGCTGCTCTCTCTCCCTAAGGCTCACTAAGGCCAATACTTCCCGAGGGGTT  
CGGTAAACCCCTCCGCACTCCGTTTCTCTGAAATCATCCGAAACATTTCCGTTCCGGAATATAGCCGTTCAATATCAATATTTGTCTCGA  
ACATTTCCGAGACTCTCTCATATGTCCTGATCAGTCTGGGACTGAACTATCTTTGGTACATCAAAAACATAAATCTATAAATCAATCGTTAT  
CGAACATTAAGCATGTGACTGAGGGAGTCCCGACTAGGGGTTGTCGGATAGCCGAACTACCATCATCGGCCGACTCAAAGACTATGAAGATC  
AA

>TaFDL-B4 CDS, extracted from IWGSC chr3E\_ab\_k71\_contig\_10749302  
ATCGGGAGTGGGAAAATGGCGTACAGCAGGGGCGTGGCGACGCGGCACGTCACAGCCGGGGCGGGCAGCCGGCACATCGCAGCGGGCCAGG  
TGCAGAGCTGGCGAGGAGGGGTCTCTGTACAGCCTCACCTCGACGAGGTGCAAGAACCATCTGGGAGAGCCCTGCGAGGATGAACCTCGACCA  
GCTGCTCAGGACCGGTTTCTGACGACCTGGAGCCGATGGCGGACACCCAGGCTGTGTGCCGAGCTCAAGCTCTCTGCGGAGGGCAGCAGT  
ACCATGCGCAGCCAGGCTTCAGCAAGAGCAGGTGGATGAGGTTGGAAGGGCATCCAGGAGACACCAAGAGGAGTGTCCAGGGGAGTGTGCGCGCA  
AGCGGGAGAGGACGCCACGCTCGGGGAGATGACACTCGAGGATTTCTTGGTCCAAGCAGGGGTTGTTTCCAGGGATTTCTCAAGGACACGAGCGA  
TGTTGGCAATTTGGTCTGATGGGAGAGGTGCCACAGCAGCTGGAGCCACCGATTTGACATCTGGGCGACAGTGGTTAGGCCAGTACCAGCAGCAG





GACGCCGAAAGAACTTGATAAAAACCTAGGAGAGCCTTACTGTTTATCACCACTGGACATGGCTTTAGAGCAAGCACAATAGGATGAGCAAGCACAAT  
AGGATGACGTAGTGGACTTAAATAGATAATTTTGTAGTGTAGAAAAAAGAGAAATGTGAGAGAGAAGGAAAGCCGGCTATTAACATAACAGTC  
AGCTATAACACGTGTTTCTAGACACTTTATGAGAAAGAAGTGTGGATTACATATCAATAAAGTAGTTCCTTTTTTGAAACGTATGCAAAAGCTTTGC  
CTTATCTCATTAAATTAAGAAGAAGTTTACACATAGTTTCAAGCATACAGTACACAGCAGGTCACATATAAATAGAAGGGTTCGTTTTCGCGGAATTA  
AATGTCTTAGAATTTAGCCCGTCAATGACCCATGTCTTGCTCGCTTTGATTATTGACACCACCTCTCGTGGTGAAGATTCCTTGTATACAGAA  
GACCCCTAGCATTTCTCTCGTTTTCAGATTCCCTGCACACAAGCATTTCGAGGAGATTTCGCTTTCTAGGATAGTTAGGTCATCCATCGTTGTCTG  
GCCACCATTGTTTACTGTTTGAAGATCACCTCATGAGGGTGTGCACACTGTATGCACATCCAATTATAAATCATGTTCCATACTCTTATGGTGT  
GGCGCATTTGAACATAAAGATGTGGCGTGATTCTGGTTCCTTTTGCACAACGACAAAGTTCGCAATTTGACCACCCTCTGTGATGTAGTTTGT  
AGAAGTCCAAATTTGTCTTGAAGAAGTACCAAGAGAAGAAATTAATCTTGGGGTGCACAAATTTGACACACCATTCTCAGTAAGCAATGGCCGC  
TGAGCAGCAACCATCATTTGGTGAATTTTCAGTGTTCAGGATGACATTGATCTCTTGGATTTTGCACCAAGGTCAAAAAATCTTGAATAATGTT  
TACCTAGATCCCTCCCTTGCATGTTGATTGACGGAACCAATCATTATTAATCATTGCCTTGGCAACGTAGGAGTTTGTTCGCTTAGAGAGGGCGA  
AAATGCCCGGAGCAATATCCTTCGGTTTTTACCAGAAAGCCAAAGGAGCGTCAAGAACTAGCCTTCTTGTCAATTGCCCATAGTAATCACGGTTGC  
CGAATAGATAAATAATTTGCTTTGTTTATCGTACGGAGTTTCGAAGCCAACCCATGCTCTTTGAGGATCCATCCAAGAAAACCAAAGCCAACCGCAG  
CGGAGAGCCCTTGCAAAATTTGTCCACATCAAGGATTCTGAGACCTCCAAGAGTGGTTCGGTGACATGCCGCTTTCCAATTTACCTTGCACTTTCCCA  
CCTGAAACGTGATCGGTTCTGCCACAGAACAAGCCCTCTCAATCATGGTAATACTCGCATTGATTCCATGTGGAATGACAAGCGCGATGATGAAG  
TAGGTCATGAGTGAAGTTAAGATCGACTTGACAAGGACGACCGGTCGGTTGAGTTAATGATGTTTCTTGCACAAAGGAGGCTTGGCCGCCACCT  
TGTCATCGAAAATTGACAGCCGACCGTCTTCGGGTTGTGGTGGACAGGTGTAGGGCAAGATACTAAAGAGGAAATCTCACATGGGTCATGGGTGG  
CAGGAAAACCGTGGAGGATATCATCGAGGTCAATGTTTACCGCAATGGATGGGAGCCACAACGCTTTTAGAGGATATCAATAAAGTAGTACTTTTT  
TTACGGGAGTATTTATTTACATTTAGTTATTTGACATGCAGGGTAAAGTTTGCATATAGATAACATGGCAATACATATAGCTATTAACCATGTTT  
TTAGAGCATCTCCAGCTCTCCCCCAGGGCGTGAATAGTGTCTGCTTGGGGTGCATTTGATGGAATAATCAGCCTGGGGGAGGGTTCCAGCCGC  
CCCCAGCCACCGATTTTGGCCATTTTCGACGCAAAATGCTCCACTTTTCGGCAAAATTTGGCCACTTTTGGCCCATATTCGCGCATGCTTTGGCACA  
GATTGAACAACAATAGTGTTTTTATCACATAGTCGACCACAGAAATCAATACAAATAAAAAAT

> HvFDL-H4, CDS, morex\_contig\_1572371 + morex\_contig\_7624

ATGGGGAGTCGGAAAATGGCGTTCGACGCCGGGGCGTGGCACCGGGCGGCGACCGCGGCAGCTCGCAGCGCGGGCAGGTGCAGAGCCTGGCGAGGCAGG  
GGTCTCTGTACAGCCTCACCCCTCGACGAGGTGCAGAACCATCTGGGAGAGCCCTGCAGAGCATGAACCTCGATGAGCTGCTCAGGACTGTCCTTTCC  
CGATGACCTGGAGCCCGATGGCGCGACCACCAGCCAGTATGTGCCGAGCTCAAGCCTCATGCCCGAGGCAGCATCACGATGCCGACCGAGCTCAGC  
AAGAAGACGGTGGATGAGGTGTGAAGGGCATCCAGGATGCGCCCAAGGGGAGTGTCCAGGGGGTGTTCGGCGCAAGCGGGAGAGGCAGCCACGC  
TCGGCGAGATGACACTTGAGGATTTCTTGGTCAAGCAGGGGTTGTCAACCAAGGATTTCTCAAGGATACGGGCGATGCTGGCAATTTGGGTCTGGT  
GGGAGAGGTGCTACTGCAGCCGAGCCGCGGATTTGACATCTGGGGCACAGTGGTTAGGCCAGTACCAGCAGCAGATTCAGCTGCCACCCATCGAC  
ACTCCTCAACATGGACATCAAAATTTGTGCCAGCTGCTTATATGCCCAATTCAGTTTGTCCCTAAGCCACTGAATGTTGTTGGCCCTGGTGCCACTCTGG  
GATCTGCTTACTCTGATGGCCAGAGTACATCAACAATGATCAGTCCAATTTCTGATTCTCAGACGCCCTGGGAGAAAGCGTGGTGTATCAGGAGATGT  
CCCGAACAAGTTTGTGGAGAGAAGGCAGAAGAGGATGATCAAGAAATAGGGAGTCCGGTTCGCCGTTCAAGGGCTAGGAAGCAGCCTACACAATGAA  
CTGAGAAACAAAGTATCTCGTTTGAAGAAGGAGAATGAGAGGCTAAAGAAGCAAAGGAGTTGAACATGATACTTTGGCGGGTGGCTCTACCGGAAC  
CCAAGTATCAACTCAGGAGAACATGCTCGGCCGCTTTCTGA

>HvFDL-H4, protein, morex\_contig\_1572371 + morex\_contig\_7624

MGSRKMASQPGRGTGGDAGTSQRQVQSLARQSLYSLTLDEVQNHLEPQLQSMNLDLLRTRVFPDDLEPDGATTSQYVPSLSLMRQGSITMPELS  
KKTVDVEVWKGIQDAPKGSVQGGGRRKRERQPTLGEMTLEDFLVQAGVVTQGFLLKDTGDAGNLLVGRGATAAGAADLTSGAQWLQYQQQIAAAPID  
TPQHGHIQVPAAYMPIQFVFKPLNVVGPATLGSAYSQDQSTSPMISPI SDSQTPGRKRQVSGDVPNKFVRRQKRMIKNRESAARSARKQAYTNE  
LENKVSRLLEEENERLKKQKELNMILCAVALPEPKYQLRRTCSAAF\*

## TaFDL5

>TaFDL-A5 Genome=A, IWGSC\_chr4AS\_V2\_ab\_k71\_contig\_5961634

ACTGATCTGATCATCTTAAGTCTTGTATTTCCTTCTTAGAAAATCCGGGTCAATAGGCCAGCTTCATACTCAGTTTGTGACATTGGTTTC  
TCACACAGAAACTGTGAAGAATAATTCATTTGATTGCGCTCCCAATGCTTAAAGAAAAATATTGGTCTTGAATACTCATCTGATTTTCAGCCGG  
CTTAAAGATGTAAAACCTGTCCGTTTATCATTTGCTAAAATTTGCTGGTTTATAAATATTGATGGCACCGGGTCACTACTGTAGTTAACATCAAGCTTG  
AAAATATACATCTTATATGCCATTACTTGTAGCCCCAAGTCTTAAGAAGGCAGCGTAGGAACAGCTTAAGACTTGTCTCAATATAAATGTACAA  
CCTTGAAGAAACCCGATTTGTTTCTCTCGGTCACTAGTCAAATGAATTTCCACATATGTAGCCCCAAGTGTGGGTTGTGATGCTTGCAGCAAC  
CTGGGACTTGTAAATGTCTGATGCCATAAAAACCTTCAACCAAGTGTAGCCCCAAGGTCGGGTCAATTAAGCAATAATGAACAGGACTTTATATAT  
ACTTCATTGAAAATAATATCATATGATGTAACCTCGCCATGGGGCTCGAACCACGTCACAAAGGTTAAGAGCCTTGTATTTTACCAACTGAGTAG  
TAGACCTTTCAATATAACGGATTAAGACTTGTGTACTTGAATTTTGCACAGGCAATTTGTTAGCCCCAAGGCGGCTCATACGTTGTGACAGA  
GTCGGGCTTCAATAAGGCAAGTAAGGAATGACCTTGCATTAGCCCCAAGTCCCATGGTGCATGCTGGCAGTGACATGAGACATGCATATTTGATG  
TAATCTCAACTGAATAATGTAGCCCCAAGTCCGGGTGCGAAGCCTGCAGCGACTCGGGACTATTCTTCCATTATAGAATAAATCATATCCATT  
GATAACATAATAGCCATTGCGCTAAAGCGCACTTTGAAAACCTCAATATACTGTTATTGATAACCATAAAAAATCCAGCCATGTTGGCTATTCA  
AGATTTGAATAAATAAATTCGCTGCGGTTATTGACTCTAGGATGCAATATACATGATTTTGGATTGCTCAAGGCAAGATATCTGGCAACATATAG  
TCTGCTATCAGGGCAGGTTATTTACCCAATATGCTCAATATGAGTCAATATAGTTAAGGCTACATGGCCTGAATTTGTGAAAACCATATGTCAATATG  
GTACAAAGATGAACCCAAAAATGTTCAATAGAAAATAATATATCAGAAAAACAAGGCTTTTATAGGACGCCAAGCTTAAATCTCAAGTGTCTTCA  
TGGGACGCACAACCGCTGAGTTAAACCTTATAAGCCGGACATCACACCAACTCGTCTTTAACTTTGACAAAGTTGAGGTTTGTATAACATGTC  
CTTGTANCGGGTCAATTCAGGATTCCTGGCGGAGTTCGGGATTTAAAGACAGGATAACCCAGGTTTGGCTTTTAAAGCTTATTAAGCTTCAACGGGTC  
ATAAAAACCTTTGCTCTCGGAACAAGAGCCCCCAAGCAACTACTTTTGAAGTGTGCTCAATGGGCACCTATGTTTATTGATTTGGGCTTTTGAACAGA  
CTCTCTTTGGTCCCTTAACTGGGTAGCAAGCCCCAAGTGTCTGTAAGAATGGCGTATAGCCTGATCAAGGGTAATCATAGCTTCGCTCAA  
TGAGCAGGAAGCCCCCAAGTGACATAATAAGATAAGCCCAAGGAGGATGTCATATTTGAATCACGCATCATGGCAGCAAGTTTCTTTGGC

