

Comparative genomics of the non-legume *Parasponia* reveals insights into evolution of nitrogen-fixing rhizobium symbioses

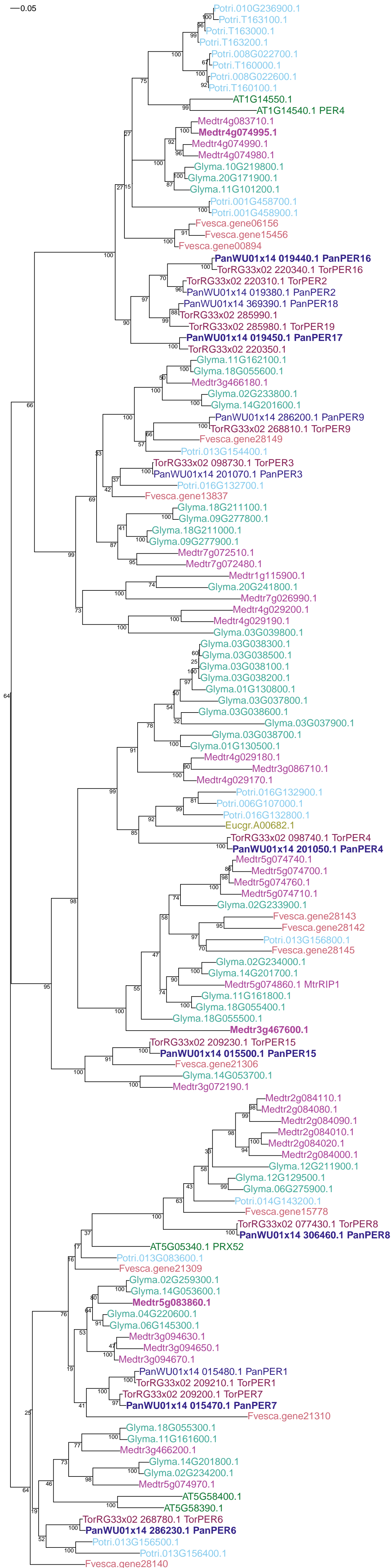
Robin van Velzen, Rens Holmer, Fengjiao Bu, Luuk Rutten, Arjan van Zeijl, Wei Liu, Luca Santuari, Qingqin Cao, Trupti Sharma, Defeng Shen, Yuda Roswanjaya, Titis A.K. Wardhani, Maryam Seifi Kalhor, Joelle Jansen, Johan van den Hoogen, Berivan Güngör, Marijke Hartog, Jan Hontelez, Jan Verver, Wei-Cai Yang, Elio Schijlen, Rimi Repin, Menno Schilthuizen, M. Eric Schranz, Renze Heidstra, Kana Miyata, Elena Fedorova, Wouter Kohlen, Ton Bisseling, Sandra Smit, & Rene Geurts

Phylogenetic analysis of genes utilized in *Parasponia* and medicago root nodules.

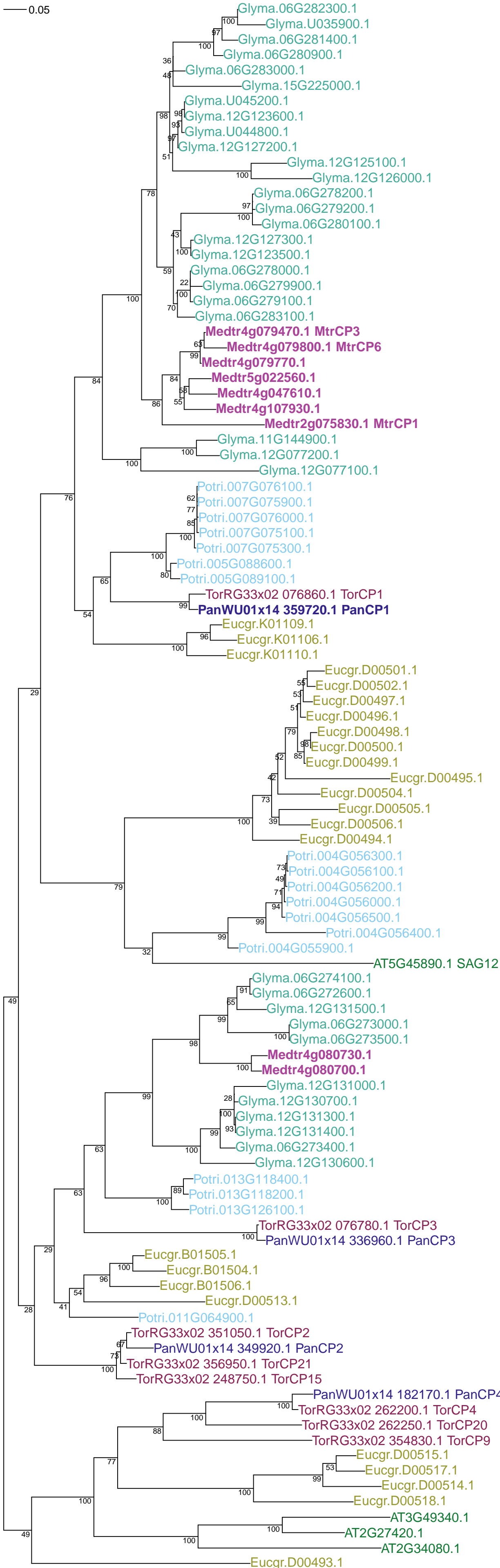
Phylogenetic trees (based on Maximum Likelihood) of orthogroups containing genes with significantly enhanced expression level in any of three *Parasponia* nodule developmental stages (Fig. S12; Dataset S4) as well as genes with significantly enhanced expression in nodules of medicago (Roux *et al.* 2014) (Dataset S5). OrthoGroup number corresponds to Dataset S2. Node labels indicate bootstrap support values; scale bars represent evolutionary distance in substitutions per site. Nodule-enhanced genes are marked in bold. Proteins from *Arabidopsis thaliana* (AT) are marked in green, *Eucalyptus grandis* (Eucgr) in olive, *Populus trichocarpa* (Potri) in light blue, *Medicago truncatula* (Medtr) in purple, *Glycine max* (Glyma) in mint, *Fragaria vesca* (Fvesca) in pink, *Parasponia andersonii* (Pan) in dark blue, and *Trema orientalis* RG33 (Tor) in dark red.

OG0000054: Symbiosis genes. Peroxidase

—0.05

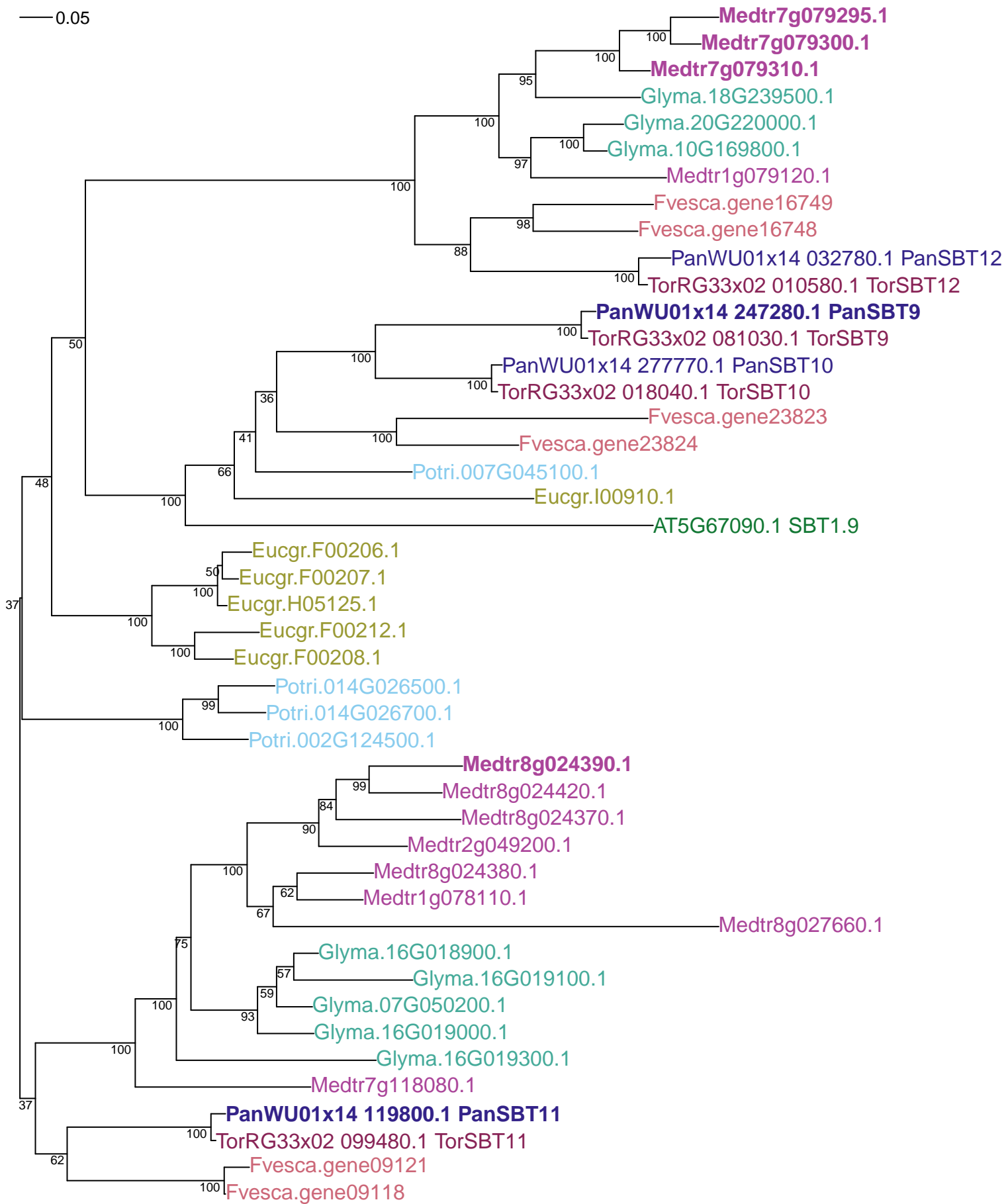


OG000092: Symbiosis genes. Cysteine Protease

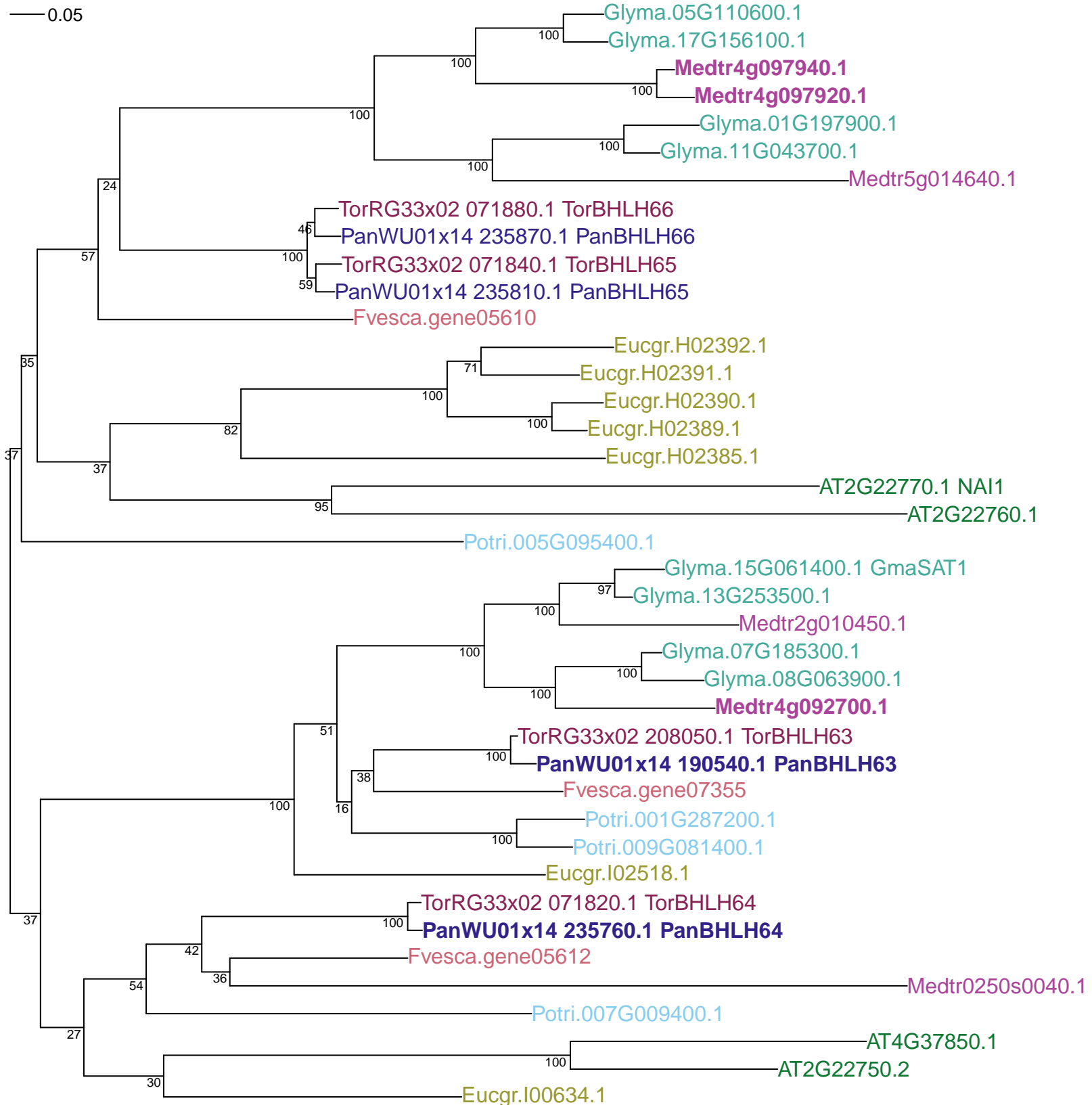


OG0000392: Symbiosis genes. Subtilase

— 0.05

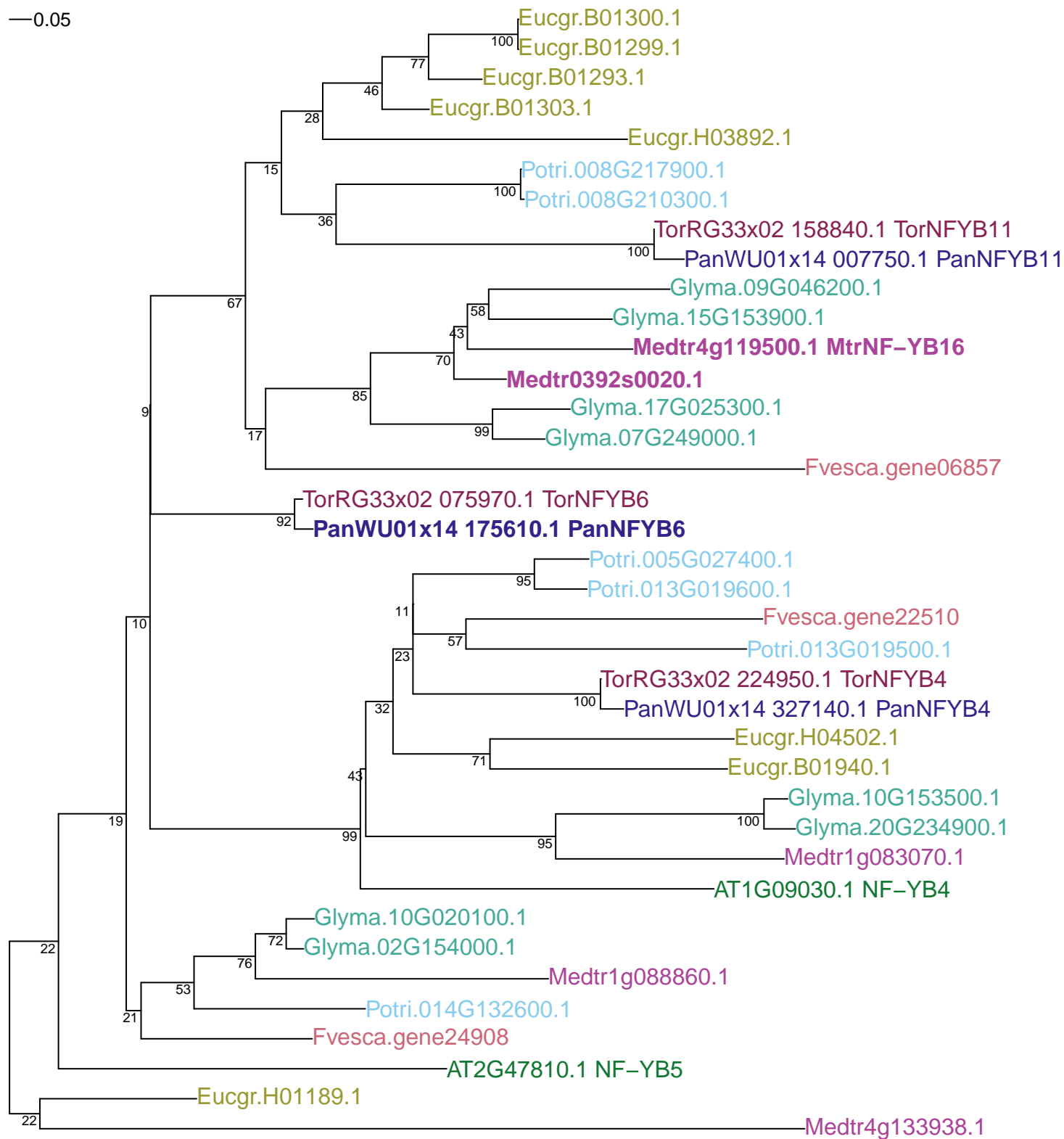


OG0000482: Symbiosis genes. Basic helix-loop-helix transcription factor



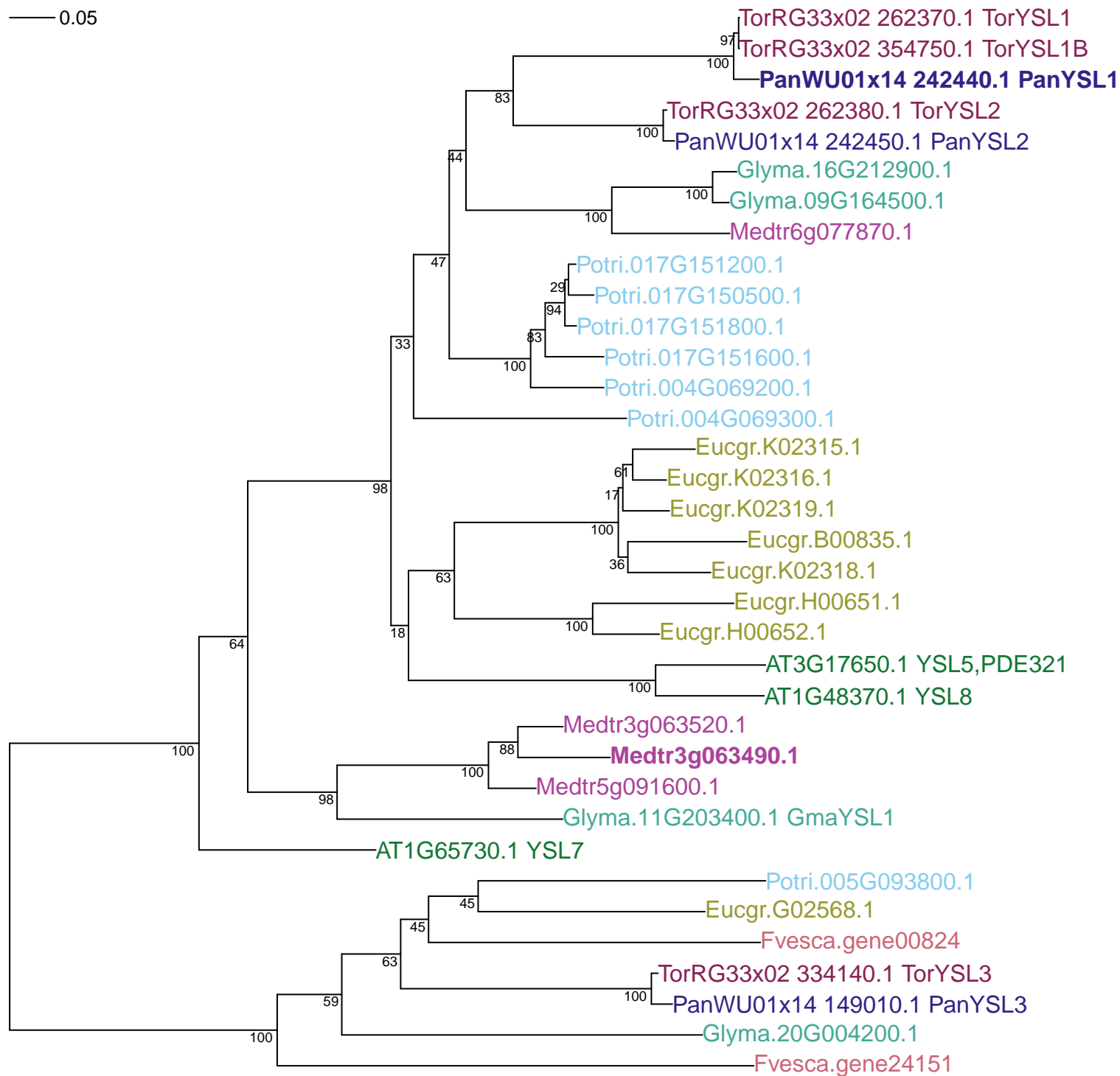
OG0000523: Symbiosis genes. Nuclear transcription factor Y subunit B

—0.05

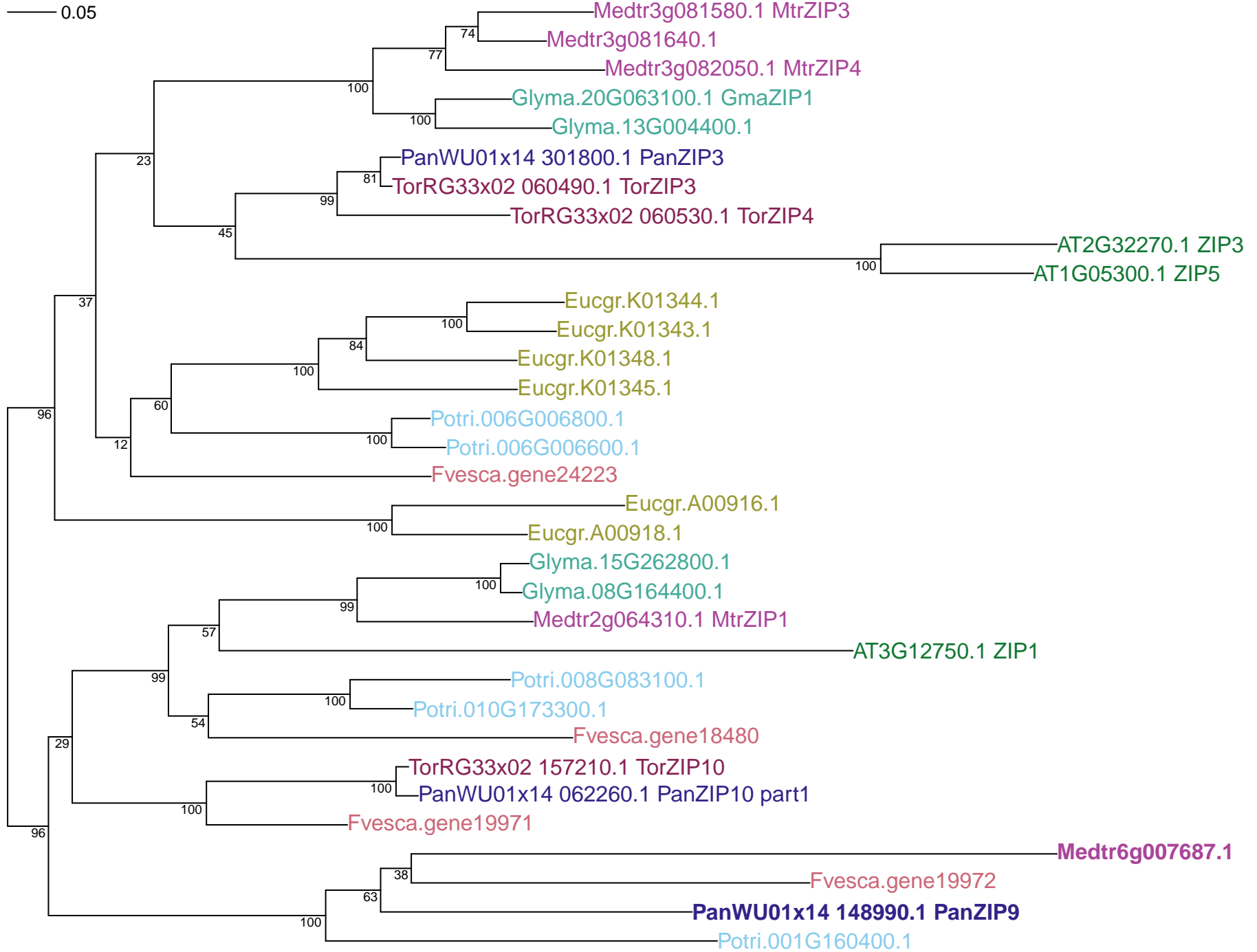


OG0000599: Symbiosis genes. Oligopeptide transporter

— 0.05

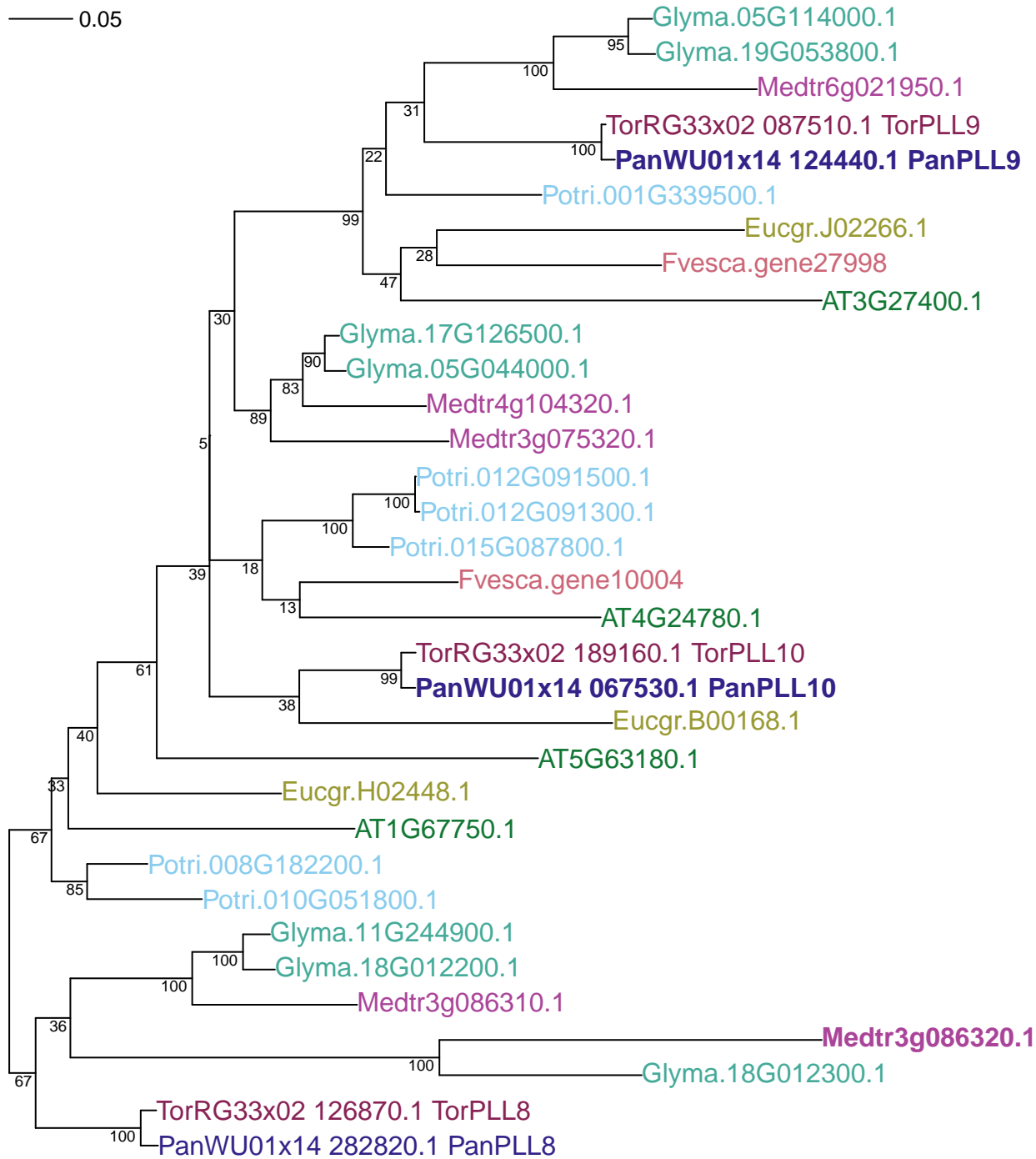


OG0000681: Symbiosis genes. Zinc/iron permease

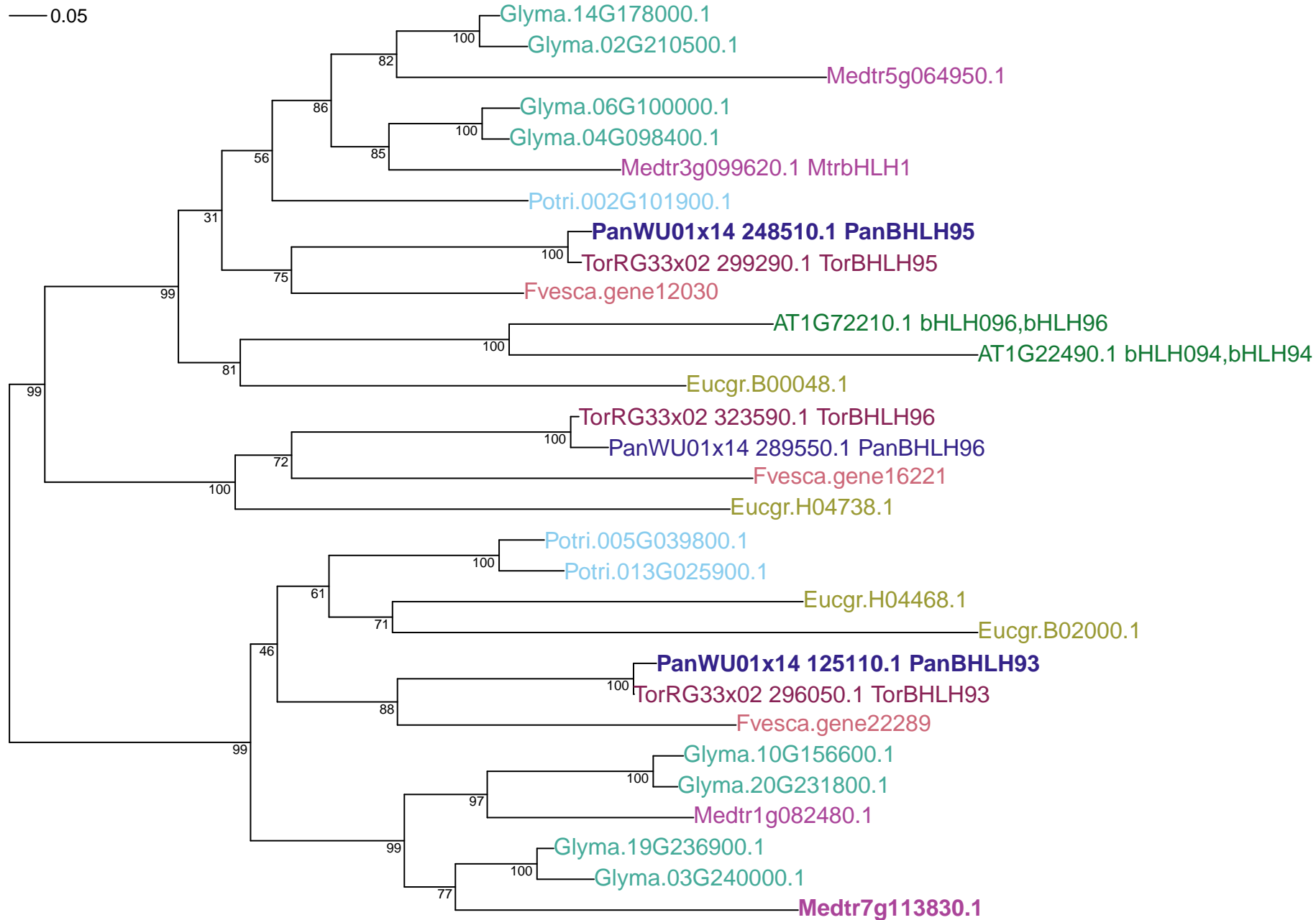


OG0000686: Symbiosis genes. Pectate lyase

— 0.05

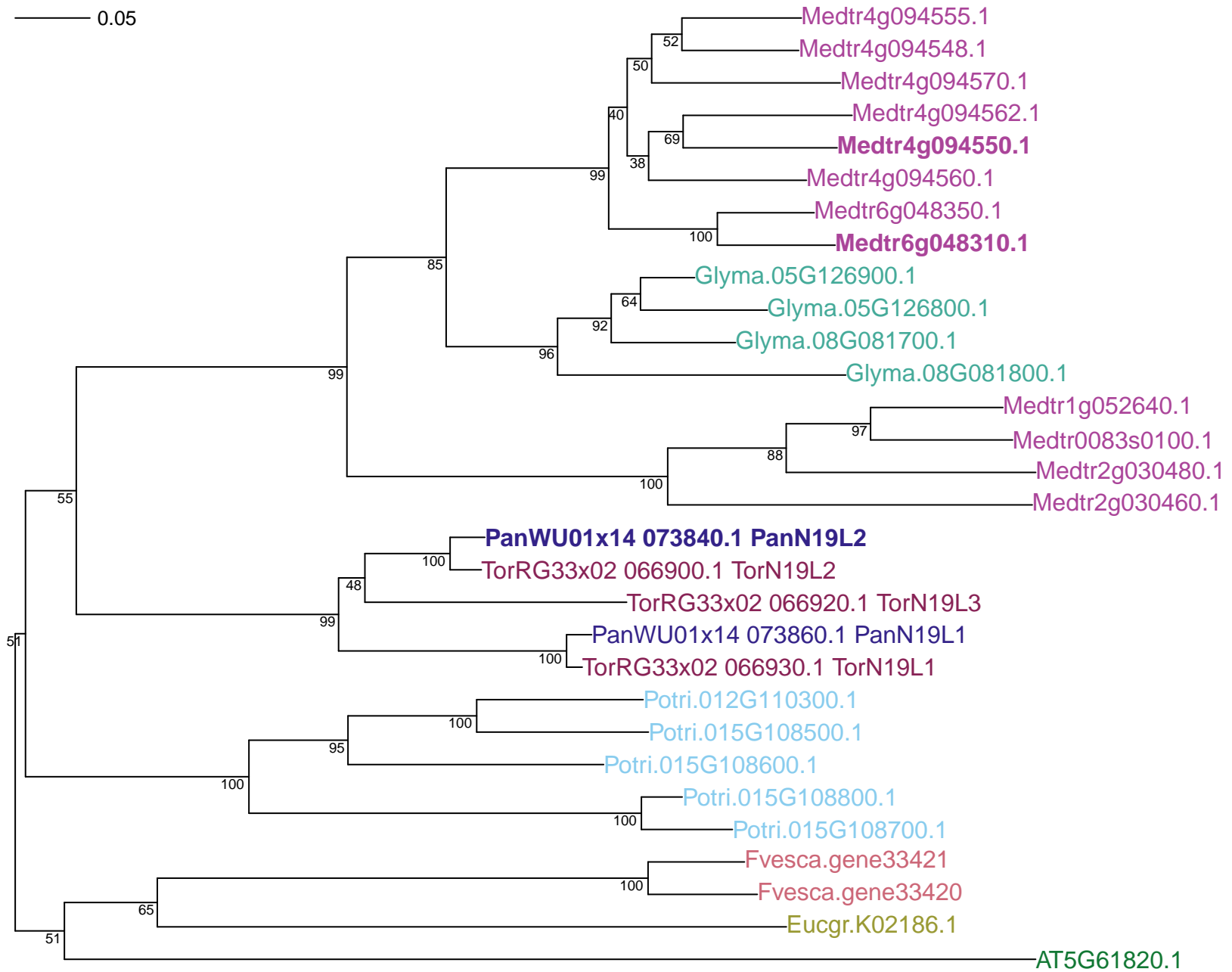


OG0000817: Symbiosis genes. Basic helix-loop-helix transcription factor

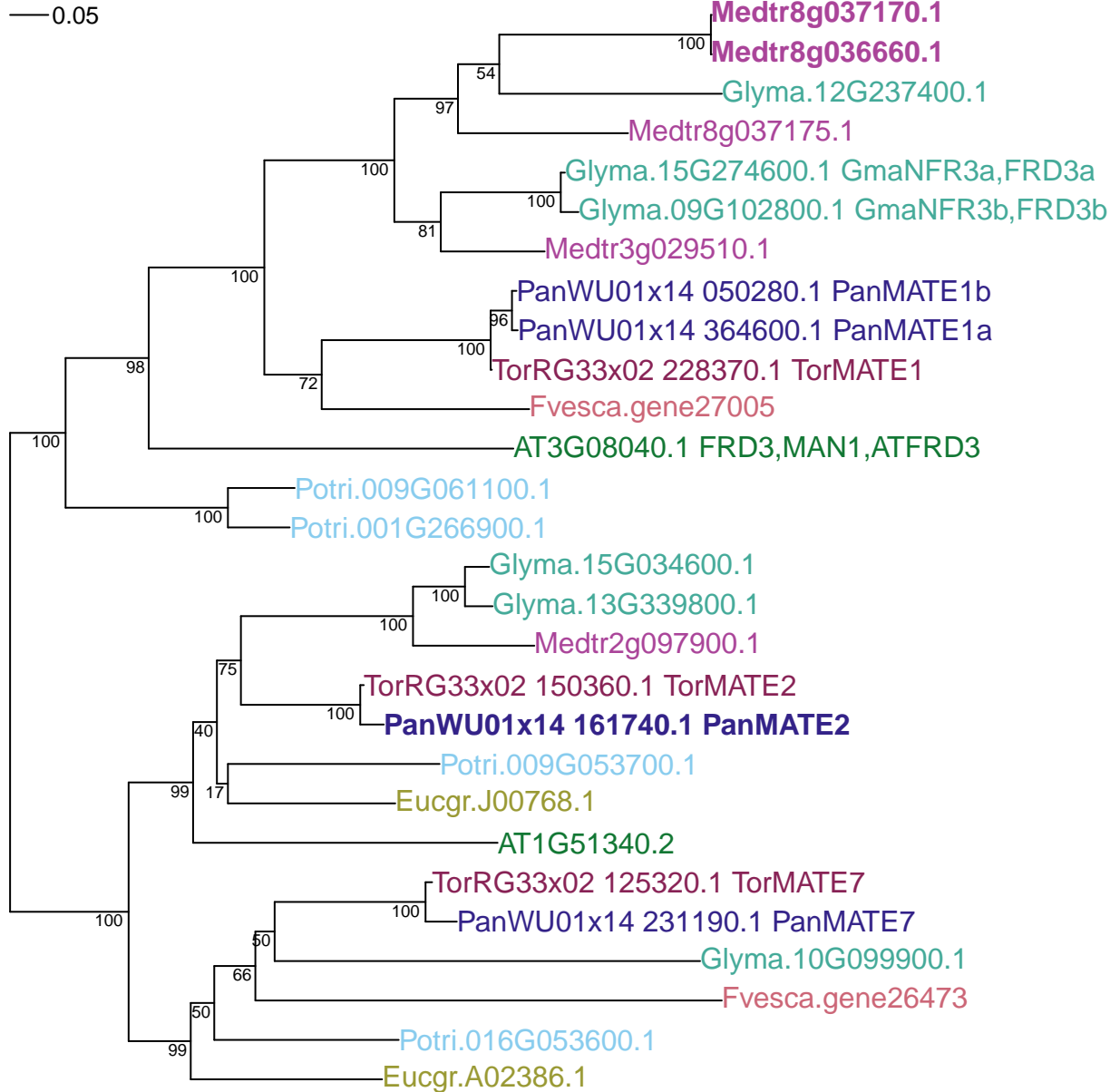


OG0000842: Symbiosis genes. Stress up-regulated Nod

0.05

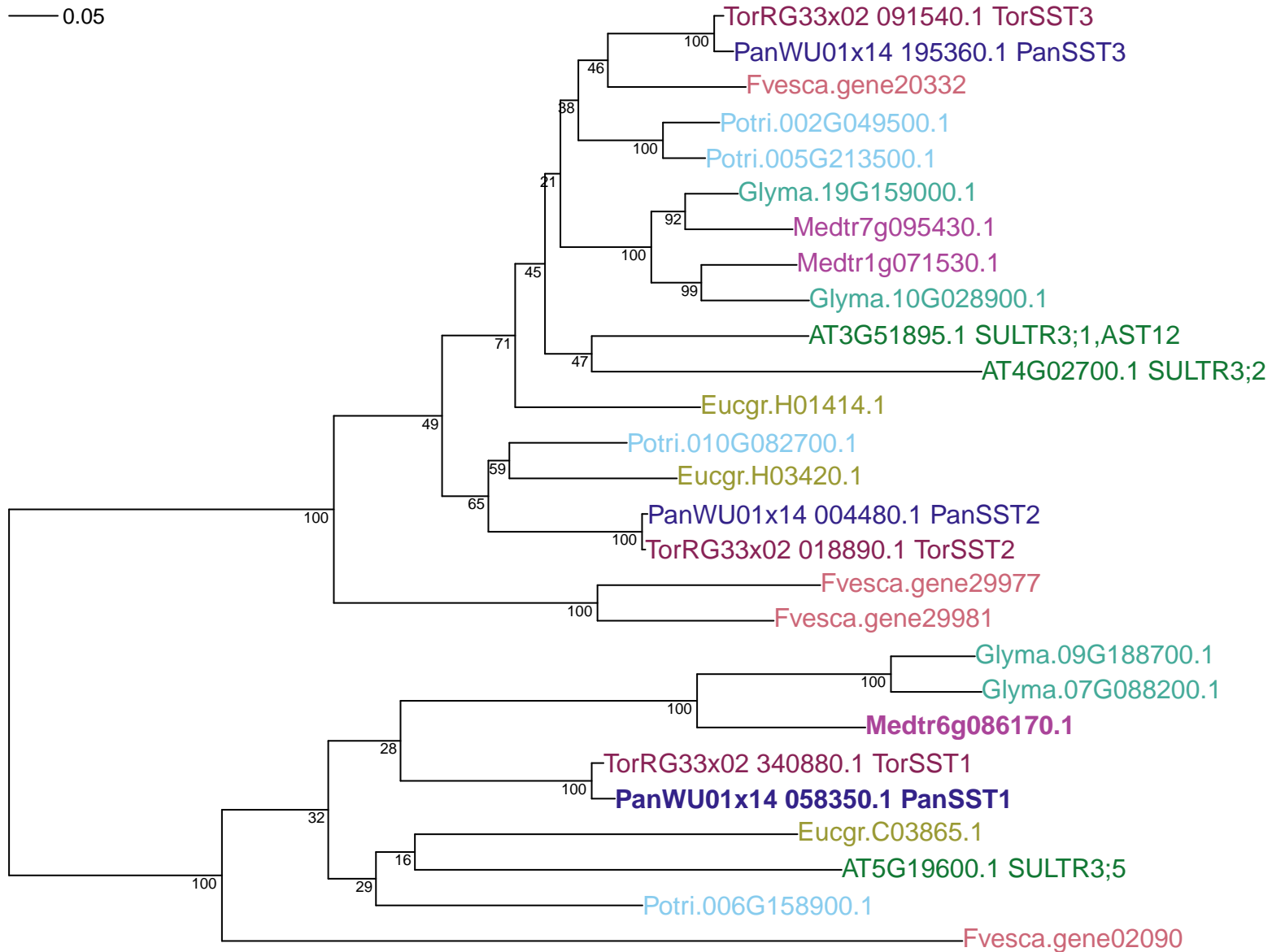


OG0000938: Symbiosis genes. Multi antimicrobial extrusion protein



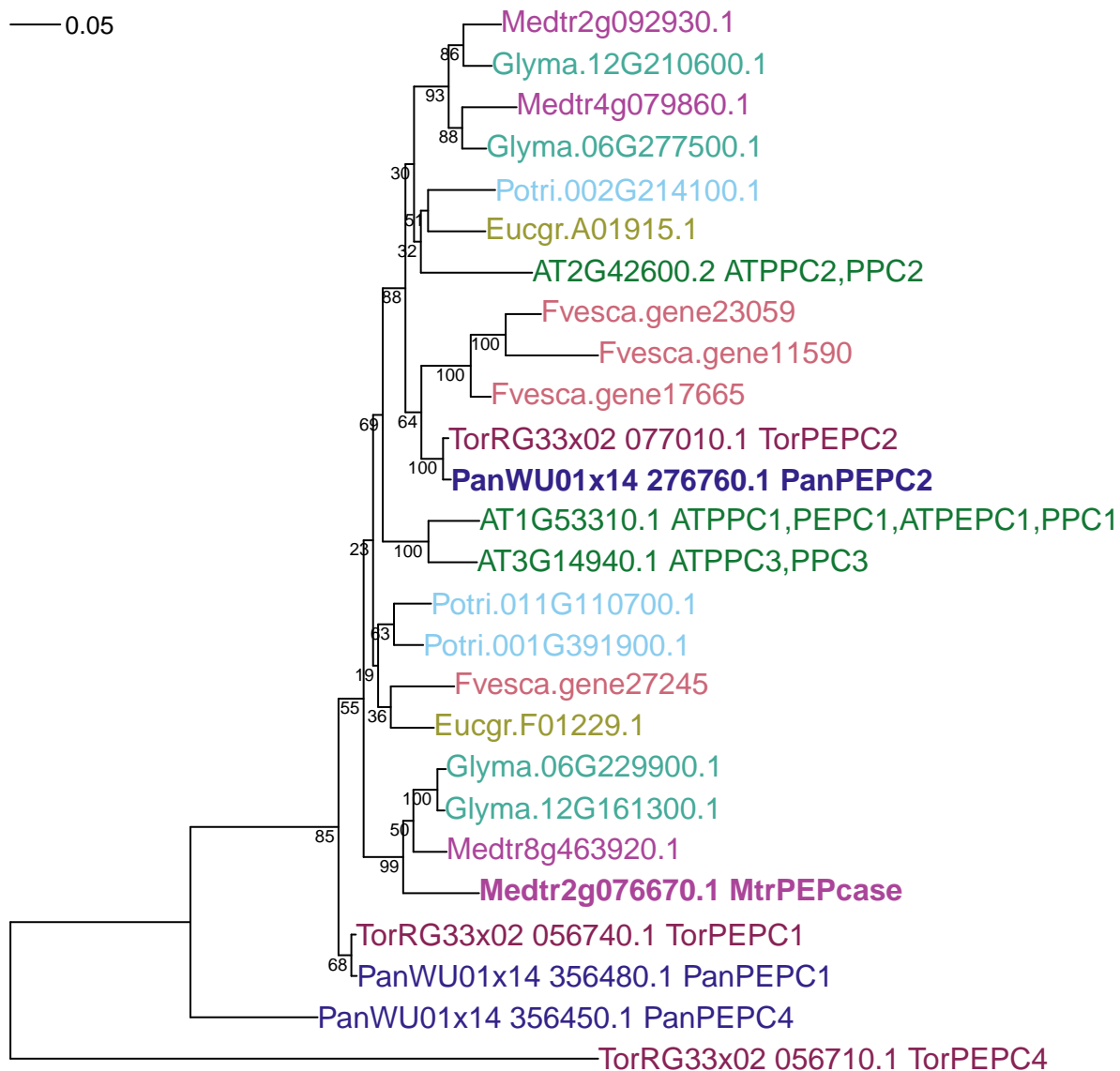
OG0001069: Symbiosis genes. Sulfate transporter

— 0.05



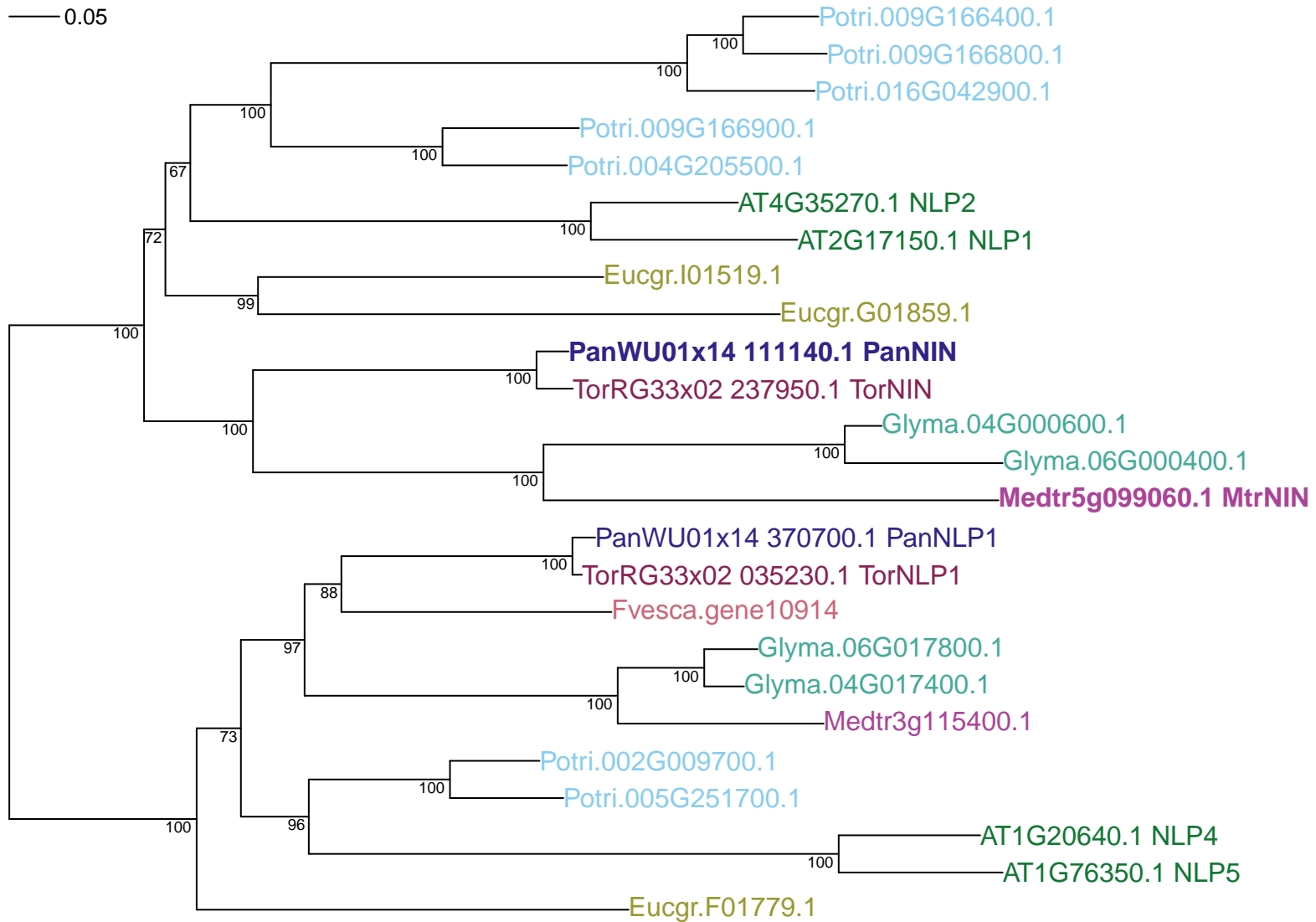
OG0001113: Symbiosis genes. Phosphoenolpyruvate carboxylase

— 0.05

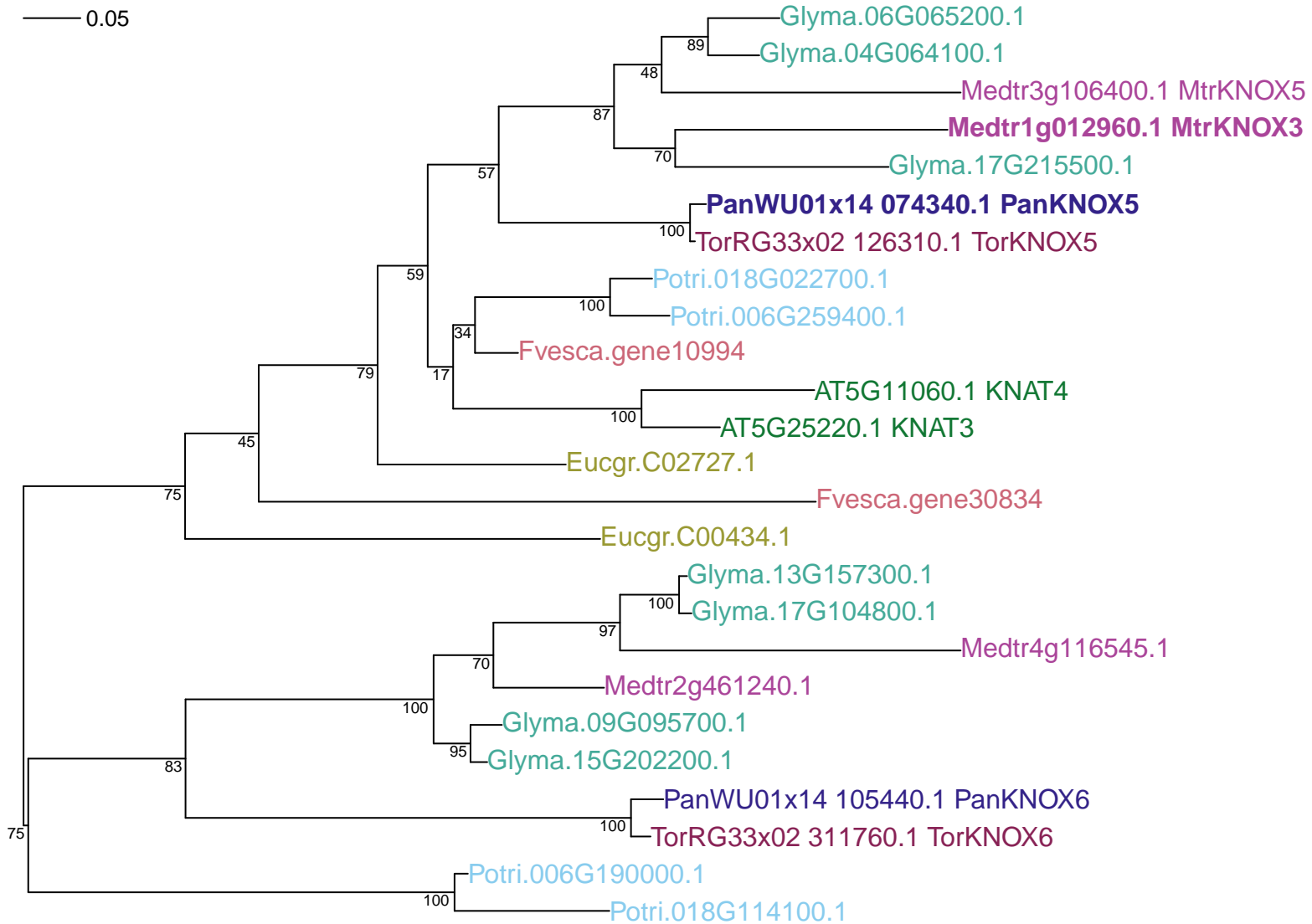


OG0001118: Symbiosis genes. NIN transcription factor

— 0.05

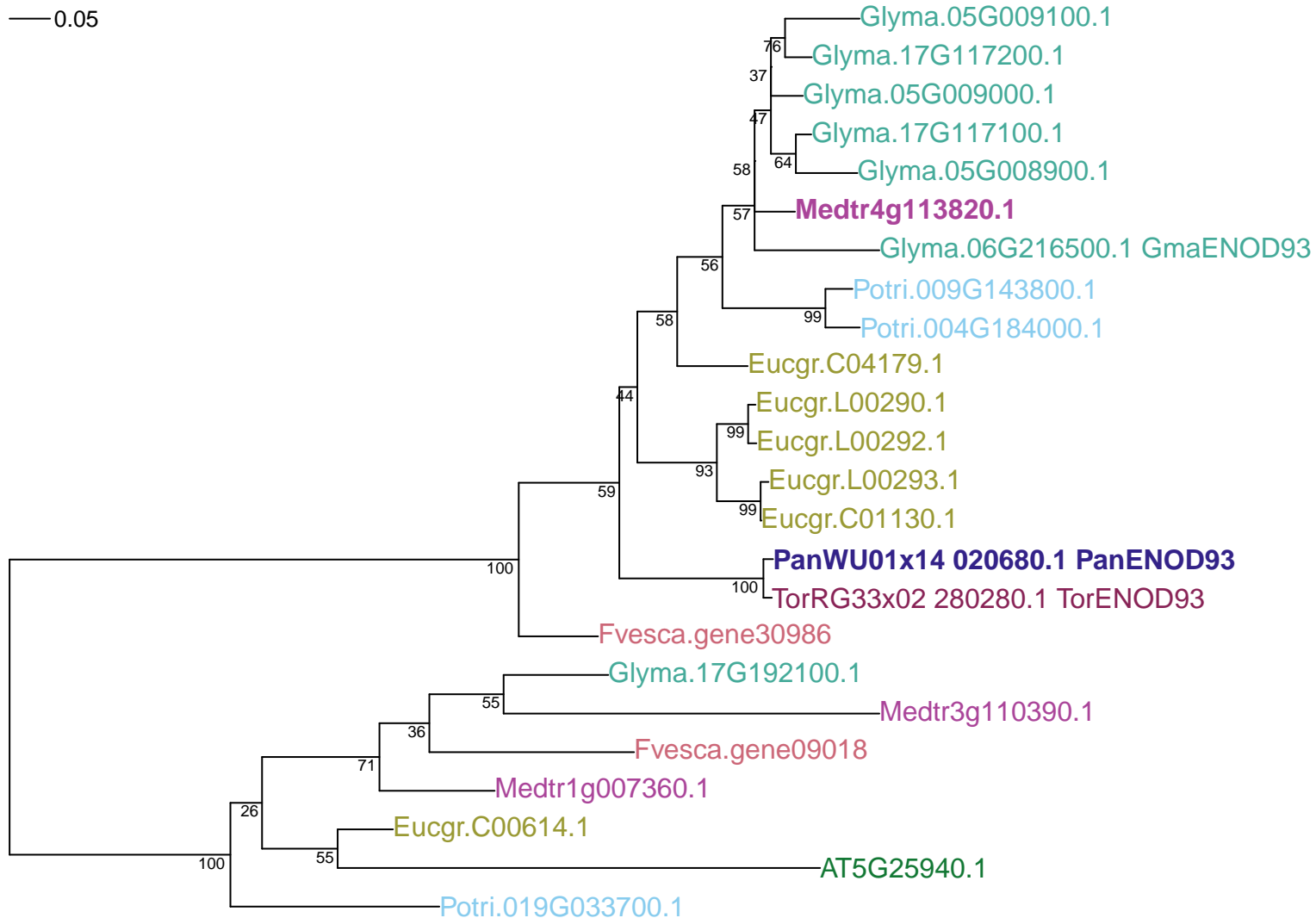


OG0001293: Symbiosis genes. Knotted-like homeobox transcription factor



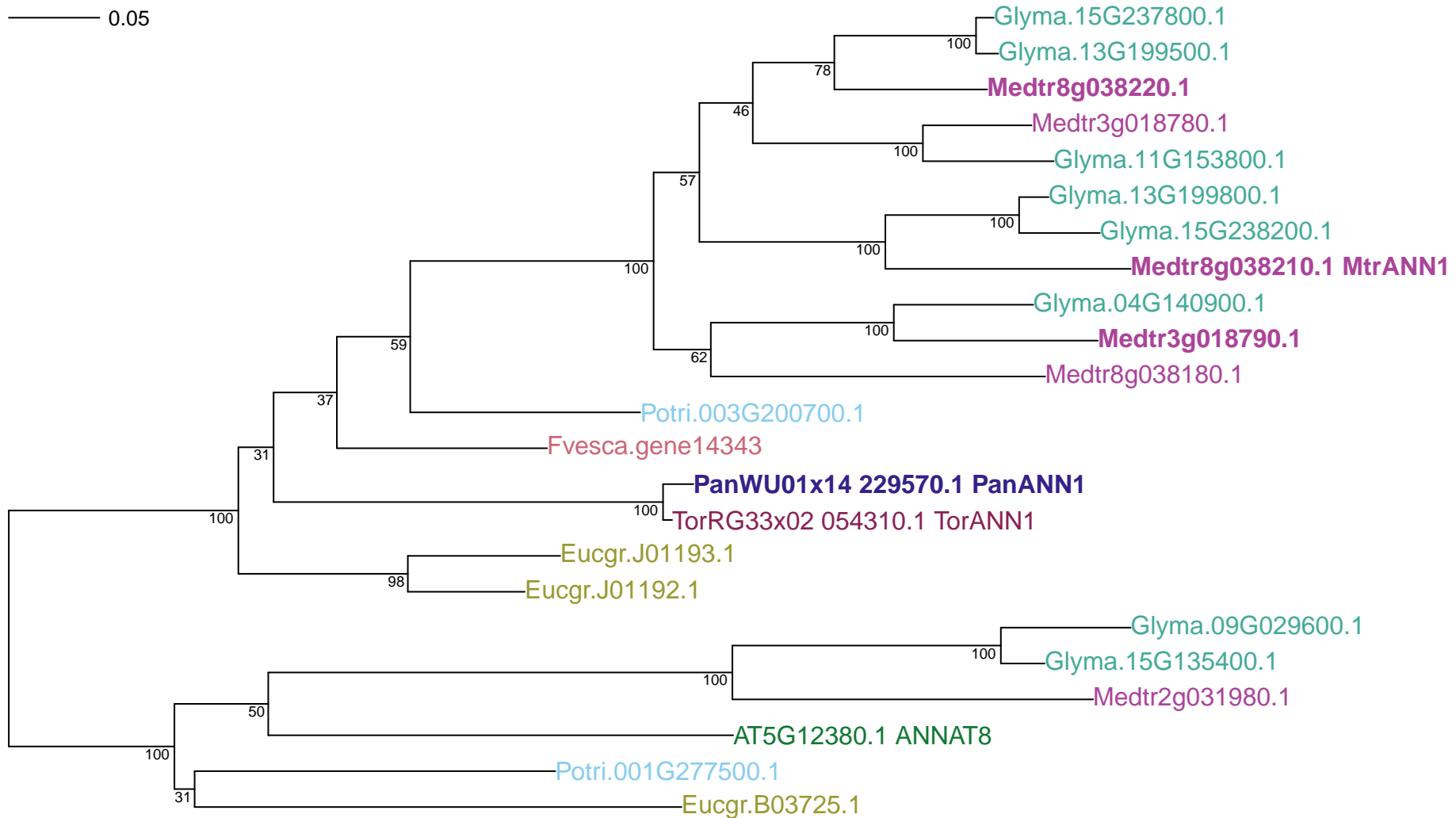
OG0001416: Symbiosis genes. Early nodulin 93 ENOD93 protein

—0.05



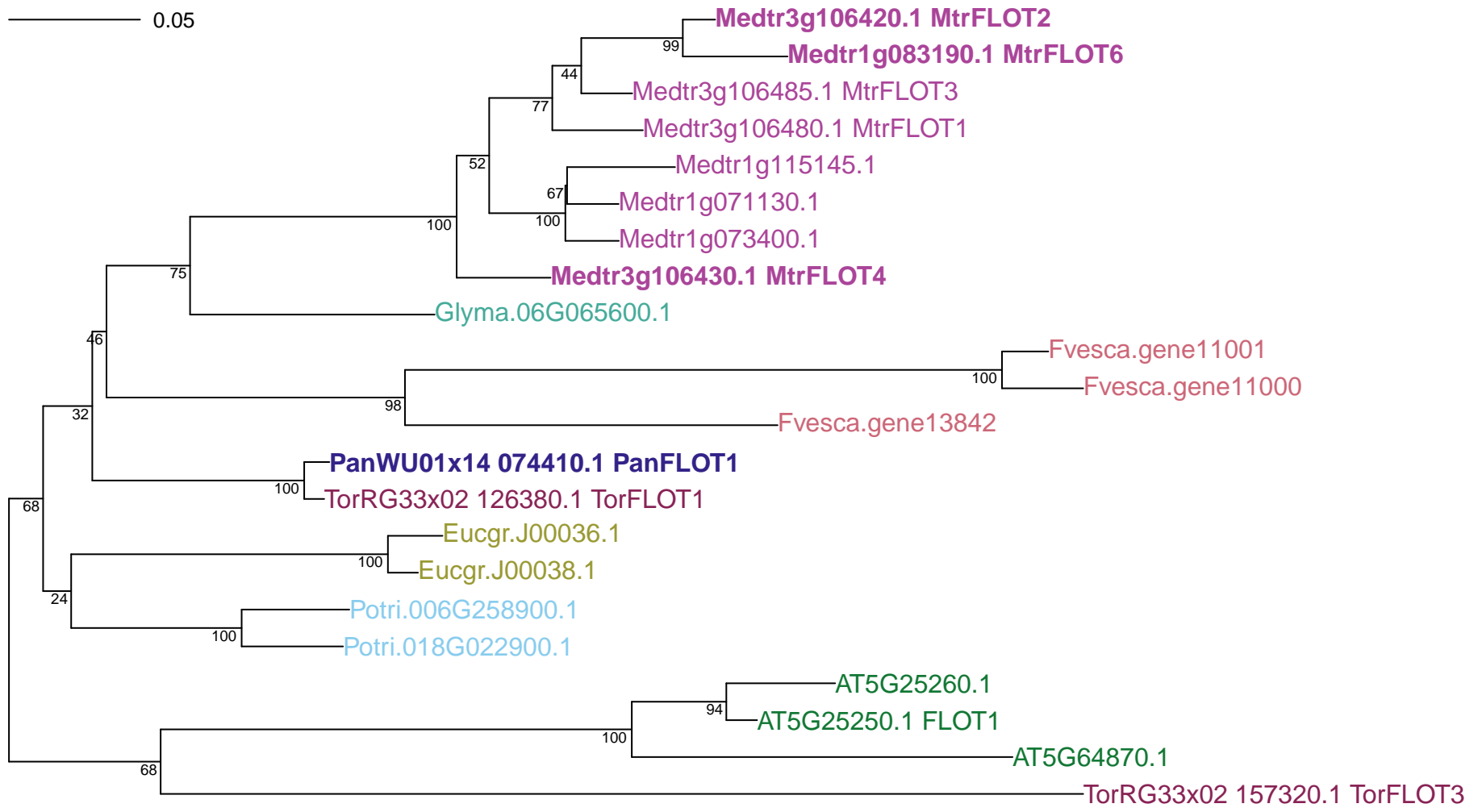
OG0001569: Symbiosis genes. Annexin

0.05



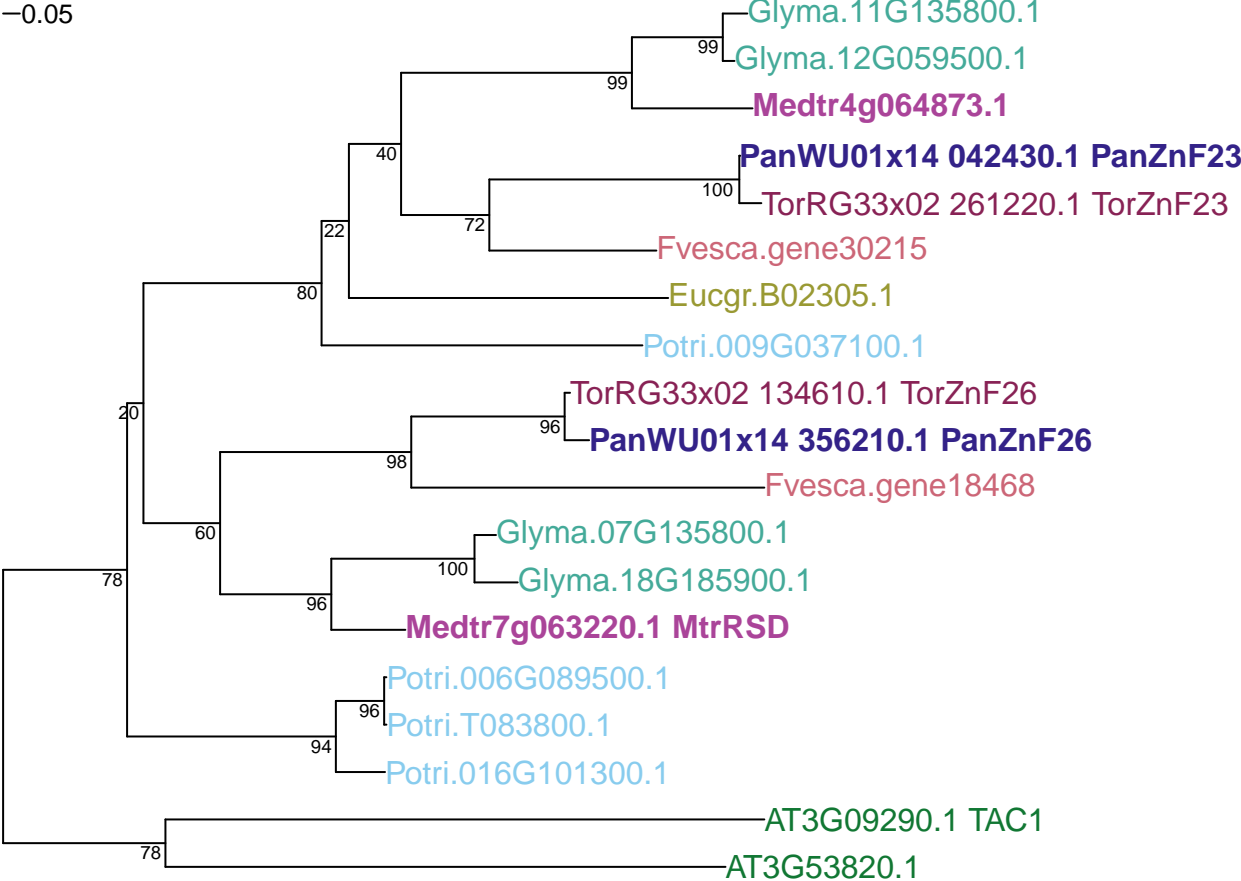
OG0001771: Symbiosis genes. Flotillin

0.05



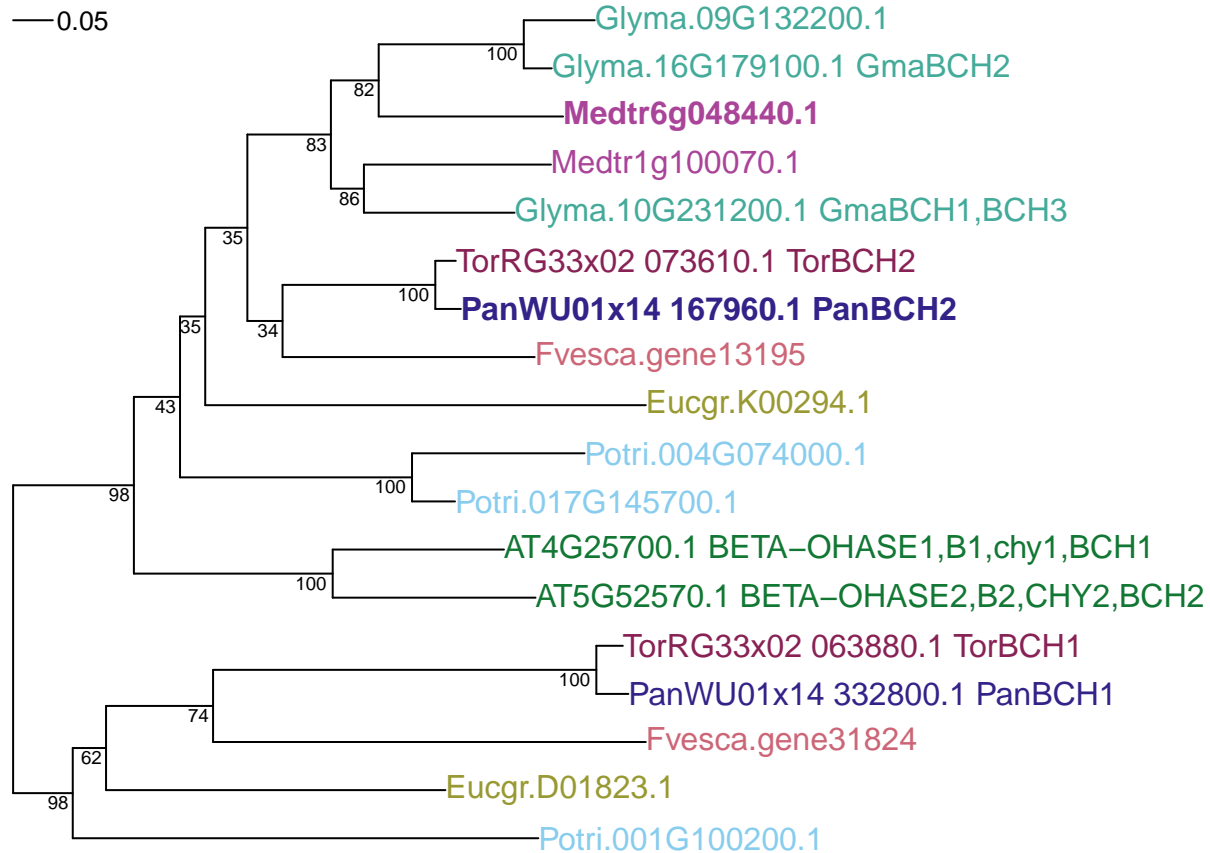
OG0002397: Symbiosis genes. Zinc finger transcription factor

-0.05



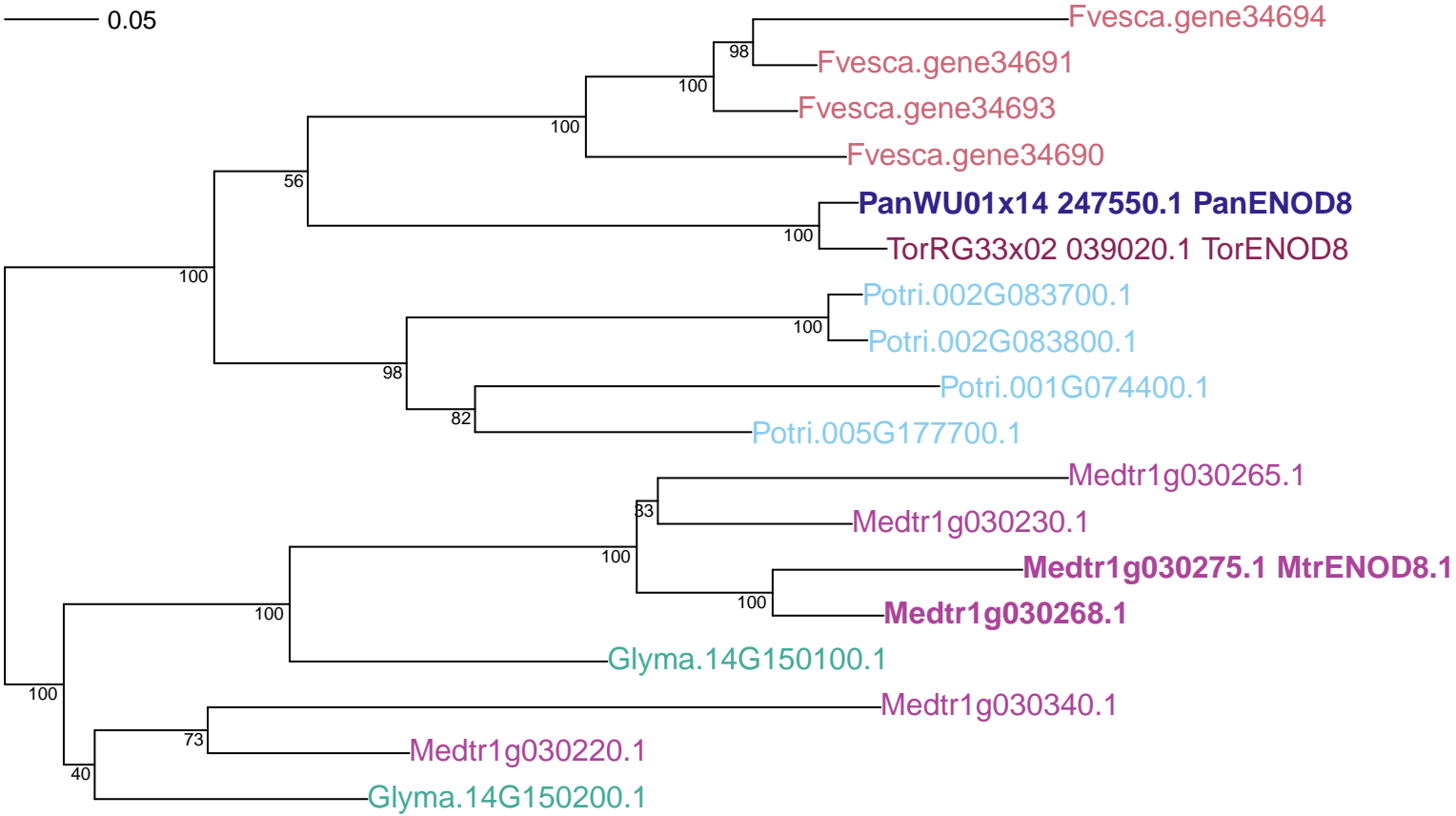
OG0002725: Symbiosis genes. Fatty acid hydroxylase

—0.05

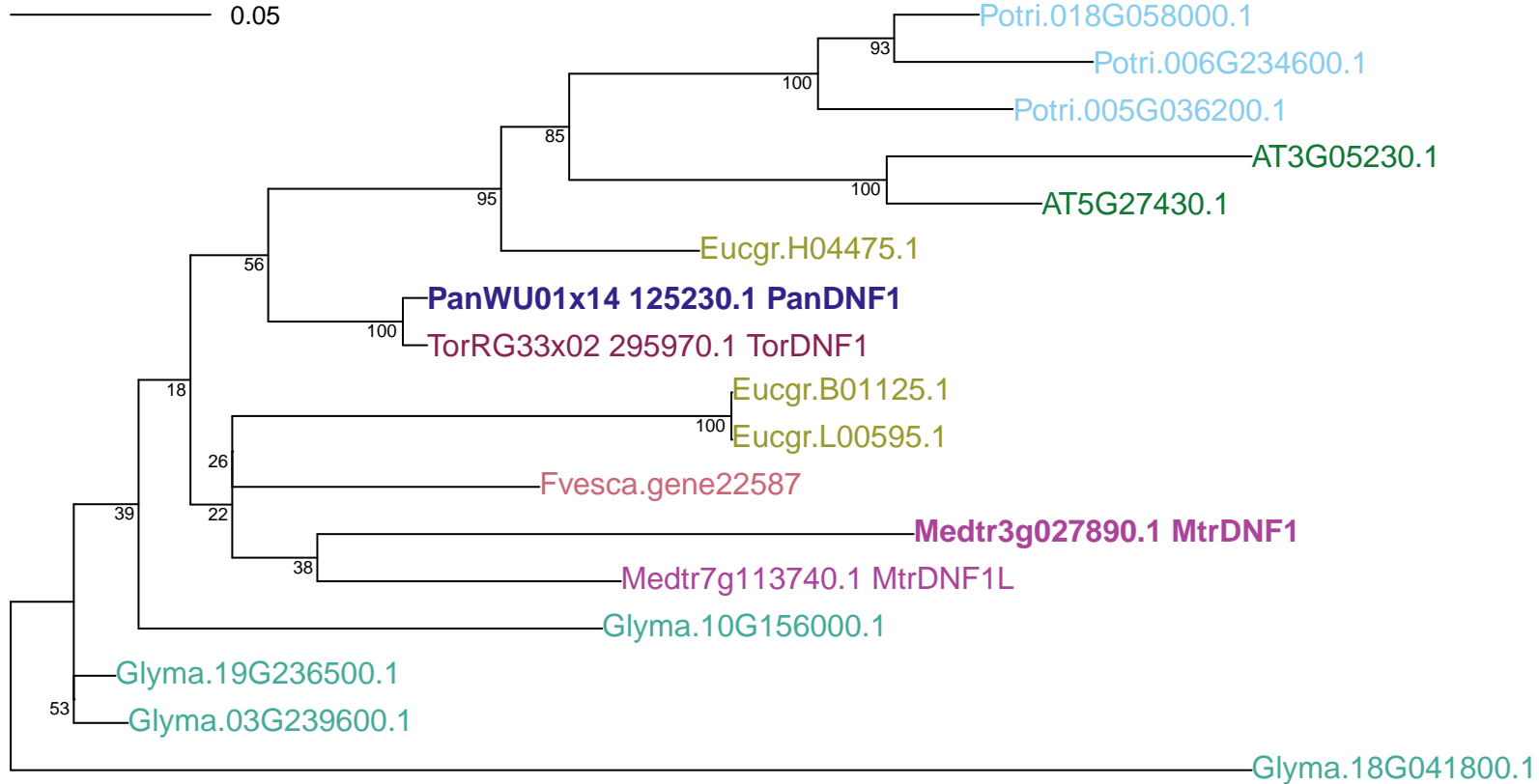


OG0002788: Symbiosis genes. Lipase

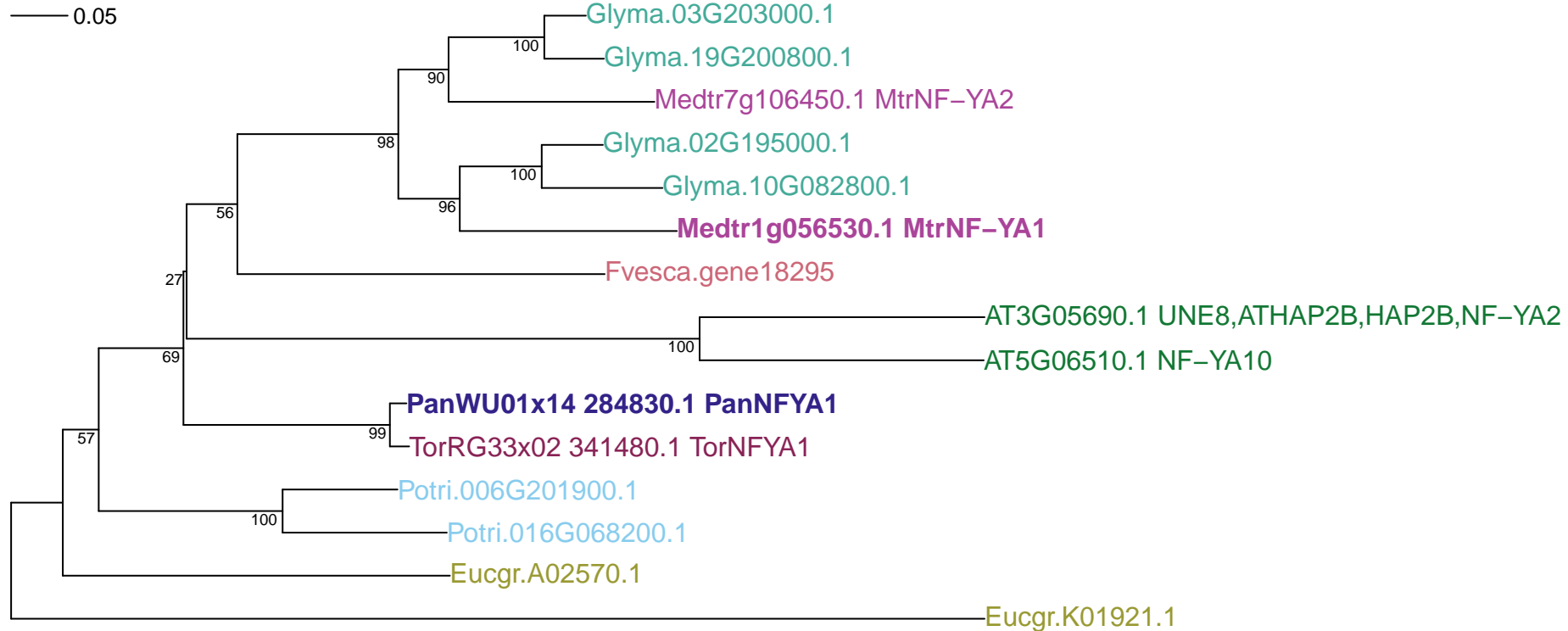
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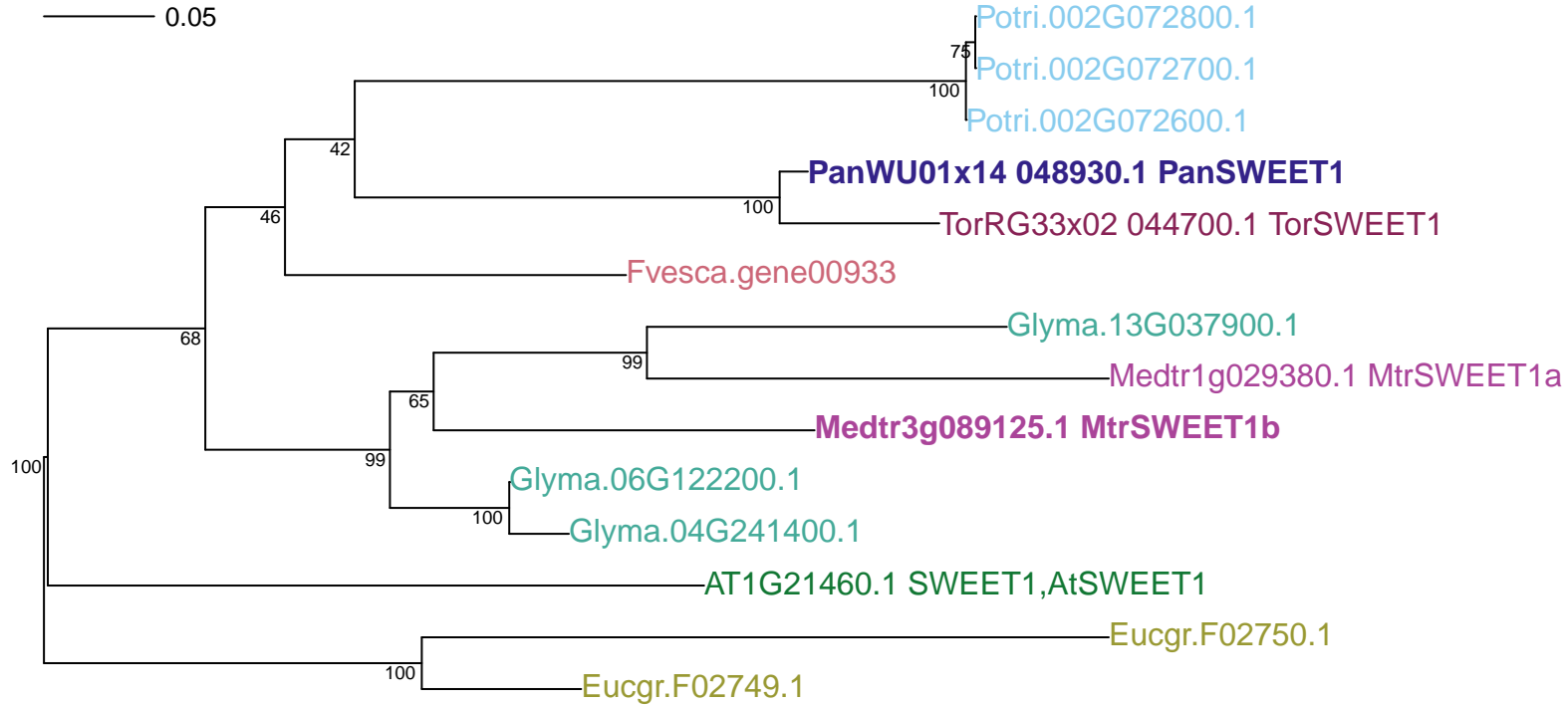
OG0002964: Symbiosis genes. Signal peptidase



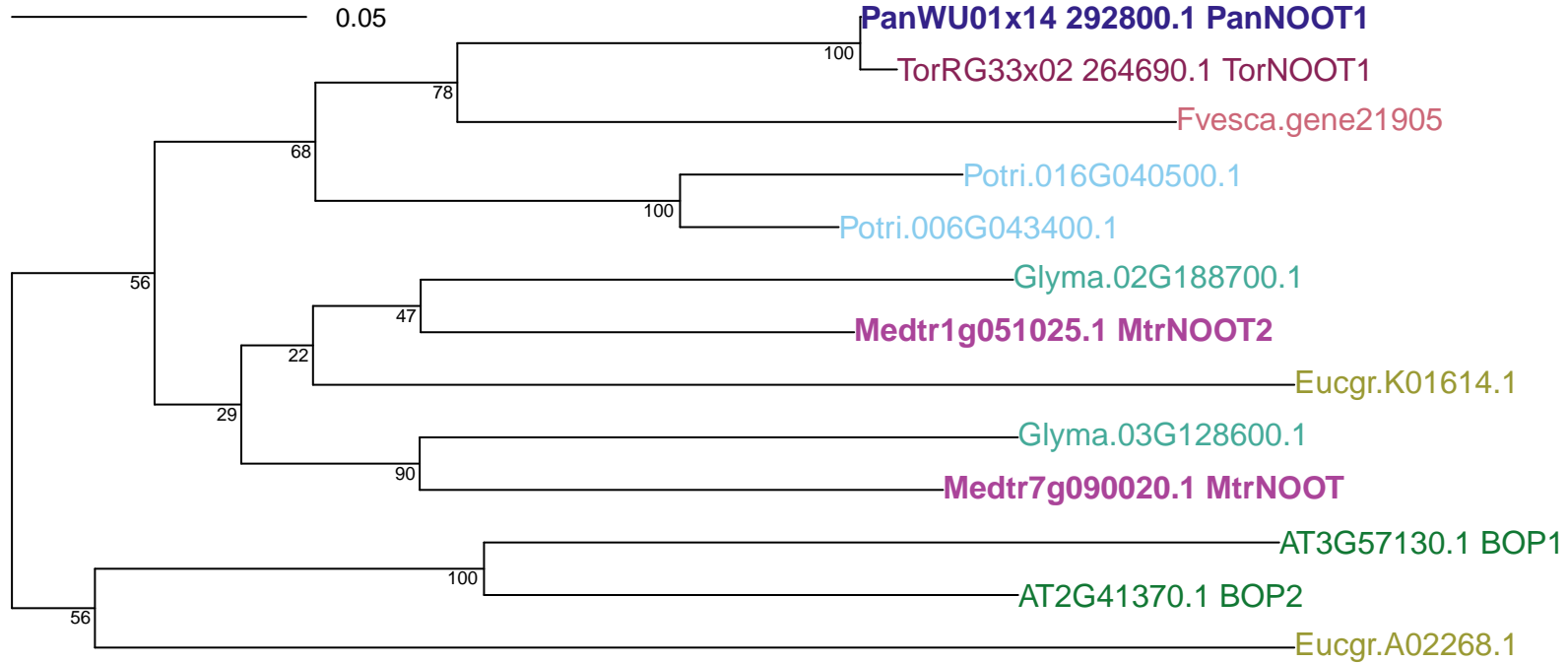
OG0003683: Symbiosis genes. Nuclear transcription factor Y subunit A



OG0003989: Symbiosis genes. SWEET sugar transporter

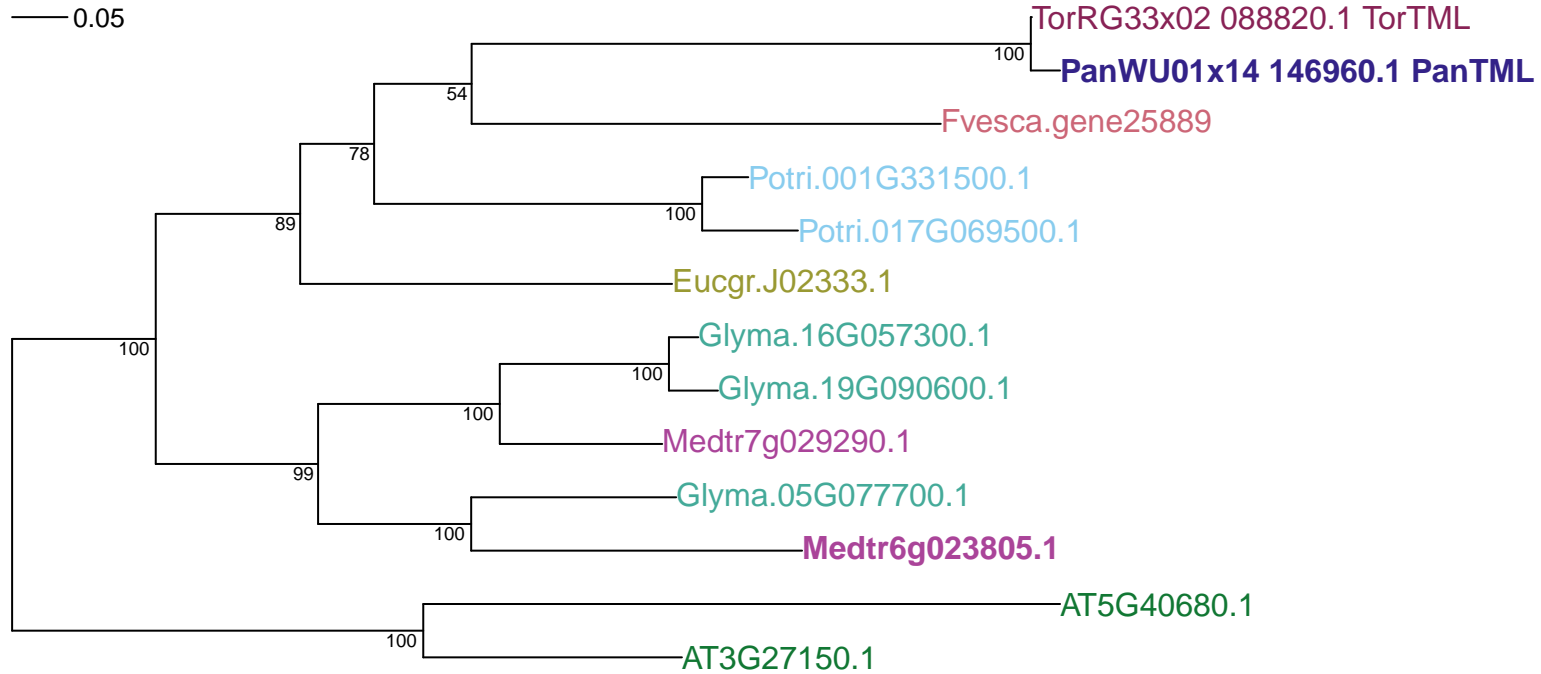


OG0004789: Symbiosis genes. Potassium channel

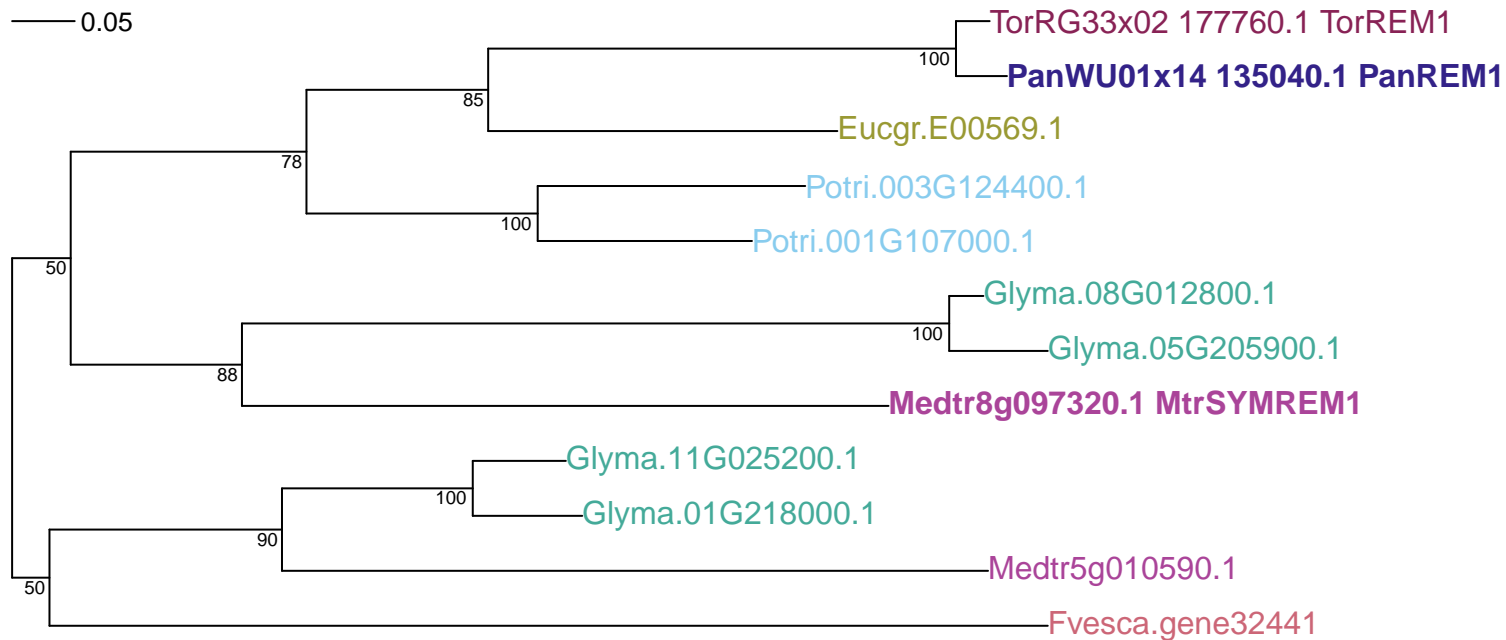


OG0005040: Symbiosis genes. Kelch repeat-containing F-box protein

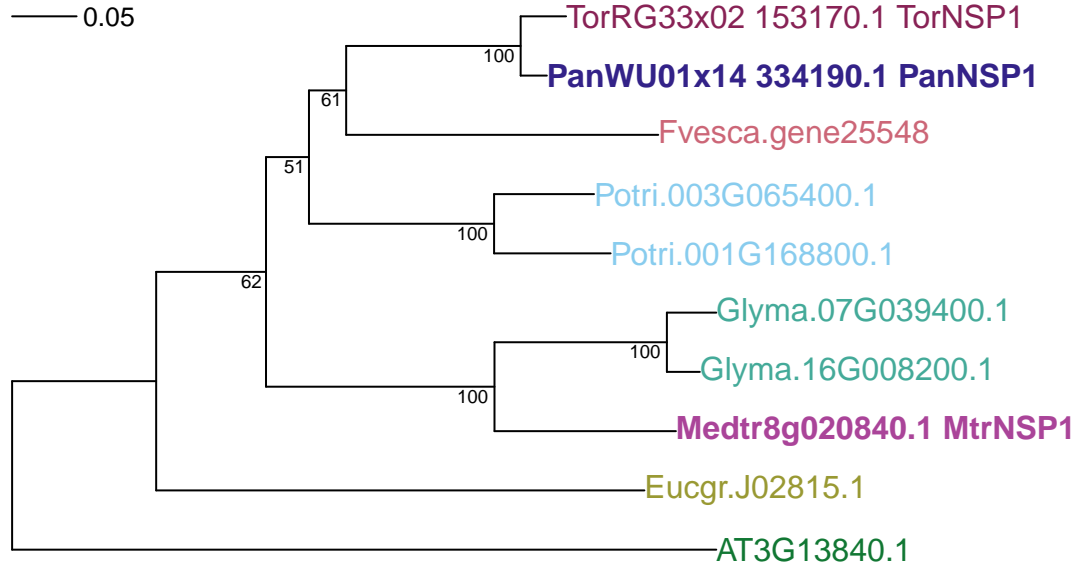
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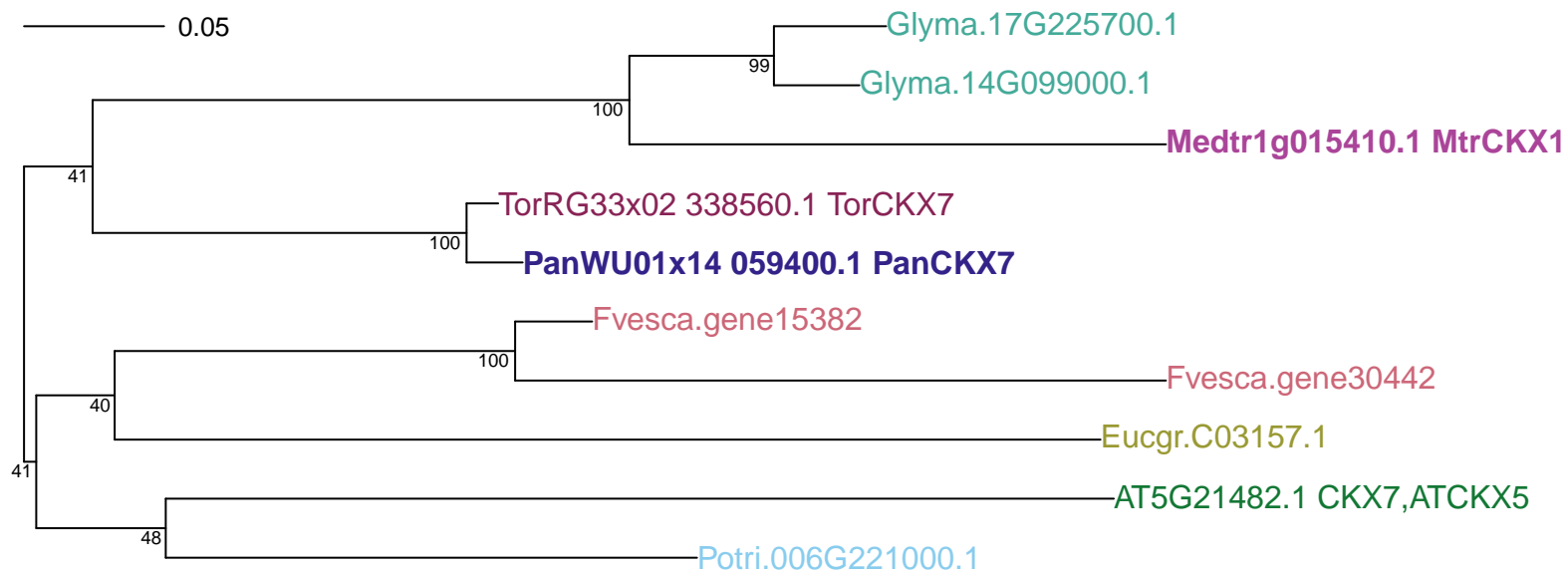
OG0006355: Symbiosis genes. Remorin



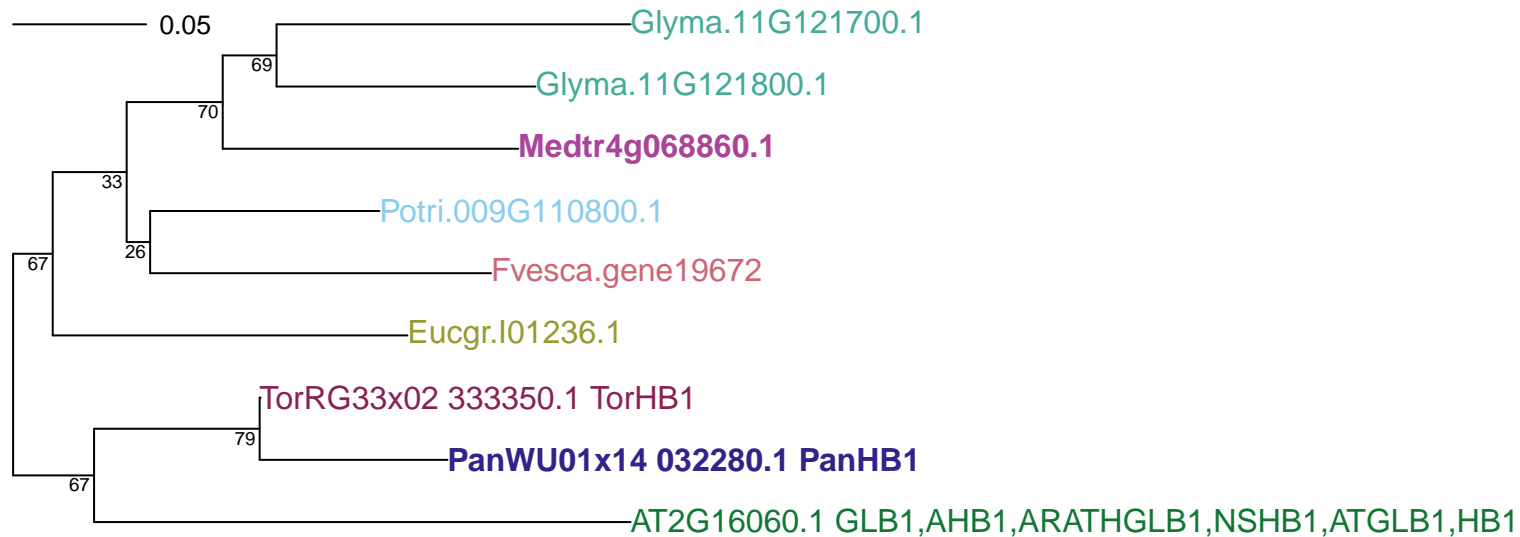
OG0008769: Symbiosis genes. GRAS transcription factor



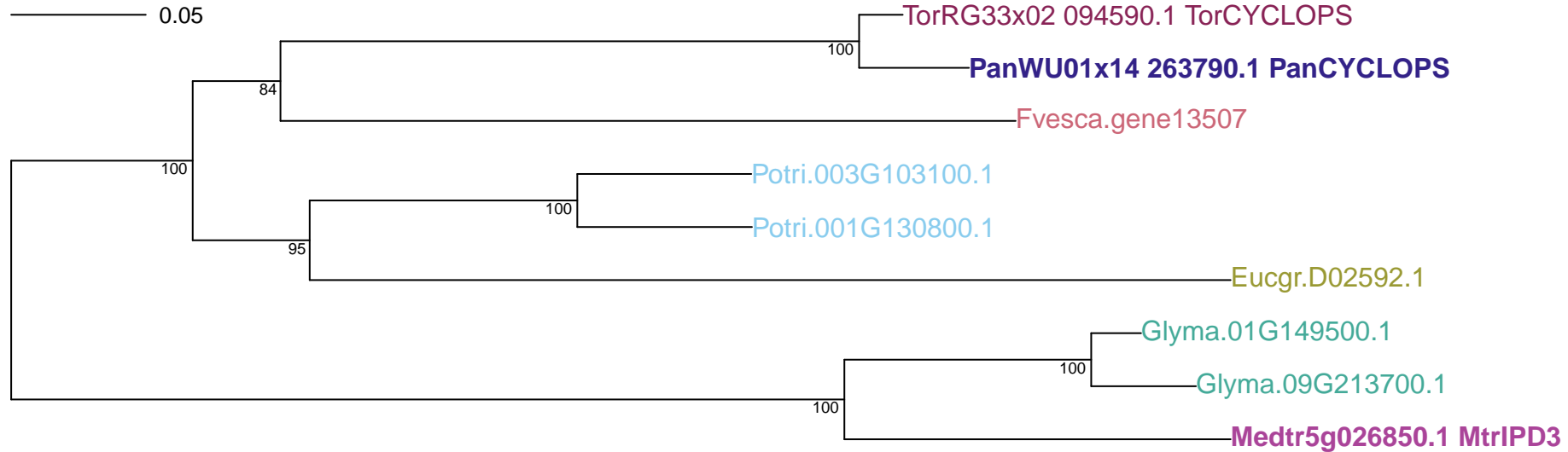
OG0009417: Symbiosis genes. Cytokinin oxidase



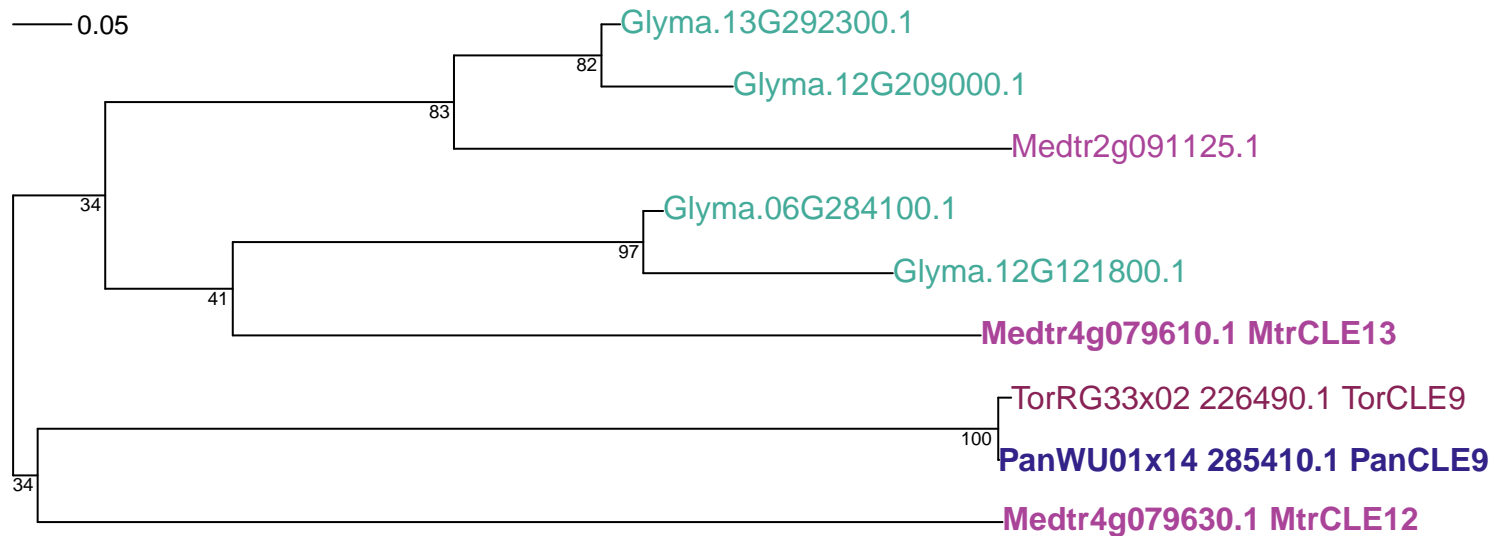
OG0010523: Symbiosis genes. Hemoglobin



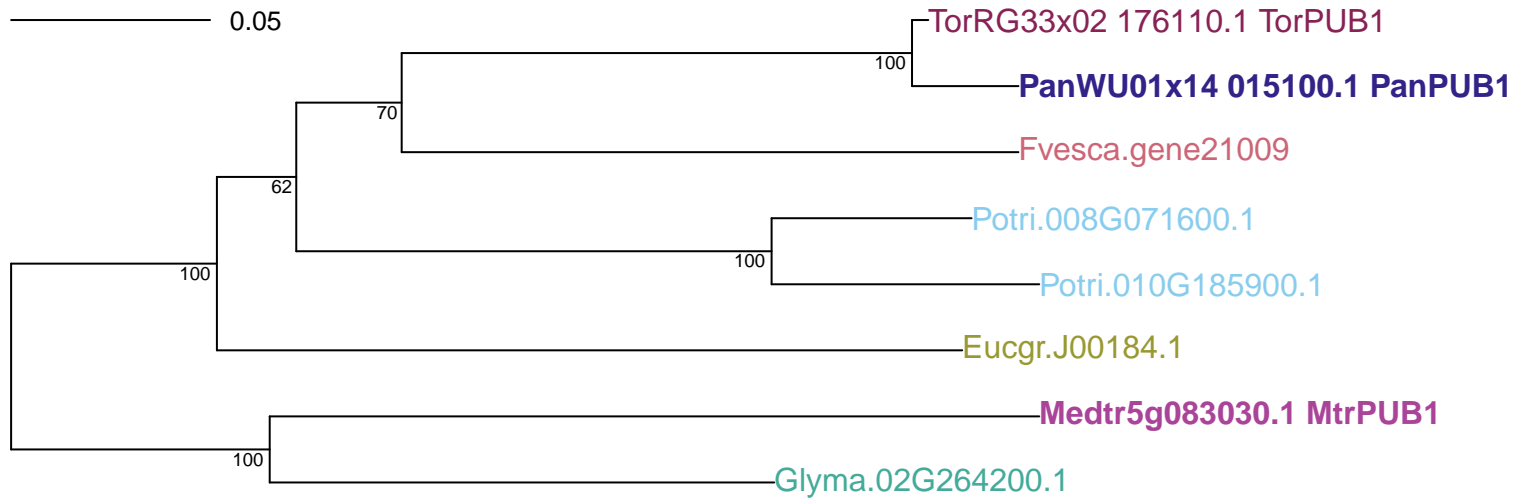
OG0012045: Symbiosis genes. CYCLOPS Transcription factor



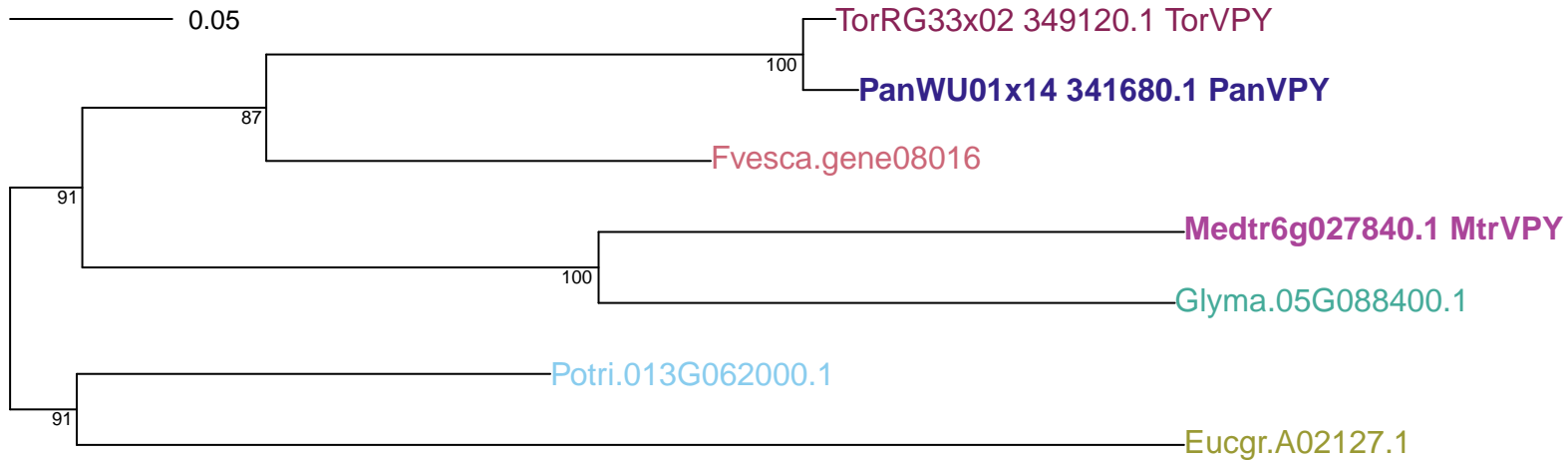
OG0012170: Symbiosis genes. CLAVATA3/ESR (CLE)-related protein



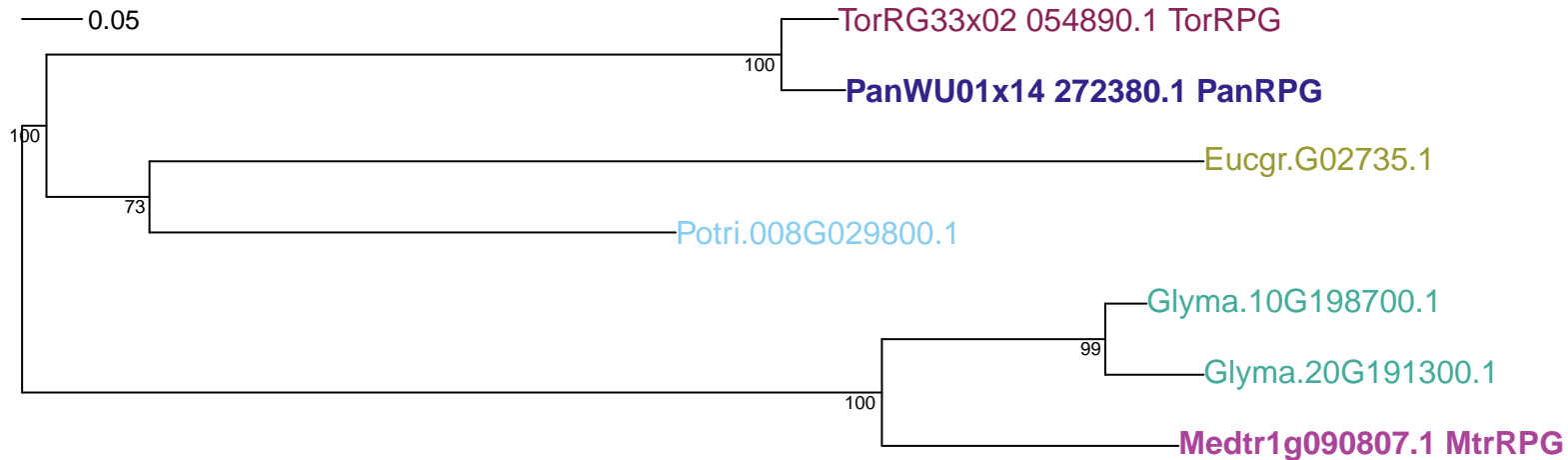
OG0013351: Symbiosis genes. Beta-catenin



OG0013991: Symbiosis genes. Ankyrin repeat containing protein

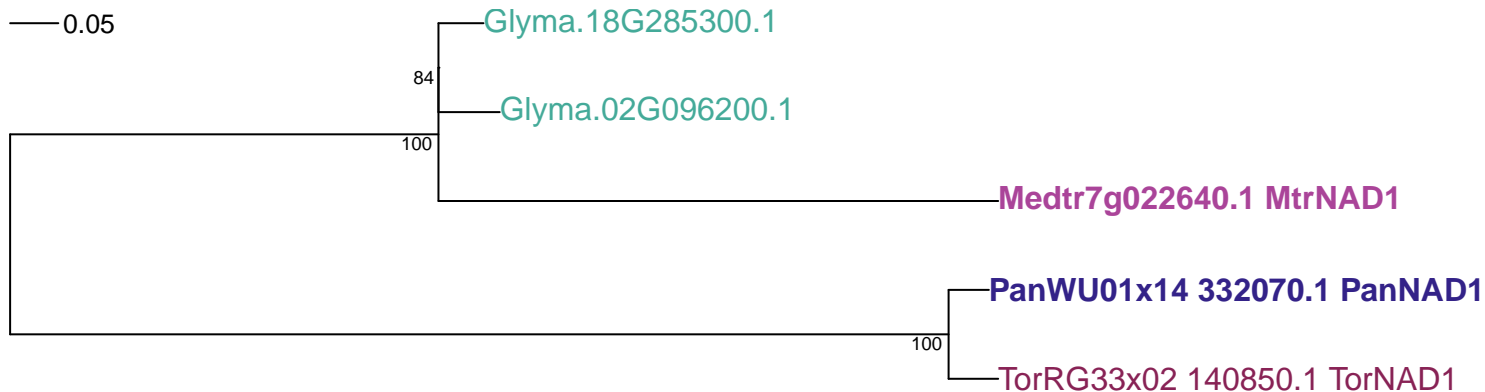


OG0014072: Symbiosis genes. Rhizobium-directed Polar Growth-like protein

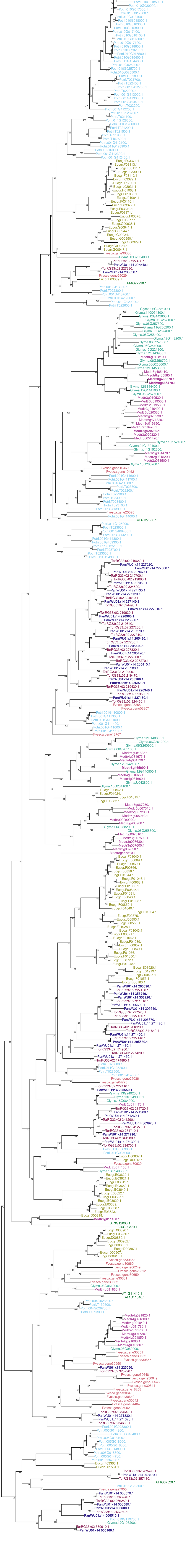


OG0015095: Symbiosis genes. None

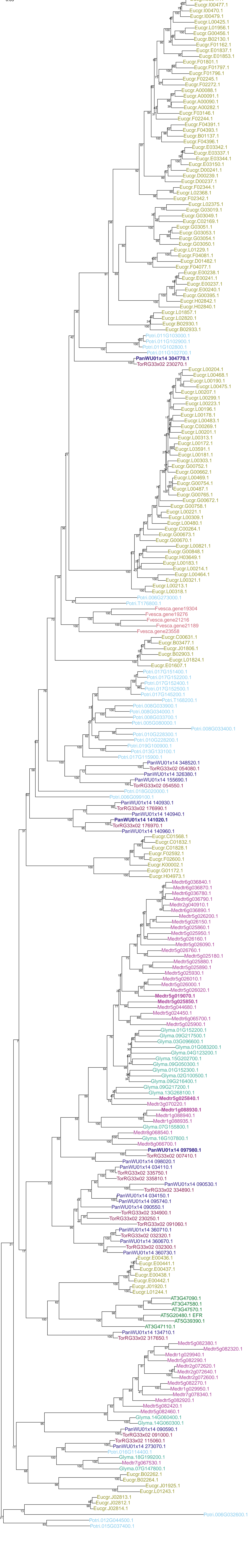
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OG000002: Signaling_S-receptor-like serine/threonine-protein kinase

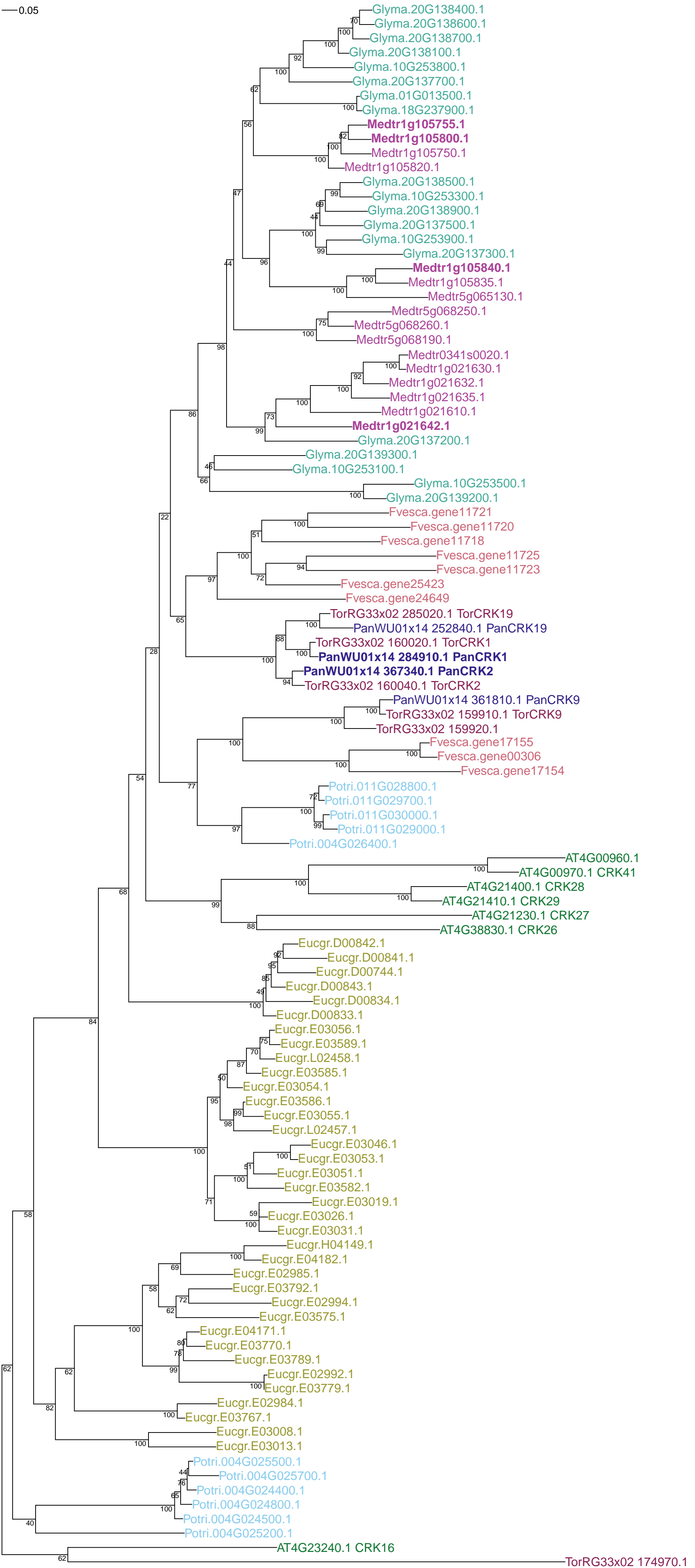


OG000014: Signaling. Serine/threonine protein kinase

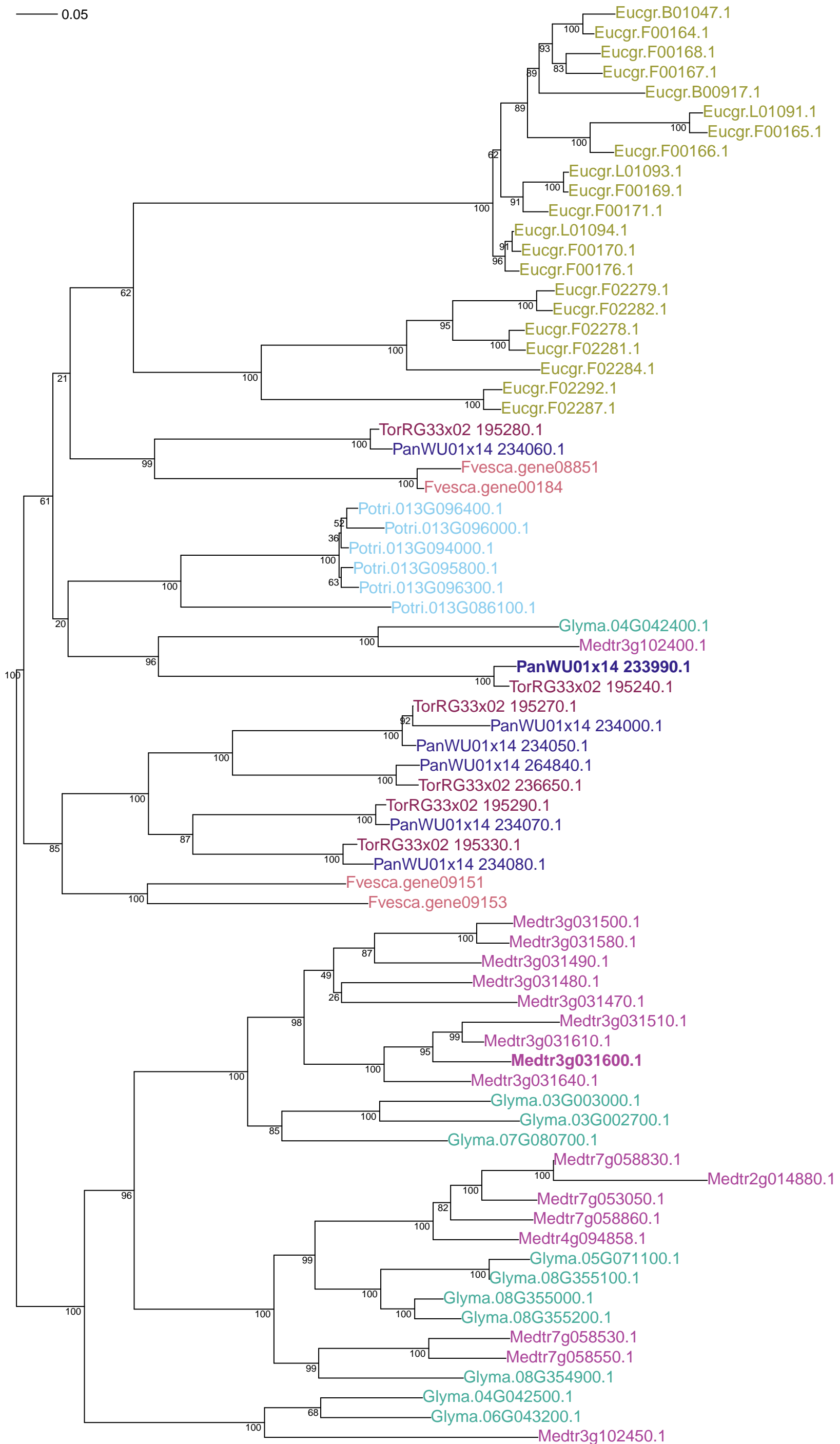


OG0000086: Signaling. Cysteine rich receptor like kinase

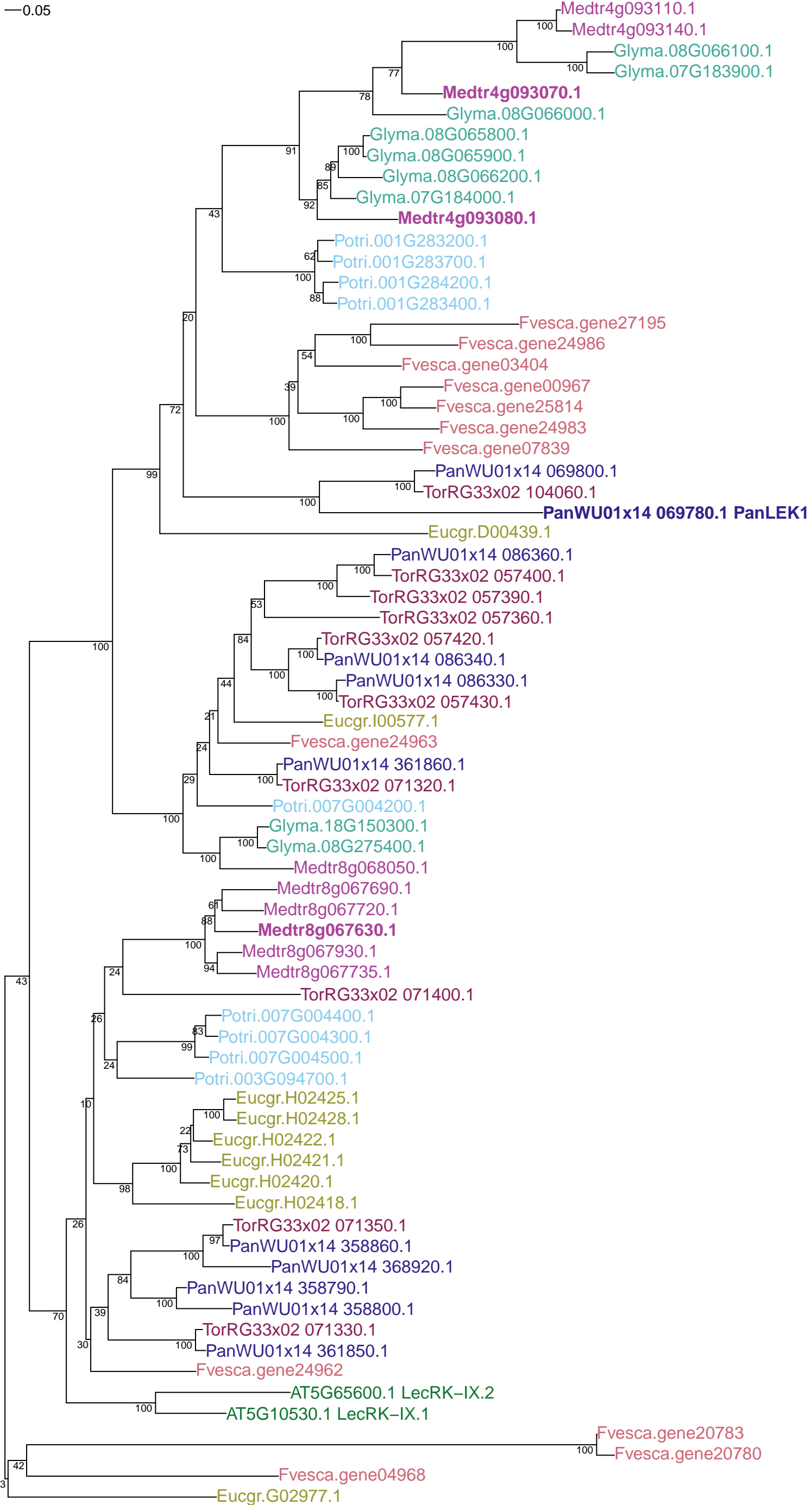
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OG0000169: Signaling. S-receptor-like serine/threonine-protein kinase

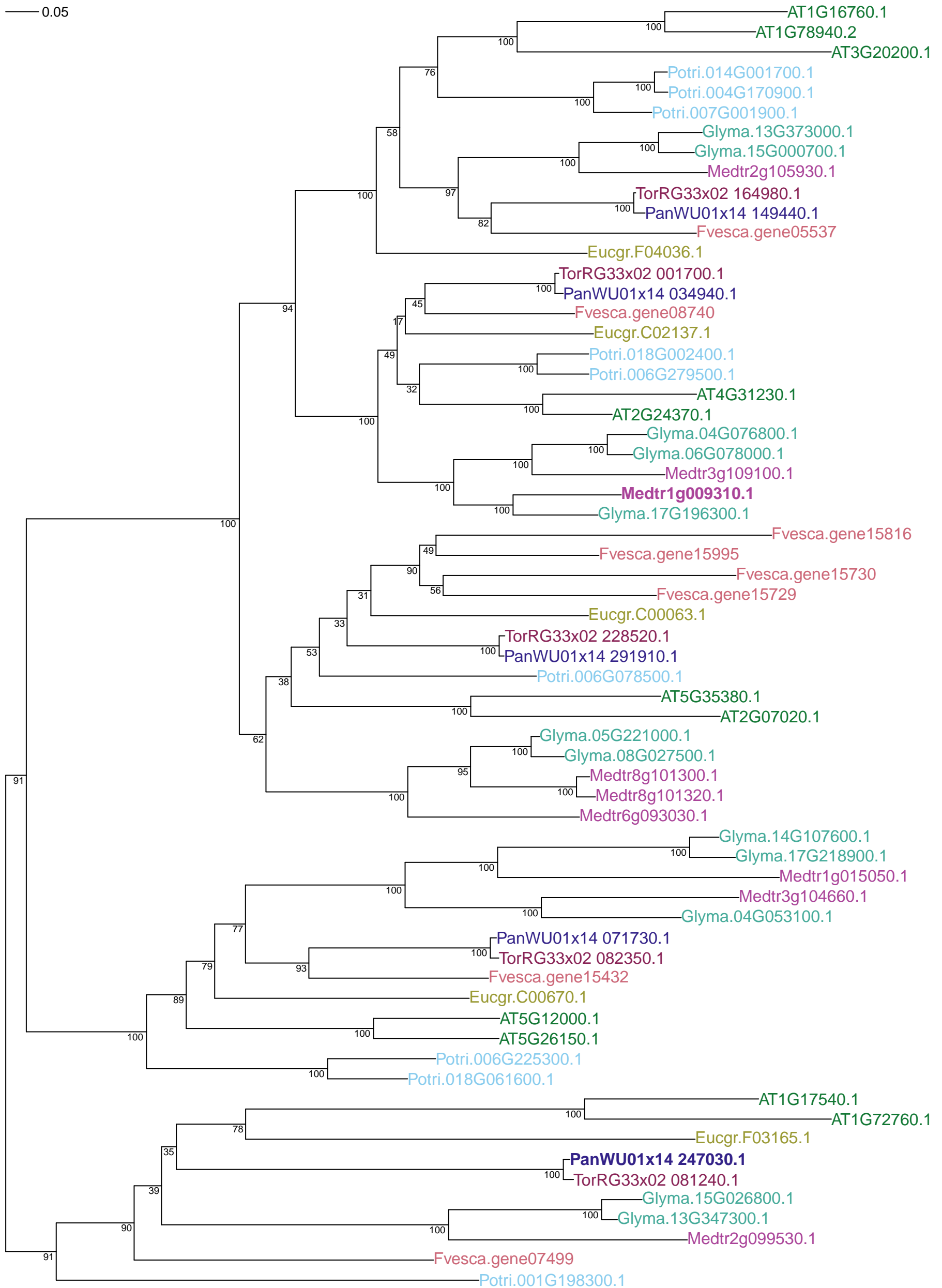


OG0000174: Signaling. Serine/threonine protein kinase



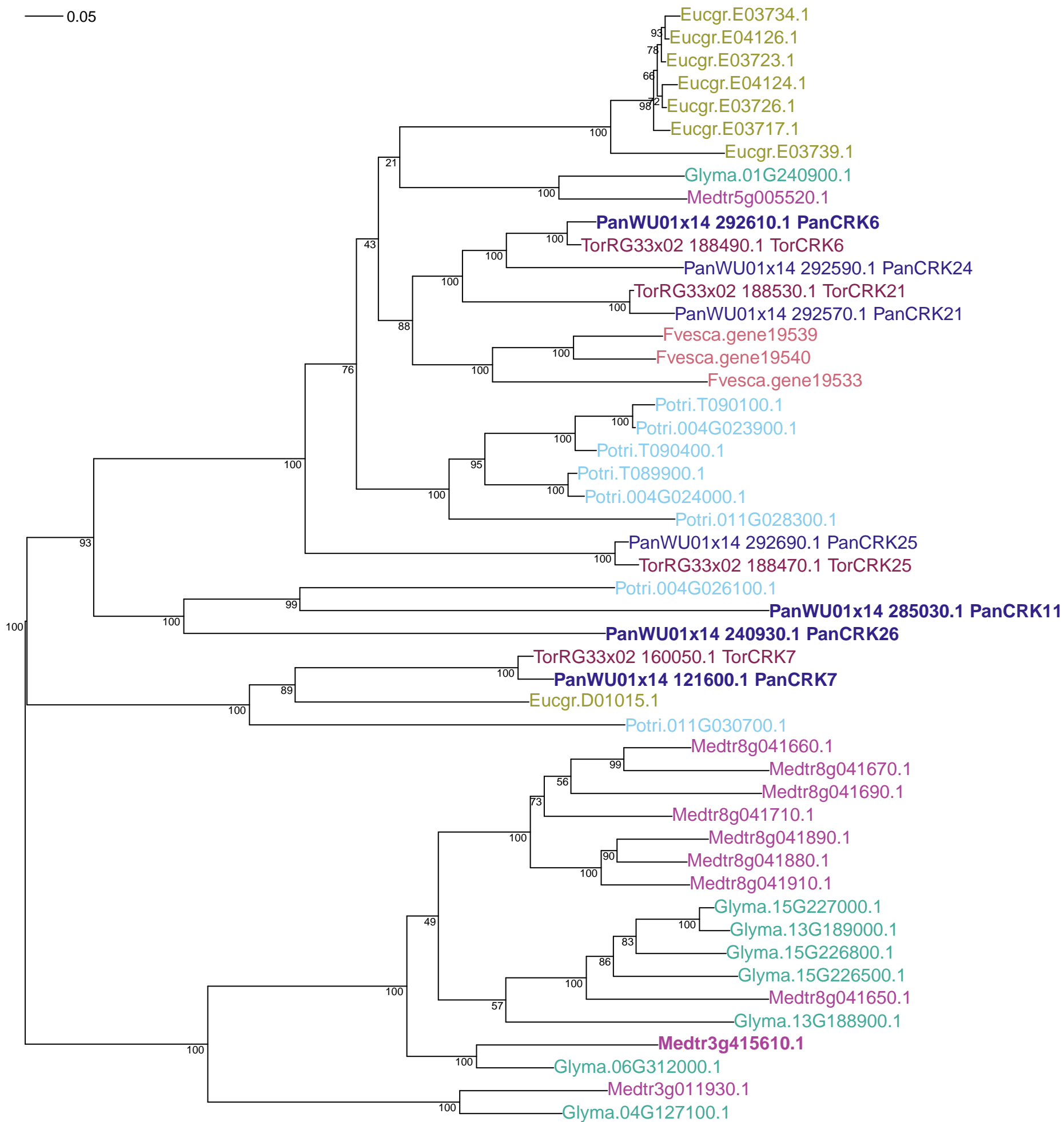
OG0000213: Signaling. Phosphorylase kinase, gamma catalytic subunit

— 0.05



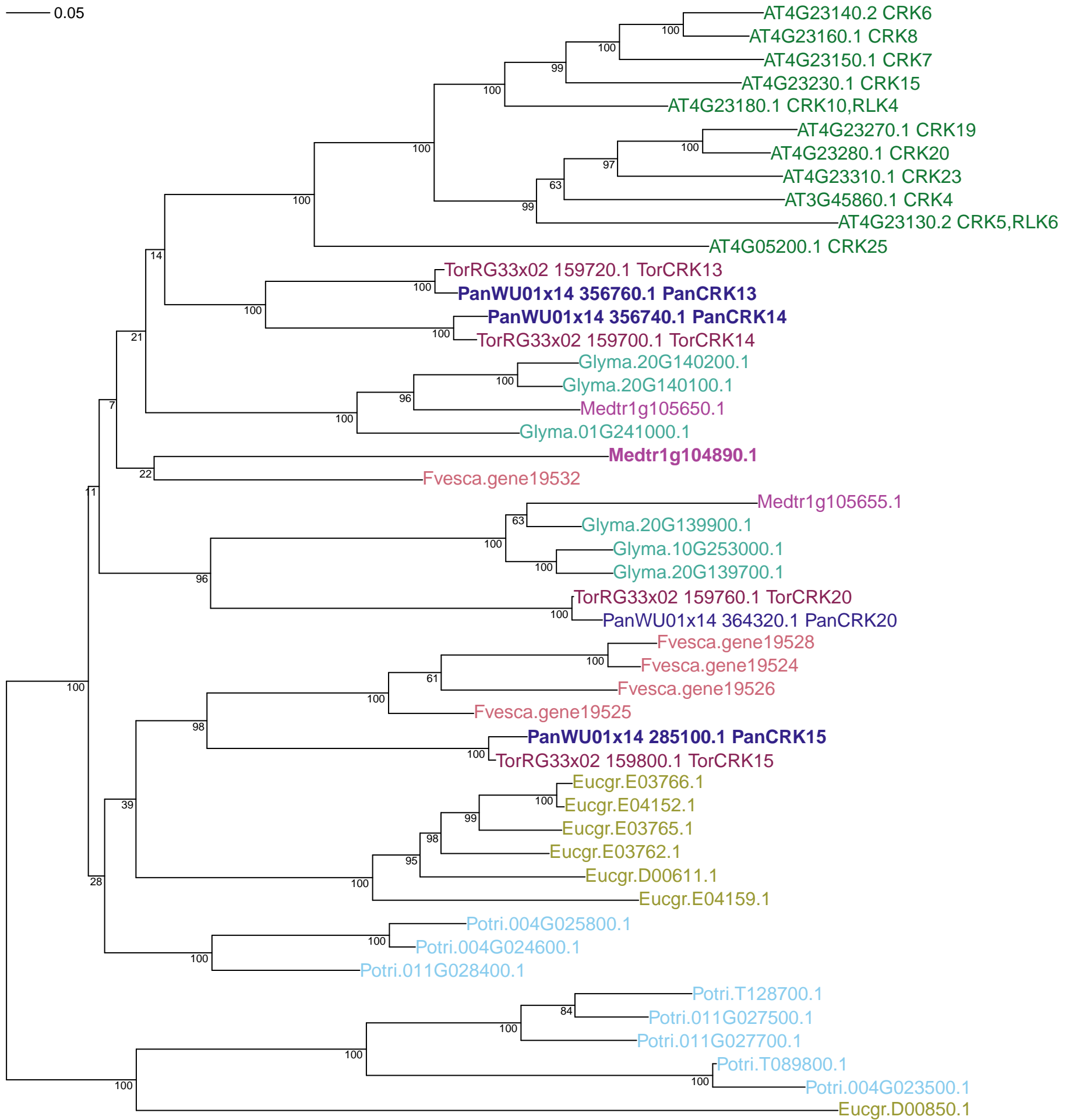
OG0000341: Signaling. Cysteine rich receptor like kinase

— 0.05

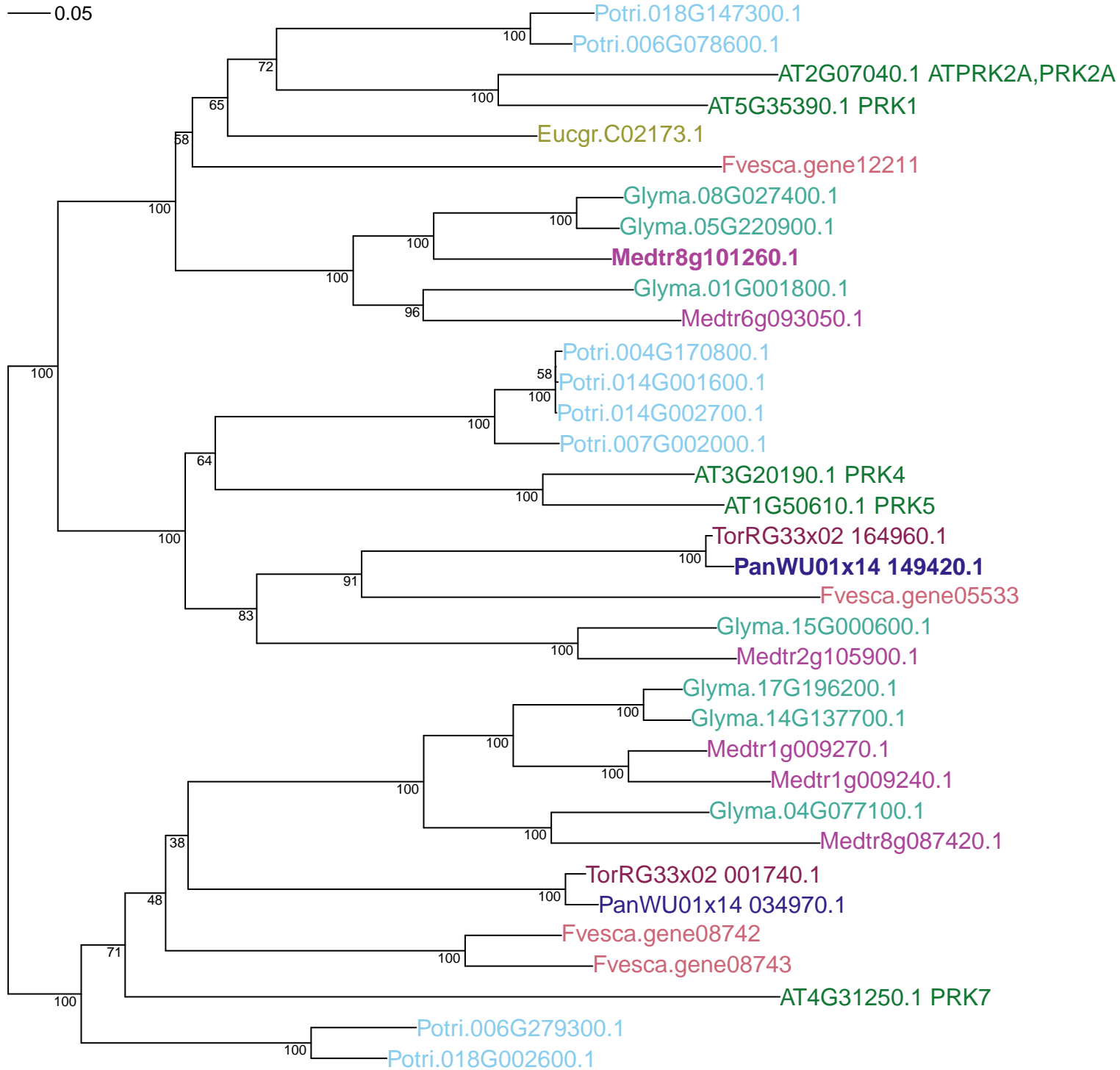


OG0000348: Signaling. Cysteine rich receptor like kinase

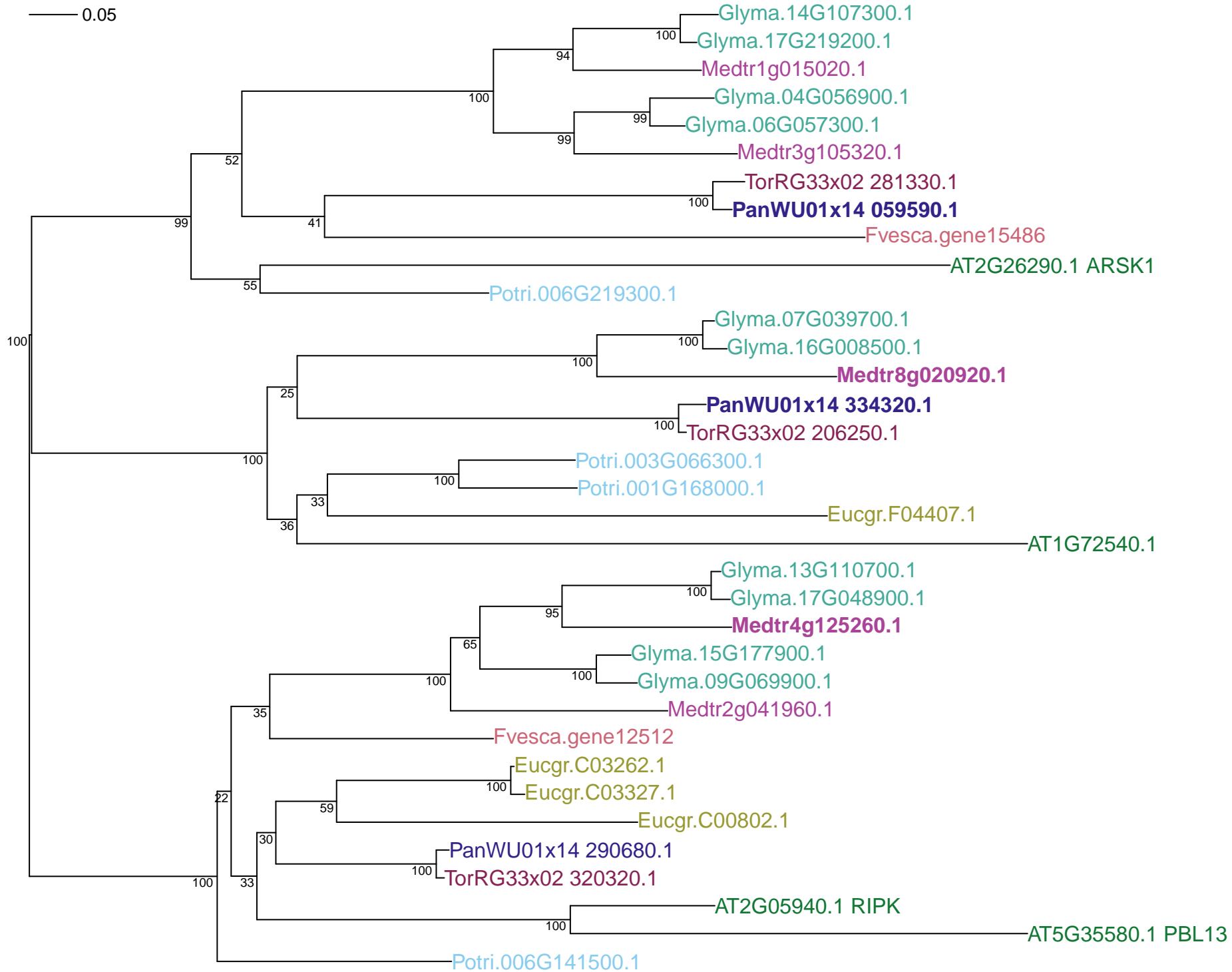
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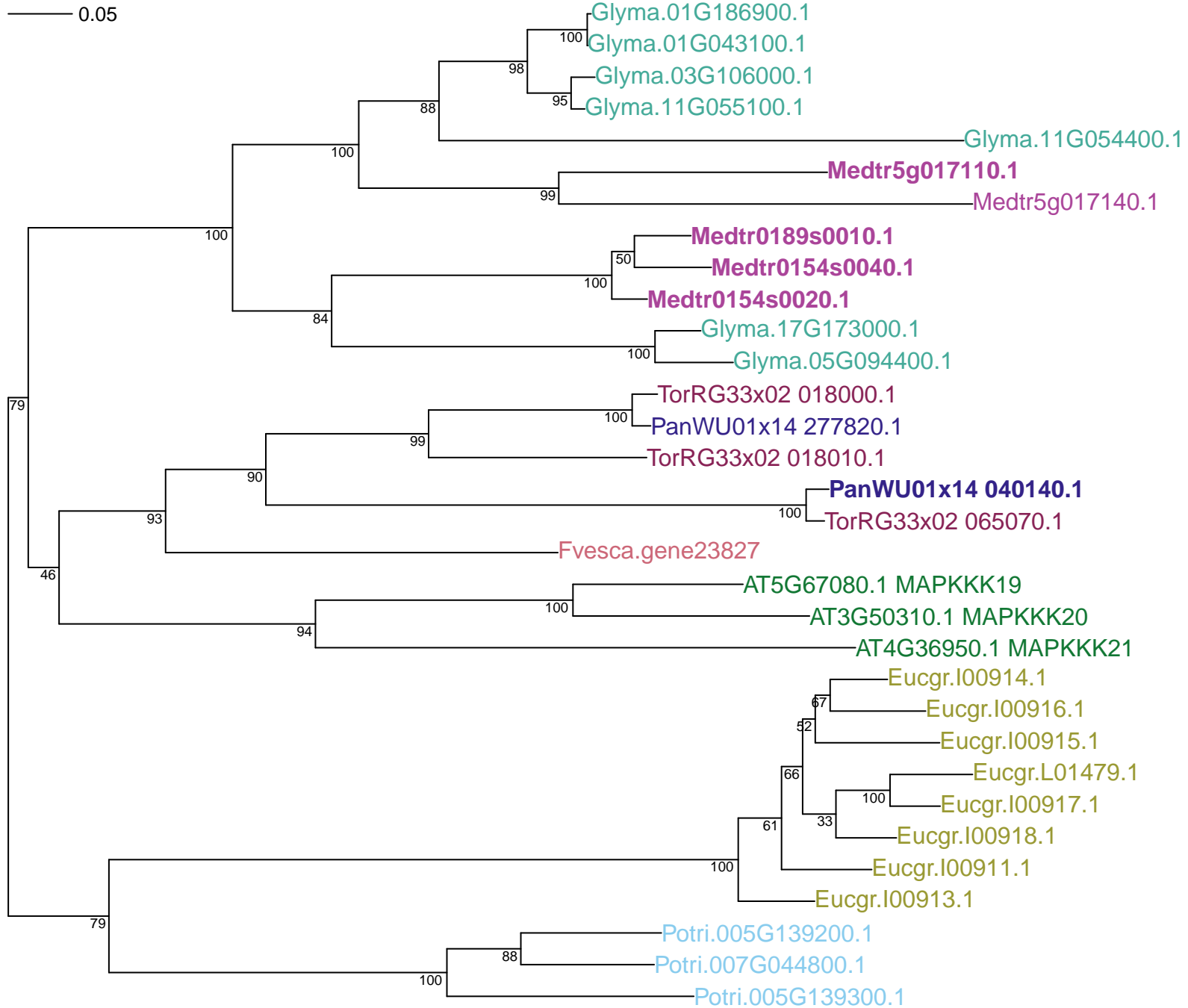
OG0000604: Signaling. Tyrosine-protein kinase



