**Supplementary Table 1:** Information on sequence datasets used in this study

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Strain** | **Alt. names** | **Host of isolation** | **Country** | **Locality** | **Year**  | **Reference** | **Phylogenet. lineageA** | **NCBI accession no.** |
| Br58 |  | *Avena sativa* (Oat) | Brazil | PR | 1990 | Yoshida, et al. 2016 | L1 | SAMD00051172 |
| As345 | 12.0.345 | *Avena sativa* (Oat) | Brazil | MS | 2012 | Castroagudín, et al. 2016 | L1 | SAMN07829574 |
| P28 | P-0028 | *Bromus tectorum (cheat grass)* | Paraguay | IT | 2014 | Pieck, et al. 2017 | L1 | SAMN05864041 |
| P29 | P-0029 | *B. tectorum* | Paraguay | IT | 2014 | Pieck, et al. 2017 | T | SAMN05898532 |
| Ce642i | 12.0.642i | *Cenchrus echinatus* (Buffel grass) | Brazil | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN07829578 |
| Ce88454 |  | *C. echinatus* | Philippines | Bulacan | 1988 | Borromeo, et al. 1993 | C1 | SAMN19488801 |
| MG07 |  | *C. ciliaris* | India | Bangalore, KA |  | Shirke, et al. 2016 | C2 | SAMN04217096 |
| Cd88215 |  | *Cynodon dactylon* (Bermuda grass) | Philippines | Cabanatuan, NE | 1988 | Borromeo, et al. 1993 | C1 | SAMN14167123 |
| Cd88217 |  | *C. dactylon* | Philippines | Cabanatuan, NE | 1988 | Borromeo, et al. 1993 | C1 | SAMN14167123 |
| CpJA159 |  | *Cynodon plectostachyus* (Bermudagrass) | Brazil | MG | 2018 | Present study | C1 | SAMN19488802 |
| BR29 |  | *Digitaria sanguinalis* (Hairy crabgrass) | Brazil | Goias | 1989 | Gladieux, et al. 2018 | Pg | SAMEA3108252 |
| Dig41 |  | *D. sanguinalis* | Japan | Hyogo |  | Yoshida, et al. 2016 | Pg | SAMD00051174 |
| Ds363 |  | *D. sanguinalis* | Brazil | PR | 2012/2013 | Castroagudín, et al. 2017 | Ec | SAMN19488803 |
| Ds555i | 12.0.555i | *D. sanguinalis* | Brazil | PR | 2012 | Castroagudín, et al. 2016 | L1 | SAMN07829577 |
| DsLIZ |  | *D. sanguinalis* | USA | KY | 2000 | Gladieux, et al. 2018 | Pg | SAMN08009550 |
| P26 | P-0026 | *D. sanguinalis* | Paraguay | Canindeyú |  | Present study | Pg | SAMN19488804 |
| NI907 |  | *D. sanguinalis* | Japan | Tochigi | 1974 | Ikeda et al. 2013 | Pg | SAMN10496230 |
| P30 | P-0030 | *D. sanguinalis* | Paraguay | Itapúa |  | Present study | Pg | SAMN19488805 |
| U167 |  | *D. sanguinalis* | Uruguay | Lavelleja | 2010 | Yasuhara-Bell, et al. 2018 | Pg | SAMN19488806 |
| VO107 |  | *D. sanguinalis* | USA | TX | 1981 | Gladieux, et al. 2018 | Pg | SAMN08009577 |
| U170 |  | *Echinochloa sp.* (Jungle rice) | Uruguay | Treinta y Tres | 2010 | Yasuhara-Bell, et al. 2018 | Pg | SAMN19488807 |
| Ec88443 |  | *Echinochloa colona* (Jungle rice) | Philippines | Los Baños, LB | 1988 | Borromeo, et al. 1993 | Ec | SAMN19488808 |
| Ecrus326 | 12.0.326 | *Echinochloa crusgalii* | Brazil | MS | 2012 | Castroagudín, et al. 2016 | L1 | SAMN07829573 |
| G22 |  | *Eleusine coracana* (finger millet) | Japan | Unknown | 1976 | Gladieux, et al. 2018 | E2 | SAMN08009554 |
| JP29 |  | *E. coracana* | Japan | Unknown | 1991 | Tredway, et al., 2003 | Er | SAMN19488809 |
| PH42 |  | *E. coracana* | Philippines | Unknown | 1983 | Farman, et al. 2017 | E1 | SAMN08009570 |
| Z2-1 |  | *E. coracana* | Japan | Kagawa | 1977 | Yoshida, et al. 2016 | E2 | SAMD00051173 |
| MG03 |  | *E. coracana* | India | Bangalore, KA | 2013 | Shirke, et al. 2016 | E2 | SAMN04216994 |
| MG04 |  | *E. coracana* | India | Bangalore, KA | 2012 | Shirke, et al. 2016 | E2 | SAMN04216996 |
| MG12 |  | *E. coracana* | India | Bangalore, KA | 2013 | Shirke, et al. 2016 | E2 | SAMN04217237 |
| B51 |  | *Eleusine indica* (goose grass) | Bolivia | Quirusillas, SC | 2012 | Farman, et al. 2017 | E1 | SAMN08009542 |
| Br62 |  | *E. indica* | Brazil | Unknown | 1991 | Islam, et al. 2016 | E1 | SAMEA4029901 |
