**Table 1**. Geographic origin and host of C. albifundus isolates screened for laccase activity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Isolate number a** | **Geographic region** | **Host** | **SS/SF d** | **Presence**  **of laccase**  **activity e** | **Collection date** | **Collector** |
| CMW4065b | Kwa Zulu Natal | *Acacia mearnsii* | SF | + | 1/4/1997 | Roux J |
| CMW4075b | Kwa Zulu Natal | *Acacia mearnsii* | SS | + | 1/4/1997 | Roux J |
| CMW4090b | Kwa Zulu Natal | *Acacia mearnsii* | SF | + | 1/3/1997 | Roux J |
| CMW17274b\* | Gauteng | *Faurea saligna* | SF | - | 1/3/2005 | Roux J |
| CMW17620b\* | Limpopo | *Terminalia serecia* | SF | - | 1/1/2005 | Roux J |
| CMW17628c | Gauteng | *Faurea saligna* | SS | - | 7/2/2005 | Heath RN |
| CMW21146b | Limpopo | *Acacia grandicornula* | SS | - | 1/11/2005 | Heath RN |
| CMW21150b | Limpopo | *Acacia nigrescens* | SS | + | 1/11/2005 | Heath RN |
| CMW21473b | Gauteng | *Nitulid beetle* | SF | + | 1/1/2006 | Heath RN |
| CMW22302c | Gauteng | *Brachypephus beetle* | SF | + | 2006 | Heath RN |
| CMW23823c | Mpumalanga | *Acacia mearnsii* | SS | + | 2006 | Heath RN |
| CMW23839c | Limpopo | *Terminalia serecia* | SF | - | 2006 | Heath RN |
| CMW37312b | Mpumalanga | *Terminalia serecia* | SF | - | 2010 June | Mbenoun M |
| CMW37313b | Mpumalanga | *Combretum zeyheri* | SF | - | 2010 June | Mbenoun M |
| CMW37949b | Mpumalanga | *Combretum apiculatum* | SF | - | 2010 June | Mbenoun M |
| CMW40625b | Western Cape | *Protea gaguedi* |  | + | 2013 May 05 | Roux J |
| CMW41421b | Mpumalanga | *Peltophorum africanum* |  | - | 2014 May 27 | Dong Hyeon |
| CMW41550c | Mpumalanga | *False Marula* | SS | + | 2014 May 29 | Dong Hyeon |
| CMW41551c | Mpumalanga | *False Marula* | SF | - | 2014 May 29 | Dong Hyeon |
| CMW41552c | Mpumalanga | *False Marula* | SF | + | 2014 May 29 | Dong Hyeon |
| CMW41580c | Mpumalanga | *Terminalia serecia* | SF | + | 2014 May 28 | Dong Hyeon |
| CMW41601c | Mpumalanga | *Terminalia serecia* | SF | + | 2014 May 27 | Alain Misse |
| CMW42100b | Western Cape | *Acacia melanoxylon* | SF | + | 2014 | Alain Misse |
| CMW42101b | Western Cape | *Acacia melanoxylon* | SF | + | 2014 | Alain Misse |
| CMW42102b | Western Cape | *Acacia melanoxylon* | SF | + | 2014 | Alain Misse |
| CMW42103b | Western Cape | *Acacia melanoxylon* | SF | + | 2014 | Alain Misse |
| CMW42104b | Western Cape | *Acacia melanoxylon* | SF | + | 2014 | Alain Misse |
| CMW42108 | Western Cape | *Acacia melanoxylon* |  | - | 2014 | Alain Misse |
| CMW42117c | Western Cape | *Acacia melanoxylon* | SF | - | 2014 | Alain Misse |
| CMW42119c | Mpumalanga | *Terminalia serecia* | SF | - | 2014 May 27 | Dong Hyeon |
| CMW42120b | Mpumalanga | *Terminalia serecia* | SF | + | 2014 May 27 | Dong Hyeon |
| CMW42123c | Mpumalanga | *Terminalia serecia* | SF | - | 2014 May 27 | Dong Hyeon |
| CMW42408c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW42409c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW42410b | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Roux J |
| CMW42413b | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Roux J |
| CMW42414b | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW42415b | Western Cape | *Protea cynaroides* | SS | - | 2013 May | Roux J |
| CMW42416c | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Roux J |
| CMW42417c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW42419c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW 42420c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW 42421c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW 42423c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |  |
| CMW 42425c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |  |
| CMW 42428c | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Roux J |
| CMW 42429c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW 42432c | Western Cape | *Protea cynaroides* | SS | - | 2013 May | Roux J |
| CMW 42434 | Western Cape | *Protea cynaroides* |  | + | 2013 May | Roux J |
| CMW 42436c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW 42437c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |  |
| CMW 42438c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW 42441 | Western Cape | *Protea cynaroides* |  | + | 2013 May | Farm owner |
| CMW 42442c | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Farm owner |  |
| CMW 42444c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Farm owner |  |
| CMW 42445c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Farm owner |
| CMW 42446c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Farm owner |
| CMW 42450c | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Farm owner |
| CMW 42474c | Western Cape | *Protea cynaroides* | SS | - | 2013 May | Roux J |
| CMW 42476c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW 42477c | Western Cape | *Protea cynaroides* | SF | + | 2013 May | Roux J |
| CMW 42478c | Western Cape | *Protea cynaroides* | SS | + | 2013 May | Roux J |
| CMW 42479 | Western Cape | *Protea cynaroides* |  | + | 2013 May | Roux J |
| CMW 43681c | Western Cape | *Protea cynaroides* | SF | - | 2013 May | Roux J |
| CMW 43682c | Western Cape | *Protea cynaroides* | SF | + | 2014 May | Roux J |
| CMW 43683c | Western Cape | *Protea cynaroides* | SF | + | 2015 May | Roux J |