OG0000612: Signaling. Mitogen-activated protein kinase kinase kinase

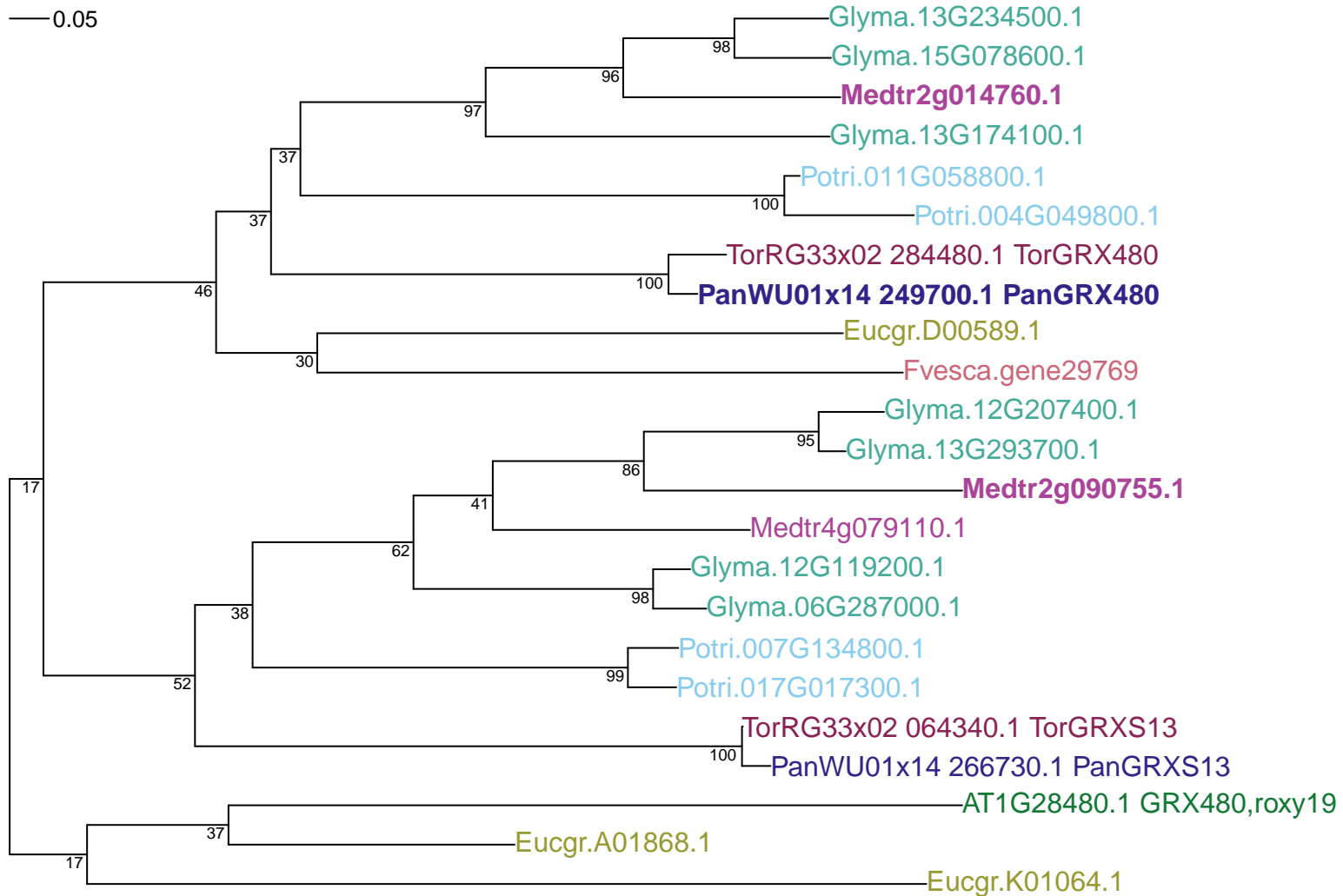


OG0000735: Signaling. Serine/threonine protein kinase



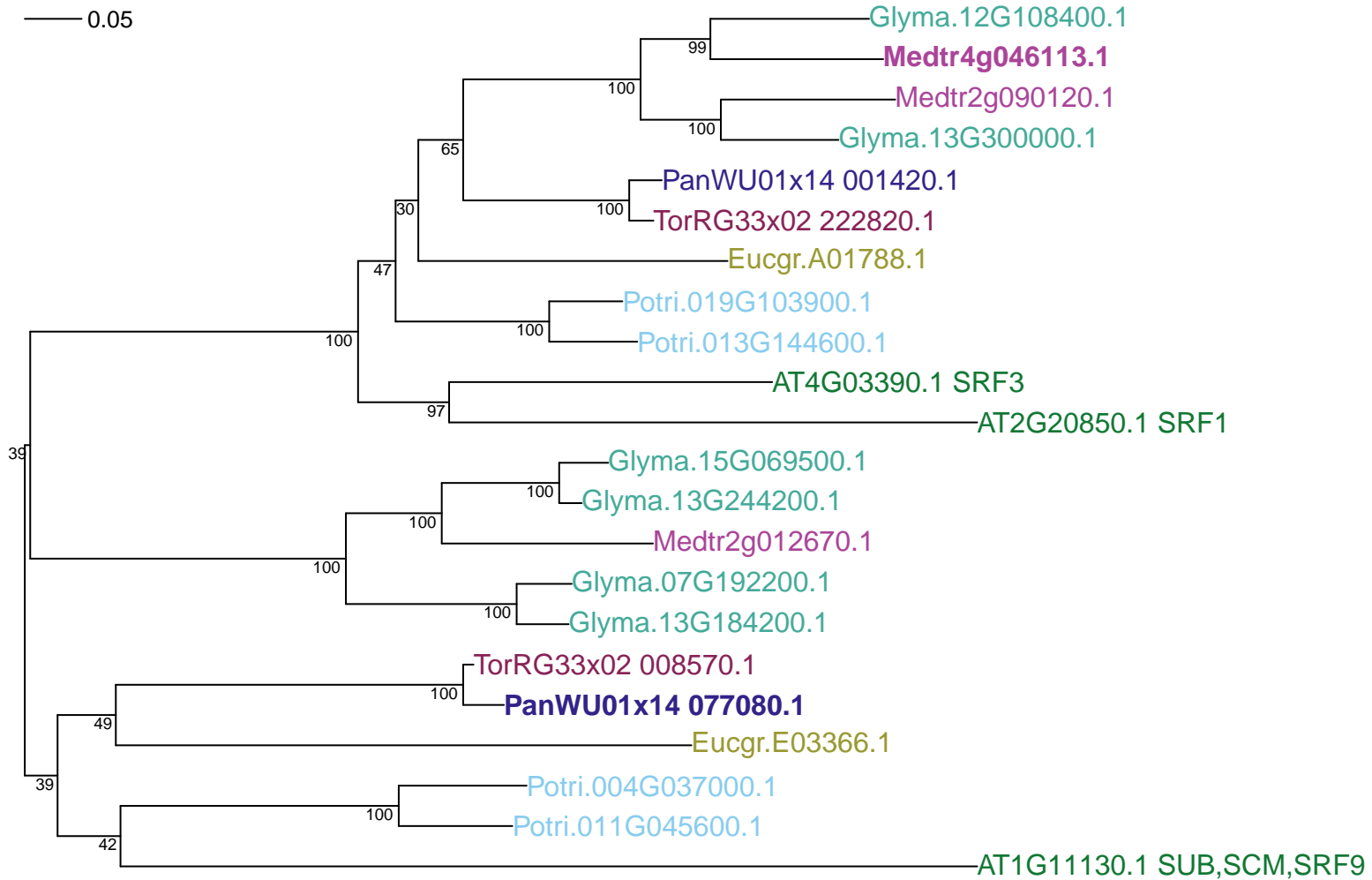
OG0001460: Signaling. Thioredoxin-like fold containing protein

—0.05



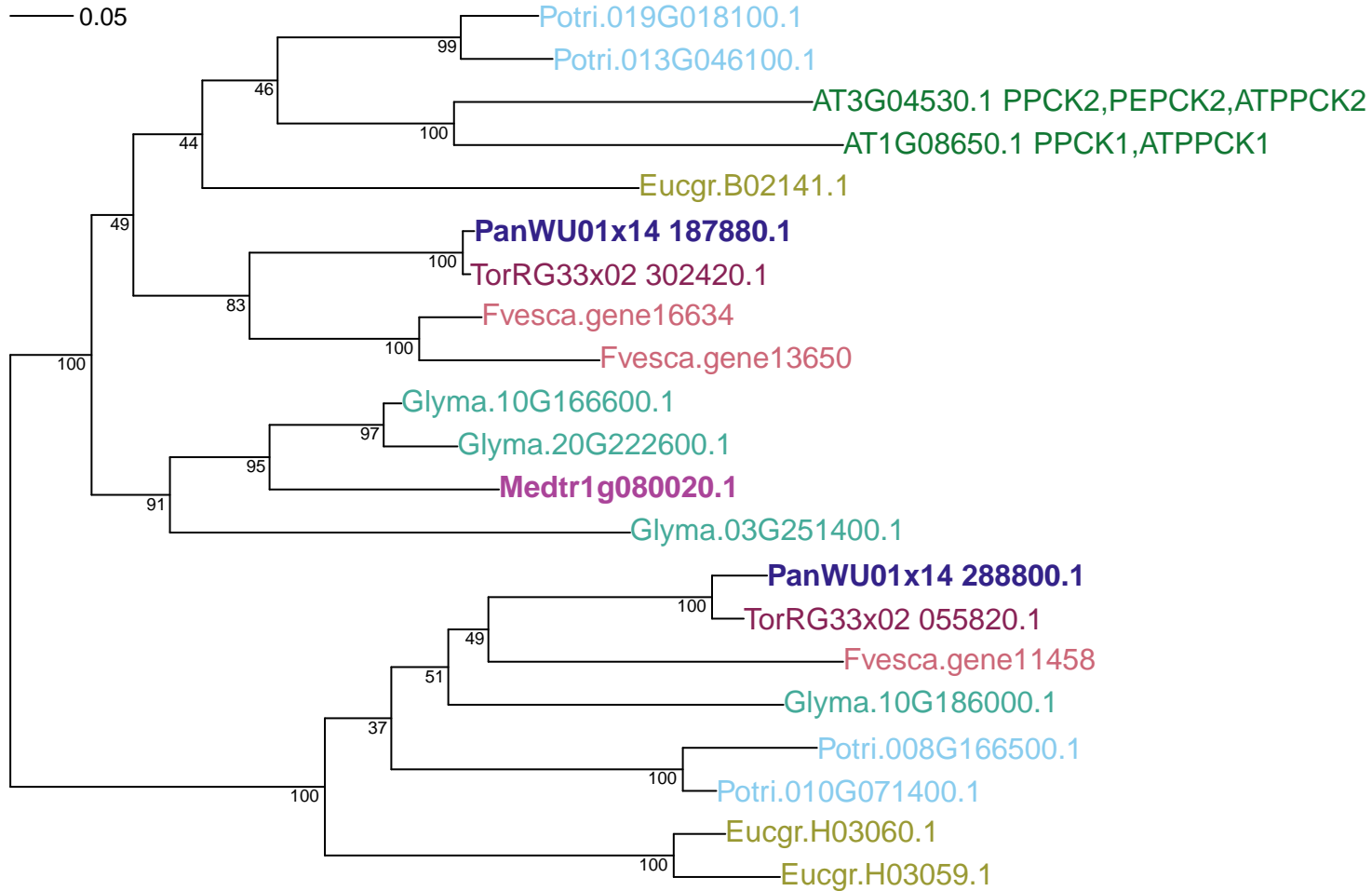
OG0001633: Signaling. Tyrosine-protein kinase

— 0.05



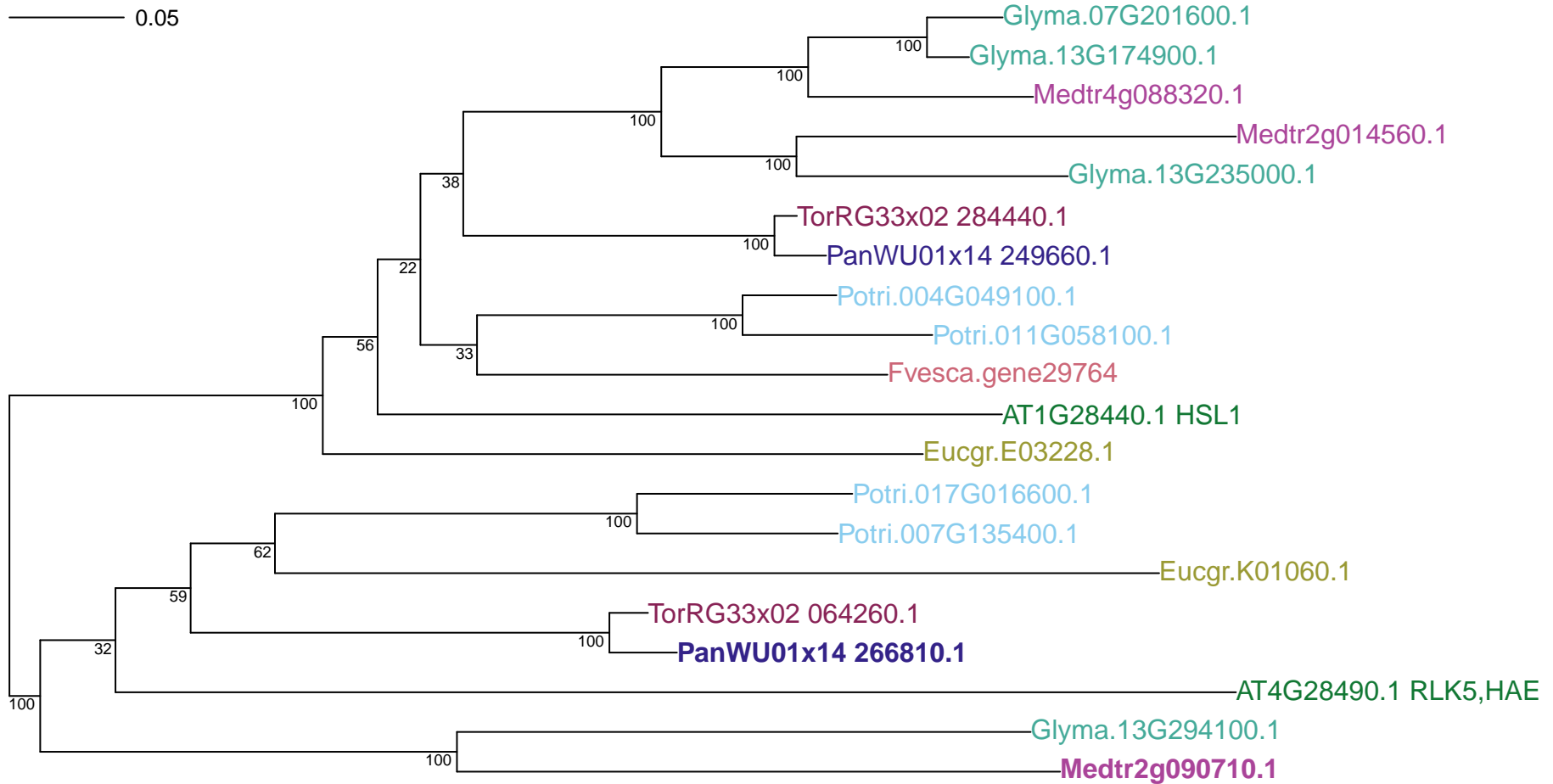
OG0001855: Signaling. GPCR kinase

0.05



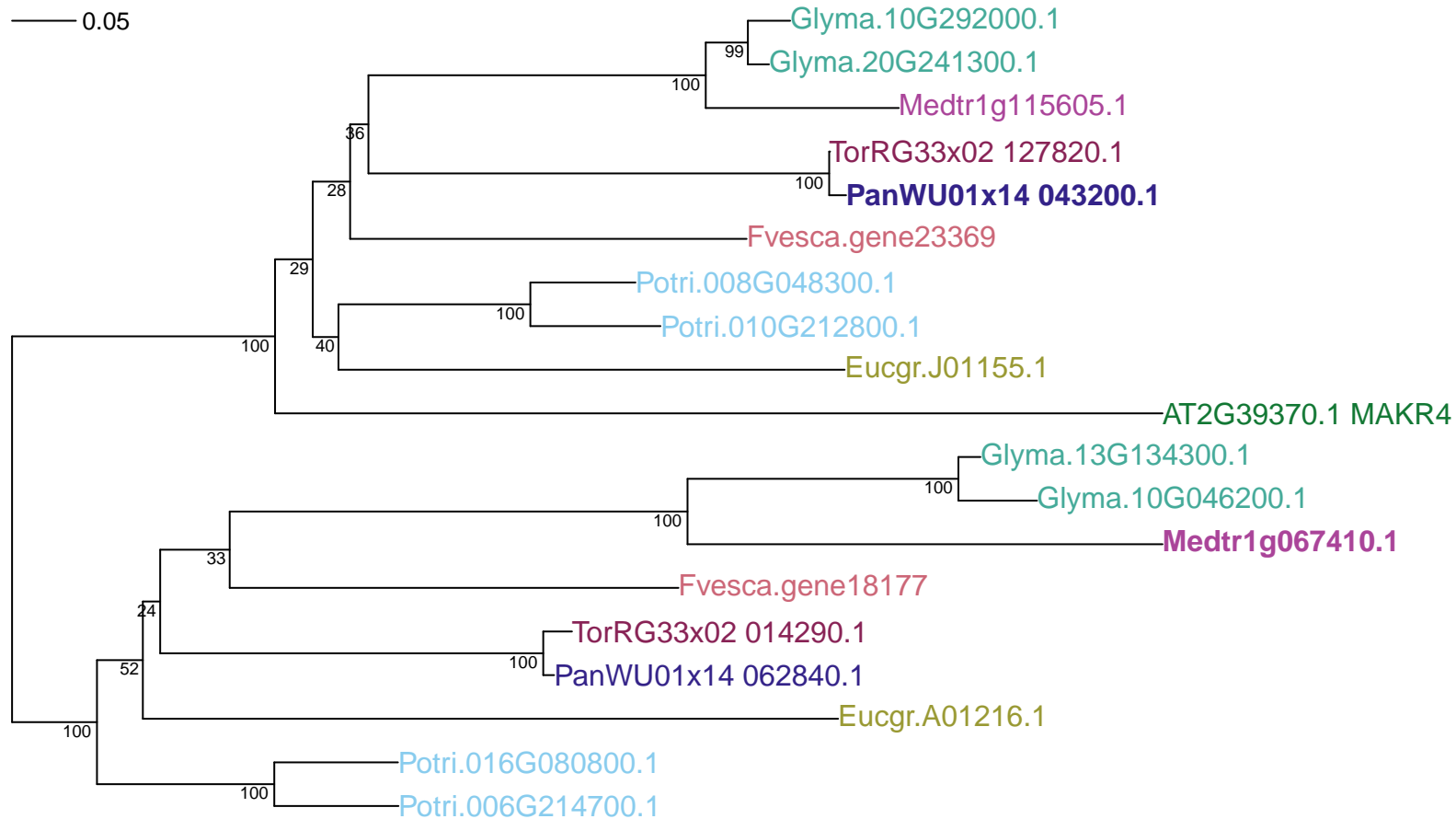
OG0002084: Signaling. Serine/threonine protein kinase

0.05



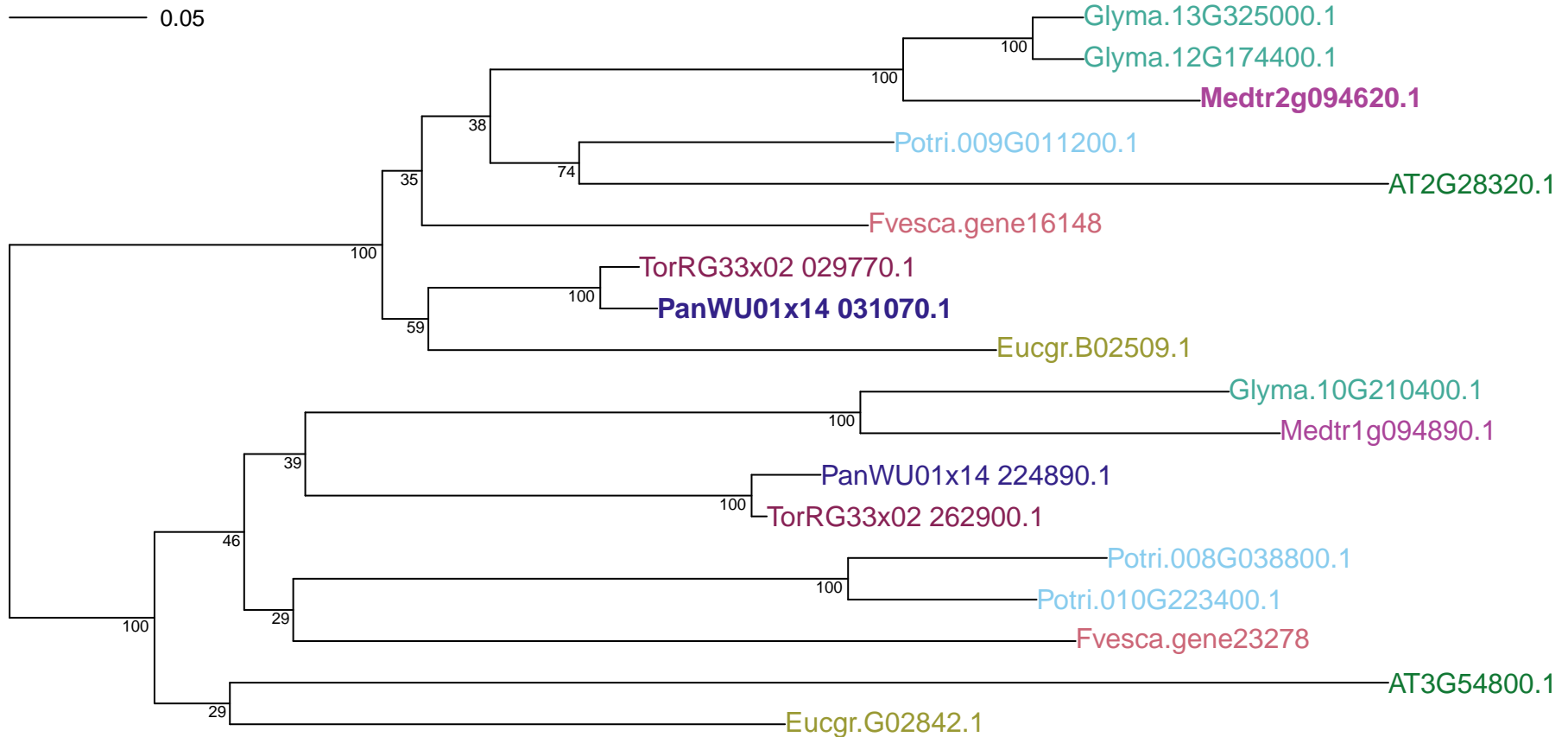
OG0002365: Signaling. Probable membrane-associated kinase regulator

— 0.05

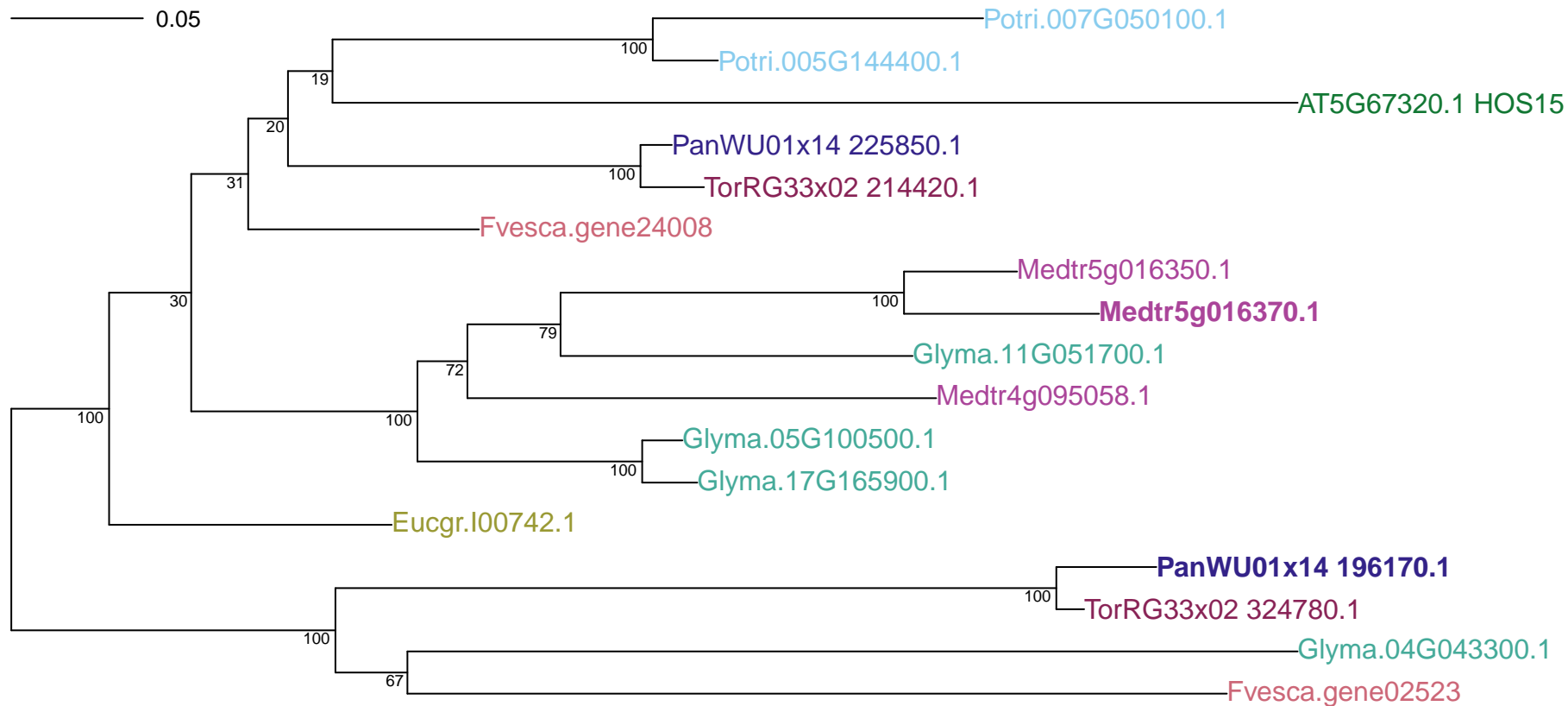


OG0002638: Signaling. Rho GTPase activating protein

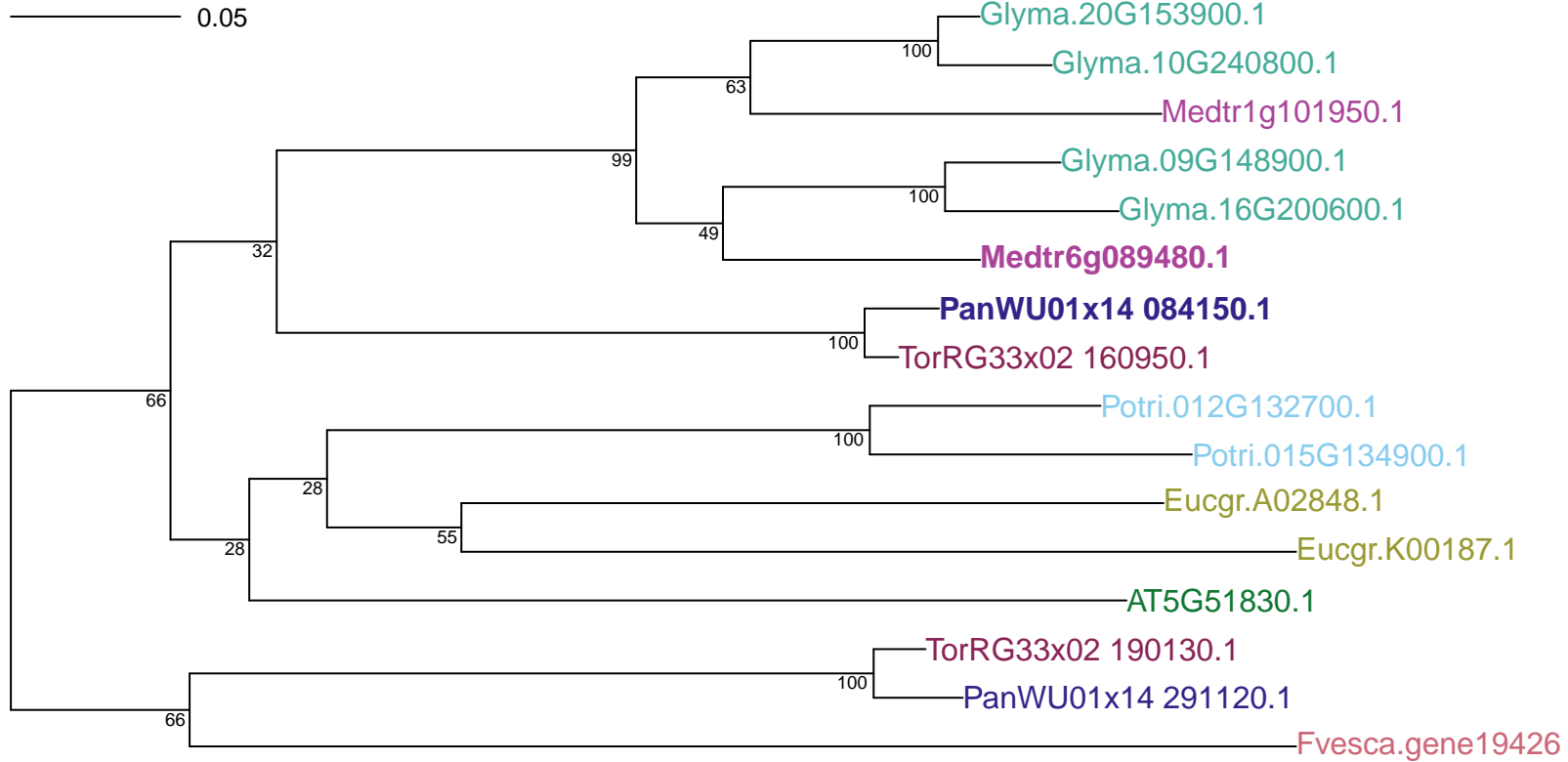
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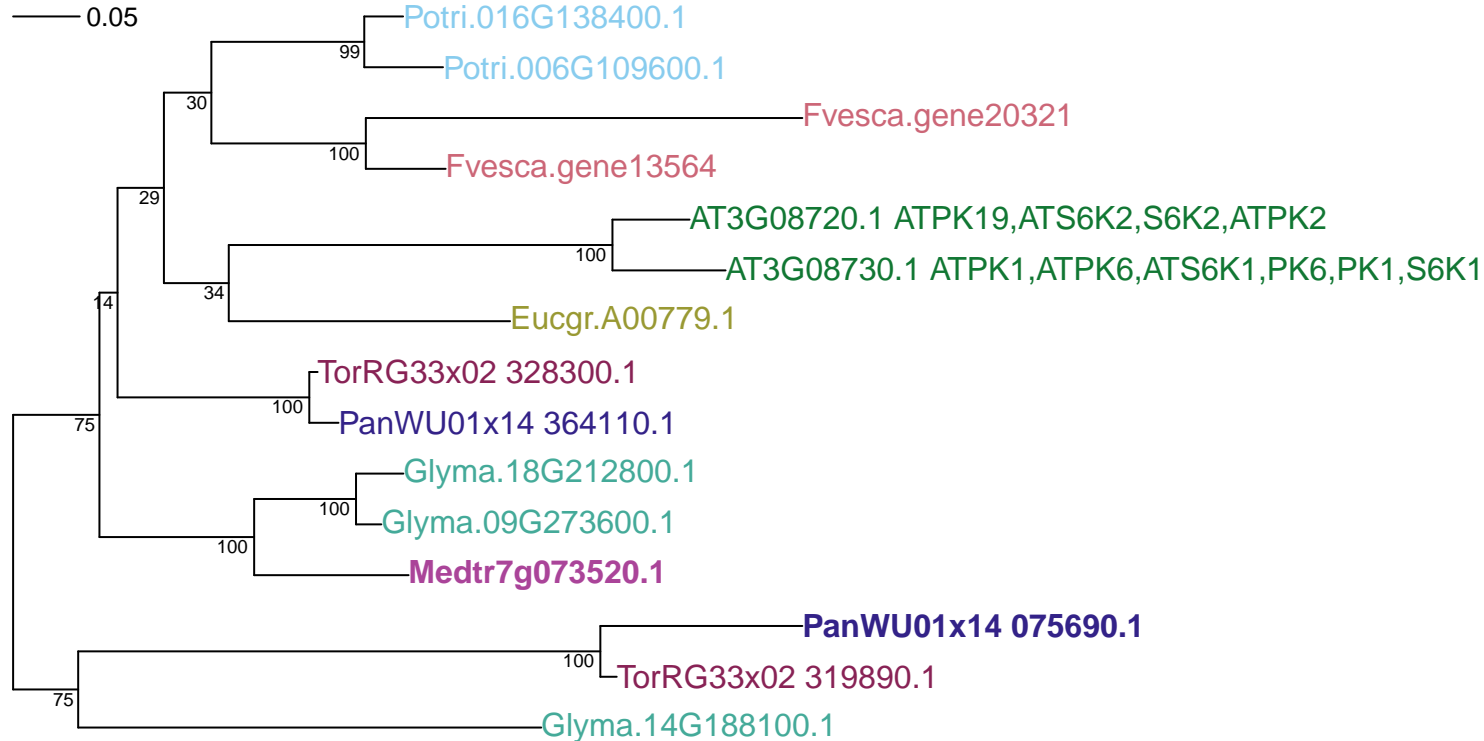
OG0003055: Signaling. Guanine nucleotide-binding protein, beta subunit



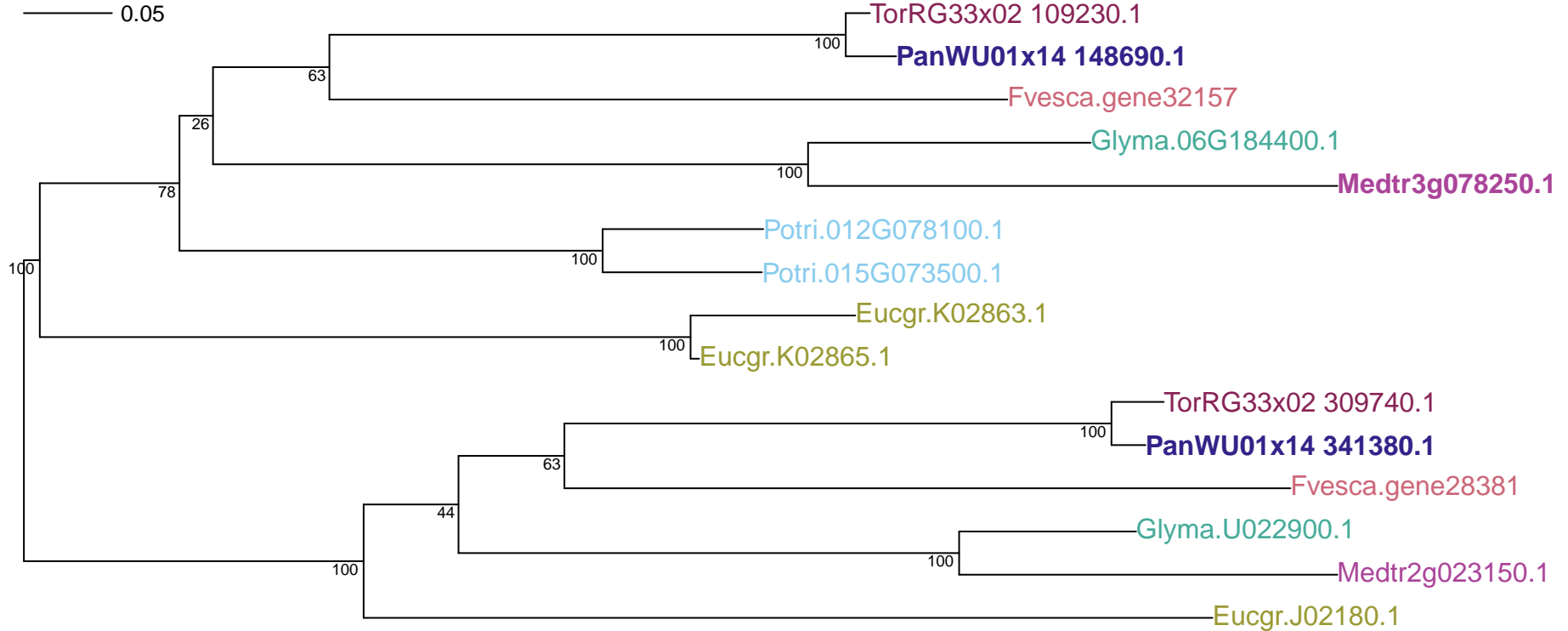
OG0003403: Signaling. Ribokinase



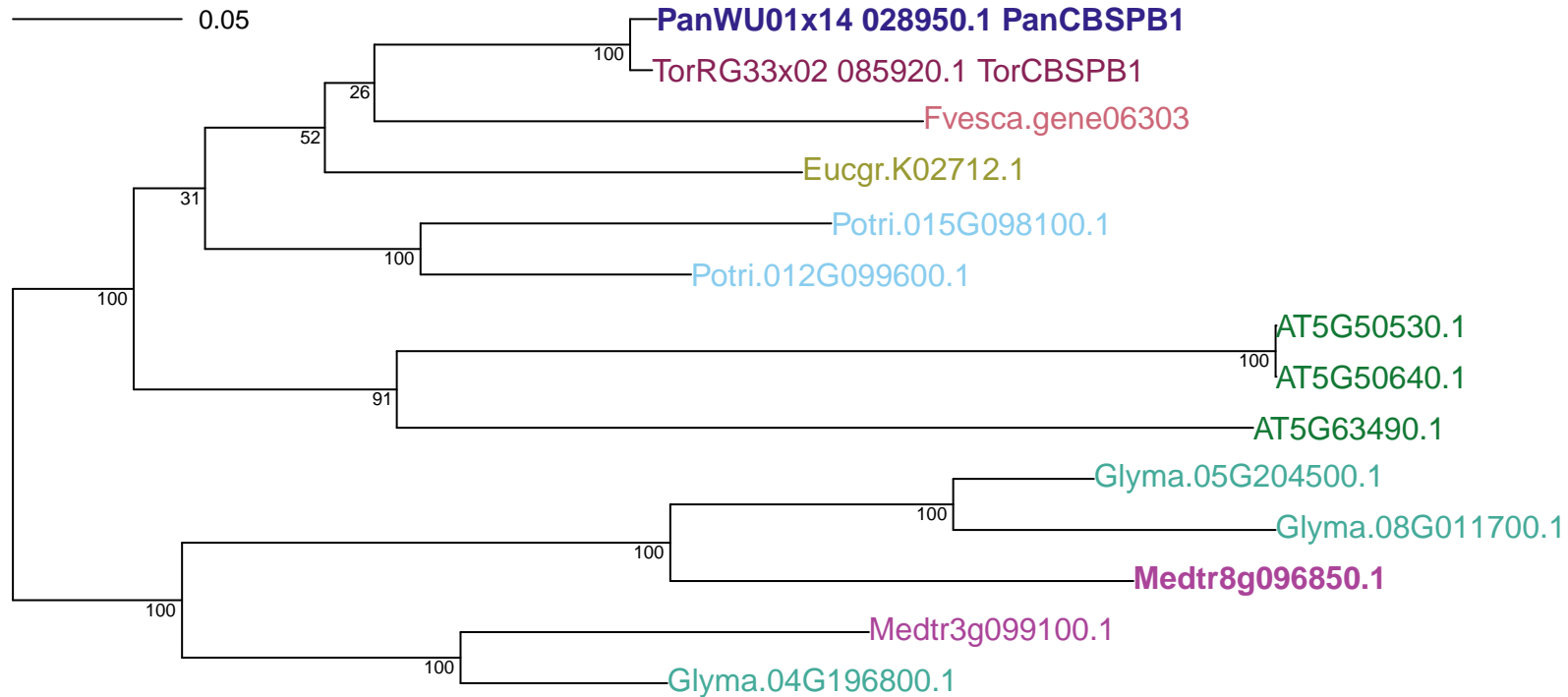
OG0003684: Signaling. cGMP-dependent kinase



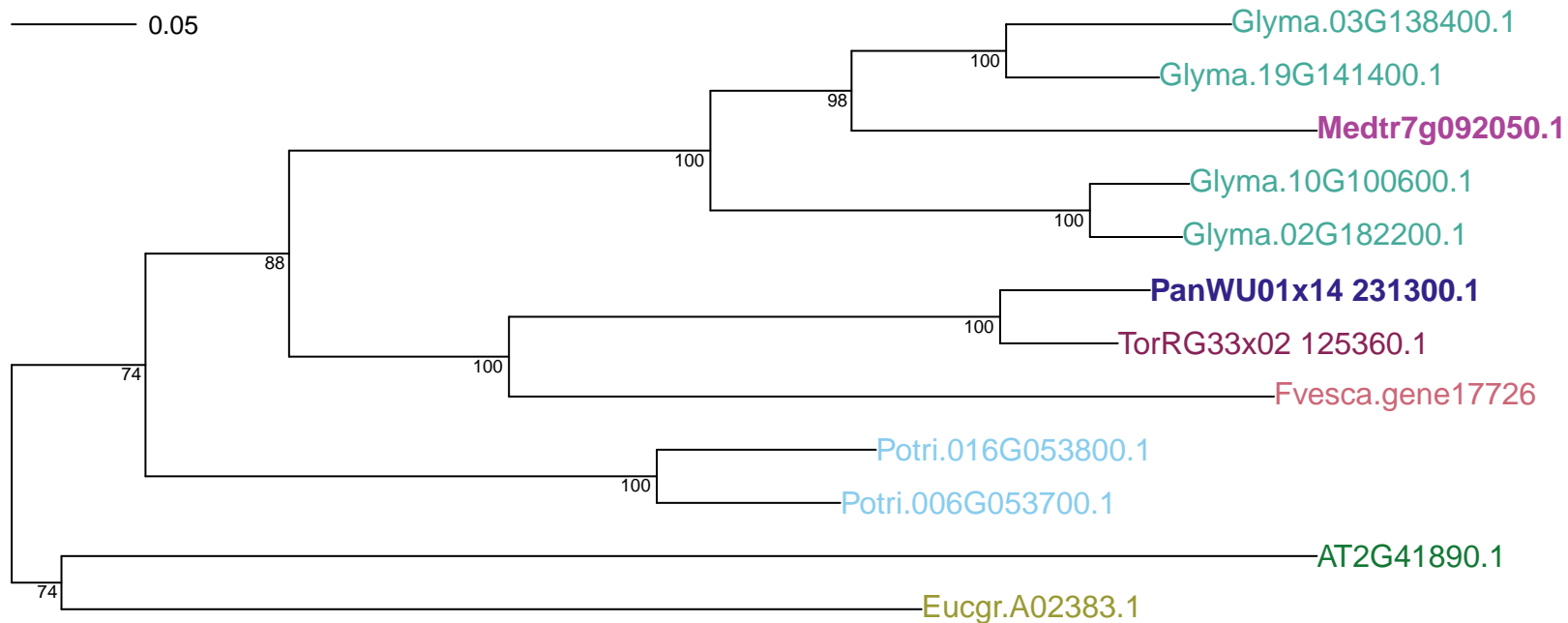
OG0003851: Signaling. Tyrosine-protein kinase



OG0004429: Signaling. CBS- PB1 domain contining protein

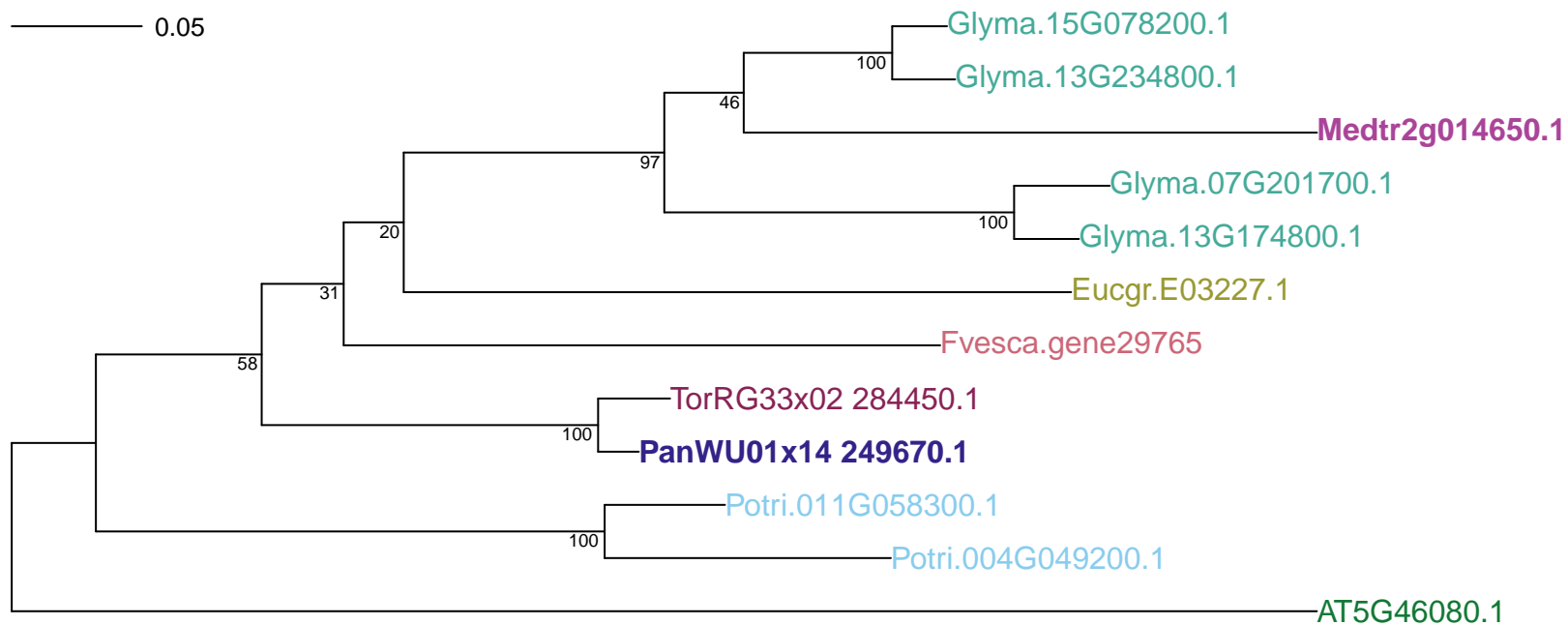


OG0005752: Signaling. S-receptor-like serine/threonine-protein kinase

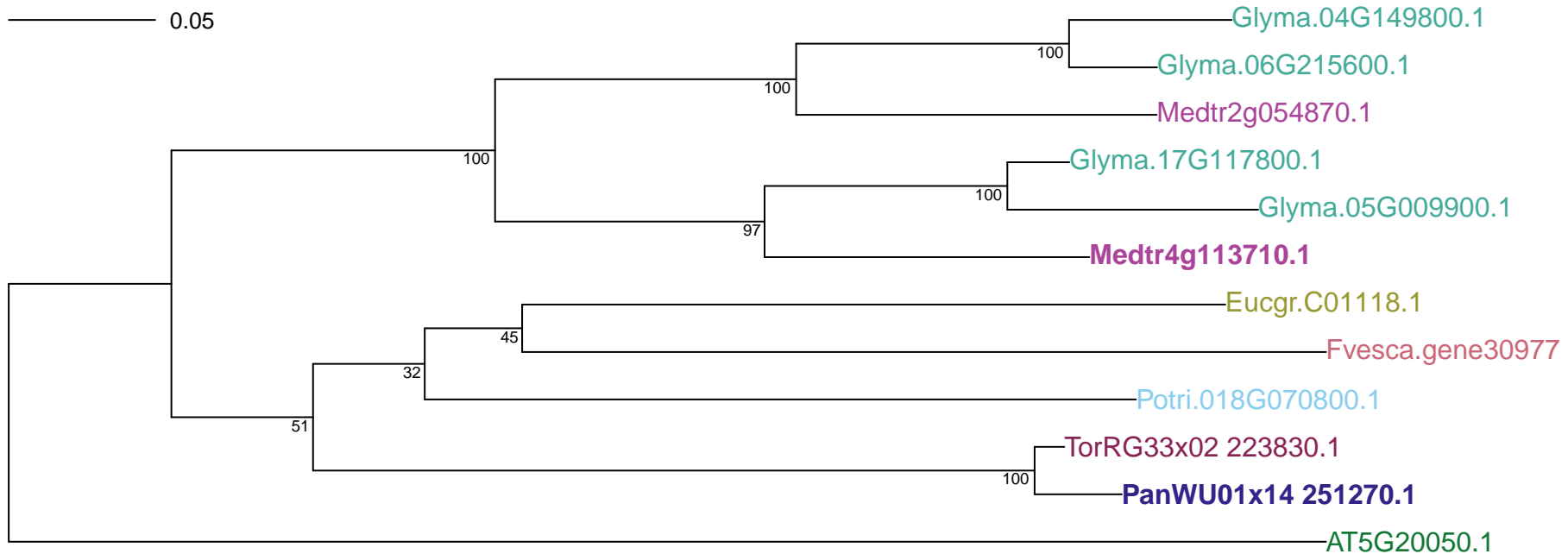


OG0006232: Signaling. Tyrosine-protein kinase

0.05

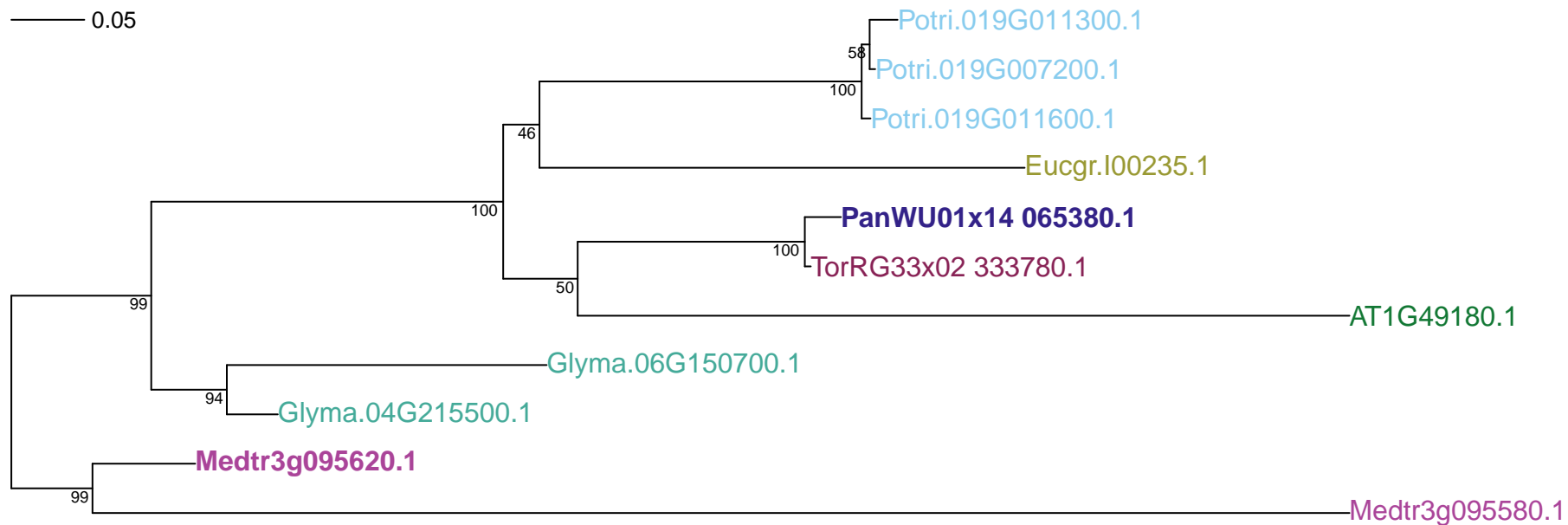


OG0006319: Signaling. Serine/threonine protein kinase

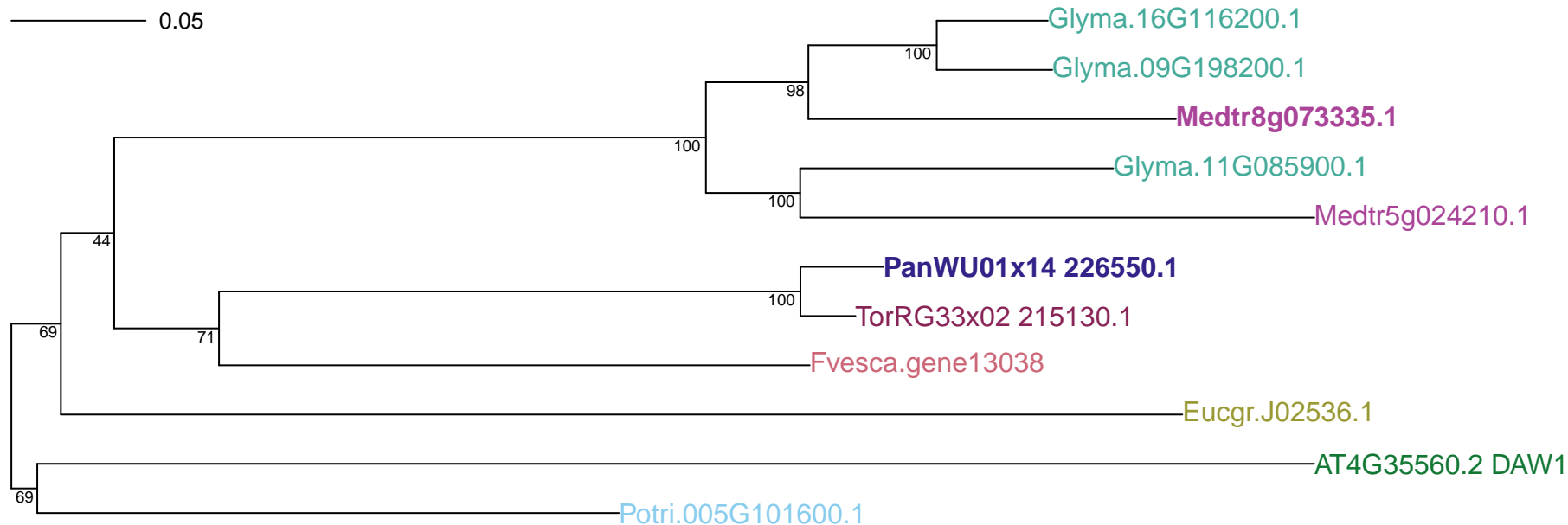


OG0006684: Signaling. GPCR kinase

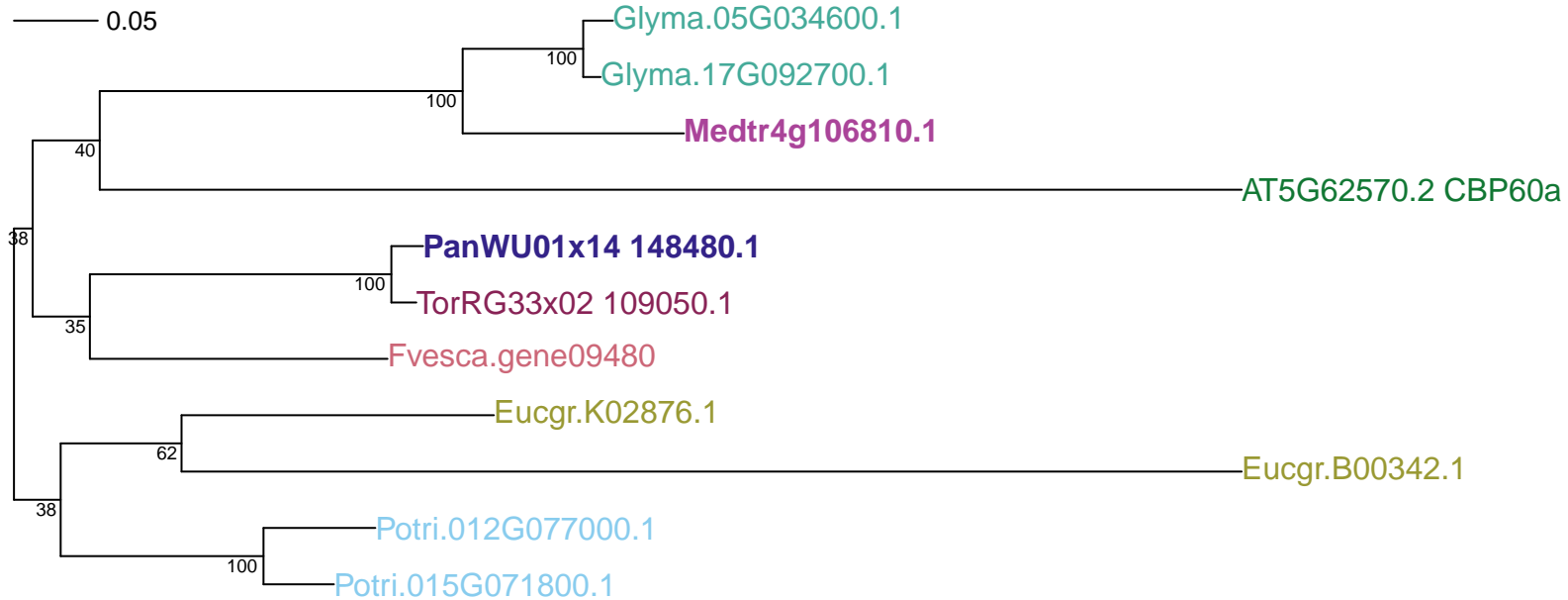
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OG0007497: Signaling. Guanine nucleotide-binding protein, beta subunit

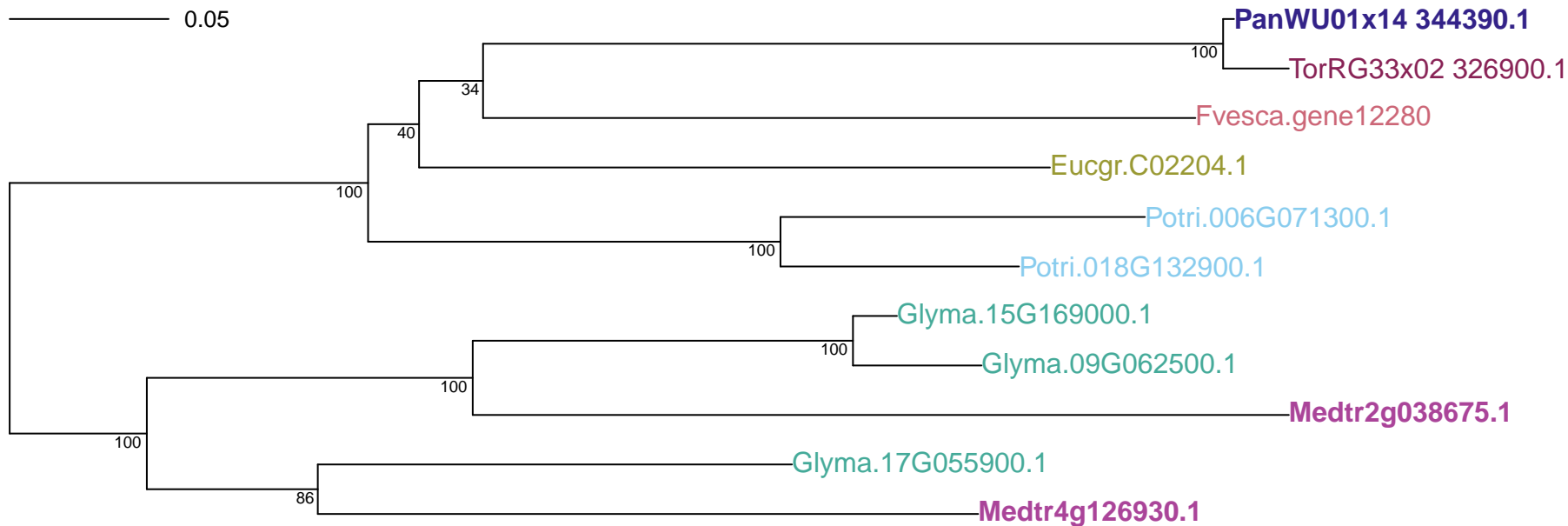


OG0007719: Signaling. Calmodulin-binding protein

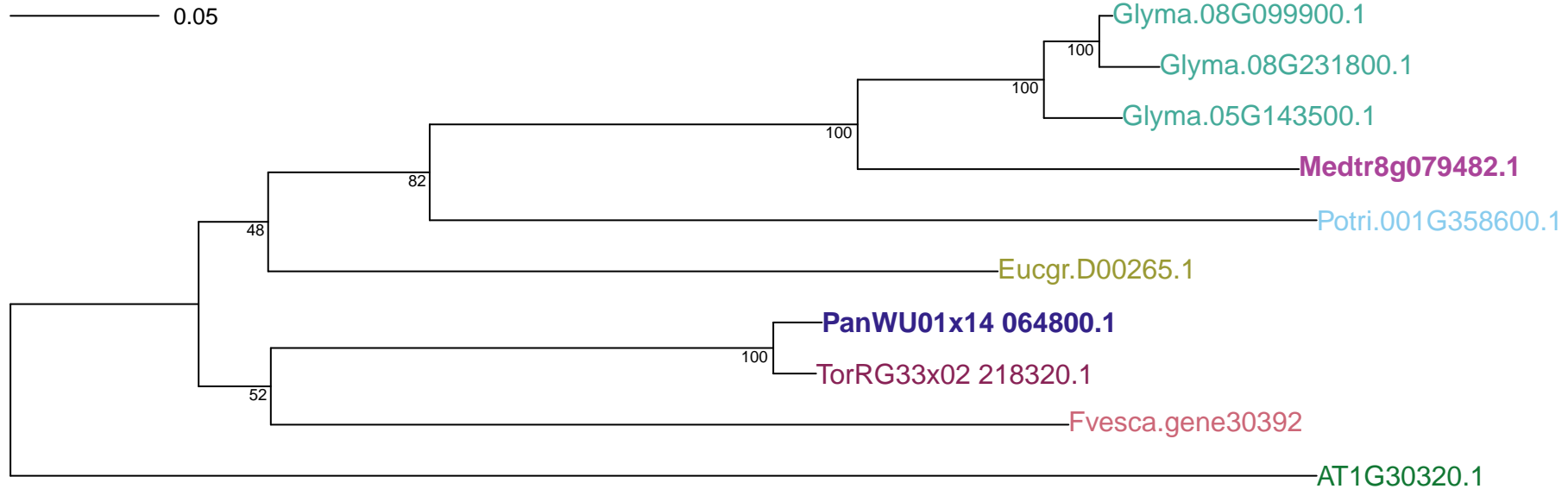


OG0007745: Signaling. Serine/threonine protein kinase

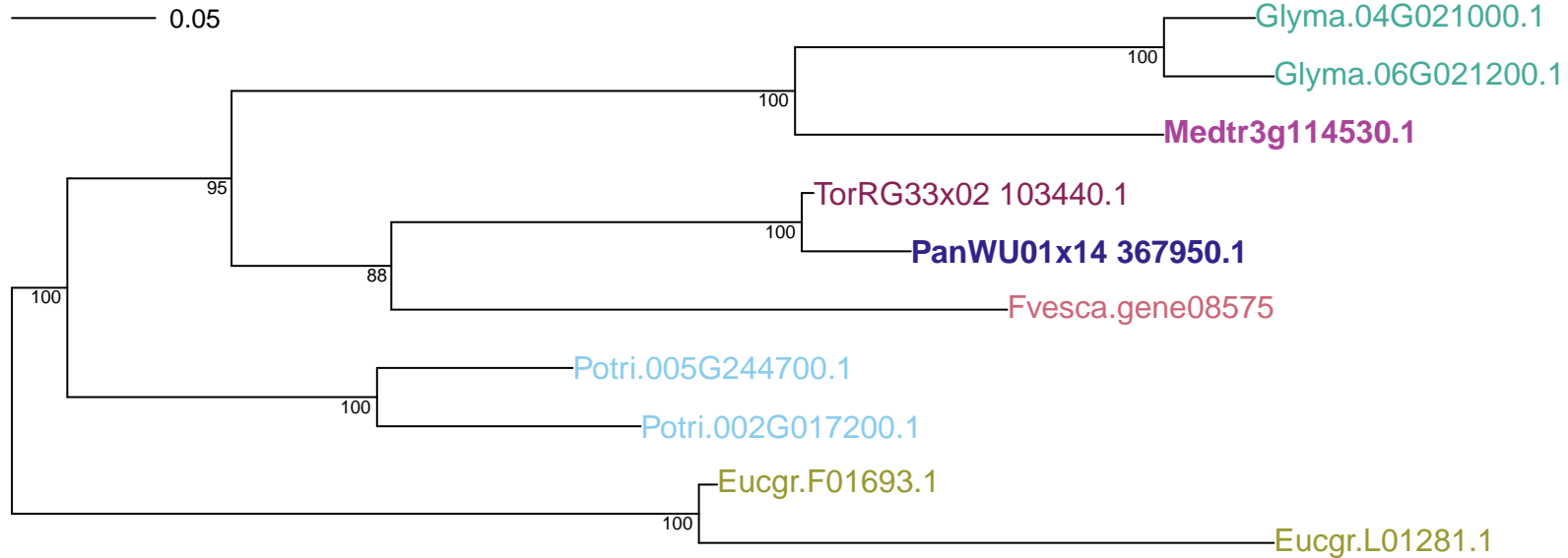
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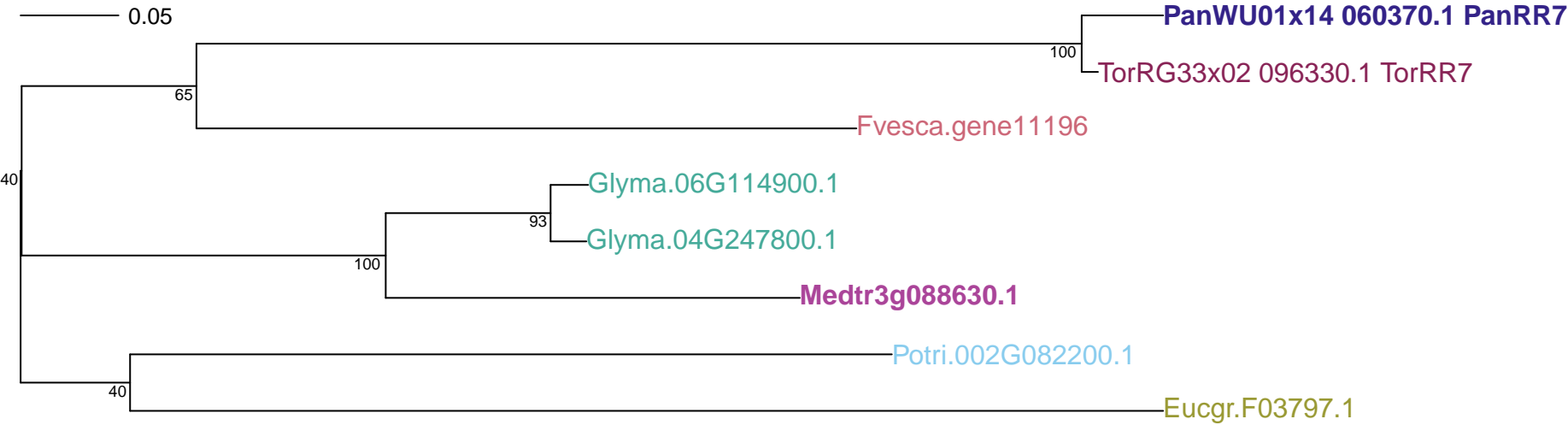
OG0008142: Signaling. Remorin, C-terminal



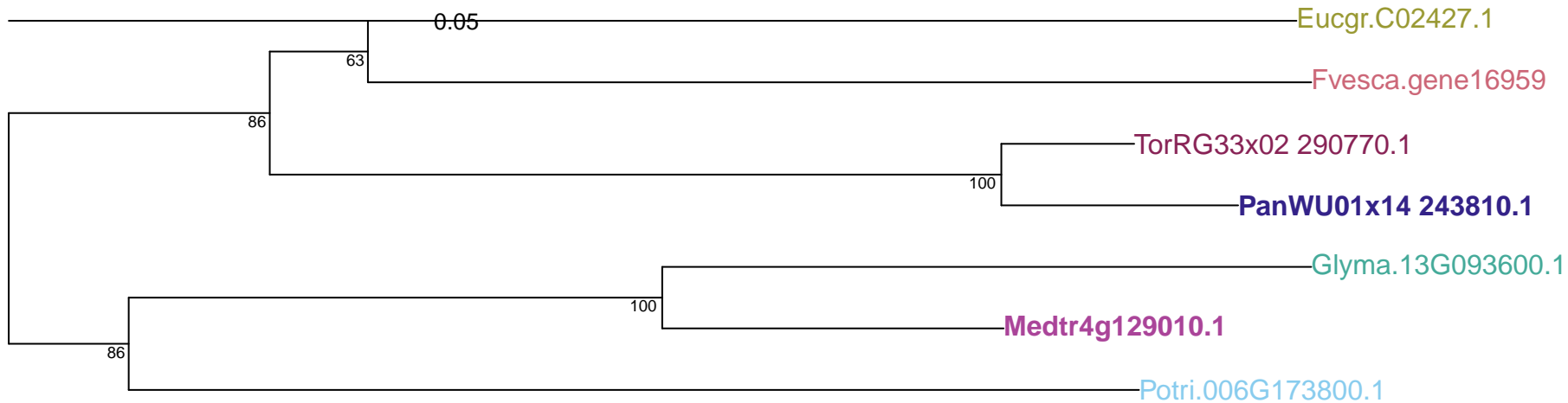
OG0009765: Signaling. Thioredoxin-like fold containing protein



OG0013434: Signaling. Two-component response regulator

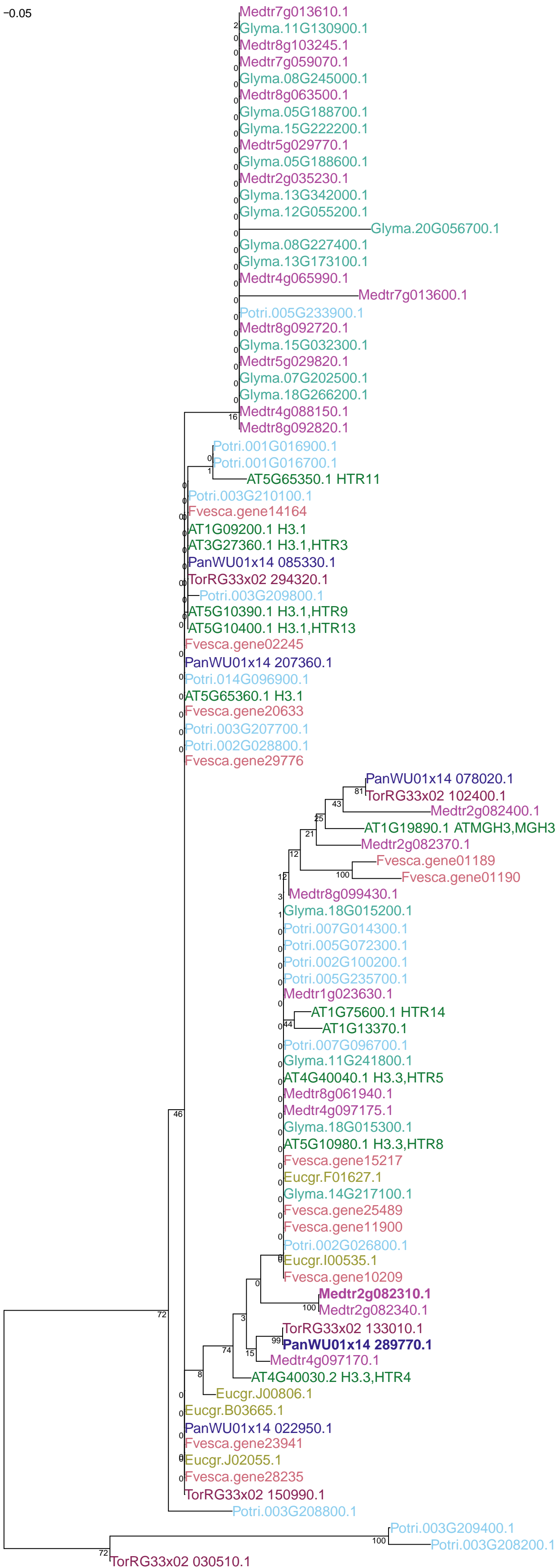


OG0013960: Signaling. Mitogen-activated protein kinase kinase kinase

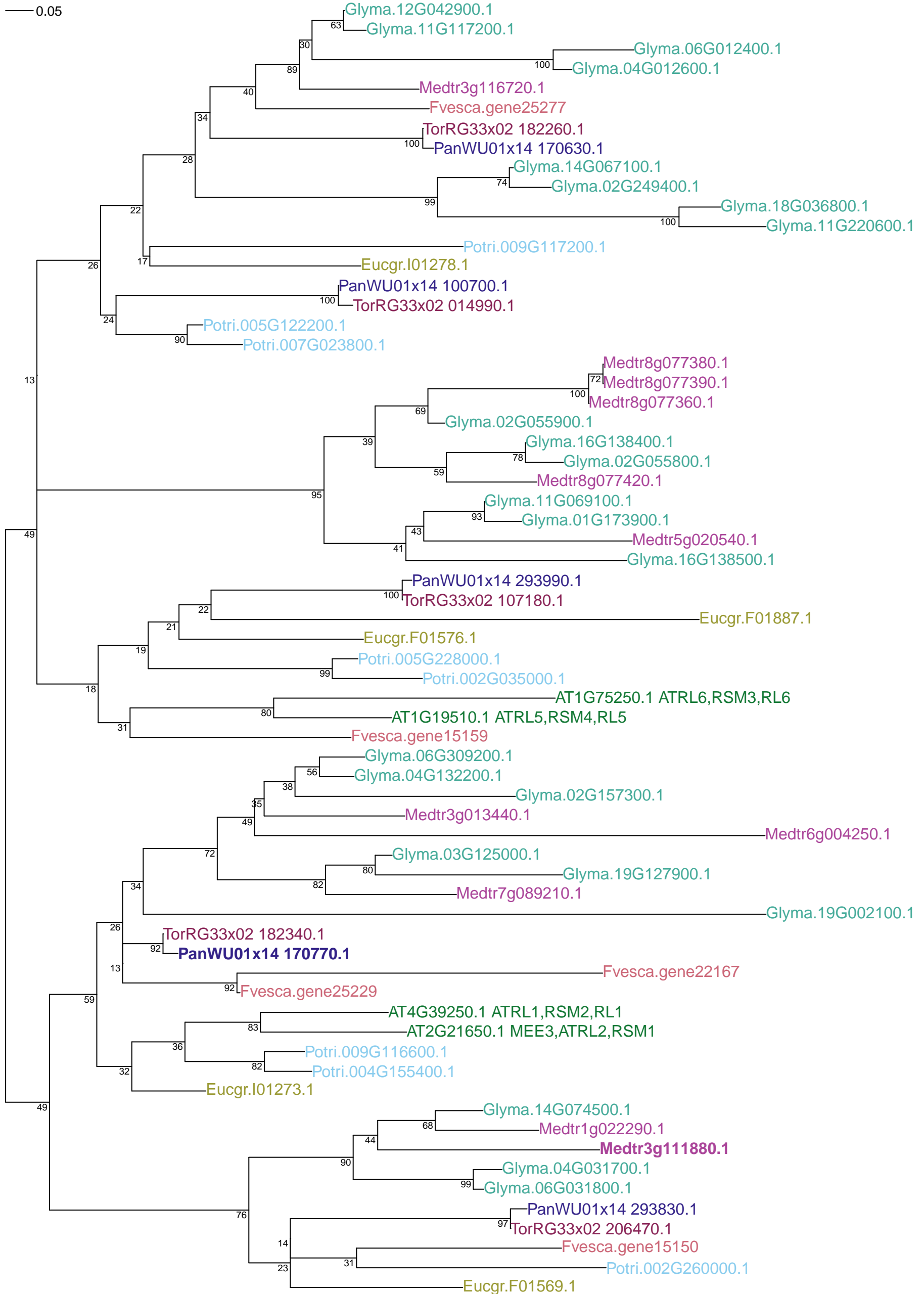


OG0000107: Transcriptional regulators. Histone H3/CENP-A

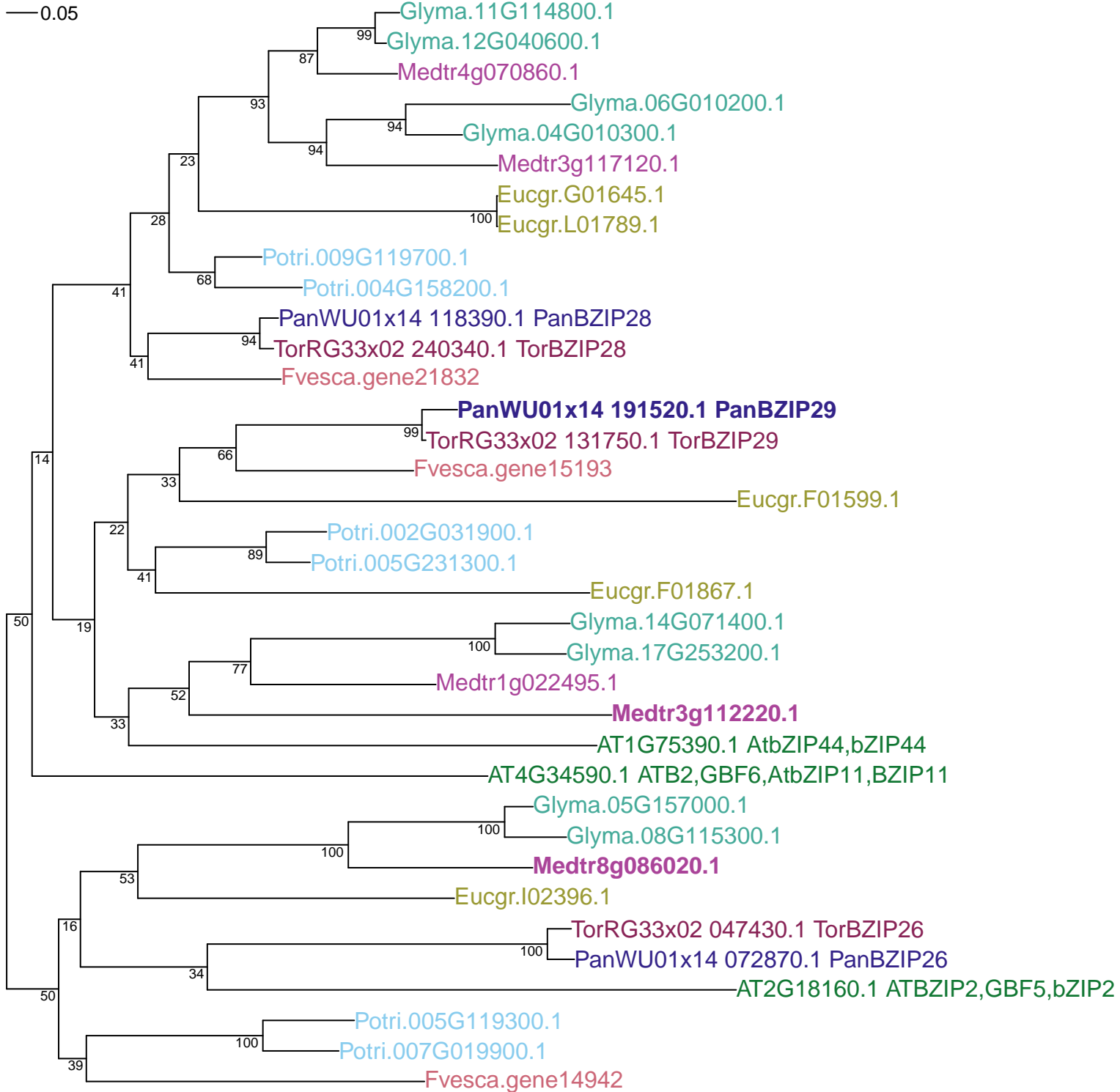
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OG0000197: Transcriptional regulators. Octamer-binding transcription factor

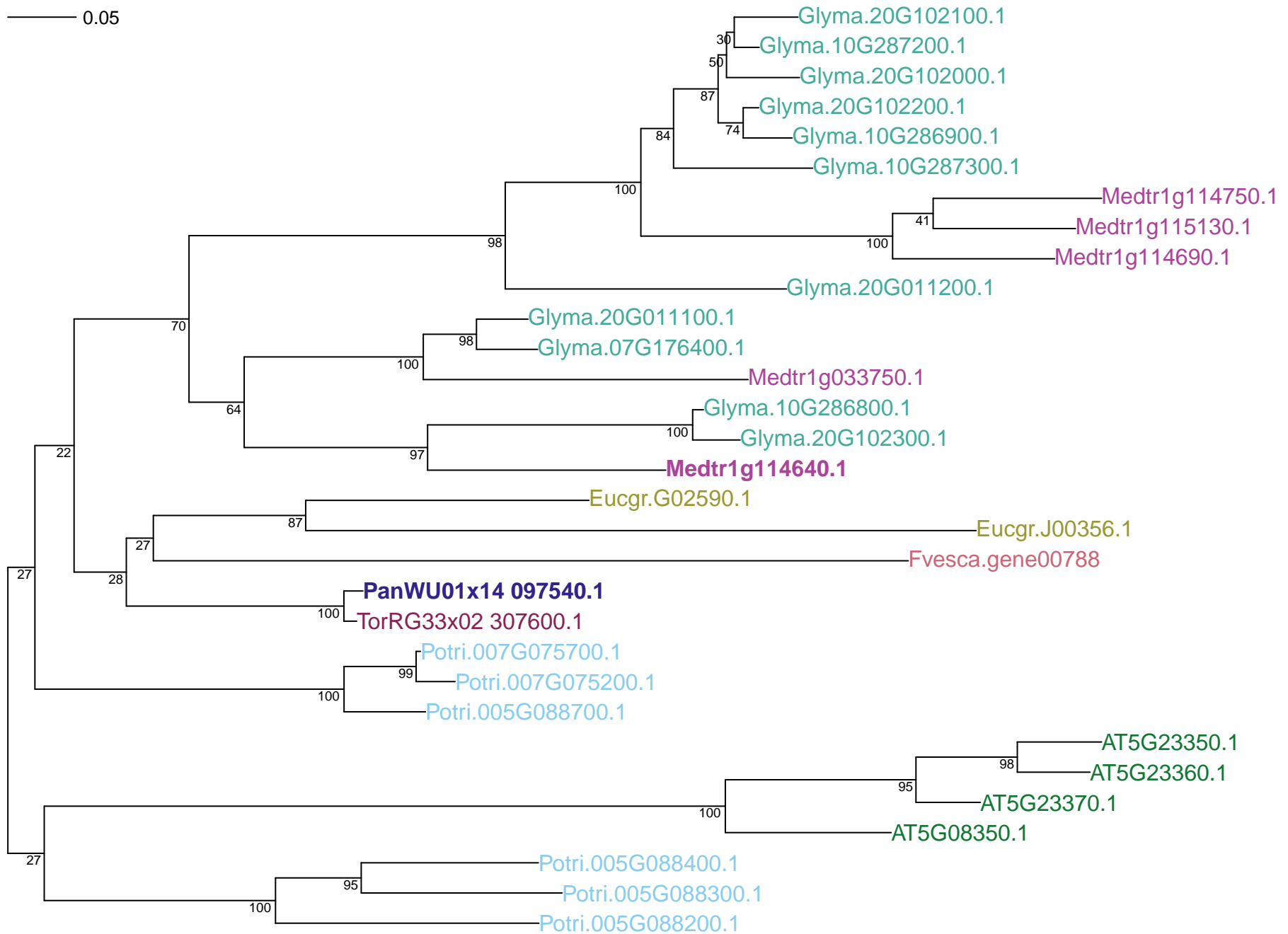


OG0000578: Transcriptional regulators. Basic-leucine zipper transcription factor

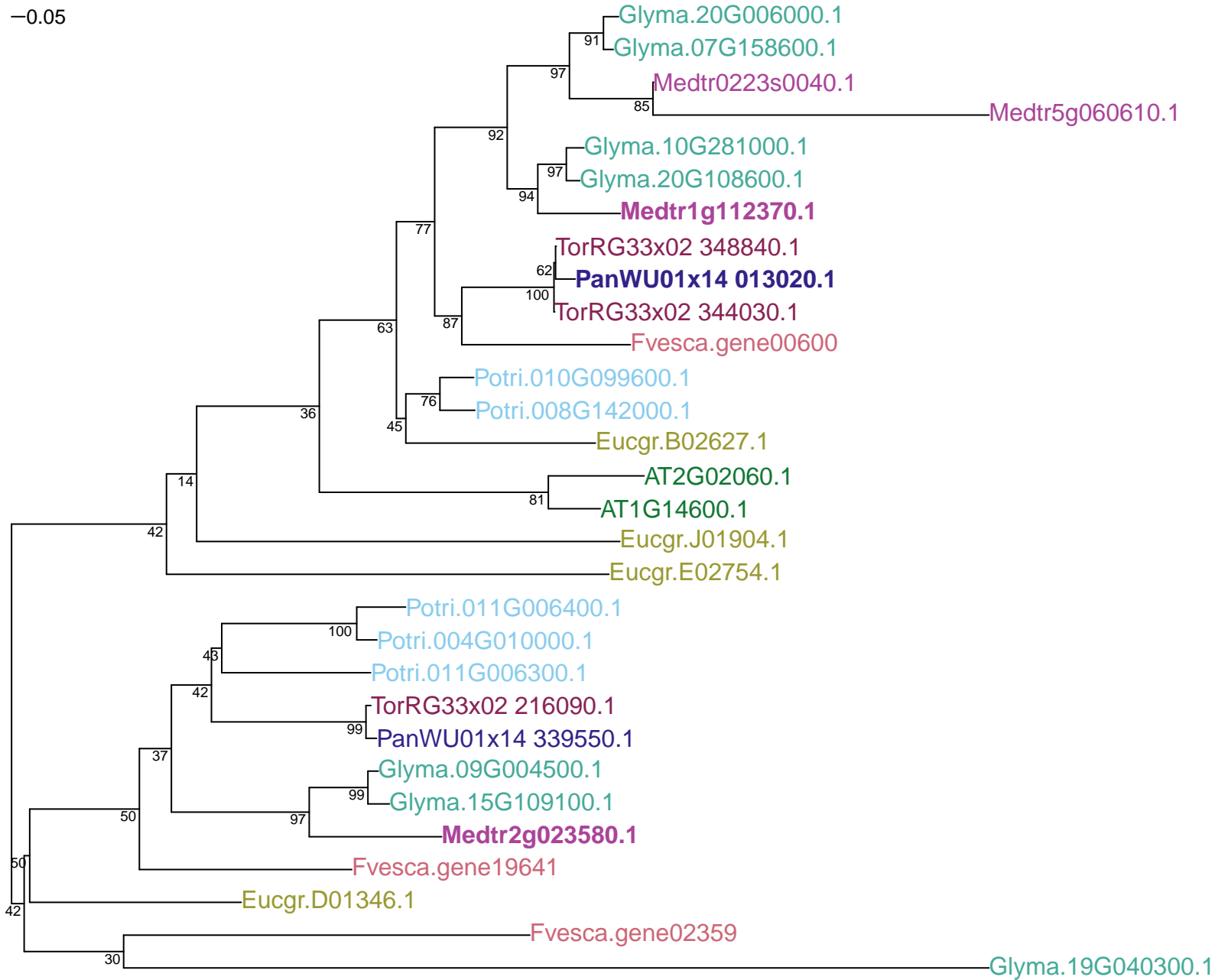


OG0000791: Transcriptional regulators. GRAM domain containing protein

0.05

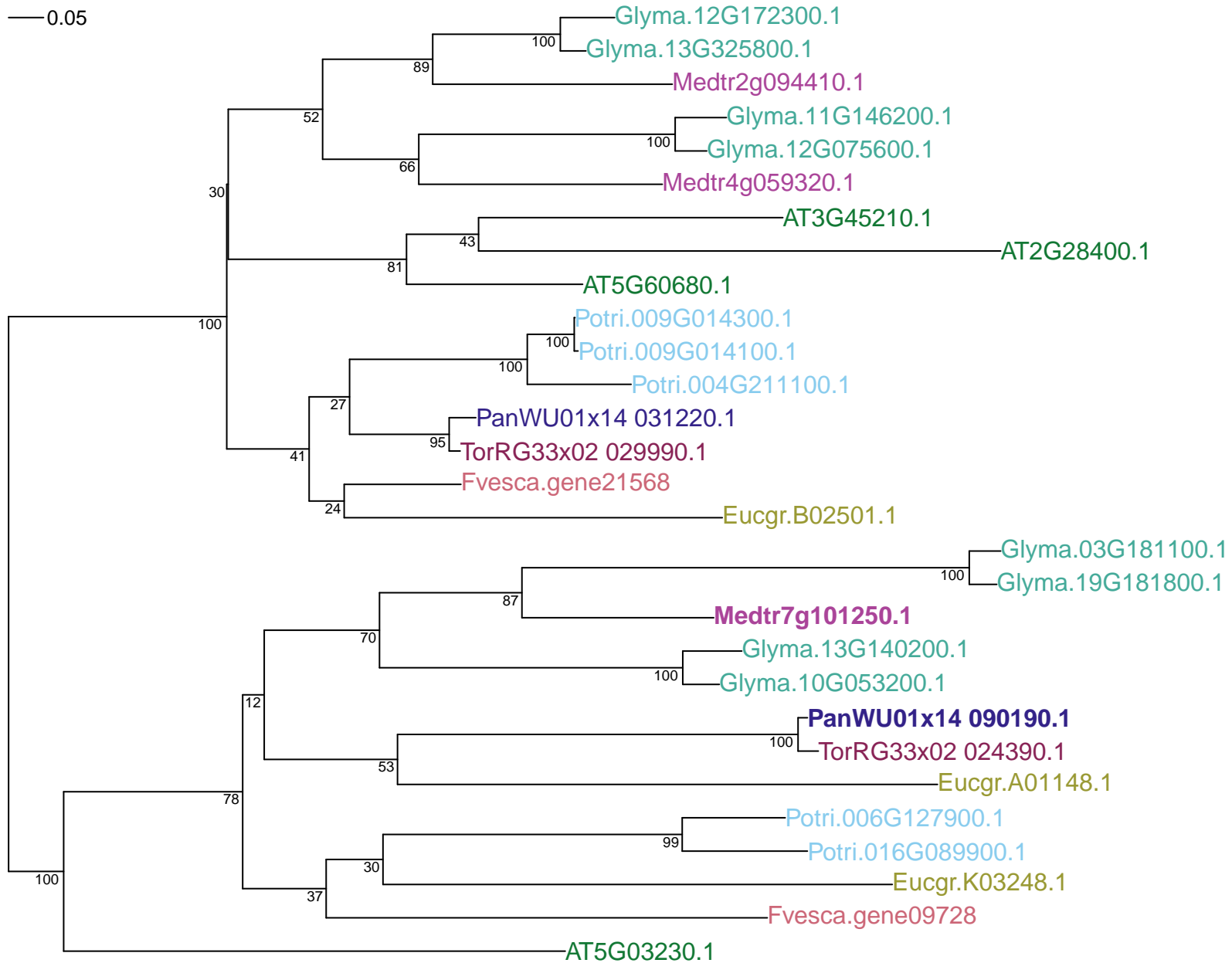


OG0000805: Transcriptional regulators. Octamer-binding transcription factor

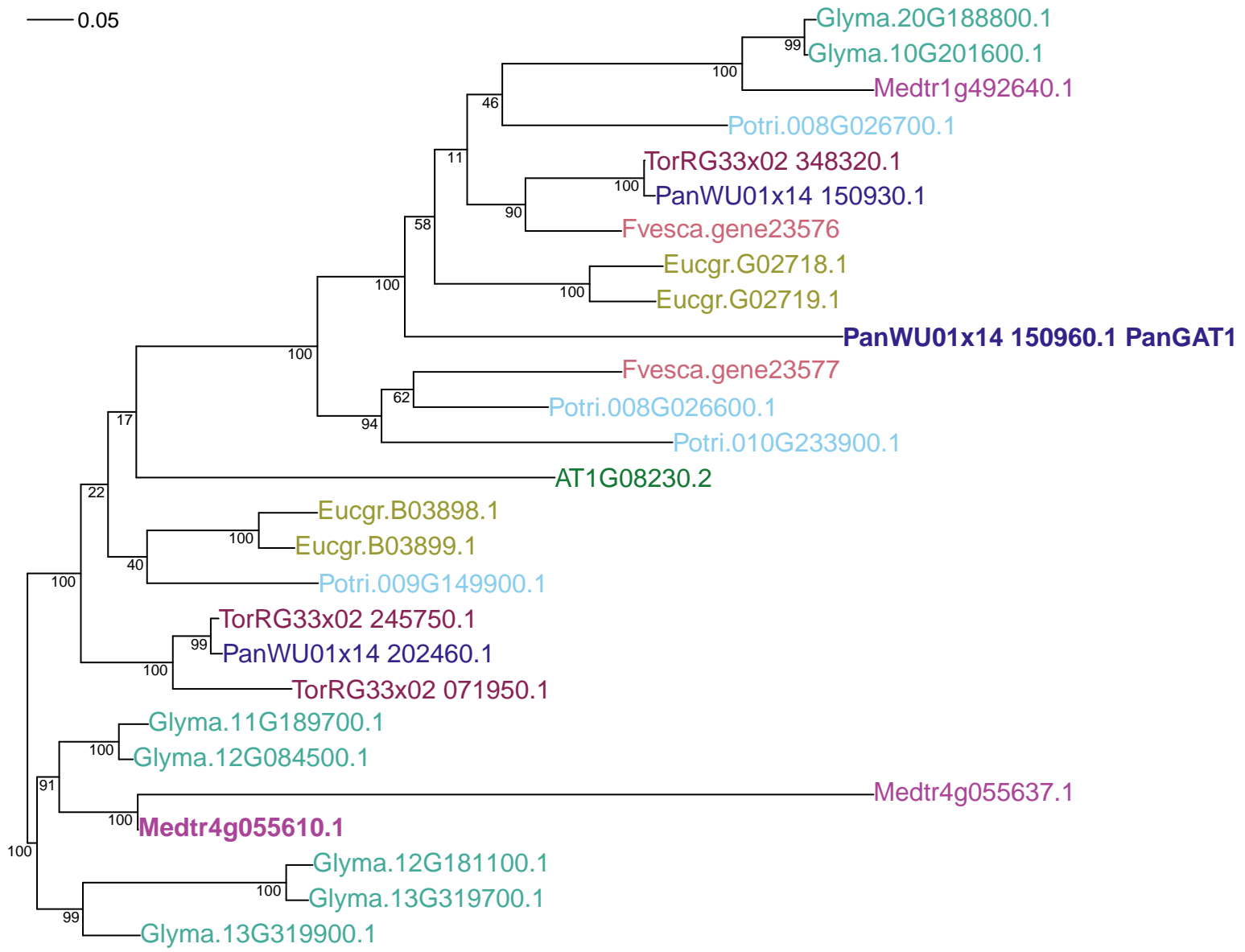


OG0000895: Transcriptional regulators. Senescence regulator

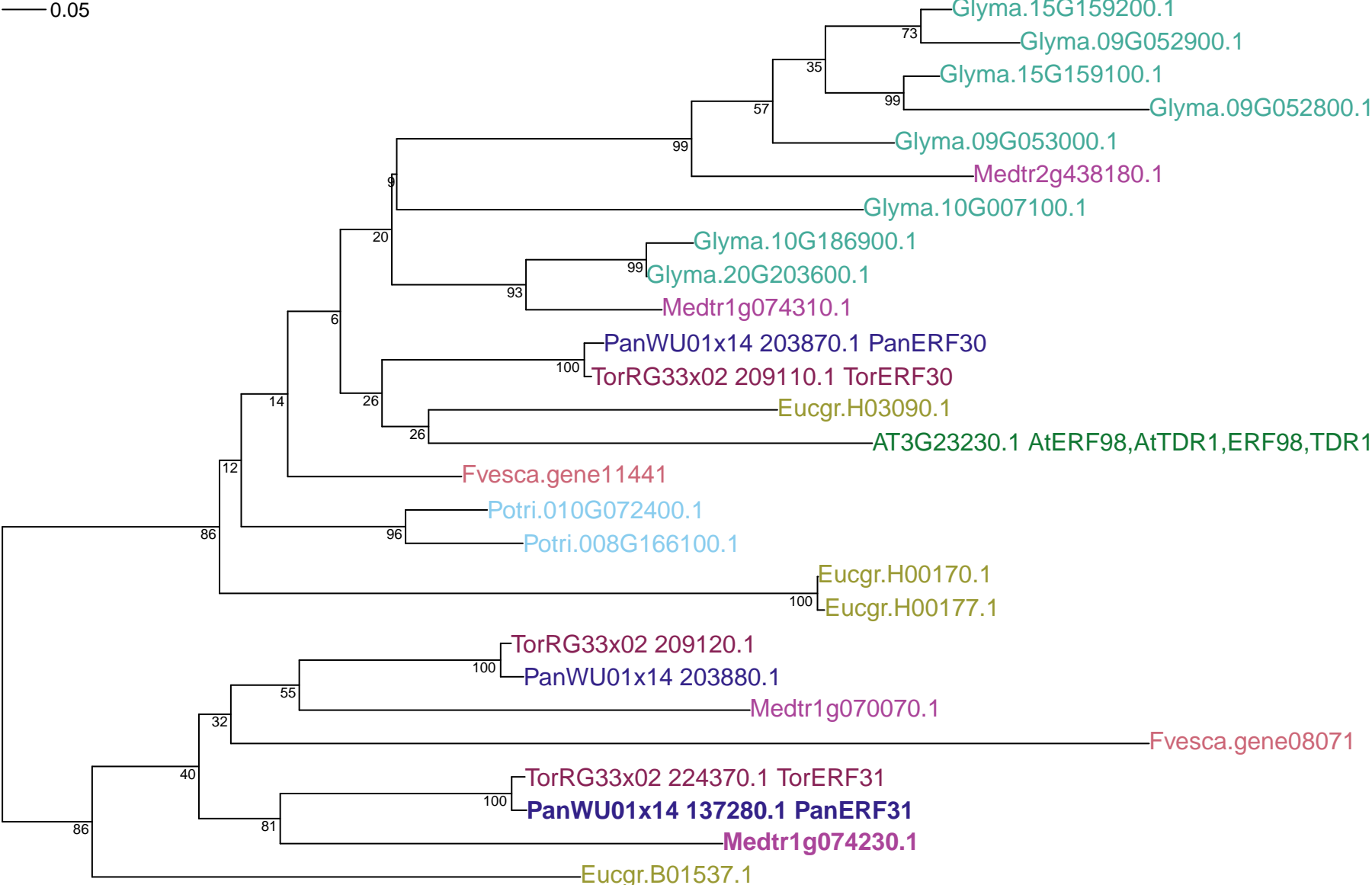
—0.05



OG0001042: Transcriptional regulators. Amino acid transporter, transmembrane domain containing protein

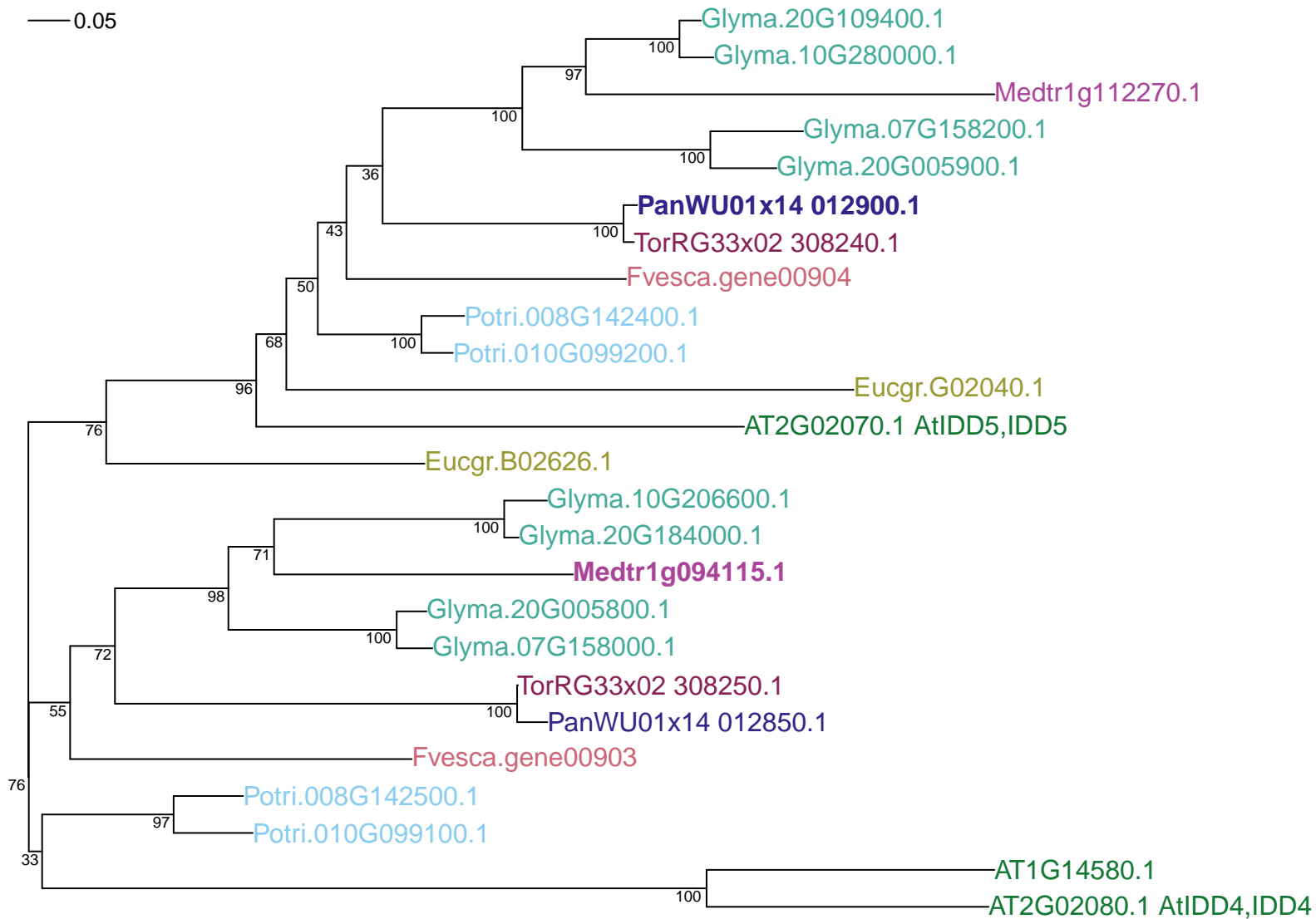


OG0001070: Transcriptional regulators. AP2/ERF transcription factor

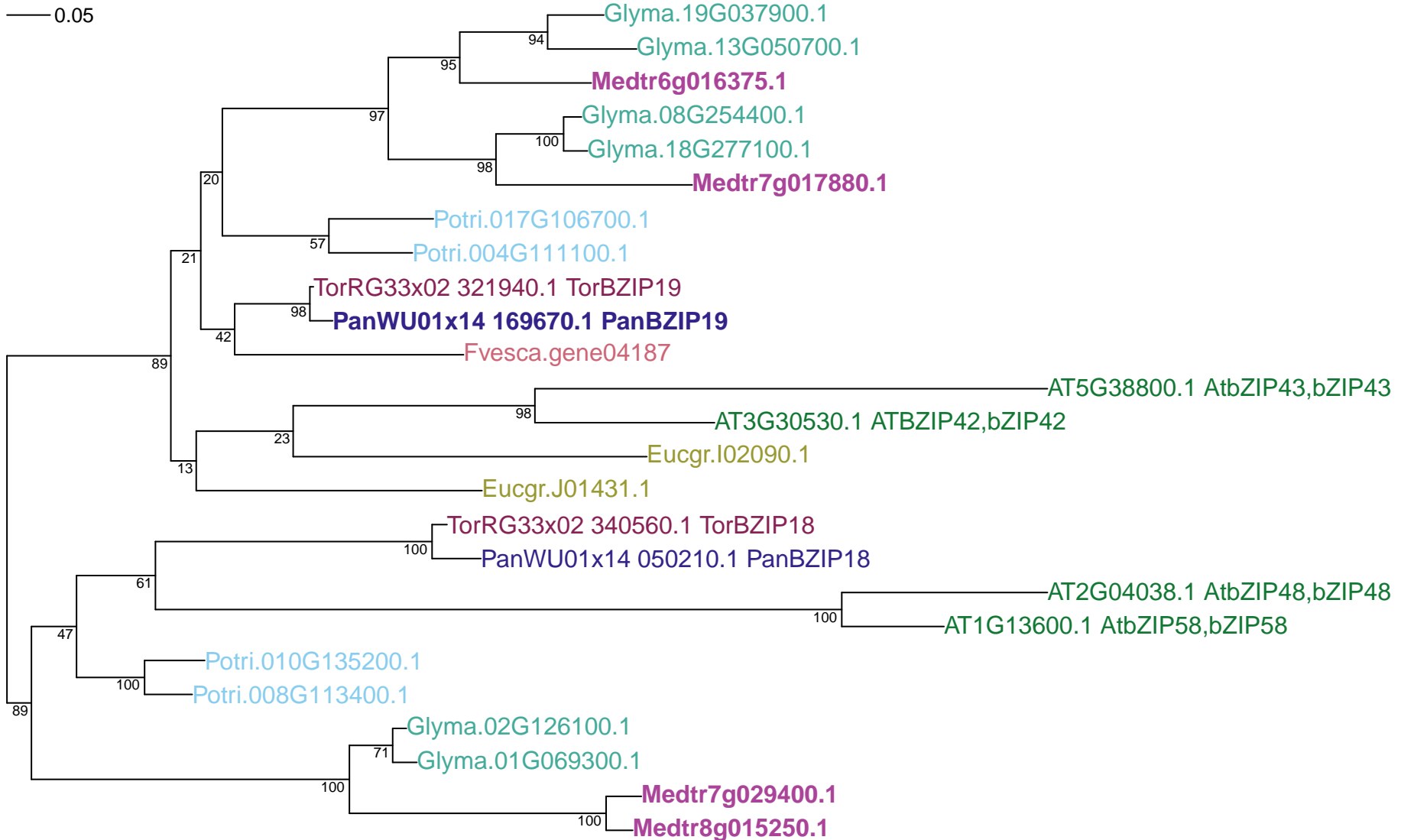


OG0001206: Transcriptional regulators. TFIID C1-like domain containing protein

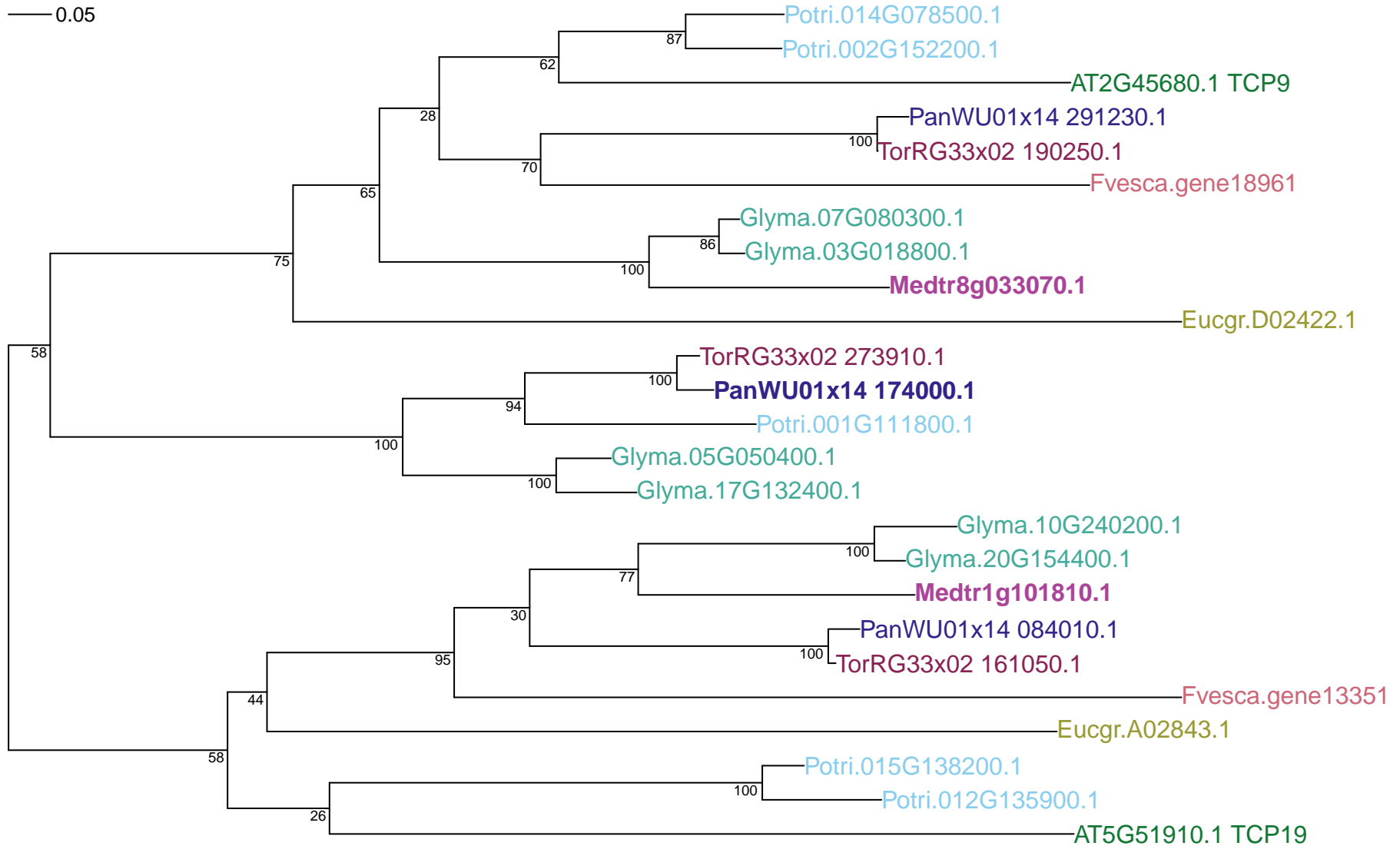
— 0.05



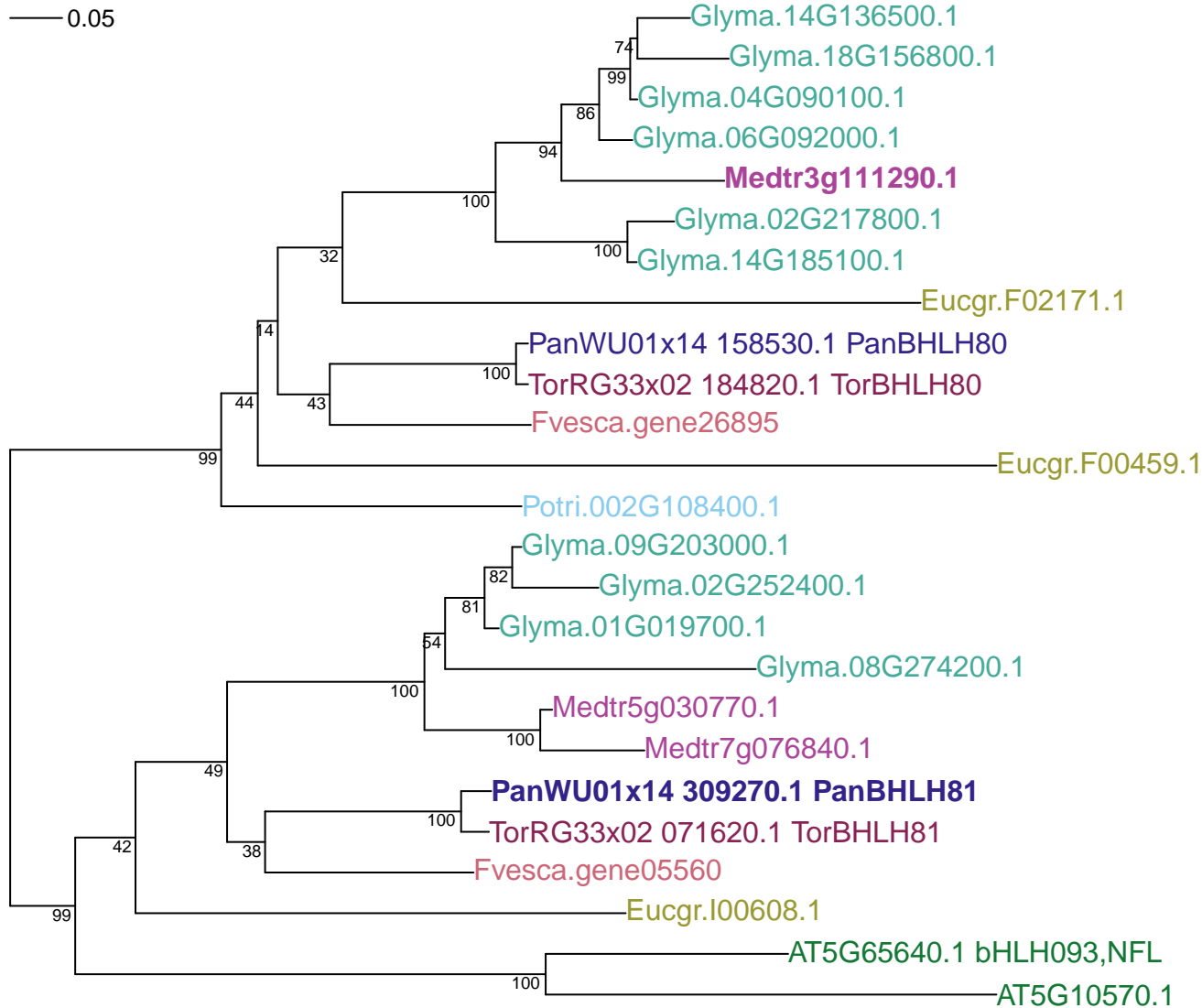
OG0001230: Transcriptional regulators. Basic-leucine zipper transcription factor



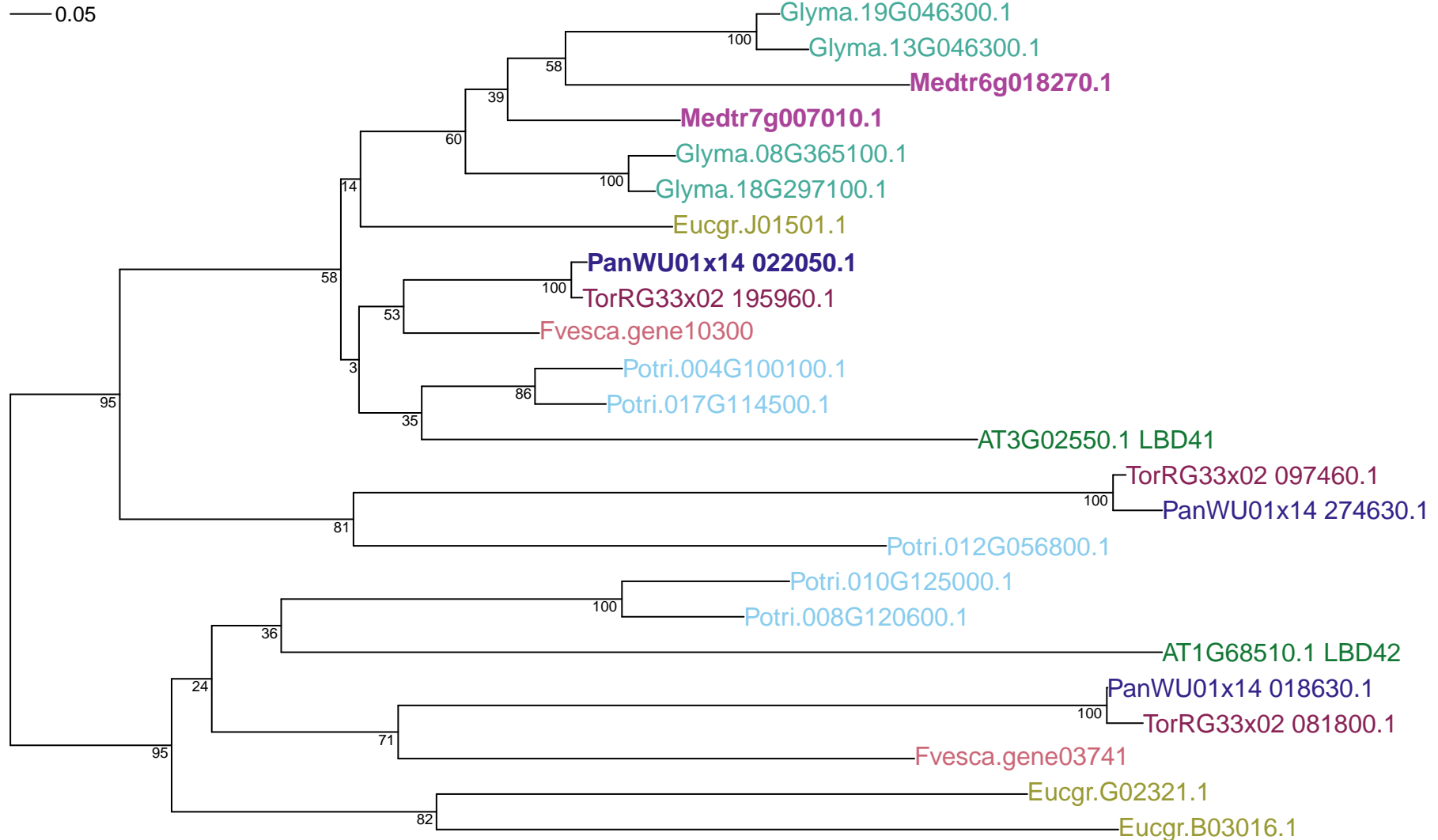
OG0001251: Transcriptional regulators. TCP transcription factor



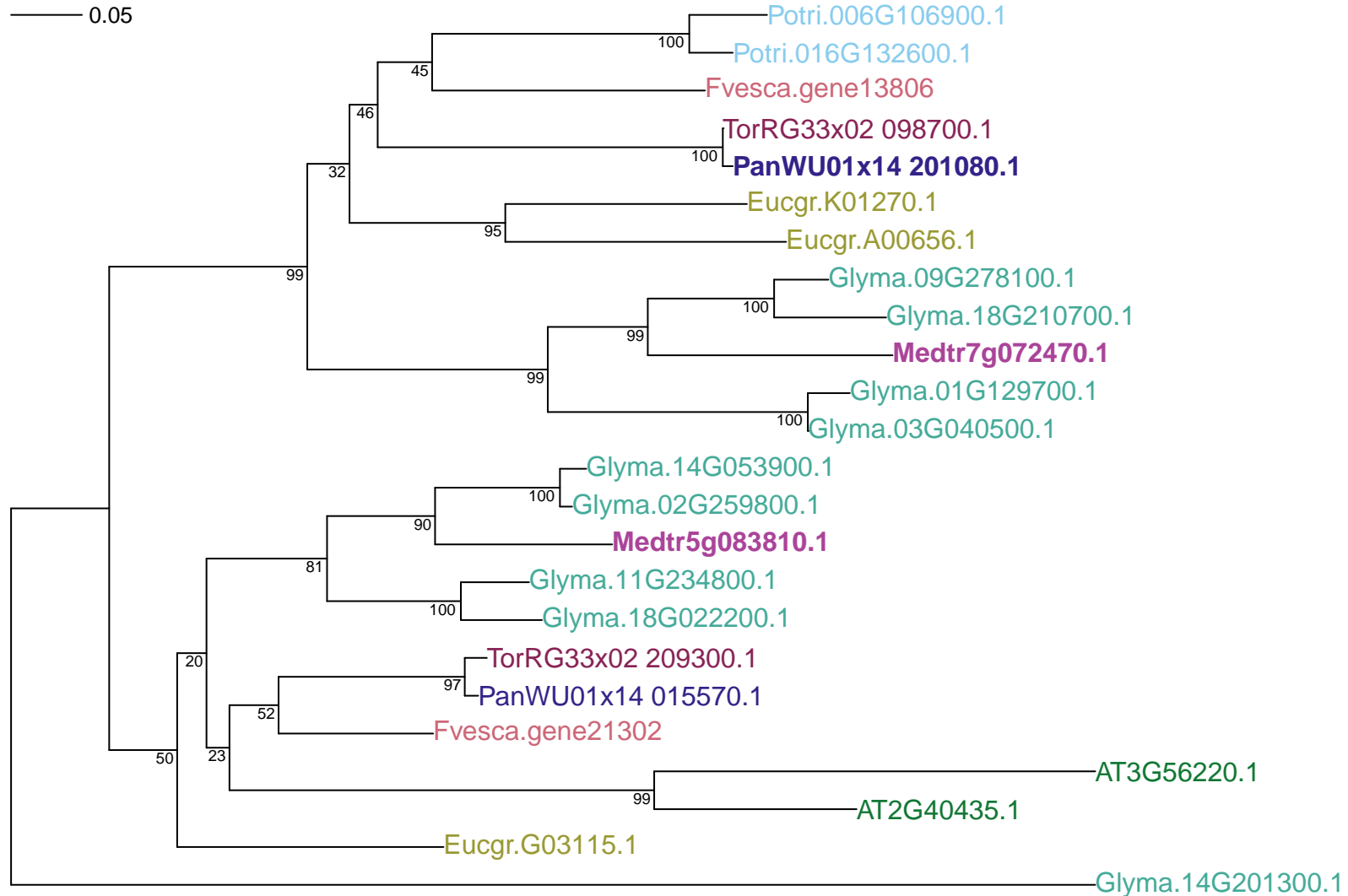
OG0001288: Transcriptional regulators. Basic helix-loop-helix transcription factor



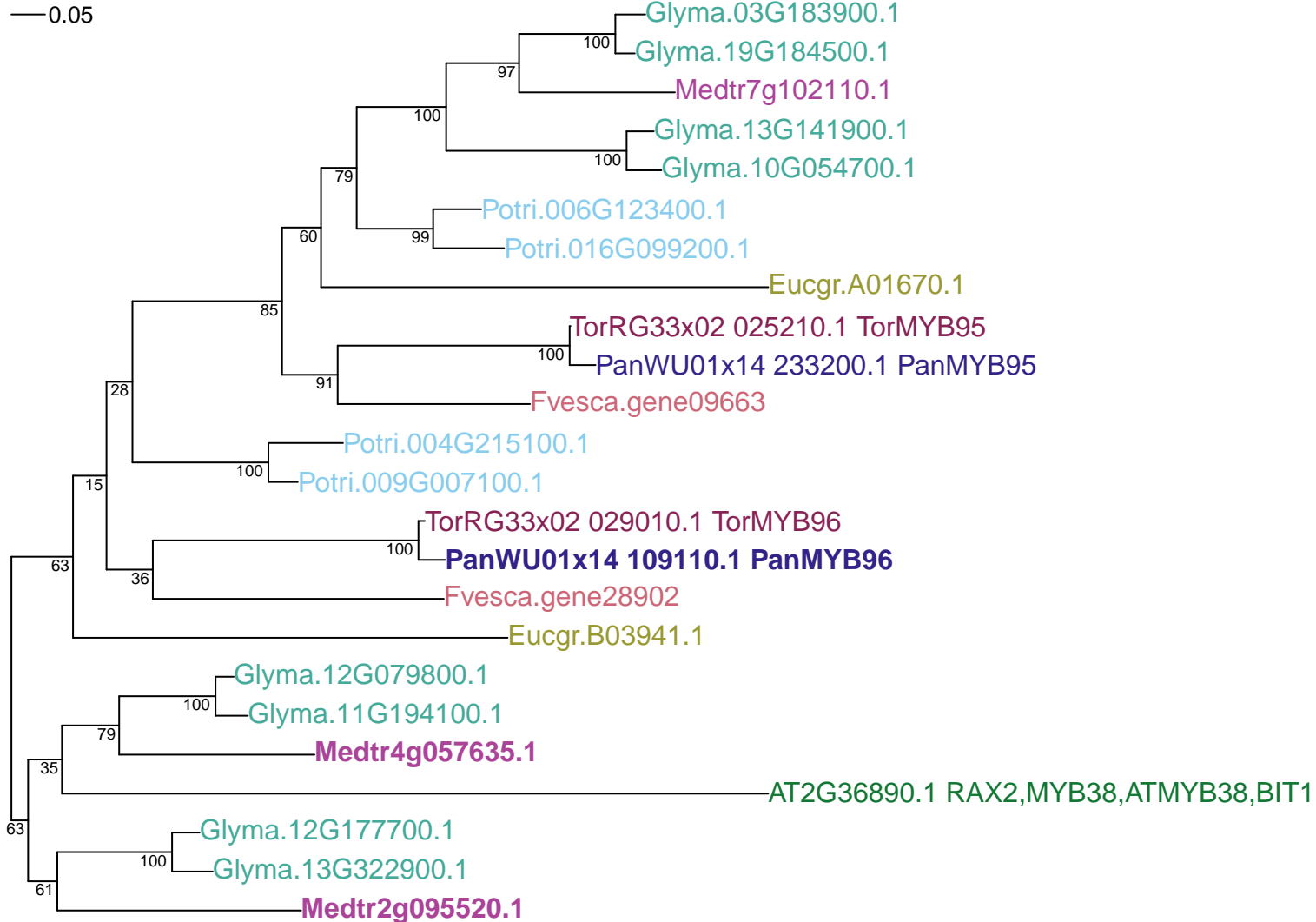
OG0001346: Transcriptional regulators. LOB domain-containing protein



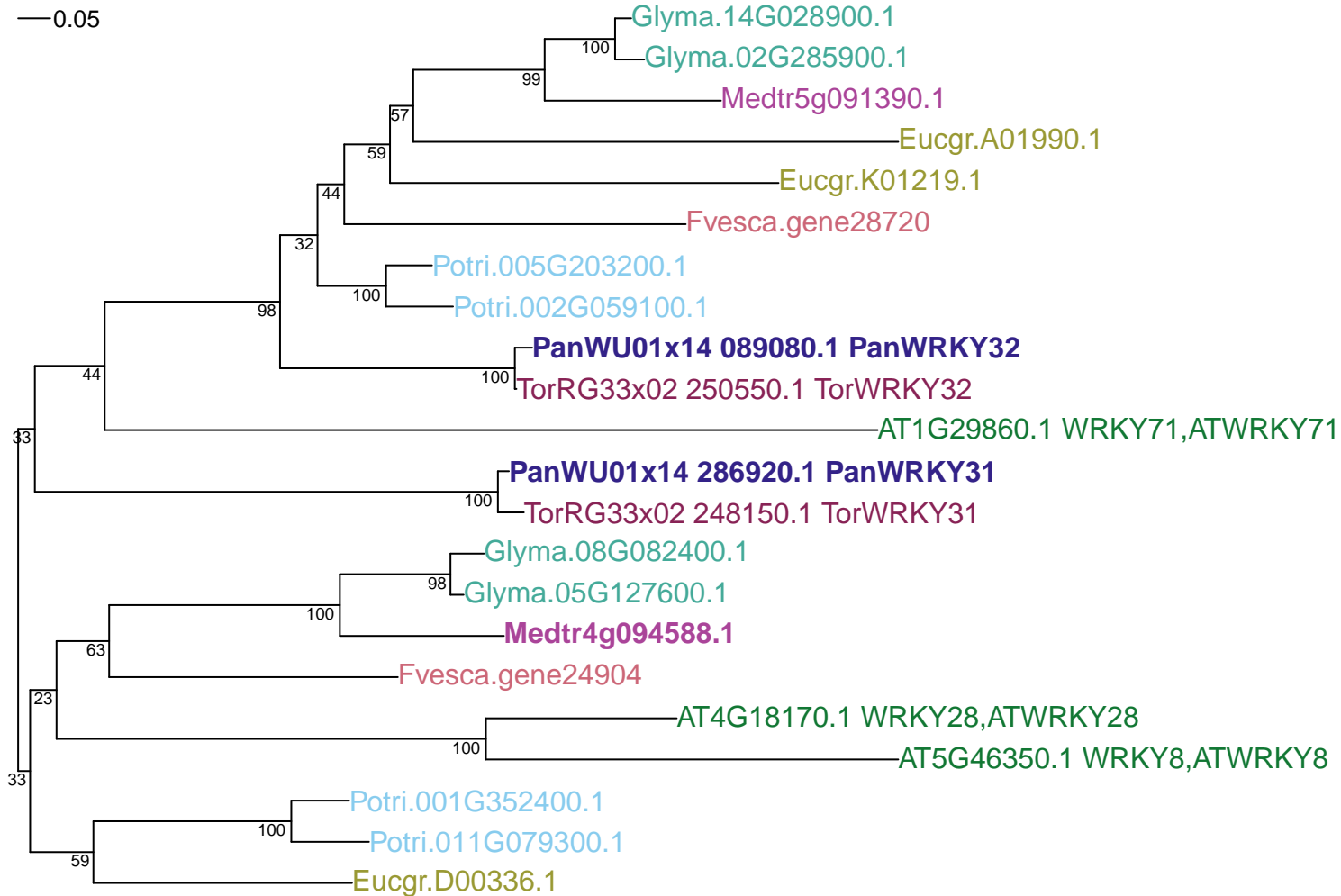
OG0001356: Transcriptional regulators. Myc-type basic helix-loop-helix domain containing protein



OG0001385: Transcriptional regulators. MYB transcription factor

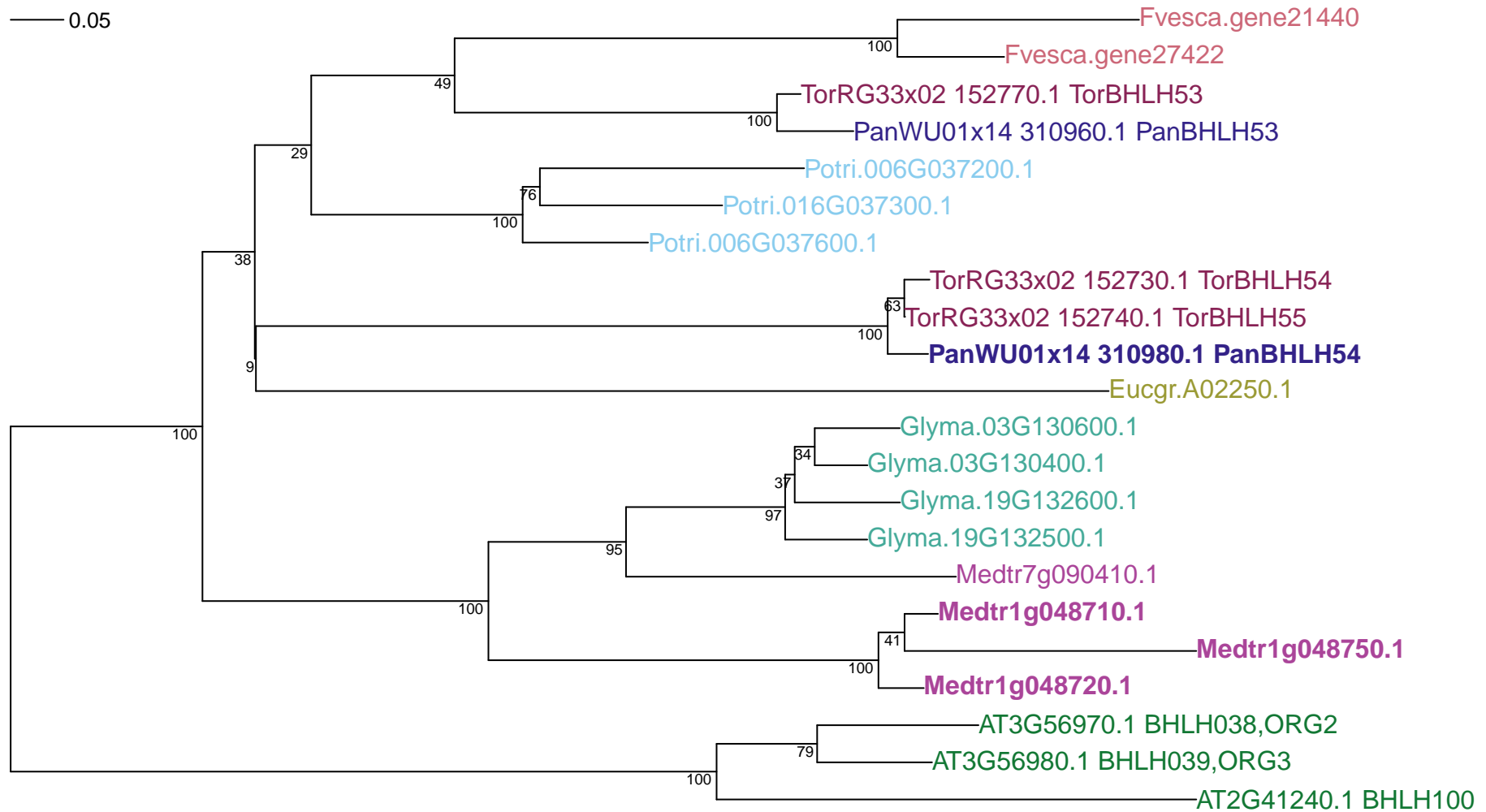


OG0001616: Transcriptional regulators. WRKY domain containing protein



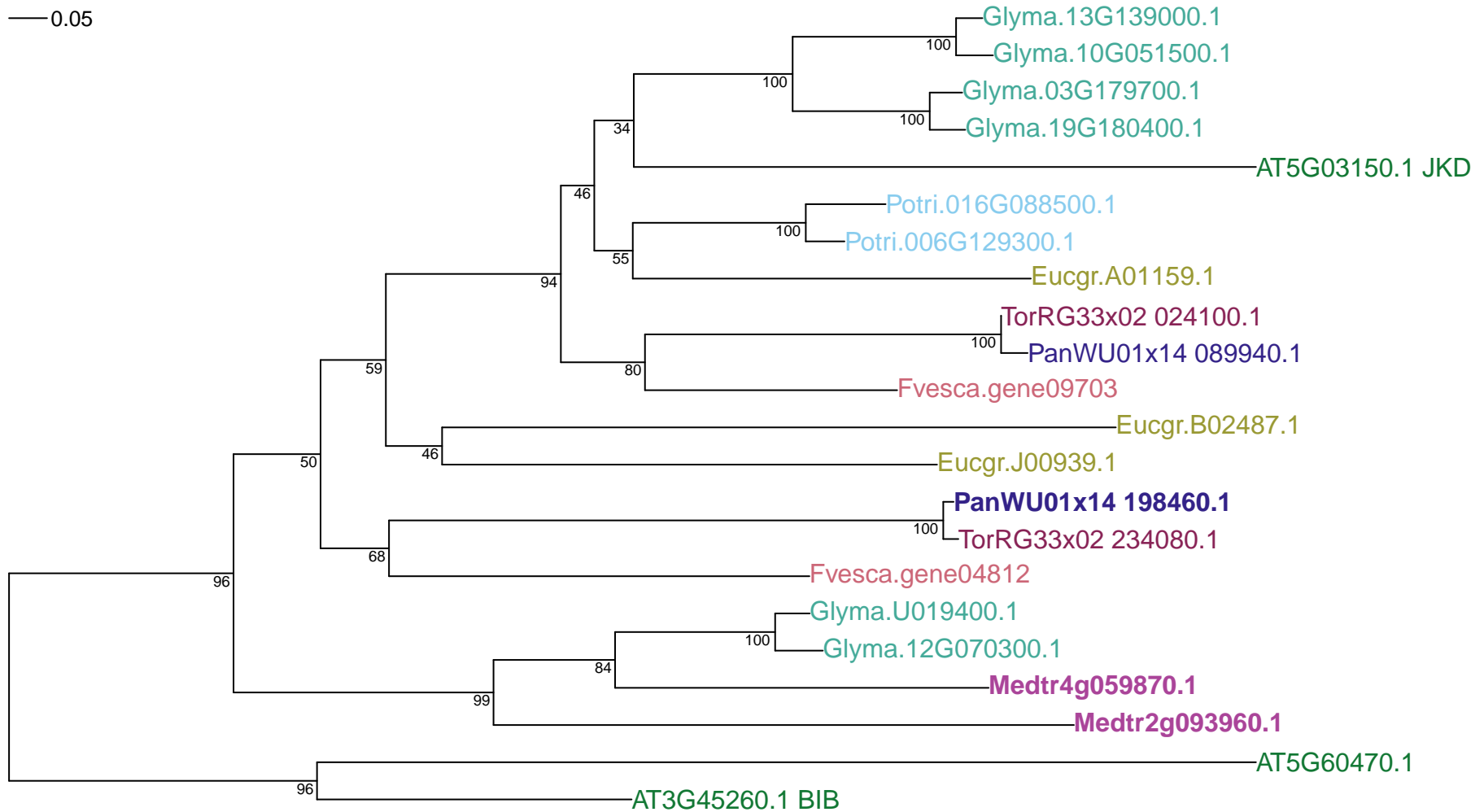
OG0001683: Transcriptional regulators. Basic helix-loop-helix transcription factor

— 0.05

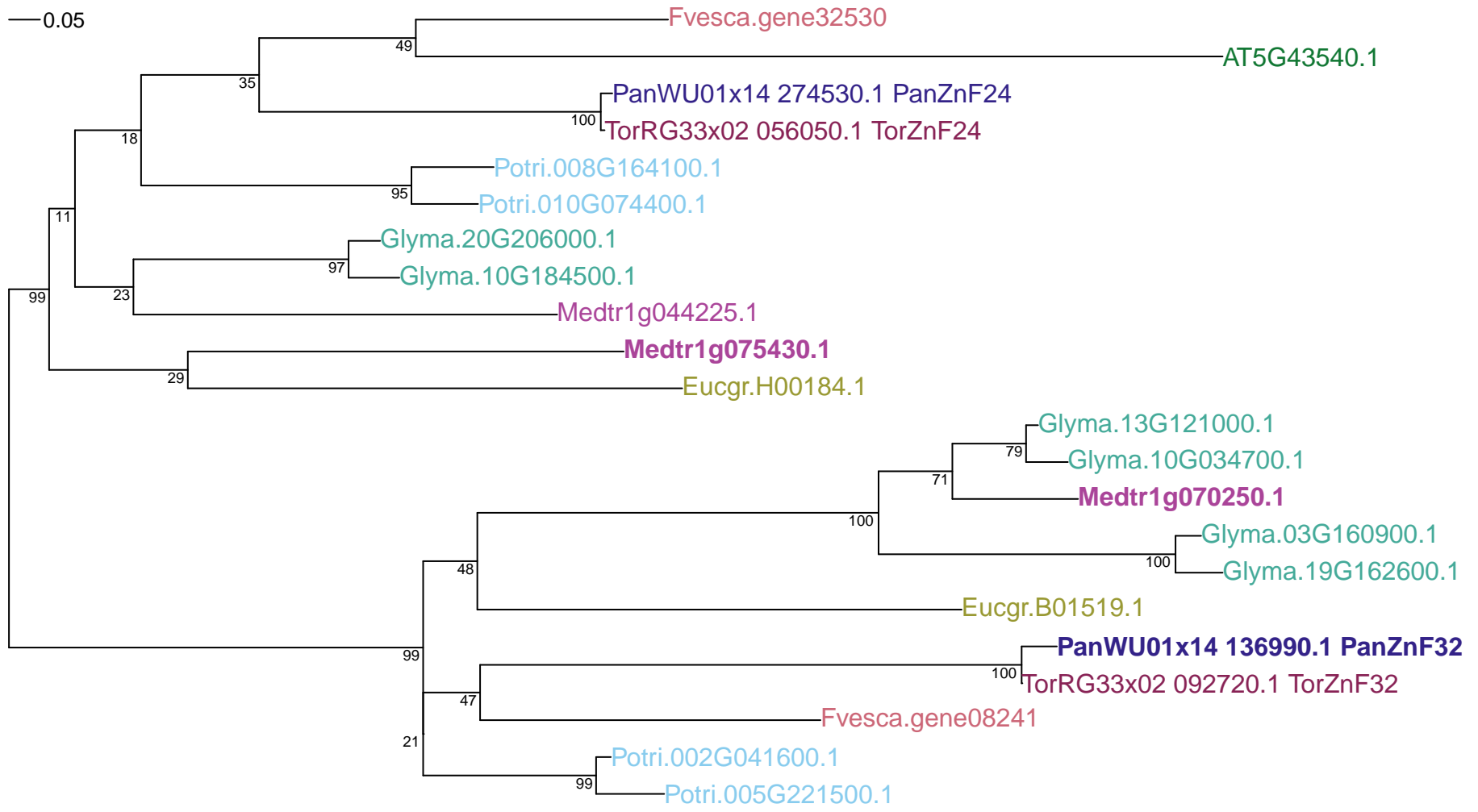


OG0001734: Transcriptional regulators. TFIID C1-like domain containing protein

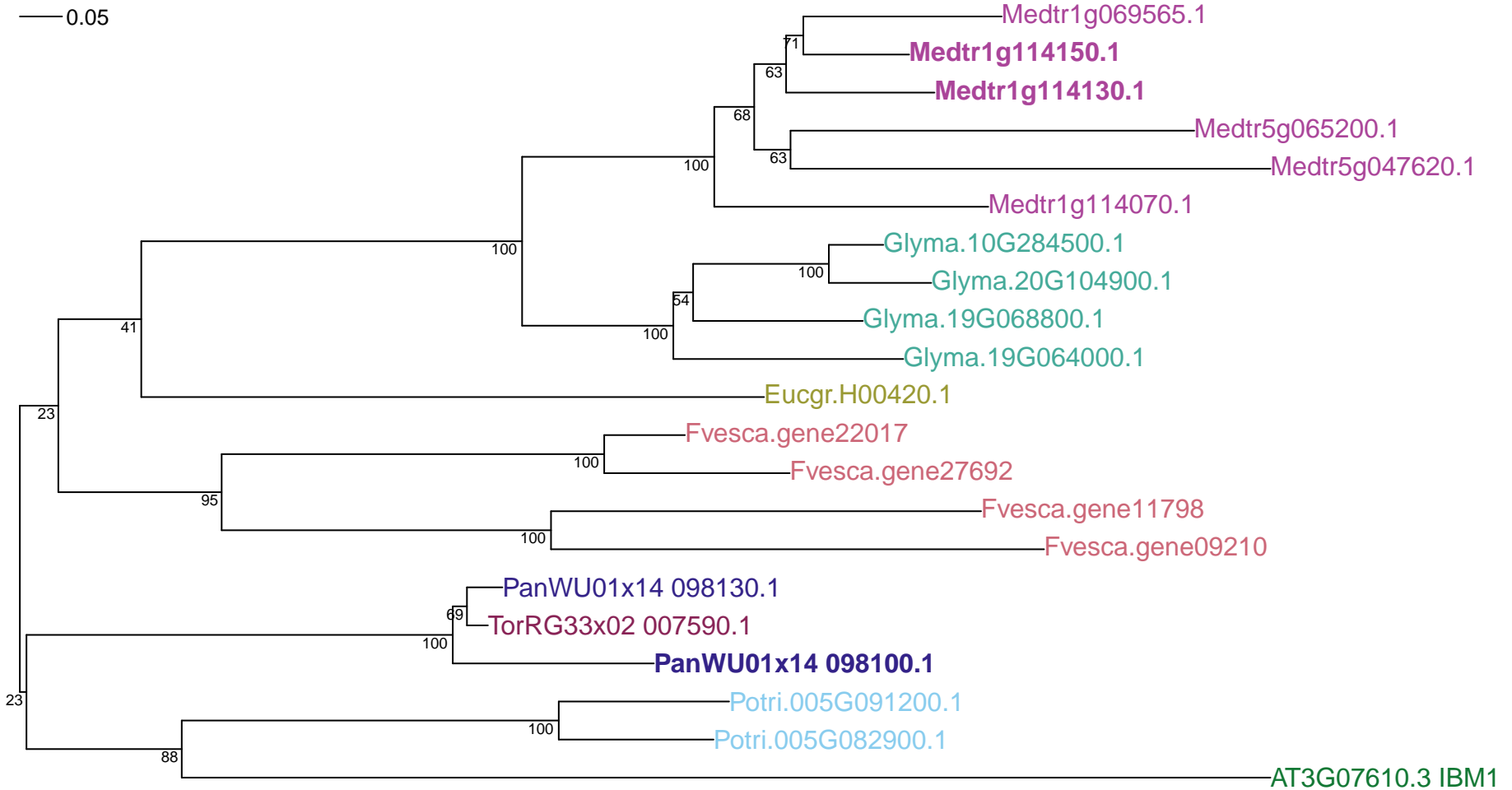
—0.05



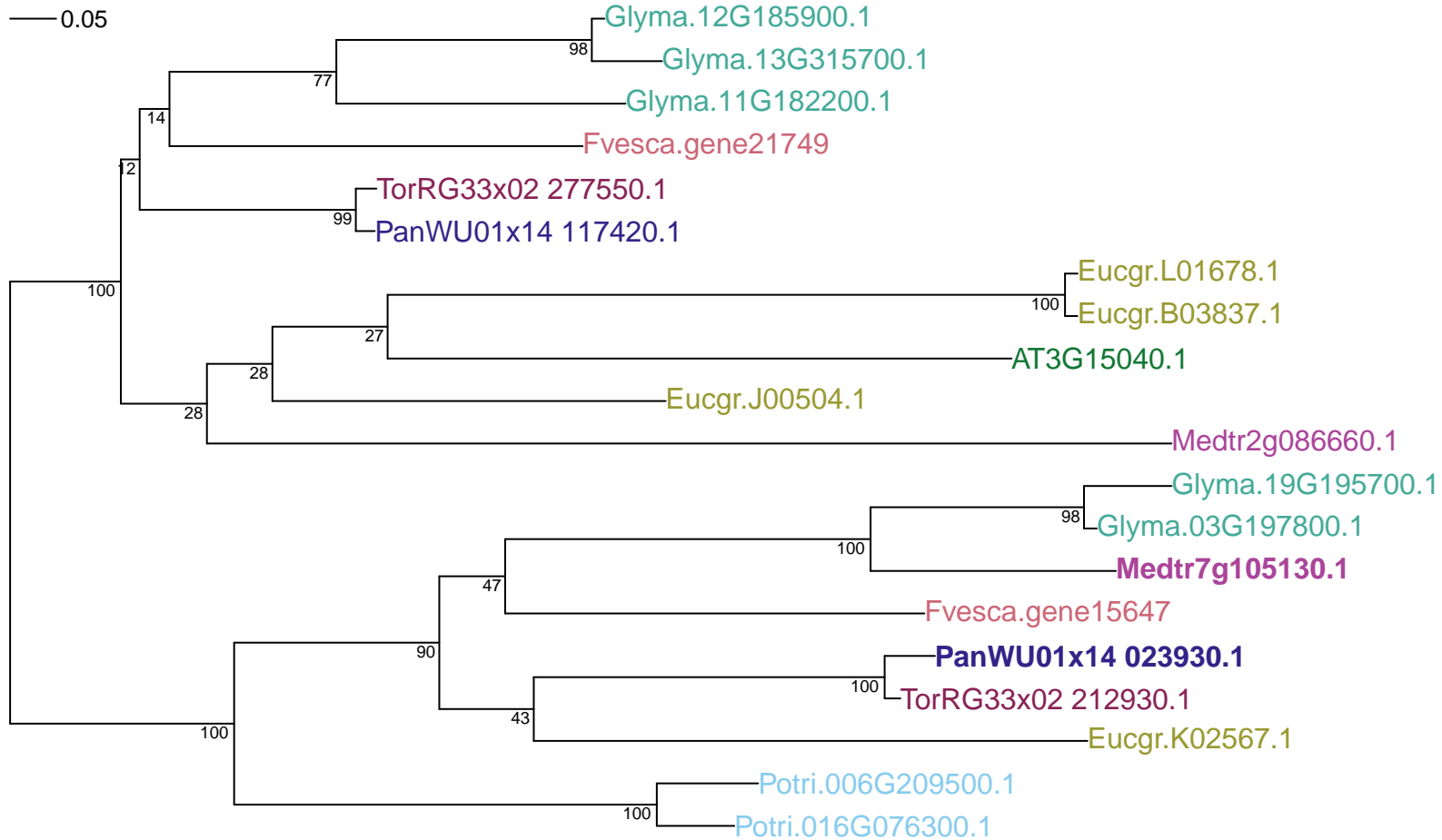
OG0001778: Transcriptional regulators. Yin/yang transcription factor



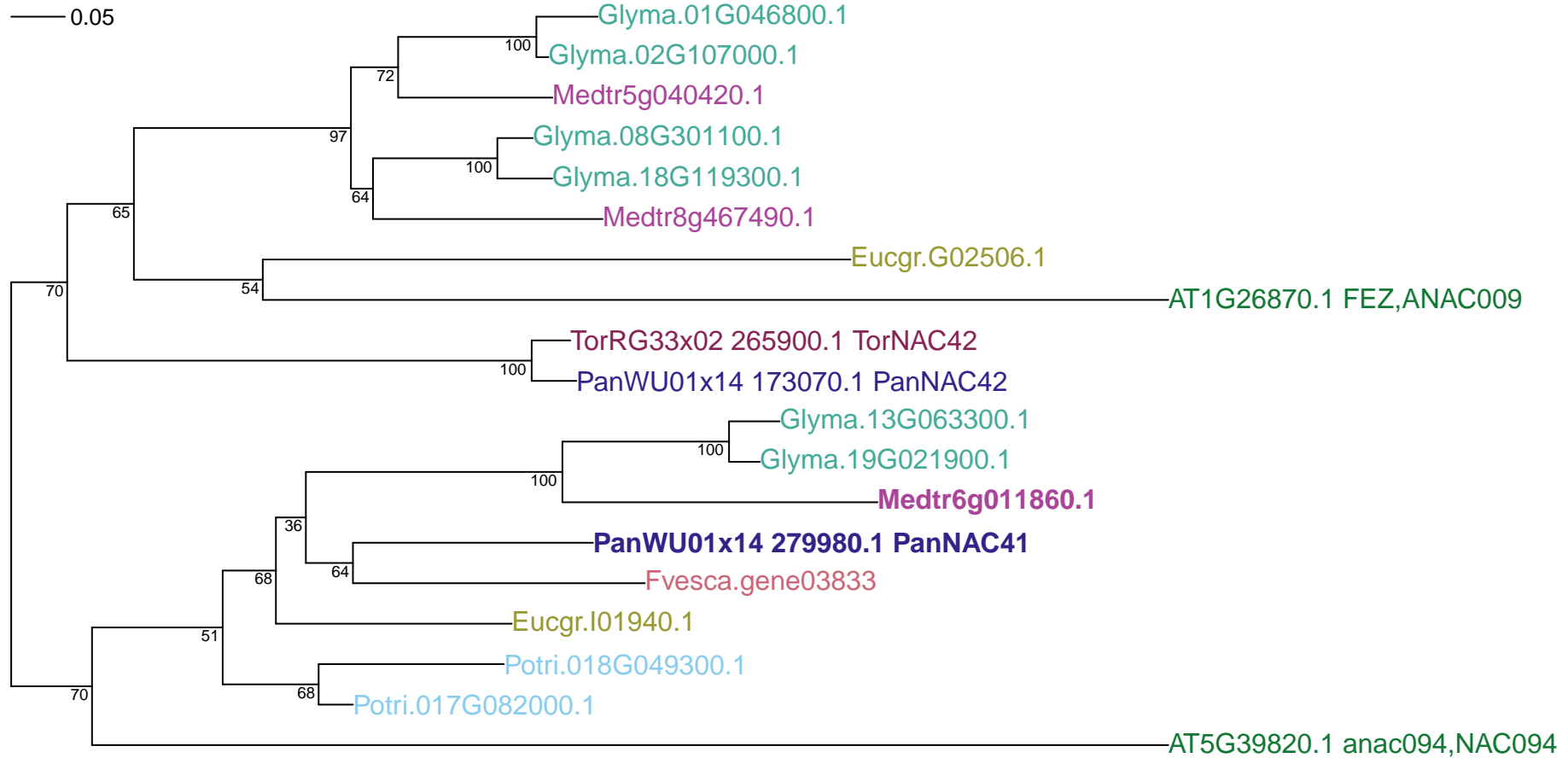
OG0001948: Transcriptional regulators. JmjC domain containing protein



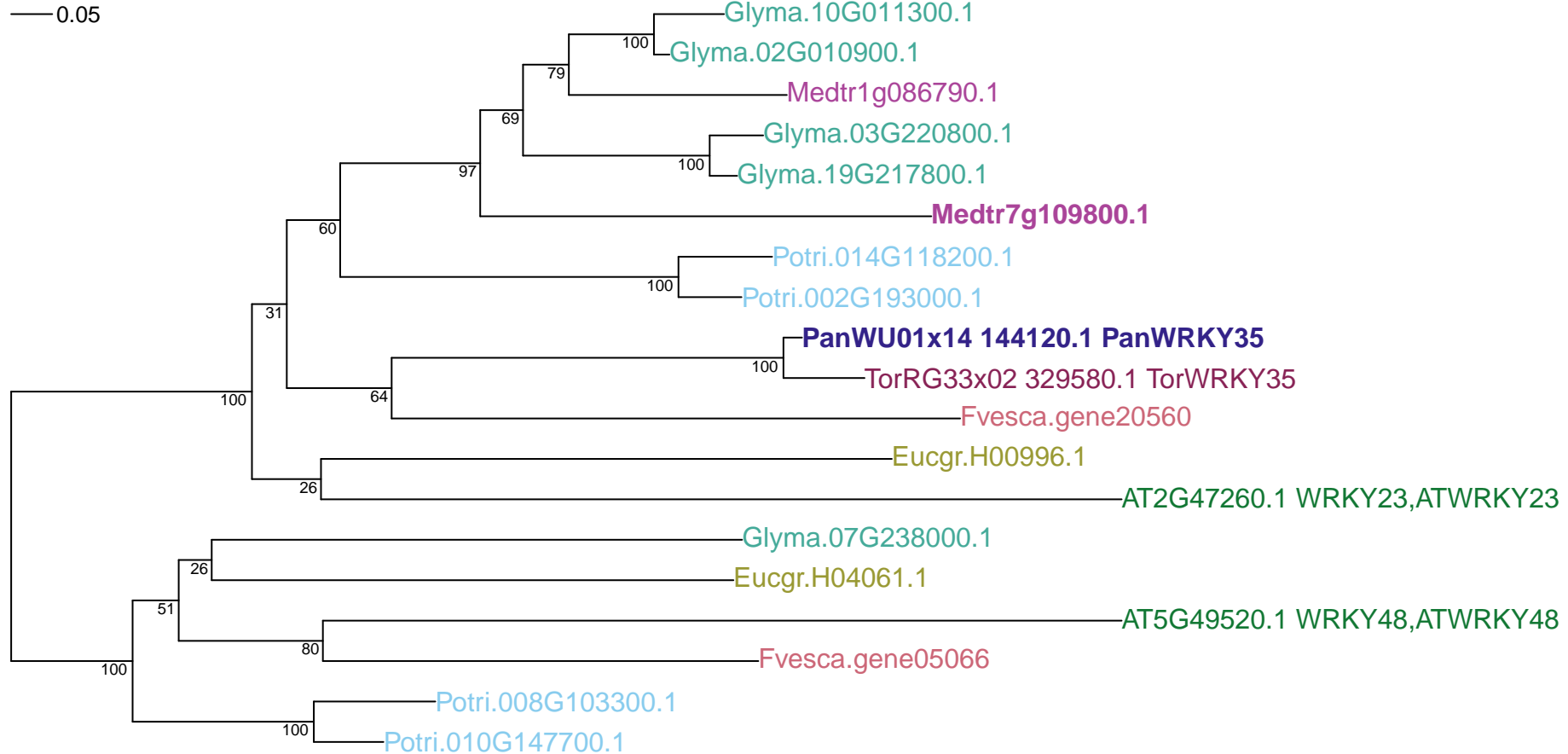
OG0002183: Transcriptional regulators. Senescence regulator