| CD156 |  | *E. indica* | Ivory Coast | Ferkessedougou, SV | 1989 | Chiapello, et al. 2015 | E1 | SAMEA4708261 |
| Ei534i | 12.0.534i | *E. indica* | E. indica | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN07829576 |
| Ei8303 | EiA8303 | *E. indica* | Philippines | Los Baños, LB | 1984 | Borromeo, et al. 1993 | E1 | SAMN19488810 |
| Ei88365 |  | *E. indica* | Philippines | Santo Tomas, BTG | 1988 | Borromeo, et al. 1993 | E1 | SAMN19488811 |
| Ei8927 |  | *E. indica* | Philippines | BUDA | 1989 | Borromeo, et al. 1993 | E1 | SAMN19488812 |
| Ei9064 |  | *E. indica* | China | FJ | 1996 | Borromeo, et al. 1993 | E1 | SAMN19488813 |
| Ei9411 |  | *E. indica* | China | FJ | 1990 | Borromeo, et al. 1993 | E2 | SAMN04318447 |
| EiJA22 |  | *E. indica* | Brazil | Patos de Minas, MG | 2018 | Present study | T | SAMN19488814 |
| EiJA178 |  | *E. indica* | Brazil | Viçosa, MG | 2018 | Present study | E3 | SAMN19488815 |
| EiJA56 |  | *E. indica* | Brazil | Viçosa, MG | 2018 | Present study | E3 | SAMN19488816 |
| MZ5-1-6 |  | *E. indica* | Japan | Unknown |  | Inoue, et al. 2017 | E2 | SAMD00069327 |
| U229 |  | *E. indica* | Uruguay | Valle Alto, TT | 2017 | Yasuhara-Bell, et al. 2018 | E1 | SAMN19488817 |
| U231 |  | *E. indica* | Uruguay | Valle Alto, TT | 2017 | Yasuhara-Bell, et al. 2018 | E1 | SAMN19488818 |
| U169-v1 | U169 | *Eleusine spp.* | Uruguay | Río Branco, CL | 2010 | Yasuhara-Bell, et al. 2018 | E1 | SAMN19488819 |
| AR4 |  | *Eragrostis curvula* (weeping lovegrass) | Japan | Unknown |  | Chao & Ellingboe 1991 | Er | SAMN19488820 |
| Er88271 |  | *Eragrostis sp.* | Phillipines | Los Baños, LB | 1988 | Borromeo, et al. 1993 | Pg | SAMN19488821 |
| P25 | P-0025 | *Eragrostis sp.* | Paraguay | Canindeyú | *Eragrostis sp.* | Yasuhara-Bell, et al. 2018 | L1 | SAMN19488822 |
| G17 |  | *E. curvula* | Japan | Unknown | 1976 | Islam, et al. 2016 | Er | SAMN08009553 |
| EtKY19-1 |  | *Eragrostis tef* (Teff) | USA | KY | 2019 | Rahnama, et al. 2020 | Er | SAMN13964779 |
| pg1213-2 |  | *Festuca arundinacea* (Tall fescue) | USA | GA | 1999/2000 | Yasuhara-Bell, et al. 2018 | L2 | SAMN14603777 |
| pg1213-22 |  | *F. arundinacea* | USA | GA | 1999/2000 | Pieck, et al. 2017 | L1 | SAMN08009569 |
| TF05-1 |  | *F. arundinacea* | USA | Lexington, KY | 2005 | Gladieux, et al. 2018 | L1 | SAMN08009576 |
| TF15-1 |  | *F. arundinacea* | USA | Lexington, KY | 2015 | Present study | L1 | SAMN14144147 |
| FPH-2015-44 |  | *Hakonechloa macra* (Hakone grass) | USA | OH | 2015 | Yasuhara-Bell, et al. 2018 | H | SAMN14144145 |
| BTBa-B1 |  | *Hordeum vulgare* (Barley) | Bangladesh | Gazipur | 2016 | Soanes, et al. 2017 | T | SAMEA104190806 |
| BTBa-B2 |  | *H. vulgare* | Bangladesh | Gazipur | 2016 | Soanes, et al. 2017 | T | SAMEA104190807 |
| TH0012-rn | TH0012, TH12 | *H. vulgare* | Thailand | Unknown | Unknown | Islam, et al. 2016 | O | SAMEA3231789 |
| TH0016 | TH16 | *H. vulgare* | Thailand | Unknown | Unknown | Islam, et al. 2016 | O | SAMEA3232033 |
| Lh8401 | LhA8401 | *Leersia hexandra* (Southern cutgrass) | Philippines | Los Baños, LB | 1984 | Borromeo, et al. 1993 | Le | SAMN19488823 |
| Lh88405-2 | Lh88405 | *L. hexandra* | Philippines | Los Baños, LB | 1988 | Borromeo, et al. 1993 | Le | SAMN14167125 |
| Lh8844 |  | *L. hexandra* | Philippines | Cabanatuan, NE | 1988 | Borromeo, et al. 1993 | Le | SAMN19488824 |
| Lc8401 | LcA8401 | *Leptochloa chinensis* (Red sprangletop) | Philippines | Los Baños, LB | 1984 | Borromeo, et al. 1993 | Ec | SAMN14144146 |
| ATCC64557 | U49 | *Lolium multiflorum* (Festuca perennis*)* | USA | MS | 1972 | Tosa, et al. 2007 | L1 | SAMN19488825 |
