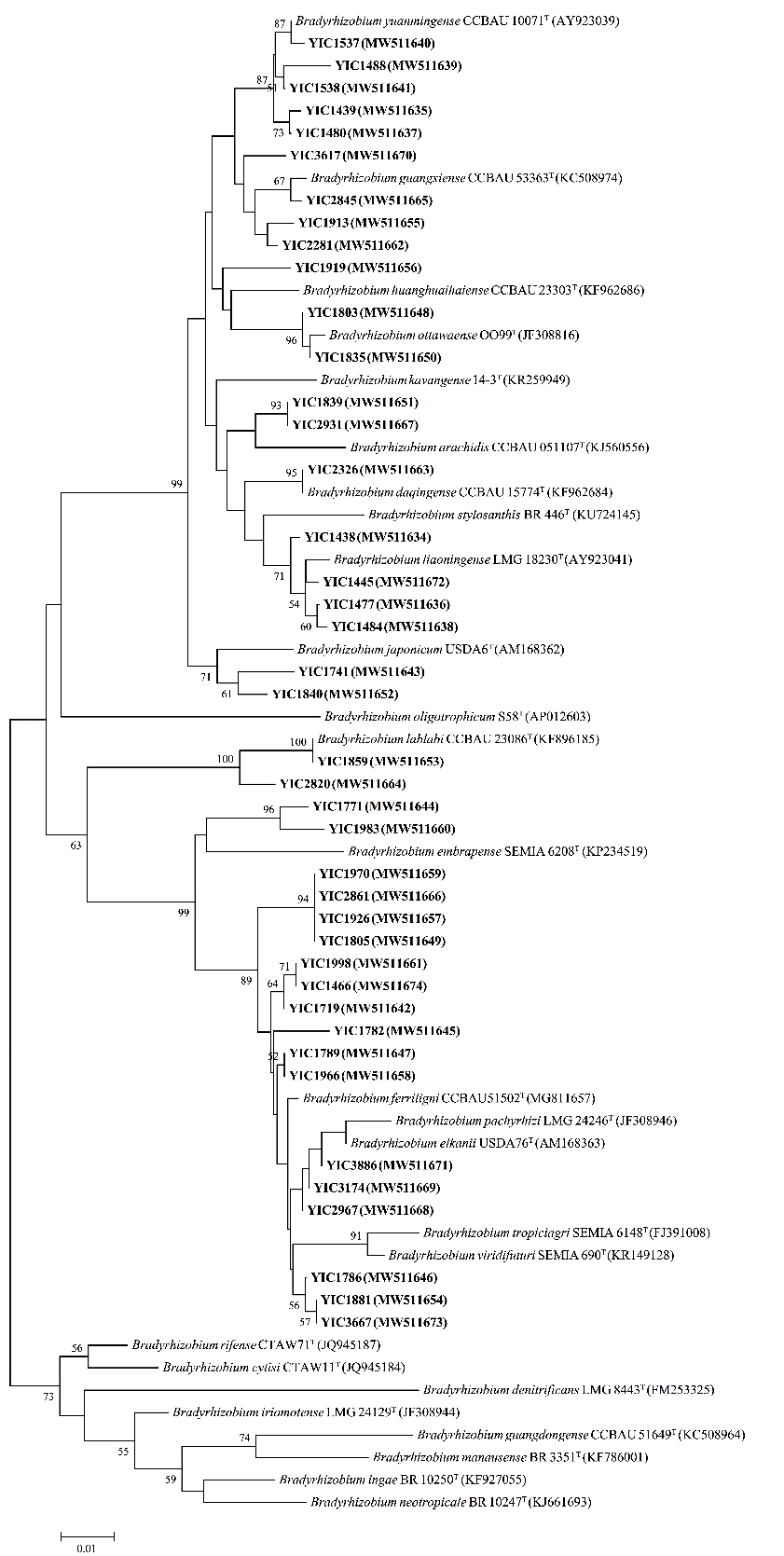
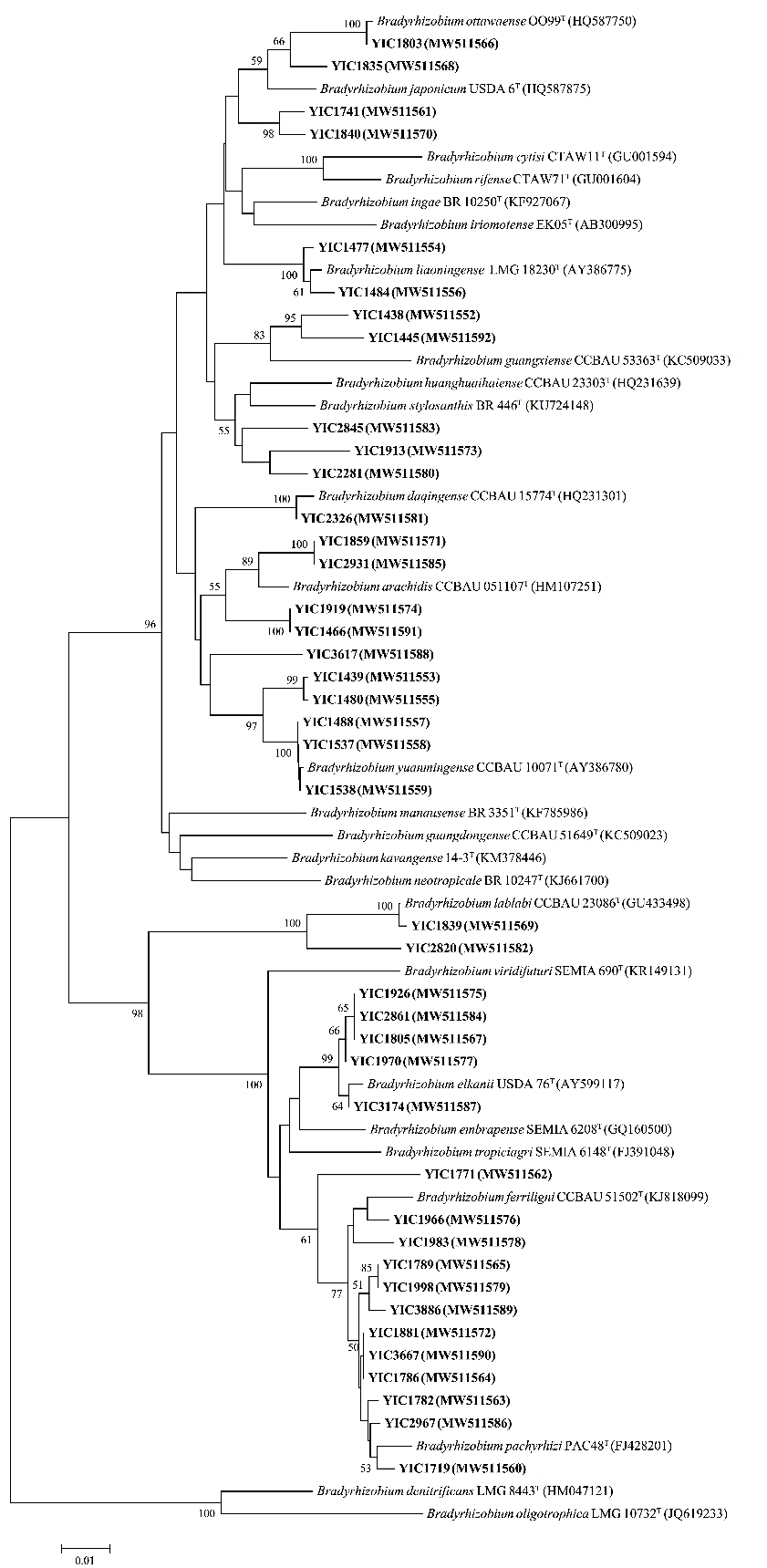