OG0002267: Transcriptional regulators. NAC domain containing protein

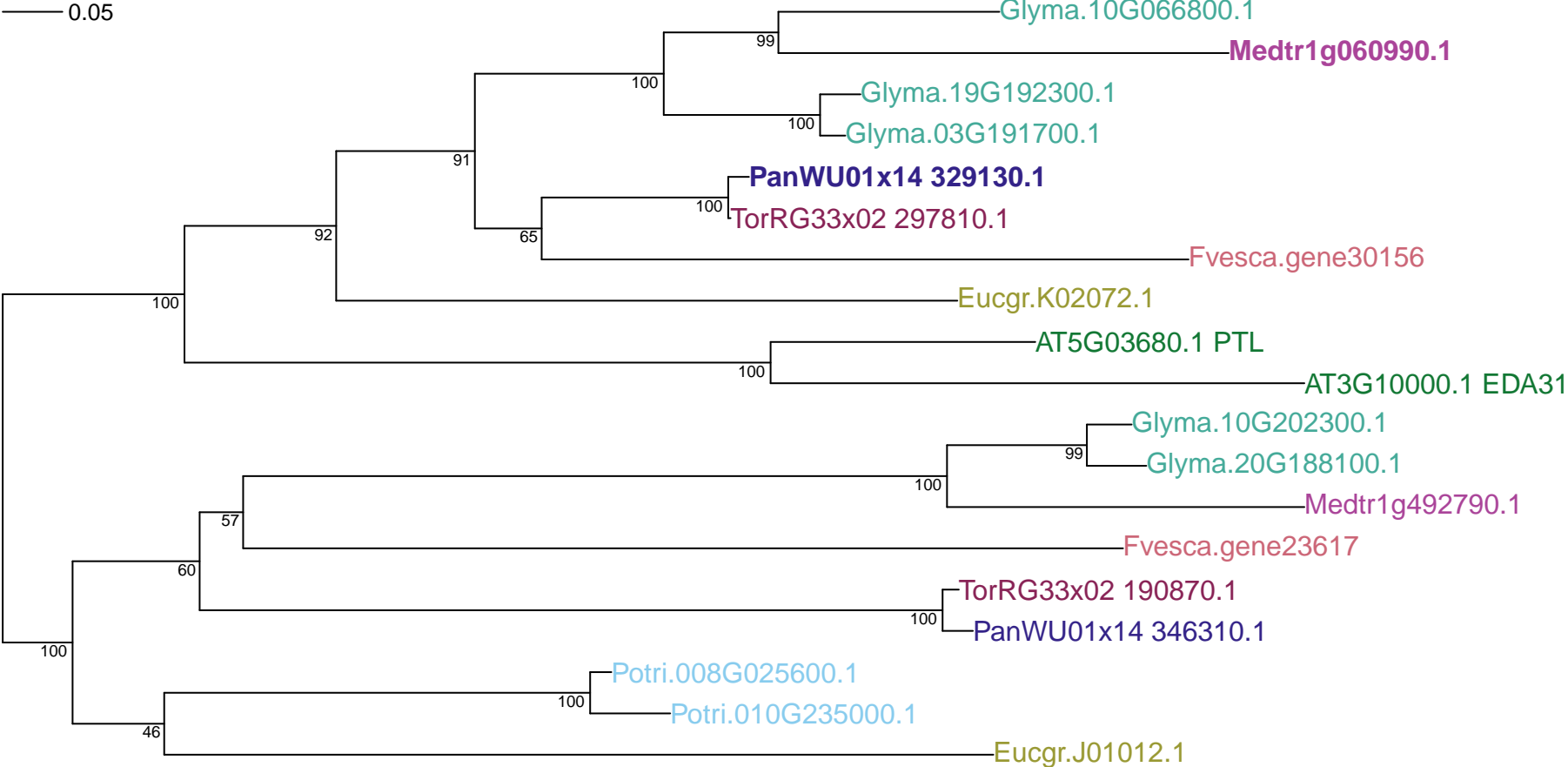


OG0002355: Transcriptional regulators. WRKY domain containing protein

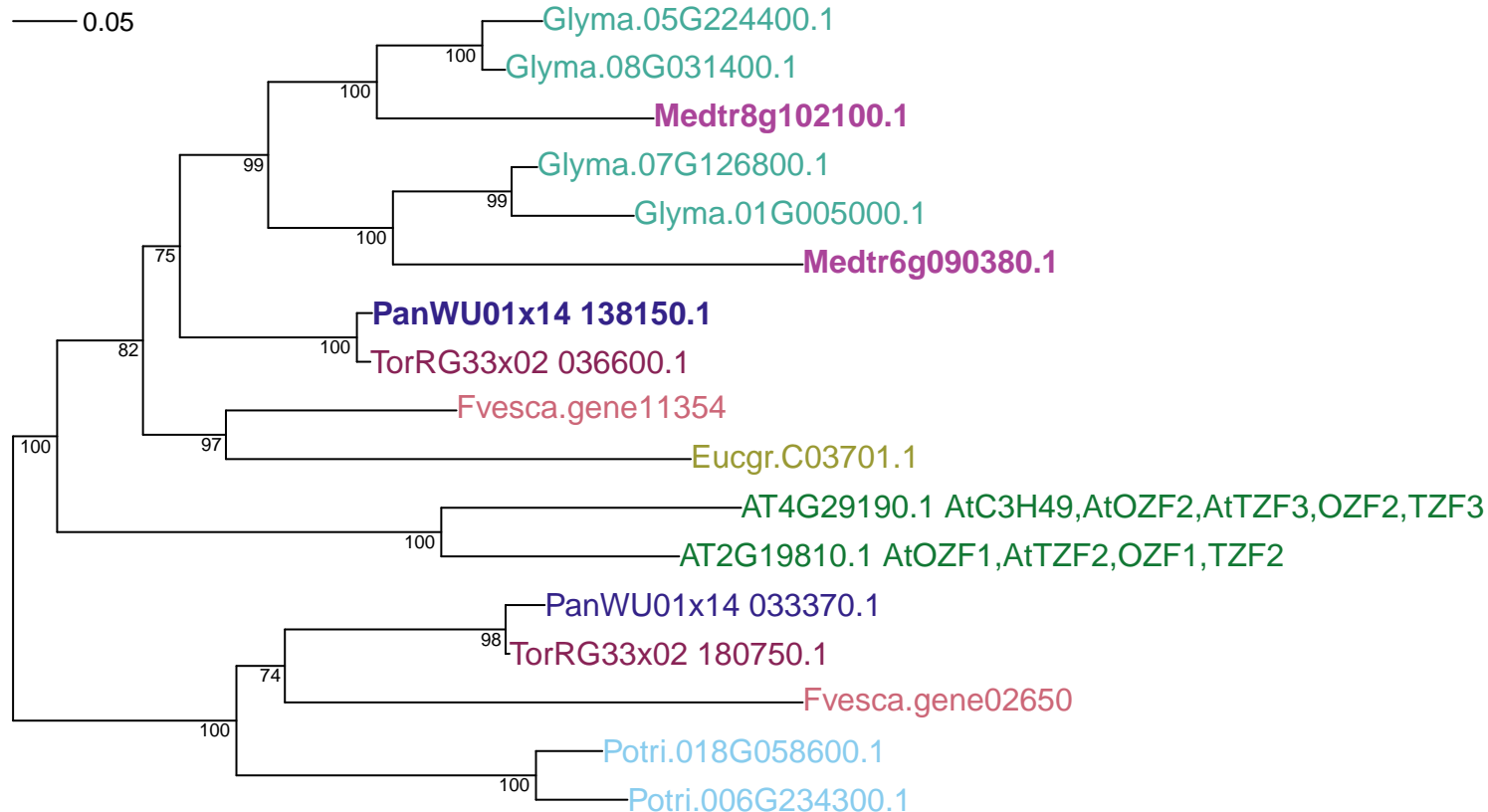


OG0002399: Transcriptional regulators. GAMYB transcription factor

— 0.05

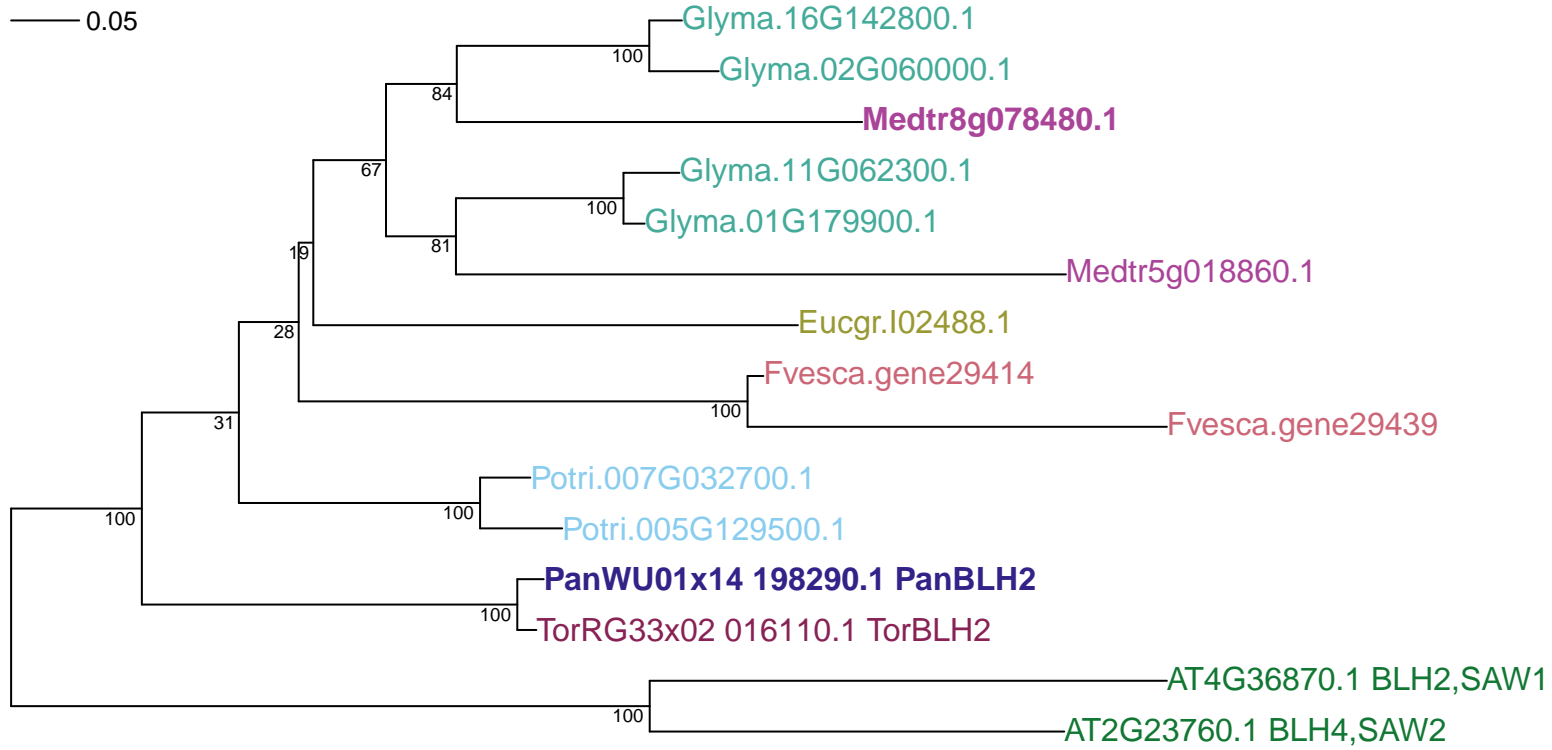


OG0002926: Transcriptional regulators. Zinc finger, CCCH-type



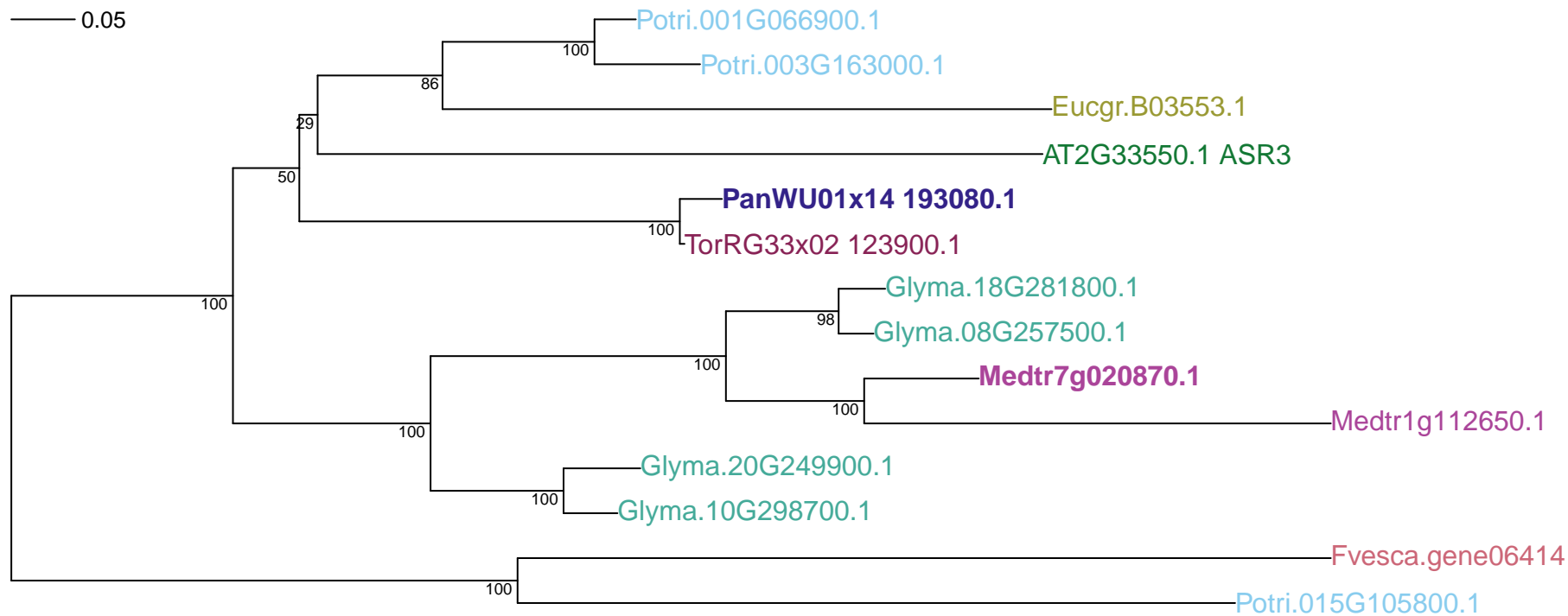
OG0003596: Transcriptional regulators. Knotted like homeodomain transcription factor

— 0.05



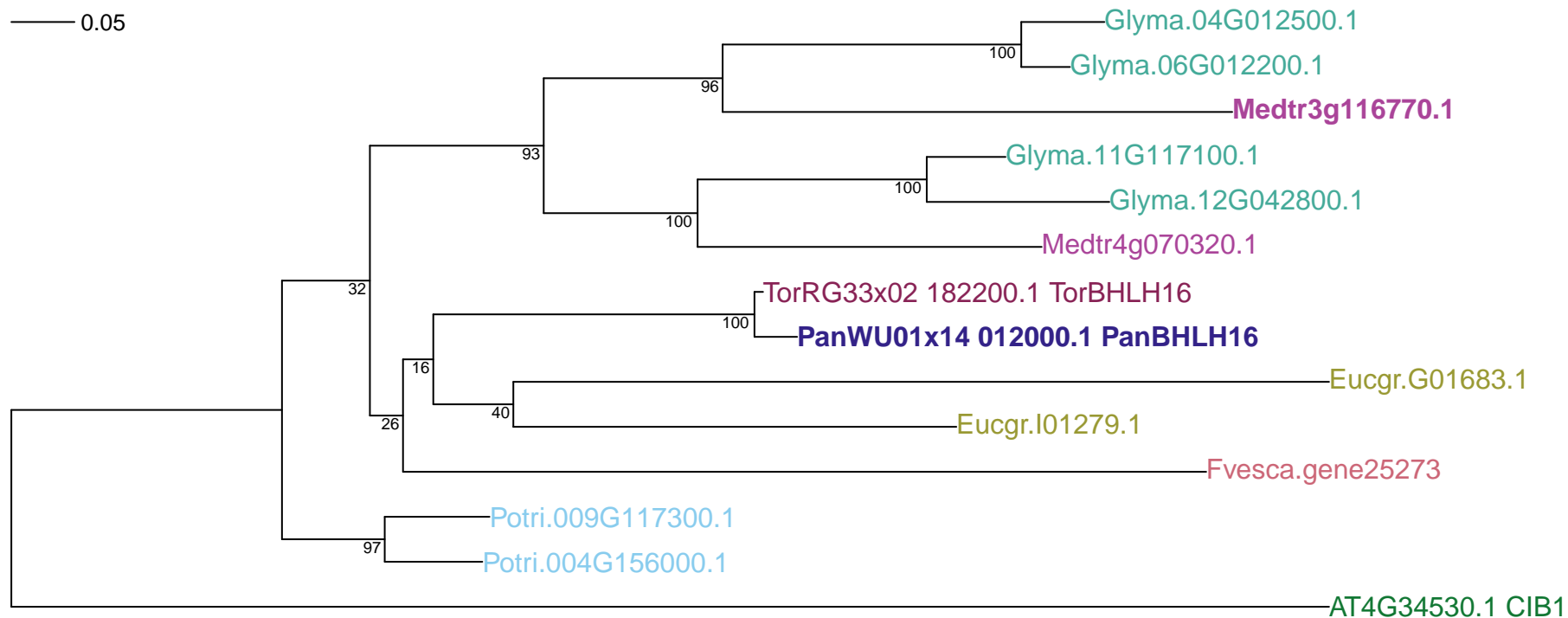
OG0004155: Transcriptional regulators. Homeodomain-like

0.05

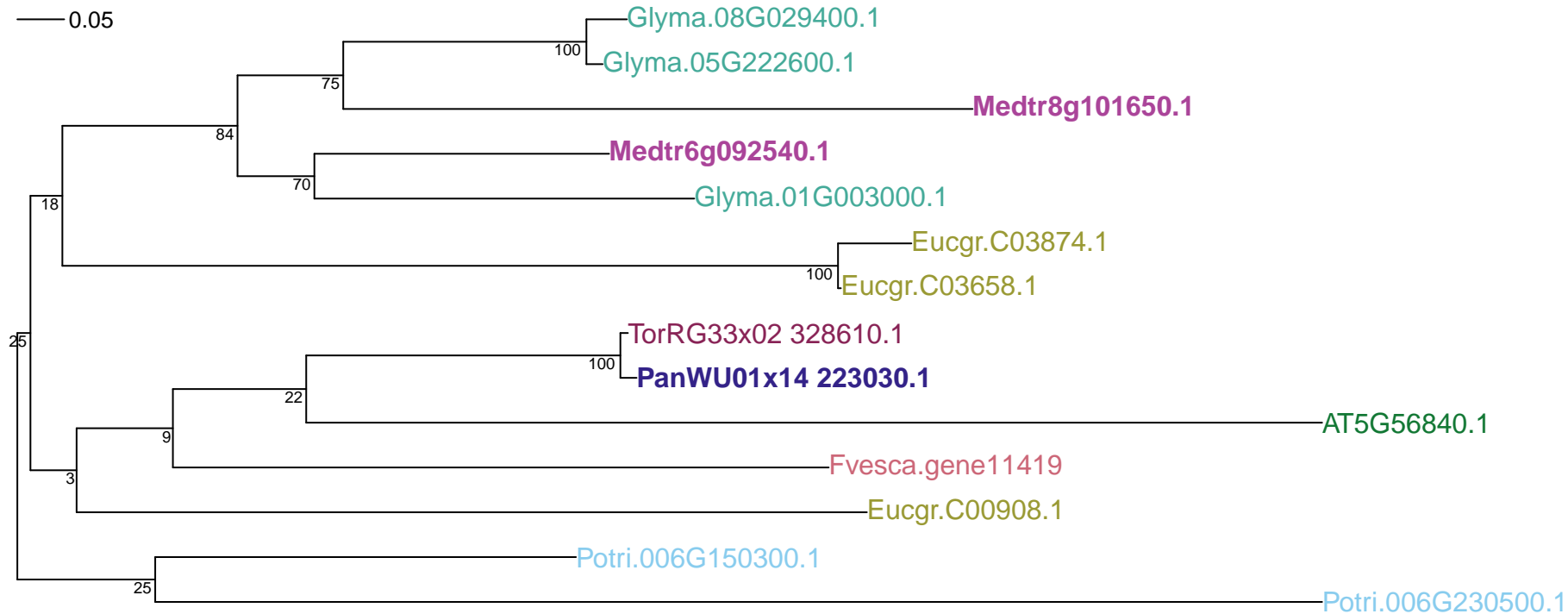


OG0004363: Transcriptional regulators. Basic helix-loop-helix transcription factor

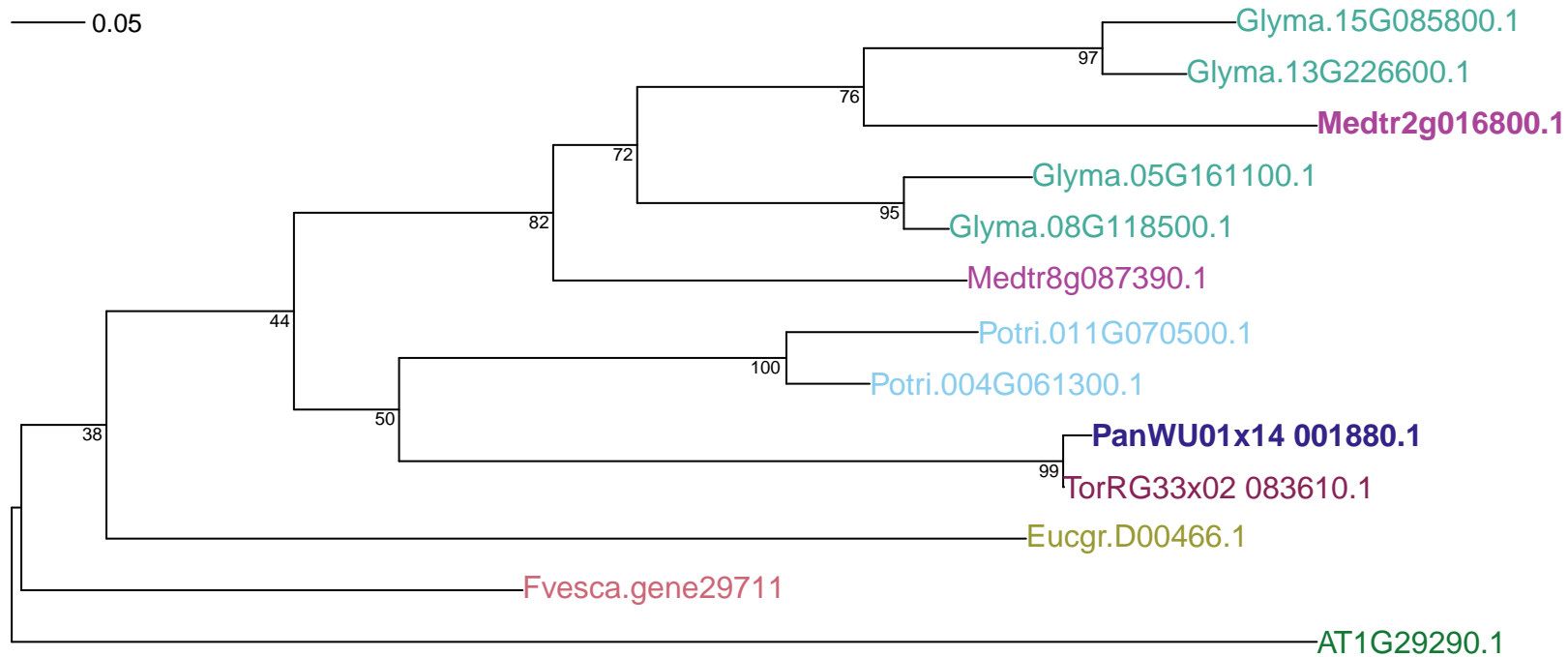
— 0.05



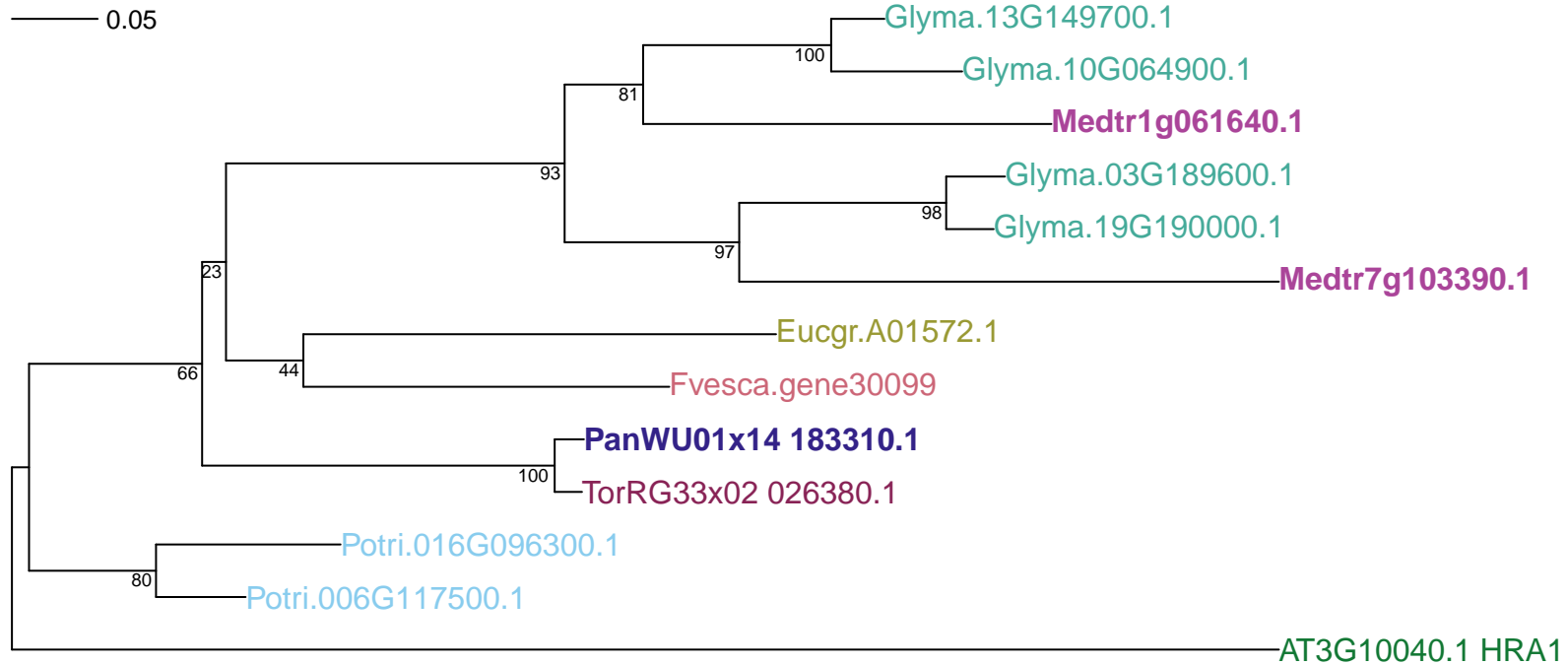
OG0004432: Transcriptional regulators. GAMYB transcription factor



OG0004589: Transcriptional regulators. B-cell lymphoma 6 protein

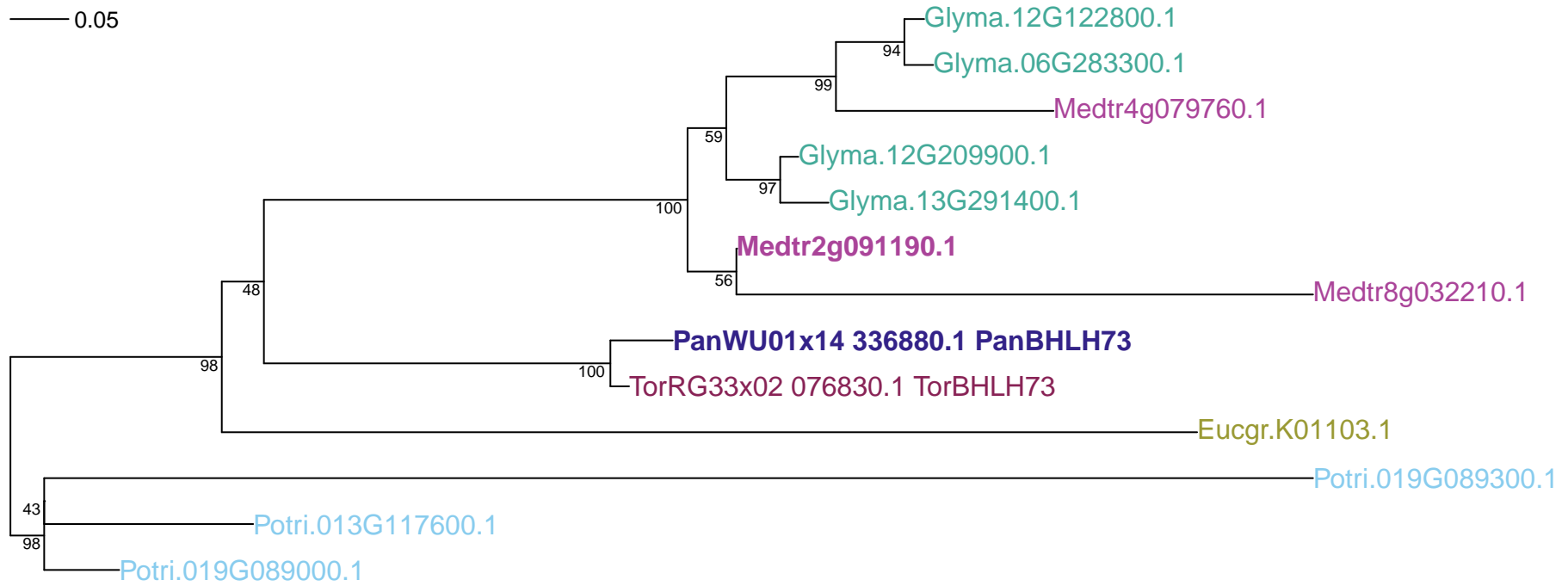


OG0005031: Transcriptional regulators. sequence-specific DNA binding transcription factor

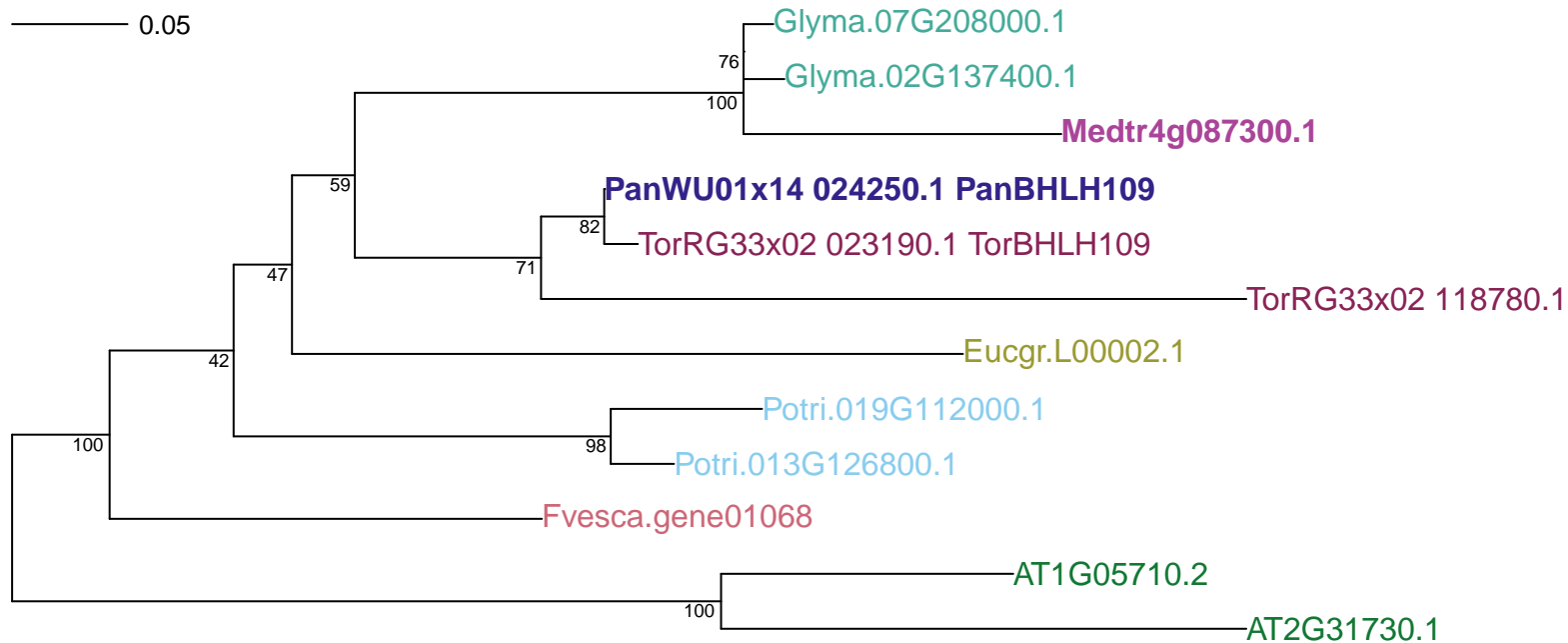


OG0005333: Transcriptional regulators. Basic helix-loop-helix transcription factor

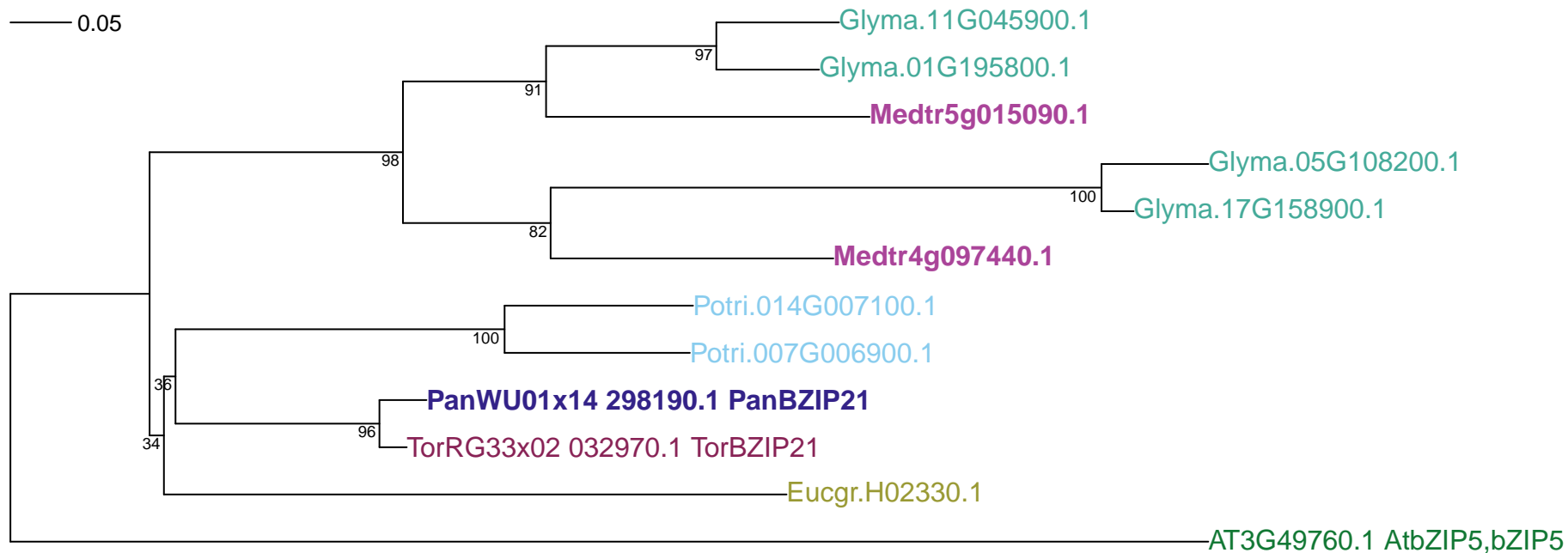
— 0.05



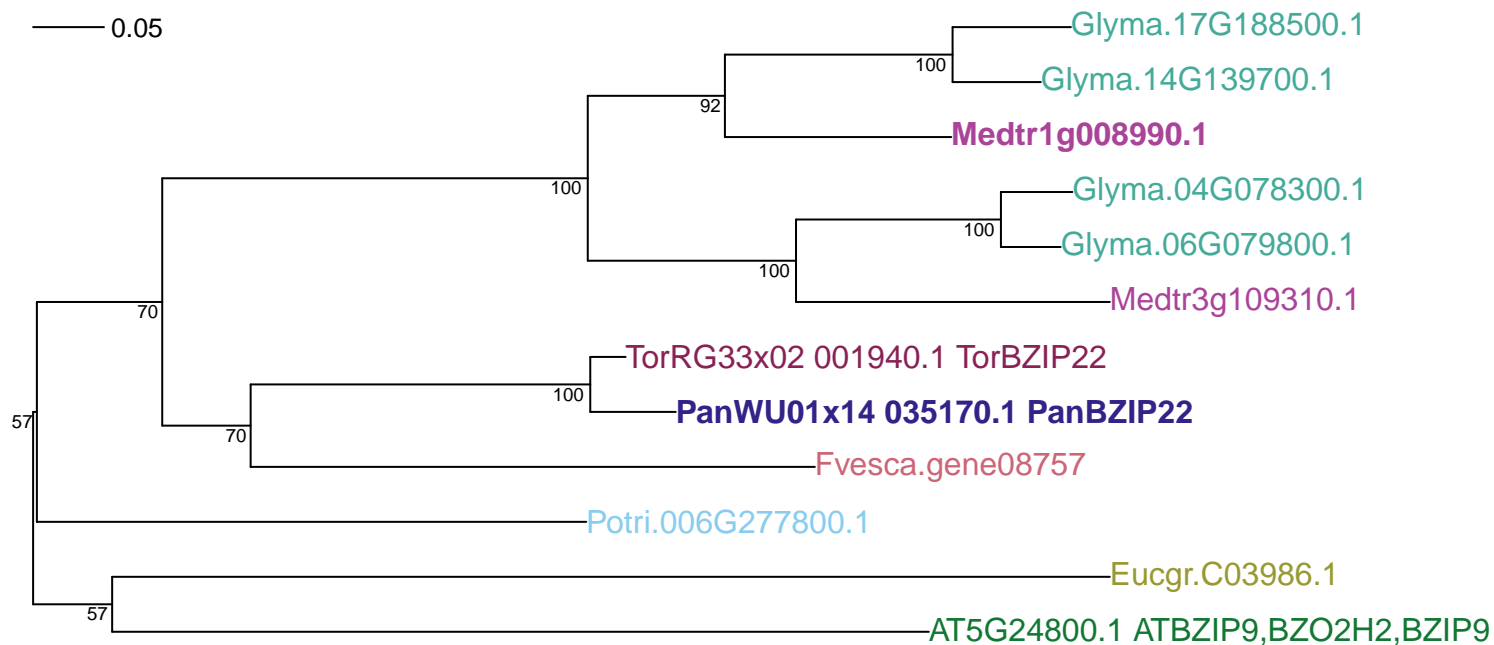
OG0005648: Transcriptional regulators. Myc-type, basic helix-loop-helix (bHLH) domain containing protein



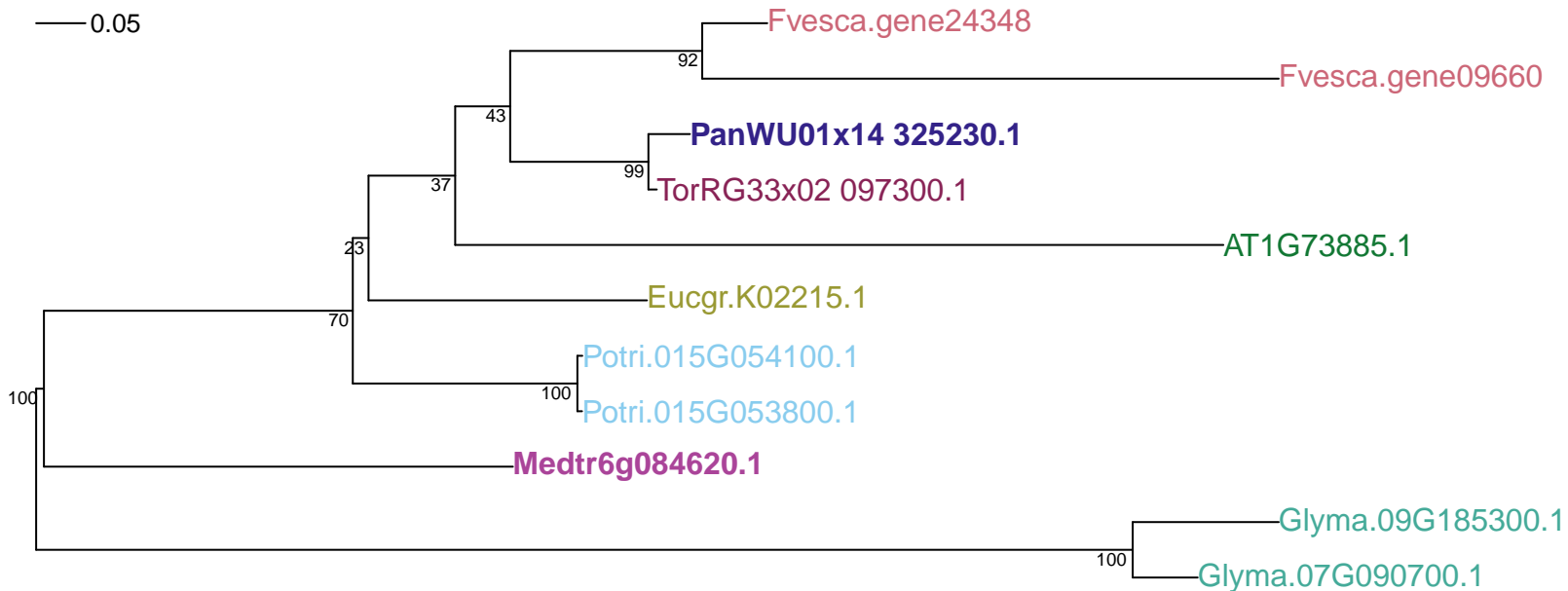
OG0005855: Transcriptional regulators. Basic-leucine zipper transcription factor



OG0006273: Transcriptional regulators. Basic-leucine zipper transcription factor

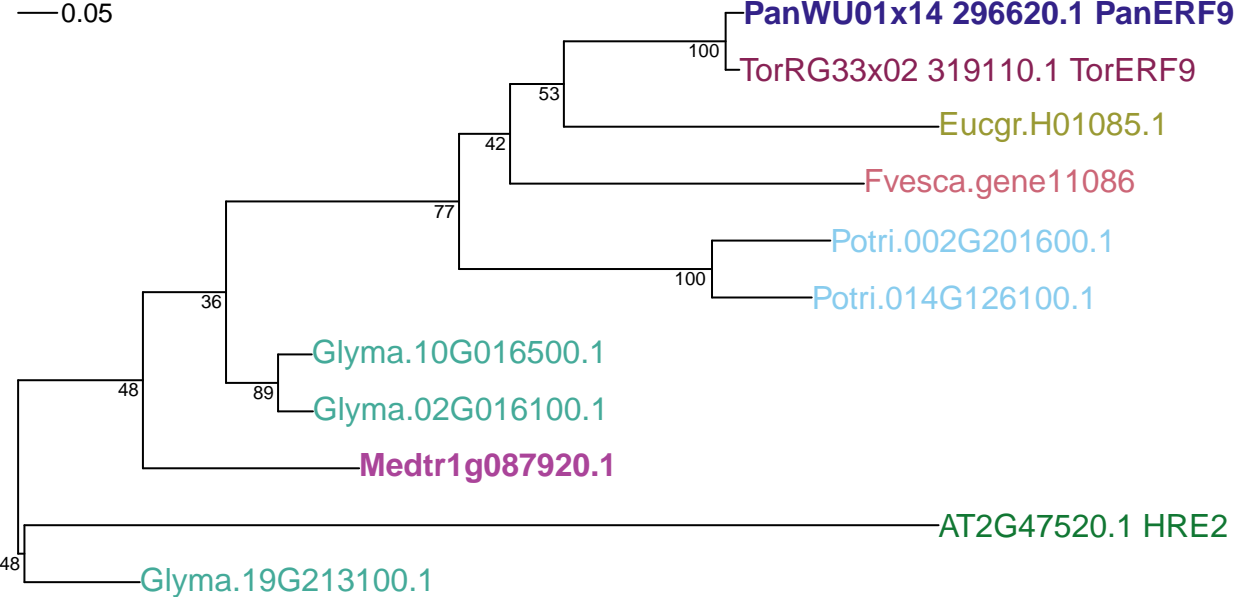


OG0006734: Transcriptional regulators. AT-rich interactive domain protein

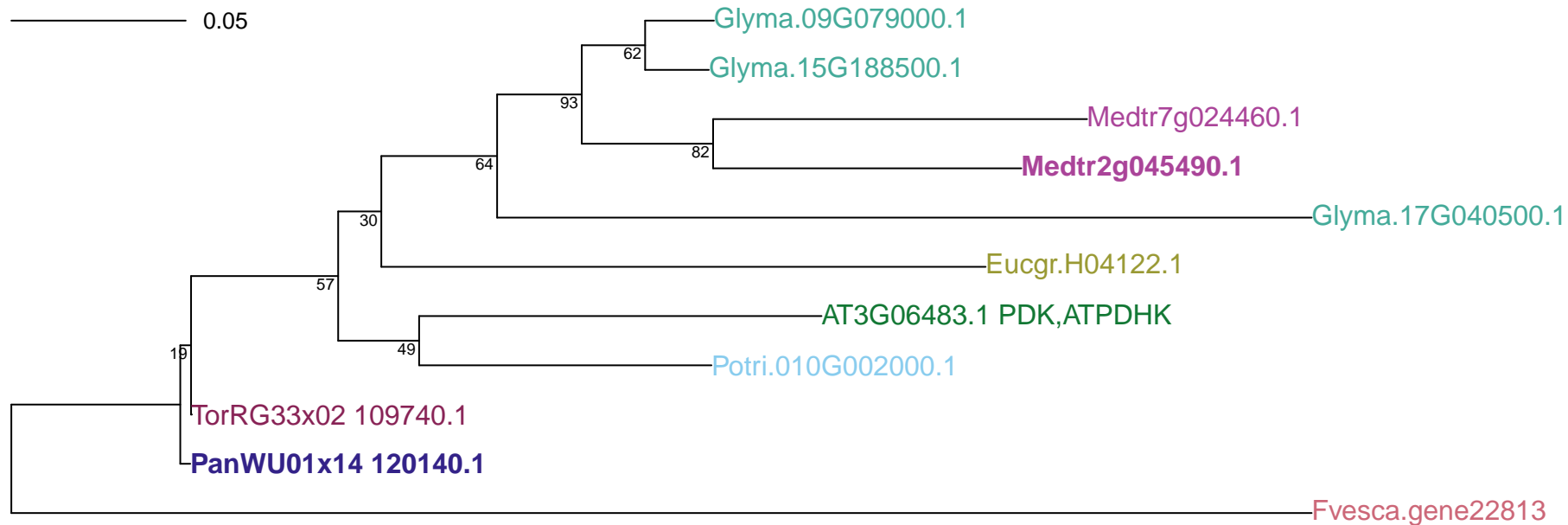


OG0006886: Transcriptional regulators. AP2/ERF transcription factor

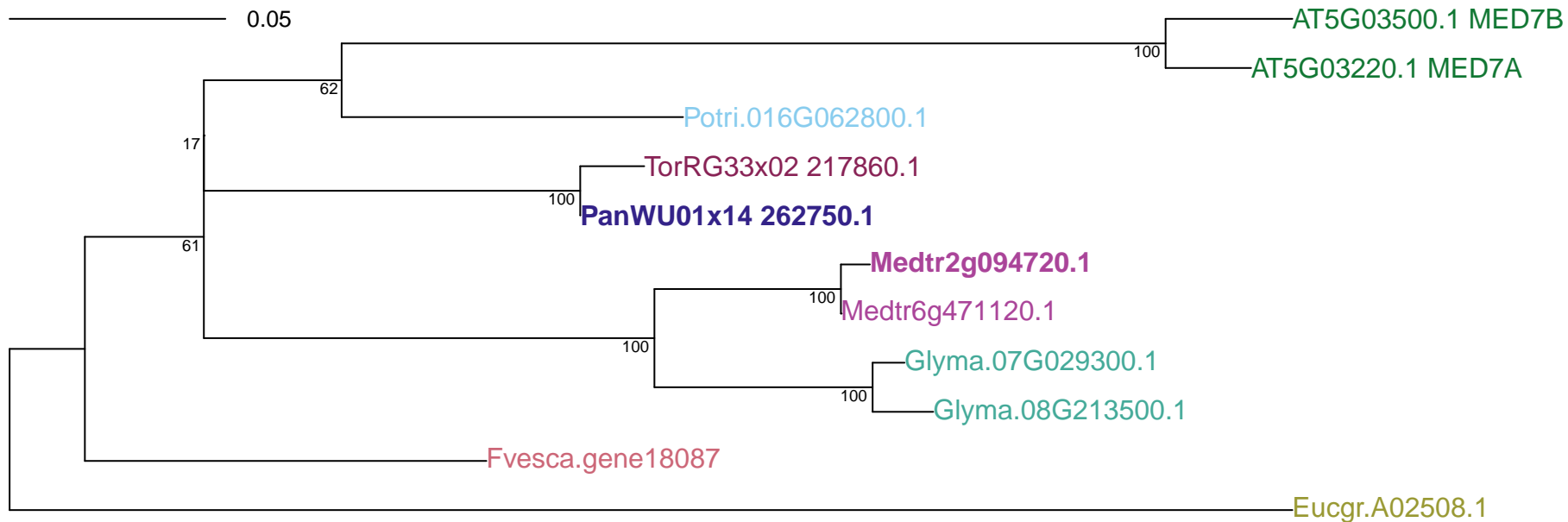
— 0.05



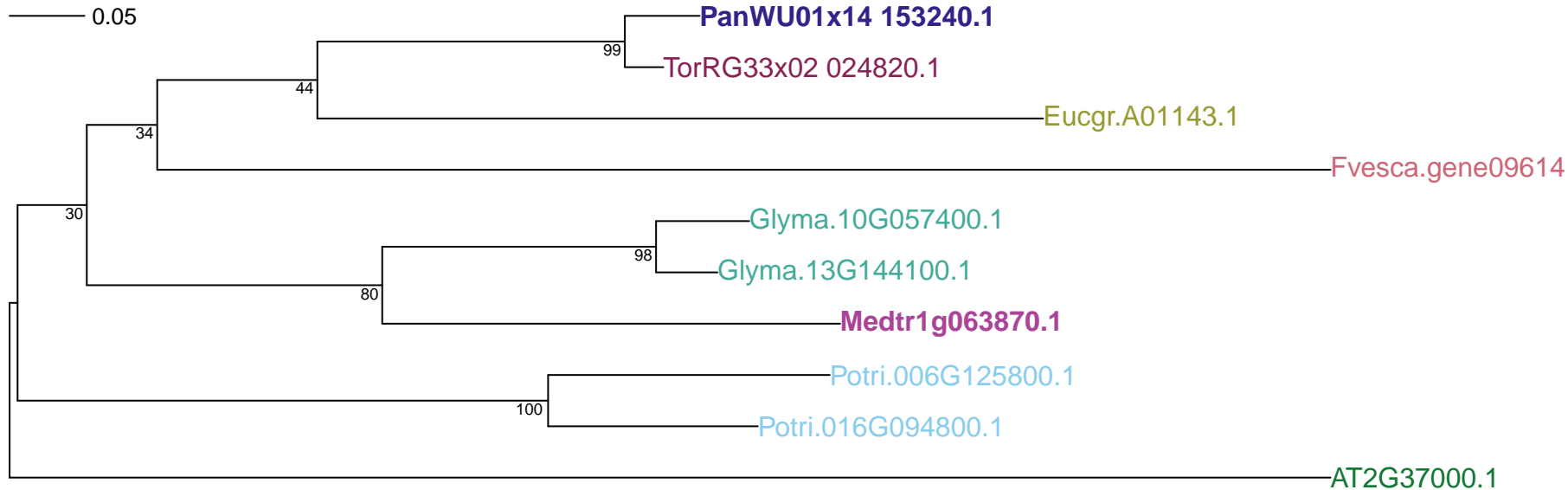
OG0007247: Transcriptional regulators. Nitrogen fixation negative regulator NifL



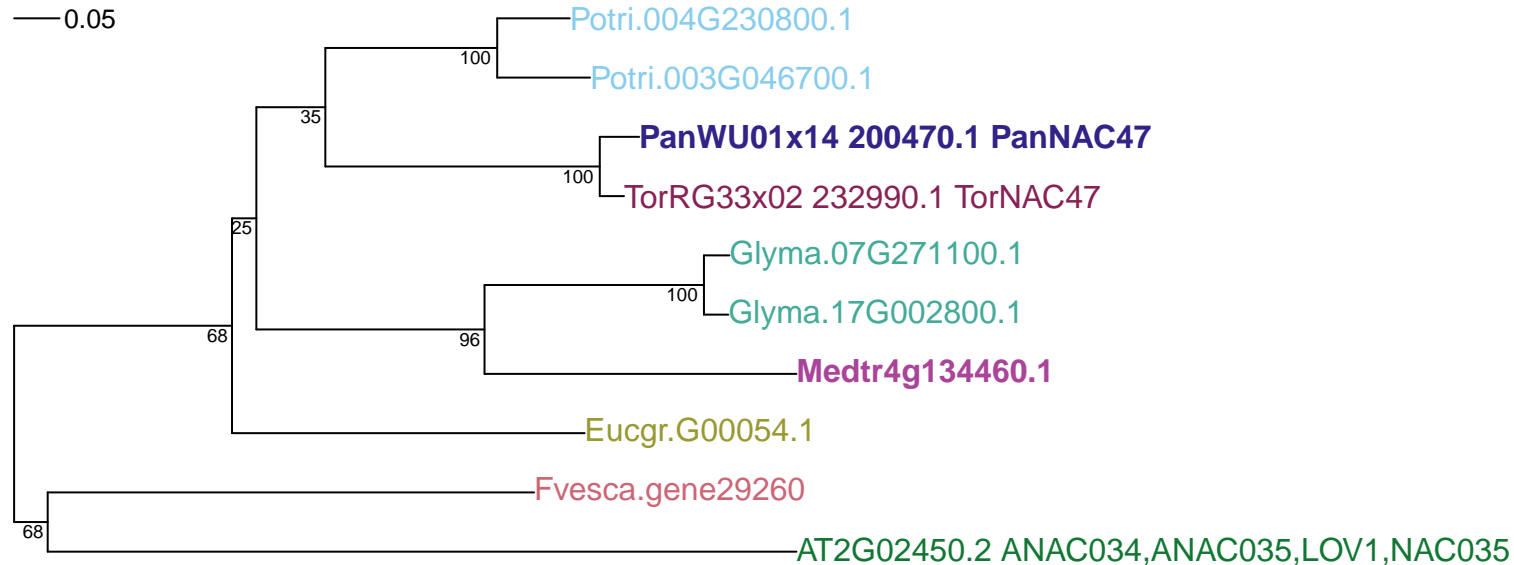
OG0007499: Transcriptional regulators. Mediator complex, subunit Med



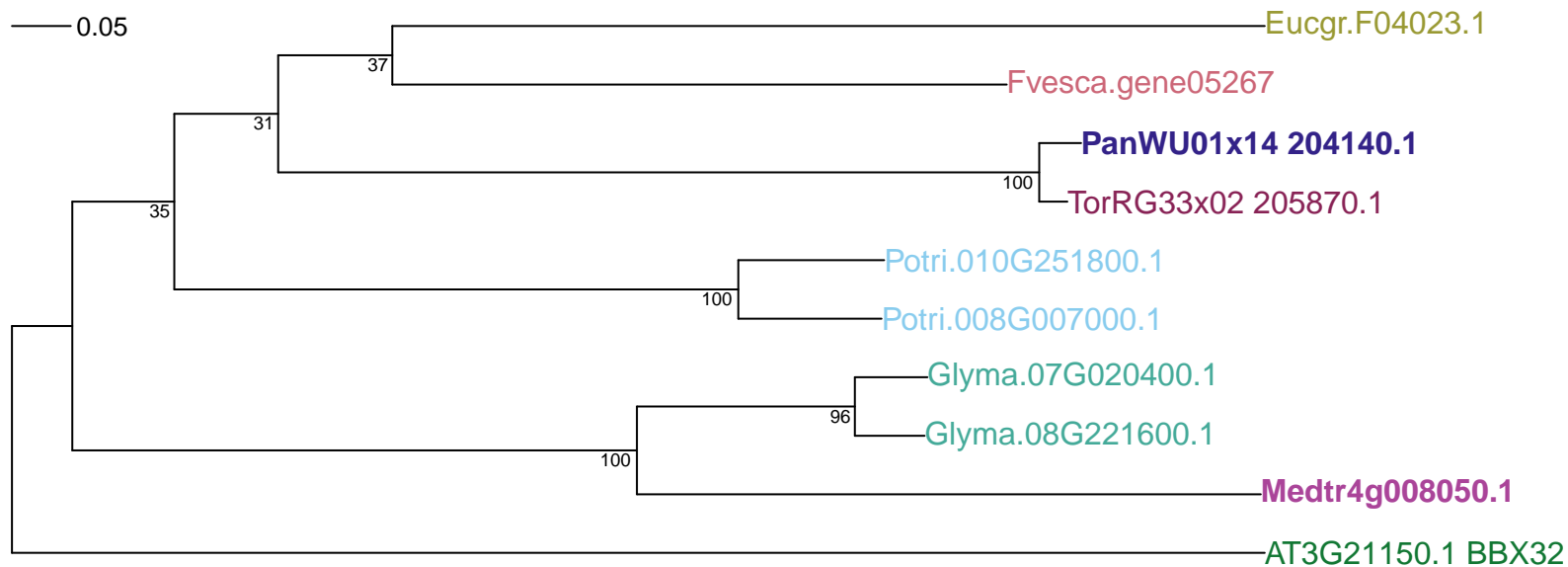
OG0008596: Transcriptional regulators. TCP transcription factor



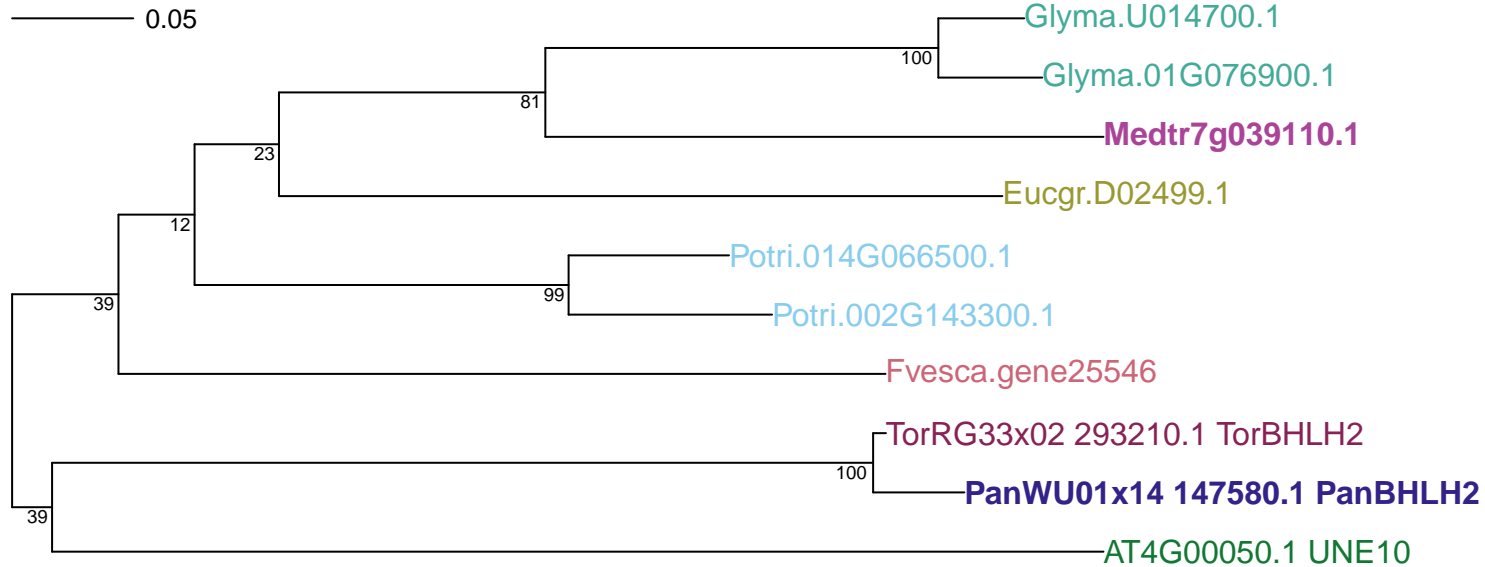
OG0008646: Transcriptional regulators. NAC domain containing protein



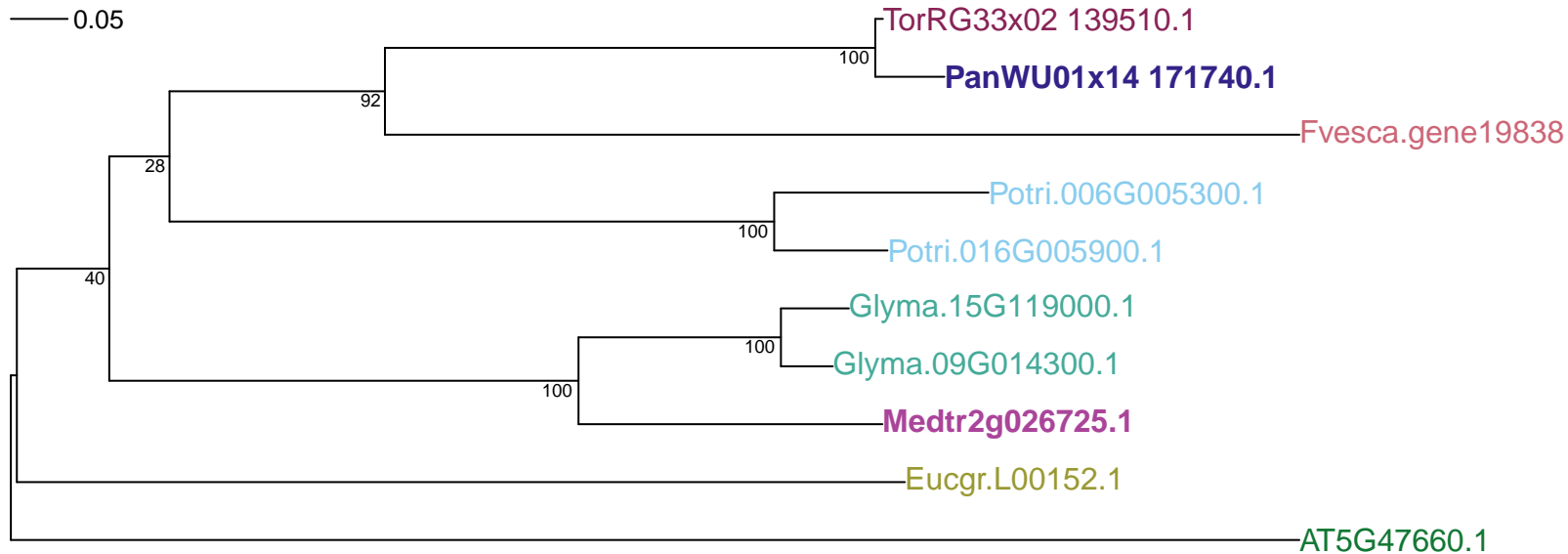
OG0008830: Transcriptional regulators. B-box-type zinc finger



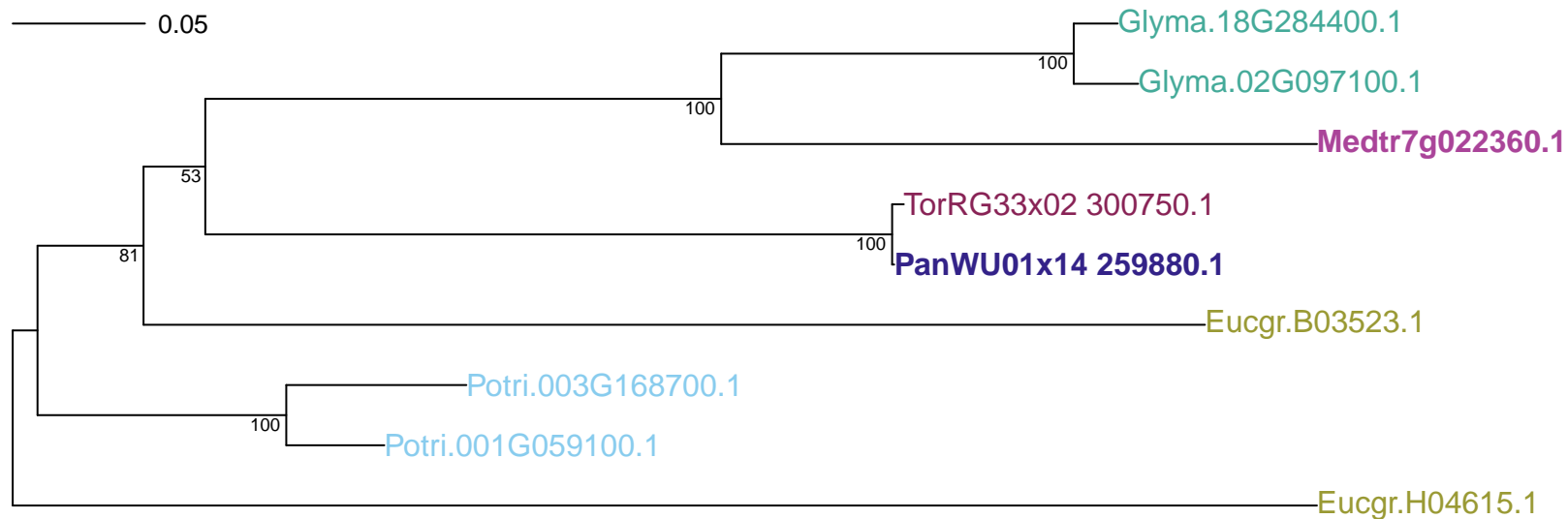
OG0009069: Transcriptional regulators. Basic helix-loop-helix transcription factor



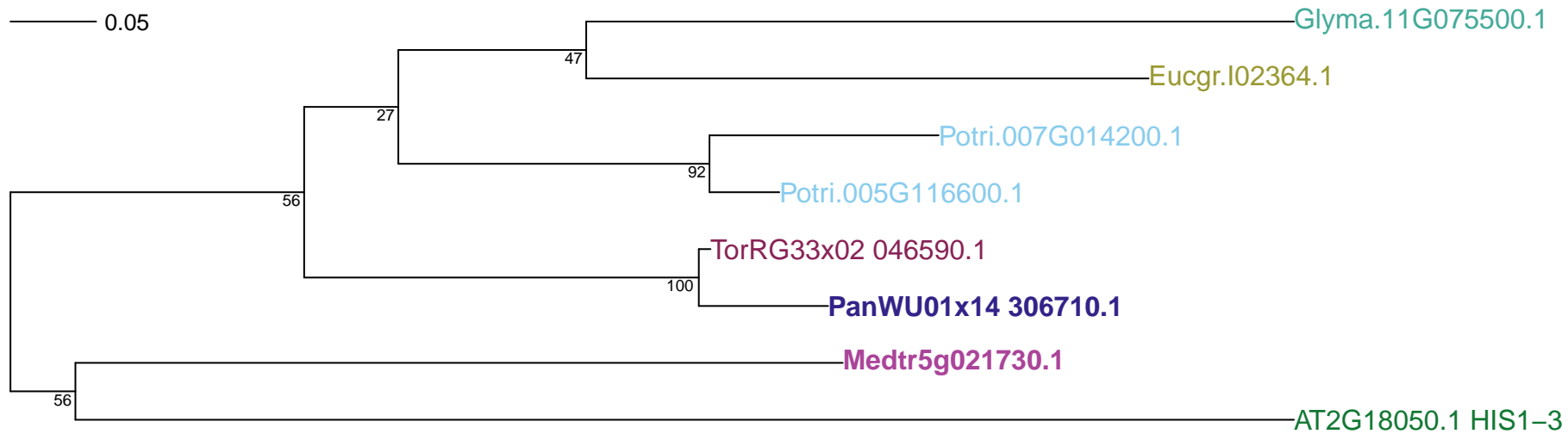
OG0009394: Transcriptional regulators. Octamer-binding transcription factor



OG0012031: Transcriptional regulators. regulator of nonsense transcript protein

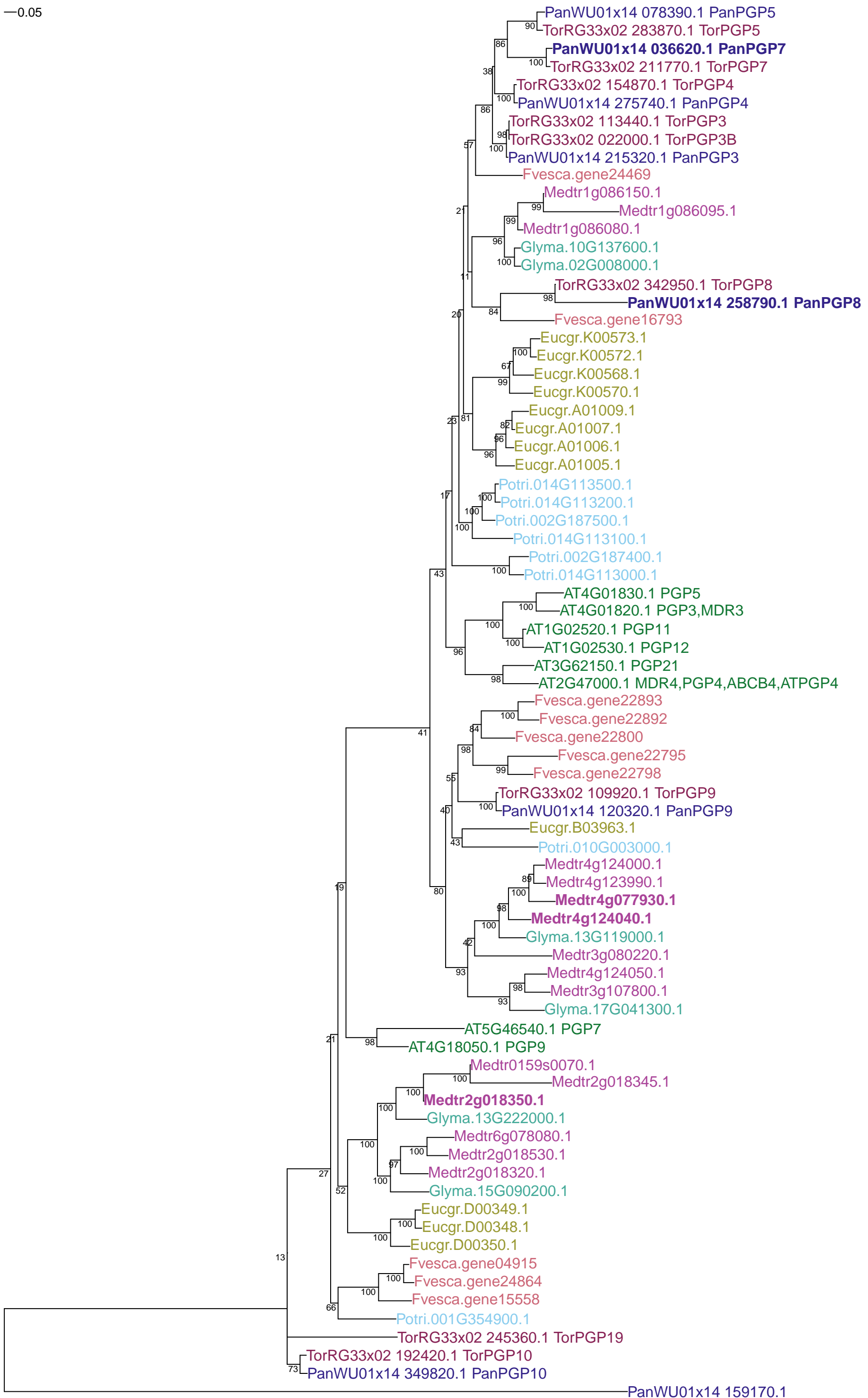


OG0012568: Transcriptional regulators. Histone H



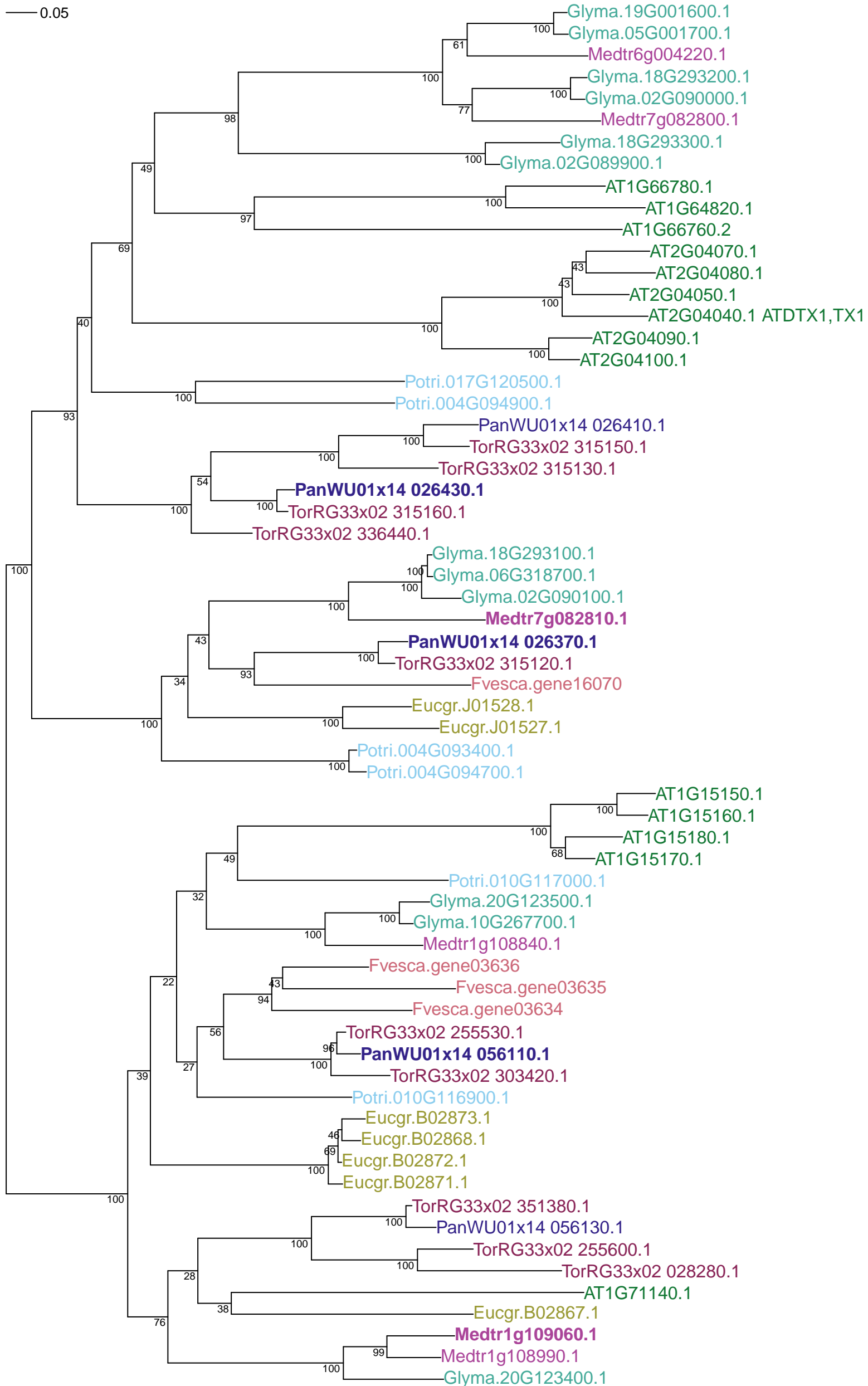
OG0000150: Transporters. ABC transporter-like

—0.05



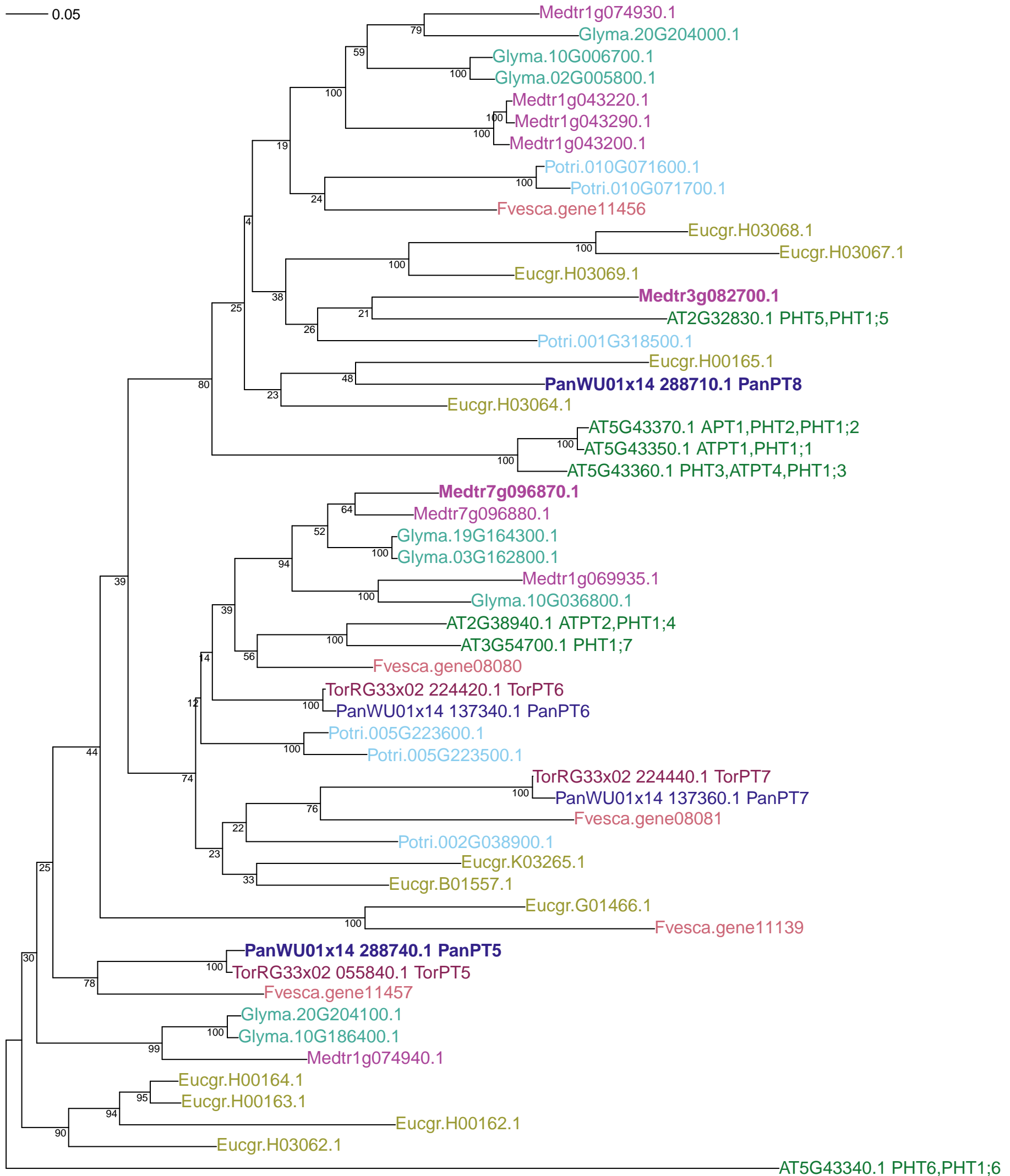
OG0000214: Transporters. Multi antimicrobial extrusion protein

— 0.05



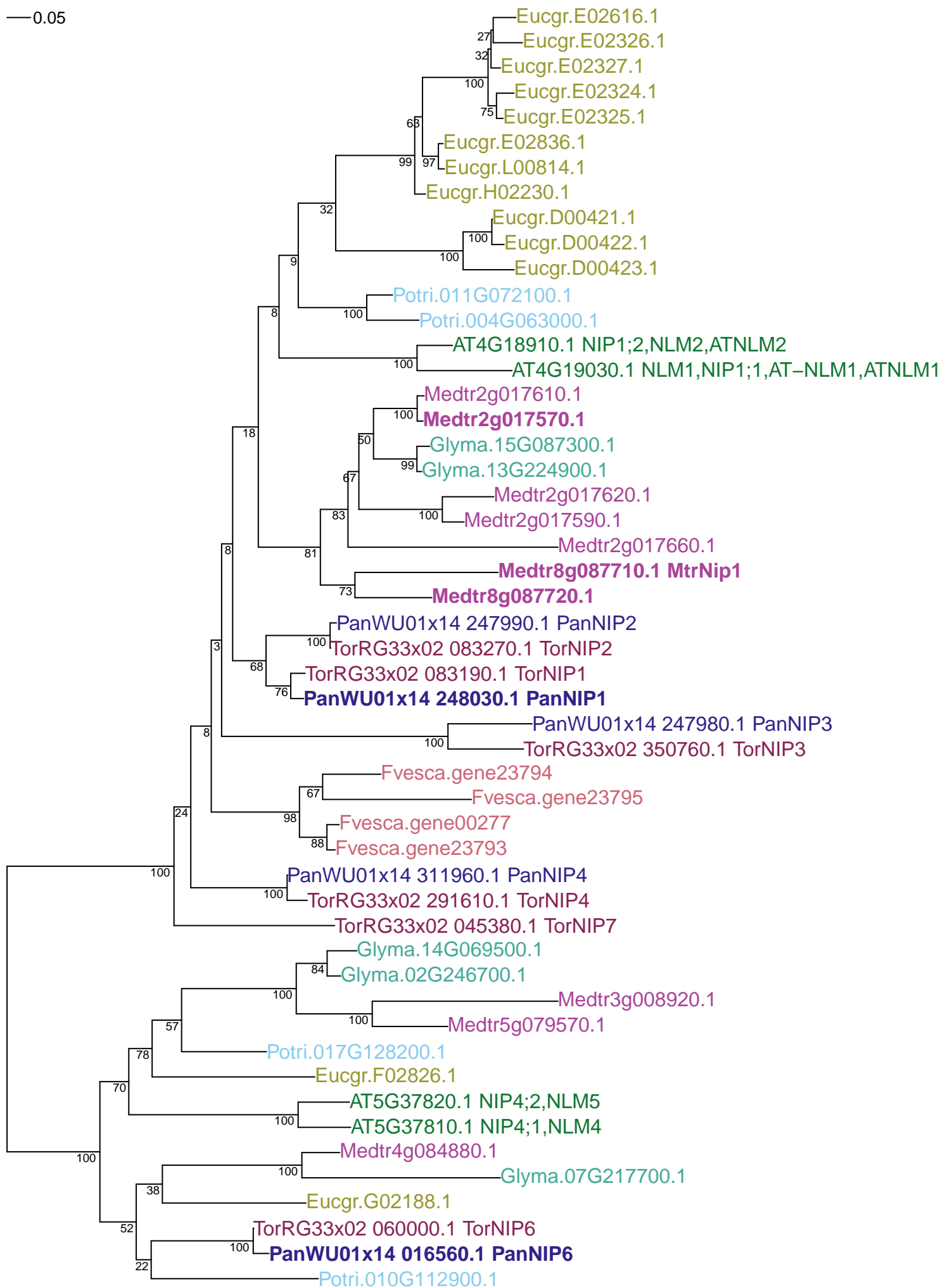
OG0000288: Transporters. Phosphate transporter

0.05



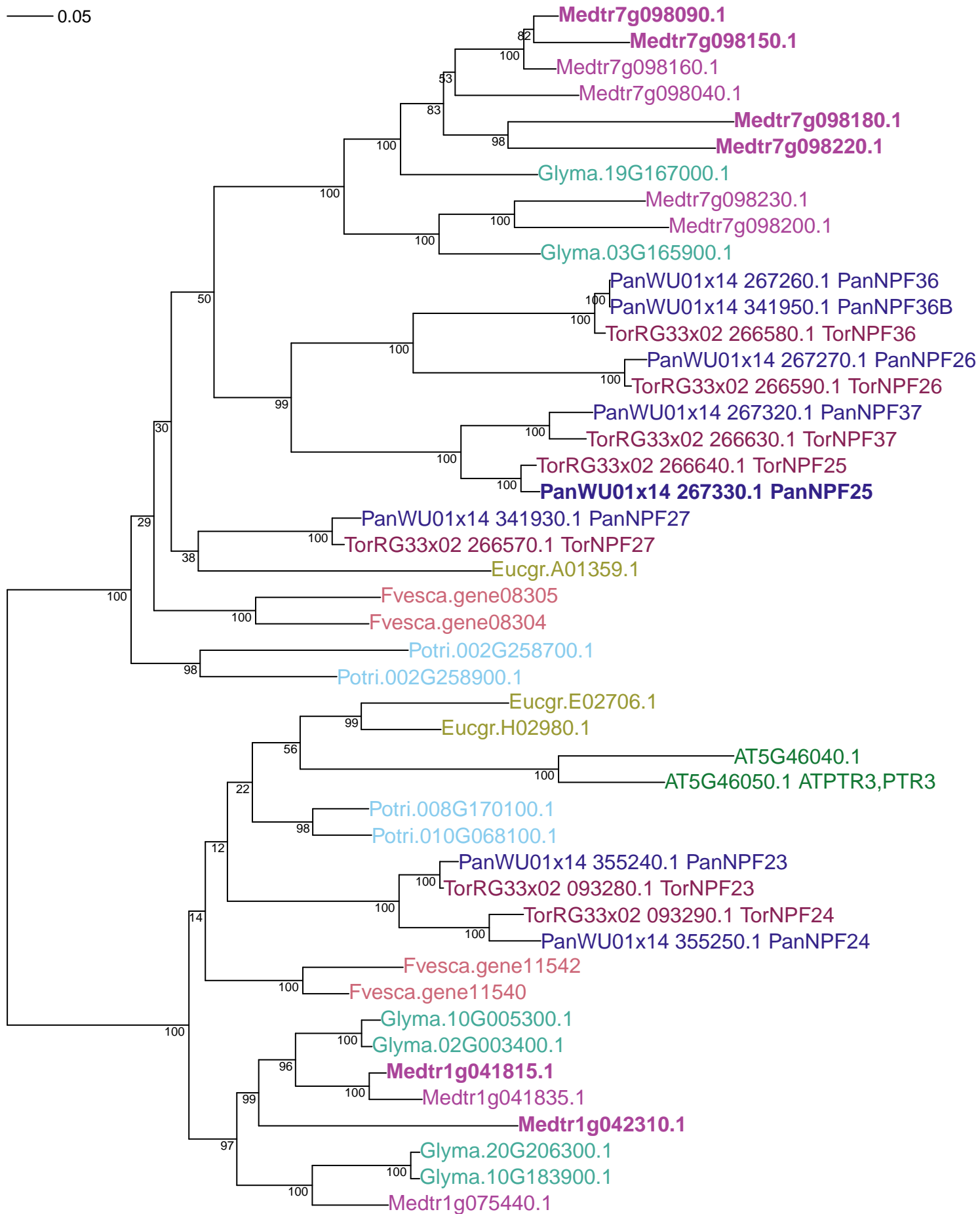
OG0000320: Transporters. Major intrinsic protein

—0.05



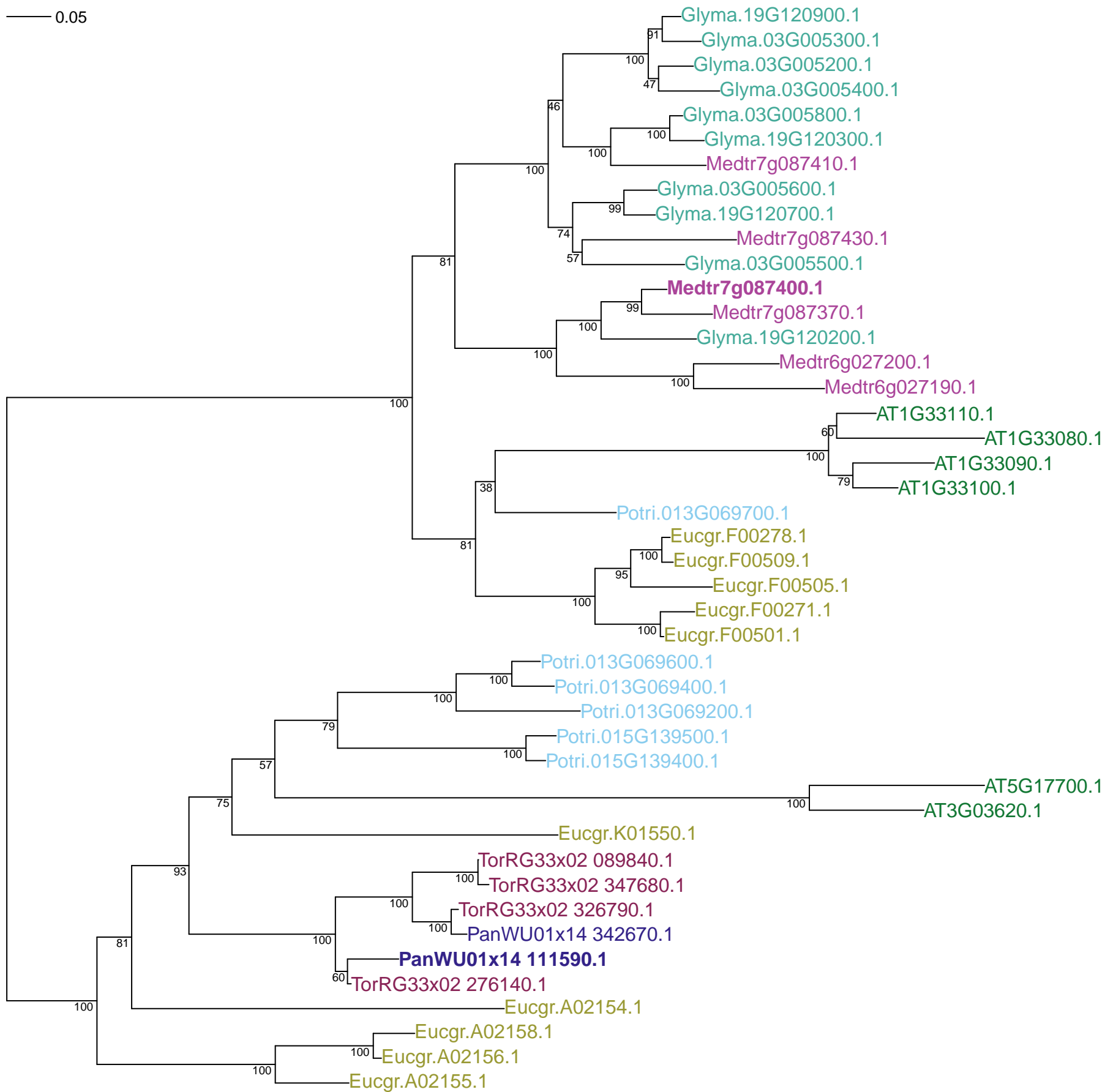
OG0000373: Transporters. Proton-dependent oligopeptide transporter

0.05

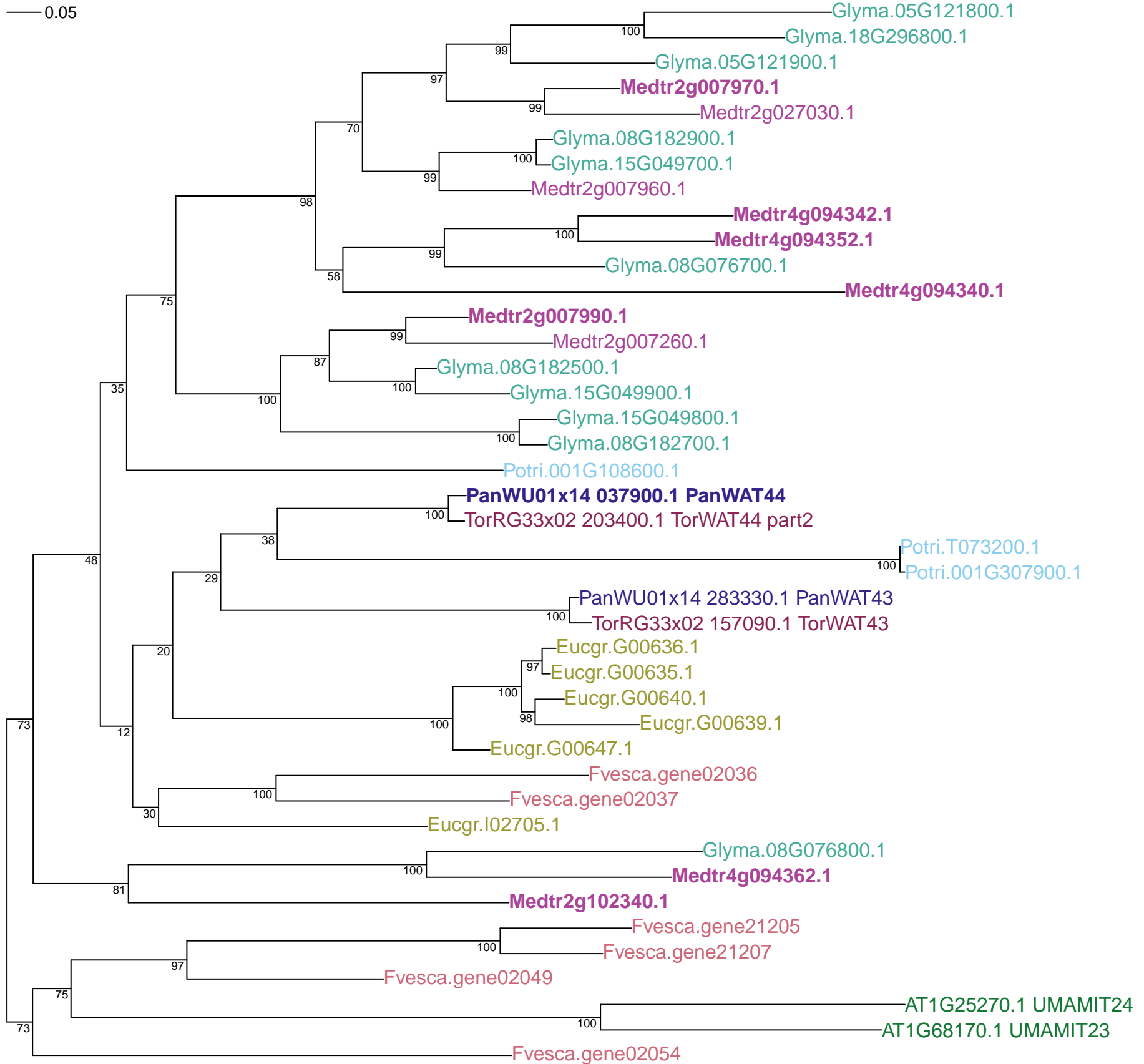


OG0000404: Transporters. Multi antimicrobial extrusion protein

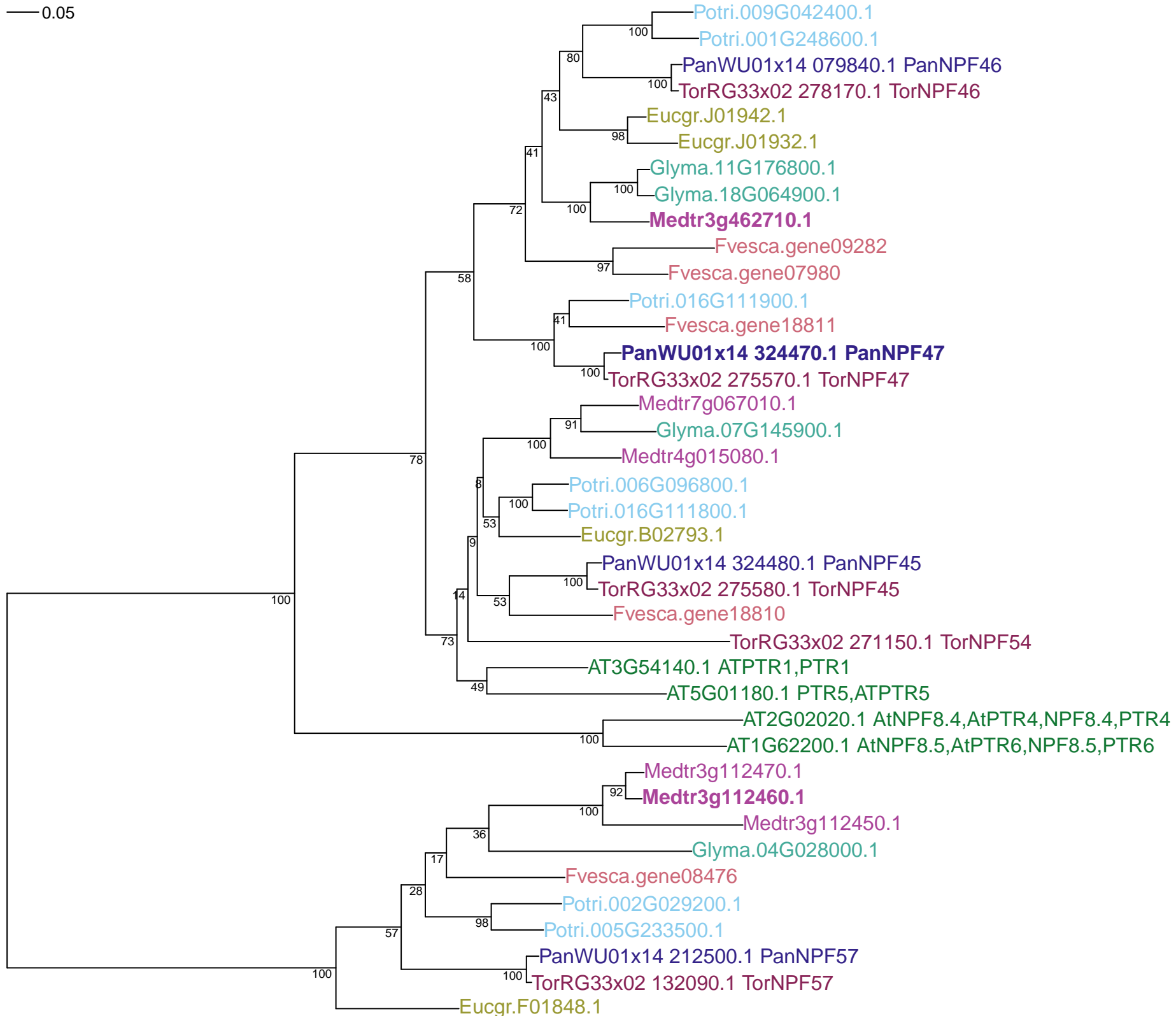
0.05



OG0000437: Transporters. Plant–drug/metabolite exporter

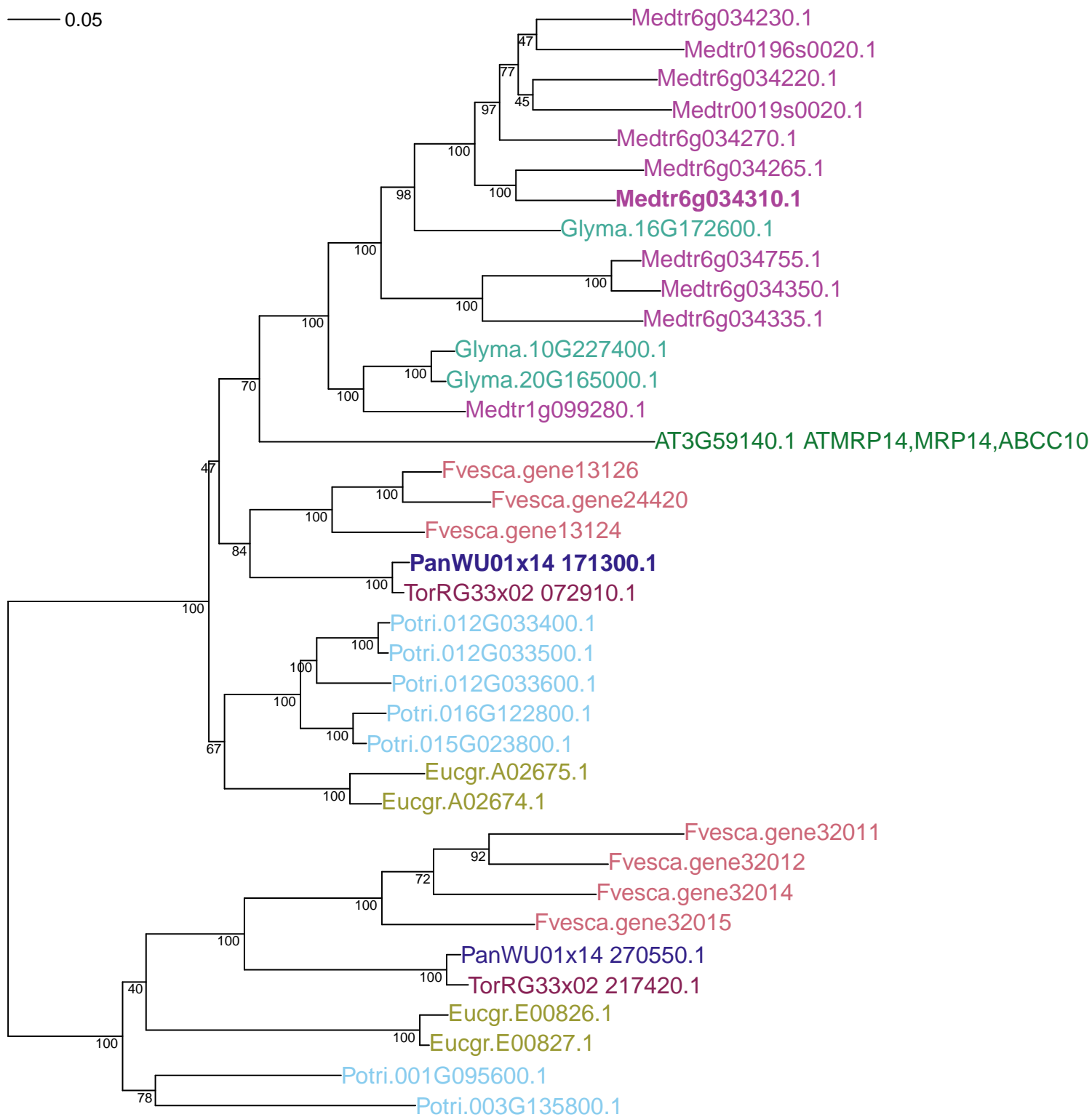


OG0000502: Transporters. Proton-dependent oligopeptide transporter



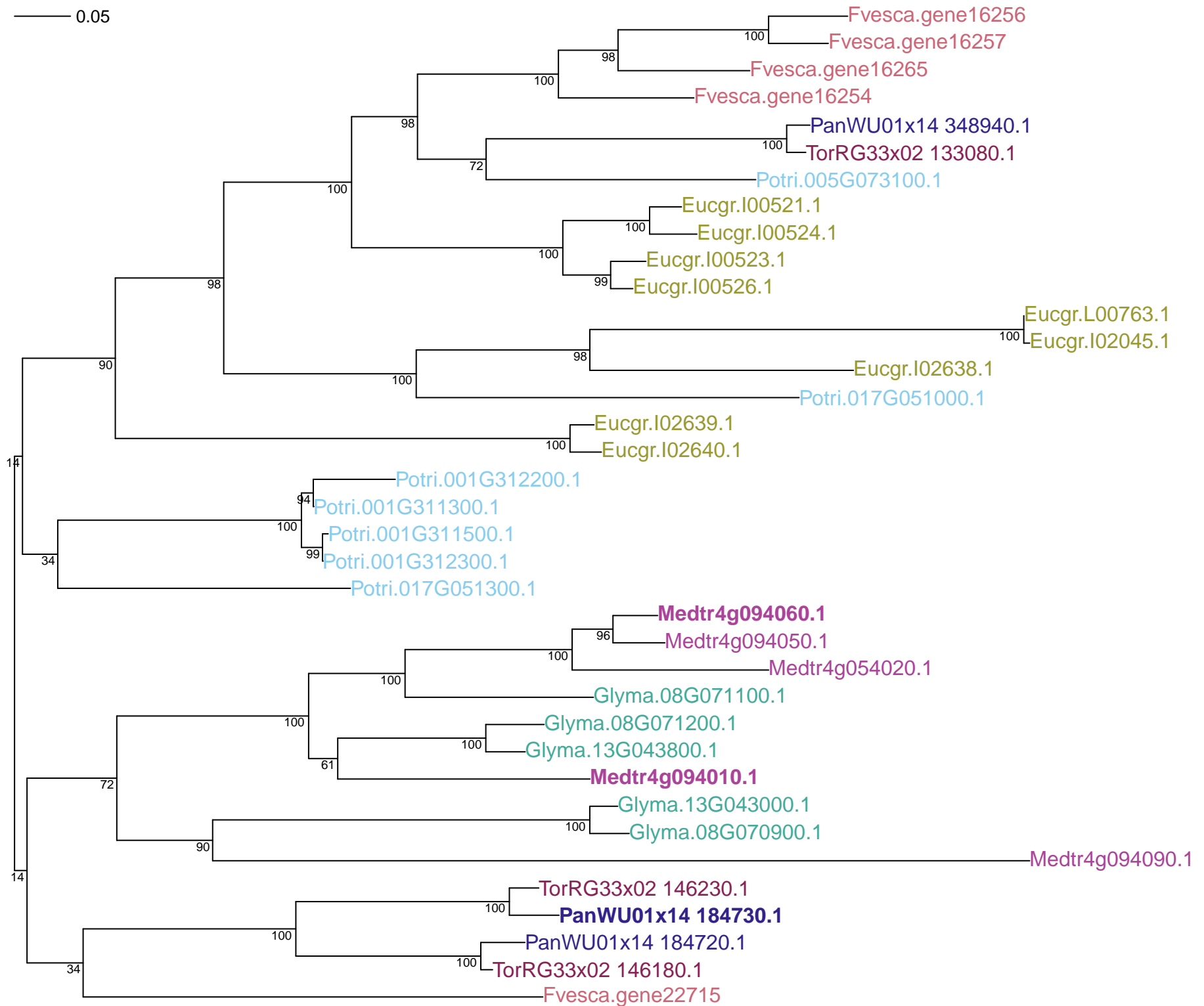
OG0000560: Transporters. ATP-binding cassette containing protein

— 0.05



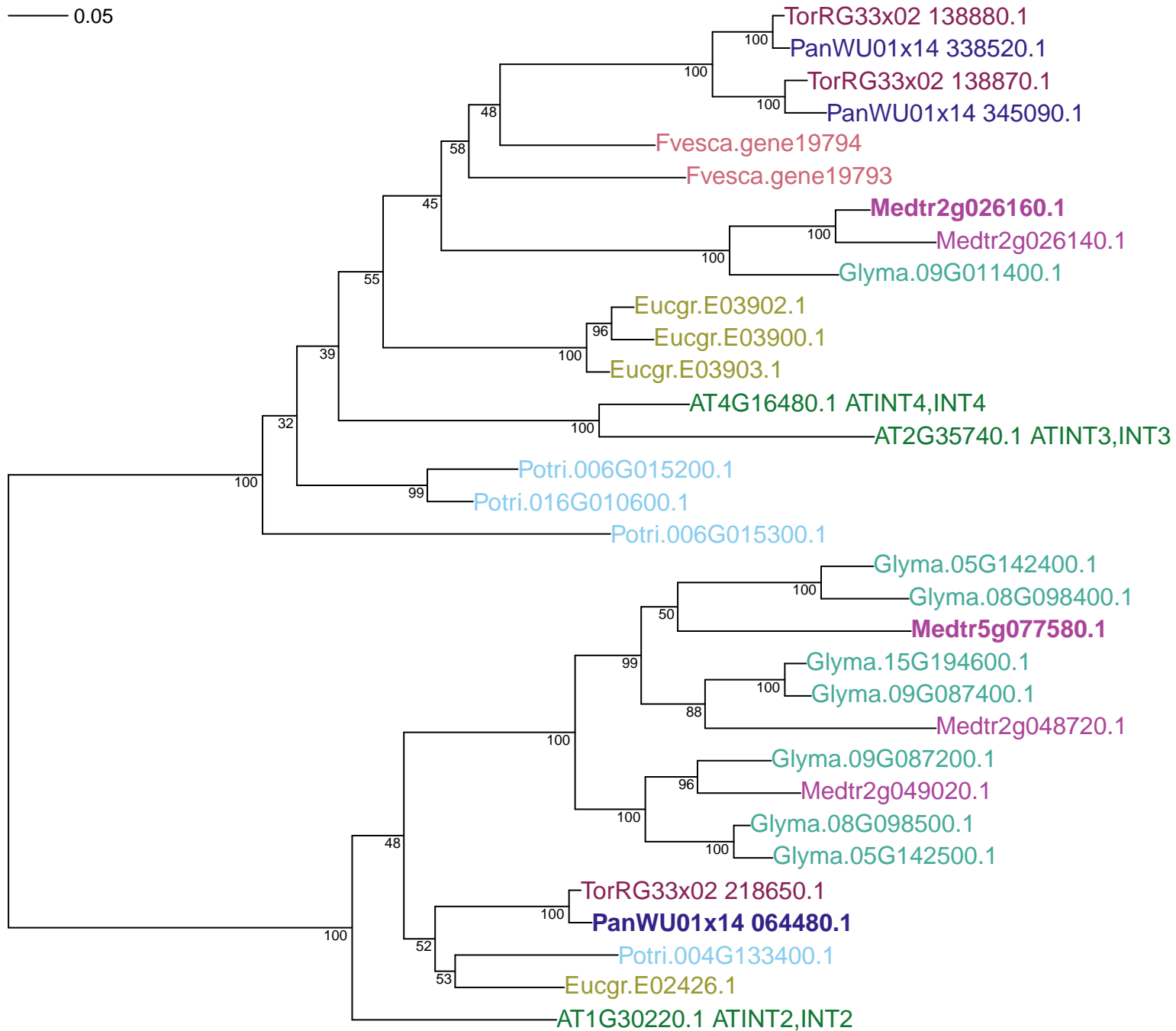
OG0000563: Transporters. ABC transporter-like

0.05

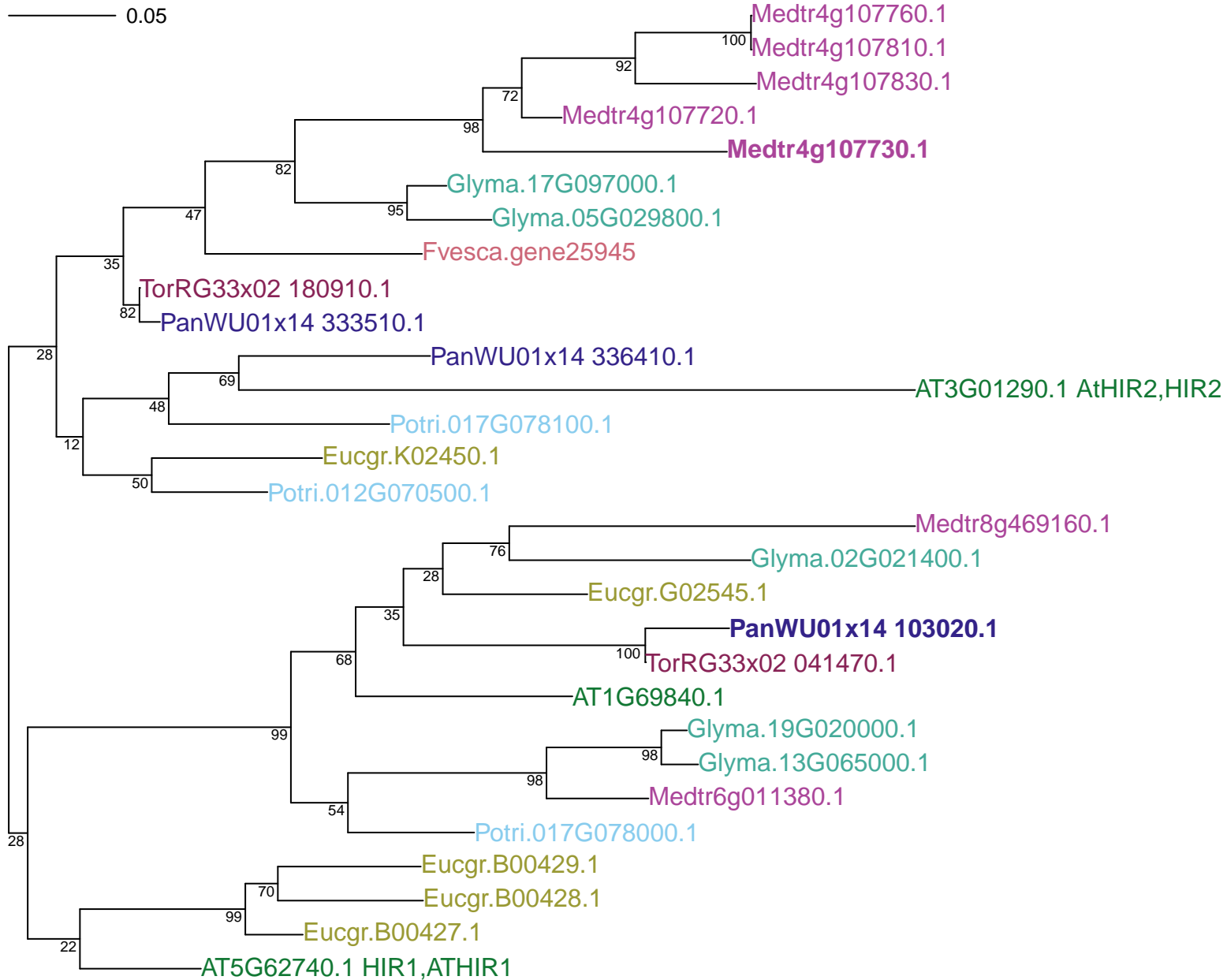


OG0000723: Transporters. Sugar/inositol transporter

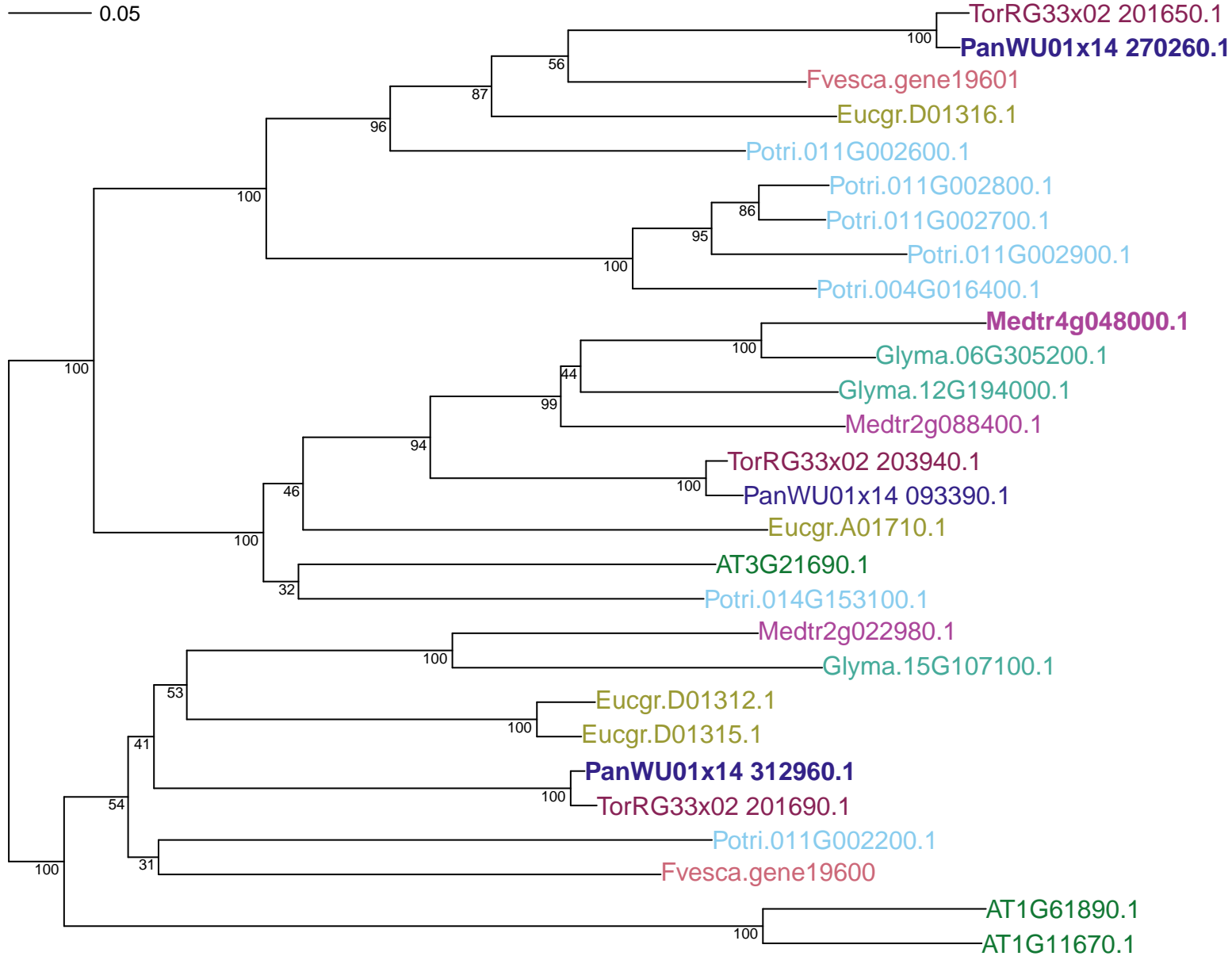
— 0.05



OG0000880: Transporters. Stomatin family

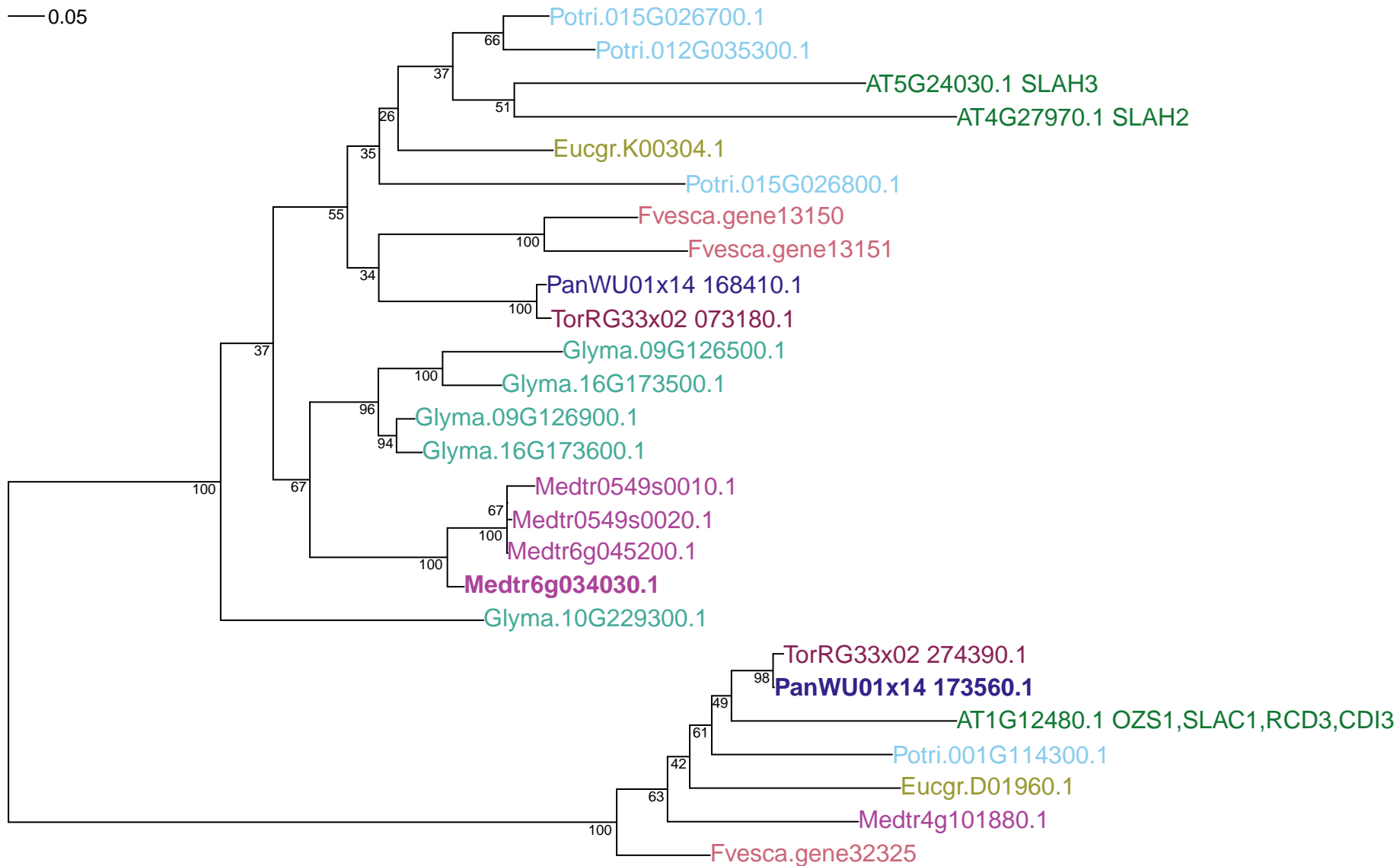


OG0000959: Transporters. Multi antimicrobial extrusion protein

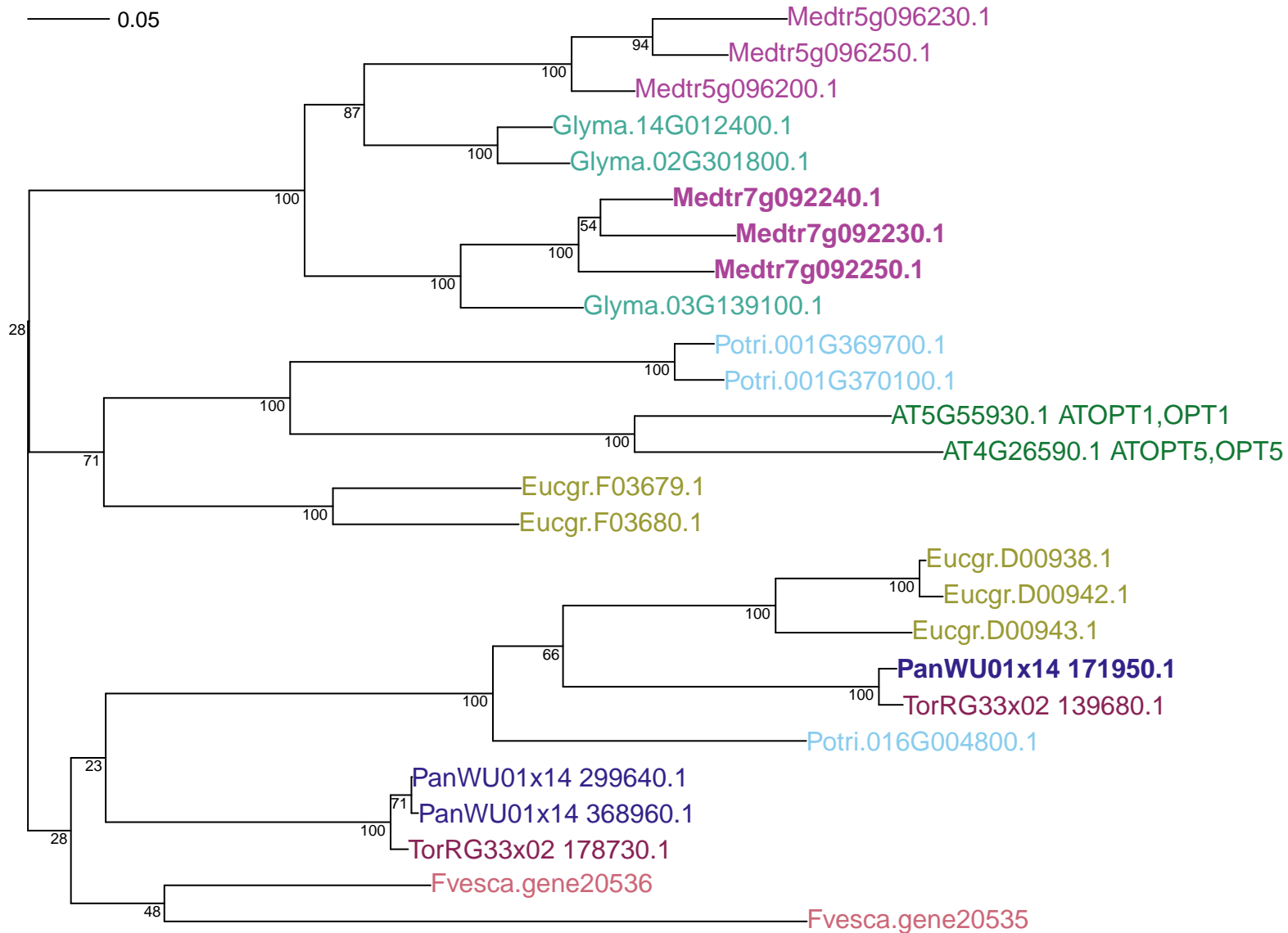


OG0001138: Transporters. Voltage-dependent anion channel

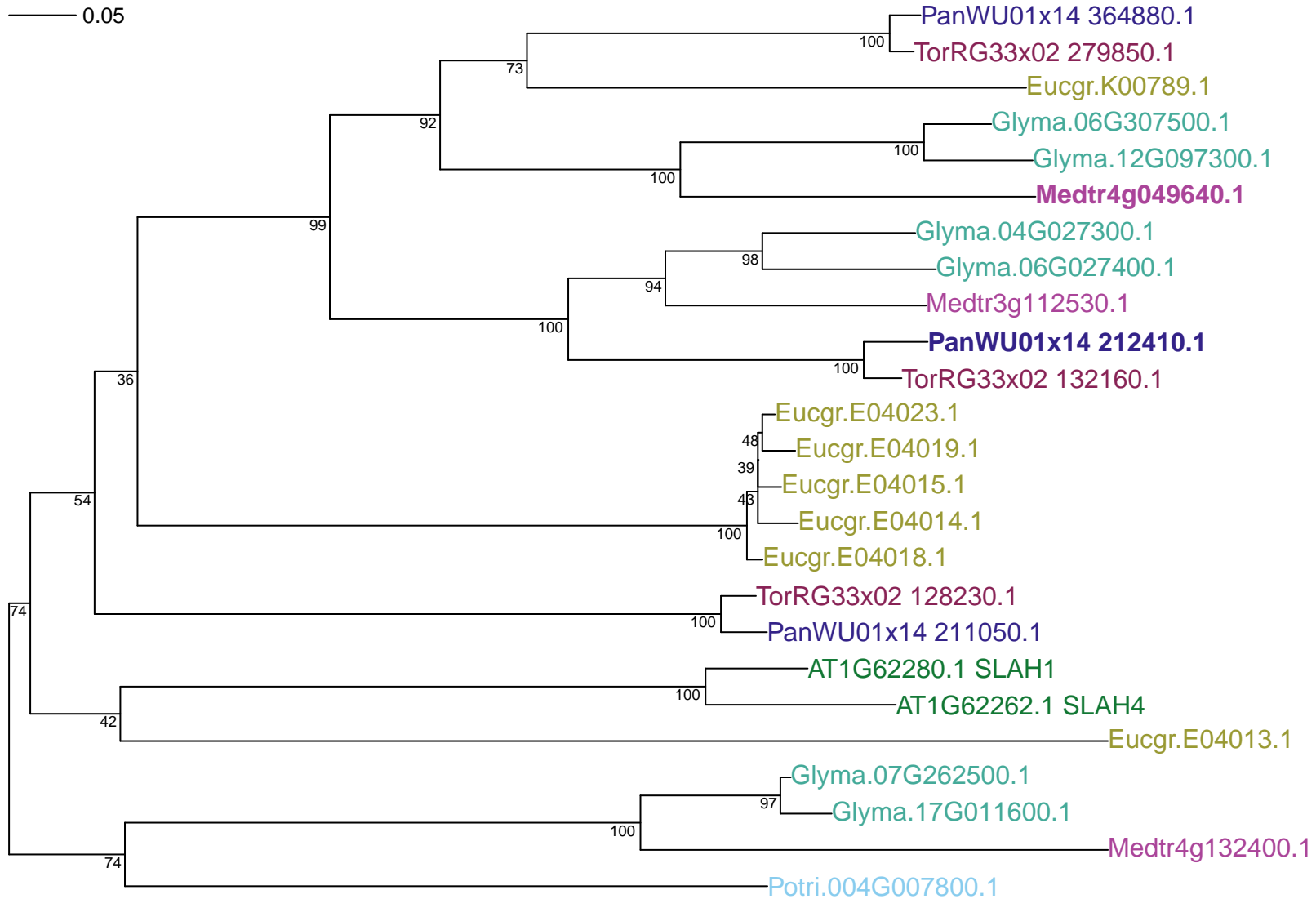
— 0.05



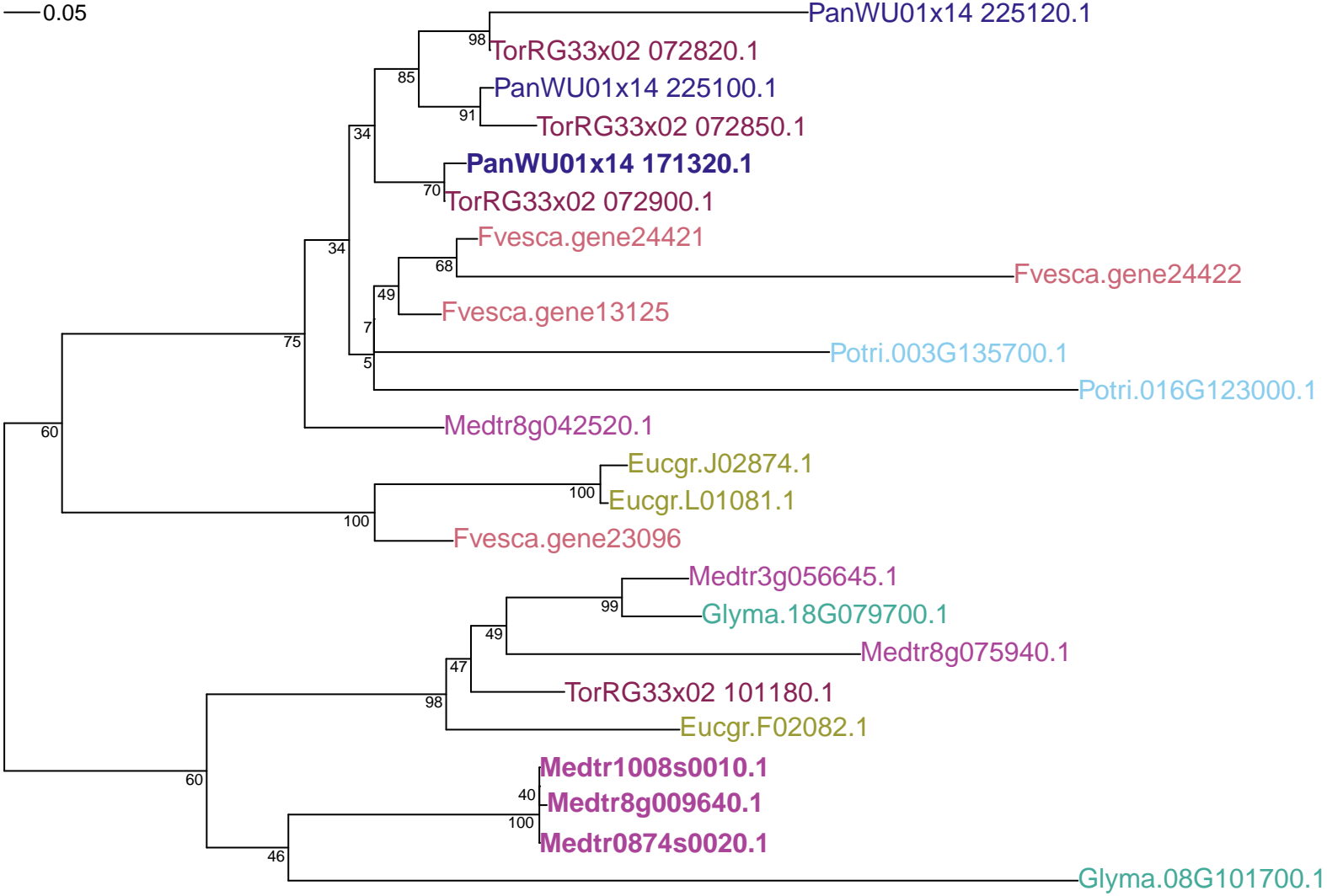
OG0001178: Transporters. Tetrapeptide transporter



OG0001239: Transporters. Voltage-dependent anion channel

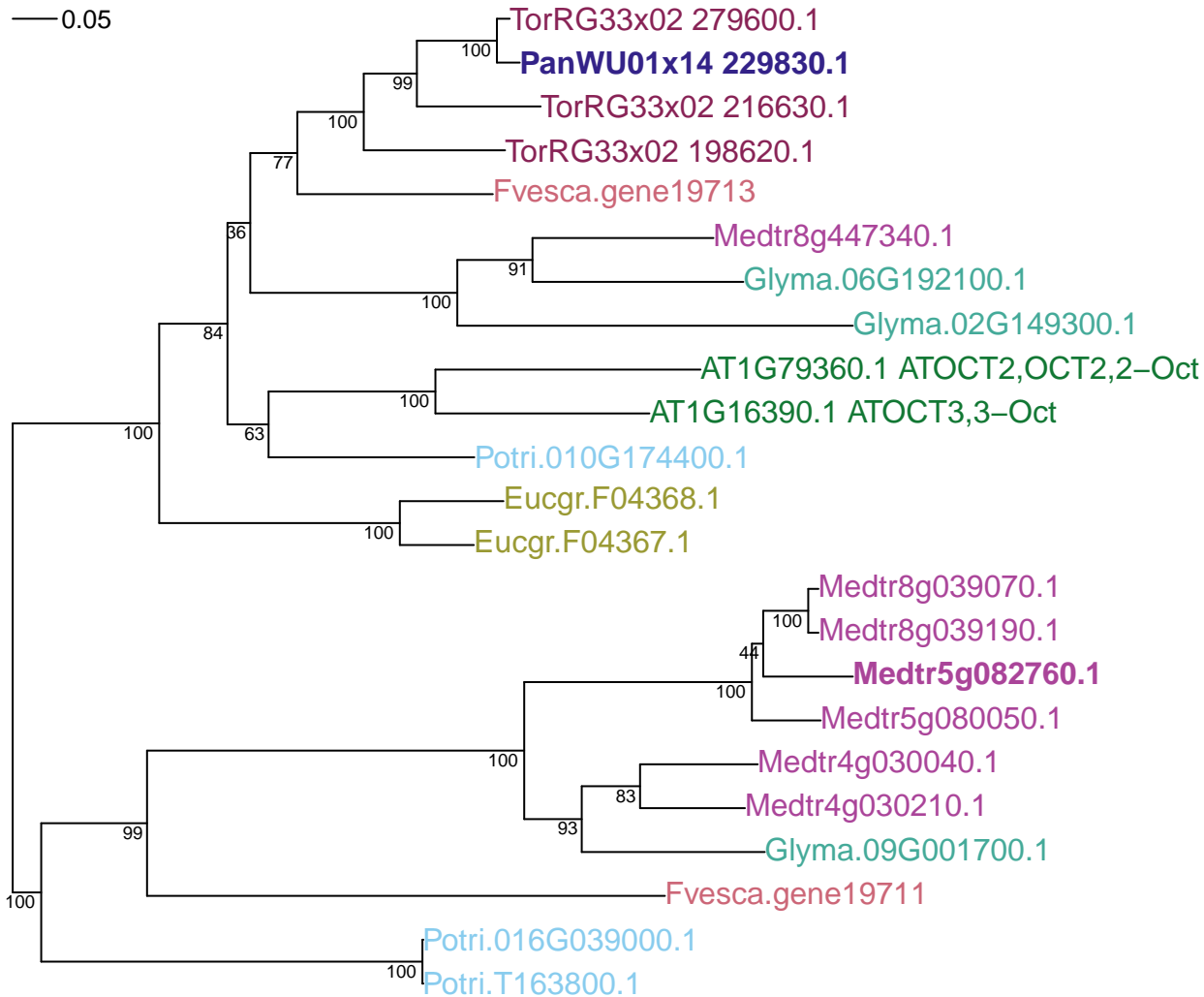


OG0001426: Transporters. ATP-binding cassette containing protein

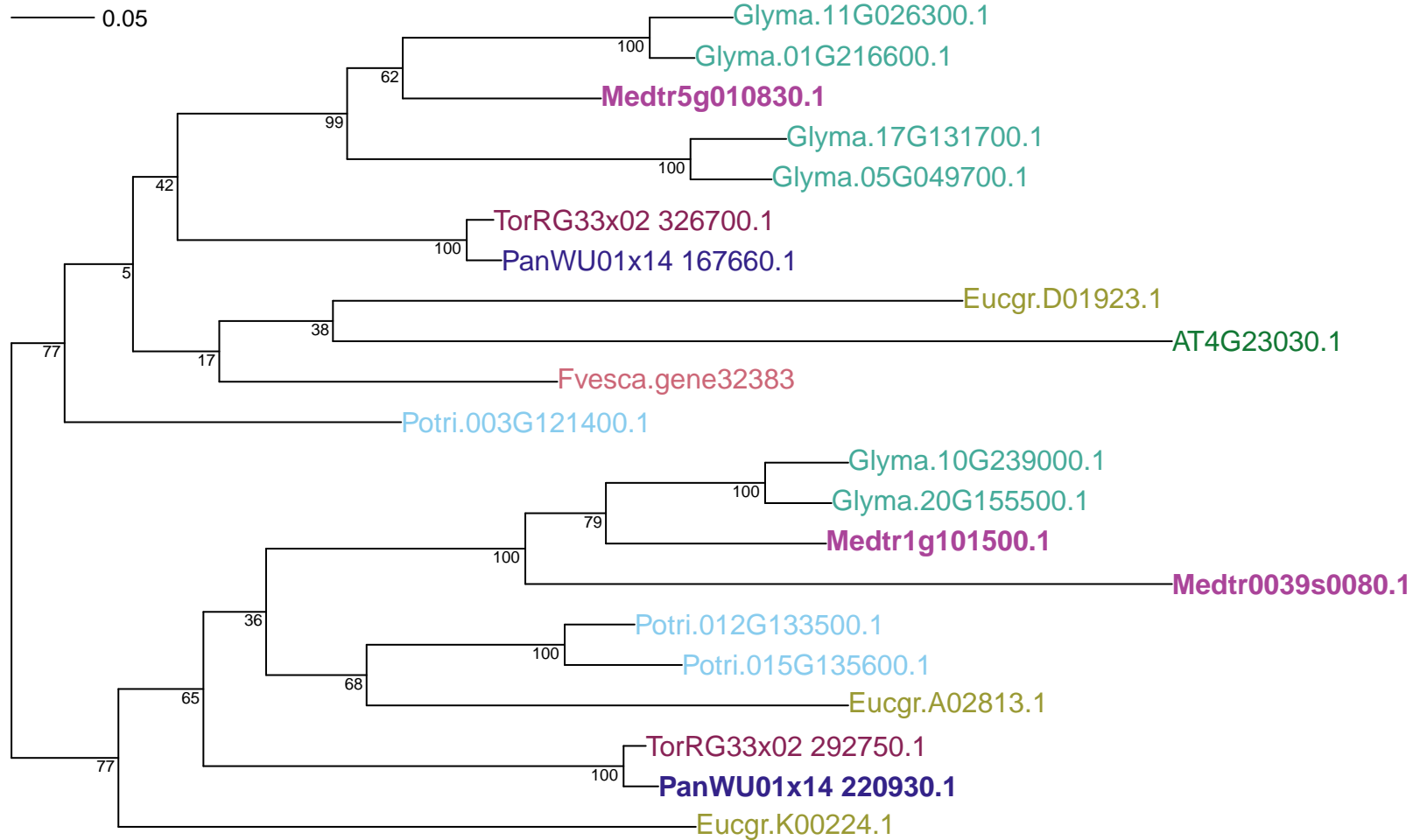


OG0001446: Transporters. Major facilitator, sugar transporter-like

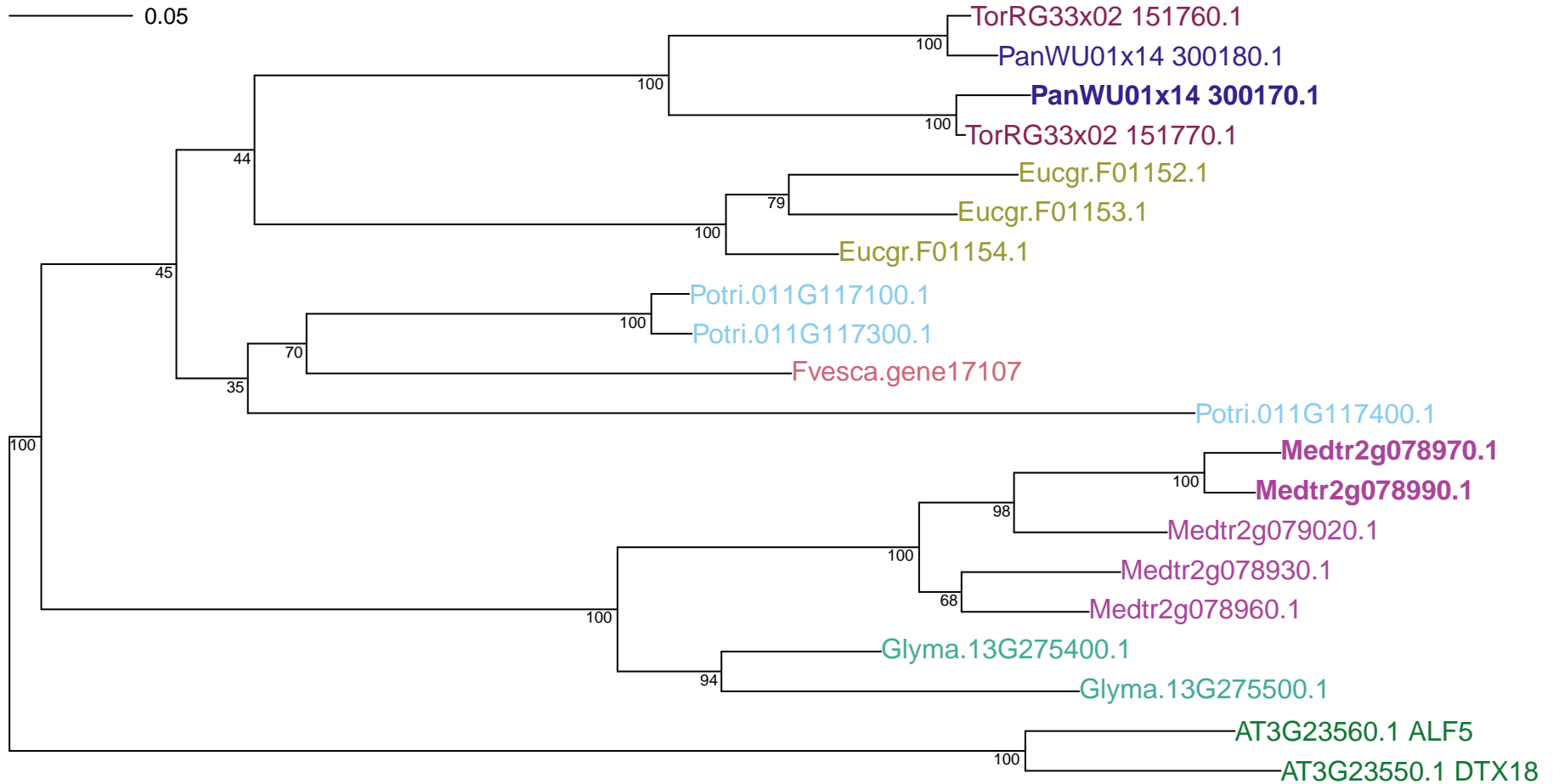
—0.05



OG0001961: Transporters. Multi antimicrobial extrusion protein

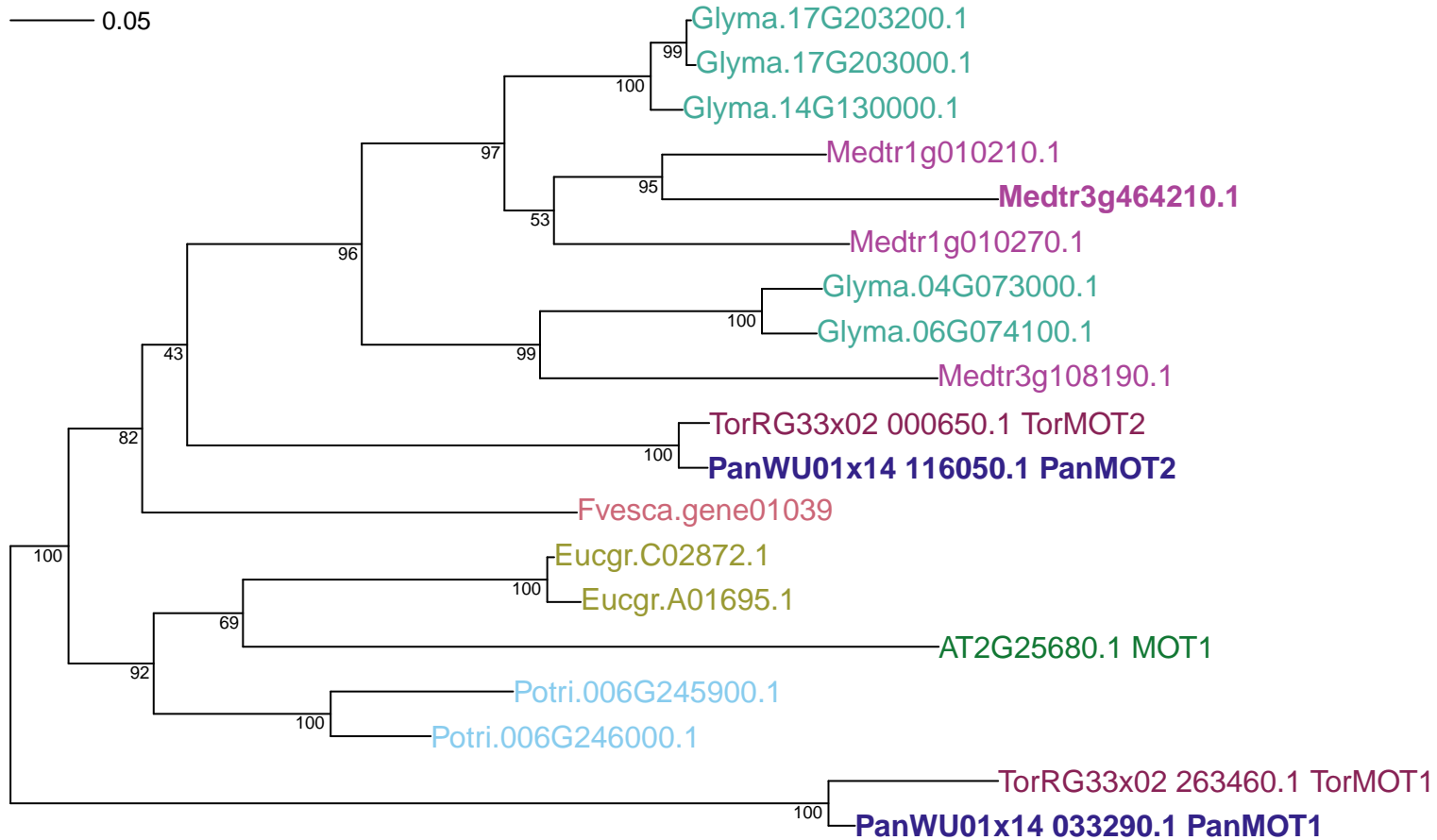


OG0002187: Transporters. Multi antimicrobial extrusion protein



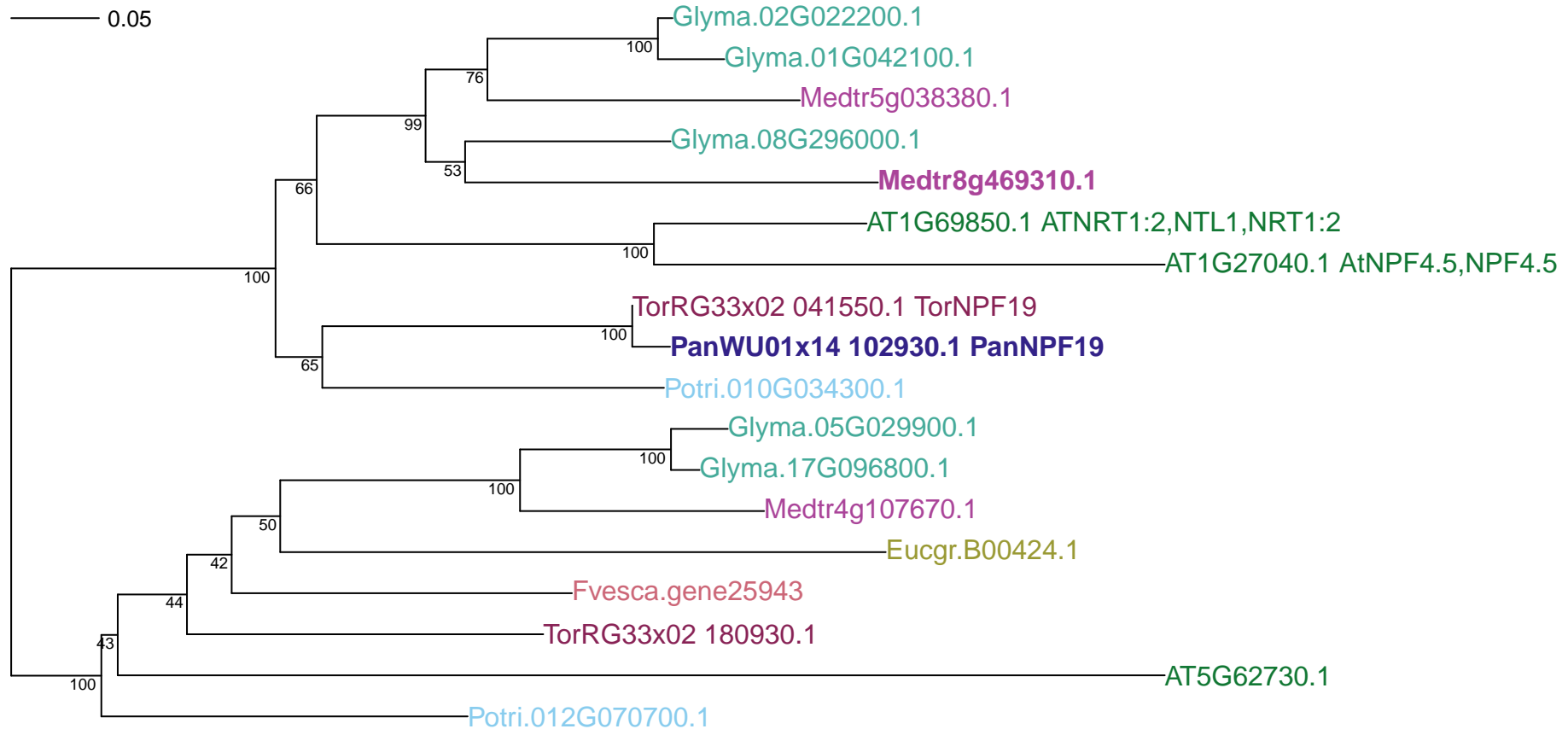
OG0002353: Transporters. Molybdate transporter