| PL2-1 |  | *L. multiflorum* | USA | Pulaski Co., KY | 2002 | Inoue, et al. 2017 | L1 | SAMN08009571 |
| PL3-1 |  | *L. multiflorum* | USA | Pulaski Co., KY | 2002 | Farman, et al. 2017 | L1 | SAMN08009572 |
| Po221 |  | *L. multiflorum* | Uruguay | Cerro Largo | 2015 | Present study | L1 | SAMN14153273 |
| U234 |  | *L. multiflorum* | Uruguay | 18 de Julio, RO | 2017 | Yasuhara-Bell, et al. 2018 | L1 | SAMN19488826 |
| U235 |  | *L. multiflorum* | Uruguay | 18 de Julio, Rocha  | 2017 | Yasuhara-Bell, et al. 2018 | L1 | SAMN19488827 |
| U237 |  | *L. multiflorum* | Uruguay | Treinte y Tres | 2017 | Yasuhara-Bell, et al. 2018 | Ec | SAMN19488828 |
| CHRF |  | *Lolium perenne* (perennial ryegrass) | USA | Siler Springs, MD | 1996 | Inoue, et al. 2017 | L1 | SAMN08009548 |
| CHW |  | *L. perenne* | USA | Severna Park, MD | 1996 | Inoue, et al. 2017 | L1 | SAMN08009549 |
| FH |  | *L. perenne* | USA | Hagerstown, MD | 1997 | Pieck, et al. 2017 | L1 | SAMN08009551 |
| GG11 |  | *L. perenne* | USA | Lexington, KY | 1997 | Farman, et al. 2017 | L1 | SAMN08009555 |
| HO |  | *L. perenne* | USA | Richmond, PA | 1996 | Gladieux et al. 2018 | L1 | SAMN08009558 |
| LpKY97 | LpKY97-1 | *L. perenne* | USA | Lexington, KY | 1997 | Farman, et al. 2017 | L1 | SAMN08009564 |
| PgKY | PgKY4OV2.1 | *L. perenne* | USA | Lexington, KY | 2000 | Islam, et al. 2016 | L1 | SAMEA4029903 |
| PgPA | PgPA18C-02, PGPA | *L. perenne* | USA | PA | 1998 | Islam, et al. 2016 | L1 | SAMEA4029904 |
| TP2 |  | *L. perenne* | Japan | Tochigi | 1997 | Inoue, et al. 2017 | L1 | SAMN14151737 |
| Wk3-1 |  | *L. perenne* | Japan | Yamaguchi | 1996 | Tosa et al., 2004 | L3 | SAMN14603776 |
| U168 |  | *Luziola peruvianum* (watergrass) | Uruguay | Río Branco, CL | 2010 | Yasuhara-Bell, et al. 2018 | Lu | SAMN14603775 |
| U171 |  | *L. peruvianum* | Uruguay | Zapata, TT | 2010 | Yasuhara-Bell, et al. 2018 | Lu | SAMN19488829 |
| 87-120 |  | *Oryza sativa* (rice) | Unknown | Unknown | Unknown | Gladieux, et al. 2018 | O | SAMN08377452 |
| FR13 |  | *O. sativa* | France | Unknown | 1990 | Faivre-Rampant, et al. 2008 | O | SAMEA4708258 |
| Guy11 |  | *O. sativa* | French Guyana | Unknown | 1988 | Islam, et al. 2016 | O | SAMN06050151 |
| IA1 | ARB114 | *O. sativa* | USA | AR | 2009 | Pieck, et al. 2017 | O | SAMN08009559 |
| IB33 |  | *O. sativa* | USA | AR | unknown | Present study | O | SAMN08009560 |
| IB49 | ZN61 | *O. sativa* | USA | AR | 1992 | Pieck, et al. 2017 | O | SAMN08009561 |
| IC17 | ZN57 | *O. sativa* | USA | AR | 1992 | Pieck, et al. 2017 | O | SAMN08009562 |
| IE1K | TM2 | *O. sativa* | USA | AR | 2003 | Pieck, et al. 2017 | O | SAMN08009563 |
| INA168 |  | *O. sativa* | Japan | Aichi | 1958 | Inoue, et al. 2017 | O | SAMD00051169 |
| Ken53-33 |  | *O. sativa* | Japan | Aichi | 1953 | Yoshida, et al. 2016 | O | SAMD00051177 |
| MBSD02 | RMg-Dl | *O. sativa* | India | BR | 2016 | Kumar, et al. 2017 | O | SAMN05425585 |
| ML33 |  | *O. sativa* | Mali | Unknown | 1995 | Gladieux, et al. 2018 | O | SAMN08009565 |
| P-2 |  | *O. sativa* | Japan | Aichi | 1948 | Yoshida, et al. 2016 | O | SAMD00051176 |
| P131 |  | *O. sativa* | Japan | Unknown | Unknown | Farman, et al. 2017 | O | SAMN02981399 |
| PH0014-rn |  | *O. sativa* | Philippines | Unknown | Unknown | Islam, et al. 2016 | O | SAMN19488830 |
| Rmg\_DI |  | *O. sativa* | India | Bihar | 2012 | Present study | O | SAMN19488831 |
| SSID116 |  | *O. sativa* | USA | Unknown | 1997 | Yasuhara-Bell, et al. 2018 | O | SAMN19488832 |
| TH3 |  | *O. sativa* | Thailand | Unknown | ND | Yoshida, et al. 2016 | O | SAMD00051175 |
| U75 |  | *O. sativa* | Uruguay | Treinte y Tres | 2005 | Yasuhara-Bell, et al. 2018 | O | SAMN19488833 |