AACCTTTAACTTTTCTGAGAAGTTGAACTTGGCGAGAGATGAATTTCTTTTTCAACCGGAGTTTAACTGGATATGAGAGCTTCAAGCTTTGC  
GGGAGACAGATTTCCCTTGAACCGGATTTAAACCGGAATTTTCATTTTGGACCGGAAATTTTCTGACAACATTTAAATTTTCATCAATATAACAGC  
AGCTCCGGGACCGGTTATCTTCCCTCCACTGACCCGGATTTTACTGCTTTAAACTGACAGTCAATTTACTGATCATGTCATGTCATGTCATGTCATG  
AAGTCTCAAGCGGACTCGAGGAGTTGGTTTGAAGTCTCCATATTTGATCGTGACATAAACCCGGTATGAGCCATTCAACAGCTCATTGATATAATAA  
TCCTTTTGCAGTAGACAACCTTGTCTACATTAAGAAGTCCGAAGTCAGAGTAATTTGCTCTTTTAAAGAAAGCAATATGTAATATAAAAAATATAG  
TGGATGTACTTCACTAATATGTCAGGCTAGAGATTATCCACCGCGGAGTTCGATGATCACCATGGTGAAGCGGCCAGTAAACCGTGGCGGACGGGCA  
AGTTAGCCGCATCGTATTGTAGCAGGGGCATCACTTGGCAGTATACCCATAGTATAGTATGGCACGAACGCATAGTGCAAAAAATAATATTGACGC  
ACACCCCTTGGCGACACATTTGTAATGAATAATGGTCTACGAAAAAATATCATAGACCAAGTAATTTCTTTGACAAAAAATAATATATGTAATA  
AGATAAATTTAGACAAATATCACATGTTTTGTTTGGACGATCGATAAACCGTAATTTAGCATCCGTAGATAACTTTTCAATGCGGTTGCGCTTTATCC  
CCTCAGGCTCCCAACCAACCGCTTATTGACTTATTTCTTTTCGCCCTCTATATCCCATACCCAAAATAGGCCGCCCCGTGTACCCTTGTAGACAA  
GGCAGAAAACAAGTGGAGCCAGCGCCAGAAAACATGCAGGCTCAGGCGAGCTTGCATCGTACTTGCAGGACGCTAGGCGGTCATAGGGATCGG  
AGAGCAGTCAACCGCAGGACTTGAACCTTCCGGGGCCATGGCGAGTTGGCGGGCCACGGCGAGCGCAAGGCCAGTCTGTTGTTGAGCGGCA  
TAAGTCTTAAAGCGGAGGCGAGGTGATGTCACGTGACAGCGGCTCGGCTCACGGCAATTTGGATGTGCCGGGATTTAAGGCGTGCATAAGAAAT  
GGCAAGACCGGCCAGGTAGGCTCGGAAAACAGCGGGTTGAGACCGCAGAGGCAAAAACCGGGCATGGCTTAAACCGGAGGCGATGAATCACACCGCT  
GGGGCAGCTCGAGGAGGAAAAACAGGGCCAGGTGGTACTCGGCCACGGCTCTTAAAGCCACAGCGGGGGATGAGCAGCGGAGGCGGCCAGCG  
GTTTTAAACAGCAGCAGCGCTCAGCACACCGAGGCCACCGGAGGCAAGCGGCTCAGTCCGCTATAAGGTAGCGCGGTTTAGAGAGCGGTTGGGT  
GCTCGGCAATGGAGGCGAGGTCGTGGCCATGGTGGATCGAAACCGCGGCTTAGAGGCGAGGTGAACCGCGGGTTCGACGGAGGCGGCGCTGAGGAG  
CGCTATAATCGGGCGACTCATGGAGGAGTGGCAAGGTGGGTTACTCAGCAGTGGCGGTTTCAAGACGAAACCGGGTGGCTCGGGGTGCGGCCGCTGAC  
CCGCCAGCGGAGGCGTGGGCTGGGTGGCTCCACAGCGCGGCTCTCCACGACCATGGACGGCGGGGAAAACCCCGAGGACGCTCGGCGACTCGC  
GGCGGCTCGAACCGCAGGACTTGAACCTTCCGGGGCCATGGCGAGTTAAGACAGCGGAGCGGTTTAAAGCAGCAGTGCAGCCGGGACCGCG  
CGGCTTGGTGGTTAAGCATGATTGCAGCCGATGGCGACGACGGCTTGGTGGTTGGCGACACAAGAAGCGAAACCGCGAGACGAGTCAATGCGAGG  
CCACAGCTGCCGTTGCCCGAGGCAATCTGGTGGAGCGAGTAGGCAAGCGGTTGCCATCGACTCCAACGAAAGGTGGCCGGCGGTTACACAGCGA  
GACGGAATCCGACCGGAGGAGCGAGTTGAGAAGCGCTGTTGGTAGCGCCAGCAGAGACGCGCGGCTCGGTGGAACACCTTTTCGAGCGCAGC  
AGTGGAGGCGACAGCGCTCAGGACTGGCCGGAGCAACGGGAGCCAGCCGACTACTCGGGGGCGGTTTAAACCGGAGGCGGTTGAGGAGGTTGCG  
GACAGAGTATGACTCGCCGAGAAGGGGAAGCGGAGGATCGTGGTCTTGGCGACTTAGTCAGGACAGCTCGATGCAGAGGTGGCTCGAGGGTGGAG  
TTTGGCGGGGTTGACTTGAAGTGACTCGTGGCCGTTCCGATAATGAGACAGAGATGGCGATAGCTGTGGCCGGGCTCGTCCAAGCGGCTTGCA  
AAGTCAGTGGGCGGCGCACAGAGACTTGGCGGTGGATCAACGGCTTAAACAGGTCACGAAGCGGAGGATGCCAGTGGCGGCTCGTTGATAG  
ACGACGCGGACAGCGCTCCCGGACAGAATAAGCGGCAAGAAACAACACTCGAATCTGGGACAGGCAAGGCAAGGCAAGGCAAGGCAAGGCAAGG  
CACTGCCCTTCTCGTTTCCGGTCTGGGCCCTGGATGACCCCTCTTTTTTAAAGATGTATGAACCTCCGTCCTTCCATGCAGAAGGCACTGCCT  
GCCGTGGCTCTCTGCTTTGCTATCGATTACTAAATGACGTGGAGAGAAACAACAACATGGCACCTTGGCCGATCGAGCCTCTCGCGGCCCTCGA  
GACTTAATCATTTGGACCGGAGAGATGCAGTAGCAATCGGATACGAACCGGCTACAAGTTGATACTACAGCGGAATTTTTTGGCAACCTTGCATCGA  
CGATTTGACTGCTCACCAACACACATATATGCTGTGAATTTCTCCTTGTGCGGCTGCTGATATGATGATGATGATGATGATGATGATGATGATGATG  
TCGACCTGTGGTAGCGGCGGCGGCTATTCATGCCACCTTAATTTCTTTTGTACTATCAGCTCCAAAGCTAATCACAAATTTCAATCACAA  
AACAAATGAATTTTGGCAGCTCTTCTACATTTGACACATGACGAGCTTCTCAACATCTTAGGAAAGATCCCTCCAAAACCTCAACACACCGCTGCGCT  
AGCCCCACGATGGGCGCAACTGTCTGAAATTTGTCACGGCAGATGCTCTACTATGAGGATTTAGTCTGAGGCAACGCATCTATGTGGTAGCTTG  
AGAGGGGTTGATTTGAATCTGAGAGCGCAACAACAAGAGAGGGGTTGGAGCTTGGGCTCCCGGAAACATCATCCGTTAAGGAGGATGAGT  
TGTTTGTGGCTGTGCTTATTATCATCACGAGGAGTCAACCGTAAACCGGCTCTCCTAGTTGTGTCTAGCCTTAAAGATCCCCCCCCCTCTTGGG  
TGCCCTGCCCTCTTATATAAGTTGAAGGGCGGGTTACATGTAGAGTCCATCTCGGACTAAGACTTACACTATTCTGACATCTCTTCATGGGCTT  
ATTAACATCTCGGCTTCTAACGCTCTCGGCTTATTAACCCAGGCGACCATATCTCTGGGTTATGACTGTCCACCGGATTTATAATCTGACTTAA  
CATCTGGCTTACGCTCAGGATTTGATCTGACTTAACTTAACTTCTGCTGGCTTACCATCTGACTTACCATCTGGTCTTCCGCTTATGATGAT  
TGACTTAACTATCTGTGGGTTACCATCTGACTTAACTATCTGTCTTAACTGTCTGCCCTAACCATCTGTCTTAACTCTCTGCCTAACCATCTGTCT  
TAACTCTCTGTGGTTTACCAAGTCCAGTCCGGTTATAACTCTGGTCCGCTCATACCGCAGGATATATCCCGCAGGTTGATATTCTTTTCTG  
GAAACTCTAAAACAAGGGGAAAACAGGAAGTGGCACTGCGCTTAGGTTAATAGGTTAATCCAAAATCATATAAAATAGCATATTAATGCAATACA  
AAACATCCAAAACAGATAAATAAATAGCATGAACAATAAATAAATATAGATATGTTGGAGAGCTATCACGCCCCCAACAGCTCCCGCTCCCGAG  
ACAAGTTTTTTATGTGCGCGCCGAAAAAACCCAGGACGTCGAATTCGCGGTTAGGCCGATTTTTTGGCCCGGCGATTTAGGGGCAACCCAGCG  
CAGGGCGGGTGGGGGCGCTTGGTGGCTCCAGCGGAAGGAAAAATGACATATAGGCCACCACTGTGAGGCAAAAACAATTTTCCAGCTCCAGATC  
CCCCCTCCCGCCGCACTACCCCTTCCGCCGTTGTGACGATCTCGGACACCCCAACCCGCTAGGAAGGTCAATTTCCCGCCGAAAAGAGAGGGTCC  
GCGCGACATCTCAGCTCAGGATTTGGCGAGCTTTTGGCGGCTCCAGGCTCAGGACTTCAAGGTGGGATCCCGGAGCTACCGGAGCTACCGGAGGCTA  
GGTGTTCGGCGGTTTTCTGCTCGGTGATGACTCAGACGACGAGGAGGTGTTTGGCGGCTGCTGGAGGAGGAAAGCAGAGGCCGACGCCAAGACG  
AAGAGCCTCATGTTCTCGCGCTTGGCCGGCTGTTCCGGAGCAATGCAAGCGCGCAGGAGGTGGCTCAGCACCGGGCCGCAAGAGACAA  
GCAGAGGATGTTTGGAGGGCTATTGCTTGTCTACCGGACTACTTCTGTCAGGCTCCACTGCACAGTGAGAAAGTATTTGCGCGCGGTTATCGG  
ATGAGCGAAAACCTACGTCAGGATTTGAATTCATTTGGGAGTTGCAAGTACTCAAGTGCAAGAAAGTGTGACCCGCAACCTTGGATTCAC  
CTCACTCCAGAAGTGCACGGCAGCTATGAGGATGCTTGCATACGGAGCCCGGTGATATACTGGAAGACTATGGACGATGGCCAGTCCACCACCA  
TTAAGTGTGTTGACAAGTCTGCAGGGCAGTATGTCAGTGTGAGCCATAAATCTTGCATCACCAATGTTGAAGACACTACTCGGATCTTAGC  
ACAAAATGCAGCAAGAGGATTTCTTGAATGCTTGAAGCATCGACTGCATCGACTCGGATGGAAAATTTGCCATTTGCTTGCAGGGGATGATCA  
AAAGCGCTAAAAGGAGCTTGCAGTGGTACTTGGAGCAGTGGCCACACAGCACTTGAATTTGGCACTCTTCTTTAGTATGGCCAGCACTCACAA  
ATGACATCAACATAGTGTAGTCTGAATGCTTTGCAAGTCTTGGTGTAGTCTGATGCTTCTTCCGTTGAACCTTTCAGTGCATGGCGCCCACTCAA  
TAAGGGATACTACCTAGTAGATGGCACATTTGTAAGACTATCTCAAACCTGTGACAGGAGGCAAGAACTCTGCTTTGCCAAGTGCAGGAGGCT  
TGCAGGAAGGATGTGAGCGGGGCAATTTGACGTTCTCAACCTCGAATTTGCTGTGTCGGGTACCCCACTCTGACTGGTTCGAAAAGATCAAATGTGG  
GAAGTCATGACTTGGGTTGCTATTTGCACGACATGATGTTGAGAGTGGAGGAGAGACAAATGTTGACACTGAACCATATACATGACAGGATC  
CTCTGTCCAAGTTGATCAGCTACTGGCAACCTGGGCTGCCCTTCTCAATATGTTGTCAGGAGATCGGAAATCCACAGGTCAGAAATCAAGAATGCA  
ACAGGATCTTGTGGAGCACCTATGCAGGCTCAAAGGCAATGCCTATCTCGATGTGTGATGAAATATGATTTTTATTTGTTTGAATATGACTTTG  
ATTCGTTGAACATTTGATTTGATTTGATTTCTGTGATGAAATATGATGATAAAAATAGTTTTAGTTGAAATTTGTGACGAAACACGCGGAATTTGGG  
AGCATTTGGATCAATTTCCGCTAAATTTGGGCTGAAATCGATGACTAGGGGATGAACTTAGGGGCGGCGGCTGGGAAACCCGAGCCCACTGCGAT  
TTTTATCGCCGATTTGGCTCAGACAACGTTATTTAAGCCTTATGGGCGGCAAGGATGGAGATGTTCCCATCGGGTCACTTGTCTTCTGCGCAC  
CAGCCTAGCTCTCGGCTCCTAGGCTTCTCCTTCTACAGCTAGAGCTAGAGGTCAAACCAATGTGCCGTTGTGGTTTACACAAGTGGTATATTTCA  
CGCCACGATTCGCCCCGAATCTTTGCTACTTTCCGCTCCGCTCGGAATGATTTGCCCTTGTCTTGGAGGATACCGCATCGTTTACTATTCCGTA  
GGTCGAAATTCAGCAAAATCTGCACAGCAGCTGTAATGGAACCGGATTTGAGCGGGGCGGCGCTCTGTGGCACTCGTCAACCGCTGTCACTAC  
TCGATACCTGCTGCTGACCCAGCAGCTGCAGAGACTGCAGCGCCCGCCGCAAAAATAAAAATAAAAATCCACCGGCGAAAAGGCGATGGAAT  
TGAAGCAAGCCAGCAACCTTGGCTGGCTCGCTAAAAGCCAGGAGCTCTTTCCCTCCCGCTCTCGCTCTCCCTTTTTGGATTTCTCCCAT  
CTTGGAGCATCGCTGTCTGCCCATCGGCCAAGCCACCACTCCCTTTGAGGAATCGTAAATCTTGCCTCTCTGCTCTCTCTCTCTCTCT









TTTTTTTACTTCTTCAAGTTTTTCGGGTGTGTGCATCCGTAATGTCCTTAGGACATTTTCGTTGTTGTGAGAGTTGGATGTAATGGTATCTTCATGA  
TATTAATATATTTCTTTGTAATAAAAAAATCAATCATTCATGGTTAGTGCAAAAAATGTGTGTCTGCTTTGATATAAAGTTTAGGGTCAAAAATACCTC  
CAGAGAGAAGACTAGGACAATAATACAGTGCAGCGGCTCCAAATTCGAACGGTCAAGAGCAAAGTTCCATCTTGTCTGGGGAAAAAACACG  
AGCAGCTGGATATGATATTTTTTCTACTGAAATGCATCAGAACATGAAACACTGGTAGTGAAAATTAAGTCTTCATATCTCAGAAGTTGAAATTCCT  
TCCTTTTATCATTCTTTCTTCTGCCCAGCTGTGATCATTGCAAGAACATGCCAATCTATCAATTACCTCTCCGAAAACATGGTCAAAAGTCAAGAT  
AATGAACAGTAATAATCTAAAGCAGCGTGTGACATACAGAGCAGAAAGCCCTCCTTCTCGCAGTAGGCTGGTATCACCGACATAAAAATCTCCA  
CTTGCCTCGAATCCCAGTCTTACTCATAAACATCTCCGTAAGTGCATTTCATTTGTTTTCAGTACAGTCAAGTATGCTTGCCTTGCACACAGTAGATA  
AGTAGACAACACGACTGTACAGCTTACATCTTCAAGTTGTCCAACATCTTTCAGCAATTTTCATGGTCCGTTGGTAGCCTTATCACATCAAGACCTGT  
GTCATTTCTCCTCAAACCATGTGAGCGACTTTGGACACCAAGTCCCAATTTCGTCTGCTTATCCTCAAGGAACATGCGCAAGACATCTCCCCGAAA  
CTGTACCCGGCTATCAGTTCCAACAATGAGACACCGGATTAGTATGAAAGAACAAATGCAAGAACCTTGTGGTGTAGTACAGTACTCTTGGC  
CTTCTTCTTTTTATAGCATGGATTTAAATACACCAACGCATGGAGAAAATAACGTGTTCAAAAATCAGAATGCTGTGGCCAAGTAAATCCCGACCCATT  
TTTAGCATCGCGAGAAGTAAACCCGAGAAAATGCAAGAAAGAAATCTATTTTCAGTCTTTCAGGTTTTCAGGTTACTCCCTTATACAGAGTTACACAACGGGAATATA  
TTTTGCATCTATAAAGACCACCAACGATACGAGGCAACATTAATGATATTTCTTTTACTAGTAACTATTTAATTGTTATGCATGCATTCGTGA  
TTTTTCTGACCTTGATATAAAAAATGGAGGAAGTACCGAATTTCCAGCGGCCATACAATTTGAGCATGGTGAAGTAGGCAAGTACCTTTGGAG  
AGACGAGTAGCGTAGAGCGAGGCGGGGGCGACTGCGAGGGCGGCAAGGCGGAGAGGAGGGAGCCGGGGCGGCAAGGTCGACGAA  
CGCAGACCGGGAAGCCTCGCCATGGCAGAATTTAGCTGGGGGCGACTGTTGCCGAACCTGGCTGCGCGCCCGCCTCGCGTACGGCGTGGCTTCTG  
TGATTGCCCGCGAAAGAGCTGTCCGCCAACAGCTCGCTGATCTACCTAGACTCCTACCTCCTCGATGGAGGCAGCGGTGGGACGGGGAGAGCGG  
GAGGGAGTCTGCTCGGAGAGAGAACCATGGAGGGGAGGGCTTCAGGTGGATAAGAGTACGATGAAGTTCGATCTGGAGCGTCCAAGCGCACG  
ATCGGGCGGTGAAGCCTTCTCCGATGTTGTCCCTATCTGTTTCGTAACAATAACAAATACGTAATAATGTTGTATGCAACAATGCTCTCAGAAA  
TGGCAAAAATATCTCGCTCAGATGAAACACCAAGTCAATGGCTATGACCGCTTTATTCAGAGTTACACAACGGGAATATCTTC  
GATGGCAACCCATAATTTATTTTGGAGTGTGTCTCTTTTAGTCTACGGTAGATGGATTGCATAACCTTCTCAACTCAGCTGGTTGAACAAAA  
CAGCTTCAAATGCACCATCTGCAAGTTGTTGGTTGCATGCATGCCCTCTTGGCTGCATGGGTTGAATCATATGGCCGATGTTGGTTGCGTGCATG  
TTAGTGGACAACCCAAAGGCATGGTGGTGGTGAATGCAACCGGTTGTGTGATAACCTATTTGGCTAGTTGATGAGGTTACCAGCACACTTCGA  
CGCAACCATGTACCAAGCTTCAGCTACTTAACGATGTTCAACTGATAGTTCAAATAAATCAGCGCATAAACCATGTTTCAAGCAGACT  
CGATAGTACTTAGGAAGGAGTGCCTCCGGCCCTAGTCCCTGGCGGCAAGGCTTTCGTCTGCTCTCCCGCACTTGTGGACCACTCAATGCCATCGTC  
GTCGAAGATGATGACCTTGGAGGTGTGCGGAGTTCAGGAGCTTGAACGTCATCATGTAGCCGATATTTATCTGATGAACGGCGCGCAAGGTTGGCCAA  
CCCTGATCCAGGTCACCTTCCGCTTACATCAGCTTACCGCTCACCTCCACGAGCAGCCGATGTTGTCTTCGGCTTGAACCTCGTCGGCACCGCGG  
CGAAGTCTTGGTCAACTCCAGGGCATGGGGATGCACTCAAGCTTCGGTGCAAGGATGACCTTGCAGAAGTGAAGTTGGGCCACCCTCCTCATGGTA  
GTGGTTGATGCTGCGGCGCTTGTGCTGGGGATCCTCCATGCGCTCGTCTGCGCAACCATTGGAGTCTTCGGTTGTTCTCAGCGATGGCGGAA  
GCACCACCTCGGGCATTGGATGAACCGCTCCTTGCCTTTCTTGTCAACGGCGAGGACACCTCCGTCGCCATCTCATGTCTCCTCGACCATGCAC  
ACAATTCATGGAGTTCAGGACAGACAGAGTTCATGGCTCATTGAAGAGCATGTAGTATAAAACGACATGACTGTCACTCTCTCTCCTCTCCATCGTGC  
CTATATTTACTCAACCTGACCCACTTACCCTCCGCTCCTTCTCTCACTATCAACCTTCCCTCTCCTCCTCCTCCATGCCATCAGCTCCAGTCAAAA  
CTCCAACGCCAACCCCTTCCCTTGGGGTATTGGCTGGAGGCTTCTTCTCCTGGGTGGTGCAGTGGTACCACACCAAGTTTGGAGACACCATG

>HvFDL-H5 CDS, extracted from morex\_contig\_45564, CAJW010045564

**ATG**GGAACTCAGGCAATGCCGTCGGTGGGGCCATCTCGCGCCAGGGCTCGCTCTGCAGCCTCACGCTGAGCGACGTCGAGGGCCAGCTGCACGGCG  
TCAACCTCGACGACCTCTCCGACAGGGCCGGCTCGGCTAGGAAGACGGCTGACGAGGTGTGGCGGGACATCCAGGGCGGCACCCAGATGACGCTGGGA  
AGACTACCTGTCCAGGCCGGTCCGATGCGGGGGGCGCCACTGGGCGGAGCAGTACAATCCCGCTGCCCGGGTGCGGGGGAGCAGCGCCACACC  
AACGTCGGGGCGTCCCCTGCCCGGGCCGCTAGGGGTGGGCGGGCGGGCGGGTGTGGACGCGCTGTACCACGACCACGACCACGACCAGCGGGGCCA  
CCATGTCGGGACGGAAGCAGTCCCGCGGGCGGCGGGGAGAAAGACGGTGGAGGCGGGAAGAAGCGGATGATCAAGAACCAGGCTCGGGCGGCGG  
GAGGTGCGCGCGGAGGAAGCAGCGCTACACGAACGAGCTCGAGAACAAGATCTCCCGGCTGGAAGAGGAGAACCAGCAGCTCAGGAGTTACAAGCGCA  
TTTGAACCGGTTGTCAGTGTGTGCCGAGCAGGAGCCAAAGAACCAGCTCCCGCGGAGGAACCTCGGCGAGCTTCTGA

>HvFDL-H5 protein, extracted from morex\_contig\_45564, CAJW010045564

MGTQAMPSSGGAIISRQGSLSLTLSDVEGQLHGVNLDLRLRTAGSARKTADEVWRDIQGGTQMTLEDYLSRPGADAGGAHWAQYQNPAAVPVPGQQRHT  
NVGRPLRPLRPLGVGAGPVLDAALYHDDHDDHDGATMSGRKRAAAGGPEKTVERRKRMKIKNRESAARSARKQAYTNELENKISRLEENQQLRSYKA  
FEPVHVCPVQPEPKNLRRRNSASF\*