0.05

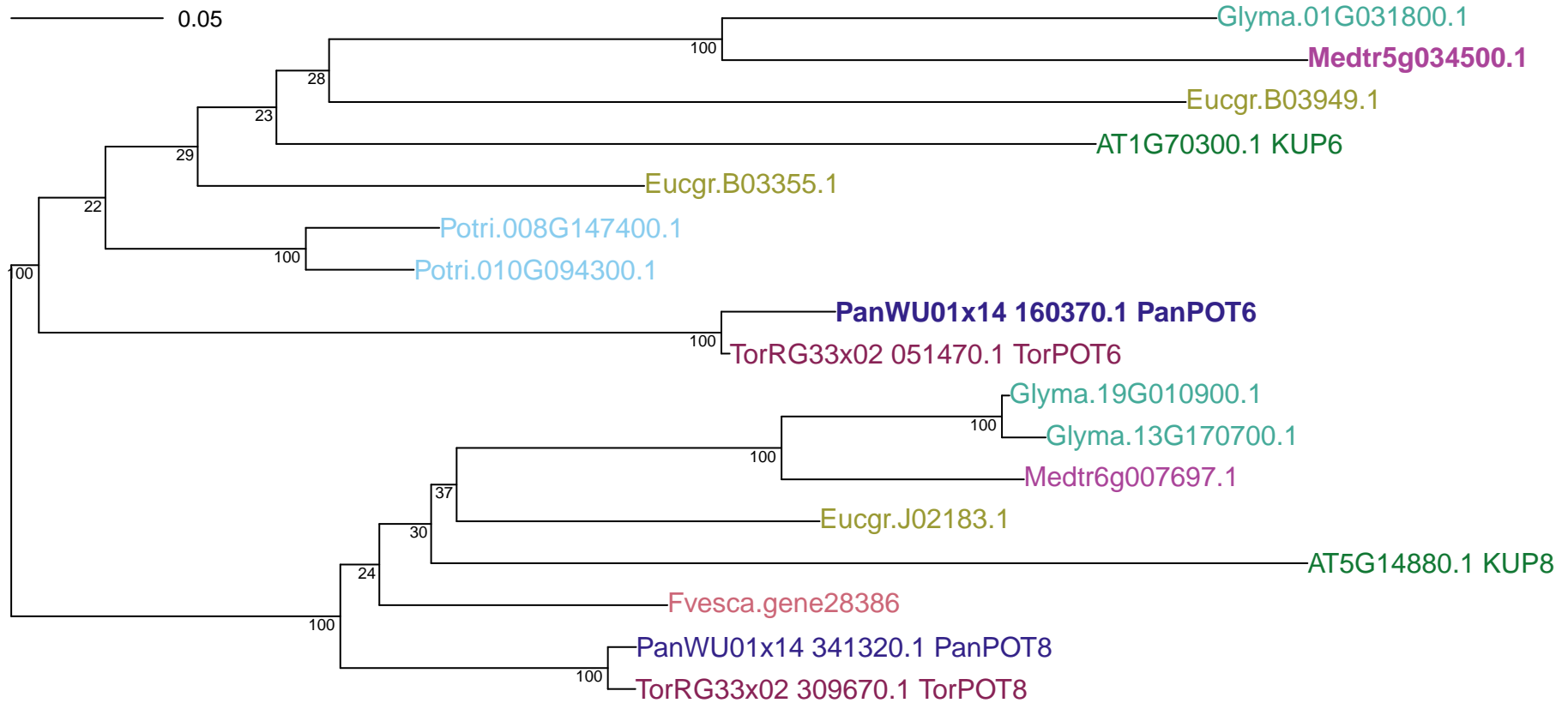


OG0002547: Transporters. Proton-dependent oligopeptide transporter

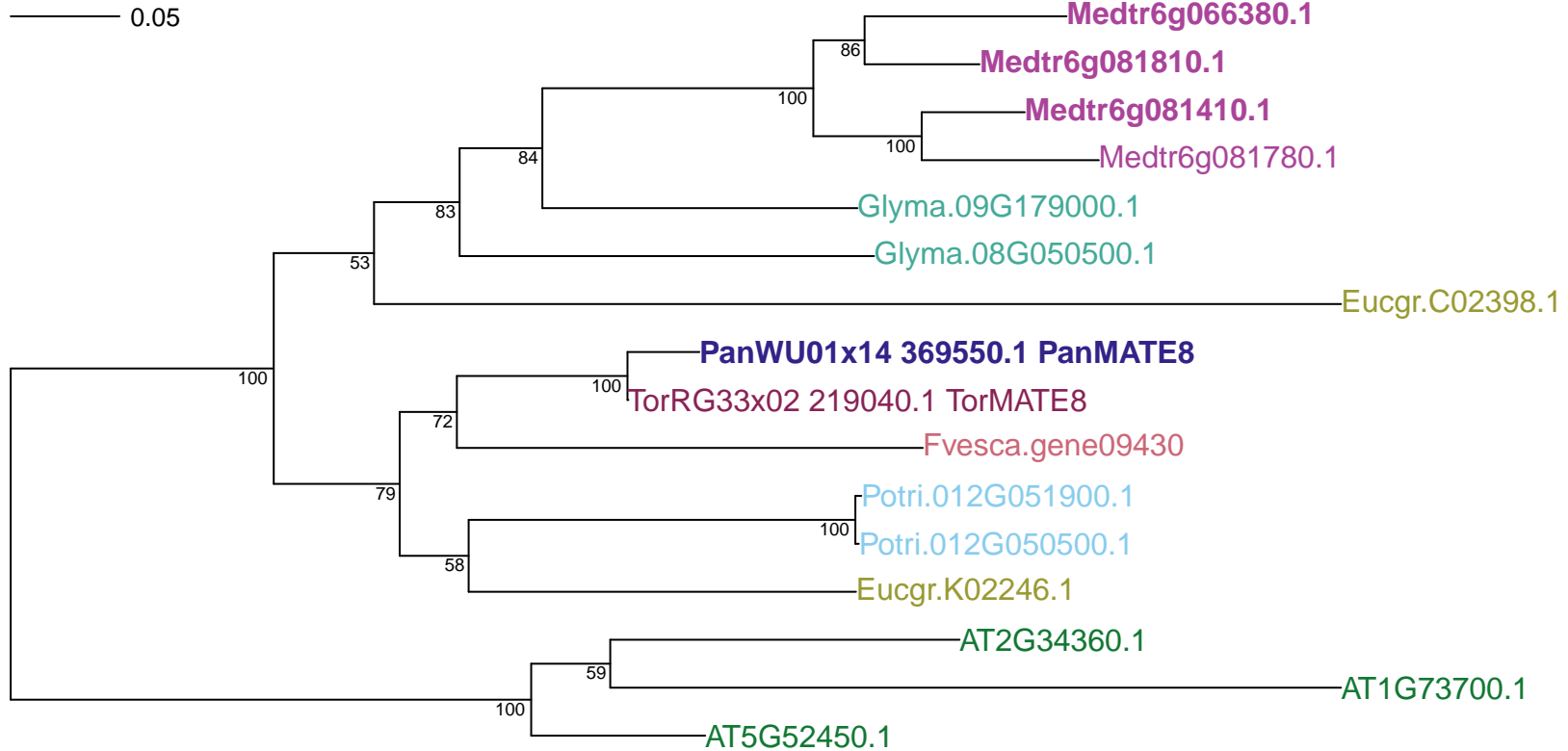
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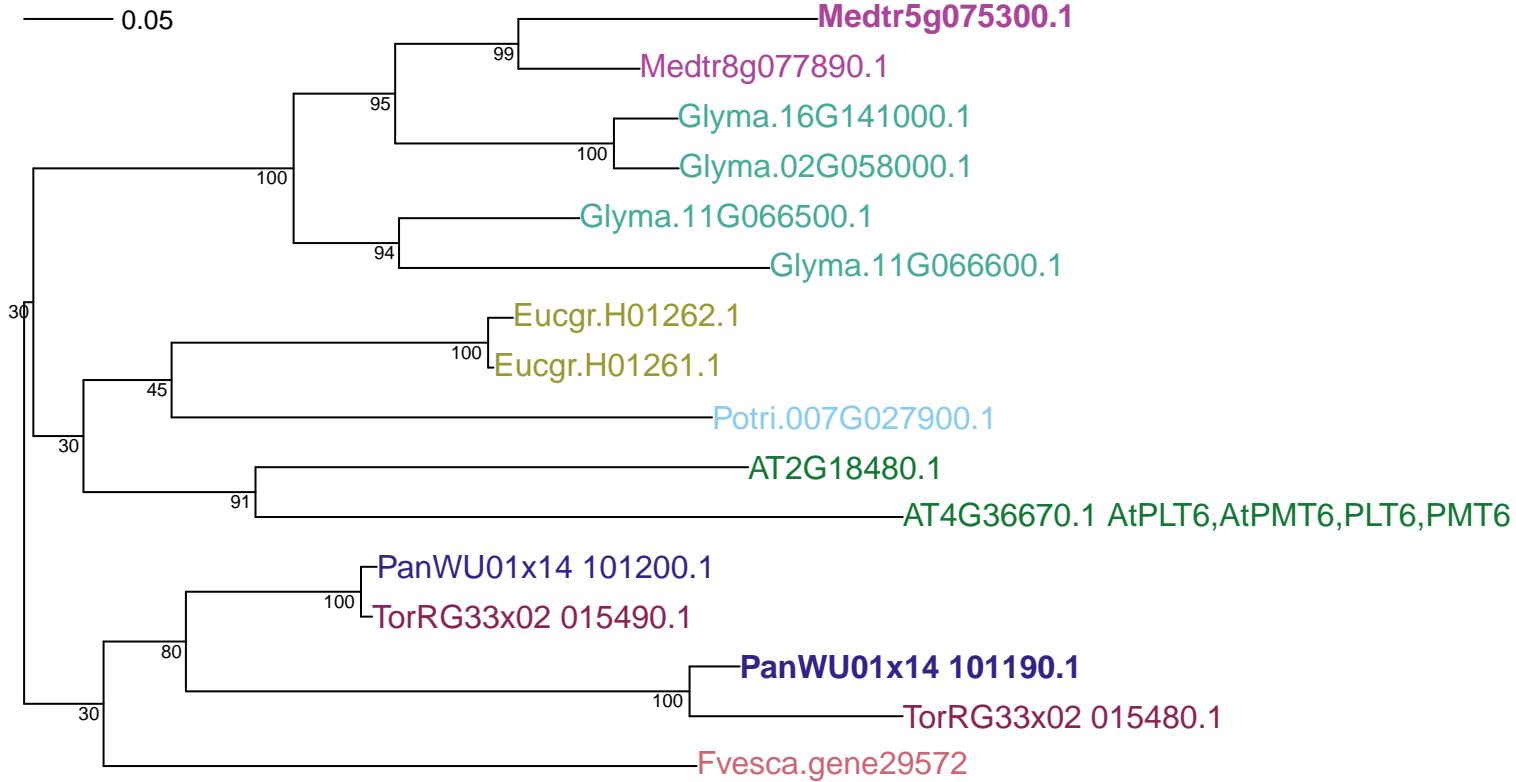
OG0002863: Transporters. Potassium transporter



OG0003156: Transporters. Multi antimicrobial extrusion protein

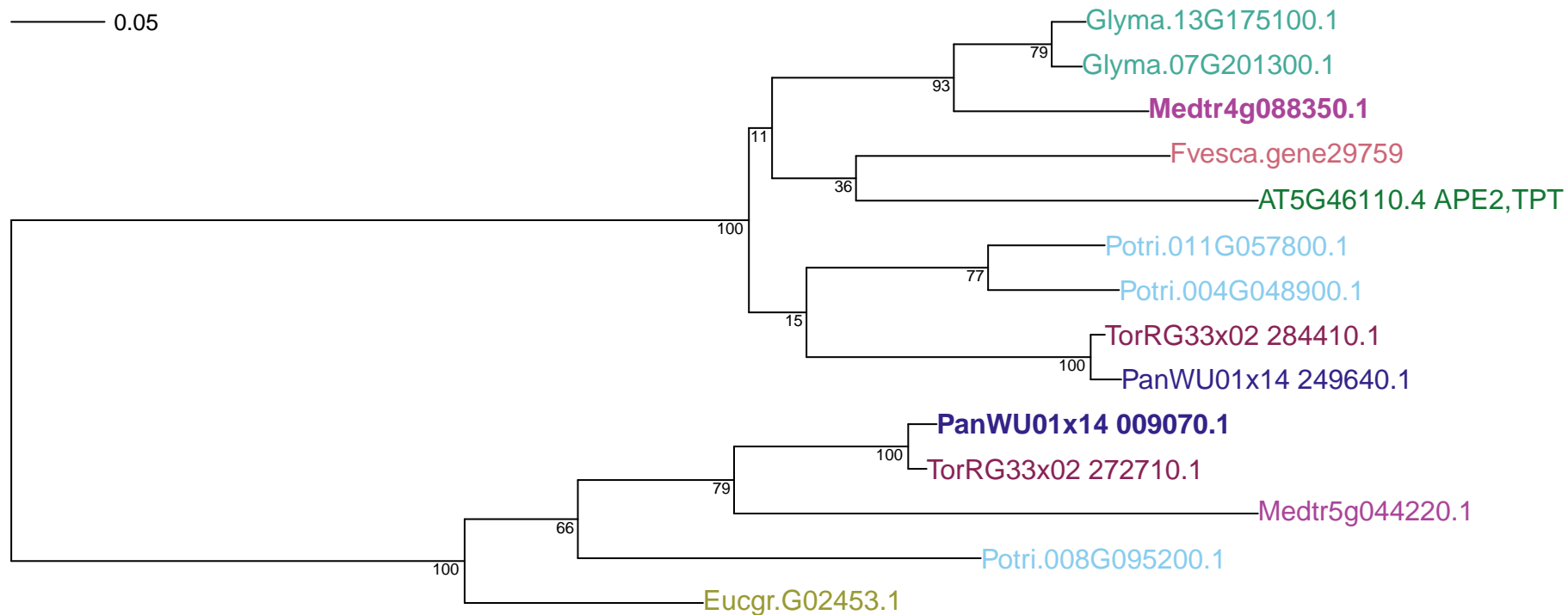


OG0003241: Transporters. Sugar/inositol transporter



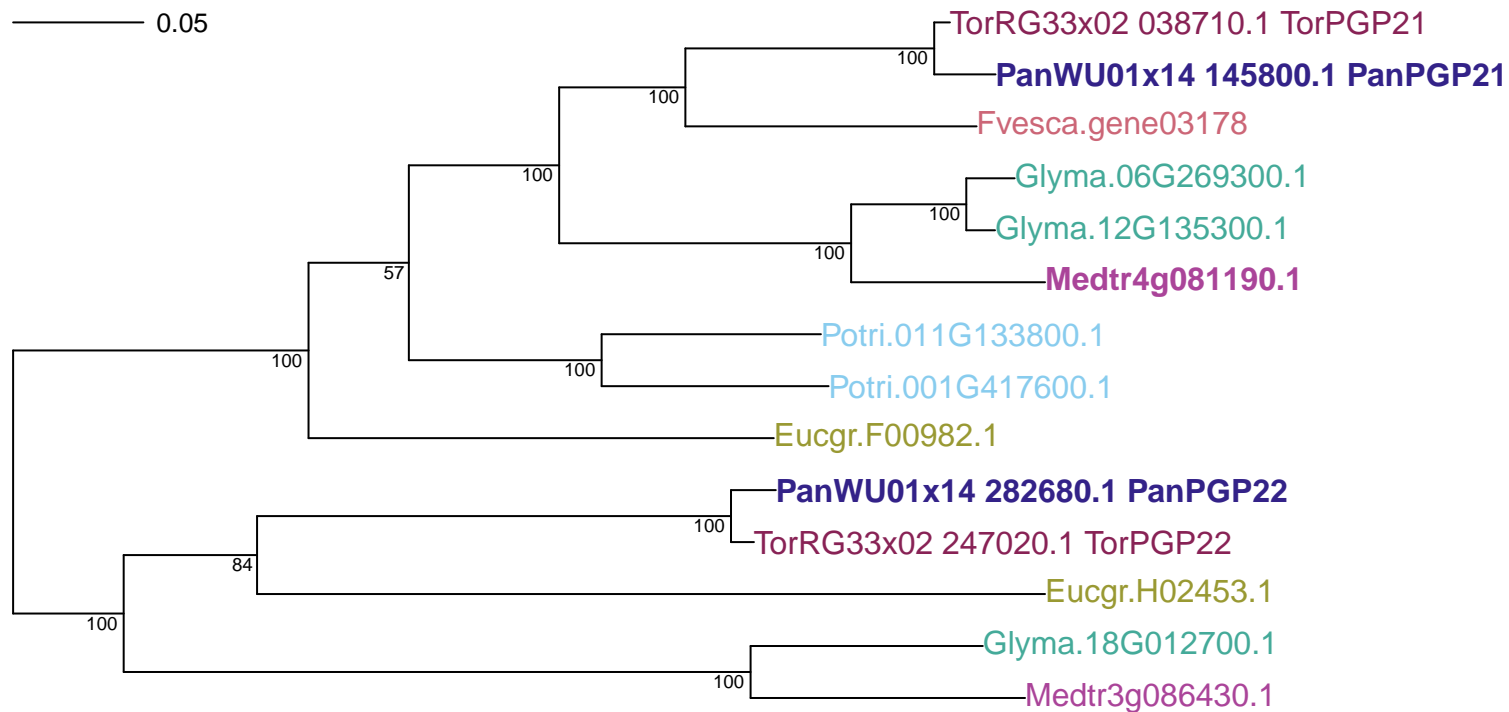
OG0004467: Transporters. Triose phosphate/phosphoenolpyruvate translocator

0.05

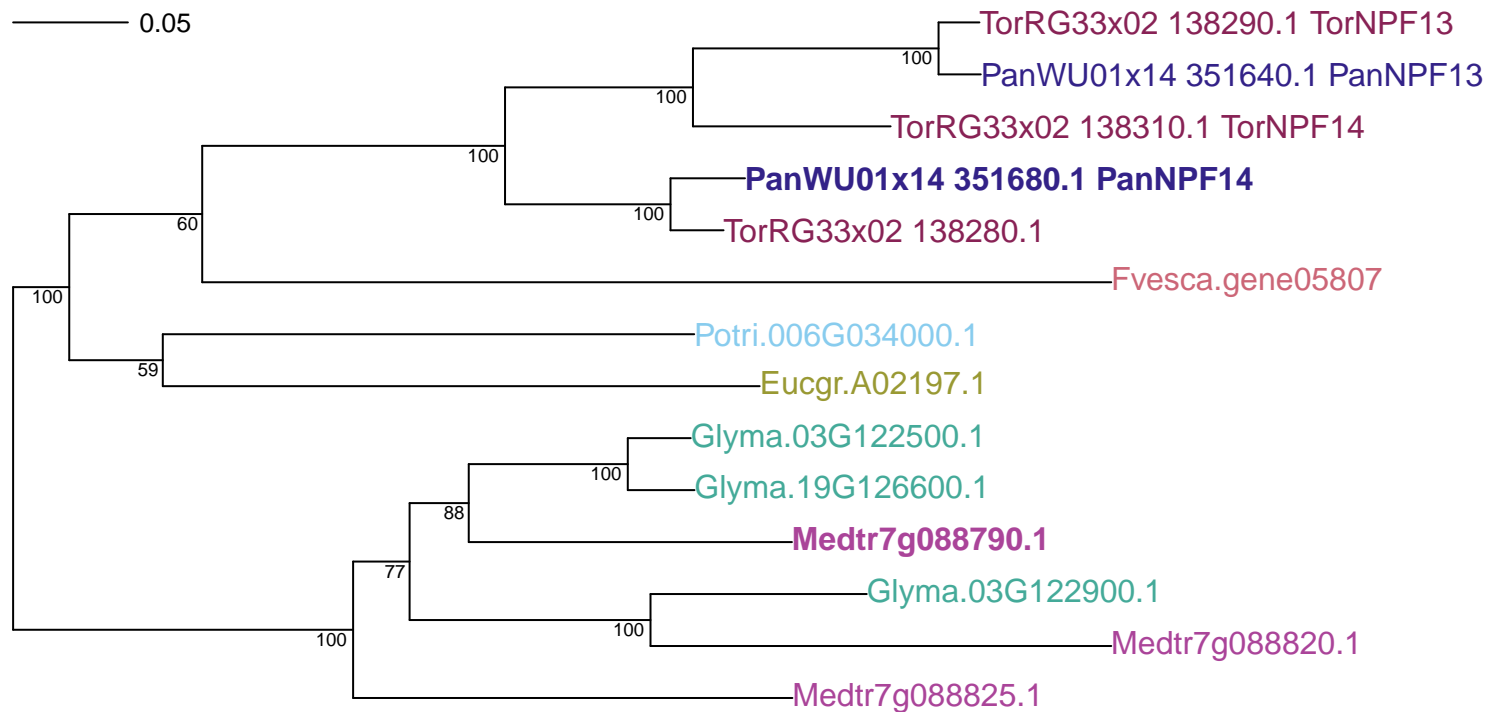


OG0004488: Transporters. ABC transporter

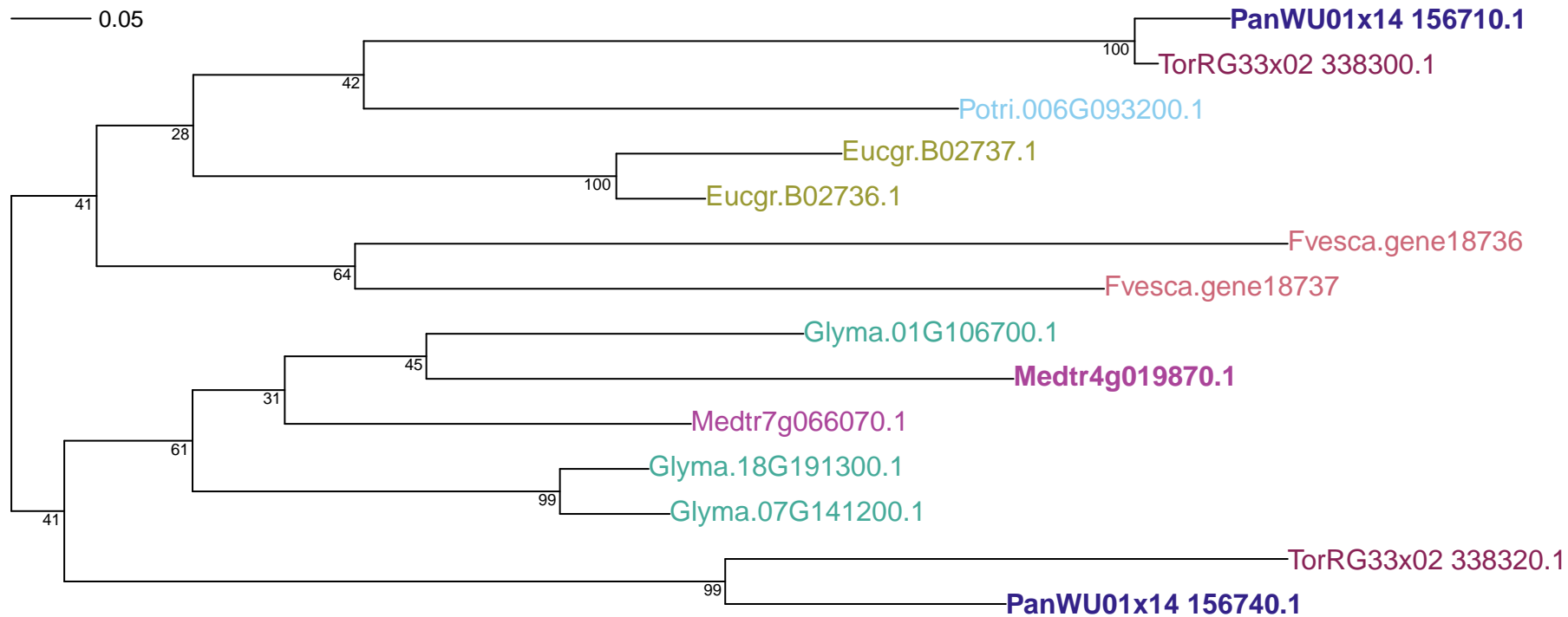
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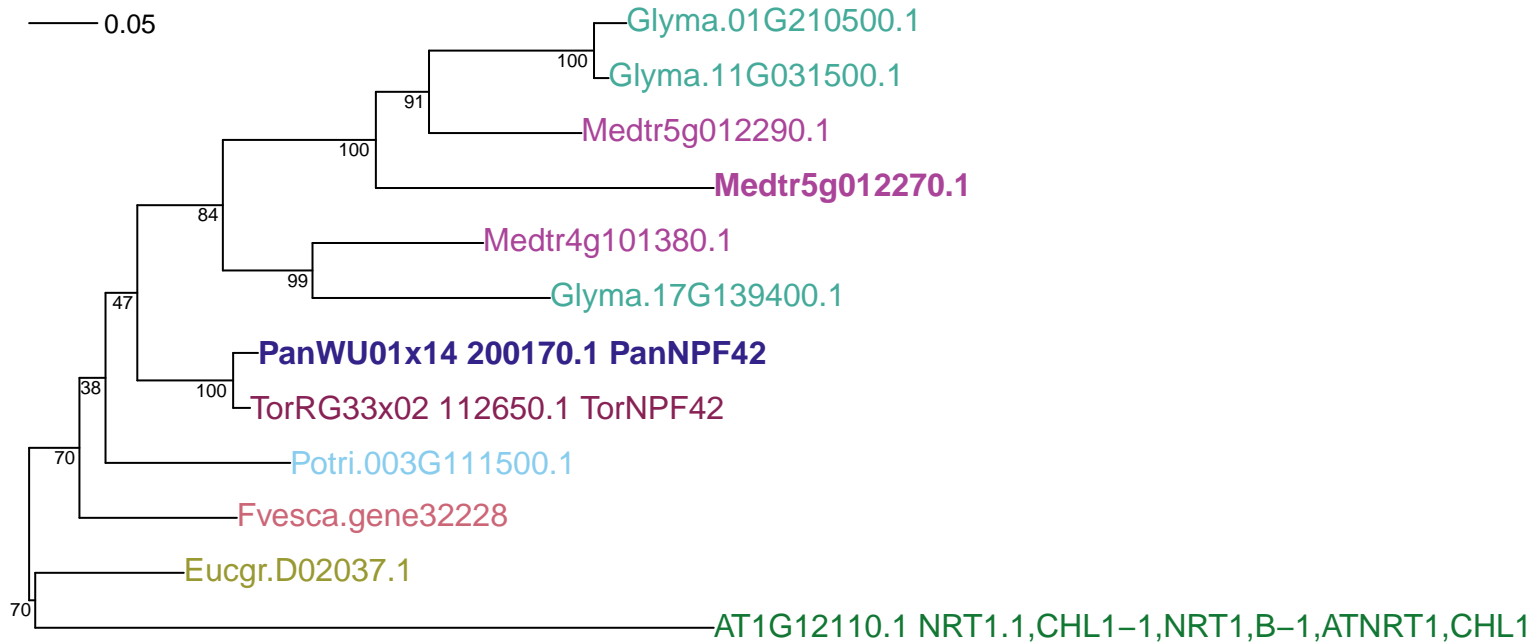
OG0004492: Transporters. Proton-dependent oligopeptide transporter



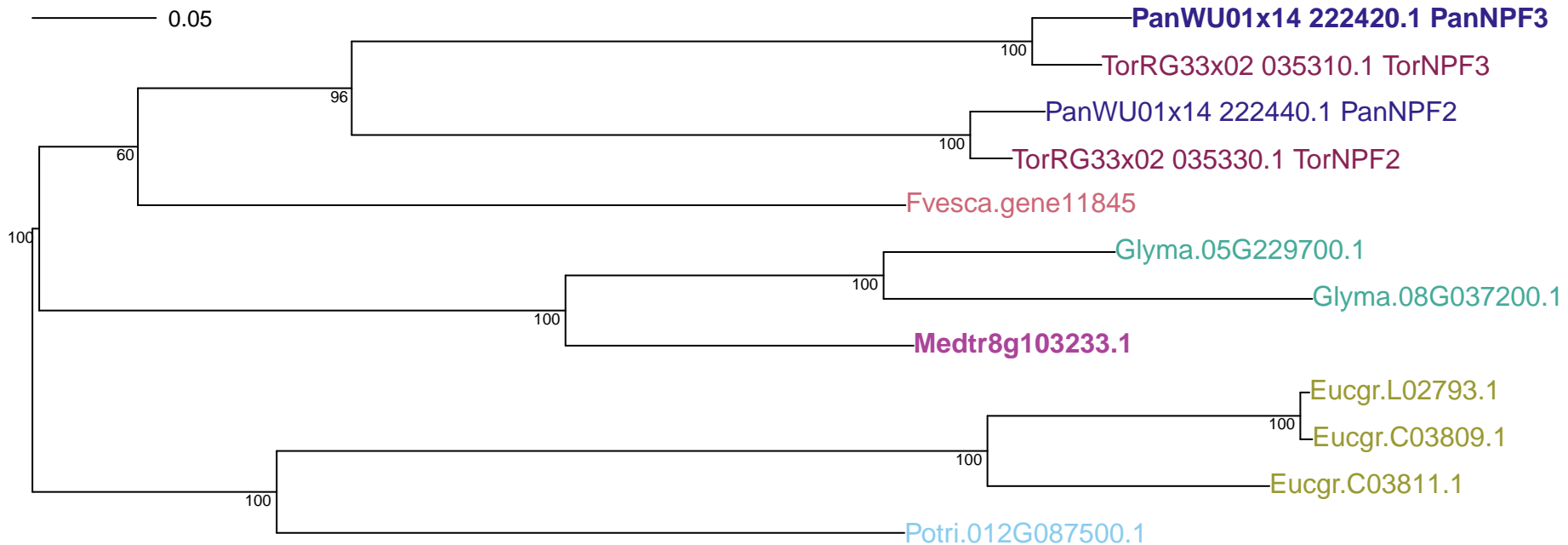
OG0004494: Transporters. Ctr copper transporter



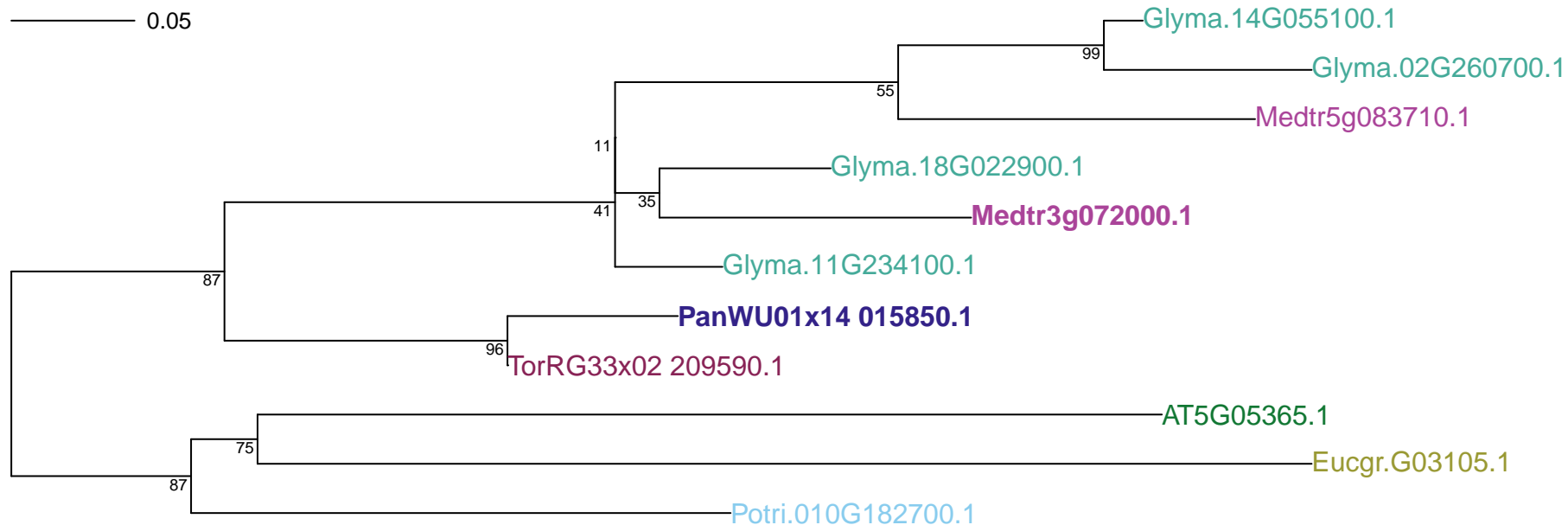
OG0005603: Transporters. Proton-dependent oligopeptide transporter



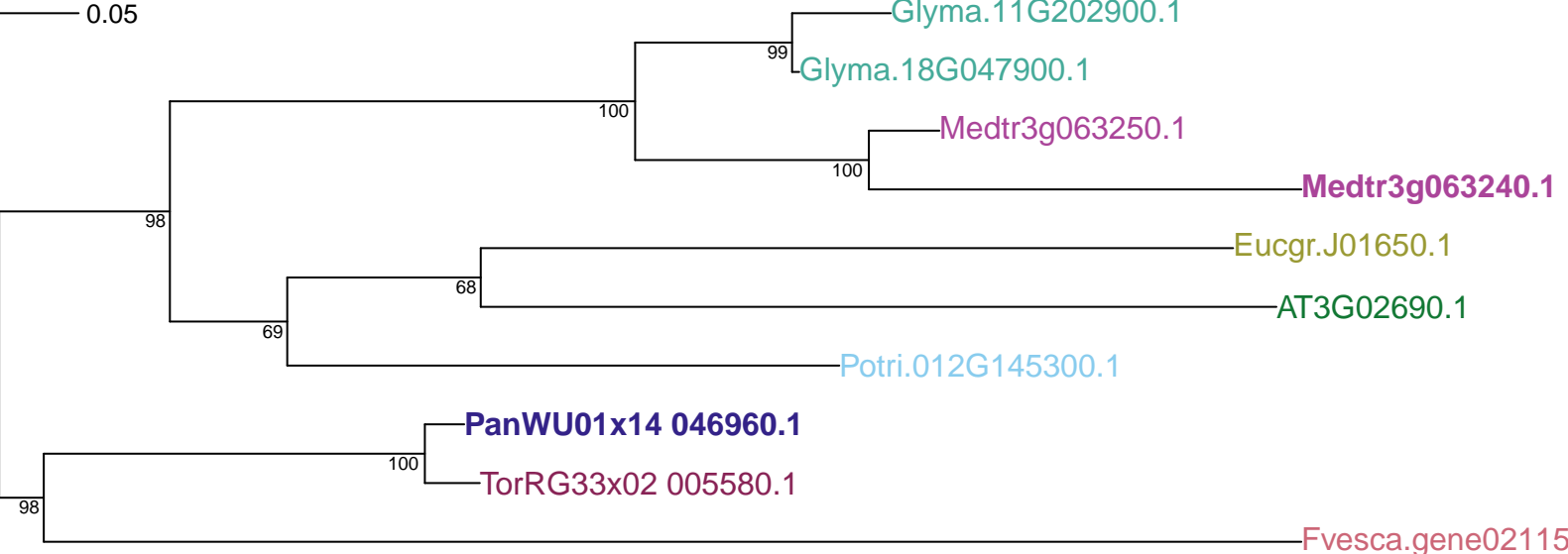
OG0006366: Transporters. Proton-dependent oligopeptide transporter



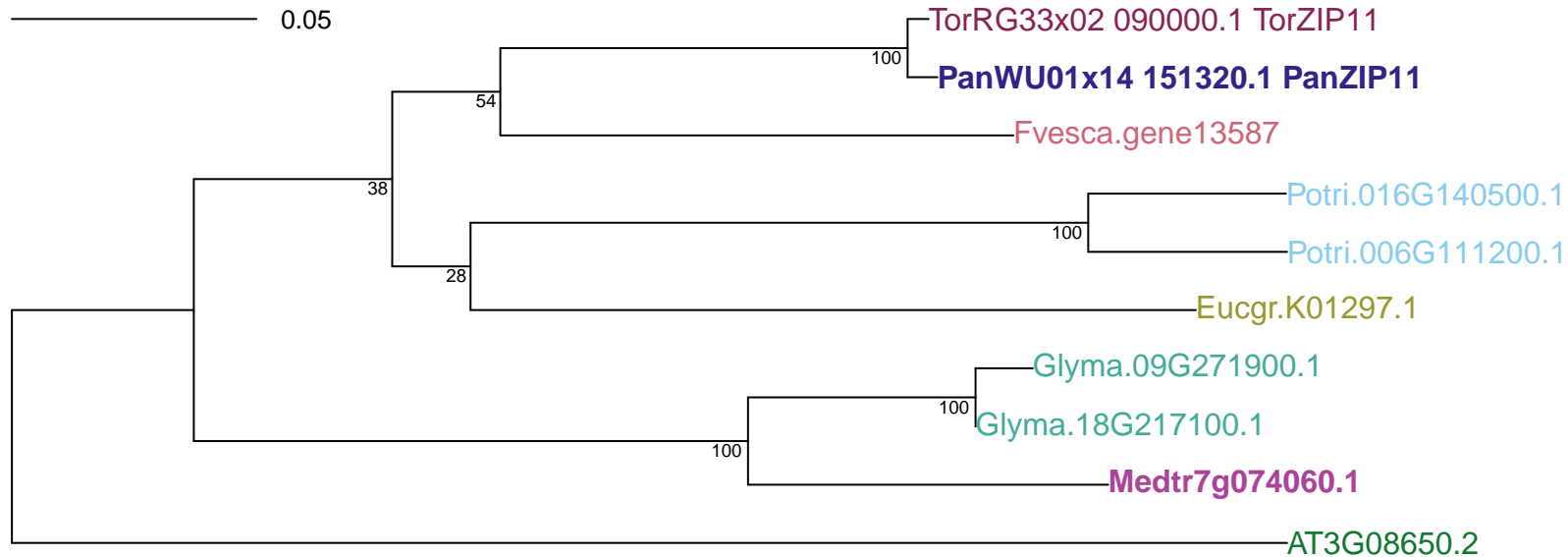
OG0007703: Transporters. Heavy metal-associated domain containing protein



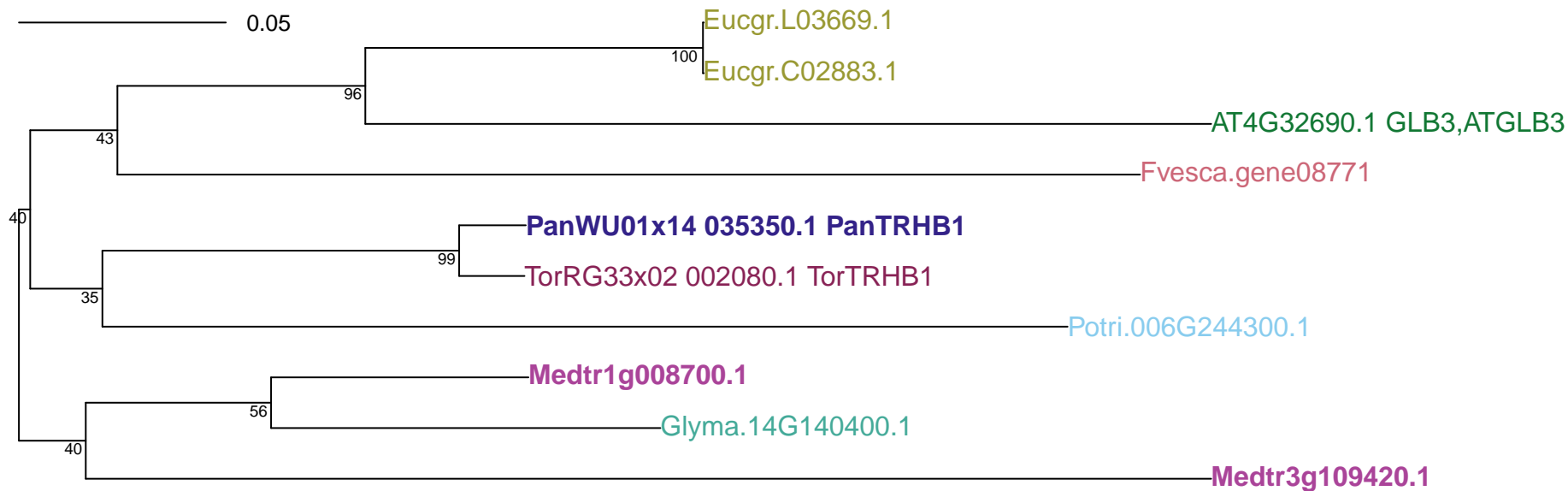
OG0008703: Transporters. EamA domain containing protein



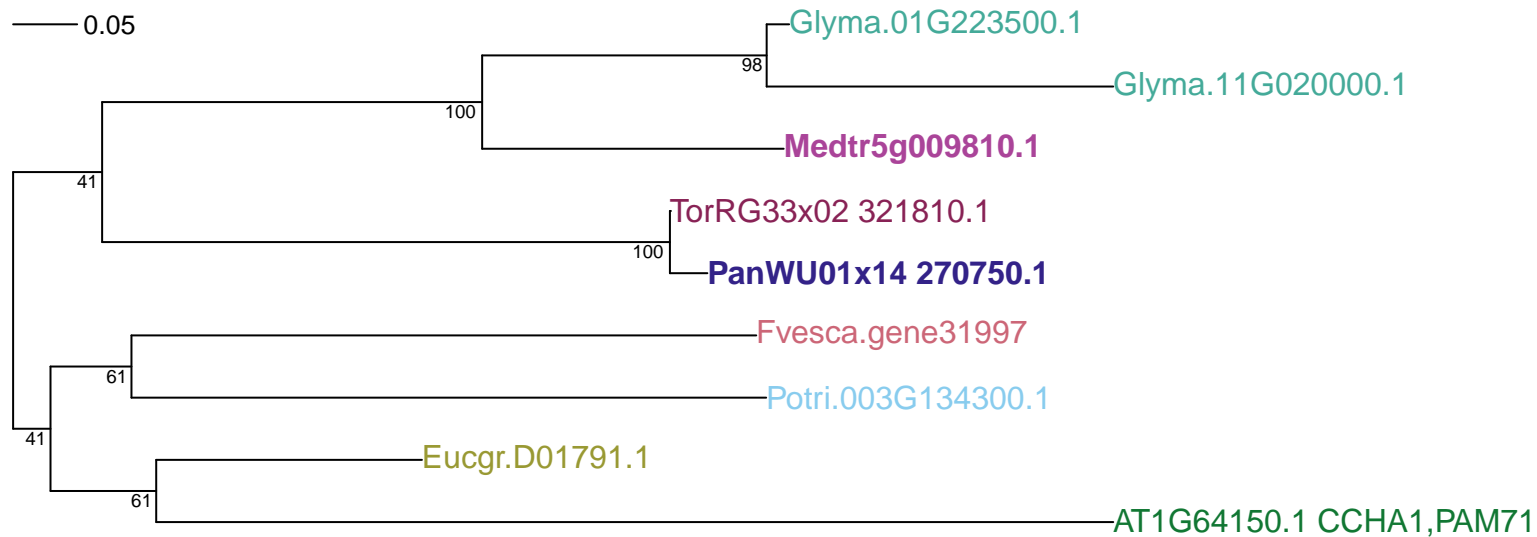
OG0009021: Transporters. Zinc/iron permease



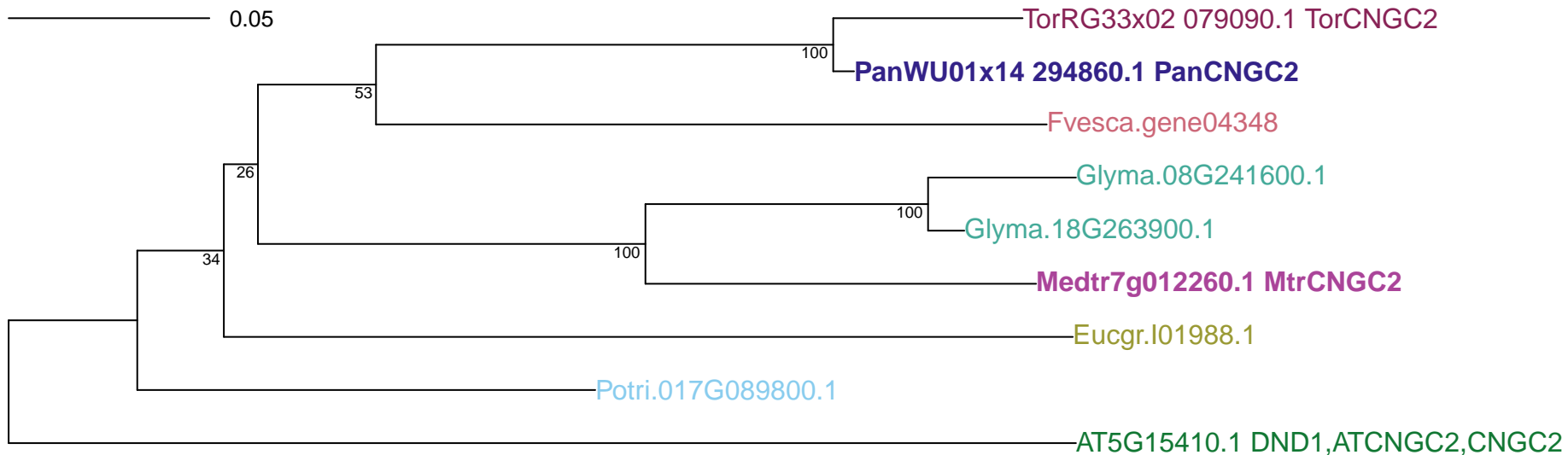
OG0009195: Transporters. Truncated hemoglobin



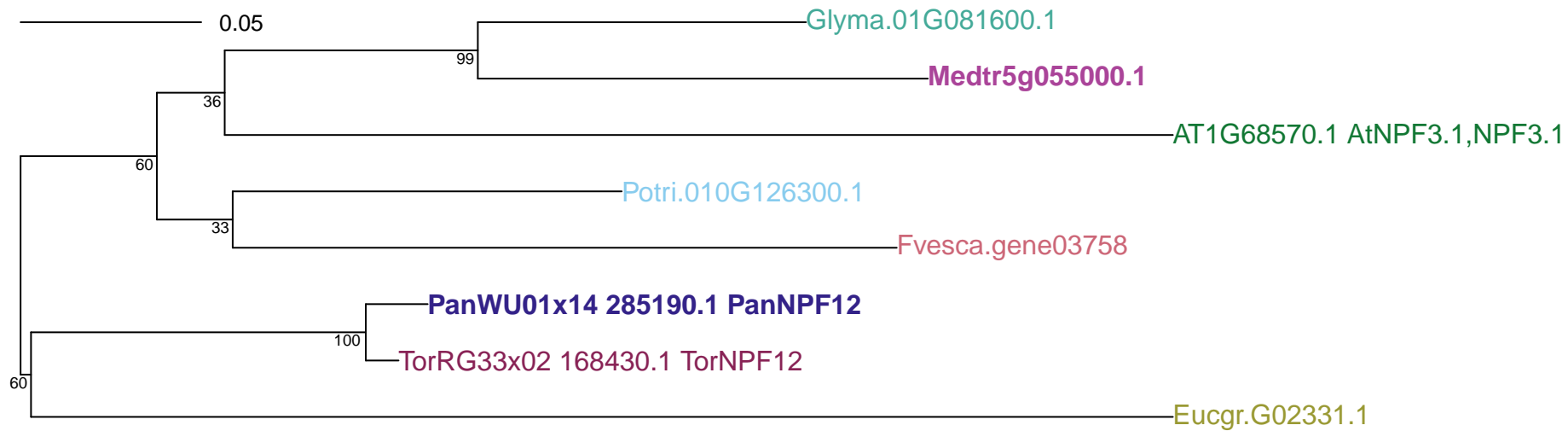
OG0010146: Transporters. GDT1-like protein



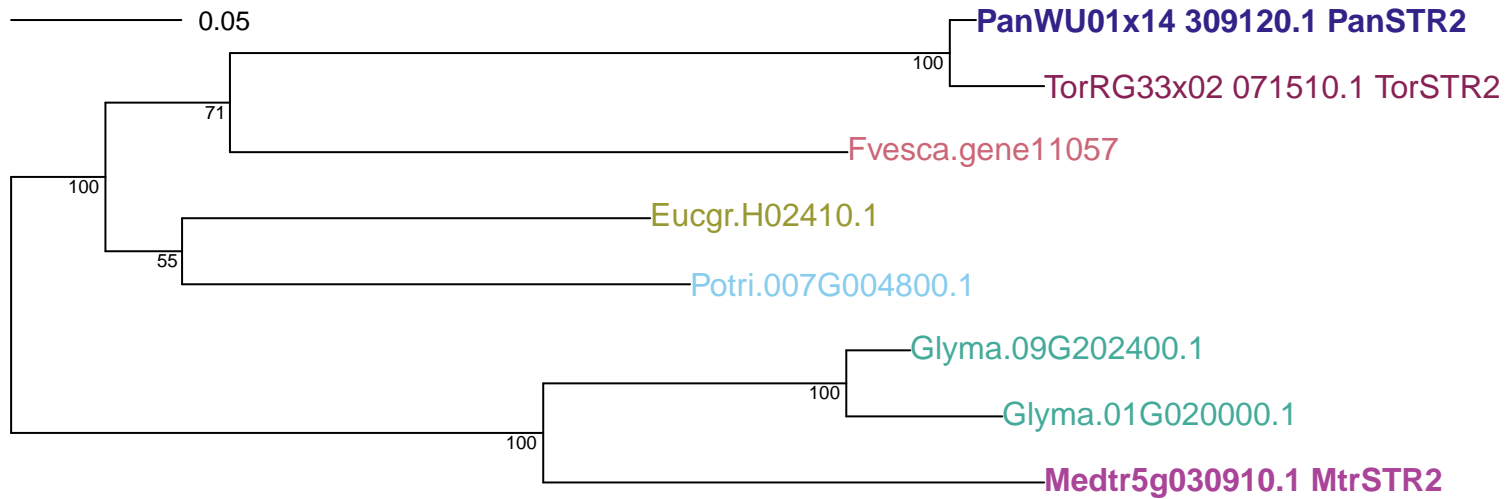
OG0011917: Transporters. Voltage dependent potassium channel



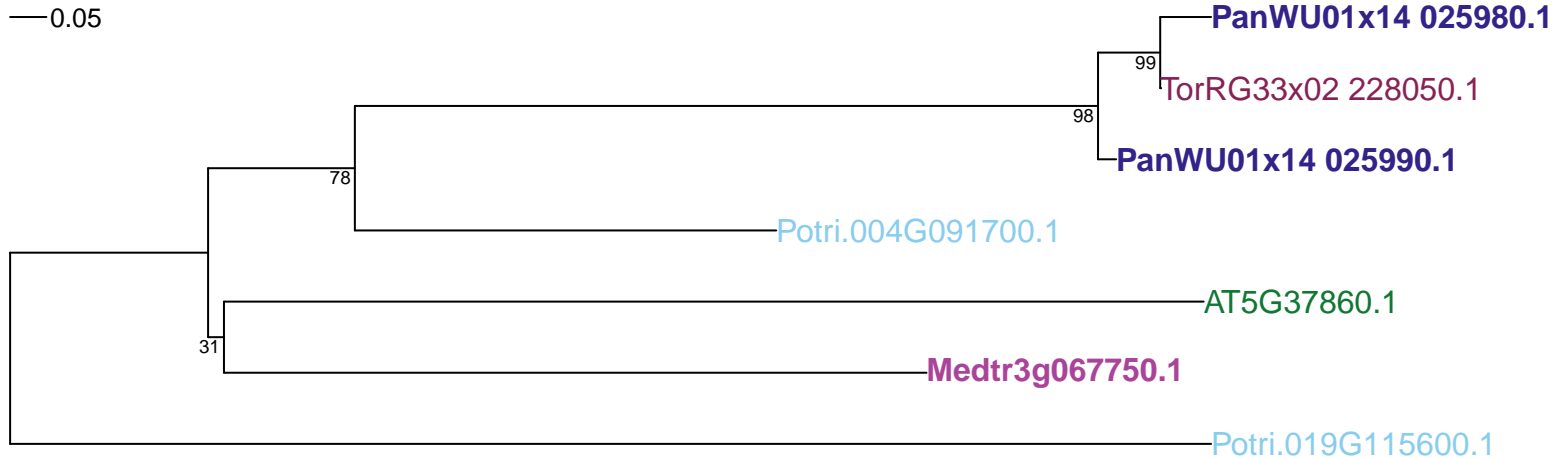
OG0012469: Transporters. Proton-dependent oligopeptide transporter



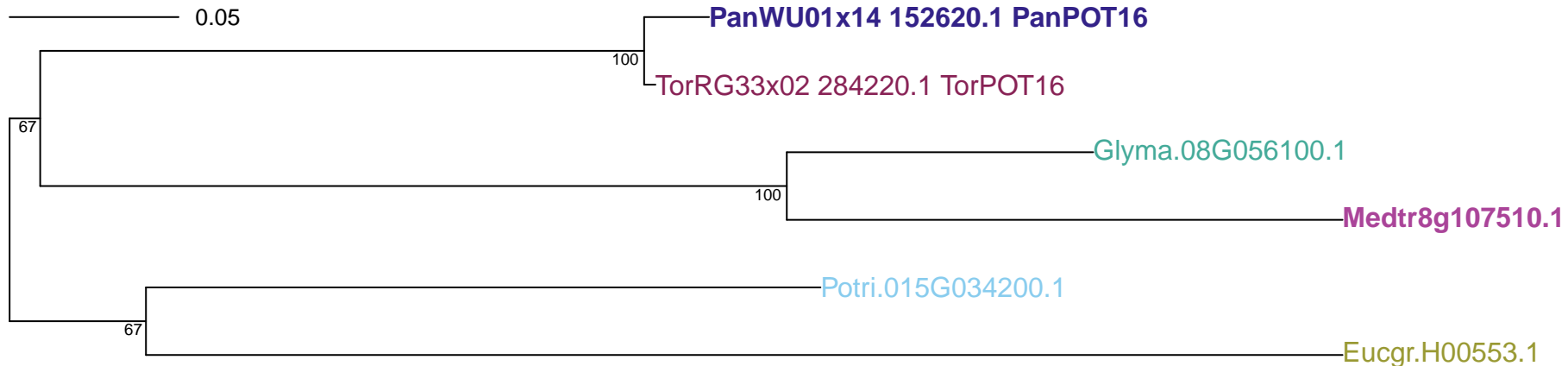
OG0013396: Transporters. Half-size ABCG transporter



OG0013893: Transporters. Heavy metal-associated domain containing protein

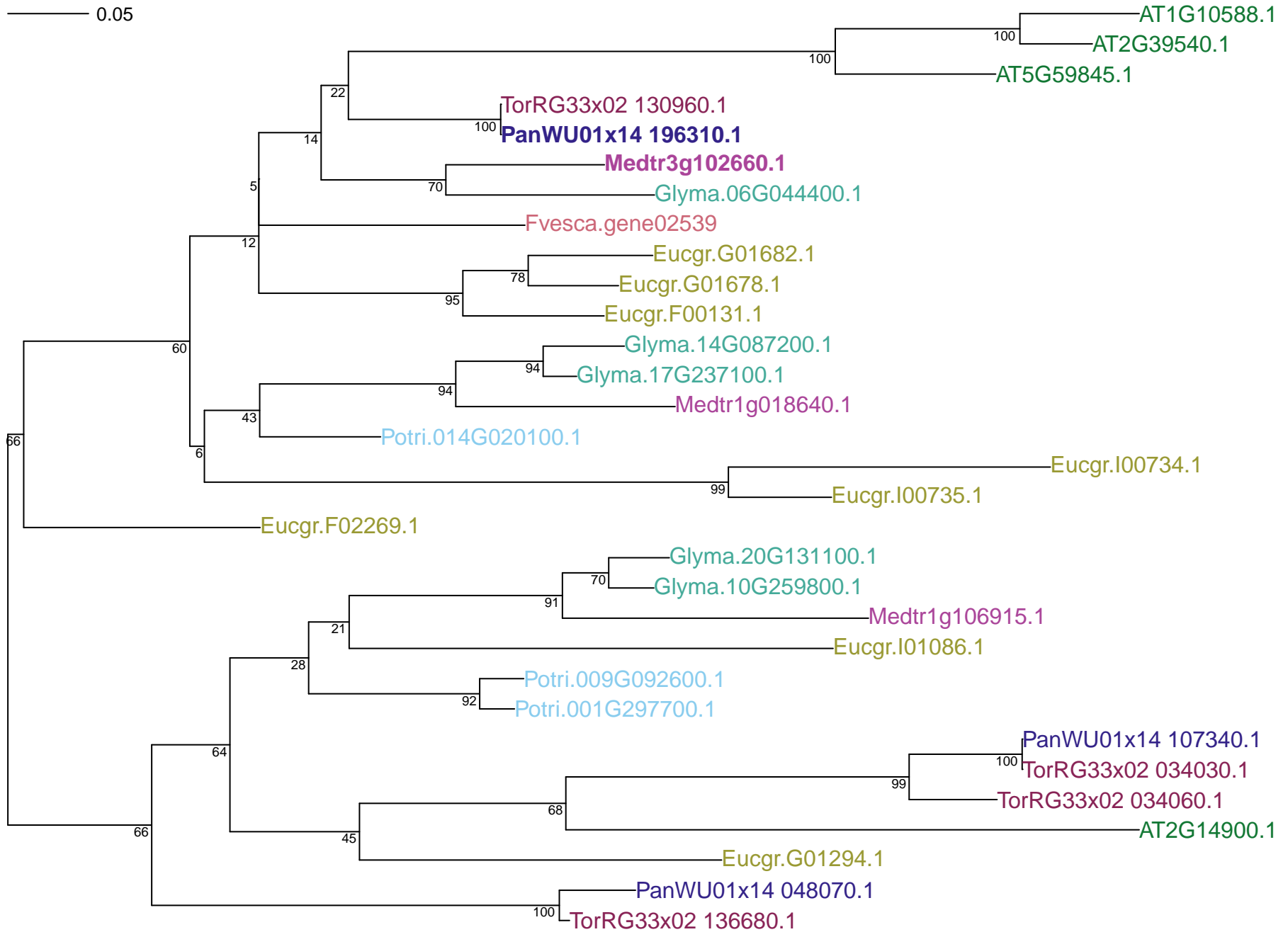


OG0014444: Transporters. Potassium transporter

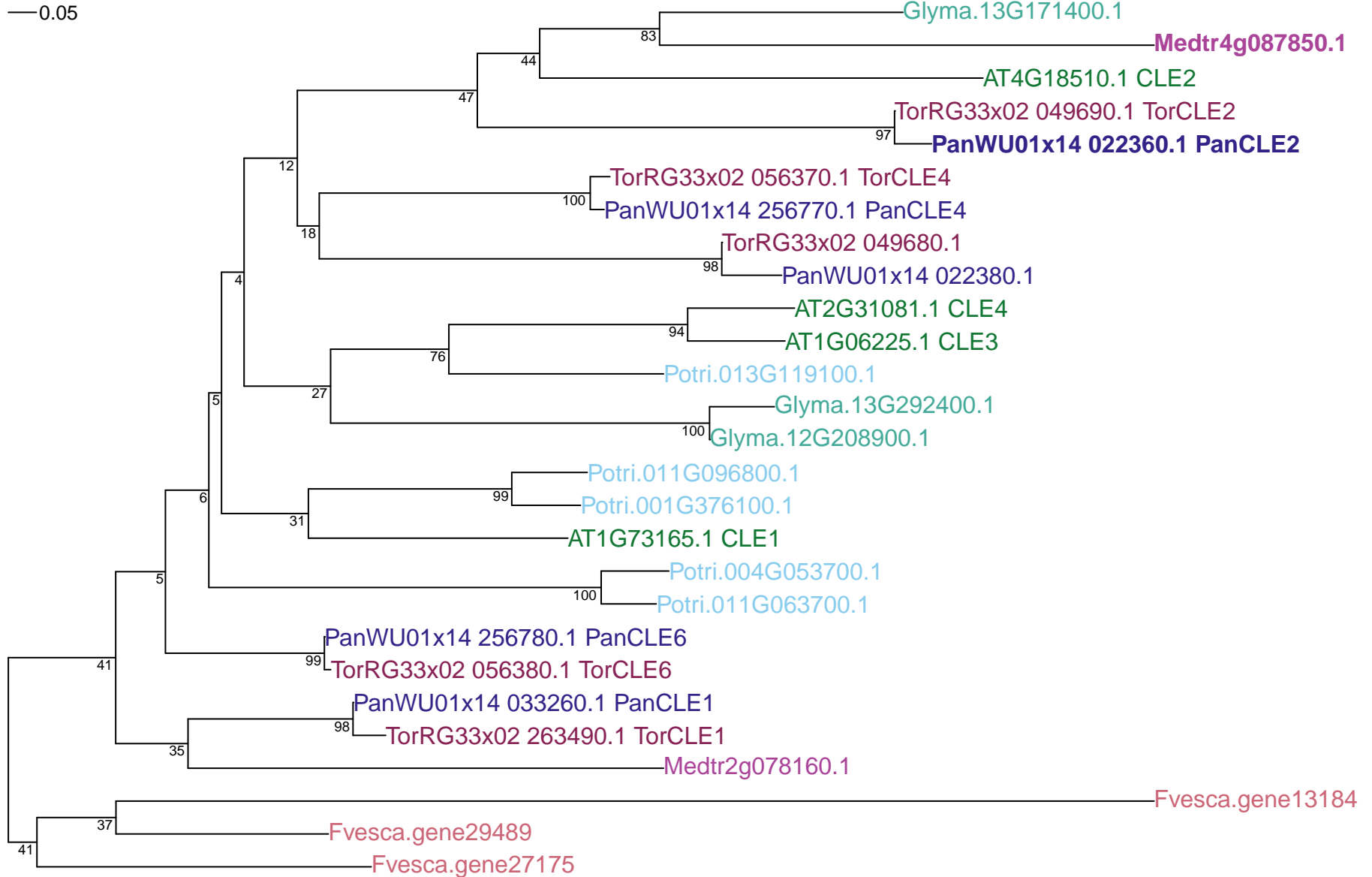


OG0000775: Hormones. Gibberellin regulated protein

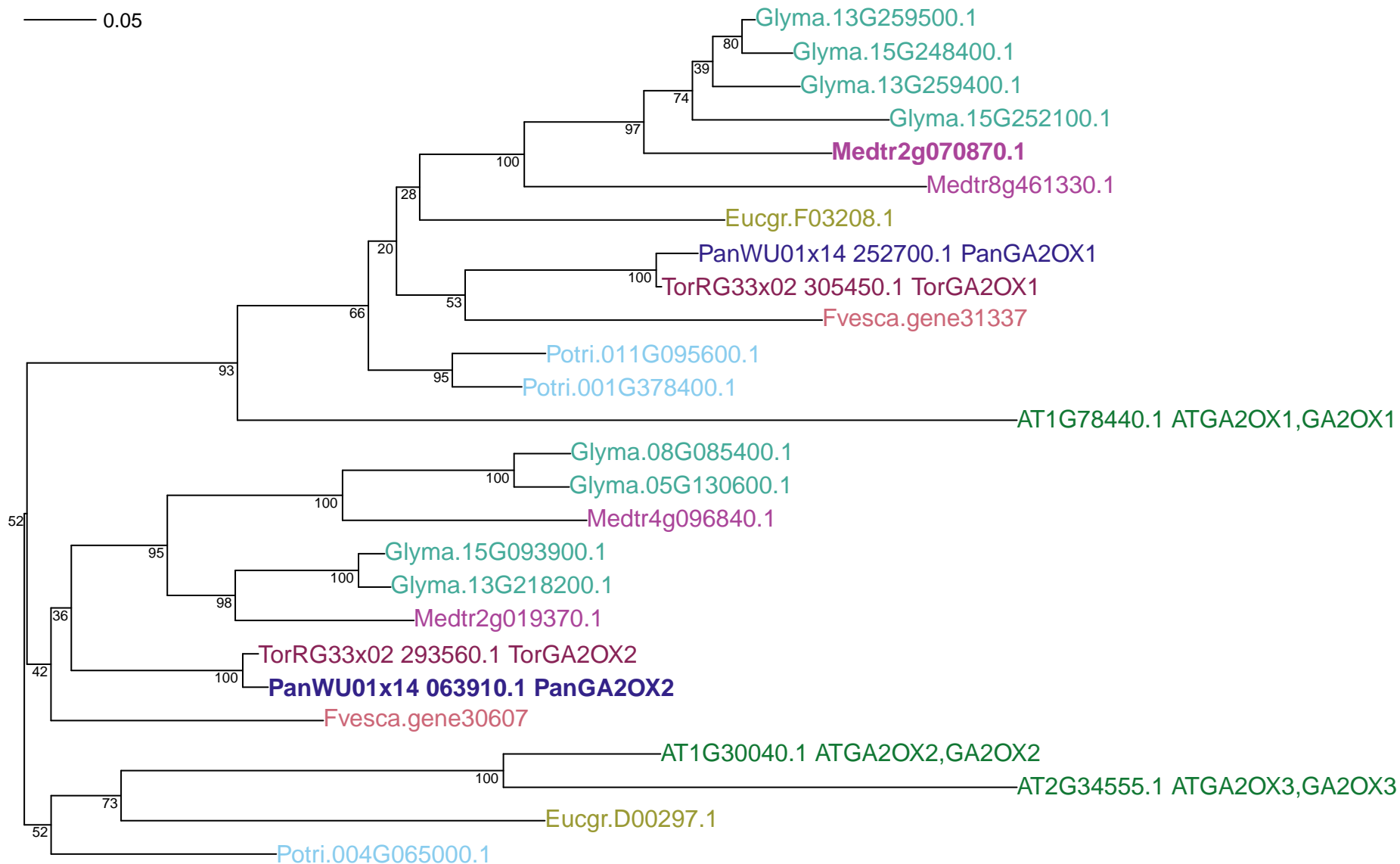
0.05



OG0001018: Hormones. CLAVATA3/ESR (CLE)-related protein

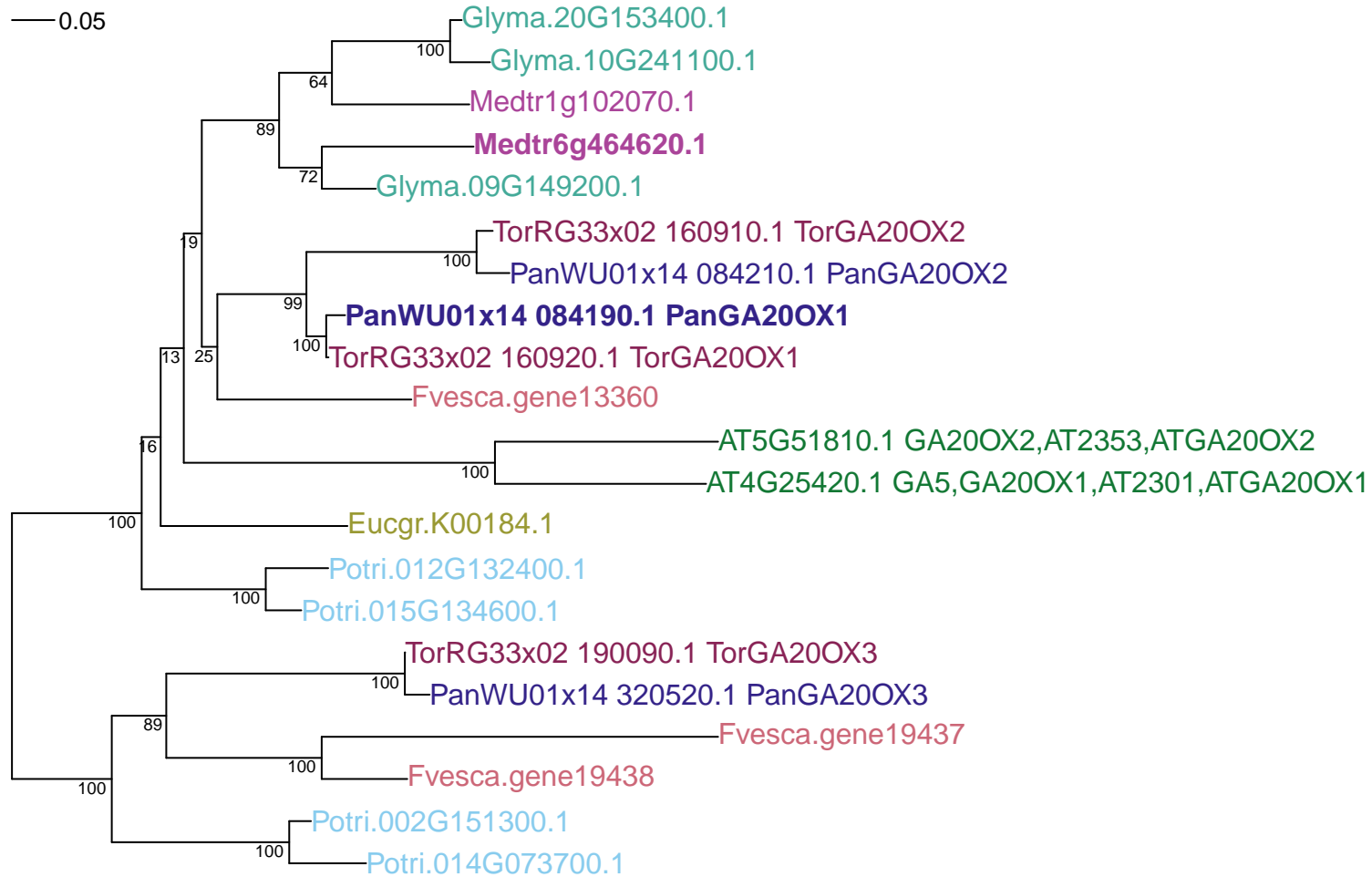


OG0001120: Hormones. Gibberellin-2 oxidase

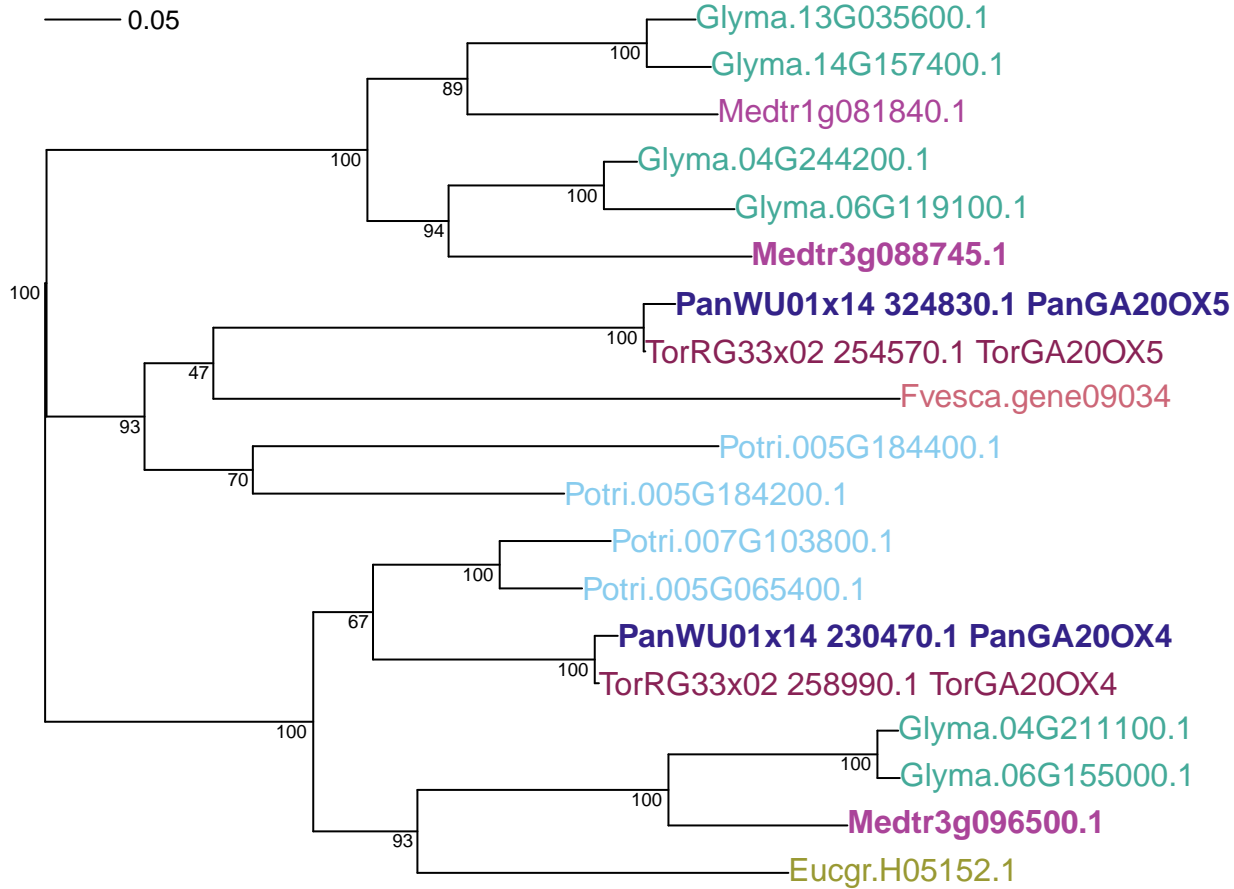


OG0001956: Hormones. Gibberellin-20 oxidase

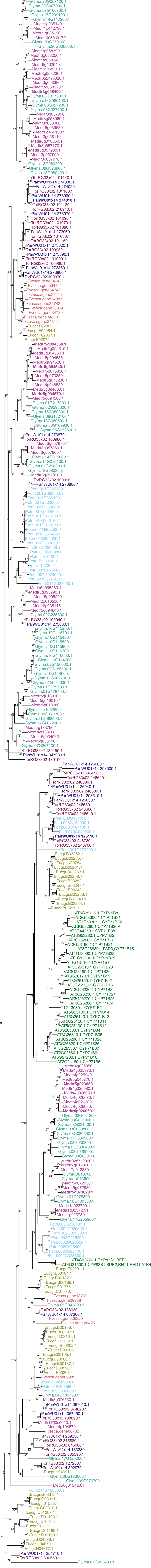
—0.05



OG0002470: Hormones. Gibberellin-20 oxidase

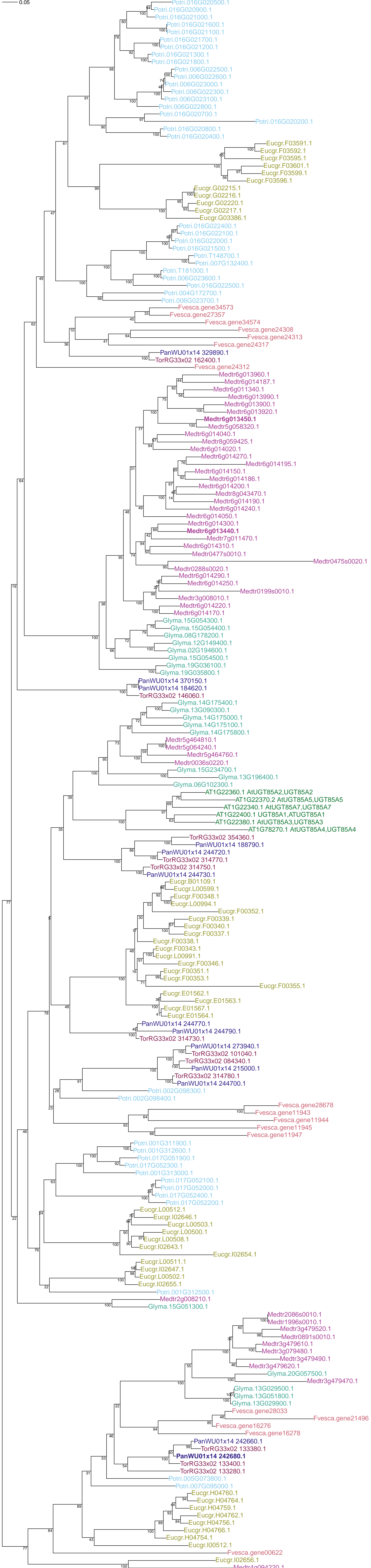


OG000006: Enzymes. Cytochrome P450, E-class, group I



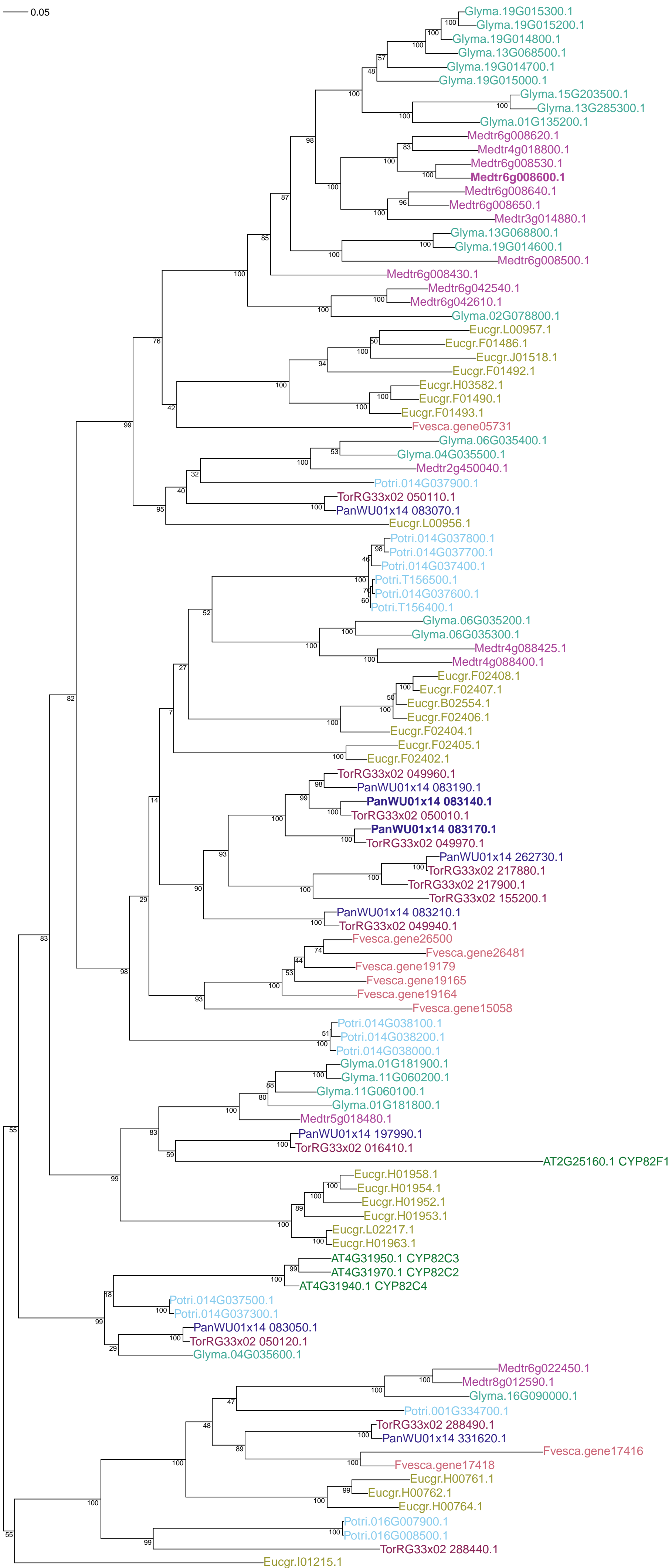
OG000023: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase

0.05

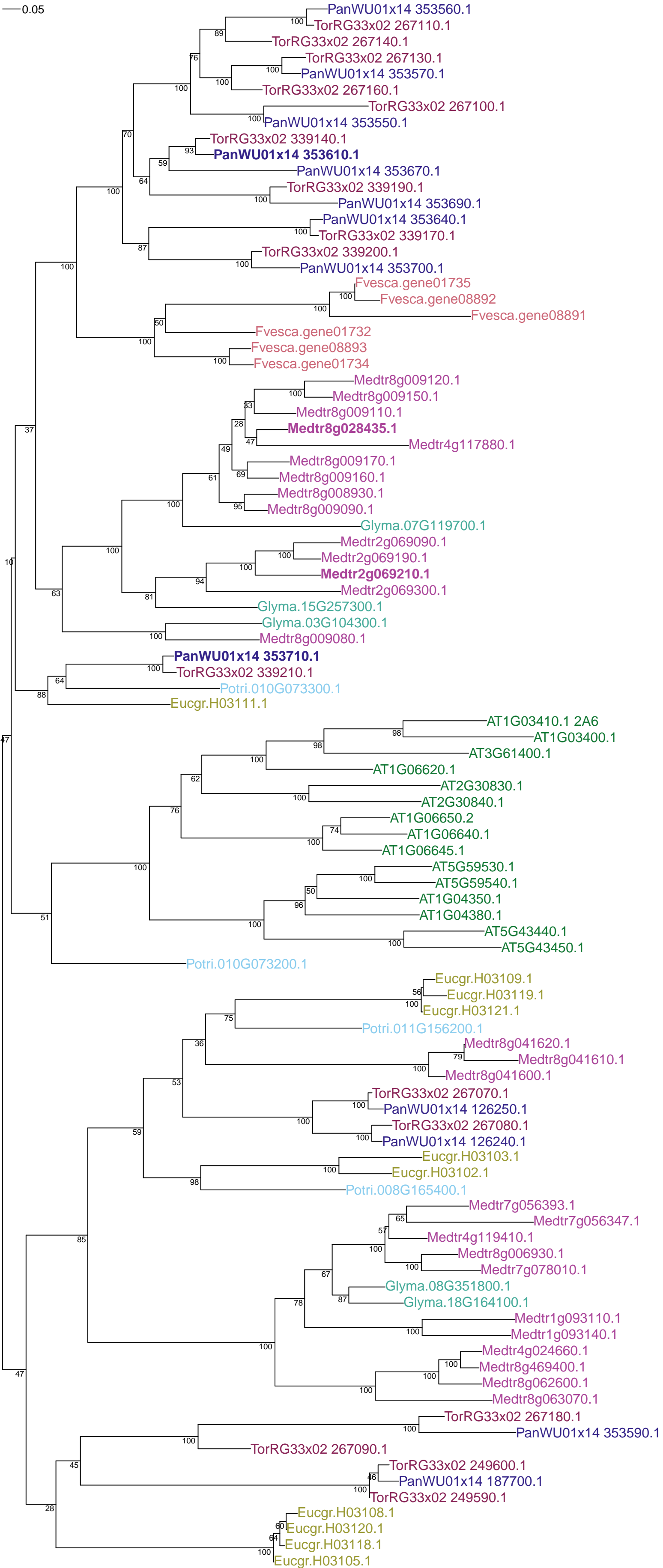


OG000077: Enzymes. Cytochrome P450, E-class, group I

0.05

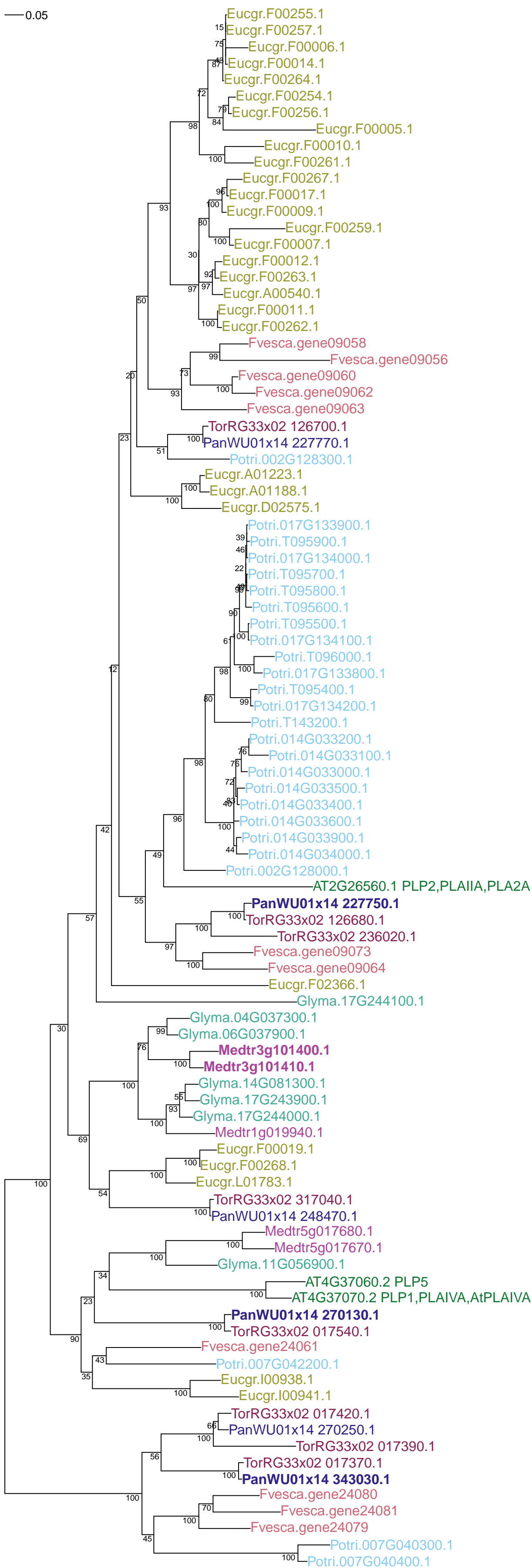


OG0000103: Enzymes. Oxoglutarate/iron-dependent dioxygenase

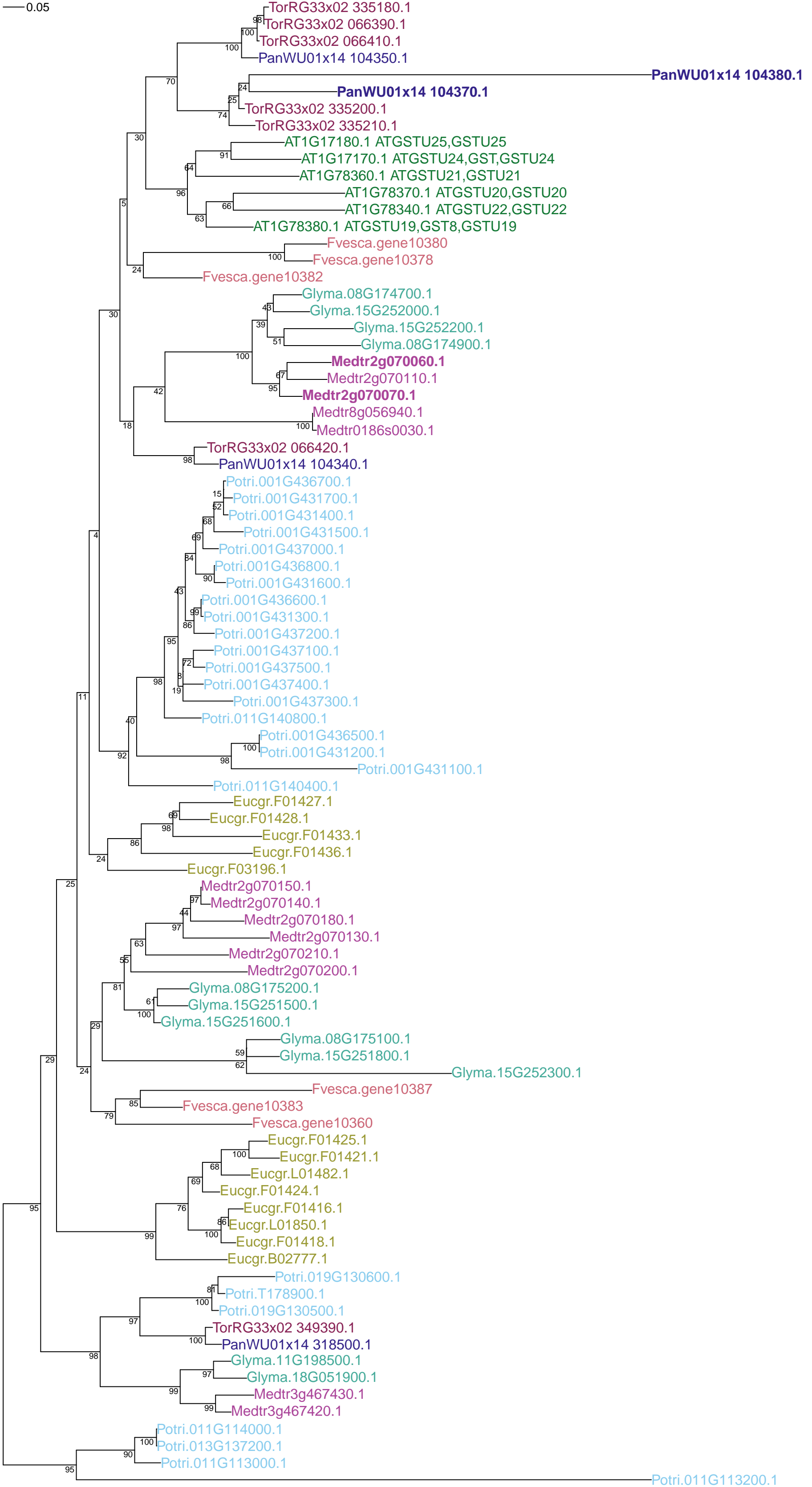


OG0000106: Enzymes. Patatin-related protein

—0.05

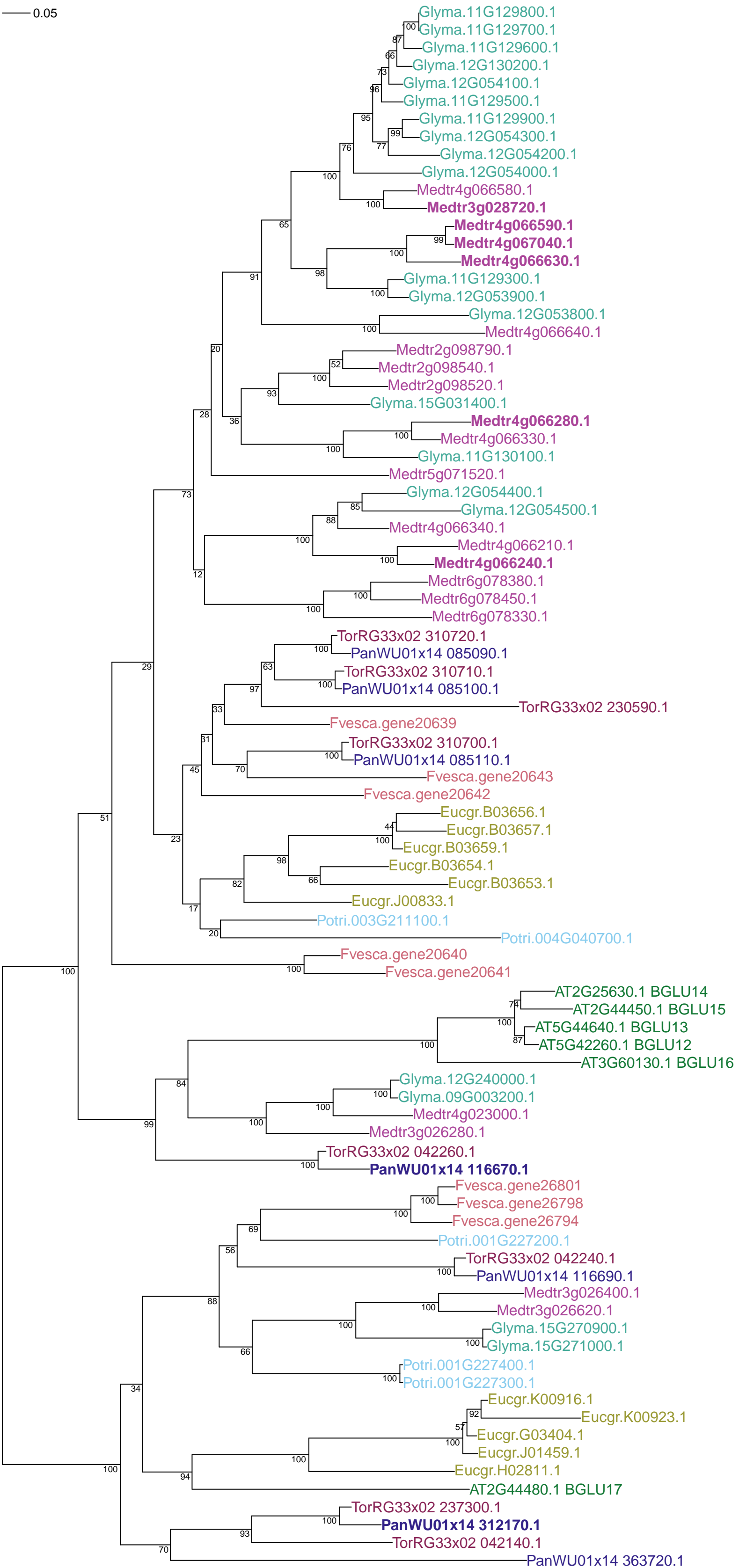


OG0000120: Enzymes. Glutathione S-transferase, C-terminal-like



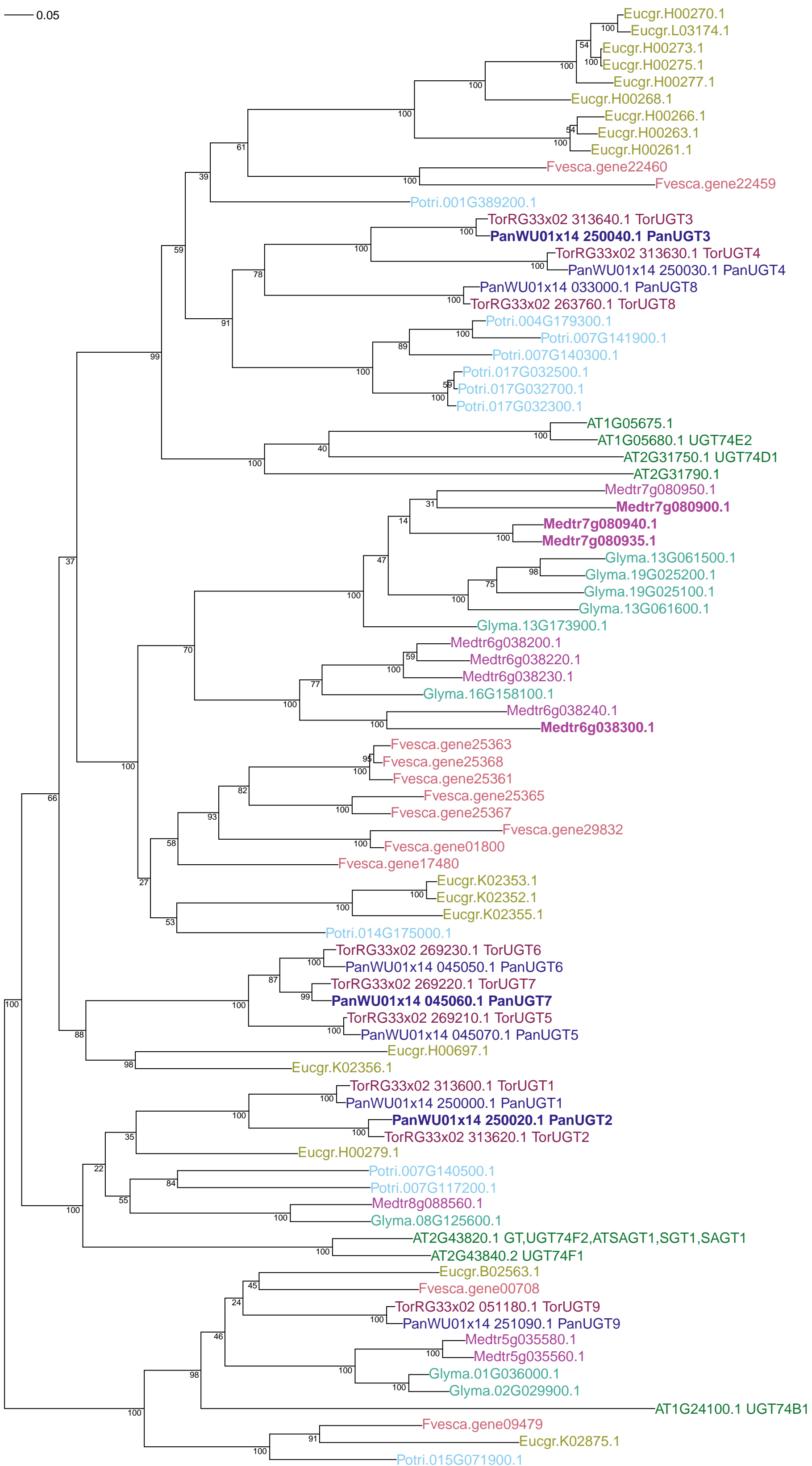
OG0000121: Enzymes. Glycoside hydrolase

— 0.05



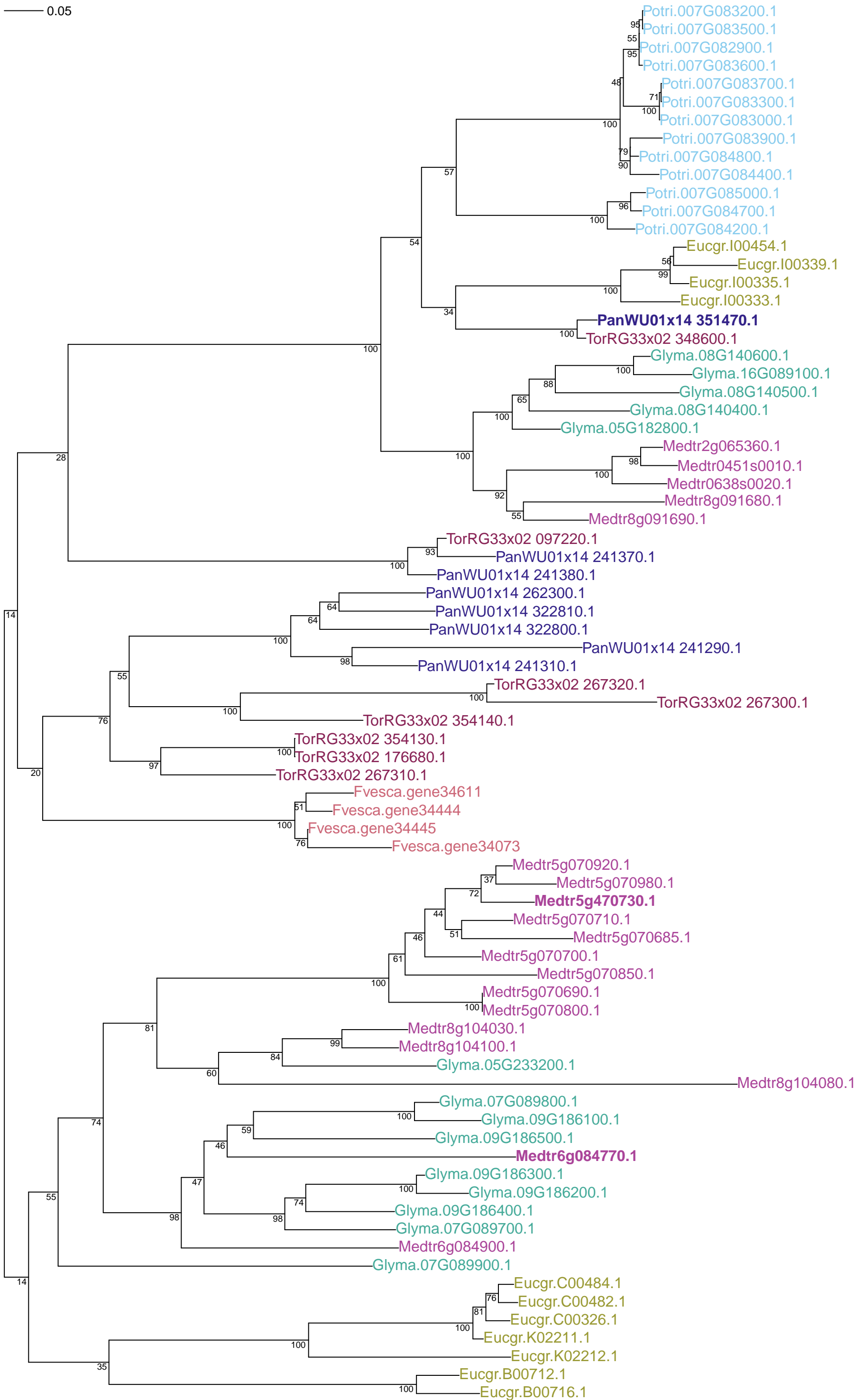
OG0000127: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase

0.05

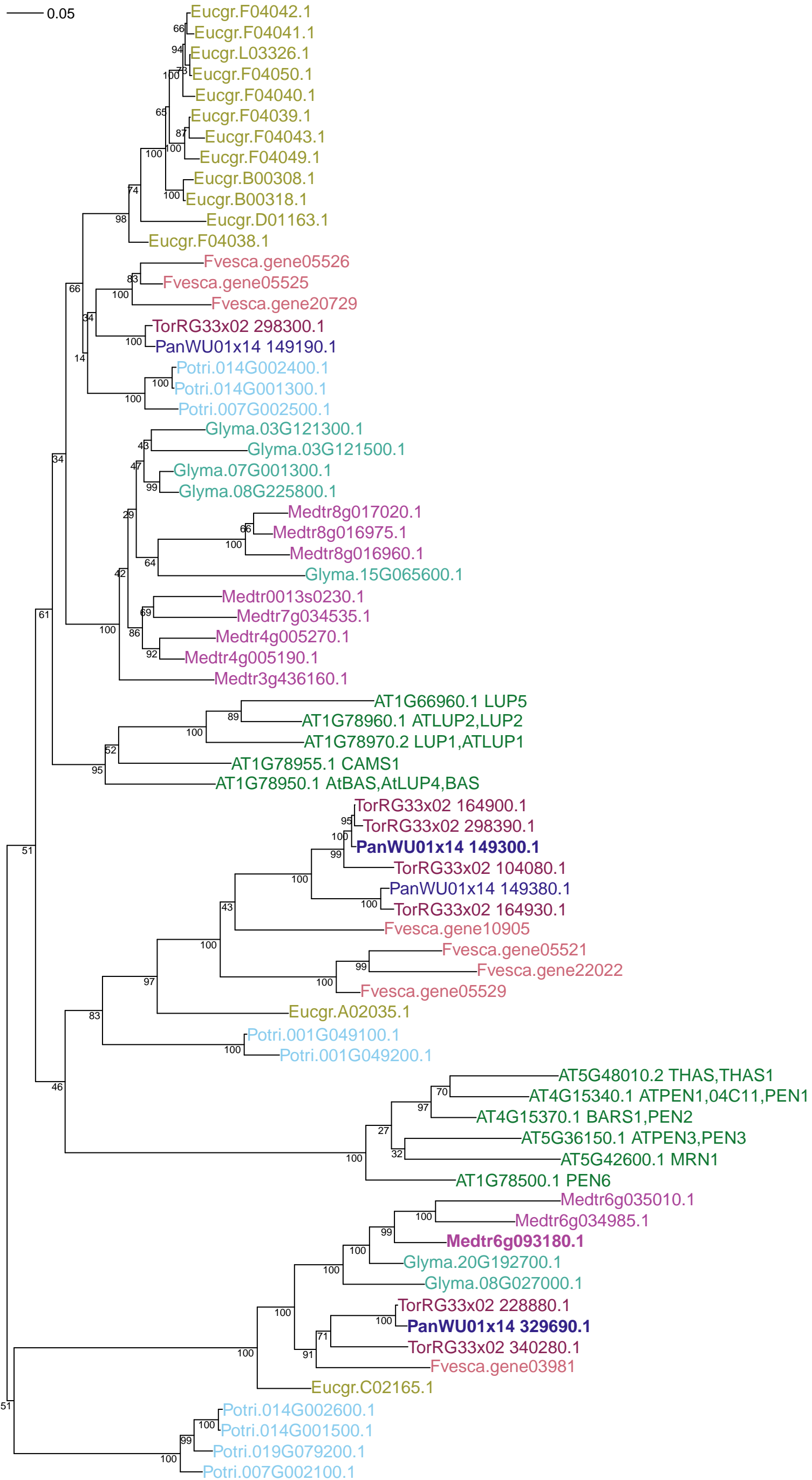


OG0000153: Enzymes. Cytochrome P450, E-class, group I

0.05

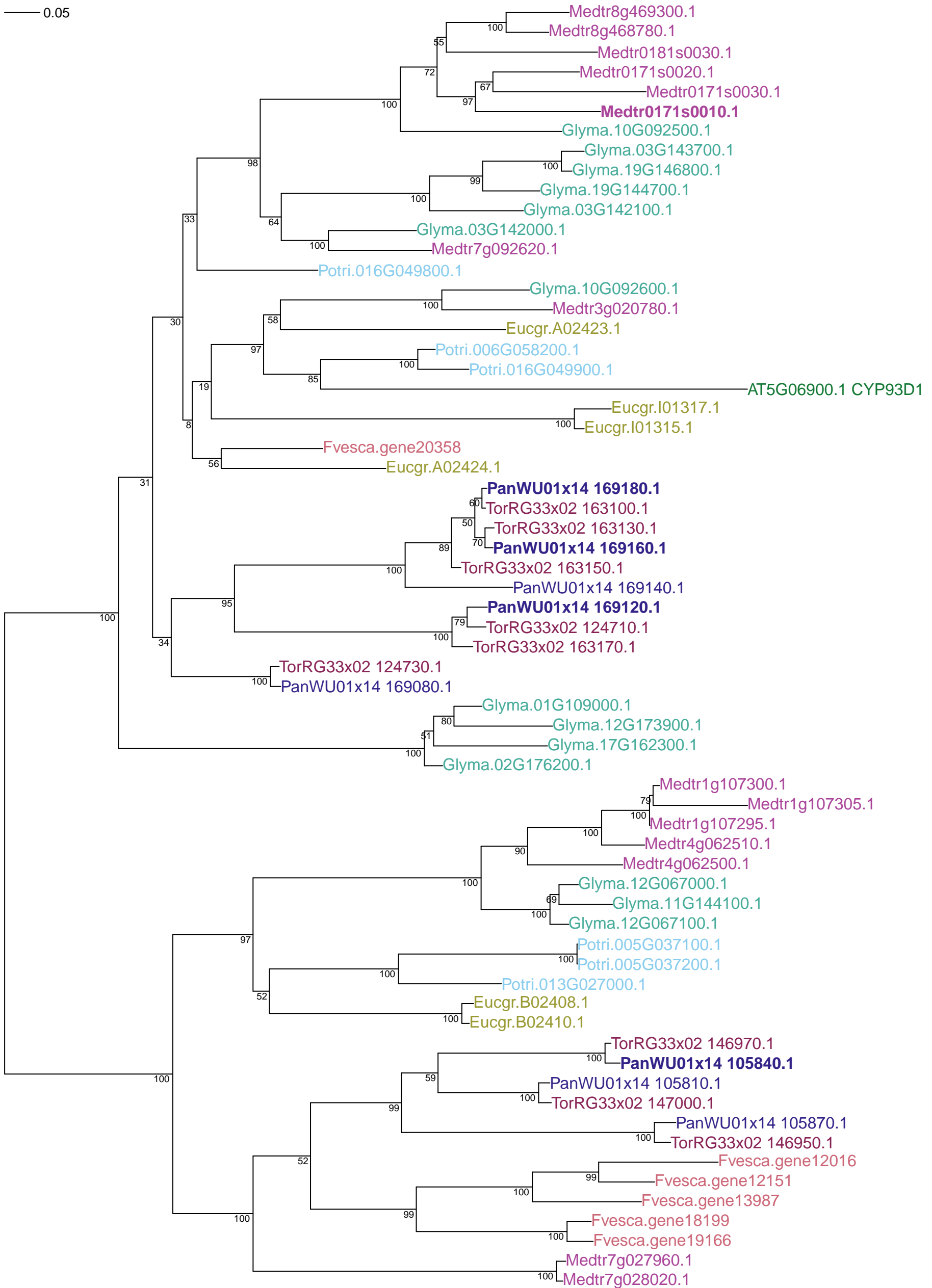


OG0000177: Enzymes. Squalene cyclase



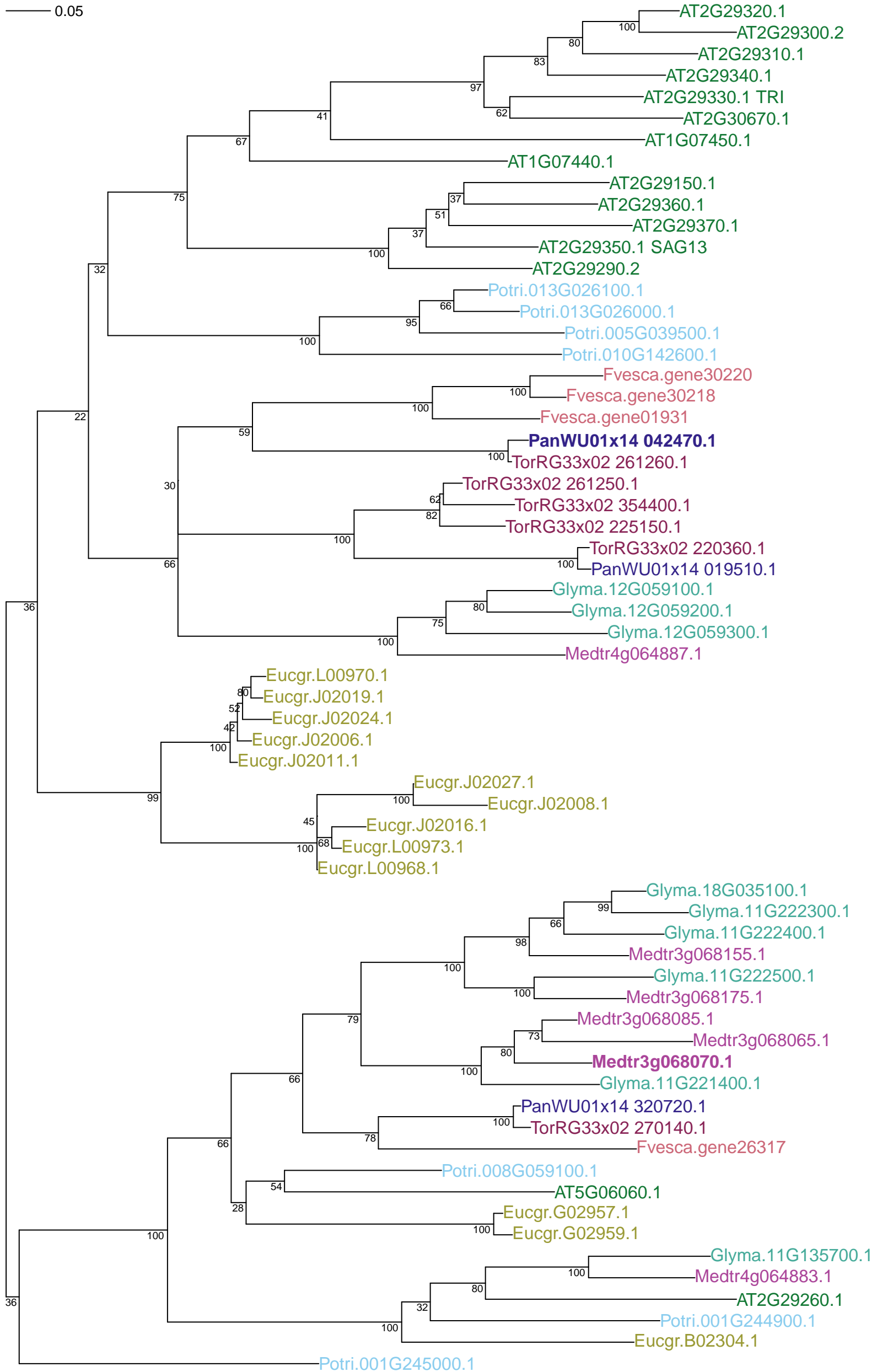
OG0000206: Enzymes. Cytochrome P450, E-class, group I

0.05

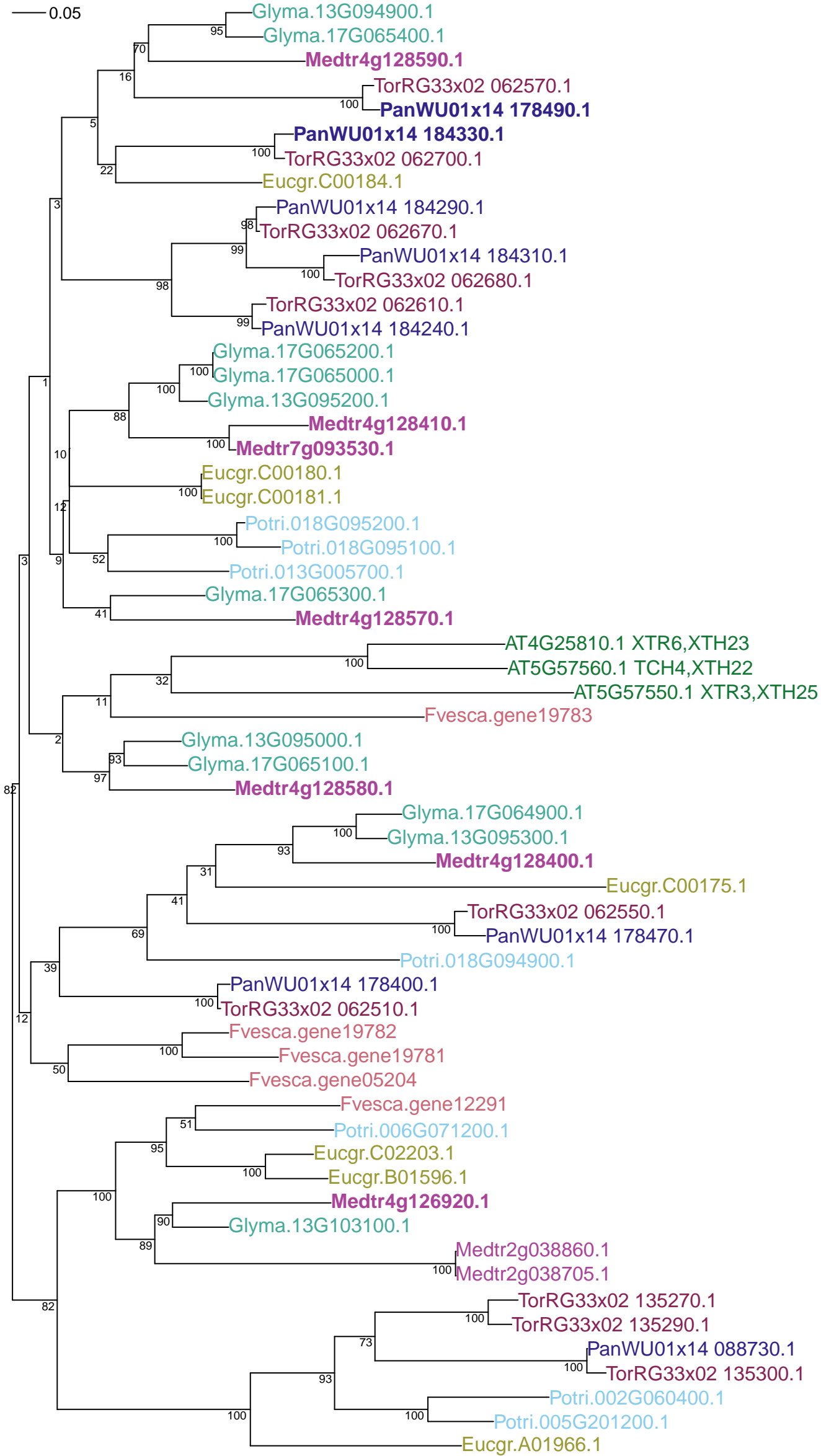


OG0000211: Enzymes. Short-chain dehydrogenase/reductase

0.05

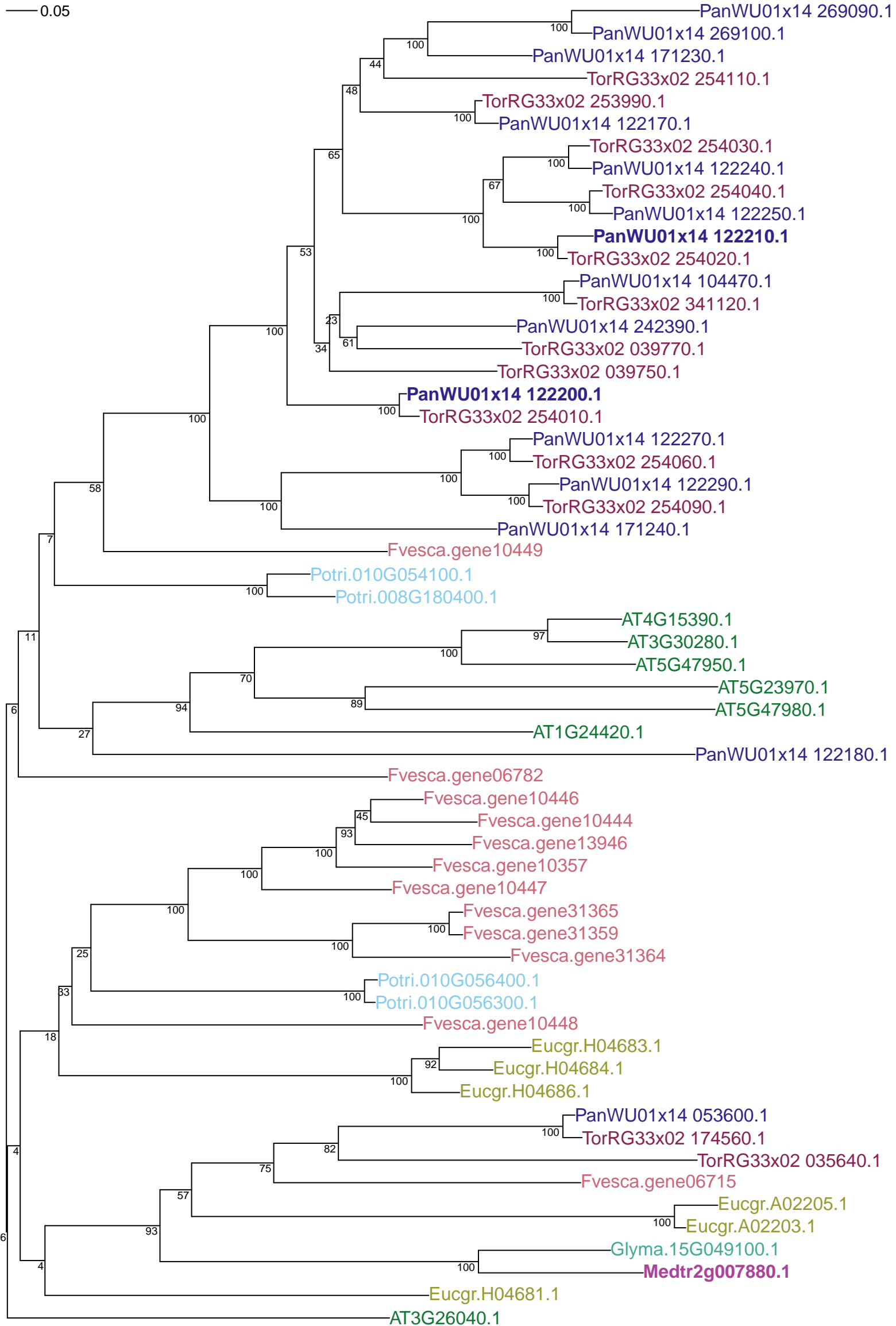


OG0000245: Enzymes. Xyloglucan endotransglucosylase/hydrolase



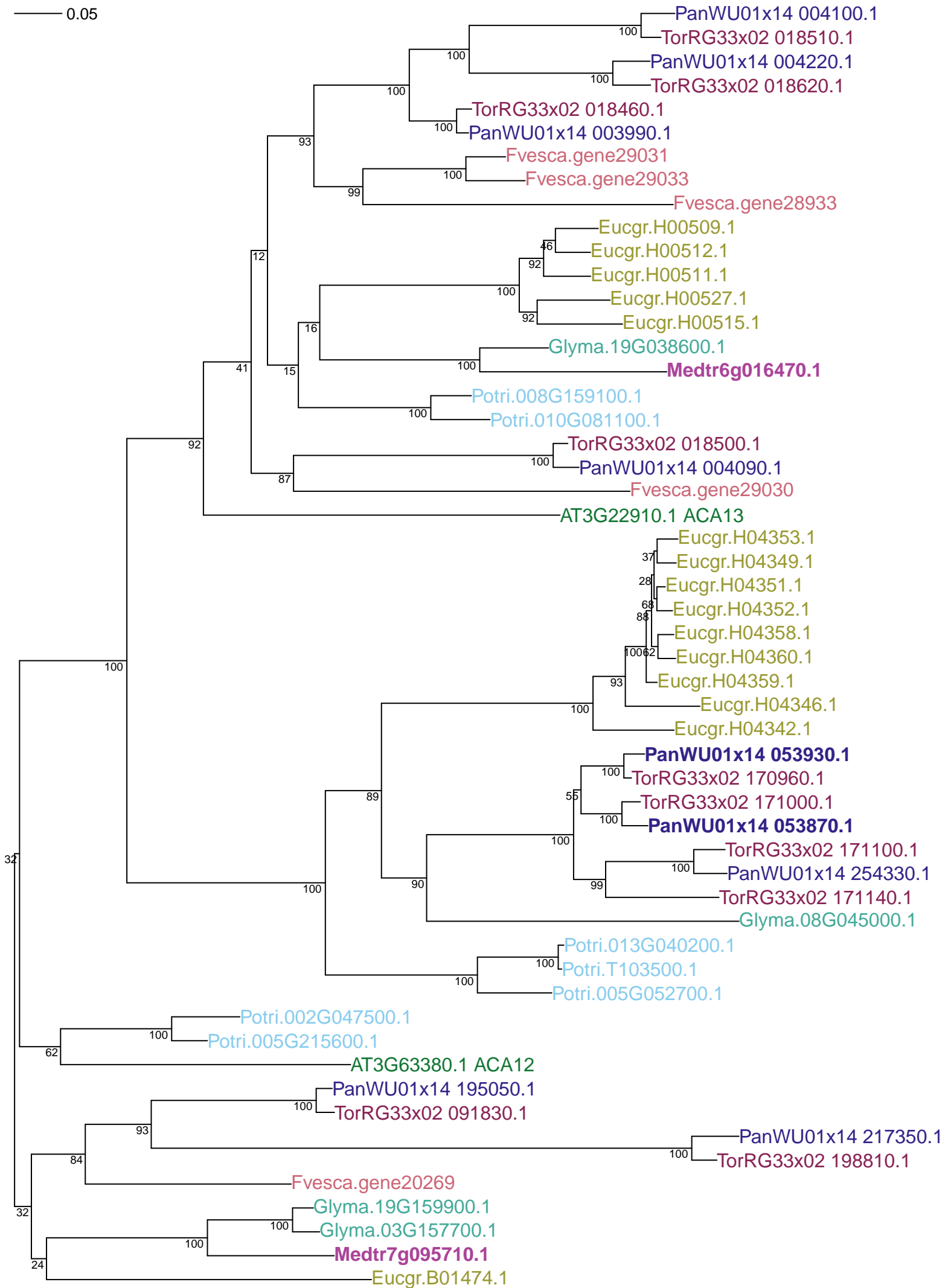
OG0000253: Enzymes. Transferase

— 0.05



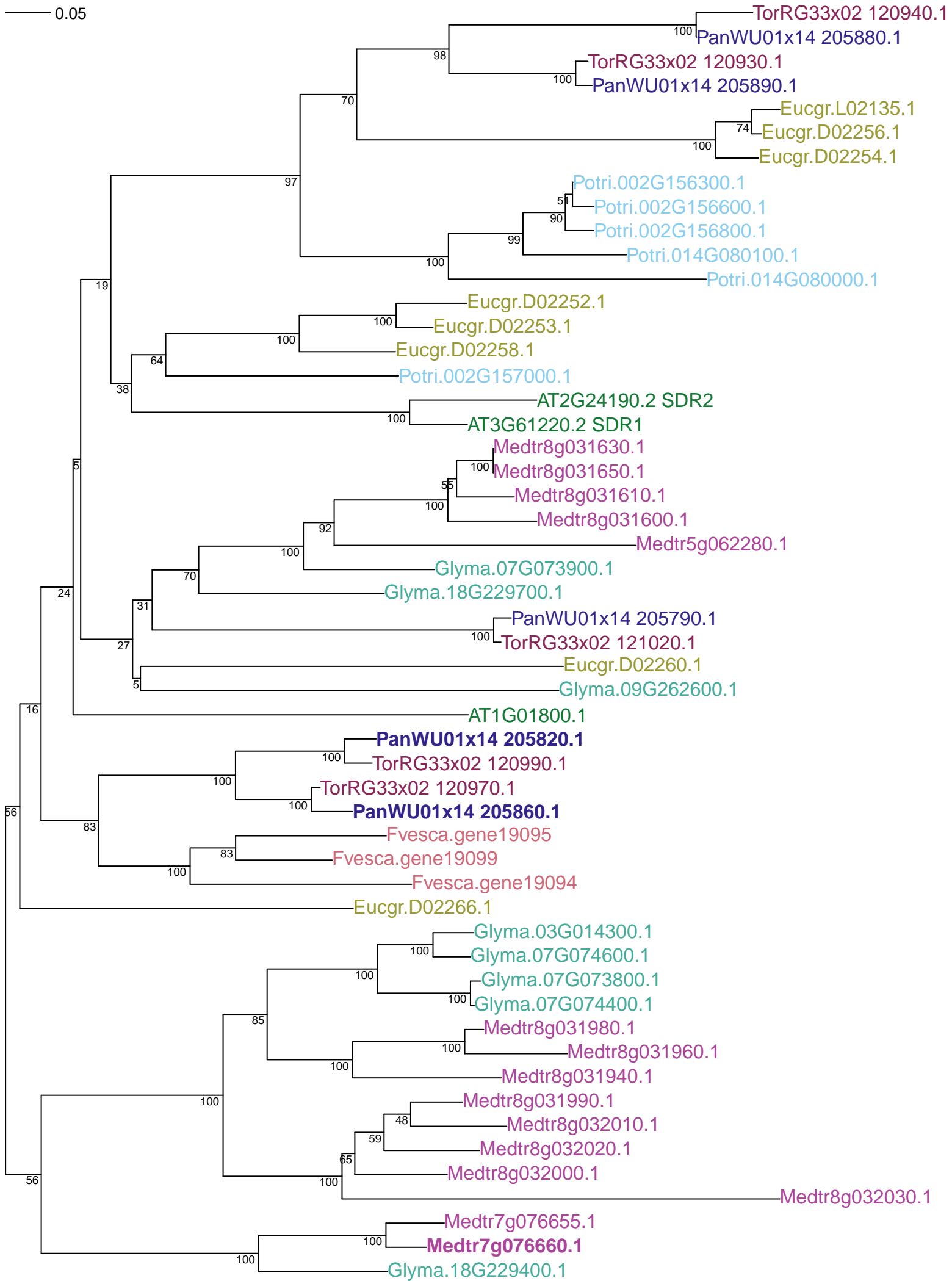
OG0000290: Enzymes. P-type ATPase

— 0.05



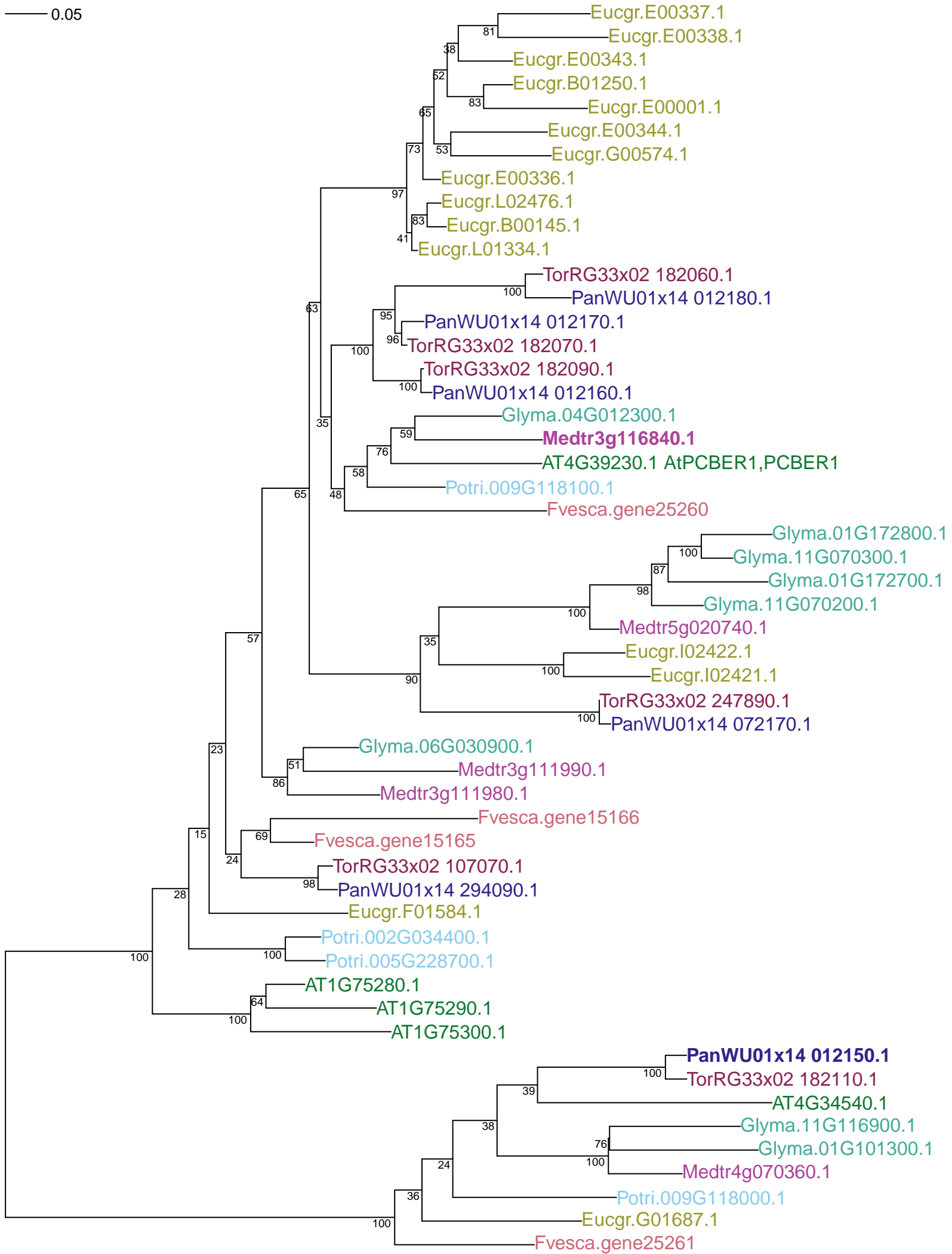
OG0000296: Enzymes. Short-chain dehydrogenase/reductase

0.05



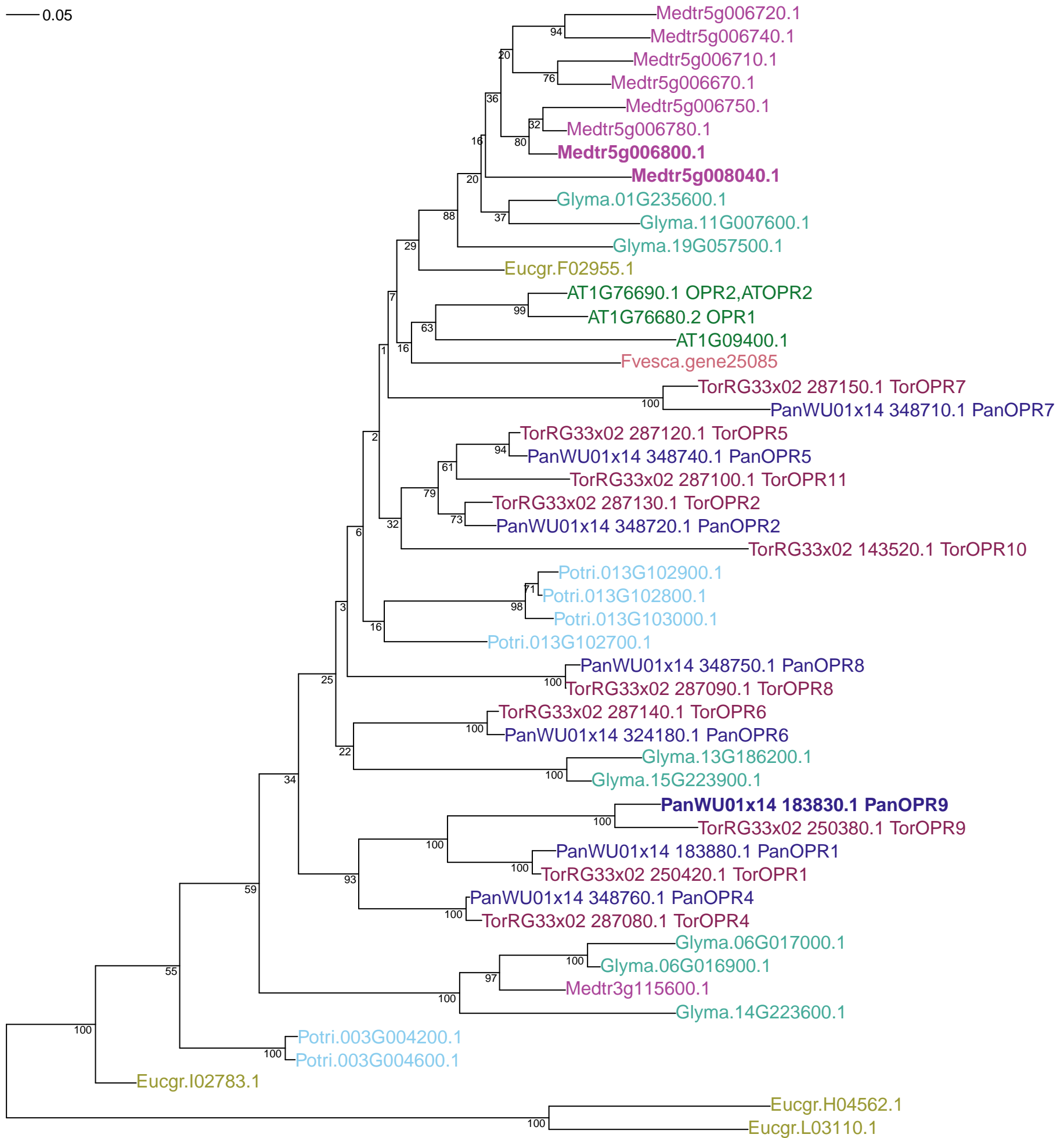
OG0000300: Enzymes. Hopanoid-associated sugar epimerase

— 0.05



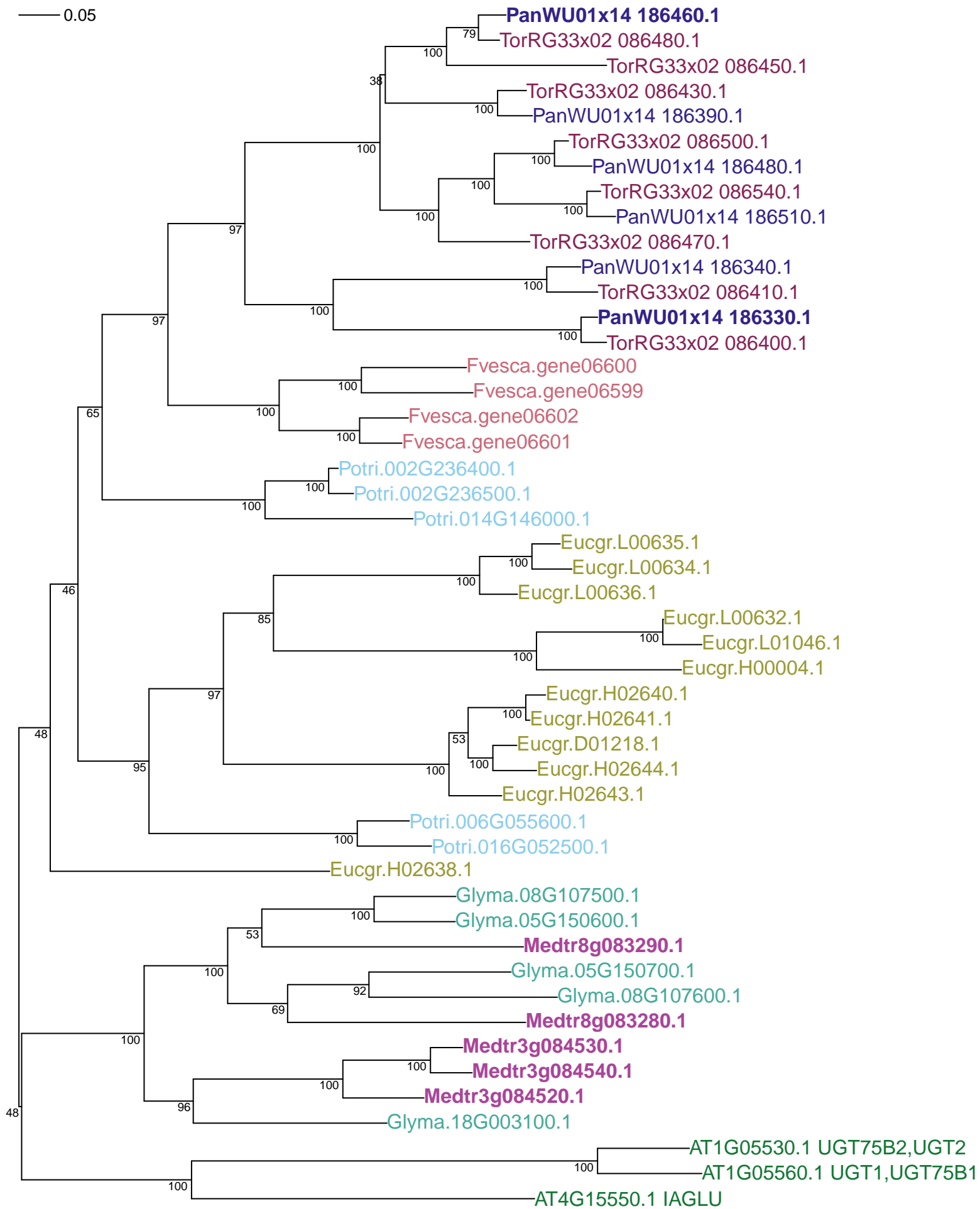
OG0000332: Enzymes. NADH:flavin oxidoreductase/NADH oxidase, N-terminal

— 0.05



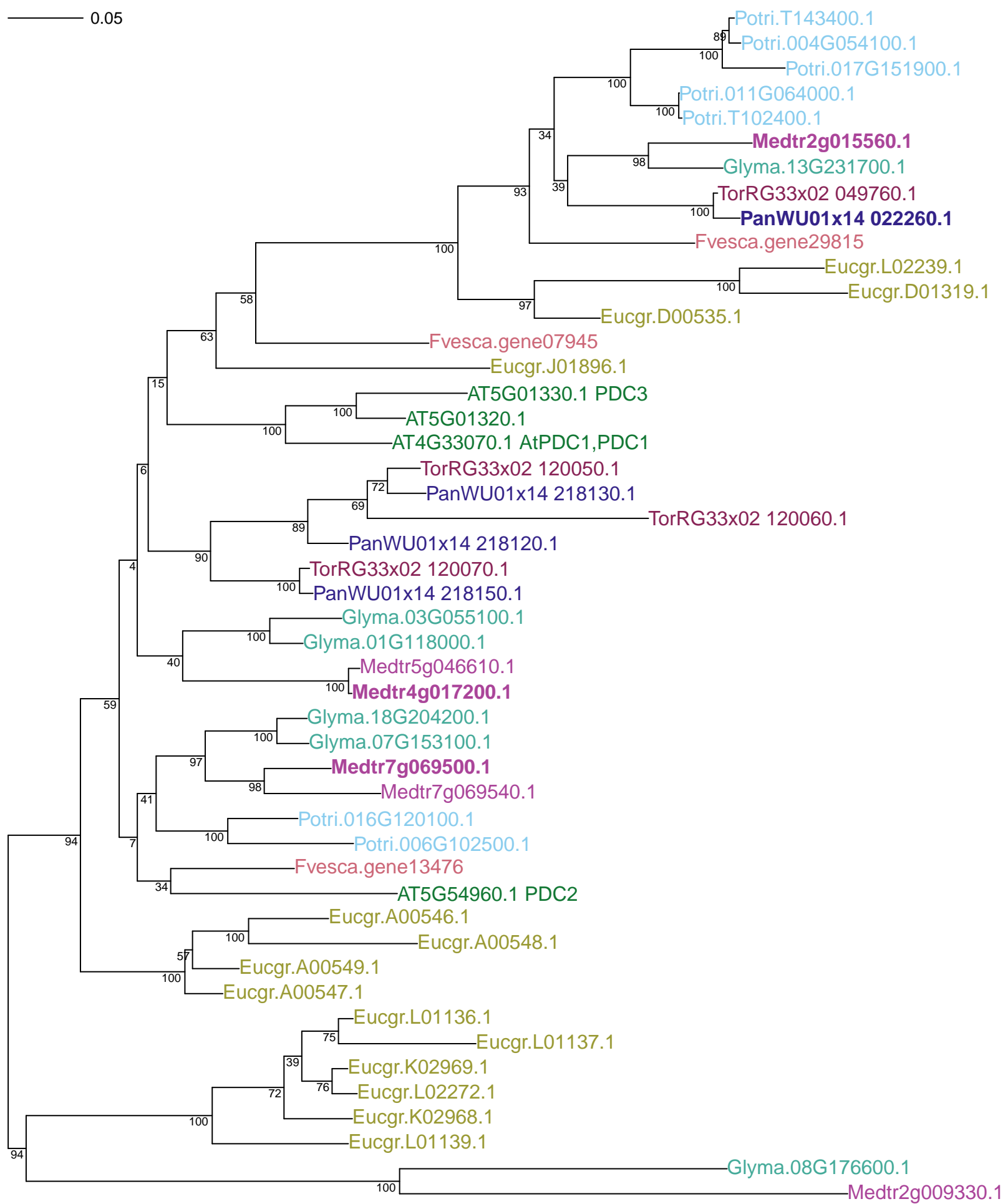
OG0000344: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase

— 0.05



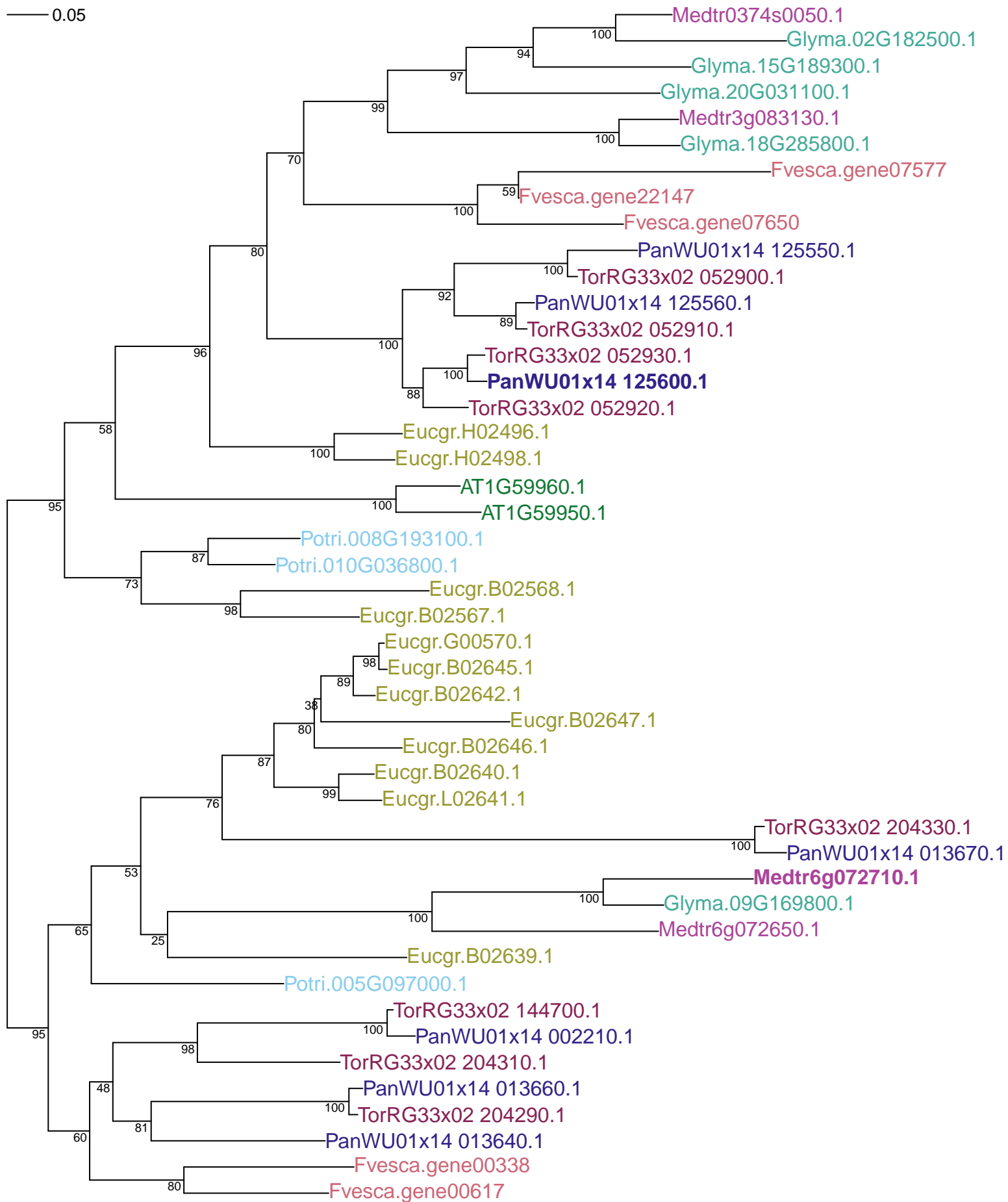
OG0000350: Enzymes. Thiamine pyrophosphate enzyme, N-terminal TPP-binding domain containing protein

0.05



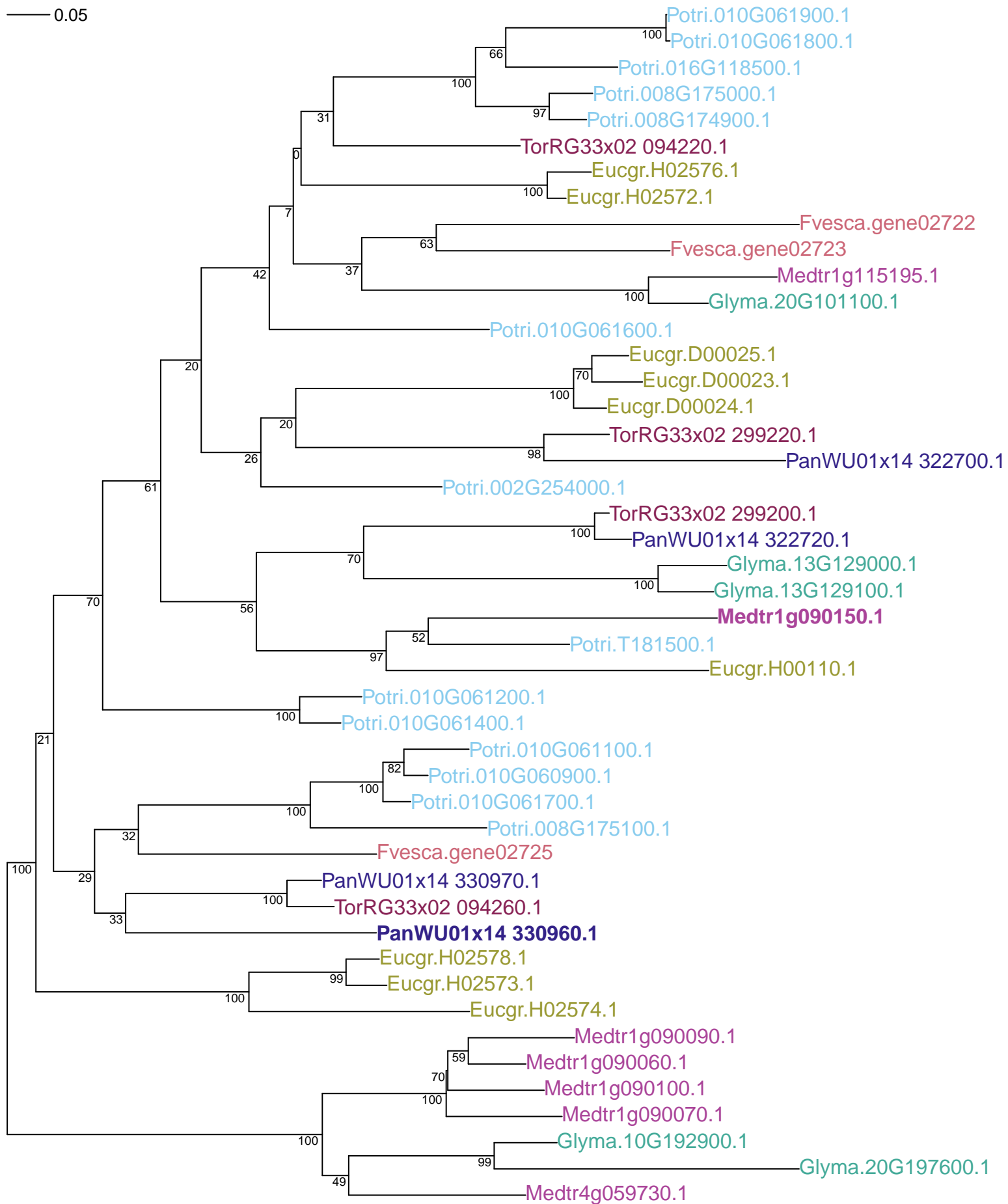
OG0000366: Enzymes. Aldo/keto reductase

— 0.05



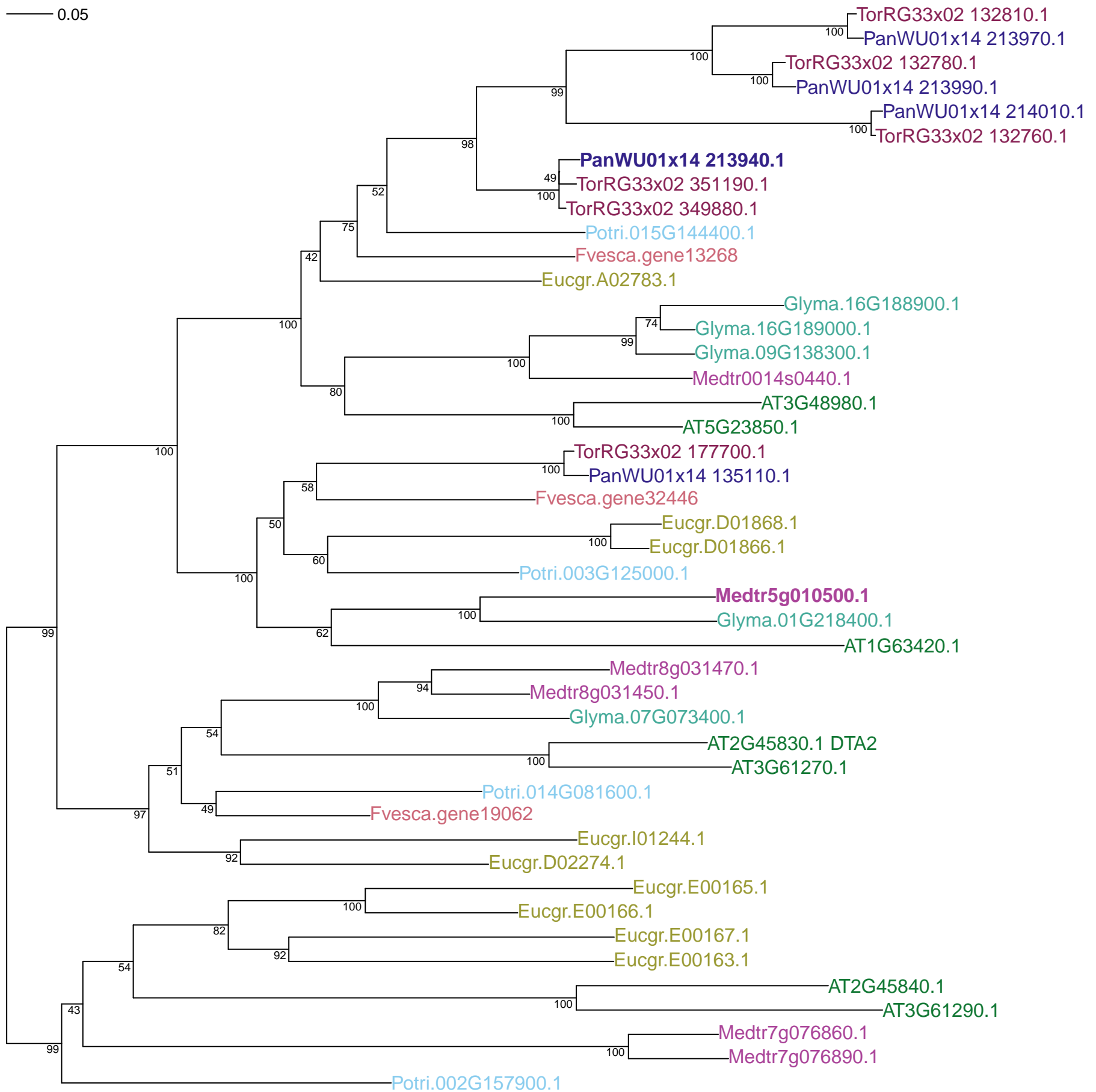
OG0000376: Enzymes. S-crystallin

— 0.05



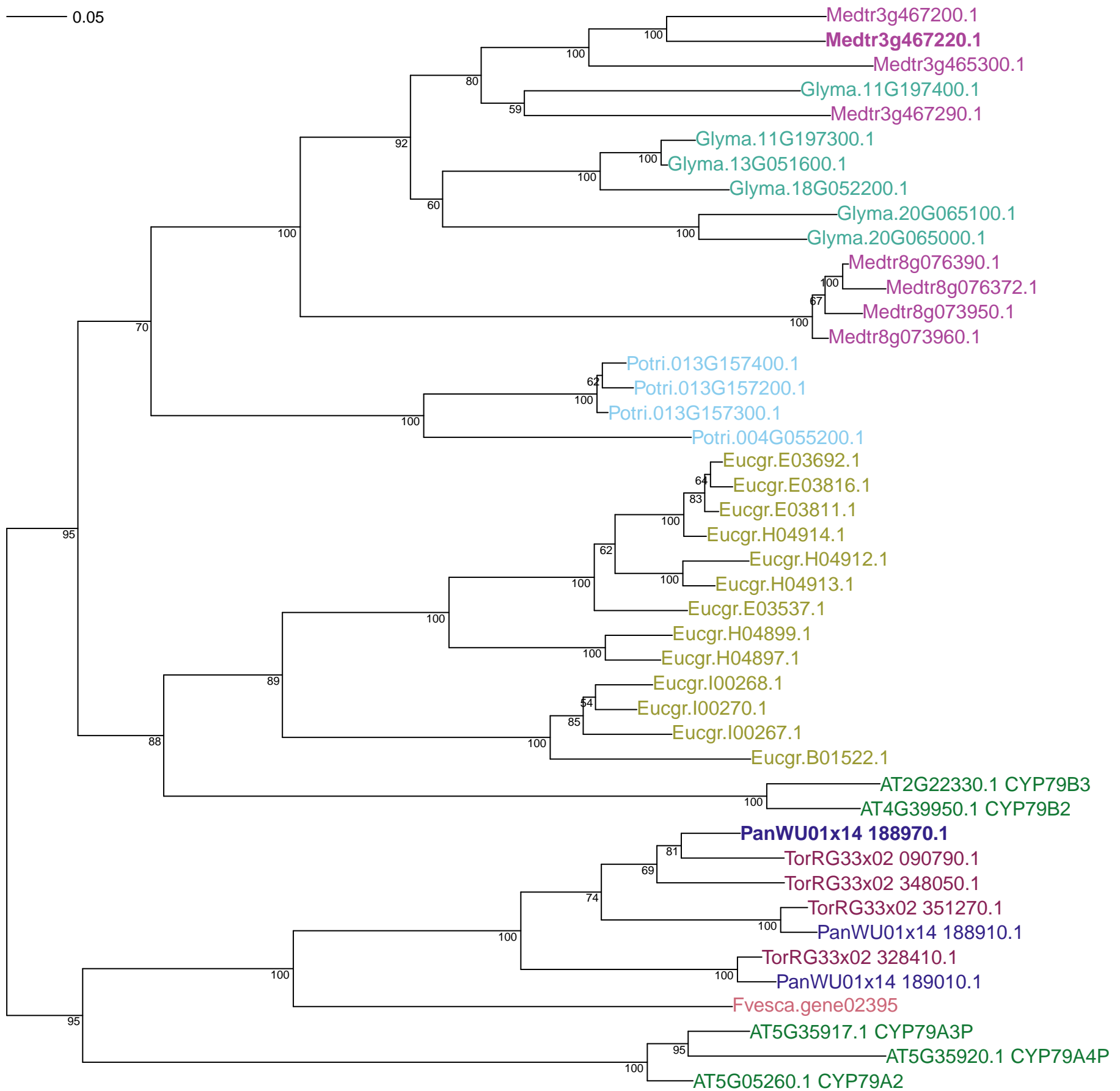
OG0000382: Enzymes. Lipopolysaccharide-modifying protein