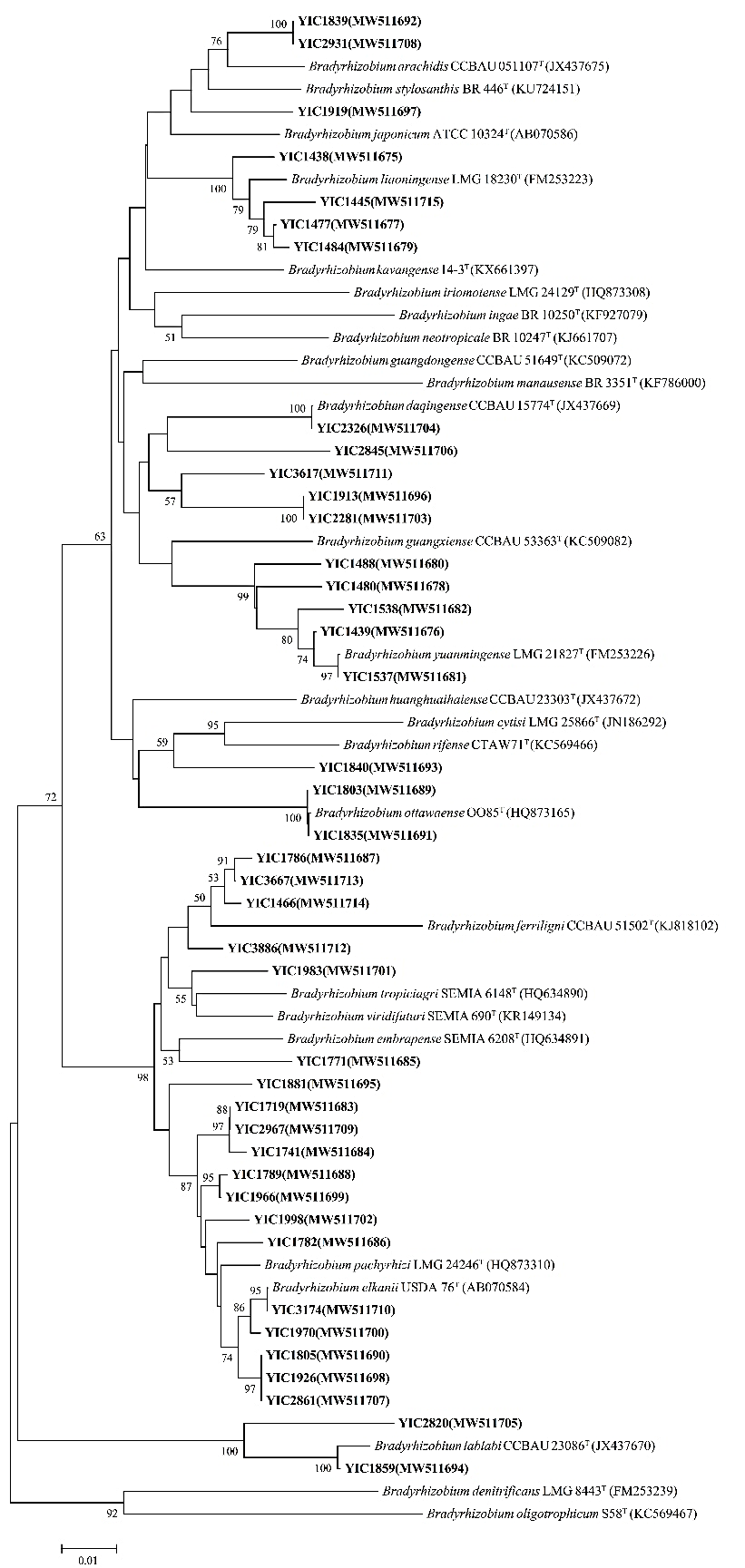
**Fig. S1.** Phylogenetic tree of *recA* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.



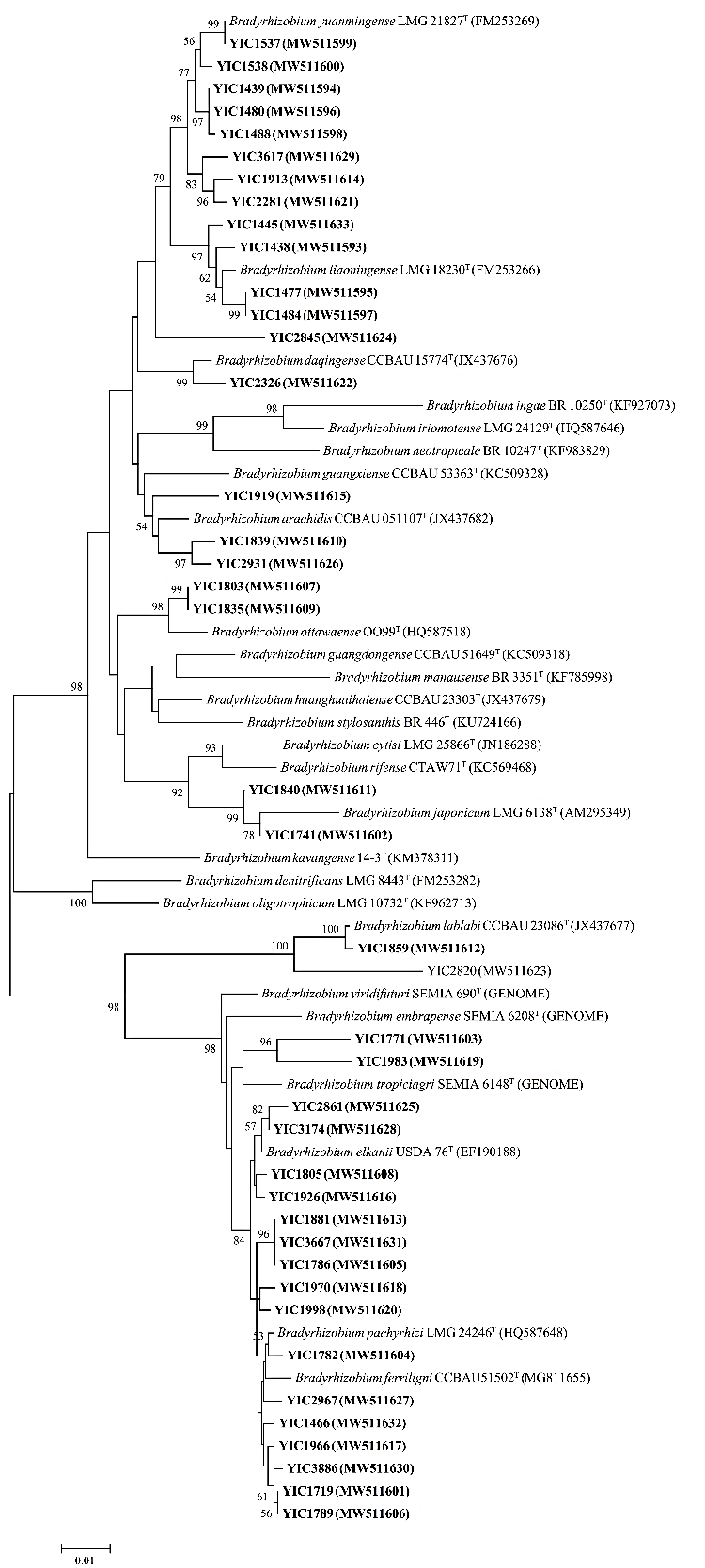
**Fig. S2.** Phylogenetic tree of *dnaK* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.