| U107 |  | *O. sativa* | Uruguay | Treinte y Tres | 2009 | Present study | O | SAMN19488834 |
| U198 |  | *O. sativa* | Uruguay | Tacuarembó | 2014 | Present study | O | SAMN19488835 |
| Y34 |  | *O. sativa* | China | YN | 1982 | Xue, et al. 2012 | O | SAMN02981398 |
| BTTrp-5 |  | *Panicum repens* (Torpedograss) | Bangladesh | Gazipur | 2016 | Soanes, et al. 2017 | P | SAMEA104190823 |
| BTTrp-6 |  | *P. repens* | Bangladesh | Gazipur | 2017 | Soanes, et al. 2017 | P | SAMEA104190824 |
| Pr8202 | PrA8202 | *P. repens* | Philippines | Los Baños, LB | 1982 | Borromeo, et al. 1993 | P | SAMN14603774 |
| Pr88165 |  | *P. repens* | Philippines | Cabanatuan, NE | 1989 | Borromeo, et al. 1993 | P | SAMN19488836 |
| Pd88413 |  | *Paspalum distichum* (knotgrass) | Philippines | Los Baños, LB | 1988 | Borromeo, et al. 1993 | Ec | SAMN14144143 |
| ML36 |  | *Pennisetum sp.* | Mali |  |  | Present study | Pp | SAMN19488837 |
| Pm1 |  | *Pennisetum americanum* | USA | GA | 1990 | Gladieux, et al. 2018 | Pp | SAMN08377453 |
| PtKY18-1 |  | *Poa trivialis* (Rough bluegrass) | USA | Lexington, KY | 2018 | Present study | L1 | SAMN19488838 |
| RrJA49 |  | *Romulea rosea* (Guildford grass) | Brazil | MG | 2018 | Present study | U4 | SAMN19488839 |
| BP1-FLA |  | *Setaria faberi* (Japanese bristlegrass) | USA | FL | 2018 | Present study | S | SAMN19488840 |
| GFSI1-7-2 |  | *Setaria italica* (foxtail millet) | Japan | Gifu | 1977 | Yoshida, et al. 2016 | S | SAMD00051170 |
| MG05 |  | *S. italica* | India | Bangalore, KA | 2012 | Shirke, et al. 2016 | S | SAMN04217000 |
| MG08 |  | *S. italica* | India | Mandya, KA | 2012 | Shirke, et al. 2016 | S | SAMN04217082 |
| U232 |  | *S. italica* | Uruguay | Minas, LA | 2017 | Yasuhara-Bell, et al. 2018 | S | SAMN19488841 |
| US71 |  | *Setaria spp.* | USA | Lexington, KY | ND | Chiapello, et al. 2015 | S | SAMEA3373385 |
| Arcadia2 |  | *Setaria viridis* (green foxtail) | USA | Lexington, KY | 1998 | Farman, et al. 2014 | S | SAMN14167122 |
| GRF52 |  | *S. viridis* | USA | Lexington, KY | 2001 | Gladieux, et al. 2018 | S | SAMN08009556 |
| KANSV1-4-1 |  | *S. viridis* | Japan | Kanagawa | 1975 | Yoshida, et al. 2016 | S | SAMD00051178 |
| SA05-144 |  | *S. viridis* | Japan | Nagasaki | 2005 | Yoshida, et al. 2016 | S | SAMD00051180 |
| SA05-43 |  | *S. viridis* | Japan | Nagasaki | 2005 | Yoshida, et al. 2016 | S | SAMD00051179 |
| Sv9610 |  | *S. viridis* | China | ZJ | 1996 | Zhong, et al. 2016 | S | SAMN04318449 |
| Sv9623 |  | *S. viridis* | China | ZJ | 1996 | Zhong, et al. 2016 | S | SAMN04318450 |
| Pg1054 |  | *Stenotaphrum secundatum* (St. Augustinegrass) | USA | GA | 1999/2000 | Yasuhara-Bell, et al. 2018 | St | SAMN19488842 |
| Pg1204 |  | *S. secundatum* | USA | GA | 1999/2000 | Present study | St | SAMN19488843 |
| SSFL02-1 | SSFL02 | *S. secundatum* | USA | Disneyworld, FL | 2002 | Pieck, et al. 2017 | St | SAMN08009573 |
| SSFL14-3 |  | *S. secundatum* | New Smyrna, FL | New Smyrna, FL | 2014 | Gladieux, et al. 2018 | St | SAMN08009574 |
| SSTX16-11 | SSTX16-1 | *S. secundatum* | USA | TX | 2016 | Yasuhara-Bell, et al. 2018 | St | SAMN14144144 |
| STAG-MS |  | *S. secundatum* | USA | MS | 1980 | Present study | St | SAMN19488844 |
| U217 |  | *S. secundatum* | Uruguay | Treinte y Tres | 2015 | Yasuhara-Bell, et al. 2018 | St | SAMN19488845 |
| U233 |  | *S. secundatum* | Uruguay | Covidef 1, FL | 2017 | Yasuhara-Bell, et al. 2018 | St | SAMN19488846 |
| B2 |  | *Triticum aestivum* (wheat) | Bolivia | Quirusillas, SC | 2011 | Inoue, et al. 2017 | T | SAMN05580113 |
| B71 |  | *T. aestivum* | Bolivia | Quirusillas, SC | 2012 | Inoue, et al. 2017 | T | SAMN04942725 |
| BdBar | P161 | *T. aestivum* | Bangladesh | Barisal | 2016 | Inoue, et al. 2017 | T | SAMN04940126 |
