

LOC_Os06g51050.1 ---MRALALA---VVAMAVVAVRGEQCGSQAGGALCPNCLCCSQYGCSTSDYCG-AG
sorghum_ --MMRALAVLAM--VALFAASSARAEQCGTQAGGALCPNCLCCSKFGWCSTSDYCG-SG
maize_ MAMTRALAMVAMLATAALFFMSARAQQCGTQAGGALCPDCLCCSQWGYCGSTPDYCT-DG
At3g12500.1 ---MKTNLF LFL--IFSLLLSLSSAEQCGRQAGGALCPNGLCCSEFGWCGNTEPYCKQPG
LOC_Os03g04060.1 ---MRRLPLAG---ATLLIAAAGGASGQAG-----
poplar_ -----

LOC_Os06g51050.1	FVAAANAYPDFATTGDADTKREVA AFLAQTSHETTTGGWPTAPDGPYSWGYCFKEEN-NG
sorghum_	FIAAANAFPGFGTTGGADTQKRELA AFLAQTSHETTTGGWATAPDGAYAWGYCFKEEQGAA
maize_	FIAAANAFPGFGTTGGADTQKRELA AFLAQTSHETTTGGWDTAPDGPYTWGYCFKEEVGGV
At3g12500.1	FITAAKSFPGFGTTGDTATRKKEVA AFFGQTSHETTTGGWATAPDGPYSWGYCFKQEQ- -N
LOC_Os03g04060.1	FIKAAGDFPRFGTTGNDETRRRELA AFFGQTSHETTTGGWATAPDGPFAWGYCRVNEITPS
poplar_	-----WNLTASGPRPN-----
	* *

LOC_Os06g51050.1	KTAFWFWMTQPSPKPSCHAVITGQWTPSADDQAAGRVPGYGEITNIINGGVECGHG-ADD
sorghum_	ETAVWFWMTQPSPKPSCHAVMTGQWTPSGADTAAGRLPGYGVVTNIINGGLECGKG-ADS
maize_	ETALWYWMTPQPPKPSCHDVITGQWAPSPADVAAGRLPGYGVLTNIINGGLECGHG-ADA
At3g12500.1	KAAIWFWMTAQPPKPSCHAVIAGQWQPSDADRAAGRLPGYGVITNIINGGLECGRG-QDG
LOC_Os03g04060.1	RTAIWFWMTAQSPKPSCHDVITNQWTPSGDDRSSGRLLPGYGMATNIINGGEECGKGYSTD
poplar_	N-GVSYIPADTPLKIADYFNIPGVFSLGSMPS- - -PSWGNAYLQTAVMSAN- - - - -
	. . . : : . * : : : . : : * : : : . . .

LOC_0s06g51050.1	KVADRIGFYKRYCDMLGVSYGDNLDCYNQRPYP--
sorghum_	RVADRIGFYKRYCDLLGVSYGDNLDCANQKPFNS-
maize_	RVASRIGFYKRYCDMF-----
At3g12500.1	RVADRIGFYQRYCNIFGVNPGGNLDCYNQRSFVNGLLEAAI
LOC_0s03g04060.1	NAKDRVGYKRYCDMFRVGYGDNIACRDQKPYGGG--
poplar_	-----FREFIEIVFQNWEDTVQSWHID-----
	::: :::

CLUSTAL W (1.83) multiple sequence alignment

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maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
-----
--MGPLLRAAVLSVALLALAAVGGEAHSASDFLNIFKPRNEHDYFHNANQGQEEEDVMPR-
-MWPLLLRAAVVYAALLAAG----EADGSHDVLDFGTRSESDYYRNAFQGKQGQAVPLP
MGSSSLPRAAVLAVALLLLAD--SGEAFDLFSIFRPRSDSDYFP--FDGSPGQAKRKP
--MKASTRVIWTISVLMLAAS--EAIFPLPFLPFLPG-----FNGFRDNEAVKVAKP