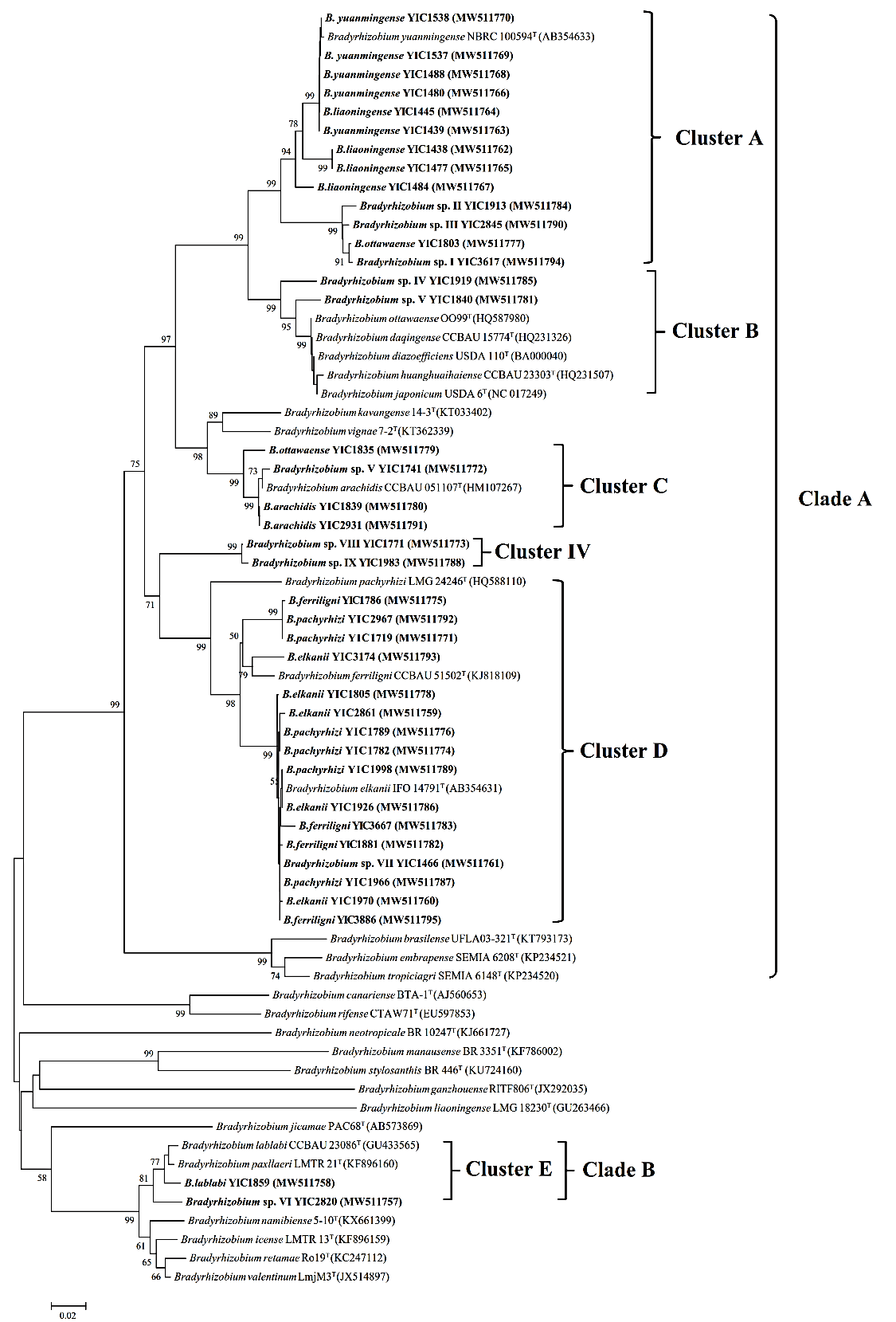
**Fig. S3**. Phylogenetic tree of *glnII* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.



**Fig. S4**. Phylogenetic tree of *gyrB* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.



**Fig. S5**. Phylogenetic tree of *rpoB* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.



**Fig. S6**. Phylogenetic tree of *nodC* sequences showing the relationships between the representative strains isolated in this study (in boldface) and the related species. The Neighbor-joining tree was reconstructed using MEGA 7.0, and Kimura 2-parameter model was selected as the nucleotide substitution model. Bootstrap confidence levels of ≥ 50% are indicated at the internodes. The bar indicates 1% nucleotide divergence.

**Table S1.** The list of *recA* haplotypes classification of *V. minima* nodulating rhizobia isolated in this study.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Classification** | **Haplotypes No.** | **Representative strain** | **Number of Isolates** | **Distribution (number of strains) in sampling site** |
| *B. yuanmingense*  (15 isolates) | H1 | YIC1537 | 6 | Haiyang (5), Qingdao (1) |
| H2 | YIC1439 | 1 | Haiyang (1) |
| H3 | YIC1488 | 3 | Haiyang (3) |
| H4 | YIC1538 | 3 | Haiyang (1), Qingdao (2) |
| H5 | YIC1480 | 2 | Haiyang (1), Laoshan (1) |
| *Bradyrhizobium* sp. I | H6 | YIC3617 | 1 | Weihai (1) |
| *Bradyrhizobium* sp. II  (31 isolates) | H7 | YIC1913 | 30 | Weihai (7), Rongcheng 1 (3), Rongcheng 2 (1), Haiyang (1), Laoshan (6), Qingdao (2), Yantai (10) |
| H8 | YIC2281 | 1 | Yantai(1) |
| *Bradyrhizobium* sp. III | H9 | YIC2845 | 2 | Rongcheng 1 (1), Rongcheng 2 (1) |
| *B. daqingense* | H10 | YIC2326 | 2 | Laoshan (1), Yantai (1) |
| *B. liaoningense*  (13 isolates) | H11 | YIC1438 | 2 | Haiyang (1), Yantai (1) |
| H12 | YIC1445 | 3 | Haiyang (1), Rongcheng 1 (1), Yantai (1) |
| H13 | YIC1477 | 1 | Haiyang (1) |
| H14 | YIC1484 | 7 | Haiyang (7)M |
| *Bradyrhizobium* sp. IV | H15 | YIC1919 | 14 | Jimo (8), Laoshan (1), Weihai (2), Rongcheg 2 (3) |
| *B. arachidis* (4 isolates) | H16 | YIC1839 | 3 | Rushan (3) |
| H17 | YIC2931 | 1 | Rongcheng 1 (1) |
| *B. ottawaense*  (16 isolates) | H18 | YIC1803 | 14 | Rongcheng 2 (4), Laoshan (1), Penglai (8), Weihai (1) |
| H19 | YIC1835 | 2 | Rongcheng 2 (2) |
| *Bradyrhizobium* sp. V  (3 isolates) | H20 | YIC1741 | 2 | Rushan (2) |
| H21 | YIC1840 | 1 | Rushan (1) |
| *Bradyrhizobium* sp. VI | H22 | YIC2820 | 1 | Penglai (1) |
| *B. lablabi* | H23 | YIC1859 | 3 | Laohan (3) |
| *Bradyrhizobium* sp. VII | H24 | YIC1466 | 26 | Laoshan (1), Yantai (9), Rongcheng 1 (4), Rongcheng 2 (6), Rushan (2), Haoyang (4) |
| *Bradyrhizobium* sp. VIII | H25 | YIC1771 | 2 | Laoshan (2) |
| *Bradyrhizobium* sp. IX | H26 | YIC1983 | 1 | Weihai (1) |
| *B. elkanii* (433 isolates) | H27 | YIC1805 | 108 | Weihai (21), Rongcheng 1 (4), Rongcheng 2 (13), Rushan (4), Haiyang (4), Jimo (15), Qingdao (11), Penglai (3), Yantai (33) |
| H28 | YIC1970 | 53 | Weihai (25), Rongcheng 1 (7), Rongcheng 2 (4), Rushan (10), Jimo (3), Yantai (4) |
| H29 | YIC3174 | 2 | Jimo (1), Rizhao (1) |
| H30 | YIC1926 | 238 | Weihai (5), Rongcheng 1 (28), Rongcheng 2 (28), Rushan (19), Haiyang (1), Jimo (21), Laoshan (26), Qingdao (14), Rizhao (57), Penglai (6), Yantai (33) |
| H31 | YIC2861 | 32 | Weihai (2), Rongcheng 1 (8), Rongcheng 2 (1), Rushan (5), Jimo (4), Laoshan (6), Qingdao (1), Penglai (2), Yantai (3) |
| *B. ferriligni* (226 isolates) | H32 | YIC1786 | 17 | Rongcheng 1 (3), Rongcheng 2 (1), Jimo (2), Laoshan (9), Yantai (2) |
| H33 | YIC3667 | 116 | Weihai (2), Rongcheng 1 (6), Rongcheng 2 (26), Rushan (5), Haiyang (24), Laoshan (10), Qingdao (15), Penglai (21), Yantai (7) |
| H34 | YIC1881 | 79 | Weihai (2), Rongcheng 1 (15), Rongcheng 2 (7), Rushan (10), Haiyang (1), Jimo (9), Laoshan (12), Qingdao (3), Penglai (6), Yantai (14) |
| H35 | YIC3886 | 14 | Rongcheng 1 (1), Rushan (2), Jimo (5), Laoshan (1), Qingdao (1), Penglai (2), Yantai (2) |
| *B. pachyrhizi* (81 isolates) | H36  H37  H38  H39  H40  H41 | YIC1782  YIC1998  YIC1719  YIC2967  YIC1789  YIC1966 | 12  9  38  1  10  11 | Rongcheng 2 (9), Rushan (2), Yantai (1)  Penglai (1), Rongcheng1 (1), Rongcheng2 (3),Rushan (1), Jimo (1),Rizhao (2)  Weihai (2), Rongcheng1 (2), Rongcheng2 (7),  Rushan (6), Haiyang (4), Jimo (2), Laoshan (12), Qingdao (3)  Laoshan (1)  Yantai (3), Rongcheng1 (3), Rushan (1), Jimo (2), Laoshan (1)  Yantai (2), Rongcheng2 (3), Rushan (2), Jimo (1), Laoshan (3) |

**Table S2**. Distribution of rhizobia in different sampling sites and rhizobial haplotype classification

|  |  |  |
| --- | --- | --- |
| **Isolates (YIC code)** | **recA haplotype** | **Species affiliation** |
| Isolates from Penglai |  |  |
| 1803, 1804, 1816, 1872, 1873, 1876, 1944, 1945 | H18 | *B. ottawaense* |
| 2820 | H22 | *Bradyrhizobium* sp. VI |
| 1805, 1948, 2862 | H27 | *B. elkanii* |
| 1808, 1997, 2344, 2345, 2577, 2841 | H30 |
| 1878, 1879 | H31 |
| 1810, 1812, 1814, 1815, 1870, 1871, 1877, 1990, 2343, 2414, 2415, 2422, 2529, 2531, 2561, 2793, 2811, 2821, 2842, 2865, 2960 | H33 | *B. ferriligni* |
| 1807, 1813, 1874, 1875, 1880, 2501 | H34 |
| 1999, 2789 | H35 |
| 2840 | H37 | *B. pachyrhizi* |
| Isolates from Yantai |  |  |
| 1796, 1797, 1892, 1893, 1820, 1823, 2266, 2267, 2350, 2535 | H7 | *Bradyrhizobium* sp. II |
| 2281 | H8 |
| 1074 | H10 | *B. daqingense* |
| 1123 | H11 | *B. liaoningense* |
| 1081 | H12 |
| 1053, 1059, 1061, 1054, 1055, 1060, 1080, 1134, 1157 | H24 | *Bradyrhizobium* sp. VII |
| 1781, 1821, 1827, 1968, 1969, 1971, 1973, 1974, 1975, 2268, 2279, 2280, 2300, 2363, 2364, 2365, 2370, 2377, 2533, 2536, 2541, 2546, 2558, 2571, 2584, 2626, 2629, 2852, 2859, 2860, 3619, 1082, 1151 | H27 | *B. elkanii* |
| 1970, 2614, 1117, 1120 | H28 |
| 1783, 1819, 1882, 1914, 1926, 1930, 1931, 1965, 2272, 2274, 2310, 2319, 2334, 2339, 2346, 2521, 2522, 2523, 2524, 2525, 2528, 2549, 2555, 2838, 1118, 1125, 1136, 1079, 1109, 1119, 1132, 1138, 1156 | H30 |
| 2556, 2861, 1154 | H31 |
| 1795, 1786 | H32 | *B. ferriligni* |
| 1972, 2545, 2788, 1058, 1135, 1071, 1078 | H33 |
| 1787, 1788, 1790, 1791, 1792, 1794, 1809, 2824, 1780, 1881, 2292, 2544, 1052, 1137 | H34 |
| 2582, 2863 | H35 |
| 1782 | H36 | *B. pachyrhizi* |
| 1784, 1785, 1789 | H40 |
| 1966, 1967 | H41 |
| Isolates from Weihai |  |  |
| 3617 | H6 | *Bradyrhizobium* sp. I |
| 2342, 2439, 2514, 2785, 2855, 3526, 3928 | H7 | *Bradyrhizobium* sp. II |
| 2465, 2512 | H15 | *Bradyrhizobium* sp. IV |
| 3320 | H18 | *B. ottawaense* |
| 1983 | H26 | *Bradyrhizobium* sp. IX |