| BdJes | P162 | *T. aestivum* | Bangladesh | Jessore | 2016 | Inoue, et al. 2017 | T | SAMN04942531 |
| BdKUS |  | *T. aestivum* | Bangladesh | Kushtia | 2016 | Inoue, et al. 2017 | T | SAMN14144137 |
| BdMag |  | *T. aestivum* | Bangladesh | Magura | 2016 | Inoue, et al. 2017 | T | SAMN14144138 |
| BdMeh | P163 | *T. aestivum* | Bangladesh | Mehepur | 2016 | Inoue, et al. 2017 | T | SAMN04942534 |
| BR116 | Br116.5 | *T. aestivum* | Brazil | PR | 1992 | Inoue, et al. 2017 | T | SAMN14144139 |
| BR118 |  | *T. aestivum* | Brazil | PR | 1992 | Inoue, et al. 2017 | T | SAMN14144140 |
| Br130 |  | *T. aestivum* | Brazil | MS | 1990 | Farman, et al. 2017 | T | SAMN08009547 |
| BR32 | BR0032 | *T. aestivum* | Brazil | Unknown | 1991 | Chiapello, et al. 2015 | T | SAMEA4708260 |
| Br48 |  | *T. aestivum* | Brazil | MS | 1990 | Yoshida, et al. 2016 | T | SAMD00084261 |
| Br7 |  | *T. aestivum* | Brazil | PR | 1990 | Urashima, et al. 1999 | T | SAMN08009545 |
| Br80 |  | *T. aestivum* | Brazil | Unknown | 1991 | Farman, et al. 2017 | T | SAMN08009546 |
| BR81 |  | *T. aestivum* | Brazil | Unknown | 1991 | Couch, et al. 2005 | T | SAMN14144142 |
| BTGP-1b |  | *T. aestivum* | Bangladesh | Mehepur | 2017 | Soanes, et al. 2017 | T | SAMN19488847 |
| BTGP-6e |  | *T. aestivum* | Bangladesh | Mehepur | 2017 | Soanes, et al. 2017 | T | SAMN19488848 |
| BTJP4-1 |  | *T. aestivum* | Bangladesh | Mehepur | 2017 | Soanes, et al. 2017 | T | SAMEA4708257 |
| PY0925 |  | *T. aestivum* | Brazil | Predizes, SP | 2009 | Islam, et al. 2016 | T | SAMEA4029894 |
| Py221 | Py22.1 | *T. aestivum* | Brazil | PR | 2007 | Pieck, et al. 2017 | T | SAMN05725179 |
| PY36 | PY36.1 | *T. aestivum* | Brazil | Brasilia, DF | 2007 | Yasuhara-Bell, et al. 2018 | T | SAMEA4029897 |
| PY5003 |  | *T. aestivum* | Brazil | Londrina, PR | 2005 | Yasuhara-Bell, et al. 2018 | T | SAMEA4029888 |
| PY5010 |  | *T. aestivum* | Brazil | Londrina, PR | 2005 | Islam, et al. 2016 | T | SAMEA4029898 |
| Py5020 |  | *T. aestivum* | Brazil | Londrina, PR | 2005 | Pieck, et al. 2017 | T | SAMN05762829 |
| PY5033 | PY05033 | *T. aestivum* | Brazil | Londrina, PR | 2005 | Islam, et al. 2016 | T | SAMEA4029889 |
| PY6017 | PY06017 | *T. aestivum* | Brazil | Coromandel, MG | 2006 | Islam, et al. 2016 | T | SAMEA4029890 |
| PY6025 |  | *T. aestivum* | Brazil | MG | 2006 | Inoue, et al. 2017 | T | SAMEA4029891 |
| PY6045 |  | *T. aestivum* | Brazil | GO | 2006 | Inoue, et al. 2017 | T | SAMEA4029900 |
| PY86 | PY86.1 | *T. aestivum* | Brazil | PR | 2008 | Inoue, et al. 2017 | L1 | SAMEA4029893 |
| T12-8 |  | *T. aestivum* | Brazil | Floresta, PR | 1988 | Present study | T | SAMN19488849 |
| T13-3 |  | *T. aestivum* | Brazil | Floresta, PR | 1988 | Present study | T | SAMN19488850 |
| T1-1 |  | *T. aestivum* | Brazil | Camp Grande, MS | 1988 | Present study | T | SAMN19488851 |
| T2-1 | T-0002 | *T. aestivum* | Brazil | Londrina, PR | 1987 | Present study | T | SAMN19488852 |
| T21-1 |  | *T. aestivum* | Brazil | Floresta, PR | 1988 | Present study | T | SAMN19488853 |
| T25 |  | *T. aestivum* | Brazil | São Jorge do Ivaí, PR | 1988 | Present study | T | SAMN08009575 |
| T3-1 |  | *T. aestivum* | Brazil | Vicentinópolis, GO | 1986 | Present study | T | SAMN19488854 |
| T30-2 |  | *T. aestivum* | Brazil | PR | 1989 | Present study | T | SAMN19488855 |
| T37-2 |  | *T. aestivum* | Brazil | PR | 1989 | Present study | T | SAMN19488856 |
| T4-2 |  | *T. aestivum* | Brazil | Floresta, PR | 1988 | Present study | T | SAMN19488857 |
| T42-2 |  | *T. aestivum* | Brazil | PR | 1989 | Present study | T | SAMN19488858 |
| T46-2 |  | *T. aestivum* | Brazil | PR | 1989 | Present study | T | SAMN19488859 |