0.05



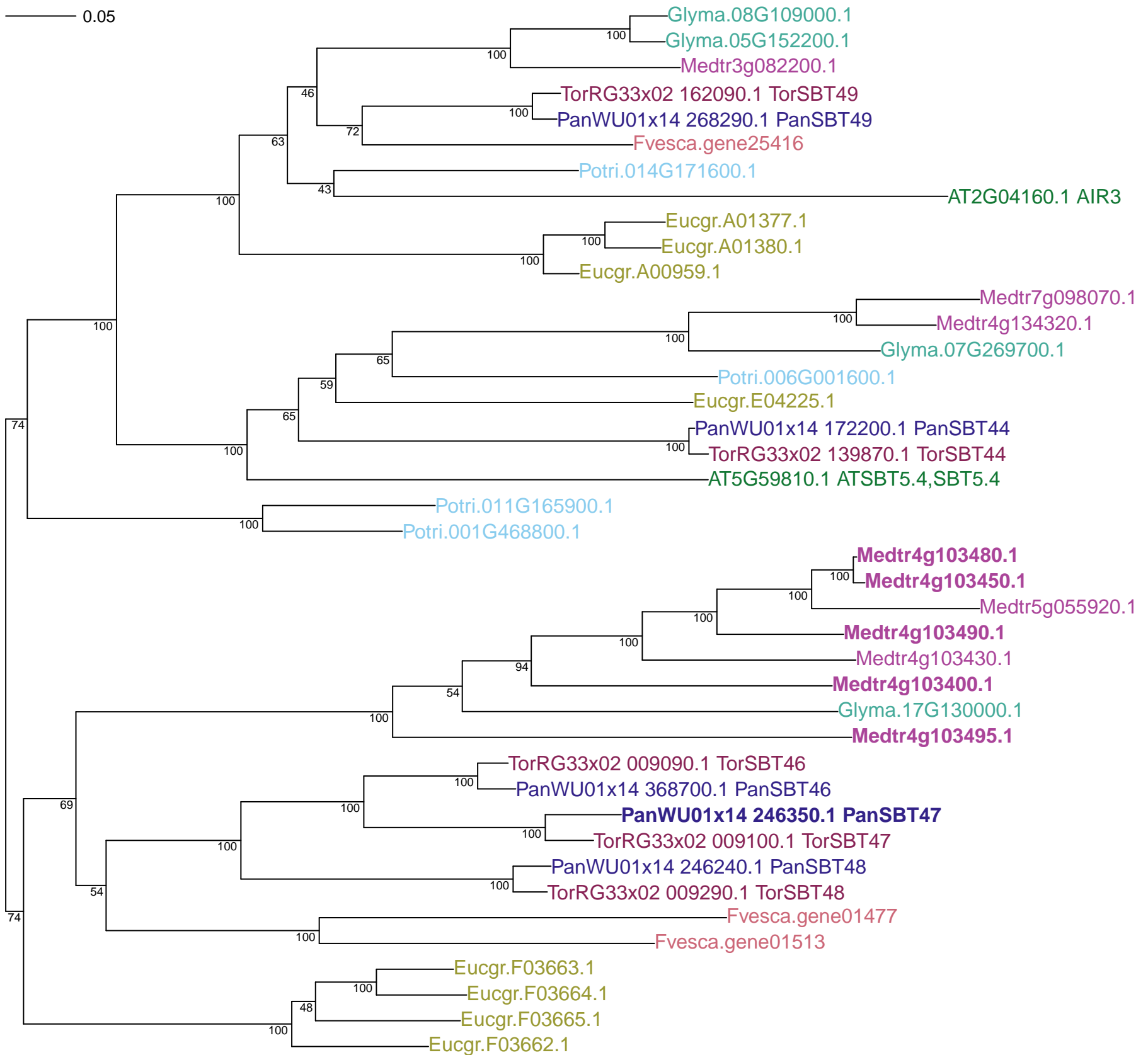
OG0000406: Enzymes. Cytochrome P450, E-class, group I

0.05



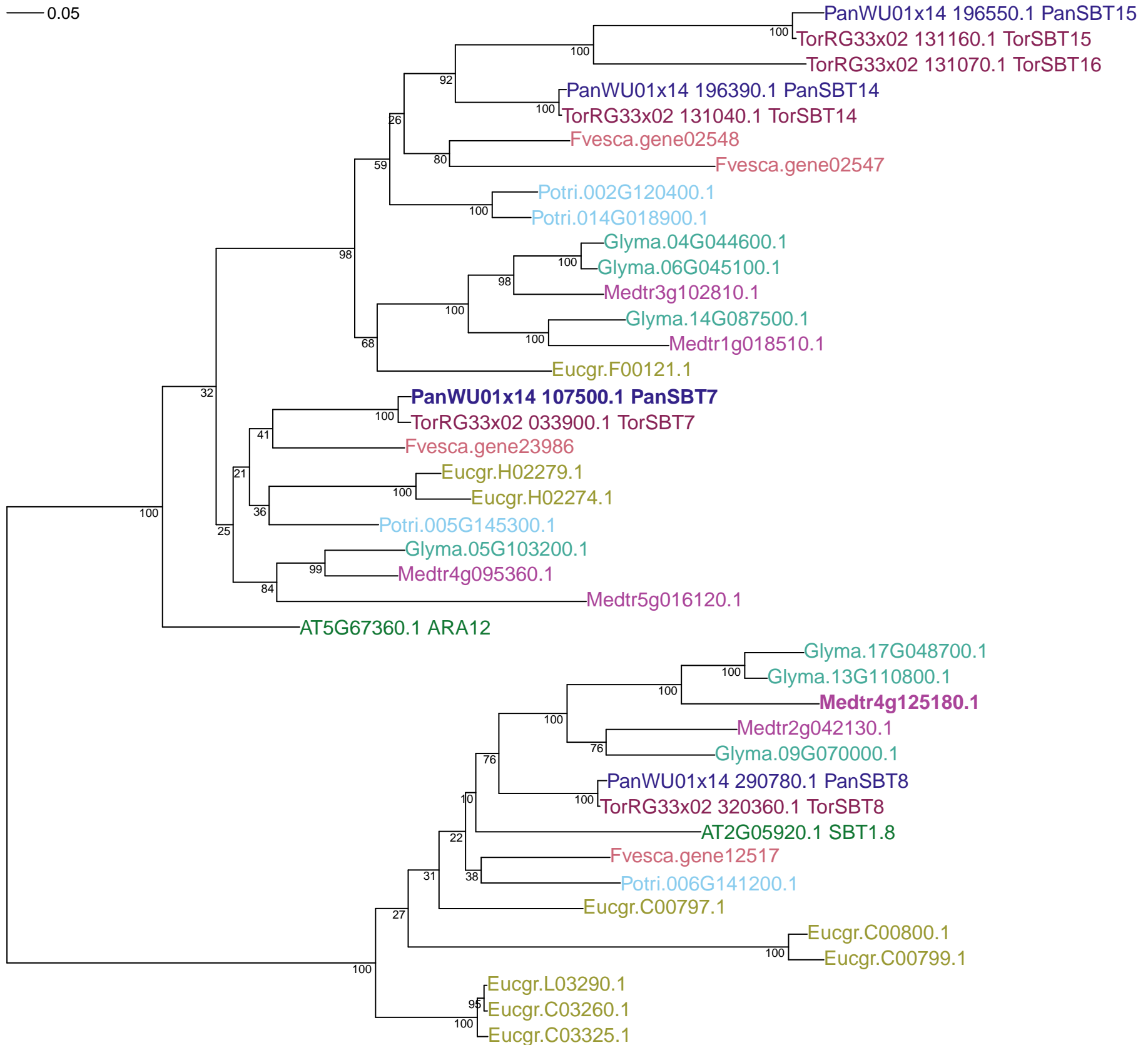
OG0000463: Enzymes. Subtilase

0.05

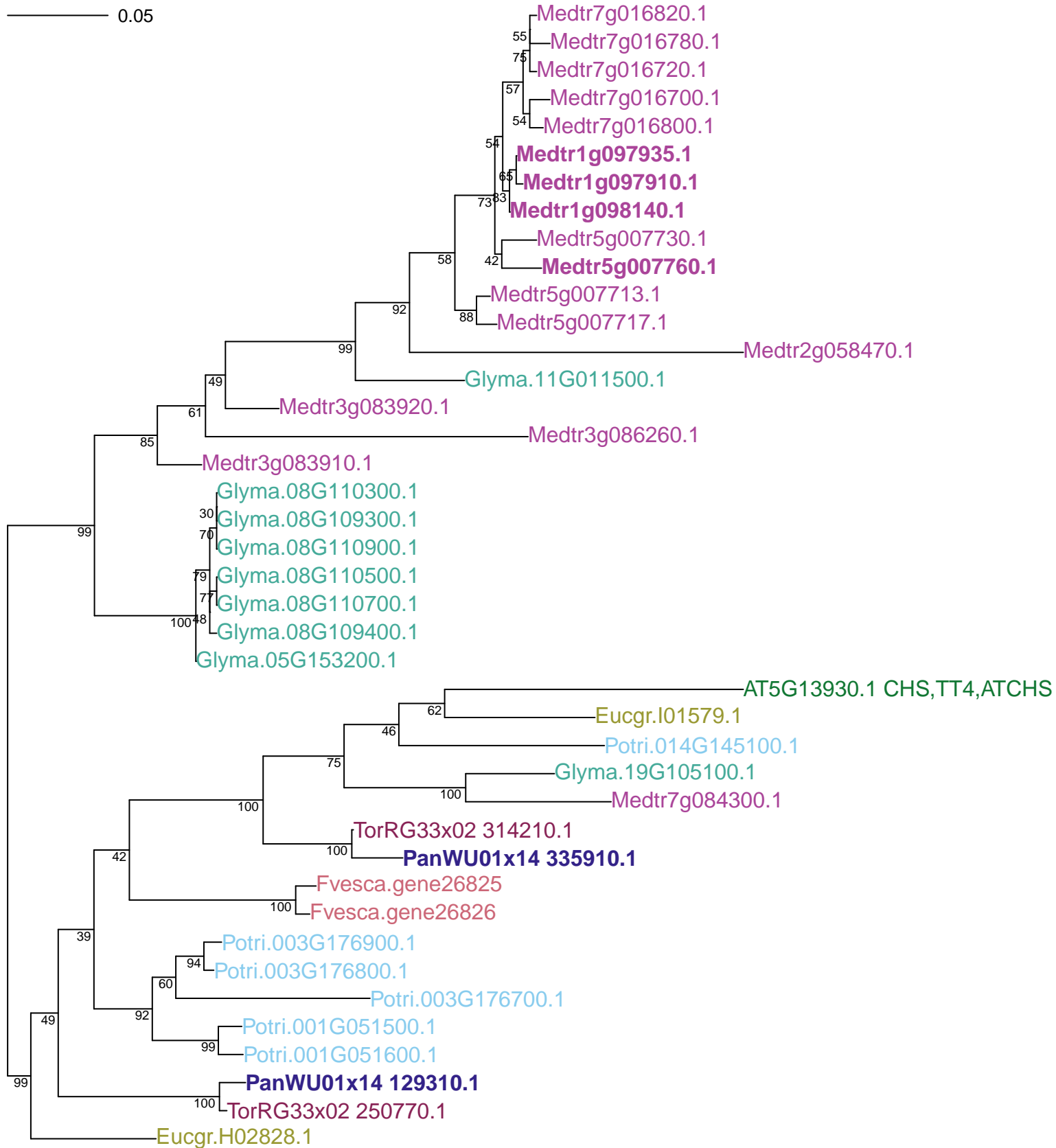


OG0000464: Enzymes. Subtilase

— 0.05

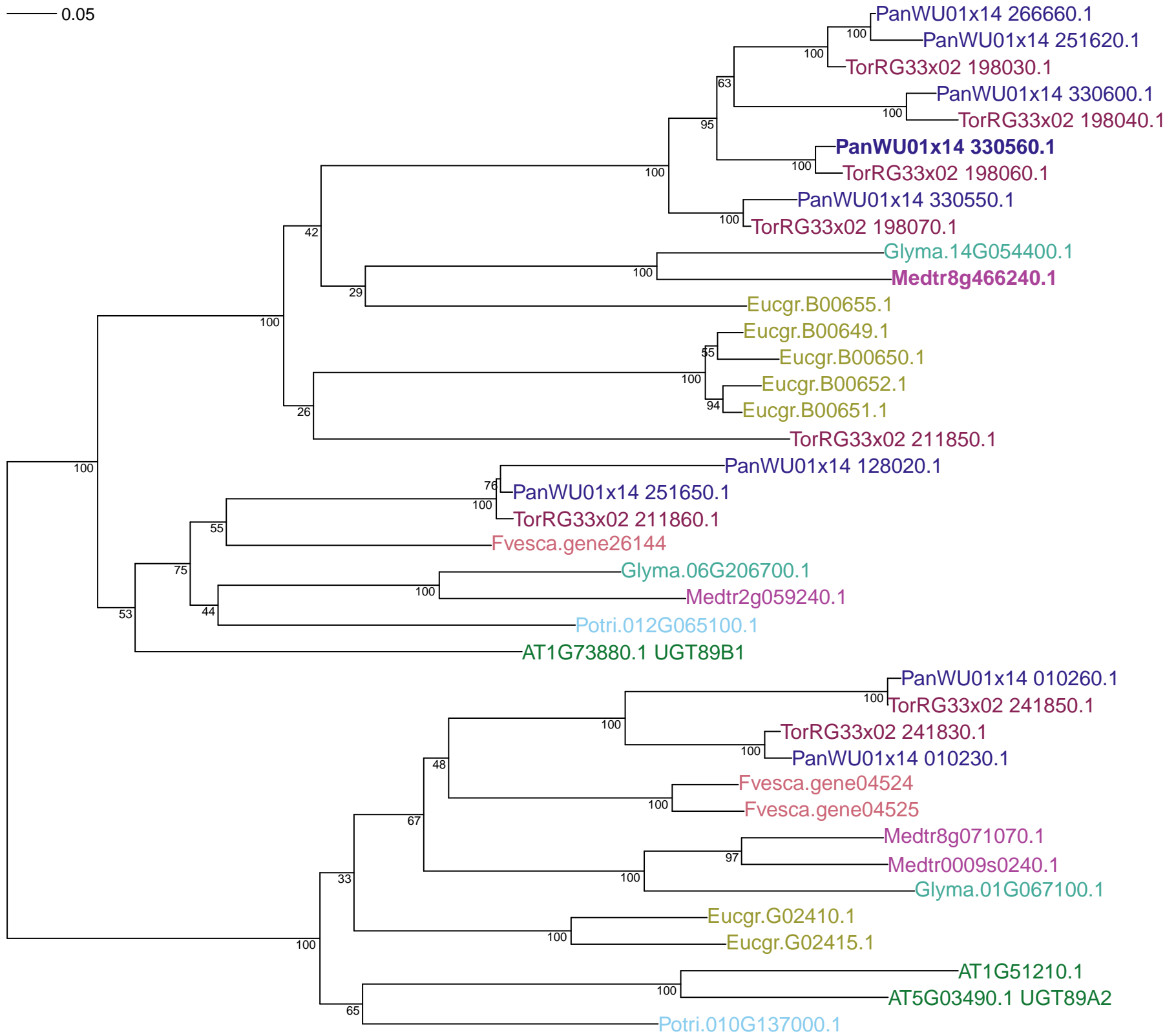


OG0000468: Enzymes. Polyketide synthase, type III



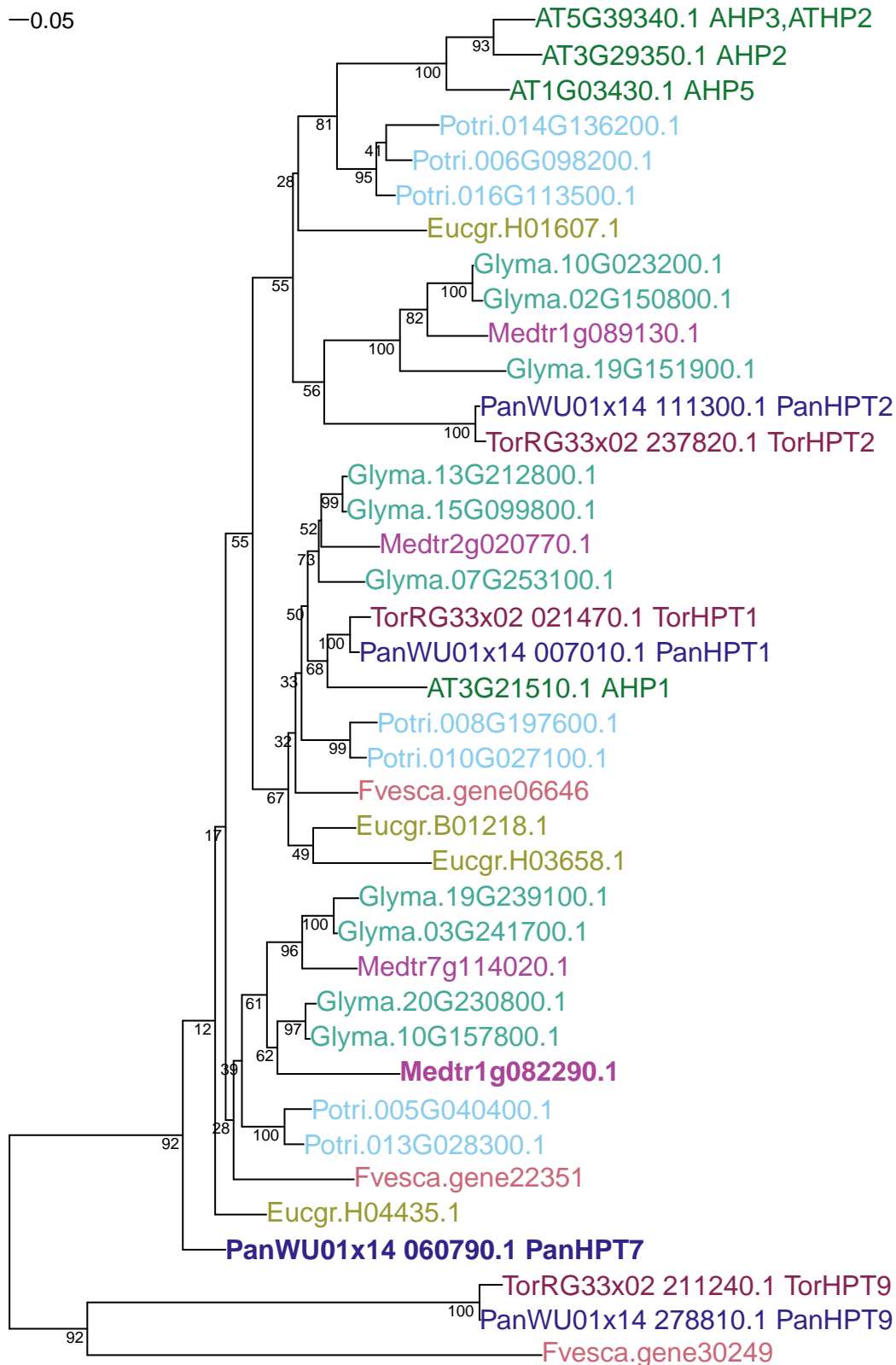
OG0000493: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase

0.05

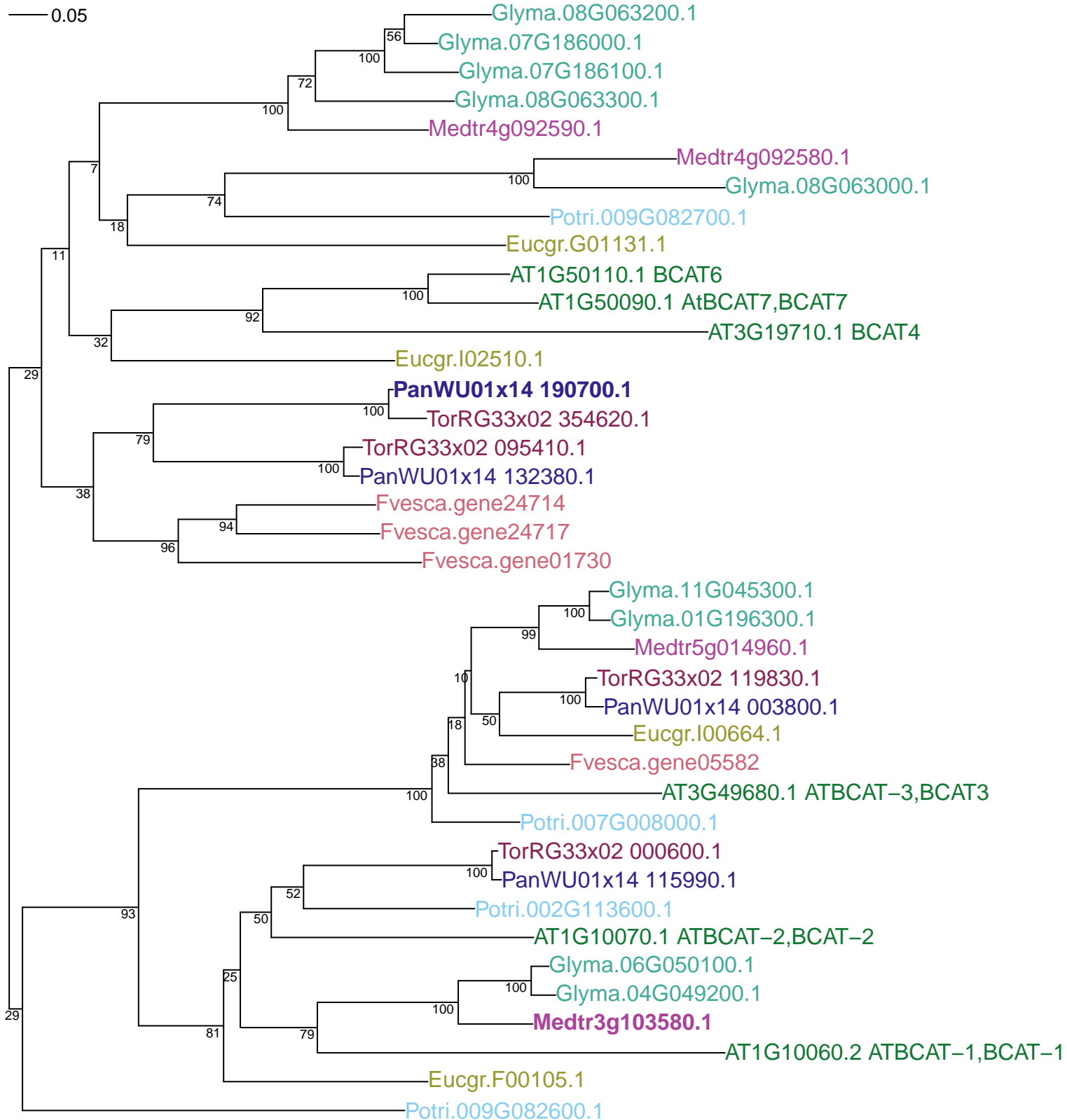


OG0000494: Enzymes. Histidine phosphotransferase

-0.05

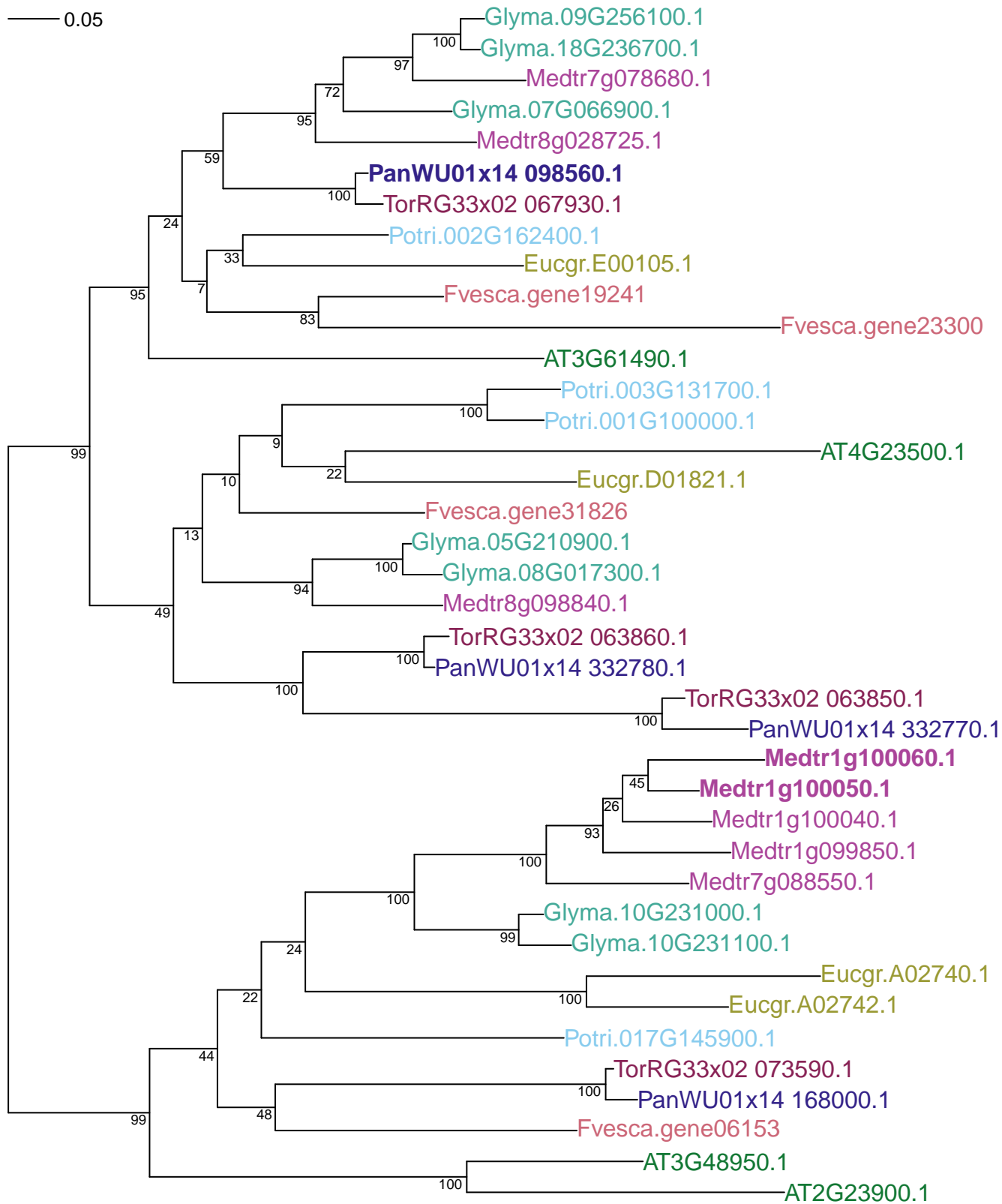


OG0000497: Enzymes. Branched-chain amino acid aminotransferase II

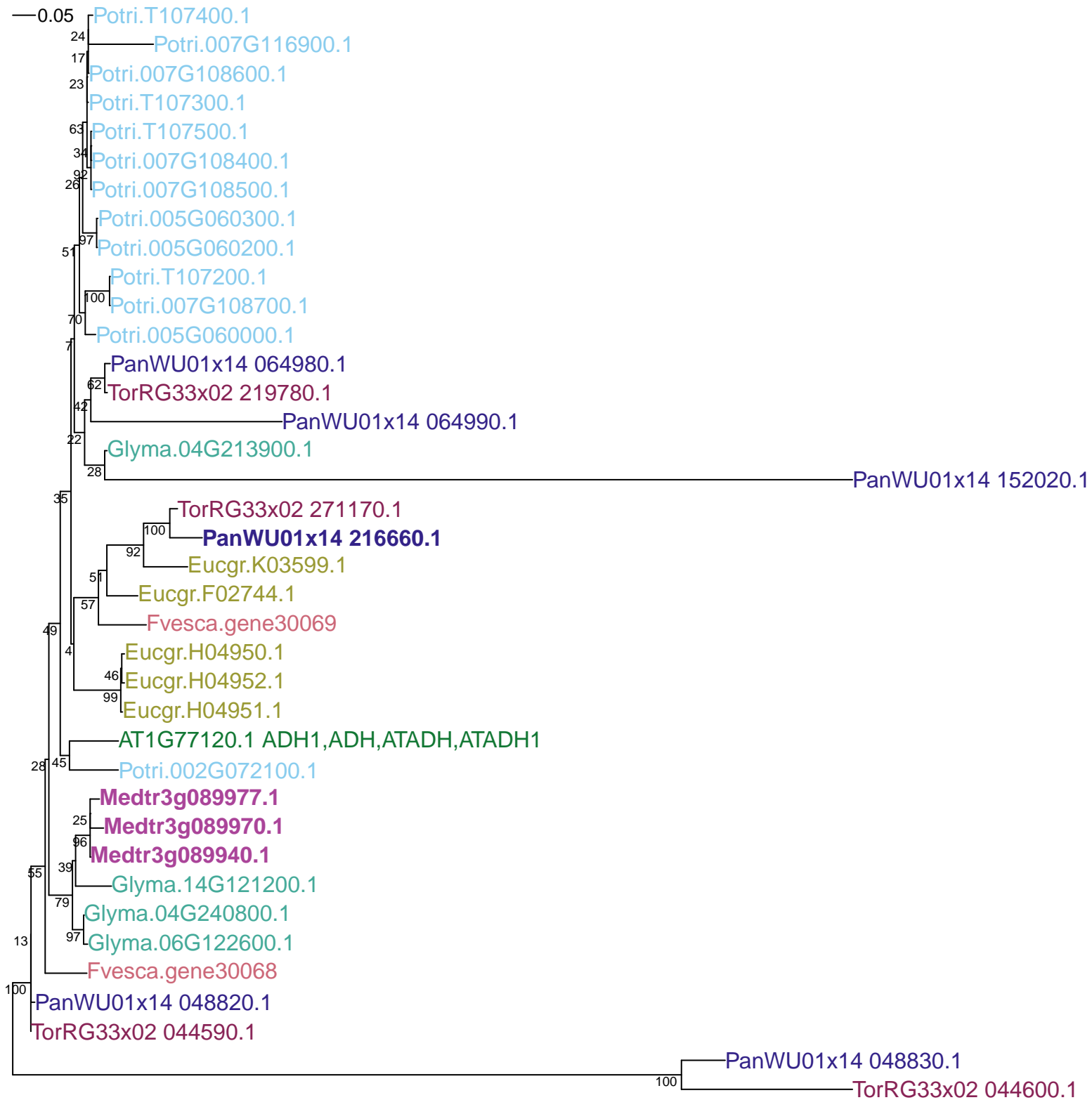


OG0000507: Enzymes. Glycoside hydrolase

— 0.05

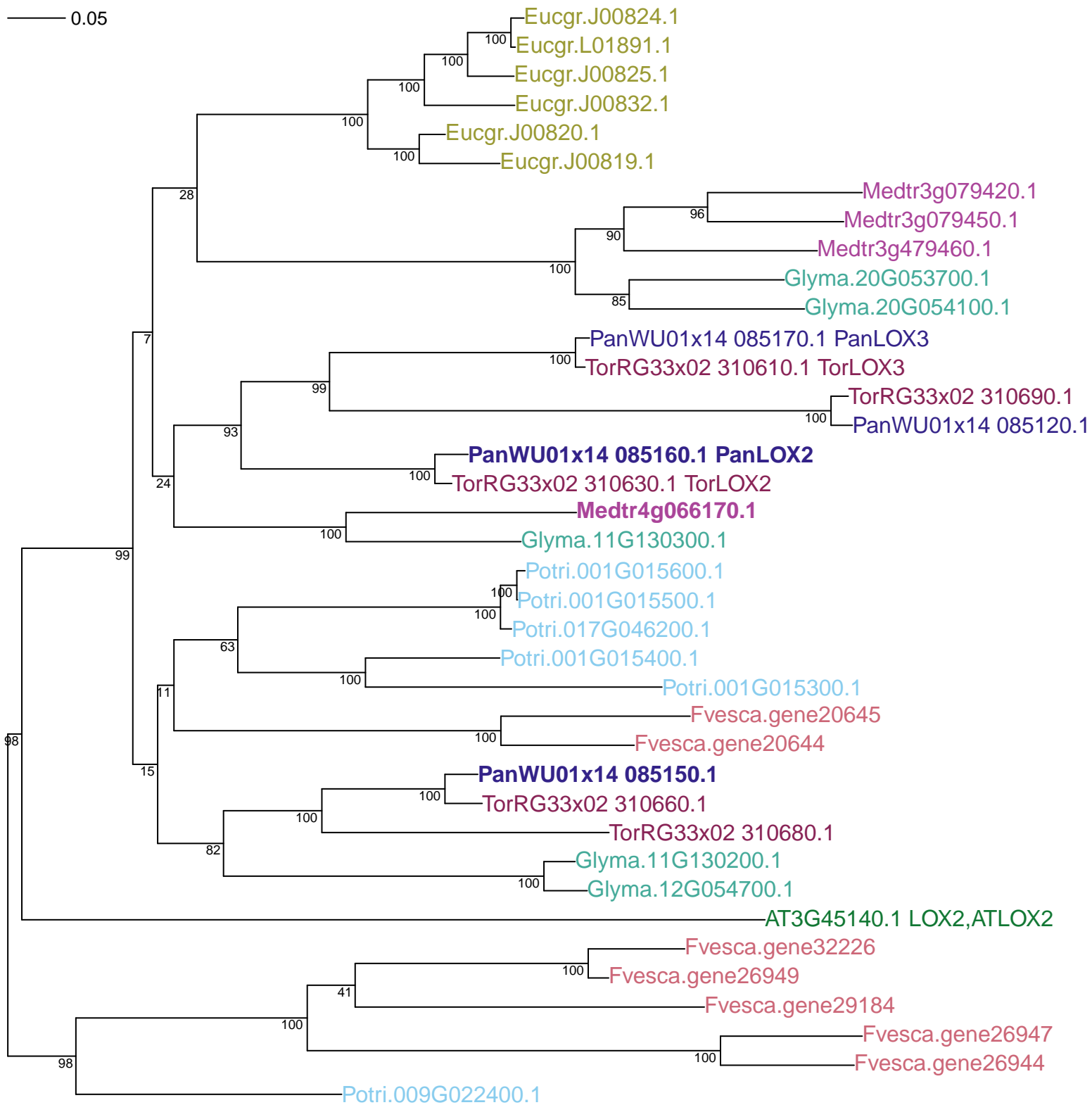


OG0000522: Enzymes. Alcohol dehydrogenase superfamily, zinc-type



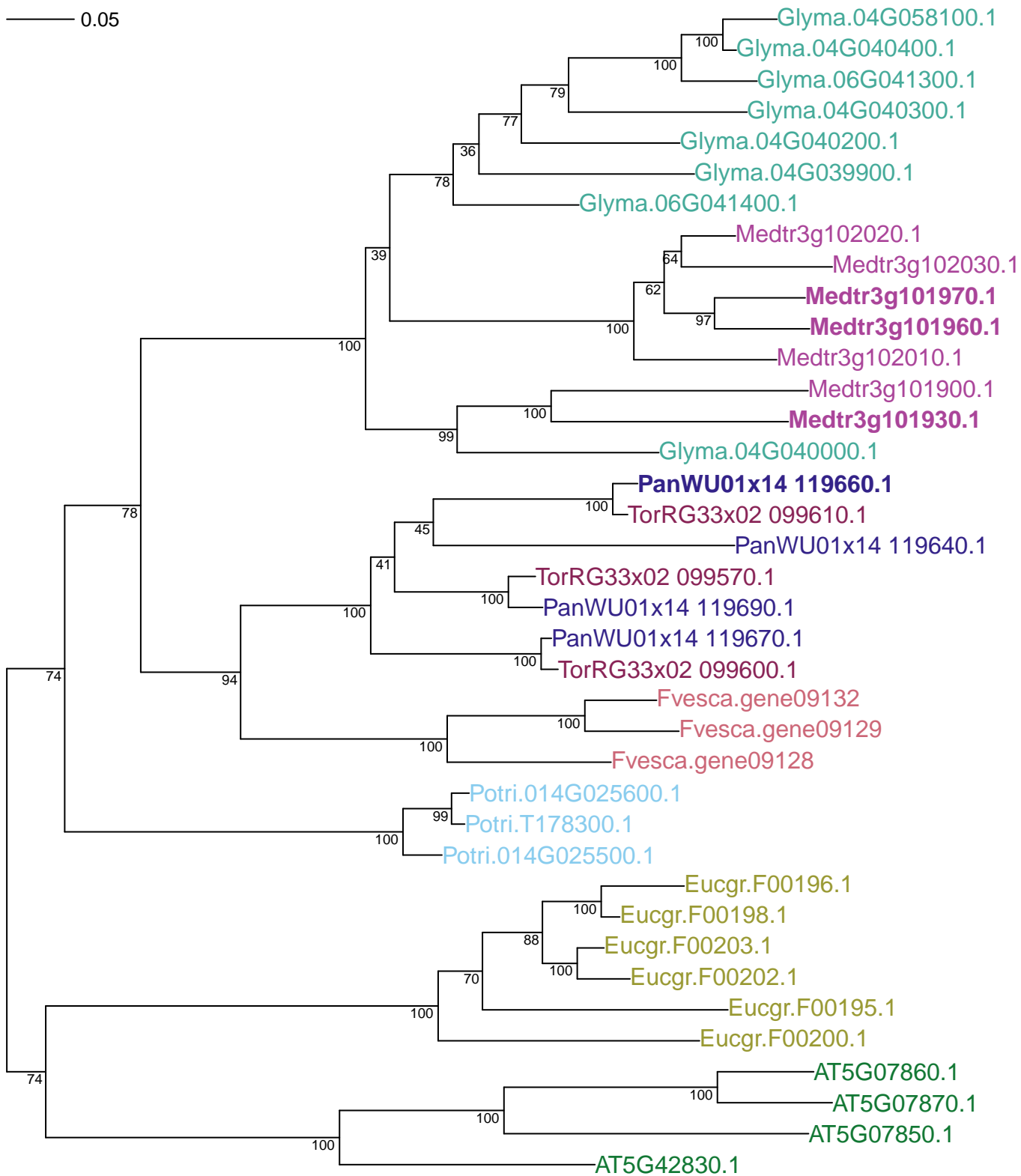
OG0000536: Enzymes. Lipoygenase

0.05

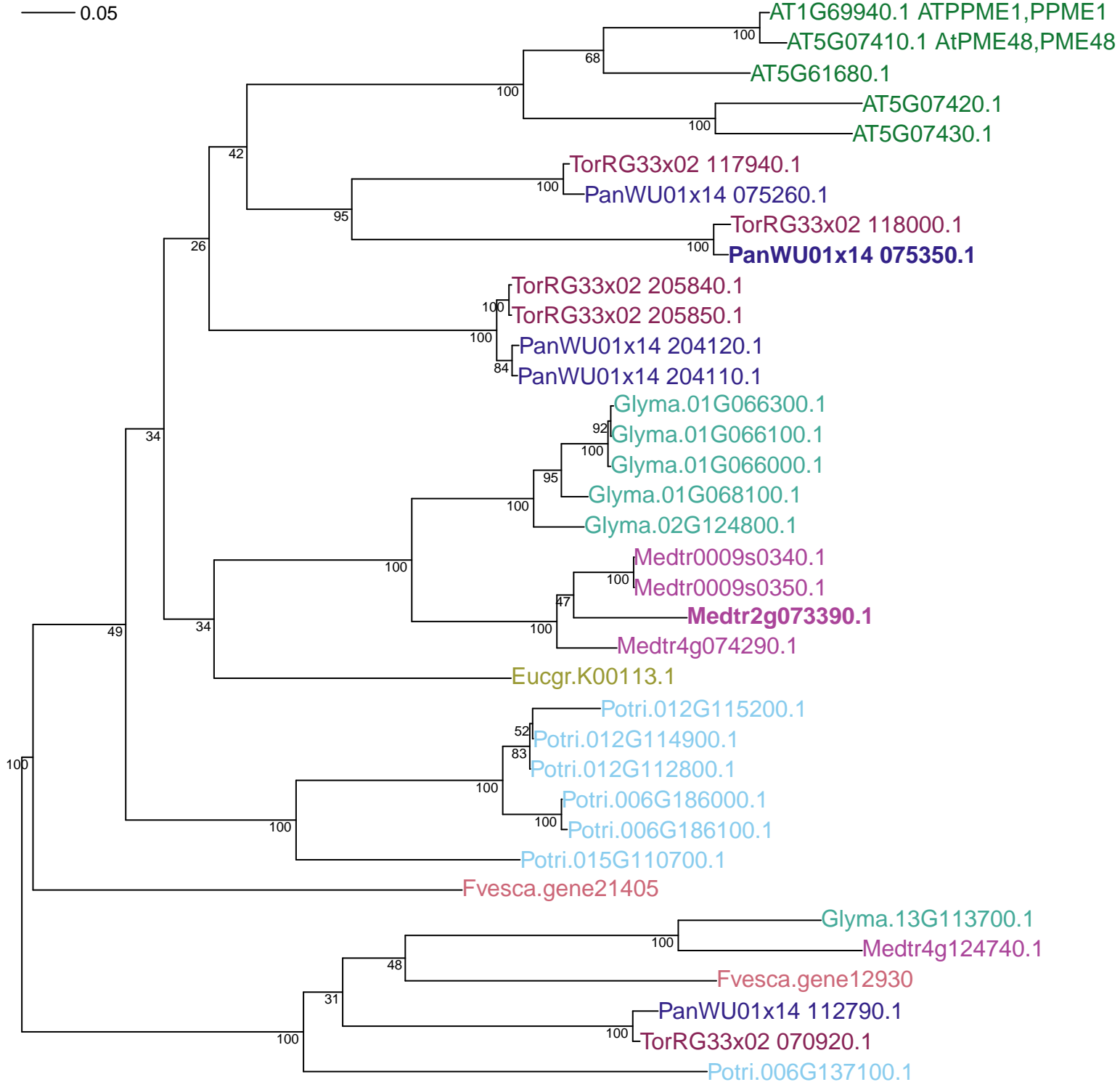


OG0000539: Enzymes. Transferase

0.05

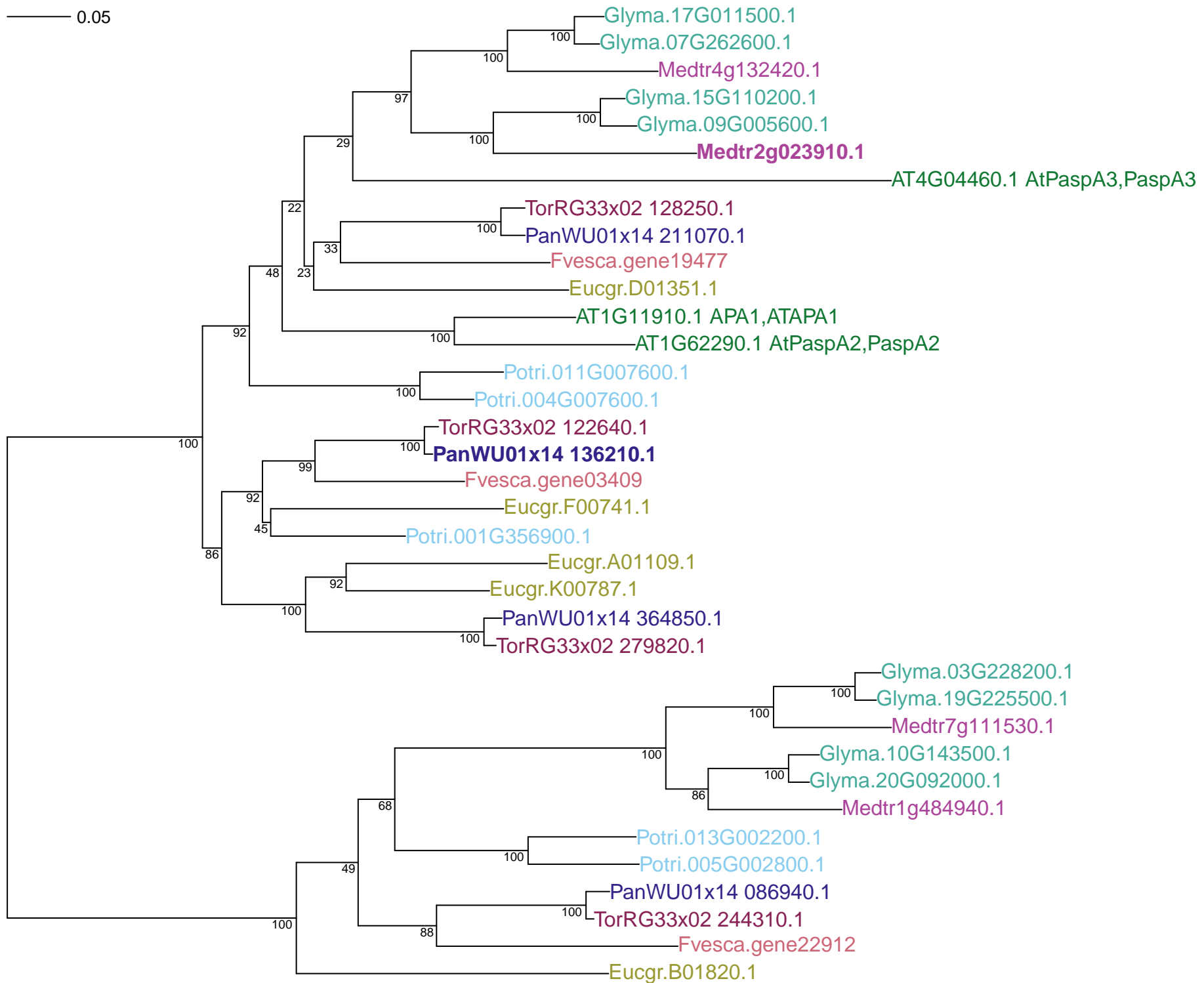


OG0000576: Enzymes. Pectinesterase, Tyr active site

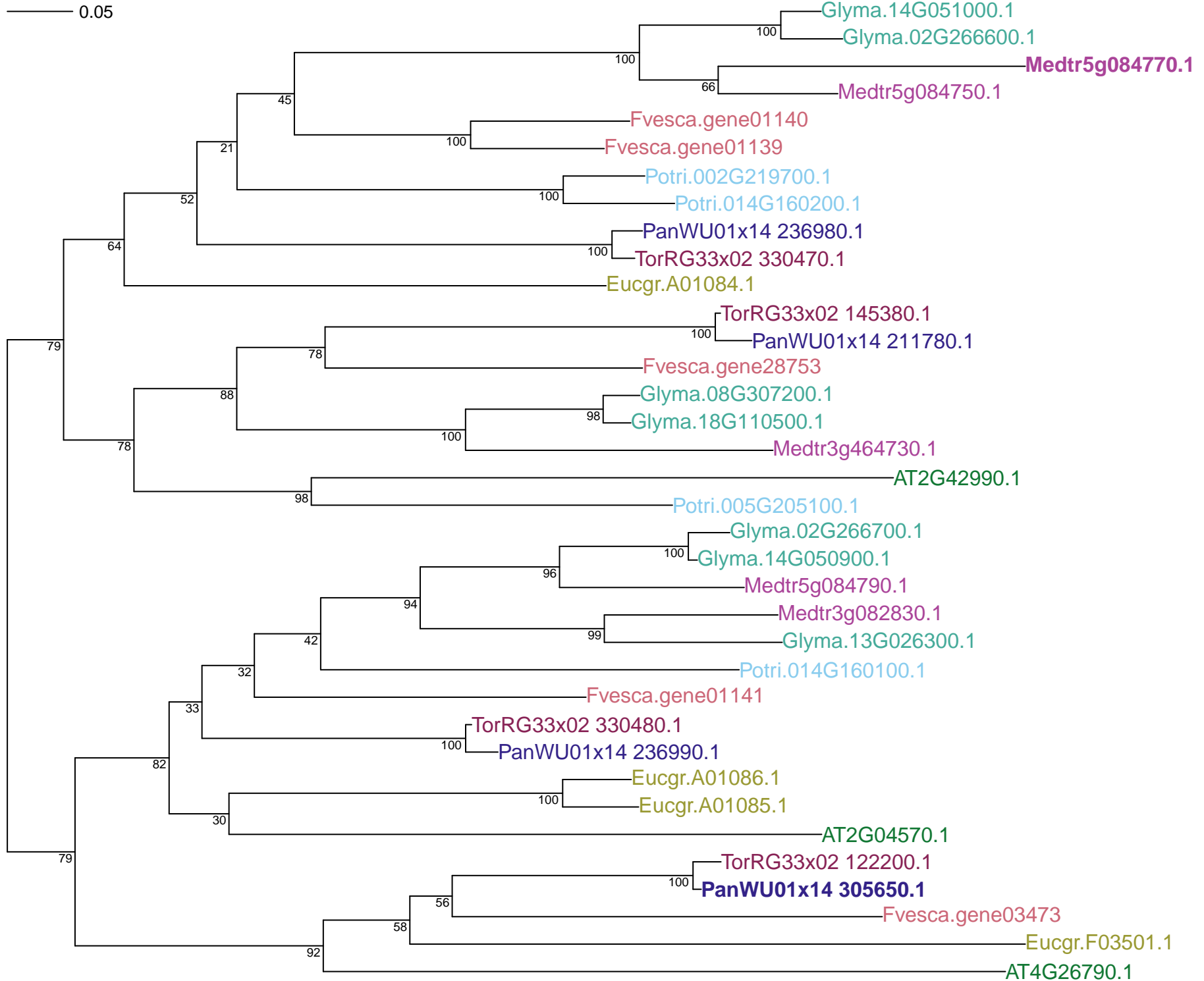


OG0000581: Enzymes. Aspartic peptidase

0.05

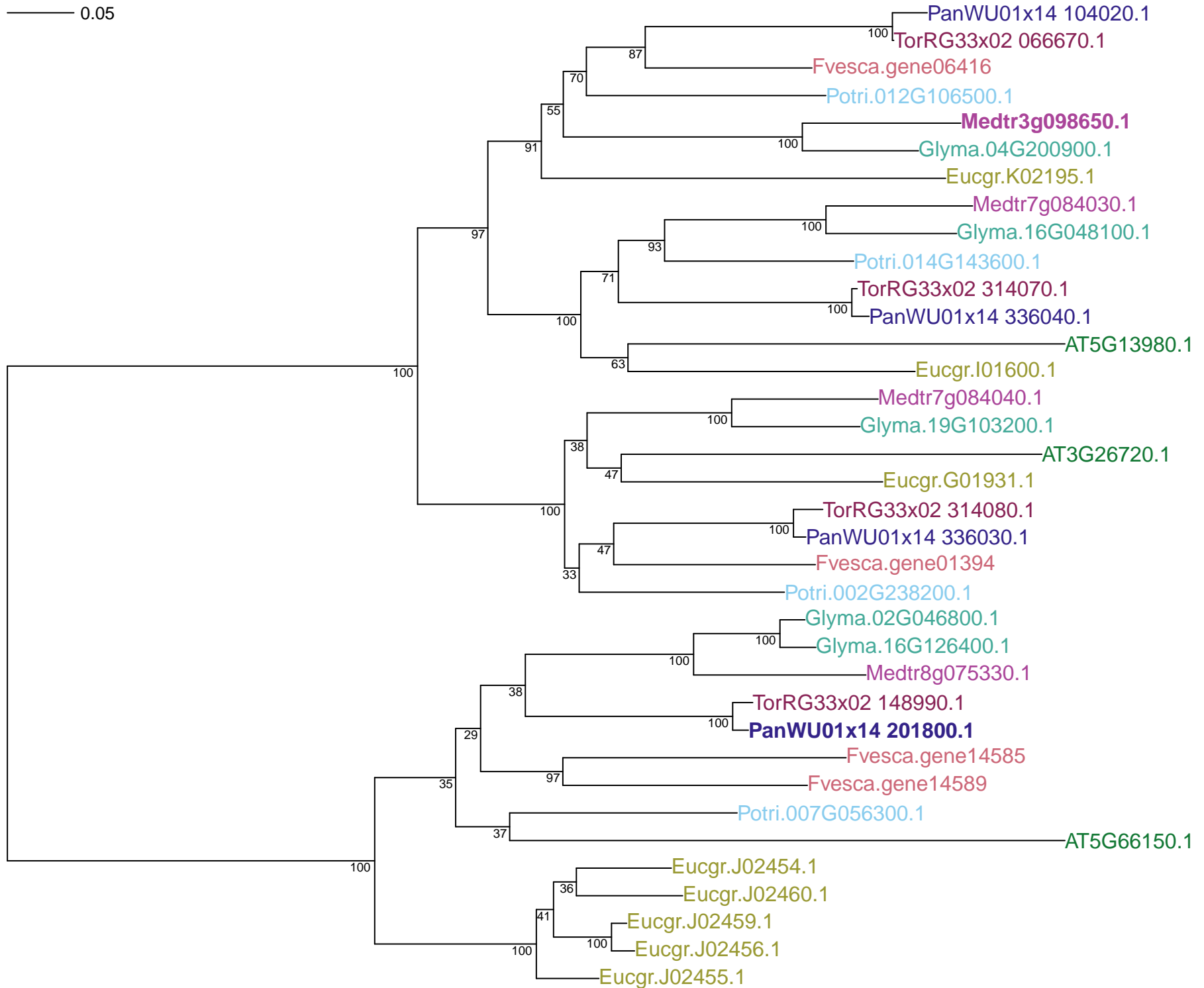


OG0000582: Enzymes. Lipase



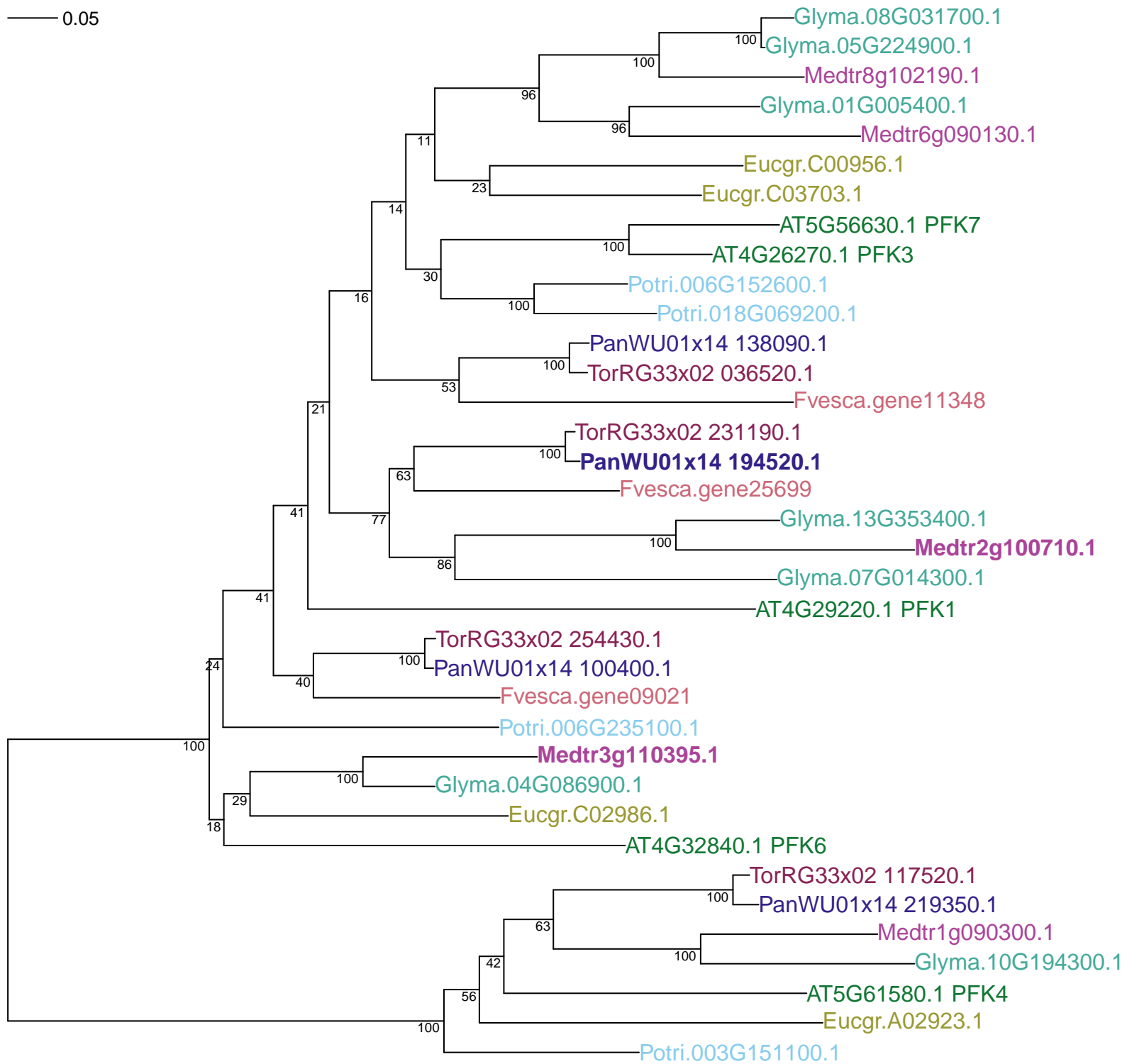
OG0000590: Enzymes. Glucan biosynthesis, periplasmic

0.05

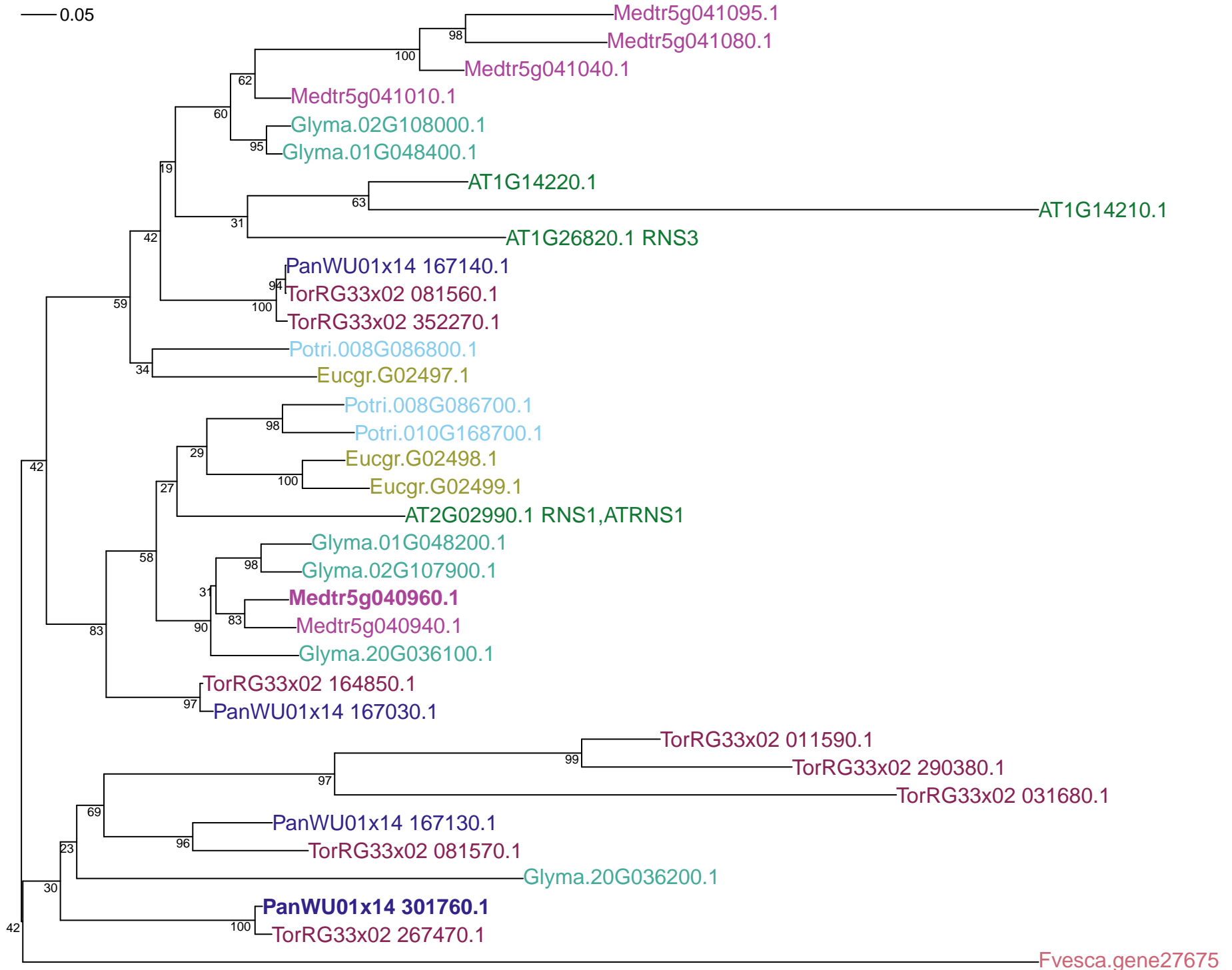


OG0000592: Enzymes. Pyrophosphate-dependent phosphofructokinase TP0108-type

0.05

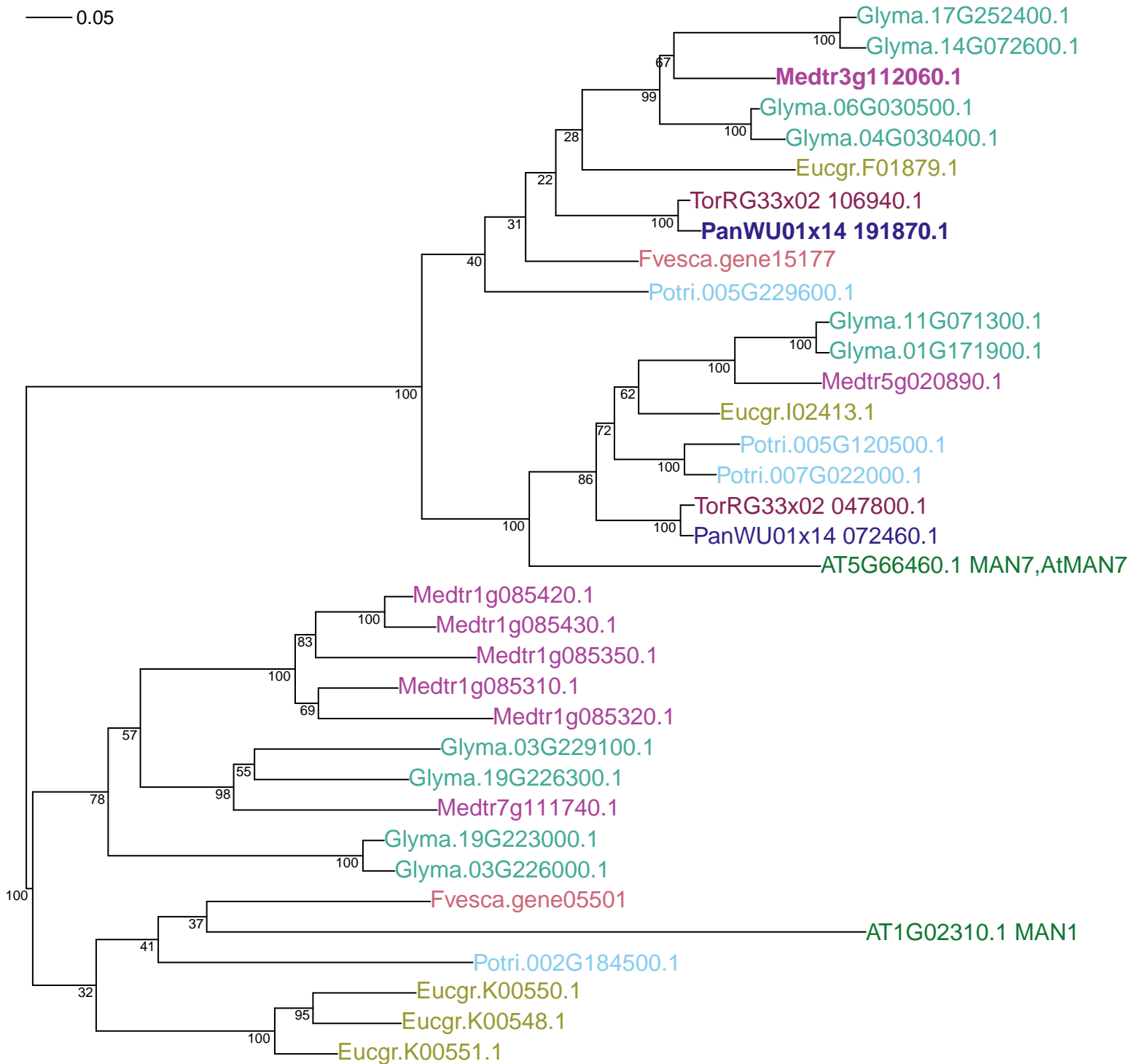


OG0000607: Enzymes. Ribonuclease T2-like

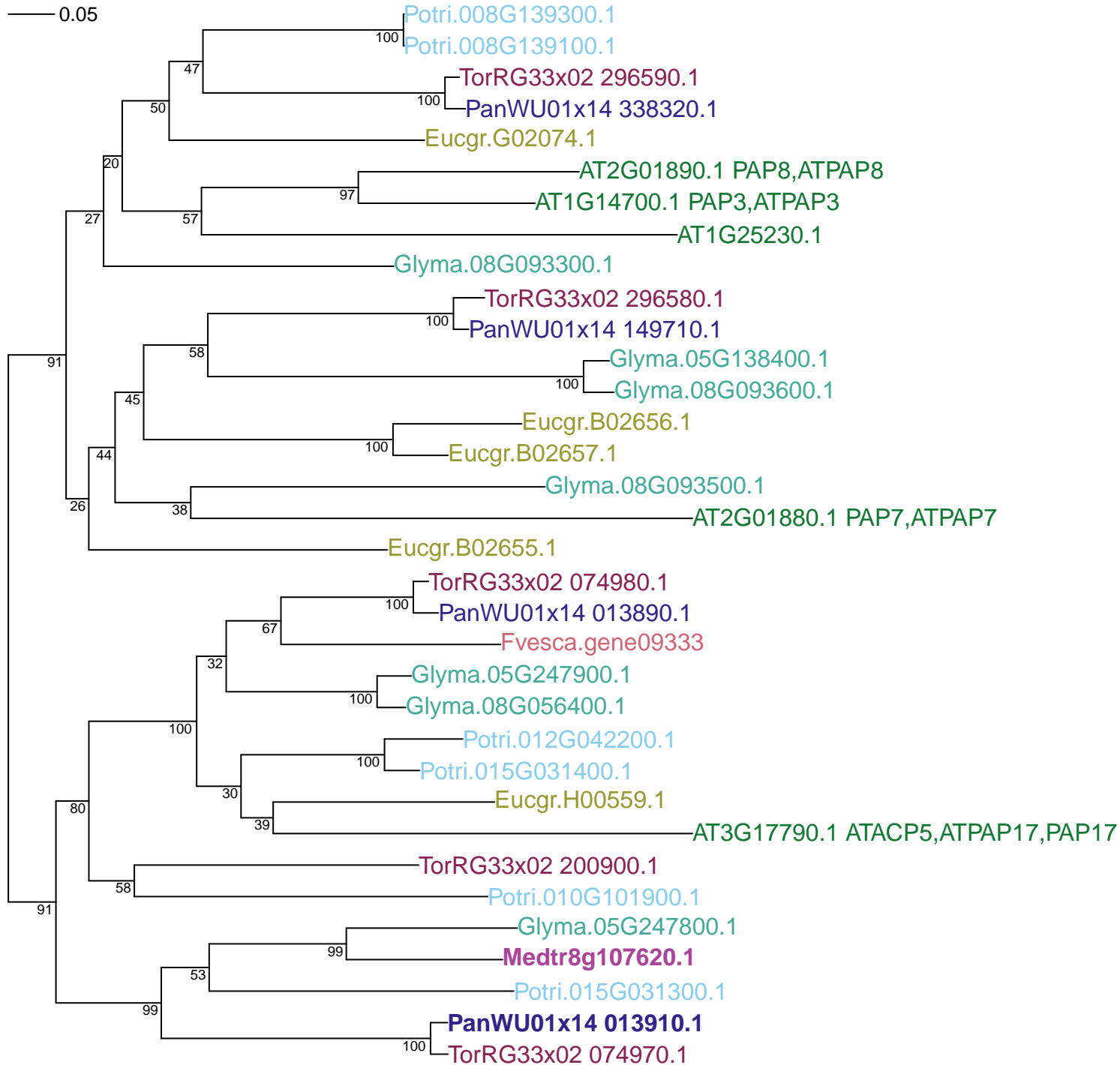


OG0000614: Enzymes. 1,4-alpha-glucan-branching enzyme

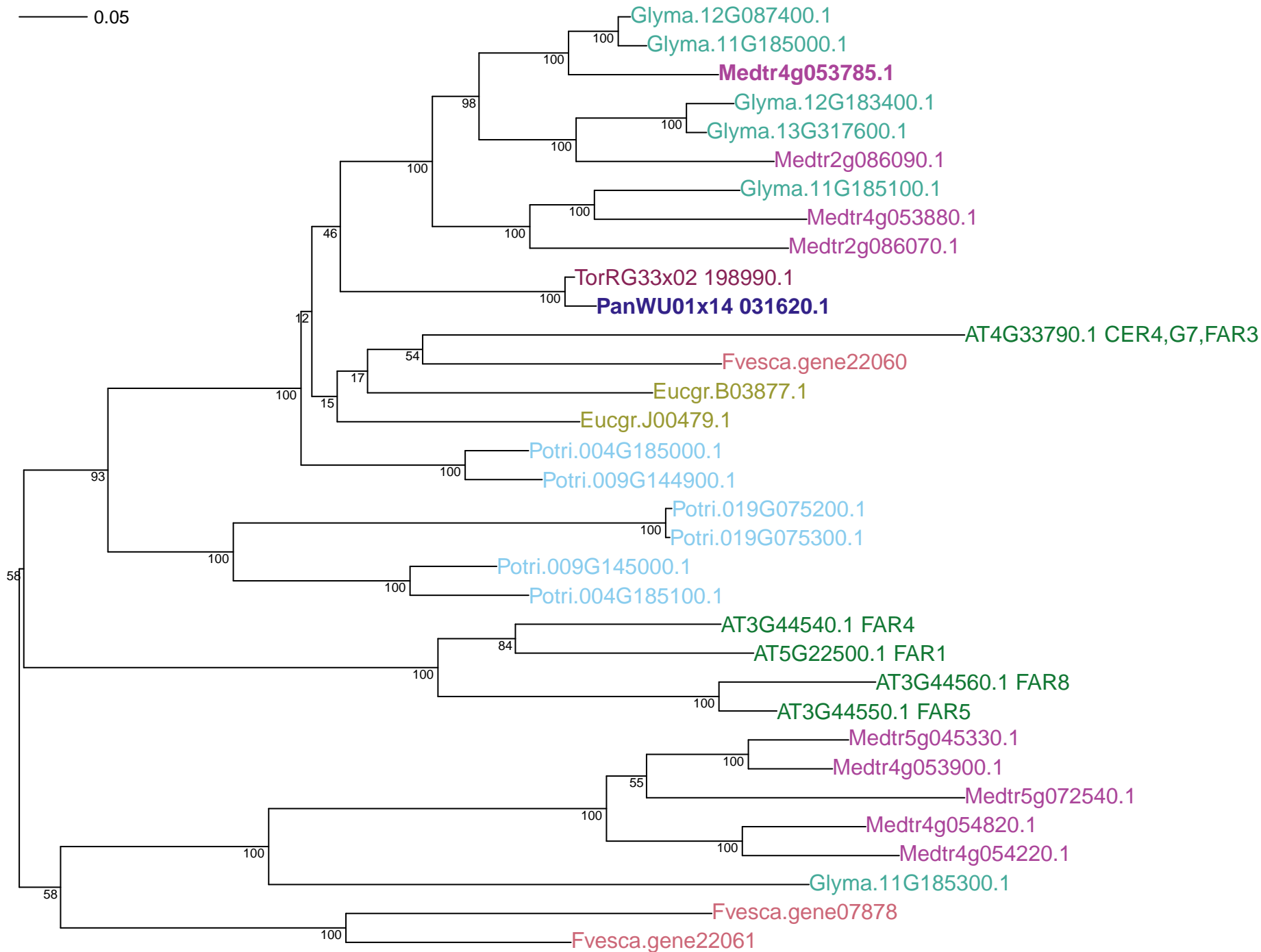
— 0.05



OG0000643: Enzymes. Calcineurin-like phosphoesterase domain, apaH type

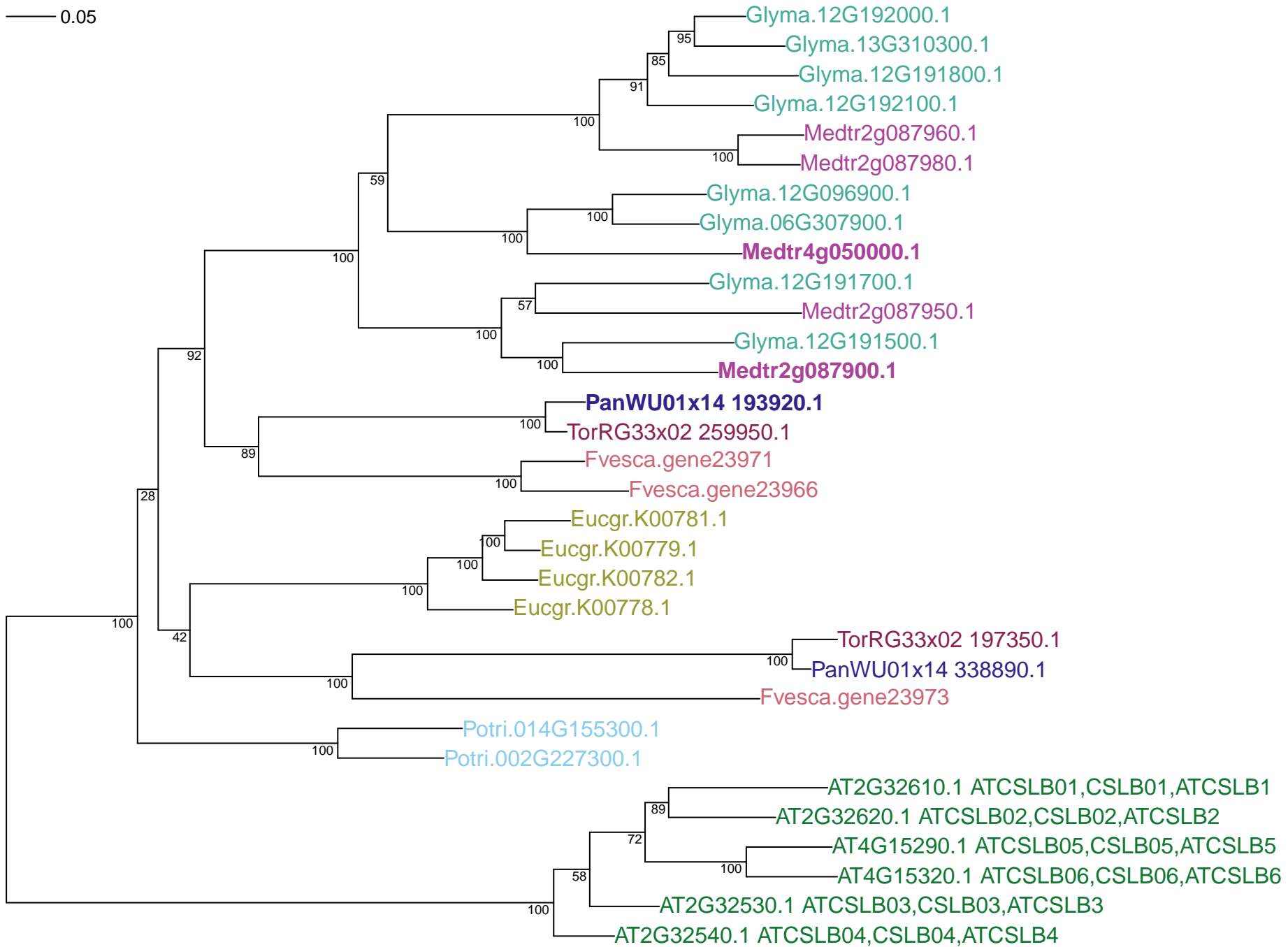


OG0000704: Enzymes. Fatty acyl-CoA reductase



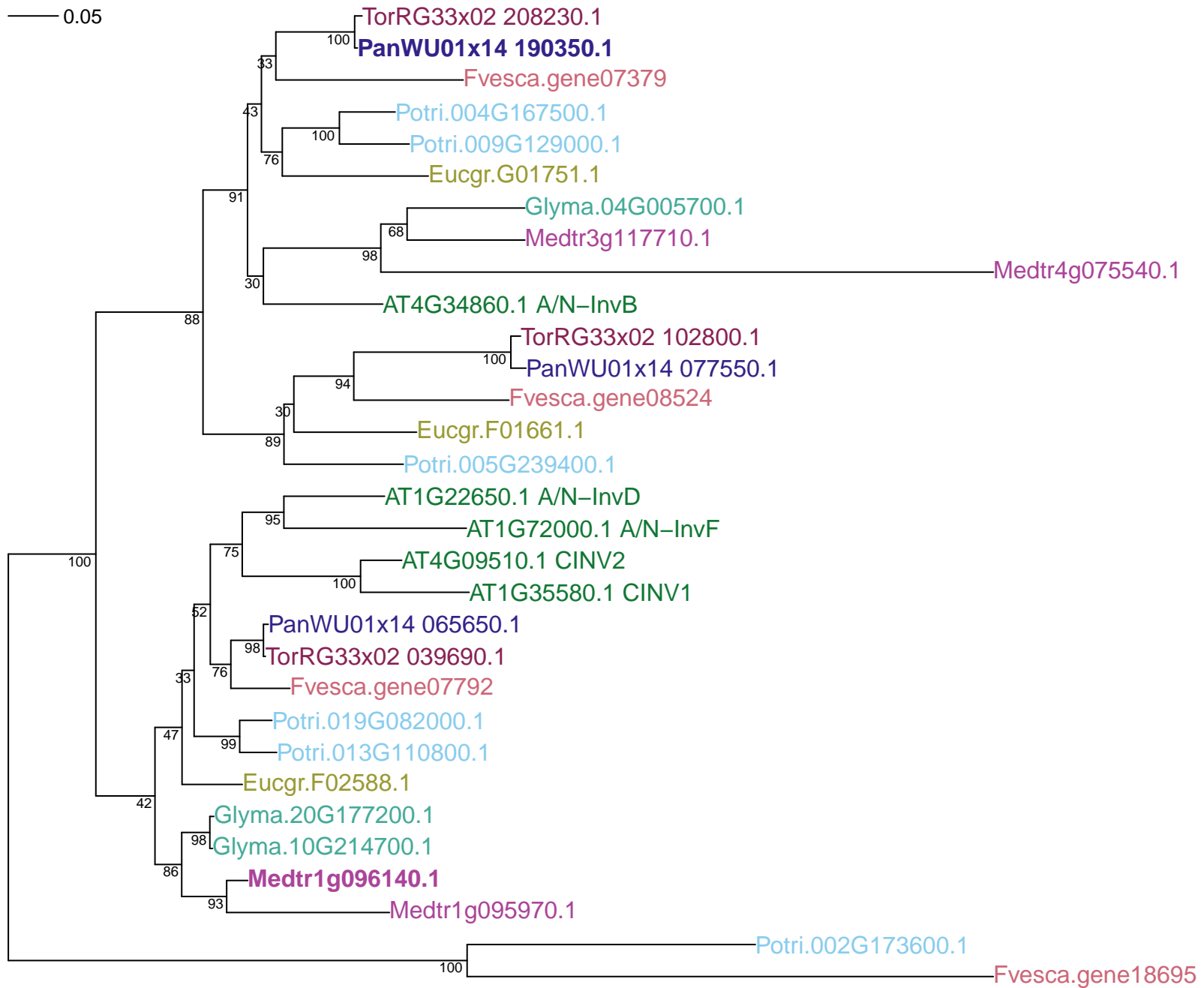
OG0000731: Enzymes. Cellulose synthase

0.05



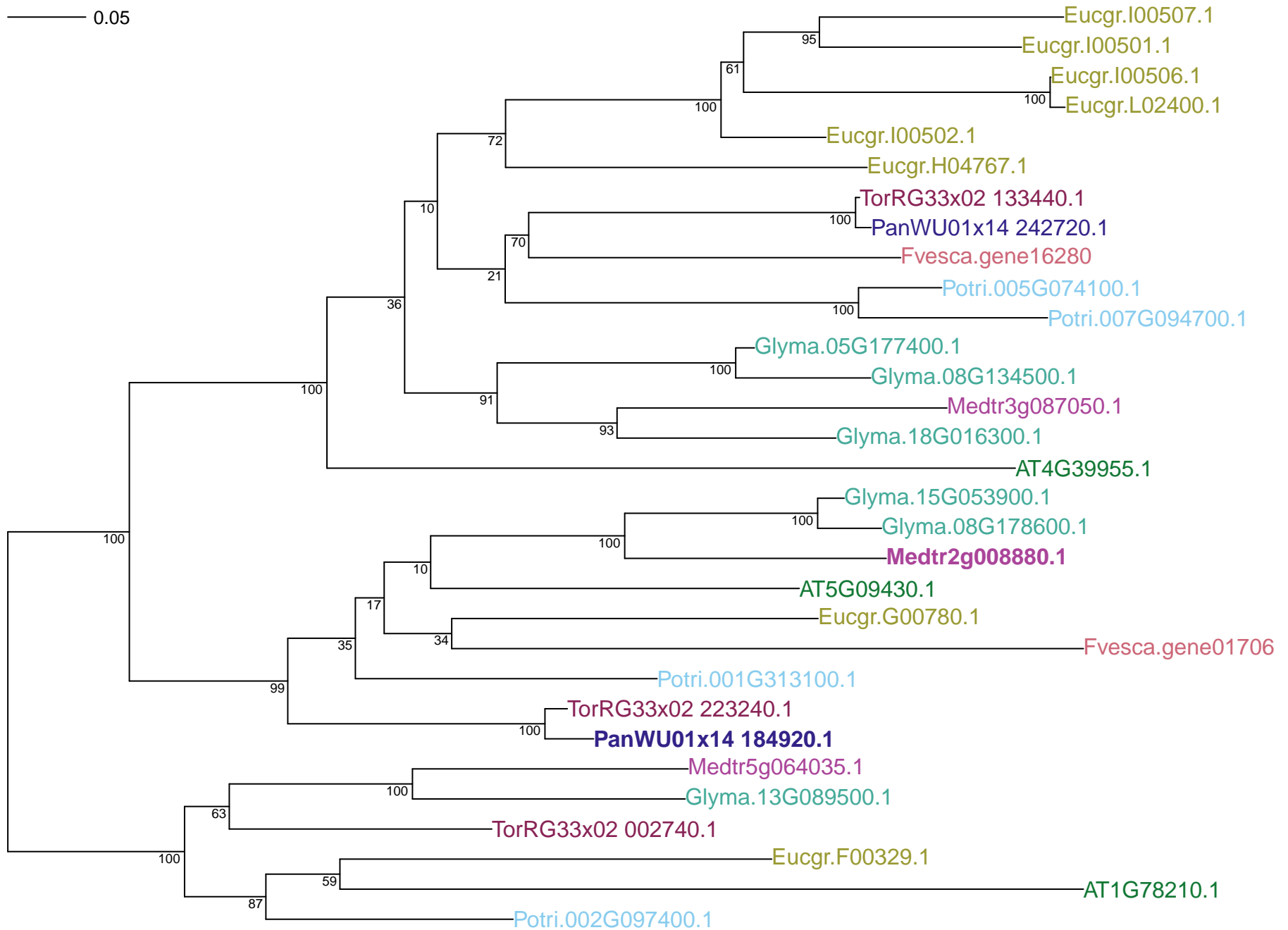
OG0000754: Enzymes. Glycosyl hydrolase

— 0.05

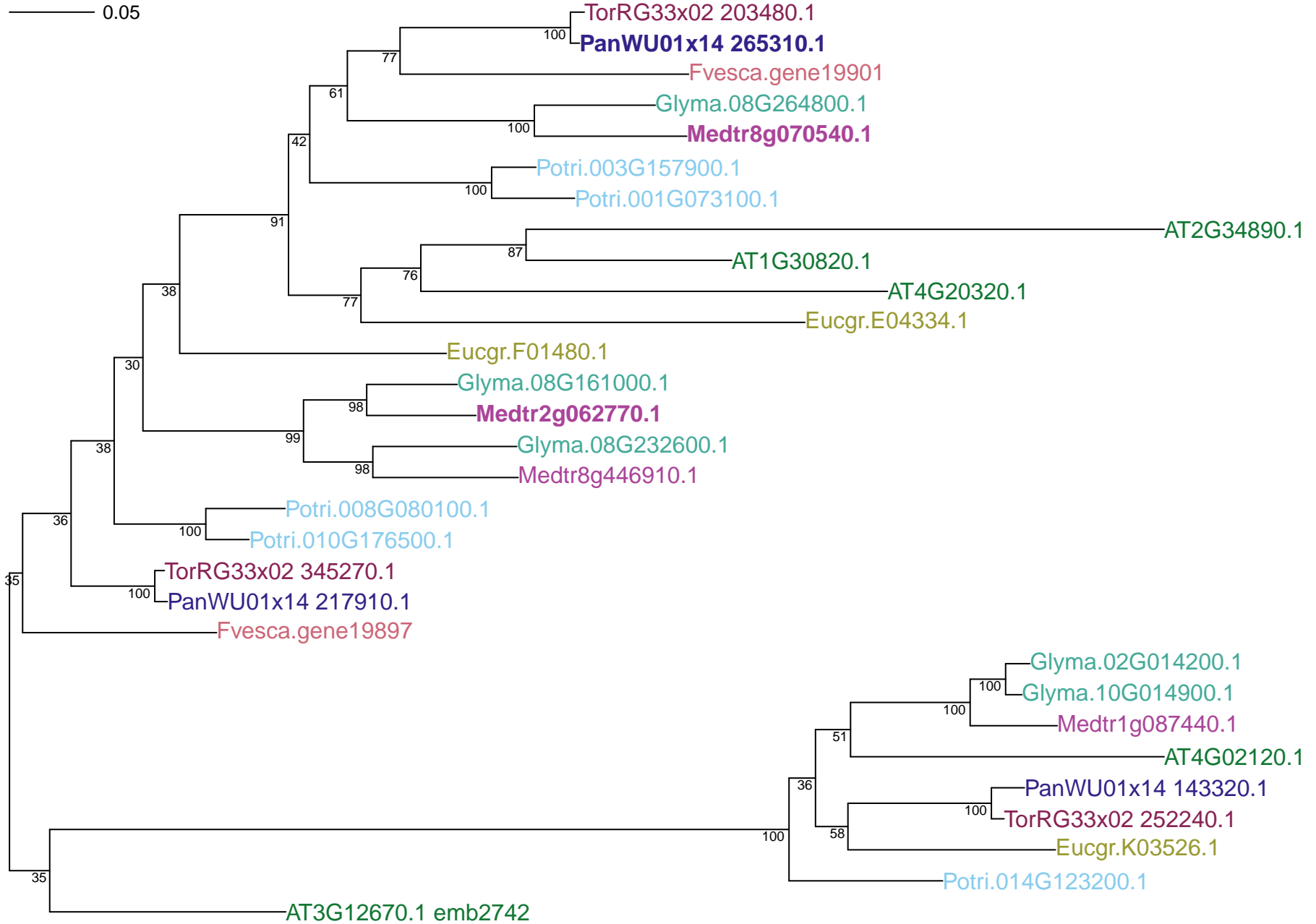


OG0000770: Enzymes. Epoxide hydrolase-like

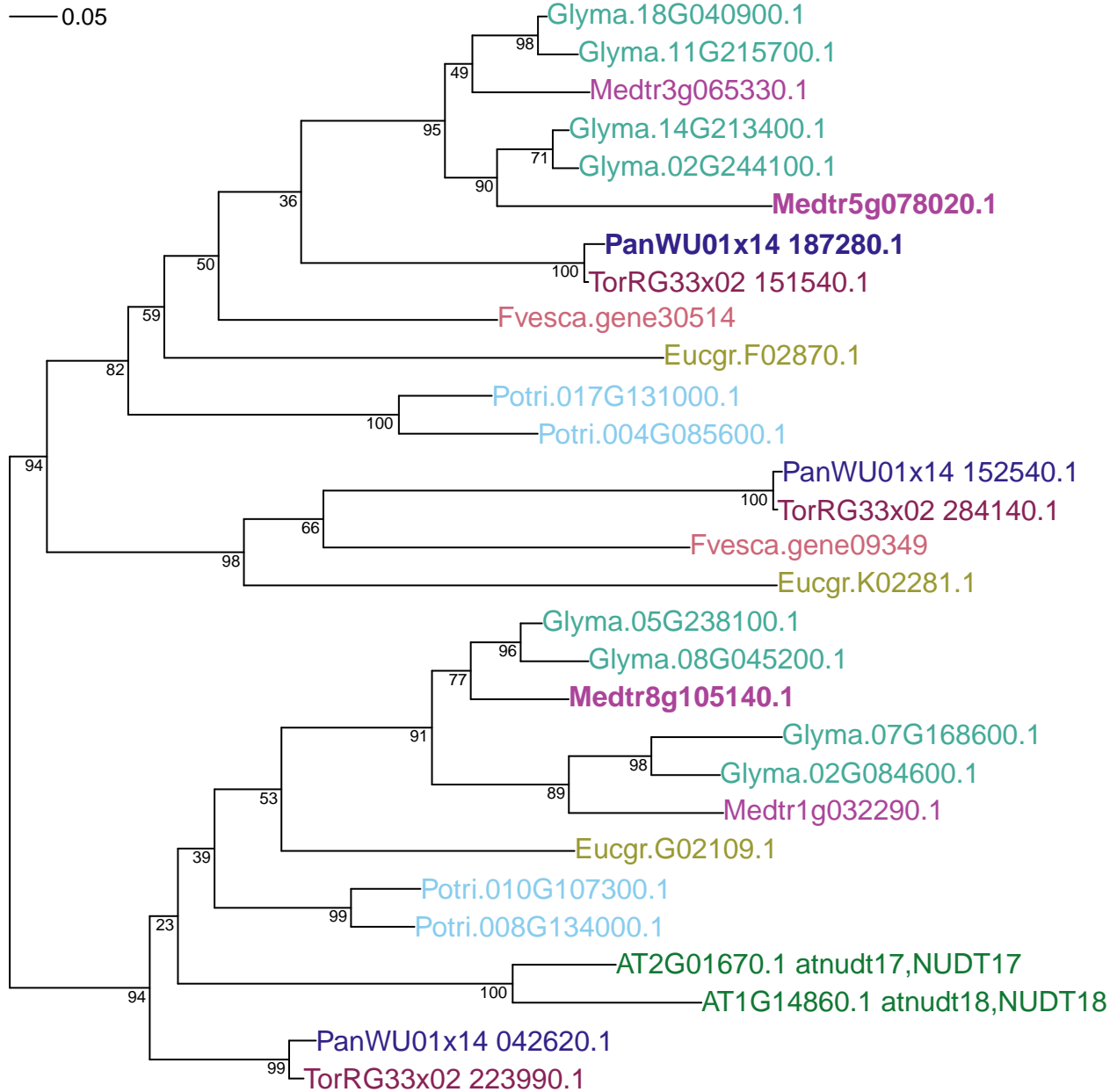
0.05



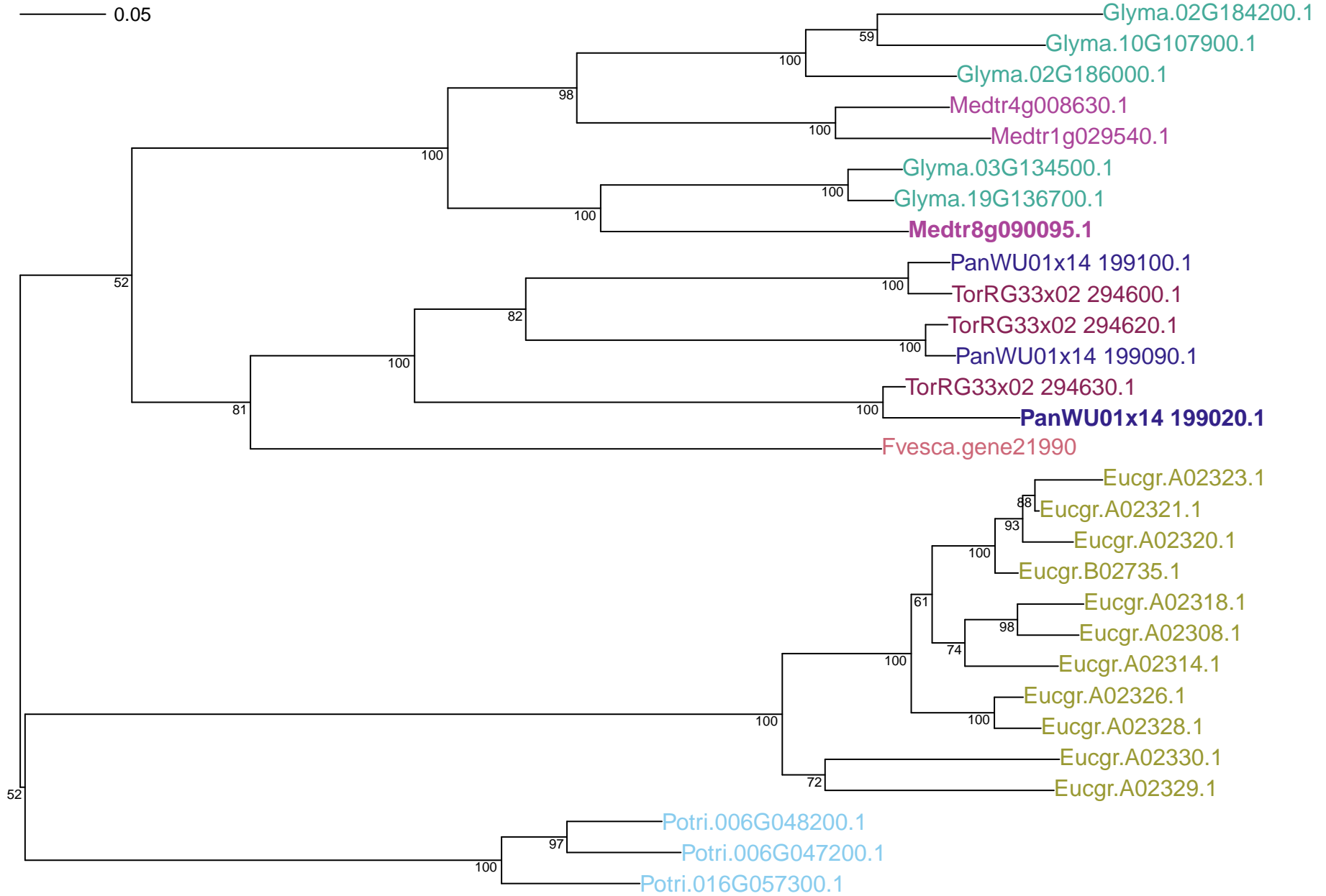
OG0000820: Enzymes. CTP synthase



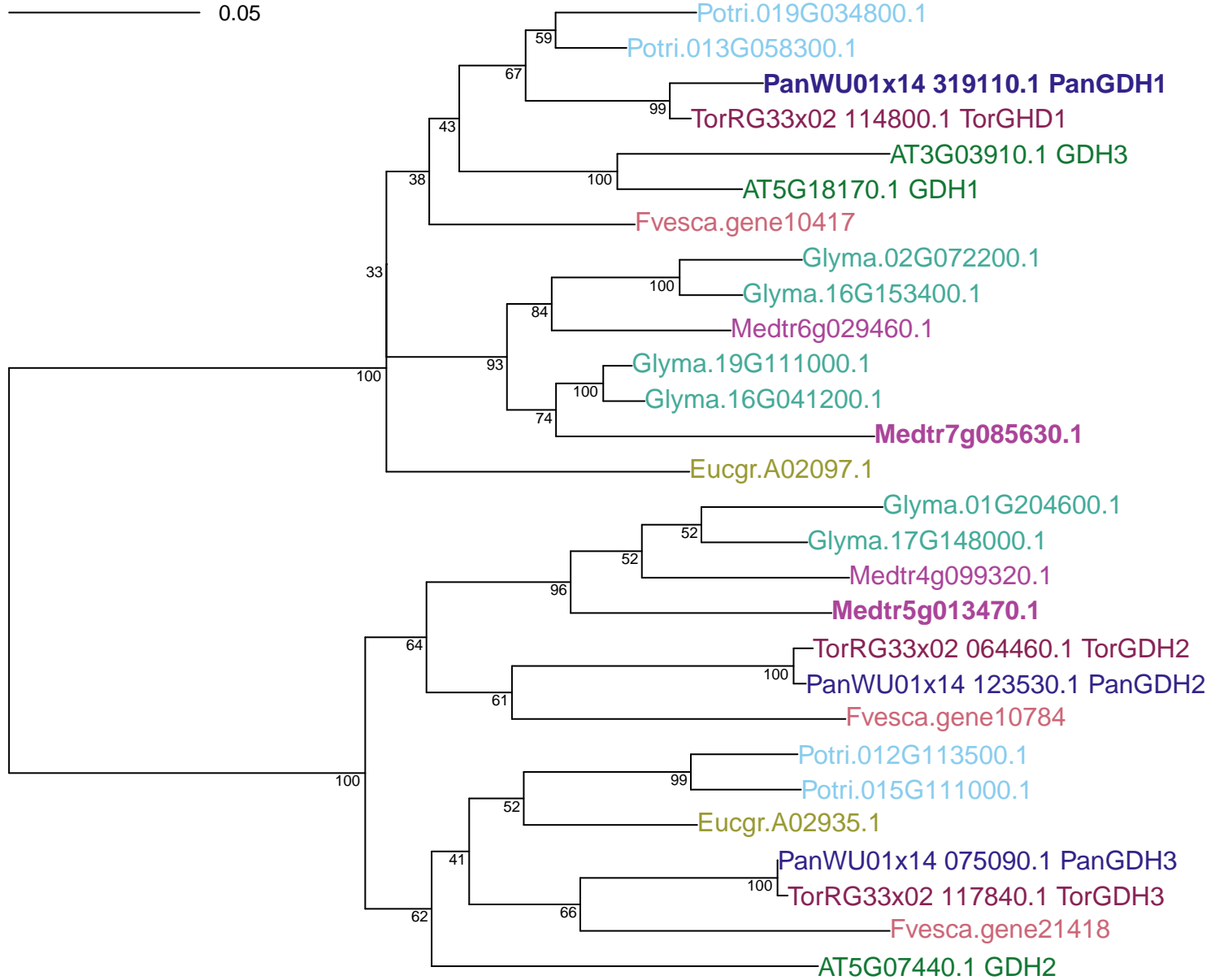
OG0000864: Enzymes. Dihydroneopterin triphosphate diphosphatase



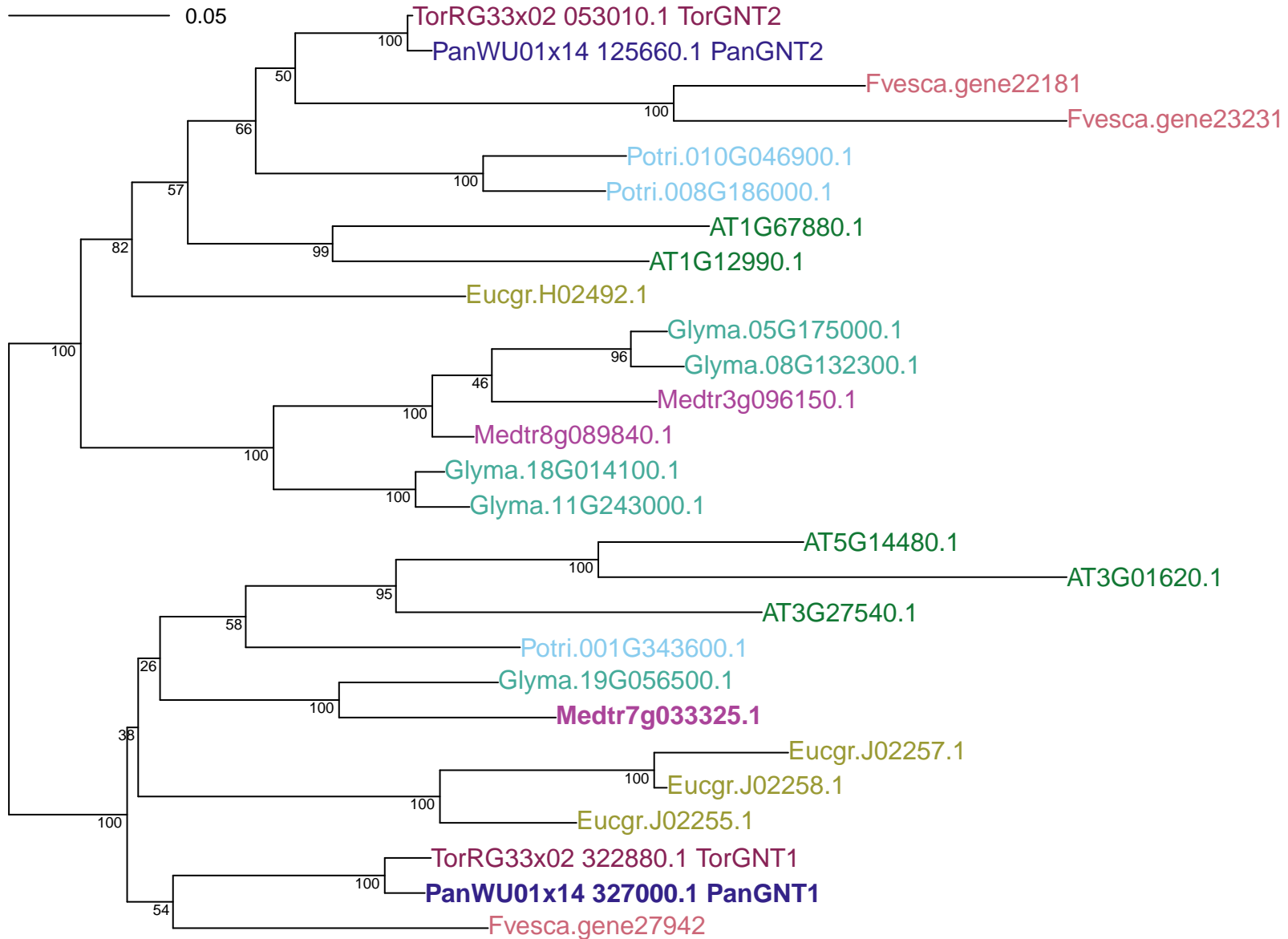
OG0000924: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase



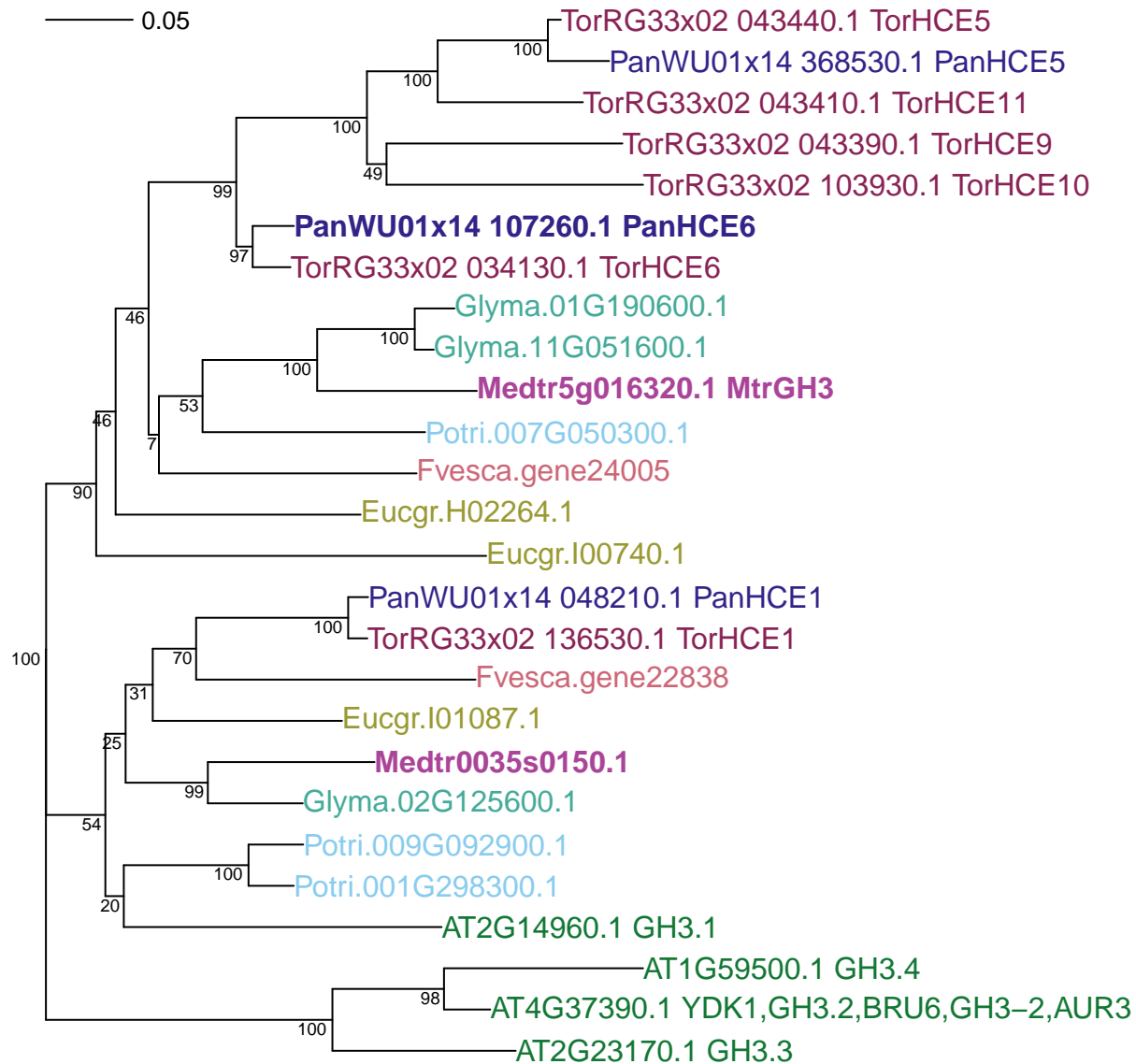
OG0000988: Enzymes. Glutamate dehydrogenase



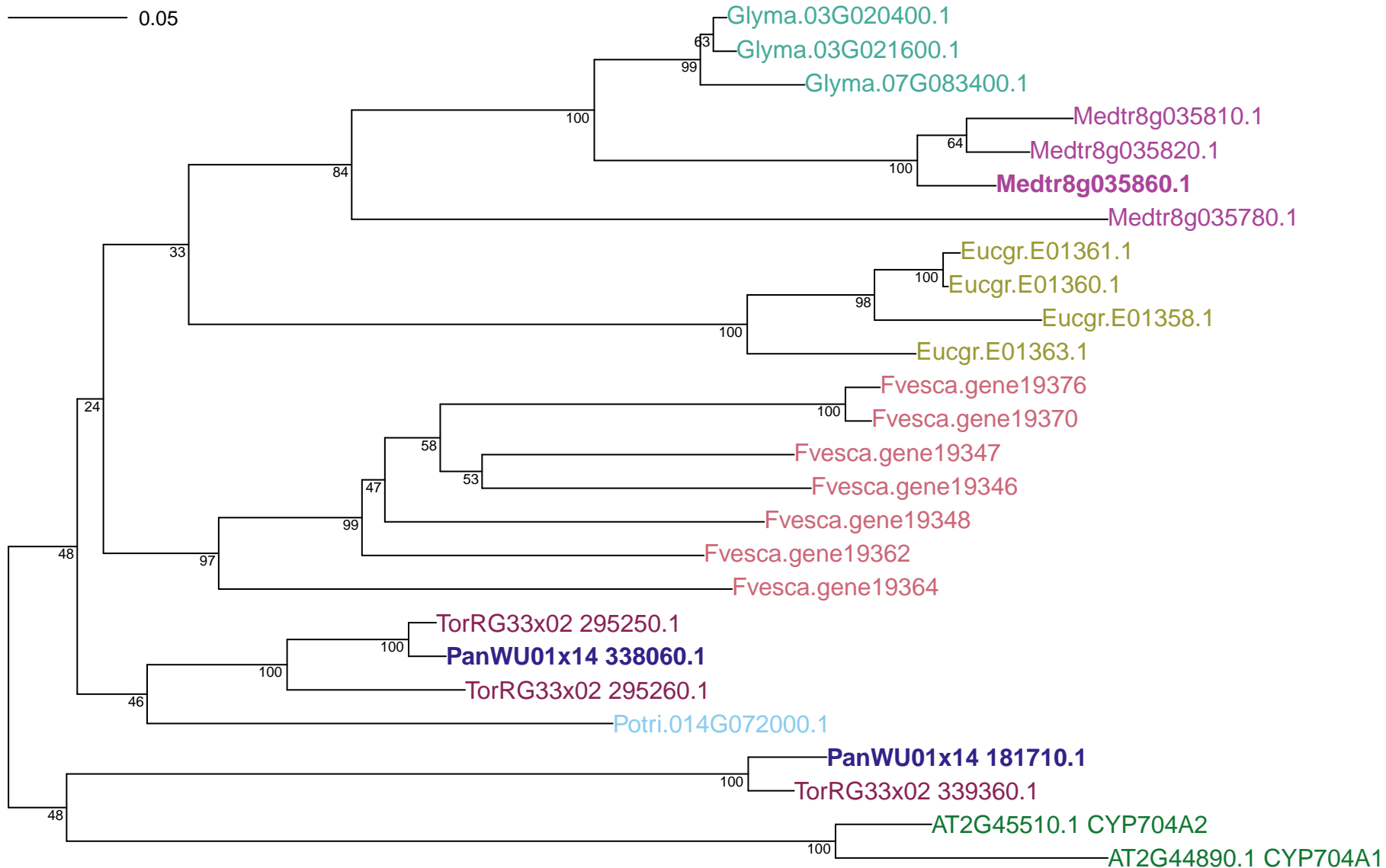
OG0001020: Enzymes. Glycosyl transferase



OG0001119: Enzymes. GH3-like hormone conjugating enzyme

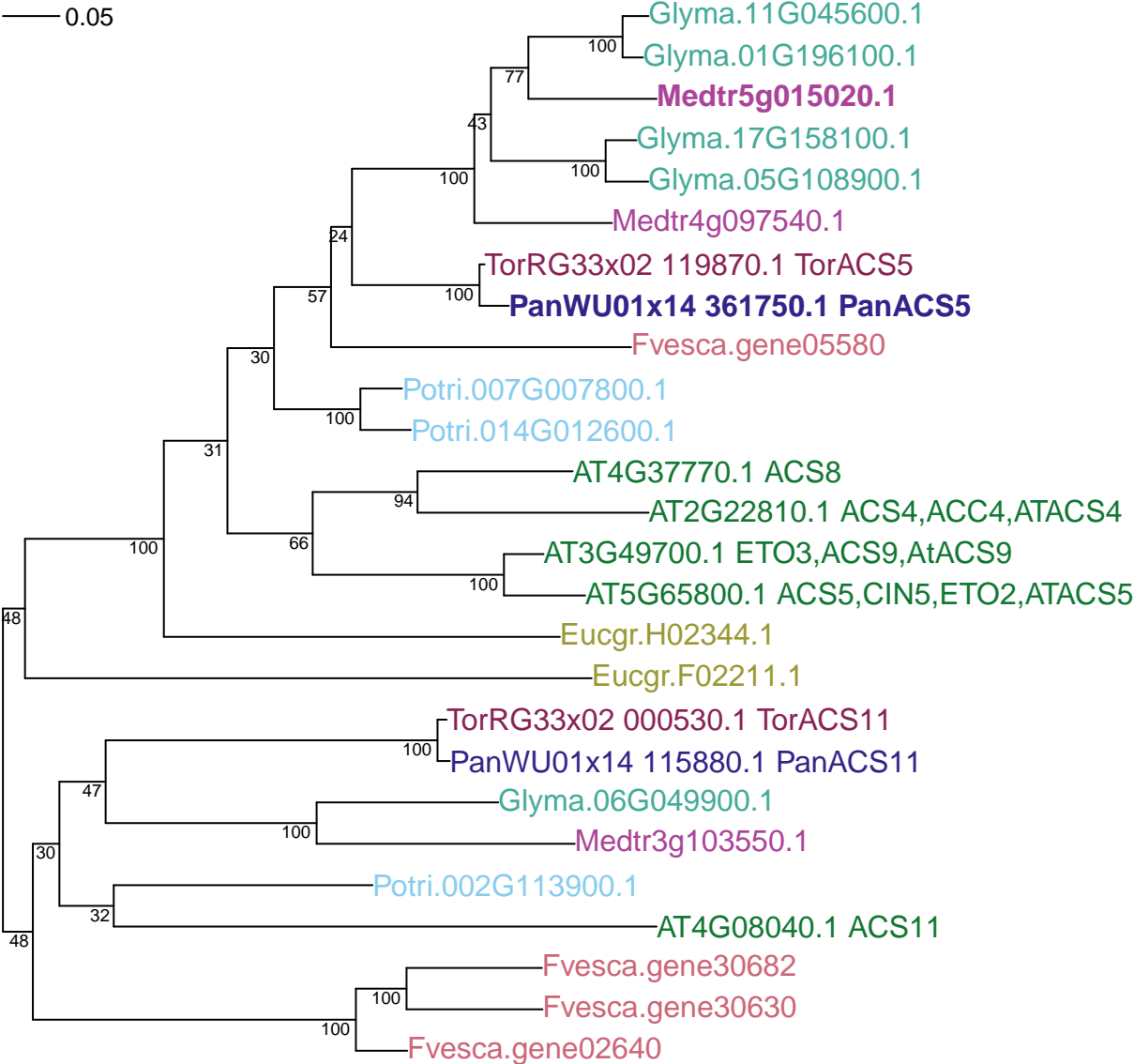


OG0001142: Enzymes. Cytochrome P450, E-class, group I



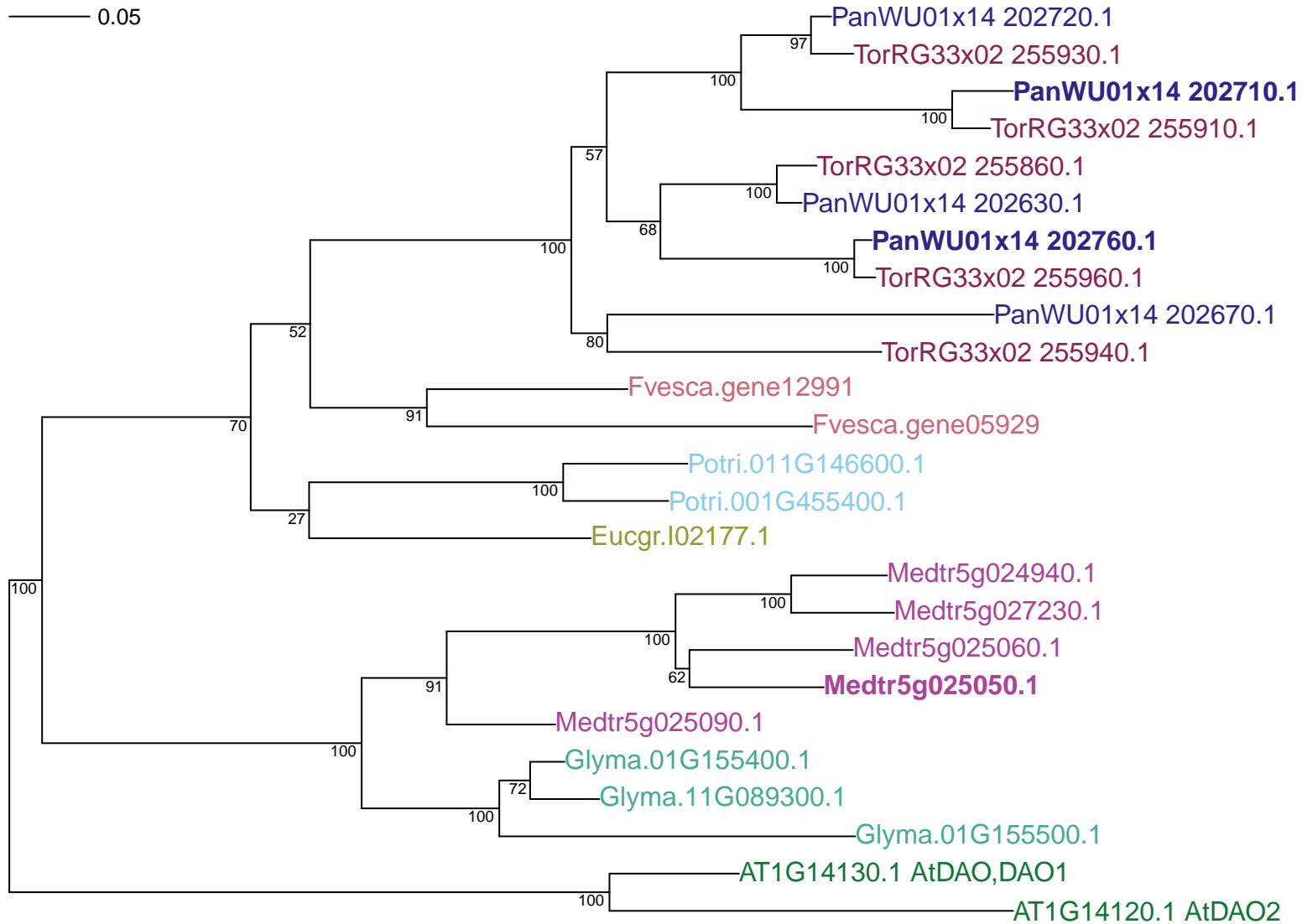
OG0001147: Enzymes. L-threonine-O-3-phosphate decarboxylase

— 0.05

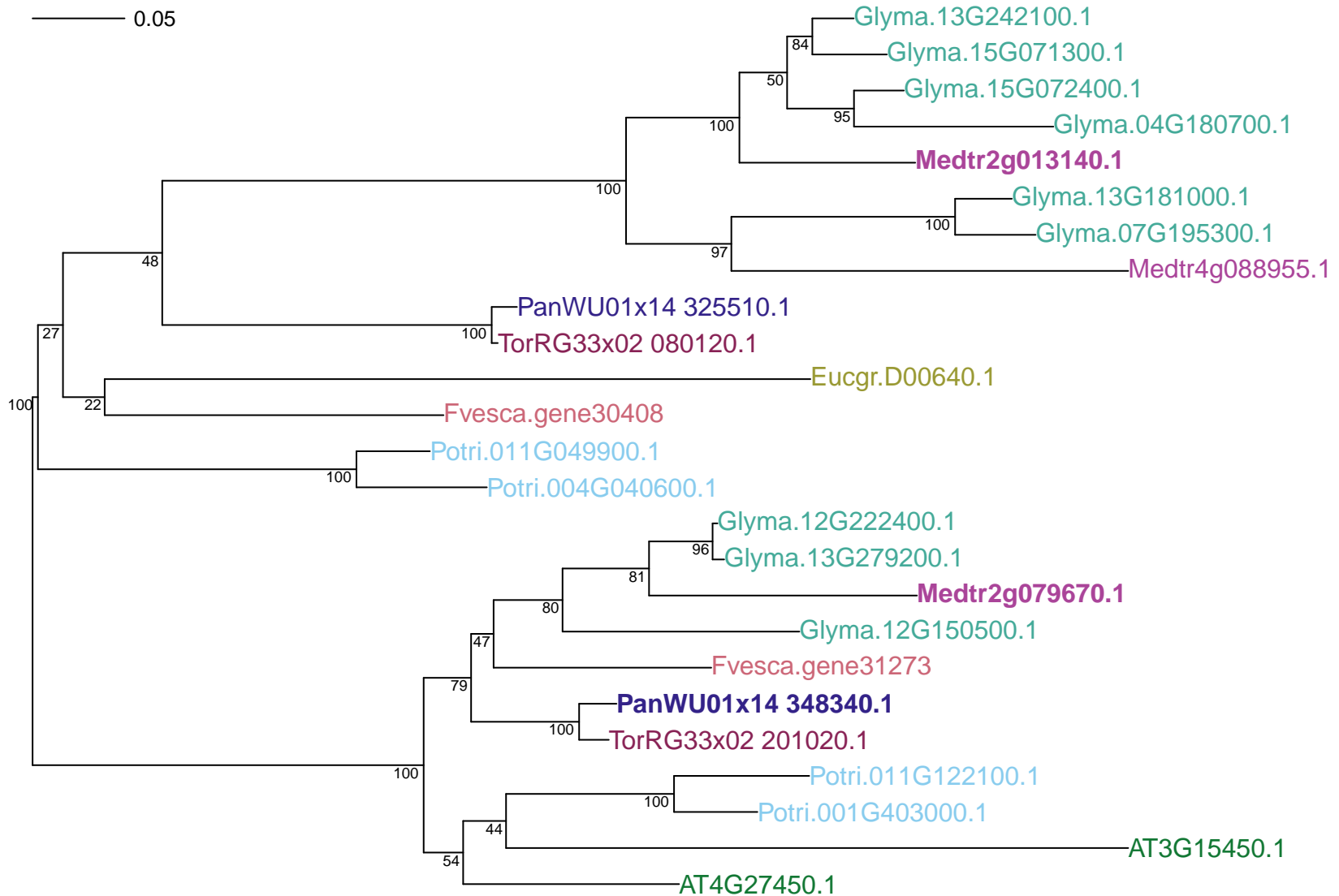


OG0001229: Enzymes. Oxoglutarate/iron-dependent dioxygenase

0.05

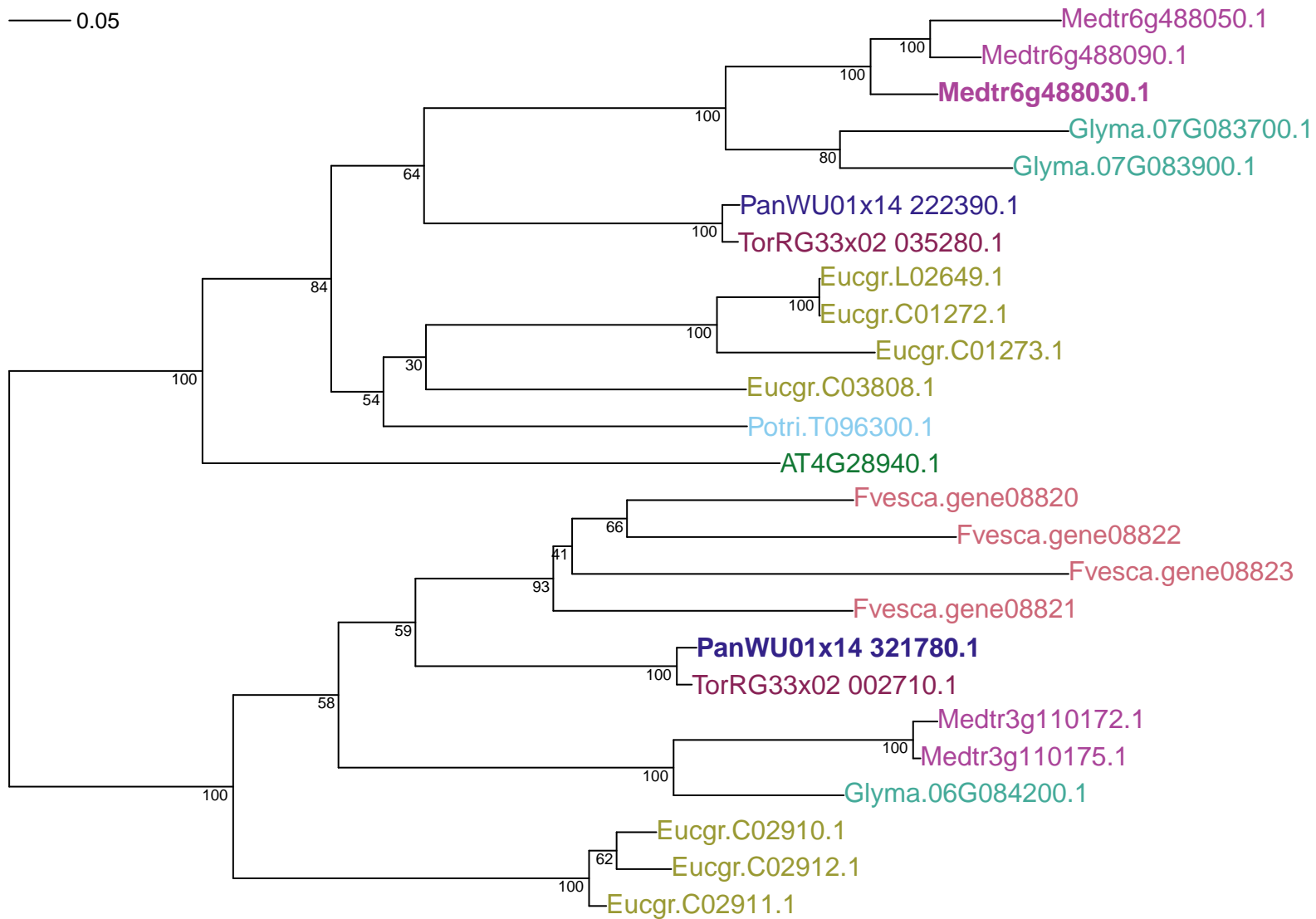


OG0001272: Enzymes. Nucleophile aminohydrolase, N-terminal

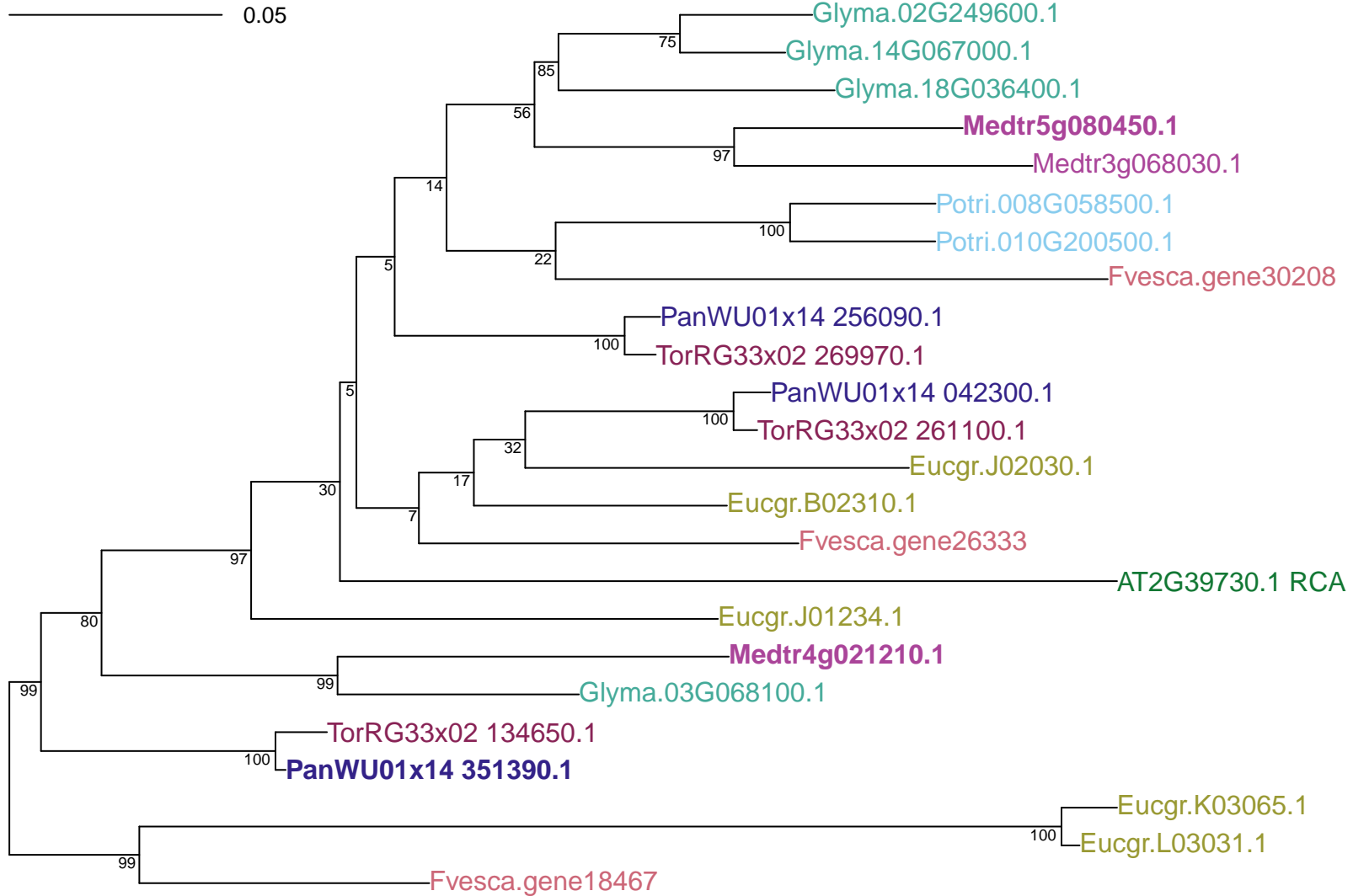


OG0001282: Enzymes. Nucleoside phosphorylase

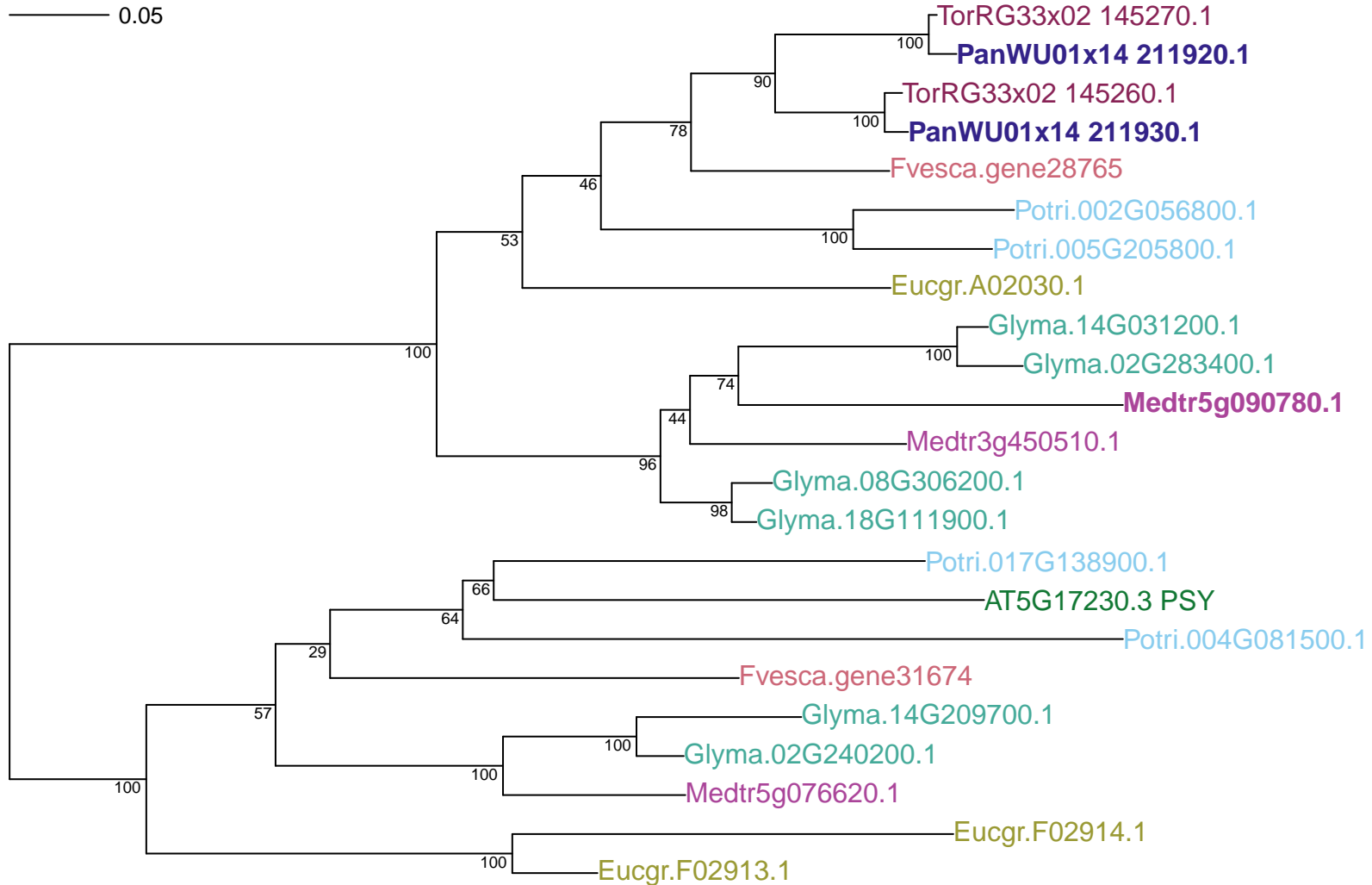
— 0.05



OG0001384: Enzymes. ATPase, AAA-type, core

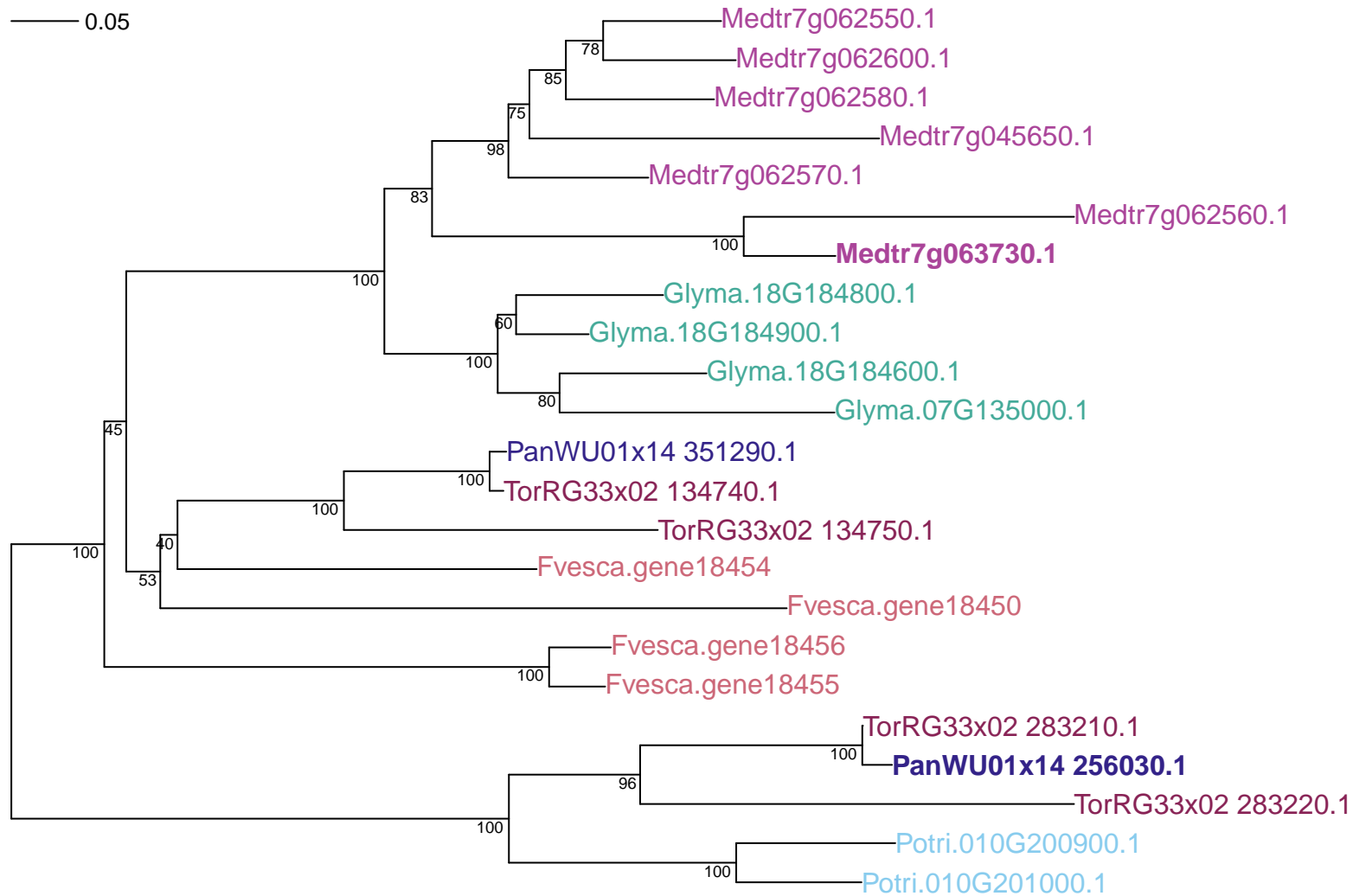


OG0001576: Enzymes. Squalene/phytoene synthase



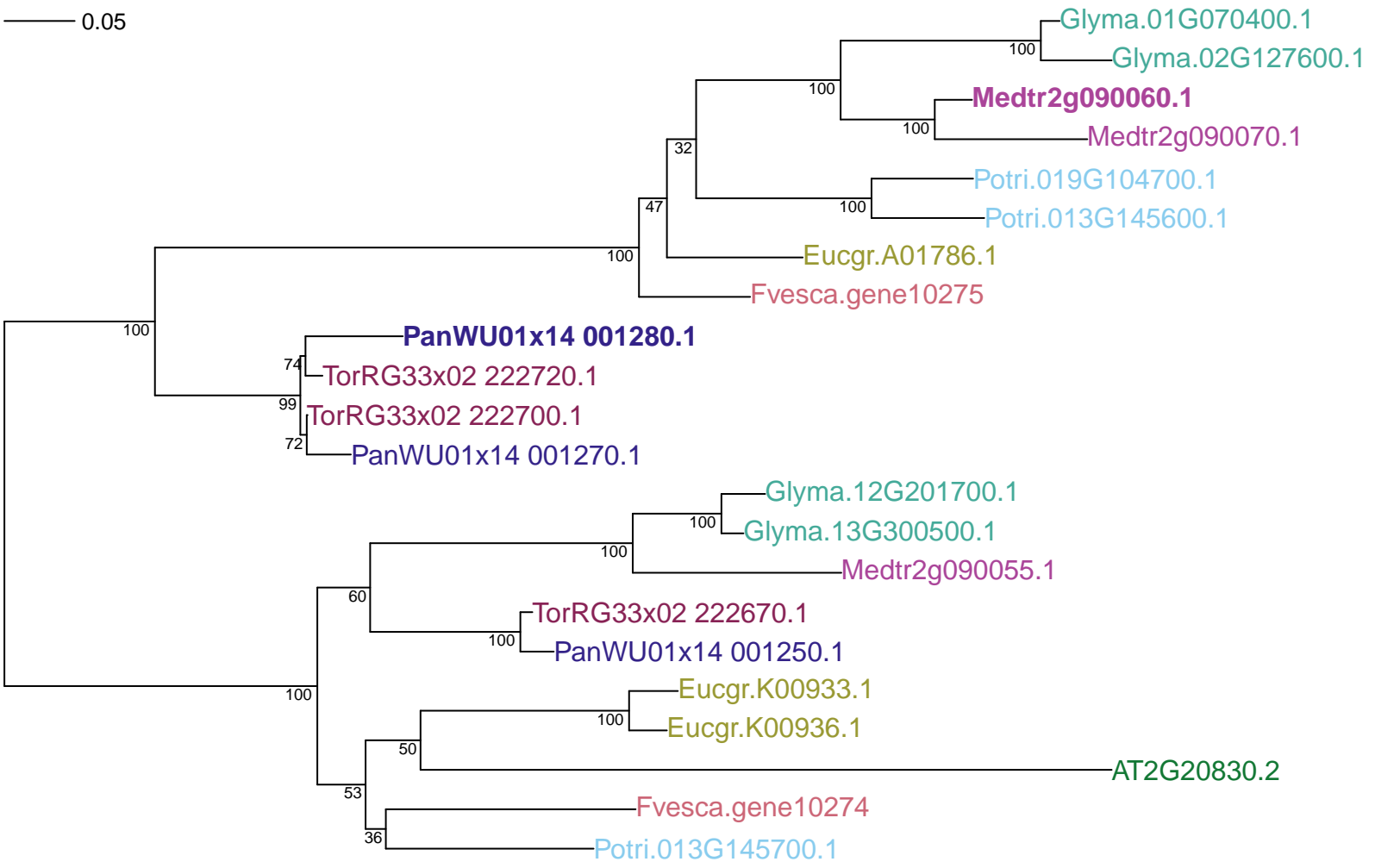
OG0001591: Enzymes. Oxoglutarate/iron-dependent dioxygenase

— 0.05

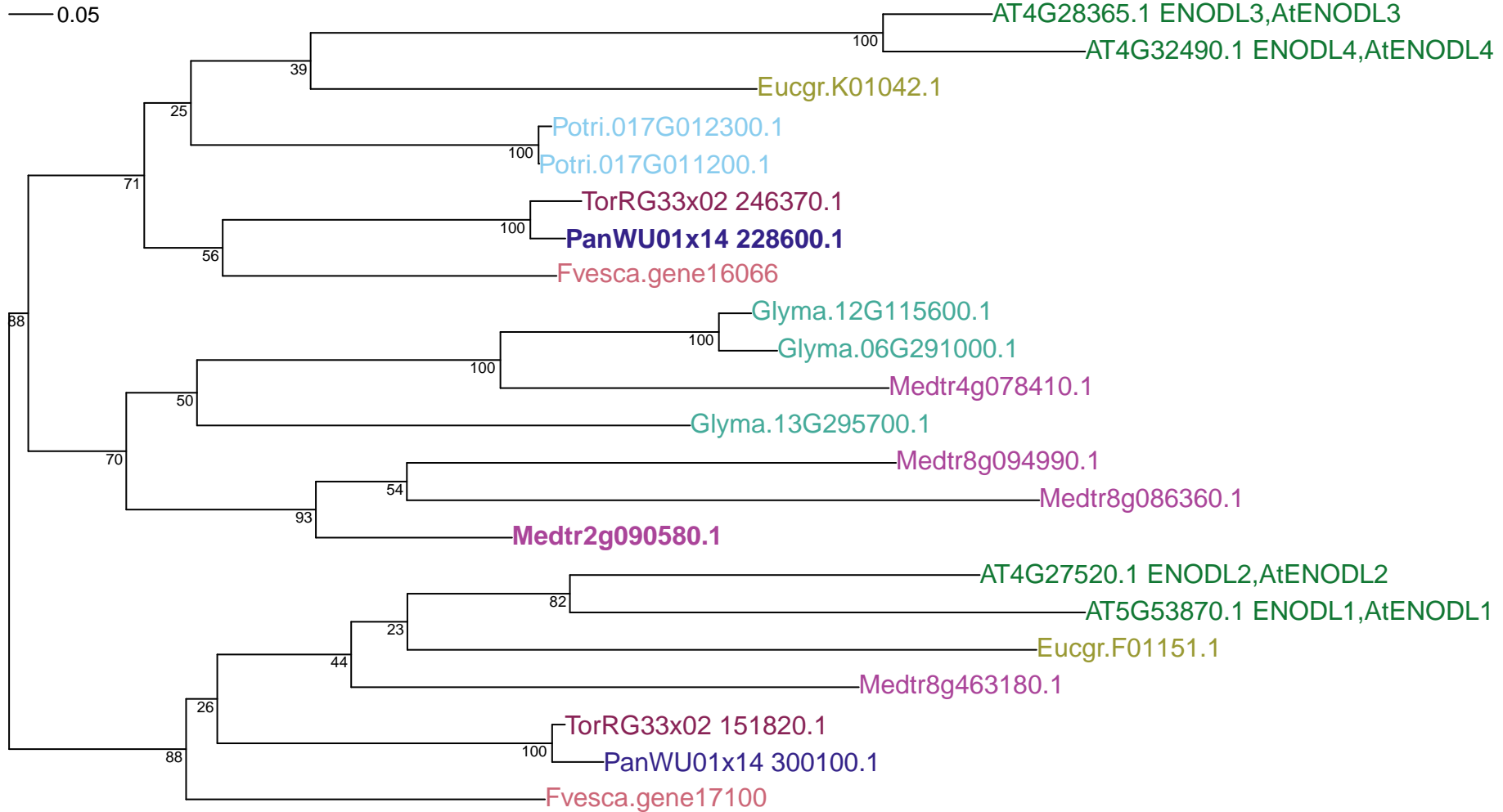


OG0001703: Enzymes. Formiminotransferase catalytic domain containing protein

0.05

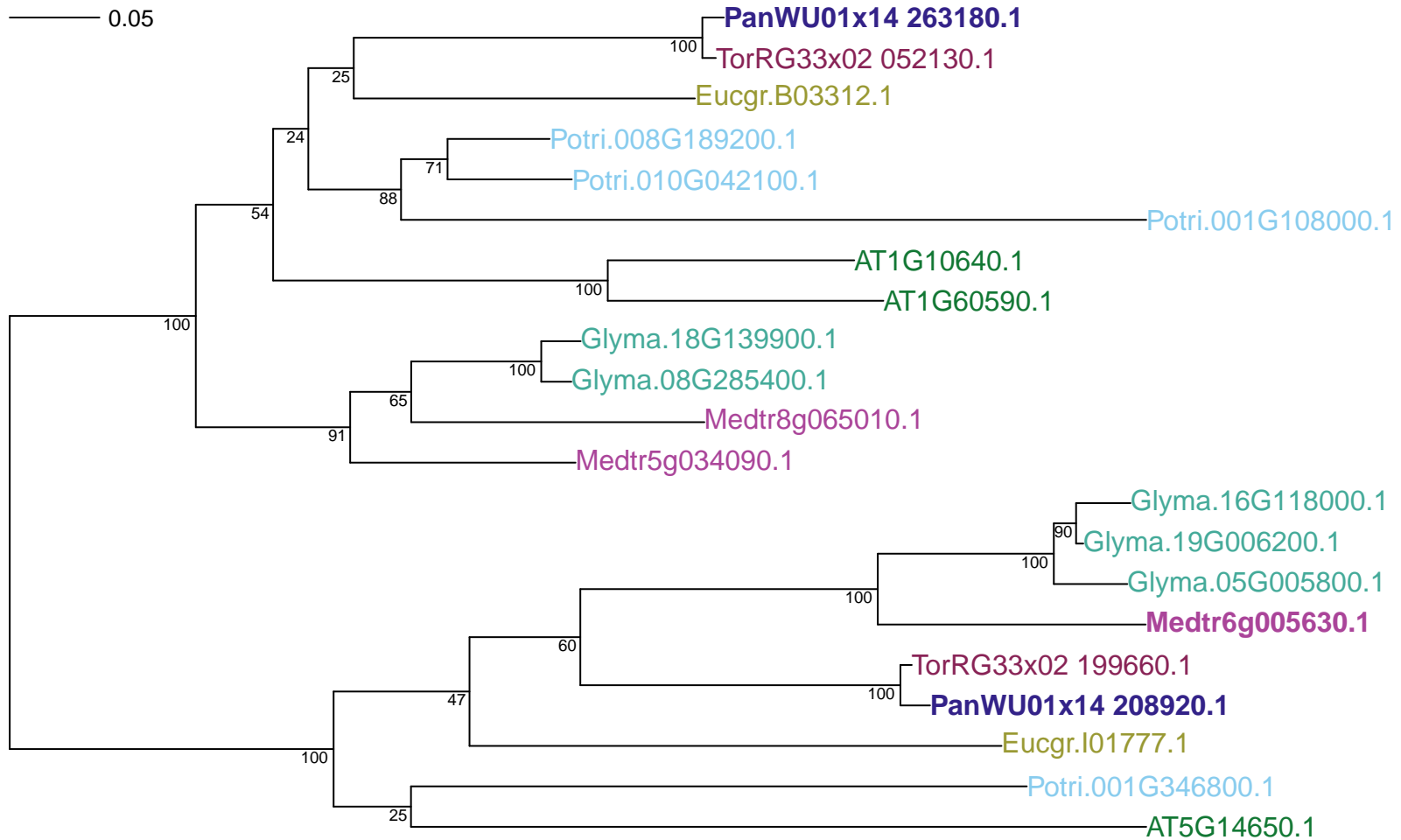


OG0001748: Enzymes. Cupredoxin

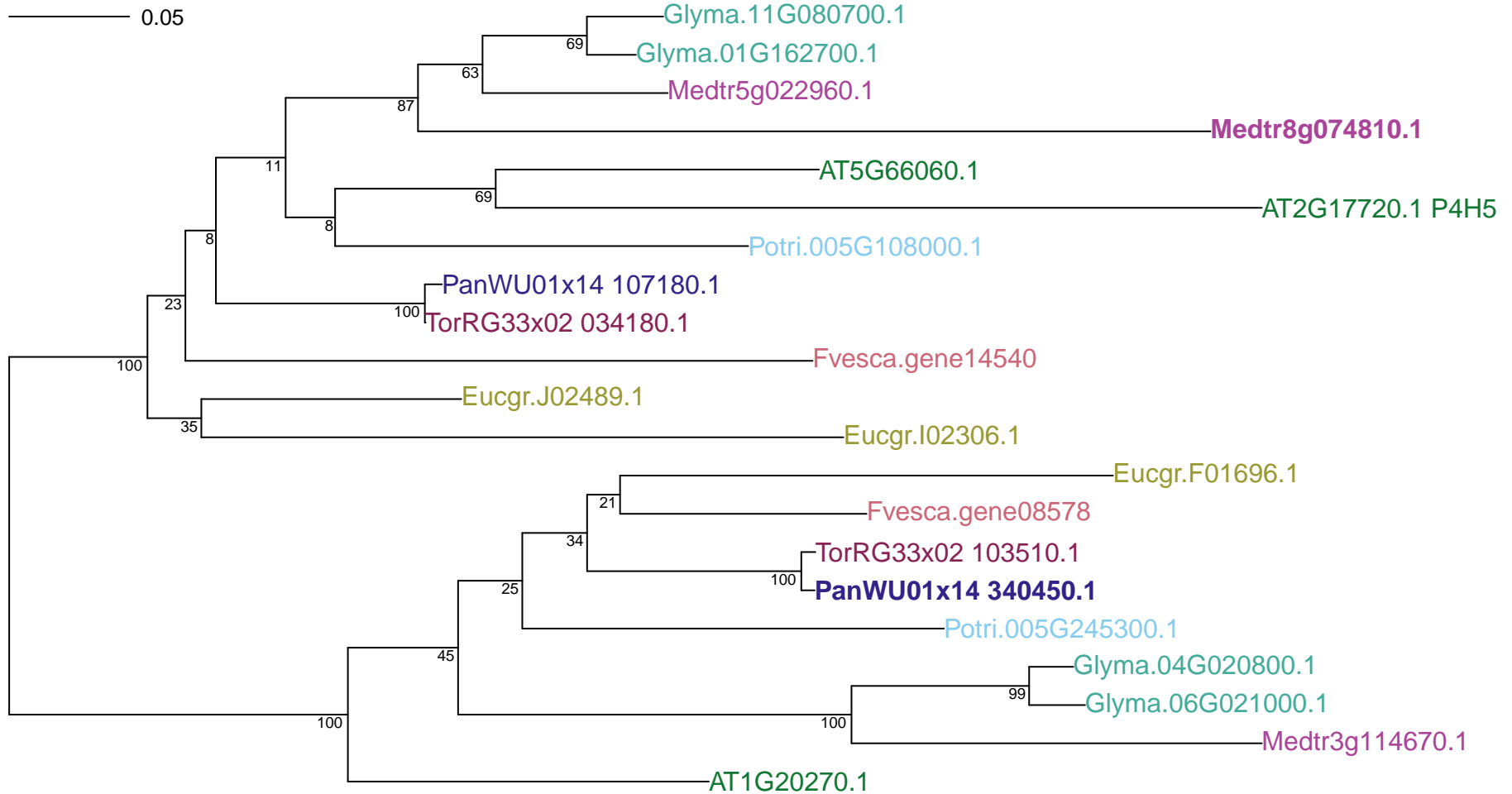


OG0001847: Enzymes. Glycoside hydrolase

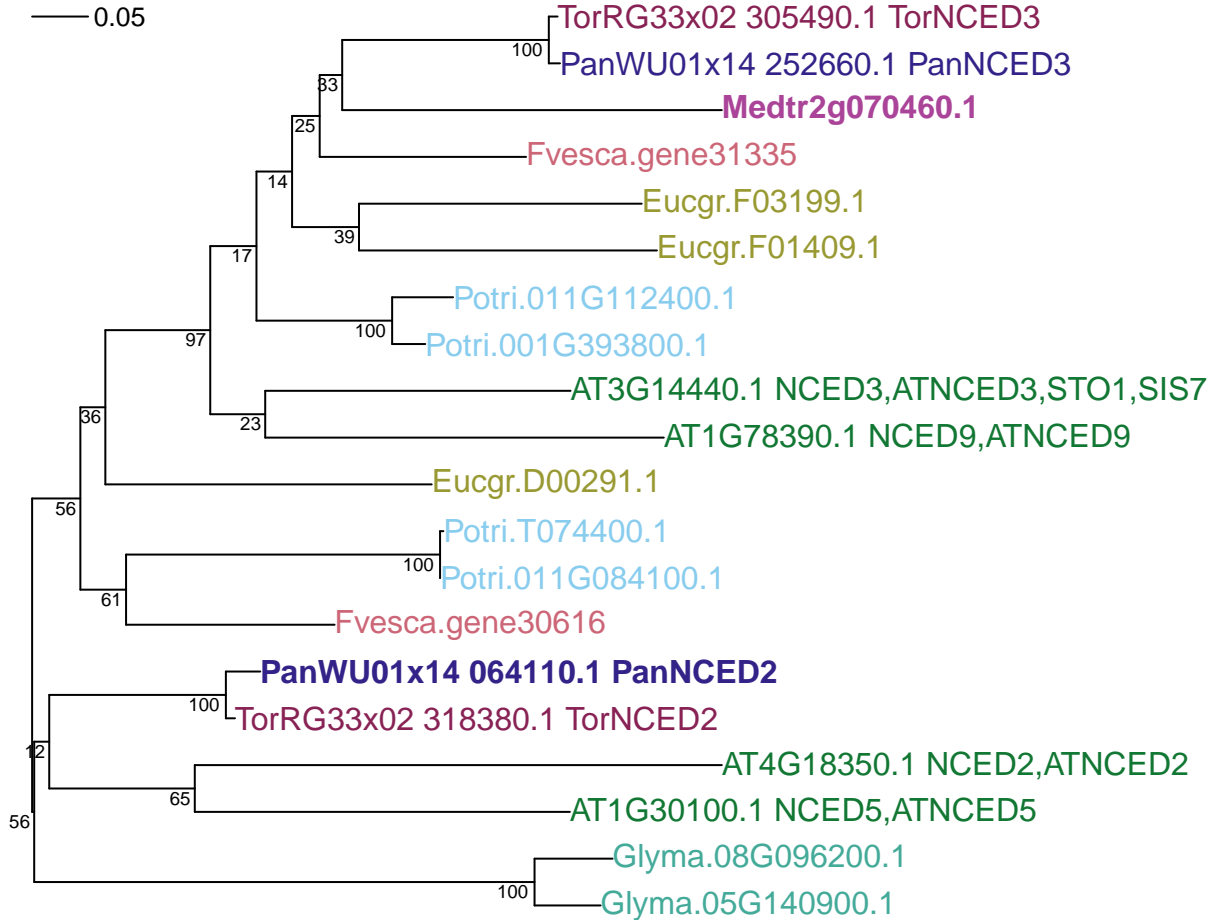
0.05



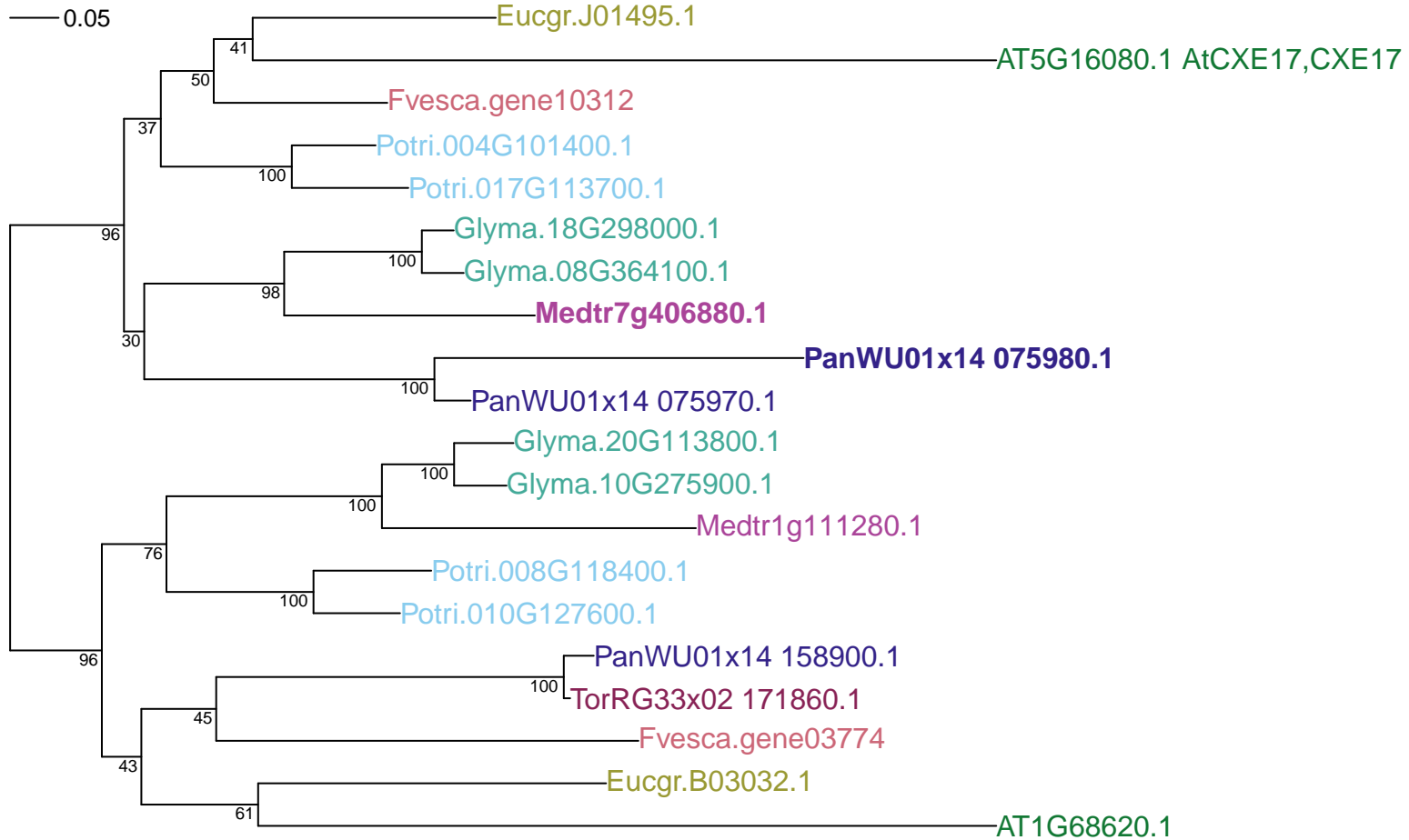
OG0001882: Enzymes. Isopenicillin N synthase



OG0002078: Enzymes. 9-cis-epoxycarotenoid dioxygenase

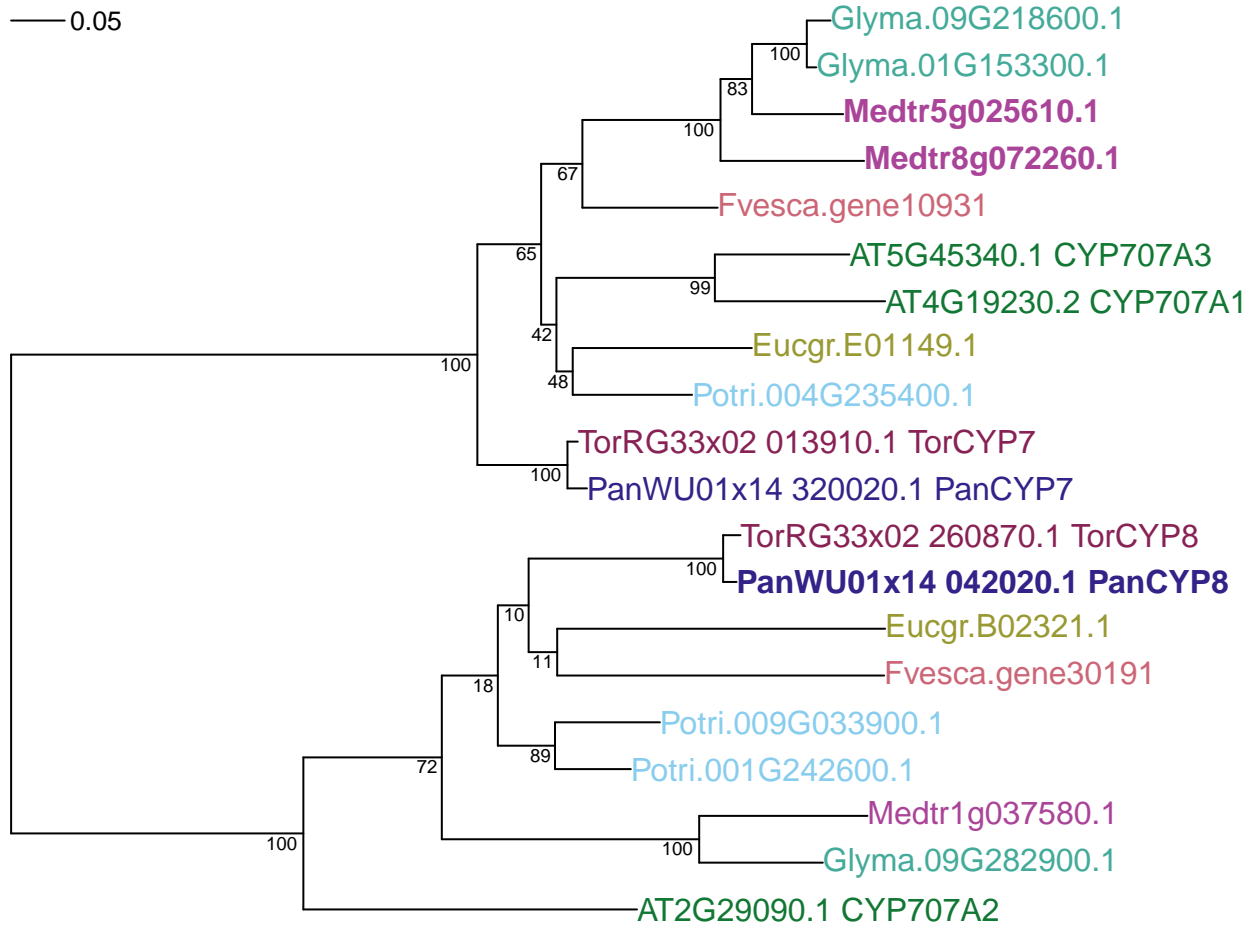


OG0002087: Enzymes. Alpha/beta hydrolase fold

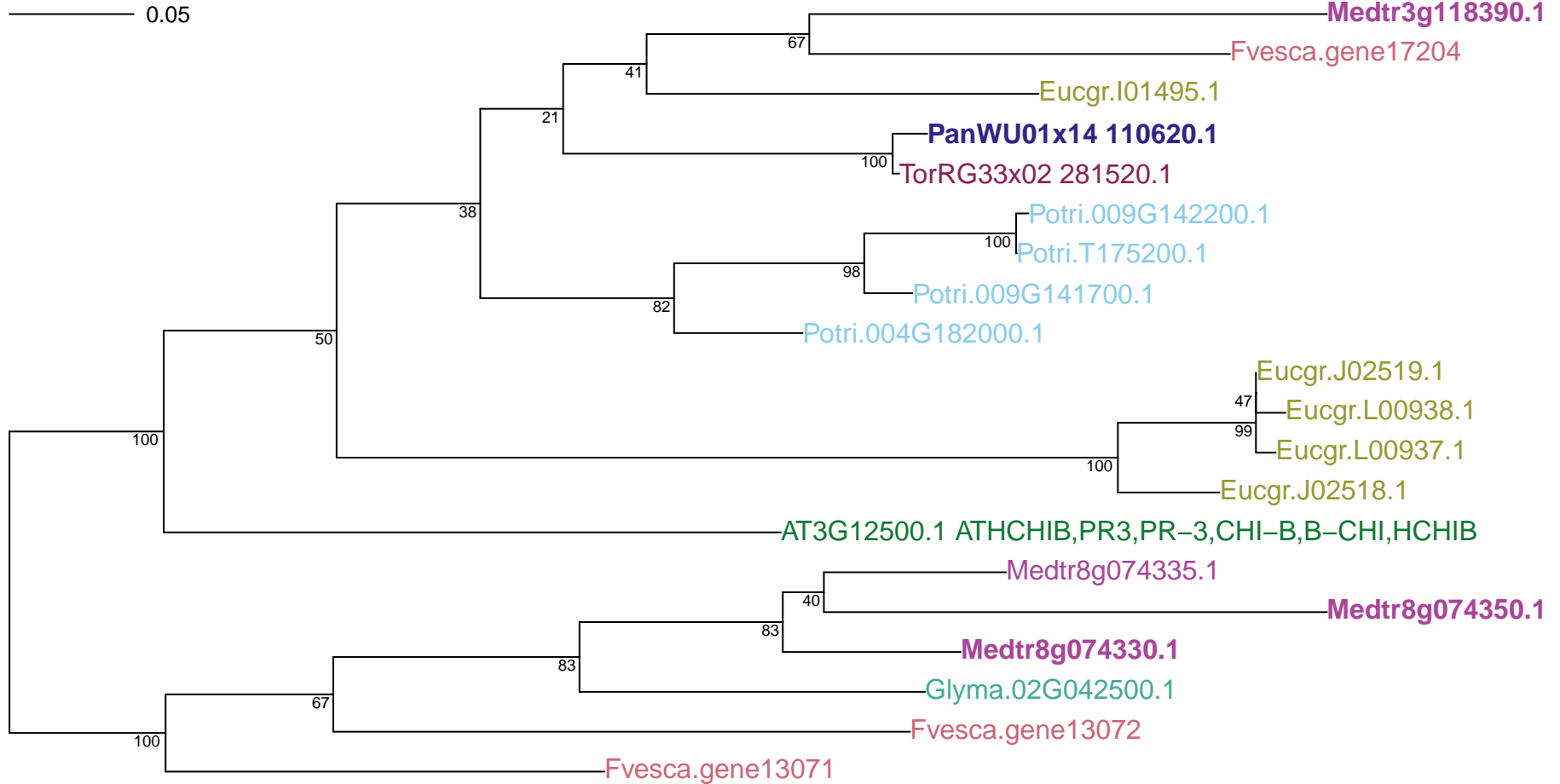


OG0002106: Enzymes. Cytochrome P450

— 0.05

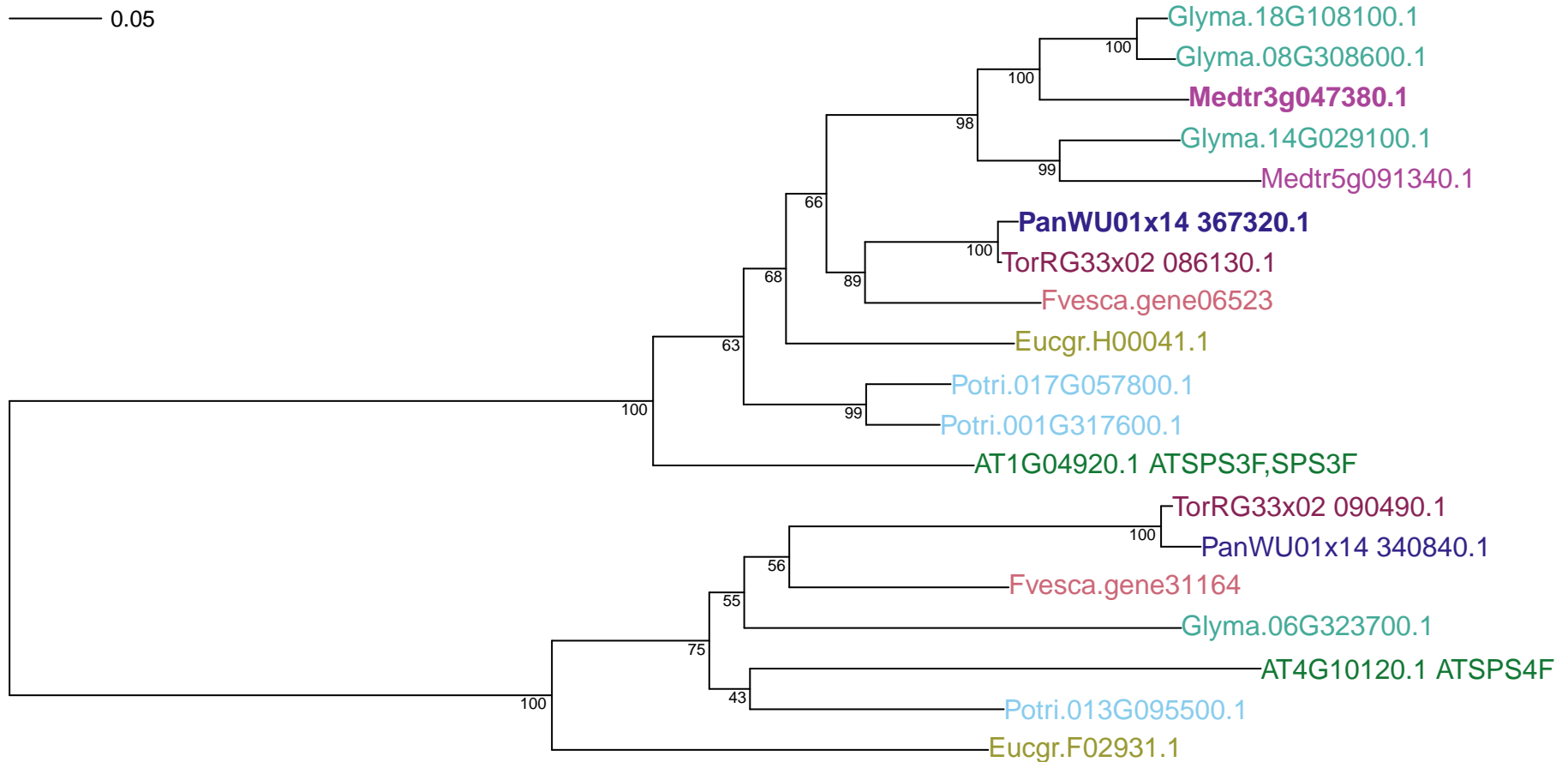


OG0002184: Enzymes. Glycoside hydrolase



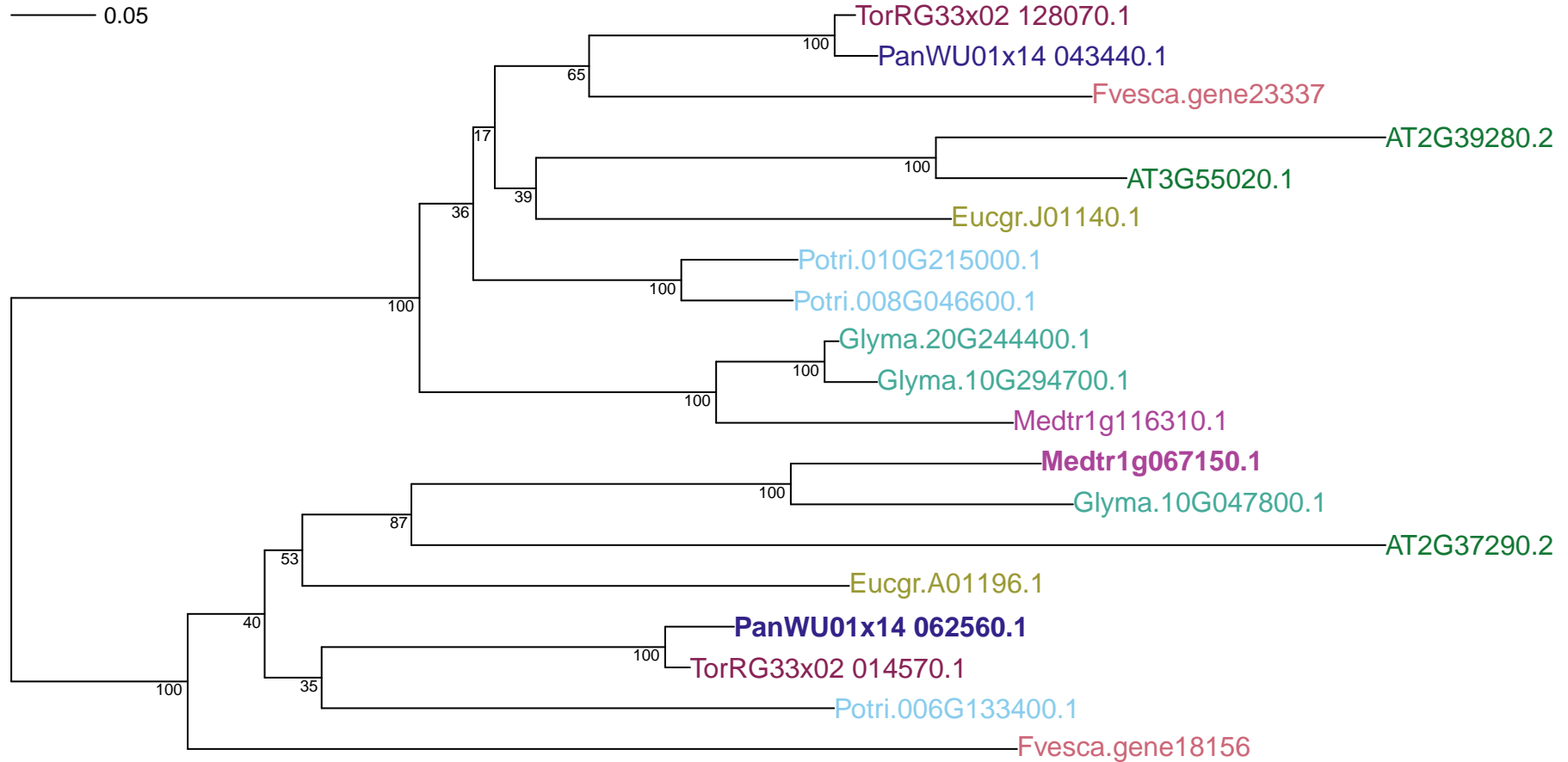
OG0002282: Enzymes. Sucrose phosphate synthase

0.05

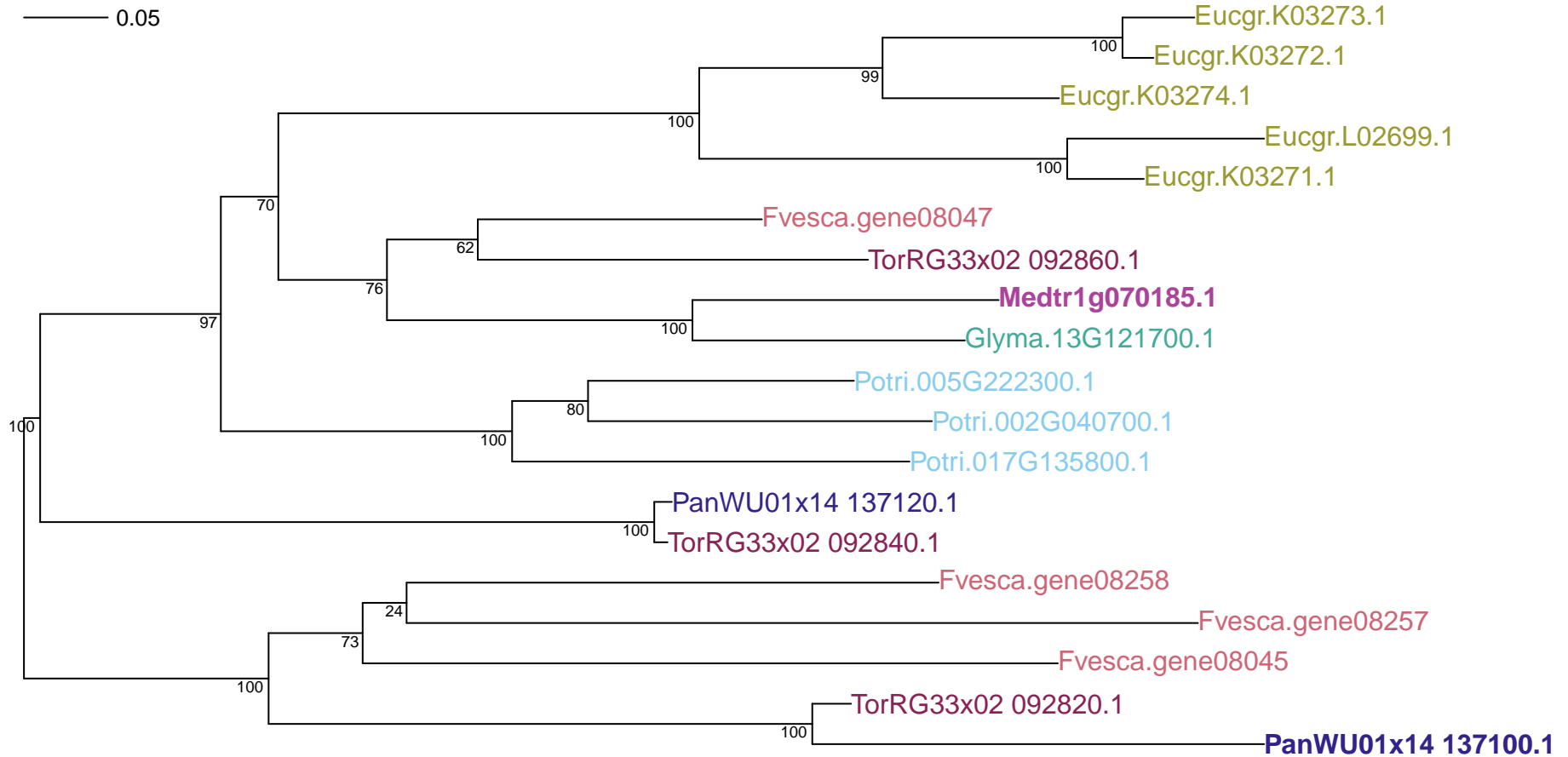


OG0002382: Enzymes. Ribonuclease H domain containing protein

0.05

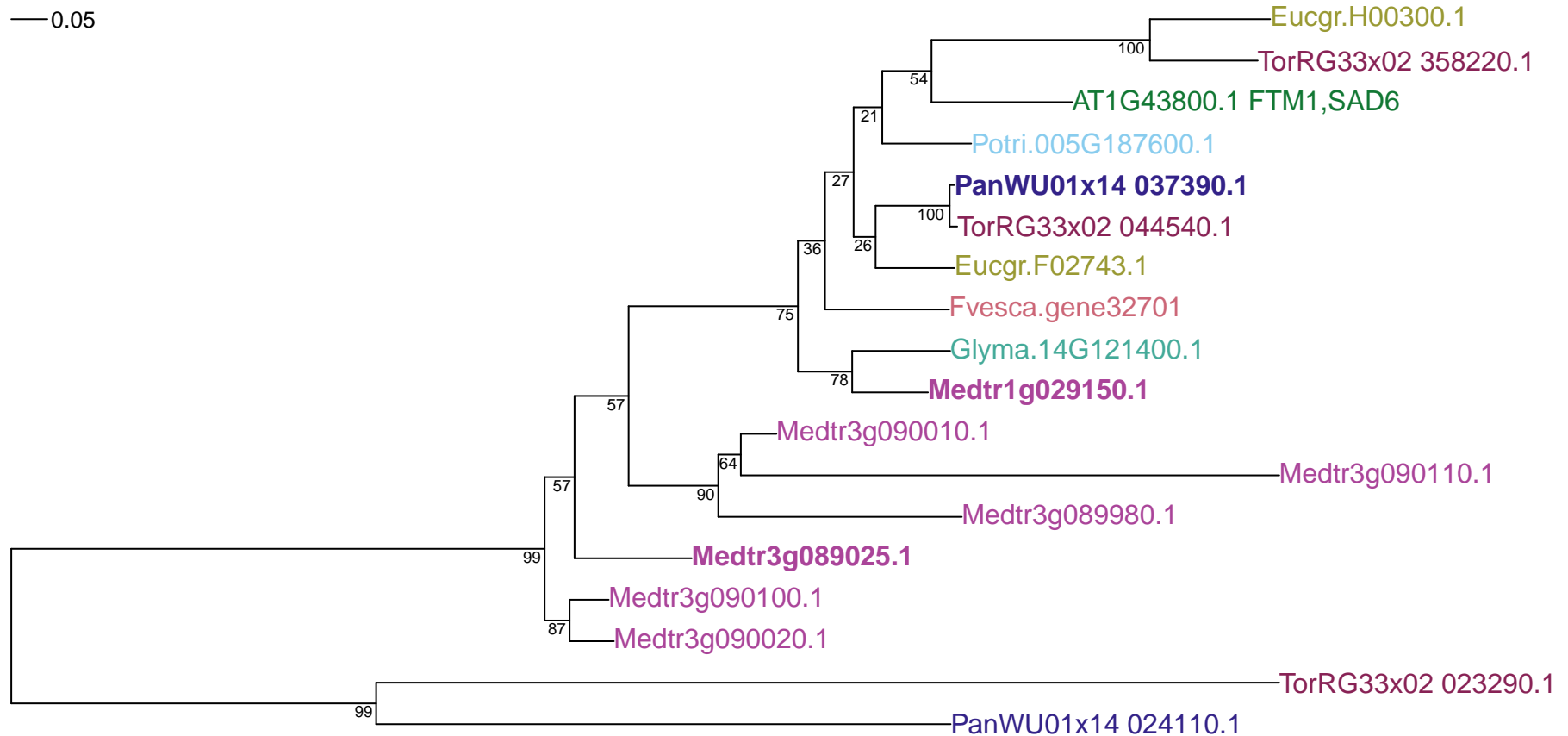


OG0002477: Enzymes. Oxoglutarate/iron-dependent dioxygenase



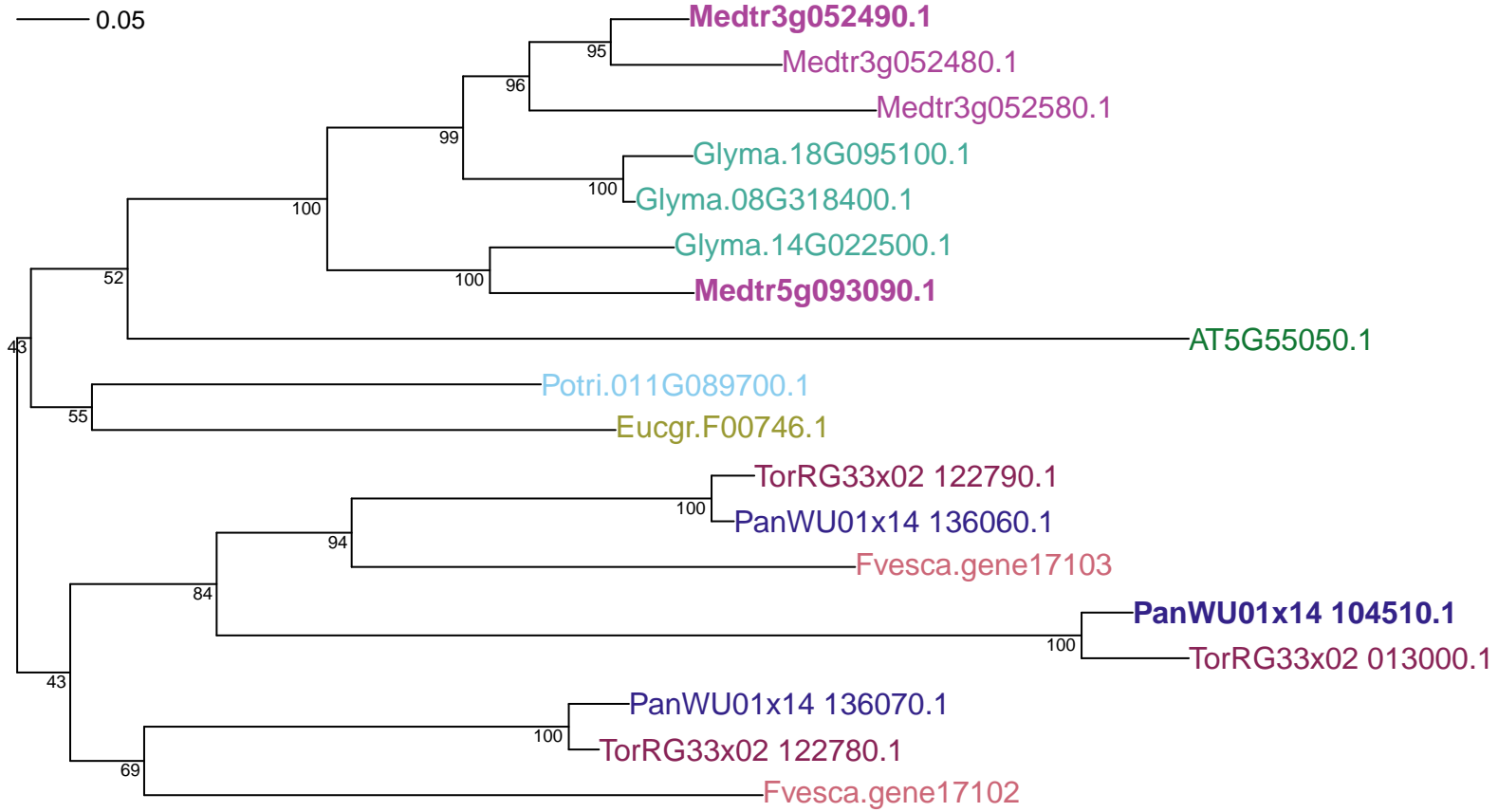
OG0002494: Enzymes. Fatty acid desaturase, type

—0.05



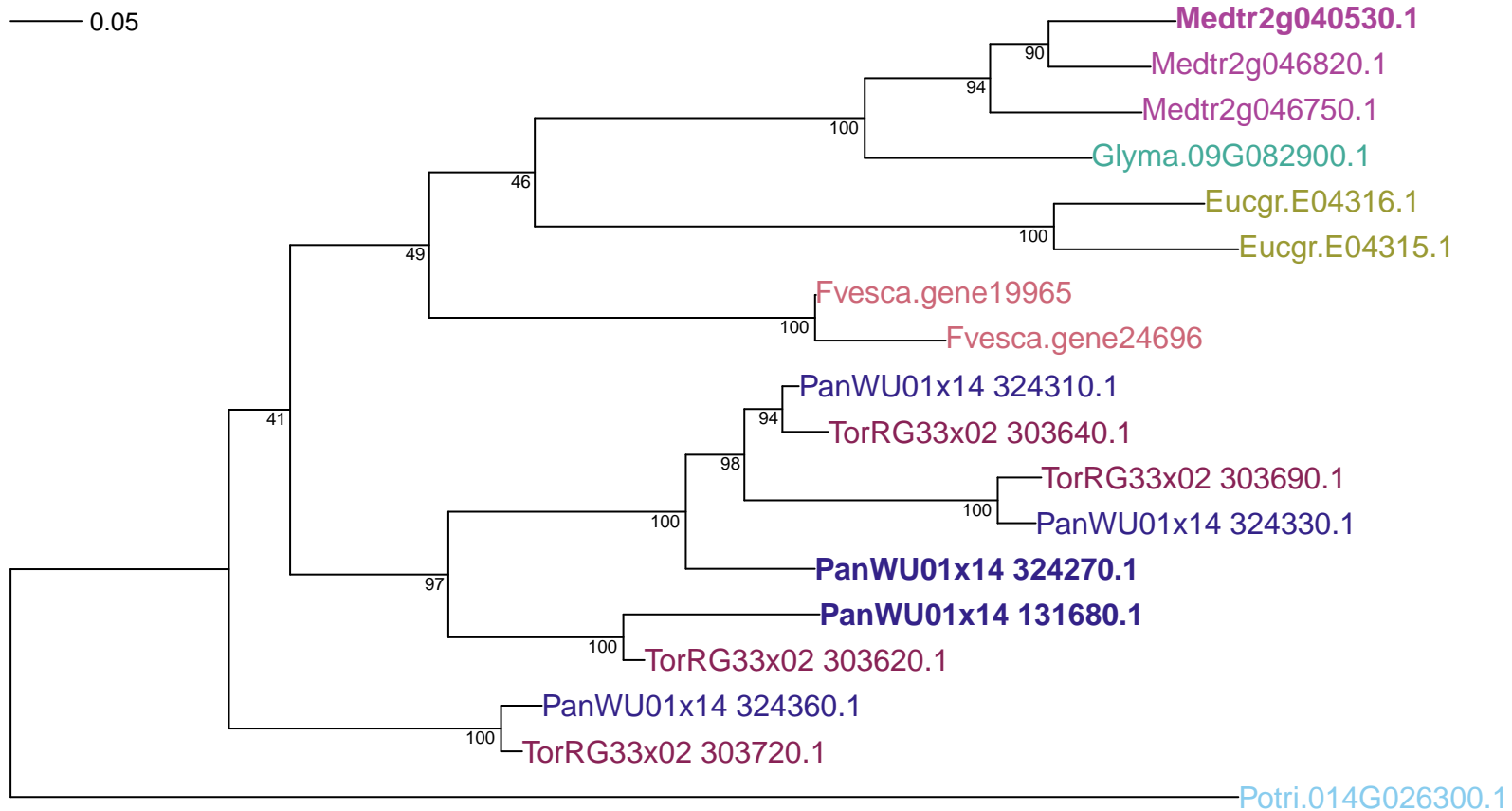
OG0002743: Enzymes. Lipase

— 0.05

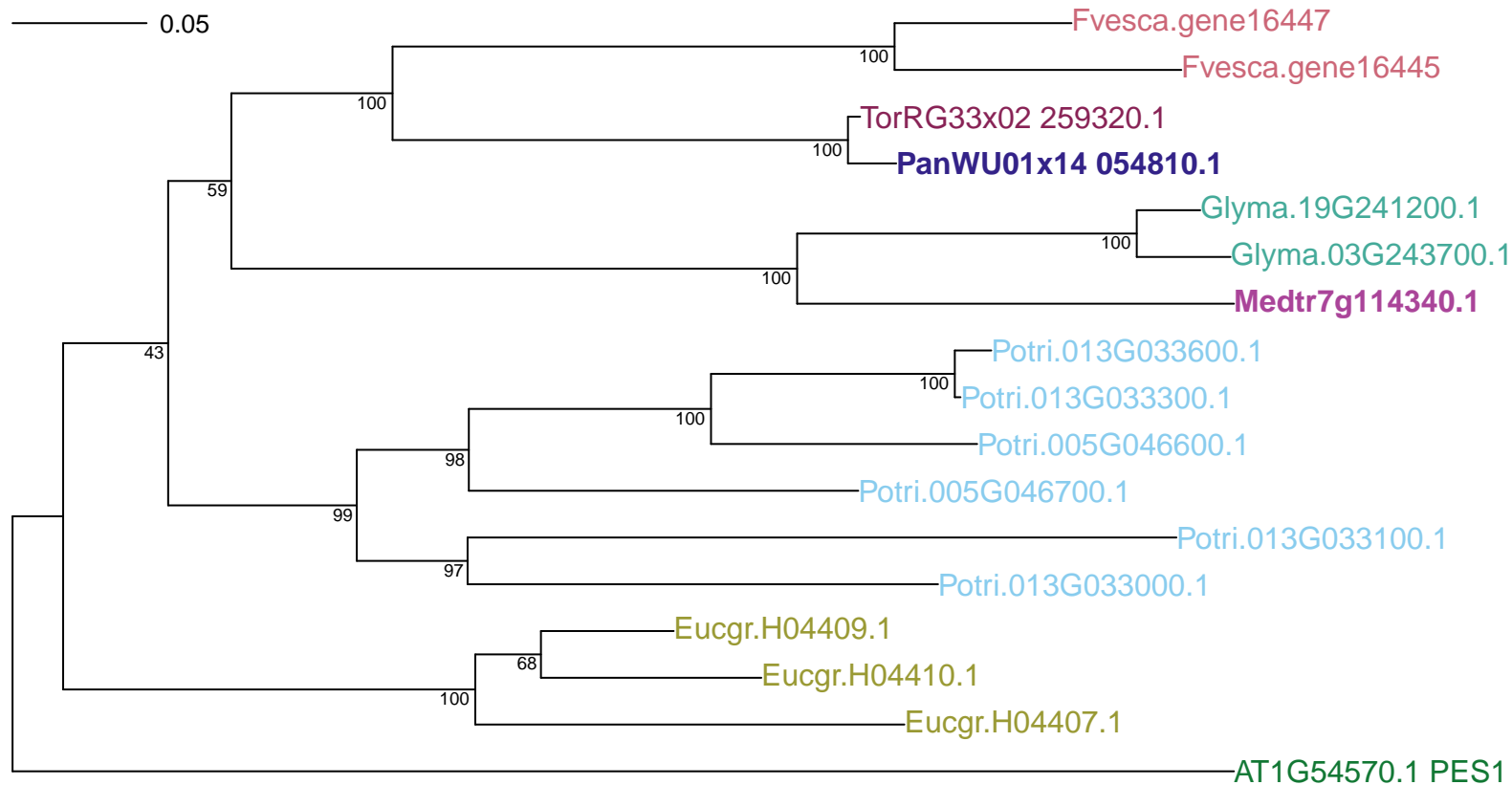


OG0002763: Enzymes. UDP-glucuronosyl/UDP-glucosyltransferase

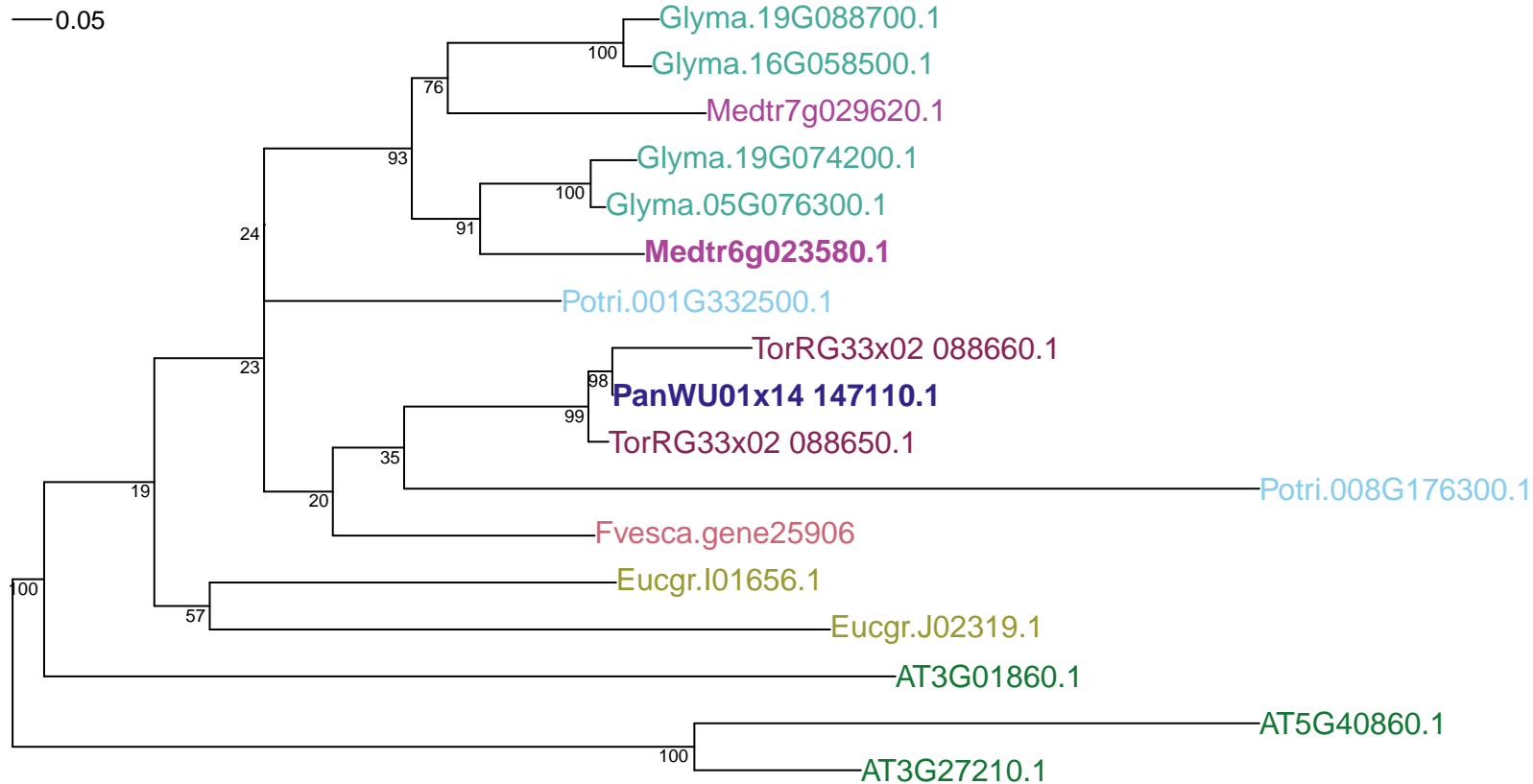
— 0.05



OG0002844: Enzymes. Diacylglycerol acyltransferase

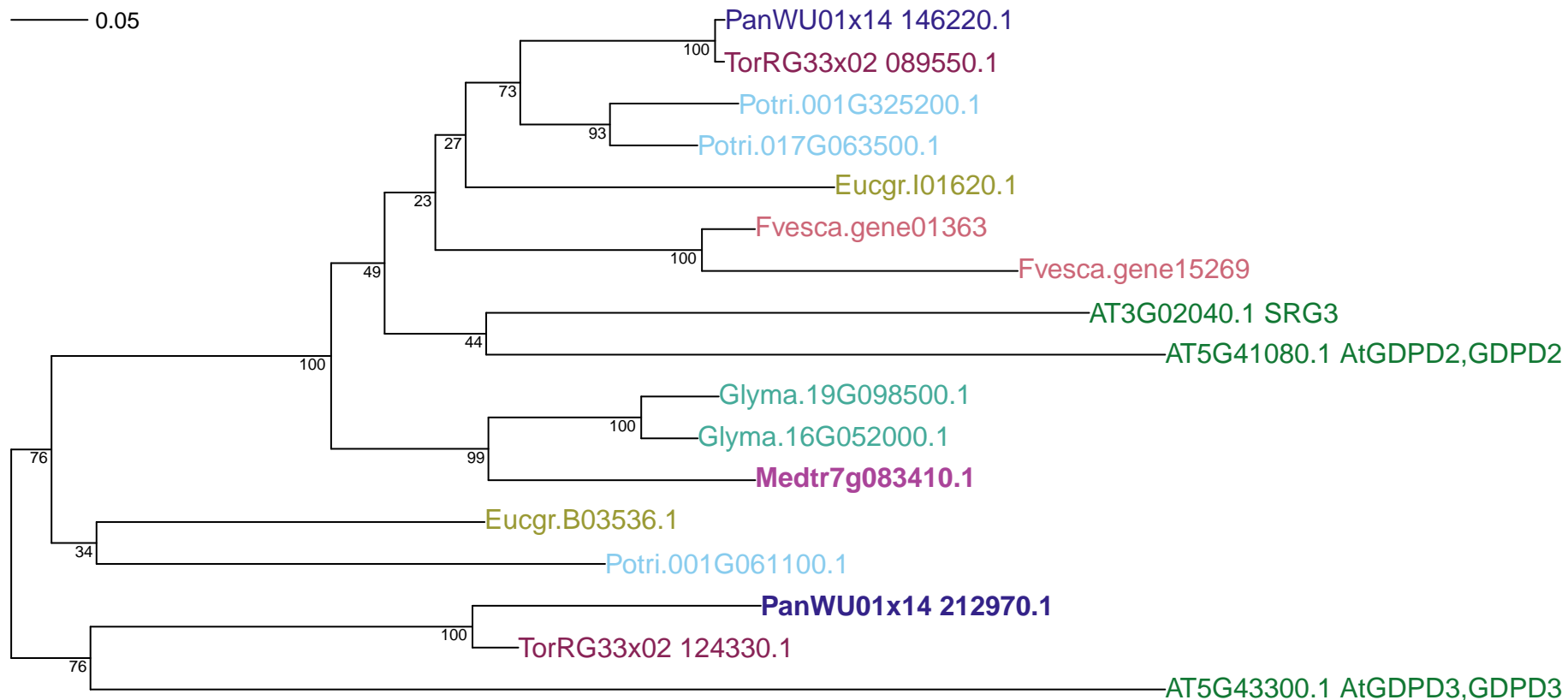


OG0002936: Enzymes. F-box domain containing protein



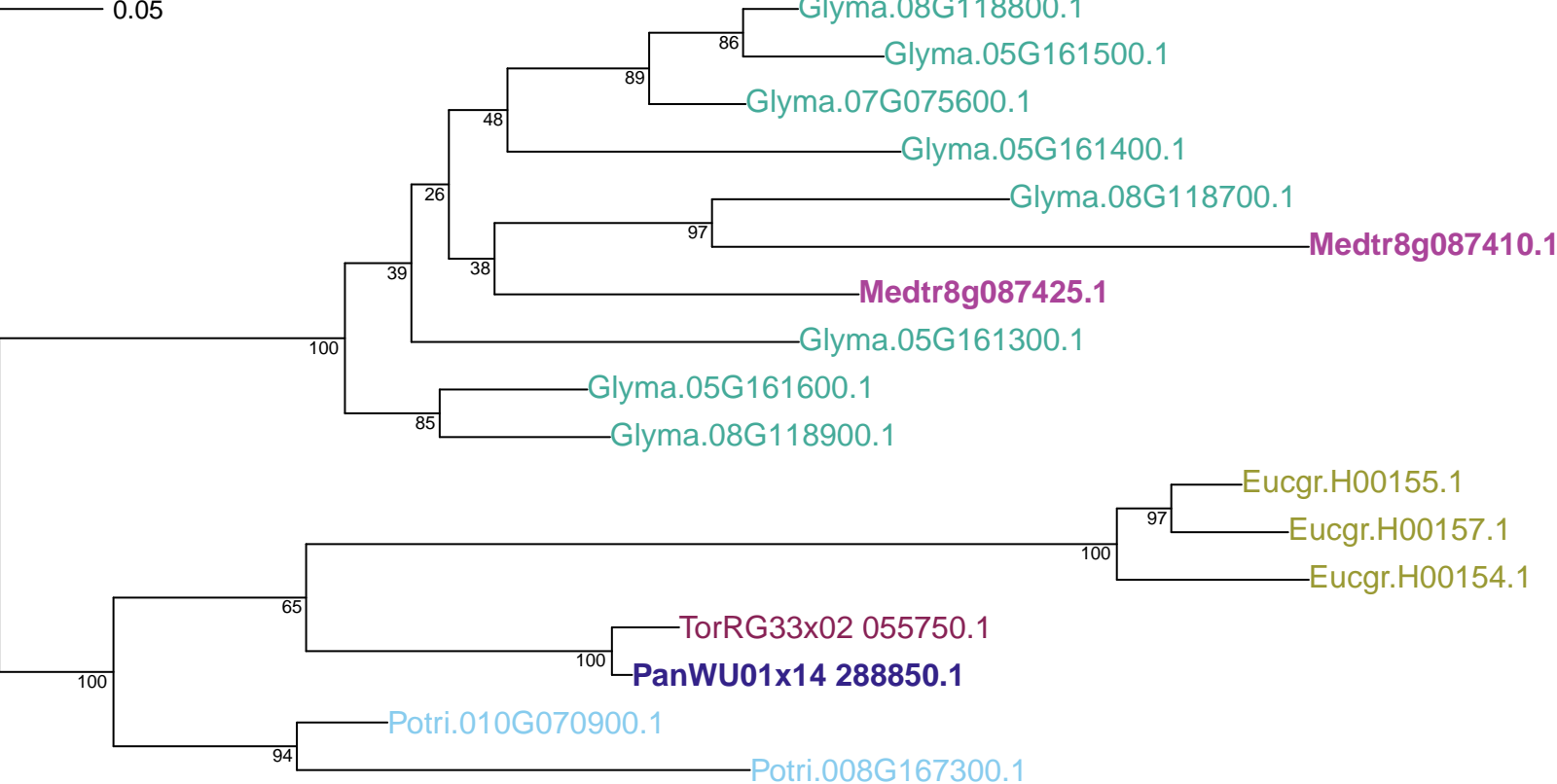
OG0002976: Enzymes. Glycerophosphoryl diester phosphodiesterase

0.05



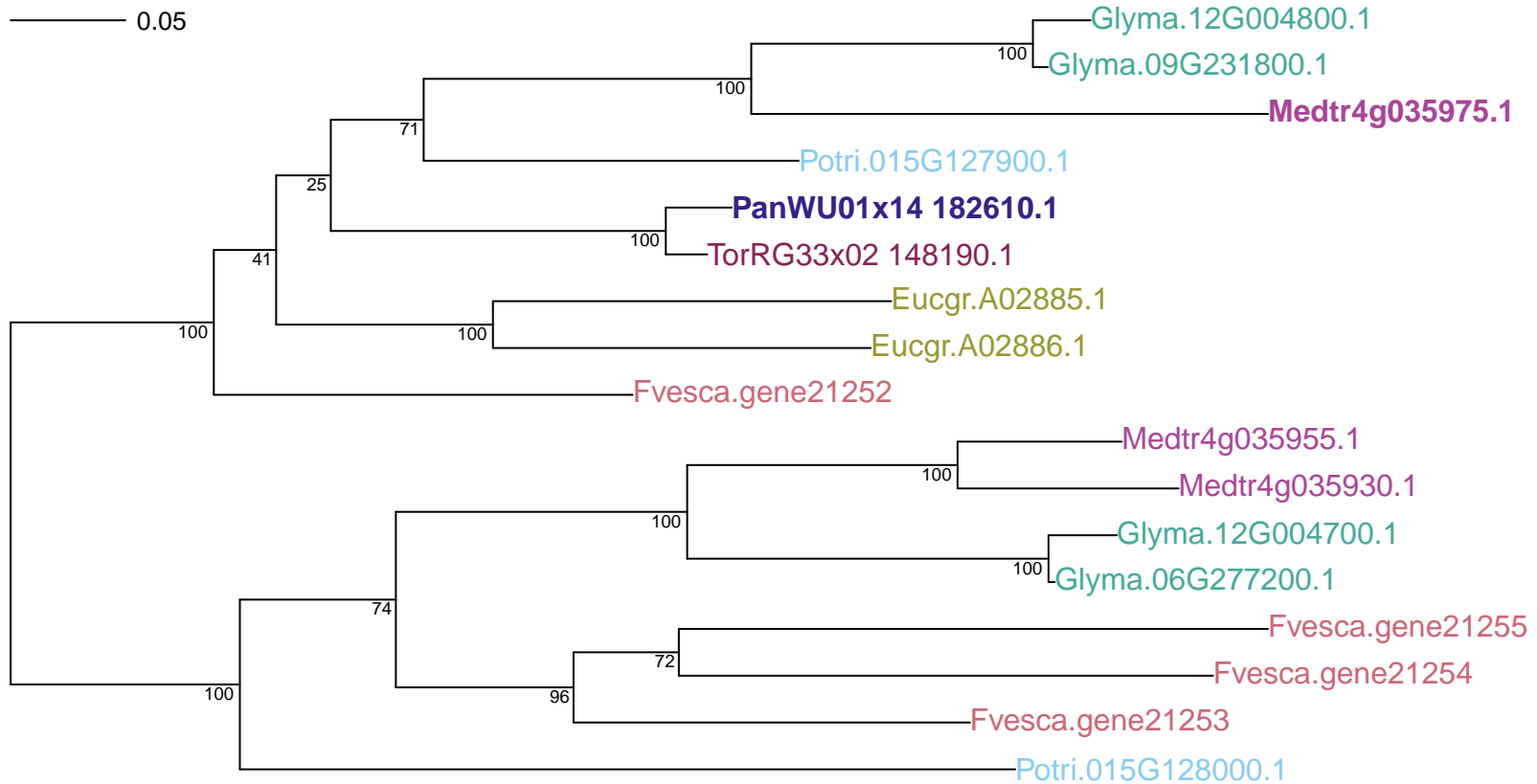
OG0003074: Enzymes. S-crystallin

0.05

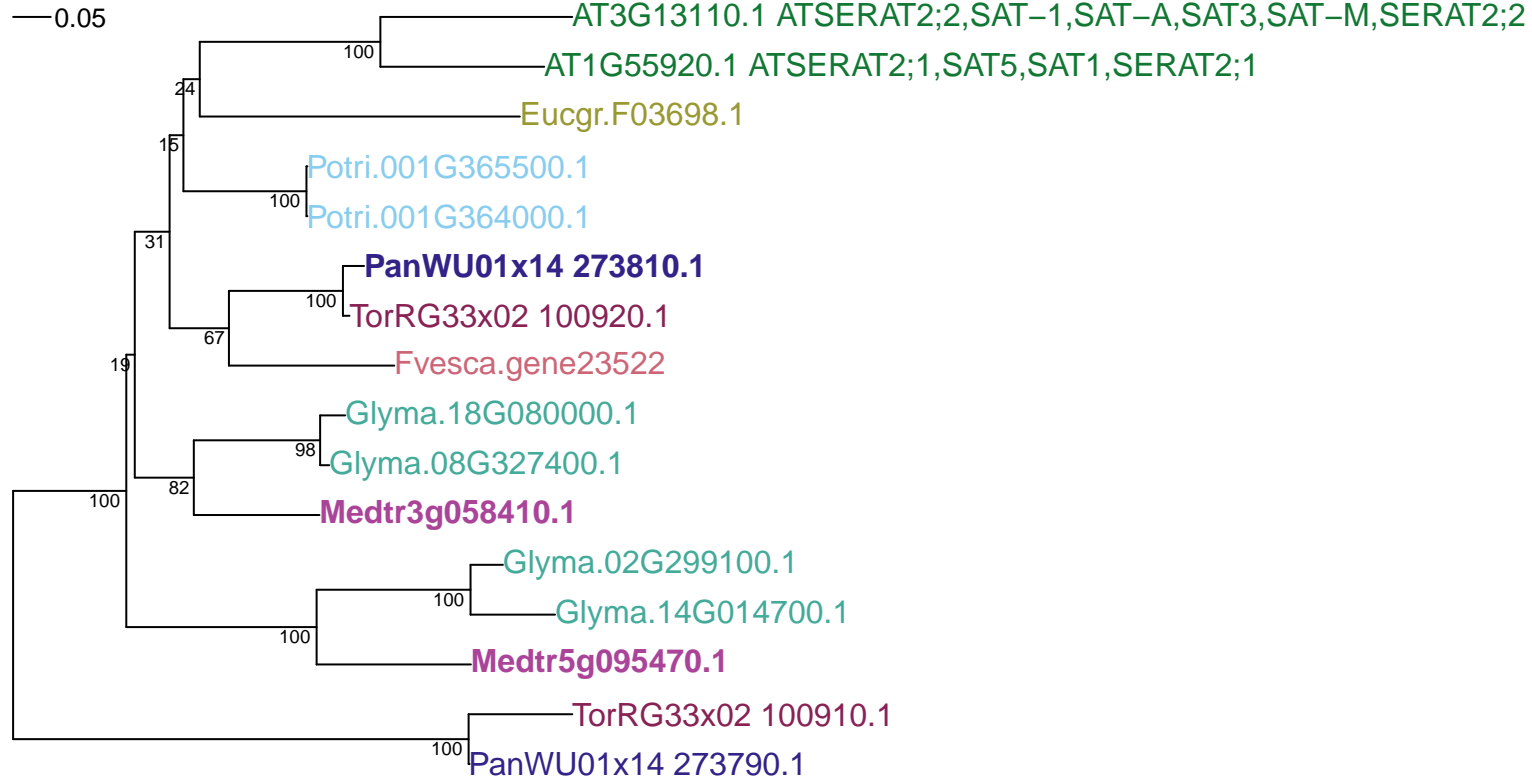


OG0003077: Enzymes. Glycoside hydrolase

0.05

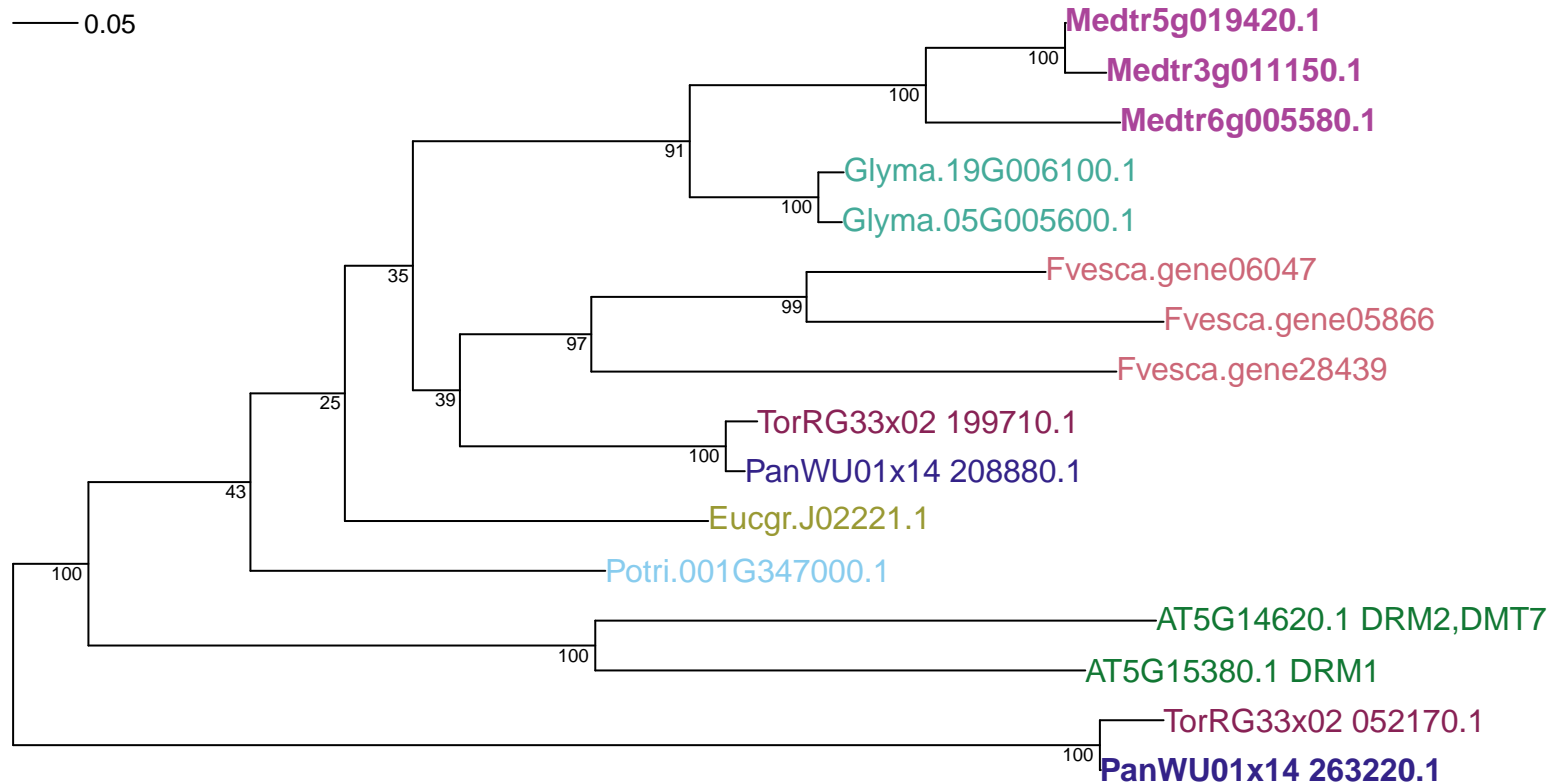


OG0003202: Enzymes. Serine O-acetyltransferase

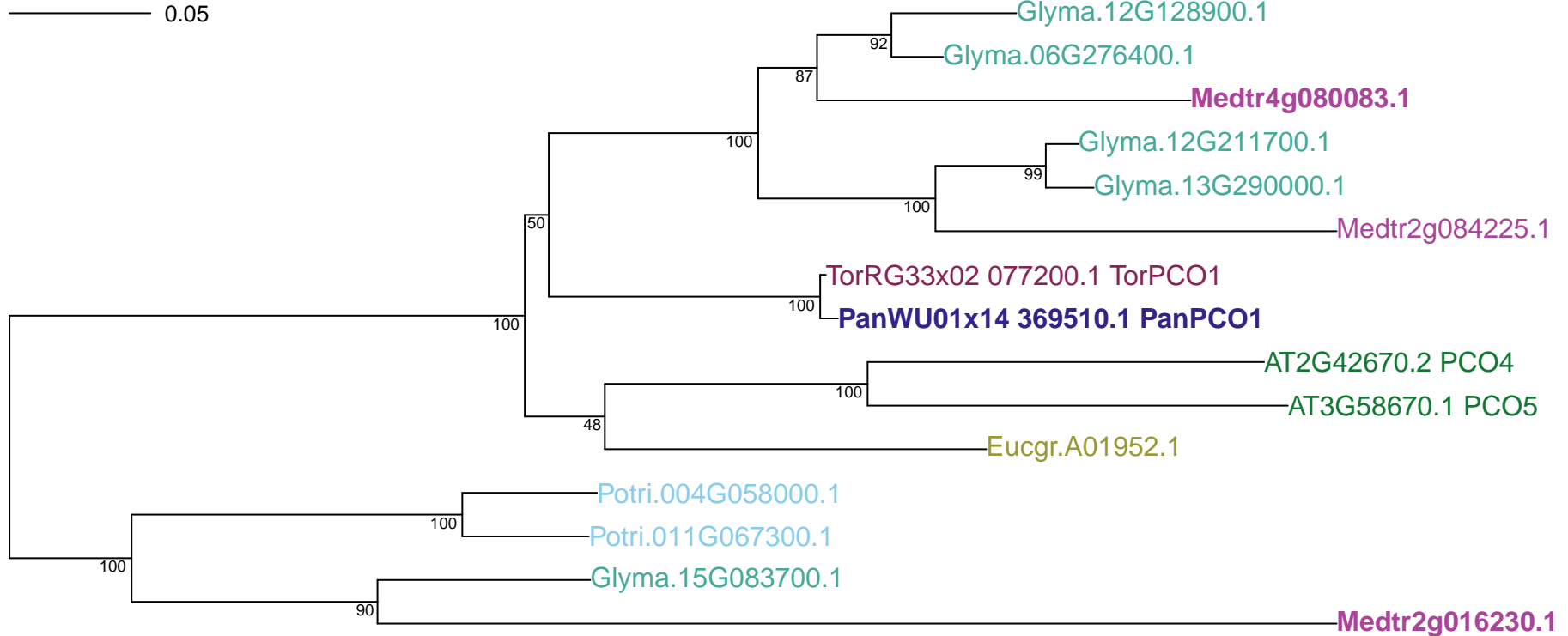


OG0003406: Enzymes. DNA methylase, C-5 cytosine-specific, active site

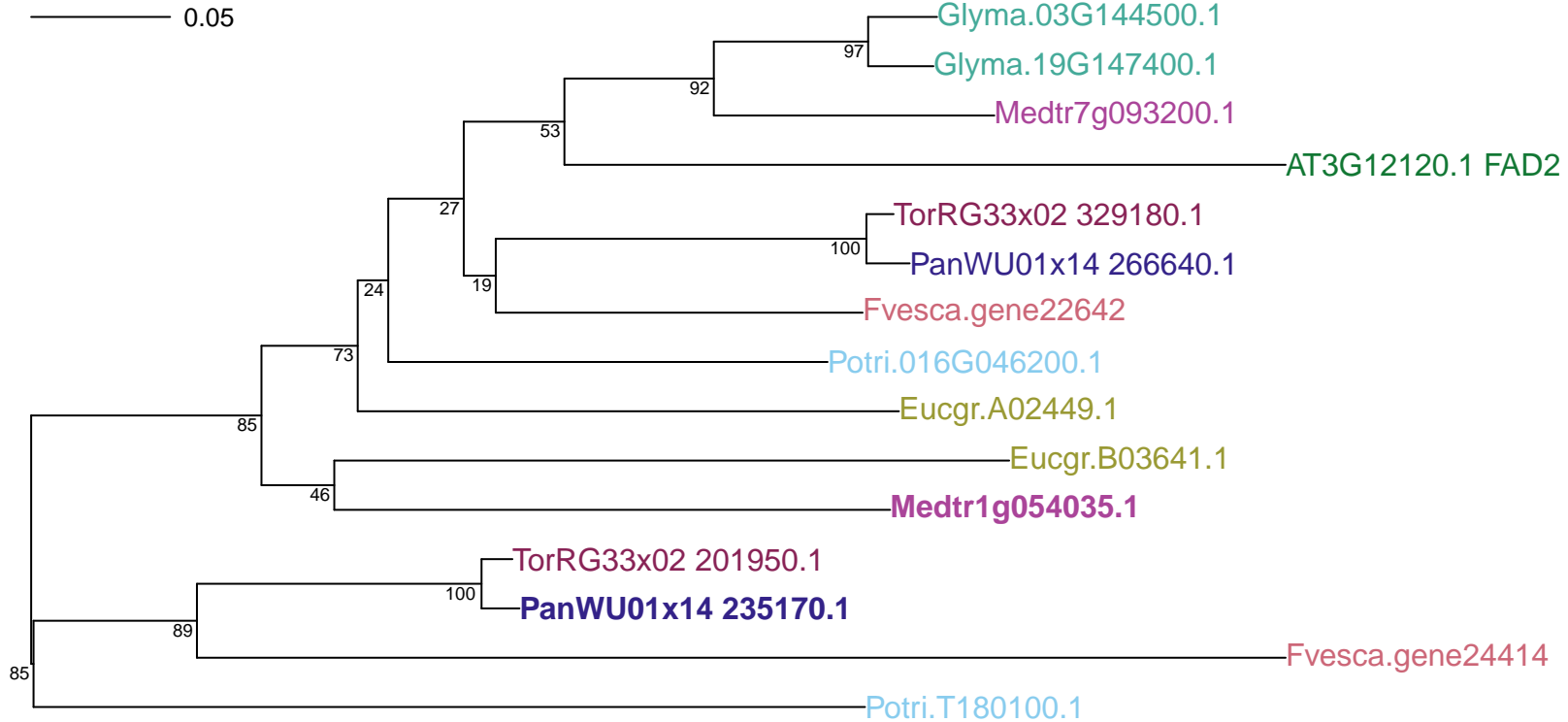
— 0.05



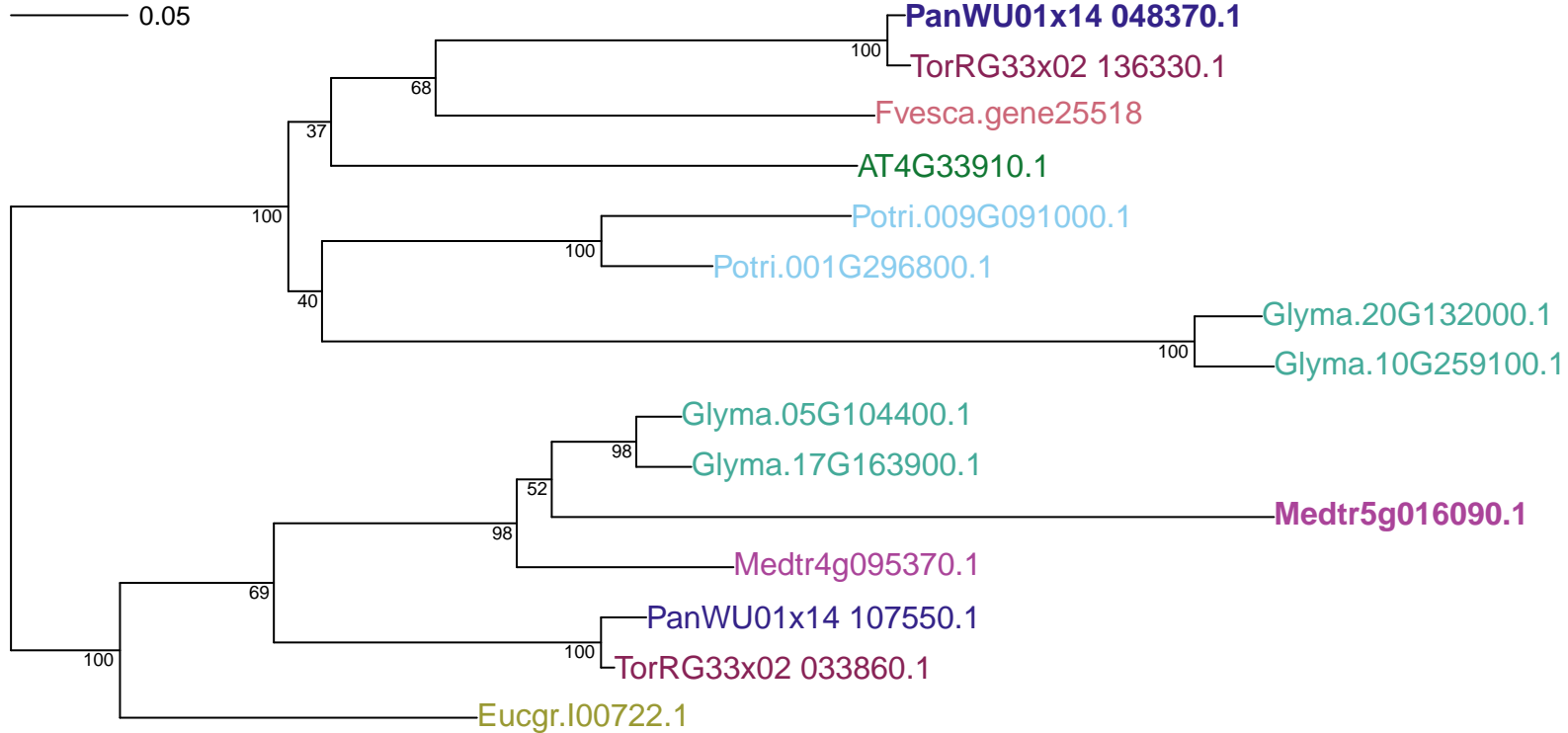
OG0003650: Enzymes. Cysteine oxygenase/2-aminoethanethiol dioxygenase



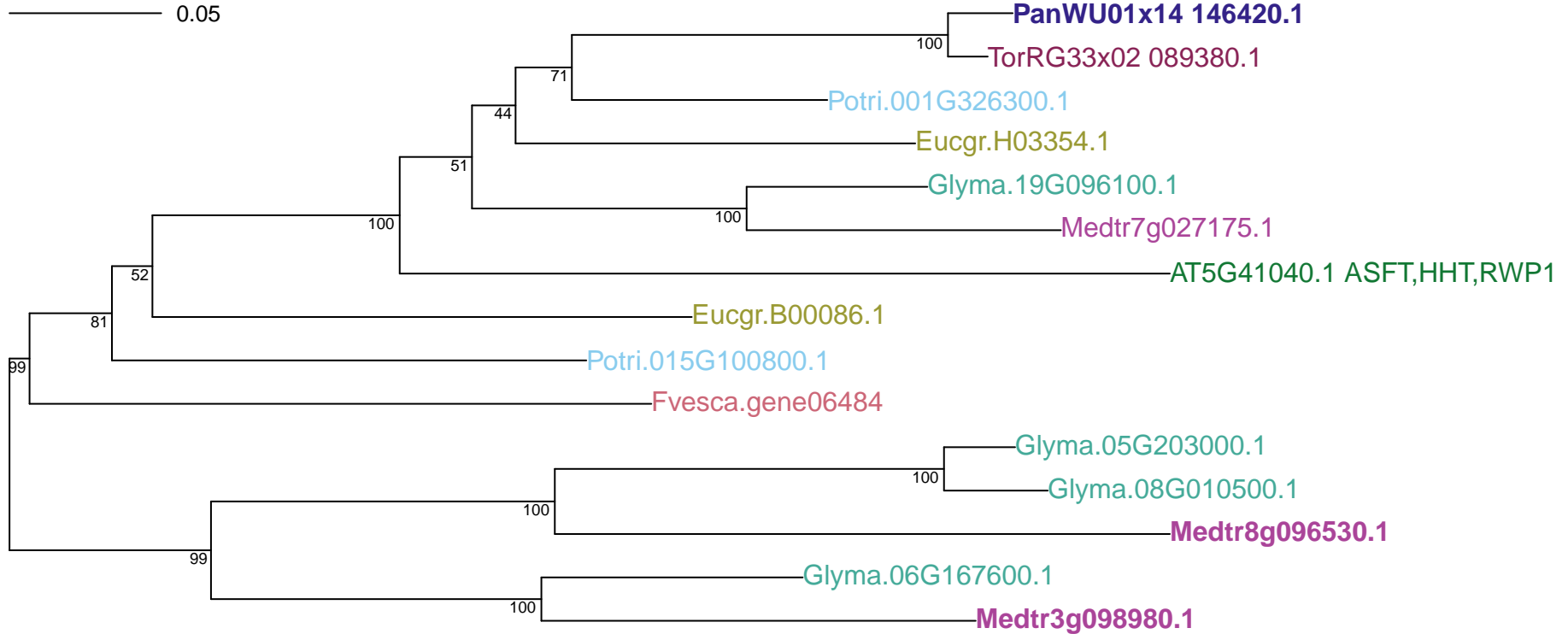
OG0003677: Enzymes. Fatty acid desaturase



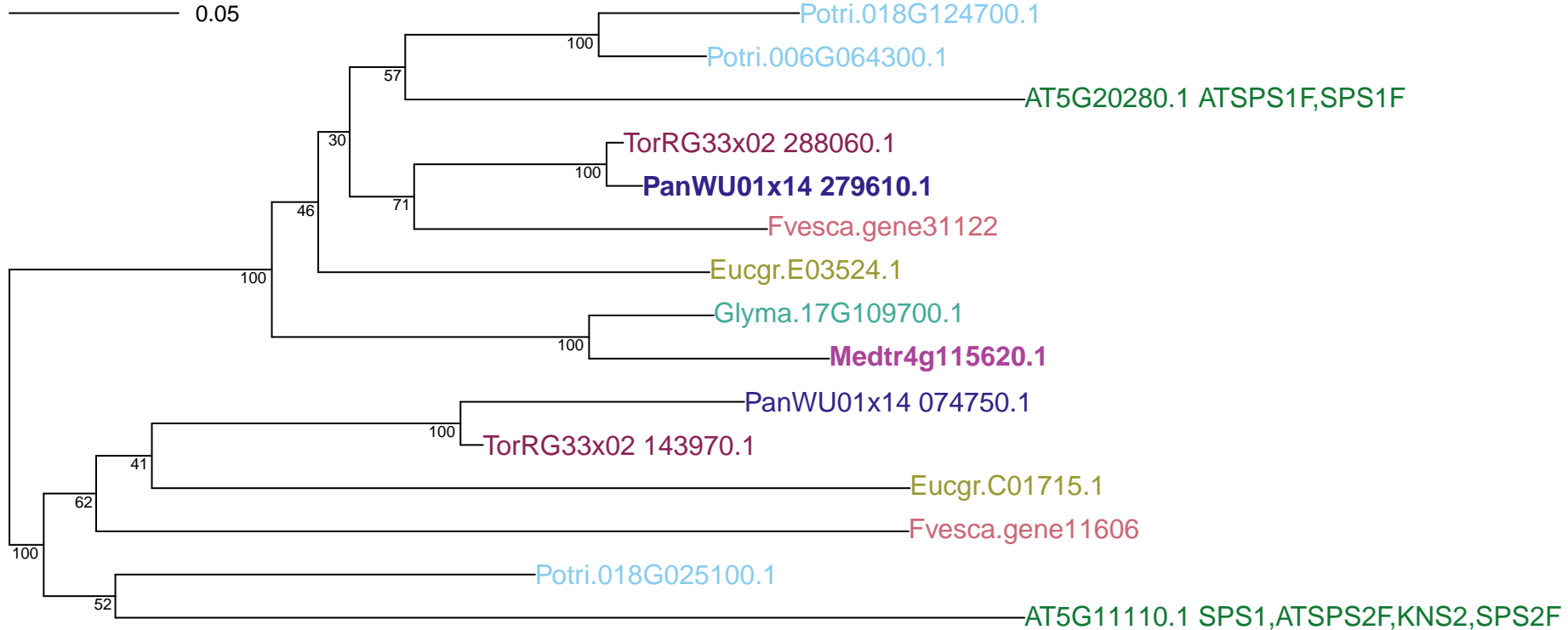
OG0003746: Enzymes. Isopenicillin N synthase



OG0003799: Enzymes. Transferase

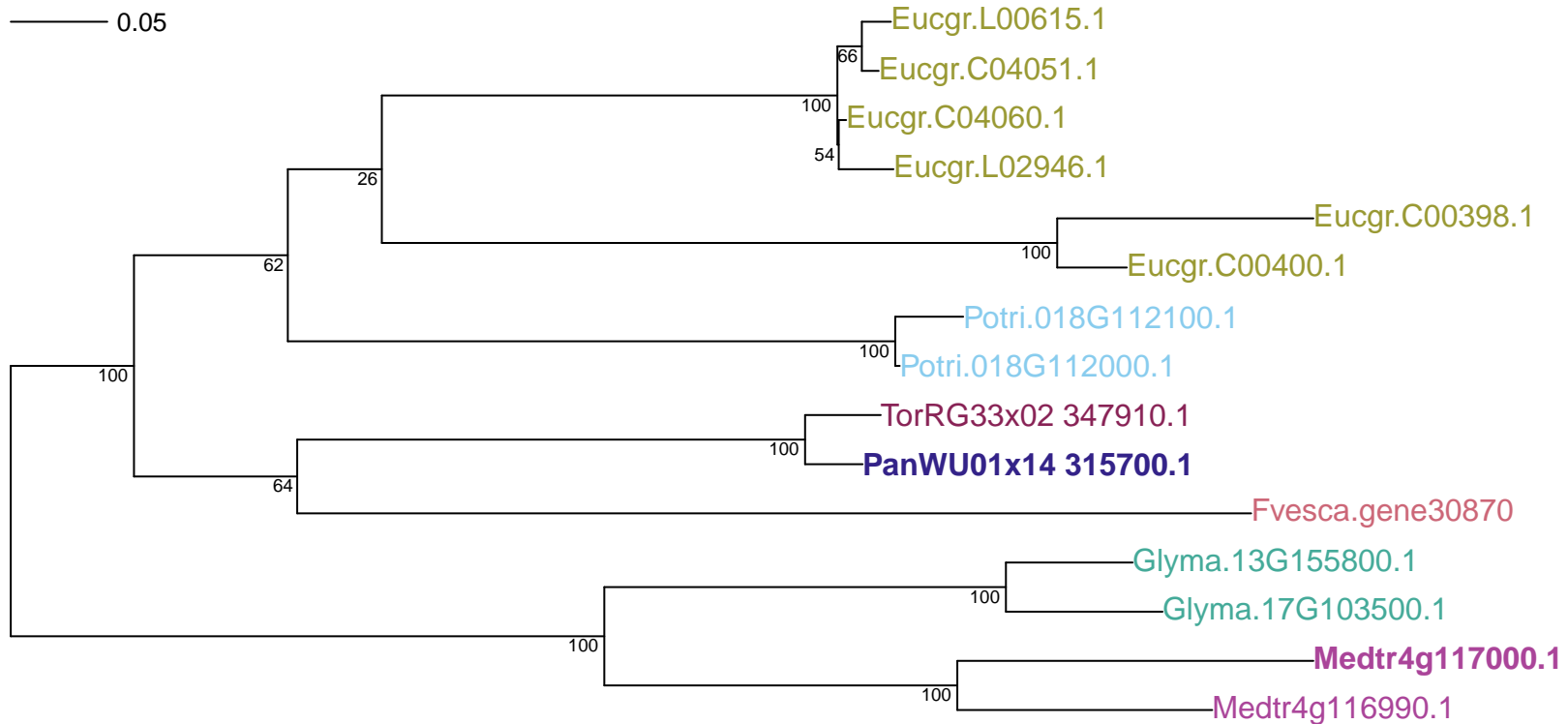


OG0003825: Enzymes. Sucrose phosphate synthase

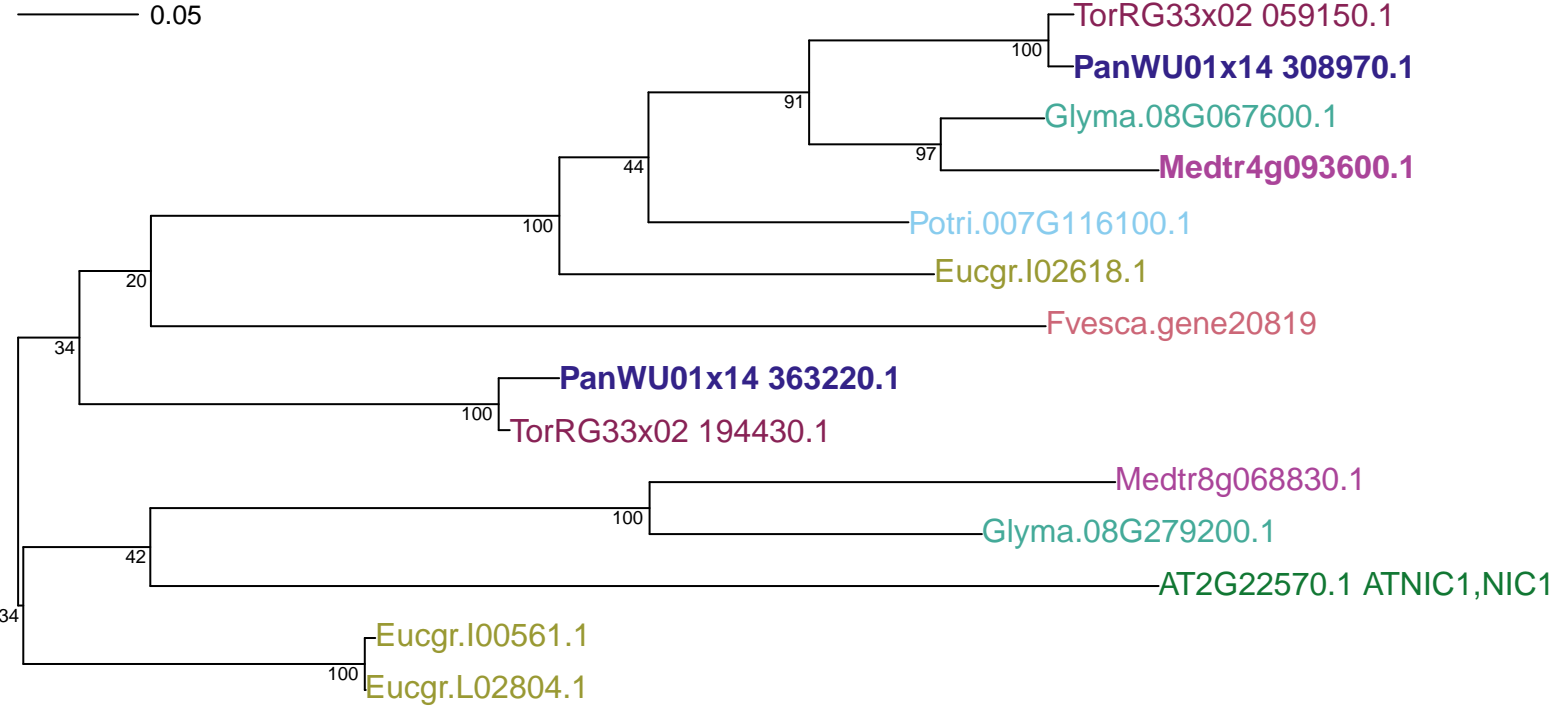


OG0003846: Enzymes. 1,4-alpha-glucan-branching enzyme

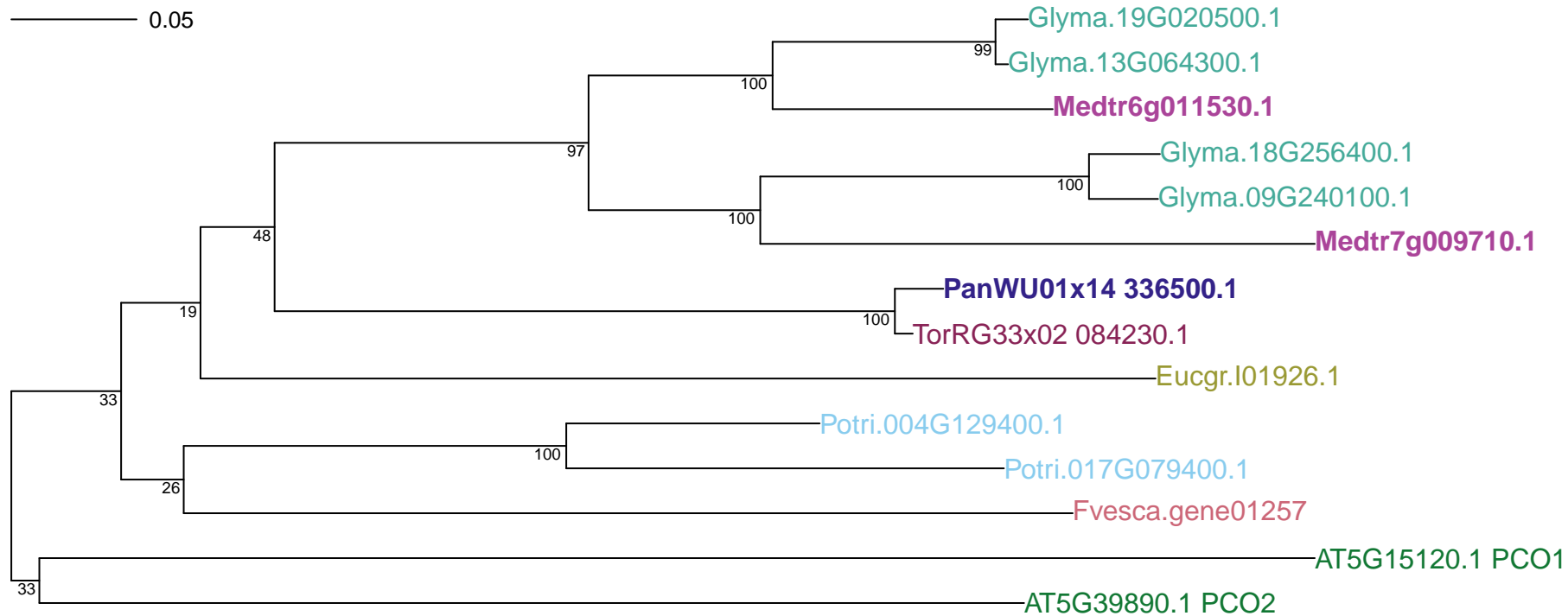
0.05



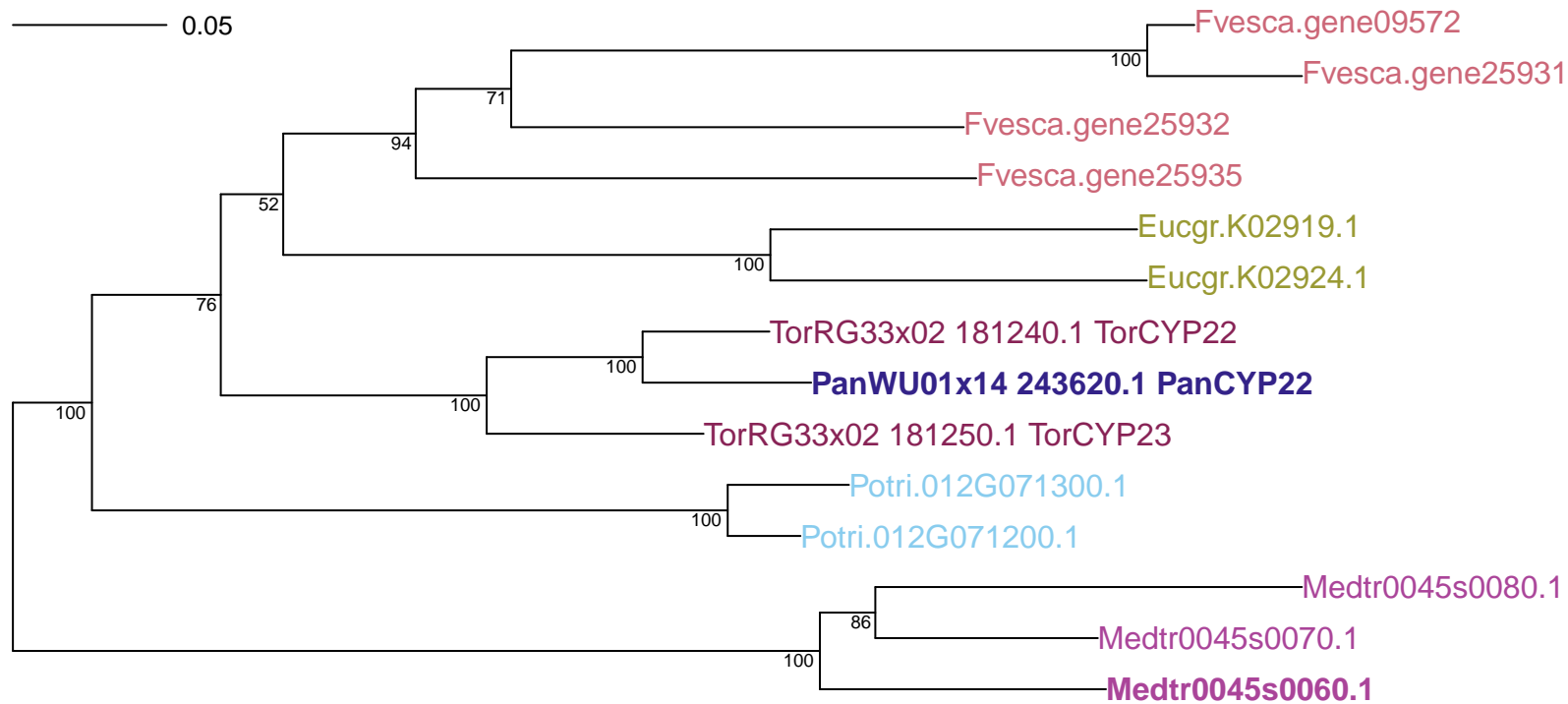
OG0004180: Enzymes. Isochorismatase-like



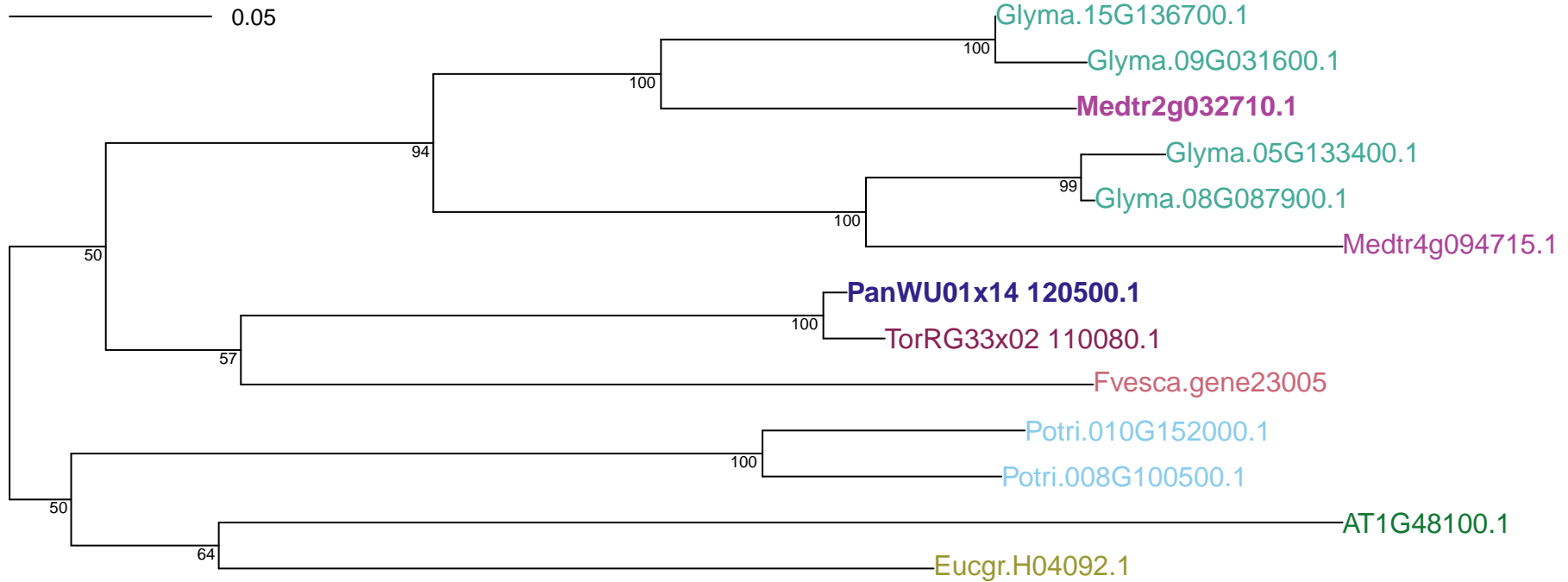
OG0004442: Enzymes. Cysteine oxygenase/2-aminoethanethiol dioxygenase



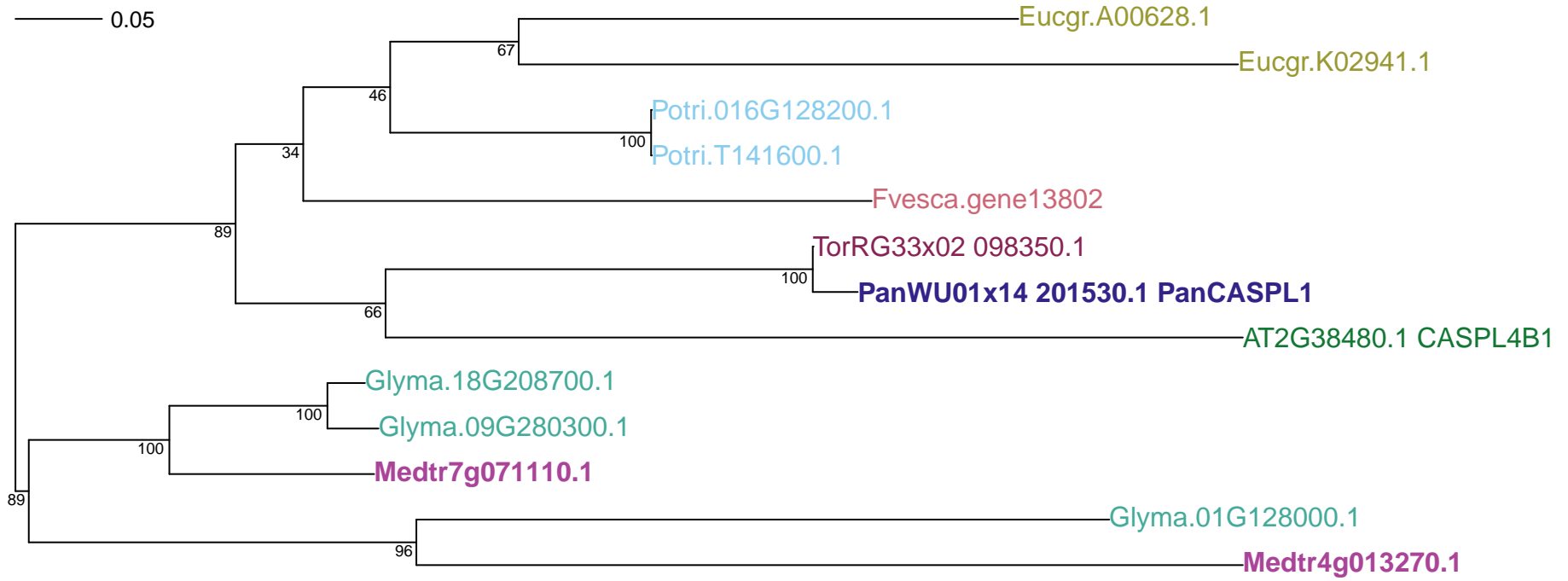
OG0004508: Enzymes. Cytochrome P450



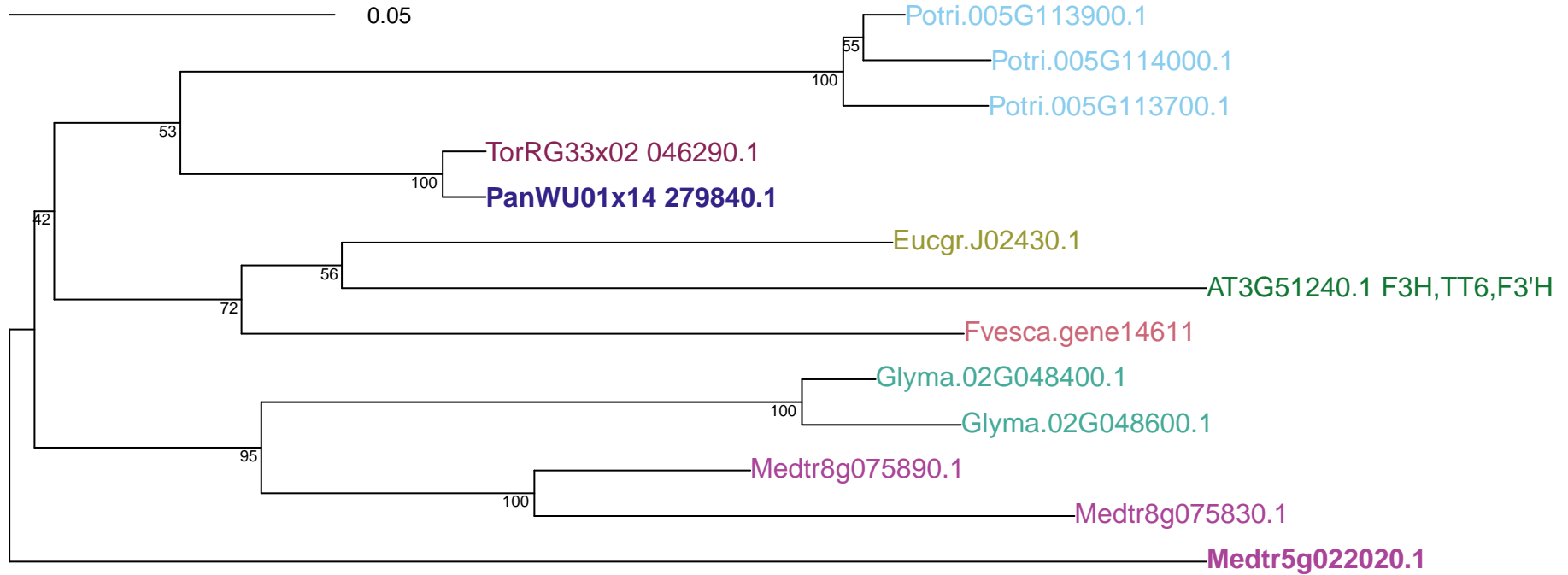
OG0004734: Enzymes. Glycoside hydrolase



OG0004849: Enzymes. CASP-like protein 4B

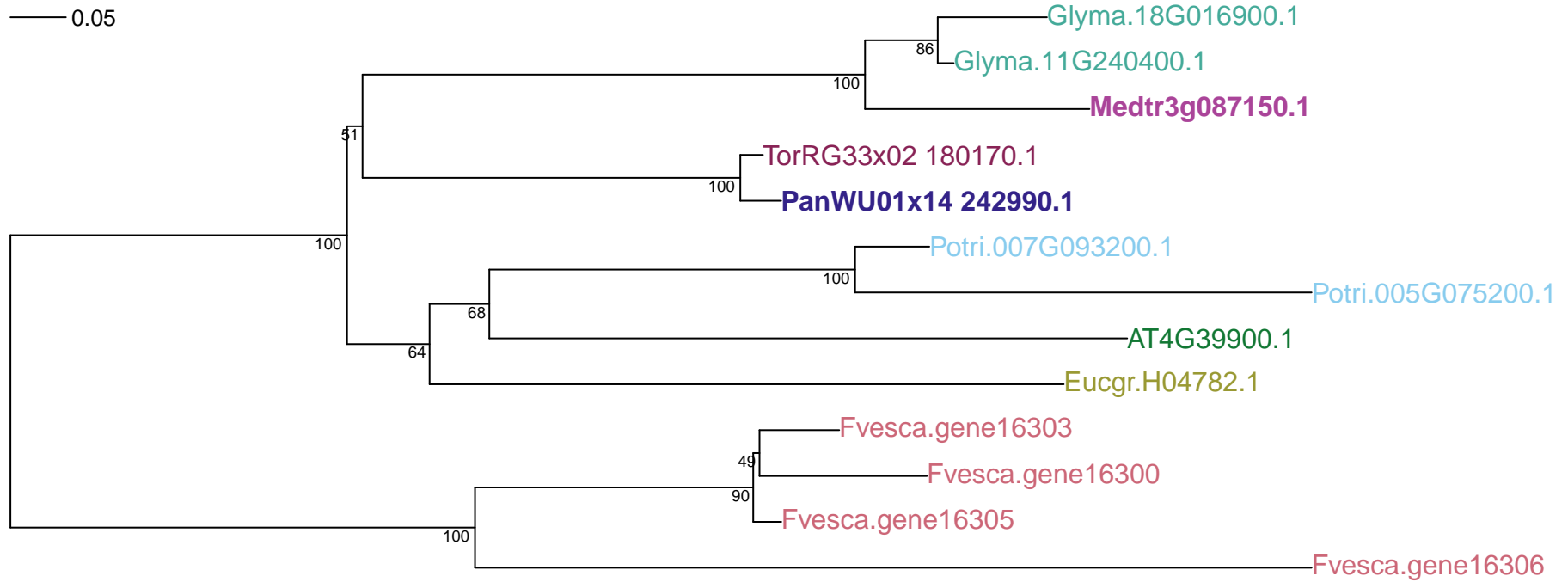


OG0005007: Enzymes. Oxoglutarate/iron-dependent dioxygenase



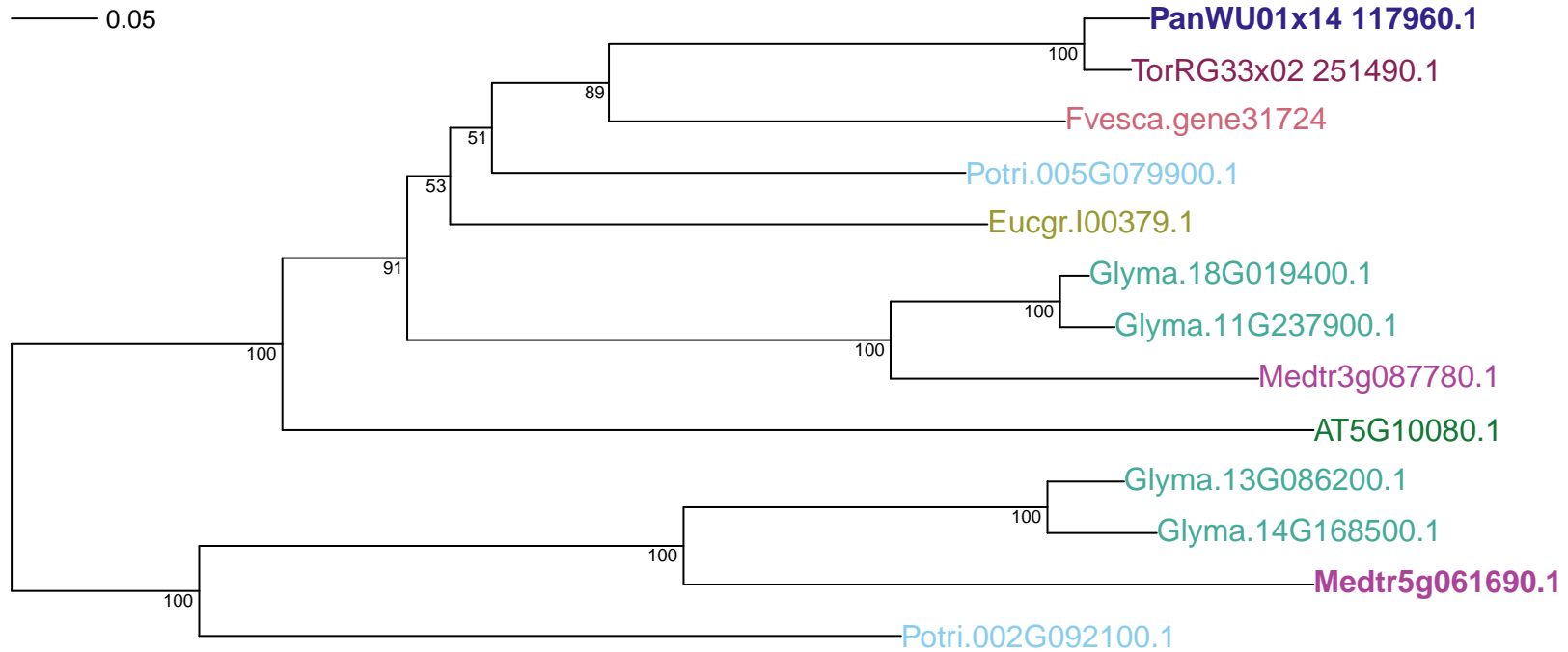
OG0005149: Enzymes. adenine deaminase

— 0.05

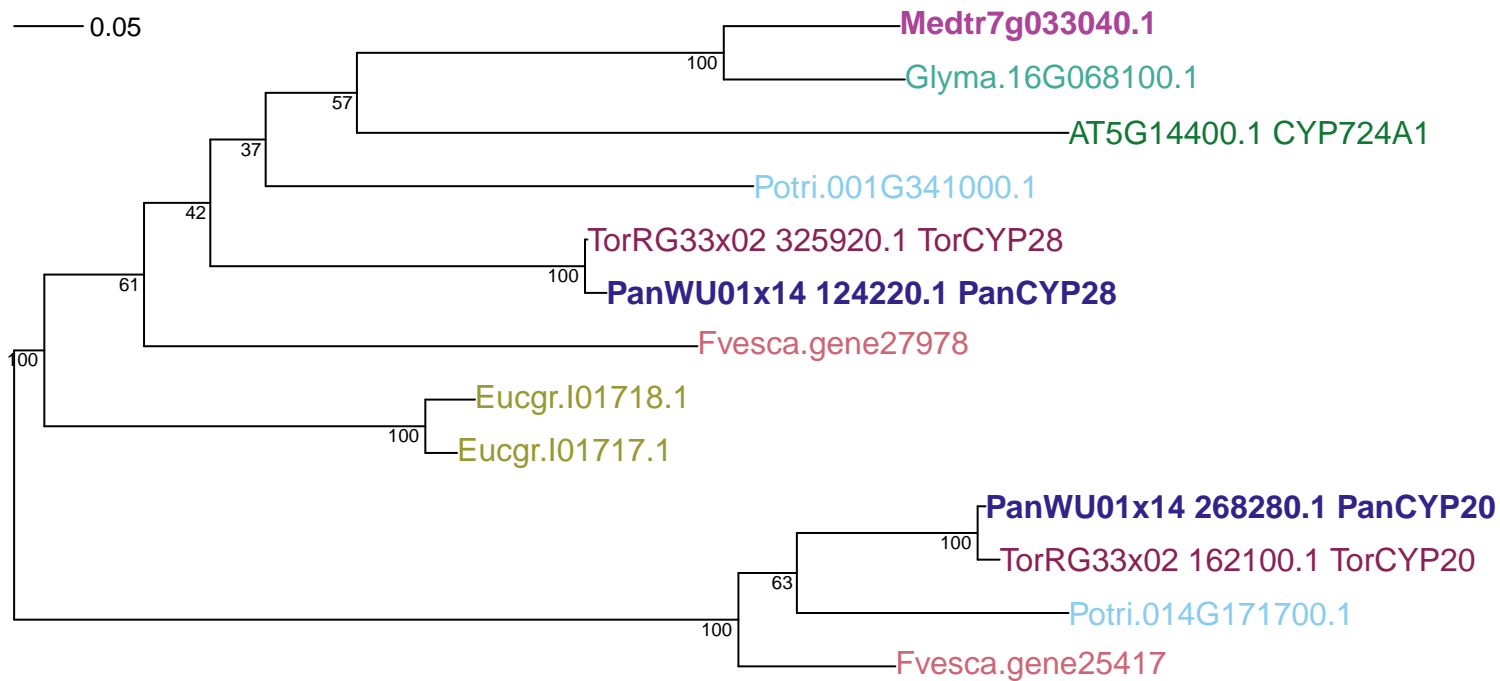


OG0005206: Enzymes. Aspartic peptidase

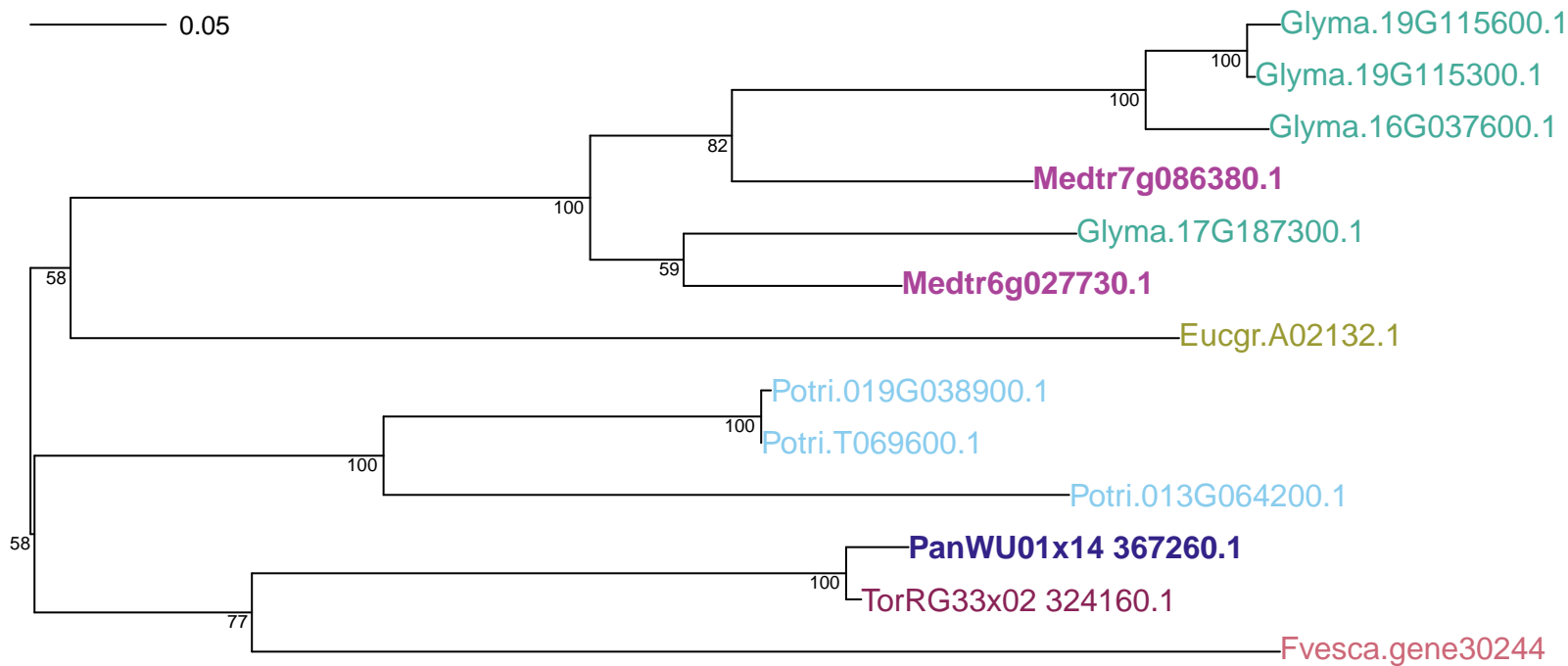
0.05



OG0005259: Enzymes. Cytochrome P450, E-class, group I

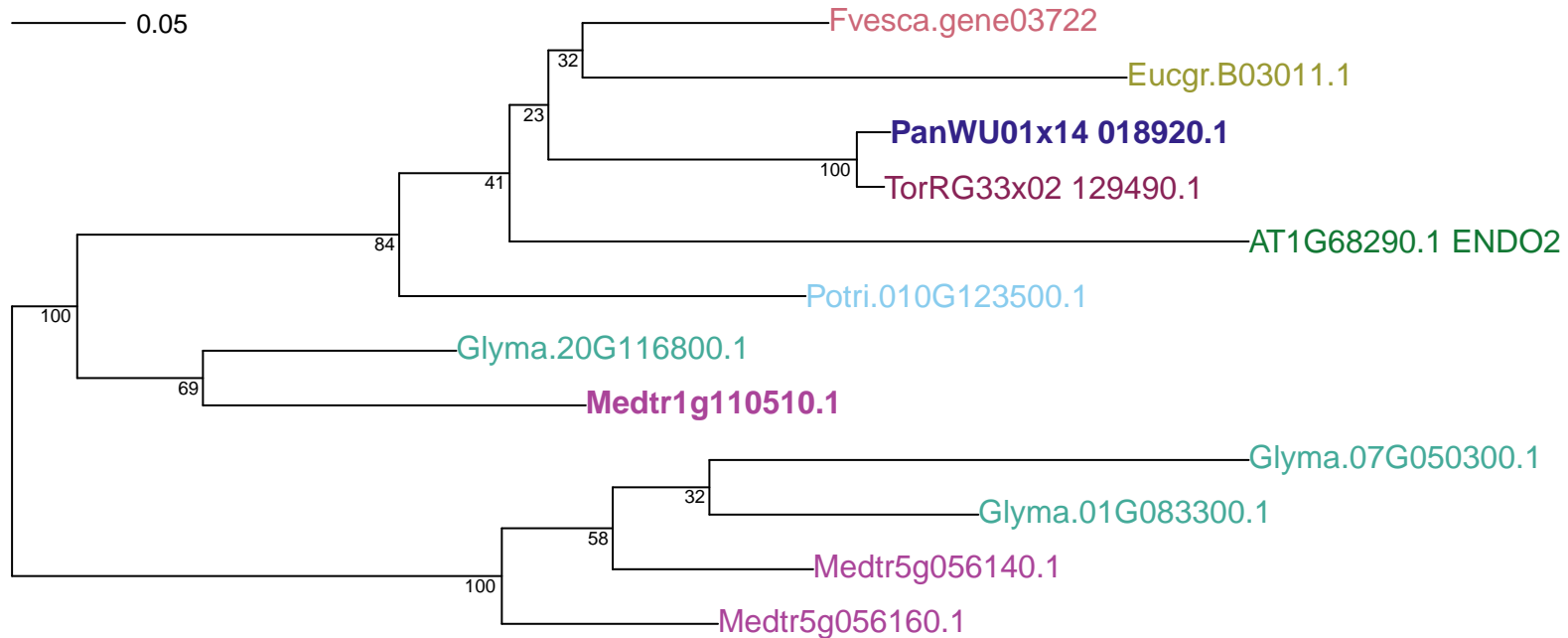


OG0005318: Enzymes. Cysteine oxygenase/2-aminoethanethiol dioxygenase

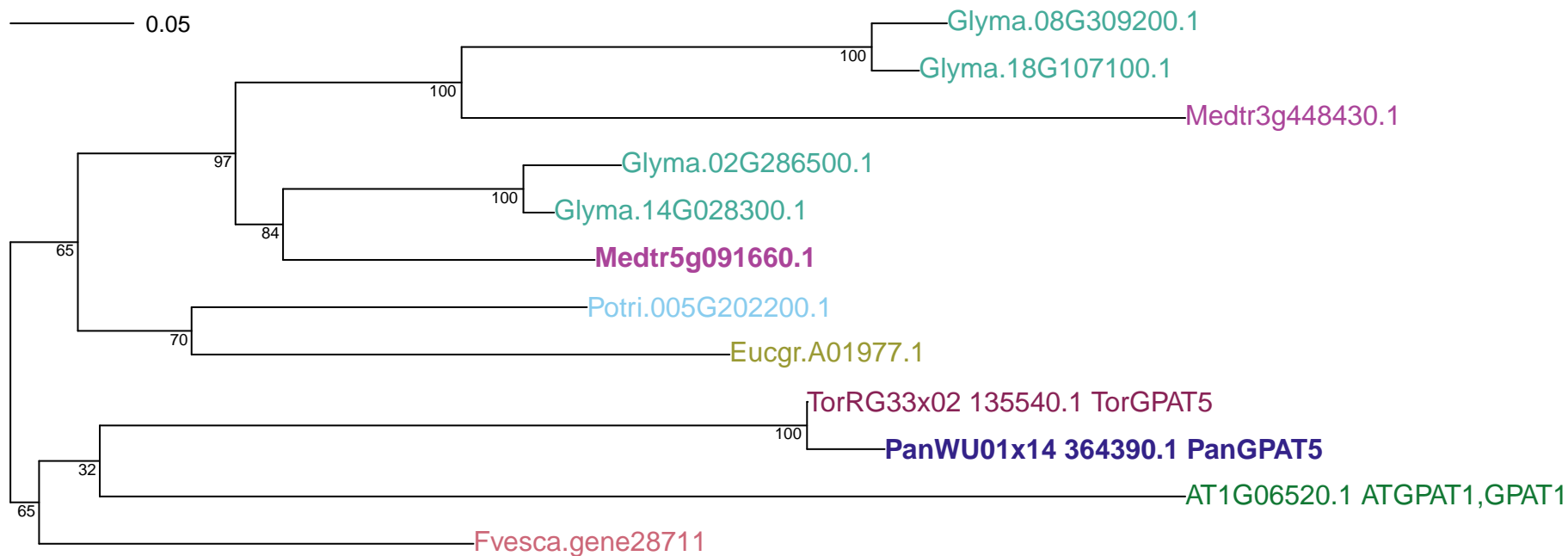


OG0005610: Enzymes. S1/P1 nuclease

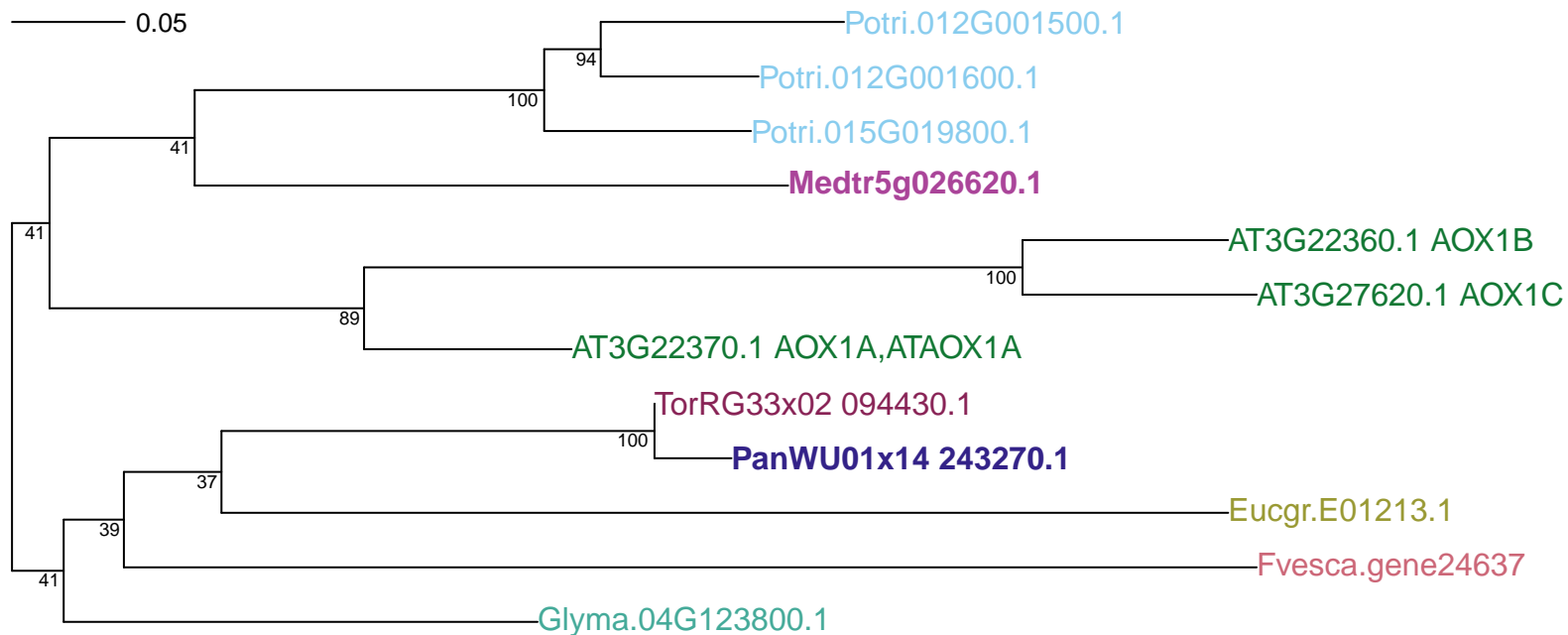
0.05



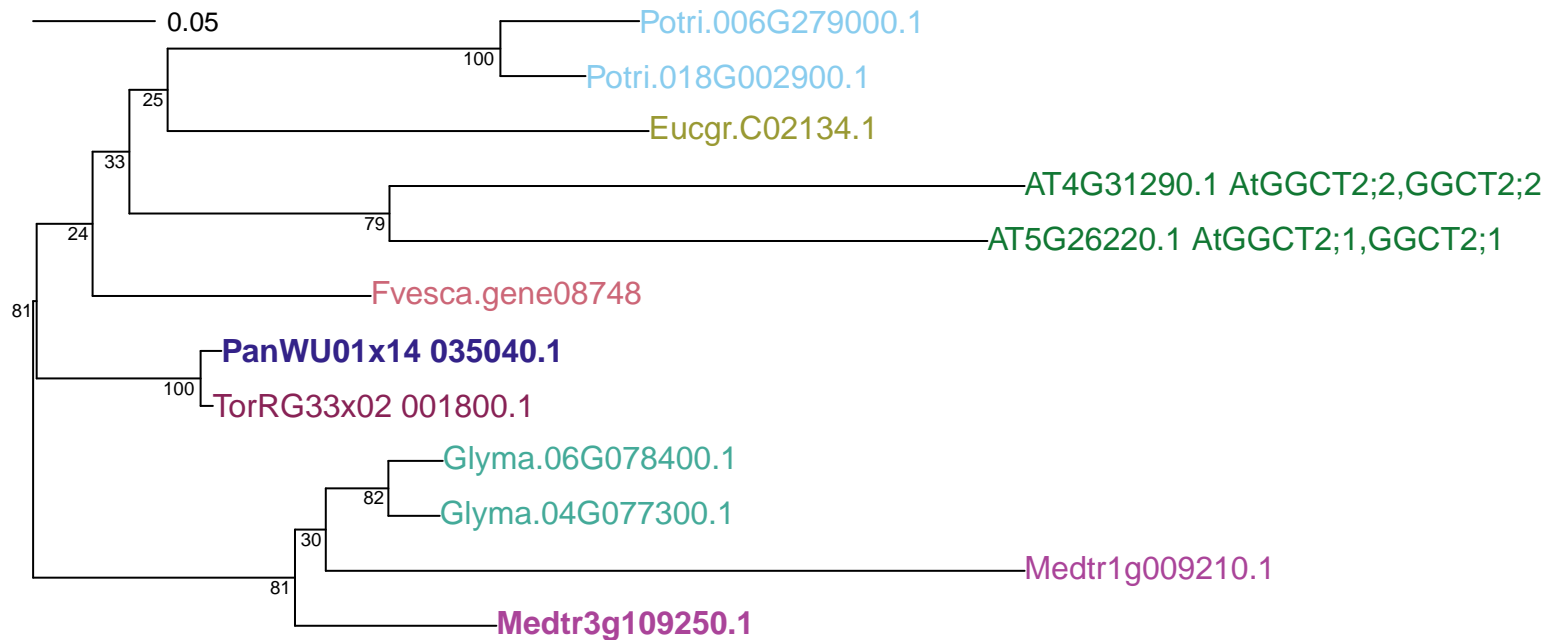
OG0005630: Enzymes. Phospholipid/glycerol acyltransferase



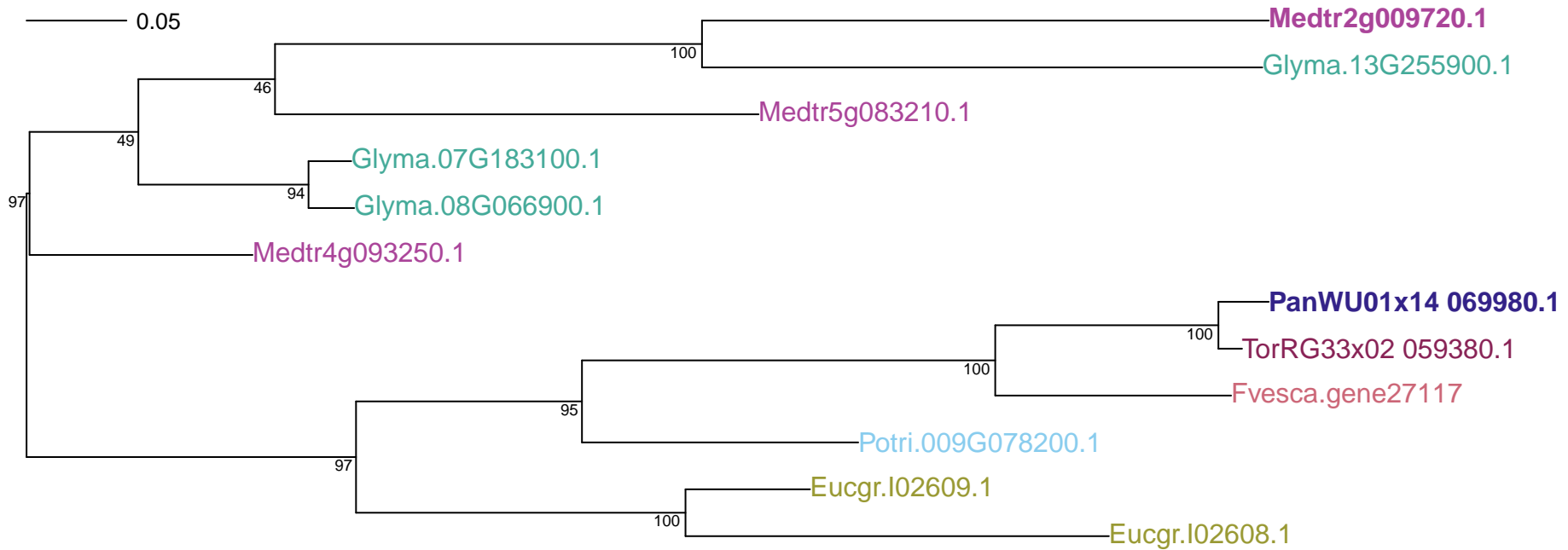
OG0005853: Enzymes. Alternative oxidase



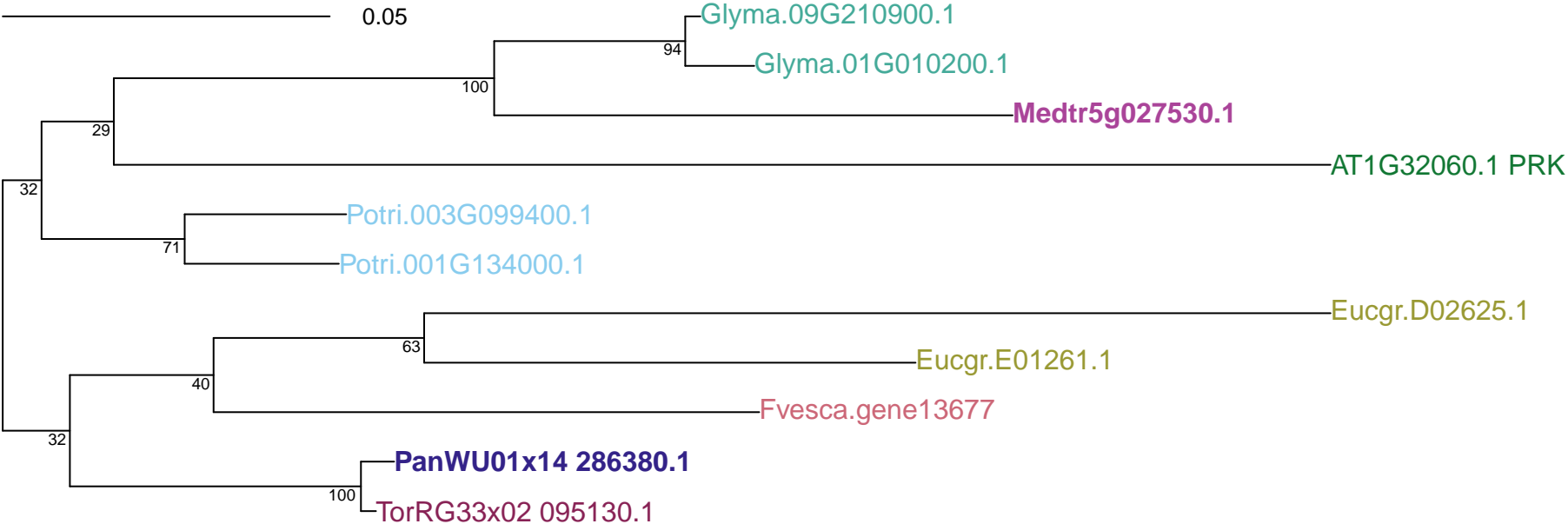
OG0006032: Enzymes. ChaC-like protein



OG0006405: Enzymes. Glutamine amidotransferase

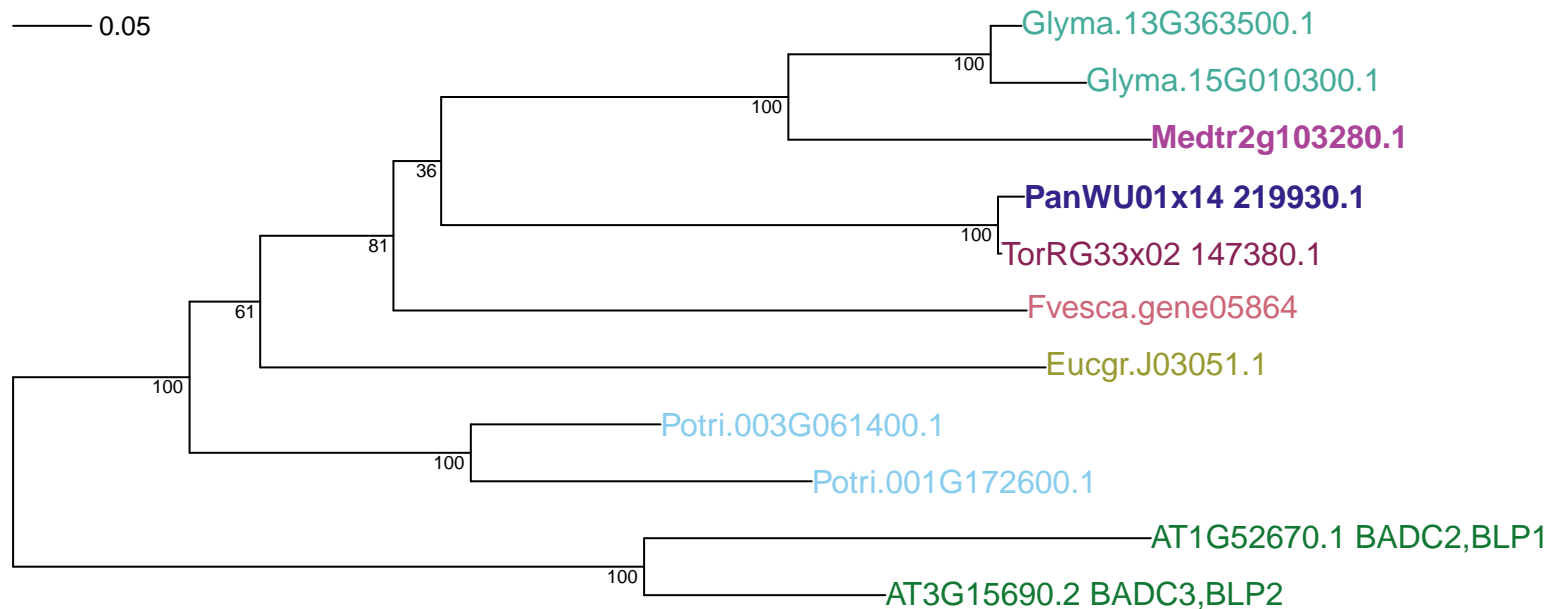


OG0006565: Enzymes. Phosphoribulokinase

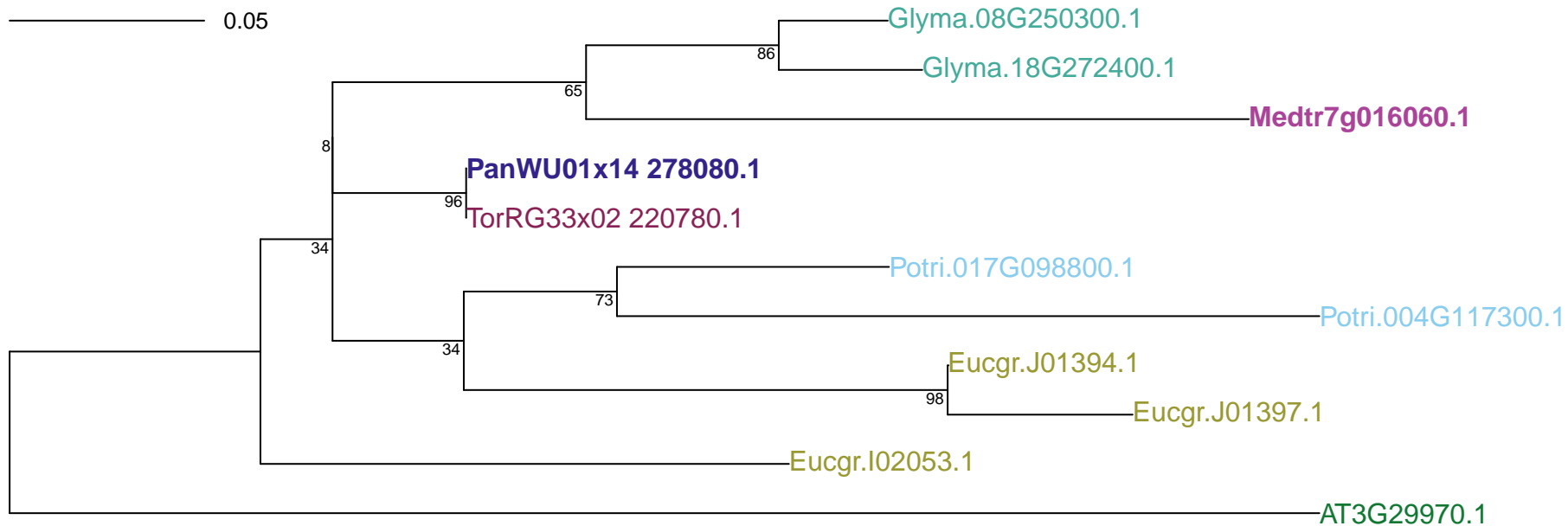


OG0006671: Enzymes. Lipoamide Acyltransferase

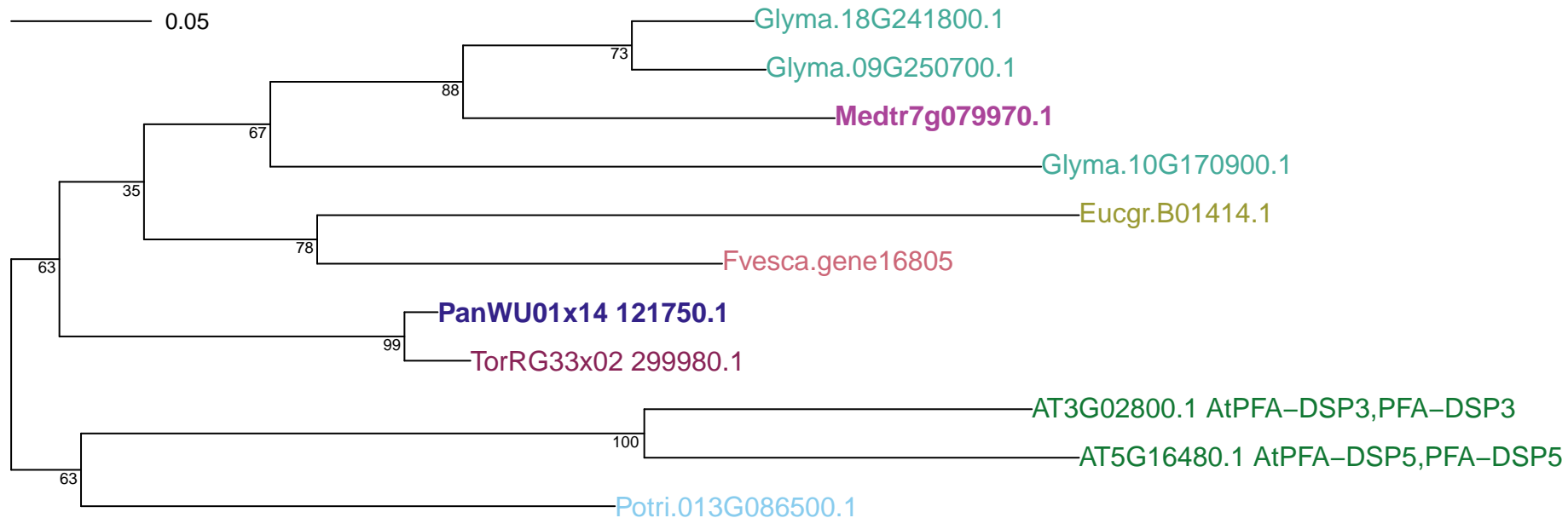
0.05



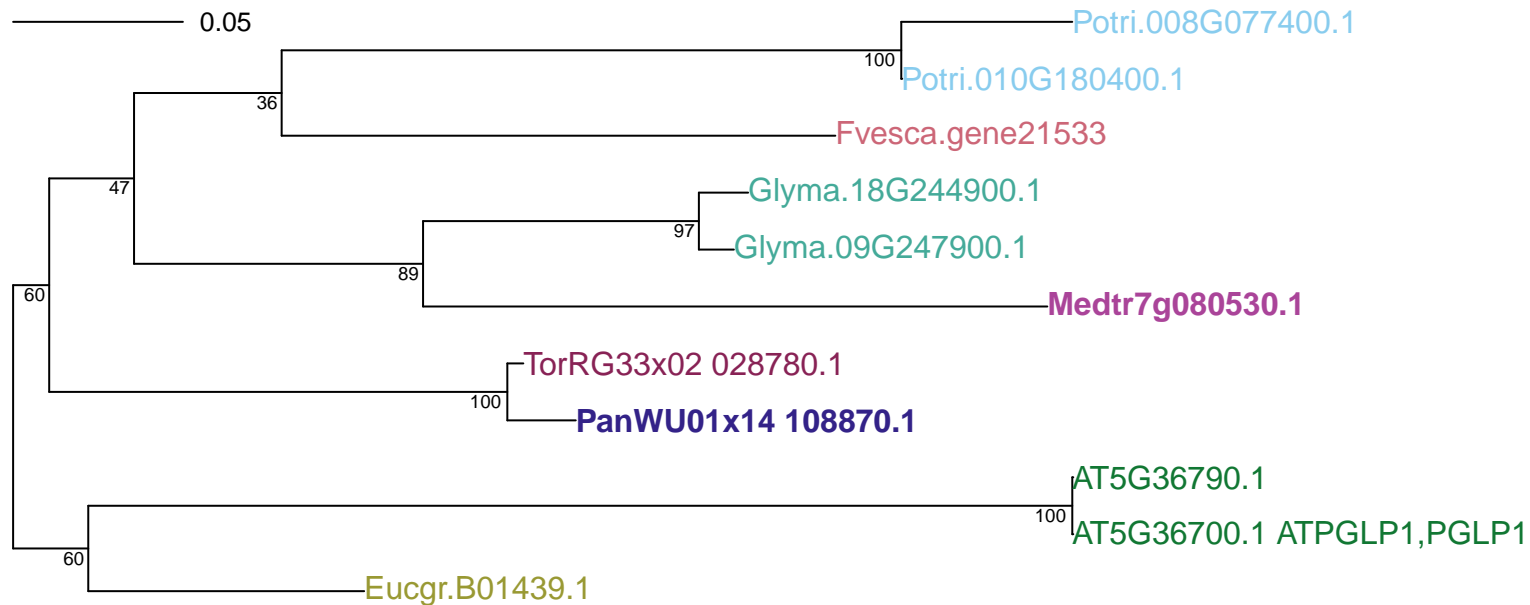
OG0007085: Enzymes. NADH-ubiquinone reductase complex 1 MLRQ subunit



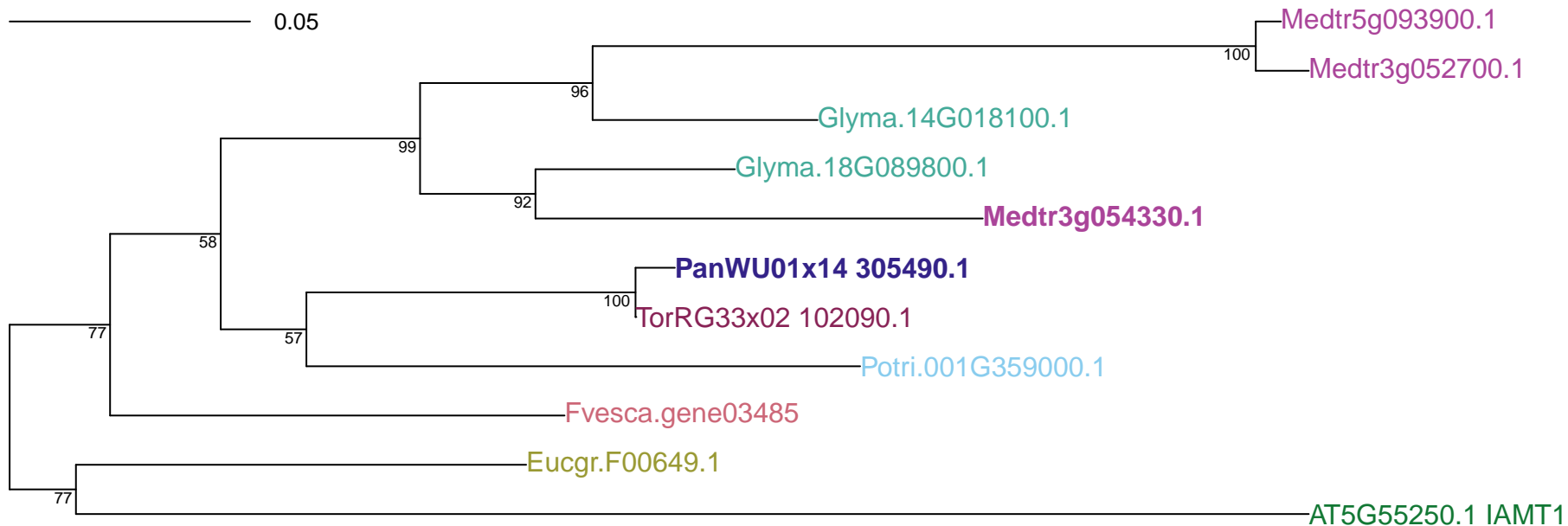
OG0007100: Enzymes. Protein-tyrosine phosphatase SIW14-like



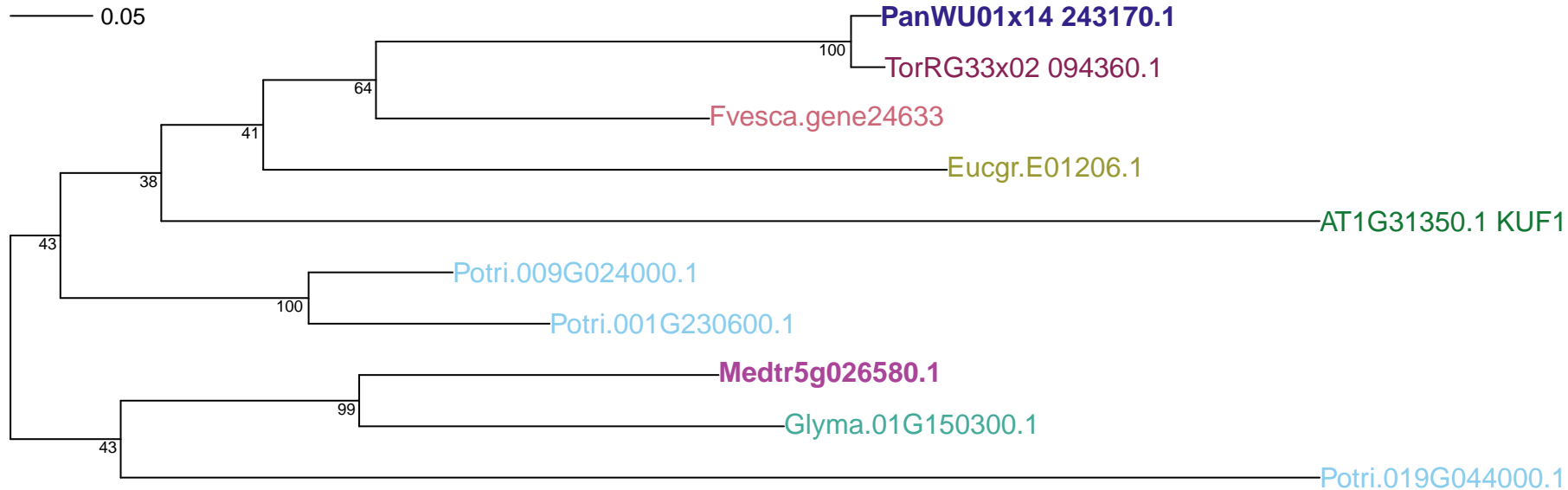
OG0007506: Enzymes. 2-phosphoglycolate phosphatase



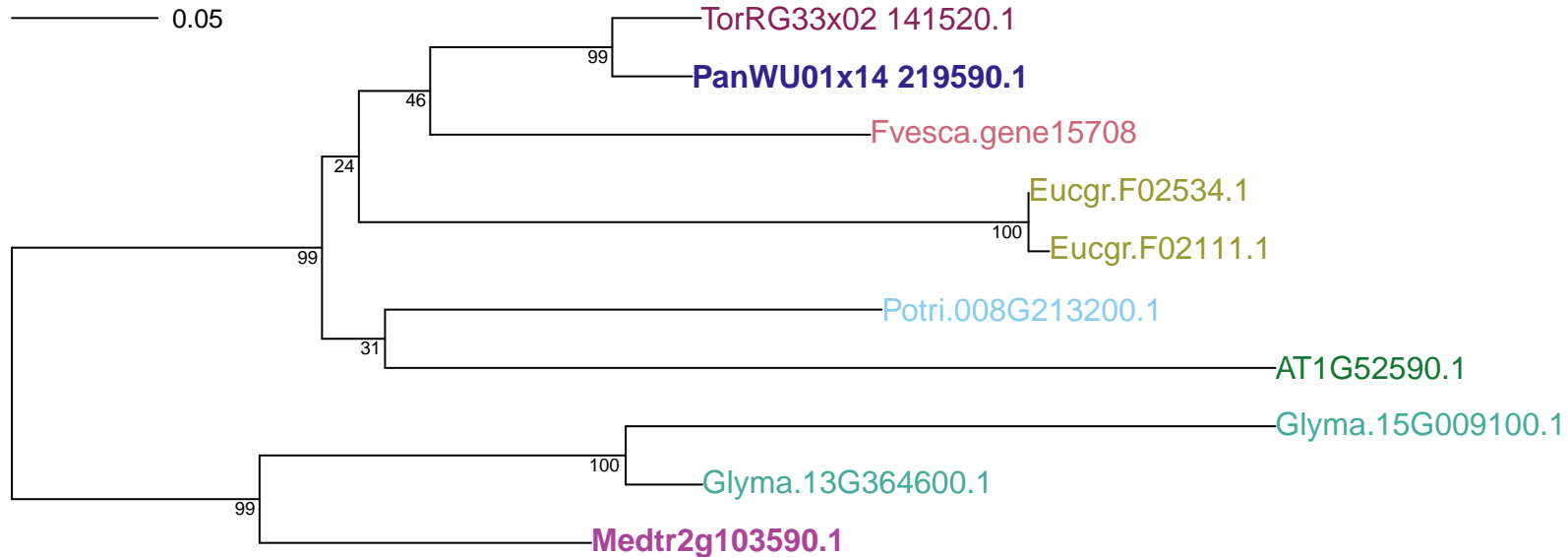
OG0007599: Enzymes. SAM dependent carboxyl methyltransferase



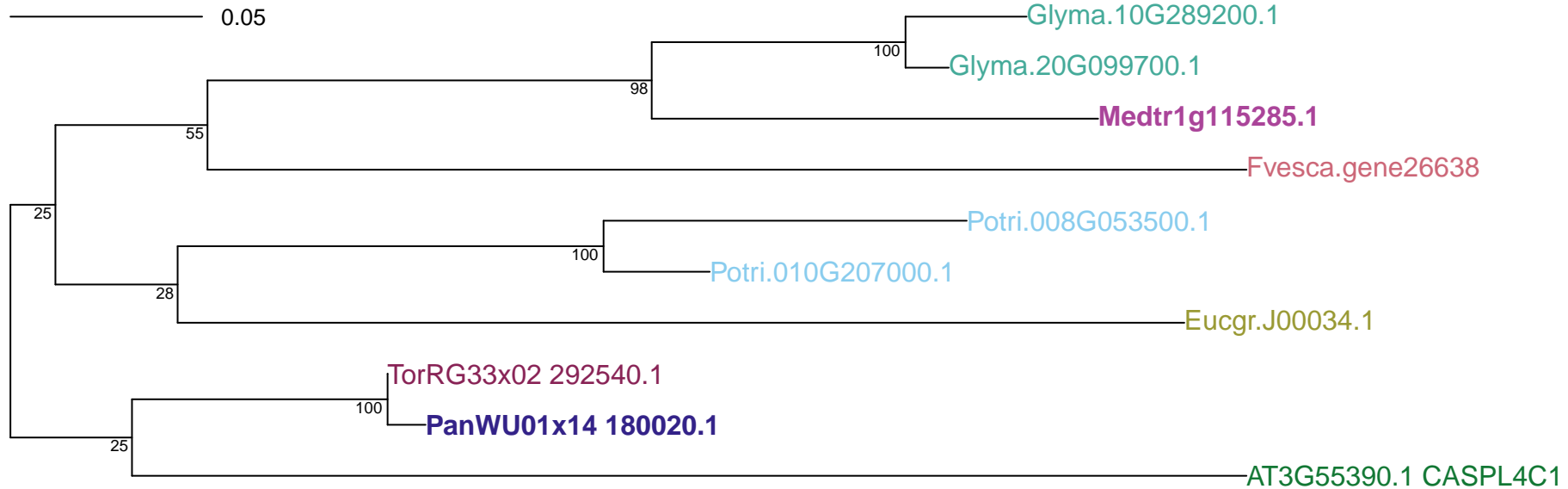
OG0008074: Enzymes. F-box domain containing protein



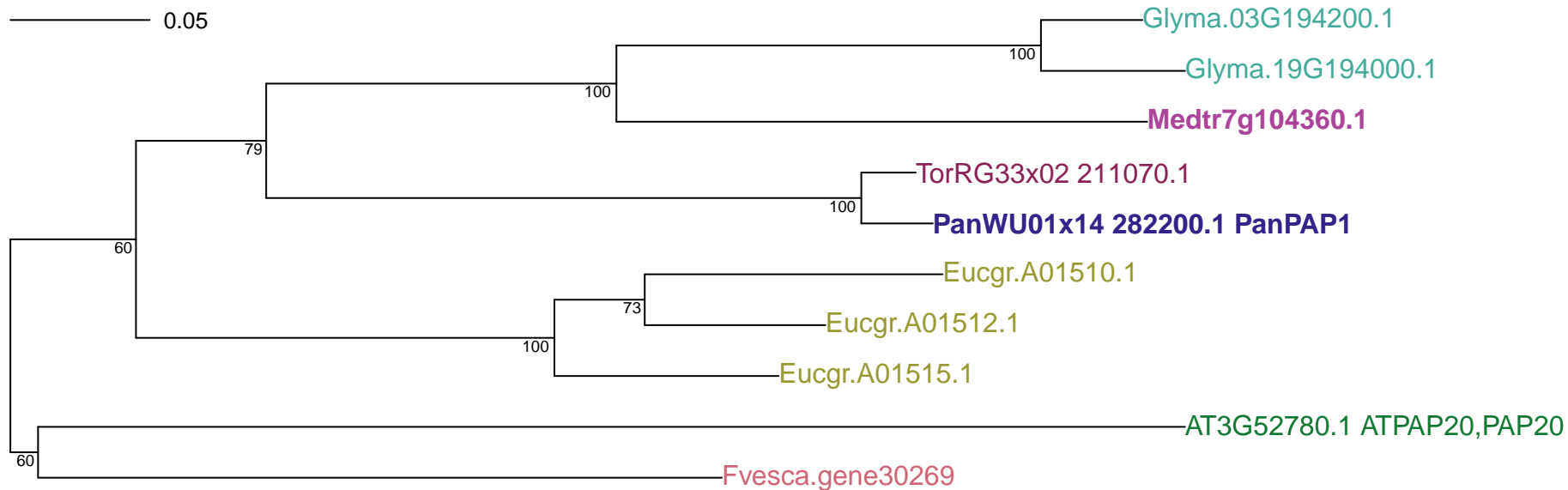
OG0008193: Enzymes. DCC family protein



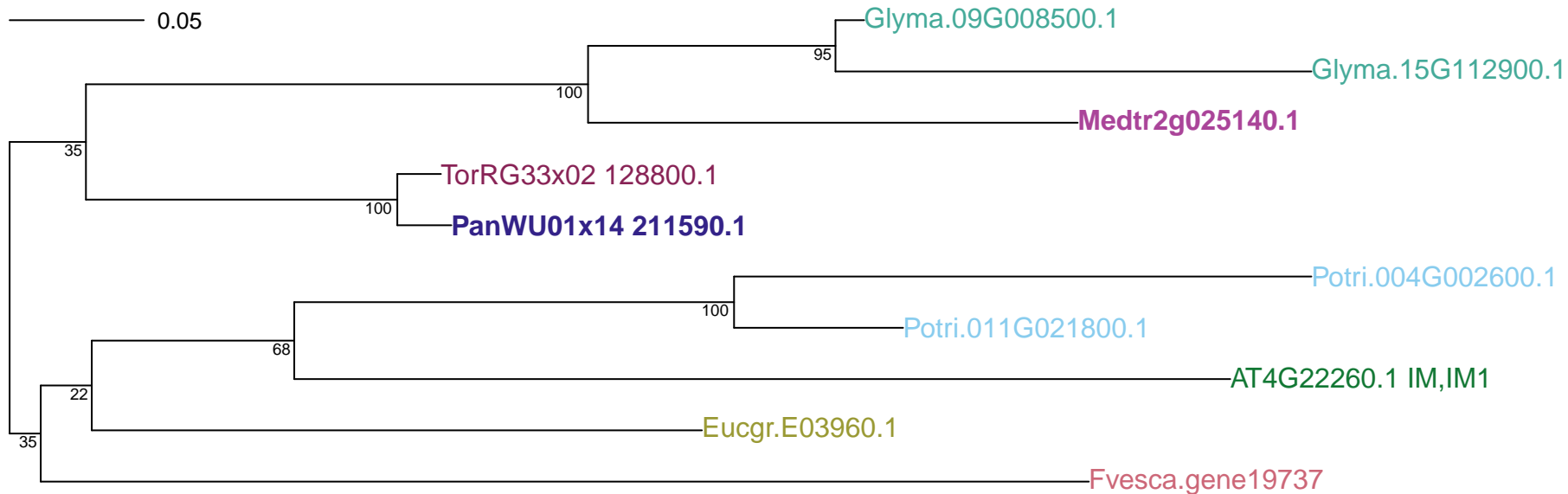
OG0008943: Enzymes. CASP-like protein 4C