## TaFDL6

>TaFDL-A6, IWGSC\_CSS\_5AL\_scaff\_2776616

CCCCATCTCGCTGATTCCAGACATGCCCTTTGAGCAACGTTGTGCTGGTTGAAGCATTGCATCGTAGCAGCTGTGATGATGCATCAACAGCGGGT  
GGTTGTCGTCATAGTACGCTCTAGCTAGTCGCATCACCACTGTGCCTTCAGCCACAGCTCCGGCATCACCGCTTGCACCATCGTCAACTCGTGTG  
CTAGTTGAAGGTTTTTTATCTTAGGTTGCGAGCTTGTAAAGTGCATCTAGTGCACCCCTTAGTTGGTTTTTGGAGTATTCACGACAAAATTTGGTTGAGGG  
ACTAATGTGTTATGAGAATTGCAGGATAACACAGGTAGTAGTCCCATATTGATTTGGTTTACCTACCAGAGATGACCCTTAAAAATGTTGTAAGAT  
ATTGAAGACAATGGTGGTCTCTGAAGATATTACAGTGAAGATTATGACATGAGAAGACATTATGTGAAGACTATGGAGTGCAGAGACATAGTGT  
TTGCTAGTTTCTTTCTTTCTTTGTTGAGTCTATAGGAACCACTACTGTTAAGTGGGTCCAAAGTGAACAAAGTCAAGTGAAGTGAAGTGAATC  
AACCAAAATCCTATGCTTTCGAGCGAAGACAGCGAGAGCAAAATCTATCCAGAGTGGATGAGTCAAGTCTTACTTGTATCCCAAGTCAAGCTGCCGCG  
TGTGTTTTGAAATCTGACCGTTGGACACGTTAGTTCCCTAGTACCAGGGCCATTTCCGACAAATCAGGTCGGGTGCTCCTGGCTATAAAATAT  
CCACCCCTTACACATAAATTTGGTGGTGTCTCAGAGTGTAGTGACCGCTTTTATCATTTGAGAGCAACCCACTCCGAAGCATTTGAGAGAGAGAT  
TCTTGAAGTACAAGCCCAAAACCCAAAGCCGAAGAGTGTAGGCATCACTGAAGTCTTCTGTCGCGGTCATGTAAGACTTGTACTTACTTGA  
GGACTGTGAATCCTCCAGCGTTAGCGCTCAGCTTCTAAGCATCAAAGAGTATTGATGATTCAGGCTGAACGAAAGTCTGTGATGGTTTGGAAAGTC  
TACCTTGAAGACTTACCAGAGTATTGGGTGAGGACTGTGTCTTATAGTCAAGGGGAATGAGGTGAAGACGCGGCTTCTGAGTTAAATCTCAGC  
CTCCCTAACAGACGCTGAGTTGTACAGCAACTGGAAGTGGTCTACCAAAATCCTTGTCTTCCAAAGCTACTGGTTTATCTTCACTCCCTTTT  
CTTTATAGTATGTTCTGTTGAATCACTGTCTTCTGATGATGATGACTTACTGAGTGAAGACTATTTACTGTTTGTTCATACTACTTCTTC  
CATCCCGATCCACTACTAGTTGCTGATGATCTTCCGAATTTCACTTACTTCTGATGATGACTATGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTG  
CATATCAATAGGTCCATTTCTACTGTTTGTCTTCAAAGCCCTCGTGTGTTGAAGACTTCCATAAAAAATCGCCTATTCACCCCTCTAGTCGATAACT  
AGCACTTTCACAGCTTCGTGGTTATGGAGTGGCTGGTCCGGGCTTCCCTCGCCATCGGTTGAATATTTTTTCTTTGGTTGAACCTTTTCCATCA  
ACGGTTGCGGGCTTCCCTTGGCTATGCAAGTGGGAGGTTCCCAACTTTTGCTCTTGTGTTGGTGGTAGCTTCTCACTCGCTGTGACGCTTTGGTTGT

TGCCGGTTCAGCAATCAATGACTGCTACTCCCGCTGGAGTCGTTGGGTTTCTCCAAAGAGGAAGGGTGAAGTAGATAACAACAAAGTCATCCCTTG  
GTTAAGAAGCAAGGTTTATCAAAACAAAAGGAGCTCCTAAGCTAAACATATAAGCAACACATGCACACAAAATAAAAAATTTGACCCAGTGT  
GGTGAGAGGGTTGTCAAGCCCTTGCTTGCTAGTTACAAGAATAAAAGCAAATAGATATAGATGGTGAAGTGAAGACAAAATAAAGAGGAAA  
TTTTGTATAAGAATGTATCAATAAAGAATAGGCCAGGGCCATAGGTTCACTAGTGGCATCTCTCCGAAAACAAGCGAATGGCATGGTAAACAAA  
TTACAGTTGGGCAATTGAAAAGATTGCAATATTATGACTATGATCATTATGGCATAATATCATATAGGCATTATGTCCTGATAGTAGACCATT  
AGTCCAACCTGCATCTACTACTAATACTCCACCCAAAACCCGCTATCCAACATGCATCAAGTATTAAAGTTTGCAAGAAGTAGAGATTCGCAATAA  
GAAAGATGACATAATGTAGACATGAAGAATTCATCAATATGATAAAAACCCCGTCCCTTTATCCTTGGCGGCAATAATAACAGTACGTGTTATAAGA  
TCACCTCCCTAAGAAAAGTCTAGGGTTCTTTTCTCCACCACCTCGTCGTCGGTCGGCCAACTACCCATTGGGAAGCCACGCCCCGAGCTAT  
GTAGTCTAAGAGGGAGATCTTCACTTTTCTAGGGTATCAGTGAAGATAATGTTAGGGCCGCTGCCCTCCGTTTATCAGGACGCATGAGAGGCATTA  
GCCCCATGACAGGGTCCAGTACCAGGGTGTGCTTTCTGGCTGCACGACGCTCTCGGGTGGTCCCTGTGTGGAAGGTAATTTGTCTTTGGGACC  
ATGCCAGTTGTTCCGCTGGTACTCTCCGTTGTGTAGATCGCGCTCANNNNNNNNNNNTCCGCCGTGTGTACAGCCGTTGTGAATATCATGTTTACG  
GAGGTTTCGCAAGAGCTTCATAGCGTCTGGAGGTACATACGATGCATGCTTTCATGCGGGTGCAGGGGCGGTGCGTGAAGCTTTGGTCTTTCCAT  
GCCTGTTATACATGCTTTTGTGTGGCTGAAGGCAAGATGTCAAGAAATTTCCCGATCTATCAGCGATTAGCTCGAAAGAGCAAACGTTAGGGTG  
AGGTGATGGCGTGGCGAGAGATCGTTGGCCTTAGTGTATTCTGAGCCGGTTCGTTCTCCGTTCAACGTCACCTGTGCCTGGCGGCCAACCTGAC  
GAAGCAATTCTAGTCAGATCCCTCGGTAGGGTTATGACGAGACTGGAAGTACCAGCAATAGAATTTGCACACAAATTTATCCAGGTTCCGGCCCTC  
TGAGGATAAATCCCTCAGCTGCTTTGCTTGTGATTTATCATGGTACGGGGATACCTCGTGCAGAGGATTACAATGGTGTGGGATGCTCACCAG  
AGTTGAGTTCACATTGGATCCCTAATGAGGACCTAGACCTCCCTTTATATAGACATGAGAGGCTAGGGTGTACACGGAGAAGAGATCAGATCGA  
TATGGCCGCCGCTTCTGCTTTGGGTTACACGTTACCGCCCTCTCCTTCTAGGGTTCATGATTCTCTCTGGGCTGGTGGGCCCTGGTCAAGGT  
CGAGCCGGTCTCCTTACGTTAGGACTCCGGTCCCTACCCGCTACTGGTCTTATGGGTTAGCAGGAGGACTCTCTGATTGTCTACTACA  
ACAAGTTTCCCGACTCCAGCAGGGGAGGGGCGGTGCATCGATGCACGCTTTCATGCGGGTGCAGGGGCGGTGCGTGAAGCTTGTAGTCGTCGCTTATGAT  
CTGGATGAATAAGTATTATTATGGCGTTCATTGTATTGCCATGATTGAATATGAATAGATTGGAATTTTCTCGCAACGAAAAATACAATAAA  
TGTTCTAGCCCTTATTGTCAGTGGTTAGAGCAATGCAAGATTAACCCACTACAAGCACTACTCCCACTGAATAAAAAATCAATCGAAGCTTGGCCA  
AAGAACATAGATAGTCGGAGCATTACAACATTTAATTAATGTTGGCAATAAGTCCAATAAGATTCAATTGAATTAAAGTGAACAACTGATCAT  
AAAGTGAAGATTCAATTTTCCAAACACACACCAATGATTATGACGTTGATCTGATCAAGAACGATAACATGATGAAGTGAACATTCAAAAGAG  
AAAGAGAAACCATCTAACTACTACTATGGACCCGTTGGTCCATAAGGAACTACTTACACATGGTCTAGGAGCAACAAGGTTGATCAAGATGGCTT  
CGGAATGGCTTCTCCTCCGTTAGAGCTCCGTAACAGGGCTCTAAATGCTATCTCTTTGGAATAGAGGCTTGGCGCGCGATAAAAAATCTTTTAG  
GGCACAACCGGATGGTTCAGTATTTATAGGAAATTAAGCAGTGAATCAGGTCAAGGGGTTTGTGAGCCCCACAGGACGAGGGGGCGCGCG  
CACCCCTGGCTCTCCGCGCTGCTTGTATCTCTCCTAAACCTACAACACTCTCTTGTGGTTCGCAAAAAAATCATGTTAAACCGACAACTGTTTGT  
ACCTCCGCGGATATTGATGTCATGCAAAACAAAATAAACAATAACAAGAAGGAACAGGCTTACAACAACGCCACCTCCCTCGCAGAGTAGACA  
TGGGAGGAGACACCGGCTTCGCAACTCCCTCCCTGGCCAGTCTCACGGTGGCTTCTAGCATTGTATGCCAACGATCTCGAGAGTGAAGATGCGAG  
TGGTGGGAATGCGACTCGCCGACGAGGTCACCAGATGAAAAGGAGATGAGAAGTGAAGATTCAAGCCCATCAAGCGATGAGGGGACCGGGTGG  
CTACACGGAGGAAAAGAAAAGAAAGATGCAAGTGGACCATGCTAAATTTTTTCTGAGTCGACTTAGAAAACATAAGCCCTGCACGTCAAACGGACCG  
ACATTTCTTTGGGCTCTGGGTTCTGGATAATTACCGATTGGTTAGATCCAGCCAAAACAAGCACACCTTTGGGCCAAGTAAACACAGTCCACGT  
CTTAGGGCCCGCATCACTCTTACCTGTCGTCGCTTTCGCTTCCACGCGAGAAATATATCTCCGTTGCTTCCCTTCTCTCTCTTTTCTCAT  
CTCTGTGCGCGGAGCAAGATTTCCACTCTCGATACCTCGGAGTTATCGCGCAGGACGAGCAGATTCTCTCTCCCTGCAGGCTCGCGCTGCTCTC  
TCCAAGTTAGTATGATCCTAATCAGCTGCTGTTGCTTTTCCCGCAGCCCGGCAAAATTTGTTCCGCTGATCCATCATGCTGCTTGTGTTGGATT  
GGAATGGATCAGTTAGCACATTTTACTCGGAATCCAGTGCAGTGTCTATTAGCGTAGGTTTCAATTTCTCTCTGGGAATGAAGCGGAATTCGCCGATT  
TCTTGTCTGTTGGGGTTTCGGCGTTTTATGCGGTCGCTTTTGGCAATGCGGGCTGCGATGAGATAGACTGGTGTCCACTAATTTAATTTA  
GAATTGCCATGCTGTATATCCGTTTCTTAGGTTCTACTAGTATATATGTTGTGCTTCTGTTTCCAGACTTTAGAGTTTGGGTTCCCGGTAG  
ATGATATTTGGCTAGATAAATTTATTCCTTTTGTGCGCTACTACTATTTCTACTCCCTCCGTTTCAAATAATAGTAGACTCAACTTTGTGAAGTTAGT  
ACAAAGTTGAGTCATCTATTTTGAAGGGAGGAAGTTCGTGTCAGCAGGCGTCTTTCTTTCTACTGCTTGAACCTCTATAATTTTAGAGGATGTG  
TTAATTTTGTGCTACAGCCATAATCTATGGCCTTTTCAATTTCTTTAACTTTACCCCTGGTGAATACTGCAAAATGTTAGTCCAGTACTCAGTT  
TATGACTTGGGCGCAGAGGTTTTGTCTCCAATCTATGGAAGTAGTTTCAATGATGCTTCAAATGATGTTGACATTTGAAAAGAACTCATGTGT  
ACATTCATGAAGTATGAACAACAGTTTTTCTCGAAAACATGTTTCTATGTTGTTGATACAAAAGAGTGAAGAGTGAAGTGAAGTGAAGTGAAGTGA  
TTTTTAGGTGCGGCACACAAATTTGGCTTCTGACCATTTGCATGTCCATCTTTAATCCCATGATCTATGTACAAAGTTATTCGCGCAGCACAGTAT  
ATGAAGAAATGGTCCACCTGAGATTTTGTGGCAGTGCCTCAGTGGTGCATATGAATTTTCCCTAGGAAGTGTATTTGCGAGTATTTCAATAATGATTA  
TGCTATTTCTTCTCGTATAGGATCATATATGTTATTGTCAGTTTCTCTGTTTGGTTCATTTTTTCTCTCTCAAGTCAAGTGGGTTAGGATAAG  
GTTGACCTGCCTTTTGGGTTTGGTTTTCAGTTTGTGTTTACTGTCATGTCAGCAGTCAACAACCTCAGTGTACAATTTTGGACGGGTTGCCCTT  
TATCTTTTATTTGTTGGAATTCGAAGTTGGACAAAATACATATGATAGTGCACGTTGAACTACATTTCTACTAAGTATAATTTTCTGAGCTTGC  
TCTATCATATGATATTTGGATCTTAATTAATCTTCCATATGTCAGTAAAGTTGCGCTGCTGAATTAATCAAATCTGAATATTTTGGCACAAGG  
ATTACCAAAATCAGAAAGCTTACTGTTTCTATGCTATCAACGACTGATCATCAATAGTGTCTTGGTCAAACAATAAAACAGGCAAAATGAGCTTGAA  
GGCGGTGGCAGCCCATACAGCAAGAAGCGGAACAGGGCCAAATTCAGACACTAGTCCAGGAAGGCTCTCTATAAACCTCACCCCTCAGTGAAG  
TTGAAAGCCACCTTGGTGGCCACTTCTAGTATGAACCTTGATGACTTGTGAGGAGTGTGCTCCAGATGAGAAGAACCTTCCATTACCAATGG  
CGTGGGAATTCAGGCAGTCAAAGCAGTCCAGCTTTGGTGGAAAGTCCAGGGCAGCAGCATTACTGTGCCCTGCCATTGAGCAAGAAGACAGTG  
GATGAAATTTGGAGAGACATCCAGCAGGAAGAGGAGAGTAGTATGATGAGAAAAGGAGTTAGGTTGTGATGCACAGATGTCGTTTGGGAGATAA  
CACTTGAGGAGTTTGCAAAGGGCTGGCATTTACTGGGCGATCAGAAGGATGCTGAGGAGTTAATGATCTTTAGGAACTGGAAAGTGC  
TCATTTGATGACCAAGTCCAGGATTTCCACAGGGAACAAGTGCAATTTGATGCGTATATTGTACGTCAGTGCATTGCGCAACCTTGGTGTGCA  
ATCCCTTGCACAAATGGATCCATCTACCCAGATCGTCAAATGAGTATTTCTGTCATCTTGAAGCTTTCTGATCTTCAAAGTCTAGTCTGTAAGAGAA  
TGCTTCCAGGATGTTGATACAAGGTTGCTGATCGGAGGCAGAAAGGATGATCAAGAACCAGAGATCGGCTGCACGTTCAAAGAGCTAGGAAACA  
GGTTTATTTTCTGACTTTTACGATTCAGTCACTAGACTATAGAACTGTTTACACTTTAGAATGATACAAAAGCTTCTATGAGATTTAGAACAAT  
ACTAATAGAGGAAAAGTGAATTTAGCTCTCATGTAGGATCCAGTTAGCAAGGAGCCTAGCAAGCAATCTCTAATTAGCAACTCCCAAAAGCTAAA  
TTTTTTGTAAGAAAGACCTTTATTTGGTTACTCTGCACAAGAACAGAACTAACATCCCTCTTTAGATTAGAACACACTATAATAGGTTAGTTTGGC  
TATTTTGCACCTACATAACCCCTTATTTACTCATGAAAGGACTACTCTGTTCTGGATTTATCTTACTACACCAATAATATGTTAGCTTGTCTATT  
TTGCACCTACATAACCCCTAATTTACTCATTGTATGATTACTGTTCTGGTTTTACTTAAATTCACGGCAGCAGCTGGGTATATTTCTTTGTATCA  
AAACTAATTTTTAACTTTGGAACTTTTGTATGAAATTTAGCCTACACAAACAGGCTCGAATGCAAACTGCTTGTCTGGAAGAGGAGAAACAAG  
AGGCTGAAGAGAGAGAAGTGTAGATCATGCTCATTTCTGTACATAACCTGTTTAAATTTCTTTAGATTGTTTGGTGGAGGTTTGTAAATTTACTA  
CTGTTATTTTTTCCAATGTTTTCTGCTTCACTGTATAGTTTGCATTTTAGTGAAGCAGCACCAGGCGTCCCTGTTTCCAAATAATTTTACA  
CCTTTGCTCTCTTTTCTGTTGGTGAATTAATAAAATCAAAGCATCGCTTTGGATGACTTCTCAAATACTCGGTGCACCTGTTGATCATGAAGC  
CATGGCTCAAGAATAAGCATGAAGCATGATGCTGAAAGAAATATTTCTGAGTATAAAAATTTCTGCCGCAAGAAATTAATTTCCGTTCTCT  
TCTGCTTTCAAGATCTGCCTCTTGGTTTCTCACATGAATACGAATAACACACAAGTACATTAATCTTGGTGCAGTTTGAACAAGACAGCAATTC  
TGCTATGTCTATTGAAAGTGTGAGCCTGTATTTATCTAGTATTGCCATTCACCTCTTATTTGACGACAACGATGTTTACCGCATTCGCTTGCAG