| T47-3 |  | *T. aestivum* | Brazil | PR | 1985 | Present study | T | SAMN19488860 |
| T5-3 |  | *T. aestivum* | Brazil | Palotina, PR | 1988 | Present study | T | SAMN19488861 |
| T50-3 | T-0050 | *T. aestivum* | Brazil | MG | 1989 | Present study | T | SAMN19488862 |
| WB032i | 12.1.032i | *T. aestivum* | Brazil | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN19488863 |
| WB053i | 12.1.053i | *T. aestivum* | Brazil | SP | 2012 | Castroagudín, et al. 2016 | T | SAMN19488864 |
| WB127 | 12.1.127 | *T. aestivum* | Brazil | MA | 2012 | Castroagudín, et al. 2016 | T | SAMN19488865 |
| WB169 | 12.1.169 | *T. aestivum* | Brazil | MA | 2012 | Castroagudín, et al. 2016 | T | SAMN19488866 |
| WB205 | 12.1.205 | *T. aestivum* | Brazil | RN | 2012 | Castroagudín, et al. 2016 | T | SAMN18576983 |
| WB37 | 12.1.037 | *T. aestivum* | Brazil | GO | 2012 | Castroagudín, et al. 2016 | T | SAMN18576980 |
| WBKY11 | WBKY11-15 | *T. aestivum* | USA | Lexington, KY | 2011 | Farman, et al. 2017 | T | SAMN08009578 |
| WBSS |  | *T. aestivum* | Brazil | Unknown | Unknown | Farman, et al. 2017 | T | SAMN08009579 |
| WHTQ |  | *T. aestivum* | Brazil | Unknown | Unknown | Present study | T | SAMN08009580 |
| P3 |  | *Triticum* *durum* (Durum wheat) | Paraguay | CY | 2012 | Pieck, et al. 2017 | T | SAMN08009568 |
| Ub007i | 12.0.007i | *Urochloa brizantha* (Palisade grass) | Brazil | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN07829570 |
| Ub009i | 12.0.009i | *U. brizantha* | Brazil | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN07829571 |
| Ub012i | 12.0.012i | *U. brizantha* | Brazil | PR | 2012 | Castroagudín, et al. 2016 | T | SAMN07829572 |
| Ub368 | 12.0.368 | *U. brizantha* | Brazil | MS | 2012 | Castroagudín, et al. 2016 | L1 | SAMN07829575 |
| UbJA112 |  | *U. brizantha* | Brazil | MG | 2018 | Present study | U3 | SAMN19488867 |
| UbJA92 |  | *U. brizantha* | Brazil | MG | 2018 | Present study | U4 | SAMN19488868 |
| Ud8401 | Bd8401 | *Urochloa distachya* (Tropical signalgrass) | Philippines | Unknown | 1984 | Gladieux, et al. 2018 | U2 | SAMN08009543 |
| Um8309 | Bm8309 | *Urochloa mutica* (Buffalo grass) | Philippines | Los Baños, LB | 1983 | Borromeo, et al. 1993 | U1 | SAMN19488868 |
| Um88324 | Bm88324 | *U. mutica* | Philippines | Cabanatuan, NE | 1988 | Borromeo, et al. 1993 | U1 | SAMN08009544 |
| Um8946 | Bm8946 | *U. mutica* | Philippines | Imus, Cv | 1989 | Borromeo, et al. 1993 | U1 | SAMN19488870 |
| Up35 | Br35 | *Urochloa plantaginea* (Creeping signalgrass) | Brazil | PR | 1990 | Inoue, et al. 2017 | U3 | SAMN14144141 |
| GN0001 |   | *Zea mays (maize)* | Gabon | Wey |   | Pordel et al. 2020 | Ec | SAMEA7540994 |

A Lineages/species are as follows: C1 = Cynodon1; C2 = Cynodon2; E1 = Eleusine1; E2 = Eleusine2; E3 = Eleusine3; Ec = Echinochloa; Er = Eragrostis; H = Hakonechloa; L1 = Lolium1; L2 = Lolium2; L3 = Lolium3; Lee = Leersia; Lu = Luziola; O = Oryza; P = Panicum; Pg = Pyricularia grisea; Pp = P. pennisetigena; Pu = P. urashimae; S = Setaria; St = Stenotaphrum; T - Triticum; U1 = Urochloa1; U2 = Urochloa2; U3 = Urochloa3; U4 = Urochloa4

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**Supplementary Table 2.** Comparative genomic analysis of MoTeR relic loci. MoTeR relics were identified in MinION assemblies of each genome and orthologous MoTeR copies were identified based on chromosome synteny and identical flanking sequences.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Chr** | **Strain** | **also present in:** | **3’ end Position** | **Relic length (bp)** | **3’ end sequenceA** |
| Chr1 | CD156 | - | 215205 | 40 | CGCGAATTAAAA**CCCTAACCCTTA** |