| 1700, 1701, 1703, 1704, 1749, 1752, 1754, 1755, 1756, 1757, 1940, 2311, 2325, 2331, 2332, 2340, 2353, 2354, 2392, 2500, 2835 | H27 | *B. elkanii* |
| 1689, 1690, 1691, 1692, 1694, 1695, 1698, 1699, 1751, 1759, 1760, 2366, 2436, 2464, 2570, 2589, 2813, 2814, 2816, 2839, 2959, 3312, 3321, 3659, 3925 | H28 |
| 1696, 1750, 2352, 2445, 2466 | H30 |
| 1753, 1758 | H31 |
| 1688, 2823 | H33 | *B. ferriligni* |
| 2367, 2369 | H34 |
| 1693, 1697 | H38 | *B. pachyrhizi* |
| Isolates from Rongcheng 1 |  |  |
| 2579, 3578, 3946 | H7 | *Bradyrhizobium* sp. II |
| 2845 | H9 | *Bradyrhizobium* sp. III |
| 2607 | H12 | *B. liaoningense* |
| 2931 | H17 | *B. arachidis* |
| 3587, 1982, 2409, 2413 | H24 | *Bradyrhizobium* sp. VII |
| 1730, 2324, 1908, 2400 | H27 | *B. elkanii* |
| 2263, 2484, 2818, 2828, 2864, 2866, 3603 | H28 |
| 1731, 2273, 2318, 2388, 2402, 2617, 1923, 1981, 1985, 2261, 2270, 2271, 2276, 2378, 2405, 2408, 2410, 2481, 2483, 2486, 2487, 2491, 2494, 2853, 2856, 2889, 2951, 2964 | H30 |
| 2312, 2313, 2613, 1906, 2488, 2504, 2518, 2822 | H31 |
| 2306, 2519, 2825 | H32 | *B. ferriligni* |
| 1733, 2316, 2317, 2349, 2262, 2440 | H33 |
| 1732, 1910, 1911, 1912, 1915, 1922, 1929, 1984, 2335, 2336, 2616, 2832, 2892, 1907, 2509 | H34 |
| 2393 | H35 |
| 2963 | H37 | *B. pachyrhizi* |
| 1909, 2817 | H38 |
| 2401, 2482, 2808 | H40 |
| Isolates from Rongcheng 2 |  |  |
| 2068 | H7 | *Bradyrhizobium* sp. II |
| 2166 | H9 | *Bradyrhizobium* sp. III |
| 2168, 2180, 2576 | H15 | *Bradyrhizobium* sp. IV |
| 2164, 2210, 2550, 2567 | H18 | *B. ottawaense* |
| 2235, 1835 | H19 |
| 2044, 2403, 2538, 2568, 2620, 2624 | H24 | *Bradyrhizobium* sp. VII |
| 2067, 2189, 2193, 2211, 2212, 2224, 2226, 2227, 2228, 2229, 2239, 2240, 2251 | H27 | *B. elkanii* |
| 2223, 1799, 2283, 2621 | H28 |
| 2066, 64285, 64316, 2081, 2083, 69399, 69430, 2091, 2092, 2169, 2170, 2187, 2188, 2230, 2231, 2256, 2258, 1798, 1833, 1834, 2285, 2347, 2411, 2511, 2517, 2787, 2831, 2945 | H30 |
| 2099 | H31 |
| 2165 | H32 | *B. ferriligni* |
| 2138, 2139, 2141, 2142, 2181, 2182, 2190, 2192, 2195, 2201, 2204, 2205, 2209, 2225, 2232, 2233, 2234, 2237, 2241, 2250, 2257, 1836, 1837, 2275, 2348, 3667 | H33 |
| 2191, 2206, 1800, 1832, 2291, 2562, 2802 | H34 |
| 2074-1, 63586, 2202, 2203, 2207, 2208, 2213, 2238, 2249 | H36 | *B. pachyrhizi* |
| 2252, 2253, 1998 | H37 |
| 2167, 2186, 2236, 2284, 2553, 2575, 2956 | H38 |
| 1811, 1830, 2559 | H41 |
| Isolates from Rushan |  |  |
| 1839, 2471, 2472 | H16 | *B. arachidis* |
| 1740, 1741 | H20 | *Bradyrhizobium* sp. V |
| 1840 | H21 |
| 1838, 1847 | H24 | *Bradyrhizobium* sp. VII |
| 1738, 1848, 2278, 2470 | H27 | *B. elkanii* |
| 1745, 1746, 1747, 1900, 1901, 1902, 2441, 2548, 2583, 2623 | H28 |
| 1736, 1743, 1748, 1844, 1896, 2259, 2265, 2391, 2397, 2398, 2399, 2406, 2407, 2469, 2551, 2569, 2585, 2882, 3947 | H30 |
| 1735, 1737, 1843, 1895, 2473 | H31 |
| 1845, 1897, 2327, 2438, 2883 | H33 | *B. ferriligni* |
| 1828, 1829, 1842, 1846, 1894, 1899, 1925, 2351, 2396, 2586 | H34 |
| 2404, 3669 | H35 |
| 1744, 2394 | H36 | *B. pachyrhizi* |
| 1898 | H37 |
| 1739, 1841, 2277, 2479, 2796, 3576 | H38 |
| 1742 | H40 |
| 2395, 2792 | H41 |
| Isolates from Haiyang |  |  |
| 1441, 1443, 1444, 1490, 1537 | H1 | *B. yuanmingense* |
| 1439 | H2 |
| 1482, 1486, 1488 | H3 |
| 1538 | H4 |
| 1480 | H5 |
| 1514 | H7 | *Bradyrhizobium* sp. II |
| 1438 | H11 | *B. liaoningense* |
| 1445 | H12 |
| 1477 | H13 |
| 1442, 1481, 1484, 1505, 1509, 1518, 1535 | H14 |
| 1465, 1466, 1470, 1473 | H24 | *Bradyrhizobium* sp. VII |
| 1479, 1483, 1536, 1539 | H27 | *B. elkanii* |
| 1507 | H30 |
| 1471, 1472, 1475, 1476, 1478, 1487, 1489, 1491, 1502, 1504, 1506, 1508, 1510, 1511, 1512, 1513, 1515, 1516, 1517, 1519, 1520, 1521, 1534, 1545 | H33 | *B. ferriligni* |
| 1503 | H34 |
| 1485, 1500, 1501, 1540 | H38 | *B. pachyrhizi* |
| Isolates from Jimo |  |  |
| 1904, 1918, 1919, 1946, 2515, 2526, 2539, 2580 | H15 | *Bradyrhizobium* sp. IV |
| 1947, 1949, 1950, 1951, 2289, 2437, 2442, 2443, 2458, 2497, 2520, 2578, 2610, 2625, 2628 | H27 | *B. elkanii* |
| 2587, 2611, 2827 | H28 |
| 2506 | H29 |
| 1987, 1988, 2450, 2451, 2452, 2454, 2457, 2460, 2463, 2496, 2543, 2547, 2552, 2630, 2631, 2884, 2927, 2929, 2944, 2950, 2977 | H30 |
| 1986, 2480, 2887, 2888 | H31 |
| 2456, 2554 | H32 | *B. ferriligni* |
| 1905, 1917, 1920, 1921, 2453, 2462, 2493, 2588, 2930 | H34 |
| 2459, 2461, 2495, 2786, 3886 | H35 |
| 2455 | H37 | *B. pachyrhizi* |
| 2846, 2962 | H38 |
| 1933, 2527 | H40 |
| 2948 | H41 |
| Isolates from Laoshan |  |  |
| 1718 | H5 | *B. yuanmingense* |
| 1851, 1856, 1913, 1941, 2290, 2320 | H7 | *Bradyrhizobium* sp. II |
| 2326 | H10 | *B. daqingense* |
| 2314 | H15 | *Bradyrhizobium* sp. IV |
| 1705 | H18 | *B. ottawaense* |
| 1773, 1824, 1859 | H23 | *B. lablabi* |
| 1854 | H24 | *Bradyrhizobium* sp. VII |
| 1771, 2502 | H25 | *Bradyrhizobium* sp. VIII |
| 1707, 1710, 1712, 1715, 1716, 1717, 1724, 1725, 1727, 1857, 1858, 1916, 1924, 1932, 2260, 2269, 2282, 2293, 2315, 2322, 2337, 2376, 2485, 2498, 2507, 2815 | H30 | *B. elkanii* |
| 1706, 1723, 1726, 1927, 1928, 1903 | H31 |
| 1852, 1761, 1762, 1763, 1825, 1863, 1864, 1869, 2321 | H32 |
| 1708, 1713, 1714, 1722, 1729, 1853, 2287, 2323, 2341, 2797 | H33 |
| 1850, 1855, 1942, 1765, 1770, 1774, 1775, 1779, 1861, 1868, 2328, 2355 | H34 | *B. ferriligni* |
| 1777 | H35 |
| 1711, 1719, 1764, 1768, 1776, 1778, 1822, 1860, 1866, 2826, 2849, 2885 | H38 | *B. pachyrhizi* |
| 2967 | H39 |
| 1709 | H40 |
| 1728, 1943, 1867 | H41 |
| Isolates from Qingdao |  |  |
| 3100 | H1 | *B. yuanmingense* |
| 3200, 3201 | H4 |
| 3118, 3283 | H7 | *Bradyrhizobium* sp. II |
| 3117, 3127, 3184, 3191, 3194, 3199, 3208, 3210, 3211, 3252, 3293 | H27 | *B. elkanii* |
| 3121, 3122, 3123, 3188, 3192, 3193, 3195, 3197, 3198, 3202, 3204, 3206, 3251, 3285 | H30 |
| 3288 | H31 |
| 3101, 3102, 3103, 3105, 3106, 3185, 3186, 3189, 3190, 3205, 3212, 3282, 3289, 3290, 3292 | H33 | *B. ferriligni* |
| 3203, 3286, 3305 | H34 |
| 3287 | H35 |
| 3099, 3209, 3253 | H38 | *B. pachyrhizi* |
| Isolates from Rizhao |  |  |
| 3174 | H29 | *B. elkanii* |
| 3137, 3138, 3139, 3140, 3141, 3142, 3143, 3144, 3145, 3146, 3148, 3149, 3150, 3151, 3152, 3153, 3154, 3155, 3156, 3157, 3158, 3159, 3160, 3161, 3162, 3163, 3164, 3165, 3166, 3167, 3168, 3169, 3170, 3171, 3172, 3173, 3175, 3176, 3177, 3178, 3179, 3232, 3233, 3234, 3235, 3236, 3237, 3238, 3239, 3240, 3241, 3242, 3243, 3275, 3276, 3303, 3304 | H30 |
| 3147, 3302 | H37 | *B. pachyrhizi* |

**Table S3**. List of the accession numbers obtained in this study.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Strains | *dnaK* | *glnII* | *gyrB* | *recA* | *ropB* | *nifH* | *nodC* |
| YIC1438 | MW511634 | MW511552 | MW511675 | MW528316 | MW511593 | MW511718 | MW511762 |