TACC AAAATCAGAAAGCTTACTGTTTCATGCTATCAACAACCTGATCATCAATAGTGTCTATTGGTCAAACATAAAAACAGGCCAAATAGAGCTCTGAAGG  
CGGTGGCACCCGCATCACAGGCAAGAAGCGGAACAGGGCCCAAATCAGACACTAGTCAGGGAAGGCTCTCTCTATAACCTCACCCCTCAGTGAAGGT  
GAAAGCCACCTCGGTGGCCGCTTCTTAGTATGAACCTTTGATGACTTTGTGAGGAGTGTCTTCCAGATGAGAAGAACCCTCCATTTACCAAATGGCC  
CTGGGAATTCAGGCAGTCAAAGCACGTGAGCTTTTGGTTTGGAACTGAGGGCAGCAGCATTACTGTACCCCTGCCATTGAGCAAGAAGACAGTGGAA  
TGAATTTGGAGAGACATCCAGCAGGAAGAGGAGAGTGTGATGATGAGAAAAAGGAGTTTCTGAGTTCAGGTTGTGAGGCACAGATGTCGTTTGGGGAGATAACA  
CTTGAGGAGTCTTGGCAAAGGGCTGGCATTGTTACTGGGCAGTATCAGAAGGATGCTGAGGAGTTAATTGATCTTGTAGGAAGCTGGAGAAAGTGCTC  
ATATGATGCCAGATGCAGGATTTCCACAGGGAACAAGTCAATTGATGCTGATATTTGACGTGAGTGTGCGCAACCGCTGAGTGTGGCAAT  
CCCTTCGACAAATGGATTCCATCTACCCAGATCGTCAAATGAGTATTTCTGTCATCTCTAGAACTTTCTGATCTTCAAAGTCTTAGTCTGAAGAAATG  
TCTTCCAGGATGTGGTATACAAGGTTGCTGATCGGAGGCAGAAGAGGATGATCAAGAACCAGGAATCGGCTGCACGTTCAAGAGCTAGGAAACAGG  
TTTATTTTCTGACTCTTACAATTCAGTCTGACTATAGAACTTGTTAGCACTTTAGAATGATATAAAAAGTTTCTATGAGATTTAGAAACATAC  
TAATAGAGGAAAAGGTGAATTAGCTCTCCTGTAGGAGCATGGTCCAGTTAGCAAGGAGCCTAGCAAGCAATCTCTAATTAGCAACAATCCCAAAGC  
TAGTTTTTTTGAAGAAGACCTTATTTGGTTACTCTGCAAGCAAGAAAGCAACTAACATCCCTCTTAGATTAGAACACATATAATAGGTTAGT  
TTGCCATTTTGCACCTACATAACCCCTTATTTACTCATTTGAGGACTACTGCTGTCTGGATTTATCTTACTACACCATAATATGTTAGCTTGT  
CTATTTTGCACCTACATAACCCCTAATTTACTCATTGTAGGATTACTTCTGTTCTGAGTTTACTTAAATTCACGACAGCAGCTGGGTATATCATTG  
TATATCAAACATTAATTTTTCTTTGGAACTTTTTGTATGAAATTTAGCTTATACAACAGAGCTCGAATGCAATTTGCTTGTGGAGAG  
GAGAACAAAAGGCTGAAAGAGAGAAAGCTAGATCATGCTCATTTCTGATCAACCTGTTTTAATTTCTTTAGATTTGTTTGGAGGTTGTTT  
AAGTGTACTGTTATTTTTTCCAATGTTTTCATGCTTCTATGATAGTTTGCACCTTTAGTGAAGCATGCACCGGCATGCCCTGTTTCCAAAA  
TAATTTACACCTTTGTCTCCTTTTTCTGTTGGTGATTAAGAAAAAGCAAAAGCATCGCTTTGGATGTAATCTCAAATCTGATGCTGAAAGGAA  
TATTCGTTGAGTACATAAATGGCTGCCGAAAGAATTAATTTCCGTGTTCTTACTGCAAGATTTGCCCTTGGGTTTCCCAATGAATAACAAAG  
AACACACAGATATATTTTGGCCAGGATTTCCCAAGAACCAAGAACTATTGCTATGCTATTGAAAGTGTCTGATGAAAGTGTCTGATGAAAGT  
ACTGACGACAAGGATGTTTACCACGTTCTGCTGAGGTTGGACATGTTATGAAGTGGCGCCCCCTCCGGAACCGAAAAAGCATCTTCCGGAGA  
ACGCCATCGACCTCATTTAATTTGTTGTTAGTACAGGCTTCTGTAGATTTGATCACTCTTTTGTCTTCTCCTCGCATGTAACATGAGGAGTGTGT  
GCAGCTTGTCTTGTGTAATTTGTAAGGCTGGGACACCCGACAATCTTGTGAAATATCTTCCCGGCCCTTAGGTTTCCAGTTTCCAGTTTGAAT  
TGTGCAAAATCTTGGCCAGGATCCAGTGATGACCTGCAAGCTGCAAGCTTCTTGTGAAATCTTCTGTAATCTTCTGTAAGTTTCTGCTGTAACCTGT  
AGCCGCATGGTAAACTCAATGAACCTGTATCTGCTTTCAGAGTCTTTCGTTGGGAAGAGAAATGCTCTCACGGCAGTCTAAGCTGAAC TAGAGAATGT  
TAACCCAAAGAAAATCCCTCTTGTGGTCACTCATTTCCCATGTTCCATATGCCATCTACAGTGTGGTCCAAGAGAAAAGGGCCAAAGCCAAAGAACG  
TCTCAATGATTCAGAGGAAGAAGAAGCAGCTCGGCAGTTAACTTGGCAATTAATGAGTCTGCAAGCTTAATCTTGGACTGGGACTTGGAA  
GACAGATGGTCCATGGCCAGCTTCCCATAGTGCAGTCCCAAGCTAGTACTATGAGCATTATTTGCTTTTTTTTTTCTATAGCACGATCGGAAT  
GTACATCTTTTGTATTGGAAATACAGTTTGTCTAATTCACATCTAGATGTTTTTTAAGGATGTACATCTAATCTCCACAAAATATAATGTAGC  
ACTTGGAAATAACACGCCAAAATAGTGGCCGCGCCAAAAGGTTAAAGGTAAGTACTACTATTGTTCCGATCATGTCAATTTTCTCAATTTTCTG  
AGCTCATGCCATGGGAATATGATCCATCTAACCGCCCGCTAGTTTGGAGTGGCAGGACTTGTCTGAAATCTGCCGGAATGAGCTGTTTATG  
TGAATTTCAATGGAGTTTCTTGAATTCGTAAGTGTTCGCGCATGCAAGCTTCTGCAAACTTCCAGCATGTTGCAAGGAGGAAATGTTTGTCTCTT  
GAATATGCAGATACTTGTATATCTTGGTGGCCTATGGAGAACACATGTTTTTTTTTGAAGTGTCCAGCAATTTGCTGGCTATTTTCAATGATTTAAA  
GCAGGGAGAACATGGTGATAACAGAAAAGTGCCTGGCCGTGAGGCAACAGGAAACTGAAAAGAAAACAAAAGAGAAAAGAGGCTCCTAATA  
ACCTACTATCTCATGGTGGCTCCCGAAGGGGATCTCAATGCAGTGGCTCCCGCAACCTCCATAATTTCCAGTGAATTTCTCAGTTCTCTCAACA  
GGCAGAGTGGAGGATATCTTGTTTTGAAGTGCATCTATTTCTTCTGCAAACTTCCAGCATGTTGCAAGGAGGAAATGTTTGTCTCTTCT  
CGCTCCGTTGGTGACGCTCTGTTGATTAATTTCTGATAATCACAAAGGCTTCTTCTGTTGCCAGTCACTCCGTCGGCGTGAAGGCGGAGCAGCCGT  
GCCAAGATGCCACCCGTTGCCAAACTTTCCAAGCCTCGGGCATTTCCAGATGATGTCTTGTGACTCCAGGCTCCGGAGACAGAGCTGGCAGAA  
ATAGCCATTTGGCCAGCCCGCTGTTGGAGTGTGCTGTTGGACAGACTCGGTTTGTGAGCAGCCAAACAAACTTTTGTATCTTTCCAGGGGCC  
CAAGATTTCCATATGTTTCCAACTGTAGTGTGCTGCTTCCAGCTTCCAGAACTGCAATTTGGTAAGCGGAGCTCGCTGTGTAATCTCCCTTTGCTCTCC  
TGTTCCTGAAATTTTGTCTTTCATCATCGTTTAGTGGACGTTTGCCTCACGAGTTTCCCGGTGTAGCCGAGGAAATCAGTCAATCTCCGTT  
GATATCGCCGTGCTCAAGGTCATGATCCATGCTCTGTTTGGCAGAGCTTGAAGAACTGCTCTGTTTGGCTCGGGAGTGTGGAACAGGGTTGGG  
AAGCCCTGAGCTAGTGTCCAGGTCAGCCATGTTGATTGCCAGAAATAGCGCCGCTTGGCCATCTCAACTGTACCTTTGTTGCTGCAGCAAA  
AAGCTGTCTCGTGTGCATCACATGGTGGTGGTGTGCCAATGCTTCTGCGGATGCTTCCAGGCTCCATAGCAGCAGCTGAGCAGGCTCG  
GCTGAAGCTTGGCAGGTCAGGATTTCAAGCCCTCCCTTCTGTTGGCGCGCAGACTGTTGGCCAGTTACCTTGCAGTTGGCCCTGTTACTTCC  
TCCTCTGCTTCCAAAGGAAACGCTTCTACACTTATCAATTTCTTTGAGTAATTTGGGTGGAACCCGTAGAACCAGGAGGCGAATGTTGGCATTG  
CGGTGAGGACGCTGCGGACAGCACTTCTGCTTGGCAGGGGAAGGAGGCGCCCTTCCAGCCAGCTAGCCGAGCCTTGTATCTATCTACAGGAA  
CTGACAGTGCACATAATTAAGCGTGTGCTGTTGTCACGGGAGCTAGATTAATTTGGGGAAGAAATGTTGATGGAACACCAAAATTTCAAGGATG  
TCAGAAAGATCAATGTGTTACATCTAATCGGTGTGCTGTTGATTTTGGCGGTTGATATGCAGGCCAGTGGCGTTTCCAAATTCAGTGAATCT  
CCATGATGGTTTGCACCTCATGCTGGTGTGGGTTTGGCAAGATTAAGTGCATGCTGATATAGACTGACTCTAAGCTTGTATCTCACGGCCCGGCAG  
AGGGCGGATAGTGTGCTCCACCGCTGCTCTAAACACTCTATGAAGTGGTCTATGGCTAGGATGAAAAGGAAAGGCGAGAGGGGCTCGCCCTGC  
CGCAGTCCCTTCTGTGACTATGTTTGGCCCGCTATGCTTCCATTTGAGCAGGAAGGCCATGATGATGAGAGTGAAGGAAATGTTGATGGAACACCAAAAT  
ACCTCGCCTGAAGCCAAAGCTTGGAGCAGCTCGAGCAGGTAATCCAGGAGACATTAACAAAGCCTTGGAGATATCTAATTTCAAGTGAACATGA  
CGGAGTCTTCTTGGCTGGAGGAGCTTGACACAATTTTGCACGTAGAGATAGTATCTGATATGCAATTTTGTCTGAGGAAGCCGCTGTCGCGCGGA  
GAGATCAAGCTTTGAATCACCGTTGCAAGGCGGAGCGAGAGCACTTTGGAGATCAGTTTGGCAACCGAGTGAATTAAGCTAATCGGTCTGTAGTCTG  
TGATTTGGCCAGCACCTTTTTTGGGGAGTAGACTACGACAGTGTGTTGAGGGCTTGAAGTTTCCCCCGCTAAGTGTGAACTGAACTGATGAAA  
AACTTGCATAACATCCCTTTTATGATTGGCCAGCAGCTTCTGAAGAACACCCCGGAGAAACCATCCGGGCCAGGTGATTTTTCCCGCGCGATTGC  
TTGATCGCTTGGCACACTTCTGCTCAGTGAACGGTGTGCCAGGCCACCACCCTGAACCCTTGGCATGCTATGTAGCTCTAGTCAATTTGTGCTAG  
TTCCGTTCTGCTTGTCCCTAAAGATCTAGTGAAGTGAAGTGAAGCAGTATTTCTTCTTTTCACTGCTGCTAGTGGCAACCCAGCCGCTCCGTCGAG  
CGAGTGGATGAAATTTTTCTGCGCTGGCGTTGATCTTGGCTGAAAGAAAGCTGTTTGGCGTCCCGCCGAGCCTGTTTGGAGCTTCCCGCCGAGCCTGATG  
TGTCGTTTTCCGGGCCCCCTTCCACCGCTGCCAGCCAAAGAAATTCGACGCTTGAAGAGCTTTCTCAGTGAAGACTCACTCTGCTGAGGCTCCGAGCCT  
CTTGGCCTATATCTAGCCGTAGCACTACCATTGTGGCCAGCTGCAGCTGCATTTTAGCATCACTAAACAGGACTTGTCTCAAATTTTGGAGTCTCT  
AGCTACCCGAGCATTCTGATGTTTCCAGGAGCAAAAGCGCAGGCCACTGGCCTGGCCGCTGCCATGCTCGTTGCACCGTCTCATGGAAGCGCGGG  
AACTTTGGCCAAAACGATTAACCCGAAACCGGGCGCTGCCCTTAGGGCCAGAGGCTAGCTAGTAGCAGTGGGAGTGTCCGAGCATGAAAGTGA  
ACCCCGCTGGAGCATGAAATCAGGGAACAGGACCTCCCACTCAATTTGACAGAAACTTACTATGCTCGCAAGACTTGGCTGTCGCGGCTCACT  
ACTCCAAGTGAACCGCTATTTTTGCATTTGATCTCCCGCAGGCCACCAGCATCTATTGGCCCTAAACCTACCCATGATCCTTCTGTTTATGTTG  
TTGTTGTTTTTATCGCGGCTCGTAGATGATGTTGAAGTCAACATTTAGGAGCCAGGGCTCTCCGGGGGTTGTGCAGCTCTGACTGACTCCACCG  
AAAGGAGTCTTTTCCGCGCTCTCAGACGGGCTGAGACCGTTGCAACAGAAACTAGCTCCCGAGGAGGATCGTGGCCTTGGCCGTGATGGAG  
AACTCGCCGATCATGGGATTTGATGCTGCGGAGGTCGAATCCCAAGAAAGTGGCAGGCCCTCTCTTGTGCCAATGACTGCGCAGGACCGGCT  
CATCGAGCCTTTGCCCTCTACTTCTTAGCAATCGCTGCTGCTCATTCTCGAGCTTGGTCTCTGGATGCAGAAAATGGCTAGACGGTGTGCGTT  
TGCCGTGCTTGTACTACAGCACACCGGCTGGATTATTCAGCCCGGAGCTTCAACACATGATTGGCCGGCCGCTGACTCATGAGGAACATG

GATCATTCGCATTGTGCTAGCCTTAGGTTGAGAGCCAGGGCTGGTGCAGACAGTTCCTATTTCTGAAGGAAAAACAAGTACACAGCACTACCATCC  
GGGGTTGCCGGCGCCACCAATAGGCCAAGATCCCGCCGGCAAACTACACAGCCATGCCCACTACTGTTACATCTCACTAGCCCTAAGGCTA  
ACAATCTACTACTTAGCTTTGACCCAGCACAGGGCTGGTCTGCTAGCTATGTTGGTGGTCTTAACATGGGGAAACCGGGCGGAGAGGCCTTCCA  
TCAGCGCCAAGCATGCCGGCAGCGCCCTTGAGAGCCTGGGCGTCTAGCGTGTGAGTCTTGGCATTGCGAGCTATGCTTTCGTCGTCAGAGGCTCGT  
CGAAGCGGGGATGAGCGCCTACGCCGAGCCGCTGTATCTTCTCCTTTGGTCCAGGATCCAAGCCATGCACCAGGCGGAAAGTTGCAGCGTG  
CGCATGGGGTACCGCCGCTTGTGCTTGCCTGTGCGCACTCGCCGGACTGGGACTGGGACTGGTGTCTTGGTCTTGGGGGGGCTGTCTTGTCTGG  
GGGTTGCCGATCACCGGGTGGGCGACTGGTGAAGAACGGAAGCTCGGCTGGCGTGCACCTTCGCTCCGCTACCTCCCTGCTAGCTGCAGGCTCG  
GTCACCTGCCTGGTACCGCCCCAGCTGGAGCGCGTGAAGGCTCACGGTGGCGGGAGTGTGACGCGCAGGGACAGCGCCGGTCCCAAGTCCGCTGG  
ATTCCCCGCTGGATCCATCTTCAATTGGCGAAGTCGAGAGGCTTGTGAGCTTGGCCGCGATCACTTGTCCAGCGTGGAGCCATCACATCAGGGCG  
CTTGGGGCGGCTAGTTGCCGCTTGTCTCCCTCGAAGAACTGGGCCACTGGATCTTCCACCGGCGCAGCTGAGGACGAGACAGTGTCCCGGTGCAGC  
TTTCATGGTGGGCGAGCAGGACACTGGCGCTCCCCCTGCCCGCATCTGCAGCTTTCCTTGGTGGCGCTTTCTCCTCAAGACCAGCAGCAGC  
GAGCGCCCTTTTTGCCCTGCCCTCGGGCCGCGTGGGCGCCTCCCGCAGGGTCCAGCAGGAACGGCACTCCATCGACAGTCCGGTCTCCAGGGCG  
ACATTGGCGGTGCCTTGACGTCGGGGTGGGCTGCGGTGTCTGGTGGTGGCCTTGGTGGCCTTGGCGTGGTCCGCGCGCCCTCTACTAGCAGC  
GCTTCCCTCCAGGAGTGGCGGTGGTGTCTCGGTATCTCCGTATGCTCCCTGCGTGCACCCCCAGCGGCATCCCTTCCAGCCAGAGGAGGAGA  
CACGGGAGGTGGGCGCAGCAGGGGCGCCTGGGGTTGGCGGGCCCGCTTCAACACGCGCGTCCAGACCCAGGGTCGATGGGGGGTATGG  
CCGCTCGTCTCTCATCATCGTCGGAGGGGAGGCCACTCTGCGGCGAGTGGGAGGAGCGCGGCGGAGAGCGGCTCCAGTCCCTGCACCGTTCATG  
TGAGCAGCAGGTACTATGCAGCAGCTCCGGCGGAGGAGCGACCGCGCGCTCGGTGGCGAGTAGCCGAGCATCTCTCCACGCGGCCCGCCCC  
TCGCATGCTTCCAGATCGTCTTGTGTCGGGATGAAGGAGAGGTTCCAGACCCAGCCAGCATGCGAATAGCTTGGTGTGGCGCGCTCAAAGT  
TCGGTGTGAGGCGGTGCAGCATCACTTGTCTCAAAGAACTCCACCGCGCCCTCGAGCGTCCAGAGTGCATGGGCGACTTCTCGATGACCACC  
CGGACGCGCAGCATCTTGTGTGTCAGCGCGTGGGGTCCCTCCCGCAGGGTCCAGCAGGAACGGCACTCCATCGACAGTCCGGTCCGAGCGGCG  
GCACCGCCAGATCTTGTGCCCGGCGAGTTGAAGAAGACGAAGAATCTTCAGGGTCTGGGCGGTACGCGCAGCAGGTGAGGCGGGACCTTCAG  
CTCCTTCCAGCGCCCTCCCGATGACAGAGGGCTTGGCGGTGCGCCTTGGTGGCAGCCGAGTGTGACGACGGCATGTGGGTGAGCAGGGCGC  
ACTTGGTGTCCATTGACAGGGTGAAGCGATGACCTTGTGGTGTGGCGGGCGGCGAGTGTGGTGCAGCAGCGGAGCGAGCTCCATGGCAGCTG  
GGAGGGAGGGAGTGGCGCGGTGGCGTAGTGGTGAACAGGAGGGTTCGAGCGACCAAGATCGCCGAGCGGCTCTAGCAGAGCCCGCTCCTCT  
CTTCTTGGCGTGGTGGTGGCGGCGATTCCAGCGTAGTGGCCCTGCCGCTTGCAGATGATGCAGCGCAGGGGGTCTCTACAATCTACTCTACGATGG  
TGAGTGTGACGCAACGAAACAGAGGCTTTGAACCTGCTTAAAAAGGCGCTCGCGCGGAGACGTGGCGATGGCGATGGGCGACGAGCGCTGT  
TCGGGGGTGGCCAGACCCGCTGGATCAGAGCCAGCGCACCGGCCCTTACAGGATTTCTGGAGCGTCCATCCCTCTCAATGGCGCTGTCTATTGCC  
ACCTCGCCAGCTGAGTGTGGGGGAAGGCAACCCACCAATGGATTTAGAGGGGTGCCCGCCCAAGATGGGCGGCGGAGTGTGTCACCGGGCA  
ACCACAGCAGCAGCTCCGGATCCACGCGAGGGGGCGAATCAAAGGGCGGATCCGCGCGACGGTGCGGCAGGGGTCTCCGGCACCTGGGACGGACC  
GCTGGACGACGCCAGATCTCCCGCTTCTCCGAGTGTCTCAGGCCAGGCTGGTGGTGGCGAGGCGGGCCCGCCCTTGGGAGCAGCGCGACATG  
GCCAGGGGCGGATCCACCGCGCGCGGGGGTAGGGCTAGGGCGTGGGGTGGCGCGCGGCGGAGCGGCGCGGGCGCTGGGGGAGGAGAGGGAG  
GGCGTTTCTGGTGTGTTGGGATGCAATGCAATGAGAACAACATGTGAATGTGTATCTGATCACATGACATGGCACTACTTAAATAGATTAGAT  
CAAACCACTTTTCTATATTAGTCAAAGATGAACATCACATGGTCCGCACTCAATCAGGAAGTCCAGACTCTGGCTGTATTACTGAACCCACATGA  
TCAGTCCACAAGATGACCCACACAACGTACGTACGGAACACGATGTGCTTACTTCAAGTAGTGTAGTGTGTGTCTACTGCTCAGTATTCGAGAAA  
CAACTTGTATTATTTAATTTTGGTTTTCTAAACAACATTACTTTTCAATTTTCGGAAGAAGTGAACCCCTTAGGTTACAGCCATTAATTAAGA  
AGAAAGAAATGGCGGATTAACCTGTGAGAAAAACAGCGCAAACTGCAATCACCCACACAAGACGTAGTGGTATTGTTTATTCTTCTTCTC  
AGTGAGAGTATAACGAGTTTCTCTGCCATAATATATAGTTATATAAGCTAGTAGTAGTCCGAAATGTAGTGGAGCTCATGCTTCATTGAGCCC  
AACAAACAAAAACAACAACAATGCCTTTAGTCCCAACAATAATTTGGGTAGGCTAAGGTGAATCCGTAAGATCTCGCGCAACACTTATGGCTCT  
AGCACATGAATAGCAAGCTTTACGCACC