| Chr1 | CD156 | - | 753727 | 4,277 | GCGCGAATTAAGA**CCCAT** |
| Chr1 | CD156 | - | 5749080 | 40 | CGCGAATTAAAA**CCCTA**TA |
| Chr1 | B71 | - | 6127382 | 40 | CGCGAATTAAAA**CCCTA**  |
| Chr1 | U233 | - | 4947590 | 2,089 | CGCGAATTAAAA**CCCTAA** |
| Chr1 | Arcadia | - | 5692246 | 26 | CGCGAATTAAAA**CCCT** |
| Chr1 | Arcadia | - | 5425062 | 97 | CGCGAATTAAAA**CCCTAACCCT** |
| Chr1 | Arcadia | - | 5374231 | 140 | **TTAGGGTTAGGG**TTTTAATTCGCA |
| Chr2 | LpKY97 | - | 25940 | 98 | ACGCGAATTAAAA**CCCTAA** |
| Chr2 | LpKY97 | FH, B71, Arcadia | 28007 | 117 | B AAAATTAAGCGC |
| Chr2 | LpKY97 | Guy11, Bm88324 | 42376 | 40 | GCGCGAATTAAAA**CCCTAACCCTAAC** |
| Chr2 | FH | LpKY97, B71, Arcadia | 645364 | 109 | **GGTTAGGG**TTTTAATTCGCG |
| Chr2 | CD156 | - | 7550702 | 31 | CGCGAATTAAAA**CCCTAAC** |
| Chr2 | CD156 | - | 7553167 | 40 | CGCGAATTAAAA**CCCTA** |
| Chr2 | B71 | LpKY97, FH, Arcadia | 39554 | 118 | **GGTTAGGG**TTTTAATTCGCG |
| Chr2 | Guy11 | LpKY97, Bm88324 | 44503 | 40 | CGCGAATTAAAA**CCCTAACC**GTAA |
| Chr2 | Guy11 | Bm88324 | 45642 | 102 | CGCGAAATAAAA**CCC**AAA |
| Chr2 | Guy11 | - | 5458604 | 40 | CGCGAATTAAAA**CCCTAA** |
| Chr2 | Arcadia | LpKY97, FH, B71 | 11850 | 118 | **GGTTAGGG**TTTTAATTCGCG |
| Chr2 | Bm88324 | LpKY97, Guy11 | 3176 | 39 | CGCGAATTAAAA**CCCTAACCCTAA** |
| Chr2 | Bm88324 | Guy11 | 4311 | 98 | CGCGAAATAAAG**CCC**AAAA  |
| Chr3 | LpKY97 | FH, Arcadia, Bm88324 | 152722 | 40 | **GGGTTAGGG**TTTTAATTCGCGT |
| Chr3 | LpKY97 | FH, CD156, B71 | 2548296 | 41 | **AGGGTTAGGG**TTTTAATTCGCGT |
| Chr3 | LpKY97 | FH, CD156, B71 | 2742283 | 40 | ACGCGAATTAAAA**CCCTAACCCTA** |
| Chr3 | LpKY97 | FH, CD156, B71 | 2751680 | 41 | **GTTAGG**TTTTAATTCGCG |
| Chr3 | LpKY97 | FH, CD156, B71 | 2787030 | 31 | **GGTTGGGG**TTTTAATTCGCG |
| Chr3 | LPKY97 | FH, \*CD156 | 7355697 | 114 | **TTAGGG**TTTTAATTCGCGC |
| Chr3 | FH | LpKY97, Arcadia, Bm88324 | 169997 | 40 | **GGGTTAGGG**TTTTAATTCGCG |
| Chr3 | FH | LpKY97, CD156, B71 | 2553536 | 41 | **GGGTTAGGG**TTTTAATTCGCG |
| Chr3 | FH | LpKY97, CD156, B71 | 2749138 | 40 | CGCGAATTAAAA**CCCTAACCCTA** |
| Chr3 | FH | LpKY97, CD156, B71 | 2758545 | 41 | **GTTAGGG**TTTTAATTCGCG |
| Chr3 | FH | LpKY97, CD156, B71 | 2793917 | 40 | **GGTTGGGG**TTTTAATTCGCG |
| Chr3 | FH | LpKY97, CD156, B71 | 7315089 | 119 | **TTAGGG**TTTTAATTCGCG |
| Chr3 | CD156 | LpKY97, FH, B71 | 2424482 | 40 | **AGGGTTAGGG**TTTTAATTCGCG |
| Chr3 | CD156 | LpKY97, FH, B71 | 2621949 | 40 | CGCGAATTAAAA**CCCTAACCCTA** |
| Chr3 | CD156 | LpKY97, FH, B71 | 2625549 | 41 | **GTTAGGG**TTTTAATTCGCG |
| Chr3 | CD156 | LpKY97, FH, B71 | 2660716 | 31 | **GGTTGGGG**TTTTAATTCGCG |
| Chr3 | CD156 | LpKY97, FH | 7124927 | 15 | **TTAGGG**TTTAATTCGCT |
| Chr3 | B71 | LpKY97, FH, CD156 | 2523720 | 41 | **GTCAGGGTTAGGG**TTTTAATTCGCG |
| Chr3 | B71 | LpKY97, FH, CD156 | 2719208 | 40 | CGCGAATTAAAA**CCCTAACCCTA** |
| Chr3 | B71 | LpKY97, FH, CD156 | 2722828 | 41 | **GTTAGGG**TTTTAATTCGCG |
| Chr3 | B71 | LpKY97, FH, CD156 | 2758440 | 31 | **GGTTGGGG**TTTTAATTCGCG |
| Chr3 | B71 | - | 7468533 | 40 | **TAGGGTTAGGG**TTTTAATTCGCG |
| Chr3 | Arcadia | LpKY97, FH, Bm88324 | 165684 | 40 | **GGGTTAGGG**TTTTAATTCGCG |
| Chr3 | Bm88324 | LpKY97, FH, Arcadia | 148531 | 40 | **GGGTTAGGG**TTTTAATTCGCG |
| Chr4 | Arcadia | - | 15722 | 239 | CGCGAATTAAAA**CCCTAACCCTAA** |
| Chr4 | Bm88324 | - | 5007462 | 131 | CGCGAATTAAAA**CCCTAA** |
| Chr5 | LpKY97 | FH | 4395439 | 147 | CGCGAATTAAAA**CCCTAACCC** |
| Chr5 | FH | LpKY97 | 4423681 | 149 | CGCGAATTAAAA**CCCTAACCC** |
| Chr5 | Guy11 | - | 185204 | 140 | **TTATGGTGAGGG**TTTTAATTCGCG |
| Chr5 | Arcadia | - | 122817 | 105 | CGCGAGTTAGAA**CCCTAACCCTAA** |
| Chr5 | Arcadia | - | 4700151 | 166 | **AGGGTTAGGG**TTTTAATTCGCG |
| Chr6 | LpKY97 | FH, CD156, B71 | 83149 | 31 | CGCGAATTAAAA**CCCTAA** |
| Chr6 | LpKY97 | FH, CD156, B71 | 2132281 | 40 | **GTTGGGG**TTTTAATTCGCG |
| Chr6 | LpKY97 | FH, CD156, B71 | 3271965 | 131 | CGCGAATTAAAA**CCTAACCATCCCA** |
| Chr6 | FH | LpKY97, CD156, B71 | 83149 | 31 | CGCGAATTAAAA**CCCTAA** |
| Chr6 | FH | LpKY97, CD156, B71 | 2144774 | 39 | **TTAGGG**TTTTAATTCGCG |
| Chr6 | FH | LpKY97, CD156, B71 | 3282558 | 131 | CGCGAATTAAAA**CCCTAA** |
| Chr6 | CD156 | LpKY97, FH, B71 | 95554 | 31 | CGCGAATTAAAA**CCCTAA** |
| Chr6 | CD156 | LpKY97, FH, B71 | 2153119 | 40 | **TTGGGG**TTTTAATTCGCG |
| Chr6 | CD156 | LpKY97, FH, B71 | 3282214 | 132 | CGCGAATTAAAA**CCCTAACC** |
| Chr6 | B71 | LpKY97, FH, CD156 | 78239 | 31 | CGCGAATTAAAA**CCCTAA** |
| Chr6 | B71 | LpKY97, FH, CD156 | 2138379 | 40 | **GTTGGGG**TTTTAATTCGCG |
| Chr6 | B71 | LpKY97, FH, CD156 | 3275257 | 135 | CGCGAATTAAAA**CCCTAACC** |
| Chr6 | Arcadia | - | 22696 | 1146 | CGCGAATTAAAA**CCCTAACCCTA** |
| Chr7 | LpKY97 | FH, CD156, Bm88324, B71 | 3688512 | 38 | CGCGAATTAAAA**CCTTAACCCTAA** |
| Chr7 | LpKY97 | FH, CD156 | 3825400 | 63 | **TTAGGTGTGGG**TTTTAAATCGCG |
| Chr7 | LpKY97 | FH, CD156 | 3835928 | 110 | CGCGAATTGAAA**CCCTAACCCTAA** |
| Chr7 | FH | LpKY97, CD156, Bm88324, B71 | 3694340 | 37 | CGCGAATTAAAA**CCTTAACCCTAA** |
| Chr7 | FH | LpKY97, CD156 | 3836980 | 63 | **TTAGGGTTAGGG**TTTTAAATCGCG |
| Chr7 | FH | LpKY97, CD156 | 3841696 | 116 | CGCGAATTGAAA**CCCTAACCCTAA** |
| Chr7 | CD156 | LpKY97, FH, Bm88324, B71 | 3761013 | 38 | CGCGAATTAAAA**CCTTAACCCTAA** |
| Chr7 | CD156 | LpKY97, FH | 3893775 | 63 | **TTAGGGTGTGGG**TTTTAAATCGCG |
| Chr7 | CD156 | LpKY97, FH | 3896604 | 105 | CGCGAATTGAAA**CCCTAACCCTAA** |
| Chr7 | B71 | Bm88324 | 3755038 | 59 | **TAAGGGTTAGGG**TTTTAAATTCGCG |
| Chr7 | B71 | LpKY97, FH, Bm88324, CD156 | 3755790 | 59 | CGCGAATTAAAA**CCTTAACCCTAA** |
| Chr7 | Arcadia | - | 2960437 | 132 | CGCGAATTAAAA**CCCTAA** |
| Chr7 | Bm88324 | - | 560250 | 94 | **AGGGTTAGGG**TTTTAATTCGCG |
| Chr7 | Bm88324 | B71 | 4570424 | 112 | **GTTAAGGTTAGG**TTTTAAATTCGCG |
| Chr7 | Bm88324 | B71, LpKY97, FH,, CD156 | 4571156 | 124 | CGCGAATTAAAA**CCTTAAACCCAAA** |

**A** MoTeR 3' terminus sequence is underlined. Flanking telomere vestige is highlighted in bold.

**B** No obvious telomere sequence detected.

**Supplementary Table 3.** MoTeR relic positions and their associated duplications in the CD156 genome. The positions of the sequences adjacent to the relic are listed first, then the duplicated copy. Relics without duplications are also listed.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Chr** | **Relic 3’ position** | **Duplication type** | **Start (5’)** | **End****(3’)** | **Length** | **Dupl. Chr** | **Dupl. start** | **Dupl. end** |
| Chr1 | 215205 | 3’ | 215231 | 216153 | 922 | Chr1 | 82487 | 83397 |
| Chr1 | 753727 | - | - | - | - | - | - | - |
| Chr1 | 5749080 | 3’ | 5749041 | 5749080 | 242 | Chr3 | 2488147 | 2488390 |
| Chr1 | 5749080 | Relic + 5’ | 5748567 | 5749085 | 518 | Chr6 | 95111 | 95570 |
| Chr2 | 7550702 | Relic + 5’ | 7550142 | 7550719 | 577 | Chr6 | 94948 | 95571 |
| Chr2 | 7553167 | - | - | - | - | - | - | - |
| Chr3 | 2424482 | 3’ | 2423615 | 2424461 | 849 | Chr5 | 4504267 | 4505293 |
| Chr3 | 2621949 | 3’ | 2621959 | 2622189 | 230 | Chr1 | 1600219 | 1600452 |
| Chr3 | 2625538 | 3’ | 2622713 | 2625525 | 2812 | Chr5 | 191310 | 204348 |
| Chr3 | 2660705 | 3’ | 2658586 | 2660695 | 2230 | Chr5 | 213434 | 215664 |
| Chr6 | 95565 | Relic + 5’ | 94948 | 95571 | 623 | Chr2 | 7550142 | 7550719 |
| Chr6 | 2153119 | - | - | - | - | - | - | - |
| Chr6 | 3282214 | - | - | - | - | - | - | - |
| Chr7 | 3761013 | - | - | - | - | - | - | - |
| Chr7 | 3896608 | - | - | - | - | - | - | - |