| YIC1439 | MW511635 | MW511553 | MW511676 | MW528317 | MW511594 | MW511719 | MW511763 |
| YIC1445 | MW511672 | MW511592 | MW511715 | MW528356 | MW511633 | MW511720 | MW511764 |
| YIC1466 | MW511674 | MW511591 | MW511714 | MW528355 | MW511632 | MW511738 | MW511761 |
| YIC1477 | MW511636 | MW511554 | MW511677 | MW528318 | MW511595 | MW511721 | MW511765 |
| YIC1480 | MW511637 | MW511555 | MW511678 | MW528319 | MW511596 | MW511722 | MW511766 |
| YIC1484 | MW511638 | MW511556 | MW511679 | MW528320 | MW511597 | MW511723 | MW511767 |
| YIC1488 | MW511639 | MW511557 | MW511680 | MW528321 | MW511598 | MW511724 | MW511768 |
| YIC1537 | MW511640 | MW511558 | MW511681 | MW528322 | MW511599 | MW511725 | MW511769 |
| YIC1538 | MW511641 | MW511559 | MW511682 | MW528323 | MW511600 | MW511726 | MW511770 |
| YIC1719 | MW511642 | MW511560 | MW511683 | MW528324 | MW511601 | MW511727 | MW511771 |
| YIC1741 | MW511643 | MW511561 | MW511684 | MW528325 | MW511602 | MW511728 | MW511772 |
| YIC1771 | MW511644 | MW511562 | MW511685 | MW528326 | MW511603 | MW511729 | MW511773 |
| YIC1782 | MW511645 | MW511563 | MW511686 | MW528327 | MW511604 | MW511730 | MW511774 |
| YIC1786 | MW511646 | MW511564 | MW511687 | MW528328 | MW511605 | MW511731 | MW511775 |
| YIC1789 | MW511647 | MW511565 | MW511688 | MW528329 | MW511606 | MW511732 | MW511776 |
| YIC1803 | MW511648 | MW511566 | MW511689 | MW528330 | MW511607 | MW511733 | MW511777 |
| YIC1805 | MW511649 | MW511567 | MW511690 | MW528331 | MW511608 | MW511734 | MW511778 |
| YIC1835 | MW511650 | MW511568 | MW511691 | MW528332 | MW511609 | MW511735 | MW511779 |
| YIC1839 | MW511651 | MW511569 | MW511692 | MW528333 | MW511610 | MW511736 | MW511780 |
| YIC1840 | MW511652 | MW511570 | MW511693 | MW528334 | MW511611 | MW511737 | MW511781 |
| YIC1859 | MW511653 | MW511571 | MW511694 | MW528335 | MW511612 | MW511716 | MW511758 |
| YIC1881 | MW511654 | MW511572 | MW511695 | MW528336 | MW511613 | MW511739 | MW511782 |
| YIC1913 | MW511655 | MW511573 | MW511696 | MW528337 | MW511614 | MW511717 | MW511784 |
| YIC1919 | MW511656 | MW511574 | MW511697 | MW528338 | MW511615 | MW511740 | MW511785 |
| YIC1926 | MW511657 | MW511575 | MW511698 | MW528339 | MW511616 | MW511741 | MW511786 |
| YIC1966 | MW511658 | MW511576 | MW511699 | MW528340 | MW511617 | MW511742 | MW511787 |
| YIC1970 | MW511659 | MW511577 | MW511700 | MW528341 | MW511618 | MW511743 | MW511760 |
| YIC1983 | MW511660 | MW511578 | MW511701 | MW528342 | MW511619 | MW511744 | MW511788 |
| YIC1998 | MW511661 | MW511579 | MW511702 | MW528343 | MW511620 | MW511745 | MW511789 |
| YIC2281 | MW511662 | MW511580 | MW511703 | MW528344 | MW511621 | MW511746 | -- |
| YIC2326 | MW511663 | MW511581 | MW511704 | MW528345 | MW511622 | MW511747 | -- |
| YIC2820 | MW511664 | MW511582 | MW511705 | MW528346 | MW511623 | MW511748 | MW511757 |
| YIC2845 | MW511665 | MW511583 | MW511706 | MW528347 | MW511624 | MW511749 | MW511790 |
| YIC2861 | MW511666 | MW511584 | MW511707 | MW528348 | MW511625 | MW511750 | MW511759 |
| YIC2931 | MW511667 | MW511585 | MW511708 | MW528349 | MW511626 | MW511751 | MW511791 |
| YIC2967 | MW511668 | MW511586 | MW511709 | MW528350 | MW511627 | MW511752 | MW511792 |
| YIC3174 | MW511669 | MW511587 | MW511710 | MW528351 | MW511628 | MW511753 | MW511793 |
| YIC3617 | MW511670 | MW511588 | MW511711 | MW528352 | MW511629 | MW511754 | MW511794 |
| YIC3667 | MW511673 | MW511590 | MW511713 | MW528354 | MW511631 | MW511755 | MW511783 |
| YIC3886 | MW511671 | MW511589 | MW511712 | MW528353 | MW511630 | MW511756 | MW511795 |

**Table S4.** Taxonomy and *recA*, *dnaK*, *gyrB*, *rpoB*, *glnII* and MLSA similarities of intra-genospecies isolated in this study, and MLSA similarities between each haplotype with the related published species.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Representative strains | Similarities between haplotypes of intra-genospecies | | | | | | MLSA Similarities between haplotypes and related species | Definition of genospecies |
|  | recA | dnaK | gyrB | rpoB | glnII | MLSA |
| YIC1439, YIC1480, YIC1488, YIC1537, YIC1538 | 96.1-98.6% | 98.4-99.8% | 96.8-99.5% | 99.0-100% | 98.3-100% | 98.1-98.9% | 98.2-99.8%, *B. yuanmingense* CCBAU 10071T | *B. yuanmingense* |
| YIC3617 |  |  |  |  |  |  | 96.8%, *B. yuanmingense* CCBAU 10071T | *Bradyrhizobium* sp. I |
| YIC1913, YIC2281 | 97.6% | 99.3% | 100.0% | 99.4% | 97.6% | 98.8% | 96.3%, *B. yuanmingense* CCBAU 10071T | *Bradyrhizobium* sp. II |
| YIC2845 |  |  |  |  |  |  | 95.8%, *B. yuanmingense* CCBAU 10071T | *Bradyrhizobium* sp. III |
| YIC2326 |  |  |  |  |  |  | 99.4%, *B. daqingense* CCBAU 15774T | *B. daqingense* |
| YIC1438, YIC1445, YIC1477, YIC1484 | 96.8-99.5% | 99.1-99.8% | 97.9-99.7% | 99.0-100% | 94.5-99.3% | 98.2-99.7% | 97.9-99.0%, *B. liaoningense* USDA 3622T | *B. liaoningense* |
| YIC1919 |  |  |  |  |  |  | 95.6%, *B. liaoningense* USDA 3622T | *Bradyrhizobium* sp. IV |
| YIC1839, YIC2931 | 98.6% | 100.0% | 100.0% | 99.1% | 88.4% | 97.2% | 95.6-97.8%, *B. arachidis* CCBAU 051107T | *B. arachidis* |
| YIC1803, YIC1835 | 99.8% | 100.0% | 100.0% | 100.0% | 97.8% | 99.5% | 99.1-99.7%, *B. ottawaense* OO85T | *B. ottawaense* |
| YIC1741, YIC1840 | 99.1% | 98.4% | 92.4% | 99.1% | 99.0% | 97.6% | 96.8-96.9%, *B. japonicu*m LMG 6138T | *Bradyrhizobium* sp. V |
| YIC2820 |  |  |  |  |  |  | 96.3%, *B. lablabi* CCBAU 23086T | *Bradyrhizobium* sp. VI |
| YIC1859 |  |  |  |  |  |  | 97.5%, *B. lablabi* CCBAU 23086T | *B. lablabi* |
| YIC1466 |  |  |  |  |  |  | 96.2%, *B. elkanii* USDA 76T | *Bradyrhizobium* sp. VII |
| YIC1771 |  |  |  |  |  |  | 95.8%, *B. embrapense* SEMIA 6208T | *Bradyrhizobium* sp. VIII |
| YIC1983 |  |  |  |  |  |  | 96.2%, *B. embrapense* SEMIA 6208T | *Bradyrhizobium* sp. IX |
| YIC1805, YIC1970, YIC3174, YIC1926, YIC2861 | 95.5-99.5% | 98.9-100% | 99.0-100% | 98.9-99.6% | 99.5-100% | 98.7-99.7% | 98.8-99.4%, *B. elkanii* USDA 76T | *B. elkanii* |
| YIC1786, YIC3667, YIC1881, YIC3886 | 98.4-99.8% | 99.3-100% | 96.3-99.7% | 99.0-100% | 99.1-100% | 98.6-99.9% | 98.0-98.3%, *B. ferriligni* CCBAU 51502T | *B. ferriligni* |
| YIC1782, YIC1998, YIC1719, YIC2967 YIC1789, YIC1966 | 96.4-99.5% | 98.4-100% | 98.2-100% | 99.3-100% | 98.8-100% | 98.4-99.5% | 98.1-98.3%, *B. pachyrhizi* LMG 24246T | *B. pachyrhizi* |

**Table S5.** Different haplotype numbers were observed through analyses using different housekeeping gene sequences of 41 representative strains.

|  |  |
| --- | --- |
| Gene | Haplotype number |
| *recA* | 41 |
| *dnaK* | 34 |
| *glnII* | 33 |
| *gyrB* | 35 |
| *rpoB* | 35 |