>TaFDL-B6 CDS, extracted from IWGSC\_CSS\_5Bl\_scaff\_10903754

ATGAGCTCTGAAGGGCGTGGCACCGCCATCACAGGCAAGAAGCGGAACAGGGCCAAATTCAGACACTAGTCAAGGGAAGGCTCTCTCTATAAACC  
CCCTCAGTGAGGTTGAAAGCCACCTCGGTGCGCCACTTCTTAGTATGAACCTTGTGAGTACTTTGTGAGGAGTGTCTTCCAGATGAGAAGA  
ATTACCAAAATGGCGCTGGGAATTCAGGCAAGTCAAGACAGCTTGTGGTTGGAACTGAGGCGCAGCAGTACTGTACCCCTGCCATTGAGC  
AAGAAGACAGTGGATGAAATTTGGAGAGACATCCAGCAGGAAGAGGAGTAGTGTATGATGAGAAAAGGAGTTCAGGTTGTGAGGCACAGATG  
TTGGGGAGATAACACTTGAGGAGTCTTGCAGAAAGGGCTGGCATTGTTACTGGGCGATCAGAAAGGATGCTGAGGAGTTAATGATCTTGTAG  
TGGAGAAAGTGTCTATATGATGACCCAGAGTGCAGGATTTCCACAGGCAAACTGCAATTTGATGCGTATATTGTACGTCAGTTCAGGCA  
CTGAGTGTGCAATCCCTTCGCAATGGATCCATCTCCAGCTGCAAACTGCAATTTGCAATTTGCAATTTGCAATTTGCAATTTGCAATTTGCA  
GTCGTAAGAGAATGTCTTCCAGGATGTGGTATACAAGGTGTGATCGGAGGCGAGAAGAGGATGATCAAGAACCAGAAATCGGCTGCAGCTT  
AGCTAGGAAACAGCCTATACAAACGAGCTCGAATGCAAAATTTGCTTGTCTGGAAGAGGAGAAACAAAGGCTGAAGAGAGAGAGGAGTTGG  
TTATTGAAGTCCGGCGCCCTCCGGAACCGAAAAAGCATCTTGGGAGAACCGGATCGACCTCATTCTAA

>TaFDL-B6 protein, extracted from IWGSC\_CSS\_5Bl\_scaff\_10903754

MSEEGGTAITGKRNRAQIQTLVREGSLYNLTLSEVESHLAGPLLSMNLDDFVRSVLPDEKNLPLPNGAGNSGSQSTSAFGLERQGSITVPLPLS  
KKTVDIEWRDIQEQEESDDEKRSSGCEAQMSFPEITLEEFQRAGIVTGYQKDAEELIDLVTGESAHMMTRVQDFPQGTSAIDAYIVRQISIAQP  
LSVAIPSTMDSIYPDRQMSISSLSLESLDLQSPSRKRMSQDVVYKVADRRQRKRIKNRESAARSARKQAYTNELECKLSCLLEENKRLKREKELDM  
LLKSAPPEPKHLRRTSTSF\*

>HvFDL-H6 morex\_contig\_135261 carma=5HL\_ORTHOLOGUE 5H cM=43.76

GATTCGTTCTTTGACTTAAATCCGATTGCGGGTTGATTTTAGGAAACGCTCGGGGCTTTTTTGTAAATGCCGTGGTGGGTTTTCCGACGNNNNNN  
NNNNCGCTTTTATTATTAGGATAGATAAGCCTGCACGTCAAATGGGCTGACATTTCTTTTGGGCTCTGGATTTCTGGGATAATTGGTTAGATCCAGCC  
CAAACAAGCTCACCTTGGGCCAAGTAACACACGTCACGCTCTCGGGCCTGGCATCACCTCTACCTGTCGTCGTCTTCGCTTCCAGCGAGAAA  
TATATTCTCCGGTGTCTTCCCTTCTCTCTCCTTTCTCTCTCTGCGCGCGGAGCAAGATTCCACTCTCGATACCTCGGAGTTATCGCGCA  
CCGAGCAGCAGATTACTCTCCCTGCCGCTCGCGCTCTTCCAAGTTAGTATCTGATCCTGTTTCCAGCTCCGTTGCTTTCCCTCACCCGCGC  
CCAAATTTGTCGCTGATCCATCATGGCGTCTTGTGGATTTGAAATGGATCAGTACGACACATTTACTCGGGAGCCTGTAACCTGCTGTAGC  
GTAGGTTTCTCTCTCCTGCAAAATGAAGCGGAATTCGCCGATTTCTTGTGTTGCTGGGTTTCCGGCGTTTTATTCCGTCCTGTTTGGCAATT  
GGGGTTGCGATGAAATAGACTGGTGTCCACTGATTTAATTTAGAGTTGGGATGATCCGTGATCCGTTTCTTTAGGTTCTATATATACGATTTGT  
TCTTTCTGGTTCAGCTTTAGATTTTGGGCTCCGGTAGATGATATTTGGCTAATCCCAATTTAAATTTATTCGCGTATTTACTGTGAAAGTTAG  
TGTACGACGCGCTGCTCTTTTCTACTGCTTGAACCCCTATAATTTAGAGAGTGTGTTATTTTTTTCTTCTTCCAGCCACTATAACCAATGGGT  
CTTTCAATTTCTTTAATTTACCCCTTGCAGATAATCTACCAATGTTTATACAGTAGTCACTTTATGACTTGGGCCAGAGGTTTTTGTCTCCAA  
TCTATGGAAGTAGTTCGTTGATACTGTATAATTGATGCTTCAAATGATGTTTACATTTGGAAGAAGTCAATGTGTACATTCCTCTTTCCATGAA

GTATGAGCAATAGTTTTAGGAGAAAAATGTCCATTGTGTGTTGTACAAAAAAGAGTGGGAGAGTAAATAGCATATAATTTTTATGTGCG  
GCACAAAATGGGCTGTGACCAATTTGCATGTCCATACCTTTATCCCATGATTAGTACAAAAGTTTTTCGCGCAGACACAAATAGAAGAATGCTC  
TCACCTAAGATTTGTGGCCACTGCTCAGTGGTCCATAGTTTCCACTAGTAAGTATTTGCAGTATTTCAACAGCACTATGCTATTTCTTTTC  
TCATATTTGAATCATATATGTTTGGTACCTTTTCATGTTGTTTGGTTCATTTTTATATGCAATTTTTTTGACAGGTGCGCCCTTATCTTTTATTTGT  
TGGAATTCGAAGTTGGAAAATTAATACATATGATACGTCAGGTTGAAGTACATTTCTTCAGTAACTGATAATTTTTCTGAATATACATGTTTGTAT  
CATGAGCTTGCTCATATATGATATTTGGATCTTAATTAATCTTTTCTTATACAGTAAGGTTGCCTGCTTGAATAAATCAAAATCTGAACAAT  
TTTTGCACAAGGATTTACCAAAATCAGAAAGCTTACCCTTTCATGCTATCAACAAGTATCAACAGTCCATCAACAGTCCATTTGGTCAAACATAAAAACAGGCAAAA  
**TCAGCTGTGAAGCGGTTGGCACCCGCATCACGGCAAGAAGCGGGACAGGGCCACATTCAGACACTAGTCCGGGAAGGCTCTCTCTATAACCTCAC**  
**CCTCAGTGTGAGTGTGAGAGCCACTCGGAGCGCCACTTCTTAGTATGAACTTGTATGAGTTTGTGAGGAGTGTGCTTCCAGATGAGAAGAACCCTCCA**  
**TTACCAAAATGGCGCTGGGAATTCAGGCAGTCAGAGCAGTCAGCTTTTGGTTTGGAACTGAGGGTAGCAGCATTACTGTGCCCTGCCATTGAGCA**  
**AGAAGACAGTGGATGAAATTTGGAGAGACATCCAGCAGGACCAGGATAATAGTGTATGATGAGAAAAGGAGTTGAGTTGTGAGGCACAGATGTCGTT**  
**TGGGGATATAACACTTTGAAGAGTTCTTGCAGAGGGCTTGGCATAGTTTACCAGGACAGTTCAGAAAGGATGTCAGAGGATTAATTTGTAGGAAGT**  
**GGAGAAAGTGTCTATTTGATGACTAGAGTGCAGGATTTCCACAGGGAACAAGTGAATTTGATGCGTATATTTGACGTCAGTCGATTGCGCAACCGC**  
**TGAGTGTGCAATCCCTTCGACAATGGATGCCATCTACCCAGATCGTCAAATGAGTATTTGCTCATCTCTAGAAGCTTCTGATCTTCAAAGTCTTAG**  
**TCGTAAGAGAATGCTTCCAGGATGTTGTTATACAAGTTGCTGATCGGAGGCAGAGAGGATGATCAAGAACCAGAGATCTGCTGCACGTTCAAGA**  
**GCTAGGAAAACAGGTTTATTTTTTGCCTTTTACAATCAAGTCATGCTATAGAAGCTTTGTTTGTGCACTTTAGCATGATAAAAAGCTTCTATGAGA**  
**TTTAGAAAATACTACTAAGAGAAGAAAAGTGAATTAGCTCTCATGTTGGAGCAGAAATCCAGTTAGCAAGGAGCCTAGCAAGCGATCTCTAATTAG**  
**CACAACCTCCAAAAGCTAGTTTTTGTAAAGAAAACATTTATTTGGTTACTCTGCACAAGAACAGAACTAACATCCCTCTTTAGATTAGAACATGCC**  
**GTAATAGGTTAGCTTGCCTATTTAGCACCTAATAACCCCTAATTTACTAATTTGACGATTTTCTGTTGGTGTATCTTATTTACGACAAAC**  
**ACTGGGATATATCTGTTTTTCAAACATAATTTTTTCCCTTTGGGAACTTTTTTTTGTGAATAATTTAGGCTTACACTTAACTTTGAATTTAGGAA**  
**TTGCTTTGTCTGGAAGAGGAGAGAAACAAGAGGCTGAAGAGAGAGAGGTTACATCGTGTCTATTTCTGTACATAACCTGTTAATTTCCCTTAGATTG**  
**TTTTGGTGGAGGTTTGTTAACCTACTACTGTTATTTTTTCCAATGTTCTTGTCTTCAATTTGTATAGTTTGCACCTTTTAGTGTAAAGCATGCACCGCGCT**  
**GCCCGTTCCACTAAATAATTTACACCTTTGTCTCCTTTTTCTGTTGGTATTAATAAAAAAATCAAAGCATCGCTTTGGATGACTTCTCAAATAC**  
**TTGGTGCACCTGGTGTGATCTAATTTGAAGCCATGGCTGCATGAATAGGATAGAACATGATGCTGAAAGAAATATTCGTTGAGCATATAAAATGGCAC**  
**CCGAAAGAGTTATATTTCCCTGTTCTTCTGCTTGCAGATTTGCATCTCGGGTTTCCACATGAATACAAAGAACACACAAGGGCATTATTTGAT**  
**GCAGTTTGCACATCAAGAACCAACAATTTGTTGCTATGTGCTATTGGAAGTGCAGGATTTGATTTTATCTAGTATTACCATTACCTCTTATTTGATG**  
**ACAACGATTTACCCGCTTCCGCTTGCAGAGTTGGCAGTTATTTGAAGTCTGCGCCCTCCAGAACCAGAAAAGCATCTTCCGAGAACCGCAT**  
**CGACCTCTCTTAAATTTGTGTCAGAGTAGAGGCTTCTGGTAGATTTGATCATCTTTTGTCTCCTTGCATGTAACATGATGATGTGTCAGATT**  
**TGCTTTGCTTGTAAATTTGTAAGGCCTAGGACACCCGACAATCTTGTGAAATATCTTACCAGGCTTTAGGTTTCCAGATTGTAAATCTGGCTGTTT**  
**CAAATATCTTGTGTGACAGATCCAGTATGCGGATCGTACTGCGAAGTTTCTTGTGATGACTTGTGTAAGTTTCCACTGCTGTAACCTGTAGCC**  
**GCATAGCAAATTAACGAACCTTGTATCTGCTTTGCGAATCTTTGGTGGGAAGAGAATGTCTCGCAGCAGTCTAAGCTGAATAGAGAATGTTCA**  
**CCTAAGAAAATCCCTCTTGCCTGATCCCATGTCATGTTCCATGTTCCATATAGTACCATATACCATGCTGCTGAAAGAAAAGGGCCAAAACCAAGCCGT**  
**CTCAATGATTGAAGAGGAGGAAGAAGAAAACAGCAGCTGGGCGTAACTTGGCCAATTAATAGCTGGTCAAGCTTAGTCTGTAGACTTGGACTTGA**  
**GAGACAGATGGTCCATGCCAGCTTCTTCCATGTGAGAGTCCAAAGCTAGTTCTGTATGAGCATATTTGCTCTCTTTTCTCTATAGCACGATATCG**  
**GAATGTGCATCTTTGGTATTACAAATAGCACAAAAAAGAGTATATACTTAGTGCCTATGGAGAACAATGTGAATGTGTGATCTGATCAGATGCCATGGC**  
**TACTTAAACTATATAGATTGAACACTTCTCTCAATATAGTACAGTAACTACTCTGATCCCTGATCATGTAATTTTCACTTCAATTTTGAAGCTGAGC**  
**CTGGCTGTATTACTGAACCCACATGATCAGTCCACAGGATAACCCACACAATGTACGTACGGAACACACATGTGCTTACTTCAAGTAGTGTAGTGT**  
**GTGCTCAATATTCGAGAAGCAACTGTTATTTCTTTAATTTTTGTTTGTAAACAATTTTGTCTTATACATTTTCAAGAAGAACCGGAGCCCTTGA**  
**GGCTCAACCCATTAATTAAGAAGAGAGAAAAGTGTGGAAAACAGGTGAAAAGTGGTGCATCACCCCAAGGCGCTGCTGGTTAGTTATTTTTTGT**  
**TATTTTTTCAGTCAGAGTATAATGAGTTTCTTTCCTAATAATATAGAGATTATAAGACTAGTATAGTCCGAAATTTTCAAGTAAAGCTGAGCTC**  
**ATGGAGCCCTTTTTTTTTAAAAACAAACAGAAATCAACTTTTTAACTTAAAAAATCTAAAATATATGATGATATATAGAGATGACTTCTCTGTT**  
**TTTTAAATATAAGTCATTTTACAGATTGTAAGAGTCTACATACGAAACAAAATTTGATGAATCTACTATATAAGATATGCTACATACATCTGTAT**  
**GTAGTCTTTAGTGAACCTTTTTAAAAGACTTATATTTAGAACCAGGAGGAGTATACTGATGTTTGTAAACATTTTTATGATGAAATACATTATAAT**  
**GTGAGCTACACGCAAAATACAAATAGTCTTTTGAATGAAATGAGACATTCGTTTGCACAAGTAAAGTATTTTGTGTTGATGATCAATCAAGACGATTTT**  
**ATCATGAAAATCTACGACATTAAGTATTTTTAAAGCCTGAACCTTAAAAATGATTGATTTTTGCAAAAATTTGAGTTGAGCTCGGGAGCCAAAATCC**  
**TGACTCATTAGTAGTTCCTTTTGTATCAACGCAACACAACAATCCCGACTGGACTTGAAGCAAAAGAGAAGTACTTACACTCTCTTGTATATAACT**  
**TATGAAAGTGCCTTATATCGACTAGAGGGGTTGAATAGACGATTTTTATGAAATTTGTCTCAGTCGCGAATGGCGAGCAGCGGATTAAGGACTCAGC**  
**CAAGTGTGCAAAAATAACAATATAGTCTTTTGAATGAAATGAGACATTCGTTTGCACAAGTAAAGTGTTCAGGATTTGCAAGTAAAGCAAGT**  
**GAAGTGAAGAAATTTGGGTTGAGGAAATGCAAAAAGTCTTCAGTCAAAATCTTCAANNAGTAACGATCAATTTTCAACATACACAACCTCAGGAAATGA**  
**AAGGGTTGATGAAATAGAACCAGGTGCTCAATGAAGACAGTGTGTTGATGACCAAGTTTCAACTGCTGGGACATTCGATGCTGTTTGGACCGACT**  
**TGGTATTTAAATCAAAGGACACACAATCCTTACCCTATNNNNNNNNNNNNNNNNCGCACAGTCTCGCCCAACACTCGTAGTAAGTCTTACAGAGCA**  
**GACTTCTAAACTGTTAGGGCATATTTATGCCTAAGTAACCTTTGGTGA**