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maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
-----
----ASDQQNLITAPVSSTGLMNVPPRSAPTAVAQDTVVLVDNAAGFPGAWSMISENA
RGGGLRREQQELGAAGPGGSLSKAPPRSAPSKVALDSLKLVDTSAGFAGGWNLSSENS
----KIEQEEDGAAPATATGLTKVPLGAPSKAALDTIVLPVDDSGAHAGSWTIVSENS
-----QPAGAVG-----GKAARRQRGGGLDAQTTWGGKWELFLENS

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maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
-----
GVSAMHVMIMHSD-KAIMFDTVTTGPSLLRLPKGNCRLDLRSKEVGAQDCAAHAVEFDYA
GVSAMHLVVMQHG-KAIMFDTCTTGRSLMRLPPGRCRDPDRSKQPGAMDCWAHAVEFDYN
GVSAMHLAVMRHG-KAIMFDTSTTGRSLMRLPMNNCRADPRAKREGTMDCAHAVEFDYS
GVSGMHAILMPVINKVQYYDATIWRISKIKLPPG-VPCHVVDAKTNKVDCWAHSILMDVN

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maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
-----M
TNGVRALKILTVDWCSSGALDAEGNLVQTGGYFEGEKVVRYLSPCGNCDWREFPGSLAEG
TGALRSLKIVTDTWCSSGAFDADGNMVQTGGFFEGDKSVRYLSACGTCDWKEFPKSLADG
TGALRSLKTATDTWCSSGAFDADGNLIQTGGYFEGDKAVRRLDACDTCDWREYPNSFAEG
TGALKPLGLSTDTWCSSGGLTVNGTLVSTGGYGGGANTARYLSSCENCKWEEYPQALAAK

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maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
R~RYGTQQLLPDGRSIVLGRRAFSIEFVPAEGQSNAQAIPLQILRDTTDDVENNLYPFVH
R~WYGTQQILPDGRSIVLGRRAFSIEFVPAEGQSNAQANPLQILRDTTDDVENNLYPFVH
R2WYGTQLVLPDGSFIVIGRRAFSIEFVPAAGRANARATPLRLLRDTTDDVENNLYPFVN
R~WYATQQVLPDGRFIVFGRRAFSIEFVPQPGMTNGQSIKFPLLRETTDDVENNLYPFVN
R~WYSTQATLPDGKFFVIGGRDALNIEYIPEEGQNNRKLFDLLLLRQTDDPEENNLYPFVW
* *.** **** :*:*** *:.***:* * * : :*:** * *****

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```

maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
LLPDGTLFIFANDRSILFDPRNGQVVREFPVLPGGGRNYPASGMSALLPLDLR--RGDV
LLPDGTLFIFANDRSILFDPRNGQVVRELPLVLPGGGRNYPASGMSALLPLDLR--RGDV
LLPDGTLFIFANDRSIVFNRTGQVVRELPILPGGSRNYPASAMSTLLPLDLR--KGAG
LLPDGNLFVFANDRSVFDHRTGKVRELPLKLAGGGRNHPASAMSAMPLPLDLRLNLTGAD
LNTDGNLFIFANNRSILLSPKTNQVIKEFPQLPGGARNYPGSGSSALLPIQLYVK-NPKV
* .**.*:***:***:.. :..:***:* *.**.*:*. * :*:***:

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```

maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
LSPEVIVCGGSPKNAFTLGESNTFPPALKDCARINPLKPDARWALDQMPVARTMGDLLIL
LSPEVIVCGGAPKNAFKLGEANTFNAALKDCARINPLKPGARWATDQMPVPRMTMGDLLVL
LSAEVIICGGATKNAFKLGETSTFPPALRDCARINPSKPGARWALDQMPSGRVMGDVLIIL
PEPEVIVCGGALKTAFLRGENTTYQPTLRDCARINLGKIDAVWAVEAMPVGRVMGDVLIIL
IPAENVLCGGSKQDAYYKAGKKIYEPALQDCARIRINSAKPRWKTEMMPTPRIMSDTVIL
.***:***: : * : . : :*:***. . . * : ** * *. * :*:

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```

maize_
sorghum_
LOC_Os01g48540.1
LOC_Os05g48520.1
At5g19580.1
PTGDLLILNGAAKGCSGWGFGFRQPVLSPLLYSPRQARGSRFRALAPTTIPRMYHATSAVL
PTGDLLMLNGAAKGCSGWGFGFRQPVLSPLLYTPRLKRGSRFRALAPTTIPRMYHASSAVL
PTGDLLMLNGAAKGCSGWGFGFRQALLSPVLYSPYLRRGKRFRVLNPSNIPRMYHSTSALL
PTGDLLMLNGAAKGSSGWFARQPILSPILYSPRHPEGSFRFRPLAASVARMYHSTSASVL
PNGDILLVNGAKRGCSGWGYGKDPAPAPLLYKPHAARGKRFRQLKPTTIPRMYHSSAIIL

```

maize_ PDATVLVAGSNTNSAYNFGSVDFQTEVRVERFTPPYLAPERAANRPAIDVATVPDGMAY
sorghum_ PDATVIVAGSNTNSAYNFGSVDFQTEVRVERFTPPYLSPELANRPVIDVGTVPDGMAY
LOC_0s01g48540.1 PDATVLVAGSNTNSAYNFGSVDFPTEVRVERFTPPYLSPLSNRPAIDAASVPDGMRY
LOC_0s05g48520.1 PDATVLVAGGNTNAAYNFGSVDFPTEVRVERFAPPYLSREL TGNRAVIDVASVPAGMRY
At5g19580.1 PDGKVLVGGSTNDGKYKN - VEFPTELRVEKFSPPYLDPALANIRPKIVTTGTP - KQVKY

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maize_      APGKPELAPPGYYLLYVIAKGVPSKAAWVKVHK
sorghum_    APGKPELAPPGYYMLYVIAKGVPSKAAWVKVHK
LOC_0s01g48540.1 APPKPELAPPGYYMVVYVAKGVPSKAAWVKMHK
LOC_0s05g48520.1 TPRKPELAPPGYYLVVYVSKDVPSEAAWVKIQ-
At5g19580.1 APPNGNIAPPGYYLIFAIYKGVSPSTGEWIVVV-
* * * * *
* * * * *
```

LOC_Os11g45720.1 -----MDRPNLAVAVVGLLAVVAATLP-----APS--WQFFDLFLPAGP
maize_
LOC_Os12g37660.1 ---MEIISPSSSSNNNSPVLATFLVLVLLASSRP-----ASSQNQQSFTINPGGAA
sorghum_
At5g61680.1 -----MGYNYVSLIVTILLVVITSP-----VVFGNDAAPIP

LOC_Os11g45720.1	SHRSSGG--GFGKWLMNHEEYVEKKSLYAMKAAGD-----IGG--KTIDASLSAAEEAK
maize_	-----
LOC_Os12g37660.1	AARPGGGKGGGGGGPGSFSDFLTQNVQHYVLSEQK----YAGKVKALDAELSAAEAGA
sorghum_	TNNNNIKMPAADGGAAGSFTFVTENVELYSNVSSSEQHKYGAGAGGKVWDPELLAAQGMA
At5g61680.1	ENK-----GRIEQWFNTN-----

LOC_0s11g45720.1	VTWVVDPKGTPGDTTFTTIAAALEKVPEGNTKRVILDLKPGAEF	REKLLLNITKPYITFK
maize_	-----	^
LOC_0s12g37660.1	ARYVVS GDGKG ---KFRTITEAIKAVPEYNKKRVILDIRPG- TY2	KEKLLIPFTKPFITFV
sorghum_	LRYVSPD GKG ---KFRSINEAIKAVPDGNKRRVILDIRTA- TY	KEKVVVPYMKPFVTFS
At5g61680.1	----VKQNGRG ---HFKTITEAINS VRAGNTRRVIKIGPG- VY	KEKVTIDRSKPFITLY

