

```

GRMZM2G021614 -----MARFVDPLVVGGRVIGEVVDLFVPSISMTVAYDGPKDISNGCL 42
Sb03g8270 -----MARFVDPLVVGGRVIGEVVDLFVPSISMTVAY-GPKDISNGCL 41
GRMZM2G152689 -----MARFVDPLVVGGRVIGEVVDLFVPSISMTVAY-GPKDISNGCL 41
GRMZM2G059358 -----MARFVDPLVVGGRVIGEVVDLFVPSISMTVAY-GPKDISNGCL 41
Os01g02120 -----MARFVDPLVVGGRVIGEVVDLFVPSISMTAAY-GDRDISNGCL 41
HvMFT -----RSSEKEEEEEERNIYNGDMSRCDPLVVGGRVIGEVVDMFVPSVAMAVAY-GARDLSNGCH 59
Qphs.pseru-3AS -----MSRFVDPLVVGGRVIGEVVDMFVPSVAMAVAY-GARDLSNGCH 41
Bradi2g01020 -----MSRFVDPLVVGGRVIGEVVDLFVPSVAMAVAY-GPKDISNGCH 41
Os06g30370 -----MASHVDPLVVGGRVIGDVEDLVFPPTAMSVRF-GTKDLTNGCE 41
At01g18100 -----MAASVDPLVVGGRVIGDVLDMFIPPTAMMSVYF-GPKHITNGCE 41
          *: *****:*:*:*: *.: * :.:***

GRMZM2G021614 LKPSATAAPPLVVISGRRNDLYTLIMTDPDAPSPSNPTMREYLHWIIVNIPGGTDATKAH 102
Sb03g8270 LKPSATAAPPLVVISGRRNDLYTLIMTDPDAPSPSDPTMREYLHWIIVNIPGGTDASK-- 99
GRMZM2G152689 LKPSATAAPPLVVISGRRDDLYTLIMTDPDAPSPSDPTMREYLHWIIVNIPGGTDANK-- 99
GRMZM2G059358 LKPSATAAPPLVVISGRRDDLYTLIMTDPDAPSPSDPTMREYLHWIIVNIPGGTDANK-- 99
Os01g02120 VRPSAADYPLVVISGRRNDLYTLIMTDPDAPSPSDPSMREFLHWIIVNIPGGTDASK-- 99
HvMFT VKPSLAADQPLVVISGRRNDLYTLVMTDPDAPSPSEPTMREYLHWIIVNIPGGTDATK-- 117
Qphs.pseru-3AS VKPSLAADQPLVVISGRRNDLYTLVMTDPDAPSPSEPTMREYLHWIIVNIPGGTDATK-- 99
Bradi2g01020 IKPSMAAAQPLVVISGRRNDLYTLVMTDPDAPSPSDPTMREYLHWIIVNIPGGTDATK-- 99
Os06g30370 IKPSVAAAAPAVQIAGRVNELFALVMTDPDAPSPSEPTMREYLHWIIVNIPGGTDPSQ-- 99
At01g18100 IKPSTAVNPPKVNISGHSDELYTLVMTDPDAPSPSEPNMREWHIIVVDIPGGTNPSPR-- 99
:.*: * *.:*: :.:*:*****:*.*:*:*: * :*****:..

GRMZM2G021614 AKRRHRSALTRAGVGAGEEVEYMGPRPPVGIHRYVVLVLFQKTRVHAEA---PGDRANF 159
Sb03g8270 -----GEEVVEYMGPRPPVGIHRYVVLVLFQKTRVHAEA---PRERANF 140
GRMZM2G152689 -----GEEVVEYMGPRPPVGIHRYVVLVLFQKTRVHAEA---PGERANF 140
GRMZM2G059358 -----GEEVVEYMGPRPPVGIHRYVVLVLFQKTRVHAEA---PGERANF 140
Os01g02120 -----GEMVEYMGPRPTVGIHRYVVLVLYEQKARFVDGALMPPADRPNF 143
HvMFT -----GEVVVPMYMGPRPPVGIHRYVVLVLFQKTRFPYVDAASPEDRAYF 161
Qphs.pseru-3AS -----GEVVVPMYMGPRPPVGIHRYVVLVLFQKTRFPYVPAASPDDRAYF 143
Bradi2g01020 -----GDTVVPMYMGPAAPVGIHRYVVLVLFQKTRAVDGMTAAPADRAYF 143
Os06g30370 -----GDVVVPMYMGPRPPVGIHRYVMVLFQKARVAAPPPEDAARAF 143
At01g18100 -----GKEILPYMEPRPPVGIHRYIILVLFQNSPVGLMVQ-QPPSRANF 142
          *. :. :.* * *.*****:*.*:*: * : *

GRMZM2G021614 KTRAFAAAHELGLPTAVVYFNAQKEPASRRR----- 190
Sb03g8270 NTRAFAAAHELGLPTAVVYFNAQKEPANRRR----- 171
GRMZM2G152689 NTRAFAAAHELGLPTAVVYFNAQKEPANHRRR----- 172
GRMZM2G059358 NTRAFAAAHELGLPTAVVYFNAQKEPANHRRR----- 172
Os01g02120 NTRAFAAHQGLPTAVVHFNSQEPANRRR----- 174
HvMFT NTRAFAGNHELGLPVAVVYFNSQKEPSGHRRRGMHAITLHAKQSDADLSRRIIAELPYIY 221
Qphs.pseru-3AS NTRAFAAHHELGLPVAVVYFNSQKEPSGHRR----- 175
Bradi2g01020 STRAFAAHDLGLPVAVVYFNSQKEPAHNR----- 175
Os06g30370 STRAFADRHDLGLPVAALYFNAQKEPANRRRRY----- 176
At01g18100 STRMFAGHFDLGLPVATVYFNAQKEPASRRR----- 173
          .** ** .:****. *:.:*:*:*: * :

GRMZM2G021614 -----
Sb03g8270 -----
GRMZM2G152689 -----
GRMZM2G059358 -----
Os01g02120 -----
HvMFT -----MHSNVCYVLLITVSSHCAVCVMEHMRMGTDIFWGFAAQVCLPPRDGVFPGAPSCNNSR 281
Qphs.pseru-3AS -----
Bradi2g01020 -----
Os06g30370 -----
At01g18100 -----

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Figure S4 Sequence alignment of the deduced amino acids of *TaPHS1* homologs from maize (GRMZM2G021614, GRMZM2G152689, GRMZM2G059358), sorghum (Sb03g8270), *Brachypodium* (Bradi2g01020), barley (*HvMFT*), rice (Os01g02120, Os06g30370), *Arabidopsis* (At01g18100), and wheat (*Qphs.pseru-3AS*).