>HvFDL-H6 CDS, extracted from morex\_contig\_135261

**ATGAGCTGTGAAGGCGGTTGGCACCCGCATCACGGCAAGAAGCGGGACAGGGCCACATTCAGACACTAGTCCGGGAAGGCTCTCTCTATAACCTCA**  
**CCCTCAGTGTGAGTGTGAGAGCCACTCGGAGCGCCACTTCTTAGTATGAACTTGTATGAGTTTGTGAGGAGTGTGCTTCCAGATGAGAAGAACCCTCC**  
**ATTACCAAAATGGCGCTGGAAATTCAGGCAGTCAGAGCAGTCAGCTTTTTTGGTTTGGAACTGAGGGTAGCAGCATTACTGTGCCCTGCCATTGAGC**  
**AAGAAGACAGTGGATGAAATTTGGAGAGACATCCAGCAGGACCAGGATAATAGTGTATGATGAGAAAAGGAGTTGAGTTGTGAGGCACAGATGTCGT**  
**TTGGGGAGATAACACTTTGAAGAGTTCTTGCAGAGGGCTTGGCATAGTTTACCAGGACAGTTCAGAAAGGATGCTGAGGAGTTAATTTGATTTTGTAGGAAC**  
**TGGAGAAGTGTCTATTTGATGACTAGAGTGCAGGATTTCCACAGGGAACAAGTGAATTTGATGCGTATATTTGACGTCAGTCGATTGCGCAACCG**  
**CTGAGTGTGCAAAATCCCTTCGACAATGGATGCCATCTACCAGATCGTCAAATGAGTATTTTCTGTCATCTCTAGAAGTTTCTGATCTTCAAAGTCTTA**  
**GTCGTAAGAGAATGCTTCCAGGATGTTGTTATACAAGTTGCTGATCGGAGGCAGAAAGAGGATGATCAAGAACCAGAAATCTGCTGCACGTTCAAG**  
**AGCTAGGAAAACAGGCTTACACAACAGGCTTGAATGCAAAATGTTCTTGTCTGGAAGAGGAGAGAAACAAGAGGCTGAAGAGAGAGAAAGGAGTTGGACAT**  
**TTATTGAAGTCTGCGCCCTCCAGAACCAGAAAAGCATCTTCCGAGAACCGATCGACCTCTCTTAA**

>HvFDL-H6 protein, extracted from morex\_contig\_135261

MSCEGGGTAITGKRRDRAHIQTLVREGSLYNTLSEVESHLGAPLLSMNLDEFVRSVLPDEKNLPLPNGAGNSGSQSTSFAFLERQGSITVPLPLS  
KKTVDIWRDIQQDQDNDSDDEKRSQGEAQMSFGEITLEEFLQRAGIVTGCQCKDAEELIDFVGTGESAHLMTRVQDFPQGTSAIDAYIVRQSIAPQ  
LSVAIPSTMDAIYPDRQMSISSLSLESLDLQSPSRKRMSSQDVVYKVADRRQKRMKRNRESAARSARKQAYTNELECKLSCLLEENKRLKREKELDM  
LLKSAPPEPKKHLRRTSTSF\*

## TaFDL15 (TaFDL13 alternative splice variant)

>TaFDL-A15, IWGSC\_CSS\_2AL\_scaff\_6429764 (underlined TAA is a stop codon in the alternative splice form TaFDL-A13 resulting from intron retention)

```
CCTCCTCCTCCTCCATCCTTTATATACTGAGGCAAGGGGCACCCCATGAACACAAGTTGATCTTCGTGATCGTTCCTTAGCCGTGTGCGGTGCCCC  
CTCCATCATATTTCCACCTCGGTATATGTAGCGGTGCTTAGGGGAAGCCCTGCGACAATAGAACATCAAGATCGTCAACACGCCGTGCTGCGACG  
GAACTCCTCCCGACGCTTTGCTGGATCGGAGCCCGGGATCGTATCGAGCTGAACATGTGCAAGAAGCTCGGAGGTGCCGGAGTAACGGTGTCTG  
GATCGGTGCGATCGTGAAGACGTACAACACACACCGCTTGTGCAACCGCTCCGCTGTGCTTACAAGGGTAGCTAGATCACACTCTCCCT  
CTCGTTGCTATGCATCACCATGATCTTGCCTGTGCGTAGGAATTTTTTTGAAATTACTACGTTCCCAACACCAAATCTTCAAGCATCCTCAAT  
TCATCGATGTAAGCATGCGATTCACACTCTTGTGGAACCTGCCCTGAATTCGCTTTTTCTTGGTGTACAACAATCCTAGTGAATCTTTAGCCTTCT  
TGAAGACATGCCACTTGACCATCTGTGTGCCGTATGCGGCAACACATTTTTATGCGCACCCTCATCGAACGGTTCGTATGCACAATAACACAA  
ATCATGTTATTTAATCTTTTGGTCTCAAAAGCATCCGATATAATTCAGGATCGTACCAATTAGAATTTCTTCGGTGAAGGCAATCCGCCATCA  
ACAACTCTGTGAAGACCCACTCAAAGTCTCCACTTTTTTGTACACACCAAACCCTAGCTAGGATGATGCTCTGGAAATGATTATTCACACCTA  
TAAACAGGCCAAAAGGCATGTTGTACATATTTGCTGTATGCTGATCGAAGGTAAACCACGTCGCTGAAGAAATGTGTACTGCAATCTGTCTGCTAC  
ATTTGCCACATAAGAGTGTCTTCCGACCTTCATTTGTCTGCTTCCACTCGGTACGTGAAATGCGGATCACGGAACCCAAATCTGCAAAAACCTCC  
ATGTTTTTCTAAACATCTTCTGCCTACTACTGTGCTGATTTGCAACACAAATTTTCAGAGCTCGCTTCGTGAAAGGCACCTTCTCATTTGAAC  
AAAAAACTGCCGATGATGCTGTGCACCTTTGCGAGGTTACATTTGCTGCGCAACTGCTCCACCAAGTCCCTGCTGTAGGCATCAATGTGCTTG  
TGGATGGCCAGTGTATGCTGTCCATACGTTGGAGACAATACATGTTCTGCTGTTTCACGATGCTCTGCTATATACCAACCGTTGCTTTTGTGAT  
GGAGGAGTCTTATTAATGACGGGCACCTGCATCTACACGACCTCGTGTTCACACACGACTTTGCCCTGAAAAACCAAAGTGGAGGCAAAAAGAA  
CATATCAGGATCCATCCAGGAAGAAATCAGTCCGGAATCAGTCAATGATGTTGCAAGCAAGTGTACACATGTTACCGCACAATCCATCACTT  
TTGATGCATTTTGTCTCTCCACATTAACCTACTCTTGTGTATCTAATTCGAAACCCCTCTCCACGAATAGAGATTGTAAGTTCATACGCC  
TCCTAGCGTATCGAAGCTGTACCAAGTCTGCGGACAATACCATGTCCCTGGCTGATCAGCAAACCCCGTATCGCTTCTCAAGGGCAGCTTATT  
CGCCAGGGCAGATGCTCTTCCGGGTGCAGCTGCTCAATTTTACCCTGCATTTTAAACACAACAGTGTGTAGATGCCTGGTTTTTCATACGAA  
TTCTGAAATTCAGAAATCTGCATACGACTGCTCTGCTATGTTCAAGCATCCTGAGTCTCATGTATTTCTAAACCCGTCAGATGTCGTTATCCATG  
GTTTTGCTGGATTCCATGAGTAAACTAAGAACTCTGCAAACTGACTTACATGTTCAATTTTGTGCTTTTTTTCTTAAACCACTTTCTGACGGGTA  
TGACTTATGTGCTCATATATCTAGTACAGAAATTCAGTCTTCAAACCTCAGCTGGACAGATTGATATAGGAATGTTCTTATATCATCCATAAAGAA  
GAACCTTTAAGCACTCAGTTAAATGGAAAATTCATTCATATGTTTTCAGGGCAATCATTTAGAACGACGCAACCAATTTCCATAGATAAAGAA  
GC AAAAATATGCTTCCAGTAATCCATCTACTACATATATGTTTAAAGTCCCGCTCCCAACTCCTGCTATTTAGTACATGTCCCATCCGAC  
GACCAGCAAGAAAACAGCCGCTCCATTGGCCTGCGCTTCTTGTTCCTATCAAATGATGCTACTTTCTGAACCTGTGCAACCACGATAGTACTCGA  
TCTTTTCAATGAACTGACTAATATATCTACTAAGCGATCTGAAAGTATTTTAAATATCCATGTGCTTCTTATCGTACATTAAGCTGCCCAG  
ATACATAATTCACGTAGTGTAAATTTCTAGTTGGAAGTGTAAATCTCCCAATAGAACTGAAACAAAACCTTACTGTACTGCAACCAAGTTTG  
CCATCAGGATCCATCCAGTCCATCCAGTCTTGGAGTCTTGGAGTCAATCTGCTTCTGCTGCTGCAAGCTGCGGCTCAGATGTCGTTATCCATG  
GCTCCCCCTCGGCCGCACAGATCTGCCCTCAACACTACCAGCCGCATGGCCGGGAGCTGCTCAGTTCAGTGGCCATCACGGGTAGTGAAGCG  
GCTCCATCGAAAGCTGGTGTCTATTCTTCCATCACCGCAGTGTGCGATGGCAAATCTCCGTCTCAGTACGGCCAAAGATACAAAAGCAG  
AATCTATAGATCAAGCACTTCCGACGGGGGGTGGGGGCGCAGCACAGATGGAATAGTTCATCTTACCTCCTAATCCGGTGCAGCAAGAACTCCAT  
CCCAACAAATCTCCGCTGTTTTGCTCCACCGCAGATCTGCACAAGCGCAATGGCGAACAGGAATCCTCATCCAGAGATGGGAGACAACTCGGCC  
TTATCTTTTACTTCCGCCATAACGCTGCTTCCGAAAGCTAGCTTCCAAAGCCACAGATCAGGGGCGCAGAACCATCCCGAGCCACGGCTCGTCT  
ACCTCGCGTCATGGCGCGGCTGCAAGCCCGCTCCTCCACAGCGCGCTAGCGATCTCTATACTGTATTTCTGACTGGGTTAATTAATAAAGAG  
CTTACCCTGCCCTGTAACCTTAGCGTCAACATCCCGAAGTCAATTCCTACCGCCAGATAACGAGACAACTGTGCTCGTACGACGAAACACCGC  
GTCCGTACTTGCCTACAGTTTAAAGTGCCATATCTTTGAAAATTTGAAGAGTGCACATGTCTGTTGGTGGGGCTCGTTCCCATAGTAAAGTA  
TCCCAGATCAAGTTAACCAGGAAGATCACTCTTATCATGAATTTGGAAGTTTTTTAGAAAGAGAGCTTTGTTGTGAGTAGCTATGTCCAAGA  
CCCTAAACCACTTGTCTTTTGGTTTTGCAAACTGTGTTCCAAGCAATGAGGGAAGGACCAGCACCTTCCAGCCATATTTCTTCAAAAACATG  
TCTGATGTAGGAATTTACTTGTATCCACCAGTGTGACAGCGAGTTCAAAAGGACACATGAAGAAAGTTGGCAGGCTGGTGAACACTCTTGGTAAAG  
GAAAGTTTTTCTCCTGTTGAAGCAAGGTAGGCAACTTGTGAGCTTCTCAATTTCTGCTGATCATGAGGGAAGAAATCCACTTTTGGCTTTT  
TAGTGCCTAGGGGTAGGCCAAATAAGGAAAAGAAAAGATCCAATATGCAACCAGAAATAGCAGCCAGCTGAGTCAAGTTTATCTGGCCCCAATT  
GATTGGATACATAGCAGACTTTGAAAAATTTATCCTTAGGCCAGTGAAGCAGAGAAGTGAATAACAGGTTTTGGATTGTGCAACTGTGTGGGA  
TAAAGTTGCAGAAATAACAAGAGTGTCTCGGCATCTGAATGACAGGAAAATCTTGTGTTATCCAGAGGAGAGGAAATCAATCTGTGTTTCATG  
CTCATTGAAGATAGATTGAAAATGTGACGACCAAGACAAAATCAGAGGAGAGACTGGTCCCTTGTCTTACACTTTTTTGCAACAAAATTT  
CTTTCTAGAACTCCATTAAGGAGAACATTAAGATACACAGAAGAAAATTCATGTCCATCCAATGCATCTGGGACAAAACCTTTGGCCA  
CCATTATGCTTTTCAGAGTCTGATATTAATCATGTCAAAAGCCTTTTCAAATCTAATTTCCGAATGATAGTCTTCTTCTGACTGTTGCAATTG  
ATATAAATATTCATATGCCATGCCAGACAATCCTGGATGTCTTTCTTTGAGAAAACCATATGATTTCTGTGAACGAGTTTCAGAATAATTTTT  
TGCAGTTTTGTGGCCACAGTTTGTGATAATCTTAAAGAACAAATTAAGTGAATAGTTGAAATAGGTCGAAATCATTAGCCTCAATAGAACATCTTTA  
TGGGAATCAAAGTAATGTAAGAGCAATGATGCTCTGCAGATACATACCTTAAGAAATCATCAATCAACTGATAGGATCAGTACGATGATGAT  
GTCCAGCAAGATTTTATAAATTTGGTGTGAGAAGGAGTATCATTTTTCTTTTCGACGAGGGTCATATAAAGTCTGTATGGGATTTTCGAGGCCA  
GAGGCAGGGGAACGAGCTACTTATTTCTTACAGTGTGTGATGATGATGATTTTTTTAGCATAGTACAAACCAAGTCTCATATATACCGG  
CATACACTCACCTATGAACACACACAGCACACCCACTACTTATGAGCATCTCCAAAACCTGAGCCGGCAGATCACTTGGATTTACGAAGTC  
ACCGTAGGCCTGCTGCTCGACAGAAGACGCTTCTCTCACTACGAAAGCGCATCCACGAAAATCCTGAAATAAATCCAGAAAATATGCAAGCATGAG  
ATTTGAACCATGATGAATTAGGAATATCACTGTCCACCTAATCATCTCAAACACAGGTTGATTCGTGTGTGACGAGTACTAGTGTGATGGACTCGCT  
GTAGTGAAGGAGCGCGAGAGACGAAATGGAGTGCACACCGCAGCAGTATGGCCGTGCACTGAAGCCCGTGGCTGTGCGTGTGCCGCAAGGCG  
GTTCTGATTCAGAGGTCCTGCACGCACGCACGCAACACGACTACTTTTCTGGCGGACGTGATGGATGATGCCATCTCATCCAAATCCAAATCCGAGG  
ACCAATGAAGCTGGGCCCTTCCGCTTCCGCTGCGGCGCCTCCCTCTGCCTCACTCCTGCTGGTGGCTGCTTGTGAGGCTGCTTGTGCAAAAGCAAG  
GGTGTGTTTGTATTCTGGCTCAGATTTGCATACTTAAACCGTGCCTTTTGTGTACTAACACGCGGGCCATACGGTTCCGGGCCCCACAGCTCAGTG  
ACCTAAATGACCTGACTTAAAGTCCGCGAATGCCACCCCGTGTGATTCGATGGCCGCCCACCTAGTACCTCCCTATAGCTACGCTTTCATCATCC  
TCTTCTGACCTGTAGCTCCTCTGCTCCATCCCGTCTACTGTCTACCCACACCACAGTGCGCACACCACAGGGGAAGCGGGCGTAGATAGGG
```



TATGTGAGAATTACAATAGCTATTATCAAACCTCCTCCACATTATGGTCAATATGTGCCACTAGTGAACGTGTTGAACTACGGTAACATCAATGGAGAT  
ATCATGGTAAGATTTTCTTCTATTACGCATCCGTGCATCTTTTGCATAAAATCTTCTTAAACCTAACTATATTTGCTAACTACAAAGTTATTACTAT  
GTTTT

>TaFDL-A15 CDS, extracted from IWGSC\_CSS\_2AL\_scaff\_6429764

ATGTCGGTGGGAGGAGCCCGGCATCCCGCAGCTGAGCCCTGAGCGGCTTCAGCTCCCTCGCCTCCATCTCCAGCACCCGCGCTCCGCCCCCGCCGCTGC  
CCTCCCTCCTCAGCATCGGCACCCGGCGGGAGGACCAGCAGCCGGCGTCAAGCGGACGCGCCACAAGAGCGTCCGGCGGATGAAGAACC  
GGAGTCGGCGCTGCGGTCCAGGCCAGGAAGAGAGCCTACACGCAGGAGCTCAGAAAGGAGTCCGCGGCTCGTTCGAGGACAACCTCAAGCTCAAG  
CGACAGTGCAAACAGCTTCAGTCGGAGATTGCCGCGCTCACCGCCAGCAGGAAGCAGCAAGCAGAGCAGCCCGCACCGGAGAATTCGTCCACTC  
AGTTCTAG

>TaFDL-A15 protein, extracted from IWGSC\_CSS\_2AL\_scaff\_6429764

MSWEEPGIPQLSLSGFSSLASISSTAAPPARLP~~SLSL~~SISIGTGGEDQQPGVSSDDGHKSVRAMKNRESALRSRARKRAYTQELEKEVRRLVEDNLKLL  
RQCKQLQSEIAALTAQQASSKQSSPHRRTSSTQF\*