LOC_Os11g45720.1	SDPANPAVIAWNDMAATRKGDKGKPVGTGSGTTVAVESDYFMAYGVVFKNDAPLAKPGAEG
maize_	-----PVGTGGSATLAVESDYFTAYGVVFRNDAPLAKPGAAG
LOC_Os12g37660.1	GNPRSPPTIMWDDRAATHGKDGQPMGMTLSATVAVEADYFMASIIIFKNNAPMAAPGAHG
sorghum_	GNPKNPPVIMWDDRAATRKGDKGKPVGTGYSATVAVESDYFMASGVHFKNAAPLAAPGTGEG
At5g61680.1	GHPNAMPVLTFDGTAAYQG-----TVDSATLIVLSDYFMVAVNIILKNSAPMPDGRKRG
	* * * * *

LOC_Os11g45720.1	GQAVALLRLFGTKAAIYNCTIDGGQDTLYDHKGLHYIKDSLIMGSVDFIFGFGRSLYEGCT
maize_	GQAVAVRLFGTKTQIYNCTIDGGQDTLYDHKGLHYFKGLIRGSVDFIFGFGRSFYEDCR
LOC_Os12g37660.1	GQAVALLRVFGSKVAMYNCTIDGGQDTLYDHKGLHYFKNCLIRGSVDFIFGFGRSLYADCT
sorghum_	GQAVAVRVYGNKAAFYDCTFDGGQDTLYDHRGLHYFKSCHIQTVDIFGFGRSLYEDCA
At5g61680.1	AQALSMRISGNKAAFYNCKFYGYQDTICDDTGNHFFKDCYIEGTFDFIFGSGRSLYLGTQ
	.*****: *. * . :*: * : * ****: *. * *:*. * *:***** ***: *

LOC_Os11g45720.1	IVSVTKEVSVLTAQQRKTIEGAIESGFSFKNCSIKGQ---GQIYLGRAWGDSSRVVYSY
maize_	IESVWKEVAVLTAQQRKSIEGAIDTGFSFKNCSIGGVK-GGQIYLGRAWGDSSRVVYSY
LOC_Os12g37660.1	IESVTKEVAVVTAQQRKNIAEAIDTGFSFLRCKISGI---GQIYLGRAWGDSSRVVYSY
sorghum_	ITSVTKDVAIVTAQQRTRSIADALETGFSFLRCRIGSSTGAGQIYLGRAWGDSSRVVYAY
At5g61680.1	LNVVGDGIRVITAHAG---KSAAEKSGYSFVHCKVTGTG--TGIYLGSRWMSHPKVYAY
	: * . : :*: * .*: * . * : . ***** * . :*: *

LOC_Os11g45720.1	TDMSKEVVPIGWDGWNIAKPESSGIYYGEFKCTGPGSDAKK--RVGWALDLTADQAKPFI
maize_	TKMGEEVVPVGWDGWIAPKESSGIYYGEFKCFGPGADAKKKRVGWALDLTEAQAKPFV
LOC_Os12g37660.1	TTMGKEVVPIGWDGWEVQKPEHSGIYYGEYKCSGPGALPSK--RIGWSLVLSDIQAKPFT
sorghum_	TTMGKEVVPVGWDKWTQKPEHSGIYYGEYQCSGPGALPHK--R-----
At5g61680.1	TDMSSVNPSPGWQENREAGRDKT-VFYGEYKCTGTGSHKEK--RVKYTQDIDDIEAKYFI
	* *. * * *: : :*: * *. *: * *

LOC_Os11g45720.1	GTHYIYGDSWILPPPDKGSAASTSTASKSTASAIPRNSTAPATATESNSTAPATPSNSTA
maize_	GTHYVLGDTWIQPPPK-----
LOC_Os12g37660.1	GSHFVYGDSWILPPPKSM-----
sorghum_	-----
At5g61680.1	SLGYIQGSSWLLPPPSF-----

LOC_Os11g45720.1	PVTASNSTAPATASSNPPATKSYSGPPATPSASSTPAKASR
maize_	-----
LOC_Os12g37660.1	-----
sorghum_	-----
At5g61680.1	-----

