FAH1(At4g36220): partial tree
File name: FAH1.pt1.svg
224 aa residues 176 OTU included.
Partial tree including NP_922299 *Oryza sativa*.
Assemble Job Id: Nl6frH selectNalign job id: cVblHk(230)
Tree job id: hKRZaU
BP values out of 100
Analyzed by ku-bo@nibb.ac.jp
Date: Tue Dec 26 18:29:21 JST 2006

AT4G36220 = NP_195345 Q42600 AAC49389 CAA18128 AAD11580 CAB80293 CAC26922 CAC26923 CAC26924 CAC26925 CAC26926 CAC26927 CAC26928 CAC26929 CAC26930 CAC26931 CAC26932 CAC26933 CAC26934 CAC26935 CAD37901 CAD37936 CAD37990 CAD37991 CAD37902 CAD37903 CAD37

CAC26936 *Arabidopsis thaliana* **CAC26937 CAC26938 CAC26939 CAC26940 CAC26941 CAD37906 CAD37907 CAD37908 CAD37909 CAD37910 CAD37911 CAD37924 CAD37927 CAD37928 ferulate-5-hydroxylase/ferulate-5-hydroxylase /ferulate-5-hydroxylase /ferulate-5-hydroxylase**

CAC26920 *Arabidopsis lyrata subsp. petraea* ferulate-5-hydroxylase

AAG14963 *Brassica napus* cytochrome p450-dependent monooxygenase

AAG14961 *Brassica napus* AAG14962 cytochrome p450-dependent monooxygenase/cytochrome p450-dependent monooxygenase

AAW50817 *Broussonetia papyrifera* AAW50818 ferulate-5-hydroxylase/ferulate-5-hydroxylase

CAB65335 *Populus trichocarpa* ferulate-5-hydroxylase

AAD37433 *Lycopersicon esculentum* x *Lycopersicon peruvianum* ferulate-5-hydroxylase

AAS92625 *Centaurium erythraea* coniferylalcohol 5-hydroxylase

AAT39511 *Camptotheca acuminata* ferulate 5-hydroxylase

ABC59101 *Medicago truncatula* cytochrome P450 monooxygenase CYP84A

ABB02161 *Medicago sativa* ferulate 5-hydroxylase

ABB02162 *Medicago sativa* ferulate 5-hydroxylase

ABC68398 *Glycine max* cytochrome P450 monooxygenase CYP84A

AT5G04330 = NP_196053 heme binding/iron ion binding /monooxygenase/oxygen binding

NP_922299 *Oryza sativa* (japonica cultivar-group) AAG13569 AAP54586 putative aldehyde 5-hydroxylase/putative aldehyde 5-hydroxylase /aldehyde 5-hydroxylase, putative

AAO17011 *Oryza sativa* (japonica cultivar-group) Hypothetical protein

AT4G13770 = NP_193113 P48421 AAA79982 AAB71623 BAA28532 CAB36841 CAB78419 AAL16238 AAL77703 AAM26713 CYP83A1 (CYTOCHROME P450 83A1); oxygen binding/C83A1_ARATH Cytochrome P450 83A1 (CYPLXXXIII)/cytochrome p450 dependent monooxygenase/cytochrome P450

AT4G31500 = NP_194878 O65782 BAA28531 CAB45909 CAB79868 AAM61746 AAN86166 CYP83B1 (CYTOCHROME P450 MONOOXYGENASE 83B1); oxygen binding/C83B1_ARATH Cytochrome P450 83B1/cytochrome P450 monooxygenase /cytochrome P450 monooxygenase /cytochrome P450 mon

ABC59083 *Medicago truncatula* cytochrome P450 monooxygenase CYP83B

ABC59082 *Medicago truncatula* cytochrome P450 monooxygenase CYP83C

ABC68397 *Glycine max* cytochrome P450 monooxygenase CYP83A

BAB40323 *Asparagus officinalis* cytochrome P450

BAB40324 *Asparagus officinalis* cytochrome P450

NP_910063 *Oryza sativa* (japonica cultivar-group) AAO20056 AAO37955 putative cytochrome P450/putative cytochrome P450 protein /putative cytochrome P450