>TaFDL-A13 alternative splice form resulting from intron retention (supported by *T. aestivum* transcript CL9475Contig2 and *T. turgidum* transcript UCW\_Tt-k41\_contig\_70828)

MSWEEPGIPQLSLSGFSSLASISSTAAPPARLP~~SLSL~~SISIGTGGEDQQPGVSSDDGHKSVRAMKNRESALRSRARKRAYTQELEKEVRRLVEDNLKLL  
RQCKQARLLLPFFFLQLHLSFLLACLACANVIS\*

>TaFDL-B15, IWGSC\_CSS\_2BL\_scaff\_8092338 (underlined TAG is stop codon of alternative splice form TaFDL-B13 resulting from intron retention)

TGTTGTGGTCTATGTATTCACACATGTATTACAATTTCCGGATAACACAATTATAGCATGAACAATAGACAATAATCATGAACAAGGAAATATAATA  
ATAACCATTTTATTATTGCTCTAGGGCATATTTCAAACAAGTTGTCTTCTTATATTTGAACCCCTCAAATTCATGTAACCTCATGCAACGTGAAC  
GCAAGTACGTAGATGAACACGCTTAGCTGACATAATTTGCGATACTAACTTAGCGGACATGGTCAGCTGACACAAAATGGTCAAGTTCATCACCGGA  
CATTGCAAATACATATTAATAAATAAATAACATAGATAAAACAGGTGAATAAGGGCAGAGGAAATCACCATTTCCTCACCGTCCCCCTCCCTTGC  
GATTGCTGGTCCGGCTATACCCCTCCGTGATGCTCTTGTGTTGAAGTGGCTCATCGTTCGAGTATACACCACTACCACCGCTGGAAGAGGTA  
CTCATCGTTAGAGAAGATGATGCCAGTATCTACGGGACGTAGCATGTTCTGCGCCTTGGCCATCCGGGGCGCCTTCTCCTTGGCAACCACTTC  
CGTCGTAGCCTCGCGCTCCGACTGCTCGATGGTACCTGAAGCGCTTTCGCGCTTCTGCGGGGAGCCGCGCTGCGTCCGTTTGCATCATGACG  
GAGCGCCGGAGGACCGTCTGTAAGAGCTCGTCTCTGGATCCACTGGCGCACACACAGTCCAGGCTCGCAGCCAGCGCCTCCCTCCCGCTGCC  
TCTCCTTGGCCGCTGCCGCTCTCGACATGTTGCTCGTGCCTTGGATTTCGGGCTCCTCTTCTGGCGCCAGGCTGGCCGGGACAGGACCTAGCG  
GCGCCCGTACGCCATTCGGAACAGGTTGAGCGAGCGAAGAGGGGTGCGGTAGGCGAAGTACGTGGATATGGACGAAGTAGGCGGGCTGCGTAAAA  
GACGGTTTGGGTAGGTTGAGGAGTGTGGTTCAGCCCAAATCTACAGAGCCGGAAGTAGAAGTGCATTTTATTTGACCGATGTGTAACAGGGT  
GTTCCGGCATATAGGGCGATCTGGGAGCCCGGCTGCATATGCTCCATCCACAGGCACAAATCCTATCTTGGGAGCATGAAGAATAACCTAGCCTGC  
CCTTTTGTCCGAGTGTATCTAGCGGCGAAGGAATGGACAGATCTGGCTGTGGATAGTATACCACTACCACCGCTGCAAGGCAAG  
GGTATAGATGTTTTCGCGGAGACACCGAACTACACTTCGCACATGGGGCTCGTCCAACTTGAAGGCGGTTTTCGTGCTGCTGTTTCTCGCATGCGT  
GCACGGGCGCGCCACGTACGAACAATCACGTGAGCTTTCAGTCCCGAGAGAAGGCTGGCGGGAGGAGGACGCTTCGCTCAGTTCATGCTAAAA  
TCGCATTTGATTCGCGGCTTTCGAGCGCTACACATCTGTCCCTCACGCGGGGAGAATCACACATGTGAGCCTGTGCCCTGTGCGTGGCCGTG  
CCGGTTCGACCCAAACAAGATCTTCCACACCTCACACGCAAGTGGACAGATCTGGCTGTGGATAGTATACGTAACAAAGTTTATTTCCATTAACCGGCGGT  
TGCAGGCACAAAGCTTGCATGCATGCTCTTCTCAATAAAAAAAGCTTGCATGCATGCATGCATGCAGCCAGCGATGCGTGAAGCCACGGCCCGG  
CACCAGCGGAAAGACGCGTGCATGTTACTCTCCGGTGTCTTCTTCTACTTCCATCAGTGGCTCGGTGCAGTGCAGCGGTTGGTGGCGCTGGCGCT  
GGACCAGAGACGAGACGGCCGGAGGCCATGCGCGCGGATCGTATCCATGGCAGCGTGCCTAGCTTTCCCATGATTAACCACTAACTTTCTCCACC  
CATCTTCACCCAAACAAGATCTTCCACACCTCACACGCAAGTGGACAGATGATTAATACGTAGTAAACAAGTTTATTTCCATTAACCGGCGGT  
CTCCTTGAATAGGTAAGTATGATGGATCCAGTGCATCCATCTTGGCTCCATGTGCTCCCGAGCGGAAAGCCCGGCTCCACGTCCGGGGCGTCA  
CGAGCCGCCAGCGGATGCAAGCGCCATGAGTAAAGATGTTATTTCAAGCGCCGGCATCATCGAAGTAGAGAATCATTATCGCGCTCCTCTC  
TGGATCTGACGGGTGCATGCGGCTACCTTTTCTTCAAGAAAAATACAGATATACTATTACAATAAATACAAAGCAGCTCAAACGTAACAA  
AAATTACTCGAGATCTTAGACCTTAGACCTCAATGACCACTACCTAGGAAATGGACAGATCTGGCTGTGGATAGTATACCACTACCACCTGAGTTGGC  
TTGATCTTGTGATGAAATTCGAAAGTTTTCGTGCACATGCTTCTAAGGACCGCCACCTGGAGTGCAGTGCCTGCTGTTGAACTCTTGAAGTGT  
CATGAGTTTCGCCATTCGATACATAATCCATCAATATGCATGCTTACTCCACAACACTTAATATGTTGCGGTAAGGGCATCTTAATGGCTCTC  
CCAAATGGGACTCAATATCCGTCCGCGGACGTGGACACAGGACCGGCTATCAACCTTGTCCATCAATCGTCCGCCCTTGTCTGCACCTGTTCTCA  
GCTTTGCATAAGTTAGCAAGATTCAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATAAATA  
ACACATTAAGTTTACAATAAACAAGTCAAACCTTGAATTTTATTTTCTAGTTGTCGCTTTACGCGTCCACATATGTTCAATTAGATCATTATGAA  
CTGCTCATGAGTTCCTTATGATGCAATATGTTGATGCAATTTGGATAAACTCATCAAACATGACCAAATCTAAGCTGGAAATGCAAAGGATAACTA  
ATGTTCTTAAATATAGACCTCGACGGCTCCTTCATCCCCATCTCTACAATATGTTGTGATGATCACAAAAGCTGACATCACCTTCACAGGTT  
CTCTGGATCCCATATATTTTCCATGTCCTCGAACAAGTGCAAAACATTTGGAACACTTCAAATGGCCATAACCACCTTTTATGCTCCTTATCT  
TTTGGTAAAGTAGAAATTTTCTGATCAACTGGCTAAGAGATGGTCTTGCAGAAAGTCTGCAACGGAGATTGATACCATCAACCAGATAGTAGTC  
CTTCTTTGTAGACATGACCGTTGATGGTATAGTTGCACGGAGGAGCTTGTGAGACCCGGCCATGCCAAAGAAAGCGTGTGAAATCCATATATAGGTC  
GTGTGATGAAACTGCTTCAAATAATGACGGTGGGCTTCTTAAGATTACCTTGCACCTGTAGAGCATATGGGTAGTTTCTCCATCTTCAGCGCATGCA  
ATCAAGTATCCGAGCTAGCAACCTTACTTCCGAGAGTCCATGAGACTTTTGGTGTCTGCGACAGTTGCTTCTCTCAAGTACAGTTGT  
CCAAACCTTGTATCACTGAGTAGCAACAACAACATGGCAACTCCATATGTTGCTTTTCAGACATCCGGAGGTACTCCTCTCAAAAATTTGGTCA  
TGCCATAGGAAAAGCATCTGAAAACCATTTGAGAGGCGATAAAAAAATCCGCATCCGGAAGTACTGGCAAAAAAATGTCTGTTAATAAGGCATCGG  
GGCAAAAGTATGCTCCATCAGCGTCAATGCTCTCGTCCCTTCTTTCGATTAACATTCGATGTCCTTGTGATCCATTGAAATCAAGACATG  
CTCCTCTGCGCTCCACGTCTGCAAGGACCTCCTGCATCATCATTTTCACTCCTCTCATTTGACGAGAACGAGTCCACGAAGTTGTTGTAAGTA  
CAAAAATGTTCTGGGTGATAAGAAATAGTACAATATGTTATTAATAAGAGTAGACATGATTTAAAAAAGGAACAAGAAAGAAAGAGAAAAACT  
AAATAAAACCAACAACAATGAAGACTATTAAGAAAAATAGAAACGAATATAAATAAATACATGAAACCTTCCAAAACATAAATAATCAGTG  
AAAGTTTAAACATTAAGTGGTCCGCCATCCTACCGCTCTCTGAGTCTCTGCTCTCAAAGAGCGATATATAGCCCTTGGCGGTGCGACCATAGCG

ACTTGTACATTTGGCGTTTATGGCGTCCGTGGTTGACCTCGACAAATCCCATTTGCCACCCTTAGCGGCAACAGATGAGCTTTCGTCGAAAGCGA  
GCCATCTGCCCGCTCCATTTGGGCCAGCCCAGCGCTTCGATGTTGTGTTTCTCGTTTACGGGATCCCTGGTTTCAGGAATCTTTTTGAAGGTCCTCGGC  
CGTTTTGGGAACCTTTTAGAAGGTTCTGAACCATTTTTCAATGCTTATGTTTAGCTTTTTGTTTTTCTTTTGTGATTTTTTGGTTTTTCCTGTT  
TGCTTTACCTGTTTTTTACTCACATTATCTTTGCTTTTTGCTAGTTTTGCTTCCATTTTTCTTTTGCATTATCCAGTTTTATTTTTG  
TTTGGCAATATATGGTGAACATTTTTCAATATACATAAAAATTTTTCAATACACATTCAACTTTTAAAAAAATACGTGTAACATATTTTTAATGC  
ACACTCAATAGTTTTTTCTAATATACAATGAACATTCGTTAATATACATGACATTTTTTCAATATAGGATGAACTTTTTAATGAACATTAACATTT  
TTAATAATCCATTGAGCTTTCGTGAACAAATACAGCTTTGTTTATTATACAATGAACTTTTTTAATAAAATATGTATGAACATTTTCCAAATA  
TTTTTTCTATTTGTAATAGGGTTTTTTAAATATCCAGATCCAAAAACAACCGTTTTTTTTGGGTGAAAACCCGACTAAAAAATCAAAGTAGAAAAAT  
ATAAATAACATGCAGGGCGAATGGGTGGGCTCAATTTCTCTGCTACATTGAAGCCCTCCCTAGTTGACACACATGGGCAAGCACGAGGGTTGT  
TTAAGGGTTGCAGTCTGAGCCATCGCCGCCCGCGAGAATTTGGGGTCCCTCAGCTCCGGGTGCCATCTGGCGTTTTGAGGTGAAGGGACCTTGCA  
CTTTGAAGAGTTCTACGTTCTTCGTCAATATCTAATGATCATCGTATTTTGAGATAAATACTTACTCTCATCTTTTTGTGGAGTTACTTTGTAAAT  
CTTTGTGCATAGGAATTGCTTCTGATTTTTTTAGATCTTAGAACCAAAATATGATCTATAATGTTGTTATGAAATATAAATAACATATGTTTTAT  
CAAAAAGAAAGTTGACACACATGGGCGTAAACGATATGTCACGATGTCTCGCTTATAGCAGGGCTAGGGTGCAGCCCGCTCAGATGCATCCCTTA  
TGCGCCGCTGCAGCGTGCAGGAGGGCACAGGCCACATCCTCCTTTTTCCCATGTTTTCTGTCTTCAATTTTTTATTCCAGATATTCTAAATAGATA  
TATTACAAAAAGACTGTACATAAAAACCTTTGAAGAAGTTAACAAAAGCATTTGAAAAGGTTAAATATGTATAGCGAAAATGTTCTCGTGTATACC  
AAAAGAGCAAAAGGTGATGATGTAATGATGCTAACAAAAATGTTAATCAAGCATTTTCAATTTTTTAAATGTGTATGATGTAATTAATAAAAA  
TACAATGCGTATGAAAAACATAGATAATGTTTTAAAAAGTTAAATTTGTATTCAAAGTTGTTCCAGGATAGACAAAAATATACAACGCACATTA  
AATAAAGTGACATAAAAAGATCATATATTGTAATAAAGTTGATCTGTAGTTATGAAATGTTAAACATGTCTATAAAAAATGTTCTGGTGCATTTAA  
AAATGTAATTTATGTTTTCAAAATGTTTGTCCGCATAAAAATGTTCCCGGTGATTGAAAAATGATCATTTTGTATTATAAAAAATTTAATATTGTAT  
TTAAAAATATTGAATTGCTTCTGATTTTTTATTAGATACACAAAAATATGATCTATAAAAAAGTAGACATAAAAATATATGTTTTCAA  
TATATGTTAATCATGTTTTAAAAAATATTGAATTTGATATGAAATTAATTTTATGTTATACAAAAATGTTGAATATGTACTGAAAAAGTTGA  
AATGTTGTGAACAAAAAGAACTGATGAAATCGACAAAGAACCCTAATAAAAACAAAAGTAAATTTAAGAAAACCAAAAAGTAAATGAAAATC  
TGAGAAGCAAGTTGAAAAGGATGAAAATAGAGAAAGTCAAGGAAAAGAAATGTCGATGAAAACCAAAAAGAAAACAAAATGAAGAAAAGAA  
AGAAAAGCAAAAGGAGAAATAGAAATAAAAATAAAAAAGTGTGAAACCTGAAAACCTGAAAAGAAAATAAAAACGATGAAATTTTTAAATTTTGT  
GATAAAGAAAACAGAGAAAATCGAAATAAAGTATTAAAAAGGAAAAAACTGAAACAGACCAGCCGCGCGGTGAGAGGGTACATAAAGACATTTCT  
TTTTCGACGAGGGGCGAGTGAAACAGCTACTCTGCTTCTACAGTAGTGGTTGACTCTCCTCGTTCTAAATATAAGACCTTTTAGAGATTTCAA  
ATATGAAGTAAATGAACGAATCTAATTAAAAATTAATCTATTTTAGAAAAGTACTTTAAATATGTCTATAACATCCATAAAAAGCAAC  
TCCAACCGGGTGACTCATTTCCCGCAGCCGCTGGTTGGGTCTGGTGCAGACAAAAGGGCAGCCACCGCCAGCTAGATCTCTACTAACACGCTCGTCCGACACCGGCA  
CTTTCTCGTCCGCGGGCGACTATTCCCGACCCATTTTTAGCCGGATTTCGCTGGCGGGCAGCAGCGACGGCAGCCGCTCGCCCTCTCTCC  
CGGGCCCGCCGTTCCGTGGCACATTGGCCTCCCCACCCCAACAACCCCTCACCCACTCCTCTCGTGCAGCAGCCACCGCCCTTTTGCCGG  
CAACTCTGAAGCTGTCCGGCCCTCCACATCTGCCAGCAACGCGCCCTTCCCAGTCGCCACCGCCCGCTTGGCACCGGGAGCCGATTTG  
CTTCCCACCGCCCGCCCCATAACACAGCCNGACCAAGAGCCGCTCCGCGCCCGGTAGATCTCTACTAACACGCTCGTCCGACACCGGCA  
AGGCAGCTAGCTGGTCCGTGCGCGCGCACTCCCTTCGCGGGCCTCTCTCTCGTGCAGCCCGCAAGTGTGTGGCAGTTTAGCAAGATACAAAT  
GGACTCTGCCAGCAGTCTTTTTTTCACAATTTCCCTTTCGCAGCTCTGCAGATTCAATGTCTGATGACGAGGAGGATATGGCTGCCATATTGGTC  
CATCCACCATCAAACAGCAGCGGCTATTGTTCCATGGCTCCATTCCGGGCCACTTCCGGCGTGAATTCGCAACCCGAGAGAGGCGGGCATTTCTCT  
CTTTGAAGACTACTTTTTACATAACAACCAACCCGTTGTCAAAACTCAGCACTCCCTCCTGCTTAACTGCTATGAGTAGGACTTTTCAACCCGTATTA  
AAGAGGGGGTGGTCCGCTATGATGAATAATTCGAGTGCAGAGAGGATGCCGTTGGTGAAGATTGTTTTCTCTTTATCAGAAAATACACTGCCACCAT  
CCGAATGCTTGCATACAGAATGCTGGTGTATCTATTGACAGTACATCCGATGAGCGAGTCTACTGCTAGAGTCCATGTATAAAATCTGCAAG  
GCTGTATTGTTGTTTAGCCCTGAGTACTTGAGAGAGCCGACTGCTAAAGATACAGTCCGTTTGTGGCGATGAATGCGCAGCGGGGCTCCCGAG  
GGATGCTGGTAGCATGATGCAATGGGATGGGATGGGATCGCAGCACTCCCTACTTTCGCAAGGGCAGTATAAGGGATGTTAGGGCTTGCCTGT  
CATACTAGAGGCTGTGGCGTCTCAAGATCTCTGGATCTGGCACTTTTTCTTTGGCATGGCCGATCACACAATGATATCAACGTGCTTCCAGCCTCG  
CCGGTGTGTAGCTAGCTTGCAGGACCAACATCCCACCGGTGAATTTACTGTCAATGGCCAACTACGACAAAGGATACTATCTGCGTGCAGGTA  
TCTATCCTCAGTGAGCACTATTGTCAAGAAAATATCCAACCCCTGTCGGAGAGAAGAGGAAAAGATTTGTCAAAGCAAGAGAGTGTAGGAAGGA  
TGTGCAGTGGGCTTTGGTTGTTTTGCAATGTCGATGGGATACGTCTGATGCTGCTAATAAATACCTGGAGCAGCGCACTGTTGGGAAAGTAACT  
GCTTGTGTGATCATGCATAATATGATCGTAGAAGCAGGCGCCGAAACATCTGTACGATCAAGGGTTTGTAGTTTCCAGGGTGAAGATTGTGTCCTG  
AGCATGGAGAAGCGCAATGTTTGAACAGTTCACTCAATTTTCAATCCGACATGCGTGTGTTGGAAAACCTCACGTCGAAATGATTTGTTGT  
GTATAGTTGGGCTCATGTTGGCAACCAAAAGATGTATCTGTTTTATTCGTTTGGCAAAATATGTGAGAAAATGTGAGACATTTTTTTTATTTC  
GGCTTGTAAAACATACTGTTTTTTTTCAGTTCAAACATGCTGAAATACATCAATGAAAATAGGGCAGCAACCGCCGACCGCCGACATATGGGTC  
GGCGGTTAGGCGGTTGCCGACCCATATCTGAAAACAGAACGGAGCCGGCCGCTGGCCGATCCAAACGGATAAAAAACAGACAAAATCACCATCCG  
TTTTGTACCCCAATTGGGTTGTTTTATGTTTTGTGCAACAACTGAAAAATAGTTGTTTTTGTGTACGCTAGCACAAAAATAGGGGATTTTTG  
CAATTTCTCGGACTCACTGTAGTGTAGCGAGTGCAGCAGACGAGTGGAGTGCCTGACGTCGTAAGCCCGTTGGCTGTGCGTGTGCCGGAAAAG  
GCGTTCTGATTTAGAGTCTGTGACGCACGCAAGACGACTCTGCTTTTTGCGGGACGTCGCGGATGATGCCATCTCAATCAAAATCAATCGG  
ATGAGCAGTGAAGCTGGACCGTCCGCTCTTCCGCTCTGGGCGGCTCTCTCTCTCTGTTCACTCCTGTGTCTGTTTTGCAGCAAGGACGAGCAG  
GAGTTCAGTGTGTTGATTCCGCTTACAGATTTCAGAGACTTCAGCCGGTGGTTTTGTGTCACTAACATGCGGGCATTGTTTCTCGGACCCA  
CACGTCAGTGTGCTAAGTCTGACTTAAAGTCCGCGAATCCCACCCGTTTGATTGATGGCCGCCCACCTAGTACCAGCCCTATAGCTACAC  
TTCGCTCATCATCTTTCTTTGACCTGTAGCTCCTGTTTCAATCGATTGCAGTTGCAGTGCACGCTCACACCAGCAGCGCCGACACCCACCGGGC  
GGGGCTAGATAGGGATGCGTGGGAGGAGCCCGCAGCCCGCAGCTGAGCCTCAGCGGCTTCCAGCTCCTCCCTCCATCTCCAGCAGTGCCTCAT  
CGCTGCCCGCTGCCCTCCCTCTCCTCAGCATCGGCAACGTTAGTCCGACGAGAGGATCAGCAGCTGGGCTCAGCAGGACGAGCGCCACAA  
GAGCATTCCGGCGATGAAGAACAGGGAGTCCGCGCTGGCTCCAGCCGCAAGGAGGGCTTACCCGAGGATCGAGAAGGAGGTTCCGCGGCTC  
GTCGAGGACAACCTCAAATCAAGAGACGAGTGAACGTTGACGCTTCTCCTCTCTCTCTCTCTCTTCCAGTTCATCTATTTCTTTGGTGTGCTGCT  
TGTGATAGTAAATAGTTAATCAATCCCGACTCTTTCTCCTCTCTTCACTCTCTCACTCAGCTTCCAGTTCCTGATGCTCAGTTCAGTTCAGTTC  
ACAAGCAGAGCAGCCACACAGGAGAACCTCGTCCACTCAGTTCCAGCAGCTTACATCAGGGCTGCATTTTCTCTAGCAAGCAATTCATTAGTA  
TTAGCAGTGCATGTTGTTGGTCTTGGCCCTCAATCAACTCAGTGCAGCTGAGGATGATGCAAGCGGCTGGTCCGTTTATCTCATGTGATTTATCT  
GCATGATTTGTGTGCACTGATGATGCTGGACGACGACGACATGCAACCTGCGGTTGATTGTTGTTGAGGAGCACTTTATTAAT  
AATGTTAAATCGTAATCAATGCTTGTGTTAGCTTCAGAAATGATGATGAGTTCGAGGATGAGTGAAGTGAAGTTGTTGATGTTGCTCATCTCCA  
TTTTAATCACAGCAAAATCATCATGATTGTGACTGCCAATCCGAAAATGATCTTAGCCCTGTCATGTTGTTGTTGTTGTTGTTGTTGTTGTTGTTG  
AATGCTTCTCTTTCTGTGTAGCCATCTGTGTTGGGCTGTGACAGCCGAAATGACACATTAAGCCATAAGGGGGCCATGATTTTACTGGCCT  
GTGTGTCAAGGTCAGCTGCGTACGACGAGGATCGGGTGGAGAAATCTAGTGTACACATCTGAGGCAATGTTGTTGTTGTTGTTGTTGTTGTTG  
CCGGTGTGTTGAAATGTTGAGCGCGGTTCCGGTGGTGTCTCAGGTTTATACATCCGAGGCAATGTACGATGTCGATGCTGAAAGTC  
CTCCAGGCTTCTCTCTCGGCCGATCATGCTGGAACCCACTTGTGACTCTTAGGAGTTAAGAGCAACTCCAACGGCCGACCCAAACAGA  
CACCGCTTTGTGTGCTTTTTGTCCGTTGGGTTGACGAGCGGACATCCGCTCCGATTAGAAATGGGTTGGCTTGGCCCCCAACGGGGG