a isolates of *C. albifundus* are preserved and maintained in Culture Collection, University of Pretoria, Pretoria, South Africa.

b the isolates of *C. albifundus* sequenced/collected year 2017, \* genome extracted from NCBI.

c the isolates of *C. albifundus* sequenced/collected year 2018.

d Self-Sterile/ Self-fertile mode of reproduction.

e Screening of laccase activity of sixty-six *C.albifundus* isolates was flooded with an enzyme alpha-naphthol. The indication of the presence of laccase activity (+) and absence (-) was observed with the colour change(purple and no colour change) respectively due to the oxidation of the enzyme.

**Table 4.** Significant SNP associated with laccase in GWA study.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SNPa** | **Alleleb** | **P-Value (After Step 3)** | **FDRc** | **PVEd** | **MAFe** |
| MAOA02000037.1:1710324 | A/G | 5,49E-05 | 0,386115218 | 0,258052948 | 0,033898305 |
| MAOA02000037.1:1656046 | G/C | 5,49E-05 | 0,411856232 | 0,258052948 | 0,033898305 |
| MAOA02000035.1:301201 | C/T | 5,49E-05 | 0,441274535 | 0,258052948 | 0,034482759 |
| MAOA02000031.1:957970 | A/T | 0,086439999 | 1 | 0,052501974 | 0,1 |
| MAOA02000031.1:1543018 | A/G | 9,09E-13 | 1,02E-07 | ?f | 0,120689655 |
| MAOA02000029.1:790562 | C/T | 7,73E-08 | 0,002901352 | ?f | 0,169491525 |
| MAOA02000024.1:365346 | C/G | 6,05E-09 | 0,000340505 | ?f | 0,066666667 |

a SNP: The SNP consist of the contig (MAOA020000number:position). For example, SNP MAOA02000037.1:1710324 was located on contig 37.1 at position 1710324bp.

b Allele indicates biallelic SNP

c FDR indicates a False discovery rate, FDR<0.05 is considered significant

d PVE, proportion variance explained

e MAF, Minor allele frequency ( MAF<0.05 at a call rate<0.85)

f Co-factors

**Table 5**. Candidate gene associated with the significant SNP (table 4).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Candidate genea** | | **Descriptionb** | **GO terms** | **Function** |
| MAOA02000037.1\_g1483.t1 | FAD dependent oxidoreductase-like protein | | GO:0016491 | oxidoreductase activity |
| MAOA02000029.1\_g5908.t1 | NADH-ubiquinone oxidoreductase 51 kDa subunit, mitochondrial | | GO:0008137 | NADH dehydrogenase (ubiquinone) activity |
| MAOA02000031.1\_g5384.t1 | DnaJ-domain-containing protein | | GO:0016491 | oxidoreductase activity |
| MAOA02000031.1\_g5385.t1 | Cytochrome p450 family protein | | GO:0016705 | oxidoreductase activity |
| MAOA02000031.1\_g5385.t1 | Cytochrome p450 family protein | | GO:0004497 | monooxygenase activity |
| MAOA02000031.1\_g5390.t1 | FAD binding domain-containing protein | | GO:0018530 | (R)-6-hydroxynicotine oxidase activity |
| MAOA02000031.1\_g5400.t1 | Linoleate 10R-lipoxygenase | | GO:0004497 | monooxygenase activity |
| MAOA02000031.1\_g5400.t1 | Linoleate 10R-lipoxygenase | | GO:0016705 | oxidoreductase activity |
| MAOA02000031.1\_g5400.t1 | Linoleate 10R-lipoxygenase | | GO:0004601 | peroxidase activity |
| MAOA02000031.1\_g5407.t1 | NmrA-like family protein | | GO:0016491 | oxidoreductase activity |
| MAOA02000029.1\_g5915.t1 | Pisatin demethylase | | GO:0016705 | oxidoreductase activity |
| MAOA02000029.1\_g5915.t1 | Pisatin demethylase | | GO:0004497 | monooxygenase activity |
| MAOA02000024.1\_g7006.t1 | Peroxidase | | GO:0004601 | peroxidase activity |
| MAOA02000024.1\_g7008.t1 | predicted protein | | GO:0016491 | oxidoreductase activity |

a Candidate gene: The gene associated with SNP (Table 4) consists of the gene name (MAOA020000number\_gene). For example, candidate gene MAOA02000037.1\_g1483.t1 was located on contig 37.1 with gene name g1483.t1.

b Description of candidate gene-based on Interproscan and Blast2Go terms/results.