O48958 *Sorghum bicolor* AAC39318 C71E1_SORBI Cytochrome P450 71E1 (4-hydroxyphenylacetaldehyde oxime monooxygenase)/cytochrome P450 CYP71E1

AT1G13110 = NP_172770 Q96514 CAA66458 AAD31064 AAL58941 AAO64744 CYP71B7; heme binding/iron ion binding /monooxygenase/oxygen binding /C71B7_ARATH Cytochrome P450 71B7/cytochrome P450 /Identical to gb|X97864 cytochrome P450 from Arabidopsis thaliana

AT3G26190 = NP_189250 Q9LTM2 BAB02440 CYP71B21; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BL_ARATH Cytochrome P450 71B21/cytochrome P450

AT3G26200 = NP_189251 Q9LTM1 BAB02441 AAK25981 AAK64138 CYP71B22; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BM_ARATH Cytochrome P450 71B22/cytochrome P450 /putative cytochrome P450 protein /putative cytochrome P450 protein

AT3G26280 = NP_189259 O65786 BAA28535 BAB02451 AAL90915 AAN31105 CYP71B4; heme binding/iron ion binding /monooxygenase/oxygen binding /C71B4_ARATH Cytochrome P450 71B4/cytochrome P450 monooxygenase /cytochrome P450 /AT3g26280/MTC11_19 /At3g26280/MTC

Q9SAE1 *Arabidopsis thaliana* **C71BR_ARATH Cytochrome P450 71B27**

AT1G13080 = NP_172767 O65788 BAA28537 AAD31061 AAO41864 CYP71B2 (CYTOCHROME P450 71B2); heme binding/iron ion binding /monooxygenase/oxygen binding /C71B2_ARATH Cytochrome P450 71B2/cytochrome P450 monooxygenase /Identical to gb|D78605 cytochrome P4

AAL24049 *Citrus sinensis* cytochrome P450

AAO42072 *Arabidopsis thaliana* **putative cytochrome p450**

AT5G57260 = NP_200536 Q9LVD2 BAA96949 CYP71B10; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BA_ARATH Cytochrome P450 71B10/cytochrome P450

AT2G02580 = NP_178362 O64718 T00605 AAL59946 AAC18928 AAX12868 CYP71B9; heme binding/iron ion binding /monooxygenase/oxygen binding /C71B9_ARATH Cytochrome P450 71B9/T00605 probable cytochrome P450 At2g02580 /putative cytochrome P450 protein /putati

AT3G26330 = NP_189264 Q9LIP3 BAB02193 CYP71B37; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BY_ARATH Cytochrome P450 71B37/cytochrome p450

AT3G26320 = NP_189263 Q9LIP4 BAB02192 CYP71B36; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BX_ARATH Cytochrome P450 71B36/cytochrome P450

AT3G26290 = NP_189260 Q9LTL0 BAB02452 AAM91596 AAP68310 CYP71B26; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BQ_ARATH Cytochrome P450 71B26/cytochrome P450 /cytochrome P450, putative /At3g26290

AT3G26300 = NP_189261 Q9LIP6 BAB02190 CYP71B34; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BV_ARATH Cytochrome P450 71B34/cytochrome P450

AT3G26310 = NP_189262 Q9LIP5 BAB02191 AAS49117 CYP71B35; heme binding/iron ion binding /monooxygenase/oxygen binding /C71BW_ARATH Cytochrome P450 71B35/cytochrome P450 /At3g26310

P37117 *Solanum melongena* CAA50312 C71A4_SOLME Cytochrome P450 71A4 (CYPLXXIA4) (P-450EG2)/P450 hydroxylase

P37118 *Solanum melongena* CAA50645 BAA03635 C71A2_SOLME Cytochrome P450 71A2 (CYPLXXIA2) (P-450EG4)/P450 hydroxylase /Cytochrome P-450EG4

AT3G48280 = NP_680107 Q9STK8 CAB41170 CYP71A25; heme binding/iron ion binding /monooxygenase/oxygen binding /C71AP_ARATH Cytochrome P450 71A25/Cytochrome P450-like protein

AT3G48290 = NP_680108 Q9STK9 CYP71A24; heme binding/iron ion binding /monooxygenase/oxygen binding /C71AO_ARATH Cytochrome P450 71A24

AT3G48270 = NP_680106 Q9STK7 CAB41171 CYP71A26; heme binding/iron ion binding /monooxygenase/oxygen binding /C71AQ_ARATH Cytochrome P450 71A26/cytochrome P450-like protein

AT3G48310 = NP_680110 Q9STL1 CAB41167 AAM20137 AAM91788 CYP71A22; heme binding/iron ion binding /monooxygenase/oxygen binding /C71AM_ARATH Cytochrome P450 71A22/cytochrome P450-like protein /unknown protein /unknown protein

AT3G48320 = NP_680111 Q9STL2 CAB41166 CYP71A21; heme binding/iron ion binding /monooxygenase/oxygen binding /C71AL_ARATH Cytochrome P450 71A21/cytochrome P450-like protein

AAL06397 *Mentha x piperita* menthofuran synthase

O04164 *Nepeta racemosa* CAA70576 C71A6_NEPRA Cytochrome P450 71A6/cytochrome P450

CAA70575 *Nepeta racemosa* cytochrome P450

AAB94584 *Glycine max* CYP71A10

BAD16679 *Muscari armeniacum* BAD16680 cytochrome P450/cytochrome P450

T52256 *Persea americana* P24465 AAA32913 T52256 cytochrome P-450LXXIA1/C71A1_PERAE Cytochrome P450 71A1 (CYPLXXIA1) (ARP-2)/cytochrome P-450LXXIA1 (cyp71A1)

ABA99621 *Oryza sativa* (japonica cultivar-group) cytochrome P450, putative

NP_909721 *Oryza sativa* (japonica cultivar-group) AAO38017 putative cytochrome P450/putative cytochrome P450

NP_909846 *Oryza sativa* (japonica cultivar-group) AAO38022 putative cytochrome P450/putative cytochrome P450

XP_464360 *Oryza sativa* (japonica cultivar-group) BAD15430 putative cytochrome P450/putative cytochrome P450

XP_464368 *Oryza sativa* (japonica cultivar-group) BAD15438 putative cytochrome P450/putative cytochrome P450

XP_464364 *Oryza sativa* (japonica cultivar-group) BAD15434 putative cytochrome P450/putative cytochrome P450

AAS92622 *Centaurium erythraea* cytochrome P450

CAB56503 *Catharanthus roseus* cytochrome P450

ABC59080 *Medicago truncatula* cytochrome P450 monooxygenase CYP71A

O48923 *Glycine max* AAB94588 C71DA_SOYBN Cytochrome P450 71D10/CYP71D10p

O22307 *Lotus japonicus* AAB69644 C71DB_LOTJA Cytochrome P450 71D11/putative cytochrome P450

ABC41927 *Artemisia annua* amorpha-4,11-diene monooxygenase

O81974 *Glycine max* CAA71517 C71D8_SOYBN Cytochrome P450 71D8 (P450 CP7)/putative cytochrome P450

AAO32822 *Catharanthus roseus* cytochrome P450 71D1

AAD44151 *Mentha* x *piperita* cytochrome p450 isoform PM17

AAD44152 *Mentha* x *piperita* cytochrome p450 isoform PM2

AAQ18708 *Mentha* x *gracilis* limonene-3-hydroxylase

AAT39473 *Mentha spicata* limonene-3-hydroxylase

AAD44150 *Mentha spicata* AAQ18706 *Mentha* x *gracilis* cytochrome p450/limonene-6-hydroxylase

BAC53923 *Petunia* x *hybrida* cytochrome P450

AAF27282 *Capsicum annuum* cytochrome P450

AAD47832 *Nicotiana tabacum* cytochrome P450

AAK62342 *Nicotiana tabacum* elicitor-inducible cytochrome P450

P93530 *Solanum chacoense* AAB61964 C71D6_SOLCH Cytochrome P450 71D6/putative cytochrome P450

P93531 *Solanum chacoense* AAB61965 C71D7_SOLCH Cytochrome P450 71D7/putative cytochrome P450

CAC24711 *Solanum tuberosum* cytochrome P450

AAX07433 *Pinus taeda* cytochrome P450 CYPC

XP_469015 *Oryza sativa* (japonica cultivar-group) AAX95529 putative cytochrome P450/Putative cytochrome P450

AAL66767 *Zea mays* cytochrome P450 monooxygenase CYP92A1

ABA01477 *Gossypium hirsutum* cytochrome P450 DDWF1

AAG44132 *Pisum sativum* cytochrome P450

ABC59081 *Medicago truncatula* cytochrome P450 monooxygenase CYP75A

CAA65580 *Nicotiana tabacum* cytochrome P450

CAA64635 *Nicotiana tabacum* cytochrome P450

AAK62346 *Nicotiana tabacum* elicitor-inducible cytochrome P450

XP_465852 *Oryza sativa* (japonica cultivar-group) BAD23209 BAD22905 putative cytochrome P450 monooxygenase/putative cytochrome P450 monooxygenase /putative cytochrome P450 monooxygenase

BAD38500 *Oryza sativa* (japonica cultivar-group) putative elicitor-inducible cytochrome P450

BAD36157 *Oryza sativa* (japonica cultivar-group) putative cytochrome P450 monooxygenase CYP92A1

XP_482757 *Oryza sativa* (japonica cultivar-group) BAD10411 putative elicitor-inducible cytochrome P450/putative elicitor-inducible cytochrome P450

BAD36163 *Oryza sativa* (japonica cultivar-group) BAD38068 putative elicitor-inducible cytochrome P450/putative elicitor-inducible cytochrome P450

BAD36161 *Oryza sativa* (japonica cultivar-group) BAD38066 putative elicitor-inducible cytochrome P450/putative elicitor-inducible cytochrome P450

BAD36162 *Oryza sativa* (japonica cultivar-group) BAD38067 putative elicitor-inducible cytochrome P450/putative elicitor-inducible cytochrome P450

Ppa_F5H1_45_1

Ppa_F5H1_1_1

Ppa_F5H1_34_1

AT1G01280 = NP_171635 AAF97323 AAY25435 CYP703A2; heme binding/iron ion binding /monooxygenase/oxygen binding /Putative cytochrome P450 /At1g01280

BAA92894 *Petunia* x *hybrida* cytochrome P450

XP_479935 *Oryza sativa* (japonica cultivar-group) BAD09645 BAD33366 putative cytochrome P450 protein/putative cytochrome P450 protein /putative cytochrome P450 protein

AAL73540 *Sorghum bicolor* putative cytochrome P450 family

Smo_F5H1_159_1

Smo_F5H1_4_1

Ppa_F5H1_6_1

Ppa_F5H1_66_1

Ppa_F5H1_28_1

Smo_F5H1_186_1

Smo_F5H1_49_1

Smo_F5H1_177_1

Smo_F5H1_16_2

Smo_F5H1_196_1

BAD15331 *Panax ginseng* cytochrome P450

AAL66194 *Pyrus communis* cytochrome P450

AT5G06900 = NP_196307 BAB11147 CYP93D1; heme binding/iron ion binding /monooxygenase/oxygen binding /cytochrome P450

Q42798 *Glycine max* 2209281A BAA12159 C93A1_SOYBN Cytochrome P450 93A1/2209281A cytochrome P450 /Cytochrome P-450 (CYP93A1)

BAD35561 *Oryza sativa* (japonica cultivar-group) putative cytochrome P450

AAD38930 *Glycine max* cytochrome P450 monooxygenaseCYP93D1

ABC59085 *Medicago truncatula* cytochrome P450 monooxygenase CYP93A

AAX51796 *Delphinium grandiflorum* flavonoid 3'5'-hydroxylase

O04773 *Campanula medium* BAA03440 C75A6_CAMME Flavonoid 3',5'-hydroxylase (F3'5'H) (Cytochrome P450 75A6)/flavonoid 3',5'-hydroxylase

AAT34974 *Verbena* x *hybrida* AAU00415 BAE72871 flavonoid 3',5'-hydroxylase/flavonoid 3',5'-hydroxylase /flavonoid 3',5'-hdyroxylase

BAE72872 *Verbena* x *hybrida* flavonoid 3',5'-hdyroxylase

ABC86841 *Vitis vinifera* flavonoid 3',5'-hydroxylase

CAI54277 *Vitis vinifera* ABC72066 flavonoid-3,5'-hydroxylase/flavonoid 3',5'-hydroxylase

ABC86840 *Vitis vinifera* flavonoid 3',5'-hydroxylase

BAE72870 *Clitoria ternatea* flavonoid 3',5'-hdyroxylase

AAP31058 *Gossypium hirsutum* flavonoid 3',5'-hydroxylase

BAE86871 *Gentiana scabra* flavonoid 3',5'-hydroxylase

Q96581 *Gentiana triflora* BAA12735 C75A4_GENTR Flavonoid 3',5'-hydroxylase (F3'5'H) (Cytochrome P450 75A4)/flavonoid 3',5'-hydroxylase

Q96418 *Eustoma grandiflorum* AAB17562 C75A5_EUSGR Flavonoid 3',5'-hydroxylase (F3'5'H) (Cytochrome P450 75A5)/flavonoid 3'5'-hydroxylase

O04790 *Eustoma grandiflorum* BAA03439 BAD34460 C75A7_EUSGR Flavonoid 3',5'-hydroxylase (F3'5'H) (Cytochrome P450 75A7)/flavonoid 3',5'-hydroxylase /flavonoid 3',5'-hydroxylase

BAC97831 *Vinca major* Flavonoid 3',5'-hydroxylase

CAA09850 *Catharanthus roseus* flavonoid 3',5'-hydroxylase

BAC10997 *Nierembergia* sp. *NB17* flavonoid 3',5'-hydroxylase

AAV85473 *Solanum tuberosum* flavonoid 3',5'-hydroxylase

AAV85470 *Solanum tuberosum* AAV85471 flavonoid 3',5'-hydroxylase/flavonoid 3',5'-hydroxylase

P37120 *Solanum melongena* CAA50155 C75A2_SOLME Flavonoid 3',5'-hydroxylase (F3'5'H) (Cytochrome P450 75A2) (CYPLXXVA2) (P-450EG1)/flavonoid hydroxylase (P450)

AAG49300 *Lycianthes rantonnei* flavonoid 3',5'-hydroxylase

2001426A *Petunia* x *hybrida* P48419 CAA80265 2001426A flavonoid 3',5'-hydroxylase/C75A3_PETHY Flavonoid 3',5'-hydroxylase 2 (F3'5'H) (Cytochrome P450 75A3) (CYPLXXVA3) /flavonoid 3',5'-hydroxylase

P48418 *Petunia* x *hybrida* 2001426B CAA80266 BAA03438 AAC32274 AAO91941 BAD99151 ABC74799 C75A1_PETHY Flavonoid 3',5'-hydroxylase 1 (F3'5'H) (Cytochrome P450 75A1) (CYPLXXVA1)/2001426B flavonoid 3',5'-hydroxylase /flavonoid 3',5'-hydroxylase /flavonoi

AAS48419 *Allium cepa* flavonoid 3'-hydroxylase

NP_920599 *Oryza sativa* (japonica cultivar-group) AAM74394 putative cytochrome 450/Putative cytochrome 450

AAV74194 *Sorghum bicolor* AAV74195 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase

NP_920627 *Oryza sativa* (japonica cultivar-group) AAM00948 AAN04937 AAP52914 putative flavonoid 3'-hydroxylase/Putative flavonoid 3'-hydroxylase /Putative chalcone flavonoid 3' - hydroxylase /Cytochrome P450

ABB43031 *Osteospermum hybrid cultivar* flavonoid 3'5'-hydroxylase

AAG49299 *Callistephus chinensis* flavonoid 3',5'-hydroxylase

AAX19888 *Pericallis cruenta* flavonoid-3',5'-hydroxylase

ABB43030 *Pericallis cruenta* flavonoid 3'5'-hydroxylase

AAG49315 *Pelargonium* x *hortorum* flavonoid 3'-hydroxylase

AT5G07990 = NP_196416 Q9SD85 CAB62611 AAF60189 AAF73253 AAG16745 AAG16746 TT7 (TRANSPARENT TESTA 7); flavonoid 3'-monooxygenase/oxygen binding /F3PH_ARATH Flavonoid 3'-monooxygenase (Flavonoid 3'-hydroxylase) (AtF3'H) (Cytochrome P450 75B1) (TRANSPA

AAG49301 *Matthiola incana* flavonoid 3'-hydroxylase

BAB83261 *Glycine max* AAO47846 AAO47847 BAD97828 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase /flavonoid 3'-hydroxylase /flavonoid 3'- hydroxylase

BAE71221 *Trifolium pratense* putative flavonoid 3'-hydroxylase

ABB53383 *Antirrhinum majus* flavonoid-3'-hydroxylase

BAB59005 *Perilla frutescens var. crispa* flavonoid 3'-hydroxylase

BAD91808 *Gentiana triflora* flavonoid 3'-hydroxylase

BAD00189 *Ipomoea tricolor* BAD00192 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase

AAR00229 *Ipomoea purpurea* BAD00188 BAD00191 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase /flavonoid 3'-hydroxylase

BAD00187 *Ipomoea nil* BAD00190 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase

AAS46257 *Ipomoea quamoclit* flavonoid 3'-hydroxylase

Q9SBQ9 *Petunia* x *hybrida* AAD56282 F3PH_PETHY Flavonoid 3'-monooxygenase (Flavonoid 3'-hydroxylase) (Cytochrome P450 75B2)/flavonoid 3'-hydroxylase

BAE47004 *Vitis vinifera* flavonoid 3'-hydroxylase

CAI54278 *Vitis vinifera* flavonoid-3'-hydroxylase

BAE47005 *Vitis vinifera* BAE47006 flavonoid 3'-hydroxylase/flavonoid 3'-hydroxylase

ABB29899 *Osteospermum hybrid cultivar* flavonoid 3'-hydroxylase

AAG49298 *Callistephus chinensis* putative flavonoid 3'-hydroxylase

ABA64468 *Gerbera hybrid cultivar* flavonoid 3'-hydroxylase

BAE72877 *Verbena* x *hybrida* cytochrome P450

AAQ05825 *Pastinaca sativa* cytochrome P450

CAB85635 *Vitis vinifera* putative ripening-related P-450 enzyme

NP_917091 *Oryza sativa* (japonica cultivar-group) putative flavonoid 3',5'-hydroxylase

AT4G12310 = NP_192968 CAB45978 CAB78274 AAS76776 CYP706A5; heme binding/iron ion binding /monooxygenase/oxygen binding /flavonoid 3', 5'-hydroxylase-like protein /flavonoid 3', 5'-hydroxylase-like protein /At4g12310

AAU05534 *Arabidopsis thaliana* **At4g12320**

AT4G12300 = NP_192967 CAB45977 CAB78273 BAC43375 AAO63874 CYP706A4; heme binding/iron ion binding /monooxygenase/oxygen binding /flavonoid 3', 5'-hydroxylase-like protein /flavonoid 3', 5'-hydroxylase-like protein /putative flavonoid 3',5'-hydroxyla

0.100