>TaFDL-B15 CDS, extracted from IWGSC\_CSS\_2BL\_scaff\_8092338

ATGTCGGTGGGAGGACCCCGCAGCCCGCAGCTGAGCCTCAGCGGCTTCAGCTCCCTCCCTCCATCTCCAGCACTGCCCATCCGCGCTGCCCGCCTG  
CCTCCCTCTCCCTCAGCATCGGCACCGGTAGTCCGAGCGGAGGATCAGCAGCTGGGCGTACGAGCGACGCGCCACAAGAGCATTTCGGGCGAT  
GAAGAACAGGGAGTCCGCGCTGCCGTCCAGGGCCAGGAAGAGCGCCTACACCGAGGAGCTCGAGAAGGAGGTCGCGCGCTCGTCCGAGGACAACCTC  
AAACTCAAGAGACAGTGCAAACTGCTTCAGTCCGAGATTGCTGCACCTACCGCCAGCAGGCAAGCAACAAGCAGAGCAGCCACACAGGAGAACCT  
CTCCACTCAGTCTAG

>TaFDL-B15 protein, extracted from IWGSC\_CSS\_2BL\_scaff\_8092338

MSWEEPGSPQLSLSGFSSLSISSTAHPPARLPSLSLSIGNSGADGEDQQLGVSSDDGHKSIRAMKNRESALRSRARKRAYTQLEKEVRRLVEDNI  
KLKROCKILQSEIAALTAQQASNKQSSPHRRTSSTQF\*

>HvFDL-H15, morex\_contig\_1558985 chr=2HL cM=107.93

TGACGACGGTGAATCCCCCTTTGGAGCCCTAAACAGACTCTAGATCAGCCCTCCGGAGGAAGAACGGGAGGTGGCGGTGGCTCCATCTCGTA  
GAATGCGTTGAAAACCTCTCTTATTTTTTCTCACATAATATGAATTTATAGGAGTTGAATAGGGTTCGGAGGAGCCTCGACGGCCCCACAAGCCAT  
GAGGGCGCAGATGGGGGACGCCCTATTGGCTTGTGGCCACTGGCATTCCCTCCGGCAAGTCTCGCTCCATAAATCCTTATAAATACCAAAA  
ATAATTTATAAAAAGTTTTCCTGATTCCGAGAATTTTATTTCTGCACAAAATAACAACAAGATTAGTTCTCTAAAATAACGTCAGCCCGGTT  
AGTTTCATTCAAATCCTTCAAATAGAGACAAAATGAGAGAAAAGTGTGGAAAAGTATACCTGGAGACGTATCAGGGTACAAGTTGTGT  
CCAACCAAGTTTTAATCAATAAGATATCCTTAAAAGTTGTGAATGTTGGACCTCTGCCTTGGGCACCTTTTCTTCTTTTTCTTGTGGGATTGGG  
GTTTGTGTTGCGCAACTTCAAACGTTCTGAATGGTTGCAATTTGAATCCCCCACTCATAGTCCATTGGGTTGGATATTGATTATCATTGATC  
ATTTCCGACATTATATCCCATAGAATTAACAATTTCAAATAAACTAAGGTGACACAACCTAATGGCAATGATATGCAAAGGAATGATCGAAA  
TTGAGCAAAAAAGGTACCAAGTCAACCTGTGTCATTTTCATCGAATAGGACGTGCGCATAACCCGGATCGCCGATGCTGACTGCTTGTAGCCATT  
CAAGCTGCGACAAGTGAAGACATCATTTCGCCACCCTCTACATTGACGGAAAACACTCTGGAATGCCACGTAAGCAGCCACAGGATAGTGTCTCT  
GACCCGACCGGGCCGACGGTGTGATCCTTGTCAACGGCTAGATGATGGGGTCCACAGGGTGTGGTGGGTGAACGTTGCTCCTCAAGGTCACAT  
CTGCCCTCTGACTCCACTCCCTCTCCACTACCTTCCGTTCCGTTCTCGGAGCATAGCTCTCCGACTTTCACGTCGGAGCCGATGATGGGAC  
ACCCACACAGCAGCTCGAAGCAACCTCCATGACGGTGTGGGATGGGTTGGTCAACACCTAGGGCGACAGATGGGGCTAGCGGCAAGGATGGGA  
GAGCTAGGGTGCACGCGAAGATGATCGACAACGACGGAAGAGGACGATGGGTTGCTCGACTCCGGGGATTGGTGAATTTAAGTGGGGTCCG  
ACAGTCTAGTCCGATGTGACGAACACGCGCCGTGCCATTTATATCCACCCTAAATTTGAGTAAGATATGAGGTCGTCAGTTAGACTGTAGTTT  
AGTGGGTATGAGTAGTCCATCTACATCTGTTTTTTAACTAGTAACCTAGCTTCCGTTCCGCAATCATTGAGGCGGTGAAGATGCACGGTTGTAG  
GATGTAAGAGCATCTCCAACATTTGGCCCCAAAGGGCGTTTTTCGGGGCAAAATAGCGCTCTTGGGGCTTCATCGGTGATATTTTTGGCGTGAG  
GGCCCCGATTCTCAGCCAAGACACAACCTTAGATGACCCGAAAAAATTAACACCAACACGATGAAATTCAGGCAATTTGGACGAAATATAGGTAG  
TCTCATTAATATTTGGCAATGAAAAAACATAGATAAAAACTAAAAAACTACGCCACTTTCATGCCAAGGAGGTTGTAGAAGACGGTGTAGTCTAT  
CGCTCCCGTCTGATCGGATATCGCTCGATGGCTTGTCTTCGGGGCATCCATGCTGACAGCCCTCCCTGGATCGCCACTCGAGATGGGCTTGC  
CGGGCAGTGACCTCCTTGTGTTGTCGGAGACGATGTCGCGCCGCTCCTCGTGGTCTGTCGGCTTGTGTCGGCAATTTCTCCATAGCACGGCGC  
TGGCGCTCCATCTCCTGATTGAGTAGTCTGCGCTCGACCAGACGAAGCAGCTCTCGAGGTCGGAGGATGTCCTCATGCTCCTGCTTCACATAGT  
CGCCGGCTCCTTCTTGGCTTACCAGGCGAATGTGGCCATGGGGAGCGGAGCAGCGTATTTTGCAGCTCGGACTTGACAGGGACGAGTGGAGTGG  
CCGTTCCAAAGAGGACCGGAGGACGAGGACGAGATGATGATGGTCCATGAGGTCACCAAGCAAGCAAGCTCCTGCTGCTCGACAGCAAGCAGC  
AGGGTACTCTAGCCGTGCTCGTTGCCCTCCCTCGATGTGCGGAGGATGGAAGAGAGAGTTCCGCCCGCGTACCCCGCCATTGACGGTGGCCTTC  
GAGTTGTGGCGCCCCCTCGTCTGATGCTCCTGTTGGTGAACGCGAGCTCCTCGAAGTAACGCGCATGTAAGTACATGGTCCACATCGCTGTTGT  
CGAACCGTACTATGGCTATTCGTGCGCATCTCCGGCAAGGCGGCCGAATCGCTCGACCTCACCAGGGGGTCCGCATTGGAGGGCCACGGAGG  
CACGGGGATCGCGCCGGCTATGCT  
TCATGACGCCAGTGGCACCGAAGCCGTTGGCCACTGCCCGTCTCGGAAACCTCTCCGCCATGGCGTTTCCCTTGGGTTTTTGGAGAGAAAGGAG  
ATGGTCCGTTGCTAGAGCATAGGCGAAGAGATGGCGGGTGTGCTACGAGCATCGACGAAGGTTGGCTTTTATAGCGGACAGGGAGGAGTATGTA  
GACCGTGGCAGGAAAGGGCAGGGATGCACAACGGTGGCTCGCCATCAATGGAAGGTTGAGAAAACAGTGCATTGAAATCGCGTGGAGCCAAAGG  
GAGGTGATGAGGATGACGAGGACCGGGAATGCAGTGCCTAACGAGGTGCGCCACATGAGGGAATCTGGTGGGTTGTTTTTCGCGCAAATAC  
TTTTCCACGGCGCTCCCGGTCGCCCCAGAGCGCGCTAGGTTTCAGCCTGGTCTCCGACGCCAATTTCCGTTCAAACAGCGAAATGGGGCTCCTC  
GGGATGCGACTAGGCTATTTGTTTTTGTGCGCGGTAAGAAAGGCATGCGGGAGGCGCTGTTGTGGTGTGGAGATGCTCTAAGCGCAACTCCAAGC  
GACTCCAAACGGAGCTATTTCTCTCTGTTTTCTGCTCCATTTGGGGTGGCAATCGAACCGTGTCCGCTGGATATATGGTTGGCGCAGACCGTGTG  
CTAATGTGCAACCCCATCTAGCCGATCTCGTCCGCCAAGTCAATAGTTAGTTAAATCAAACATGAAACATGAAACATGAAATTTTAAAT  
CAAACATAGAAAATATGTCCACATCCGTAATATTTCTTAGTGCCCAATCAAATGAAAAAGGAAATCAAATGTTTTTACAGCCAACCGATTTTTTT  
GCATGAAAAGAGATTTAGATGACATACCTATTGGCTGCCAATGTGAATCCACATGTGCTCAACTAAGTCACTCTGAAGCTACGGATGAGTCTCCCTA  
TCACATAATTCAGAGTGAATGAAACACCTCTTCAAATGTTGCGAGGAGTTGGTGTGAGGCTCAACATTTTCCACTGAAAATCAAACCTTGGT  
CGTAGATGCTATCACTACGCTCATCTCCACCATCATGTAGTGTGATGATCAGAGAAGCAATCAGCTCCCAAGGCTTTTGGGTGCTTCATGTCAA  
TGGAGGTTTCAAACATGAGATTTAAGCATACTAAAAGCATGTTCAAATCCTTCTACCCTCTTTTGCATTTGGACAACCTTTGTTTTCTTCCC  
CTTGGCGATTGGGTATGTTTACAAGAGTTGACCACTCGGGATAGATACCATCAGTAGGTAATATCCCTTGTGTAATAGTGGCAATGATCTT  
GAAGTTGACCTCTGGGAAGTGGCCTTCTGCAAGCCTTGCAAAAGTATGATGCCAAAAGAAAGATGACATATCCAGTATCTTGTGAAGCCATTGCT  
CATGTATGACAATGATATNNNNNNNNNNNNNNNTGTAGATTACTACCTGCCAAGCAAAATAAACAATTCGTCCTCTTCTAGTGCATACATAATACTACC  
AAGCATGCCCGAAAAGCCCTATCGCCATTGATCGTAAACAACCTTTGTGTGTCAGCGGCAGTTGGTCTCGCAGTACTACAGGCCAAAACAGACCA  
CCACAGCCTTGCAGAACTACATATTGACTGAAGACATGTGGACTCACTCATATGCATATACTCATCTACAAGATTACCAGGAATTCATATGCAAG  
CATGCAGATAGCGGCAATGCCTTTCTGGTAAGAAAAGAACCAAGCTTGCAGAGGGCATCCTCTTTGCAATCAAAGTATGGTTATGTCCTACCCT  
CCTCGTCAATATGATGAAACACATGATCCTCATTGGGAAATGGGGACCAAAATGATGTGGTTGAAGAGTGCAAAATCTCAAATAATACGACAT  
AGAGAAGGTTGTGCTTCTCCTTATTGTGGTTCAAGGCCACAGCATGTTGTCAGGATAGATCCCGTGAACCAGGGCGCTTCTACTATTTTTGGTC  
ATGGACGACCAATGCAGCAACCAAGCTCTTCACTATCCGAGGACAAATCATCAATGATCAATGAAGTTGCAAAAAAATACTCATCCGTTATT  
CATGGTACCTTGTGAGCAAAACGTCGAACACCTTGGCTGCTGGTGAAGACGCGGACGCTAGTTTTCTCTCCATTGACAACAGGAACCAACAACG  
CGACATAAAACTCTCCGAAACCGGTGCGTTGGCCGGTATCTCATGGCGGTTGATGTTTGGACGACCTGATGGAAGTGGACGCGGCGGAGAAC  
TGGGATGGCGATGCGCATGGCATGGCGAGGAGGATGGGAAAGAGAAAGGCGGTGCTGCTGATGGAACAGCAGCAAGCAAGGACGCGGAGG  
CATGGCTCCACCCGTCCTGCGTGTCCATTGCACCATAAATACAGTTCAAATTAAGCCGGAGAAAATAGAAAACATGCAAAAATAAACATTAAT  
CTGTTTTGTTTTGATGCGTTGGACAGCTGTTTCTGACGTTTACCATAAACGAACGCGGCCCTTTGGAGTTCGGAGGAGGGTCATACCTTAT  
AAGATTTCCAGGCCGAGGAGGAGTGAATAAGCTCTACGCTCCAGACTCACTATCCGTTCTTAATAAAGACCTTTTATAGATTACACTATGA  
ACTACATACGATGATANNNNNNNNNNNNNNNTGTAGATTACTACTACTTTTTGTTCTGTAAGATGGAGTATATTTGAGATTGTAATAATGATGGA  
CTCACTGTAGCGAGTGAAGCGACGAGACGAGTGGAGTGGCGCACGATGGCCGTACGGGCCTGAAGCCAGCCAGGCAACCTGTGGCTGTGCGTGT  
GCCGCAAAAAGCATCCTCATTACAGAGGCCCTGCTCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCTGCT