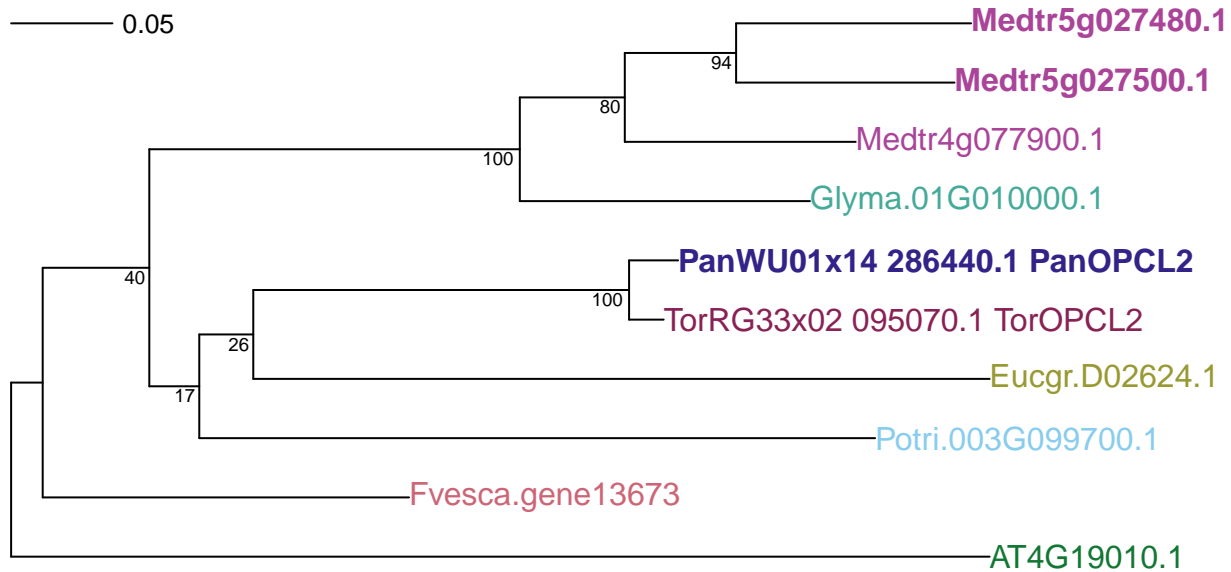
OG0009016: Enzymes. Acid phosphatase



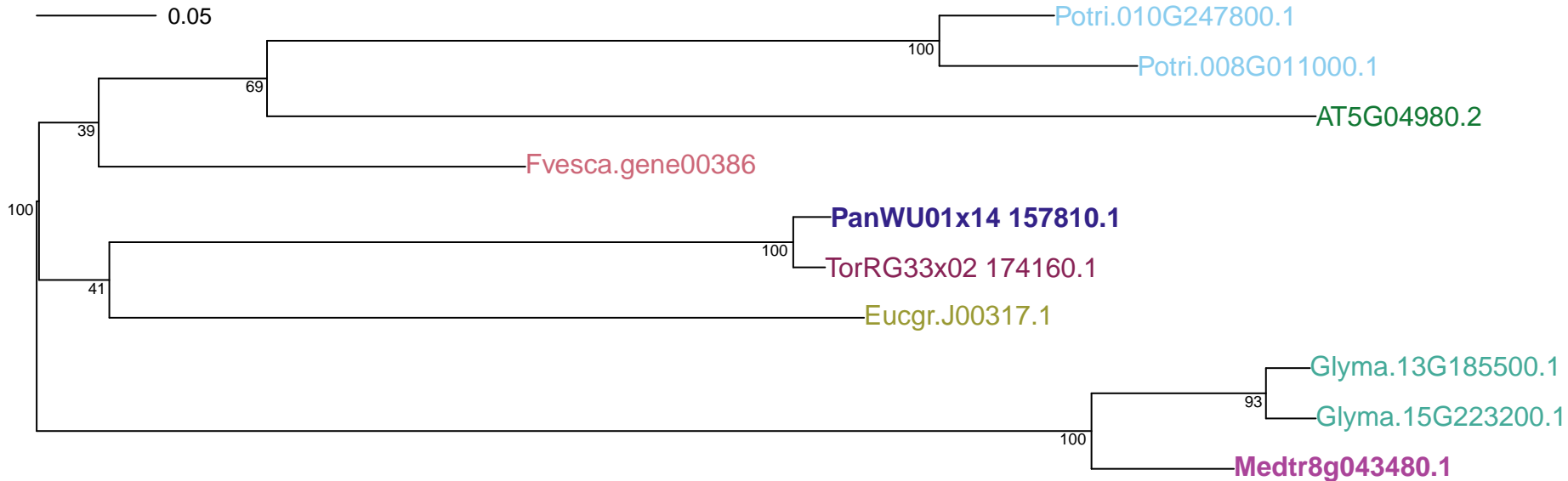
OG0009059: Enzymes. Alternative oxidase



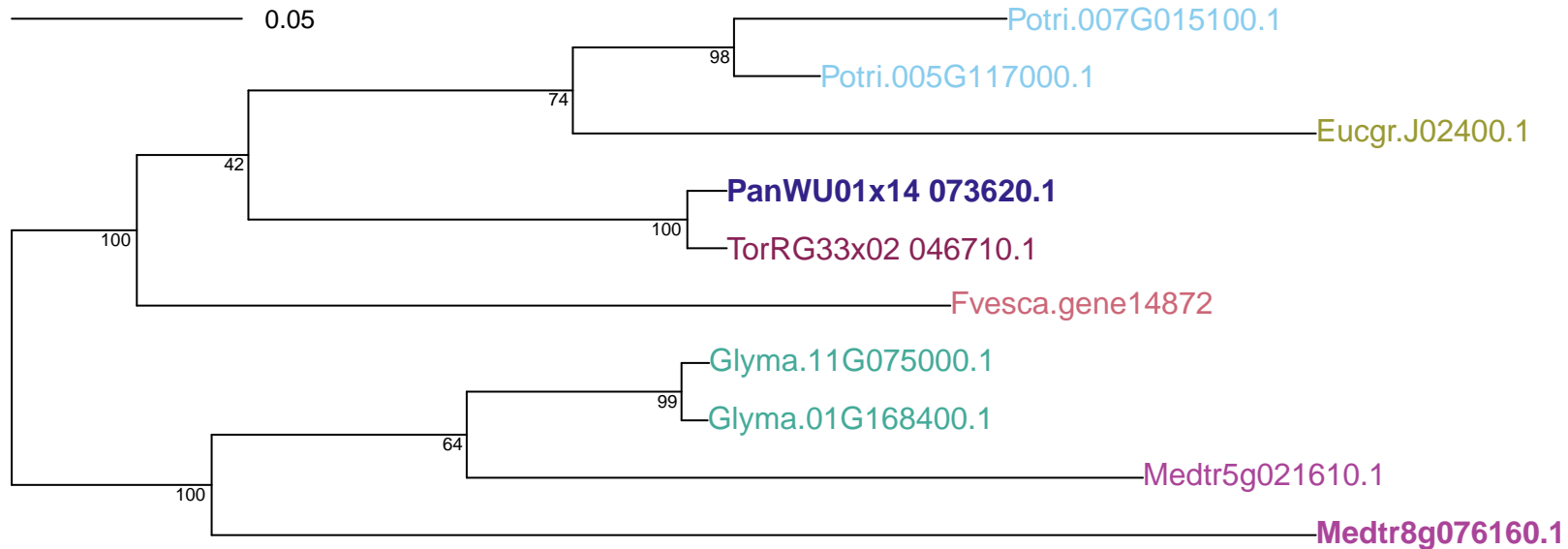
OG0009103: Enzymes. 4-coumarate-CoA ligase



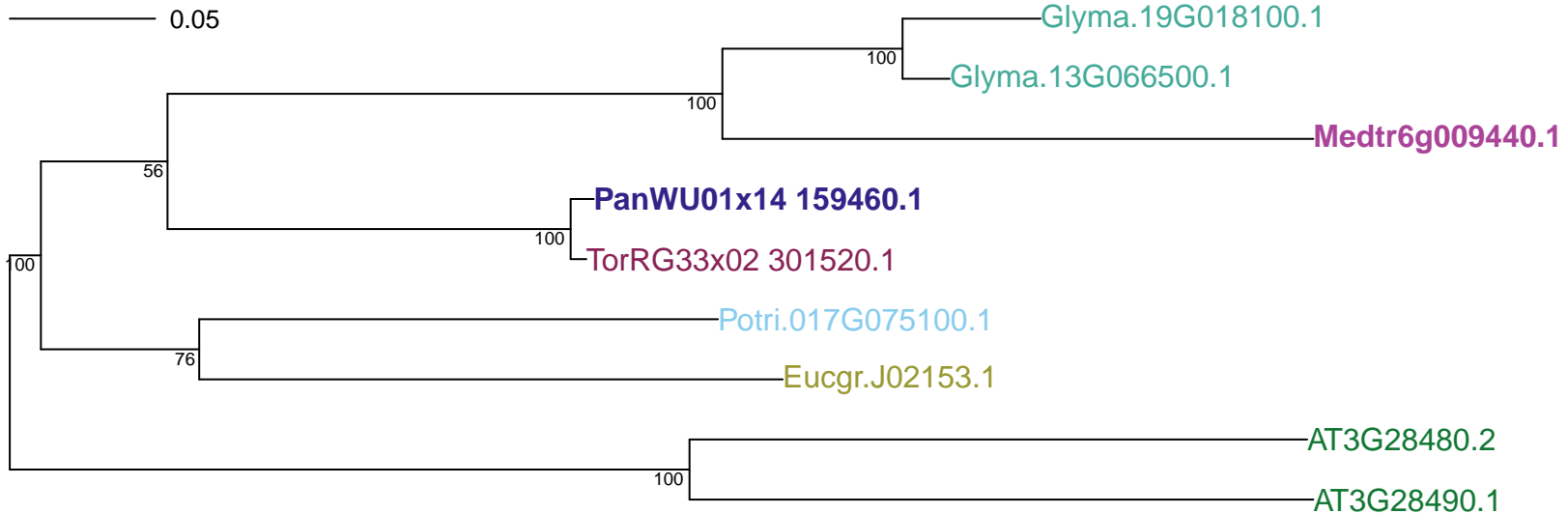
OG0009685: Enzymes. Deoxyribonuclease I



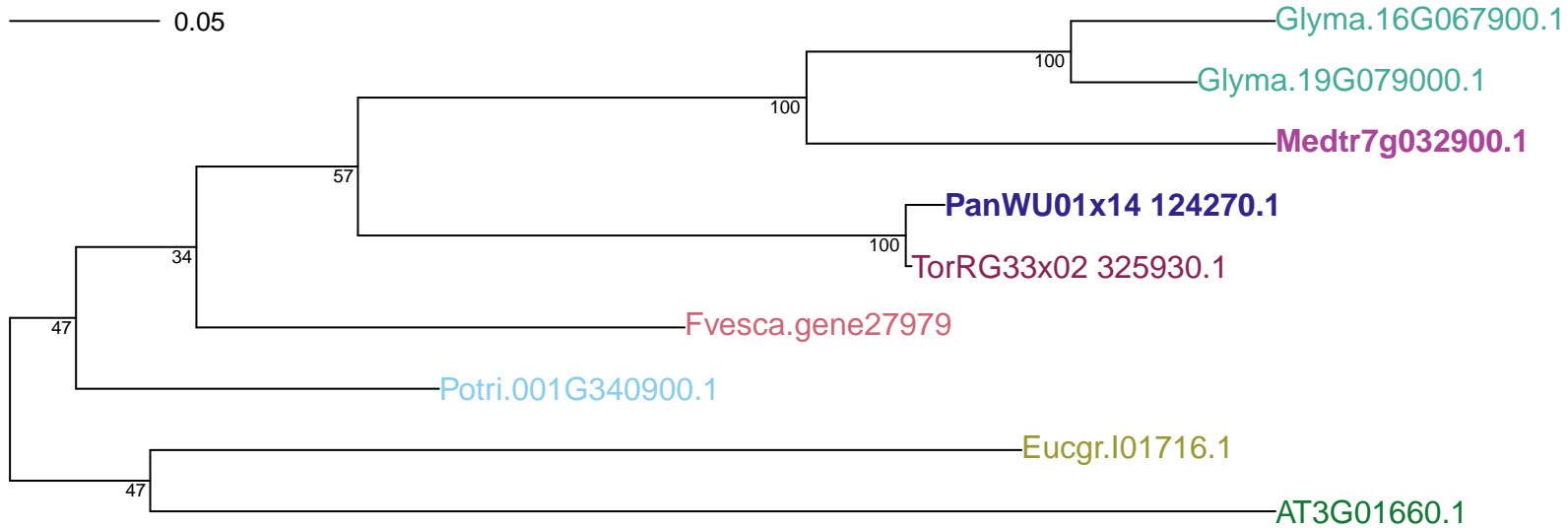
OG0009723: Enzymes. Glyoxalase-like domain containing protein



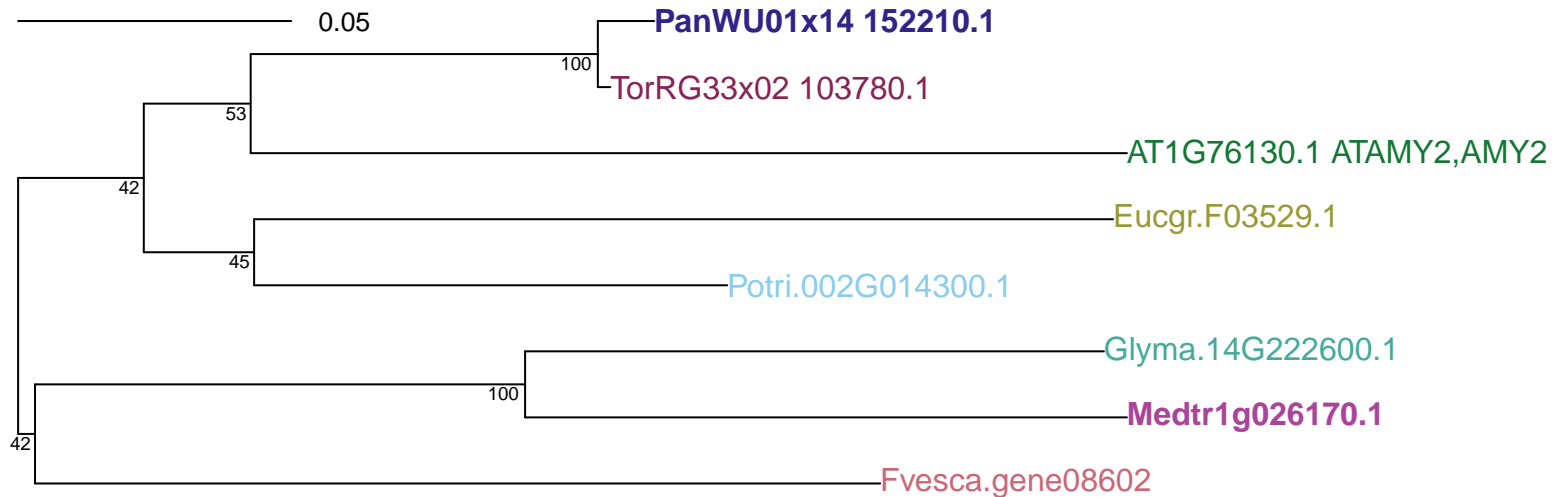
OG0010940: Enzymes. Isopenicillin N synthase



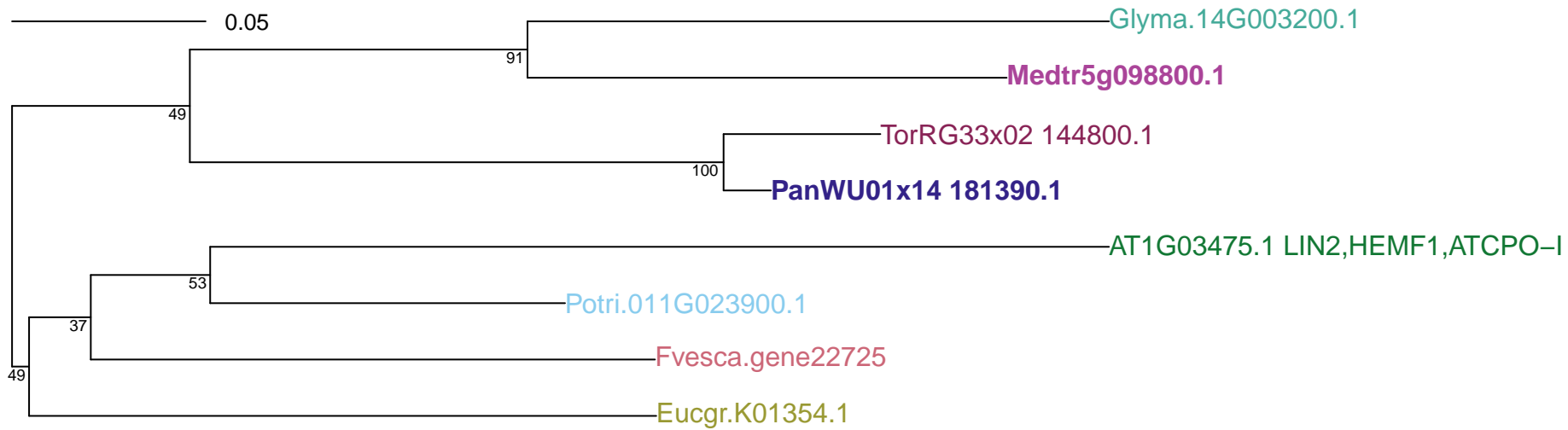
OG0011066: Enzymes. Methyltransferase type



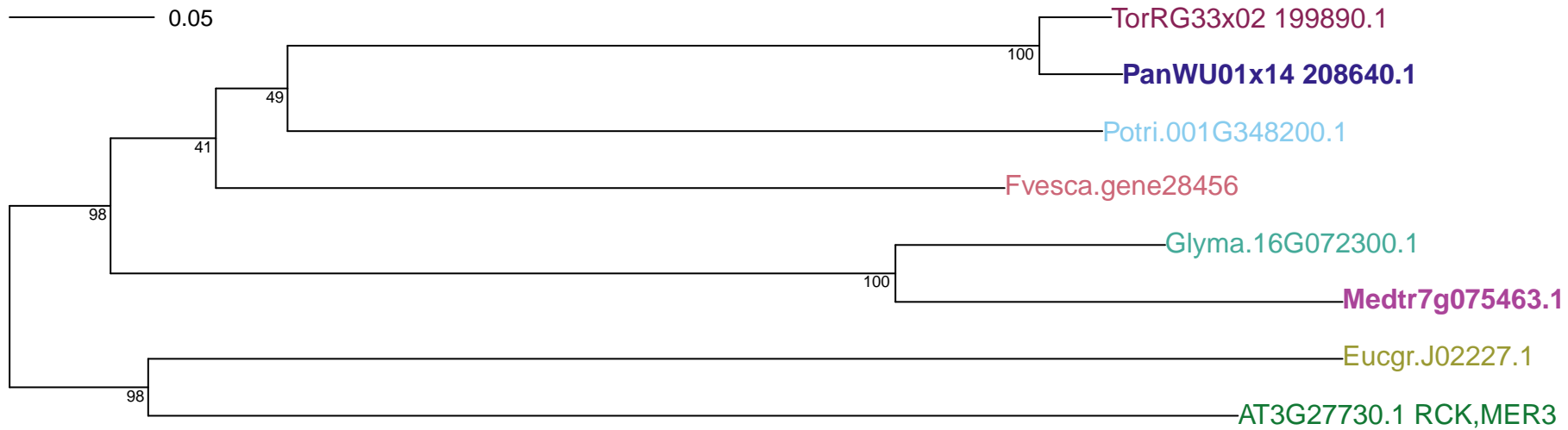
OG0012236: Enzymes. Alpha-amylase



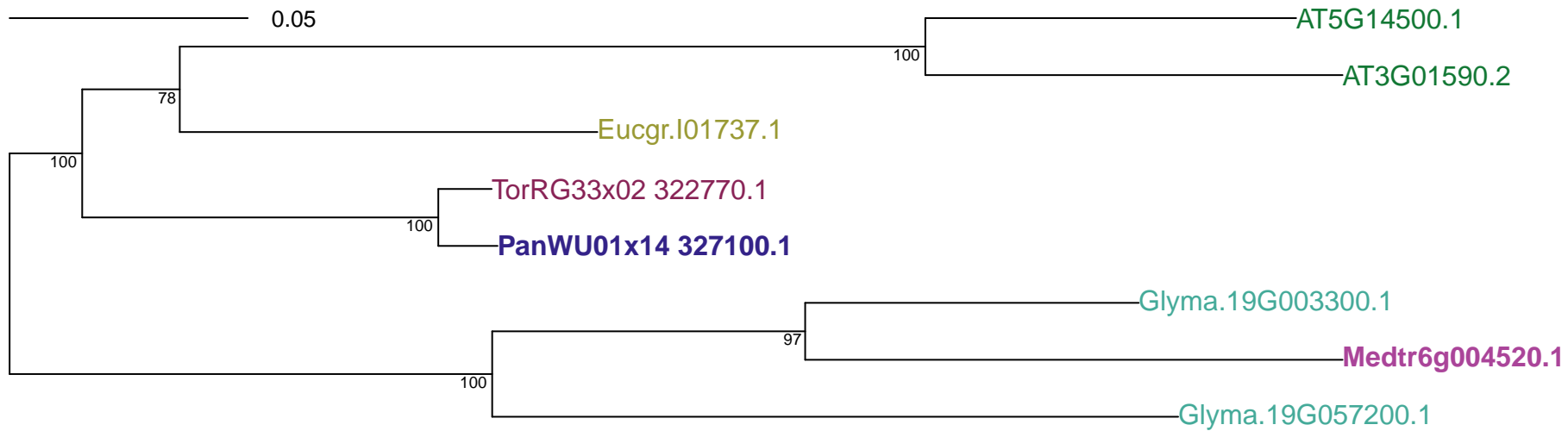
OG0012266: Enzymes. Coproporphyrinogen III oxidase, aerobic



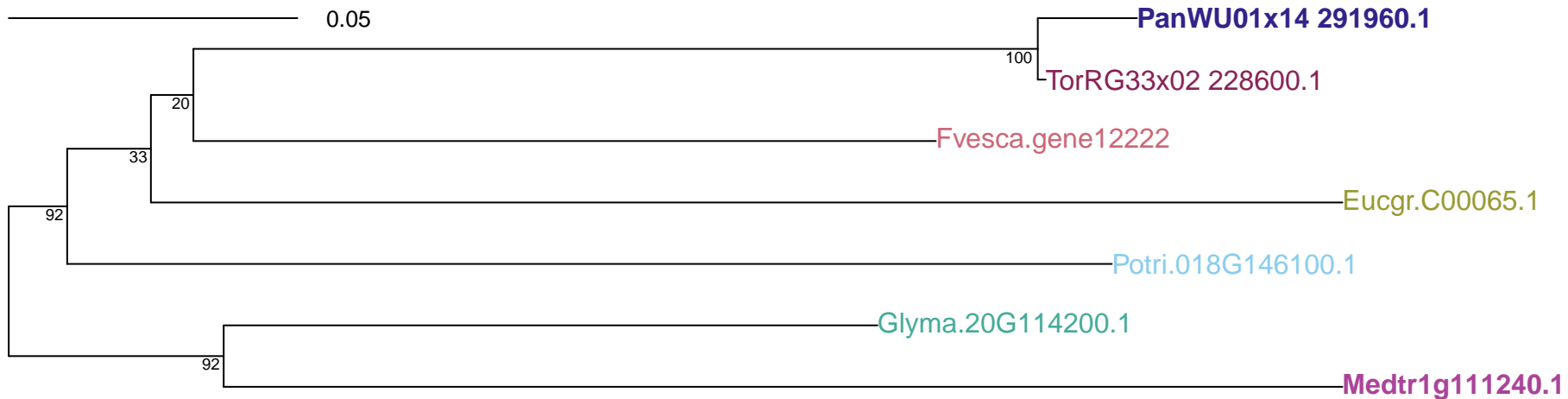
OG0012834: Enzymes. Cytochrome c oxidase subunit 5c



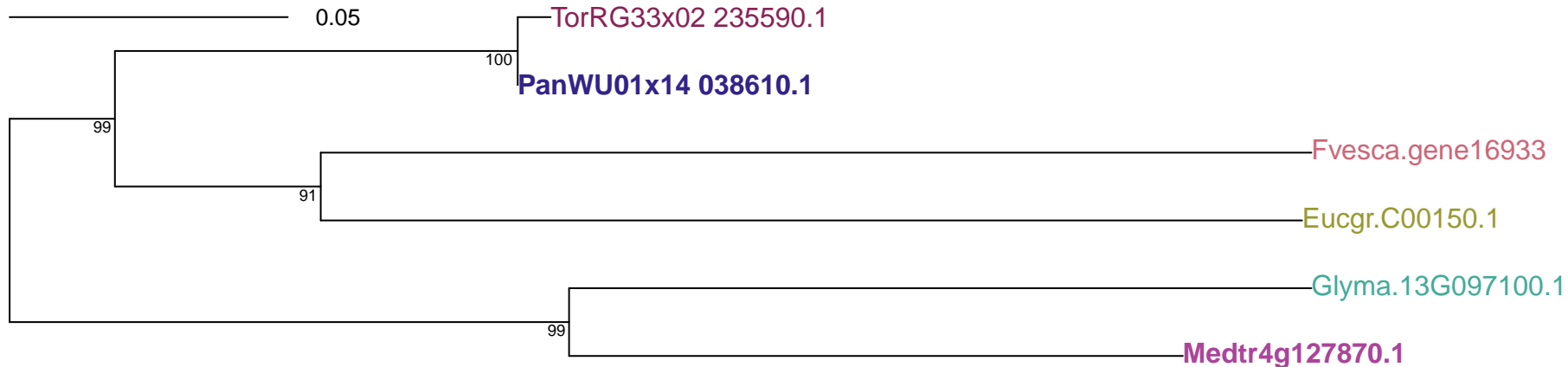
OG0012857: Enzymes. Glucose-6-phosphate 1-epimerase



OG0013963: Enzymes. Cytochrome P450, E-class, group I

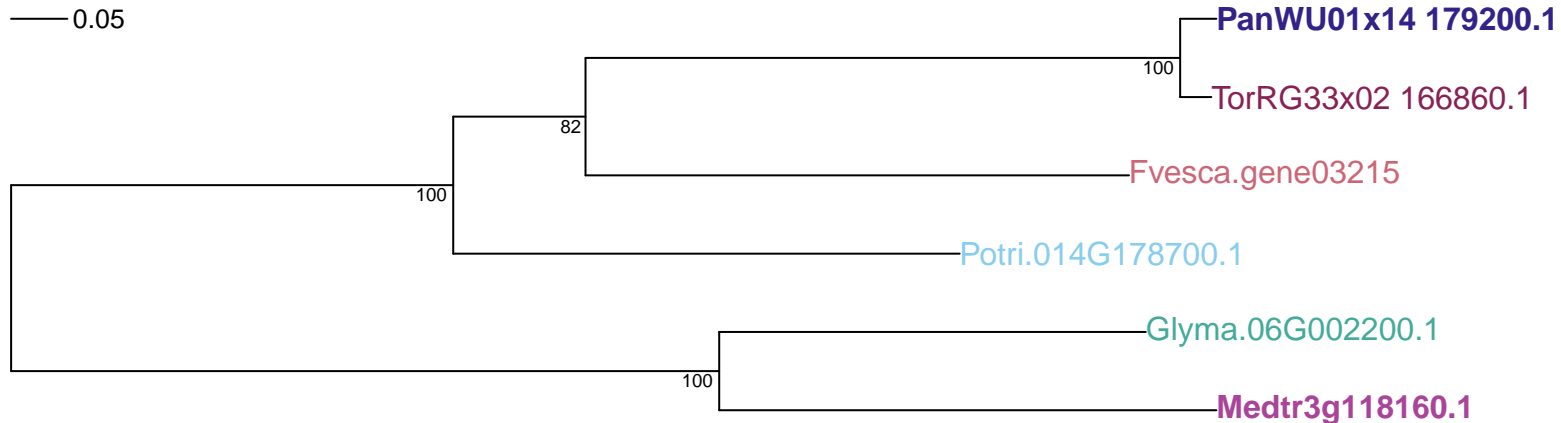


OG0014435: Enzymes. Ribulose biphosphate carboxylase, small chain



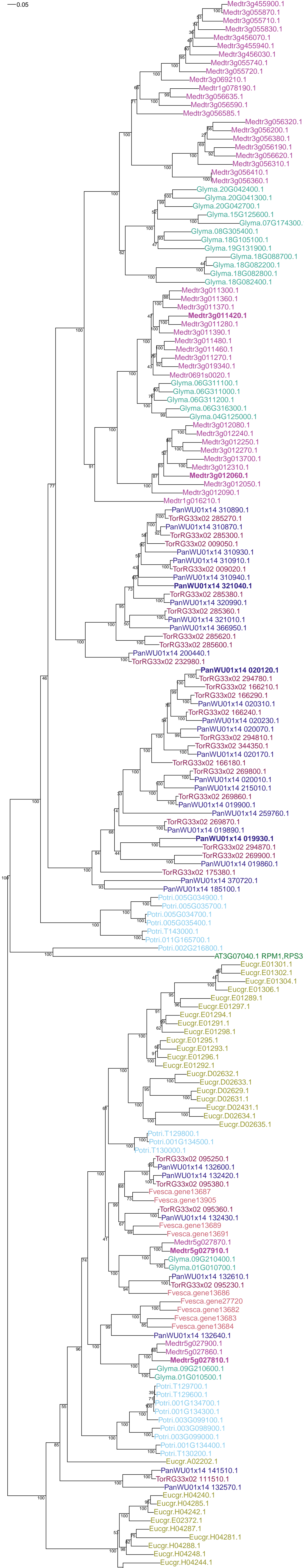
OG0014585: Enzymes. DNA polymerase III

— 0.05



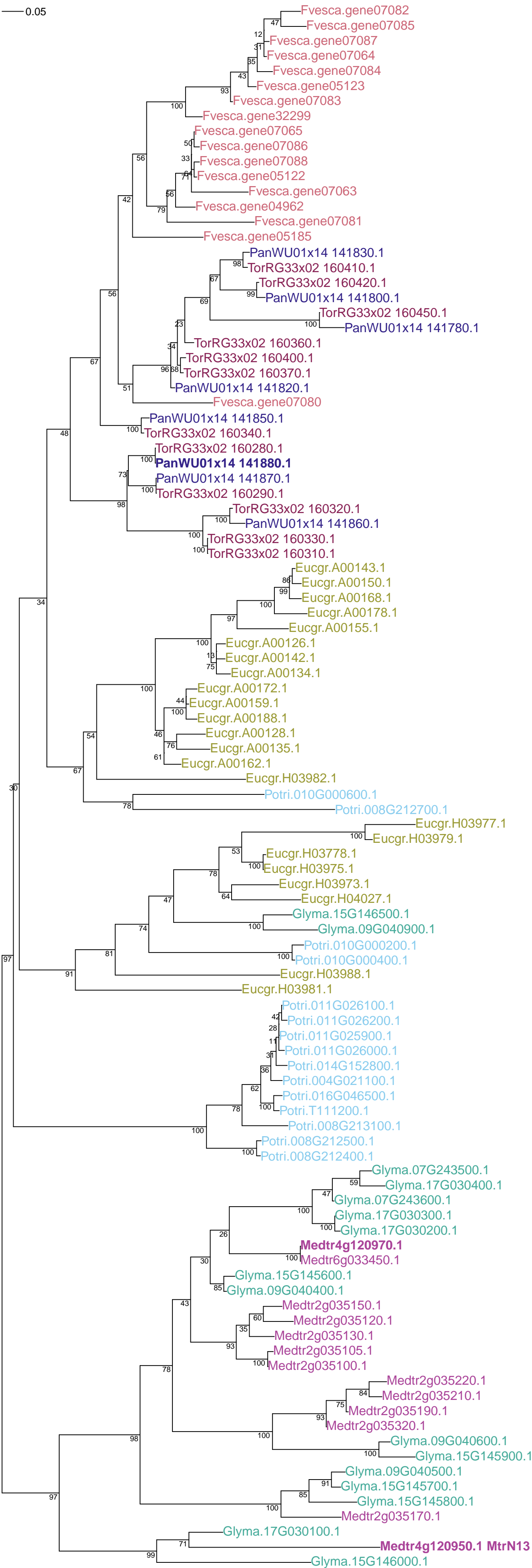
OG000029: Other. NB-ARC domain, LRR domain containing protein

—0.05



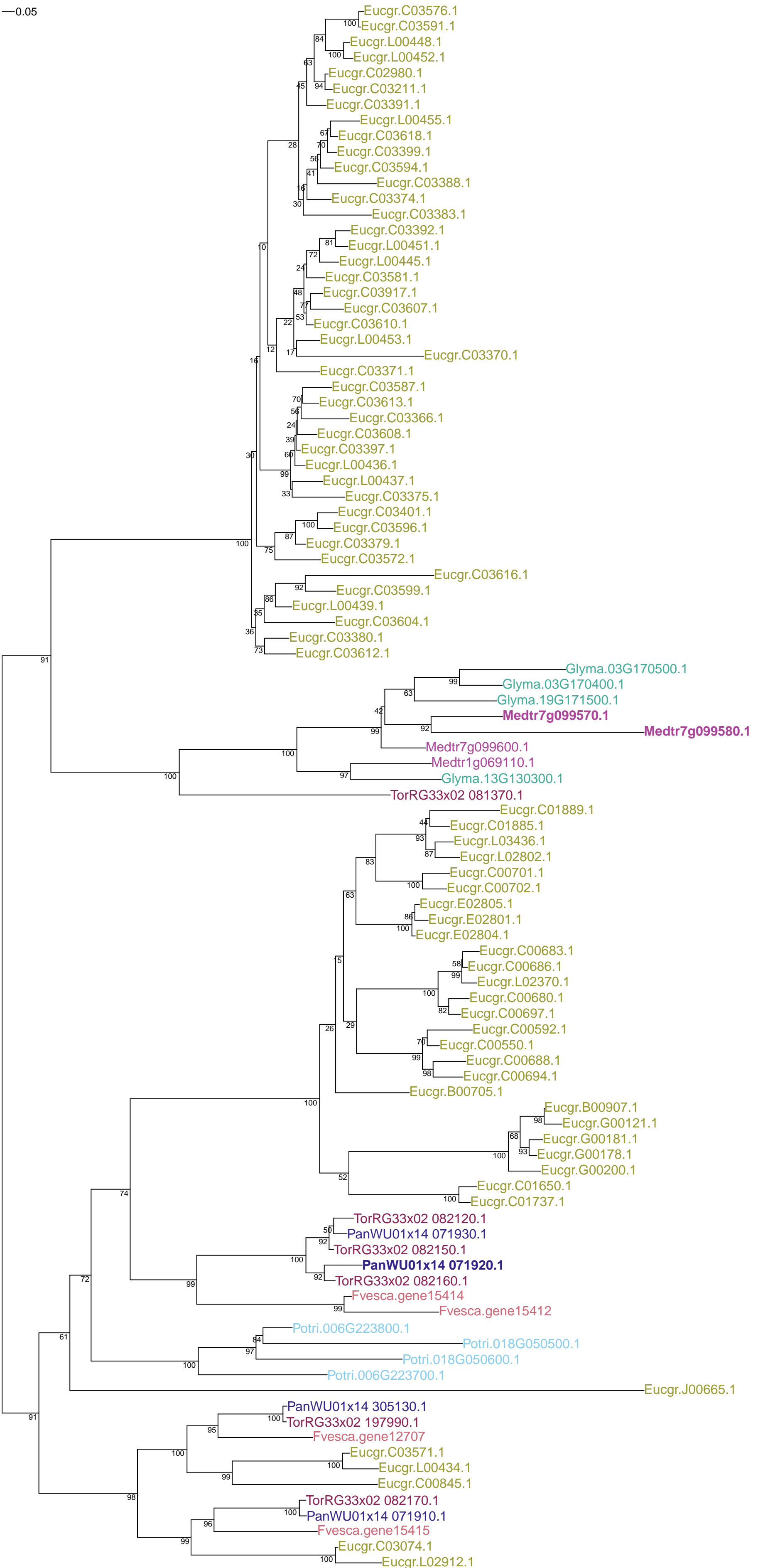
OG000093: Other. Bet v I type allergen

— 0.05



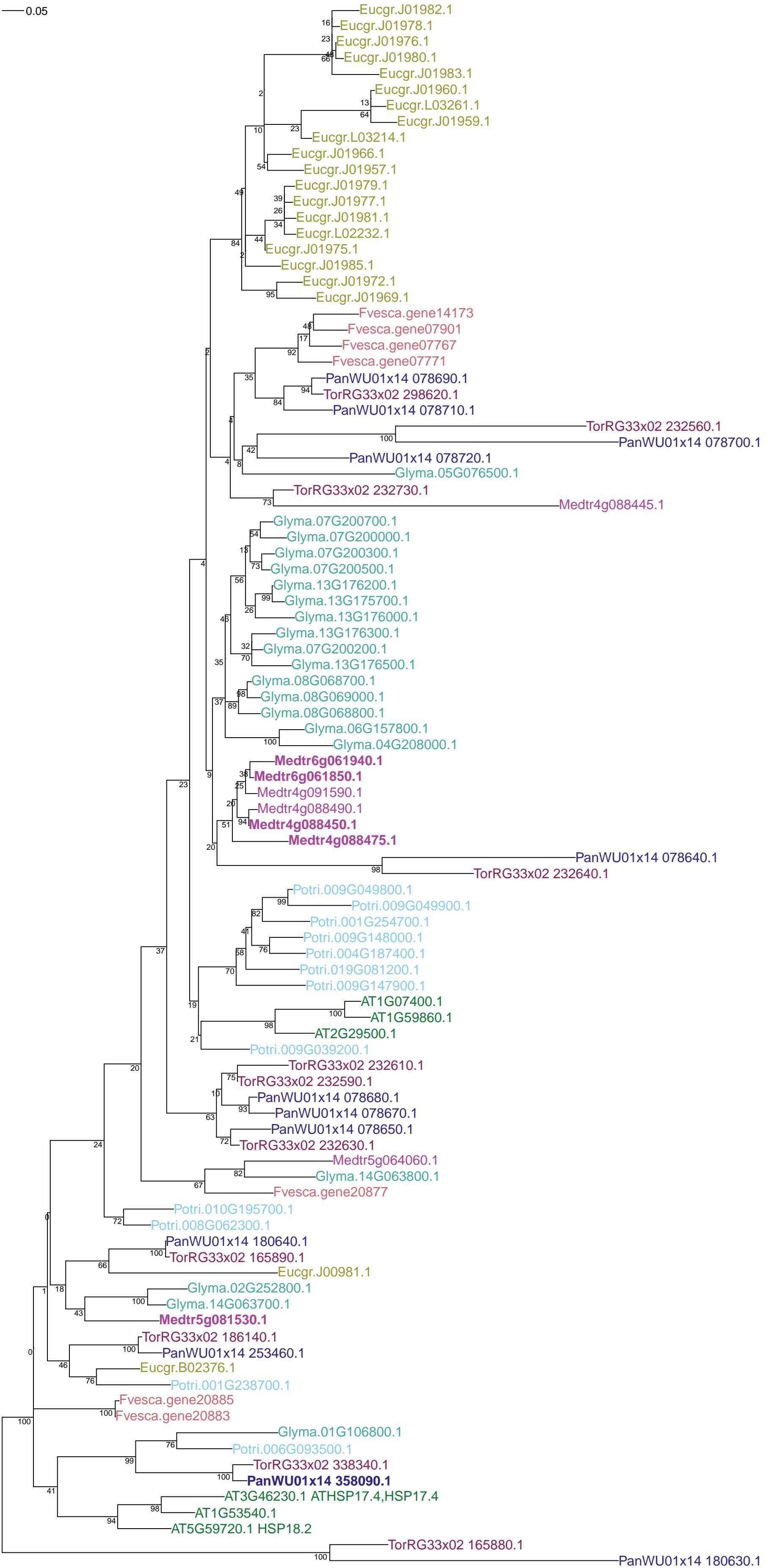
OG0000098: Other. Transmembrane protein

—0.05



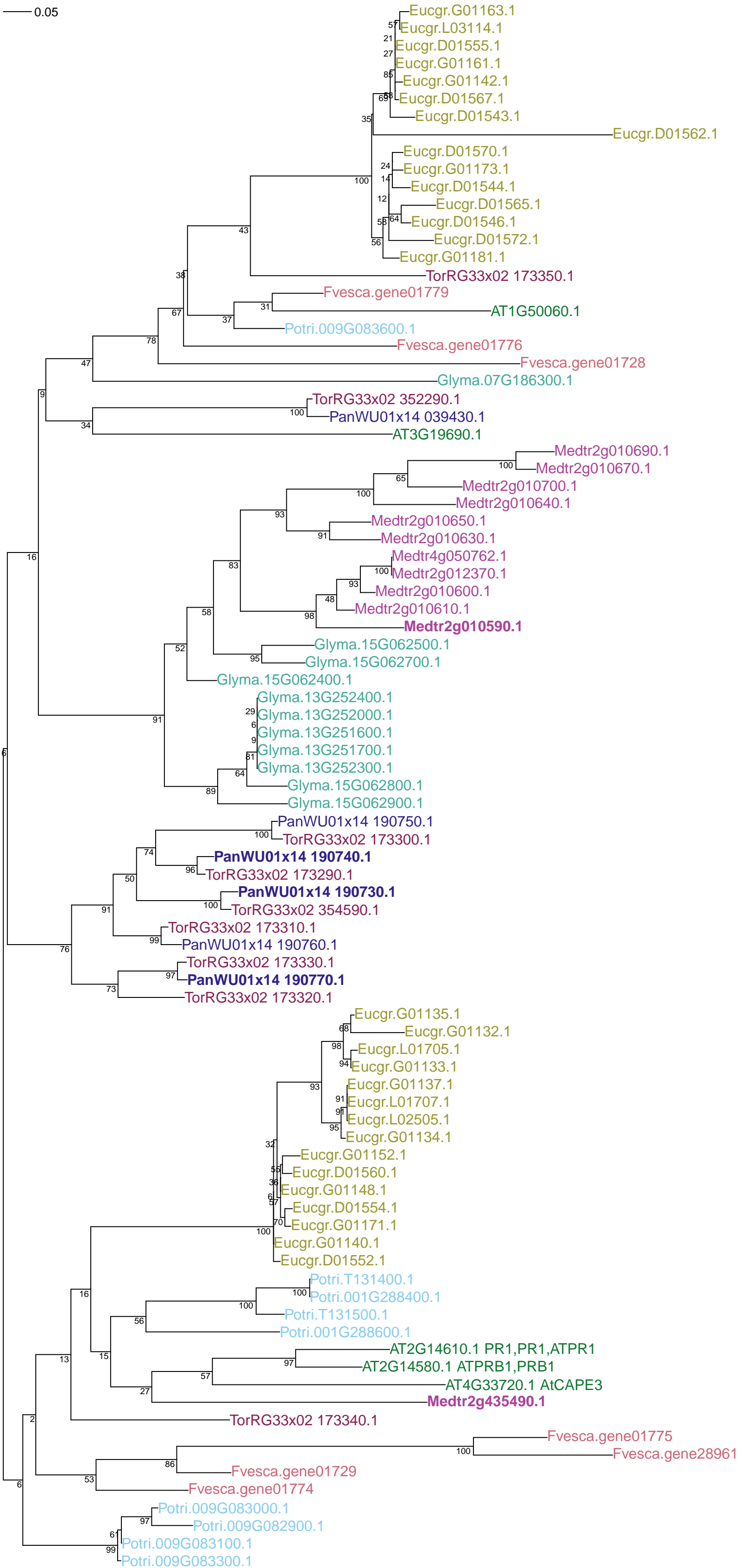
OG0000101: Other. Small heat shock protein HSP

— 0.05

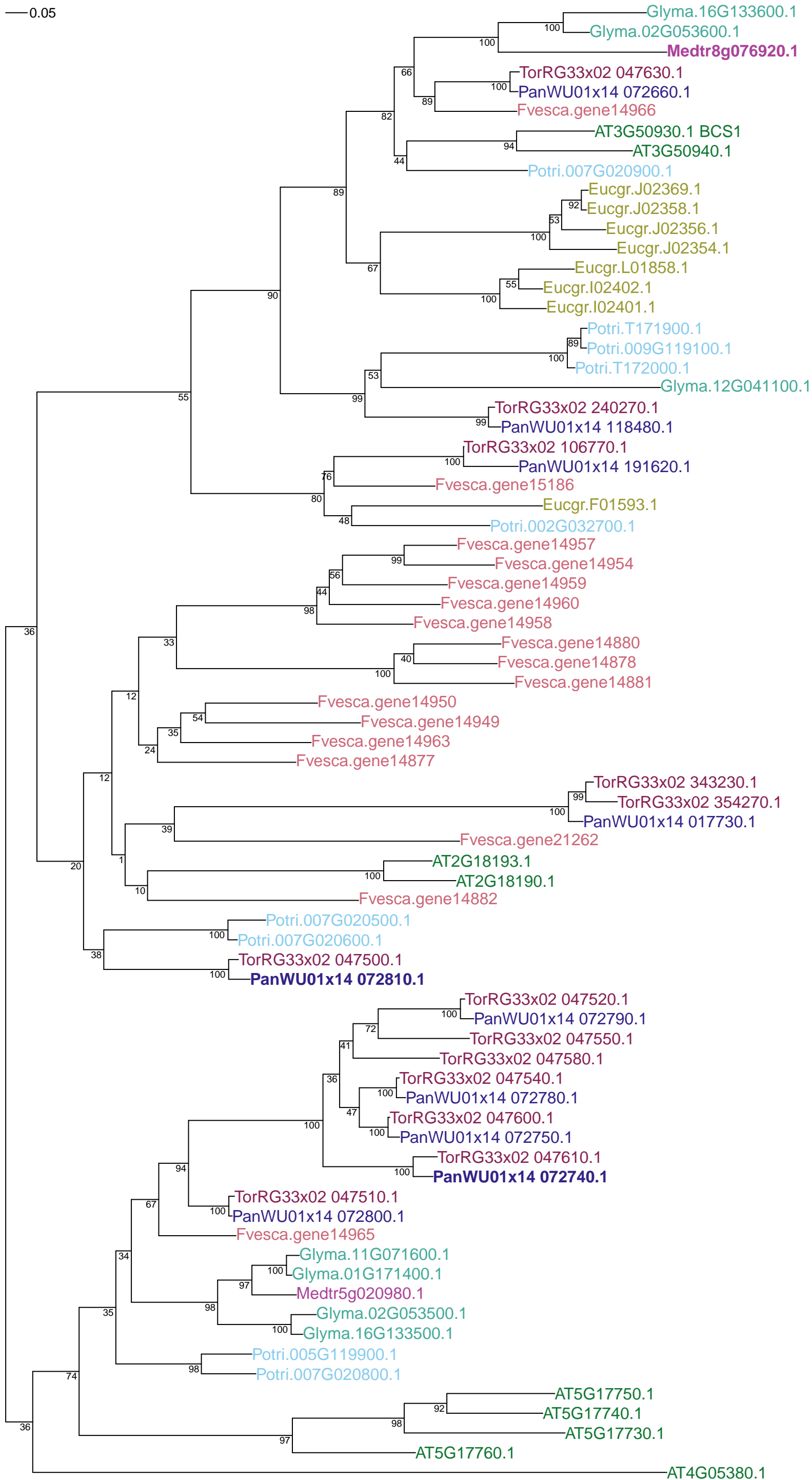


OG0000117: Other. Cysteine-rich secretory protein, allergen V5/Tpx-1-related

0.05

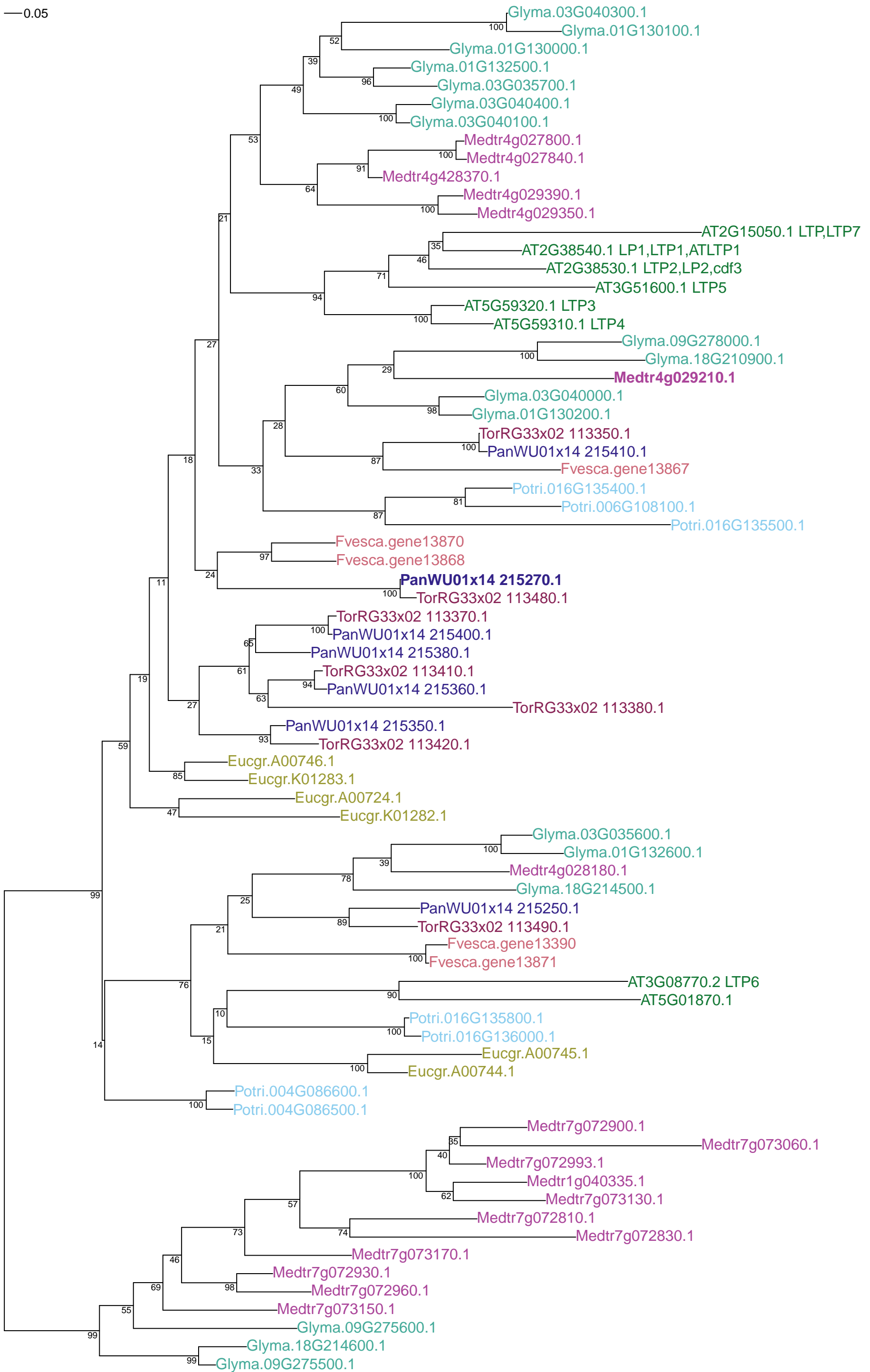


OG0000159: Other. Spastin



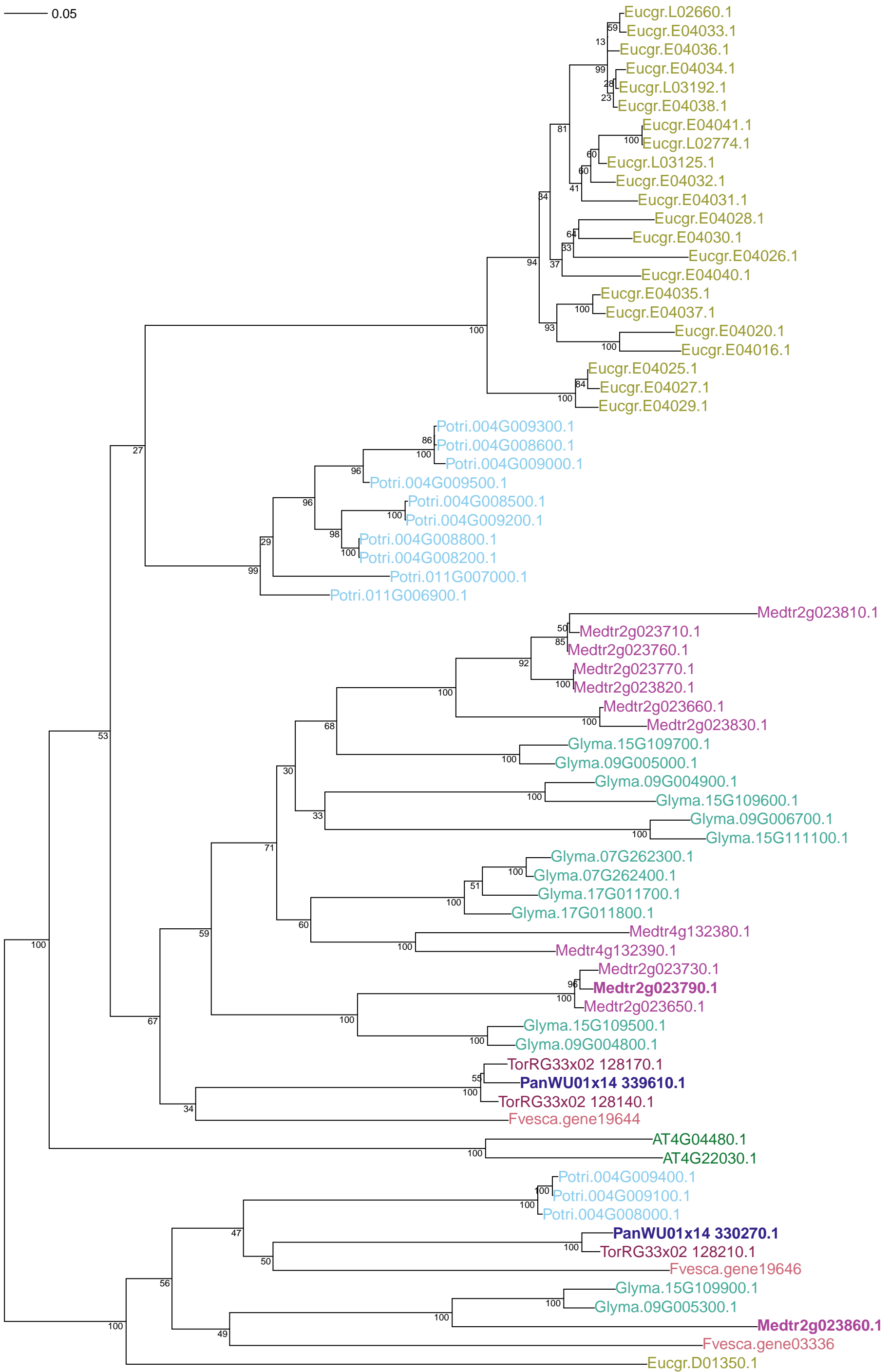
OG0000160: Other. Lipid transfer protein/Par allergen

—0.05

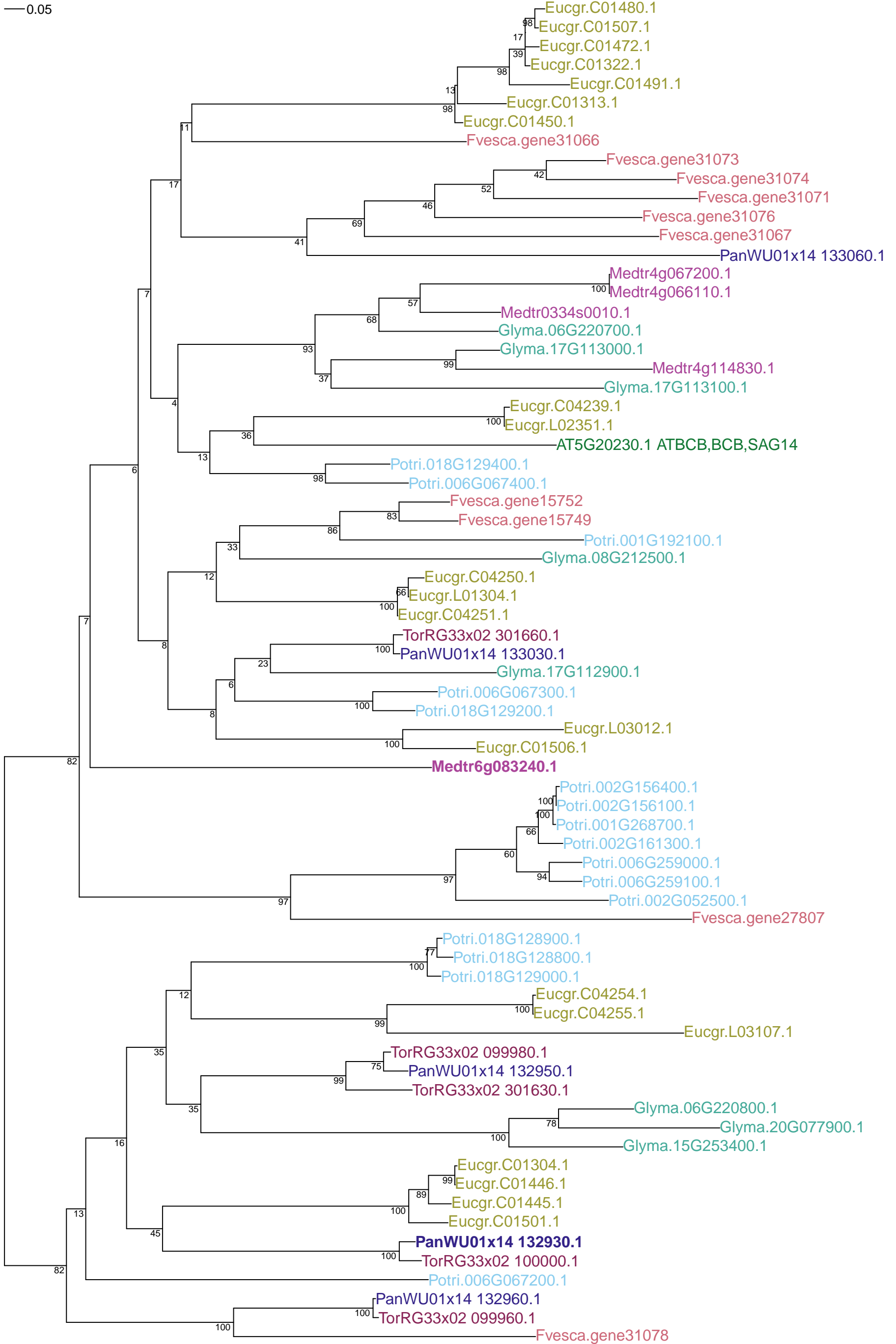


OG0000168: Other. Petal formation-expressed

0.05

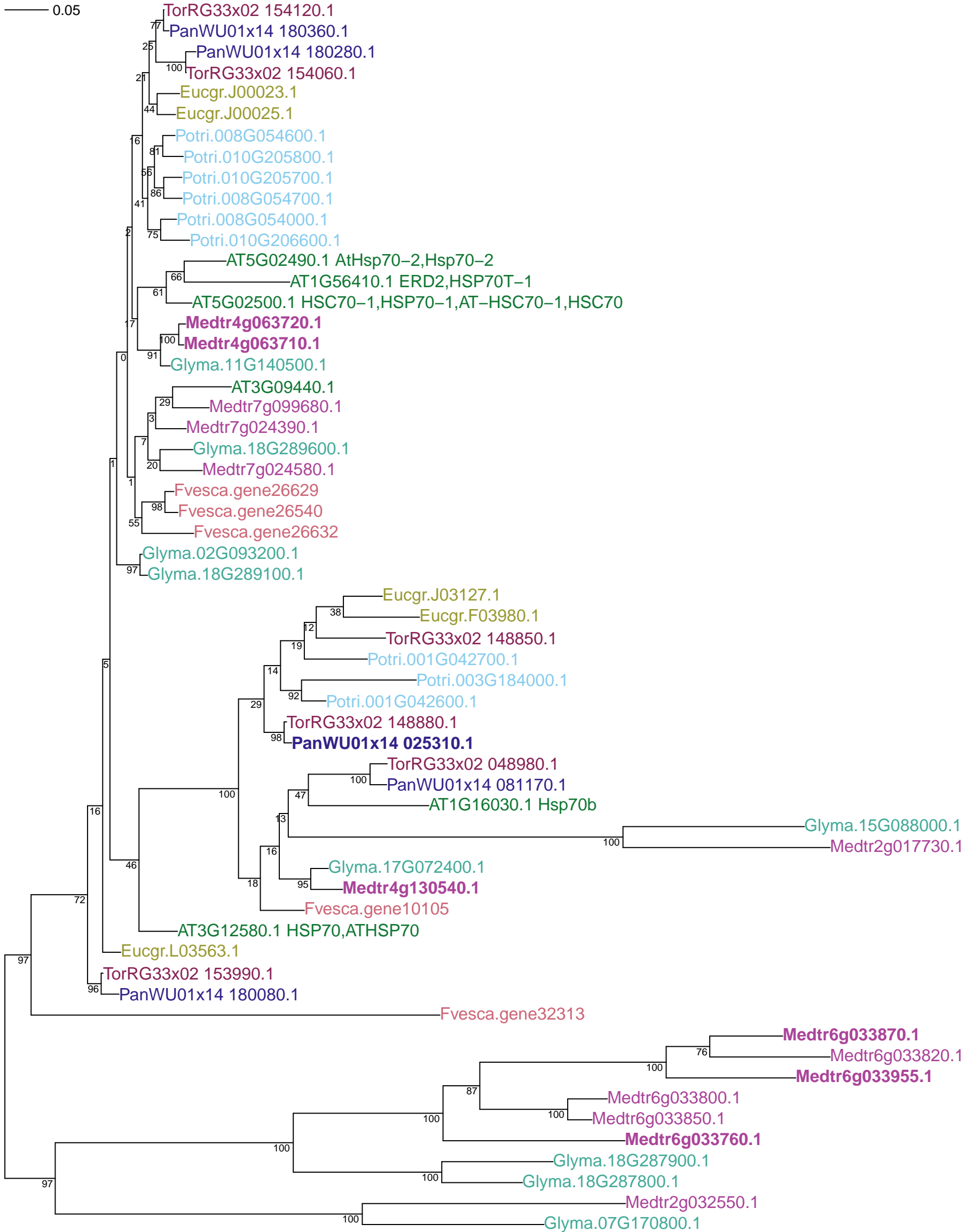


OG0000178: Other. Phycocyanin domain containing protein

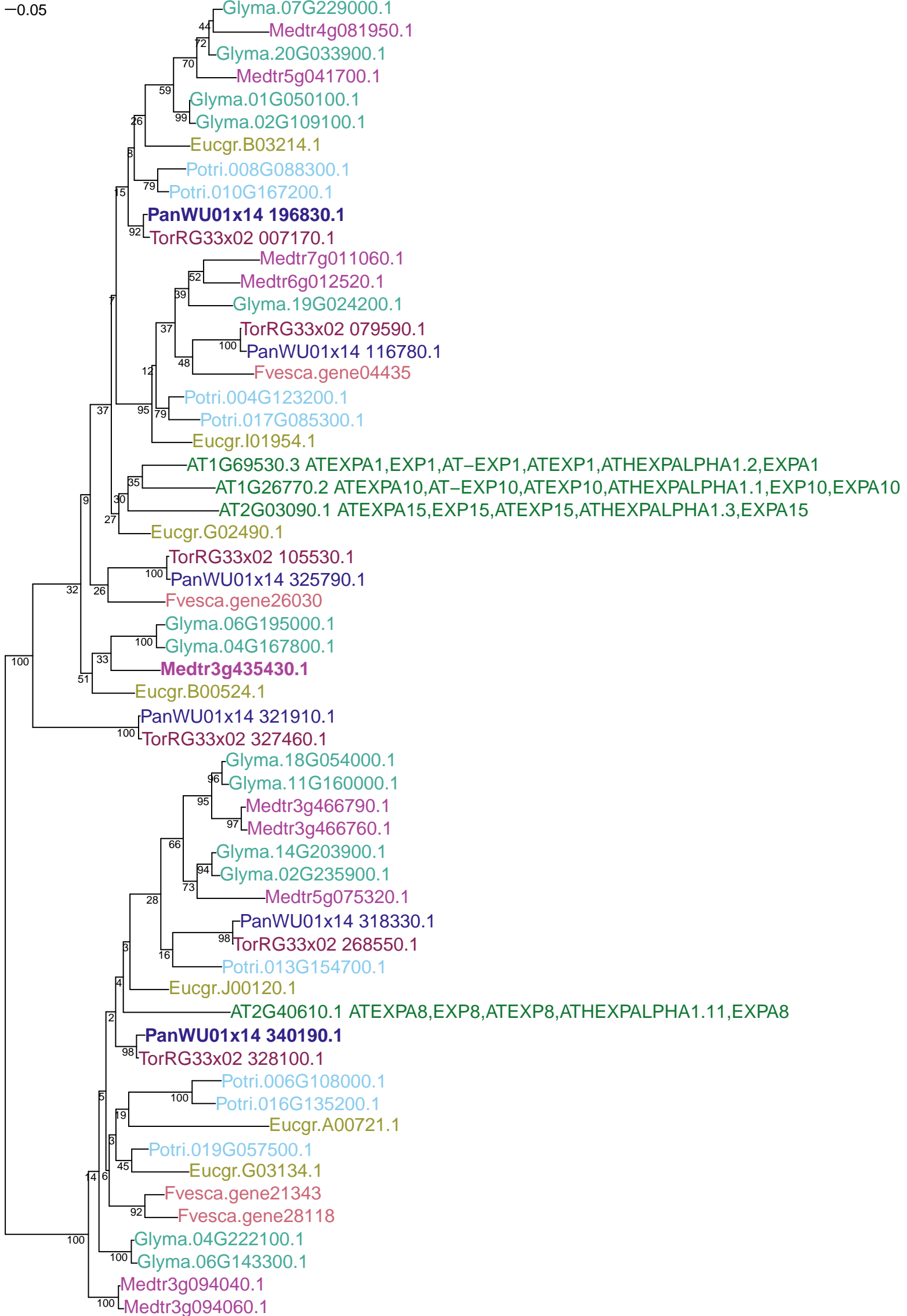


OG0000252: Other. Heat shock protein 70 family

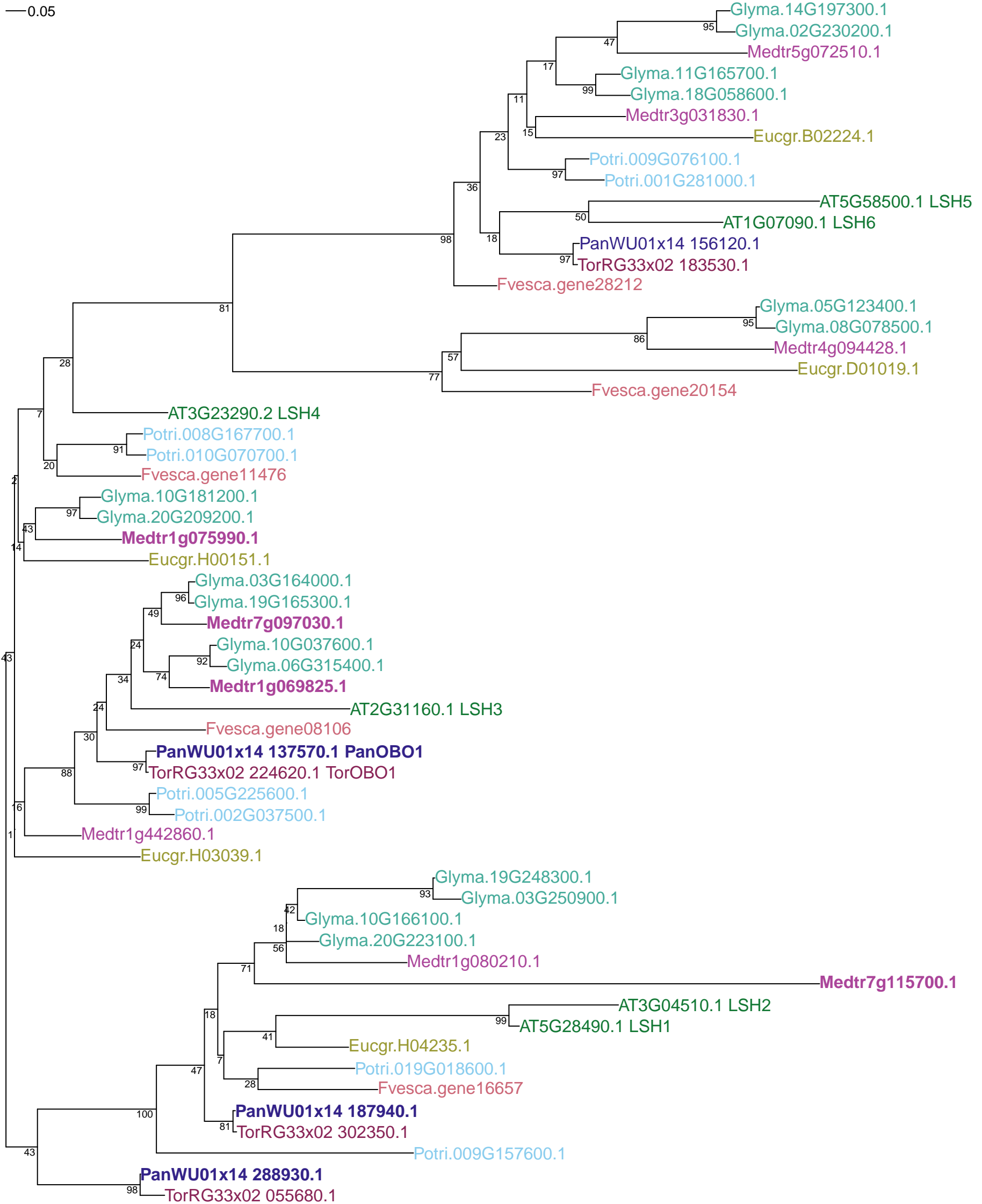
0.05



OG0000260: Other. Expansin

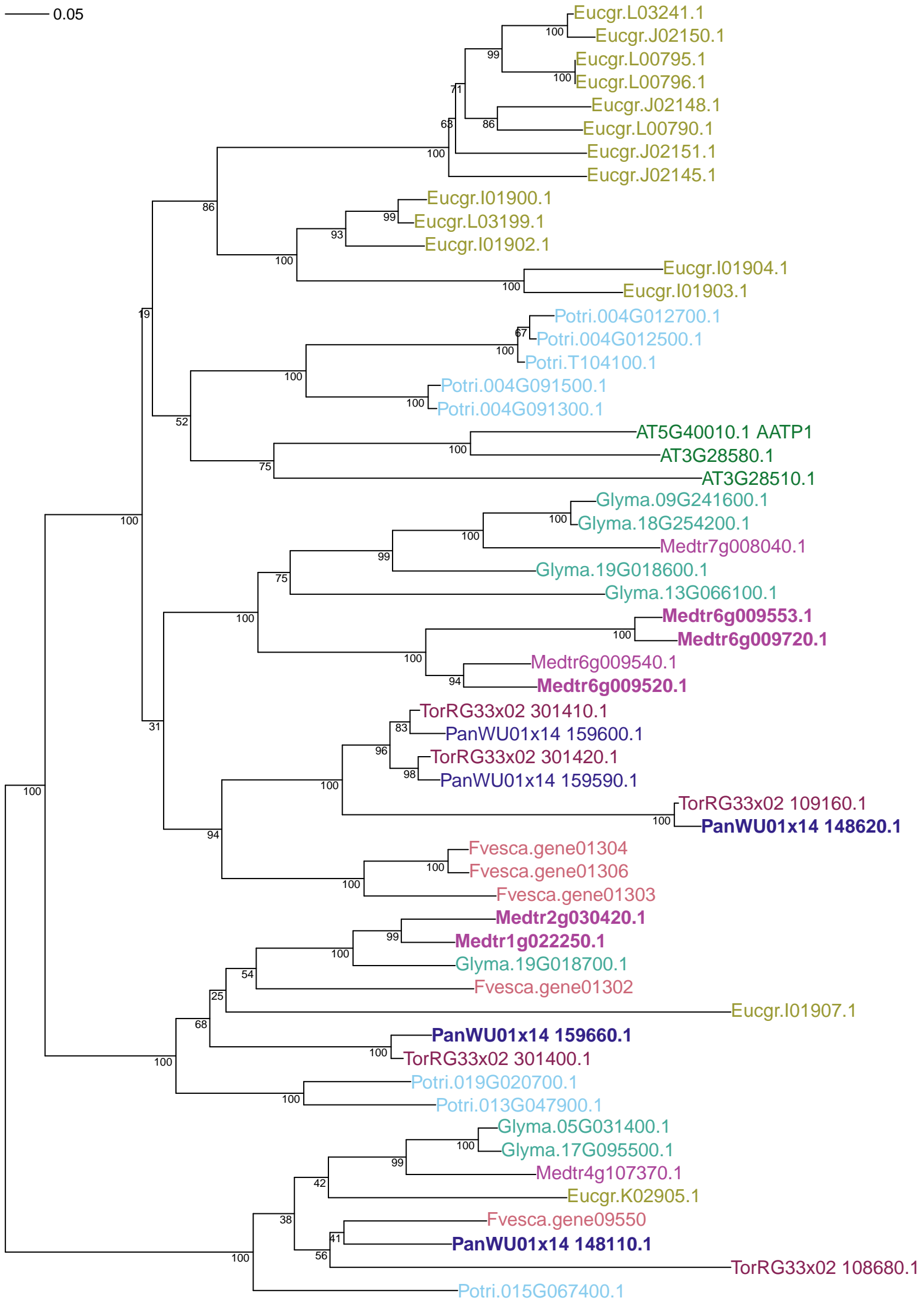


OG0000265: Other. ALOG domain containing protein



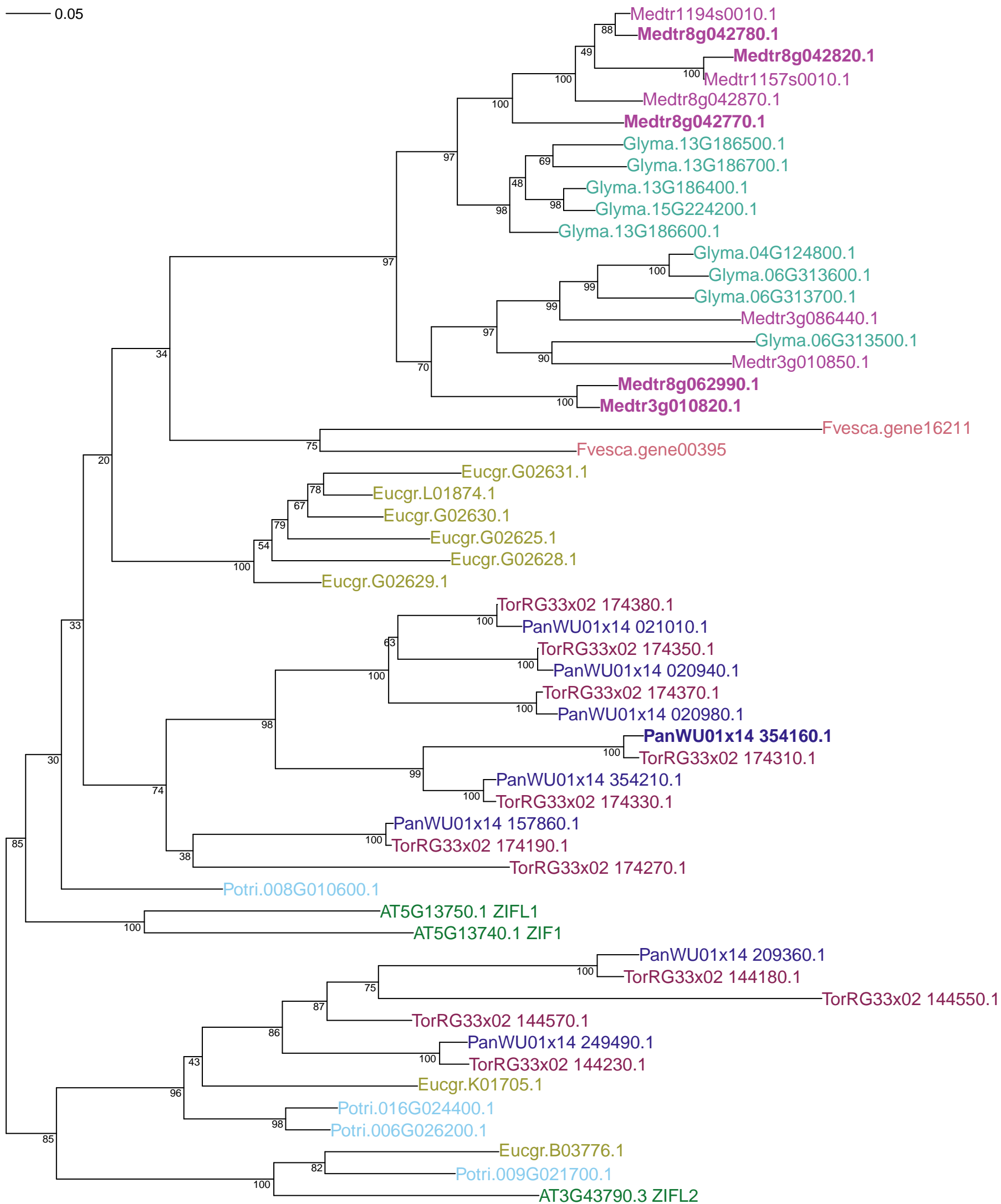
OG0000273: Other. Spastin

0.05

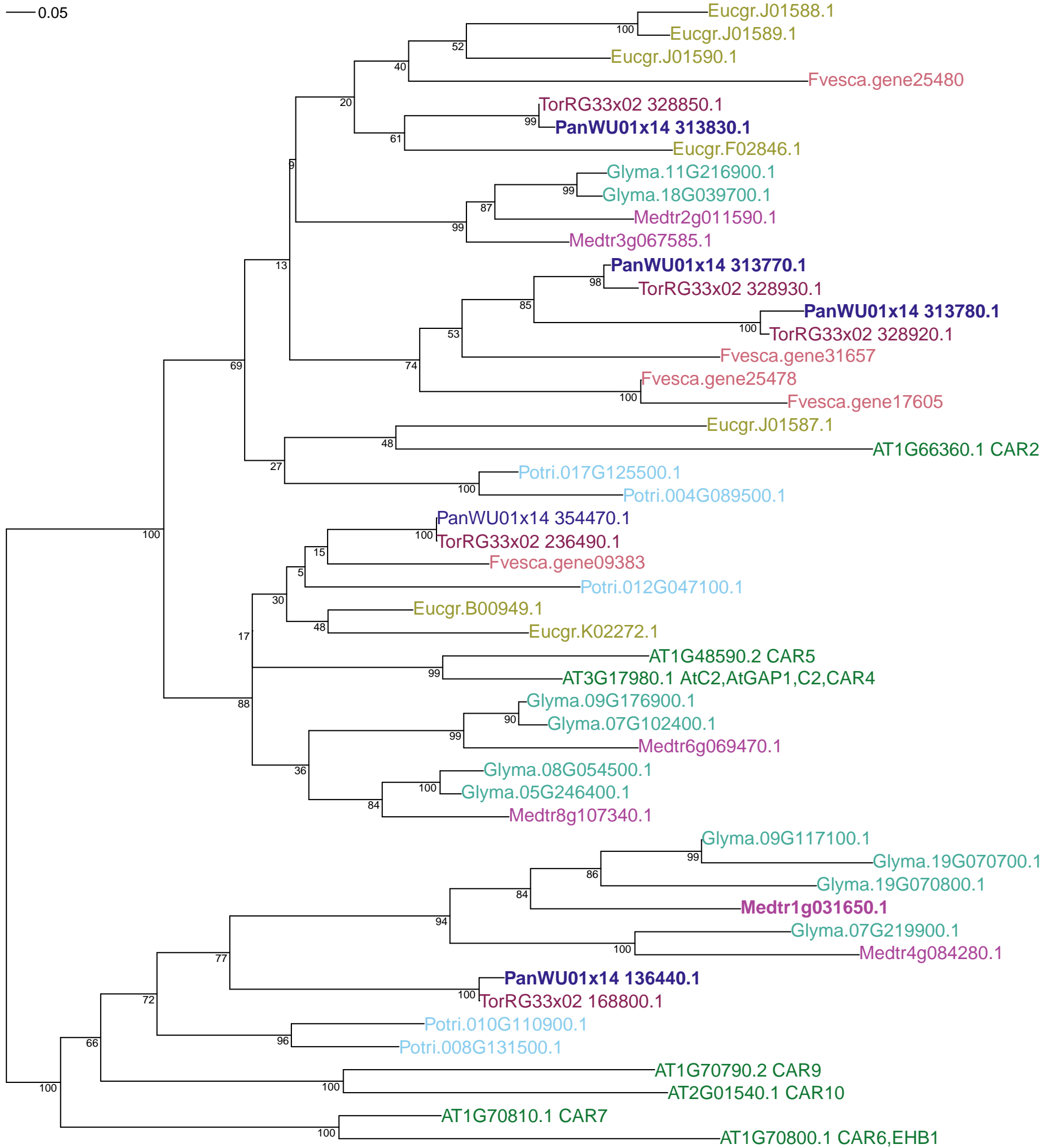


OG0000281: Other. Tetracycline resistance protein/multidrug resistance protein

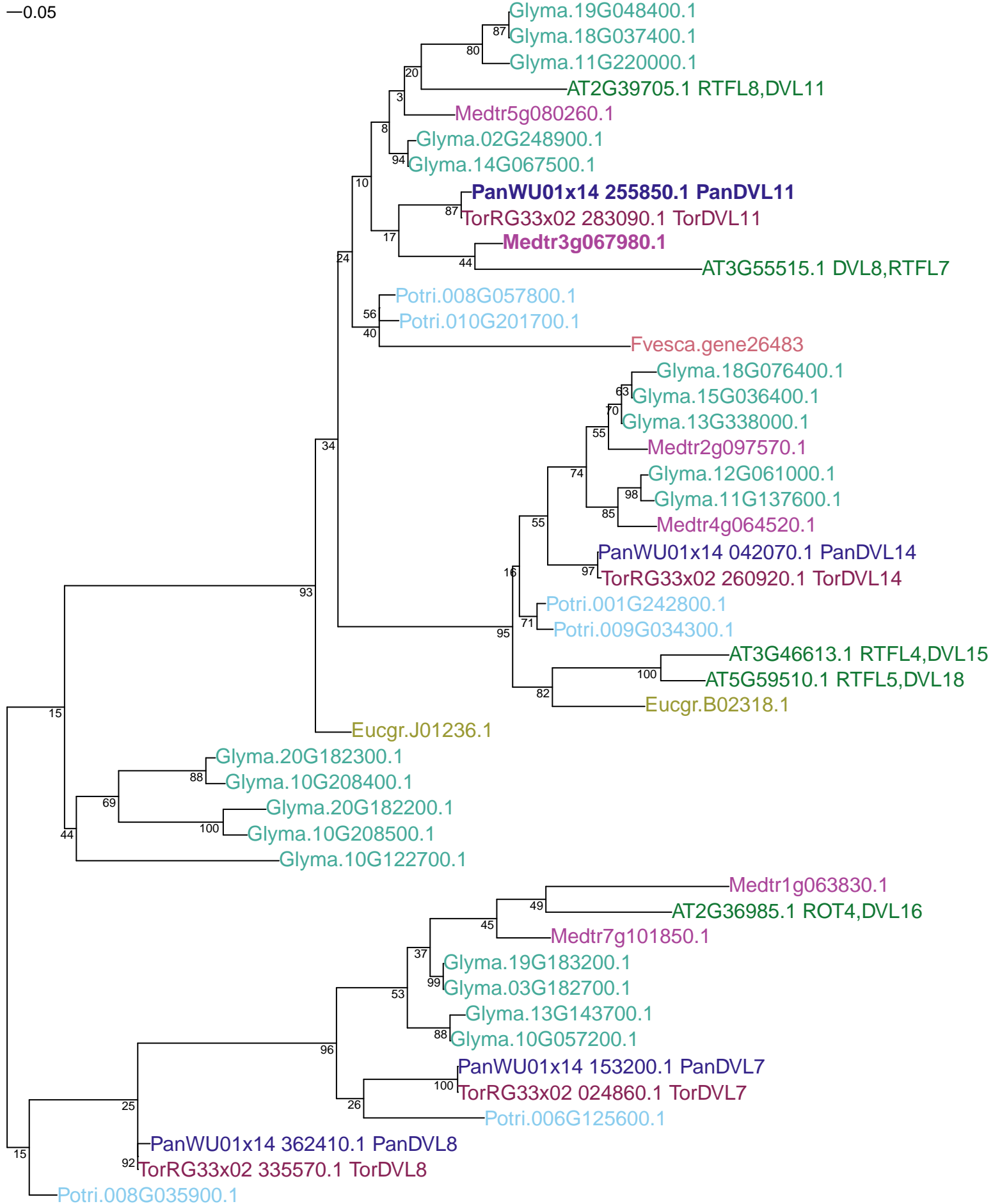
0.05



OG0000324: Other. C2 domain containing protein

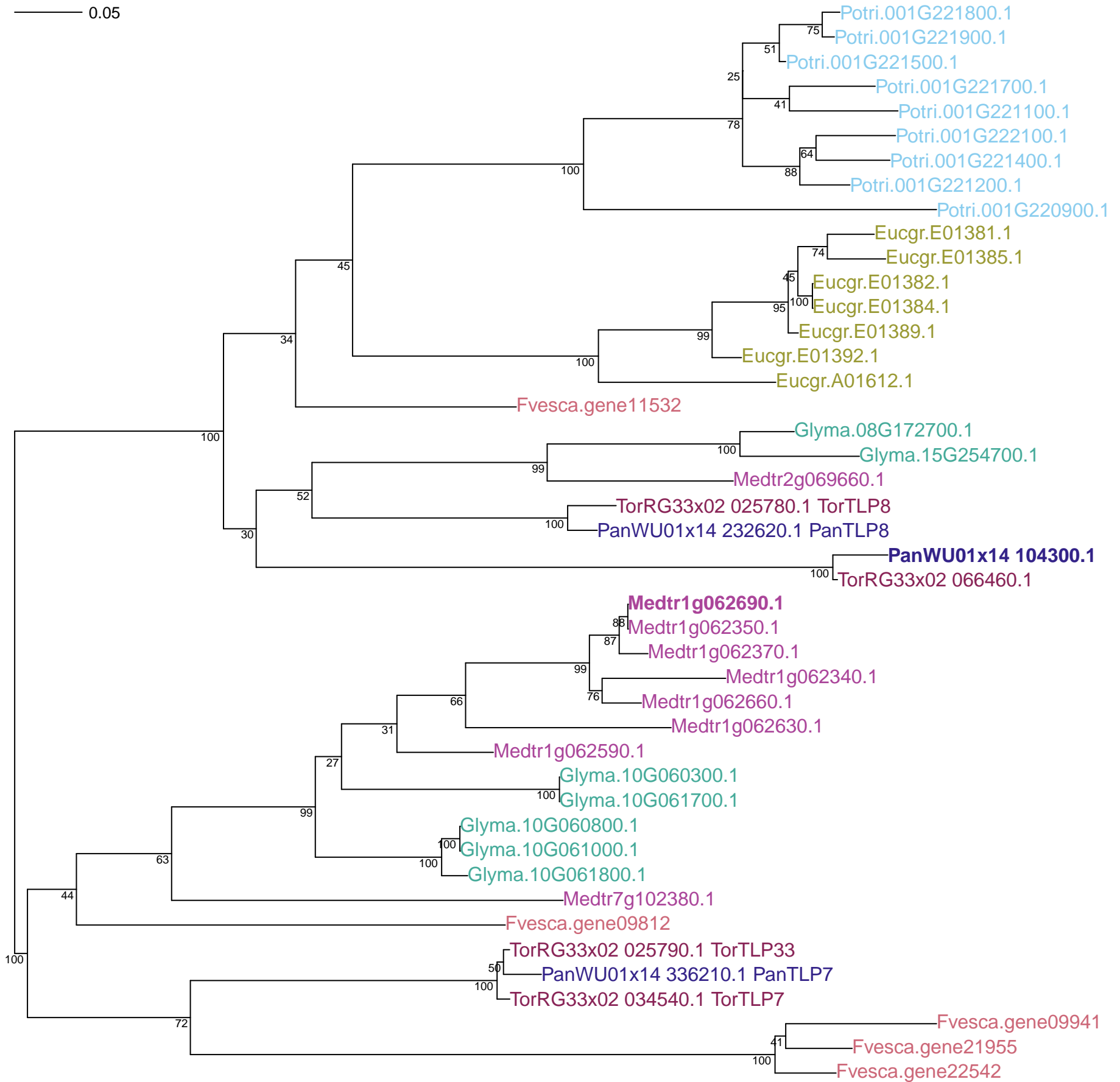


OG0000356: Other. DEVIL-like protein

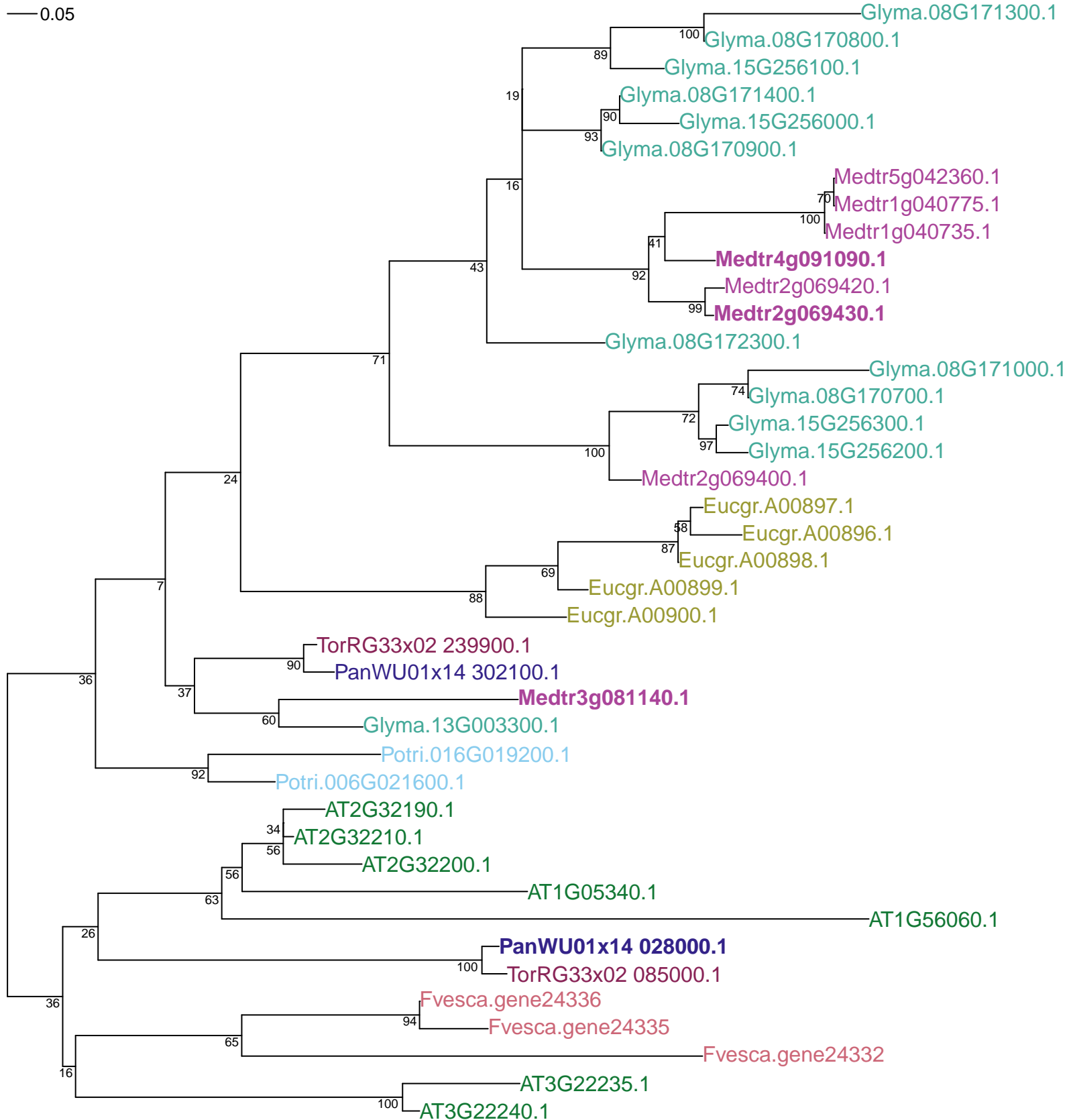


OG0000411: Other. Thaumatin

0.05

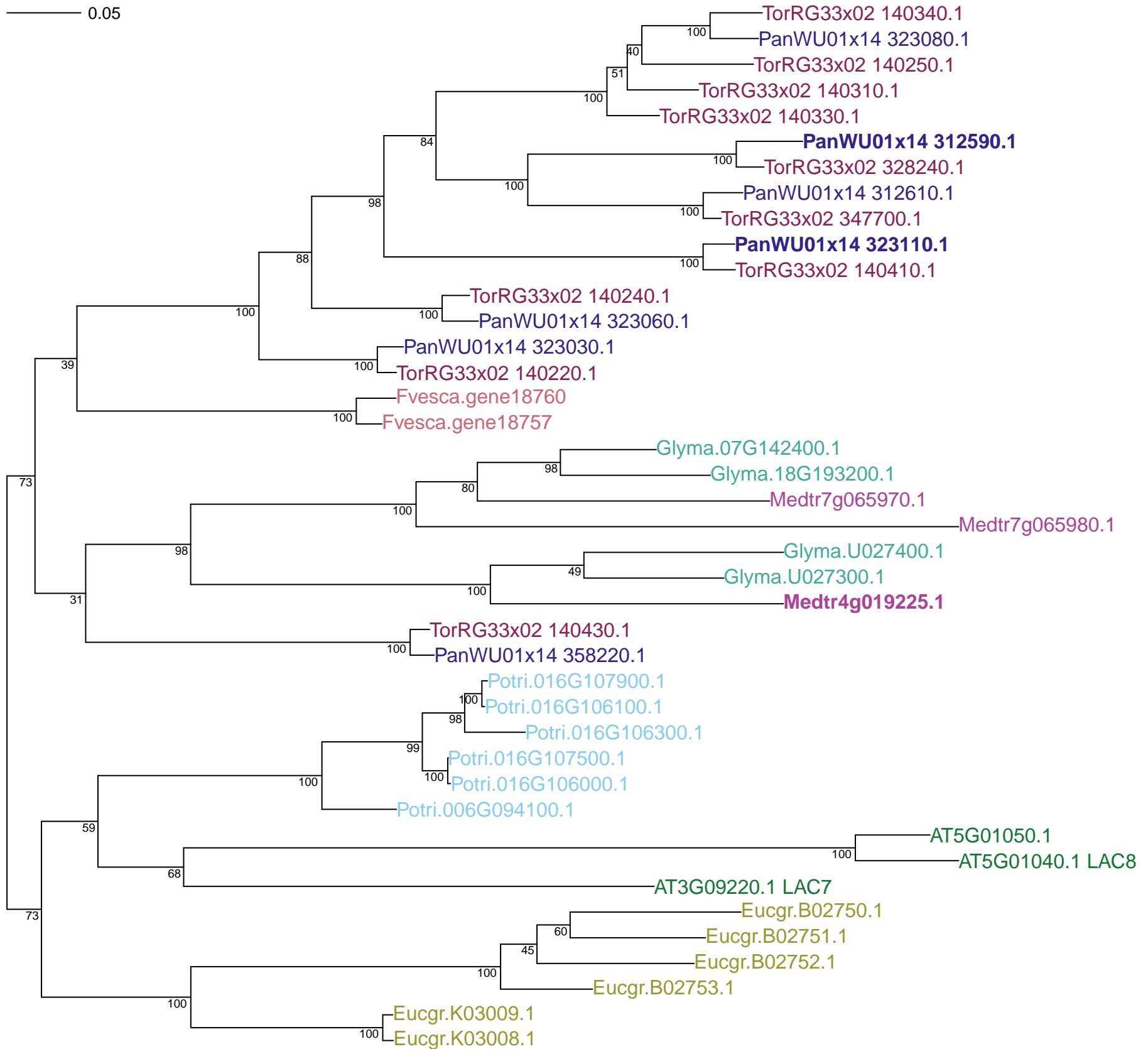


OG0000455: Other. Cysteine-rich transmembrane CYSTM domain containing protein



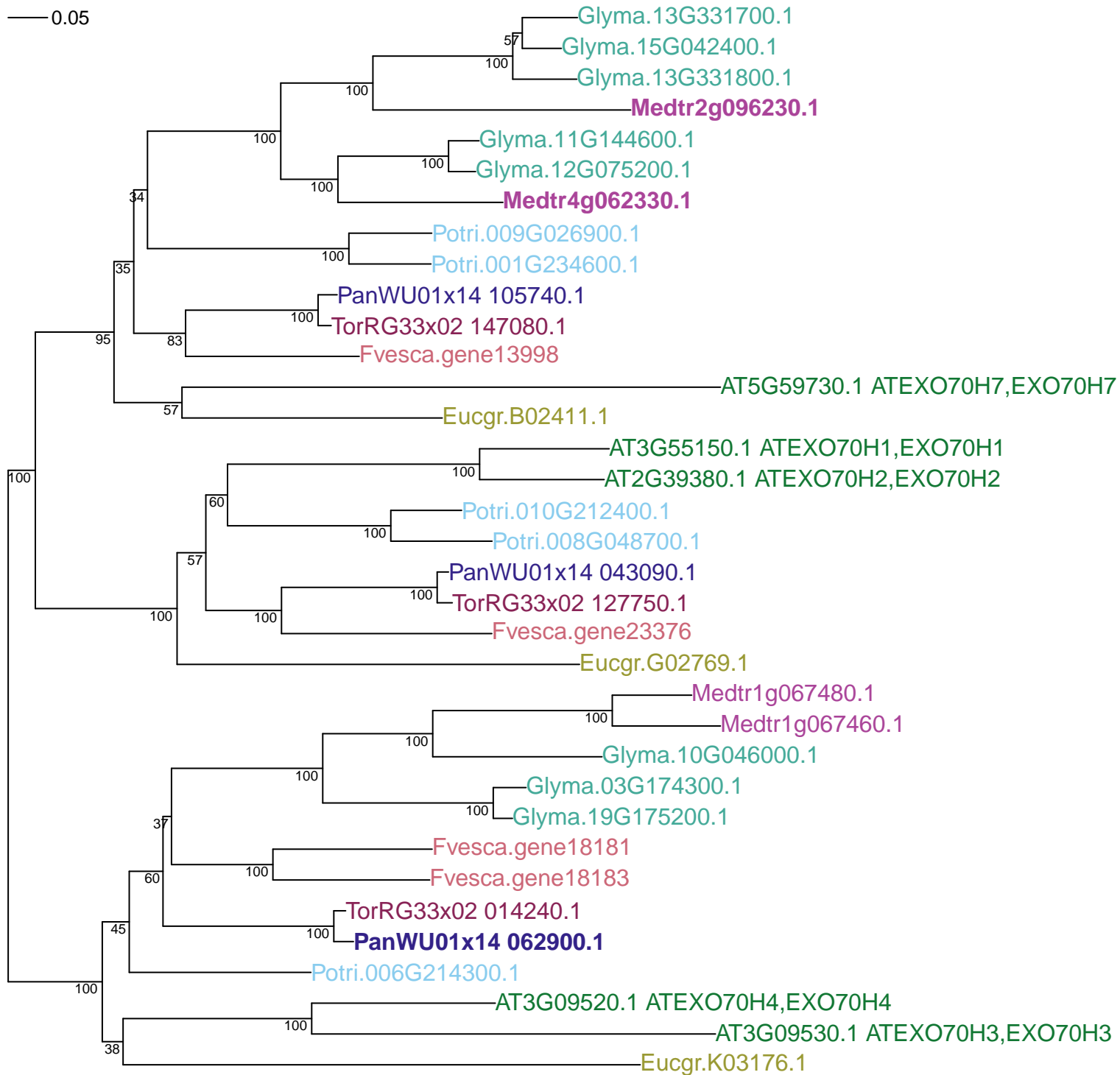
OG0000465: Other. Copper-resistance protein

0.05

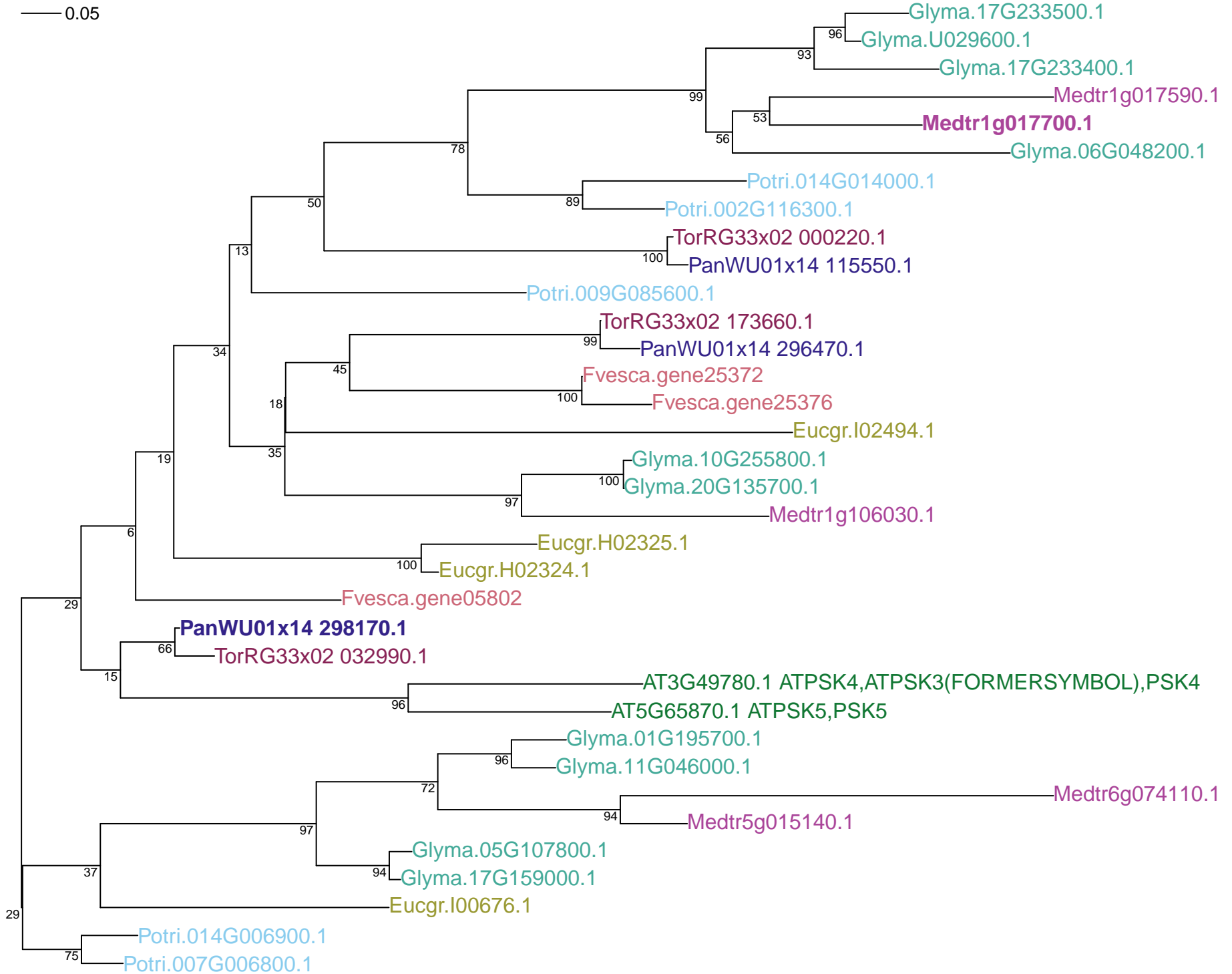


OG0000621: Other. Exocyst complex protein

— 0.05

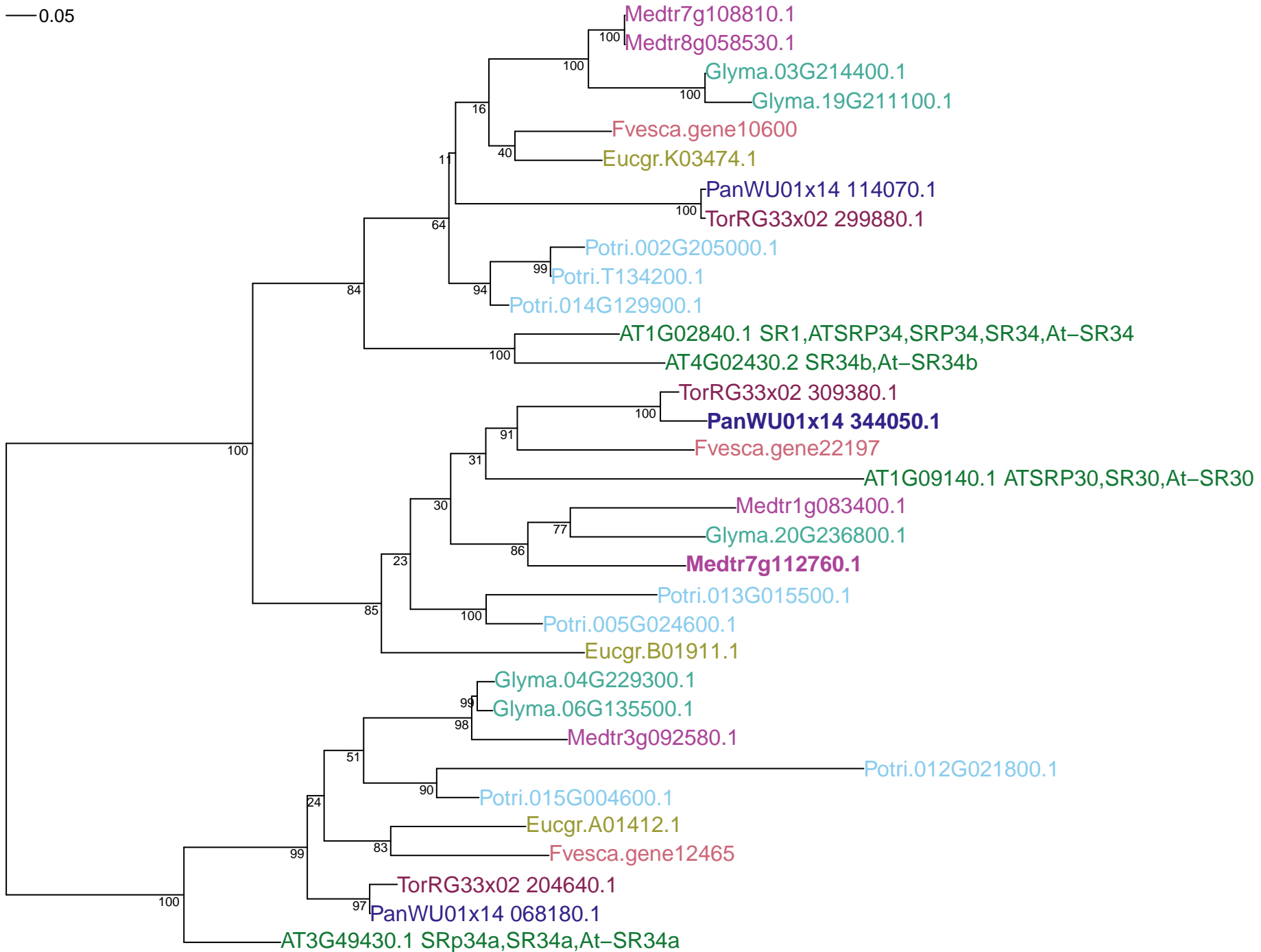


OG0000625: Other. Phytosulfokine

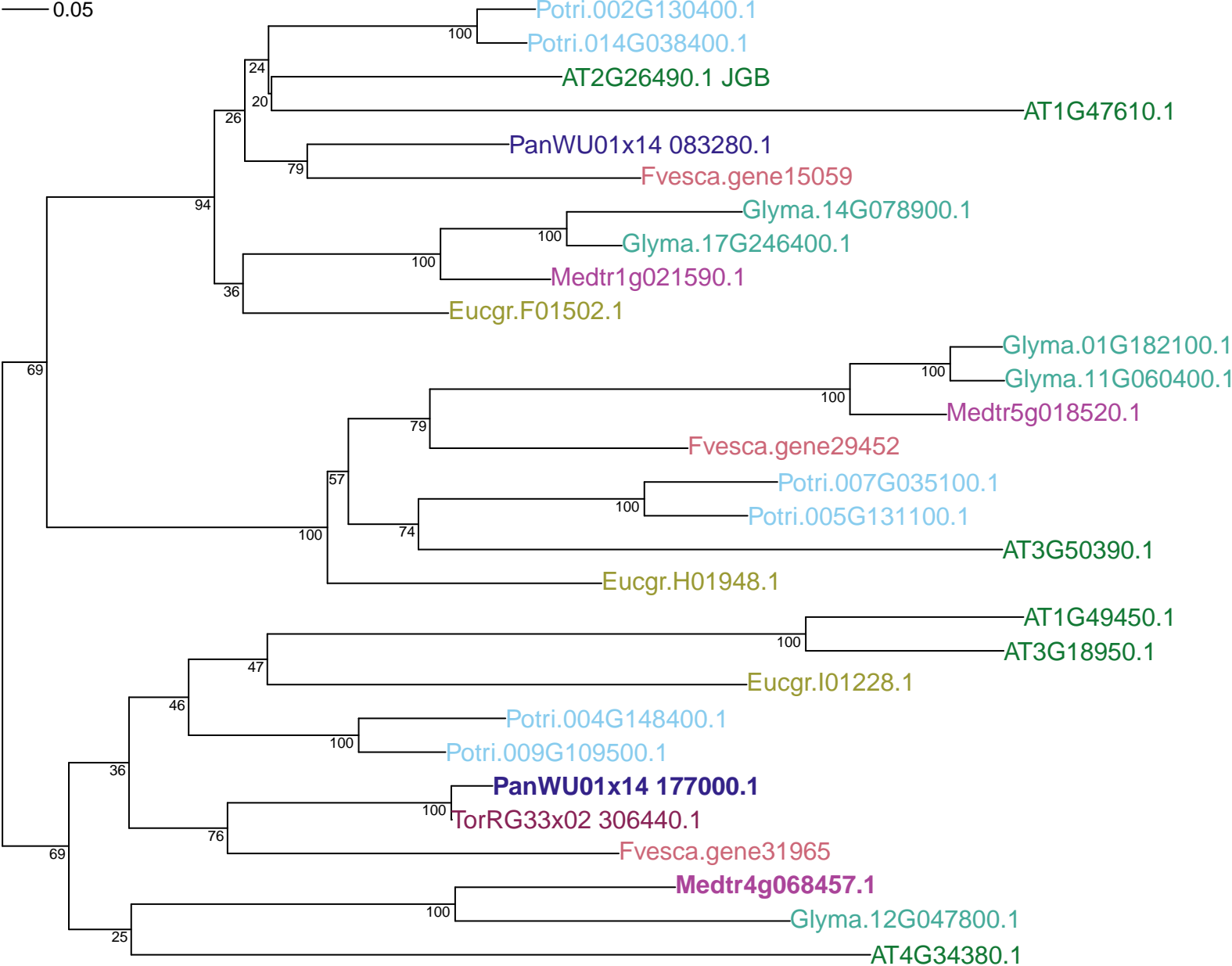


OG0000675: Other. Splicing factor-like protein

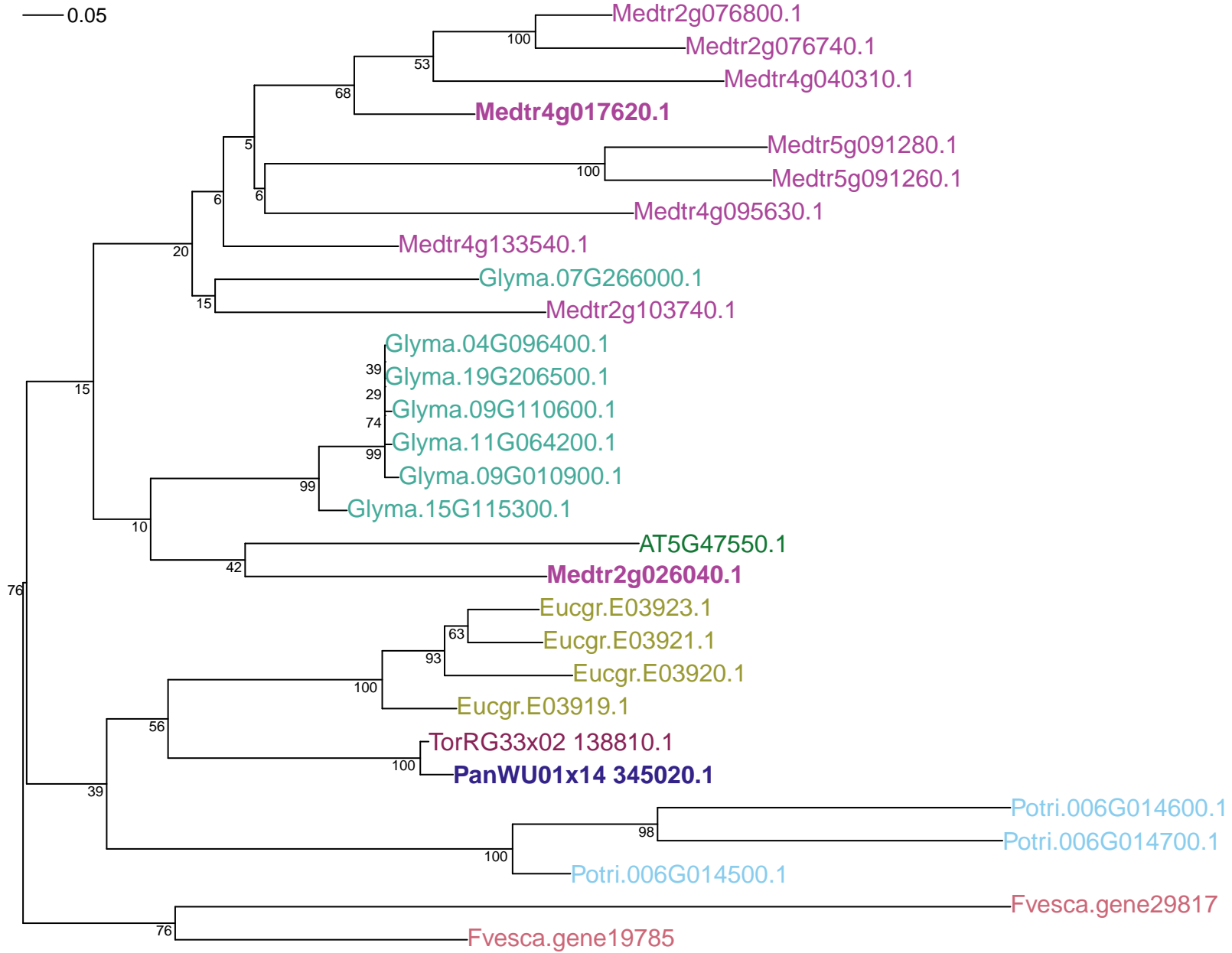
—0.05



OG0000860: Other. Coatomer beta subunit

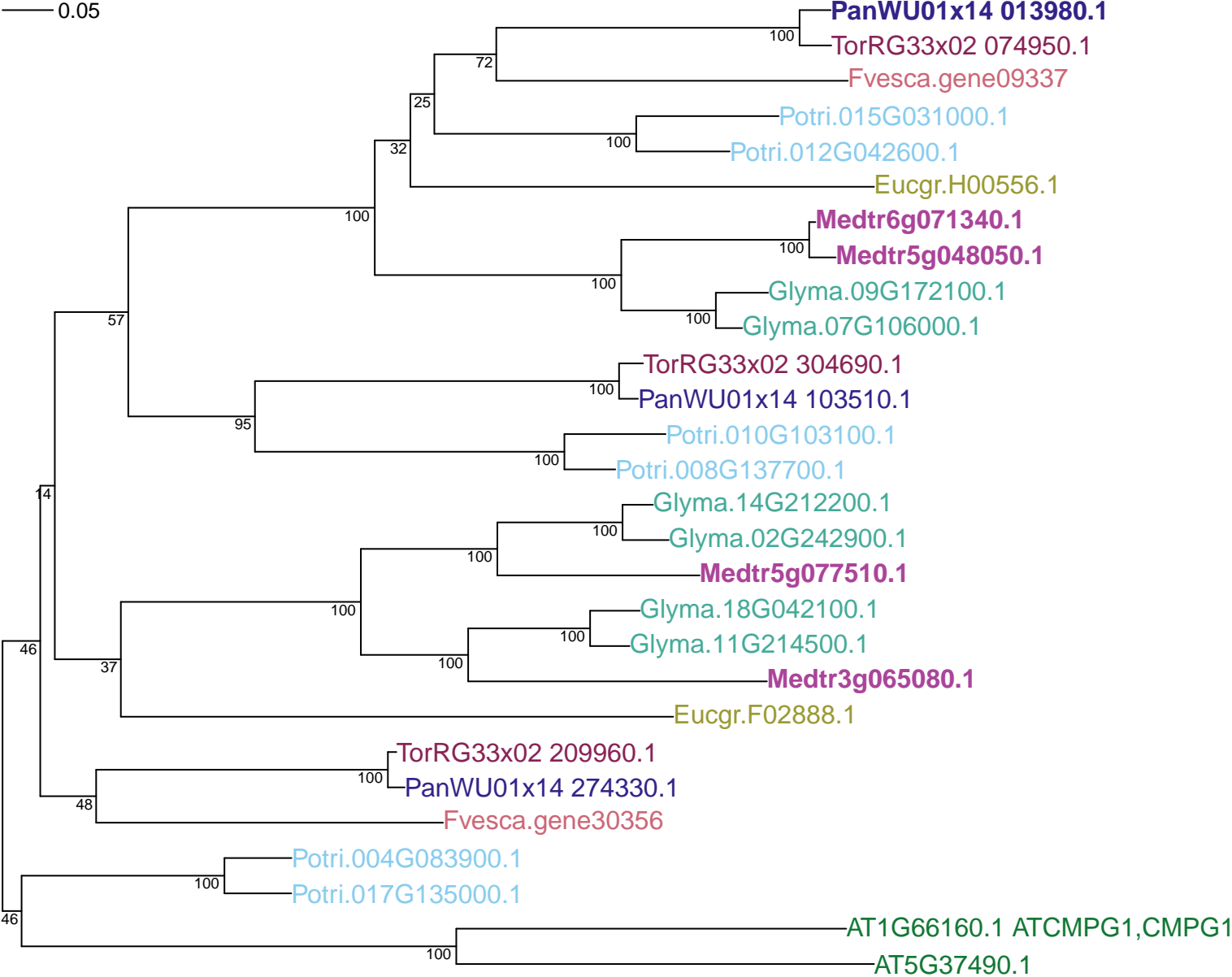


OG0000912: Other. Cystatin

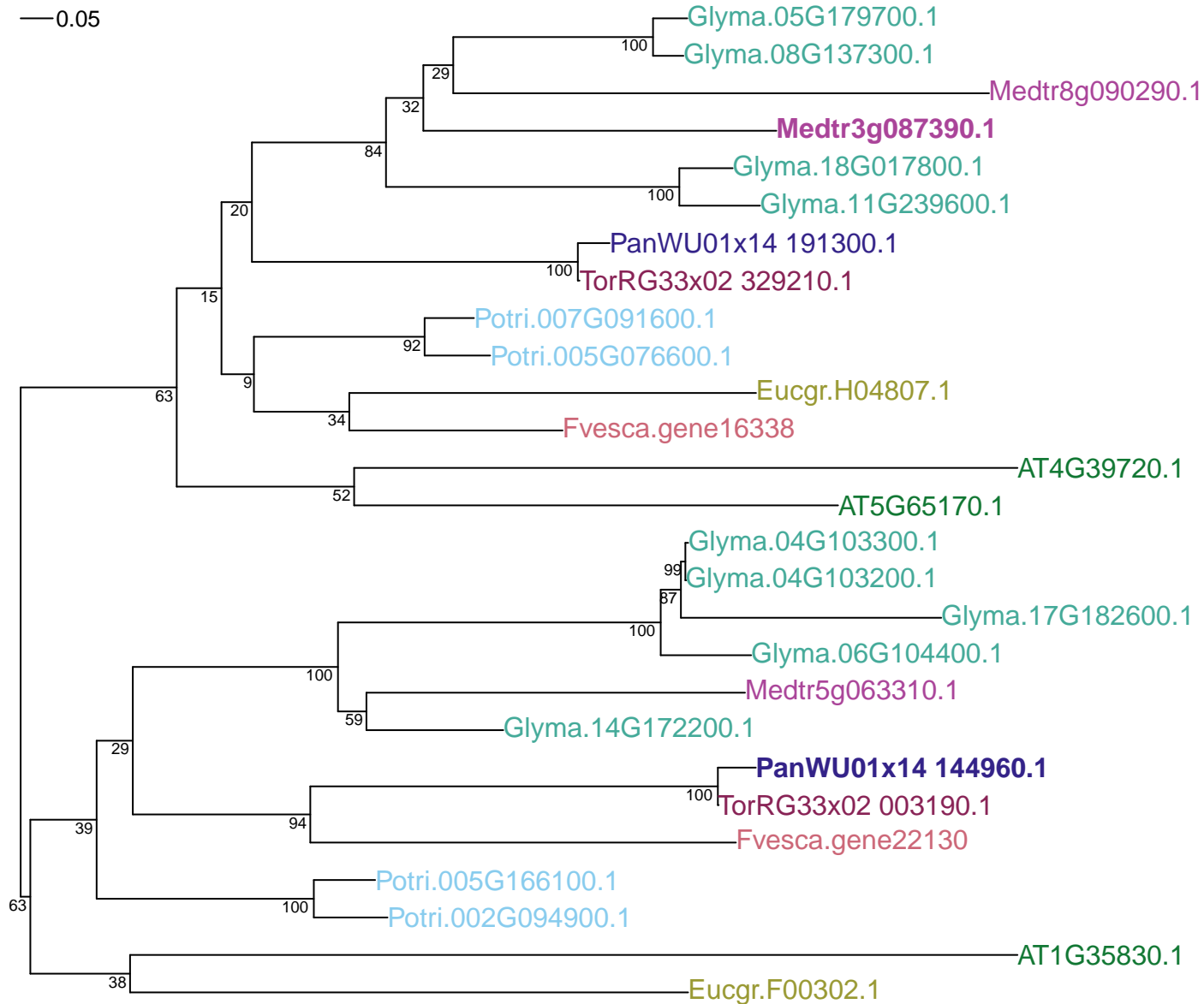


OG0000967: Other. Coatomer beta subunit

— 0.05

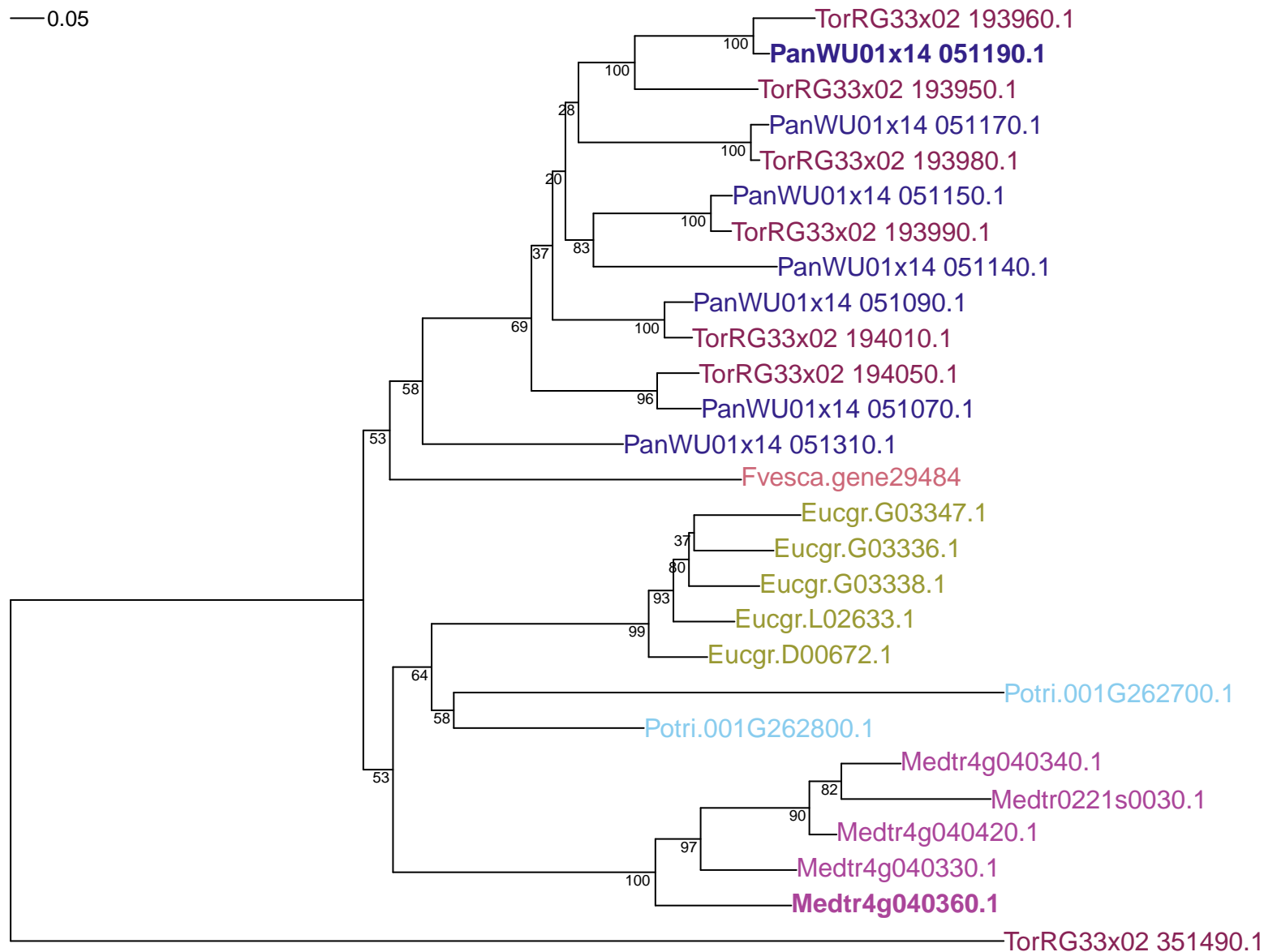


OG0001031: Other. VQ motif containing protein



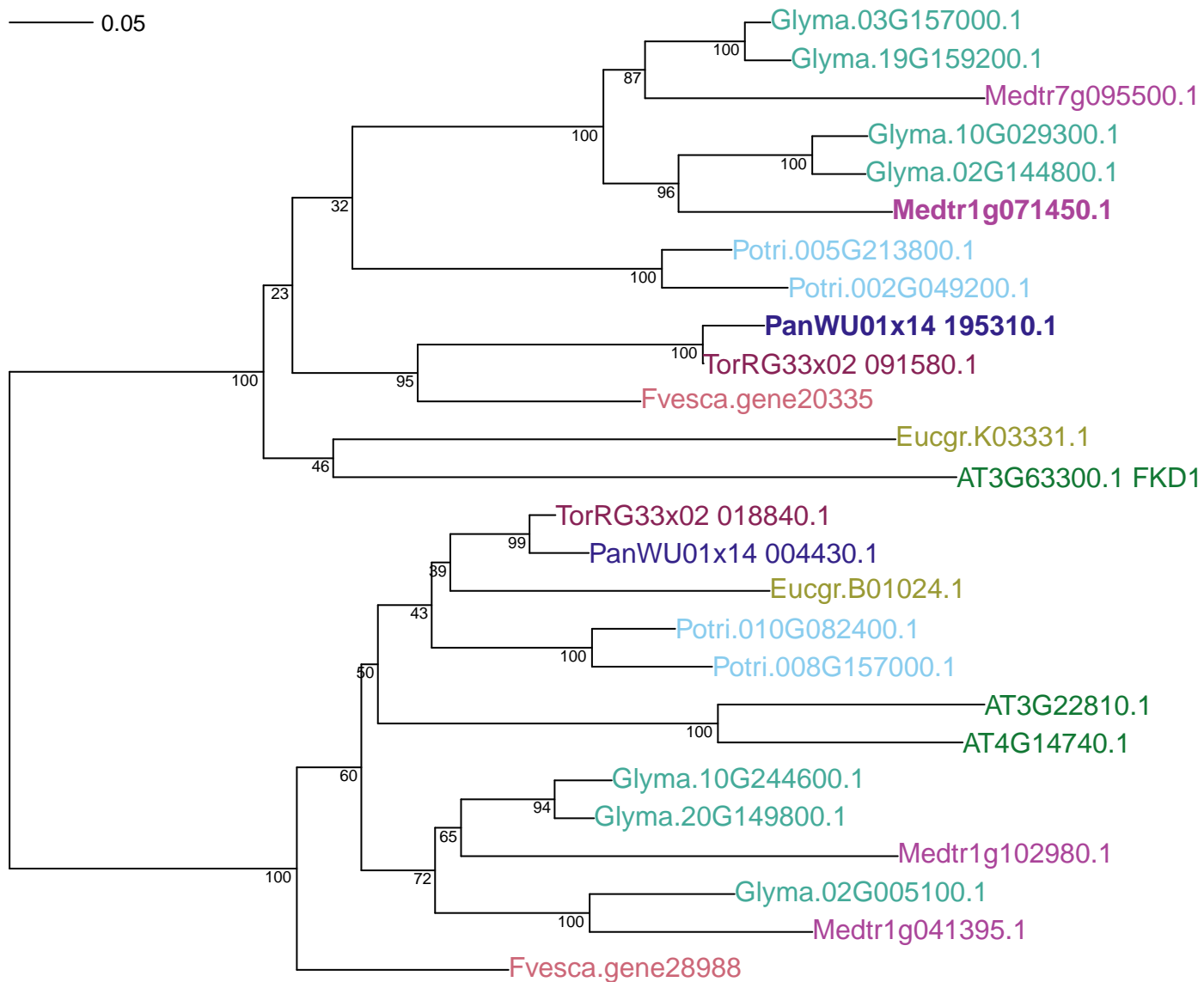
OG0001082: Other. Leucine-rich repeat domain containing protein

—0.05

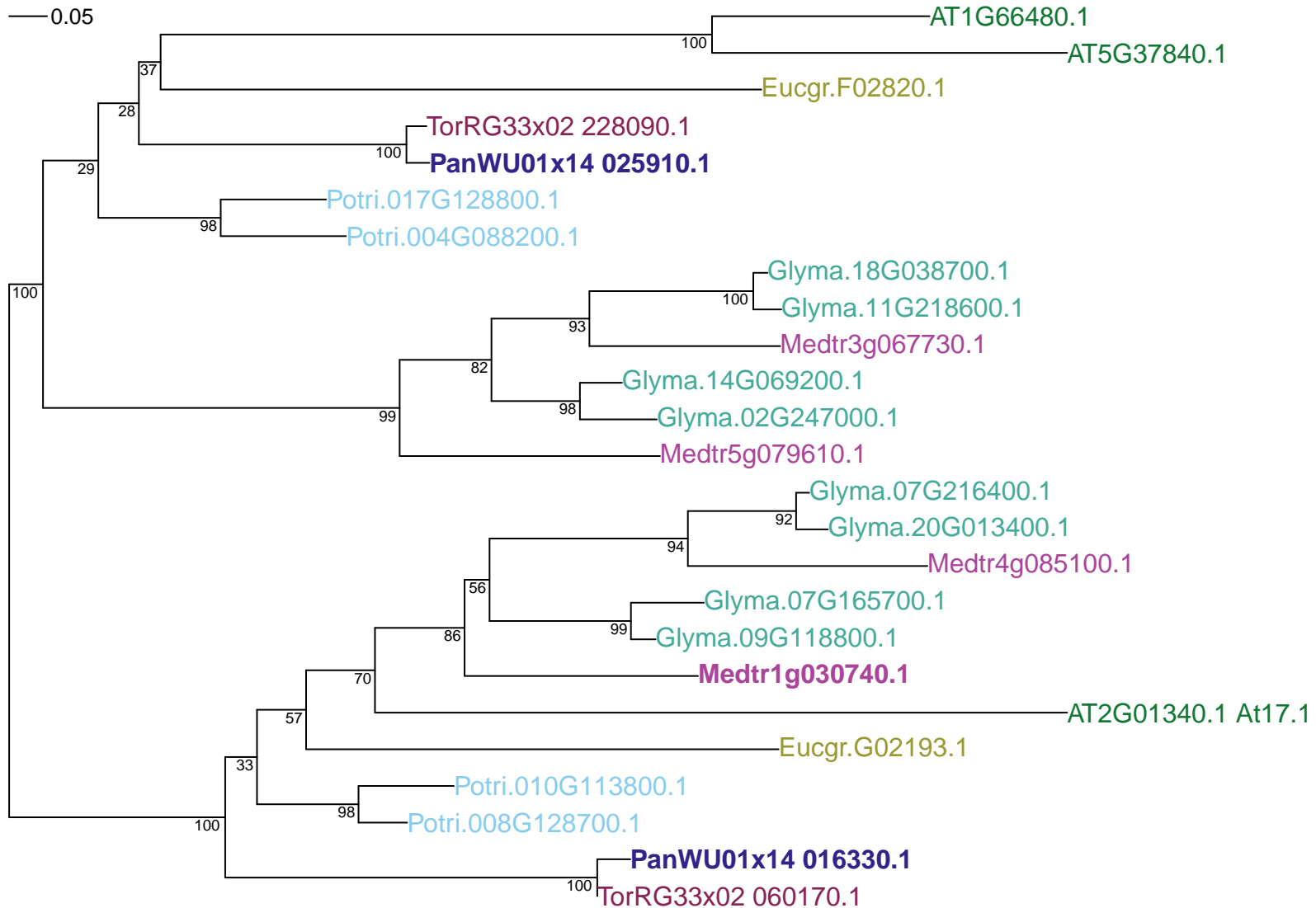


OG0001165: Other. Pleckstrin-like

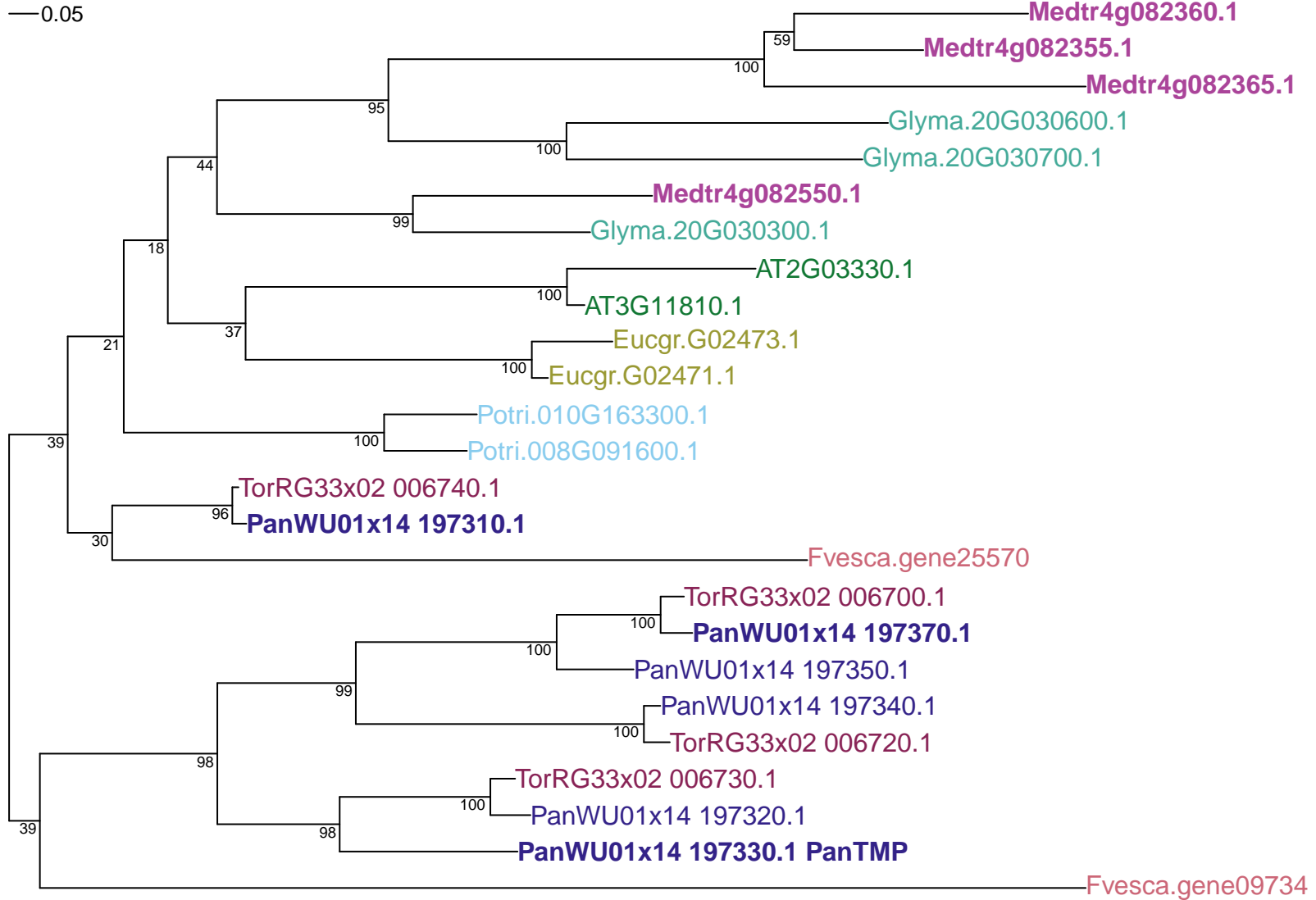
0.05



OG0001238: Other. plastid movement impaired protein

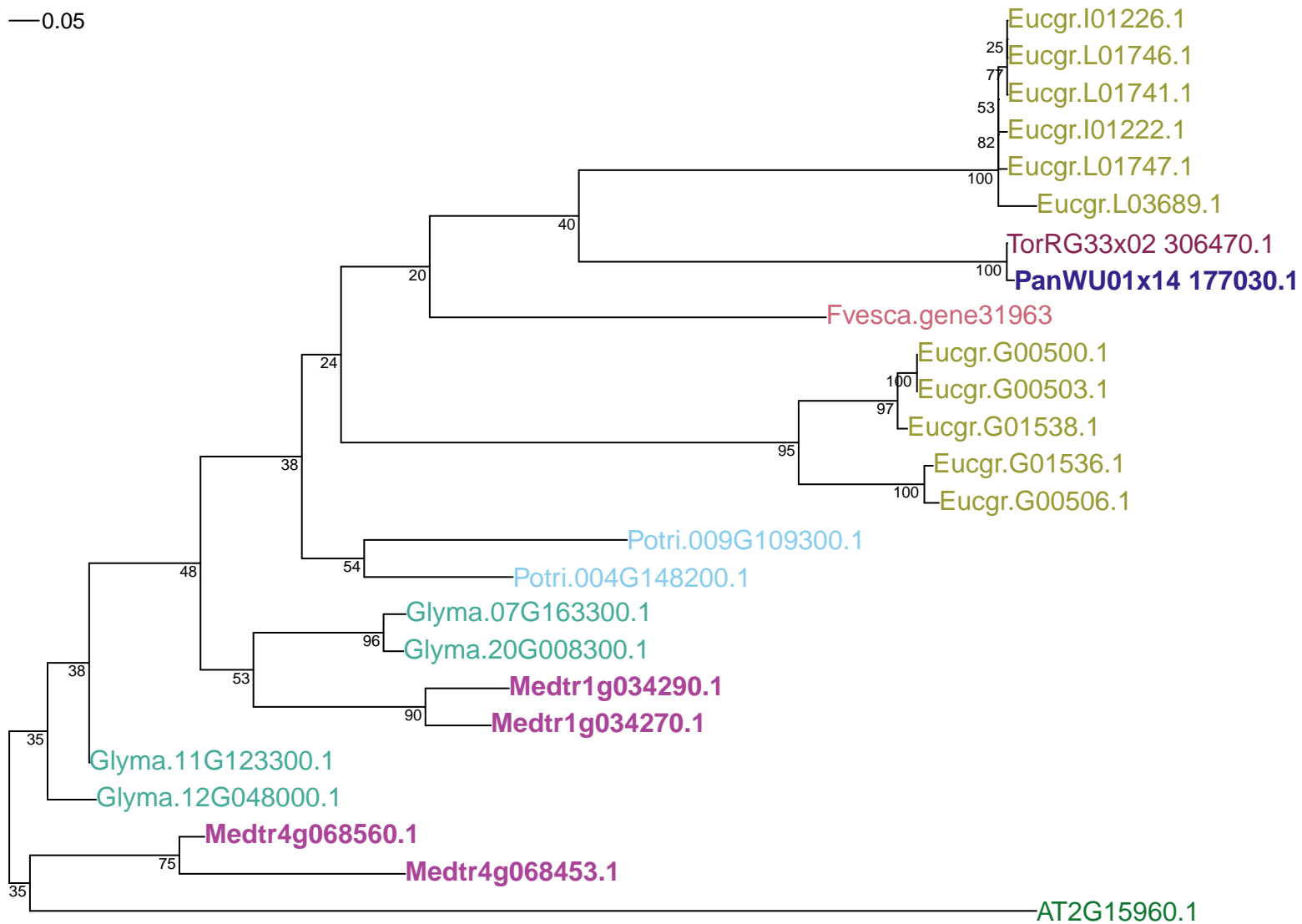


OG0001244: Other. Transmembrane protein

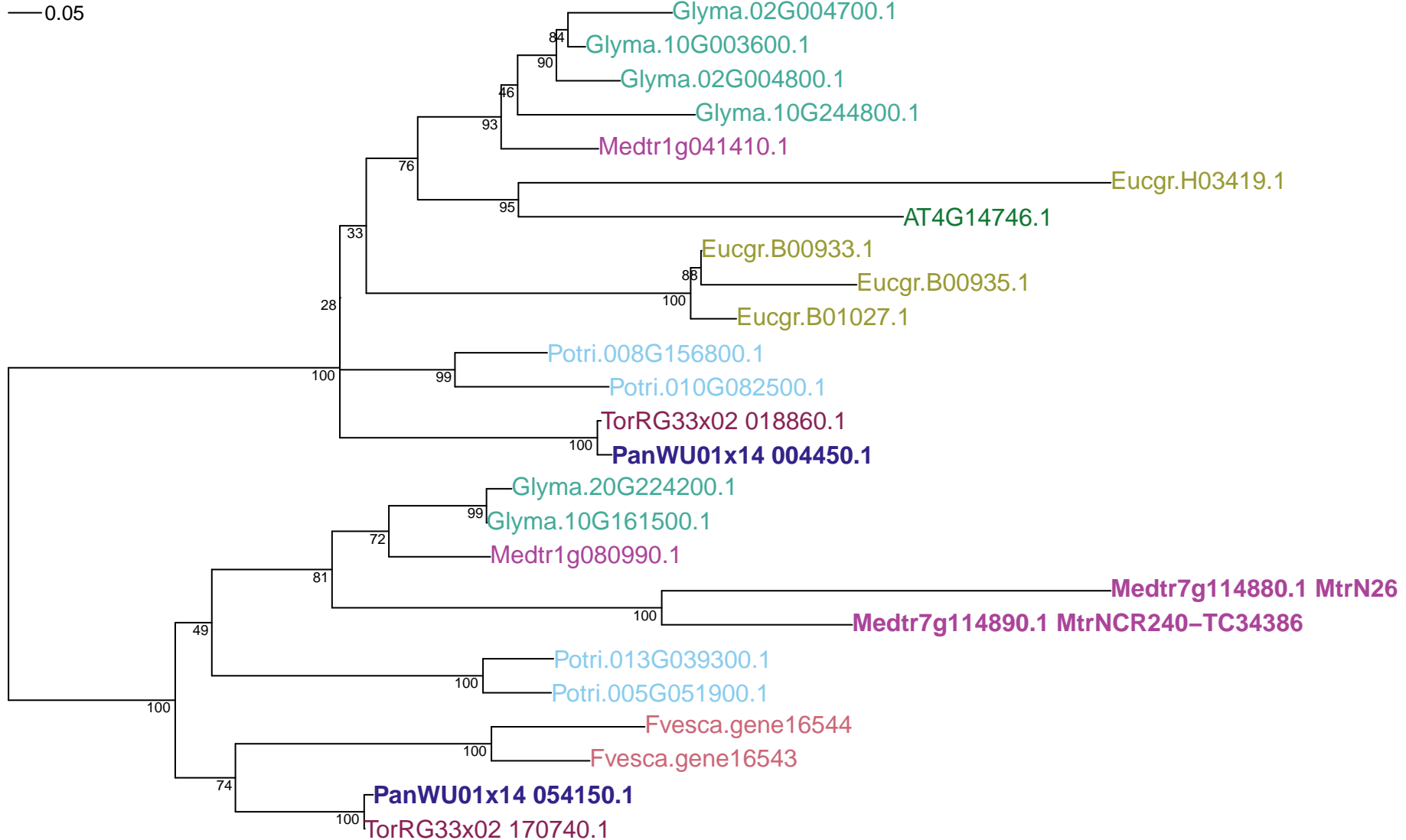


OG0001255: Other. stress-induced protein

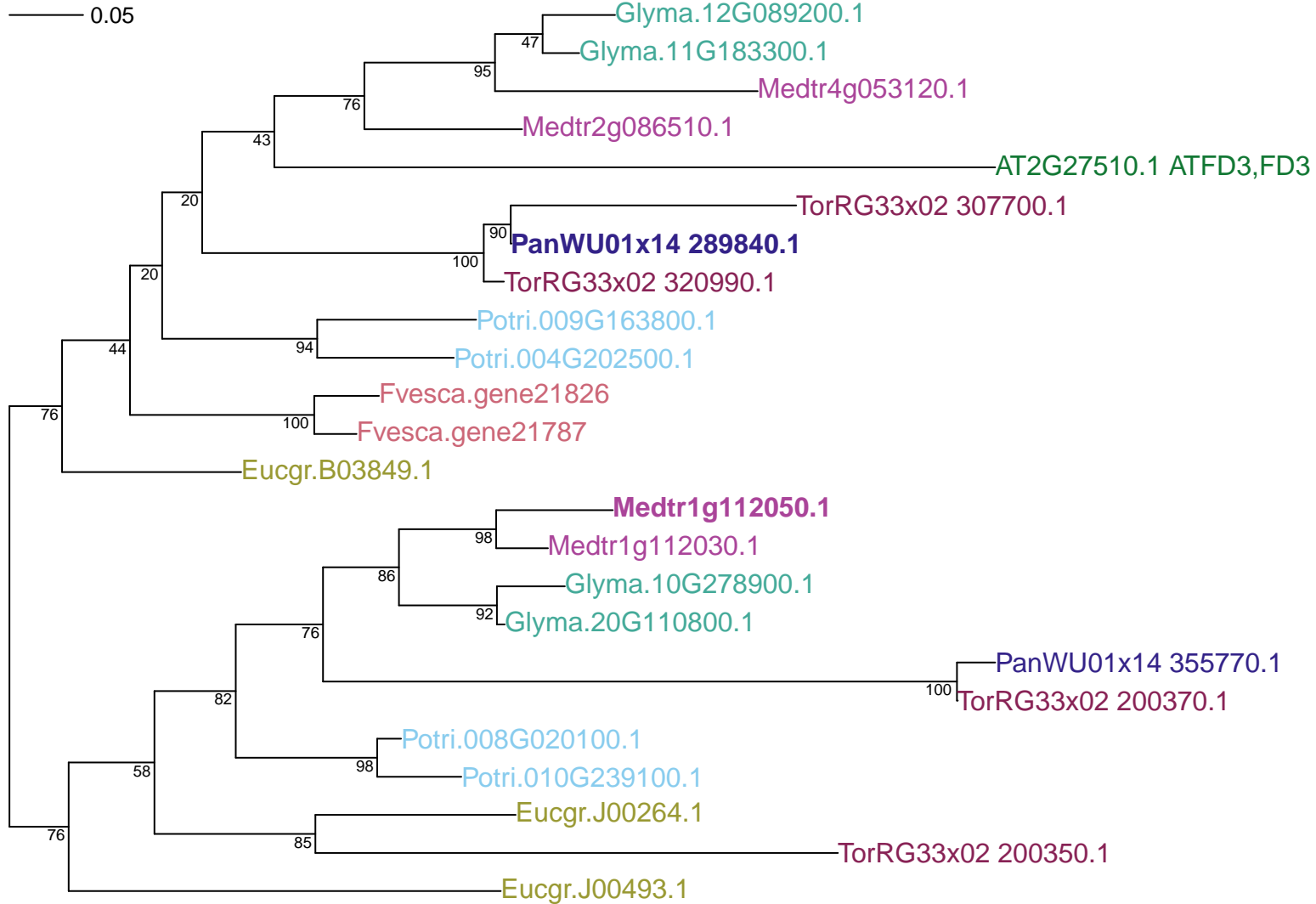
—0.05



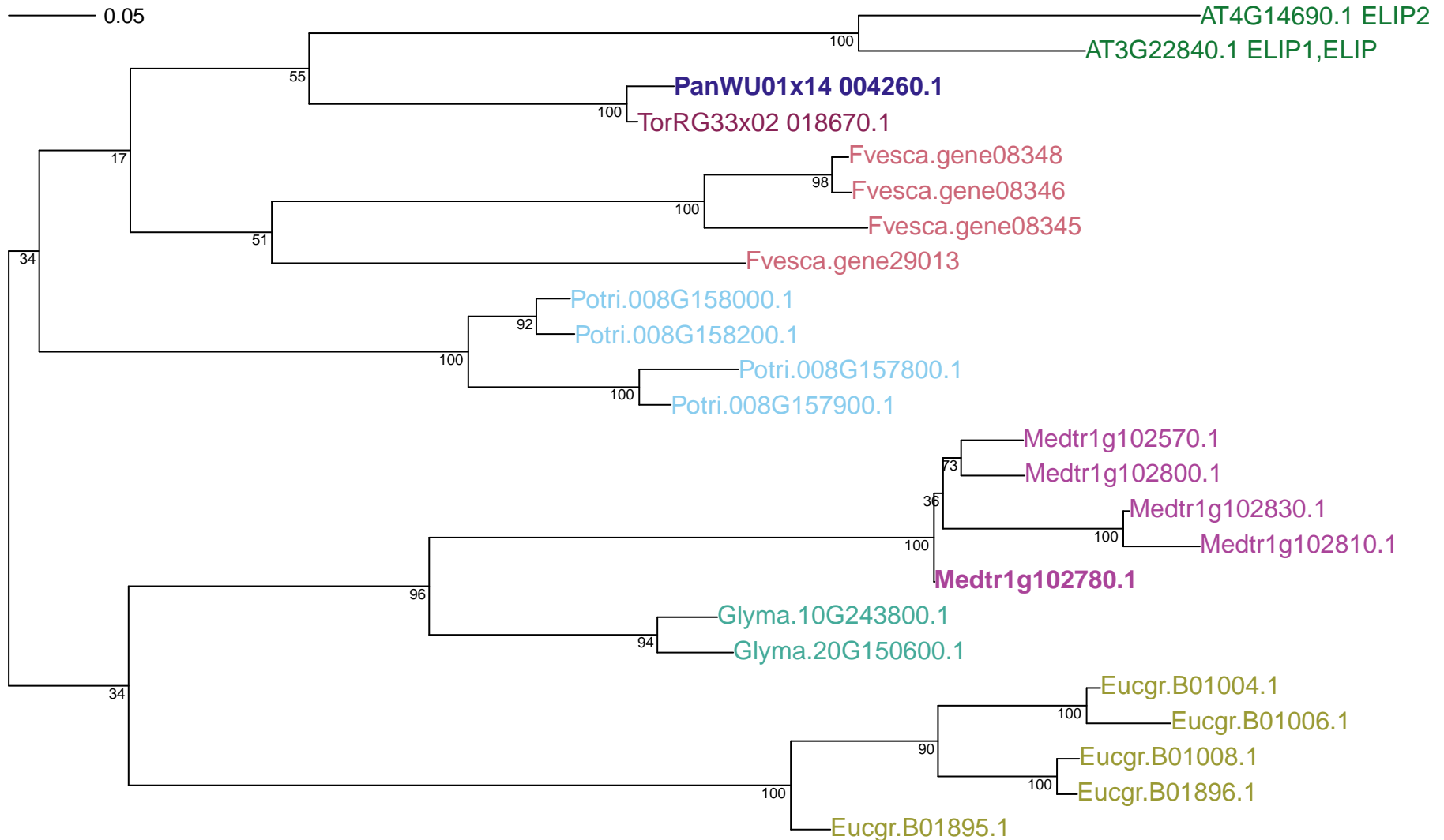
OG0001278: Other. neurogenic locus notch-like protein



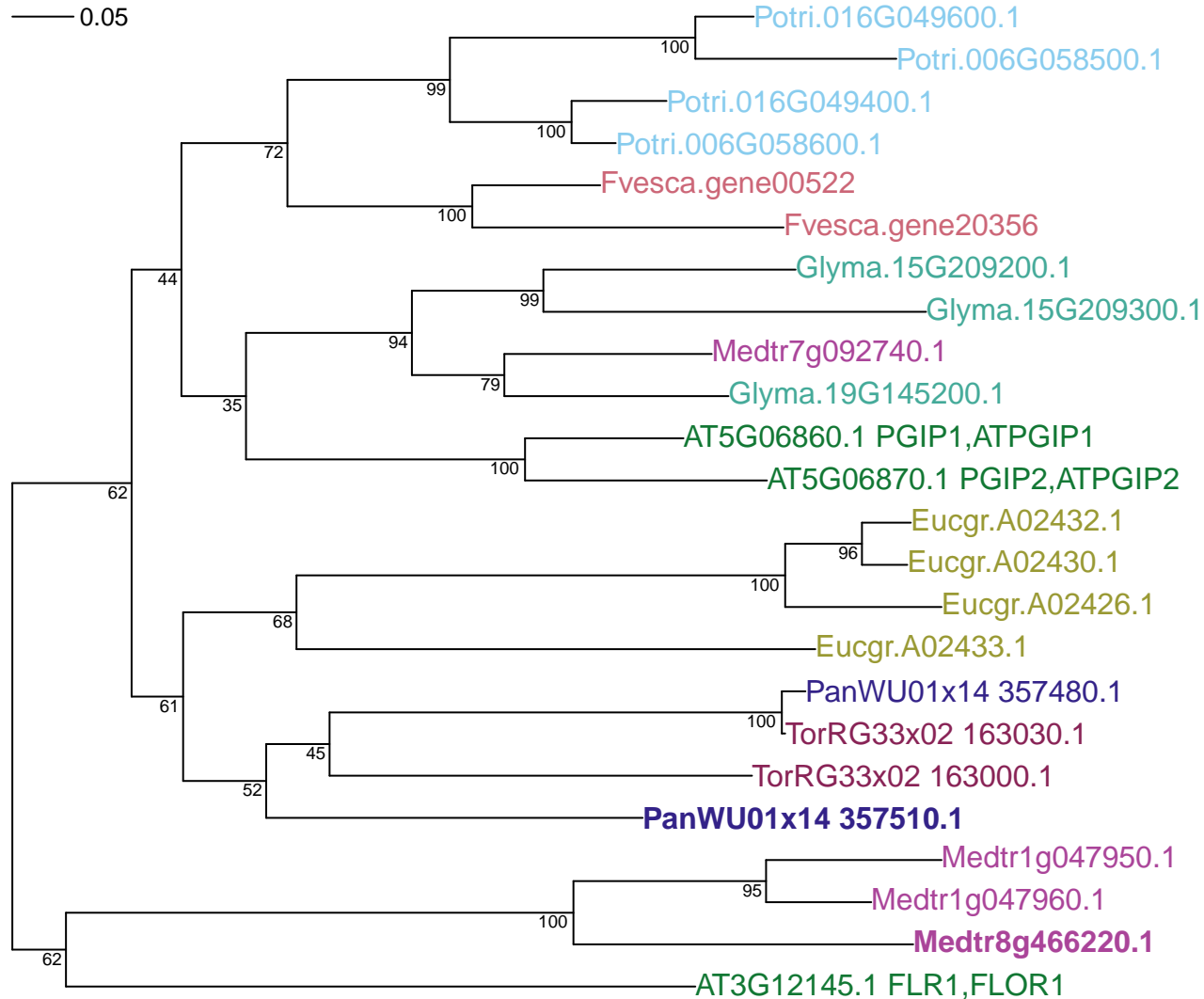
OG0001381: Other. Ferredoxin [2Fe-2S]



OG0001387: Other. Chlorophyll A-B binding protein

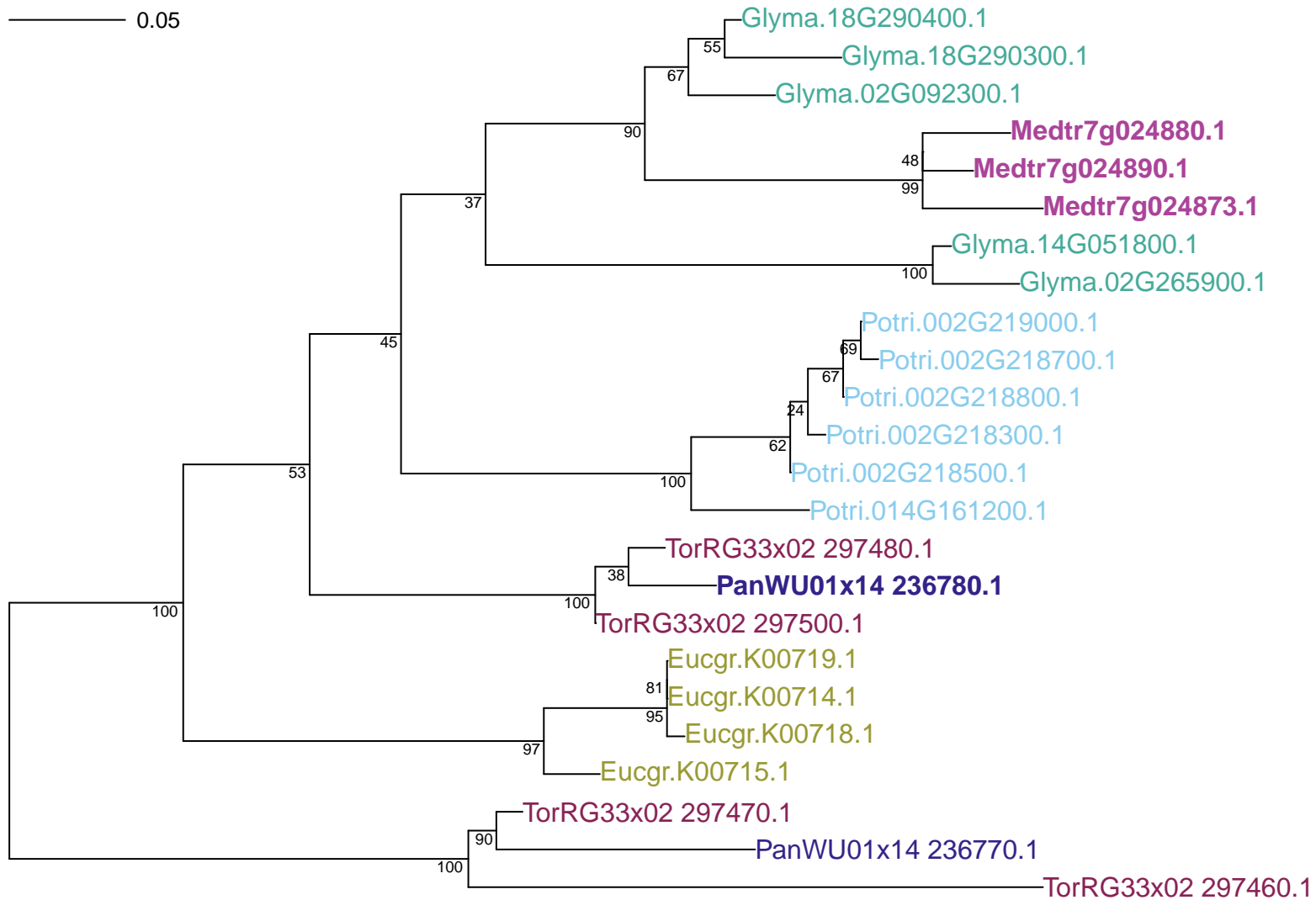


OG0001393: Other. LRR domain containing protein



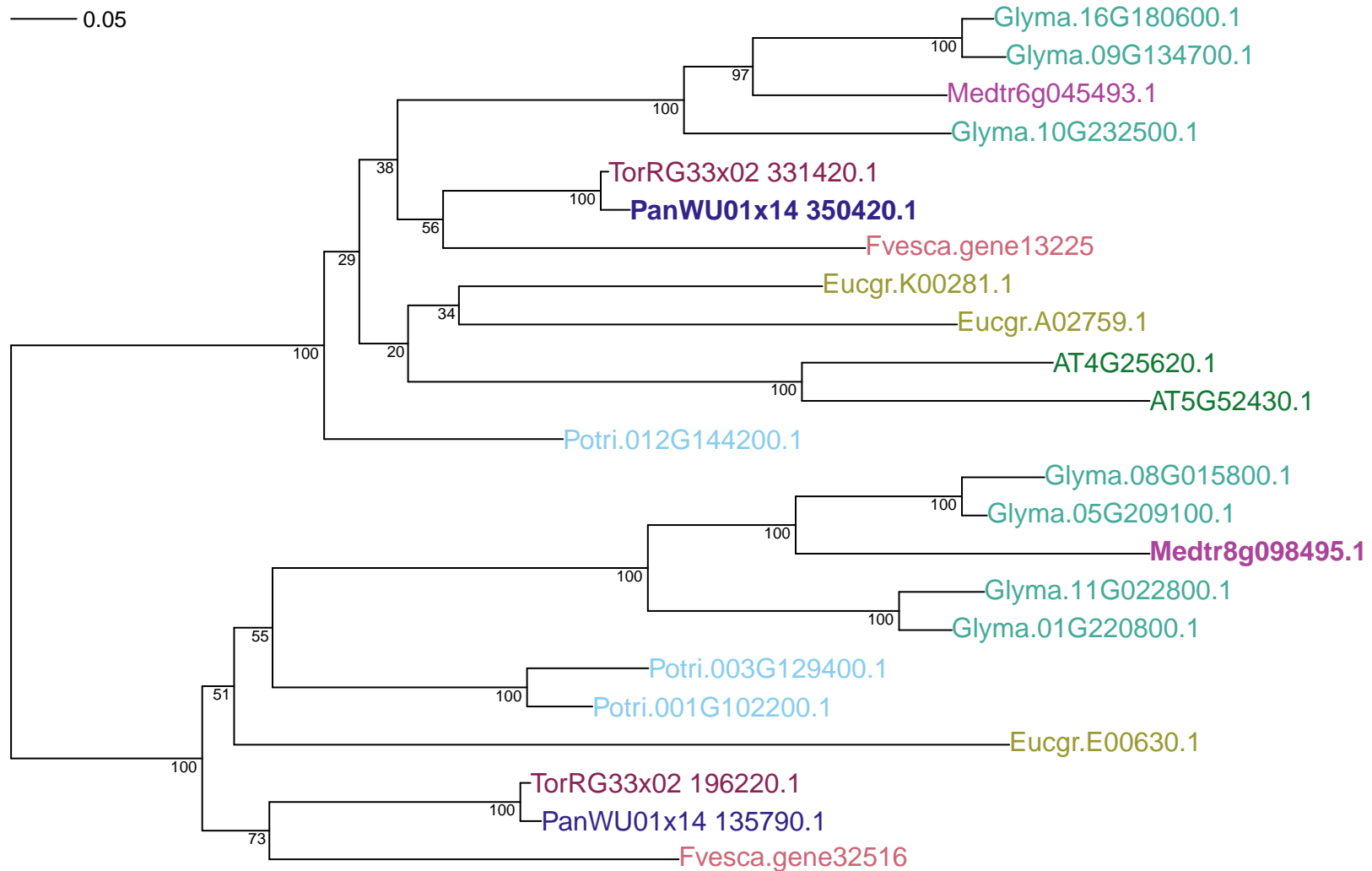
OG0001431: Other. Parvalbumin

0.05

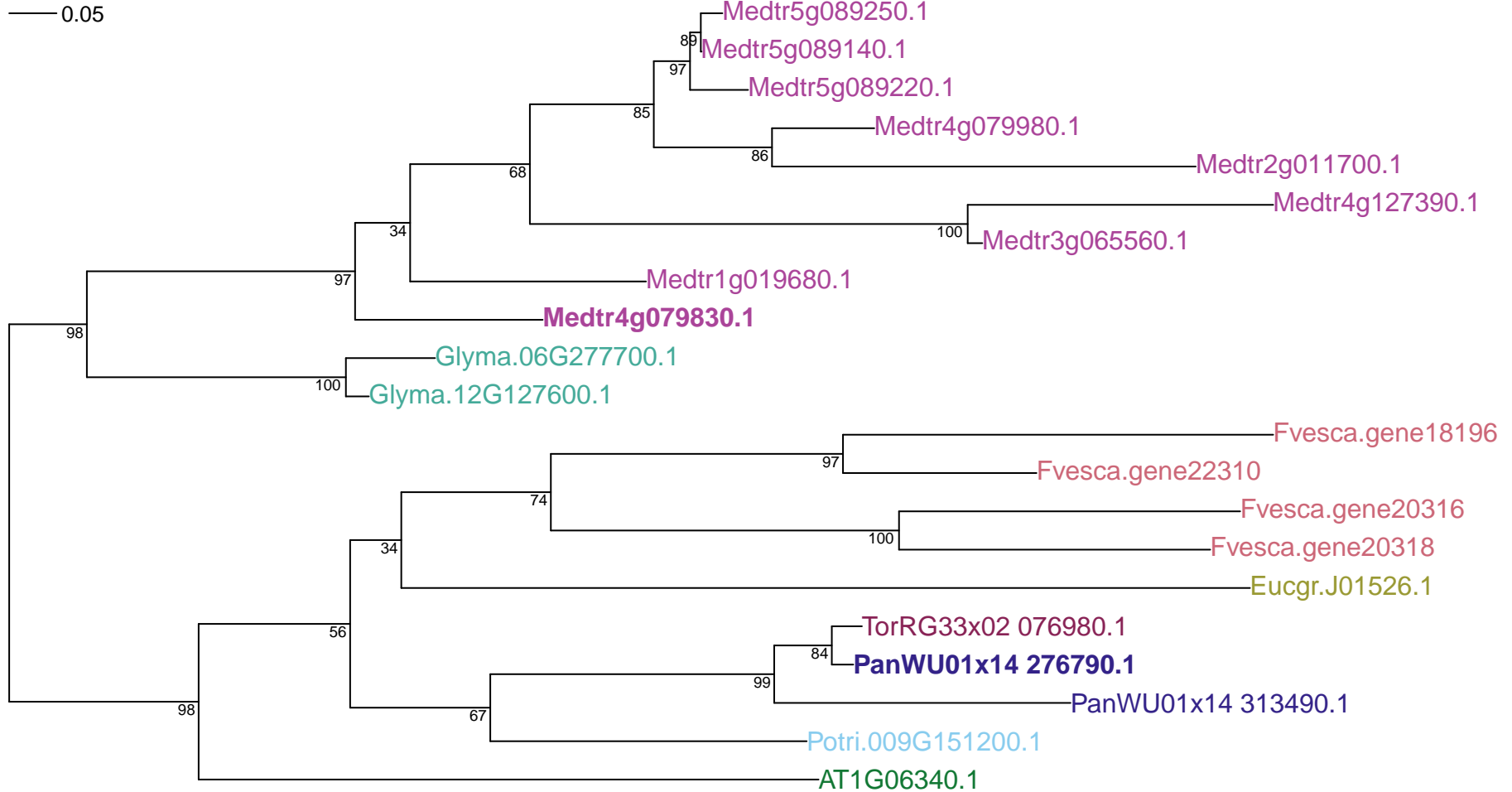


OG0001553: Other. hydroxyproline-rich glycoprotein family protein

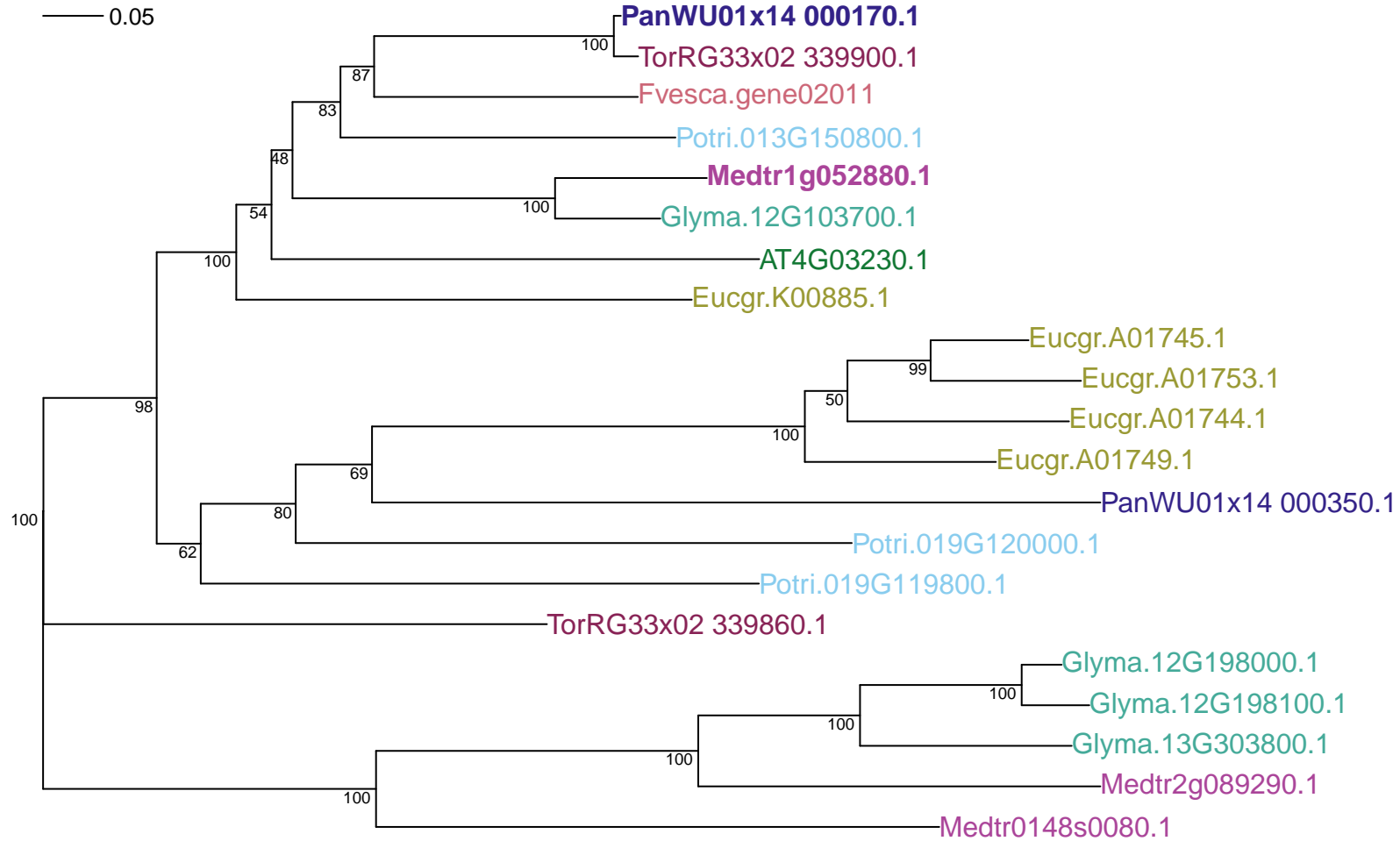
— 0.05



OG0001879: Other. Agenet domain containing protein

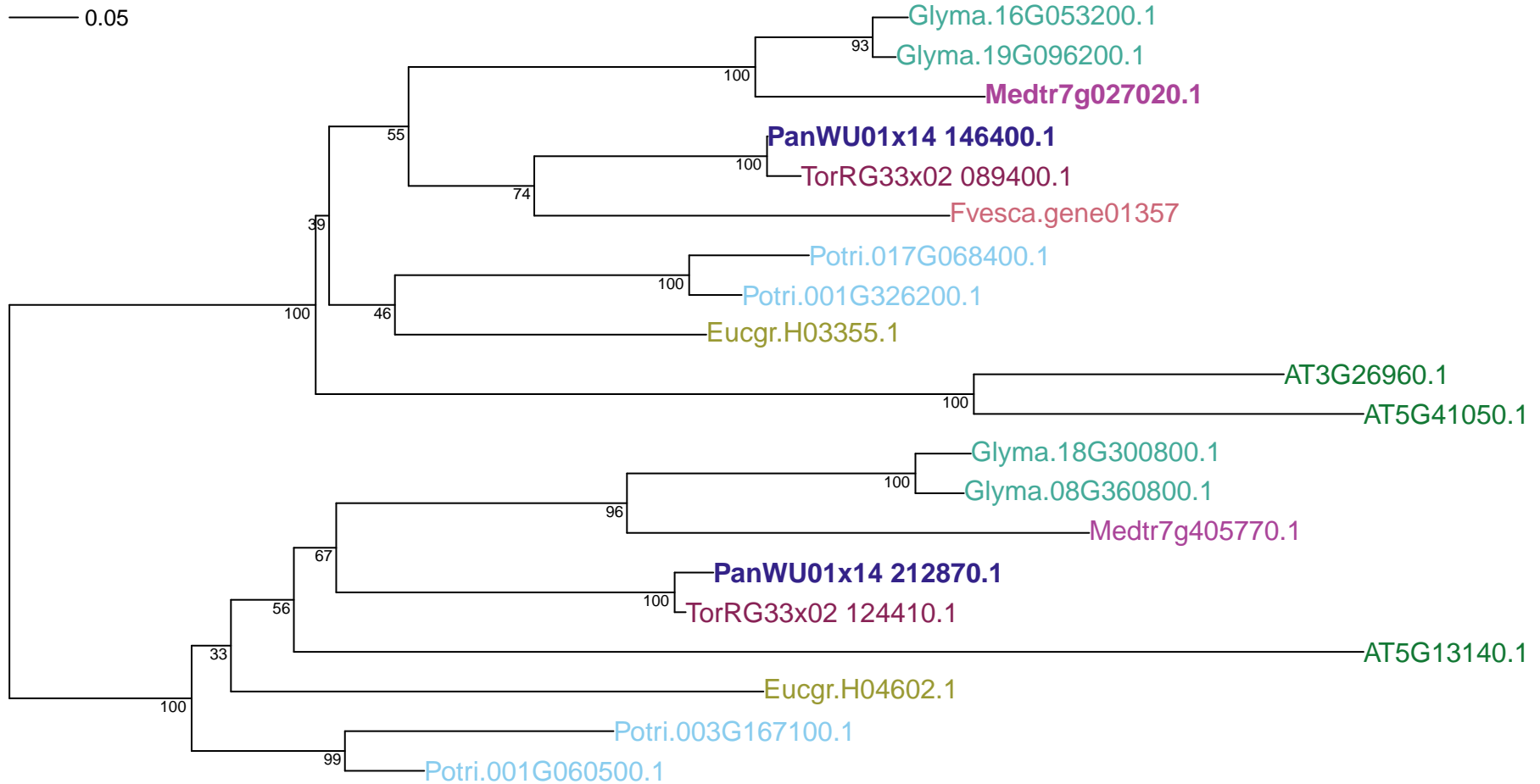


OG0001954: Other. S-locus glycoprotein



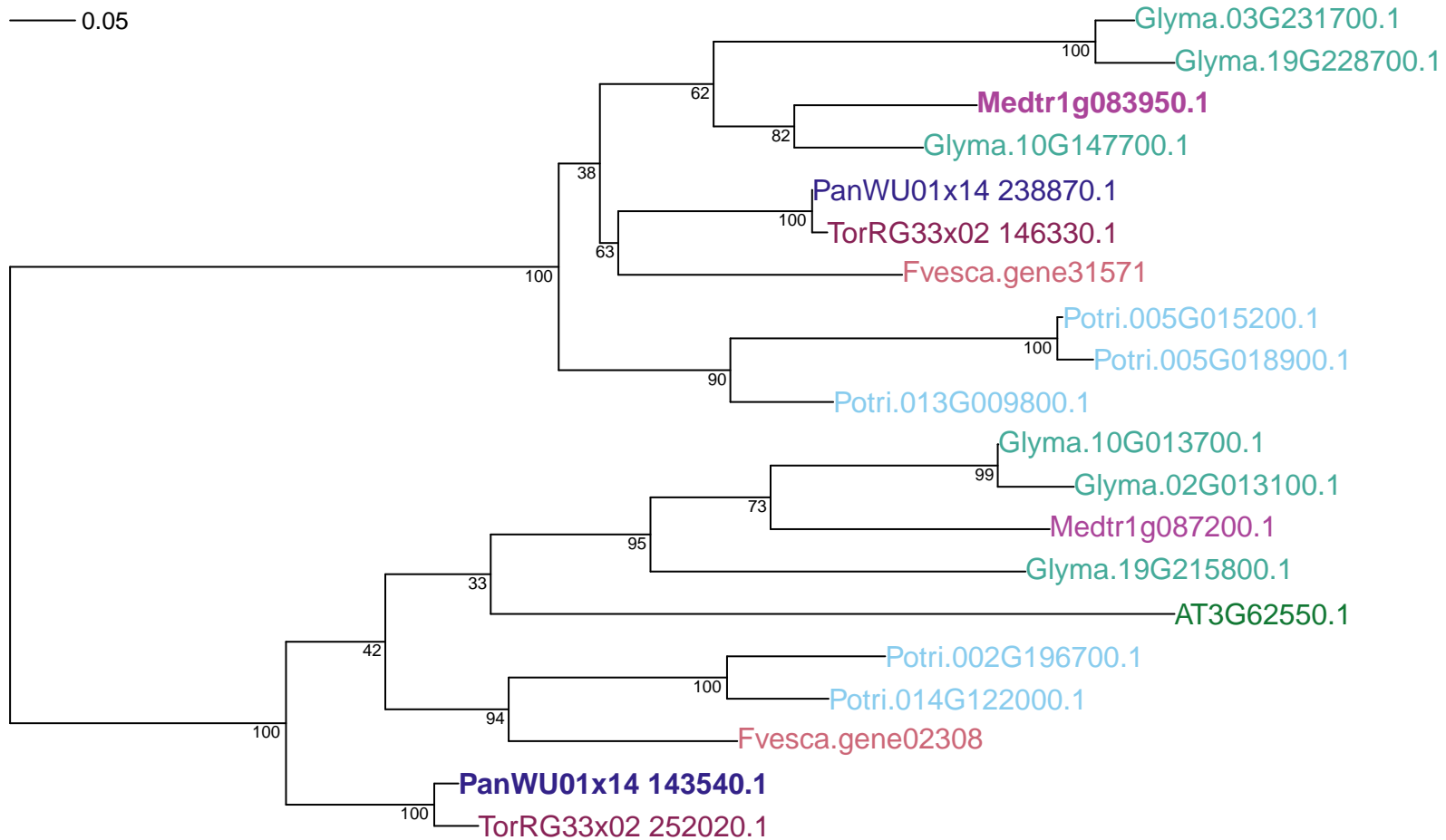
OG0002168: Other. Pollen Ole e 1 allergen and extensin family protein

0.05

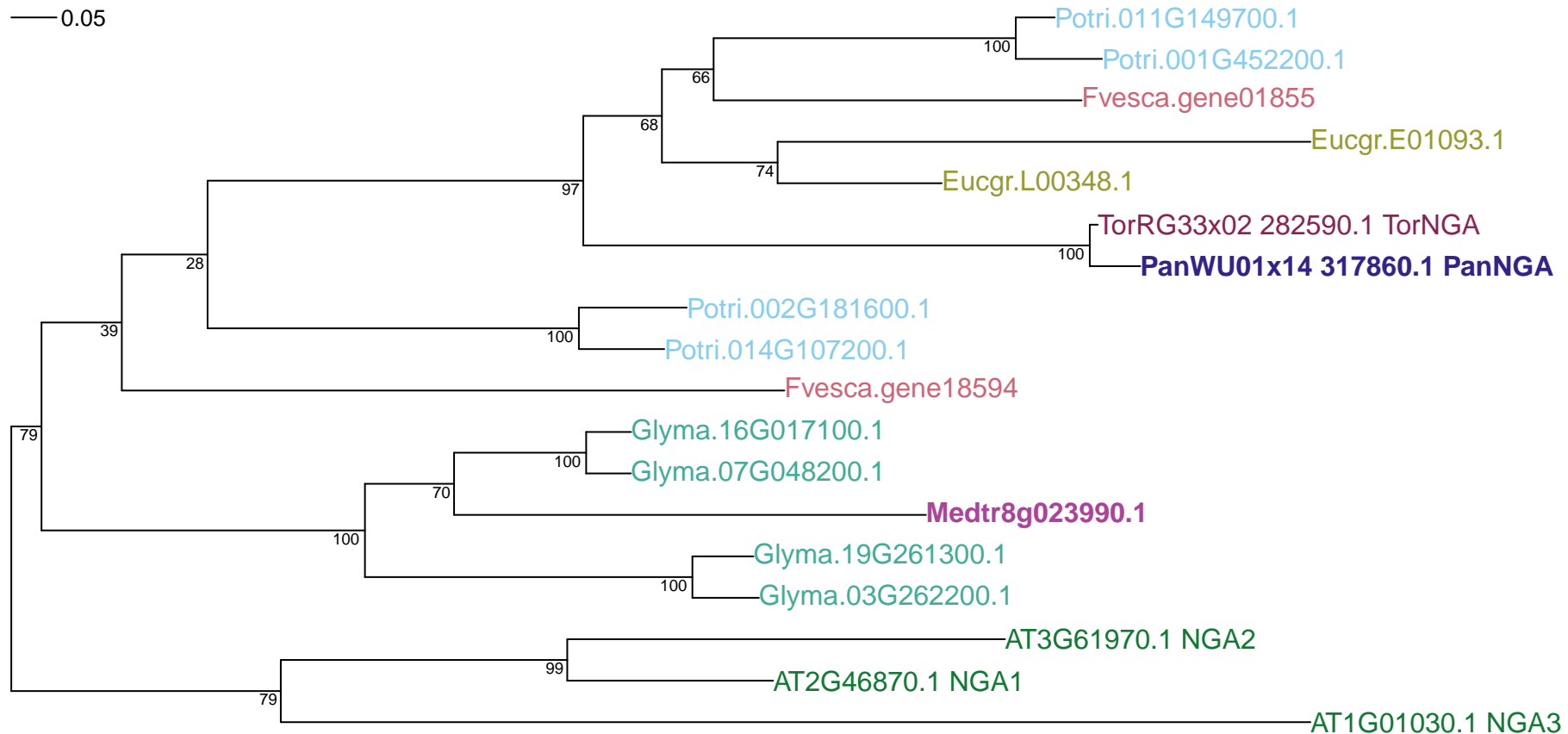


OG0002186: Other. Universal stress protein

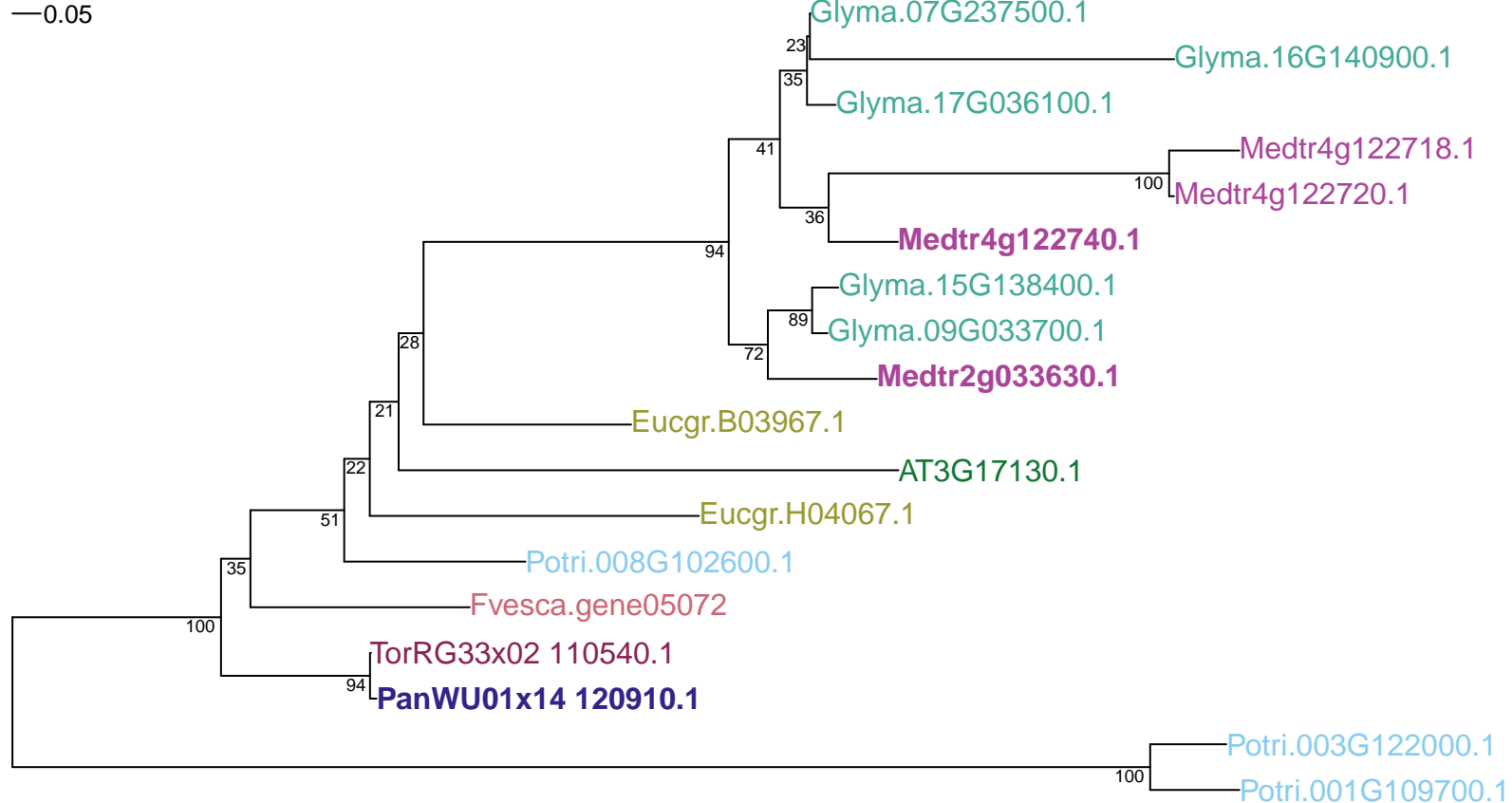
0.05



OG0002559: Other. B3 DNA binding domain containing protein

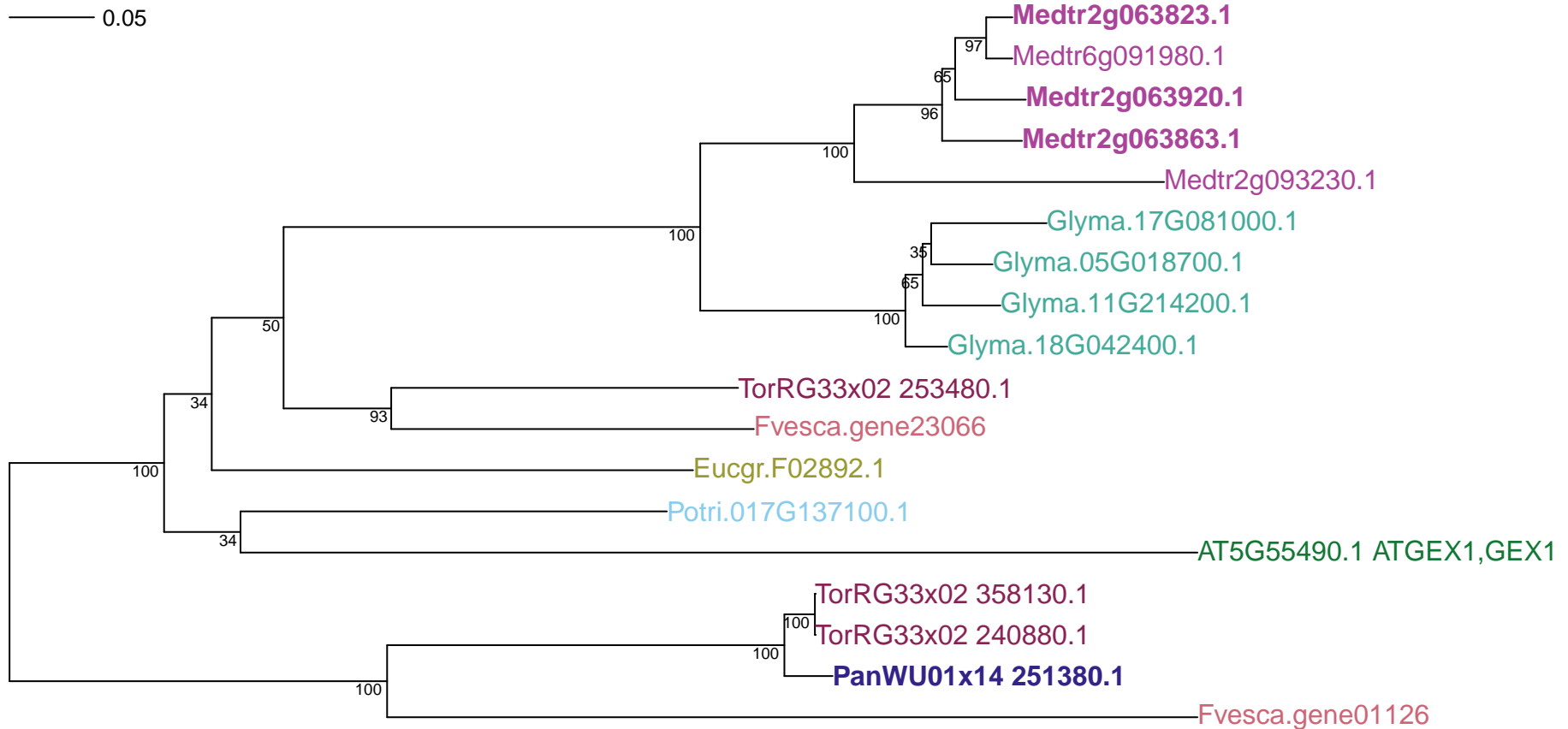


OG0002660: Other. Pectinesterase inhibitor domain containing protein



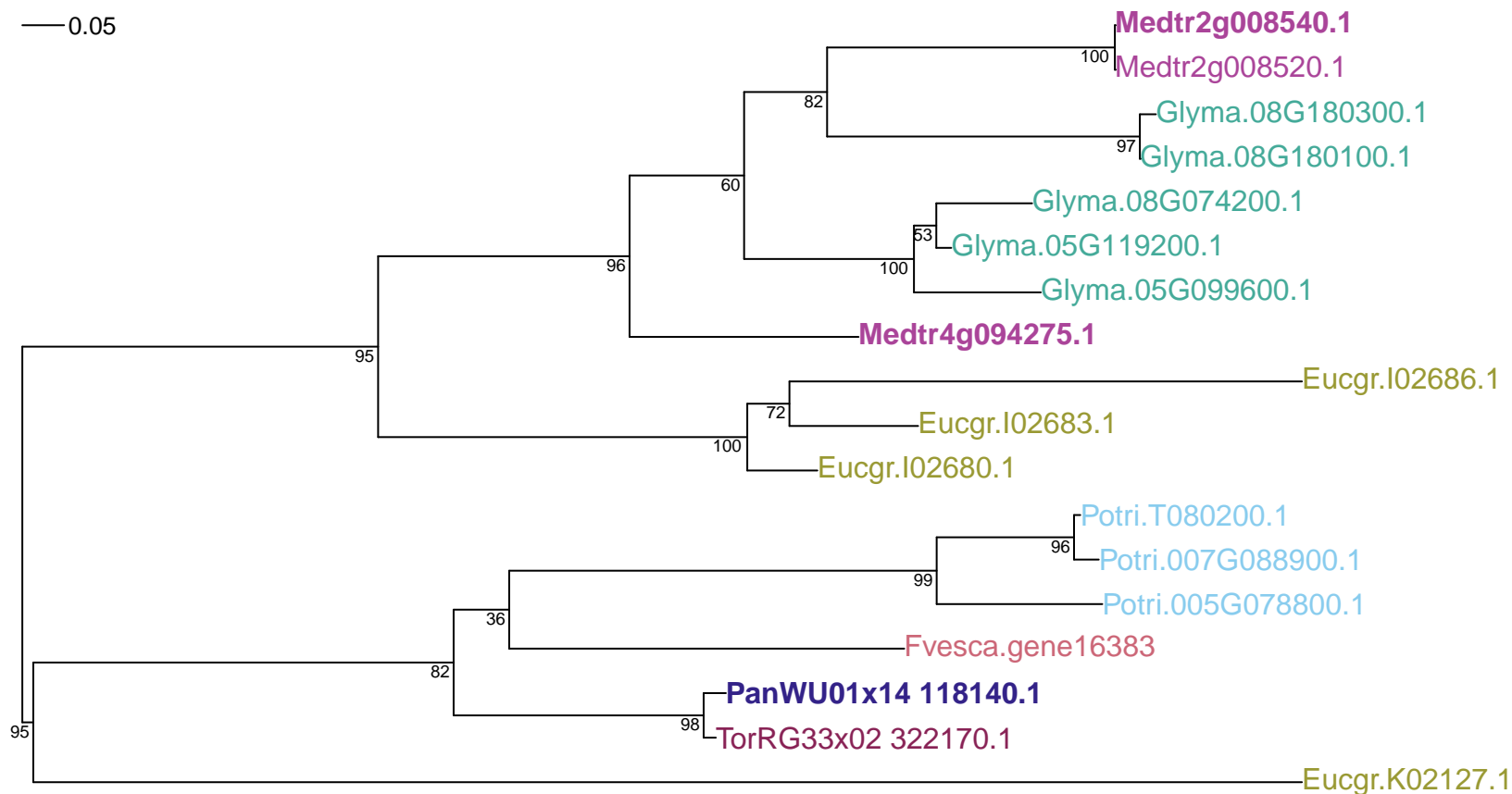
OG0002754: Other. Protein GAMETE EXPRESSED

0.05

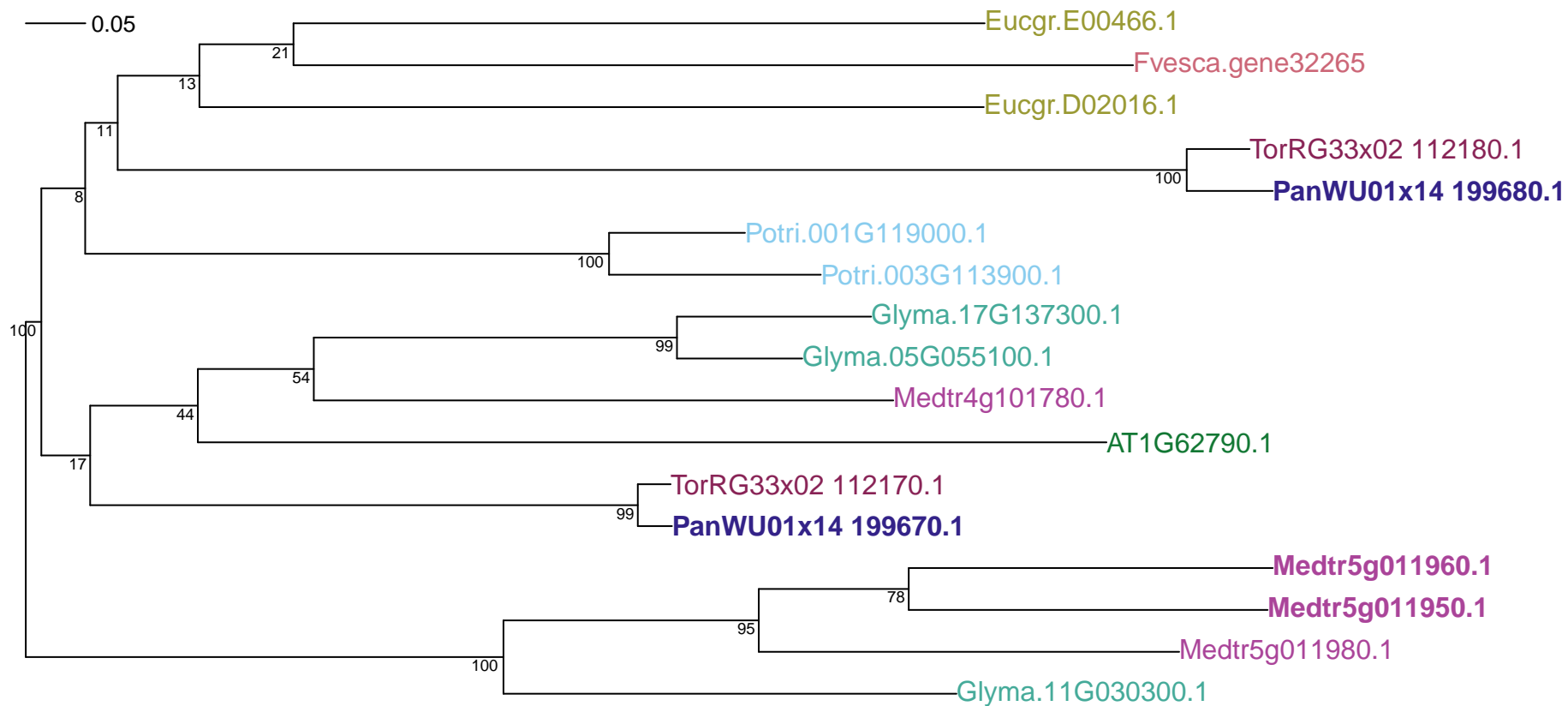


OG0002777: Other. Terminal organelle assembly protein

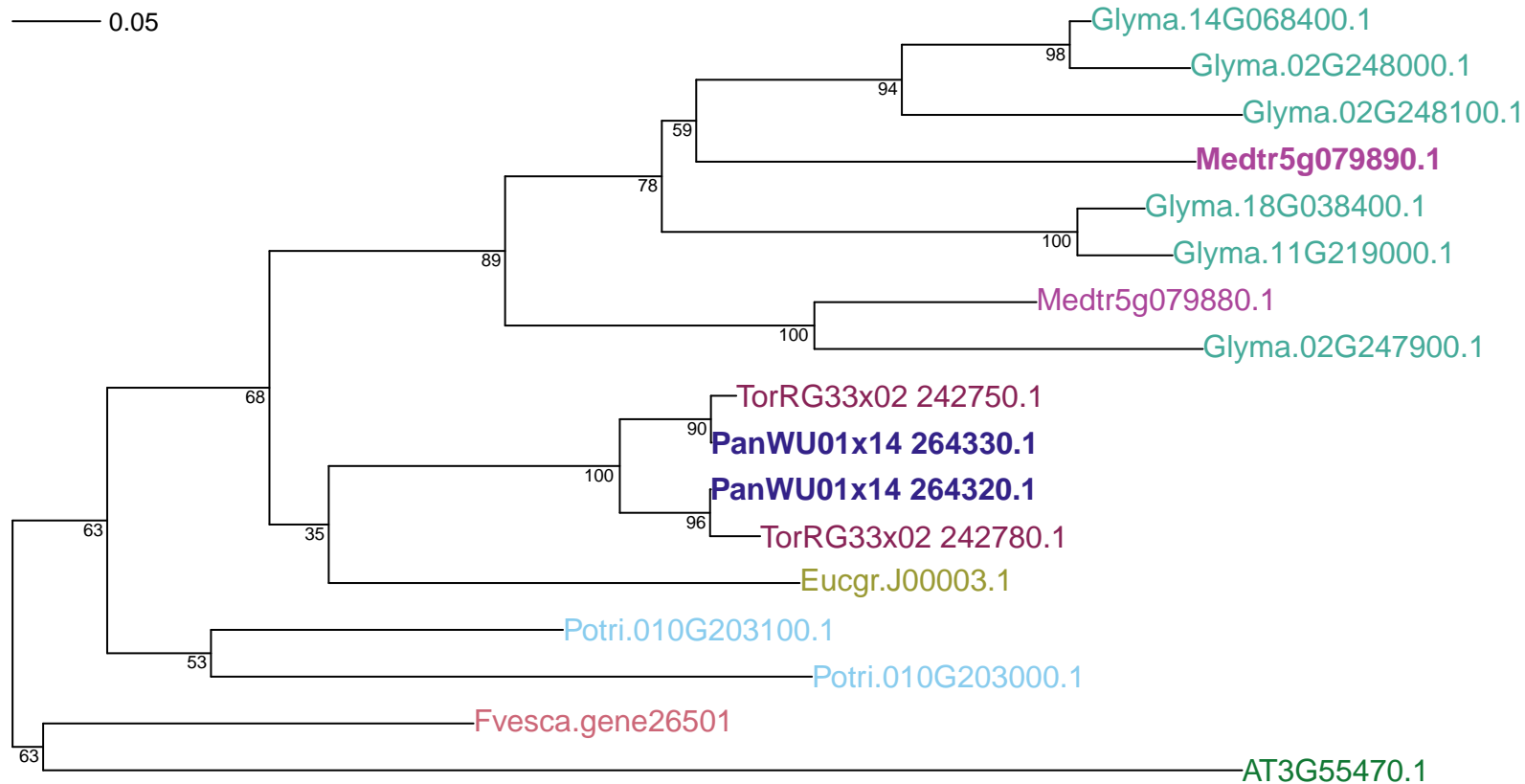
—0.05



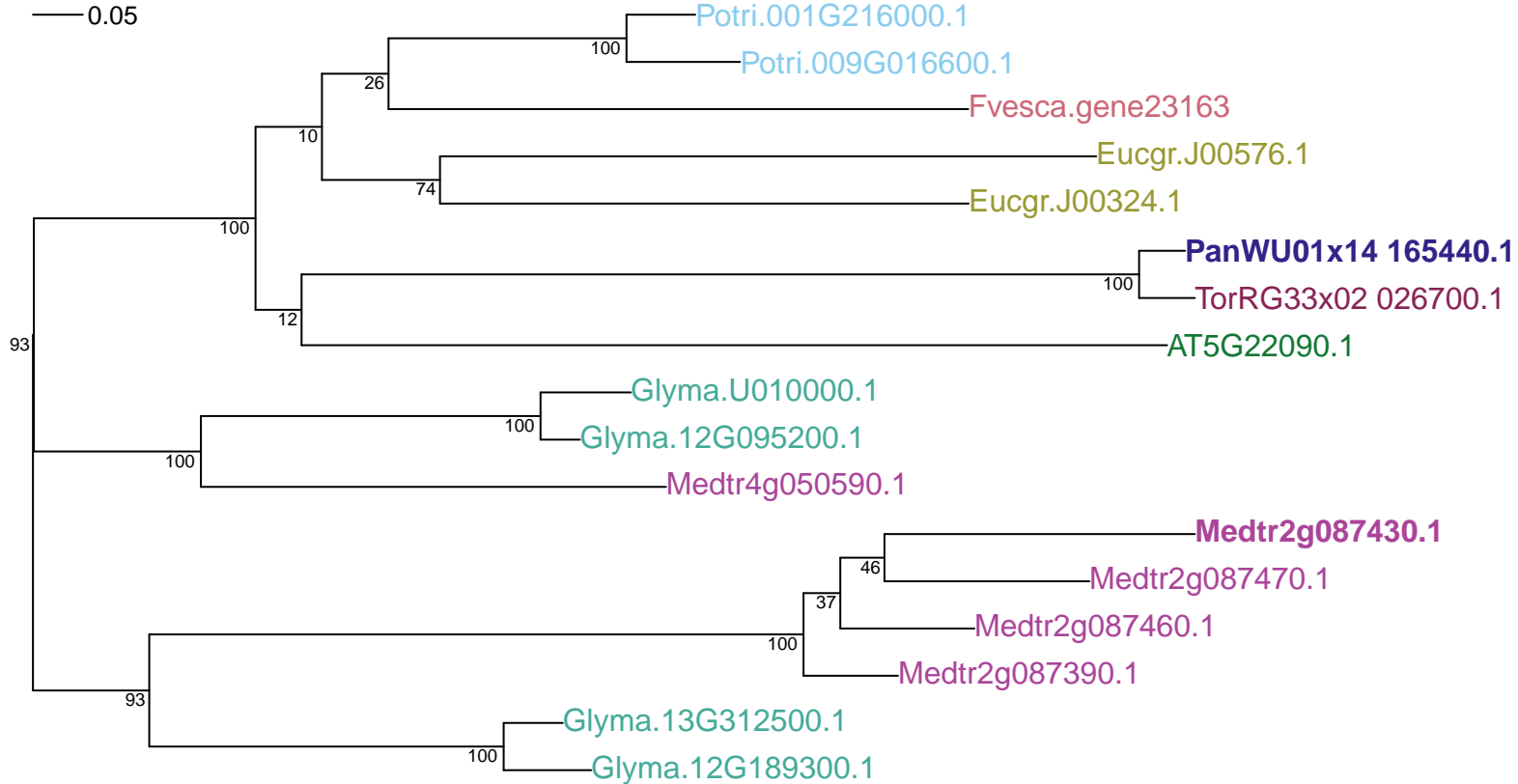
OG0002858: Other. Bifunctional inhibitor/plant lipid transfer protein



OG0002944: Other. C2 domain containing protein

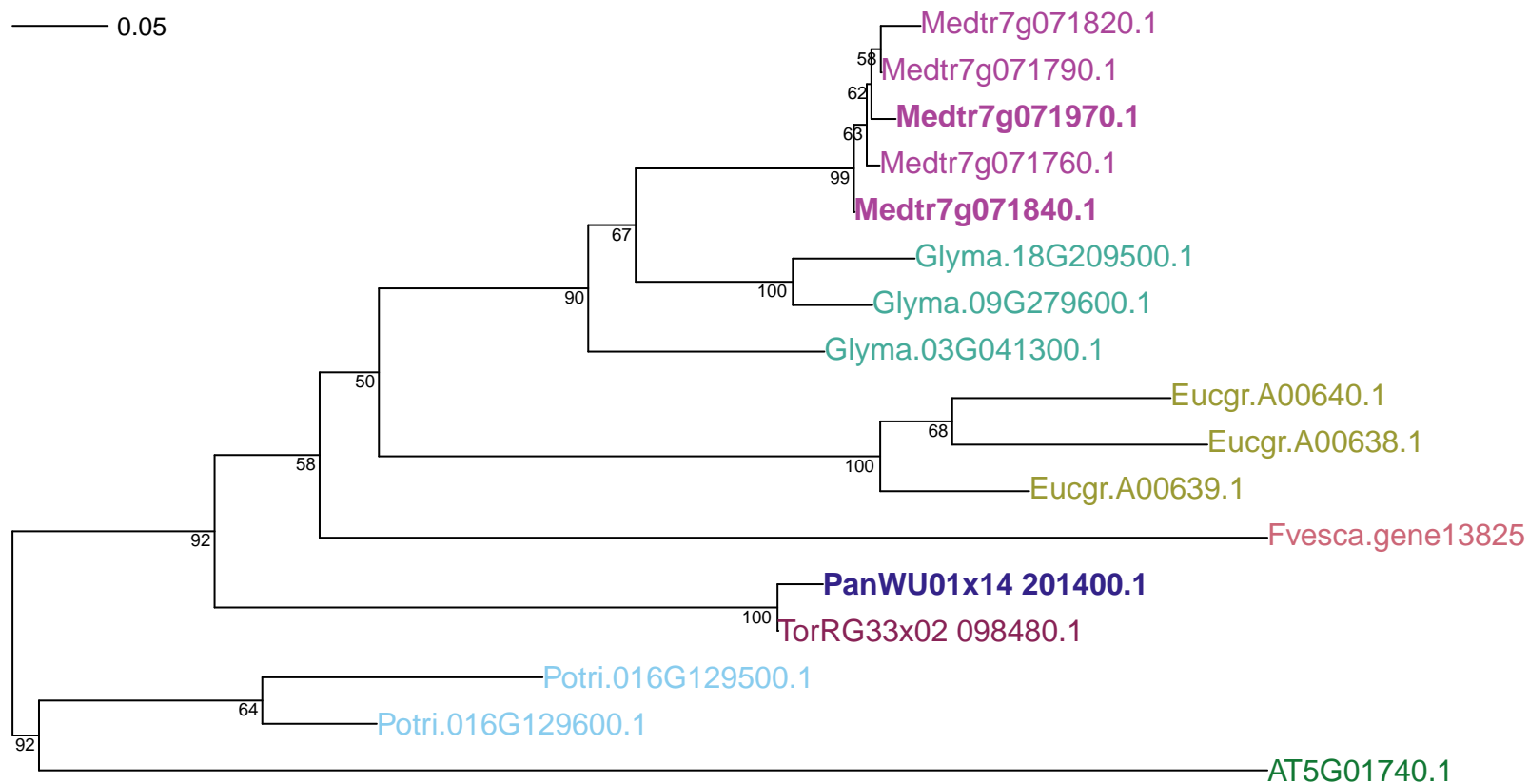


OG0003032: Other. The fantastic four family

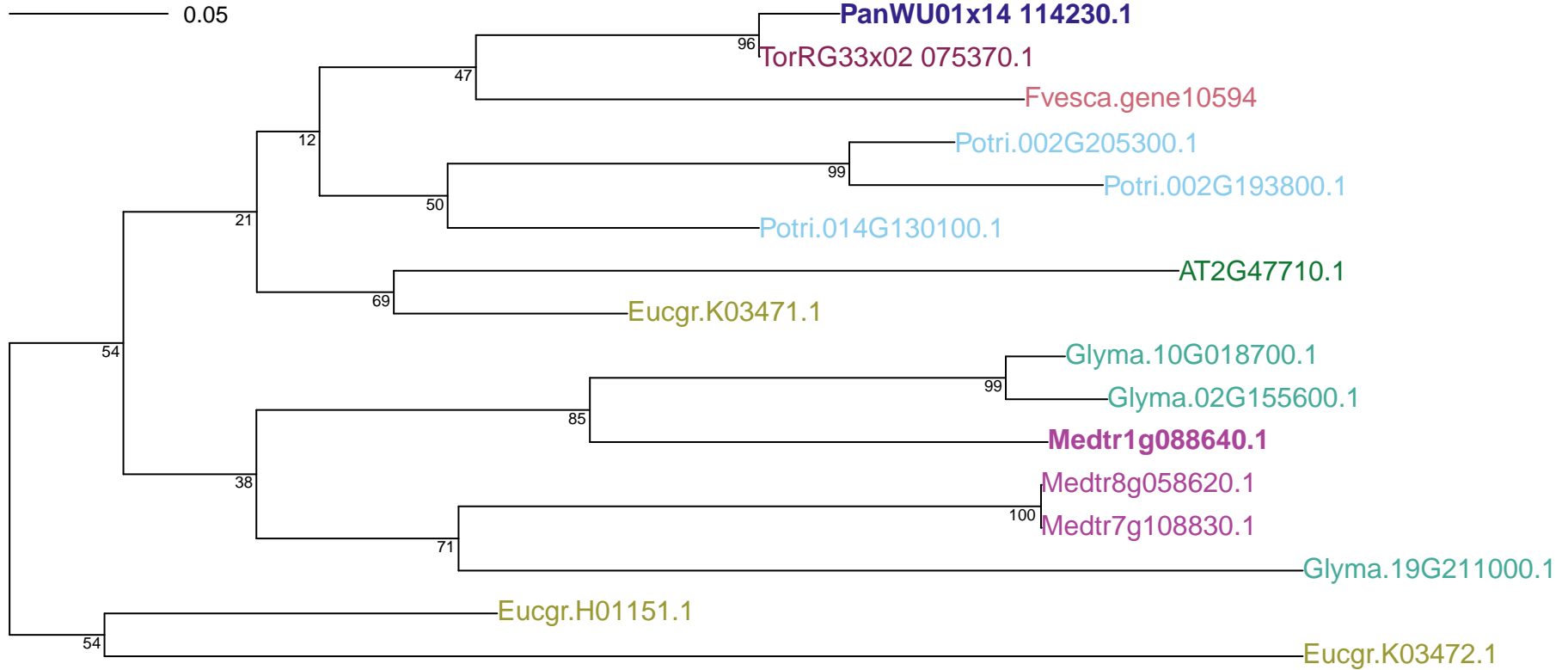


OG0003036: Other. NTF2-like domain containing protein

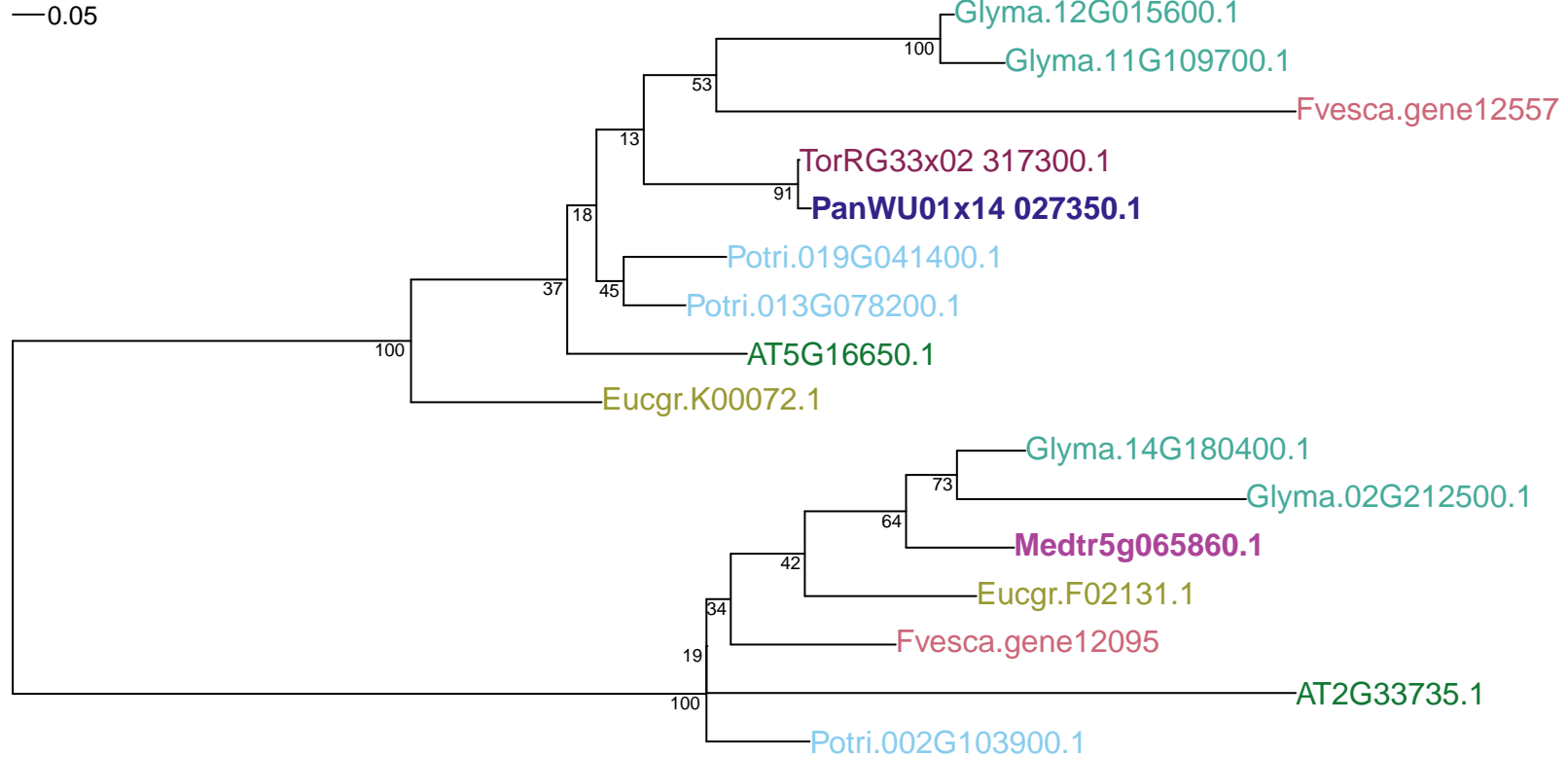
0.05



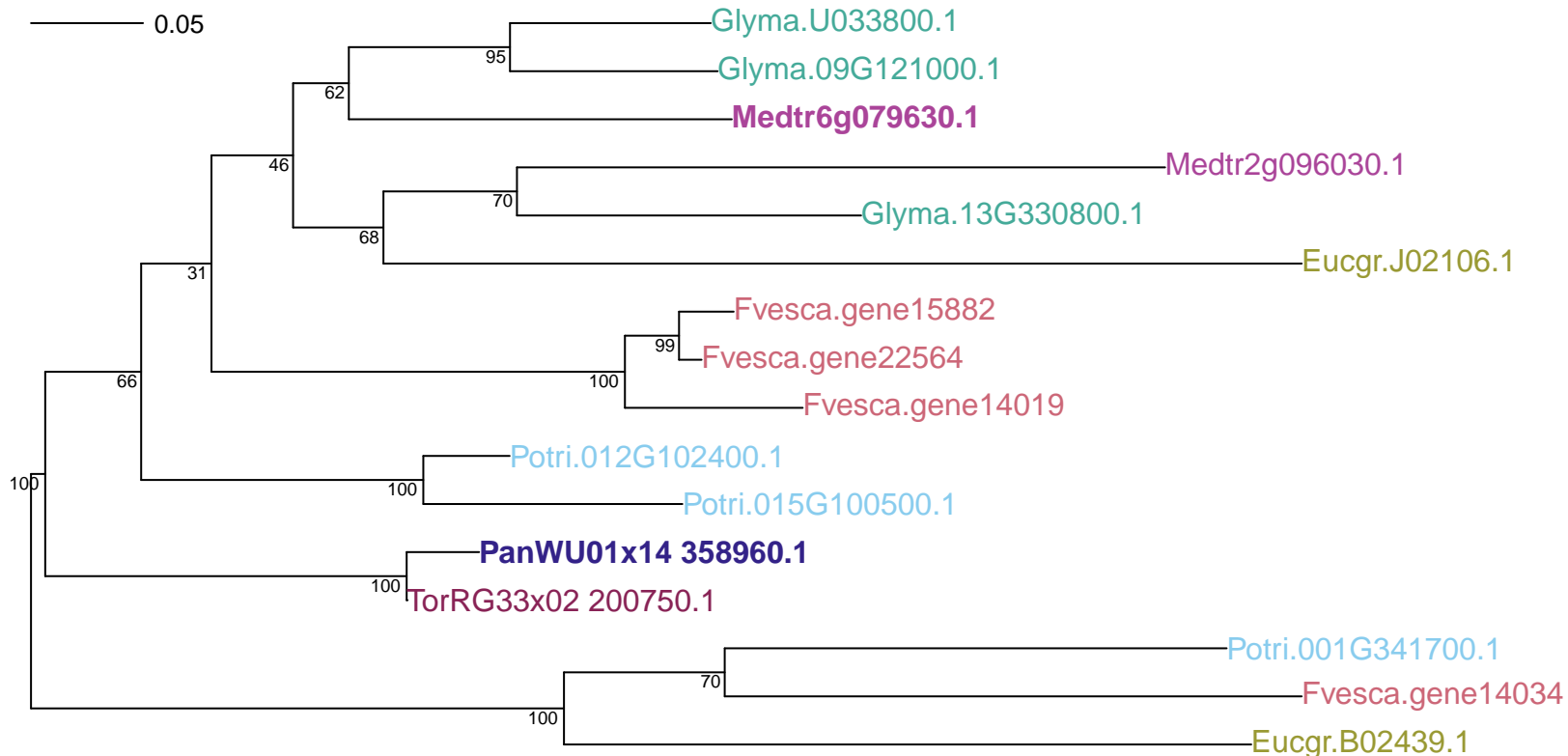
OG0003243: Other. Universal stress protein



OG0003263: Other. DnaJ domain containing protein

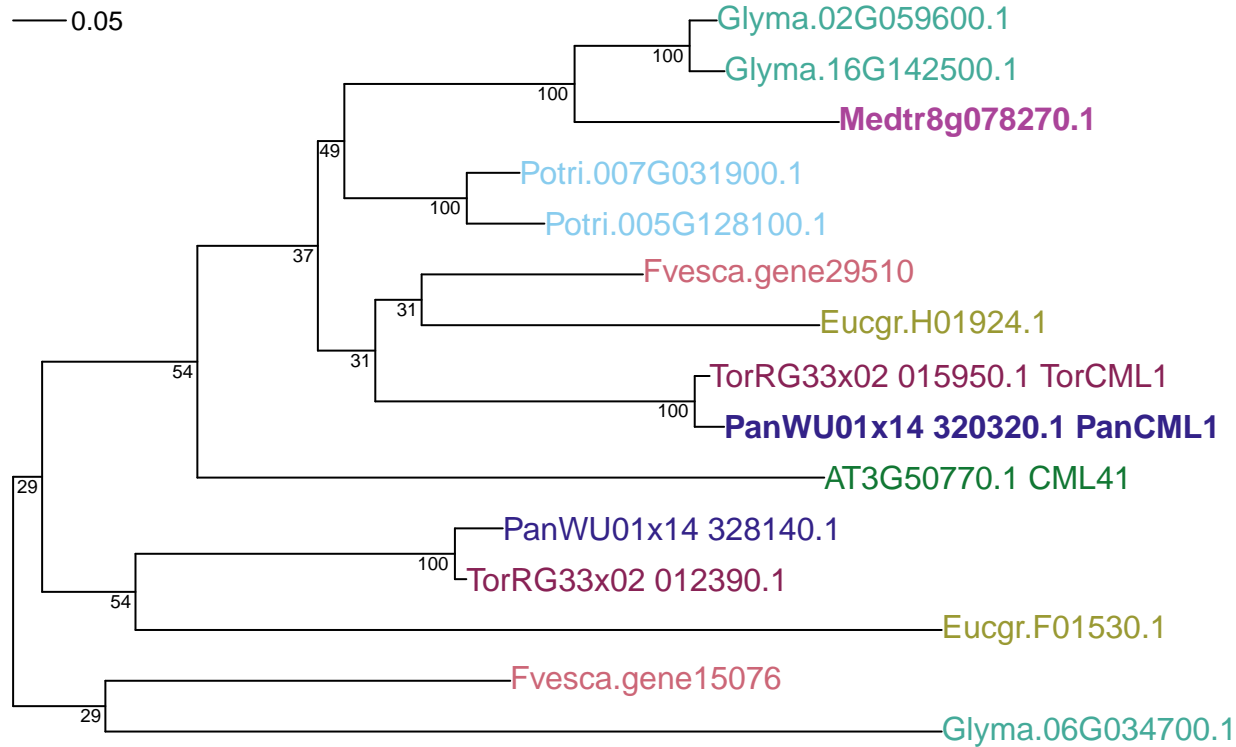


OG0003415: Other. 2S globulin

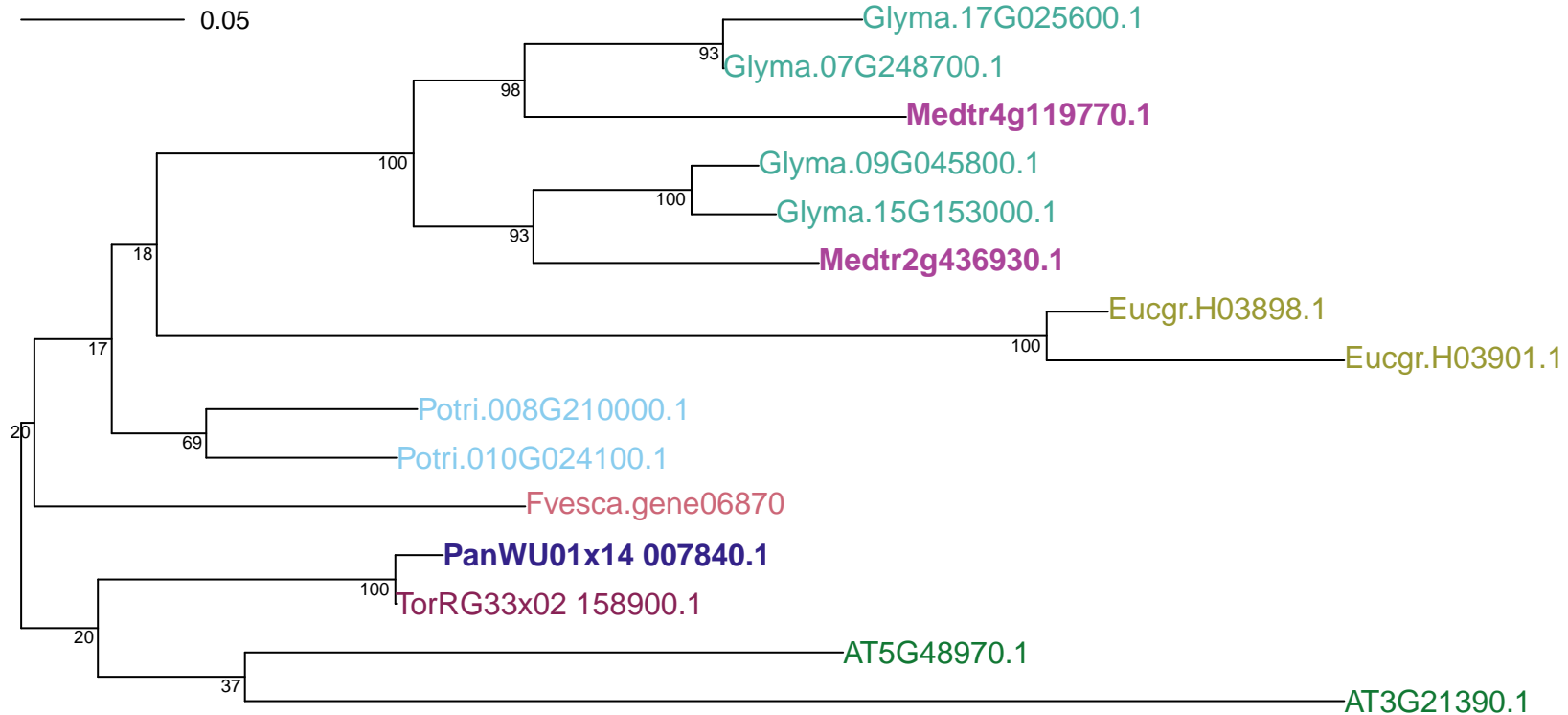


OG0003657: Other. Parvalbumin

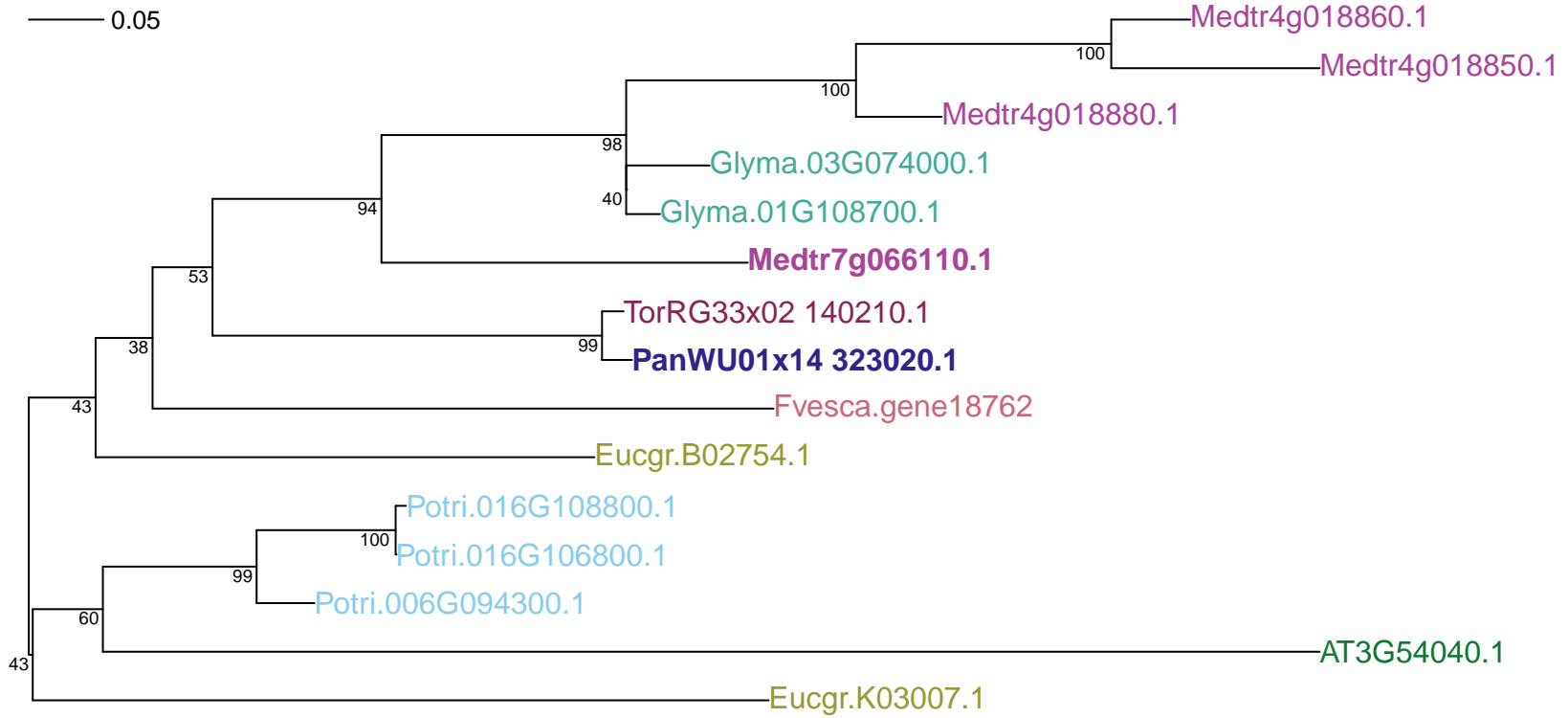
— 0.05



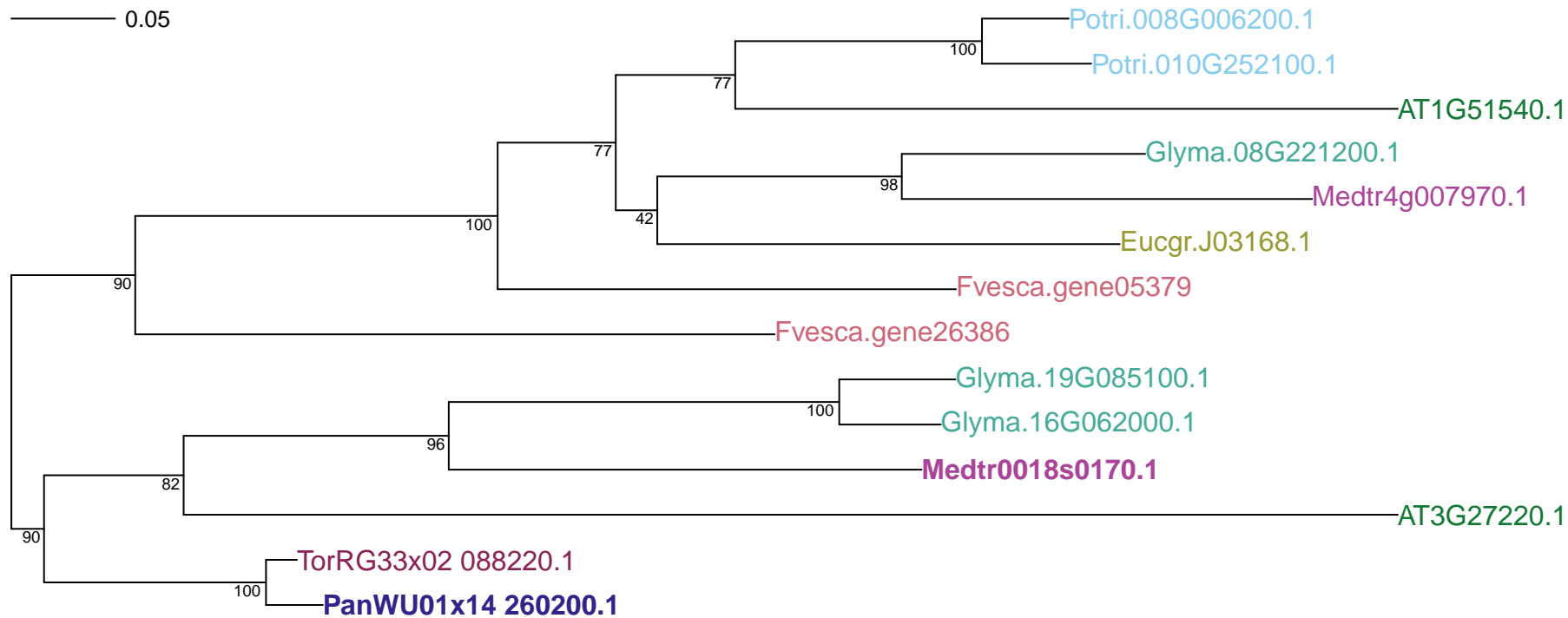
OG0003705: Other. Mitochondrial carrier protein



OG0003708: Other. PAR

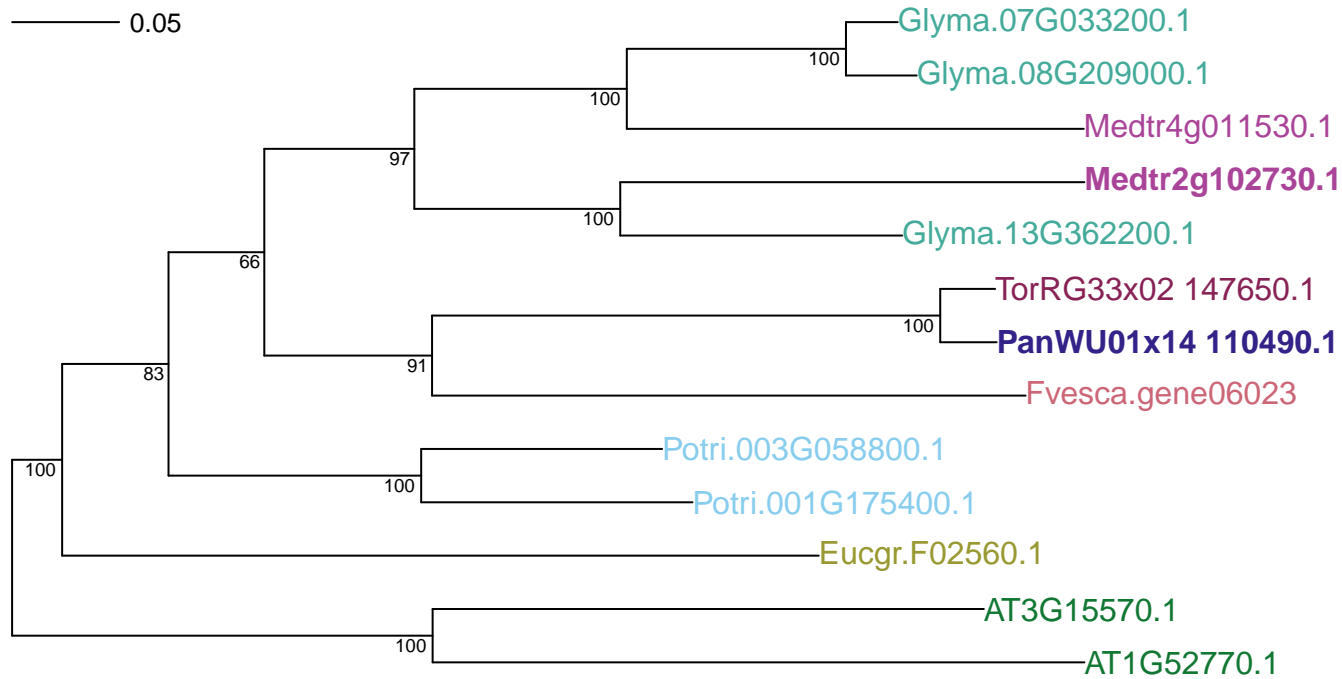


OG0003978: Other. BTB–kelch protein



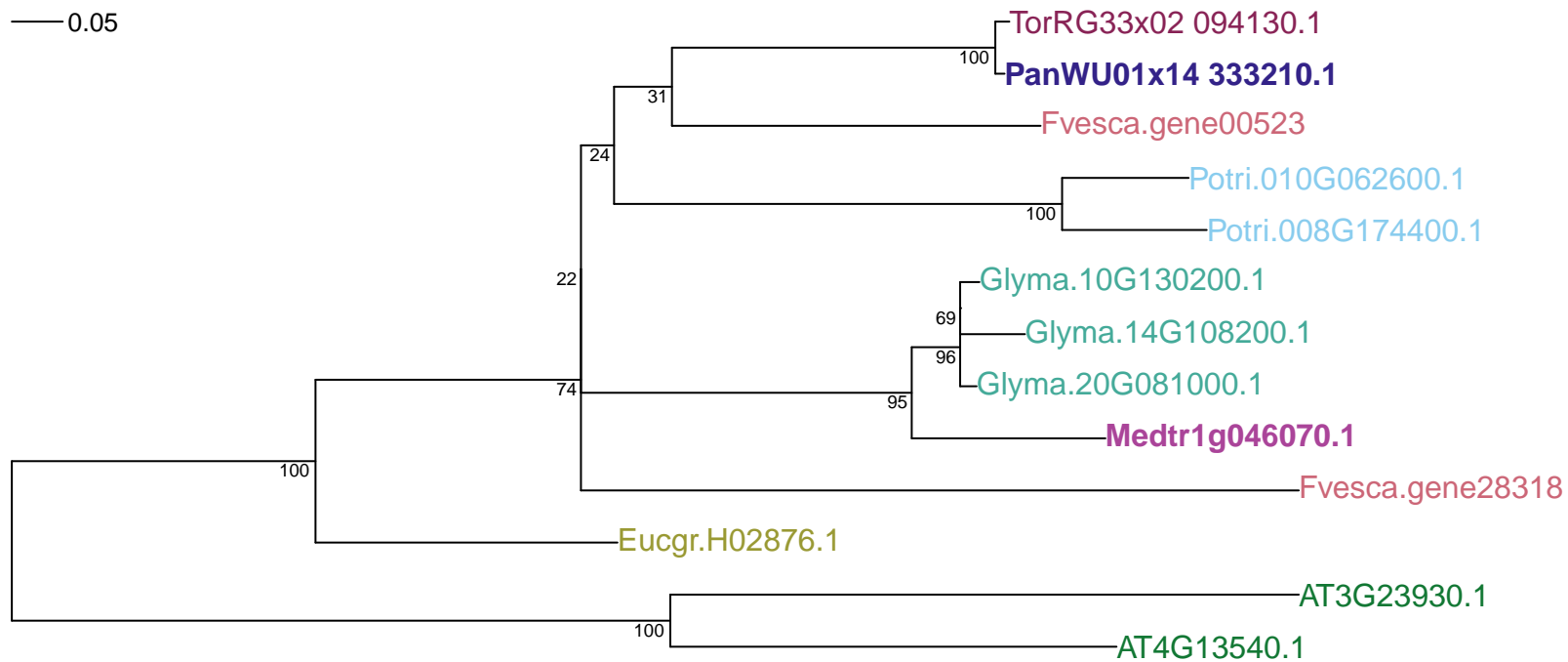
OG0004667: Other. NPH3 domain containing protein

0.05



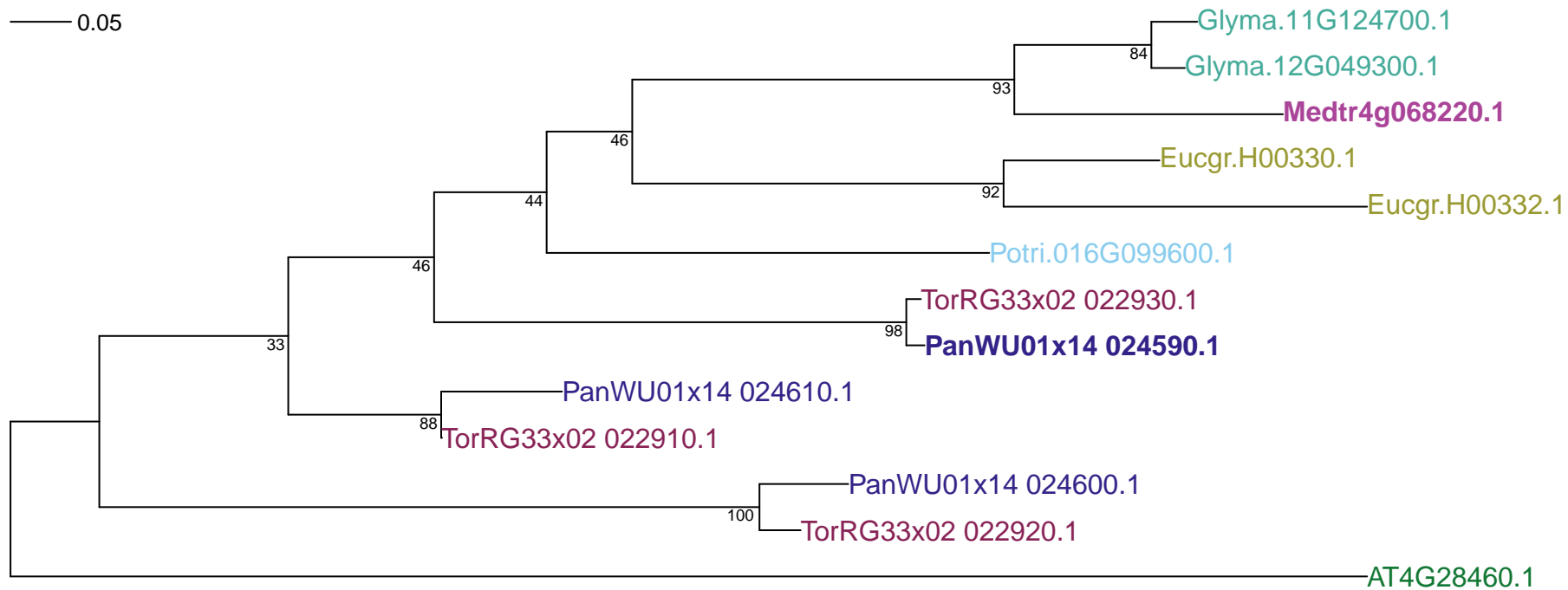
OG0005042: Other. golgin family A protein

— 0.05



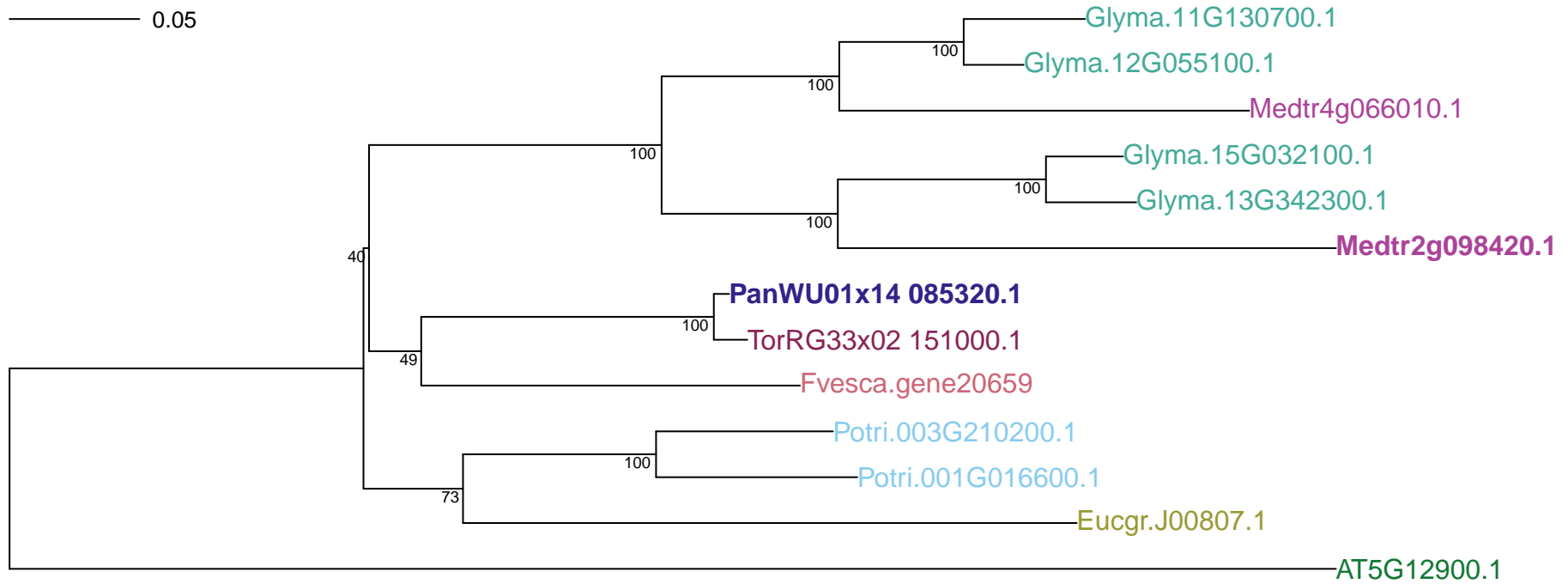
OG0005100: Other. Transmembrane protein

— 0.05



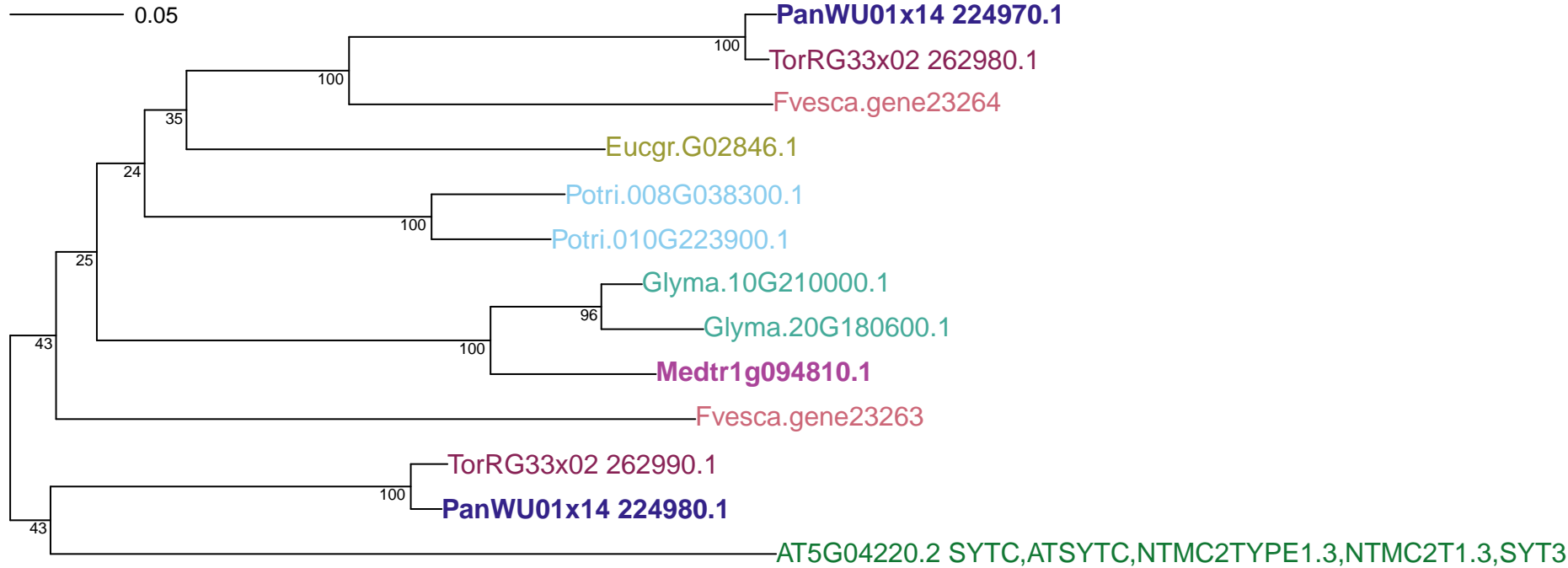
OG0005220: Other. IRK-interacting protein

0.05

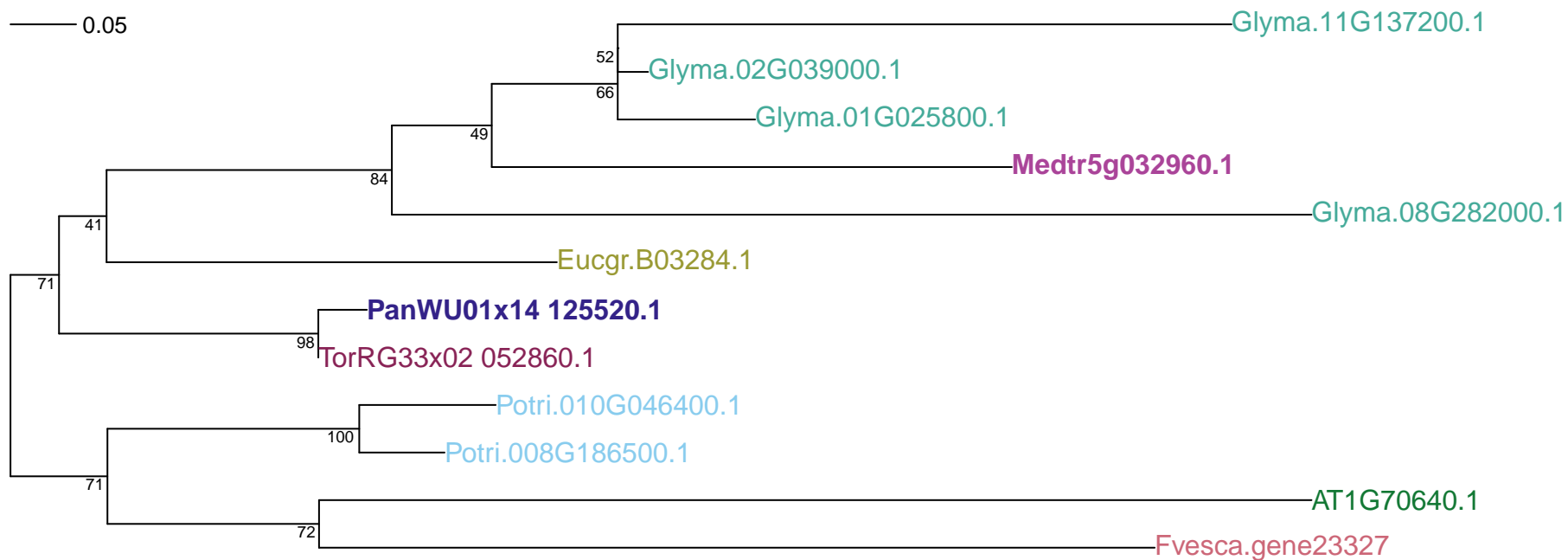


OG0005282: Other. Synaptotagmin-like mitochondrial-lipid-binding domain containing protein

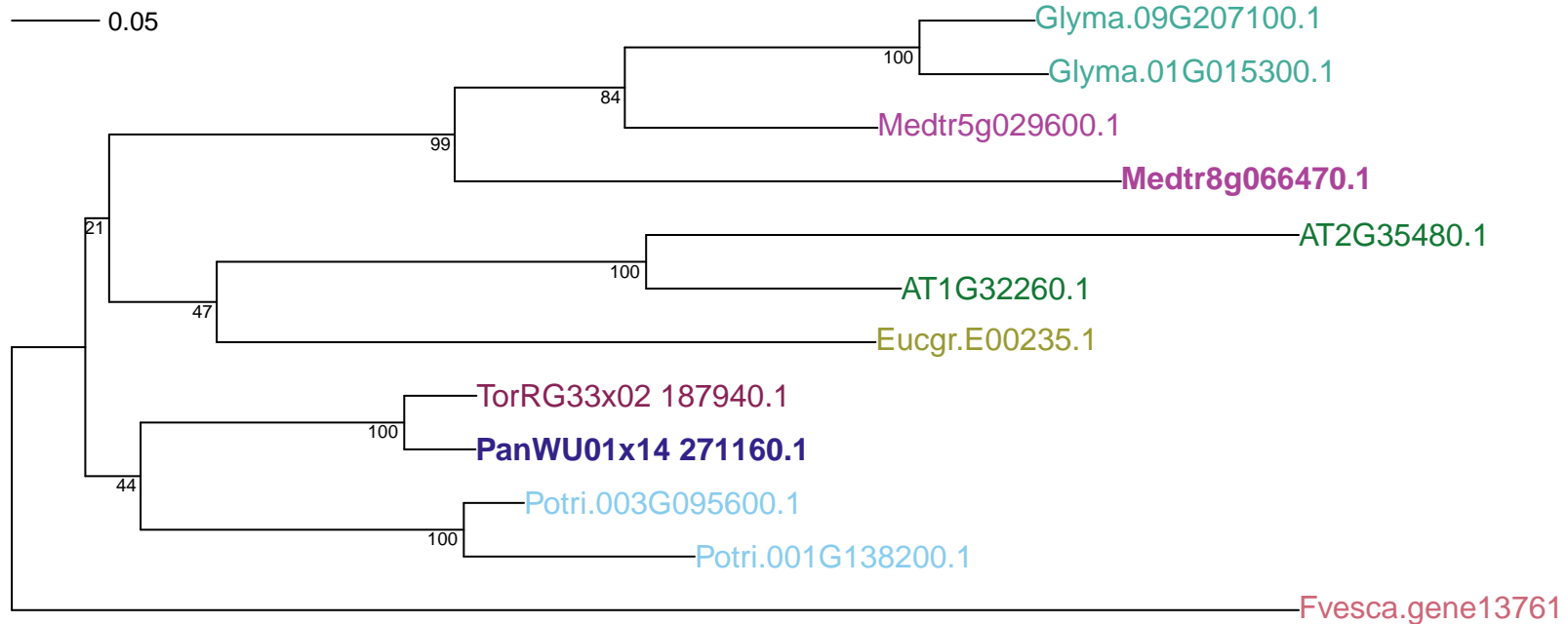
0.05



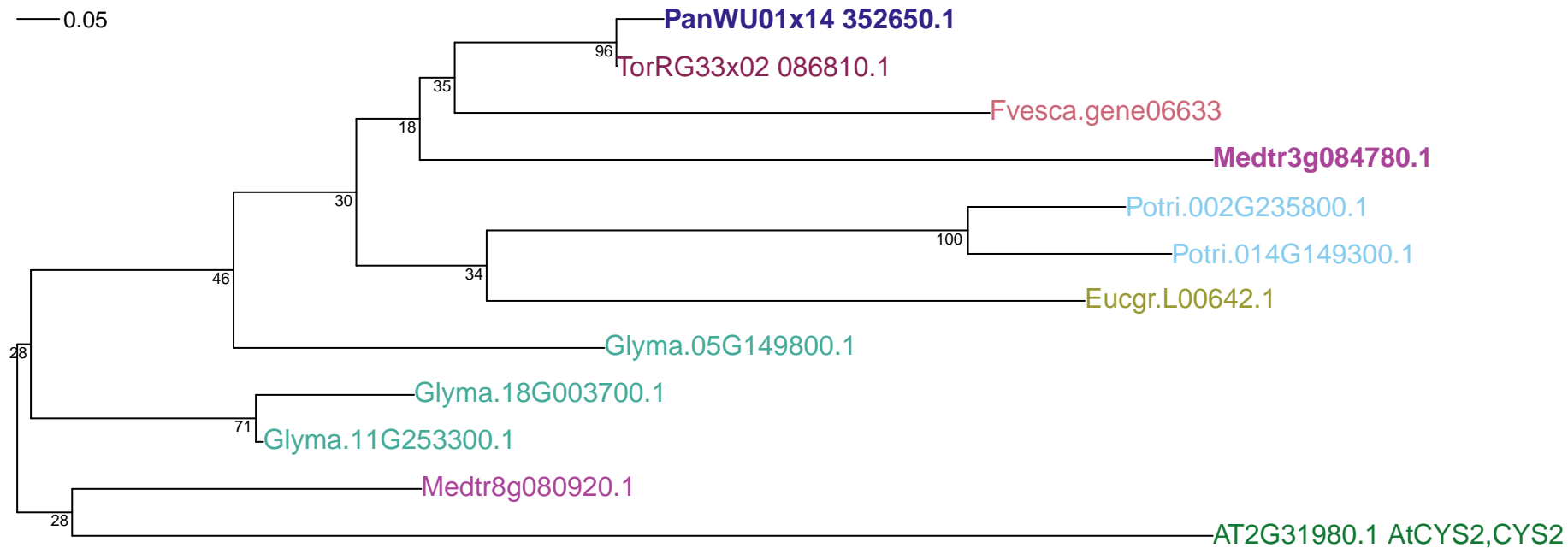
OG0005421: Other. PB1 domain containing protein



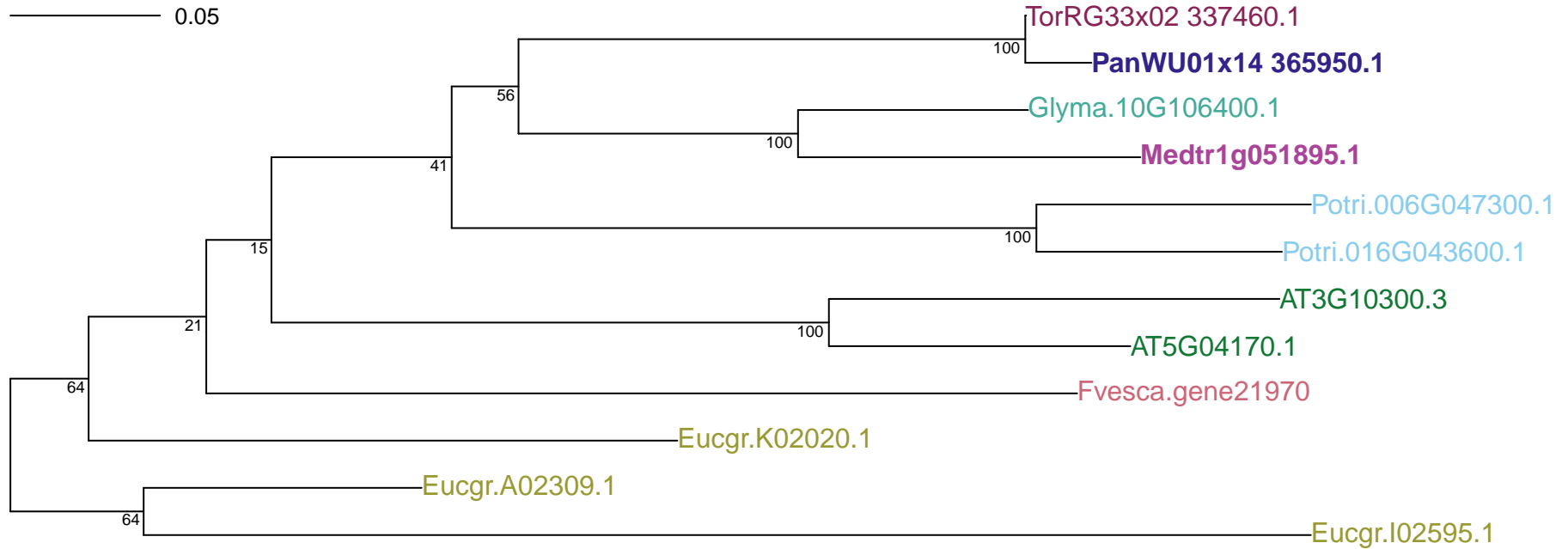
OG0005471: Other. envelope glycoprotein



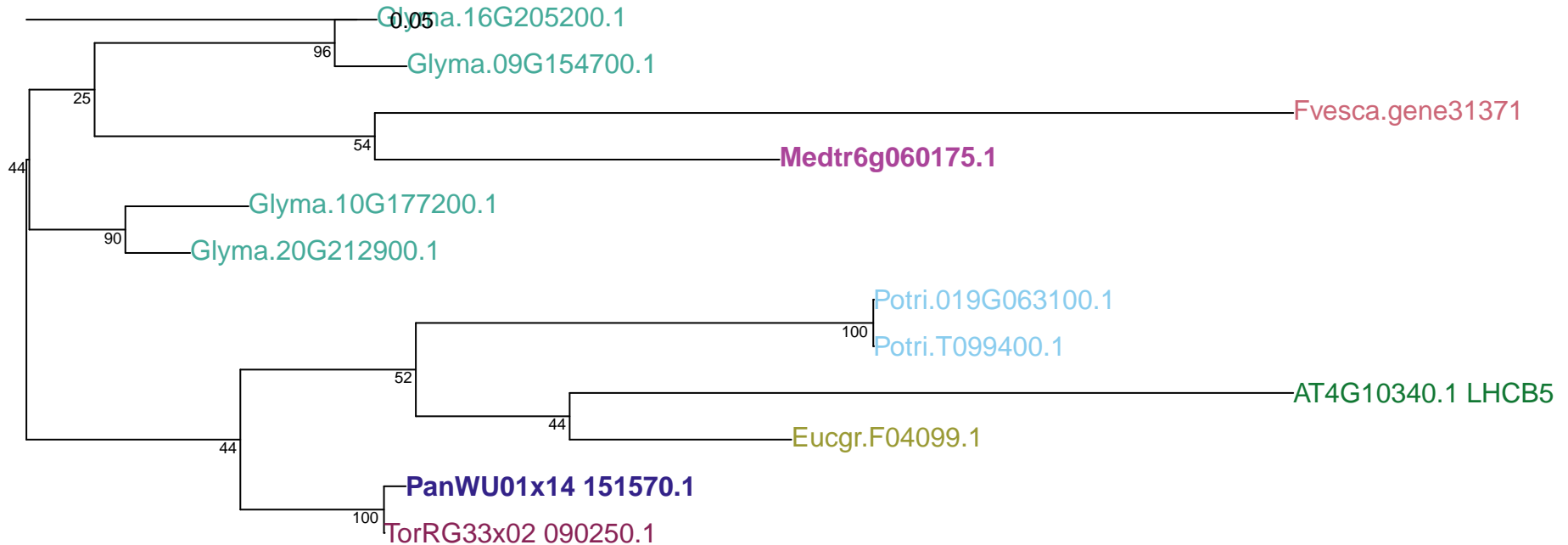
OG0005822: Other. Cystatin



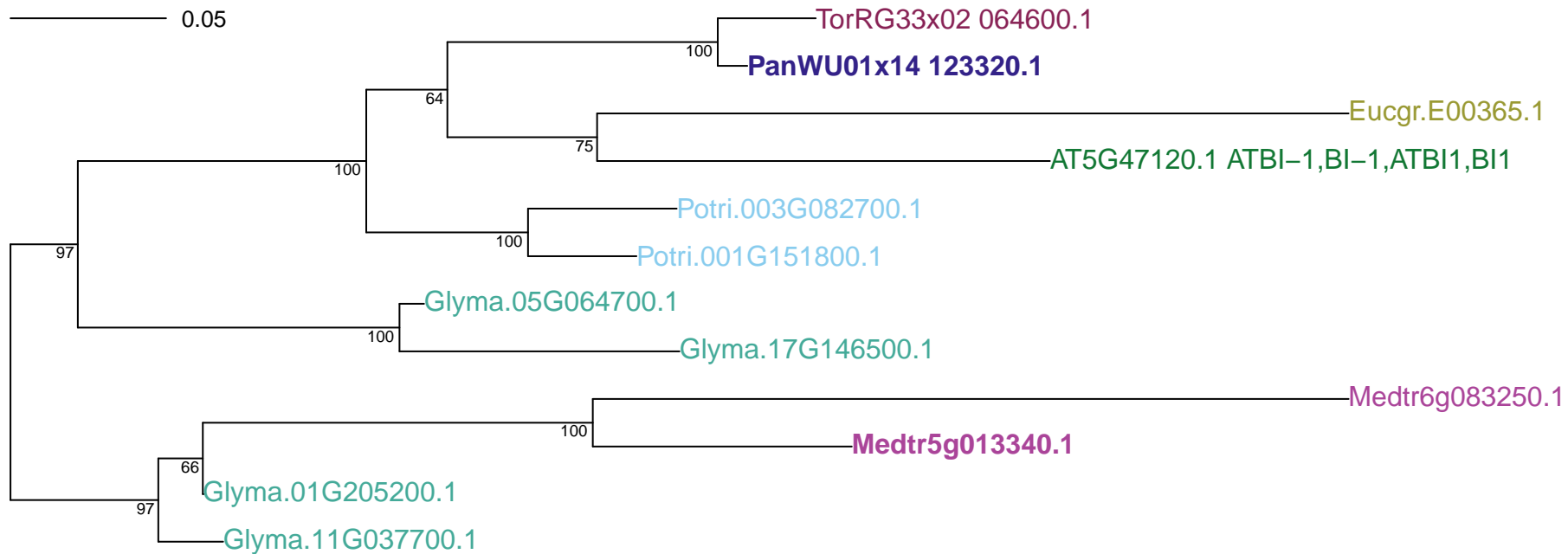
OG0006015: Other. Parvalbumin



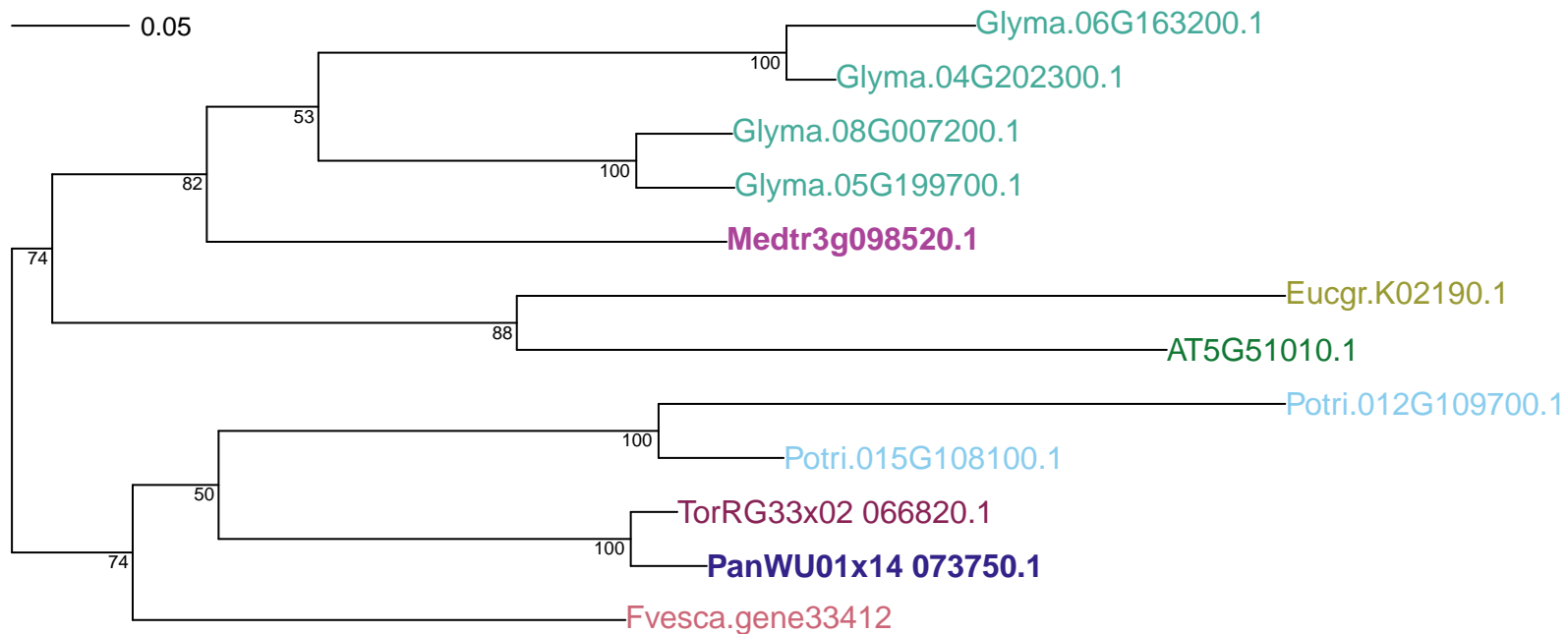
OG0006114: Other. Chlorophyll A-B binding protein



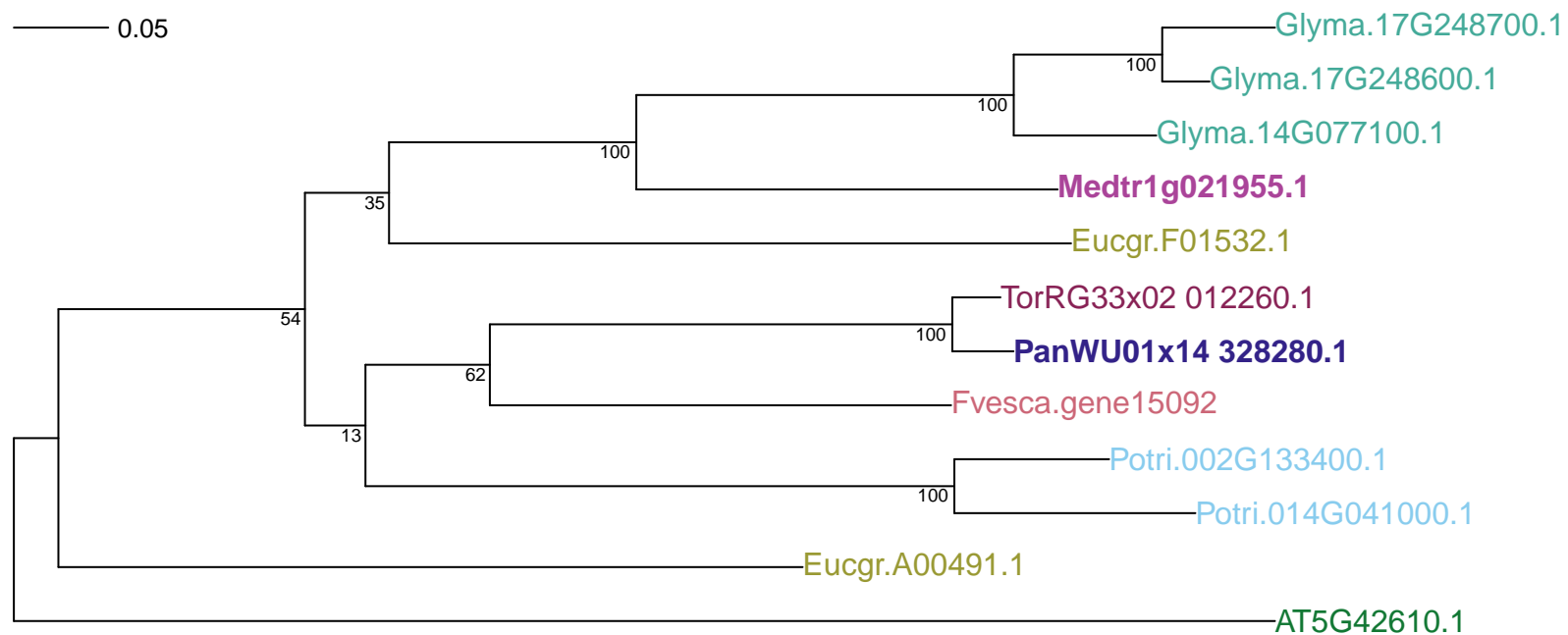
OG0006218: Other. Bax inhibitor 1-related



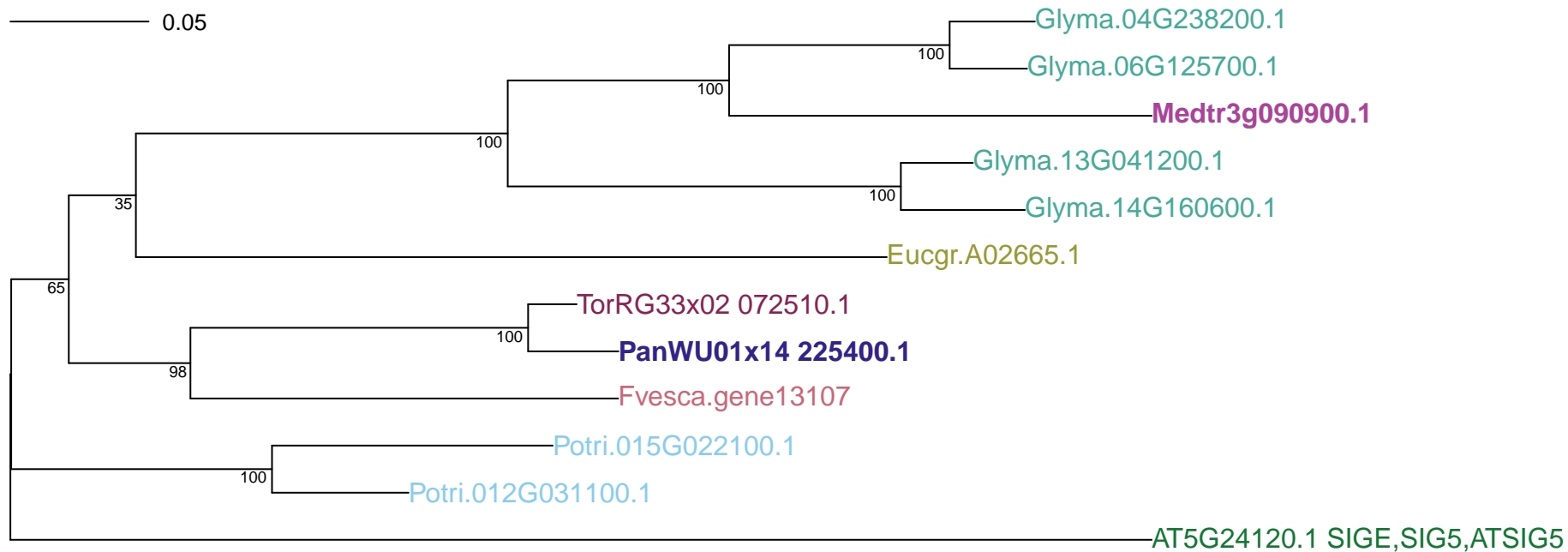
OG0006312: Other. Rubredoxin-like domain containing protein



OG0006313: Other. Coiled-coil domain containing protein 109, C-terminal

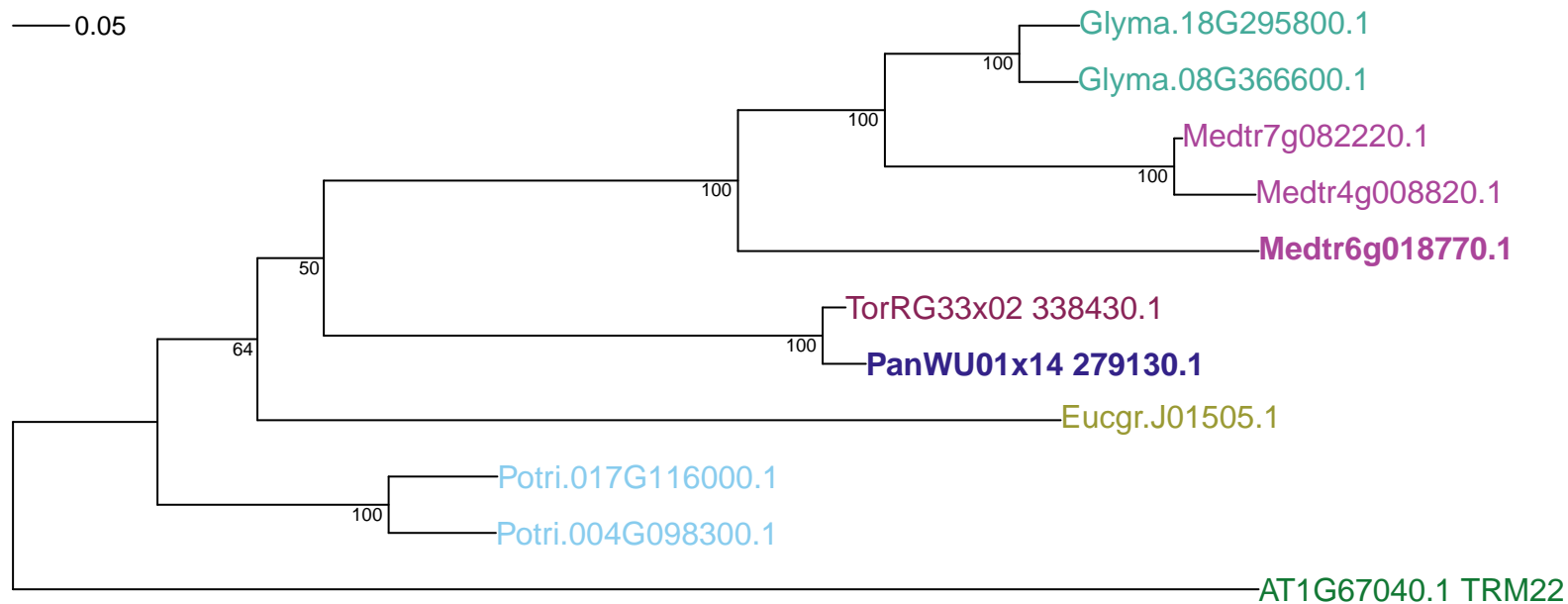


OG0006315: Other. RNA polymerase sigma factor



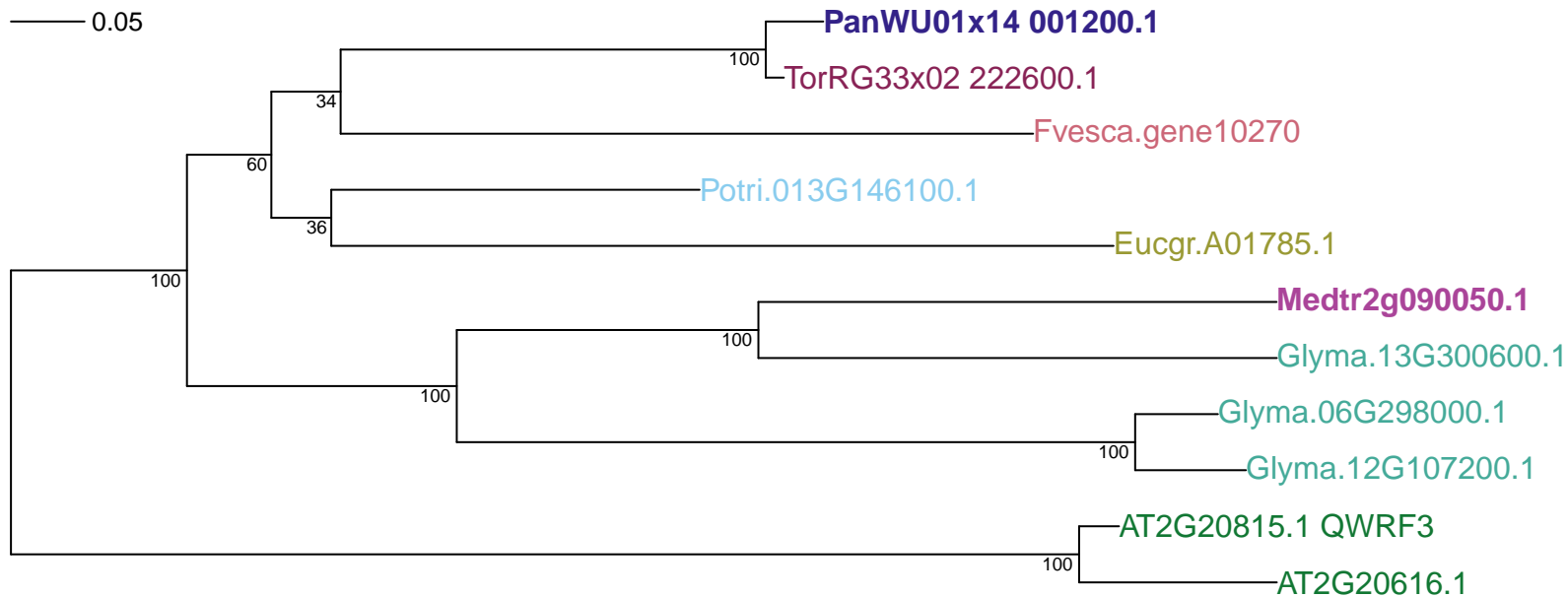
OG0006772: Other. DnaA initiator–associating protein

— 0.05



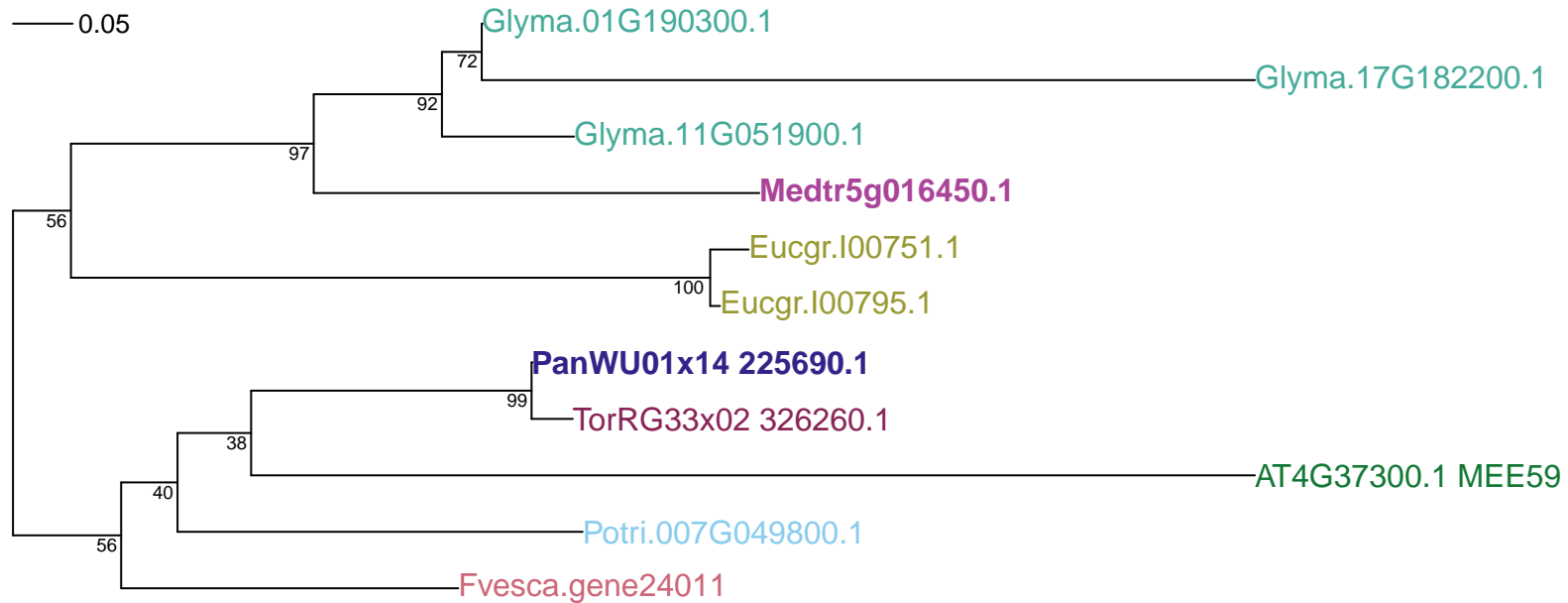
OG0007005: Other. QWRF family

0.05



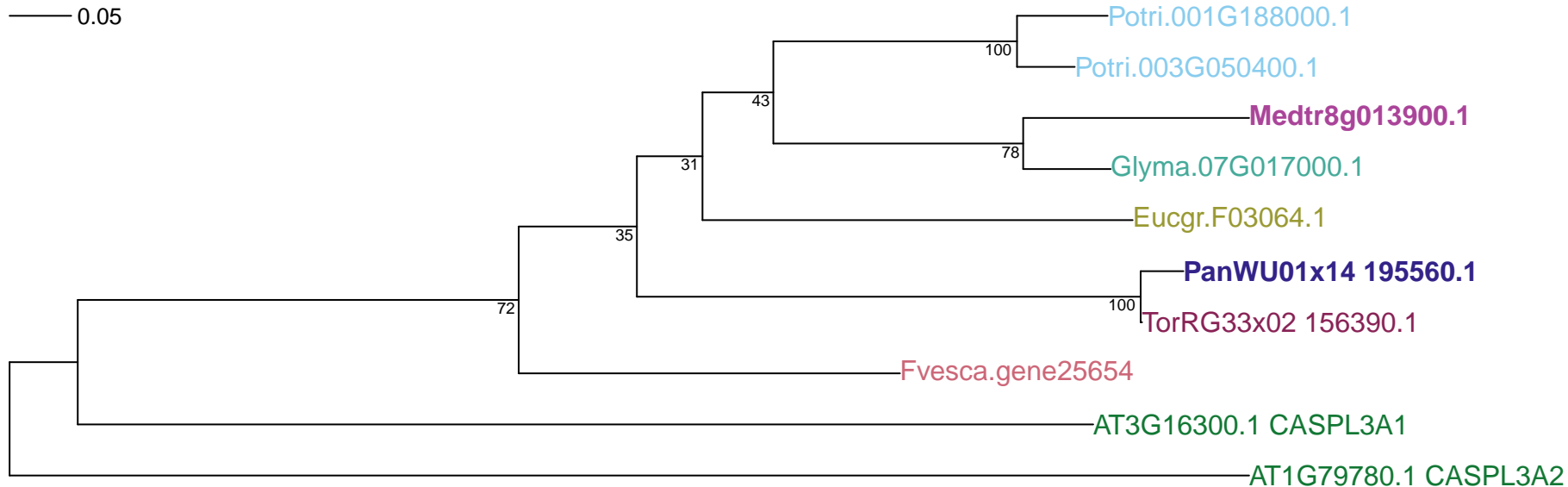
OG0007319: Other. maternal effect embryo arrest

— 0.05



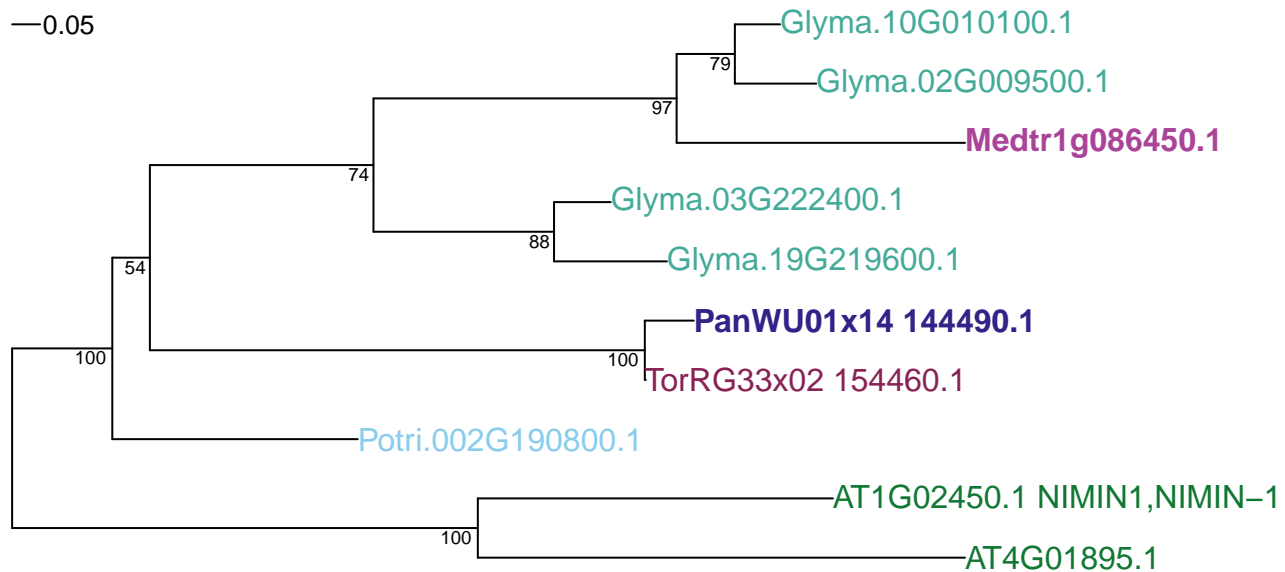
OG0008022: Other. Casparian strip membrane protein

0.05

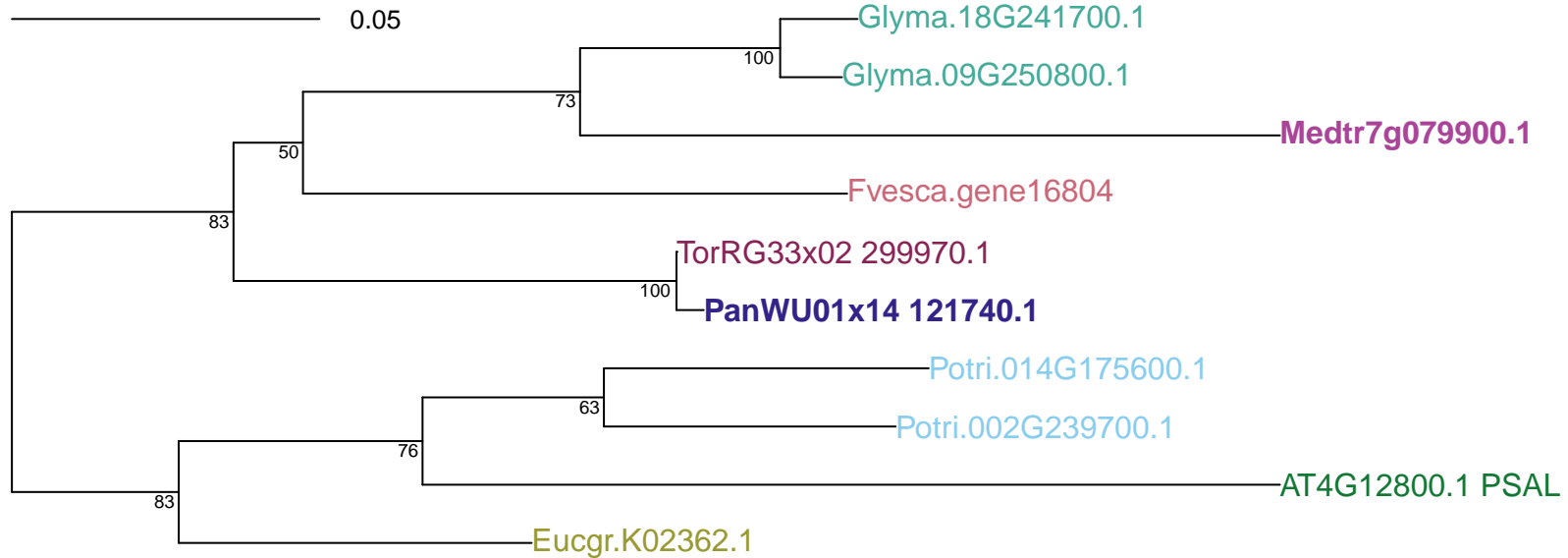


OG0008197: Other. NIM1-interacting protein

—0.05

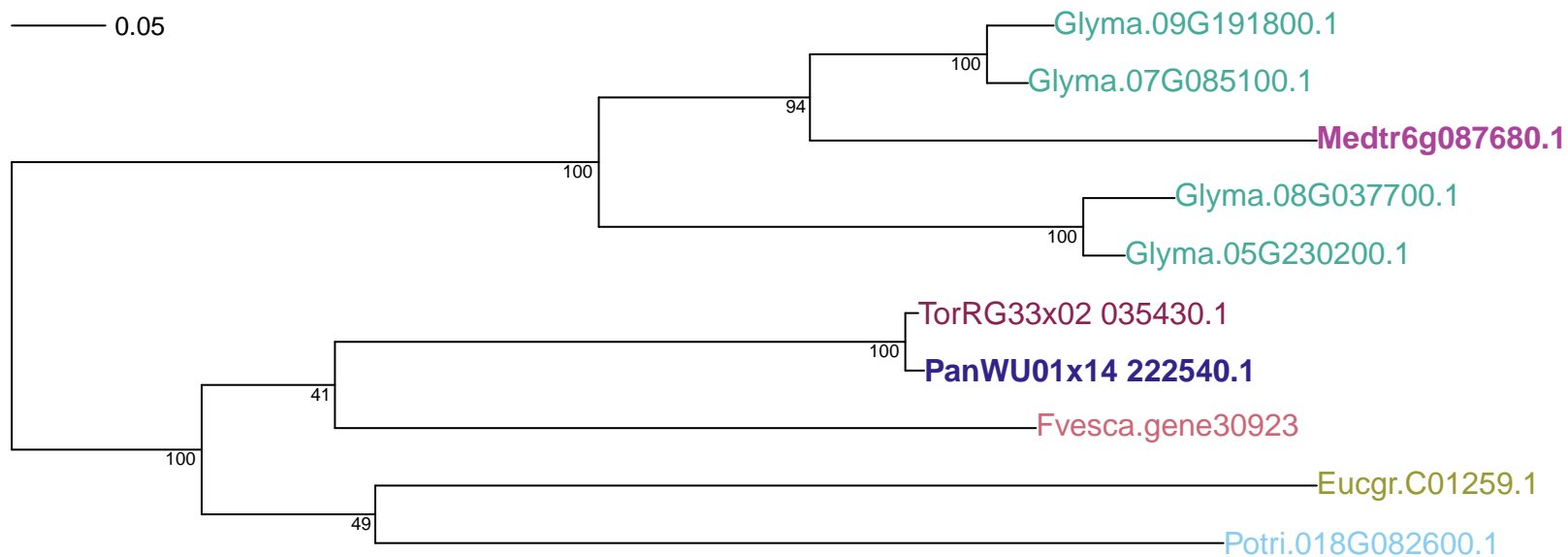


OG0009097: Other. Photosystem I PsaL, reaction centre subunit XI

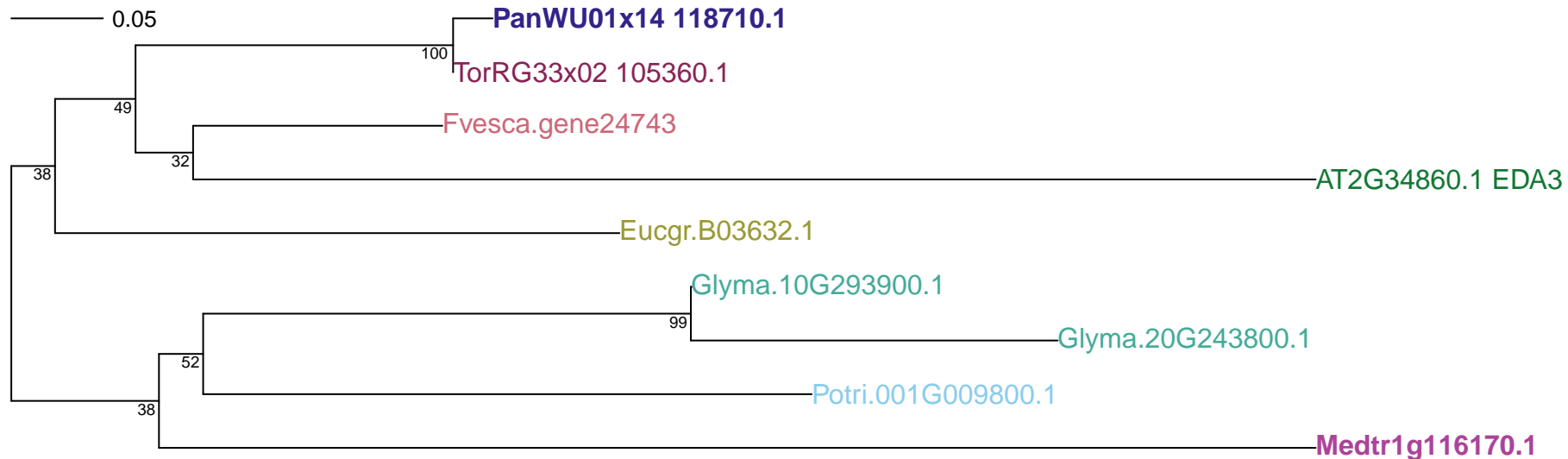


OG0009734: Other. ABI family

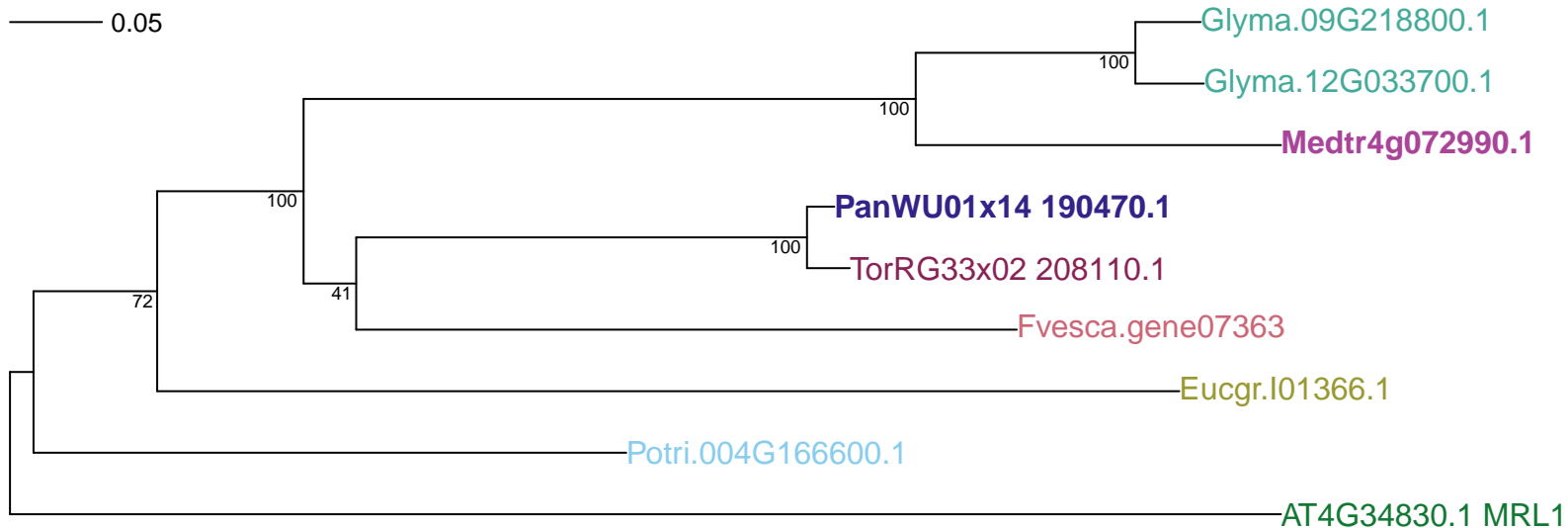
0.05



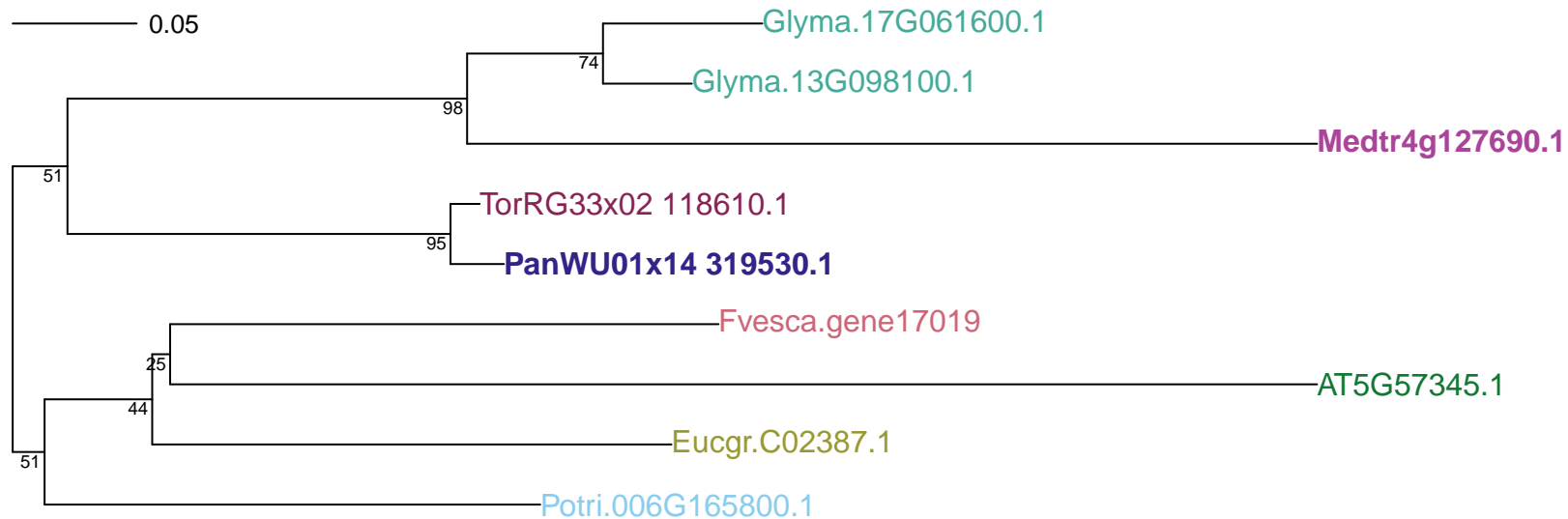
OG0010443: Other. Heat shock protein DnaJ, cysteine-rich domain containing protein



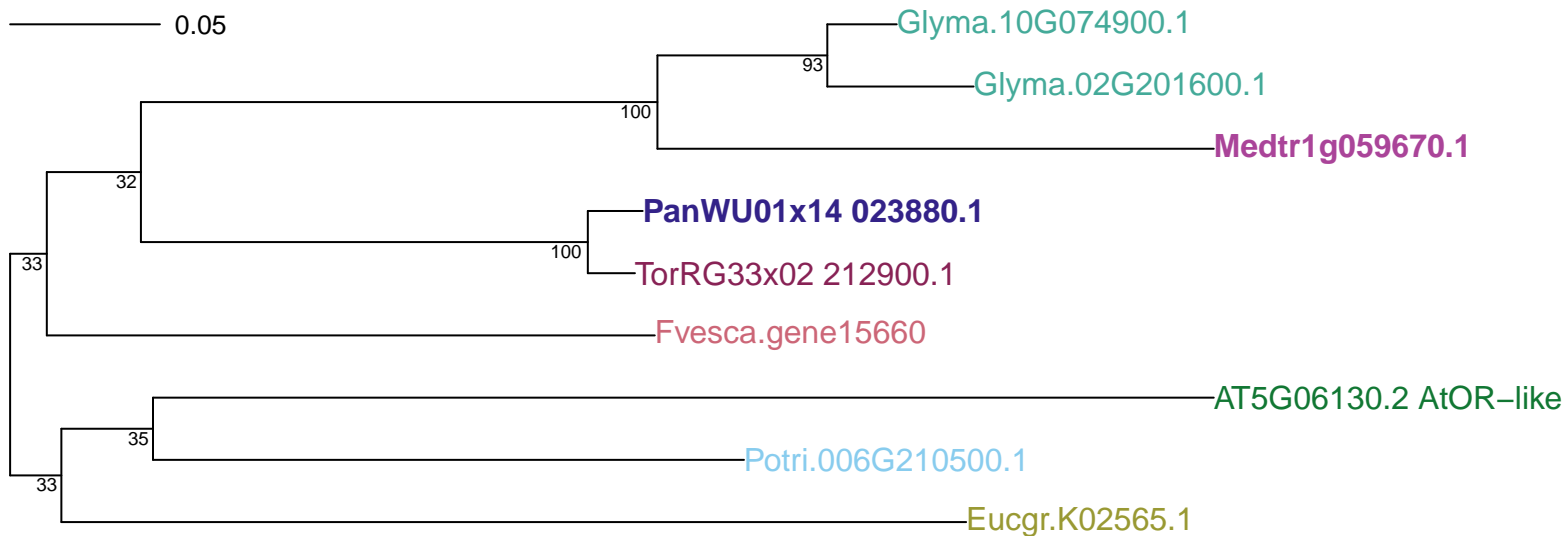
OG0011383: Other. Tetratricopeptide-like helical domain containing protein



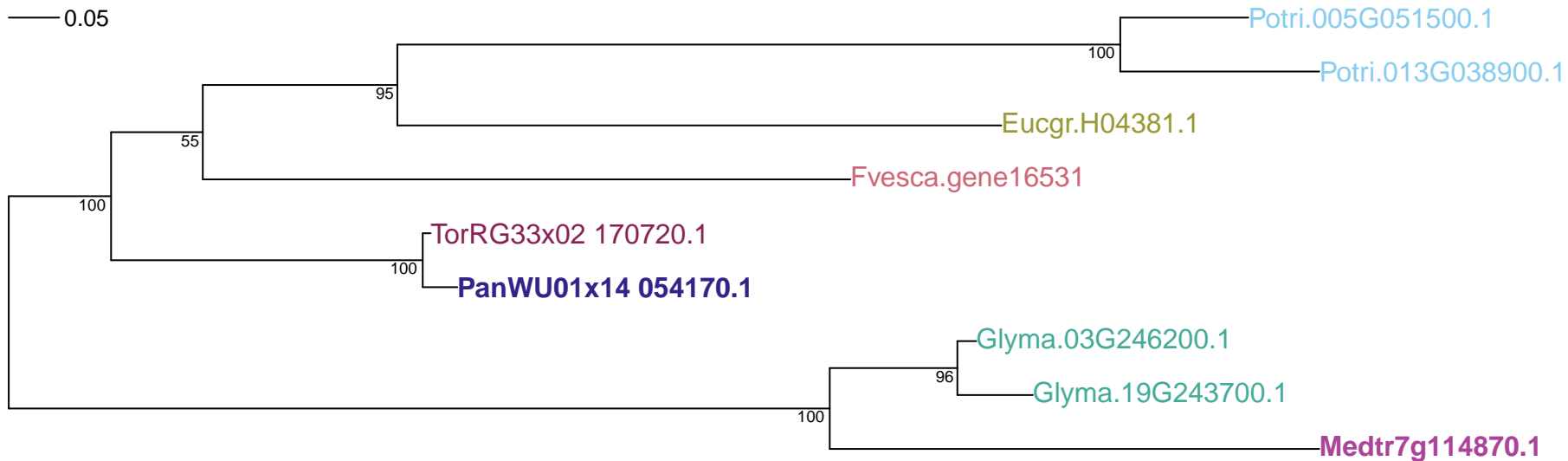
OG0011683: Other. Transmembrane protein



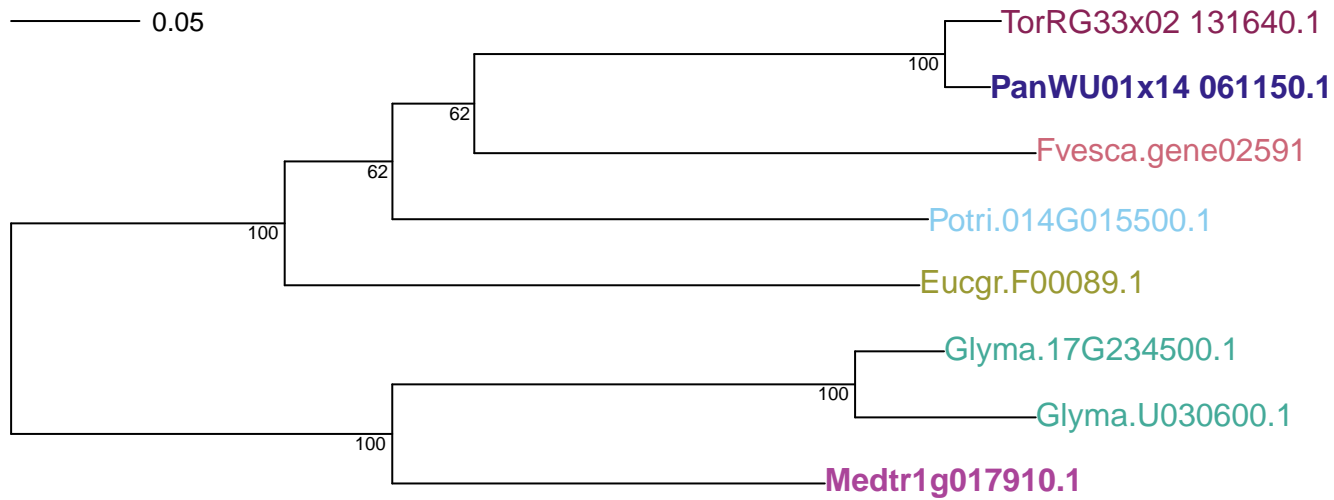
OG0011913: Other. chaperone protein dnaJ-like protein



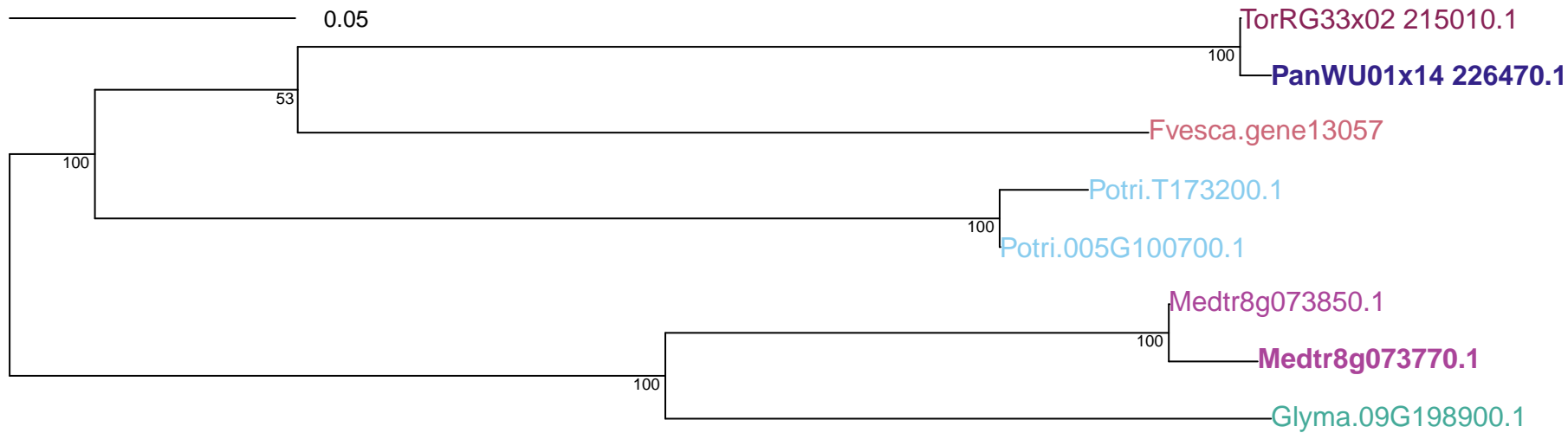
OG0012016: Other. IQ motif, EF-hand binding site



OG0013433: Other. Exocyst complex protein



OG0013514: Other. Disease resistance response protein



OG0013629: Other. nucleotide binding protein