CLUSTAL W (1.83) multiple sequence alignment

maize_	-----
sorghum_	-----
LOC_Os12g02840.1	-----MAAHTVTDPLEELWNHTMSMDKTHLMCFYPSKITMGGVWTGD
LOC_Os05g40650.1	MAPIMSGAAAAAGGTGGAVPLIKNATSASQMSRGKAGTGAGAVVCYSPMMVTAYGIWQGA
At2g13620.1	-----MATSEEPSTDASIICYAPSMITTINGVWQGD

maize_	-----
sorghum_	-----
LOC_Os12g02840.1	NPLDFSIPLLLFQILLITSTTRAATLLLSPLRLPTYISQILAGFLLGPSVLGHLPHFSNL
LOC_Os05g40650.1	SPLDFSLPLFLLQVAIIIVATTRLLVILLKPFQPRVIAEILAGVILGPSVMGQVSTWAVK
At2g13620.1	NPLDFSLPLFVLQLTLVVVVTRFFVFILKPFQPRVISEILGGIVLGPSVLGRSTKFAHT

maize_	-----
sorghum_	-----
LOC_Os12g02840.1	VFPVRSFLVLESMALLGLVYYTFIVGVEIEVSAITRAGIRSFGFAIGCTLPPLVVGALTG
LOC_Os05g40650.1	VPERSLLTLETVAHLGLLYFLFLVGLVEMDVNTIRRSGKKALIIAVAGMALPFCIGTATS
At2g13620.1	IFPQRSVMVLETMANVGLLYFLFLVGVEMDIMVVRKTGKRALTIAIGGMVLPFLIGAASF

[illegible]

LOC_Os05g40650.1	AR--MAAVHHVALLFFGGPDDREGLAYAWRMVENPGVCLTIVRLIPPGYTAPAI SPPQPP
At2g13620.1	RLNSNTVSLQVAVLFFGGPDDREALAYAWRMAQH PGITLTVLRFIHDEDEADTASTR---
	:*. ***** * * *. :* : **::*:
maize_	-----GSFTGTEFDALKERKADDGILREFLDRANSVS--GGGGAGVEYRERGVFNASEM
sorghum_	-----GSFTGTEFDALKERKADDAILREFLDRANSVSAGGGGGAGVEYRERGVFNASEM
LOC_Os12g02840.1	-----GSFTASEFDALKERKADEGCLRDFLERAN-----EGGGATVEYRERGVFNASEM
LOC_Os05g40650.1	MPAAHSRAINVVPEVAKSERQMDEEYLNFRSRNL-----GNDAILYVEQVVANSEET
At2g13620.1	--ATNDSDLKIPKMDHRKQRQLDDDYINLFRAENA-----EYESIVYIEKLVSNGEET
	:. .*: *: :. * . : * *: * *..*
maize_	VAQIREVEALG-KDLFVVGKVPGLPA--L TAGMAEWSECP ELGP IGDLLSSKDFQTTASV
sorghum_	VAQIREVEALG-KDLFVVGKVPGLPA--L TAGMAEWSECP ELGP IGDLLSSRDFHTMASV
LOC_Os12g02840.1	VGEIQSVEAMGNKDLFVVGKVPGGSG--L TAGMAEWSESP ELGP IGDLLASKDFQTTASV
LOC_Os05g40650.1	VAAIRSQLDNA-HELYIVGRHPGEASSPLTSALAEWMESPELGP IGDLLVSSEFSKMASV
At2g13620.1	VAAVRS-MDSS-HDLFIVGRGEGMSS-PLTAGLTDWSECP ELGAIGDLLASSDFAATVSV
	. :.: . ::*:*: * .. *:*:*: * *.*****.***** * :* .**
maize_	LVILYYLRH-----
sorghum_	LVLQSYARPSAGG--MSAELGLGVGGDGVPAAGRPPRPDQIRRGSLGNRS-----
LOC_Os12g02840.1	LVLQAYGRPAAVVGAGAGAMSVDFGGDSVAMAERTASGRRPWARP GV-----
LOC_Os05g40650.1	LVMQQYVITAPLPPPVALAGPPTDDPV RQYL TNANQRPSVAIGGNQMGAAGRGW SGGAG
At2g13620.1	LVVQQYVGSWAQEDDMDFP---ESPVHSHETKV TYGLENPR-----
	**.*
maize_	--
sorghum_	--
LOC_Os12g02840.1	--
LOC_Os05g40650.1	GY
At2g13620.1	--